Operational and Administrative Analysis
Dover Fire Department
Dover, Del.
Final Report – March 2016

FIRE/EMS OPERATIONS

CENTER FOR PUBLIC SAFETY MANAGEMENT

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

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International City/County Management Association (ICMA)

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

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

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

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

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

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

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Section 1. Executive Summary

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

During the study, CPSM analyzed performance data provided by the Dover Fire Department (DFD) and also examined firsthand the department's operations, including its working relationship with the Volunteer Association (formally the Robbins Hose Company No. 1), which provides fire protection in the community. Fire departments tend to deploy resources utilizing traditional approaches, which are rarely reviewed. To begin the review, project staff asked the city for certain documents, data, and information. The project staff used this information/data to familiarize themselves with the department's structure, assets, and operations. The provided information was also used in conjunction with information collected during an on-site visit to determine the existing performance of the department, and to compare that performance to national benchmarks. These benchmarks have been developed by organizations such as the National Fire Protection Association (NFPA), Center for Public Safety Excellence, Inc., (CPSE), and the ICMA Center for Performance Measurement.

Project staff conducted a site visit on **November 3-5, 2015** for the purpose of observing fire department and agency-connected support operations, interviewing key department staff, and reviewing preliminary data and operations. Telephone conference calls as well as e-mail exchanges were conducted between CPSM project management staff, the city, and the DFD so that CPSM staff could affirm the project scope, and elicit further discussion regarding this operational analysis.

DFD is a highly skilled and progressive organization that is composed almost entirely of volunteer personnel. The city and the volunteer personnel with whom CPSM interacted are truly interested in serving the city to the best of their abilities. One outstanding issue facing DFD is the interaction between the Volunteer Association and city government. Intertwined in this association is the working relationship with PrimeCare, the private ambulance transport provider contracted by the city to provide EMS transport. In addition, the collaboration between the fire and police dispatch centers is an integral component of ensuring the highest levels of protection. As service demands increase and DFD is required to provide increased response activities, the necessity for strong collaborations and seamless service delivery will also continue to expand. This workload and the potential for expanding call volume is not, however, insurmountable and CPSM will provide a series of observations and recommendations that we believe can allow DFD to become ***more efficient*** and ***smarter*** in the management of its emergency and nonemergency responsibilities.

Recommendations

The DFD provides an excellent and extremely cost-effective service to its citizens, visitors to the area, and local businesses. The department is well respected in the community and by city leadership. The City of Dover, the state capital, has maintained its relationship with the Volunteer Association (formally the Robbins Hose Company No. 1) since 1882. The working relationship observed between the city and the Volunteer Association is impressive and truly commendable.

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

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

Initial Phase Recommendations
The City of Dover should create a full-time position of Emergency Services Manager and transfer the day-to-day oversight of the fire department and the other closely related emergency services and support functions under this position. We recommend that this new position be a direct report to the City Manager.
The City of Dover and the Volunteer Association should enter into a contractual agreement that specifies the terms and conditions involved in the delivery of fire services.
The Emergency Services Manager should be assigned the administration of the contract with PrimeCare and should coordinate the emergency management activities for the City of Dover.
The City of Dover and the Volunteer Association should specify those city personnel policies that apply to members of the Volunteer Association and place these provisions in the service agreement.
The City of Dover should facilitate the development of a strategic plan for the Dover Fire Department which focuses on the department's long-term needs and anticipated service demands.

The Fire Chief and/or the duty officer, when dispatched to an incident, should respond with their assigned command vehicle to the incident scene and assume the role of incident commander.
The DFD should standardize its response to a single unit to automatic fire alarm soundings and other nonemergency situations (when these are unconfirmed as a true emergency).
The DFD should limit its fleet of primary response apparatus to three engines, one ladder truck, and two command vehicles.
The DFD should build at least a portion of its training regimens and tactical strategies around the exterior or transitional attack when the fire scenario and the number of responding personnel warrant this approach.
The DFD should work with the Dover 911 Police Communications Center in an effort to classify and dispatch fire calls into emergency and nonemergency response categories.
The DFD should modify its response protocols in an effort to reduce the number of units responding to those calls that are screened sufficiently to determine that they are nonemergency in nature.
The DFD should institute a unified incident and activity reporting system for emergency response and other support activities carried out by all personnel.
Dover should request from ISO a reevaluation of its August 2015 review after making adjustments in its fire hydrant testing procedures and the transfer of fire dispatching to Kent County.
The City of Dover should include a requirement for residential fire sprinklers when it adopts the 2015 International Code Council International Fire Code.
The Dover Fire Department should require all new firefighters to meet the training qualifications of the National Fire Protection Association (NFPA) Standard 1001, *Standard for Firefighter Professional Qualifications for Firefighter I and II*.
The DFD training program should be revised in order to schedule weekly training meetings and drills throughout the year.
The DFD should revise the ongoing training requirements for all active members (including life-members) to ensure that skills and proficiency training is carried out to sufficiently ensure firefighter readiness and safety.

Second Phase Implementation
The City of Dover should reorganize the structure of fire department operations so that the supervision and management of the Dover Fire Department is unified and under the direction of the City Manager.
The city Fire Marshal and Fire Inspectors (Deputy Fire Marshals), along with fire code enforcement, plans review, and fire inspection duties, should be assigned under the supervision of the Emergency Services Manager.
All officer positions, including Captain, Assistant Fire Chief, Deputy Fire Chief, and Fire Chief, should be filled on the basis of firefighting/emergency services training, certifications, and experience, along with successful completion of a formal, openly competitive assessment process, including a practical skills evaluation.
The City of Dover should reassign the dispatching function at the Dover Fire Department and move all fire dispatching to the Kent County 911 Dispatch Center.
The City of Dover should reduce the number of full-time dispatchers from five to two, reclassify this position to a Fire Technician designation, and eliminate the Fire Chief's Assistant position.
The City of Dover, through the Emergency Services Manager, should review all selection, promotional, and personnel issues carried out by the Volunteer Association in order to ensure compliance with city regulations, and state and federal guidelines.
The City of Dover should revisit its current prohibition of allowing employees to respond as volunteer firefighters without docking their pay or requiring utilization of leave time.
The DFD should conduct a formal fire risk analysis that concentrates on its downtown areas, high-rise structures, and manufacturing and institutional occupancies.
The City of Dover should adopt an apparatus replacement schedule to serve as a guide for the financial planning and replacement of fire apparatus.
The City of Dover should adopt an apparatus replacement program that allocates annual funding that is earmarked for future apparatus purchases.
The city, under the direction of the new Emergency Service Manager, should be responsible for fleet maintenance and vehicle acquisition for the Dover Fire Department.
The DFD should undertake a concerted effort to develop a comprehensive set of performance measures that monitors its system performance and system outcomes. The process of developing these measures should utilize input from DFD members, the community, elected officials, and city administrators.

DFD should expand the responsibilities of the Fire Technician position to include inspection and code enforcement, including the prefire planning of key occupancies.
The Dover Fire Department should mandate that all officers participate in additional officer-related training each year in order to be eligible to retain their positions.
Dover should consider the re-assignment of the Fire Marshal's Office and its fire code enforcement duties under the Fire Department's Emergency Services Manager.
The DFD should develop an annual training budget that identifies the needed training for its membership and the associated costs for each element of the training program.
Under the direction of the Emergency Services Manager, the DFD should form a committee comprised of a cross-section of the department's membership to develop standard operating guidelines (SOGs).
The City of Dover should ensure that all Fire Department personnel are familiar with applicable city policies and that these are included in the annual training curriculum.
The City of Dover should ensure that the hazard mitigation efforts of Kent County are aligned with the needs of the city and should identify those key infrastructure and public outreach efforts necessary to protect all city residents.
The City of Dover should transfer its fire dispatching duties to the Kent County 911 Communications Center.

Third Phase Implementation
The city should consider the relocation of all Fire Department operations, including Fire Code Inspections/Enforcement, EMS transport, and the emergency management functions, to the main fire station at 103 S. Governors Ave.
The City of Dover should integrate its community risk analysis and hazard mitigation efforts with Kent County.
The DFD should conduct a formal Standards of Response Coverage analysis under the guidelines of the Commission on Fire Accreditation International (CFAI)
The DFD should develop a comprehensive, department-wide risk management plan as recommended in NFPA 1500.

The DFD should make it a priority to establish a formal pre-incident planning program with the goal of having an up-to-date preplan for every business and commercial occupancy (including schools, churches, etc.) within its response area.
The City of Dover should revise its performance criteria in future contracts with the ambulance provider, with specific guidelines relating to unit availability, turnout time, and overall response time, measured at the 90 percent fractile rates.
The City of Dover should amend its future ambulance contract to require that all ambulances operating within the city be staffed with a minimum of two (2) EMTs.
At the close of the current contract with PrimeCare, the City of Dover should consider issuing a national RFP for an ambulance provider for the city service area.
The city should consider the housing and deployment of ambulance units from the Dover fire stations.
The Dover Fire Department should consider CPSE accreditation in the future.
Personnel seeking to become an officer should be required to start at the rank of captain and serve in each successive rank for a minimum period of time before seeking a higher office.
The City of Dover should develop Continuity of Operations Plans (COOP) for each department and align these plans with an overall Continuity of Government Plan.

Section 2. Scope of Project

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

Key areas evaluated during this study include:

- Fire department response times (using data from the city's computer-aided dispatch system and the city's records management system).
- Deployment and staffing.
- Organizational structure and managerial oversight.
- Fire and EMS unit workloads.
- DFD support functions (training, fire prevention/code enforcement/911 dispatch).
- Essential DFD facilities, equipment, and resources.
- Budget and financial accountability.

Section 3. Organization and Management

Governance and Administration

The City of Dover is located in Kent County in central Delaware. It is the capital City of Delaware, a distinction it has held continuously since 1781. It is also the county seat of Kent County. The city is the host to Dover Air Force base and is home to Delaware State University, Wesley College, Wilmington University, Delaware Technical and Community College, and Dover Downs International Speedway. Dover is approximately ninety (90) miles south of Philadelphia, Penn.; fifty-three (53) miles south of Wilmington, Del.; and ninety (90) miles east of Washington, D.C. The city is one of only four (4) state capitals not served by an Interstate highway. Its primary highway connection is Delaware Route 1, a limited access toll road that connects the city to points north and south.

According to the U.S. Census Bureau, Dover had an official 2010 population of 36,047 and an estimated July 2014 population of 37,355,[1] making it the second-most populous city in the state. The city encompasses an area of 23.15 square miles, and has a population density of 1,557 persons per square mile.[2] While its population is significantly less than that of Wilmington, Dover encompasses a larger area than any other city on the Delmarva Peninsula.[3] In contrast to most major cities in the Northeast United States, Dover is continuing to grow economically, in population, and in land area.[4] The city's major employers are the State of Delaware, Dover Air Force Base, BayHealth/Kent General Hospital, Dover Downs, and the institutions of higher learning.[5] There are also several manufacturing facilities, each with more than 390 employees.[6] Retail sales are also cumulatively a major source of employment.

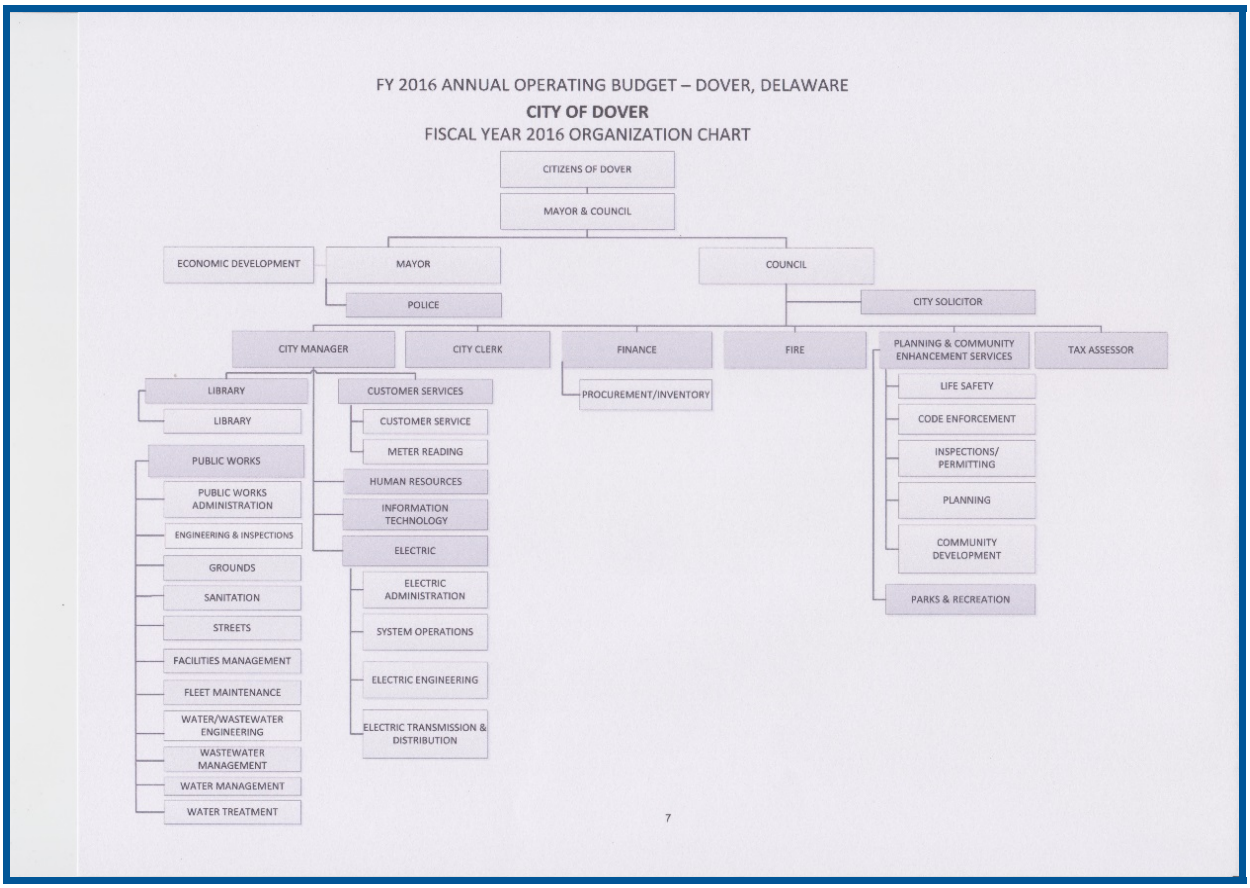
Dover operates under a hybrid form of municipal government utilizing a modified council-city manager system. The governing body is composed of a full-time Mayor and nine (9) part-time council members. Two (2) members of the council are chosen from each of the city's four (4) council districts; the ninth member of council is elected at large, as is the Mayor. All elections are nonpartisan. The Mayor and members of Council serve staggered terms of four (4) years. The City Council annually elects one (1) of its members to serve as the Council President. Together, the Mayor and City Council are the collective legislative and policy-making branch of the government.

The City Council appoints the City Manager, Tax Assessor, City Clerk, City Controller, City Solicitor, and City Planner, all of whom report directly to the Council. The Volunteer Association (Robbins Hose Company), which by city charter provides fire protection to the city, elects its Fire Chief and other officers subject to approval by the Council. The Fire Chief also reports to the City Council. The

[1] http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml, December 14, 2015
[2] http://quickfacts.census.gov/qfd/states/10/1021200.html, December 14, 2015
[3] City of Dover, Delaware web site, December 14, 2015
[4] City of Dover, Delaware web site, December 14, 2015
[5] https://imageserv11.team-logic.com/mediaLibrary/134/Kent_County_Major_Employers_2010_1.pdf, December 14, 2015
[6] https://imageserv11.team-logic.com/mediaLibrary/134/Kent_County_Major_Employers_2010_1.pdf, December 14, 2015

Mayor, whom the city charter identifies as the city's CEO, appoints the Police Chief, who reports directly to him/her. Per the charter, the City Manager is the chief administrative officer and provides financial oversight; however, as was noted, the finance officer is appointed by, and reports directly to, the council. The manager oversees public works, human resources, electric, information technology, customer services, and the library.

FIGURE 3-1: City of Dover FY 2016 Organizational Chart



In most communities with a council/manager form of government the City Manager is responsible for the day-to-day administration and operations of the city while the elected officials are responsible for policy direction and fiscal oversight. In Dover's hybrid system the manager has limited control of city operations. The Mayor and City Council both have appointment powers and direct supervision over a significant portion of the city's day-to-day operations. In the case of the Fire Department, CPSM has observed that the current oversight of operations appears disjointed. The Fire Chief and line officers are elected by the Volunteer Association membership and the election results are confirmed by City Council. Budgetary oversight and personnel matters are under the supervision of the City Manager; however, the Leadership of the Volunteer Association maintains significant oversight of Fire Department operations.

The Volunteer Association, as a separate entity, functions independent of municipal operations and the Association's structure of organization, training, selection processes, and disciplinary practices

are not under the purview of either the city's elected officials or the City Manager. There are, however, several city employees who are employed by the fire department (Dispatchers and the Assistant to the Fire Chief) who operate under city personnel policies and fall under the supervision of the City Manager. Fire Inspectors who are responsible for enforcing fire code and life safety permitting processes are also city employees, but they work under the supervision of the Director of Planning and Community Services. We believe that this overly complex arrangement creates the very real potential for ambiguous or conflicting direction. Revisions should be considered.

Recommendation: The City of Dover should reorganize the structure of fire department operations so that the supervision and management of the Dover Fire Department is unified and under the direction of the City Manager.

Compounding this management issue is the fact that the Fire Chief is elected on an annual basis by the Volunteer Association and then approved by the City Council. He/she has direct control and oversight of the department's field operations. Since the Fire Chief is elected on an annual basis there is the possibility for a lack of continuity in management and administrative oversight of the department. In addition, there are no specific qualifications, training, or supervisory experience required to be selected Fire Chief.

The City of Dover provides significant annual funding for the operation of the Fire Department and provides annual payments to the Volunteer Association. The duties for operating and managing the various functions of the Fire Department are extensive and the impacts of these decisions create significant liabilities for the city. These liabilities are in the areas involving workplace issues, discrimination, and disparate treatment with regard to age, gender, nepotism, race, or ethnicity. In addition, there are broad financial components of this oversight that require transparency, equal access, and proper accounting practices. Our analysis did not reveal any illegal or unethical practices; however, there is concern that improved oversight is warranted.

Recommendation: The City of Dover should create a full-time position of Emergency Services Manager and transfer the day-to-day oversight of the fire department and the other closely related emergency services and support functions under this position. We recommend that this new position be a direct report to the City Manager.

The duties and responsibilities of the Emergency Services Manager will be significant, with the oversight of the fire department, emergency management, EMS, fire prevention, public education, fleet maintenance, and capital planning. However, the primary objective would be to manage and administer the relationship between the Volunteer Association and its interaction with the City of Dover.

In 2009, a report by the public accounting and management firm of Haggerty and Haggerty was commissioned by City Council. In the report a number of findings and recommendations were made regarding improved oversight of the Fire Department. Ultimately, a joint committee composed of City of Dover and representatives of the Volunteer Association negotiated a nine-point agreement

that addressed financial issues and the overall working relationship between the two parties. In our interviews with various stakeholders there was a wide divergence of opinion on whether this agreement resolved the various concerns, and if the agreement is still being adhered to. It is apparent, however, from CPSM's perspective that a formal, written agreement is warranted. This agreement should specify the terms and conditions around which the city and the Volunteer Association should operate jointly in providing fire services.

Recommendation: The City of Dover and the Volunteer Association should enter into a contractual agreement that specifies the terms and conditions involved in the delivery of fire services.

CPSM believes that this agreement should be fully encompassing and should provide detailed guidance in the working relationship between the city and the Volunteer Association. We further recommend that the newly appointed Emergency Services Manager be responsible for the administration of this agreement and be the direct point of contact between the city and Volunteer Association. We would recommend the following components be defined in this agreement:

- Relationship between the city and the Volunteer Association.
- Annual budget allocations and reporting requirements.
- Reporting relationship between the Fire Chief and the Emergency Services Manager.
- Minimum training and selection criteria for new volunteer personnel.
- Professional qualifications, promotional processes, and on-going training requirements for existing volunteers.
- Safety practices, safety equipment, and PPE.
- Deployment, emergency response, and on-scene operational practices.
- Incident reporting and other report requirements.
- The management of the fire department apparatus, including purchasing, maintenance, and ownership.
- Use of fire facilities and associated rental charges.
- Working relationship with PrimeCare.
- Working relationship with Kent County.
- Service response designation and relationship with mutual aid responders.

Included in this agreement should be the delineation of the responsibilities of the Emergency Services Manager and his/her relationship with the Volunteer Association in the delivery of services. This would include:

- Managing the day-to-day administrative operations of the fire department and providing the Fire Chief with additional operational support when needed

    - The Fire Chief, as chosen by the membership of the Volunteer Association, would retain the responsibility for emergency scene management and incident control; however, he/she would report directly to the Emergency Services Manager.
- Overseeing EMS operations and managing the EMS contract.
- Overseeing the operations of the Fire Marshal's office.
- Serving as the OEM coordinator, or, at a minimum, overseeing the OEM function and its operations.
- Managing the Fire Department fleet.
- Ensuring adherence to training requirements and recordkeeping.
- Reviewing incident reports and following up on incomplete or inaccurate reporting.
- Maintaining proper workplace behavior and the supervision of fire department employees.
- Maintaining financial records.
- Long- and short-term planning for Fire Department operations, facilities, and equipment.

Emergency medical transport in the city is provided, under contract, by a private third-party entity. The current provider is PrimeCare Medical Transport. The PrimeCare contract is administered by the city's Coordinator of Public Affairs. This individual also has oversight of the city's Office of Emergency Management functions. CPSM believes that both the administration of the EMS contract with PrimeCare and the oversight of the city's emergency management activities should fall under the duties assigned to the Emergency Services Manager.

Recommendation: The Emergency Services Manager should be assigned the administration of the contract with PrimeCare and should coordinate the emergency management activities for the City of Dover.

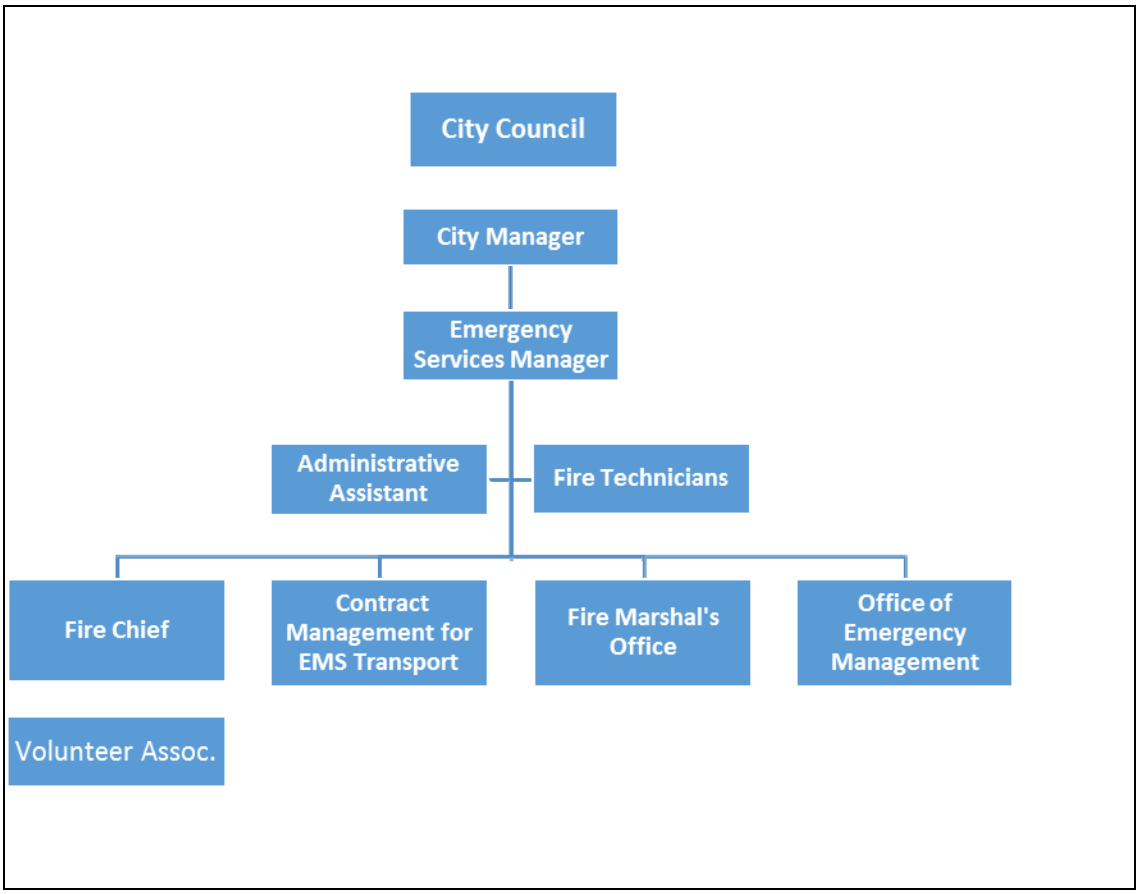
The Coordinator for Public Affairs has managed the city's responsibilities involving PrimeCare and emergency management in a very professional and proficient manner. It is strongly recommended that this individual work closely with the Emergency Services Manager in transitioning these duties. CPSM also recommends that this individual continue to play an active role in both activities and possibly assume an alternate or deputy manager status in these key duties.

The Fire Marshal's office is currently located in the Planning and Community Development Department. CPSM believes that this is a Fire Department function and should fall under the purview of the new Emergency Services Manager. It is important, however, that the Fire Marshal's duties continue to have close ties and coordination with the Planning and Community Development Department.

Recommendation: The city Fire Marshal and Fire Inspectors (Deputy Fire Marshals), along with fire code enforcement, plans review, and fire inspection duties, should be assigned under the supervision of the Emergency Services Manager.

As noted above, the current appointment of key fire officials (Fire Chief and Fire Marshal) requires approval by the Dover City Council. Under the proposed restructuring we are not recommending that these changes modify the current City Charter provisions that guide this oversight. Instead CPSM recommends that the City Manager be involved and develop his/her recommendations in these key areas of oversight, which then are presented to City Council for approval. This would include the recommended appointment of Fire Chief and Fire Marshal. In addition, the City Manager would negotiate the agreements and their respective stipulations with both the Volunteer Association and PrimeCare and present these recommendations to City Council for approval. However, once approval is achieved, it then becomes the responsibility of the City Manager and the Emergency Services Manager to administer these agreements in accordance with the direction of the city council.

FIGURE 3-2: Proposed Fire Department Organizational Structure



In addition to the revisions in the organizational structure of the Fire Department and associated support activities, CPSM believes that it is also beneficial to house all fire department operations at a central location in the main fire station. We propose that those personnel operating from this location include: the Emergency Services Manager, the Fire Marshal, Fire Inspectors, Fire Technicians, and other support personnel. This will require Volunteer Association approval and agreement regarding the stipulations involving space allocation, building maintenance, utilities, and rental charges. We believe that the proposed service agreement between the city and the Volunteer

Association is the best mechanism to negotiate these terms and should be built into the written agreement. CPSM also recommends that PrimeCare operations be moved to the main fire station. This will facilitate a closer alignment between the Fire Department and PrimeCare and will provide the ability for direct oversight of PrimeCare activities by the Emergency Services Manager.

> ***Recommendation: The city should consider the relocation of all fire department operations, including Fire Code Inspections/Enforcement, EMS transport, and the emergency management functions to the main fire station at 103 S. Governors Ave.***

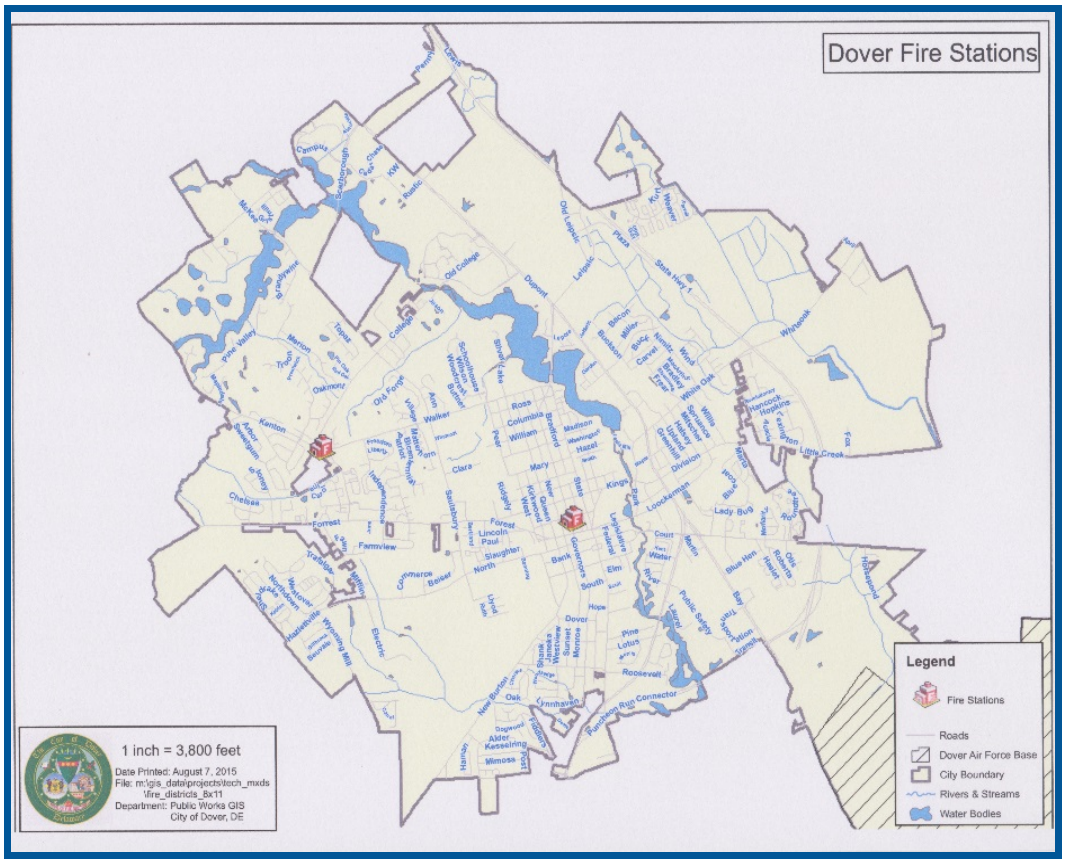
As the city and the Volunteer Association move toward a closer alignment of their working relationship, it is critical that all fire department activities are housed at a common location. The regular movement of personnel in an out of this structure will identify the structure as a fully operational government facility and this will assist in maintaining the security at this location. In addition, this very large structure provides ample space to host Fire Department administrative services, Volunteer Association activities, an EMS dormitory, and apparatus space. This facility also provides opportunities to house and operate the city's Emergency Operations Center when needed.

Dover Fire Department

The Dover Fire Department is operated and staffed by the Volunteer Association (formally the Robbins Hose Company No. 1). The designation of Robbins Hose Company as the city's official fire company is specified in the city charter and the city code. The Volunteer Association is an autonomous organization, and provides fire protection and emergency response within the corporate limits of the City of Dover along with some contiguous areas of Kent County.

DFD Station 1 is located at 103 S. Governors Ave. in downtown Dover. Engines 4, 6, and 7, Ladder 2, Rescue 1, Brush 9, and Marine 1 are deployed from this station. This facility also houses the Volunteer Association's administrative offices, a fire dispatch center, meeting areas, and a fire museum. Station 2 is located at 911 Kenton Rd., and houses Engines 2 and 3, Ladder 1, Utility 1, and a foam trailer. Members of the Volunteer Association generally respond to the station nearest their residence. The location of the city's fire stations and the municipal boundaries are illustrated in Figure 3-3.

FIGURE 3-3: City of Dover Map with Fire Station Locations



All members of the DFD are volunteer. The department's membership roll shows an active roster of approximately eighty (80) personnel. As with most volunteer organizations, the number of active volunteers continually fluctuates as new members join while other leave or move on. The Volunteer Association has been showing a net gain in its active members of approximately five (5) to six (6) new members annually. Based on our experience studying departments across the country, we can say that the city is fortunate to have a very healthy volunteer organization that appears to be effective in its recruitment and retention efforts.

The City employs five (5) full-time Fire Dispatchers, and several part-time dispatchers (alternates), who provide dispatch and communications services for the department. There is one (1) dispatcher on duty at Station 1 at all times. Dispatchers at Station 1 work a rotating schedule that consists of four (4) days on followed by three (3) days off. One (1) full-time dispatcher is also assigned at Station 2 and works four (4) ten (10)-hour days. This individual may move to Station-1 as a fill-in if one of the other dispatchers is on leave. The part-time dispatchers are utilized to fill in as necessary. The city also employs a Fire Chief's Assistant who provides administrative and noncombat operational support to the Fire Chief. This person in essence handles the day-to-day administrative needs of the department. While the position has traditionally been full time, at the time of our assessment it was only being filled on a part-time basis of twenty-nine (29) hours per week. The

Fire Chief's Assistant is designated as the supervisor for the Fire Dispatchers, though these personnel often receive work assignments and direction from volunteer personnel.

Robbins Hose Company No. 1

The Robbins Hose Company was organized as a volunteer fire company in November 1882 by seventeen citizens of Dover. The company was granted an act of incorporation by the Delaware Legislature on January 25, 1883. The company has remained the sole firefighting force for the city ever since and this relationship has been designated in both the city charter and city codes. Despite trends nationwide that have strained the ability of the volunteer fire service to protect larger communities, the Dover Fire Department has remained fully volunteer for 132 years. In fact, the city and company pride themselves on being the only state capital that is protected by a fully volunteer fire department. Although today the company is more often referred to simply as the Dover Fire Department, the traditional fire company structure which is part of its heritage is still very active in all facets of its operations.

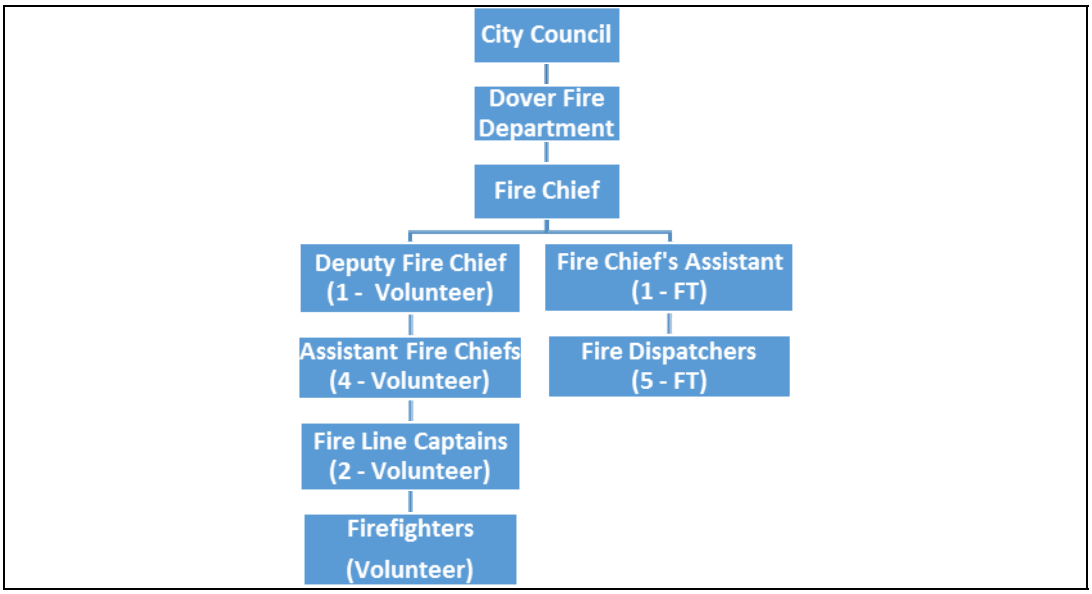
The business aspects of the fire company are overseen by a nine (9)-member board of directors whose members are elected by the company membership. On the administrative side of the company the membership also elects a fire company president (who also serves as an ex-officio member of the board), vice president, secretary, treasurer, and three (3) trustees. The trustees serve two-year (2) terms while the remainder of the officers serve one-year (1) terms. The company membership also directly votes for the members of the apparatus and maintenance committee, the rules committee, fund drive committee, and the fire recorder. There are also twenty-four (24) various committees whose members are appointed by the fire company president.

On the operations side the fire company membership elects the Fire Chief, Deputy Fire Chief, four (4) Assistant Fire Chiefs, and two (2) fire line Captains. All of these personnel also serve one-year (1) terms. As with many volunteer fire companies the administrative/social officers and board of directors and trustees, while not directly involved in emergency operations, wield significant influence and control over all aspects of the company's operations. Ultimately, if there was a major disagreement between the Fire Chief and the company President, the company President's decision would prevail.

Organizational Structure

The Dover Fire Department utilizes a traditional, although rather linear, organizational structure. The department is led by a Fire Chief who is an active responder. He is assisted by a Deputy Fire Chief who serves as the second in command and in charge of fire suppression operations. There are four (4) Assistant Chiefs, first assistant through fourth assistant, and two (2) fire line Captains. Personnel who are certified as Firefighter III are deemed to be qualified to serve as an officer on apparatus. The hierarchical relationships and the job functions encompassed in this structure does not appear to be well defined and it was difficult to determine any differences in assignments or responsibilities among chief officers and company officers.

FIGURE 3-4: Dover Fire Department FY 2015 Organizational Chart



All officers are elected annually by the membership of the department. There is not a promotional process to determine if the personnel being nominated through the company's election process are qualified to hold their respective positions. Officers are only required to have completed the four mandatory training classes that are required to receive the Class III Fire Fighter grade. Officers are not required to possess or demonstrate any skills in advanced firefighting tactics, knowledge of building construction, fire codes, code enforcement, fire pump practices, operational scene management, incident command, or firefighter safety. There is no requirement that personnel have a progression in their assignments, nor have previous experience as an advanced firefighter, company officer, or chief officer. Most of those personnel who serve as officers were simply recruited by others to run for a position to which they were ultimately elected.

> ***Recommendation: All officer positions, including Captain, Assistant Fire Chief, Deputy Fire Chief, and Fire Chief, should be filled on the basis of firefighting/ emergency services training, certifications, and experience, along with successful completion of a formal, openly competitive assessment process, including a practical skills evaluation.***

CPSM believes that the testing and selection process for the various ranked positions within the Fire Department's organizational structure is the responsibility of the Volunteer Association to manage. It is necessary, however, to include in the contractual agreement between the city and the Volunteer Association specific language that requires the Association to make these selections through an openly competitive testing processes that utilizes nationally recognized skills requirements and experience for the affected positions. The contract should also provide the city with the ability to review these processes and that detailed recordkeeping be kept regarding these selections.

As was previously noted, the City of Dover employs five (5) full-time and several part-time fire dispatchers who are assigned to work at the fire department. This dispatchers work in tandem with the city's 911 Police Dispatch Center; when a fire call is received by the 911 center it is passed to the fire dispatch center, which sends out a page to the volunteers and monitors the response and on-scene communications involving fire department personnel. However, the primary workload for the fire dispatchers is the maintenance of vehicles and station equipment along with the custodial duties for the two fire stations. CPSM believes that the assignment of duties for Fire Dispatchers is justified and appears effective. The Fire Dispatchers are charged with keeping the equipment and vehicles in a full state of readiness. They clean the facilities and provide general maintenance on the vehicles and equipment. This allows the volunteers to respond to incidents and focus on training and skills development. During fire calls the dispatcher supports scene activities via radio communications and coordinates personnel deployment. The current arrangement is not, however, the most efficient utilization of these personnel and CPSM recommends that this arrangement be modified.

Recommendation: The City of Dover should reassign the dispatching function at the Dover Fire Department and move this dispatching function to the Kent County 911 Dispatch Center.

The current dispatch operations provided by the Dover Fire Department appear redundant and inefficient. The same service can be provided by Kent County from a much more technologically advanced center, with professionally trained personnel. By using a single center to process calls, CPSM believes that this will reduce the number of times calls are transferred between agencies and will expedite the emergency response process. The Kent Center is modern and well-staffed and more technologically advanced than either the city's police or fire communications centers. The Kent Center is located in the City of Dover, which would enable direct interaction with managerial and line officers when needed. This center currently dispatches all other volunteer companies in the county, along with PrimeCare. The center has the ability to screen calls and prioritize the assignment of units to best match the nature of the call. The center also monitors all radio traffic for PrimeCare and other Mutual Aid Companies in the area. County officials with whom we spoke indicated that ***the 911 service is available to the city at no charge.*** The current workload anticipated with a move of fire dispatching services into the Kent Center could be handled without the need for additional personnel or equipment.

The city is currently expending in excess of $400,000 annually in personnel costs for the Fire Dispatchers and the part-time Fire Chief's Assistant. CPSM believes that by restructuring the organization of the Fire Department, moving dispatch operations to Kent County, reducing the number of Fire Dispatchers to two (2) full-time positions, and eliminating the Fire Chief's Assistant, there would be sufficient savings to fund the full-time Emergency Services Manager and a full-time administrative support position.

Recommendation: The City of Dover should reduce the number of full-time dispatchers from five (5) to two (2), reclassify this position to a Fire Technician designation, and eliminate the Fire Chief's Assistant position.

TABLE 3-1: Comparison of Personnel Costs

Current DFD Personnel Costs*			Proposed DFD Personnel Costs
Five (5) Dispatchers & Alternates, Fire Chief's Asst.-Salary & Benefits	$409,800		
		$80,000	1-Emergency Services Manager
		$33,000	1-Administrative Assistant
		$90,000	2-Fire Technicians
		$20,000	Fire Technicians/Alternates/OT
		$99,904	Employee Benefits (@44.8%)
TOTALS	**$409,800**	**$322,904**	

*Note: Does not include any payments to the Volunteer Association or for Fire Prevention staff.

When reclassifying the position of Fire Dispatcher to Fire Technician, CPSM proposes to eliminate the dispatching duties for these personnel and to expand their role in support of volunteer operations. Their primary jobs will continue to be the maintenance of fire apparatus, equipment, and fire station facilities and grounds. It is proposed that the two (2) full-time Fire Techs work four 10-hour days so that one (1) fire technician is on duty every day of the seven (7)-day week and on one (1) day each week, two (2)would be scheduled to work. In addition, CPSM proposes that $20,000 in additional funding be available to maintain alternates who would cover for the Fire Technicians during scheduled absences or to supplement staffing during higher workload periods, special events, training, etc. However, with the elimination of the dispatching duties, the Fire Techs can support the Fire Marshal's office in developing detailed preplans on target hazards and other commercial, industrial, and multifamily residential occupancies throughout the city. They will be responsible for producing these documents into viable prefire planning documents that would be available to responding personnel and kept on the apparatus. In addition, they could be involved in the training of these materials to the volunteer personnel during weekly training session. CPSM does not believe the new role of Fire Technician is a 24/7 operation, but instead can be accomplished on a modified 40-hour schedule with two (2) full-time positions and alternative support. We propose that the Fire Tech position be placed under the supervision of the Emergency Services Manager to assist the Emergency Services Manager in various duties involved in the oversight of fire department operations.

The Fire Chief's Assistant is responsible for many of the administrative duties within the fire department. By creating the Emergency Services Manager and the Administrative Assistant positions, the duties of the Chief's Assistant duties will be assumed by these new positions and this will eliminate the need for the Fire Chief's Assistant position.

Personnel Management/Rank Structure

Fire Department rules, regulations, and procedures should work in tandem with and be consistent with the overarching ordinances, rules, regulations, and policies that have been adopted by the City of Dover. Though volunteer personnel are not employees of the city, they operate under the authority and supervision of city government. As such, employee workplace policies involving

discrimination, sexual harassment, utilization of government funds for purchasing, freedom of information, Internet and computer usage (including social media), and smoking (on city premises or in vehicles) are typically guided by the governing body and applied across-the-board to all employees, including volunteer members. The city should provide training and familiarization concerning these policies and the supervisory oversight to ensure that these policies are being followed.

Recommendation: The City of Dover and the Volunteer Association should specify those city personnel policies that apply to members of the Volunteer Association and include these provisions in the service agreement.

CPSM recommends that a clear delineation of those city personnel policies that apply to the members of the Volunteer Association be communicated in writing. It should be the responsibility of the Emergency Services Manager in collaboration with the Fire Chief to supervise this effort.

The Volunteer Association also has a personnel committee. The committee is primarily responsible for processing applications for new volunteer members of the association. Once an application is received the chairperson of the committee performs a background check on the applicant; however, they are not fingerprinted to determine if there is a criminal history, which is a state requirement. The applicant is then sent for a medical evaluation and drug testing. The Volunteer Association has recently added a social media review component to the screening process. If the potential member successfully passes all screening, the chairperson and three additional members interview the candidate. This is a commendable effort for a volunteer organization, and which CPSM considers a best practice. Once the candidate is accepted into membership in the Volunteer Association they are assigned to the orientation officer to initiate and oversee their training.

The Volunteer Association has an internal affairs committee comprised of the President, Vice President, and Fire Chief. Other members can be appointed as necessary. The committee is tasked with investigating complaints or allegations of wrongdoing against members and recommending appropriate disciplinary action. Though these processes are valid and intended to provide the necessary oversight of the selection process and performance issues, CPSM believes that a governmental review of these activities is warranted.

Recommendation: The City of Dover, through the Emergency Services Manager, should review all selection, promotional, and personnel issues carried out by the Volunteer Association to ensure compliance with city regulations, and state and federal guidelines.

CPSM realizes that there is separation between city government and the inner workings of the Volunteer Association. However, it is incumbent upon the city to ensure that the actions of the Volunteer Association are in compliance with local, state, and federal guidelines. It should be the primary responsibility of the Emergency Services Manager in conjunction with the Fire Chief to make sure that this oversight takes place and that proper recordkeeping is maintained.

Under current city policy, employees are not permitted to respond as part of the Volunteer Association without taking personal leave for any working hours missed. Employees are permitted to be members of the Association, but are restricted in their ability to respond to emergencies. CPSM believes that there are a number of employees who have a desire to participate fully and should be permitted to do so. There is always a needed balance that must be maintained when employees assume secondary roles apart from their primary employment duties. Clear guidelines must be provided as to when it is appropriate to respond to emergencies and when it is not. In addition, worker's compensation issues may arise if an employee is injured or loses time from their primary work responsibilities because of injuries sustained in a volunteer firefighting status. In addition, the city and the employee must establish an overtime exclusion for those volunteer activities that may take place after the employee's normal working hours. Notwithstanding these considerations, CPSM believes that the city should discontinue the limitation on releasing employees who are active firefighter volunteers for responding to emergencies during business hours.

> ***Recommendation: The City of Dover should revisit its current prohibition on allowing employees to respond as volunteer firefighters without docking their pay or requiring utilization of leave time in providing this service.***

The key to a vibrant and competent volunteer fire service is directly related to its ability to recruit and maintain a viable complement of personnel. Dover has been fortunate in its recruiting effort but as national trending indicates, this capacity will be tested in the years ahead. There must always be a balance in regulating the abilities of employees to maintain dual roles and this is particularly difficult when the additional duties involve emergency response. Good communications between the employee and their supervisor regarding when it is appropriate to respond and when it is not is essential. There must be an ability to train and to participate in fire department activities without a financial hardship or reduction in leave time. Similarly, the employee must understand the limitations involved in this effort and that the ultimate priority is their primary work. The process must be guided by written policy and good common sense. Ultimately the number of participants will not be significant; however, CPSM believes that the expansion of the talent pool will have far more beneficial impacts than complications.

Section 4. Analysis and Planning Approaches

Community Risk Analysis

In an effort to reduce the nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) to provide new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for state and local entities to closely coordinate mitigation planning and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP) and the Pre-Disaster Mitigation (PDM) program, both of which are administered by the Federal Emergency Management Agency (FEMA). Communities with an adopted and federally approved hazard mitigation plan thereby become prepositioned and more apt to receive available mitigation funds before and after the next disaster strikes.

In 2015, the Kent County Department of Public Safety, Emergency Management Division, facilitated an update to the Kent County Multi-Jurisdictional Hazard Mitigation Plan, which includes the City of Dover. Kent County is vulnerable to a wide range of natural hazards, including flooding, drought, tropical storms and hurricanes, and winter storms. It is also vulnerable to a variety of human-caused hazards, including chemical releases, spills, or explosions associated with the fixed storage or mobile transport of hazardous materials. These hazards threaten the life and safety of county residents, and have the potential to damage or destroy both public and private property and disrupt the local economy and overall quality of life.[7]

The 2015 Plan Update was conducted in coordination with the Federal Emergency Management Agency (FEMA) and the Delaware Emergency Management Agency (DEMA) to ensure that it meets all applicable DMA 2000 planning requirements. A Local Mitigation Plan Review Tool, included in the Plan Update, provides a summary of FEMA's current minimum standards of acceptability and notes the location within the plan where each planning requirement is met.

> ***Recommendation: The City of Dover should integrate its community risk analysis and hazard mitigation efforts with Kent County.***

Strategic Planning/Long-Range Planning

The development of a comprehensive fire protection and prevention strategic plan involves three key steps:

- ***First:*** To generate an assumption of what the community will look like at the end of the planning process.

[7] Kent County Multi-Jurisdictional Hazard Mitigation Plan, 2015 Update (Draft)

- ***Second***: The department needs to assess realistically the strengths and weaknesses of the existing fire protection system to include codes, standards, and ordinances relating to fire prevention efforts, public safety education programs, and emergency response capability.
- ***Third:*** To project the needed capabilities and capacity of the fire protection system and its fire department component as the community changes.

This process helps to ensure that an adequate level of resources, including staffing and equipment, are allocated to meet the community's needs for the services delivered by the Fire Department as efficiently as possible. A strategic plan also assists the department in matching resources with available revenues.

Defining clear goals and objectives for any organization through a formal strategic planning document establishes a resource that any member of the organization, or those external to the organization, can view and determine in what direction the organization is heading, and as well as how the organization is planning to get there.

In a strategic plan, it is essential that clear and achievable goals and objectives for each program area are developed. Each program area must then (1) define its goals; (2) translate the goals into measurable indicators of goal achievement; (3) collect data on the indicators for those who have utilized the program; and (4) compare the data on program participants and controls in terms of goal criteria. Objectives should be SMART, an acronym that stands for **s**pecific, **m**easurable, **a**mbitious/attainable, **r**ealistic, and **t**ime-bound. Additionally, these goals should link back to fiscal planning goals.

The Dover Fire Department does not have a comprehensive strategic plan that focuses on the future, provides clear departmental direction, and defines resources that support the strategy for fire protection.

> ***Recommendation: The City of Dover should facilitate the development of a strategic plan for the Dover Fire Department that focuses on the department's long-term needs and anticipated service demands.***

Standards of Cover

A Standards of Cover is a document that is fully compliant with industry best practices in the field of deployment analysis. The evaluation and analysis of data is based on nationally recognized guidelines and criteria, including recognized National Fire Protection Association (NFPA) standards, ISO schedules, any federal and state mandates relative to emergency services, and generally accepted practices within emergency services. All methodology used in a Standards of Cover analysis of a department should follow the methodology described in the "Standards of Response Coverage, 5th Edition," published by the Commission on Fire Accreditation International (CFAI).

CFAI defines the process, known as "deployment analysis," as written procedures which determine the distribution and concentration of fixed and mobile resources of an organization. The purpose for completing such a document is to assist the agency in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations in addition to homeland security issues. CFAI further defines "Standards of Response Coverage as being those adopted, written policies and procedures that determine the distribution, concentration, and reliability of fixed and mobile response forces for fire, emergency medical services, hazardous materials, and other forces of technical response."

The City of Dover has not developed a Standards of Cover document in accordance with CFAI guidelines.

> ***Recommendation: The City of Dover should conduct a formal Standards of Response Coverage analysis under the guidelines of the Commission on Fire Accreditation International (CFAI).***

Fire Risk Analysis/Target Hazards

The City of Dover is fortunate to have a dedicated force of volunteers who provide 100% of the city's firefighting needs. If a full-time force of paid personnel were utilized, CPSM estimates that these costs could exceed $3 million to $4 million annually. The "professional volunteer fire department" in the City of Dover works well and has been effective in serving this community for many years. This arrangement is extremely cost effective and is considered by CPSM to be a best practice, and it should be fully supported and maintained.

Regardless of the type of organization that serves a given community, it is inherent upon a community's leadership to ask the fundamental question of whether the level of risk in their jurisdiction is commensurate with the type of protective force that is currently being deployed. To this end, a fire risk assessment and hazard analysis process should be utilized in an effort to provide a more objective assessment of the community's level of risk.

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

- The needed fire flow.
- The probability of an occurrence based on historical events.
- The consequence of an incident in that occupancy (to both occupants and responders).
- The cumulative effect of such occupancies and their concentration in the community.

Plotting the rated properties on a map will provide a better understanding of how the response matrix and staffing patterns can be used to provide a higher concentration of resources for worse-

case scenarios or, conversely, fewer resources for lower levels of risk.[8] The community fire risk assessment may also include determining and defining the differences in fire risk between a detached single-family dwelling, a multifamily dwelling, an industrial building, and a high-rise building by placing each in separate category. Further, an overall community risk profile can be linked to historical response time data. That analysis can then be used to establish response time baselines and benchmarks.

Community risk and vulnerability assessment are essential elements in a fire department's planning process. The City of Dover has not completed a comprehensive community risk and vulnerability assessment. According to a National Fire Protection Association (NFPA) paper on assessing community vulnerability, fire department operational performance is a function of three considerations: resource availability/reliability, department capability, and operational effectiveness.[9] These elements can be further defined as:

> ***Resource availability/reliability:*** The degree to which the resources are ready and available to respond.
>
> ***Department capability:*** The ability of the resources deployed to manage an incident.
>
> ***Operational effectiveness:*** The product of availability and capability. It is the outcome achieved by the deployed resources or a measure of the ability to match resources deployed to the risk level to which they are responding.[10]

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

The City of Dover has a number of target hazards within its service area. Target hazards automatically receive an upgraded "box alarm" response assignment, each specifically tailored to the unique risks and hazards. The Dover Fire Department clearly designates the types and number of apparatus to be deployed to each target hazard.

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[8] *Fire and Emergency Service Self-Assessment Manual,* Eighth Edition, (Center for Public Safety Excellence, 2009), 49.
[9] Fire Service Deployment, Assessing Community Vulnerability: From http://www.nfpa.org/assets/files/pdf/urbanfirevulnerability.pdf.
[10] National Fire Service Data Summit Proceedings, U.S. Department of Commerce, NIST Tech Note 1698, May 2011.

The city's target hazards include:

Luther Towers, located at 430 Kings Highway has 258 one bedroom and 33 efficiency (studio) apartments in four buildings. Luther Towers and Luther Village of Dover are operated under the guidelines established by the U.S. Department of Housing and Urban Development Section 202/8 programs. Luther Towers and Luther Village are apartment campuses for seniors 62 and older.

NRG Energy sells electricity to the mid-Atlantic region, which feeds into the City of Dover transmission/distribution system. The combined heat and power plant was constructed by General Foods in 1984, later acquired by Kraft Foods and then sold to Stat Oil in 1996 and finally purchased by NRG in 2000. NRG added two units to the facility to better support the local Kraft Foods plant, the Procter & Gamble plant, and the City of Dover.

The Garrison Oak Technology Park is home to The Garrison Energy Center, a 309-megawatt combined-cycle electric generating facility built to enhance reliability for Delaware and the regional power market. The energy center will accommodate the addition of another 309 megawatts of generation capacity should market conditions warrant.

Kraft Foods has operated a major plant in Dover since at least 1969, originally a General Foods plant. The plant is owned by Kraft Foods Group, one of the daughter companies of the Kraft Foods breakup. It makes Jell-O, Stove Top dressing mix, Baker's Chocolate, Country Time powdered mix, Crystal Light, and Kool-Aid.

Proctor and Gamble is an American multinational consumer goods company headquartered in Cincinnati, Ohio, founded by William Procter and James Gamble. Its products include cleaning agents, and personal care products. The Dover facility known as Proctor and Gamble Dover Wipes is classified as an industrial plant; it manufactures 40 percent of the baby wipes products sold in the United States, Canada, and Puerto Rico.

Dover Mall is a climate-controlled indoor mall with more than eighty-five (85) stores ranging from jewelry to apparel, appliances to cellular, and footwear to sporting goods. Large stores include Macy's, JC Penney, Boscov's, Sears, Old Navy, and Hollister Co.

> ***Recommendation: The DFD should conduct a formal fire risk analysis that concentrates on the downtown areas, high-rise structures, and manufacturing and institutional occupancies.***

Section 5. Operational Response Approaches

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

> **High-hazard occupancies:** Schools, hospitals, nursing homes, explosives plants, refineries, high-rise buildings, and other high life-hazard or large fire-potential occupancies.
>
> **Medium-hazard occupancies:** Apartments, offices, and mercantile and industrial occupancies not normally requiring extensive rescue by firefighting forces.
>
> **Low-hazard occupancies:** One (1)-, two (2)-, or three (3)-family dwellings and scattered small business and industrial occupancies.[11]

The operations necessary to successfully extinguish a structure fire, and do so effectively, efficiently, and safely, requires a carefully coordinated, and controlled, plan of action. Certain operations such as venting ahead of the advancing interior hose line(s) should be carried out with a high degree of precision and timing. Multiple operations, frequently where seconds count, such as search and rescue operations and trying to cut off a rapidly advancing fire, must also be conducted simultaneously. If there are not enough personnel on the incident initially to perform all of the critical tasks, some will, out of necessity, be delayed. This can result in an increased risk of injury, or death, to building occupants and firefighters, and, increased property damage. Figures 5-1 and 5-2 illustrate the critical tasks and resource deployment typically utilized on low-risk incidents and moderate-risk structure fires. Understanding the community's risk greatly assists fire department management planning for and justification of staffing and apparatus resources.

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

FIGURE 5-1: Low-Risk Response–Exterior Fire Attack

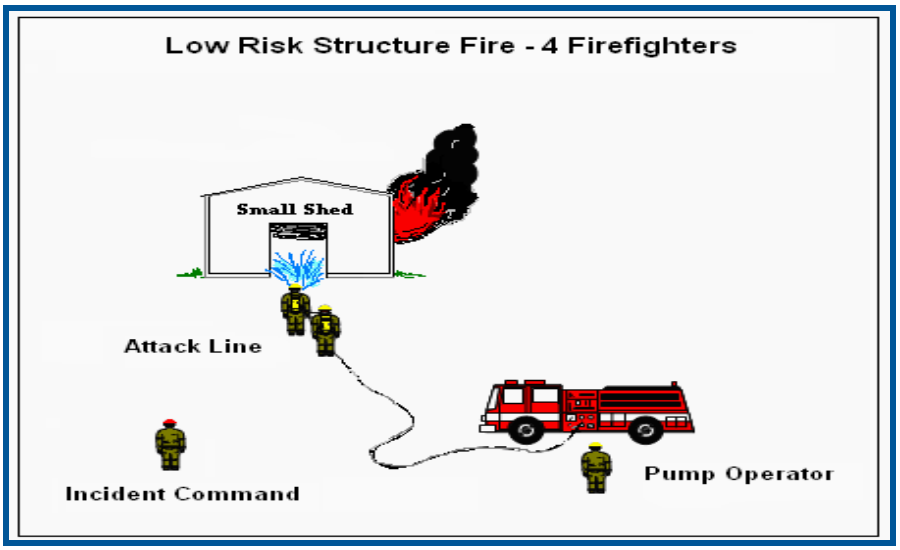
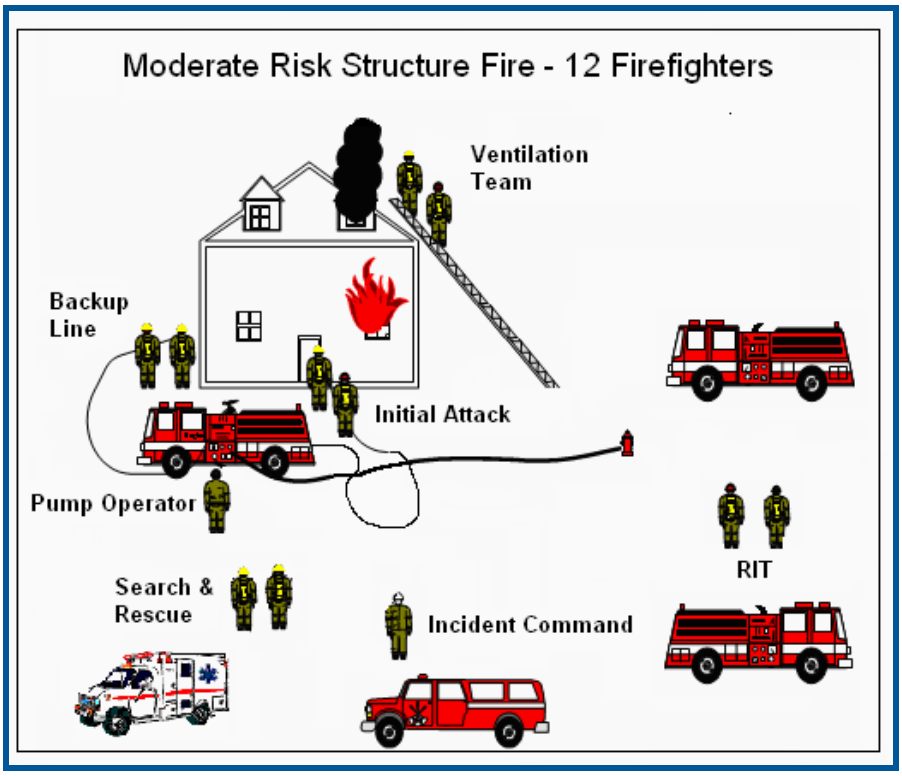


Figure 5-2 represents critical task elements for a moderate-risk structure fire. Some jurisdictions add additional response resources to meet and in some cases exceed the specifics of national benchmarking, such as National Fire Protection Association (NFPA) 1720, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Departments,* 2014 Edition. DFD often utilizes mutual aid to assemble the necessary staffing to manage its larger incidents.

FIGURE 5-2: Moderate-Risk Response–Interior Fire Attack



NFPA 1720 (paragraph 4.3.2) is a guide that can be used by the authority having jurisdiction (AHJ) to determine staffing and response time objectives for structural firefighting. This guidance is based on a low-hazard occupancy such as a 2,000 square foot, one (1) - or two (2)-story, and single family structures without basement or exposures.

TABLE 5-1: Staffing and Response Time Guidance from NFPA 1720

Demand Zone	Demographics	Minimum Staff to Respond	Response Time (minutes)	Meets Objective (% of time)
Special risks	AHJ	AHJ	AHJ	90
Urban	>1000 people/mi.	15	9	90
Suburban	500 - 1000 people/mi.	10	10	80
Rural	< 500 people/mi.	6	14	80
Remote	Travel distance > 8 mi.	4	Dependent upon travel distance	90

Note: Dover is an urban community with a population density of 1,557 people per square mile.

In addition to examining risks faced in the community at large, a department should examine the cumulative risks it places on its responding personnel. The National Fire Protection Association's *Standard for a Fire Department Occupational Safety and Health Program* (NFPA 1500) recommends the development of a separate risk management plan for the daily operations of the department.[12] This standard of safety establishes the parameters by which the department should conduct all activities during emergency and nonemergency operations. The intent is for all members of the department to operate within this standard or plan of safety and not deviate from this process.

Recommendation: The DFD should develop a comprehensive, departmentwide risk management plan as recommended in NFPA 1500.

At the time of this study the DFD had a limited number of formal prefire/incident plans. As with many other aspects of a department that is staffed with volunteer personnel, it is difficult to manage a process of this type. It is envisioned that this process can be addressed with the addition of the Fire Technician position and the assignment of these personnel to carry out this task.

Recommendation: The DFD should make it a priority to establish a formal pre-incident planning program with the goal of having an up-to-date preplan for every business and commercial occupancy (including schools, churches, etc.) within its response area.

Prefire/incident plans should be reviewed regularly and tested by periodic table-top exercises and on-site drills. In addition, the department should develop a plan to make prefire/incident plans accessible on mobile data terminals (notebook/laptop computers) on all fire apparatus for use en route to an incident and while on scene.

Dover Response Matrix/Response Protocols

The Dover Fire Department self-dispatches all incidents after being forwarded the 911 call from the 911 Police Dispatch Center. Incidents are generally classified as crew calls, station calls, or general alarms. ***Crew calls*** are incidents that are generally handled with one (1), or perhaps two (2), units. This includes minor incidents such as fire investigations, vehicle fires, or trash fires. Crew calls are dispatched from the nearest station, Monday through Friday from 6:00 p.m. to 6:00 a.m. and 24 hours on Saturdays and Sundays. If there is no response to a crew call after eight (8) minutes, the incident is re-dispatched as a general alarm for both stations and all personnel.

Station calls are incidents that are handled by a crew that is in station at the time the call is received without the incident being toned out as a crew call or general alarm. Station calls can cover a wide range of incident types and are initiated at the discretion of an officer in the station at the time the call is received.

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

General alarms are incidents to which the entire department is dispatched. These can be incidents that started as a crew call that did not generate a response. However, the majority of general alarms involve structural fire incidents including alerts from automatic fire alarm systems. A station call can be substituted for a general alarm at the discretion of an officer if warranted. If there is no response to a general alarm dispatch after eight (8) minutes the incident is re-dispatched along with the nearest mutual aid company unless an officer directs otherwise.

The department utilizes a response matrix that indicates the numbers and type of units that respond to a specific type of incident. The department's response areas (which includes areas outside of the City of Dover) are broken down into quadrants and unit assignments are designated for each quadrant. The normal Dover response to a single family dwelling fire is:

- Station 1 – One (1) engine, One (1) ladder, One (1) rescue
- Station 2 – Two (2) engines, One (1) ladder

If the officer requests to have a ***box alarm assignment*** then the dispatcher contacts Kent County for mutual aid resources. DFD has "Box Alarms" established for six (6) of its largest target and/or life hazard occupancies. These box alarms are utilized only when an actual fire is confirmed by on-scene personnel.

In an effort to reduce the high number of false fire alarms originating from Delaware State University and Wesley College, DFD has established a verification process from college security before a response is initiated. If security does not respond within seven (7) minutes from the receipt of the alarm, an activation of the volunteers is generated. This practice has been implemented in the last year and CPSM recognizes this as a ***best practice*** that should be continued.

The department has two (2) command vehicles. One (1) is assigned to the Fire Chief and the other is utilized by the department duty officer. Each officer in the department rotates through the duty officer assignment and in this capacity he/she must be available to respond to incidents as a ranking officer or for minor incidents to conduct an investigation before paging out the alarm. On most incidents the Fire Chief or the duty officer respond to a station and ride the apparatus rather than responding directly to the scene in their command vehicle. Typically, command is responsible for the incident size-up, scene safety, determining if additional resources are needed, and making assignments for the incoming units. When operating as a company officer and engaged in the tactical components of the incident, the command officer is not able to perform the necessary oversight of the incident and provide the necessary scene management. In many cases this is not a problem, as the situation is minor and the coordination of multiple resources is not required. However, on larger events it is critical that the command officer be apart from the tactical units and are able to manage the entire incident.

> ***Recommendation: The Fire Chief and/or the duty officer, when dispatched to an incident, should respond to the incident scene with their assigned command vehicle in order to assume the role of incident commander.***

Scene management and the incident command process are critical to the orderly execution of an emergency incident. It is essential that every incident have a designated incident commander and that a command post be formally established and clearly identifiable among the various responding units. The incident management process is a universally adopted management tool that is utilized in all events and is particularly critical when there are multiple agencies responding. It is critical that all company officers (captains) and chief officers are fully trained and utilize the incident command process in managing emergency events.

CPSM has also observed some inconsistencies in the number of units responding to the various types of emergency incidents. We observed two (2) automatic fire alarms that were received during our site visit. The first incident was for an alarm sounding in a large manufacturing facility. It was believed that the building was fully sprinklered, but it is a facility of significant size where a potential fire would be challenging. There was no corresponding call confirming smoke or actual fire. At the time of the incident there was a crew in Station 1 and the incident was handled as a station call, with a single engine and the Fire Chief responding. The judgement utilized in screening this call and reducing the level of response appeared sound and we believe good judgement was used in managing and adjusting the response to meet the need. The following day an alarm was received for a fire alarm in a single family dwelling. Again, there was no corroborating call confirming or observing smoke or fire. Since there were no personnel in station at the time a general alarm was dispatched. The response to this much smaller structure was two (2) engines and two (2) ladders. This level of response appeared unnecessary, thus creating an inconsistency in the manner in which the calls were handled.

Part of the Fire Department risk management assessment process is deciding what resources are necessary, and appropriate, for response to each type of incident. There should also be consistency in dispatch and response. Any time that emergency vehicles activate their warning lights and sirens it increases their chances of being involved in a vehicle accident. This risk increases as multiple volunteer personnel respond to their stations in their personal vehicles. This is coupled with the fact that many fire responses are not actual fires or true emergencies. Organizations today are attempting to limit the number of apparatus responding, and limit those responses to a cold response (no lights and sirens and following normal traffic patterns) as much as possible.

> ***Recommendation: The DFD should standardize its response to a single unit to automatic fire alarm soundings and other nonemergency situations (when these are unconfirmed as a true emergency).***

If there are no indications that the call is a true emergency, the responding unit should proceed in a cold response to investigate.

Staffing and Volunteer Deployment

The City of Dover and the Volunteer Association have fared well in maintaining a suitable and reliable workforce. However, with the changing nature of our society the leaders of both the City of Dover and Volunteer Association will need to monitor and be aware of any subtle changes that begin to occur in their operations.

With an active membership roster of approximately eighty (80) personnel the DFD would seem to have enough personnel to provide adequate protection to the city. Association records indicate that on average, fourteen (14) personnel are responding on general alarms. This level of response is excellent and well within the recommendations of NFPA 1720. This level is also well-suited for the call activities and service demands currently presented in the community.

Under Association guidelines, apparatus are supposed to respond with a minimum of four (4) personnel on board. Ideally this consists of a driver, officer and two (2) personnel certified at the FF III level. However, when necessary FF IIs are permitted to respond. The absolute minimum staffing is identified as three (3) personnel. Apparatus with fewer than three (3) personnel would not normally be allowed to respond. This is a very high staffing level and in our observation consistent with many of the more urbanized, career organizations across the nation.

The City of Dover has been extremely fortunate in its association with the Volunteer Association and its ability to maintain and recruit a viable volunteer fire fighting force. ***CPSM recognizes this effort and commends the leadership of the Volunteer Association in its service to the community.***

Apparatus and Fleet Maintenance

Apparatus purchase and maintenance is an integral part of any fire department and requires sound financial planning. As fleets age, it is logical to conclude that reliability is lessened and repair costs increase. There are two (2) proven ways to mitigate the long- and short-term costs associated with vehicle repairs and replacement. The primary way is to have a regimented preventive maintenance (PM) program that places each vehicle on a regular maintenance cycle. The other method is to have a realistic apparatus replacement plan so that when a vehicle has outlived its usefulness it is replaced and removed from service.

NFPA 1901 Appendix D, which sets "Guidelines for First-Line and Reserve Fire Apparatus," has changed and adapted over the years to reflect the changes in industry standards. It states:

> *"The length of that life depends on many factors, including vehicle maintenance, engine hours, quality of the preventive maintenance program, quality of driver training program, whether the fire apparatus was used within the design parameters …there are fire apparatus with 8 to 10 years of service that are simply worn out. There are also fire apparatus…that have excellent maintenance, and that have responded to a minimum number of incidents that are still in serviceable condition after 20 years.*

…the care of fire apparatus while being used and the quality and timeliness of maintenance are perhaps the most significant factors in determining how well a fire apparatus ages."[13]

In a 2004 survey of three-hundred-sixty (360) fire departments in urban, suburban, and rural settings across the nation, Pierce Manufacturing reported on the average life expectancy for fire pumpers.[14] The results are shown in Table 5-2.

TABLE 5-2: Fire Pumper Life Expectancy by Type of Jurisdiction

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

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

The city's fire apparatus fleet is represented in Table 5-3. In most organizations we review the typical apparatus replacement schedule anticipates the useful working life of fire engines to be fifteen (15) years in frontline service followed by five (5) to seven (7) years in a reserve status (a useful life expectancy of 20 to 22 years). Ladder trucks typically have a longer life expectancy—twenty (20) years in frontline service and five years in reserve. This is because in most systems ladders are utilized less than first-line fire pumpers and their service time is a bit longer. Today's fire engines are expected to travel a total of 100,000 to 120,000 miles, with proper maintenance, before needing replacement. The Dover Fire Department operates with seven (7) engines, two (2) aerial ladder trucks, one (1) heavy rescue vehicle, six (6) utility vehicles (including two (2) command, two (2) brush, and two (2) pickup trucks), one (1) boat, and one (1) foam trailer.

[13] NFPA-1901 *Standard for Automotive Fire Apparatus-2016 Edition, Sect. D.2*
[14] Fire Apparatus Duty Cycle White Paper, Fire Apparatus Manufacturer's Association. August 2004.

TABLE 5-3: Dover Fire Department Apparatus Inventory

Unit ID	Year	Manufacturer	Type	Age
Ladder 1	2011	Pierce	Rear mount aerial	5 years
Ladder 2	2005	Pierce	Tower Ladder	11 years
Engine 2	2008	Pierce	Pumper	8 years
Engine 3	2003	Pierce	Pumper	13 years
Engine 4	2005	Pierce	Pumper	11 years
Engine 6	2003	Pierce	Pumper	13 years
Engine 7	1997	Pierce	Pumper	18 years
Brush 1	2013	RTV Kubota	Brush Vehicle	3 years
Brush 9	2001	Ford F-350	4x4 Pick-Up truck	15 years
Rescue 1	1997	Pierce	Heavy Rescue Vehicle	18 years
Marine 1	1990	Polar Kraft	Flat Bottom Boat	25 years
Foam 46-13	2004	CNMI	Foam Trailer	12 years
Car 1	2015	Chevrolet SUV	Chief's Vehicle	1 year
Car 2	2015	Chevrolet SUV	Command Vehicle	1 year
Utility 1	2006	Ford	Pickup	10 years
Utility 2	1997	GMC	Pickup	18 years

It is CPSM's observation that the apparatus in the Dover system do not experience heavy call volume. In our analysis of call activity, Ladder 1 had the highest number of runs, 542 in the 12-month period evaluated. It is not uncommon in many suburban and urban communities to see fire apparatus respond to between 2,000 and 2,500 alarms and travel from 10,000 to 12,500 miles annually. CPSM estimates that the average, round-trip travel distance for calls in the Dover system is approximately four (4) miles. With this type of travel distance and the associated call volume, we estimate that Ladder 1 would travel approximately 2,200 miles annually. The three (3) other units with the highest response activity in this same time frame were Engines 2, 4, and 6. We estimate that these units will travel an estimated 1,200 to 1,800 miles annually. Given this amount of response activity we anticipate that fire engines in the Dover system should have an expected frontline service life of twenty 20-plus years. We estimate that a ladder truck's life-cycle would be comparable. Table 5-4 shows the workload by unit for the DFD fleet.

TABLE 5-4: Call Workload by Unit

Unit Type	Unit ID	Avg. Deployed Min. per Run	Total Annual Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
Brush	B1	17.0	3.4	0.6	12	0.0*
	B9	18.0	31.5	5.2	105	0.3
Engine	E2	27.8	199.4	32.8	431	1.2
	E3	29.0	63.8	10.5	132	0.4
	E4	27.2	164.4	27.0	363	1.0
	E6	25.7	120.7	19.8	282	0.8
	E7	32.7	20.7	3.4	38	0.1
Ladder	L1	26.1	235.8	38.8	542	1.5
	L2	26.0	50.6	8.3	117	0.3
Rescue	R1	33.7	58.3	9.6	104	0.3
Utility	U1	24.2	14.9	2.5	37	0.1
Other	Other	36.3	2.4	0.4	4	0.0*

* These units had so few runs that their average runs per day, rounded to the nearest one-tenth, appears to be zero

It is important to note that the current workload observed in Dover is considerably lower than many agencies we observe in comparably sized communities. CPSM attributes this to the infrequency with which DFD units respond to EMS-related incidents. In most communities, EMS calls make up the predominant share of workload, in most cases accounting for as much as seventy-five (75) to eighty (80) percent of response activities. We estimate that if DFD units were providing first responder service for EMS calls, total response activities would double and possibly triple from what is currently occurring.

A critical determinant in developing a suitable apparatus replacement program is the decision on the size of the fleet that is utilized and ultimately maintained by the organization. As indicated above, DFD operates five engines and two ladder trucks as its first-line response units. In addition, there are a number of support and command vehicles that are available. It is our observation, however, that only four (4) DFD apparatus are utilized regularly in handling the current workload. As indicated in the table, there are four (4) primary apparatus that respond: Ladder 1, Engine 2, Engine 4, and Engine 6. This we believe is a product of the number of vehicles needed to transport the volunteers who assemble and the amount of equipment required to manage most incidents. A review of attendance records for personnel responding to fires during 2014 indicates that on average, fourteen (14) personnel responded to most incidents. For a volunteer organization, this is an excellent response level and considered a ***best practice*** by CPSM. However, given the workload in Dover and the level of risk indicated by historical events and the strength of the city's fire prevention efforts, we recommend that the city establish as its first-line fleet an initial response force of six (6) units, and a total response force of twelve (12) to sixteen (16) personnel.

Recommendation: The DFD should establish as its first response apparatus three (3) engines, one (1) ladder truck, and two (2) command vehicles.

In addition to the primary response fleet of three (3) engines, one (1) ladder, and two (2) command vehicles, Dover should maintain one (1) engine and one (1) ladder as reserve units. The assorted support vehicles should also be maintained and kept as part of the apparatus fleet. Given the proposed first-line fleet of three (3) engines, one (1) ladder, and the reserve units (one (1) engine and one (1) ladder), we would recommend a replacement schedule for this size fleet as shown in Table 5-5.

TABLE 5-5: Proposed Fire Apparatus Replacement Schedule

VEHICLE TYPE	FIRST LINE SERVICE	RESERVE STATUS	TOTAL SERVICE LIFE
Engines	18 yrs./or 100,000 mi.	5yrs./or 120,000 mi.	23 yrs./or 120,000 mi.
Aerial Ladders	20 yrs./or 100,000 mi.	7 yrs./or 120,000 mi.	25 yrs./or 120,000 mi.

As with any schedule or plan, the proposed apparatus schedule should serve as a guide for financial planning for apparatus replacement. If an apparatus is involved in a wreck or if there are frequent and unexpected repairs that are costly, the replacement plan may be accelerated so that a replacement is made before the scheduled time frame. Similarly, if on the basis of some type of financial constraint or if an apparatus is still operating well at the end of the replacement schedule, the proposed plan may be extended so that a particular apparatus is used beyond the expected replacement schedule. It is also wise to build into any replacement schedule other factors in addition to age of the apparatus and which will assist in this decision making. Vehicle miles or operating hours should be considered. In addition, the cumulative repair costs for a particular vehicle may be used in guiding the purchase of new apparatus. For example, if through the working life of an apparatus, the total repair costs exceed fifty (50) percent to seventy-five (75) percent of the vehicle cost, this may be factored into the decision to replace the vehicle.

Recommendation: The City of Dover should adopt an apparatus replacement schedule to serve as a guide for the financial planning and replacement of fire apparatus.

If DFD were to maintain a fleet of four (4) first-line apparatus and two (2) reserve units (four (4) engines and two (2)aerial ladders), this size fleet would have a replacement value of more than $4.3 million in 2016 dollars ($525,000 per engine and $1.1 million per aerial). Thus, a straight-line calculation utilizing a Twenty-three (23) year replacement schedule indicates a need to earmark approximately $187,000 annually for apparatus replacement. This number does not account for specialty apparatus, boats, staff, and utility vehicles. Dover does not have a formal replacement program for fire apparatus, and more importantly it does not have in place any ongoing funding or depreciation program for future expenditures. In the absence of this type of sinking fund, a community can be faced with major capital expenditures that are unexpected and not planned for.

Recommendation: The City of Dover should adopt an apparatus replacement program that earmarks annual funding for future apparatus purchases.

Fleet Maintenance

Fleet maintenance is vital to preserving the quality of fire apparatus and ultimately affects the performance of apparatus at emergency incidents. Unlike other tasks that can be scheduled for once a week, month, or year, apparatus checks should be performed daily. Taking the time to properly inspect and maintain fire apparatus will not only extend vehicle life, but it's also essential to the safety of the crew, department, and community.

The Dover Fire Department has a process in place to check vehicles on a regularly assigned basis by the Fire Dispatcher. Each vehicle has a checklist that involves the vehicle, hand tools, pumps, and aerial devices. When vehicle repairs are needed or periodic service maintenance is required, this function is carried out under the supervision of the Volunteer Association, specifically their apparatus and maintenance committee, and which is managed by the committee chairman.

Pumps and aerial devices are tested annually, in accordance with NFPA Standard 1901, by Atlantic Emergency Solutions at its Middletown, Del., service center. Atlantic Emergency Solutions delivers fire and emergency equipment to Virginia, Maryland, Delaware, the District of Columbia, North Carolina, and portions of West Virginia, serving as the primary Pierce Manufacturing dealer. Pierce is a premier manufacturer of fire apparatus in the U.S. known for the quality of its vehicles and customer service. Atlantic Emergency Solutions is a respected dealer and maintenance provider in the mid-Atlantic region, with ten (10) service centers strategically located for customer convenience. Currently, Atlantic Emergency Services provides both drive line and technical repair services to the Dover Fire Department fleet. Atlantic Emergency Services mechanics maintain Automotive Service Excellence (ASE) certifications as well as Emergency Vehicle Technician Certification. The Emergency Vehicle Technician Certification Commission, Inc. (EVT) is a nonprofit corporation dedicated to improving the quality of emergency vehicle service and repair throughout the United States and Canada. EVT is governed by a board of directors that represents emergency response agencies, emergency vehicle maintenance service associations, and the educational community.

The apparatus specification and purchasing process is managed by the Volunteer Association utilizing city funds. The Volunteer Association appoints an apparatus replacement committee to develop specifications and to develop the bid process. In any purchasing process that utilizes public funds it is imperative to maintain a system of competitiveness and equal access without any indication of favoritism or preference to an individual dealer or vendor. While many volunteer fire departments develop specifications for a particular apparatus manufacturer and purchase from their vendor of choice, this practice is generally not allowed in most local and state governments. It is essential that a request for proposal (RFP) and an invitation to bid (ITB) are developed to ensure the product or service provides the intended results, and that technical specifications are written in a way that provides fairness and competitiveness.

Due to the costs and the associated liabilities involved in fleet purchases and maintenance, CPSM recommends that the city, under the direction of the proposed Emergency Services Manager, be responsible for fleet maintenance and acquisition for the Dover Fire Department.

Recommendation: The city, under the direction of the new Emergency Services Manager, should be responsible for fleet maintenance and vehicle acquisition for the Dover Fire Department.

Though the ultimate decision making and authority should reside with the city, it is essential that the Volunteer Association be integrally involved in the fire department fleet functions. For this reason it is recommended that the city utilize a committee group to provide guidance and recommendations to the Emergency Services Manager in carrying out the purchase, maintenance, and disposal of the fire department apparatus and equipment.

Fire Response

Dover is a small- to medium-sized city with a service population of about 37,000 people. As a state capital, and a community that hosts a number of well-attended special events, it is not uncommon to see population spikes and a corresponding increase in service calls. However, the fire service demand in the city is still relatively light. In the one (1)-year time frame analyzed by CPSM, the Dover Fire Department responded to a total of 991 alarms, of which 106 were structure fires and 69 were outside fires or grass fires. As mentioned earlier the city utilizes Kent County and a private ambulance provider for its EMS transports. The Dover Fire Department typically does not respond to EMS incidents unless there are extenuating conditions that would necessitate its response. Subsequently, on a daily basis the DFD responds to fewer than three (3) calls per day and in most cases these are service calls or minor incidents. On occasion there are the more significant incidents that require a substantial workforce to manage. This is the most difficult question that many communities face. They must ask themselves: What is the appropriate level of protection when considering the typical daily demand for service versus the infrequent larger event that requires a substantially higher response? Regardless of the size of the response force, it is still extremely difficult to determine the effectiveness of the initial response in limiting fire spread and fire damage. Many variables will impact these outcomes, including:

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

Subsequently, in those situations in which there are extended delays in the extinguishment effort or the fire has progressed sufficiently upon arrival of fire units, there is actually very little that can be done to limit the extent of damage to the entire structure and its contents. In these situations suppression efforts will focus on the protection of nearby or adjacent structures with the goal being to limit the spread of the fire beyond the building of origin. This is often termed ***protecting exposures***. When the extent of damage is extensive and the building becomes unstable, firefighting tactics typically move to what is called a ***defensive attack***, or one in which hose lines and more importantly personnel are on the outside of the structure and their focus is to merely discharge large volumes of water until the fire goes out. In these situations the ability to enter the building is very limited and if victims are trapped in the structure, there are very few safe options for making entry.

Today's fire service is actively debating the options of interior firefighting vs. exterior firefighting. These terms are self-descriptive in that an ***interior fire attack*** is one in which firefighters enter a burning building in an attempt to find the seat of the fire and from this interior position extinguish the fire with limited amounts of water. An ***exterior fire attack*** is a tactic in which firefighters initially discharge water from the exterior of the building, either through a window or door and knock down the fire before entry in the building is made. The concept is to introduce larger volumes of water initially from the outside of the building, cool the interior temperatures, and reduce the intensity of the fire before firefighters enter the building. An exterior attack is most applicable in smaller structures, typically, one-story detached units which are smaller than 2,000 square feet in total floor area.

There are a number of factors that have fueled this debate, the first and most critical of which are staffing levels. As fire departments operate with reduced levels of staffing, and this staff arrives at the scene from greater distances, it is likely that a single fire unit with three or four personnel will only have the option of initiating an exterior attack. The U.S. Occupational Safety and Health Administration (OSHA) has issued a standard that has been termed the ***"Two-in-Two-Out"*** provision. This standard affects most public fire departments across the U.S., including DFD. Under this standard, firefighters who are engaged in ***interior structural firefighting*** and enter an area that is immediately dangerous to life or health (an IDLH atmosphere), must remain in visual or voice contact with each other and have at least two other employees located outside the IDLH atmosphere. This assures that the "two in" can monitor each other and assist with equipment failure or entrapment or other hazards, and the "two out" can monitor those in the building, initiate a rescue, or call for back-up if a problem arises.[15] There is a provision within the OSHA standard that allows two (2) personnel to make entry into an IDLH atmosphere without the required two back-up personnel. This is allowed when they are attempting to rescue a person or persons in the structure before the entire team is assembled.[16]

When using an exterior attack, the requirement of having the four (4) persons assembled on-scene prior to making entry would not apply. Recent studies by UL have evaluated the effectiveness of

[15] OSHA-Respiratory Protection Standard, 29CFR-1910.134(g)(4)
[16] Ibid, Note 2 to paragraph (g).

interior vs. exterior attacks in certain simulated fire environments. These studies have found that the exterior attack to be equally effective in these simulations.[17] This debate is deep-seated in the fire service and traditional tactical measures have always proposed an interior fire attack, specifically when there is a possibility that victims may be present in the burning structure. The long-held belief in opposition to an exterior attack is that this approach may actually push the fire into areas that are not burning or where victims may be located. The counterpoint supporting the exterior attack centers on firefighter safety. The exterior attack limits the firefighter from making entry into those super-heated structures that may be susceptible to either a floor or roof collapse. From CPSM's perspective, and given the uncertainties regarding response of volunteer personnel at any given time, there is at least some likelihood that a single crew of three or four personnel will encounter a significant and rapidly developing fire situation. It is prudent that the DFD build at least a component of its training and operating procedures around the tactical concept of the exterior fire attack when the situation warrants such an approach.

Recommendation: The DFD should build at least a portion of its training regimens and tactical strategies around the exterior or transitional attack when the fire scenario and the number of responding personnel warrant this approach.

The Dover Fire Department should be fully capable (and we believe is) of handling fires that are limited is size and intensity in single-family dwellings. This goal becomes more achievable when sufficient staffing is available, AND the fire department can arrive at the fire incident and take definitive action before the size of the fire intensifies.

CPSM analyzed the DFD's response activity from July 1, 2014 through June 30, 2015. During the study period, the department responded to 975 calls. CPSM analyzed calls and runs. A call is an emergency service request or incident. A run is a dispatch of a unit. As multiple units are often dispatched to a call, there are more runs than calls.

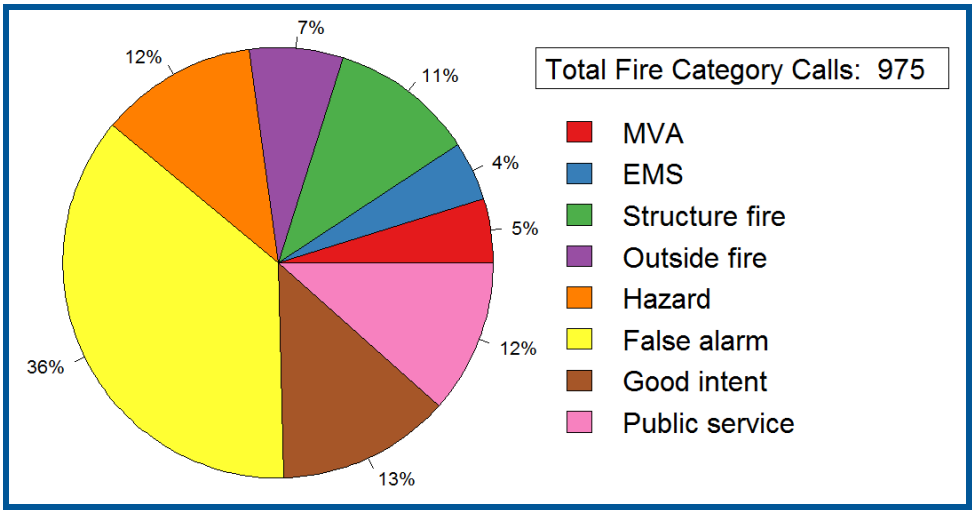
Table 5-6 and Figure 5-3 show the aggregate call totals for the twelve (12) month period evaluated, broken down by number of incidents, average calls per day, and the percentage of calls that fall into each call type category. While the Dover Fire Department does not provide ambulance services, it does respond to select emergency medical service (EMS) calls and motor vehicle accidents (MVAs) involving extrications and rescues. We include MVAs as a separate call type while we identify all other EMS-type calls grouped as simply "EMS." Actual fire calls (structural and outside) represent 17.6% percent of the overall calls (approximately 0.48 calls per day or one actual fire-type call every other day). Structure fires account for 10.7% of the incidents (approximately 0.29 per day, or one structure fire every 3.4 days). Hazard, false alarms, good intent, and public service calls represent the largest percentage of fire calls for service, which is also typical in CPSM data and workload analyses of other fire departments.

[17] "Innovating Fire Attack Tactics", U.L.COM/News Science, Summer 2013.

TABLE 5-6: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
MVA	47	0.13	4.7
EMS	43	0.12	4.3
Structure fire	106	0.29	10.7
Outside fire	69	0.19	6.9
Hazard	115	0.32	11.6
False alarm	355	0.97	35.8
Good intent	127	0.35	12.8
Public service	113	0.31	11.4
Subtotal	**975**	**2.67**	**98.2**
Cancelled	16	0.04	1.6
Total	**991**	**2.72**	**100.0**

FIGURE 5-3: Calls by Type



Observations:

- Fire calls for the year totaled 975, averaging 2.7 per day.
- Structure and outside fires combined totaled 175 calls, averaging one call every 2.1 days.
- Structure fires (106 calls) accounted for 11 percent of total calls.
- Outside fires (69) accounted for 7 percent of total calls.
- False alarms (355) accounted for the largest percentage of calls at 36 percent.

In looking at the actual calls it is important to note that of the 975 incidents tabulated, a total of 885 were fire-related (that is, excludes MVA and EMS calls). Of these 885 fire-related incidents, only 175 (106 structure and 69 outside fires) were actual fires (20 percent). False alarms, public service,

good intent, and hazard calls make up the largest percentage of the fire-related calls, at more than 80 percent. This fact is critical when we look at the response patterns that are utilized for these minor or non-emergent responses.

Table 5-7 indicates the duration of calls by type and duration using four (4) duration categories: less than thirty (30) minutes, thirty (30) minutes to one (1) hour, one (1) to two (2) hours, more than two (2) hours.

TABLE 5-7: Calls by Type and Duration

Call Type	Less than One-half Hour	One-half Hour to One Hour	One to Two Hours	More than Two Hours	Total
MVA	33	12	2	0	47
EMS	38	4	1	0	43
Structure fire	54	37	8	7	106
Outside fire	48	19	2	0	69
Hazard	64	42	8	1	115
False alarm	324	29	2	0	355
Good intent	100	23	4	0	127
Public service	67	33	11	2	113
Subtotal	**728**	**199**	**38**	**10**	**975**
Cancelled	15	1	0	0	16
Total	**743**	**200**	**38**	**10**	**991**

Observations:

Overall

- 95 percent of calls (943) lasted less than one hour.
- Four percent of calls (38) lasted between one and two hours and 1 percent (10) lasted more than two hours.
- On average, 0.1 calls per day, or approximately one call every eight days, lasted more than one hour.

Structure Fires

- 86 percent of structure fires (91) lasted less than one hour; 8 percent (8) lasted between one and two hours; and 7 percent (7) lasted more than two hours.

Outside Fires

- 97 percent of outside fires (67) lasted less than one hour; 3 percent (2) lasted between one and two hours; and none lasted more than two hours.

False Alarms

- 99 percent of false alarms (353) lasted less than one hour, and 1 percent (2) lasted more than an hour.

Again, when we look at the nature of the 86 structure fire calls, only 15 involved call durations that exceeded one hour or more. This can be attributed to the magnitude of these events. Similarly, in the outside fire category, only two (2) of the sixty-nine (69) events had durations in excess of one (1) hour.

Table 5-8 summarizes the actions taken by the Fire Department at structure and outside fires. In this table it is important to note, specifically in the row referencing "extinguishment by fire service personnel," that only in 26 of the 106 structure fires and 45 of the 69 outside fires, was extinguishment done by fire service personnel. This again may indicate that on only a limited number of instances were fire extinguishment actions on the part of the fire department actually needed.

TABLE 5-8: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Structure Fire	Outside Fire
Assistance, other	4	0
Extinguishment by fire service personnel	26	45
Fire control or extinguishment, other	11	10
Information, investigation & enforcement, other	3	3
Investigate	48	7
Investigate fire out on arrival	12	4
Notify other agencies.	2	0
Provide equipment	1	0
Remove hazard	2	0
Salvage & overhaul	6	2
Search & rescue, other	5	0
Ventilate	3	0
Total*	**123**	**71**

* Totals are higher than the total number of calls because some calls had more than one action taken.

Observations:

- A total of 26 structure fire calls were extinguished by fire service personnel, which accounted for 25 percent of structure fire calls in DFD's jurisdiction.
- A total of 45 outside fire calls were extinguished by fire service personnel, which accounted for 65 percent of outside fire calls in DFD's jurisdiction.

EMS Response and Transport

Emergency medical services (EMS) operations are an important component of the comprehensive emergency services delivery system in any community. Together with the delivery of police, fire, and emergency management, it forms the backbone of the community's overall public safety service network. When EMS activities are looked at as a percentage of overall service requests, it could be argued that EMS constitutes the most frequently utilized service request among a community's citizenry.

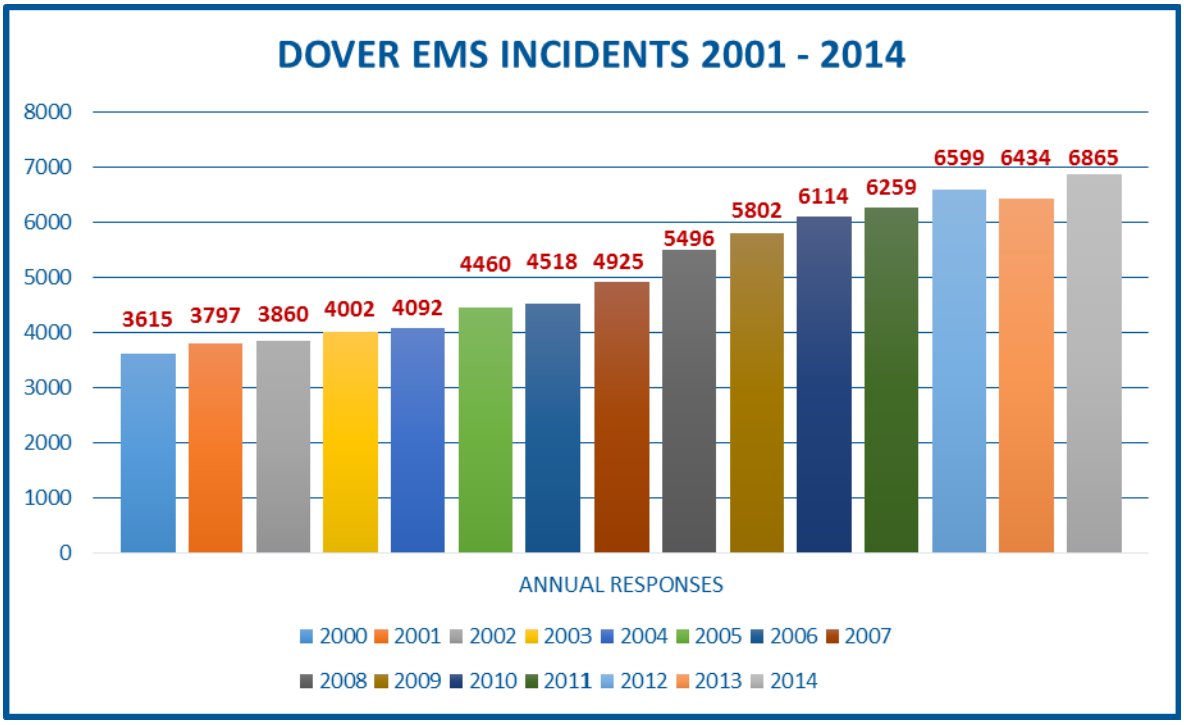
EMS in the City of Dover is provided under a two (2)-tier service delivery system for basic life support (BLS) and advanced life support (ALS). ALS is provided countywide by Kent County paramedics who utilize nontransport vehicles for response. BLS is provided under contract to the city by PrimeCare, a private and for-profit ambulance company. PrimeCare Medical Transport, LLC, has had the contract with the city for approximately ten (10) years. The most recent RFP for the ambulance contract was issued on January 8, 2015. The new contract, which is for a period of three (3) years with a provision for two (2) additional one-year renewal options, was approved and signed by the city on October 8, 2015; it was retroactive to April 1, 2015. The contract stipulates that the EMS service area is the boundaries of the Volunteer Association Fire District, which includes not only the corporate boundaries of the city (excluding Dover Air Force Base) but some contiguous areas of Kent County as well. The PrimeCare service contract is administered by the city's OEM coordinator.

PrimeCare staffs two (2) ambulances in the city from a leased facility at 601 Fulton St. One ambulance is staffed on a 24-basis throughout the year. The second unit is staffed seven (7) days a week from 7:00 a.m. to 11:00 p.m. Each ambulance is required to be staffed with one emergency medical technician (EMT-B) and a qualified driver. The ambulances are required to be maintained and equipped as required by the State of Delaware.

While not specified in the contract that we reviewed, CPSM was informed that the city pays PrimeCare a monthly stipend for providing this service. This stipend is based on a flat rate formula that pays on the basis of the number of calls and not on the basis of collections. In 2014, the payments were in excess of $237,500 and in the 10-month time frame between January-October 2015, the payments were just under $200,000. In fiscal year 2016 (July 2015–June 2016), the budget allocation for the PrimeCare stipend is approximately $238,000. In addition to this stipend, PrimeCare also bills the individual patient for transport services; however, collection rates and revenue figures were not available for our review.

In 2014, there were 6,865 EMS incidents in the City of Dover. This equates to an average of approximately 19.1 incidents each day. According to statistics provided by the Emergency Communications Division of the Kent County Department of Public Safety, from January through October of 2015, EMS incidents in Dover had totaled 6,259, or 20.8 per day. Since 2000 there has been a steady growth in the volume of EMS activity, up approximately 90 percent over this 15-year period. (Figure 5-4)

FIGURE 5-4: Dover EMS Incidents 2001-2014



The current contract with PrimeCare is very limited in its requirements regarding performance criteria, including unit availability. The contract includes a turnout time requirement that stipulates the ambulance unit must respond to calls within an average of one (1) minute (00:01:00) after receipt of the call. However, there are no other response time criteria in the current agreement. The average travel time in the time frame referenced above was six (6) minutes, thirty-two (32) seconds (00:06:32) after a turnout time of approximately forty-one (41) seconds (00:00:41). The Commission on Accreditation of Ambulance Services is an independent agency that publishes a series of standards for the ambulance service industry and it recommends that ambulances should achieve an eight (8) minute, fifty-nine (59) seconds (00:08:59) response time in 90 percent of all responses.[18] It should be noted that these reports are for PrimeCare units, when it is able to respond. When a PrimeCare unit is unavailable and a mutual aid unit responds, these times are excluded. We believe that if these incidents were calculated into the average response, the overall average would be significantly higher.

[18] The Commission on Accreditation of Ambulance Services (CAAS) is an independent commission that established a comprehensive series of standards for the ambulance service industry.

TABLE 5-9: PrimeCare Statistics, June 2015-September 2015

	JUNE 2015	JULY 2015	AUGUST 2015	SEPTEMBER 2015
Total 9-1-1 Ambulance Runs	641	669	645	672
Gone on Arrival/Cancelled	82	65	82	79
Transport Refusals	31	29	13	30
Standby at Scene	2	5	2	3
Average Turnout Time	00:00:40	00:00:40	00:00:44	00:00:41
Average Travel Time to Scene	00:06:46	00:06:27	00:06:25	00:06:31
Average Time on Scene	00:10:12	00:10:30	00:09:27	00:09:50
Average Time to the Hospital	00:06:40	00:07:05	00:06:31	00:06:34
Average Daily Responses	21	22	21	22
Average Daily Transports	17	18	17	18
Total Patients Transported	517	561	541	553

The number of times that PrimeCare units are unavailable and mutual aid EMS units are required to respond into Dover is exceedingly high. In the 10-month period from January 2015 through October 2015, there were 1,325 instances in which PrimeCare units were unavailable and a mutual aid request for an ambulance squad was required. This equates to an average of 4.6 instances each day; overall, 21.2 percent of all the EMS incidents in Dover so far this year were covered via mutual aid requests.

TABLE 5-10: 2015 Mutual Aid EMS Units Dispatched into Dover

January	February	March	April	May	June	July	August	September	October	Total
133	114	92	123	134	190	112	128	125	174	1,325

This has been an ongoing issue dating back several years and definitely prior to the signing of a new contract for EMS. In an effort to acknowledge the services of the mutual aid departments that come into Dover on a regular basis, the City of Dover has implemented a payment of $25.00 per call to those agencies providing assistance. On an annual basis this adds an additional $40,000 to the stipend paid by the city to maintain ambulance service.

> ***Recommendation: The City of Dover should revise its performance criteria in future contracts with the ambulance provider, with specific guidelines relating to unit availability, turnout time, and overall response time that is measured at the 90 percent fractile rate.***

Many municipalities include in their ambulance contracts a penalty provision in which fines and financial off-sets are required when performance criteria are not met. The city should consider the

addition of financial penalties against the ambulance provider in cases where critical performance criteria are not met.

The current contract with the city requires that each ambulance be staffed with a single EMT-B and a driver. The contract does not stipulate that the driver needs to have basic CPR, AED, and first aid training. While having only a single EMT on a career BLS unit may be permitted by Delaware regulations, it is certainly not the commonly accepted practice nationally and CPSM believes that both crew members should be EMTs. There are many reasons why two (2) EMTs are preferred, particularly in busy systems such as Dover. Chief among them is the need for both personnel to be actively involved in patient care for seriously ill or injured patients and the need to treat multiple patients simultaneously during incidents such as motor vehicle accidents.

Recommendation: The City of Dover should amend its future ambulance contract to require that all ambulances operating within the city be staffed with a minimum of two (2) EMTs.

EMS service demand in the City of Dover are significant and the level of care currently provided by PrimeCare appears lacking. The city is paying in excess of $275,000 annually to maintain the PrimeCare contract. CPSM believes that the current agreement with PrimeCare should be reconsidered. There is a substantial call volume in the Dover area and the potential to obtain a more competitive bid is likely if efforts are initiated to seek a national ambulance provider through a directed RFP process.

Recommendation: At the close of the current contract with PrimeCare, the City of Dover should consider issuing a national RFP for an ambulance provider for the city service area.

The most recent RFP for an ambulance provider only resulted in two qualified companies bidding for the contract. In the next RFP, the city should make a concerted effort to solicit bids from several of the national ambulance providers in an effort to enhance the competition and improve pricing. As part of this RFP the city should include a series of performance indicators and reporting requirements that will be part of the new contractual agreement. If a stipend is required it should be based on a performance indicator and after a thorough review of the ambulance provider revenues and collection efforts that justify the payment of a stipend and the amount.

The ability of a community to monitor and evaluate the effectiveness of its EMS delivery system is greatly dependent upon the availability of valid data and statistical analysis that measures system performance, including both clinical and financial outcomes. The city should require the contractor to provide detailed and periodic reporting as follows:

<u>Operational Reporting Requirements</u>

- Total responses.
- Total emergency transports.
- Total patients transported.

- Total responses and transport activity by ambulance unit.
- Total cancelled calls (prior to arrival).
- Frequency in which ambulance units are unavailable and the reason.
- Total patient refusals (treatment and transport).
- Distribution of responses by time of day and day of week.
- Distribution of incidents by location (ambulance service zones).
- Description of incidents by severity of injury/illness.
- Summary of patient complaints (situation found).
- Response time summary for all responses.
- Response time summary by ambulance service zones.
- Response time summary by ambulance unit.
- Frequency of simultaneous calls for service (citywide).
- Summary of mutual aid requests.
- Summary of call duration (transports and nontransports).
- Listing of equipment or vehicle breakdown/malfunctions.
- Listing and disposition of all patient complaints (regarding service).

Financial Reporting Requirements

- Total expenses and revenues.
- Total average charge per patient.
- Total average patient charge for medical supplies and disposable equipment.
- Total average patient charge for mileage.
- 30-, 60-, and 90-day accounts receivable.
- Distribution of payments by all payment groups (Medicare, Medicaid, private insurance, direct payment, and non-collectables/bad debt).
- Quarterly collection rate (percentage) for all ambulance billings.
- Total accounts written off as bad debt after 180 days attempted collections.

Miscellaneous Recordkeeping

- Deployment planning reports.
- Vehicle maintenance records.
- Continuing education and certification records documenting training compliance.

The ability to supervise the delivery of EMS transport services is a critical function of local government. As indicated by the alarm activity, thousands of residents interact directly with the ambulance service provider annually. Typically, when a private ambulance service is charged with providing these services, a municipal fire department is a coprovider of the service. This involvement creates an ongoing interaction and an indirect oversight of the process. In the system currently being utilized in Dover, this relationship does not exist because the volunteer fire service is largely uninvolved in EMS delivery. In an earlier recommendation, CPSM suggested the utilization of the Emergency Services Manager in the oversight of fire response and prevention activities. Similarly, it is our recommendation that the oversight of ambulance service delivery also be the responsibility of the Emergency Services Manager. With the proposal to institute a series of comprehensive performance criteria it is critical that an ongoing review of these performance indicators, combined with regular field evaluations, be enacted. Additionally, the city may consider the placement of the contracted ambulance units at the Dover fire stations. This would provide direct interaction with the Emergency Services Manager and draw the ambulance provider closer to fire operations.

Recommendation: The city should consider the housing and deployment of ambulance units from the Dover fire stations.

PrimeCare currently leases space for its operations in Dover. The ability to jointly house fire and ambulance operations at city facilities may create a financial incentive that would attract an outside vendor and reduce the need for a city stipend to supplement ambulance revenues.

Workload Analysis/Fire Loss

As indicated above, the fire-related call volume observed in Dover equates to 2.72 calls per day, with the majority of these calls being nonemergency in nature and public assists. Average elapsed time for a call is 26.7 minutes (from call receipt time to units returning to the station) and the total deployed time for all units is just over two and one-half (2.5) hours each day (158.8 minutes). The majority of all alarm activity (approximately 60 percent) occurs during the nine-hour period from 10:00 a.m. to 7:00 p.m. Our analysis shows that only on infrequent occasion does the Dover system experience overlapping or simultaneous alarms. There were 51 occasions in the twelve (12)-month period surveyed in which two calls occurred simultaneously. The average time of this overlap was 12.1 minutes.

When we examine the breakdown of call activity and the corresponding average deployed minutes per day for each call type (Table 5-11), we can evaluate the time Dover units are spending on the various call types. It is important to note that a total 966 hours of deployed time occurred in the period evaluated. This is the composite of all time logged for all runs by the various units responding. Of this amount, 251 hours (26 percent) were attributable to false alarm runs. If we look at the other categories of fire response activities that are typically nonemergency in nature (hazard, false alarm, good intent, and public service), it should be noted that 509.8 hours (approx. 62 percent) of all the time logged was attributable to these call types. This is of particular interest

because these are generally the call types that could be screened effectively in order to reduce the number of units responding and the mode of response (i.e., hot vs cold).

TABLE 5-11: Annual Runs and Deployed Time by Call Type

Call Type	Avg. Deployed Min. per Run	Annual Hours	Percent of Total Hours	Deployed Min. per Day	Total Annual Runs	Runs per Day
MVA	24.7	48.2	5.0	7.9	117	0.3
EMS	17.8	18.7	1.9	3.1	63	0.2
Structure fire	45.5	243.3	25.2	40.0	321	0.9
Outside fire	25.4	58.4	6.0	9.6	138	0.4
Hazard	28.8	125.4	13.0	20.6	261	0.7
False alarm	19.2	251.0	26.0	41.3	785	2.2
Good intent	24.0	109.9	11.4	18.1	275	0.8
Public service	34.6	104.5	10.8	17.2	181	0.5
Subtotal	**26.9**	**959.4**	**99.3**	**157.7**	**2,141**	**5.9**
Cancelled	15.3	6.6	0.7	1.1	26	0.1
Total	**26.7**	**966.0**	**100.0**	**158.8**	**2,167**	**5.9**

Observations:

- There were 2,167 runs in the year studied, resulting in a total of 966 hours of deployed time.
- On average, there were 5.9 runs per day, with an average of 2.6 hours of deployed time per day.
- Structure and outside fires resulted in 459 runs, with a total workload of 301.7 hours, equal to 32 percent of total DFD workload.
- Structure fires averaged 45.5 minutes of deployed time.
- Outside fires averaged 25.4 minutes of deployed time.

When we looked at the response activities among the various DFD units it was interesting to note that Ladder 1 was the busiest unit, responding 542 times, with 235.8 hours of annual total operating time. Typically, ladder trucks are the least utilized primary response vehicles. These vehicles are less maneuverable, their response times are slower, and because of their weight there is more wear and tear on these apparatus. As well, the frequency with which aerial devices are actually needed is very limited.

TABLE 5-12: Call Workload by Unit

Unit Type	Unit ID	Avg. Deployed Min. per Run	Total Annual Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
Brush	B1	17.0	3.4	0.6	12	0.0*
	B9	18.0	31.5	5.2	105	0.3
Engine	E2	27.8	199.4	32.8	431	1.2
	E3	29.0	63.8	10.5	132	0.4
	E4	27.2	164.4	27.0	363	1.0
	E6	25.7	120.7	19.8	282	0.8
	E7	32.7	20.7	3.4	38	0.1
Ladder	L1	26.1	235.8	38.8	542	1.5
	L2	26.0	50.6	8.3	117	0.3
Rescue	R1	33.7	58.3	9.6	104	0.3
Utility	U1	24.2	14.9	2.5	37	0.1
Other	Other	36.3	2.4	0.4	4	0.0*

* These units had so few runs that their average runs per day, rounded to the nearest one-tenth, appears to be zero.

Observations:

- Ladder 1 made the most runs (542 in total or 1.5 per day) and had the highest total annual deployed time (236 hours for the year or 39 minutes per day).
- Engine 2 made the second most runs (431 total or 1.2 per day) and had the second highest total annual deployed time (199 hours for the year or 33 minutes per day).

Fire Loss

In examining the fire incidents in more detail, it was determined that in fifty (50) of the total fire incidents, no fire loss was recorded. Loss amounts ranged from $100 to $100,000. The average loss amount was $9,869 and in only seven (7) incidents did we see a reported fire loss exceeding $20,000. When looking at fire loss comparisons nationwide for structure fires, NFPA estimates that in 2012 the average fire loss for a structure fire was $20,345.[19] When this is compared with the average fire loss in structure fires in Dover, which was $9,869, we see the Dover average loss is less than half the fire loss being experienced nationally. Although the fire loss in 2014-2015 was not exceptionally high, at any time a single fire can occur that results in millions of dollars in fire loss. However, one can determine from both the number of actual fires occurring in Dover and the average fire loss during these events, that the fire problem in Dover is not exceptionally high.

[19] Michael J. Karter Jr., *Fire Loss in the United States during 2012*, NFPA September 2013, 13.

TABLE 5-13: Fire Loss

Call Type	Calls	Total Loss	Average Loss
Structure Fire	35	$463,350	$13,239
Outside Fire	5	$23,100	$4,620
Good Intent	1	$250	$250
Hazard	9	$14,400	$1,600
Total	**50**	**$501,100**	**$10,022**

Note: This analysis only includes calls with recorded loss greater than 0.

Observations:

Overall

- 50 incidents had property loss, with an average loss amount of $10,022.
- Only seven incidents involved a loss amount exceeding $20,000.

Structure Fires

- Out of 106 structure fire calls, 35 had recorded loss, with total recorded loss value of $463,350 and average loss of $13,239.
- Five structure fires had under $500 in loss, and 20 had more than $500 but less than $10,000 in loss.
- The smallest loss was $100, and the largest loss was $100,000

Outside Fires

- Out of 69 outside fire calls, five had recorded loss, with total recorded loss value of $23,100 and average loss of $4,620.
- One outside fire had under $500 in loss, and the remaining four had more than $500 but less than $10,000 in loss.
- The smallest loss was $100, and the largest loss was $10,000.

Service Relationship with Kent County

The State of Delaware, because of its size, has only three (3) counties within the state. County governments work closely with cities, towns, and unincorporated communities in providing a range of county and municipal services. County governments also provide significant support to volunteer fire companies, which are the primary service providers for fire and EMS services in Delaware. Wilmington is the largest city in Delaware and the only municipality that operates a full-time career fire department. All other cities, towns, and fire protection districts are served by fully volunteer or paid-on-call fire departments.

The City of Dover is an incorporated municipality within Kent County. As the state capital, Dover has a critical working relationship with many state agencies that are located within city limits. The

Dover Fire Department works closely with the Kent County Department of Public Safety and the State of Delaware in providing fire protection to its residents, visitors, state buildings, and businesses. The Kent County Emergency Communications Center provides countywide 911 emergency call-taking, dispatching, and centralized communications services to seventeen (17) volunteer fire departments and fourteen (14) EMS agencies from a state-of-the-art facility. The City of Dover does not utilize Kent County Department of Public Safety for 911 services and instead operates its own dispatch system for its police and fire departments.

Mutual Aid

The Dover Fire Department is part of the statewide mutual aid system. Each participant of this system recognizes that "emergencies transcend political jurisdictional boundaries and that intergovernmental coordination is essential for the protection of lives and property and for best use of available assets both public and private."[20]

The City of Dover utilizes four (4) primary mutual aid partners: Cheswold, Little Creek, Hartly, and Camden-Wyoming. The mutual aid partners are dispatched by Kent County 911. In addition, two (2) of the partners have EMS ambulances that frequently respond to calls for service in Dover when PrimeCare units are not available. Mutual aid is used extensively in Dover and among the surrounding fire departments in Kent County. In the twelve 12-month period evaluated in our analysis there were a total of twenty-five (25) occasions in which a Dover unit provided assistance to a mutual aid partner. On approximately eighty (80) occasions, Dover received fire assistance from its neighboring partners. Many times this assistance took the form of a "stand-by" or "cover-up" response. In this scenario, the agency providing assistance would respond into the neighboring community and stand-by while the resident agency was tied up on an initial call. The surrounding Fire Chiefs reported that the mutual aid process was very effective and that there were no tactical, jurisdictional, or equipment/radio incompatibilities in the mutual aid process. Operational and tactical procedures are developed collaboratively by the Kent County Chief's Association in the form of standard operating procedures. The mutual aid system appears to be very functional and CPSM views this combined effort as a ***best practice*** that is commendable.

Emergency/Nonemergency Response

Another interesting trend CPSM continues to evaluate is the frequency of true emergency calls vs. nonemergency or public assist calls. Our findings nationally (from CPSM fire data reports) indicate that in many jurisdictions more than fifty (50) percent of all responses (fire, EMS, and other) are nonemergency in nature. This factor is critical when volunteer personnel are utilized and individuals are called in for a response and the call turns out to be a false alarm or something minor that could have been handled with a lesser response. In an effort to limit the response of multiple units, DFD has built into its response protocols the use of a "***Silent Alarm***" and the "***Duty Officer***

[20] Delaware Code §20, Chapter 32, Military and Civil Defense Intrastate Mutual Aid Compact.

Call." This is an excellent effort that CPSM recognizes as a ***best practice***. The Dover 911 Center and the Dover Fire Dispatch Center are very limited in their call screening efforts. In nearly all fire responses, units respond in a ***Hot*** mode, utilizing lights and sirens.

> ***Recommendation: The DFD should work with the Dover 911 Police Communications Center in an effort to reduce the number of responses that require units to respond with lights and sirens.***

Most fire responses, specifically those involving automatic fire alarm soundings, smoke investigations, smell of gas, and public service calls, are nonemergency and do not require a hot response. In most cases, an investigation of the situation is warranted and minimal personnel should be assigned. In looking at the fire responses that occurred in the twelve (12)-month period from July 2014 to June-2015, we found that more than 80 percent (710 incidents) were classified as either a hazard, false alarm, good intent, or public service call. CPSM believes that with proper screening, many of these responses could be handled as nonemergency responses.

Our analysis also found that on 35.6 percent of all responses, DFD responds a single unit. CPSM believes that this number is very low. Our experience with call activity in other communities indicates that upwards of 50 percent to 60 percent of all fire responses can be screened sufficiently to reduce the level of response. The ability to respond the fewest number of units and have these units respond in a "cold mode of response" (without lights and sirens and following traffic patterns) results in the maximization of resources and improved responder safety. Emergency response units that are responding with lights and sirens are more susceptible to traffic accidents. Accidents involving fire vehicles responding to emergencies are the second highest cause for line-of-duty deaths of firefighters.[21] It is estimated that more than 30,000 fire apparatus are involved in accidents when responding to emergencies each year in the U.S.[22] Responding fewer units and having these units respond in a nonemergency mode makes sense in terms of safety and efficiency.

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

FIGURE 5-5: Number of Dover Fire Department Units Dispatched to Calls

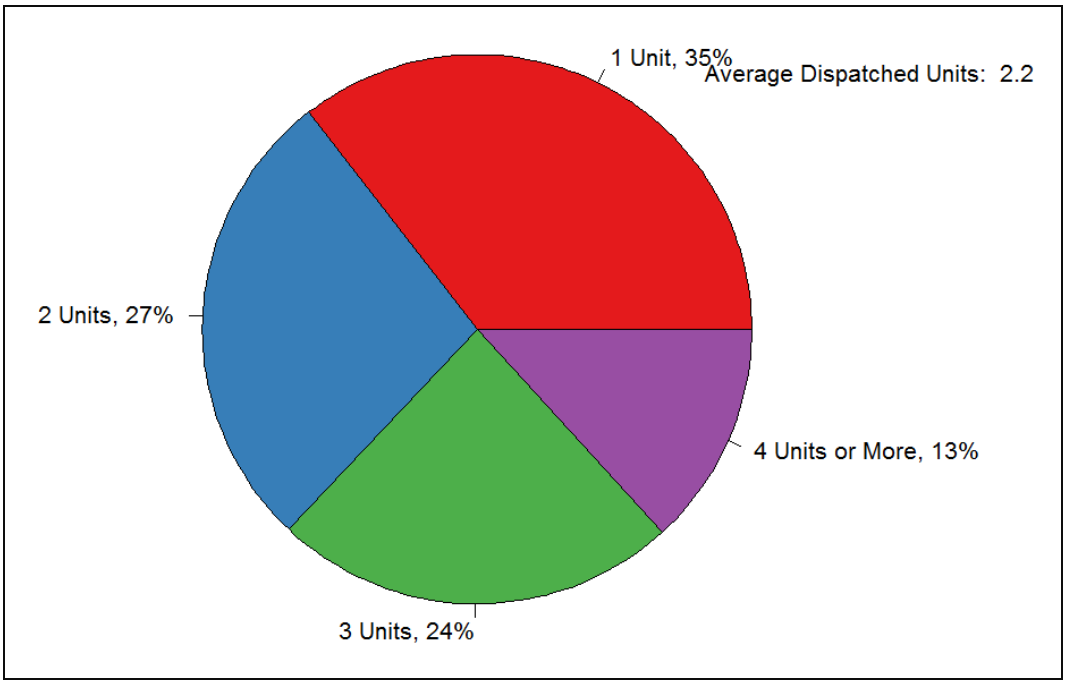


TABLE 5-14: Number of Units Dispatched to Calls

Call Type	Number of Units				Total
	One	Two	Three	Four or More	
MVA	10	11	19	7	47
EMS	30	7	5	1	43
Structure fire	20	19	27	40	106
Outside fire	31	18	13	7	69
Hazard	40	25	35	15	115
False alarm	96	130	95	34	355
Good intent	47	38	23	19	127
Public service	72	20	15	6	113
Subtotal	**346**	**268**	**232**	**129**	**975**
Cancelled	8	6	2	0	16
Total	**354**	**276**	**234**	**129**	**993**
Percentage	**35.6**	**27.8**	**23.6**	**13.0**	**100.0**

Observations:

Overall

- On average, 2.2 units were dispatched per call.
- One unit was dispatched 36 percent of the time, two units were dispatched 28 percent of the time, three units were dispatched 24 percent of the time, and four or more units were dispatched 13 percent of the time.

Structure Fires

- Three units were dispatched to structure fires 25 percent of the time, and four or more units were dispatched 38 percent of the time.

Outside Fires

- Three units were dispatched to outside fires 19 percent of the time, and four or more units were dispatched 10 percent of the time.

False Alarms

- Three units were dispatched to false alarms 37 percent of the time, and four or more units were dispatched 10 percent of the time.

Recommendation: The DFD should modify its response protocols in an effort to reduce the number of units responding to those calls that are screened sufficiently to determine that they are nonemergency in nature.

The ability to screen calls sufficiently at the dispatch level to determine their criticality is done on a daily basis in dispatch centers across the nation. In today's environment in which cellular telephones are carried by most everyone, it is very likely that during true emergencies multiple calls are received for the same incident. From this standpoint, the ability to upgrade a call from nonemergency to emergency can be done with little time delay if multiple or confirming calls are received.

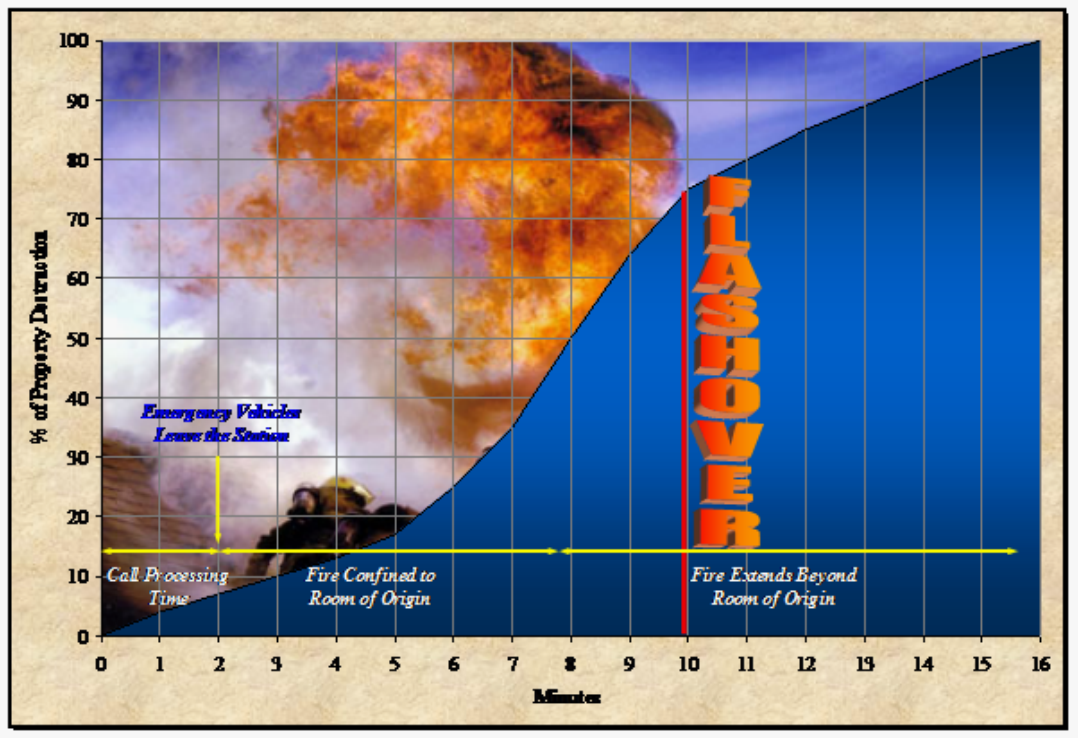
Section 6. Response Time Analysis

Response times are typically the primary measurement in evaluating fire and EMS services. Most deployment models have been built around a four-minute initial travel time for EMS and an eight-minute full-force travel time for fires. Though these times have validity, the actual impact of a speedy response time is limited to very few incidents. For example, in a full cardiac arrest, analysis shows that successful outcomes are rarely achieved if basic life support (CPR) is not initiated within four minutes of the onset. However, cardiac arrests occur very infrequently; on average they are 1 percent to 1.5 percent of all EMS incidents.[23] There are also other EMS incidents that are truly life-threatening and the time of response can clearly impact the outcome. These involve full drownings, allergic reactions, electrocutions, and severe trauma (often caused by gunshot wounds, stabbings, and severe motor vehicle accidents, etc.). Again, the frequencies of these types of calls are limited.

Regarding response times for fire incidents, the criterion is based on the concept of "flashover." This is the state at which super-heated gasses from a fire are released rapidly, causing the fire to burn freely and become so volatile that the fire reaches an explosive state. In this situation, usually after an extended period of time (often eight (8) to twelve (12) minutes after ignition but times as quickly as five (5) to seven (7) minutes), and a combination of the right conditions (fuel and oxygen), the fire expands rapidly and is much more difficult to contain. When the fire does reach this extremely hazardous state, initial firefighting forces are often overwhelmed, larger and more destructive fire occurs, and significantly more resources are required to affect fire control and extinguishment. Flashover has been observed to occur more frequently today as part of an increase in quantities of plastic- and foam-based products into homes and businesses. These materials ignite and burn quickly and produce extreme heat and toxic smoke. Figure 6-1 illustrates the flashover phenomenon and its potential impact on firefighters and fire extinguishment as the fire propagation curve.

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

FIGURE 6-1: Fire Propagation Curve



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

Measuring Response Times

There are no documented studies that have made a direct correlation between response times and outcomes in fire and EMS events. No one has been able to show that a four (4)-minute response time is measurably more effective than a six (6)-minute response time. The logic has been "faster is better" but this has not been substantiated by any detailed analysis. Furthermore, the ability to measure the difference in outcomes (patient saves, reduced fire damage, or some other quantifiable measure) between a six (6)-minute, eight (8)-minute, or ten (10)-minute response is not a performance measure often utilized in the fire service.

The level of protection in a community should be based on the specific needs of that community. So, in looking at response times it is prudent to design a deployment strategy around the actual circumstances that exist and the historical service demands that are occurring.

For the purpose of this analysis ***Response Time*** is a product of three components; ***Dispatch Time***, ***Turnout Time***, and ***Travel Time***.

- *Dispatch time* is the time interval that begins when the alarm is received at the initial public safety answering point (PSAP) or communications center and ends when the response information begins to be transmitted via voice and/or electronic means to the emergency response facility or emergency response units or personnel in the field.
- *Turnout time* is the time interval that begins when the notification process to emergency response facilities and emergency response personnel and units begins by an audible alarm and/or visual announcement and ends at the beginning point of travel time. The fire department has the greatest control over these first two segments of the total response time.
- *Travel time* is the time interval that initiates when the emergency response unit is actually moving in response to the incident and ends when the unit arrives at the scene.
- *Response time*, also known as ***total response time***, is the time interval that begins when the call is received by the primary dispatch center and ends when the dispatched unit arrives on the scene of the incident to initiate action.

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

According to NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments, 2014 Edition*, the alarm processing time or dispatch time should be less than or equal to 60 seconds 90 percent of the time. While Dover's fire department itself is volunteer, its dispatch functions are not; therefore for the purposes of dispatch time, this standard may be considered an applicable benchmark.

NFPA 1720 is silent on initial unit response times. However, for fire departments serving an urban community it states the initial first alarm assignment (a total of fifteen (15) personnel for a single family residential structure) should be assembled on scene in 540 seconds (nine minutes) 90 percent of the time (including turnout time but not dispatch time). ***NFPA 1720 response time criterion is a benchmark for service delivery and not necessarily a CPSM recommendation.***

Dover Fire Department Response Times

This section focuses on dispatch and response time analysis for the first arriving DFD unit. We typically focus on emergency calls where the department would respond with lights and sirens—also known as a ***hot response***. The DFD does not record the priority of a call in its records management system, so all eligible calls were included in this analysis. CPSM used 940 calls in creating this analysis. We excluded calls in which units were canceled en route, administrative calls, and calls in which the data were incomplete or inaccurate. We included first arriving units with complete unit dispatch time, unit en route time, and unit on-scene arrival time.

For the DFD calls analyzed the average dispatch time was 1.3 minutes. The average turnout time was 3.3 minutes. The average travel time was 3.5 minutes. The average DFD response time for EMS calls was 5.8 minutes. The average response time for structure fire calls was 7.8 minutes. The average response time for outside fire calls was also 7.8 minutes. The average total response time was 8.1 minutes.

TABLE 6-1: Average Response Times of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
MVA	2.0	1.8	3.2	7.0	42
EMS	1.3	2.7	1.8	5.8	42
Structure fire	1.0	3.4	3.4	7.8	104
Outside fire	2.1	2.0	3.7	7.8	68
Hazard	1.3	3.4	3.3	8.0	111
False alarm	1.0	3.9	3.6	8.5	346
Good intent	1.3	3.1	3.7	8.1	125
Public service	1.6	2.5	4.4	8.5	102
Total	**1.3**	**3.3**	**3.5**	**8.1**	**940**

Observations:

- 48 calls (5 percent) had a dispatch handling time greater than five minutes.
- 370 calls (39 percent) had a turnout time of greater than four minutes.
- 234 calls (25 percent) had a total response time greater than ten minutes.

Averages – First Arriving Unit

- Dispatch time: 1.3 minutes.
- Turnout time: 3.3 minutes.
- Travel time: 3.5 minutes.
- Total response time: 8.1 minutes.
- Structure fire response time: 7.8 minutes.
- Outside fire response time: 7.8 minutes.

The 90th percentile measurement, often referred as a "fractile response," is a more conservative and stricter measure of total response time. Most fire agencies are unable to meet the NFPA fractile response time standard. Simply explained, for 90 percent of calls, the first unit arrives within a specified time, and if measured, the second and third unit. Table 6-2 depicts the 90th percentile response times in Dover for various responses. It is important to note that the 90th percentile dispatch time for fire responses is 3.3 minutes while the average dispatch time was just 1.3 minutes. MVAs and outside fires were measured at five minutes (00:05:00) and five minutes, thirty

seconds (00:05:30), respectively. Structure fires had a 90th percentile turnout time of six minutes, thirty seconds (00:06:30).

TABLE 6-2: 90th Percentile Response Times of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
MVA	5.0	4.5	5.5	10.4	42
EMS	2.5	6.7	4.5	11.0	42
Structure fire	2.2	6.5	5.8	12.2	104
Outside fire	5.5	5.5	6.6	11.1	68
Hazard	3.4	6.8	5.5	12.1	111
False alarm	2.4	7.1	5.8	12.0	346
Good intent	3.3	6.6	6.3	12.3	125
Public service	3.9	5.8	8.3	14.0	102
Total	**3.3**	**6.7**	**6.1**	**12.1**	**940**

Observations

90th Percentile – First Arriving Unit

- Dispatch time: 3.3 minutes.
- Turnout time: 6.7 minutes.
- Travel time: 6.1 minutes.
- Total response time: 12.1 minutes.
- Structure fire response time: 12.2 minutes.
- Outside fire response time: 11.1 minutes.

In general, the response times reflected in this analysis are excellent considering the use of a fully volunteer operation and the average turnout of personnel that was achieved. The ability to achieve an average total response time of 8.1 minutes and a 90th percentile response time of 12.1 minutes, is considered a ***best practice***, and which CPSM views as being highly commendable.

Station Locations

The fire station is a critical link in service delivery and where these facilities are located is the single most important factor in determining overall response times and workload management. The Dover Fire Department provides its services from two (2) fire stations, which are located as follows:

- Station 1/Fire Headquarters: 103 S. Governors Ave.
- Station 2: 911 Kenton Rd.

PrimeCare ambulances respond from a single facility located at 601 Fulton St.

Typically, fire stations have an anticipated service life of approximately fifty (50) years. In most cases facilities require replacement because of the size constraints of the buildings, a need to relocate the facility to better serve changing population centers, the absence of needed safety features or service accommodations, and the general age and condition of the facility. At the time of this assessment both Dover stations were found to have up-to-date building systems, such as HVAC, and station infrastructure was generally in excellent condition. Both stations are equipped with automatic fire suppression systems and diesel exhaust removal systems.

Station 1 was originally built in 1922. It was expanded in 1976 and again, along with extensive renovations and upgrading in 2004. It occupies a total of 23,000 square feet that encompasses twelve (12) apparatus bays, the department's administrative offices, the dispatch center, meeting rooms, and operational/member spaces including bunkrooms, and a fire museum. Operational and maintenance costs for Station 1 are borne by the Volunteer Association.

Station 2 was constructed in 1993 and contains 8,300 square feet. This includes five (5) apparatus bays and administrative space. There is a room on the second floor that could be converted into a bunkroom for use by an in station duty crew. Station 2's operational and maintenance costs are borne by the city.

Assessment of Fire Station Locations

The DFD serves an estimated population of 37,355 people and a total service area in excess of 25 square miles. While the City of Dover encompasses 23.15 square miles, the fire department's service area extends beyond the city boundaries into contiguous areas of Kent County. This equates to an average service area for each fire station of approximately 12.5 square miles.

In a FY 2011 *ICMA Data Report*, ICMA reported survey information from 76 municipalities with populations ranging from 25,000 to 100,000 people. In this grouping the average fire station

service area was 11 square miles.[24] The median service area for this grouping of communities was 6.67 square miles per fire station.[25]

In addition, the NFPA and ISO have established different indices in determining fire station distribution. The ISO Fire Suppression Rating Schedule, Section 560, indicates that first-due engine companies should serve areas that are within a 1.5-mile travel distance.[26] The placement of fire stations that achieves this type of separation creates service areas that are approximately 4.5 square miles in size, depending on the road network and other geographical barriers (rivers, lakes, railroads, limited access highways, etc.). The National Fire Protection Association (NFPA) references the placement of fire stations in an indirect way. It recommends that fire stations be placed in a distribution that achieves the desired minimum response times. NFPA Standard 1710, Section 5.2.4.1.1, suggests an engine placement that achieves a 240-second (four-minute) travel time.[27] Using an empirical model called the "piece-wise linear travel time function" the Rand Institute has estimated that the average emergency response speed for fire apparatus is 35 mph. At this speed the distance a fire engine can travel in four minutes is approximately 1.97 miles.[28] A polygon based on a 1.97 mile travel distance results in a service area that on average is 7.3 square miles.[29]

From these comparisons, it can be seen that the average 12.5 square-mile service area per station in Dover is larger than all of the noted references. Immediately obvious when examining a city map showing the location of Dover's stations is that the northern and eastern sections of the city appear to lack an easy or rapid response from either of the existing fire stations. In particular, for responses to the eastern side of the city, units must cross over both US Route 13 (DuPont Highway) and Delaware Route 1 (Korean War Veterans Memorial Highway). These roads essentially divide the city, as there are limited locations where streets directly cross from one side of these highways to the other. It is quite possible that the lack of a station in this area, and the barriers presented by these highways, impacts response times.

As noted, the DFD deploys its apparatus from two (2) fire stations. Figures 6-2, 6-3, and 6-5 illustrate station locations, along with 240-second (indicated by the red overlay), 360-second (indicated by the green overlay), and 480-second (indicated by the blue overlay) travel time benchmarks.

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[24] *Comparative Performance Measurement*, FY 2011 Data Report - Fire and EMS, ICMA Center for Performance Measurement, August 2012.
[25] Ibid.
[26] Insurance Services Office. (2003) Fire Protection Rating Schedule (edition 02-02). Jersey City, NJ: Insurance Services Office (ISO).
[27] National Fire Protection Association. (2010). NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. Boston, MA: National Fire Protection Association.
[28] University of Tennessee Municipal Technical Advisory Service, *Clinton Fire Location Station Study*, Knoxville, TN, November 2012. p. 8.
[29] Ibid., p. 9.

FIGURE 6-2: DFD Station Locations and Travel Times (red = 240 seconds)

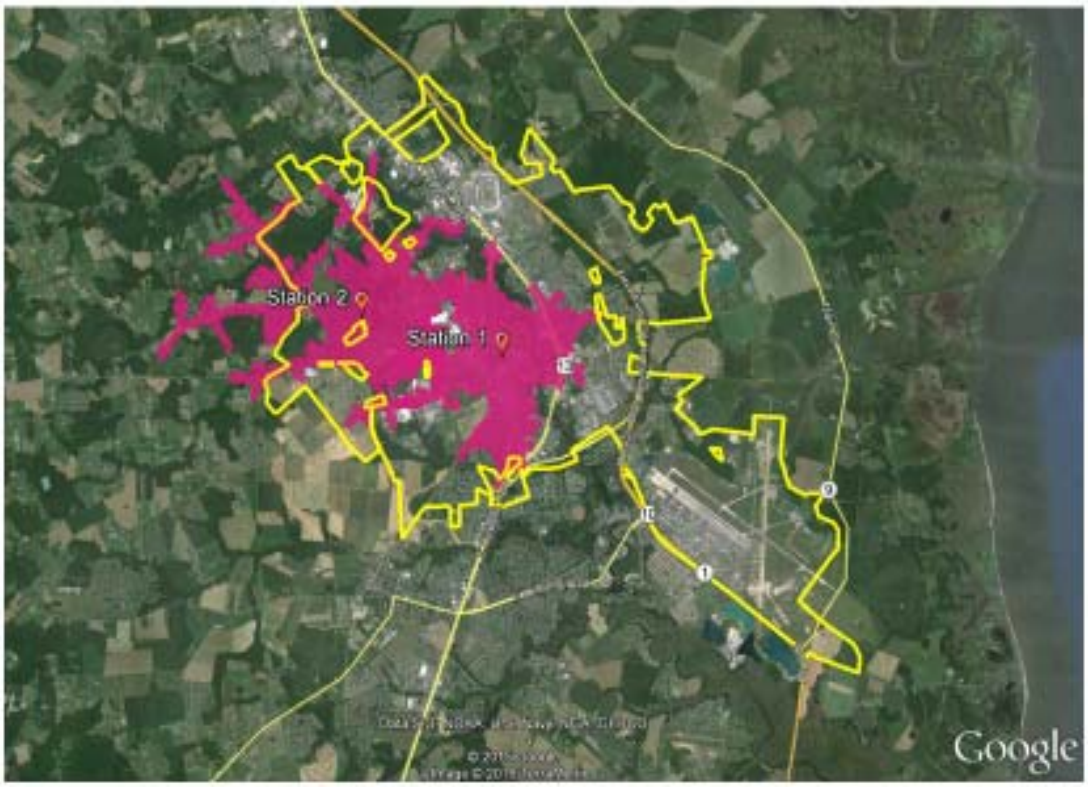


FIGURE 6-3: DFD Station Locations and Travel Times (green = 360 seconds)

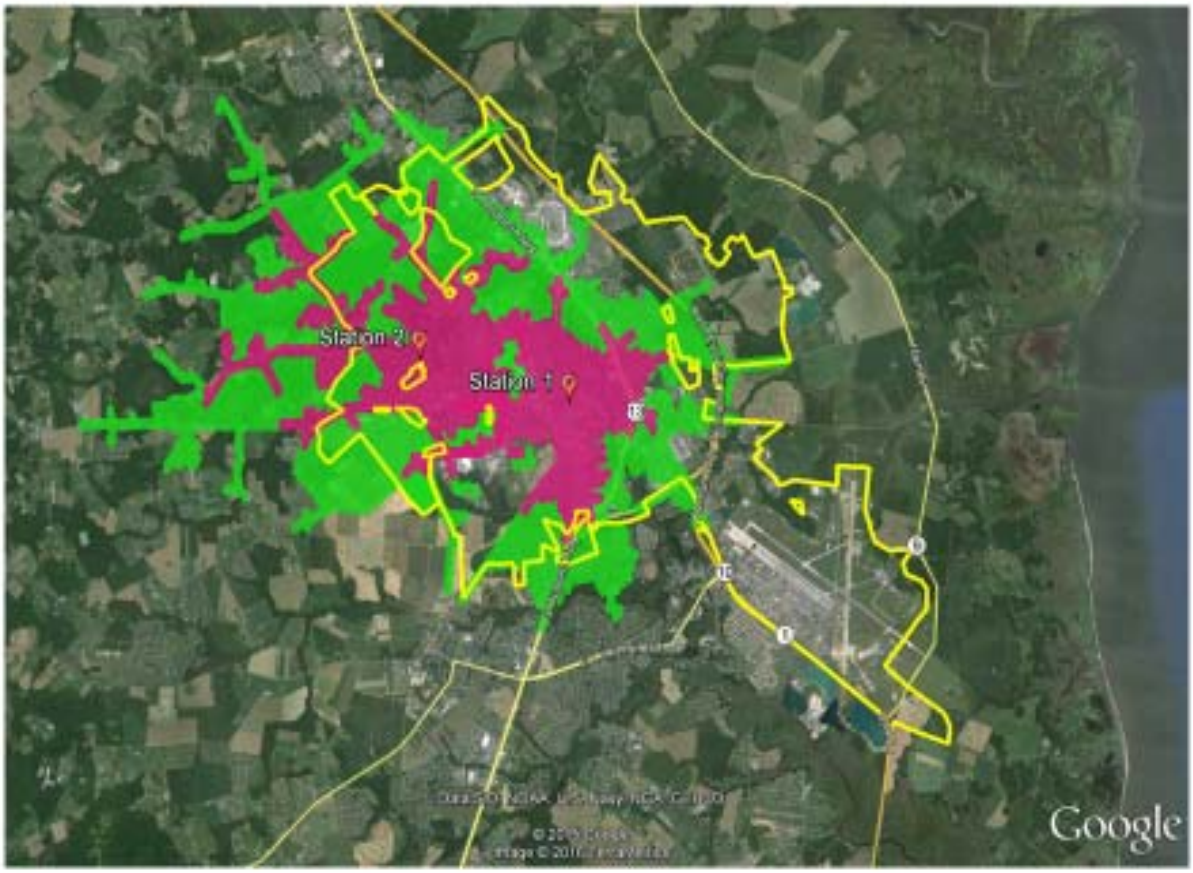


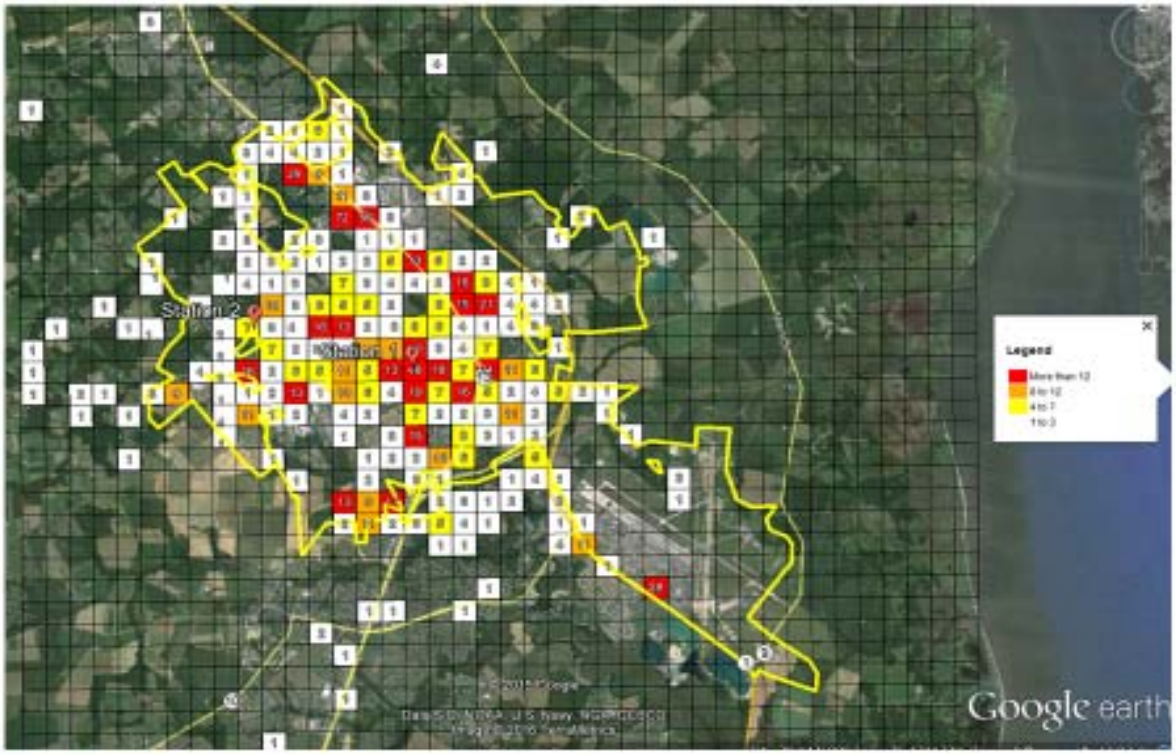
FIGURE 6-4: DFD Station Locations and Travel Times (blue = 480 seconds)

Figure 6-2 shows that approximately 50 percent of the developed areas of the city are covered under the 240-second benchmark. We estimate that approximately 80 percent of the developed area of the city is covered under the 360-second overlay and more than 90 percent is covered under the 480-second benchmark. It is important to note that the Dover Air Force base, which is officially located within city limits in the far southeast section of the city, is not served by DFD. The majority of the city, the commercial, and the more built-upon areas are well within the 240- and 360-second benchmarks. This is confirmed by the information in Table 6-2 showing 90th percentile times; it can be seen that nearly 90 percent of the calls handled by DFD result in a travel time in the six minute range (360 seconds). It is, however, important to note that these travel time distances do not take into consideration alarm handling and turn-out times. ***The maps in Figures 6-2, 6-3, and 6-4 only depict travel distances and not actual response times.***

Figure 6-5 represents the actual locations of fire and other emergency responses carried out by the DFD. It is apparent that most responses are within four to five minutes of travel time from the Dover fire stations. It is also revealing that there are a number of call generating points that are in the eastern areas of the city that are at the farther limits of the 480-second travel distance. In addition, there is a pocket of calls located in the extreme southeast section of the city, adjacent to Dover Air Force base, and these calls typically result in extended travel times. This area includes the

General Green Housing development, a small mobile home park, and some business establishments. We estimate that about 50 calls occur in this area annually.

FIGURE 6-5: DFD Fire Runs



Section 7. Measurement and Self-Assessment

Performance Measurement

Fire suppression, prevention programs, and safety services need to be planned and managed to achieve specific, agreed-upon results. Determining how well an organization or program is doing requires that these goals be measurable and that they are measured against desired results. This is the goal of performance measurement.

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

Incident reporting is the primary medium through which department activities are recorded and can subsequently be measured. Consistency, accuracy, and completeness in incident reporting is critical to an effective performance measurement system. CPSM believes that improved oversight is needed regarding the incident reporting and activity reporting (inspections, training, public education presentations, and fire investigations) systems currently utilized by DFD. It is important that all personnel be fully trained in the incident and activity report process and that clear guidelines be established on when such reporting is required. In addition, CPSM recommends that an assigned person(s) be responsible for the review of these reports for purposes of quality control.

> ***Recommendation: The DFD should institute a unified incident and activity reporting system for emergency response and other support activities carried out by all personnel.***

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

Within the fire service, performance measures tend to focus on inputs (the amount of money and resources spent on a given program or activity, number of personnel, daily staffing levels, etc.) and short-term outputs (the number of fires and average response times). One of the goals of any performance measurement system should be to include efficiency and cost-effectiveness indicators, as well as explanatory information on how these measures should be interpreted. The various types of performance measures are shown in Table 7-1.

TABLE 7-1: The Five GASB Performance Indicators[30]

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

As the DFD evolves it is critical that a series of measurements be established to track the performance of all operations. Currently, the department does not use performance measures with any regularity in monitoring system performance and efficiency. To be effective, the findings from these reports need to be published and shared with all the affected stakeholders, including the city council, the Mayor's Office, the City Manager's Office, the Volunteer Association, and the first responders. Ongoing analysis and the monitoring of trends are most useful to justify program effectiveness, direct training efforts, and to measure service delivery levels.

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

Establishing a performance management system within the framework of an overall strategic plan would help city management and elected officials to gain a better understanding of what the DFD is trying to achieve. Building any successful performance management system that measures more than outputs requires a consistent model.

[30] From Harry P. Hatry et al., eds. *Service Efforts and Accomplishments Reporting: Its Time Has Come* (Norwalk , CT: GASB, 1990).

Recommendation: The DFD should undertake a concerted effort to develop a comprehensive set of performance measures that will be used to monitor its system performance and system outcomes. The process of developing these measures should utilize input from DFD members, the community, elected officials, and city administrators.

CPSM recommends that DFD undertake a concerted effort to develop a comprehensive listing of performance measures for both emergency and nonemergency activities. The following are a number of suggested measures that may be considered:

Operations:

- Response times (fractal/average/frequency of excessive times).
  - Alarm handling times.
  - Turnout times.
  - Travel times.
  - On-scene time.
  - Call duration.
  - Cancelled en route.
- Workload measures.
  - Emergency vs. nonemergency responses.
  - Response to automatic fire alarms/frequency and outcomes.
  - Smoke detector distribution (installations and follow-up).
  - Prefire planning.
  - Public education-contact hours/numbers by age group.
- Outcome measures
  - Fire loss/limit of fire spread–point of origin, room of origin, etc.
  - On-duty injuries.
  - Volunteer participation and attendance at events.
  - Vehicle accidents.
  - Equipment lost or broken.

Staff Training and Development:

- Fire training and participation at drills.
- Officer development.
- Specialty training.

- Professional development/formal education/certifications.

Fire Prevention:

- Plans review (numbers/valuation $/completion time).
- Inspections (new and existing).
  - Numbers.
  - Completion time.
  - Violations (found/corrected).
  - Quantification by type of violation and occupancy type.
- Fire investigations.
  - Numbers and determinations.
  - Locations and occupancy types.
  - Fire loss/structure and contents.
  - Arson arrests/convictions.
  - Fire deaths (demographics/occupancy type/cause and origin).

Miscellaneous:

- Customer service surveys.
  - Following emergency response.
  - Public assist.
  - Inspections (prevention and company).
  - Public education.
  - In-service training (volunteer assessments).
- Financial/budgetary.
  - Apparatus repair costs and out-of-service time.

Hazard Analysis

The City Manager has designated the Public Affairs Coordinator as the city's Emergency Management Coordinator and as such is responsible for the city's overall emergency planning and disaster preparedness efforts. The city has adopted an emergency operations plan (EOP) that includes a line of succession, identifying the Fire Chief and Police Chief as alternates in the absence of the Emergency Management Coordinator. The city's plan is very well written and identifies those potential hazards that can affect the community. These include:

- Hurricanes/tropical storms.
- Coastal erosion/tidal surge.
- Flooding
- Drought
- Winter Storms
- Energy disruption/shortage
- Transportation accident

Dover is also vulnerable to a variety of human-caused hazards, including chemical releases, spills, or explosions associated with the fixed storage or mobile transport of hazardous materials.[31] In addition, the Kent County Multi-Jurisdictional Hazard Mitigation Plan encompasses the City of Dover. The purpose of hazard mitigation is to reduce or eliminate long-term risks to people and property from natural hazards. The emergency operations plan includes a series of response guides that identify the associated tasks and to whom they are assigned, depending on the type of incident and its magnitude.

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

Fire Preplanning/Company Inspections

The Dover Fire Department has developed a number of prefire plans for major target hazards within the response district. These documents address routes of travel, types of occupancies, water supplies, sprinkler and standpipe connections, and hazards associated with the various occupancies. Each piece of apparatus has a book with running routes and building layout for target hazards.

Risk assessment and vulnerability analysis are not new to the fire service; the NFPA 1620, *Recommended Practice for Pre-Incident Planning*, identifies the need to utilize both written narrative and diagrams to depict the physical features of a building, its contents, and any built-in fire protection systems. The occupancies that are typically specified for pre-incident plans, or "preplans," are as follows:

- Large assembly.

[31] *Kent County Multi-Jurisdictional Hazard Mitigation Plan, 2015 Update (Draft)*

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

Of particular note are the Dangerous Building Placards, which mark abandoned, damaged, and vacant structures that could pose a hazard to firefighters responding to a fire. Placards are affixed at designated locations, if applicable, indicating the need to use caution or do not enter. This procedure is a ***best practice***.

The City of Dover fire prevention functions are managed by the Fire Marshal, a section within the city's planning department. The fire department does not perform company inspections; however, obvious fire hazards while performing area familiarization are reported to the Fire Marshal by suppression personnel.

The building inspection process is the ideal mechanism for emergency response personnel to keep current with the hundreds of commercial, industrial, fabrication, storage, and residential occupancies. The absence of line fire personnel who are involved in the inspection and code enforcement process is a lost opportunity in giving emergency responders up-to-date information regarding structures and the storage of materials that they may encounter during an emergency. It is very understandable that as a volunteer force the ability to involve line personnel in the inspection process is difficult. However, the inability for this interaction to occur reduces the overall effectiveness of the suppression effort and minimizes the safety considerations that would otherwise be gained from the effort. In our section regarding the reorganization of the DFD we spoke about the expansion of the Fire Dispatcher role and moving their functionality to one of a Fire Technician. In this capacity we would recommend that the Fire Techs have an inspection responsibility in conjunction with city fire inspectors and that, in addition to their code enforcement duties, they also be involved in the transfer of this familiarization process in the tactical prefire planning of key occupancies.

> ***Recommendation: DFD should expand the responsibilities of the Fire Technician position to include inspection and code enforcement, including the prefire planning of key occupancies.***

This information, along with the impacts of this information on tactical considerations, can be discussed in weekly training sessions with the volunteers. The utilization of digital photography, schematics, and diagrams are recommended to further enforce this information exchange.

Accreditation

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

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

The CPSE Accreditation Program is built around the following key measurements:

- Determine community risk and safety needs.
- Evaluate the performance of the department.
- Establish a method for achieving continuous organizational improvement.

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

CPSE accreditation has national recognition and is widely used throughout the fire service. The key to its success is that it allows communities to set their own standards that are reflective of their needs and a service delivery model that is specific to their needs. In addition, it is a program that is based on ongoing improvement and continuous monitoring. The CPSE accreditation model may be well suited for the Dover Fire Department.

> ***Recommendation: The Dover Fire Department should consider CPSE accreditation in the future.***

ISO

ISO collects data for more than 47,000 communities and fire districts throughout the country. The data are then analyzed using a proprietary Fire Suppression Rating Schedule (FSRS). This analysis then results in a PPC (Public Protection Classification) score between 1 and 10 to the community,

with *Class 1* representing "superior property fire protection" and *Class 10* indicating that an area doesn't meet the minimum criteria set by the ISO. On July 1, 2013, the revised FSRS was released; it adds an emphasis on a community's effort to limit loss before an incident occurs.

In developing a PPC, the following major categories are evaluated:

- Emergency Communications: Fire alarm and communication systems, including telephone systems, telephone lines, staffing and dispatching systems.
- Fire Department: The fire department, including equipment, staffing, training, and geographic distribution of fire companies.
- Water Supply: The water supply system, including the condition and maintenance of hydrants and the amount of available water compared to the amount need to suppress fires.
- Fire Prevention: Programs that contain plan review; certificate of occupancy inspections; compliance follow-up; inspection of fire protection equipment; and fire prevention regulations related to fire lanes on area roads, hazardous material routes, fireworks, barbecue grills, and wildland-urban interface areas.
- Public Fire Safety Education Programs: Fire safety education training and programs for schools, private homes, and buildings with large loss potential or hazardous conditions and a juvenile fire setter intervention program.

The City of Dover is rated as 4/4Y. The 4/4Y rating is an outstanding achievement for a community with such a fire load, density, and population protected by an all-volunteer fire department. In a split classification for a community the first number is the class that applies to properties within five road miles of the responding fire station and 1,000 feet of a credible water supply, such as a fire hydrant, suction point, or dry hydrant. The second number is the class that applies to properties within five road miles of a fire station but beyond 1,000 feet of a credible water supply.

With a total point score of 68.81, the City of Dover is just 1.19 points away from the 70 points necessary to be rated as a 3/3Y. CPSM has reviewed the most recent ISO evaluation and believes that the city can achieve a Class-3/3Y rating with minimal effort.

> ***Recommendations: Dover should request from ISO a reevaluation of its August 2015 review after making adjustments in its fire hydrant testing process and the transfer of fire dispatching to Kent County.***

In the most recent ISO review the city did not receive the full allotment of points in the areas of Emergency Communications and the Water Supply section. In Emergency Communications (440) the city received only 5.81 points out of a total of 10 points available. Point deductions occurred because of the Emergency Reporting process (1.5 points), the number of Tele-Communicators (1.64 points), and the number of Dispatch Circuits (1.05 points). In the Water Supply section, specifically, in Hydrant Inspection and Flow Testing (631), the city received 4.8 points out of a total available of 7 points. If the city moves its fire department dispatching service to the Kent County Communications Center, and makes adjustments in the frequency and recordkeeping for its

hydrant testing, we believe that a sufficient point increase can result that will increase the overall rating. ISO is very cooperative in attempting to improve on recent reviews and often enters into a remediation plan, if requested by a jurisdiction. CPSM believes that the city should contact ISO and request a reconsideration of the most recent rating.

Section 8. Essential Resources

Fire Prevention, Code Enforcement, Public Education, and Investigations

Fire prevention is a function within the city's planning department. Fire code enforcement, fire plans review, and inspection activities are the responsibility of the city's Fire Marshal and two (2) Deputy Fire Marshals. This office is responsible for nearly 574 annual inspections at area businesses, institutional occupancies, public office buildings, restaurants, and multifamily residential properties. This office is also charged with the plans review process, primarily in the review of new occupancies that require fire protection systems or fire alarm systems. The Fire Marshal works closely with the Building Official in the site plan review process, preconstruction conferences for larger developments and subdivision construction, and egress issues. They are also involved in the issuance of city occupancy licenses. CPSM was advised that because of the workload, the Fire Marshal's office is only able to complete approximately 50 percent of the required annual occupancy inspections.

There is no direct organizational connection between the Dover Fire Department and the Office of the Fire Marshal, although outstanding relationships exist between the two agencies. The ability to bridge fire suppression, fire code enforcement, and public education is essential for successful fire prevention in the community.

> ***Recommendation: Dover should consider the re-assignment of the Fire Marshal's Office and their fire code enforcement duties under the Fire Department's Emergency Services Manager.***

CPSM believes that the duties of the Fire Marshal's office are more closely aligned with the Fire Department than the planning department. Though it is important that there be a close working relationship between the Building Official and the Fire Marshal, the day-to-day duties of fire prevention and life safety are a Fire Department function. From the standpoint of occupant and emergency responder safety, the focus of the Fire Marshal goes beyond the initial construction and design of an occupancy. The fire inspection process and fire code enforcement efforts are maintained throughout the life cycle of the building and with its changing occupants. Annual fire inspections ensure that these systems are operable and that storage and egress systems are maintained as designed and permitted.

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

Automatic fire sprinklers have proven to be very effective in reducing fire loss and minimizing fire deaths in residential structures. Many communities have been reluctant to impose code provisions that require these installations. The 2015 ICC International Fire Code includes the requirement for automatic fire sprinklers in single family and duplex residential structures. Given the volunteer operations utilized in Dover, CPSM believes it is essential that when adopting the 2015 ICC International Fire Code, the city should maintain the residential fire sprinkler requirement.

Recommendation: The City of Dover should include the residential fire sprinkler requirements when it adopts the 2015 International Code Council (ICC) International Fire Code.

According to the NFPA, the average cost nationally for installing automatic fire sprinklers in new, single family residential structures is estimated to be $1.61 per square foot.[32] For a 2000 square-foot home, the estimated cost would be approximately $3,220. This can be less than the cost of granite counter tops or a carpeting upgrade. In addition, many homeowner insurance policies provide a discount for homes equipped with residential fire sprinklers. Given the limited resources available for fire suppression efforts in the Dover service area, CPSM believes that the city should include in its 2015 fire code adoption the requirement for automatic fire sprinklers in all new single family and duplex residential structures.

The Dover Fire Department plays a significant role in fire prevention efforts, mainly through public fire safety education in the annual "Open House" during Fire Prevention Week each October. Members of the fire department routinely respond throughout the year to requests from schools, civic groups, and the community to see the department's fire apparatus. Department members review basic fire safety with the public such as exit drills in the home; stop, drop and roll; and changing smoke/carbon monoxide detector batteries in the spring and fall. These public fire safety efforts are a ***best practice***. The city Fire Marshal has limited staffing to perform the public fire safety education function, but does respond to requests for specific events, particularly involving the business community.

Fire investigations are conducted by the city Fire Marshal. The Fire Marshal is certified to the NFPA 1031 and 1033 level, with full law enforcement authority. His two deputies have responsibility to conduct initial origin and cause investigations, but do not have all of the same training, certifications, or authority. In our discussions there were issues raised regarding the need to obtain law enforcement certifications for the Deputy Fire Marshals. With the current fire investigation workload, CPSM does not believe that obtaining the additional law enforcement certifications are warranted at this time.

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

Education and Training Programs

Education and training programs create the character of a fire service organization. Agencies that place a real emphasis on their training have a tendency to be more proficient in carrying out day-to-day duties. The prioritization of training also fosters professionalism and teamwork and instills pride in the organization. An effective fire department training program must cover all of the essential elements in the department's core missions and responsibilities. The program must include an appropriate combination of technical/classroom training and manipulative or hands-on/practical evolutions. Most of the training, but particularly the practical hands-on training evolutions, should be developed based upon the department's own operating procedures. It is also important that all training evolutions are reflective of those accepted practices and industry standards.

The Dover Fire Department has a very good training program and there is a dedicated effort focused on a wide array of training activities. The training functions of the DFD are primarily handled by two (2) of the assistant fire chiefs who also serve as the training officers. One (1) of them handles the general fire-related training while the other focuses on driver training.

New members of the department receive a basic introduction to the department and its operations by one of the captains who serves as the orientation officer. At the conclusion of this process the probationary member is required to successfully complete a written test. This is a commendable effort that CPSM considers a ***best practice.*** At this point the person is considered to be a Fire Fighter-I (FF-1), who can ride in the "hydrant" seat, working under the supervision of the officer.

There are no state statutes/regulations or local ordinances that specify any fire department training or certification requirements. From a regulatory perspective all training is voluntary. However, all Dover Fire Department members are required (by the Volunteer Association) to complete four basic firefighter classes that are each 36 hours in length for a total of 144 hours of training. These classes include:

- Basic Firefighting.
- Structural Firefighting.
- Vehicle Rescue.
- Hazardous Materials.

Once an individual has successfully completed these courses they are considered to be a FF-II, which then allows them to utilize Self Contained Breathing Apparatus (SCBA) and enter a burning building or other hazardous environments in the accompaniment of a FF-III. In order to achieve FF-III status, and be permitted to ride in any seat on the apparatus, including the officer's seat, the individual needs to complete additional structural firefighting training (six hours) after which they are evaluated. CPSM was advised that there were no new members of the department who achieved FF-III qualification in 2015.

***Recommendation: The Dover Fire Department should require all prospective fire fighters to meet the training qualifications of the National Fire Protection Association (NFPA) Standard 1001,* Standard for Firefighter Professional Qualifications for Firefighter I and II.**

NFPA 1001 is a nationally recognized minimum fire fighter training curriculum utilized by numerous state regulatory organizations. The Delaware State Fire School located in Dover conducts periodic written and practical testing opportunities for this training. CPSM suggests that the Firefighter-I requirement be completed within one (1) year of joining the department and Firefighter-II within two (2) years or prior to the completion of the probationary process.

Training within the Volunteer Association is typically conducted for three (3) hours, three (3) Tuesday nights each month. However, very little training is conducted during the summer, from late June through late September. Although there may be more demands on the time of volunteer personnel during the summer months, this practice creates a three-month gap in training activities which is not conducive to overall readiness. CPSM believes that fire department training should be conducted year-round.

Recommendation: The DFD training program should be revised in order to schedule training and drills throughout the year.

Probationary members of the department are required to complete a minimum of 36 hours of training annually during their first two (2) years. Members who are considered to be "active" are required to complete 21 hours of training annually for five (5) years. After five years of meeting these and other company requirements members are considered to be "life" members and all mandatory training participation requirements are waived. CPSM believes that this training requirement should be changed. All personnel who are permitted to respond to emergency incidents should be required to train on a regular basis.

Recommendation: The DFD should revise the ongoing training requirements for all active members (including life-members) to ensure that skills and proficiency training is carried out to sufficiently insure firefighter readiness and safety.

It is our belief that a realistic goal for a suitable training program would be to provide seventy-two (72) hours of training per member per year (an average of six (6) hours per month). All personnel should be required to complete certain mandatory training, and participate in an established minimum number of training sessions or training hours in order to be allowed to respond to emergency incidents.

The department does not have any type of formal officer training or training requirements for fire officers. Personnel who have completed the four basic firefighter training classes are permitted to run for officer positions in the annual company elections. There are no prerequisites for pursuing officer appointments including job experience, time in grade requirements, or incident command or supervisory training. In addition, due to the annual election process, the make-up of the officer corps could change on a regular basis. Once elected to their respective positions officers do not

have any additional training or certification requirements necessary to maintain their positions other than being successful in the following year's elections.

Recommendation: Personnel seeking to become an officer should be required to start at the rank of captain and serve in each successive rank for a minimum period of time before seeking a higher office

Although several fire department officers are certified as fire officers in accordance with National Fire Protection Association (NFPA) Standard 1021: *Standard for Fire Officer Professional Qualifications*, this is not a requirement to either seek or retain an officer position. The NFPA standards identify numerous skills to assist in determining officer qualifications.

Recommendation: The Dover Fire Department should mandate that all officers participate in additional officer-related training each year in order to be eligible to retain their position.

There are a number of valuable officer training programs available including those that focus on; firefighting strategy and tactics, incident management, scene safety, leadership and management training, team building, incident reporting, building construction, public education, company inspections, etc.

The ability to train properly requires sufficient funding. This funding is needed for training materials, books, training video programs, on-line subscriptions, tuition costs, and the use of outside instructors. The city currently budgets approximately $7,000 per year for training related activities. With an active membership of approximately eighty (80) members it is important that the utilization of training dollars is sufficient to meet the organization's needs.

Recommendation: The DFD should develop an annual training budget that identifies the needed training for its membership and the associated costs for each element of the training program.

The DFD does not subscribe to any firefighter training services or resources that would permit the most up-to-date information and trends to be readily available to members. The department training library is also limited in scope. CPSM believes that annual training funds should be utilized to upgrade training resources, including manuals, DVDs, and fire training subscriptions.

Internal Communications

Effective communications systems are the key to successful operations in emergency services organizations. Standard operating procedures (SOPs)/standard operating guidelines (SOGs) and other orders are critical to the mission of consistent, effective, and safe operations. These policies are intended to ensure that consistency and safety are considered in all operations. Without them there is a tendency to "freelance" and personnel may not all be on the "same page" regarding a wide range of emergency and administrative operations.

> ***Recommendation: Under the direction of the Emergency Services Manager, the DFD should form a committee comprised of a cross-section of the department's membership to develop standard operating guidelines (SOGs).***

The Dover Fire Department should also consider expanding its written communications system to include ***Training Bulletins***, which would be issued to serve as reference with regard to tested and approved methods of performing tasks, and ***Safety Bulletins***, which are issued to serve as references with regard to general and specific safety and health issues.

The department should also develop an effective system for ensuring that any new standard operating guidelines, training bulletins, and safety bulletins are distributed to all personnel and stations. Electronic communications is highly recommended as the method of choice for distributing departmental communications and documents. All city and department policies and department SOGs should be posted on the department Intranet, in both stations, and all personnel should be required to review this information and acknowledge their receipt and understanding of it. All revisions should also be posted in each station and on the Intranet and e-mailed to every member.

> ***The City of Dover should ensure that all fire department personnel are familiar with applicable city policies and that these are included in the annual training curriculum.***

Emergency Management/COOP/Hazard Mitigation

Emergency management in the City of Dover is coordinated by a staff member who serves in a dual-role as the city's Public Affairs Coordinator and Emergency Management Coordinator. These positions were consolidated in 2012 as a cost-saving measure in response to budget constraints. The incumbent has been an active participant on the City Manager's emergency management team and has trained to the Master Exercise Practitioner (MEP) level in accordance with the federal government's Homeland Security Exercise and Evaluation Program (HSEEP). While the incumbent is qualified to serve as the Emergency Management Coordinator, the additional duties associated with public affairs and the responsibilities involved in managing the city's ambulance provider contract, is creating a significant workload. During a significant event both the function of Emergency Management Coordinator and Public Affairs Coordinator will be extremely demanding and CPSM believes will exceed the capacity of a single individual.

As recommended in the *Organizational* section of this report, CPSM suggests that the city reassign the duties of Emergency Management Coordinator to the Emergency Services Manager. We also recommend that the Public Affairs Coordinator continue to maintain a leadership role in the city's emergency management process, serving as an alternate coordinator during extended activations or during the absence of the Emergency Services Manager.

The City of Dover does not have a Continuity of Operations Plan (COOP) for each department of the city and a Continuity of Government (COG) plan for the city as a whole. The purpose of continuity of operations planning is to ensure that essential city services are provided in the wake of catastrophic or disruptive events.

Recommendation: The City of Dover should develop Continuity of Operations Plans (COOP) for each department and align the plans with an overall Continuity of Government Plan (COG).

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

Hazard mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. Federal, state, and local governments engage in hazard mitigation planning to identify natural hazards that impact them, identify strategies and activities to reduce any losses from those hazards, and establish a coordinated approach to implementing the plan, taking advantage of a wide range of resources. Mitigation plans are key to federal, state, and local governments' efforts to break the cycle of disaster damage, reconstruction, and repeated damage.

Developing hazard mitigation plans enables federal, state, and local governments to:

- Increase education and awareness around threats, hazards, and vulnerabilities.
- Build partnerships for risk reduction involving government, organizations, businesses, and the public.
- Identify long-term strategies for risk reduction that are agreed upon by stakeholders and the public.

- Identify cost effective mitigation actions, focusing resources on the greatest risks and vulnerabilities.
- Align risk reduction with other community objectives.
- Communicate priorities to potential sources of funding.

The City of Dover, as a political subdivision of Kent County, should work with the county to ensure that hazard mitigation strategies and investments meet the needs of the city.

Recommendation: The City of Dover should ensure that the hazard mitigation efforts of Kent County are aligned with the needs of the city and should identify those key infrastructure and public outreach efforts necessary to protect all city residents.

Emergency Communications Center (ECC)

The City of Dover operates its Public Safety Answering Point (PSAP) at the Dover Police Department. 911 calls that originate from landlines within the city are received at the Police Center. Fire calls that are received by the Police Center are then routed to the Dover Fire Dispatcher who is located at Fire Station 1. 911 calls that originate from a cellular telephone are first received at the Kent County 911 Center and then transferred to the city. Kent County estimates that approximately 80 percent of all calls received at its Center are made from cellular telephones.

Fire calls received by the Kent Center are not transferred, but instead the Fire Dispatch Center is called by a direct phone line and the information is transferred via voice communications. This is because the Fire Dispatch Center is unable to receive the ANI/ALI (automated name information/automated location information) function of the 911 system. The Fire Dispatch Center is not a certified dispatch center under the National Academy of Emergency Dispatch (NAED). Upon receiving a call the Fire Dispatcher will notify the volunteer personnel via the paging system and then coordinate the radio traffic of the responding units. If additional assistance outside the City of Dover is necessary, the Fire Dispatcher must then call the Kent County Center and request mutual aid assistance from surrounding communities.

The Kent County Department of Public Safety Emergency Communications Center dispatches all fire and EMS agencies in Kent County, except for the Dover Fire Department. The Center dispatches for 17 fire departments, 14 BLS departments, and a countywide paramedic department; it has 18 dispatch console positions. The Center also dispatches PrimeCare ambulance units. The Kent Center is the back-up emergency communications center for the Dover Fire and Police Departments.

Upon review of the multiple dispatch operations and the redundancy that was observed, CPSM recommends the consolidation of the Dover Fire Dispatch duties into Kent County. This would eliminate the need to transfer calls to and from the Dover Fire Center. In addition, the Dover fire dispatch function is staffed with one (1) person, which leaves no redundancy for multiple calls. This

situation is compounded with the added responsibility of the single fire dispatcher in handling both incoming telephone calls and talking via radio to responding units.

Recommendation: The City of Dover should transfer its fire dispatching duties to the Kent County 911 Communications Center.

The recent ISO evaluation elevated a number of deficiencies in the current fire dispatch operations and CPSM believes that the transfer of the fire dispatch operations to the Kent County Center will address these concerns. In addition, by eliminating the dispatching duties for the current Fire Dispatchers, CPSM believes that a number of support functions may be addressed, particularly in the coordination of apparatus repairs, prefire planning, records management, emergency planning, and the oversight of ambulance operations.

Section 9. Data Analysis

Introduction

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

This analysis contains four sections: the first section focuses on call types and dispatches; the second section explores time spent and workload of individual units; the third section presents analysis of the busiest hours in a year; and the fourth section provides a response time analysis of the first arriving on-scene DFD units.

The department utilizes five (5) engines, two (2) ladders (including one (1) aerial), two (2) specialty brush units (including one RTV), one (1) heavy rescue, two (2) utility trucks, one (1) boat, one (1) foam unit (trailer), and two (2) command cars.

During the study period, the department responded to 991 calls. The total combined yearly workload (deployed time) for all DFD units was 966 hours. The average dispatch time of the first arriving DFD unit was 1.3 minutes, and the average response time of the first arriving DFD unit was 8.1 minutes. The 90th percentile dispatch time was 3.3 minutes and the 90th percentile response time was 12.1 minutes.

Methodology

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

We received CAD data for the Dover Fire Department along with its National Fire Incident Reporting System (NFIRS) data. We first removed CAD calls to which no DFD unit responded or to which administrative units (chief units) were the sole responders — this includes calls where units were dispatched but were cancelled before going en route. We excluded 244 incidents that met these criteria from this report.

Aggregate Call Totals and Dispatches

In this report, each citizen-initiated emergency service request is a call. During the year studied, Dover responded to 991 calls. Of these, 106 were structure fire calls and 69 were outside fire calls within Dover's jurisdiction. Each dispatched unit is a separate "run." As multiple units respond to a call, there are more runs than calls. We report the department's total runs and workload in the second section.

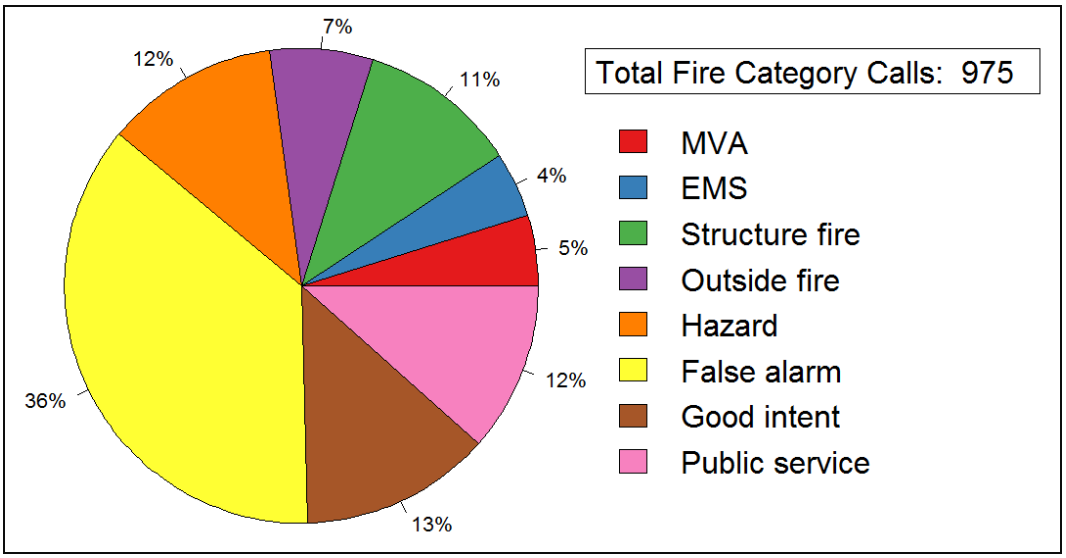
Calls by Type

Table 9-1 and Figure 9-1 show the number of calls by call type, average calls per day, and the percentage of calls that fall into each call type category. While the Dover Fire Department does not provide ambulance services, it does respond to emergency medical service (EMS) calls such as motor vehicle accidents (MVAs), extrications, and rescues. We include MVAs as a separate call type while we identify all other EMS-type calls grouped as simply "EMS."

TABLE 9-1: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
MVA	47	0.13	4.7
EMS	43	0.12	4.3
Structure fire	106	0.29	10.7
Outside fire	69	0.19	6.9
Hazard	115	0.32	11.6
False alarm	355	0.97	35.8
Good intent	127	0.35	12.8
Public service	113	0.31	11.4
Subtotal	**975**	**2.67**	**98.2**
Cancelled	16	0.04	1.6
Total	**991**	**2.72**	**100.0**

FIGURE 9-1: Calls by Type



Observations:

- Fire calls for the year totaled 975, averaging 2.7 per day.
- Structure and outside fires combined totaled 175 calls, averaging one call every 2.1 days.
- Structure fires (106 calls) accounted for 11 percent of total calls.
- Outside fires (69) accounted for 7 percent of total calls.
- False alarms (355) accounted for the largest percentage of calls at 36 percent.

Calls by Type and Duration

Table 9-2 shows the duration of calls by type and duration using four duration categories: less than 30 minutes, 30 minutes to one hour, one to two hours, more than two hours.

TABLE 9-2: Calls by Type and Duration

Call Type	Less than One-half Hour	One-half Hour to One Hour	One to Two Hours	More than Two Hours	Total
MVA	33	12	2	0	47
EMS	38	4	1	0	43
Structure fire	54	37	8	7	106
Outside fire	48	19	2	0	69
Hazard	64	42	8	1	115
False alarm	324	29	2	0	355
Good intent	100	23	4	0	127
Public service	67	33	11	2	113
Subtotal	**728**	**199**	**38**	**10**	**975**
Cancelled	15	1	0	0	16
Total	**743**	**200**	**38**	**10**	**991**

Observations:

Overall

- 95 percent of calls (943) lasted less than one hour.
- Four percent of calls (38) lasted between one and two hours and 1 percent (10) lasted more than two hours.
- On average, 0.1 calls per day, or approximately one call every eight days, lasted more than one hour.

Structure Fires

- 86 percent of structure fires (91) lasted less than one hour; 8 percent (8) lasted between one and two hours; and 7 percent (7) lasted more than two hours.

Outside Fires

- 97 percent of outside fires (67) lasted less than one hour; 3 percent (2) lasted between one and two hours; and none lasted more than two hours.

False Alarms

- 99 percent of false alarms (353) lasted less than one hour, and 1 percent (2) lasted more than an hour.

Average Calls per Day and per Hour

Figure 9-2 shows the monthly variation in the average daily number of calls handled by the DFD during the year studied. Similarly, Figure 9-3 illustrates the average number of calls received each hour of the day, shown in two-hour increments.

FIGURE 9-2: Average Calls per Day, by Month

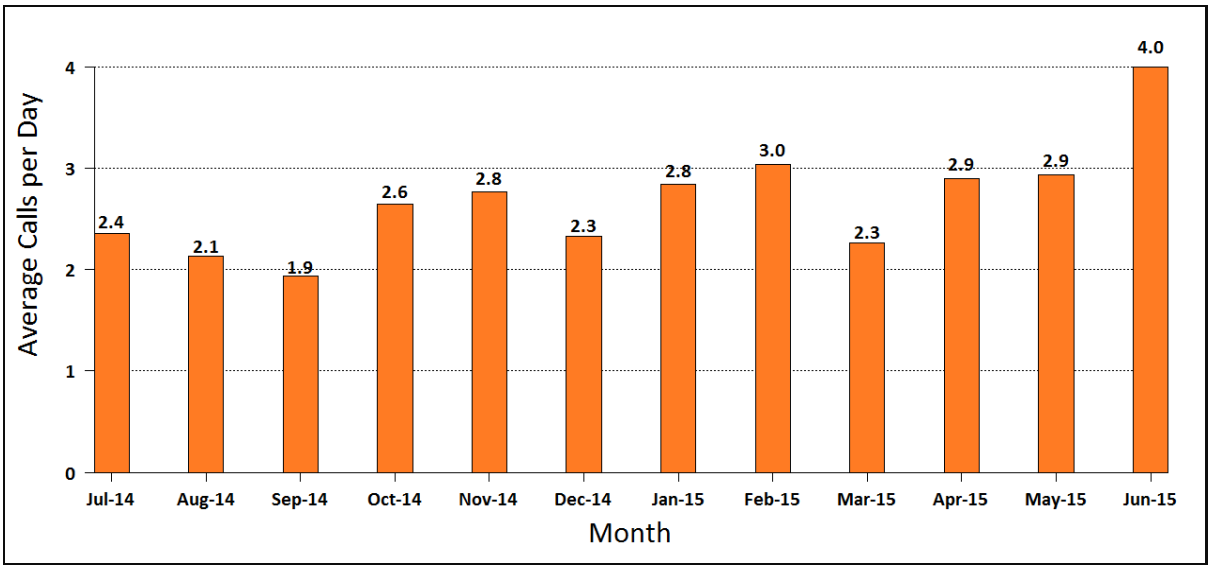
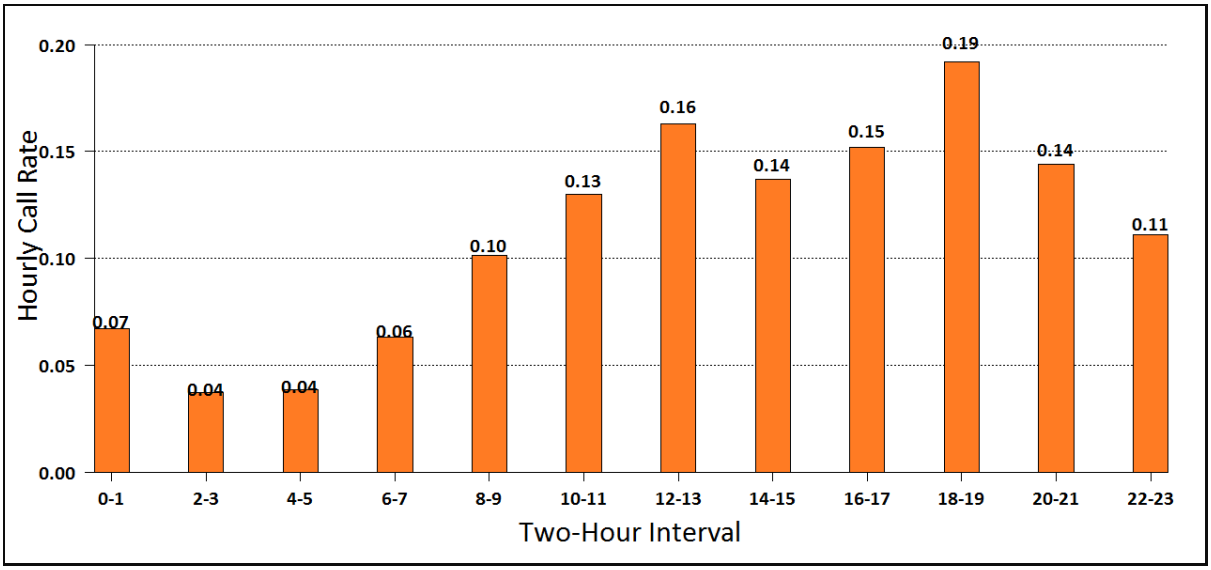


FIGURE 9-3: Calls by Hour of Day



Observations:

- Average calls per day ranged between 1.9 and 4.0.
- September 2014 had the lowest average calls per day (1.9) while June 2015 had more than double that number of calls per day, on average (4.0), which was 110 percent higher than September.
    - Multiple large music and cultural festivals were held in Dover in June 2015, drawing crowds of 10,000 up to 90,000. These included Positively Dover, the Big Barrel County Music Festival, and the Firefly Music Festival.
    - The Firefly Music Festival drew the largest crowds with 80,000 to 90,000 people attending the four-day event held June 18 through June 21.
    - Four of June's six busiest days (7 or more calls) were the four days of the Firefly Music Festival. One additional day of June's six busiest days was the last day of the Big Barrel Country Music Festival (June 28).
    - The busiest day of the study period had 15 calls and occurred on June 21, the last day of the Firefly Music Festival.
- Average calls per hour ranged between 0.04 (between 2:00 a.m. and 6:00 a.m.) and 0.19 (between 6:00 p.m. and 8:00 p.m.).
- Overall, 10:00 a.m. to 10:00 p.m. were the busiest times with between 0.13 and 0.19 calls per hour, which is three to five times more than the slowest period of 2:00 a.m. to 6:00 a.m.

Units Dispatched to Calls

Table 9-3 and Figure 9-4detail the number of DFD units dispatched to calls overall and broken down by call type.

FIGURE 9-4: Number of Dover Fire Department Units Dispatched to Calls

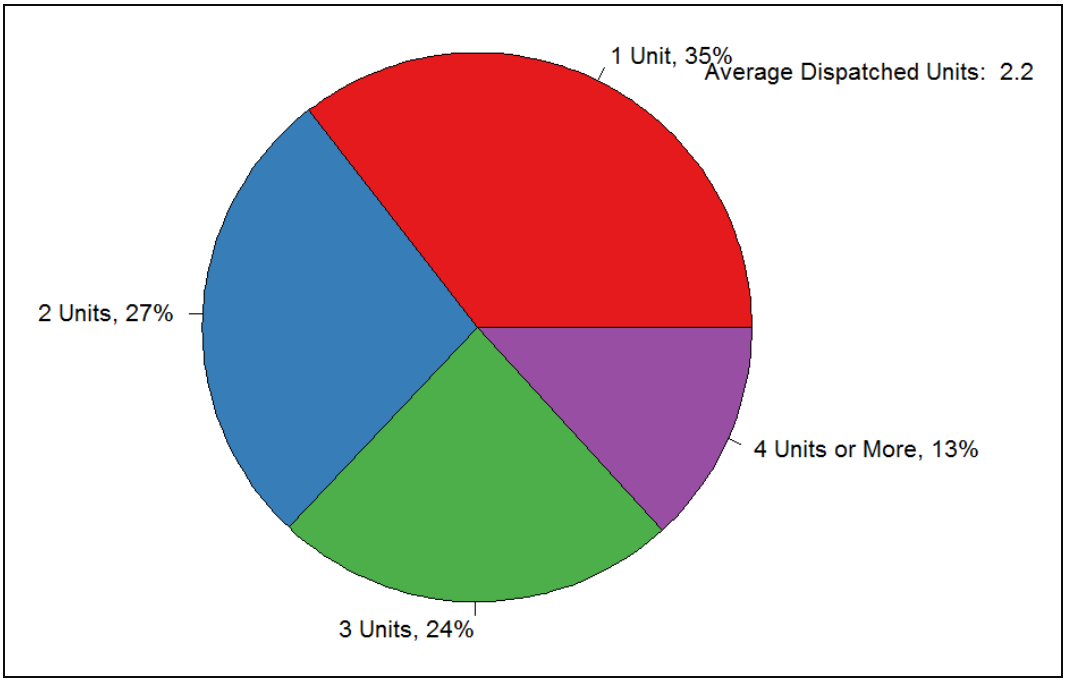


TABLE 9-3: Number of Units Dispatched to Calls

Call Type	Number of Units				Total
	One	Two	Three	Four or More	
MVA	10	11	19	7	47
EMS	30	7	5	1	43
Structure fire	20	19	27	40	106
Outside fire	31	18	13	7	69
Hazard	40	25	35	15	115
False alarm	96	130	95	34	355
Good intent	47	38	23	19	127
Public service	72	20	15	6	113
Subtotal	**346**	**268**	**232**	**129**	**975**
Cancelled	8	6	2	0	16
Total	**354**	**276**	**234**	**129**	**993**
Percentage	**35.6**	**27.8**	**23.6**	**13.0**	**100.0**

Observations:

Overall

- On average, 2.2 units were dispatched per call.
- One unit was dispatched 36 percent of the time, two units were dispatched 28 percent of the time, three units were dispatched 24 percent of the time, and four or more units were dispatched 13 percent of the time.

Structure Fires

- Three units were dispatched to structure fires 25 percent of the time, and four or more units were dispatched 38 percent of the time.

Outside Fires

- Three units were dispatched to outside fires 19 percent of the time, and four or more units were dispatched 10 percent of the time.

False Alarms

- Three units were dispatched to false alarms 37 percent of the time, and four or more units were dispatched 10 percent of the time.

Workload by Individual Unit—Calls and Total Time Spent

In this section, the workload of each unit is reported in two ways: deployed time and runs. A dispatch of a unit is defined as a run; thus, one call might include multiple runs, which results in a higher total number of runs than total number of calls. The deployed time of a run is from the time a unit is dispatched through the time a unit is cleared.

Runs and Deployed Time – All Units

Deployed time, also referred to as deployed hours, is the total deployment time of all the units deployed on all calls. Table 9-4shows the total deployed time, overall and broken down by type of call, for DFD units during the year studied.

TABLE 9-4: Annual Runs and Deployed Time by Call Type

Call Type	Avg. Deployed Min. per Run	Annual Hours	Percent of Total Hours	Deployed Min. per Day	Total Annual Runs	Runs per Day
MVA	24.7	48.2	5.0	7.9	117	0.3
EMS	17.8	18.7	1.9	3.1	63	0.2
Structure fire	45.5	243.3	25.2	40.0	321	0.9
Outside fire	25.4	58.4	6.0	9.6	138	0.4
Hazard	28.8	125.4	13.0	20.6	261	0.7
False alarm	19.2	251.0	26.0	41.3	785	2.2
Good intent	24.0	109.9	11.4	18.1	275	0.8
Public service	34.6	104.5	10.8	17.2	181	0.5
Subtotal	**26.9**	**959.4**	**99.3**	**157.7**	**2,141**	**5.9**
Cancelled	15.3	6.6	0.7	1.1	26	0.1
Total	**26.7**	**966.0**	**100.0**	**158.8**	**2,167**	**5.9**

Observations

- There were 2,167 runs in the year studied, resulting in a total 966 hours of deployed time.
- On average, there were 5.9 runs per day for an average of 2.6 hours of deployed time per day.
- Structure and outside fires resulted in 459 runs with a total workload of 301.7 hours, equal to 32 percent of total DFD workload.
- Structure fires averaged 45.5 minutes of deployed time.
- Outside fires averaged 25.4 minutes of deployed time.

Workload by Unit

Table 9-5 provides a summary of each unit's workload overall. Table 9-6 and Table 9-7 provide a more detailed view of workload, showing each unit's runs broke out by call type (Table 9-6) and the resulting deployed time by call type (Table 9-7). Some units responded to few calls during the year. Rather than showing each of these units individually, we analyzed their work as a group referred to as "other" in the tables. The "other" category includes the units: ACC1, FT, HRT, and Spec Ops1.

TABLE 9-5: Call Workload by Unit

Unit Type	Unit ID	Avg. Deployed Min. per Run	Total Annual Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
Brush	B1	17.0	3.4	0.6	12	0.0*
	B9	18.0	31.5	5.2	105	0.3
Engine	E2	27.8	199.4	32.8	431	1.2
	E3	29.0	63.8	10.5	132	0.4
	E4	27.2	164.4	27.0	363	1.0
	E6	25.7	120.7	19.8	282	0.8
	E7	32.7	20.7	3.4	38	0.1
Ladder	L1	26.1	235.8	38.8	542	1.5
	L2	26.0	50.6	8.3	117	0.3
Rescue	R1	33.7	58.3	9.6	104	0.3
Utility	U1	24.2	14.9	2.5	37	0.1
Other	Other	36.3	2.4	0.4	4	0.0*

* These units had so few runs that their average runs per day, rounded to the nearest one-tenth, appears to be zero.

TABLE 9-6: Total Annual Runs by Call Type and Unit

Unit Type	Brush		Engine					Ladder	Rescue		Utility	Other
Unit	**B1**	**B9**	**E2**	**E3**	**E4**	**E6**	**E7**	**L1**	**L2**	**R1**	**U1**	**Other**
MVA	–	1	30	11	31	10	2	–	–	30	1	1
EMS	1	21	5	1	7	4	–	9	3	6	5	1
Structure fire	–	2	74	16	51	32	11	83	28	19	5	–
Outside fire	2	31	10	14	34	25	10	6	2	1	2	1
Hazard	1	12	52	11	51	38	4	60	15	14	3	–
False alarm	2	2	183	42	104	108	3	272	44	14	11	–
Good intent	2	16	54	16	49	39	5	63	15	13	3	–
Public service	4	18	21	16	31	19	3	44	10	7	7	1
Cancelled	–	2	2	5	5	7	–	5	–	–	–	–
Total	**12**	**105**	**431**	**132**	**363**	**282**	**38**	**542**	**117**	**104**	**37**	**4**
Runs per Day	**0.0***	**0.3**	**1.2**	**0.4**	**1.0**	**0.8**	**0.1**	**1.5**	**0.3**	**0.3**	**0.1**	**0.0***

* These units had so few runs that their average runs per day, rounded to the nearest one-tenth, appears to be zero.

TABLE 9-7: Daily Average Deployed Minutes by Call Type and Unit

Unit Type	Brush		Engine					Ladder		Rescue	Utility	Other
Unit	**B1**	**B9**	**E2**	**E3**	**E4**	**E6**	**E7**	**L1**	**L2**	**R1**	**U1**	**Other**
MVA	–	0.0*	2.0	0.7	2.3	0.7	0.0*	–	–	2.1	0.1	0.0*
EMS	0.1	0.2	0.3	0.0*	0.5	0.2	–	0.8	0.2	0.3	0.2	0.2
Structure fire	–	0.4	9.0	2.3	5.6	4.9	1.3	9.7	2.8	3.5	0.5	–
Outside fire	0.1	2.0	0.6	1.2	2.2	2.0	0.7	0.5	0.1	0.1	0.1	0.0*
Hazard	0.0*	0.6	4.6	0.8	4.1	3.0	0.2	4.7	1.1	1.3	0.2	–
False alarm	0.0*	0.0*	10.4	2.3	4.8	5.2	0.2	14.8	2.2	0.6	0.6	–
Good intent	0.0*	0.7	3.9	0.9	3.4	2.2	0.3	4.5	1.1	0.9	0.1	–
Public service	0.3	1.2	1.8	2.2	3.8	1.3	0.6	3.5	0.8	0.7	0.7	0.2
Cancelled	–	0.1	0.2	0.1	0.2	0.3	–	0.2	–	–	–	–
Total	**0.6**	**5.2**	**32.8**	**10.5**	**27.0**	**19.8**	**3.4**	**38.8**	**8.3**	**9.6**	**2.5**	**0.4**

* These units had such low total deployed minutes that average minutes per day, rounded to the nearest one-tenth, appears to be zero

Observations:

- Ladder 1 made the most runs (542 in total or 1.5 per day) and had the highest total annual deployed time (236 hours for the year or 39 minutes per day).
    - Structure and outside fires accounted for 89 of these runs (16 percent) and 62 hours (26 percent) of deployed time.
    - False alarms accounted for 272 of these runs (50 percent) and 90 hours (32 percent) of deployed time.
- Engine 2 made the second most runs (431 total or 1.2 per day) and had the second highest total annual deployed time (199 hours for the year or 33 minutes per day).
    - Structure and outside fires accounted for 84 of these runs (20 percent) and 59 hours (30 percent) of deployed time.
    - False alarms accounted for 183 of these runs (42 percent) and 63 hours (32 percent) of deployed time.

Analysis of Busiest Hours

There is significant variability in the number of calls from hour to hour. One special concern relates to the resources available for hours with the heaviest workload. We tabulated the data for each of the 8,760 hours in the year. Table 9-8 shows the number of hours in the year where there were one, two, or three calls during the hour.

Table 9-9 shows the 10 one-hour intervals during the year where there were three calls.

TABLE 9-8: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	7,864	89.8
1	809	9.2
2	77	0.9
3	10	0.1

TABLE 9-9: Top 10 Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Deployed Hours*
9/14/2014 – 10 p.m. to 11 p.m.	3	12	3.2
7/23/2014 – 11 p.m. to 12 a.m.	3	8	2.1
5/29/2015 – 1 p.m. to 2 p.m.	3	8	3.0
7/24/2014 – 8 p.m. to 9 p.m.	3	7	3.3
2/22/2015 – 12 p.m. to 1 p.m.	3	7	3.4
6/23/2015 – 7 p.m. to 8 p.m.	3	6	2.1
6/30/2015 – 11 p.m. to 12 a.m.	3	6	0.8
6/28/2015 – 8 p.m. to 9 p.m.**	3	5	2.1
6/18/2015 – 2 p.m. to 3 p.m.**	3	3	0.6
6/20/2015 – 1 a.m. to 2 a.m.**	3	3	0.3

***** The total deployed hours is time spent responding to calls received in the hour, which may extend into the next hour(s).

** 06/28/2015 was the last day of the Big Barrel Country Music Festival which drew a crowd of 30,000- 35,000. 06/18/2015 was the first day of the Firefly Music Festival, which drew a crowd of 80,000-90,000. 06/20/2015 was the third day of the Firefly Music Festival.

Observations:

- During 87 hours in the year (1 percent of all hours), the DFD responded to two or more calls.
- Approximately once every four days, there was one hour during which two or more calls occurred.
- There were 10 hours in the year (0.1 percent of all hours) where the DFD responded to three calls; there were never more than three calls in an hour.
- Of these 10 hours, September 14, 2014, between 10:00 p.m. and 11:00 p.m., had the most runs (12 total) with a total workload of 3.2 hours. The longest call was a structure fire that lasted 21 minutes.
- July 23, 2014, between 11:00 p.m. and midnight and May 29, 2015, between 1:00 p.m. and 2:00 p.m., both had the second most runs (eight). The longest call was a public safety call on May 29 that lasted for 24 minutes and to which four units were dispatched.

Overlapping Calls

Overlapping calls are defined as calls that started (based on dispatch time) while another call was still active. In the analysis, calls with less than 30 seconds of overlap were excluded. There were 51 calls during the period studied that were initiated while one other call was already active. On average, calls overlapped for 12.1 minutes. There were no calls that were initiated while two calls were already active.

Of the 51 calls, 23 of the calls (47 percent) were completely overlapping with another call, meaning they started and ended while another call was active. On average, these calls overlapped 14 minutes. The remaining 28 overlapping calls (53 percent) partially overlapped with another call, meaning the call they overlapped with (first call) ended before the overlapping call (second call) ended. On average these calls overlapped 10.3 minutes.

Response Time

This section presents response time statistics for different call types and units.

Different terms are used to describe the components of response time. *Dispatch processing time* is the difference between the time a call is received and the time a unit is dispatched. *Turnout time* is the difference between dispatch time and the time a unit is en route. *Travel time* is the difference between the time en route and arrival on-scene. *Response time* is the total time elapsed between receiving a call to arriving on-scene. The main focus in this section is the dispatch and response times of the first arriving DFD unit.

We typically focus on emergency calls where the department would respond with lights and sirens — also known as a hot response. The DFD does not record the priority of a call in its records management system, so all eligible calls were included in this analysis.

There were 991 calls included in the analyses in previous sections. This section uses 940 calls and excludes the 16 cancelled calls, 18 additional calls where an administrative unit was the first to arrive, and 17 calls with unreliable data (e.g., a two-second travel time, a ten-hour dispatch time, etc.).

Response Times by Type of Call

Figure 9-5 and Table 9-10 show average dispatch, turnout, travel, and total response times for the first arriving units, broken out by call type.

Table 9-11 shows the 90th percentile times broken out in the same manner. A 90th percentile time means that 90 percent of calls had dispatch, turnout, travel, or total response times at or below that number.

FIGURE 9-5: Average Response Times of First Arriving Unit, by Call Type

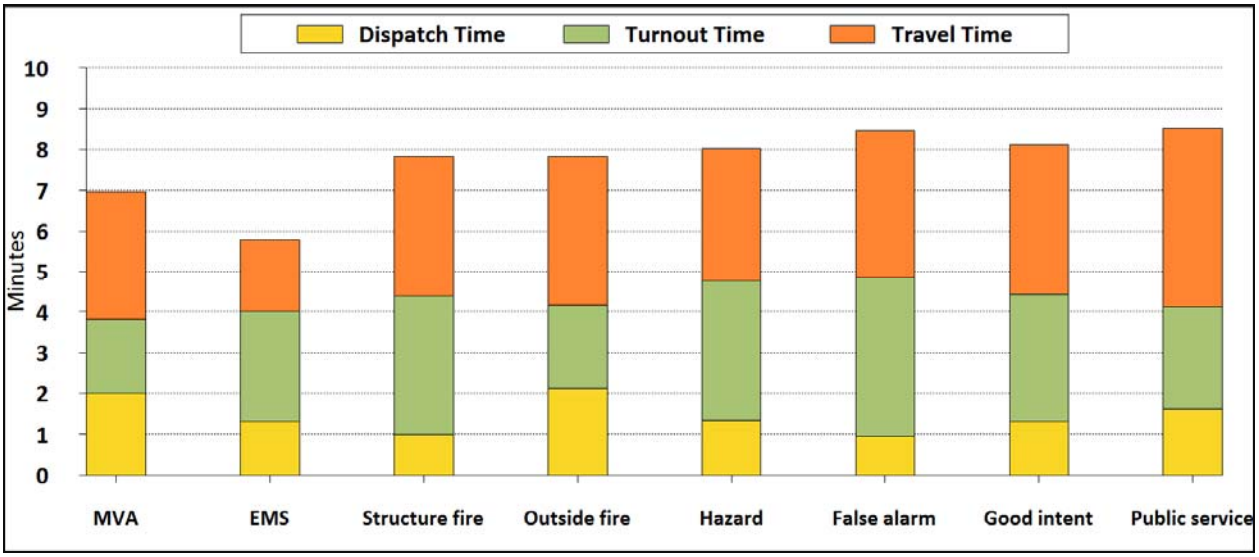


TABLE 9-10: Average Response Times of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
MVA	2.0	1.8	3.2	7.0	42
EMS	1.3	2.7	1.8	5.8	42
Structure fire	1.0	3.4	3.4	7.8	104
Outside fire	2.1	2.0	3.7	7.8	68
Hazard	1.3	3.4	3.3	8.0	111
False alarm	1.0	3.9	3.6	8.5	346
Good intent	1.3	3.1	3.7	8.1	125
Public service	1.6	2.5	4.4	8.5	102
Total	**1.3**	**3.3**	**3.5**	**8.1**	**940**

TABLE 9-11: 90th Percentile Response Times of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
MVA	5.0	4.5	5.5	10.4	42
EMS	2.5	6.7	4.5	11.0	42
Structure fire	2.2	6.5	5.8	12.2	104
Outside fire	5.5	5.5	6.6	11.1	68
Hazard	3.4	6.8	5.5	12.1	111
False alarm	2.4	7.1	5.8	12.0	346
Good intent	3.3	6.6	6.3	12.3	125
Public service	3.9	5.8	8.3	14.0	102
Total	3.3	6.7	6.1	12.1	**940**

Observations:

- 48 calls (5 percent) had a dispatch handling time greater than 5 minutes.
- 370 calls (39 percent) had a turnout time greater than 4 minutes.
- 234 calls (25 percent) had a total response time greater than 10 minutes.

Averages – First Arriving Unit

- Dispatch time: 1.3 minutes.
- Turnout time: 3.3 minutes.
- Travel time: 3.5 minutes.
- Total response time: 8.1 minutes.
- Structure fire response time: 7.8 minutes.
- Outside fire response time: 7.8 minutes.

90th Percentile – First Arriving Unit

- Dispatch time: 3.3 minutes.
- Turnout time: 6.7 minutes.
- Travel time: 6.1 minutes.
- Total response time: 12.1 minutes.
- Structure fire response time: 12.2 minutes.
- Outside fire response time: 11.1 minutes.

Response Times by Hour

Average dispatch, turnout, travel, and total response times by hour are shown in Figure 9-6 and Table 9-12. The table also shows 90th percentile times.

FIGURE 9-6: Average Response Time of First Arriving Unit, by Hour of Day

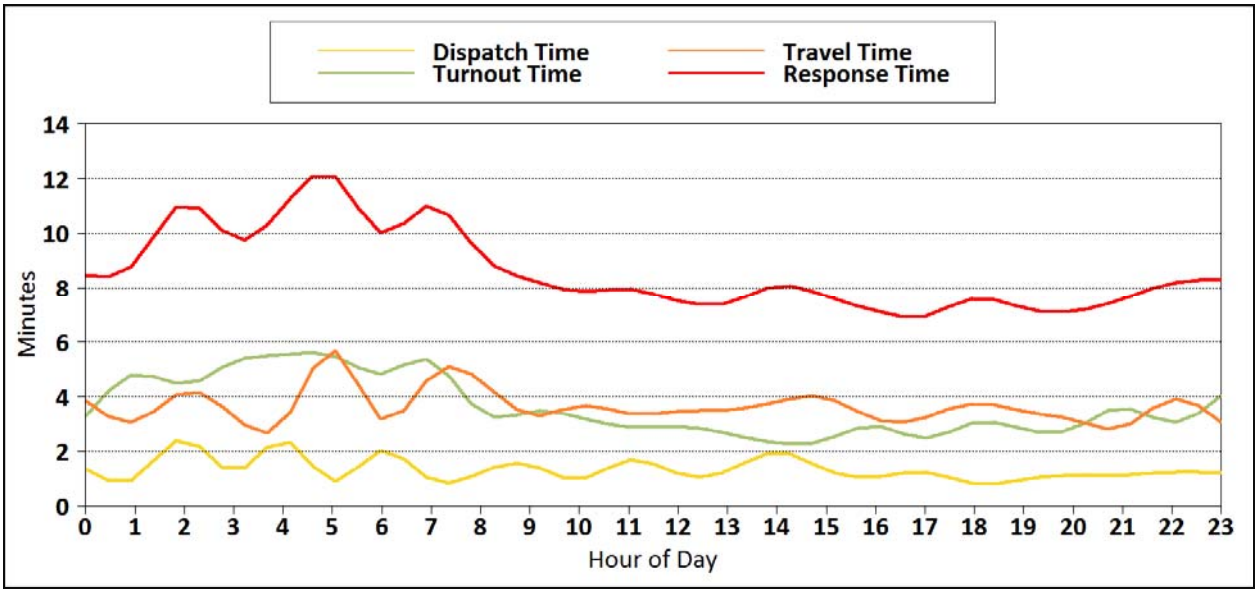


TABLE 9-12: Average and 90th Percentile Response Times of First Arriving Unit, by Hour of Day

Hour	Dispatch Time	Turnout Time	Travel Time	Response Time	90th Percentile Response Time	Sample Size
0	1.3	3.3	3.9	8.5	12.0	25
1	1.0	4.8	3.1	8.9	12.7	24
2	2.5	4.5	4.2	11.1	15.3	15
3	1.2	5.3	3.3	9.8	15.8	12
4	2.4	5.5	3.0	11.0	13.9	14
5	0.9	5.5	5.7	12.1	17.3	13
6	2.0	4.8	3.2	10.0	14.0	20
7	0.9	5.3	4.8	11.0	17.1	25
8	1.2	3.4	4.6	9.2	13.9	31
9	1.5	3.5	3.3	8.3	11.5	40
10	1.0	3.2	3.7	7.9	13.0	50
11	1.7	2.9	3.4	8.0	11.8	41
12	1.2	2.9	3.5	7.5	11.0	59
13	1.3	2.7	3.5	7.4	11.5	52
14	2.0	2.3	3.8	8.1	11.3	50
15	1.3	2.4	4.0	7.7	12.1	48
16	1.1	2.9	3.2	7.1	10.5	52
17	1.3	2.5	3.2	7.0	10.4	54
18	0.8	3.0	3.7	7.6	10.8	59
19	1.0	2.8	3.5	7.2	10.2	72
20	1.1	2.8	3.2	7.1	10.3	61
21	1.1	3.6	2.9	7.6	11.0	43
22	1.2	3.0	3.9	8.2	12.1	33
23	1.2	4.0	3.0	8.3	11.8	47

Observations:

- Dispatch time averaged between 0.8 minutes (6:00 p.m.) and 2.5 minutes (2:00 a.m.).
- Turnout time averaged between 2.3 minutes (2:00 p.m.) and 5.5 minutes (4:00 a.m. and 5:00 a.m.).
- Travel time averaged between 2.9 minutes (9:00 p.m.) and 5.7 minutes (5:00 a.m.).
- Total response time averaged between 7.0 minutes (5:00 p.m.) and 12.1 minutes (5:00 p.m.).
- The 90th percentile total response time ranged from 10.2 minutes (7:00 p.m.) to 17.1 minutes (7:00 a.m.).

Response Time Distribution

A more detailed look at how response times are distributed among units and call types is presented here. Table 9-13 and Figure 9-7 detail how often each unit was the first to arrive to a call. Table 9-14 gives the cumulative distribution of total response time for first arriving unit, and Figure 9-8 shows the same information for structure and outside fires only.

TABLE 9-13: Number of Total Calls by First Arriving Units

Unit	Structure and Outside Fire	Other Fire	Total	Percentage	Cumulative Percentage
L1	63	287	350	37.2	37.2
E2	23	134	157	16.7	53.9
E4	30	127	157	16.7	70.6
E6	20	77	97	10.3	81.0
B9	22	66	88	9.4	90.3
E3	5	35	40	4.3	94.6
U1	4	18	22	2.3	96.9
B1	1	9	10	1.1	98.0
R1	2	7	9	1.0	98.9
E7	1	5	6	0.6	99.6
L2	1	3	4	0.4	100.0

FIGURE 9-7: Number of Total Calls by First Arriving Units

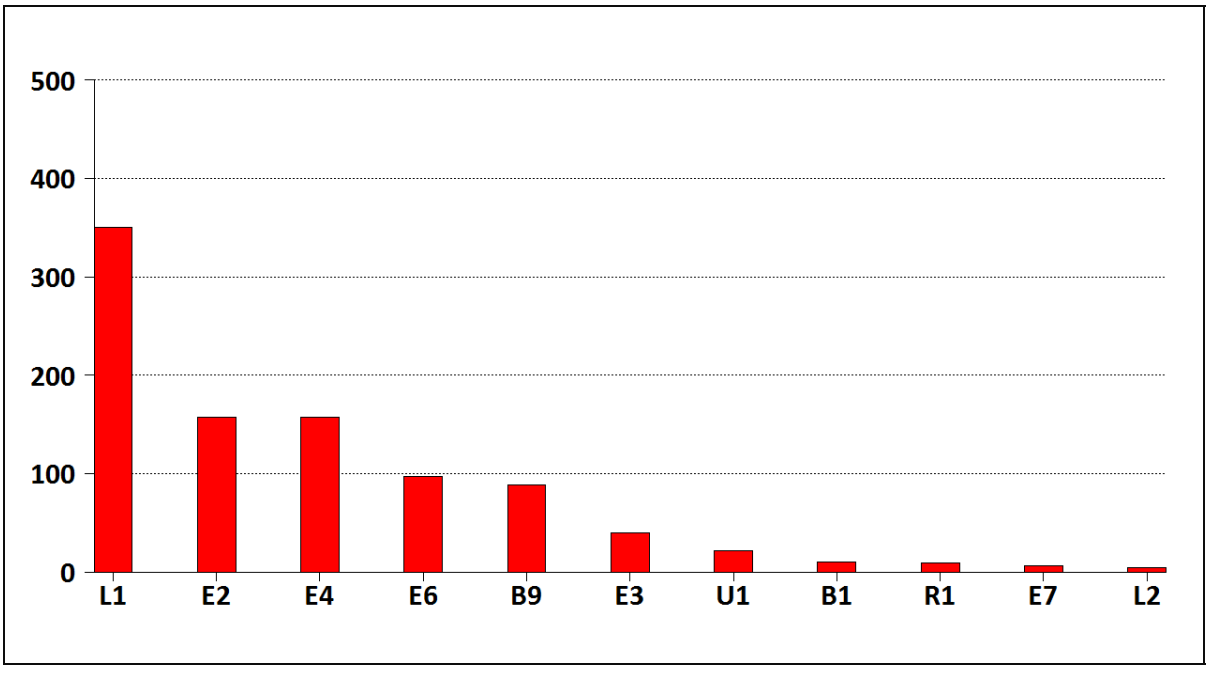
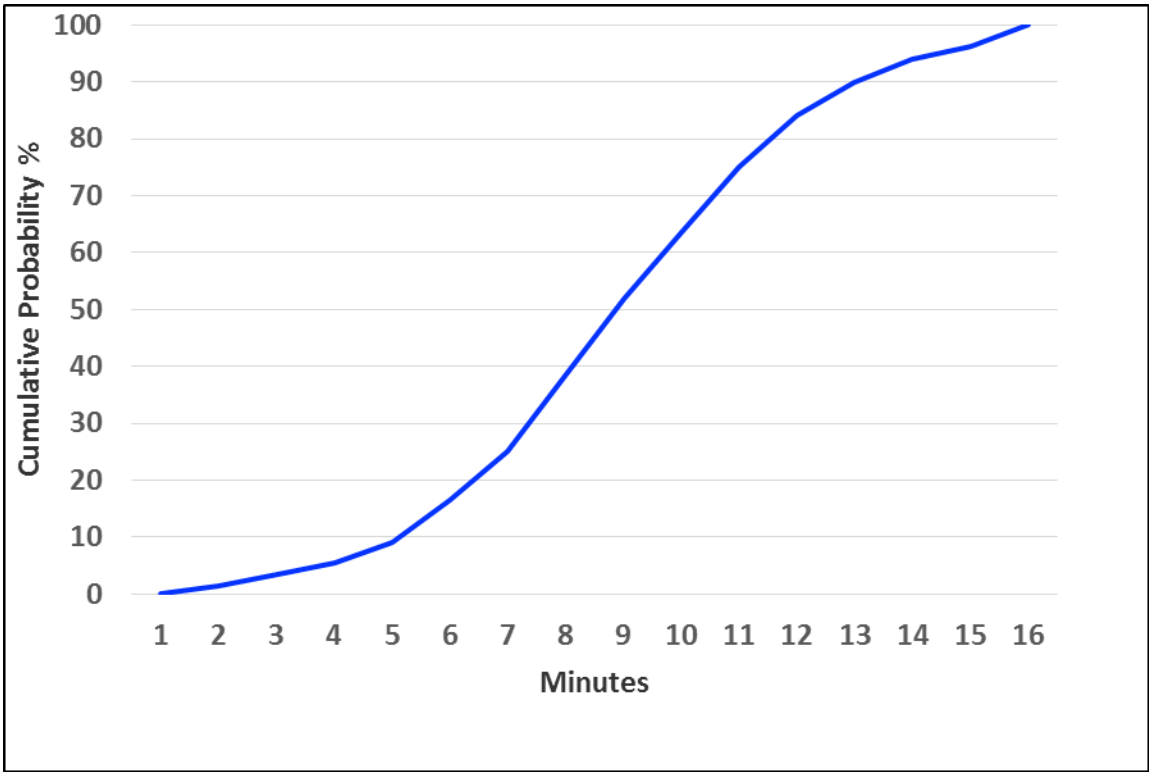


TABLE 9-14: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit

Response Time (minutes)	Frequency	Cumulative Percentage
0 - 1	0	0.0
1 - 2	13	1.4
2 - 3	20	3.5
3 - 4	19	5.5
4 - 5	33	9.0
5 - 6	69	16.4
6 - 7	81	25.0
7 - 8	125	38.3
8 - 9	128	51.9
9 - 10	110	63.6
10 - 11	108	75.1
11 - 12	84	84.0
12 - 13	55	89.9
13 - 14	39	94.0
14 - 15	21	96.3
> 15	35	100.0

FIGURE 9-8: Response Time Distribution — First Arriving Unit



Observations:

- For structure fires, Ladder 1 (L1) was the first unit on scene most often with an average response time of 8.1 minutes.
- The overall average response time for the first arriving unit to structure fires was 8.1 minutes.
- 40 percent of the time the first unit's response time was less than 7.2 minutes.
- 90 percent of the time the first unit's response time was less than 12.1 minutes.

Addendum

TABLE 9-15: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Structure Fire	Outside Fire
Assistance, other	4	0
Extinguishment by fire service personnel	26	45
Fire control or extinguishment, other	11	10
Information, investigation & enforcement, other	3	3
Investigate	48	7
Investigate fire out on arrival	12	4
Notify other agencies.	2	0
Provide equipment	1	0
Remove hazard	2	0
Salvage & overhaul	6	2
Search & rescue, other	5	0
Ventilate	3	0
Total*	**123**	**71**

* Totals are higher than the total number of calls because some calls had more than one action taken.

Observations

- A total of 43 structure fire calls were extinguished by fire service personnel, which accounted for 41 percent of structure fire calls in DFD's jurisdiction.
- A total of 57 outside fire calls were extinguished by fire service personnel, which accounted for 83 percent of outside fire calls in DFD's jurisdiction.

TABLE 9-16: Fire Loss

Call Type	Calls	Total Loss	Average Loss
Structure Fire	35	$463,350	$13,239
Outside Fire	5	$23,100	$4,620
Good Intent	1	$250	$250
Hazard	9	$14,400	$1,600
Total	**50**	**$501,100**	**$10,022**

Note: This analysis only includes calls with recorded loss greater than 0.

Observations:

Overall

- 50 incidents had property loss, with an average loss amount of $10,022.
- Only 7 incidents involved an amount exceeding $20,000.

Structure Fires

- Out of 106 structure fire calls, 35 had recorded loss, with total recorded loss value of $463,350 and average loss of $13,239.
- Five structure fires had under $500 in loss, and 20 had more than $500 but less than $10,000 in loss.
- The smallest loss was $100, and the largest loss was $100,000

Outside Fires

- Out of 69 outside fire calls, five had recorded loss, with total recorded loss value of $23,100 and average loss of $4,620.
- One outside fire had under $500 in loss, and the remaining four had more than $500 but less than $10,000 in loss.
- The smallest loss was $100, and the largest loss was $10,000.