C E N T E R F O R P U B L I C S A F E T Y M A N A G E M E N T , L L C

FIRE STAFFING AND DEPLOYMENT ANALYSIS

EXETER, NEW HAMPSHIRE

Final Report: December, 2020

CPSM®

CENTER FOR PUBLIC SAFETY MANAGEMENT, LLC
475 K STREET NW, STE. 702 • WASHINGTON, DC 20001
WWW.CPSM.US • 716-969-1360

ICMA

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

THE ASSOCIATION & THE COMPANY

The International City/County Management Association is a 103-year old, nonprofit professional association of local government administrators and managers, with approximately 13,000 members located in 32 countries.

Since its inception in 1914, ICMA has been dedicated to assisting local governments and their managers in providing services to its citizens in an efficient and effective manner. ICMA advances the knowledge of local government best practices with its website (www.icma.org), publications, research, professional development, and membership. The ICMA Center for Public Safety Management (ICMA/CPSM) was launched by ICMA to provide support to local governments in the areas of police, fire, and emergency medical services.

ICMA also represents local governments at the federal level and has been involved in numerous projects with the Department of Justice and the Department of Homeland Security.

In 2014, as part of a restructuring at ICMA, the Center for Public Safety Management (CPSM) was spun out as a separate company. It 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, PERF, IACP, IFCA, IPMA-HR, DOJ, BJA, COPS, NFPA, and others.

The Center for Public Safety Management, LLC, maintains the same team of individuals performing the same level of service as when it was a component of 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 align department operations with industry best practices. We have conducted more 315 such studies in 42 states and provinces and 224 communities ranging in population from 8,000 (Boone, Iowa) to 800,000 (Indianapolis, Ind.).

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

CENTER FOR PUBLIC SAFETY MANAGEMENT PROJECT CONTRIBUTORS

Thomas J. Wieczorek, Director
Leonard A. Matarese, Director, Research & Project Development
Dov Chelst, Ph.D. Director of Quantitative Analysis
Joseph E. Pozzo, Senior Manager
Mark Piland, Associate
Sarah Weadon, Senior Data Analyst
Dennis Kouba, Senior Editor

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SECTION 1. EXECUTIVE SUMMARY

The Center for Public Safety Management (CPSM) was contracted by the Town of Exeter, New Hampshire, to complete an analysis of the town's fire department, to assess the Emergency Communications Center (ECC), and to review the existing public safety facility and available sites to construct a new facility.

The Exeter Fire Department (EFD) currently operates out of a single station located in the downtown area. The Exeter Fire Department (EFD) has 26 personnel assigned to fire and EMS operations. Staffing is spread across four platoons, each commanded by a lieutenant. Fire and EMS units are staffed on 24-hour basis with five to seven fire staff, depending on personnel on leave and the shift. The EFD utilizes staff call-back and automatic and mutual aid to augment assembling the required effective response force to mitigate various incidents to which it responds.

The EFD provides fire response from engine and ladder apparatus, as well as advanced life support (ALS) first response from fire apparatus and EMS ALS ground transportation. The fire department provides a variety of non-operational activities and programs, including town public health service function; town emergency management function; fire prevention community programs and public life safety education; fire prevention inspections in accordance with the New Hampshire Fire Code RSA 153; fire alarm monitoring and maintaining system infrastructure, street boxes, community fiber optic network, traffic light repair and maintenance; community CPR and first aid classes (includes all town employees and high school junior class, and senior housing); and fire watch details for special events.

The service demands of this community are numerous for the department and include EMS, fire, technical rescue, hazardous materials, and other non-emergency responses. The structural risks unique to a northeast community are present in Exeter. These include single-family homes; manufactured homes; townhouses and duplexes; apartment houses; garden-style apartments; taxpayer (public) buildings; commercial/Industrial structures; strip malls; and hotel/dormitory structures. The age of many structures, multiple change of occupancy use, and renovations potentially increase fire risk.

The response time and staffing components of this document are designed to report on the current level of service provided by the EFD compared to national best practices. As well, these components provide incident data and relevant information to be utilized for future planning and self-review of service levels for continued improvement designed to meet community expectations and mitigate emergencies effectively and efficiently.

A forensic data analysis was prepared as a key component of this study. The data analysis examined all calls for service involving the EFD between September 1, 2018, and August 31, 2019. During the year covered by this study, EFD operated out of one station, utilizing three engines, two ambulances, one forestry truck, one fire alarm truck, one ladder truck, one squad, and one utility unit, as well as three command vehicles and one fire prevention unit.

During the study period, the Exeter Fire Department handled 3,917 calls, of which 48 percent were EMS calls. These calls included 1,190 fire prevention and non-emergency calls, as well as an additional 28 calls that were removed during data processing. The total combined workload (deployed time) for all EFD units excluding the removed calls was 1,736.2 hours. The average dispatch time for the first arriving unit was 1.2 minutes and the average response time of the first arriving EFD unit was 7.2 minutes. The 90th percentile dispatch time was 3.4 minutes and the 90th percentile response time was 10.0 minutes.

A significant component of this report is the completion of an All-Hazard Risk Assessment of the Community. The All-Hazard Risk Assessment of the Community contemplates many factors that cause, create, facilitate, extend, and enhance risk in and to a community. The risk analysis conducted by CPSM for Exeter considers the impact of each risk or factor utilizing a three-axis approach. The three-axis approach to evaluating risk includes the ***probability*** of the event, ***consequences*** to the community, and ***impact*** on the organization, in this case the EFD. Factors that are discussed are:

- Population and demographics.
- Climate and the environment.
- Buildings located in the town (the built upon environment).
- Transportation.
- Targeted building/occupancy hazard.
- Fire- and EMS-related risks.
- Incident demand.

CPSM measured and reported on these risks individually and as a whole.

Other significant components of this report is an analysis of the current deployment of resources and the performance of these resources in terms of response times and the single EFD fire management zone; current staffing levels and patterns; department resiliency (ability to handle more than one incident); critical tasking elements for specific incident responses; and assembling an effective response force. CPSM analyzed these items and is providing recommendations where applicable to improve service delivery and for future planning purposes.

In summation, a comprehensive risk assessment and review of deployable assets are critical aspects. First, these reviews will one assist the EFD in quantifying the risks that it faces. Second, the EFD will be better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned. The factors that drive the service needs are examined and then link directly to discussions regarding the assembling of an effective response force and when contemplating the response capabilities needed to adequately address the existing risks, which encompasses the component of critical tasking.

Although it can reasonably be anticipated that the EFD’s call volume will continue to gradually increase each year as the town continues its growth and development, at the present time the department appears able to handle its normal call volume. With the resources the department currently deploys, the department can handle most of the single unit requests for service that it receives without the need for outside assistance.

However, the EFD relies heavily on call-back staffing, along with automatic and mutual aid that responds from moderate to long distances, to assemble an effective response force for building fires. To be effective and reduce safety concerns, fire (and some EMS) critical tasks are deigned to be performed simultaneously and not consecutively. Thus, it is important to assemble an effective response force in a timely manner.

CPSM was also asked to review the Exeter Emergency Communications Center and the existing public safety facility. This was completed from both a generalized perspective and then from a fire and EMS perspective. Recommendations are provided on these two reviews.

This report contains a series of observations and recommendations provided by CPSM that are intended to help the EFD deliver services more efficiently and effectively.

Recommendations and considerations for continuous improvement of services are presented here. CPSM recognizes there may be recommendations and considerations offered that first must be budgeted for, or for which processes must be developed prior to implementation.

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RECOMMENDATIONS

1. CPSM recommends the EFD maintain proper vehicle maintenance schedules in accordance with motor and manufacturer specifications and recommendations, as well as a formal replacement schedule. CPSM also recommends the EFD consider, budget permitting, a change to a 15-year replacement schedule for engine apparatus, as apparatus over 15 years of age might include only a few of the safety upgrades required by the most recent editions of NFPA 1901 (NFPA 1901 is generally updated every five years). (See p. 10.)
2. CPSM recommends the EFD consider, funding permitting, the purchase of a water tender apparatus for response to those areas of the town not serviced by municipal fire hydrants for the purpose of enhancing water supply for firefighting operations. (See p. 12.)
3. CPSM recommends the town invest in CAD-to-CAD transfer software to link the primary state PSAP to the Exeter ECC PSAP so that redundant call answering and event processing time can be reduced. This would create a more efficient Exeter ECC dispatch system, and enable the ECC to send first responders to events quicker. (See p. 15.)
4. CPSM recommends the ANI-ALI software enhancement that will enable Exeter to view the EMS incident address as it is taken by the Bureau of Communications in Concord be fully implemented as designed. (See p. 16.)
5. CPSM recommends the CAD software be reviewed and a determination be made as to what version the system is currently operating on, and if the system requires updating that this be performed. (See p. 16.)
6. CPSM recommends the ECC be considered in any new facility discussions or current facility renovation planning for the purpose of expanding the work area and ensuring proper lighting, ventilation, security, and employee facilities. (See p. 16.)
7. CPSM recommends the ECC supervisor and staff continue to expand their post new-hire training to include regular attendance at professional conferences and dispatcher discipline specific training courses. (See p. 16.)
8. CPSM recommends the town budget for a full time dedicated IT position for public safety. (See p. 16)
9. EFD should engage the Seacoast Chief Fire Officers Mutual Aid District (SCFO) agreement jurisdictions and begin to create automatic aid agreements with mutual aid companies in order to address the effective response force requirements for open-air strip center, apartment, and high-rise structure fire incidents. (See p. 61.)
10. EFD should evaluate the minimum number of firefighters to initially send to an incident in order to comply with CFR 1910.134 and NFPA in terms of two-in/two-out requirements. (See p. 61.)
11. CPSM recommends that EFD hire two firefighters immediately to staff the A and C shifts with seven members each. This will provide consistency between the shifts and give A and C shifts one additional firefighter to cover vacancies created by leave, injury, illness, and military assignments. (See p. 61.)
12. CPSM recommends that the town review budget expenditures for overtime vs. hiring full-time staff. In 2019, EFD spent $240,733.48 on overtime encompassing 11 categories. While not all OT expenditures can be eliminated by additional staffing, OT for recall, sick leave coverage, personnel coverage, and vacation can be reduced. The budget for 2019 details an increase of 88 percent in OT for vacation; in the 2020 preliminary budget, there is a 34.6 percent

increase for vacation coverage and an OT increase for sick leave at 24.4 percent. Hiring full-time staff could result in a reduction of these OT expenditures. (See p. 62.)

13. CPSM recommends that EFD develop a strategic funding plan to increase the levels of staffing on all four shifts. Increasing staffing levels will not eliminate, but will reduce, the number of combinations on cross-staffing and will enable a consistent service level. Full-time staffing for the EFD is recommended to be eight on each shift, with a minimum staffing of seven staff on each shift. Minimum staffing of seven would allow the engine to be staffed with three personnel, and the ladder with four. Ladder personnel will then cross-staff the first EMS call for service with two personnel. A second EMS call would require the two remaining members from the ladder to respond the second ambulance. This will leave the engine with a staffing of three personnel. Under this staffing model, there will be times when the ladder will be staffed with four or two for fire response, which enhances the ability to perform critical tasks simultaneously rather than consecutively. (See p. 62.)

14. CPSM recommends that under the current staffing model, an engine be assigned to priority medical calls with the ambulance. This eliminates responding three members on the initial response ambulance. Thirty-two percent of EFD medical calls are dispatched as a priority incident, which prompts the response of three personnel on the ambulance. The better practice would be to respond with two on the ambulance and respond the engine to assist with a staff of three. If the incident turns out to be a true priority call, a member of the engine would then drop off the engine and ride with the ambulance to the hospital. The engine would remain in service with two personnel; however, staffing would be back at three within the hour given that 93 percent of all medical calls for EFD last less than an hour. In many instances, a call dispatched as an ALS call is less severe than what is initially dispatched; therefore, the need for an additional paramedic or firefighter on the ambulance is often not required. (See p. 62.)

15. CPSM recommends the EFD establish and measure a turnout time goal for fire and EMS responses that aligns more closely with the NFPA 1710 national consensus benchmark. (See p. 82.)

16. CPSM recommends that when considering an additional fire station, or the relocation of the current fire station (thus maintaining a single fire station response location), that consideration be given to a location that reduces travel time so that the department aligns more closely with the NFPA 1710 national consensus benchmark. (See p. 82.)

17. CPSM recommends that automatic aid agreements be established with North Hampton, Hampton, and Newfields so that any delay in assembling an effective response force for multicompany responses is minimized. (See p. 82.)

18. CPSM recommends the town complete a space needs assessment for fire, police, emergency operations center, and emergency communications along with a location study for a facility to adequately house and accommodate necessary parking for fire, police, emergency communications, and the emergency operations center. Once these studies are completed, CPSM further recommends the town consider the concept of a single public safety building if the concept proves to be cost efficient, as such a facility would meld joint use areas where applicable for staff and cost efficiencies. (See p. 91.)

SECTION 2. ORGANIZATION CHARACTERISTICS

AGENCY OVERVIEW

The Town of Exeter operates under a Town Manager/Board of Selectmen form of government. The Select Board serves as the governing body of the town's government, setting town policy, goals, and strategies. The five members of the Board are elected to three-year terms. A Chairperson, Vice Chairperson, and Clerk of the Board are chosen by the Board each March during the Board's organizational meeting.[1] The Select Board appoints a town manager, who serves as the town's chief administrative officer. The town manager manages all town departments with exception of the Exeter Public Library.[2]

The fire chief is the head of the fire department and serves as a member of senior management and participates in the town's strategic planning efforts, and addresses town-wide fire and emergency medical services service delivery and service level issues. In addition to fire and EMS transport services, the fire department is also responsible for the town's emergency management and public heath functions.

The fire chief reports directly to the town manager, who, in turn, reports to the Select Board. The fire chief's duties include managing the fire department; acting as the town's emergency manager; and informing the town manager and Select Board on matters of budget, planning, and policies when called upon while remaining accountable to the town manager.

The fire chief is assisted by two assistant fire chiefs, a fire prevention lieutenant, a health officer, and an office manager and office clerk. Remaining fire department staff is assigned to operations.

The fire department provides a variety of non-operational activities and programs, which include:

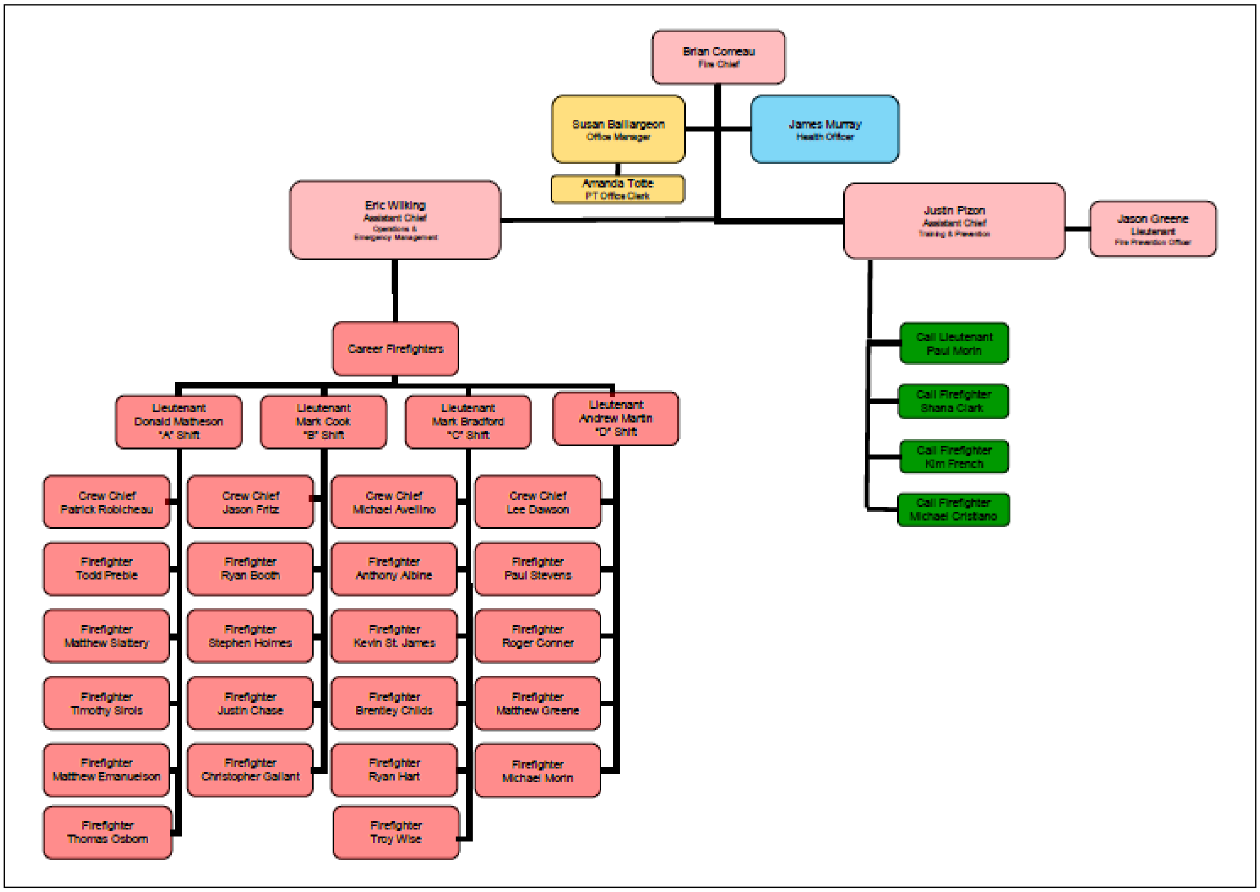
- Town public health service function.
- Town emergency management function.
- Fire prevention community programs and public life safety education.
- Fire prevention inspections in accordance with the New Hampshire Fire Code RSA 153.
- Fire alarm monitoring and maintaining system infrastructure, street boxes, community fiber optic network, traffic light repair and maintenance.
- Community CPR and first aid classes (includes all town employees and high school junior class, and senior housing).
- Fire watch details for special events.

The Exeter Fire Department (EFD) has 26 personnel assigned to fire and EMS operations. Staffing is spread across four platoons, each commanded by a lieutenant. An assistant chief has overall management responsibility for the operations branch of the department, with each shift

1. https://www.exeternh.gov/bcc-bos
2. https://www.exeternh.gov/townmanager

lieutenant reporting to this position. The following figure illustrates the organizational chart for the EFD.

FIGURE 2-1: Exeter Fire Department Organizational Chart



The EFD is funded through the town's general fund and the EMS revolving fund. The general fund fire budget is categorized in three separate areas: fire suppression; emergency management; and health. The total Select Board approved general fund fire budget for FY 2019 is $3,901,492. This is an increase of just over three percent from the approved FY 2018 budget of $3,852,528.

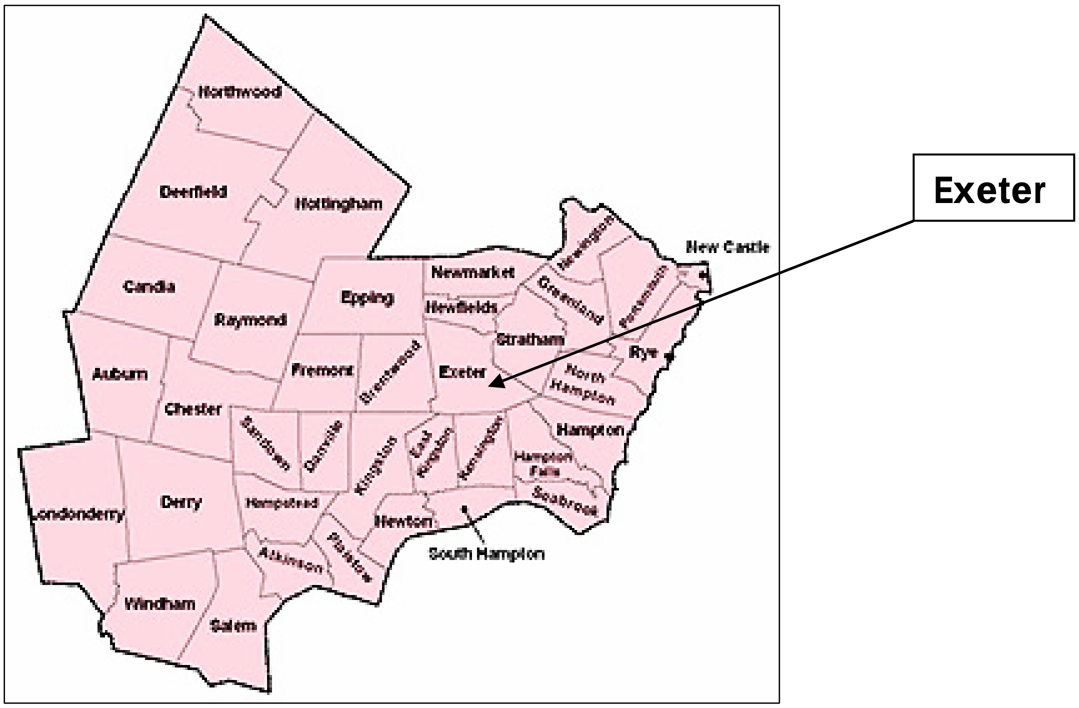
The EMS revolving fund includes revenues from ambulance transport fees that are utilized to offset operational and training costs for EMS service provided by the EFD, and one dispatcher position located in the 911 center. FY 2019 projected revenue is $566,000 with budget expenditures out of this fund approved at $354,092. A fund balance of $350,240 is projected at the end of FY 2019.

SERVICE AREA

The Town of Exeter is located in the east-central portion of Rockingham County and is comprised of nearly 20 square miles (19.93). Rockingham County itself is located in the southeast portion of the state of New Hampshire. The counties of Stafford (to the north), Merrimack (to the west), and Hillsborough (to the south west) are contiguous with Rockingham.

The following figure illustrates the town of Exeter in relationship to Rockingham County and the contiguous towns.

FIGURE 2-2: Town of Exeter and Rockingham County



FIRE AND EMS APPARATUS

The provision of an operationally ready and strategically located fleet of mission-essential fire-rescue vehicles is fundamental to the ability of a fire-rescue department to deliver reliable and efficient public safety within a community.

The EFD currently operates a fleet of fire and EMS apparatus that includes:

- Three engine apparatus.
  - 2019, 1500 GPM, with 750 gallon water tank.
  - 2010, 1500 GPM, with 750 gallon water tank.
  - 2002, 1500 GPM, with 750 gallon water tank.
- One ladder apparatus.
  - 2014, 109-foot Quint (aerial ladder, fire pump, water tank, attack, and supply hose).

- One squad apparatus.
  - 2007, 1500 GPM, with 750 gallon water tank, heavy/tactical rescue equipment.
- Two ambulance apparatus.
  - 2016, E350 Type III.
  - 2012, E350 Type III.
- One forestry/brush apparatus.
  - 2016, 350 GPM (designed for off-road fire attack).

The EFD also has an assortment of command and service vehicles to include a 16' inflatable boat for water rescue.

The procurement, maintenance, and eventual replacement of response vehicles is one of the largest expenses incurred in sustaining a community's fire-rescue department. While it is the personnel of the EFD who provide emergency services within the community, the department's fleet of response vehicles is essential to operational success. Reliable vehicles are needed to deliver responders and the equipment/materials they employ to the scene of dispatched emergencies within the town.

Replacement of fire-rescue response vehicles is a necessary, albeit expensive, element of fire department budgeting that should reflect careful planning. A well-planned and documented emergency vehicle replacement plan ensures ongoing preservation of a safe, reliable, and operationally capable response fleet. A plan must also schedule future capital outlay in a manner that is affordable to the community.

NFPA 1901, *Standard for Automotive Fire Apparatus*, serves as a guide to the manufacturers that build fire apparatus and the fire departments that purchase them. The document is updated every five years, using input from the public/stakeholders through a formal review process. The committee membership is made up of representatives from the fire service, manufacturers, consultants, and special interest groups. The committee monitors various issues and problems that occur with fire apparatus and attempts to develop standards that address those issues. A primary interest of the committee over the past years has been improving firefighter safety and reducing fire apparatus crashes.

The Annex Material in NFPA 1901 (2016) contains recommendations and work sheets to assist in decision making in vehicle purchasing. With respect to recommended vehicle service life, the following excerpt is noteworthy:

> *"It is recommended that apparatus greater than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status and upgraded in accordance with NFPA 1912, Standard for Fire Apparatus Refurbishing (2016), to incorporate as many features as possible of the current fire apparatus standard. This will ensure that, while the apparatus might not totally comply with the current edition of the automotive fire apparatus standards, many improvements and upgrades required by the recent versions of the standards are available to the firefighters who use the apparatus."*

The impetus for these recommended service life thresholds is continual advances in occupant safety. Despite good stewardship and maintenance of emergency vehicles in sound operating condition, there are many advances in occupant safety, such as fully enclosed cabs, enhanced rollover protection and air bags, three-point restraints, antilock brakes, higher visibility, cab noise abatement/hearing protection, and a host of other improvements as reflected in each revision of NFPA 1901. These improvements provide safer response vehicles for those providing emergency services within the community, as well those "sharing the road" with these responders.

Given that NFPA 1901 targets specifications for only fire suppression vehicles, NFPA 1917, *Standard for Automotive Ambulances*, was published in 2013 (updated in 2019) to provide similar recommendations governing the design and construction of ambulances. The U.S. General Services Administration also promulgates ambulance standards under KKK-A-1822. Additionally, the Commission on Accreditation of Ambulance Services (CAAS) has established a Ground Vehicle Standard (2016). While NFPA 1917, KKK, and CAAS standards do not include recommended service-life replacement standards for EMS vehicles, common industry practice suggests typical replacement intervals of four to eight years. This schedule depends on a number of variables, most notably vehicle mileage, escalation of annualized repair expenses, and frequency with which the subject vehicle is out of service. After replacement, serviceable vehicles may be retained in ready-reserve status for an additional two to four years. In light of the inherently shorter service life of ambulances, owing to a higher frequency of emergency responses handled than corresponding suppression vehicles, there are fewer legitimate concerns regarding "missing" essential improvements in occupant/operator safety standards.

The current replacement schedule for EFD first response fire and EMS apparatus is as follows:

- Fire apparatus: 20 years.
- EMS apparatus: 6 years.
- Forestry/brush unit: 10 years.

Recommendation:

- CPSM recommends the EFD maintain proper vehicle maintenance schedules in accordance with motor and manufacturer specifications and recommendations, as well as a formal replacement schedule. CPSM also recommends the EFD consider, budget permitting, a change to a 15-year replacement schedule for engine apparatus, as apparatus over 15 years of age might include only a few of the safety upgrades required by the most recent editions of NFPA 1901[3] (NFPA 1901 is generally updated every five years). (Recommendation No. 1.)

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ISO CLASSIFICATION

The ISO is a national, not for profit organization that collects and evaluates information from communities across the United States regarding their capabilities to combat building fires. The data collected from a community is analyzed and applied to ISO's Fire Suppression Rating Schedule (FSRS) from which a Public Protection Classification (PPC™) grade is assigned to a community (1 to 10). A Class 1 represents an exemplary fire suppression program that includes all of the components outlined below. A Class 10 indicates that the community's fire suppression program does not meet ISO's minimum criteria. It is important to understand the PPC is not just a fire department classification, but rather a compilation of community services that include the

3. NFPA 1901, 2016 Edition, Quincy, MA.

fire department, the emergency communications center, and the community's potable water supply system operator.[4]

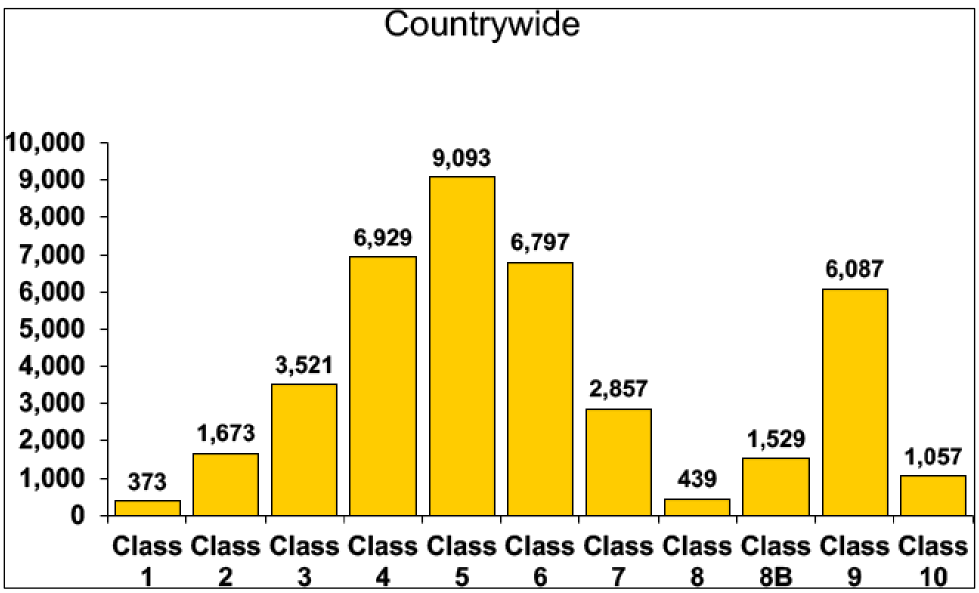
A community's PPC grade depends on:

- **Needed Fire Flows** (building locations used to determine the theoretical amount of water necessary for fire suppression purposes).
- **Emergency Communications** (10 percent of the evaluation).
- **Fire Department** (50 percent of the evaluation).
- **Water Supply** (40 percent of the evaluation).

The Town of Exeter maintains an ISO rating of ***Class 3/3Y***. This rating was achieved in November 2019.

Some communities such as Exeter have a split classification. The first number (3) represents the class that applies to properties within five road miles of the responding fire station and 1,000 feet of a creditable water supply, such as a fire hydrant, suction point, or dry hydrant. The second number (3Y) is the class that applies to properties within five road miles of a fire station but beyond 1,000 feet of a creditable water supply. The following figure illustrates the dispersion of PPC ratings across the United States.

FIGURE 2-3: PPC Ratings: United States[5]



It should be noted that the town has built-on areas that do not have municipal fire hydrants for fire department water supply. However, there are dry hydrants for fire department drafting connected to open water sources, and cisterns for the storage of non-potable water available for fire department use.

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4. EFD ISO PPC report; November, 2019
5. https://www.isomitigation.com/ppc/program-works/facts-and-figures-about-ppc-codes-around-the-country/

Recommendation:

- CPSM recommends the EFD consider, funding permitting, the purchase of a water tender apparatus for response to those areas of the town not serviced by municipal fire hydrants for the purpose of enhancing water supply for firefighting operations. (Recommendation No. 2.)

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EMERGENCY COMMUNICATIONS CENTER

The Town of Exeter operates an Emergency Communications Center (ECC) out of the public safety facility. This function operates out of a small, 520 square-foot space that includes two dispatch consoles, a partial third console, a small bathroom, and a computer server/storage area. The ECC is responsible for receiving emergency and non-emergency calls for service and handling emergency and non-emergency radio traffic for the Exeter Fire and Police Departments.

Operationally, the primary Public Safety Answering Point (PSAP) for the town is located in the state Division of Emergency Services and Communications, Bureau of Communications, in Concord (the state has a backup PSAP in Laconia, as well). This agency is nationally accredited through the National Academies of Emergency Medical Dispatch. A 911 call is received in the state center, processed, and then shipped to the appropriate emergency dispatch center. For EMS calls, the Concord PSAP utilizes Medical Priority Dispatch System™, a dispatch software program designed to prioritize EMS calls, recommend the most appropriate response resources, and provide the call-taker with pre-arrival instructions for life-threatening situations. Thus, in essence, the Bureau of Communications in Concord acts as the primary call-taker for emergency calls in Exeter. For EMS calls, the Concord PSAP does provide a call determinant to the Exeter dispatcher when the call is transferred.

Receiving an event from a primary PSAP through a telephone or computer-aided dispatch (CAD)-to-CAD system is not uncommon. Transfers (PSAP-to-PSAP by telephone) do, however, have an impact on event processing times.

In this PSAP-to-PSAP process, Exeter receives the 911 call from Concord via telephone. The Exeter dispatcher does not communicate with the actual caller, but rather the Concord call taker performs a content transfer. In the content transfer model, the primary PSAP provides information about the incident including the nature of the complaint, the address, and other pertinent incident information to the secondary PSAP. The Exeter dispatcher (secondary PSAP) then takes the information being transferred manually, creates an incident in the Exeter CAD system, and then dispatches the appropriate resources to the incident. In this model, there are two call-taking events. The initial call taking occurs in the primary PSAP. The second takes place in Exeter, the secondary PSAP. Each creates a time measurement in the call-taking metric. This does impact the overall call processing time measurement.

To speed up the call-taking transfer process for EMS calls for service, Exeter is working with the state Bureau of Communications to implement a software solution that provides the Exeter dispatcher with the address of the incident prior to receiving the phone call with the content transfer of incident information. This solution, called ANI-ALI (Automatic Number Identification-Automatic Location Identification), will occur as a “push out” of information from the Primary PSAP in Concord through a separate software system to Exeter. The address will appear on a separate computer screen at the dispatcher console. This will enable the Exeter dispatcher, for EMS calls only, the ability to quickly dispatch a unit for an EMS call for service prior to receiving the actual phone call from the primary PSAP, thus saving call processing time. Once the Exeter dispatcher receives the phone call with the additional information, the responding unit (s) will be updated.

A more efficient way to transfer call information from one PSAP to another is through CAD systems. CAD-to-CAD transfer of information is timely and effective. Essentially, when the primary PSAP receives the 911 call and creates the incident, the secondary PSAP is notified almost simultaneously with the call address and then the call type and call information as the incident is built. Updates are also transferred through this system.

From a fire and EMS perspective, the communications center is measured on three critical points in the overall cascade of events linking the event to the incident response. These are how the call is routed through the public safety network and its capabilities (wireline phone, wireless phone, E911capabilities, Voice over Internet Protocol (VoIP), mobile satellite services, telematics, and Text Telephone Devices (TTYs)), time to answer (the time it takes to answer an incoming and call on the emergency phone line), and event processing time (the time it takes to process and create the event and then notify the emergency response unit(s)). Because the Exeter communications center is a secondary PSAP, the event is received a second time, adding time to the overall communications center measurements.

National Fire Protection Association (NFPA) Standard 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2019 edition, outlines national consensus standards for emergency communications standards. Section 7.4 of this standard outlines several benchmarks for communications center operations regarding fire and EMS events.

<u>Call answering time</u> (the event is received in the communications center typically by phone) outlined in this standard is as follows:

- Ninety percent of events received on emergency lines shall be answered within 15 seconds, and 95 percent of alarms shall be answered in 20y seconds.

<u>Event processing time:</u> Event processing times for the highest-priority level emergency events shall be completed in 60 seconds 90 percent of the time. These events include:

- Trauma (penetrating chest injury, GSW, etc.).
- Neurologic emergencies (stroke, seizure).
- Cardiac-related events.
- Unconscious/unresponsive patients.
- Allergic reactions.
- Patient not breathing.
- Choking.
- Other EMS-related calls as determined by the AHJ.
- Fire involving or potentially extending to a structure.
- Explosion.
- Other fire-related calls as determined by the AHJ.

There are call types that are exempt from the event call processing standard. These are:

- Joint responses with law enforcement (involving weapons).
- Haz-Mat incidents.
- Technical rescue incidents.
- Language translation.
- TTY/TTD receipt of events.
- Incomplete location.
- SMS message to the communications center.
- Calls from outside the normal area of responsibility.
- Calls received during a significant disaster that significantly depletes resources, impacts local infrastructure, and which could result in changes to normal dispatch procedures (disaster mode).

It should be noted that NFPA 1221, Section 7.4.4, states that for law enforcement purposes, the AHJ shall determine time frames allowed for completion of dispatch. The EPD has not established these time frames.

Current event processing time measured at the 90th percentile for fire and EMS for the Exeter communications center are depicted in the following table. The Exeter Communications Center does not meet the NFPA benchmark of sixty seconds for high-priority fire and EMS events (highlighted in yellow).

TABLE 2-1: 90th Percentile Call Processing Time by Call Type

Call Type	Event Processing (Min.)	Number of Calls
Breathing difficulty	3.5	95
Cardiac and stroke	3.1	154
Fall and injury	3.1	255
Illness and other	3.2	949
MVA	3.6	86
Overdose and psychiatric	3.2	169
Seizure and unconsciousness	3.5	74
EMS Total	**3.2**	**1,782**
False alarm	3.4	302
Good intent	3.7	35
Hazard	4.1	107
Outside fire	3.2	18
Public service	4.4	41
Structure fire	2.9	20
Fire Total	**3.7**	**523**
Total	**3.4**	**2,305**

The Exeter ECC has a staffing complement of one to two dispatchers on duty, depending on availability of staffing and time of day. The first and second shifts (eight hours, day and evening) are typically staffed with two dispatchers. The third shift (overnight) is typically staffed with one dispatcher. The on-duty dispatcher(s) is/are responsible for call-taking and dispatching functions for police, fire, and EMS incidents. Scheduled and unscheduled leave is covered through overtime staffing by other full-time dispatchers or by a part-time dispatcher. The ECC supervisor fills in when needed, particularly to cover unscheduled leave. There are also EPD and EFD staff who are trained in basic dispatch functions and can assist when needed.

Along with the dispatch functions discussed, ECC dispatchers also handle law enforcement administrative and operational requests via radio, CAD messaging, or phone. These include tasks associated with real-time operational calls for service such as operator license and vehicle registration queries, NCIC queries, and the like. The dispatchers also handle front lobby citizen requests and non-emergency, town-related phone calls after 4:15 pm, Monday to Friday, and on weekends. There are also fire and EMS non-emergency administrative tasks handled by the dispatcher to include the notification of property owners when an alarm is sounding, researching and notifying a responsible party for hazardous materials, and other incidents.

Another function of the dispatcher is the notification of off-duty personnel that they are needed due to an increase in call demand, or for an incident requiring additional staffing and equipment. The department is using E-Dispatch at this time, a software solution that links with smartphones. Through this solution, the dispatcher can send a message to EPD and EFD staff smartphones regarding the need for a callback. This is an automatic notification based on the commitment of resources and/or the type of call that units are responding to or on the scene of.

NFPA 1221 stipulates a minimum of two telecommunicators (dispatchers) on duty and present in the communications center at all times. While this is a not a recommendation by CPSM, it is worth noting why the standard stipulates this. Non-emergency work by dispatchers should not degrade or delay the center's ability to receive calls or effectively and efficiently process the event. Additionally, law enforcement, fire, and EMS operate on calls that require tactical channels. These incidents are typically intense and require a dispatcher to monitor the tactical channel and interact with the incident commander. This should be timely and accurate, particularly when incident benchmarking is occurring. CPSM does recommend, however, that if demand on the current dispatch staffing increases, an increase in staffing to two dispatchers 24/7/365 be considered.

Logistically, the Exeter ECC has two standard dispatcher consoles and utilizes IMC/Central Square CAD software. The area of work is 520 square feet, has a single small bathroom facility, and appeared functional and ergonomically accommodating. The ECC, of course, should be considered in any new facility discussions or current facility renovation planning. As a note, the CAD software is behind in updates. It is essential to maintain the most up-to-date version of this software.

Training for newly-hired dispatchers consists of an eight week training program that blends didactic instruction (classroom) with hands-on console/phone training. This is typical for smaller ECC agencies. CPSM reviewed the new-hire training and found the manuals, training objectives, and evaluations to be well-structured and consistent with other dispatcher training programs evaluated in previous client projects. CPSM was also impressed that the dispatchers are being integrated into the call outcome notifications and that they are included in debriefs for critical incidents. Regular attendance at professional conferences and dispatcher discipline-specific training courses should be provided for the ECC supervisors as well as ECC staff whenever possible.

IT functions for public safety are handled by the town's IT office. Because the EFD, EPD, and ECC have records management and accompanying hardware and software, to include the CAD software, public safety IT needs are not met in a timely manner, according to staff interviewed by CPSM. This either because the town IT staff is dedicated to other town IT needs, or the need is routed to an external vendor, which in itself may not have timely service. Because public safety records management systems, software and hardware are mission critical, CPSM recommends the town budget for a full time dedicated IT position for public safety.

Recommendations:

- CPSM recommends the town invest in CAD-to-CAD transfer software to link the primary state PSAP to the Exeter ECC PSAP so that redundant call answering and event processing time can be reduced. This would create a more efficient Exeter ECC dispatch system, and enable the ECC to send first responders to events quicker. (Recommendation No. 3.)
- CPSM recommends the ANI-ALI software enhancement that will enable Exeter to view the EMS incident address as it is taken by the Bureau of Communications in Concord be fully implemented as designed. (Recommendation No. 4.)
- CPSM recommends the CAD software be reviewed and a determination be made as to what version the system is currently operating on, and if the system requires updating that this be performed. (Recommendation No. 5.)
- CPSM recommends the ECC be considered in any new facility discussions or current facility renovation planning for the purpose of expanding the work area and ensuring proper lighting, ventilation, security, and employee facilities. (Recommendation No. 6.)
- CPSM recommends the ECC supervisor and staff continue to expand their post new-hire training to include regular attendance at professional conferences and dispatcher discipline specific training courses. (Recommendation No. 7.)
- CPSM recommends the town budget for a full time dedicated IT position for public safety. (Recommendation No. 8.)

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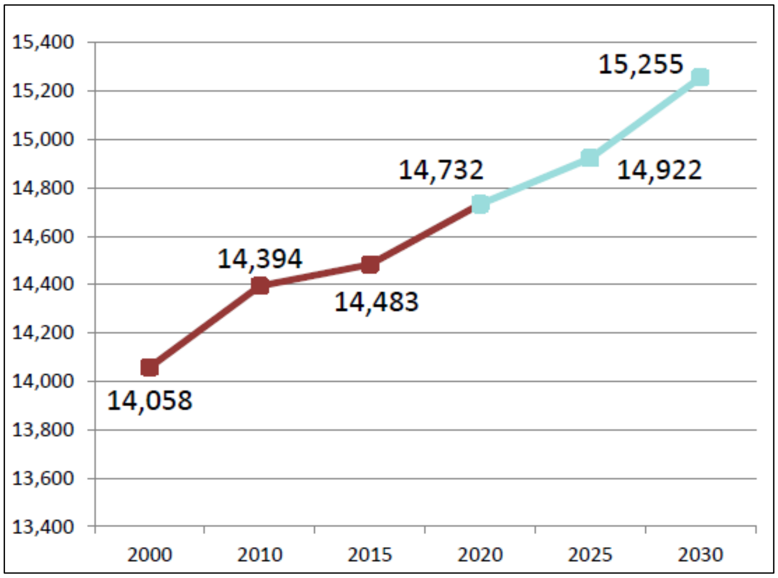
SECTION 3. ALL-HAZARDS RISK AND THE COMMUNITY

POPULATION AND DEMOGRAPHICS

The 2018 adopted Town Master Plan estimated the 2015 town population to be 14,483. According to the U.S. Census Bureau, the 2018 estimated population for Exeter is 15,317.[6] This is a 6.9 percent increase from 2010. As the town is about 20 square miles in area, the population density based on the Census Bureau population data is 766/square mile; some areas of the town are denser than others. The following figure illustrates the Town Master Plan population growth since 2000, and the projected population growth through 2030.

FIGURE 3-1: Population Counts and Projected Growth 2000 to 2030



The age and socio-economic factors of the population can also have an impact on requests for fire and EMS service. Evaluation of the number of seniors and children by fire management zones can provide insight into trends in service delivery and quantitate the probability of future service requests. In a 2018 National Fire Protection Association (NFPA) report on residential fires, the following key findings were identified for the period 2011-2015:[7]

- Males were more likely to be killed or injured in home fires than females, and accounted for larger percentages of the victims (57 percent of the deaths and 54 percent of the injuries).
- The largest number of deaths (19 percent) in a single age group was among people ages 55 to 64.
- Half (50 percent) of the victims of fatal home fires were between the ages of 25 and 64, as were three of every five (62 percent) of the non-fatally injured.

6. https://www.census.gov/quickfacts/fact/table/exetertownrockinghamcountynewhampshire/HSG650217
7. M. Ahrens, "Home Fire Victims by Age and Gender", Quincy, MA: NFPA, 2018.

- One-third (33 percent) of the fatalities were age 65 or older; only 15 percent of the non-fatally injured were in that age group.
- Children under the age of 15 accounted for 12 percent of the home fire fatalities and 10 percent of the injuries. Children under the age of 5 accounted for 6 percent of the deaths and 4 percent of the injuries.
- Adults of all ages had higher rates of non-fatal fire injuries than children.
- While smoking materials were the leading cause of home fire deaths overall, this was true only for people in the 45 to 84 age group.
- For adults 85 and older, fire from cooking was the leading cause of fire death.

The following table depicts the population demographics in Exeter from the Town Master Plan 2015. **Exeter has risk in the reported NFPA age groups as outlined above.**

TABLE 3-1: Exeter Population Makeup

	2000	2010	2015 Estimate
Under 5 years	5.5%	4.8%	4.4%
5 to 9 years	6.7%	5.2%	5.3%
10 to 14 years	7.6%	5.4%	8.8%
15 to 19 years	6.4%	5.8%	5.7%
20 to 24 years	3.1%	4.2%	4.6%
25 to 34 years	12.3%	8.0%	10.3%
35 to 44 years	17.5%	13.9%	13.3%
45 to 54 years	14.7%	18.2%	16.9%
55 to 59 years	5.4%	7.4%	6.1%
60 to 64 years	3.9%	11.2%	6.0%
65 to 74 years	7.2%	3.7%	9.4%
75 to 84 years	6.4%	7.6%	6.4%
85 years and over	3.3%	3.8%	3.0%

Source: 2000 US Census, 2010 and 2015 American Community Survey 5-Year Estimates

Additional Exeter socioeconomic factors include:

- The 2015 estimated household income was $73,519 (Town Master Plan).
- 94.4 percent of the population age 25-plus has a high school education or higher (U.S. Census Bureau).
- Seven percent of all people in Exeter live at or below the poverty level (Town Master Plan).

ENVIRONMENTAL FACTORS

The most common natural and environmental hazards prevelant to the town, according to the town's 2018 adopted Hazard Mitigation Plan include:

- Flooding: Probability–High. Flooding is a common hazard in Exeter. Flood hazards in Exeter include:
  - 100 year floodplain events.
  - Erosion and mudslides primarily along riverbanks.
  - Rapid snowpack melt.
  - Dam breech and failure (Exeter has six dams within the town or immediately contiguous with Exeter boundaries).
  - Severe rainstorms / heavy rain.
  - Sea level rise, coastal flooding, and storm surge.
- Hurricane-High Wind Events: Probability–High (Hurricanes, tornadoes, Nor'easters). Storm-Related Events: Probability–Moderate (downbursts, lightning, and hailstorms).
  - Hurricane.
  - Tornadoes.
  - Severe thunderstorm with high winds, lightning, and hail.
- Severe Winter Weather: Probability–High
  - Heavy Snowstorms.
  - Ice Storms.
  - Nor'easter.
- Wildfire: Probability–Moderate
  - The plan identifies five at-risk areas in the town for wildfire.
- Earthquake: Probability–Moderate
  - New England as a whole has the potential for earthquakes due to its geology.
- Drought: Probability–Low
- Extreme Temperatures: Probability–High

BUILDING FACTORS

A community risk and vulnerability exercise evaluates the community as a whole, and with regard to buildings, measures all buildings and the risk associated with each property and then segregates the property as either a high-, medium-, or low-hazard depending on factors such as the life and building content hazard, and the potential fire flow and staffing required to mitigate an emergency in the specific property. According to the NFPA *Fire Protection Handbook*, these hazards are defined as:

High-hazard occupancies: Schools, hospitals, nursing homes, explosives plants, refineries, high-rise buildings, and other high life-hazard or large fire-potential occupancies.

Medium-hazard occupancies: Apartments, offices, and mercantile and industrial occupancies not normally requiring extensive rescue by firefighting forces.

Low-hazard occupancies: One-, two-, or three-family dwellings and scattered small business and industrial occupancies.[8]

The construction type for residential structures in Exeter is predominately wood frame. The majority of the commercial/industrial structure building inventory is ordinary (block/brick) construction.

Exeter has the following building types and inventory:

- Single-family homes: 3,078.
- Manufactured homes: 1,001.
- Townhouses, duplexes: 92.
- Apartment Buildings (three-family or greater): 345.
- Garden-style apartments: 93.
- Taxpayer (public) buildings: 30 to 40.
- Commercial/industrial structures: 412.
- Strip malls: 8.
- Hotel/dormitory structures: 20.
  - Predominant construction type is ordinary. Two hotels were recently built and the balance are older dormitory buildings at Phillips Exeter Academy.
- Rooming/lodging structures: 12
  - Predominant construction type is wood frame.
- High-rise buildings: The Town of Exeter currently has two buildings greater than 75 feet in height:
  - The Exeter Hospital.
  - Phillips Exeter Academy Library.

Based on the Exeter building types identified above, the town has a predominantly low-hazard building risk (single-family dwellings). Medium- and high-hazard building risks are noted in this section as well. High life safety hazards (when occupied) include the hotel/dormitory structures, rooming/lodging structures, and the Exeter Hospital.

TRANSPORTATION FACTORS

The road network in Exeter is typical of towns and cities across the country and includes arterial streets, which carry high volumes of traffic; collector streets, which provide connection to arterial roads and local street networks as well as residential and commercial land uses; and local streets, which provide a direct road network to property and move traffic through neighborhoods.

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

Exeter is served by highways NH 101, portions of NH 108, Epping Road (NH 27), Newfields Road (NH 85), Brentwood Road (NH 111A), and Kingston Road (NH 111). Route 101 provides connections to Interstates 93 and 95.[9]

The road network described herein poses a vehicular accident and vehicular versus pedestrian risk to Exeter. There are additional transportation risks since tractor-trailer and other commercial vehicles traverse the roadways of Exeter to deliver mixed commodities to businesses and residential locations. Fires involving these products can produce smoke and other products of combustion risks that may be hazardous to health.

Exeter also is served by two modes of public transportation, the Amtrak Downeaster, which serves New England, and the COAST Bus Service, which provides Exeter residents public transportation to destinations in New England as well.

The Amtrak service typically sees two trains pass through the town in the morning, mid-afternoon, late afternoon/early evening, and at times late night depending on the day of the week and the train schedule. There is an Amtrak platform station located in the downtown area of the town.

In addtion to the passenger rail service, the town also has a freight rail service that utilizes the main track rail line. Primary commodities handled by Pan Am Railways include grain, coal, sand and gravel, food products, lumber, paper and pulp, chemicals and plastics, petroleum, processed minerals, metals, scrap metal, finished automobiles, and intermodal trailers and containers.[10] While these commodities are not considered hazardous materials, fires involving these products can produce smoke and other products of combustion risks that may be hazardous to health. Both rail lines utilize at-grade crossings, which creates transportation risks.

The town also has a large network of trails used for hiking, biking, running, skiing, and snowshoeing.[11] These trails typically do not cross the road network; however, there are points in the town where they do intersect.

The following figure illustrates the Exeter transportation network.

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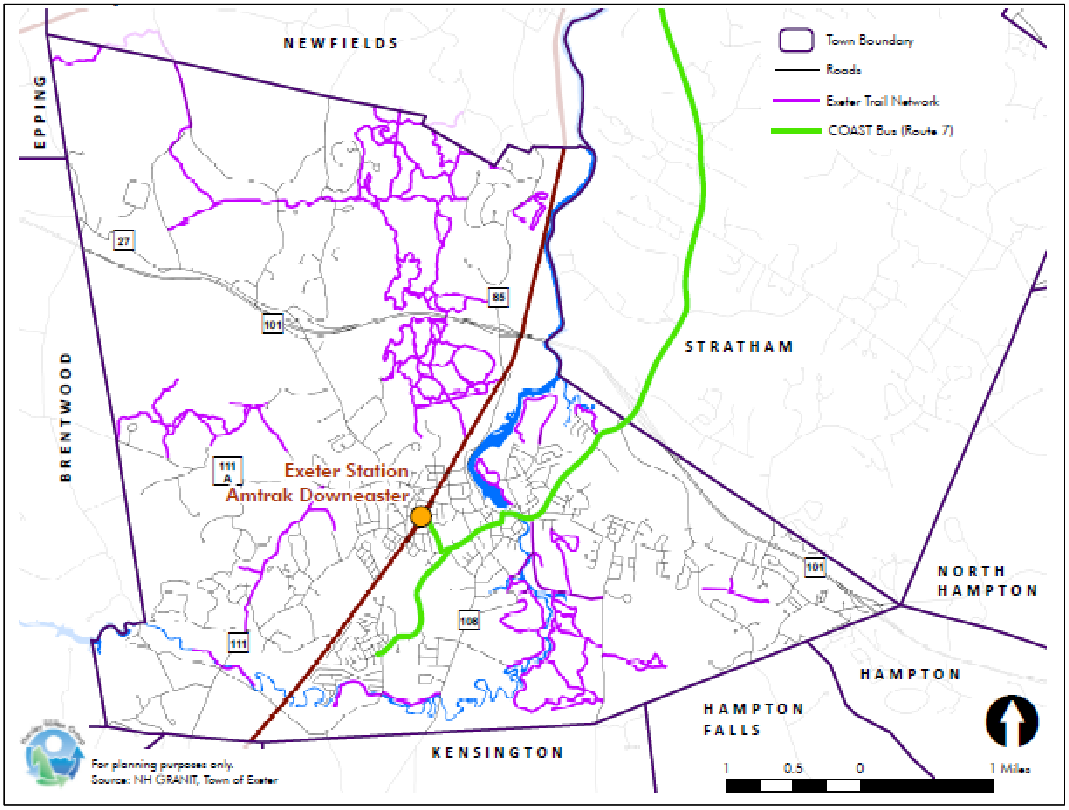
9. Exeter Town Master Plan. 2018.
10. http://www.panamrailways.com/who-we-are
11. Ibid.

FIGURE 3-2: Exeter Transportation Network



TARGET HAZARD FACTORS

In terms of identifying target hazards, consideration must be 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 materials that are regularly found in the building.

Exeter has a variety of target hazards that include:

Hotel/Dormitory Target Hazards: 20

- 3 hotel buildings with vertical/access hazards.
- 17 Phillips Exeter Academy dormitory buildings, an occupancy hazard (seasonal capacity).

Room and Lodging Houses: 12

- Construction type and occupancy capacity varies.

Multifamily Buildings: 26

- Two have size/vertical/access hazards.
- Eight have vertical/access hazards.
- 13 have age/access hazards.
- One is a nursing home with vertical hazard.

- One is an assisted living facility with access and special patient hazards.
- One has age and no automatic fire suppression system hazards.

Buildings with High-hazard Content: 16

- 11 have hazaradous materials hazards.
- One has electrical hazards.
- Two have area and access hazards.
- One has height and access hazards.

Bulk Storage Facilities: 3

- Three are warehouse storage hazards.

Medical Facilities: 4

- One is a hopital.
- One is an infirmary (student treatment at Phillips Exeter Academy).
- Two are medical buildings (one has access hazards and one has height/access hazards).

Educational/School Buildings: 7

- One has an area hazard and high student population hazard (high school, 2,400 students).
- Two have access height hazards.

FIRE AND FIRE-RELATED RISK

An indication of the community's fire risk is the type and number of fire-related incidents the fire department responds to. During the CPSM data analysis study period (September 1, 2018 to August 31, 2019), the EFD responded to 689 fire-related calls for service. The following table details the call types and call type totals for these types of fire-related risks.

TABLE 3-2: Fire Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
False alarm	339	0.9	8.7
Good intent	42	0.1	1.1
Hazard	128	0.4	3.3
Outside fire	23	0.1	0.6
Public service	135	0.4	3.4
Structure fire	22	0.1	0.6
Fire Total	**689**	**1.9**	**17.6**

Key takeaways from this data set are:

- Fire calls for the study period totaled 689 (18 percent of all calls), an average of 1.9 fire calls per day.

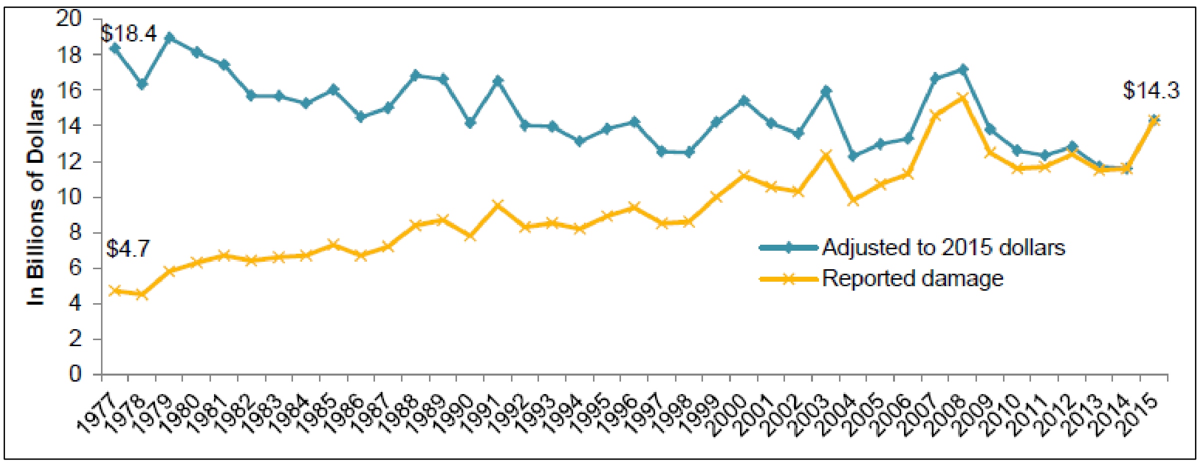
- False alarm calls were the largest category of fire calls and made up 8.7 percent of all calls, and averaged of 0.9 calls per day.
- Public service calls were the second highest category of fire type calls at 3.4 percent of all calls, and averaged 0.4 calls per day.
- Structure and outside fire calls combined made up 6.5 percent of fire calls and 1.2 percent of all calls, and represent an average of 0.2 calls per day or one every five days.

Community Fire Loss Information

Fire loss is an estimation of the total loss from a fire to the structure and contents in terms of replacement. Fire loss includes contents damaged by fire, smoke, water, and overhaul. Fire loss does not include indirect loss, such as business interruption.

In a 2017 report published by the National Fire Protection Association on trends and patterns of U.S. fire losses, it was determined that home fires still cause the majority of all civilian fire deaths, civilian injuries, and property loss due to fire. The following figure shows U.S. fire loss trends from 1977 to 2015.

FIGURE 3-3: U.S. Fire Loss Trend: 1977-2015[12]



For the five-year period of 2015 through November 2019, the Town of Exeter experienced $1,951,900 in fire loss a result of fire-related calls for service. The following table shows this information by year (along with the total value of property involved).

TABLE 3-3: Fire Loss: 2015–November 2019[13]

Year	Property and Content Value	Fire Loss
2015	$2,269,000	$316,200
2016	$2,494,000	$42,500
2017	$1,235,900	$721,400
2018	$3,306,800	$232,300
2019	$15,576,750	$639,500

12. *Trends and Patterns of U.S. Fire Losses*. National Fire Protection Association, January 2017.
13. Exeter Fire Department.

The following two tables show content and property loss just for the study period, which overlaps two years, 2018 and 2019.

TABLE 3-4: Content and Property Loss, Structure and Outside Fires, Study Period

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Outside fire	$347,750	10	$55,300	4
Structure fire	$367,150	6	$108,300	8
Total	**$714,900**	**16**	**$163,600**	**12**

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

TABLE 3-5: Total Fire Loss Above and Below $20,000, Study Period

Call Type	No Loss	Under $20,000	$20,000 plus
Outside fire	11	9	3
Structure fire	12	6	4
Total	**23**	**15**	**7**

EMS-RELATED RISK

As with fire risks, an indication of the community's pre-hospital emergency medical risk is the type and number of EMS calls to which the fire department responds. During the CPSM data analysis study period (September 1, 2018 to August 31, 2019), the EFD responded to 1,890 EMS-related calls for service. The following table outlines the call types and call type totals for these types of EMS risks.

TABLE 3-6: EMS Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Breathing difficulty	98	0.3	2.5
Cardiac and stroke	159	0.4	4.1
Fall and injury	271	0.7	6.9
Illness and other	1,004	2.8	25.6
MVA	100	0.3	2.6
Overdose and psychiatric	179	0.5	4.6
Seizure and unconsciousness	79	0.2	2.0
EMS Total	**1,890**	**5.2**	**48.3**

Key takeaways from this data set are:

- Illness and other calls, by far, made up the largest category of EMS calls at 25.6 percent of all calls, an average of 2.8 calls per day.
- Fall and injury calls made up the second largest EMS call category at 6.9 percent of all calls, an average of 0.7 calls per day.

- Cardiac, stroke, and breathing difficulty calls made up 13.6 percent of EMS calls and 6.6 percent of all calls, an average of 0.7 calls per day.

FIRE AND EMS DEMAND

The fire and EMS risk in terms of numbers and types of incidents is important when analyzing a community's risk, as outlined above. Analyzing where the fire and EMS incidents occur, and the demand density of fire and EMS incidents, determines adequate fire management zone resource assignment and deployment. The following figures illustrate fire and EMS demand in the EFD fire management zone, which is the entire town from a single station. Figure 3-4 illustrates fire incidents (structural and outside fires, alarm activations etc.); Figure 3-5 illustrates other types of fire-related incidents such as good intent and public service calls, which are calls for service such as smoke scares (no fire), wires down, lock outs, water leaks, etc. Figure 3-6 illustrates EMS incident demand.

The following three demand maps tell us that fire and EMS incident demand is highest in the core downtown area, with additional higher demand in the central, southeast, and southwest portions of the town (built upon areas south of Route 101).

FIGURE 3-4: Fire Incident Demand Density (Structural and Outside Fires)

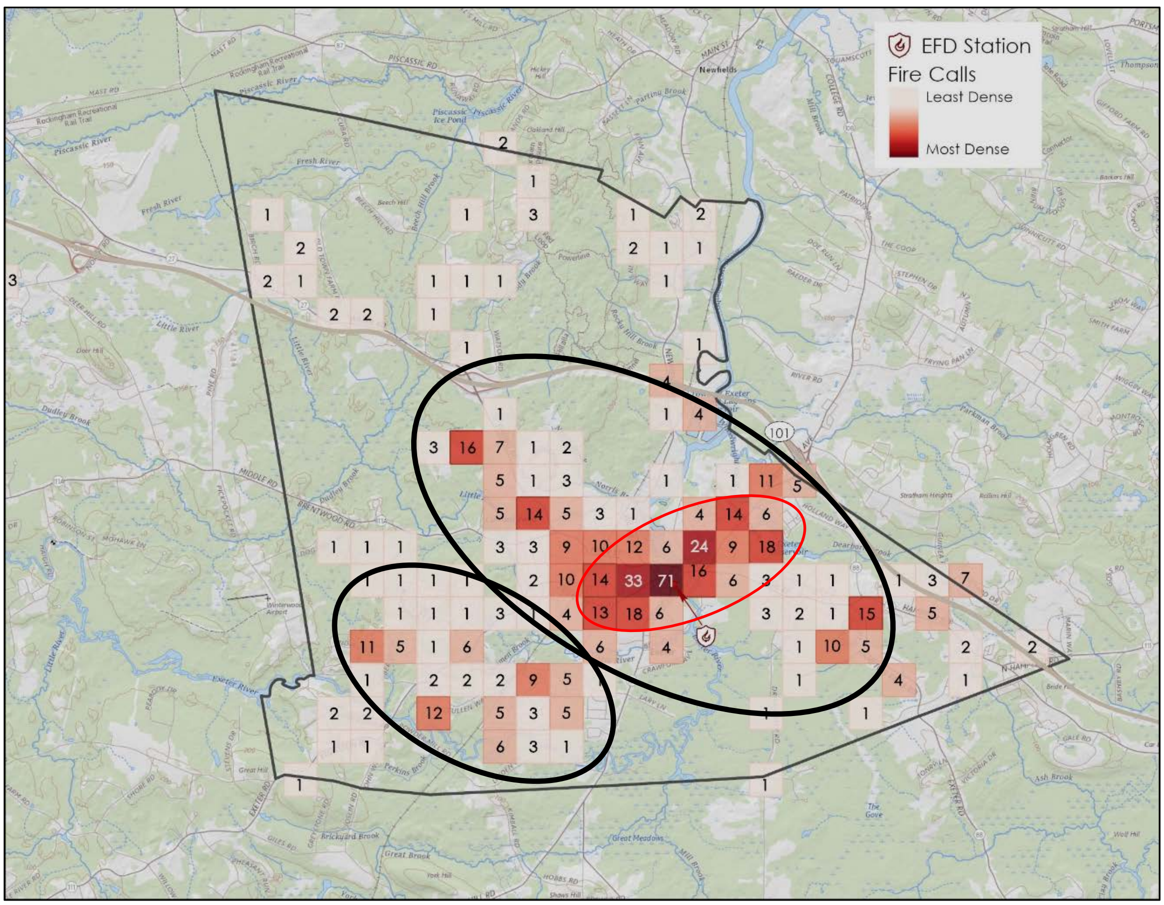


FIGURE 3-5: Fire Incident Demand Density (Other Fire-related Incidents)

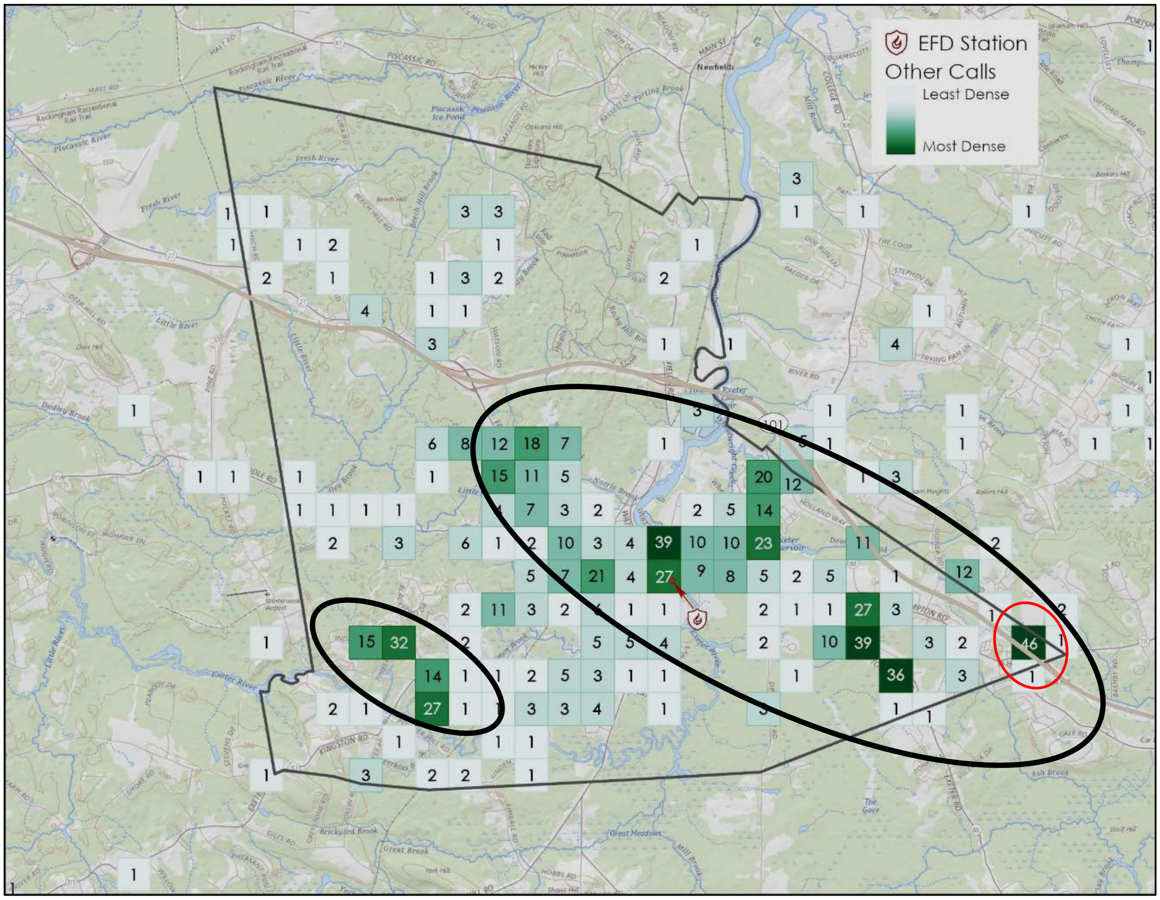
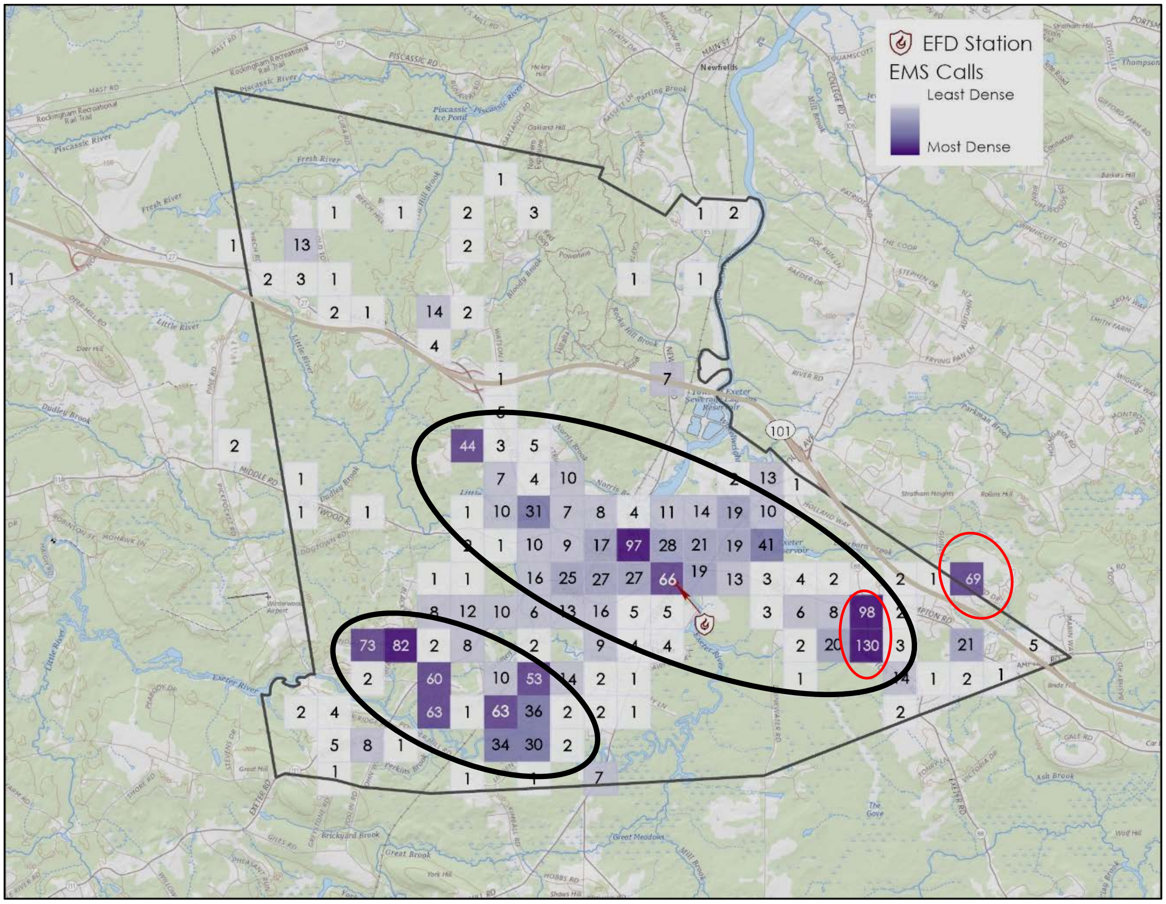


FIGURE 3-6: EMS Incident Demand Density



Regarding the discussion of fire and EMS incident responses in the CPSM data analysis, CPSM removed 80 responses by administrative units (command staff). After discussion with EFD command staff, it was determined that many of these responses were made by command staff as emergency responses when no EFD unit was available. If the response was a fire incident, the command officer was able to assess the situation, take command when needed, and ensure the most appropriate response continued to the call. If the response was an EMS incident, the command officer was able to assess the situation, render care, take command when needed, and ensure the most appropriate response continued to the call.

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RISK CATEGORIZATION AND CLASSIFICATION

A comprehensive risk assessment is a critical aspect of creating standards of cover and can assist the EFD in quantifying the risks that it faces in the town. Once those risks are known, the department is better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned. In this component, the factors that drive the service needs are examined and then link directly to discussions regarding the assembling of an effective response force (EFR) and when contemplating the response capabilities needed to adequately address the existing risks, which encompasses the component of critical tasking.

The risks that the department faces can be natural or man-made and may be affected by the changing demographics of the community served. With the information available from the CPSM data analysis, the EFD, the town, and public research, CPSM and the EFD can begin an analysis of the town's risks, and can begin working towards recommendations and strategies to mitigate and minimize their effects. This section contains an analysis of the various risks considered within the EFD's service area.

Community is often categorized in three ways, which are consequence of the event on the community, the probability the event will occur in the community, and the impact on the fire department. The following three tables look at consequence to the community (Table 3-7), which is categorized ranging from insignificant to catastrophic; the probability of the event occurring (Table 3-8) which ranges from unlikely to frequent; and the impact to the organization (Table 3-9), which ranges from insignificant to catastrophic.

TABLE 3-7: Event Probability

Probability	Chance of Occurrence	Description	Risk Score
Unlikely	2%-25%	Event may occur only in exceptional circumstances.	**2**
Possible	26%-50%	Event could occur at some time and/or no recorded incidents. Little opportunity, reason, or means to occur.	**4**
Probable	51%-75%	Event should occur at some time and/or few, infrequent, random recorded incidents or little anecdotal evidence. Some opportunity, reason, or means to occur; may occur.	**6**
Highly Probable	76%-90%	Event will probably occur and/or regular recorded incidents and strong anecdotal evidence. Considerable opportunity, means, reason to occur.	**8**
Frequent	90%-100%	Event is expected to occur. High level of recorded incidents and/or very strong anecdotal evidence.	**10**

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TABLE 3-8: Consequence to Community Matrix

Impact	Impact Categories	Description	Risk Score
Insignificant	Life Safety	■ 1 or 2 people affected, minor injuries, minor property damage, and no environmental impact.	**2**
Minor	Life Safety Economic and Infrastructure Environmental	■ Small number of people affected, no fatalities, and small number of minor injuries with first aid treatment. Minor displacement of people for <6 hours and minor personal support required. ■ Minor localized disruption to community services or infrastructure for <6 hours. Minor impact on environment with no lasting effects.	**4**
Moderate	Life Safety Economic and Infrastructure Environmental	■ Limited number of people affected (11 to 25), no fatalities, but some hospitalization and medical treatment required. Localized displacement of small number of people for 6 to 24 hours. Personal support satisfied through local arrangements. Localized damage is rectified by routine arrangements. ■ Normal community functioning with some inconvenience. ■ Some impact on environment with short-term effects or small impact on environment with long-term effects.	**6**
Significant	Life Safety Economic and Infrastructure Environmental	■ Significant number of people (>25) in affected area impacted with multiple fatalities, multiple serious or extensive injuries, and significant hospitalization. ■ Large number of people displaced for 6 to 24 hours or possibly beyond. External resources required for personal support. Significant damage that requires external resources. Community only partially functioning, some services unavailable. ■ Significant impact on environment with medium- to long-term effects.	**8**
Catastrophic	Life Safety Economic and Infrastructure Environmental	■ Very large number of people in affected area(s) impacted with significant numbers of fatalities, large number of people requiring hospitalization with serious injuries with long-term effects. General and widespread displacement for prolonged duration and extensive personal support required. Extensive damage to properties in affected area requiring major demolition. ■ Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. ■ Community unable to function without significant support. ■ Significant long-term impact on environment and/or permanent damage.	**10**

TABLE 3-9: Impact on EFD

Impact	Impact Categories	Description	Risk Score
Insignificant	Personnel and Resources	One apparatus out of service for period not to exceed one hour.	**2**
Minor	Personnel and Resources	More than one but not more than two apparatus out of service for a period not to exceed one hour.	**4**
Moderate	Personnel and Resources	More than 50% of available resources committed to incident for over 30 minutes.	**6**
Significant	Personnel and Resources	More than 75% of available resources committed to an incident for over 30 minutes.	**8**
Catastrophic	Personnel, Resources, and Facilities	More than 90% of available resources committed to incident for more than two hours or event which limits the ability of resources to respond.	**10**

This section also contains an analysis of the various risks considered in the town. In this analysis, information presented and reviewed in this section (All-Hazards Risk Assessment of the Community) have been considered. Risk is categorized as Low, Moderate, High, or Special.

Prior risk analysis has only attempted to evaluate two factors of risk: probability and consequence. Contemporary risk analysis considers the impact of each risk to the organization, thus creating a three-axis approach to evaluating risk as depicted in the following figure.
A contemporary risk analysis now includes probability, consequences to the community, and impact on the organization, in this case the EFD.

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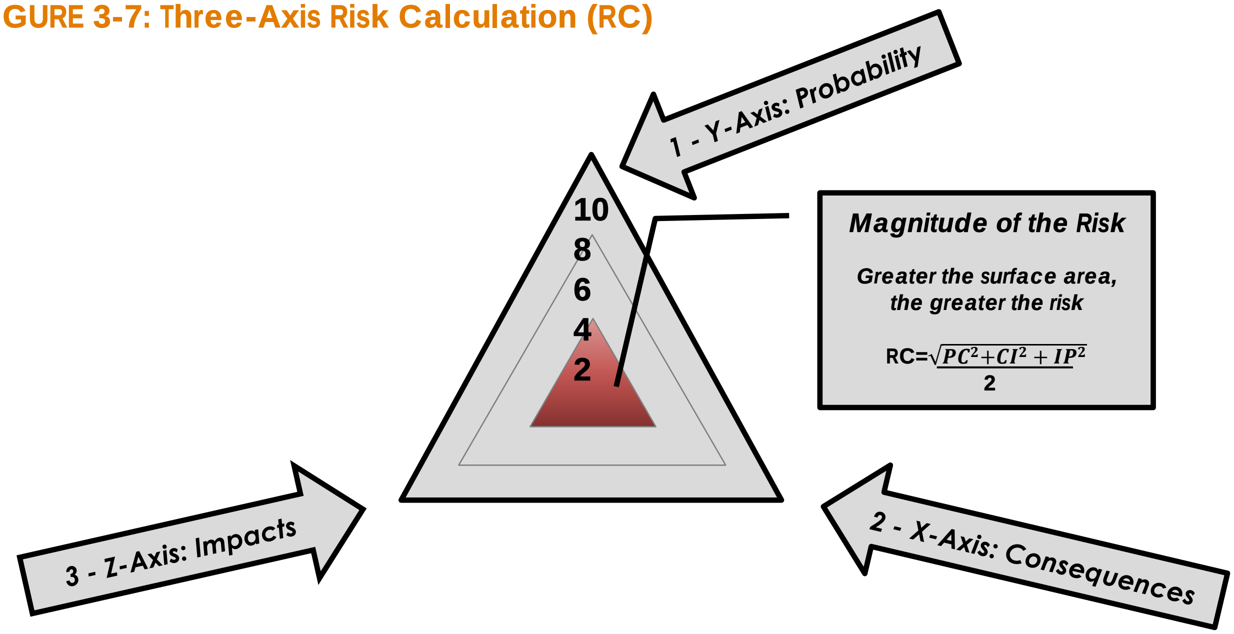
FIGURE 3-7: Three-Axis Risk Calculation (RC)



The following factors/hazards were identified and considered:

- **Demographic factors** such as age, socio-economic, vulnerability.
- **Natural hazards** such as flooding, snow and ice events, wind events, wild land fires.
- **Man-made hazards** such as rail lines, roads and intersections, target hazards.
- **Structural/building risks**.
- **Fire and EMS incident numbers and density**.

The assessment of each factor and hazard as listed below took into consideration the likelihood of the event, the impact on the town itself, and the impact on EFD's ability to deliver emergency services, which includes automatic aid capabilities as well. The list is not all inclusive but includes categories most common or that may present to the town and the EFD.

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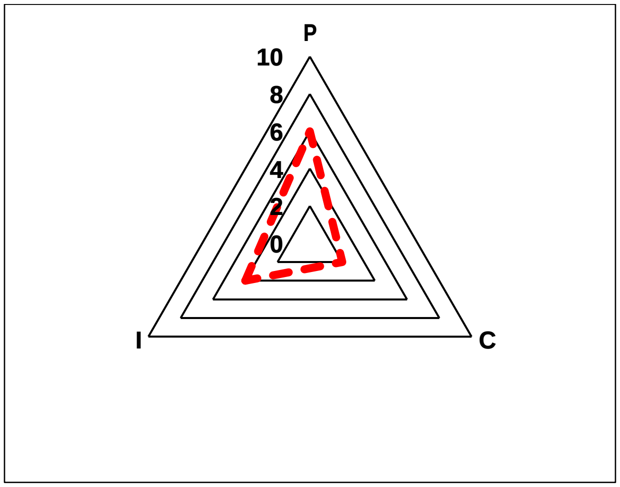
Low Risk

- Automatic fire/false alarms.
- BLS EMS Incidents
- Minor flooding with thunderstorms.
- Good intent/hazard/public service fire incidents with no life safety exposure.
- Outside fires such as grass, rubbish, dumpster, vehicle with no structural/life safety exposure.

FIGURE 3-8: Low Risk



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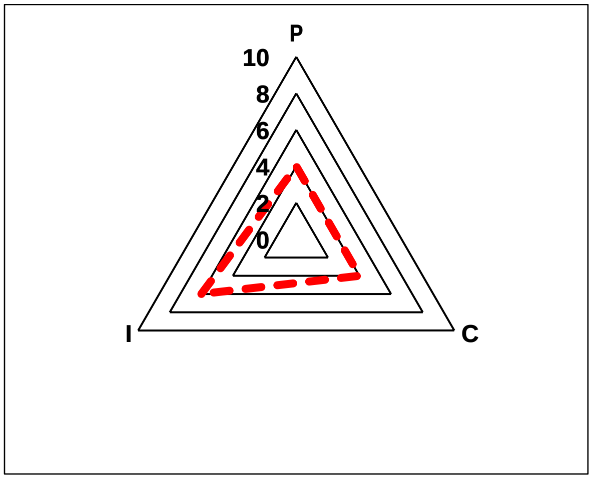
Moderate Risk

- Fire incident in a single-family dwelling where fire and smoke or smoke is visible, indicating a working fire.
- Suspicious substance investigation involving multiple fire companies and law enforcement agencies.
- ALS EMS incident.
- Motor vehicle accident (MVA).
- MVA with entrapment of passengers.
- Grass/brush fire with structural endangerment/exposure.
- Low angle rescue involving ropes and rope rescue equipment and resources.
- Surface water rescue.
- Good intent/hazard/public service fire incidents with life safety exposure.

FIGURE 3-9: Moderate Risk



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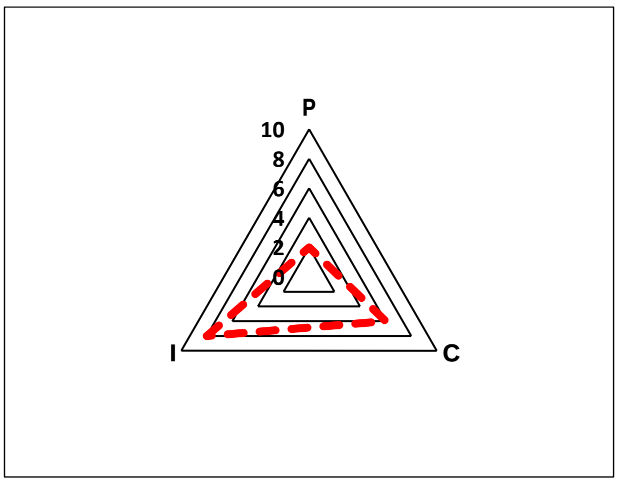
High Risk

- Working fire in a target hazard.
- Cardiac arrest.
- Mass casualty incident of more than 10 patients but fewer than 25 patients.
- Confined space rescue.
- Structural collapse involving life safety exposure.
- High angle rescue involving ropes and rope rescue equipment.
- Trench rescue.
- Suspicious substance incident with injuries.
- Industrial leak of hazardous materials that causes exposure to persons or threatens life safety.
- Weather event that creates widespread flooding, building damage, and/or life safety exposure.

FIGURE 3-10: High Risk



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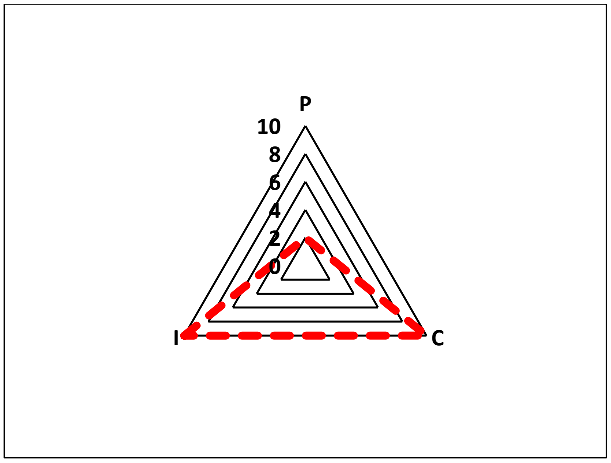
Special Risk

- Working fire in a structure of more than three floors.
- Fire at an industrial building or complex with hazardous materials.
- Fire in an occupied targeted hazard with special life safety risks such as age, medical condition, or other identified vulnerabilities.
- Mass casualty incident of more than 25 patients.
- Rail or transportation incident that causes life safety exposure or threatens life safety through the release of hazardous smoke or materials.
- Explosion in a building that causes exposure to persons or threatens life safety or outside of a building that creates exposure to occupied buildings or threatens life safety.

FIGURE 3-11: Special Risk



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SECTION 4. STAFFING AND DEPLOYMENT OF FIRE AND EMS RESOURCES

Staffing fire and EMS companies continues to remain a hotly debated topic among firefighters and governmental leadership. While NFPA 1710 and OSHA provide guidelines as to the level of staffing and response of personnel, the acceptance of these agency documents varies from state to state, and department to department. NFPA 1710 addresses the recommended staffing in terms of four types of occupancies. The needed staffing to accomplish the critical tasks for each specific occupancy are determined to be the effective response force (ERF). The ERF for each of these occupancies in detailed in NFPA 1710 (2020 edition), section 5.2.4, Deployment.

One of the factors that has helped the fire service in terms of staffing is technology. The fire service continues to experience several technological advances that help firefighters extinguish fires more effectively. More advanced equipment in terms of nozzles, thermal imaging systems, advancements in self-contained breathing apparatus, incident command strategies, and devices used to track personnel air supply are some of the advancements of technologies and techniques that help firefighters extinguish fires faster and manage the fireground more effectively. While some of these technologies do not reduce the staffing or manpower required, they can have an impact on workload capacity, property loss, and crew fatigue.

One such technology that can assist in the rapid extinguishment of fires are foam agents such as Class A and compressed air foam systems (CAFS) that have an extinguishing factor that has several advantages over water. Class A foam's advantages include cooling ability and vapor suppression. The increased surface area of the foam bubbles compared to plain water droplets increases dramatically the ability to absorb heat. With regards to vapor suppression, the foam blanket effectively covers and coats burned or partially burned fuels, thereby trapping escaping vapors.[14] Class A foam will increase wetting effectiveness, which enables greater penetration into Class A fuels such as ordinary combustibles. It also gives water a foaming ability, which enables it to remain and cling to vertical and horizontal surfaces without run off and allows water to absorb more heat. By adding a small quantity of a Class A foam concentrate into a water stream, the effectiveness of the water can be increased by a factor of up to five times.[15]

CAFS can also help provide some potential advantages vs. water-only systems. CAFS has been shown to reduce water use, reduce extinguishment time, and reduce firefighter fatigue.[16]

Even with many advances in technology and equipment, the fireground is an unforgiving and dynamic environment where critical tasks must be completed by firefighters. Providing adequate staffing (effective response force) for these environments utilizes many factors. A community fire risk assessment and the expectations of the community are factors that will drive the critical tasks needed to be completed on the fireground.

Staffing and deployment of fire services is not an exact science. While there are many benchmarks that communities and management utilize in justifying certain staffing levels, there are certain considerations that are data driven and reached through national consensus that serve this purpose as well. CPSM has developed metrics it follows and recommends that

14. www.chemguard.com
15. www.chemguard.com
16 *Fire Engineering*, 2013, Compressed Air Foam and Firefighting Research, Dicus et al.

communities consider when making recommendations regarding staffing and deployment of fire resources.

In addition to metrics, staffing is also linked to station location, what type of apparatus is responding, that is, the combination of engine, ladder, ambulance, or specialty piece. These combined factors help to determine what level of fire and EMS service is going to be delivered in terms of manpower, response time, and resources. Linked to these components of staffing and deployment are eleven critical factors that drive various levels and models from which fire and EMS departments staff and deploy. These factors are:

Fire Risk and Vulnerability of the Community: A fire department collects and organizes risk evaluation information about individual properties and based on the rated factors then derives a “fire risk score” for each property. The community risk and vulnerability assessment are used to evaluate the community. With regard to individual property, the assessment is used to measure all property and the risk associated with that property and then segregate the property as either a high-, medium-, or low-hazard depending on factors such as the life and building content hazard and the potential fire flow and the staffing and apparatus types required to mitigate an emergency in the specific property. Factors such as fire protection systems are considered in each building evaluation. Included in this assessment should be both a structural and nonstructural (weather, wildland-urban interface, transportation routes, etc.) analysis.

Population, Demographics, and Socioeconomics of a Community: Population and population density drives calls for local government service, particularly public safety. The risk from fire is not the same for everyone, with studies telling us age, gender, race, economic factors, and what region in the country one might live in contribute to the risk of death from fire. Studies also tell us these same factors affect demand for EMS, particularly population increase and the use of hospital emergency departments more frequently as many uninsured or underinsured patients rely on emergency services for their primary and emergent care, utilizing pre-hospital EMS transport systems as their entry point.

Call Demand: Demand is made up of the types of calls to which units are responding and the location of the calls. This drives workload and station staffing considerations. Higher population centers with increased demand require greater resources.

Workload of Units: The types of calls to which units are responding and the workload of each unit in the deployment model. This tells us what resources are needed and where; it links to demand and station location, or in a dynamic deployed system, the area(s) in which to post units.

Travel Times from Fire Stations: Looks at the ability to cover the response area in a reasonable and acceptable travel time when measured against national benchmarks. Links to demand and risk assessment.

NFPA Standards, ISO, OSHA requirements (and other national benchmarking).

EMS Demand: Community demand; demand on available units and crews; demand on non-EMS units responding to calls for service (fire/police units); availability of crews in departments that utilize cross-trained EMS staff to perform fire suppression.

Critical Tasking: The ability of a fire and EMS department to comprise an effective response force when confronted with the need to perform required tasks on a fire or EMS incident scene defines its capability to provide adequate resources to mitigate each event. Department-developed and measured against national benchmarks. Links to risk and vulnerability analysis.

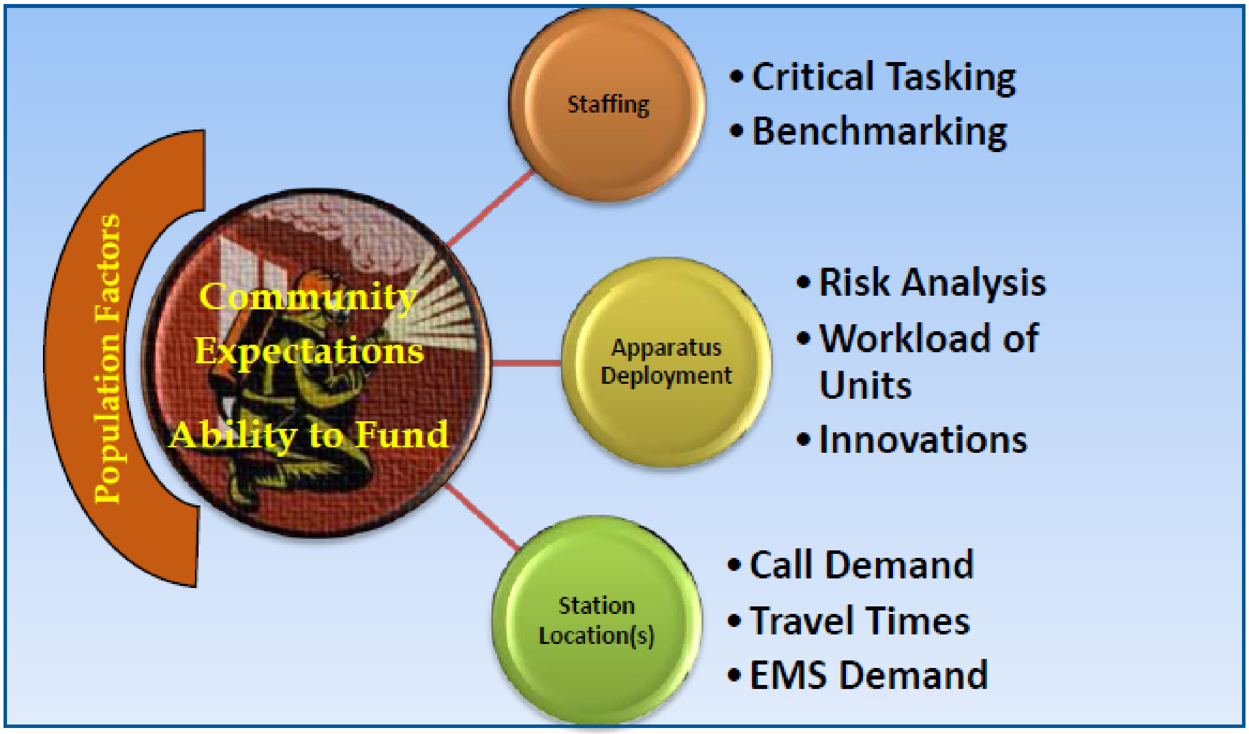
Innovations in Staffing and Deployable Apparatus: The fire department's ability and willingness to develop and deploy innovative apparatus (combining two apparatus functions into one to maximize available staffing, as an example). Deploying quick response vehicles (light vehicles equipped with medical equipment and some light fire suppression capabilities) on those calls (typically the largest percentage) that do not require heavy fire apparatus.

Community Expectations: Measuring, understanding, and meeting community expectations.

Ability to Fund: The community's ability and willingness to fund all local government services and understanding how the revenues are divided up to meet the community's expectations.

These factors are further illustrated in the following figure.

FIGURE 4-1: Fire Department Staffing Diagram



While each component presents its own metrics of data, consensus opinion, and/or discussion points, aggregately they form the foundation for informed decision making geared toward the implementation of sustainable, data- and theory-supported, effective fire and EMS staffing and deployment models that fit the community's profile, risk, and expectations.

LOCATION OF EXISTING STATION, EFD'S RESPONSE RESOURCES

The EFD's one station is located at 20 Court St. in the downtown area. The primary EFD service area includes the municipal boundaries of the town. This includes fire and EMS transport services.

The EFD town service area has response zones that have fire hydrants and response zones that do not have fire hydrants. The EFD service area ranges from a concentrated commercial center downtown that transitions to industrial, professional and technology parks, multifamily and single-family residential structures (low and moderate density), healthcare facilities, and a historic district. There are also rural residential areas. The service area has a diverse mix of buildings ranging from new to very old/historical construction with single-family and/or mixed occupancy types. According to the EFD, many older buildings have been renovated, modified, and/or altered several times; many have historical significance.

From its single location, the EFD responds with fire suppression apparatus and EMS transport units. Emergency response units include:

Engine companies, which are designed primarily for firefighting operations, the transport of crew members, hose (fire attack and larger supply), tank water, ground ladders, self-contained breathing apparatus, and storage of an assortment of hand tools used for a broad spectrum of fire operational tasks. Since engines are often utilized as first response units on EMS calls, they also carry an assortment of EMS gear to treat patients and provide life-saving measures prior to the arrival of EMS transport units. The EFD engines are set up for this as well and are staffed with paramedics and/or advanced emergency medical technicians. The staffing complement for engine apparatus is discussed in depth below.

The EFD currently responds to emergencies with an inventory of four engines (see unit detail in Section 2). Although the engines are designed and equipped similarly, they may have differing response objectives when dispatched simultaneously. In particular, Squad 3, although an engine apparatus, is capable of responding to all fires, and is also set up to respond to motor vehicle accidents and carries the specialty equipment and gear necessary for tactical and heavy rescue. Squad 3 also responds to mutual aid calls and is equipped to respond as a Rapid Intervention Team (RIT).[17]

A ladder company, which is also primarily designed for firefighting operations, and differs from the engines in that it also has a hydraulically operated aerial device designed to reach above grade floors to transport crew members, effect rescues, and provide an elevated water stream. The ladder truck also transports crew members, ground ladders, self-contained breathing apparatus, various forcible entry tools, ventilation equipment, and hydraulic rescue tools as well as other equipment to deal with an assortment of fires and technical rescues. Some ladder trucks, such as the one in the EFD, carry hose (fire attack and larger supply) and tank water.

The EFD currently responds to emergencies with an inventory of one ladder truck (see detail in Section 2). When needed, the unit responds with a crew capable of performing ladder company functions such as ventilation, utility control, above-grade firefighting tasks, and elevated master stream application. Staffing for the ladder apparatus is discussed in depth below.

EMS transport units, which are primarily designed to respond to EMS calls for service with crew members, and provide scene treatment and then transport while continuing care to the hospital

17. https://www.exeternh.gov/fire/exeter-fire-department-our-equipment

emergency department. Equipment includes both basic and advanced life support targeted at timely intervention and patient stabilization.

The EFD currently responds to emergencies with an inventory of two ambulances, which are staffed with paramedics and/or advanced emergency medical technicians. Staffing for EMS transport units is discussed in depth below.

A forestry unit, which is a specially designed vehicle for off-road terrain encountered during brush and wild land firefighting operations, are typically 4-wheel drive, and carry crew members, water, hose, and an array of hand tools specific to brush and wild land fires. The EFD forestry unit also carries foam because of foam's surface penetrating abilities.

Then EFD currently deploys one brush fire rig from the Court St. fire station. The unit is not typically staffed full time. Staffing for the forestry unit is discussed in depth below.

Command Vehicles, which are typically SUV-type vehicles with command centers built into the cargo compartment, are designed to carry a command level officer to the scene. They are equipped with radio and command boards, as well as scene personnel tracking equipment and associated gear.

The EFD has three command vehicles assigned to the chief and the two assistant chiefs. These personnel are responsible for responding to fire and EMS incidents and establishing command and control of the incident.

Figure 4-2 illustrates the town boundaries with the location of the fire station.

Figure 4-3 shows the current town land use map.

Figure 4-4 shows the current town zoning districts.

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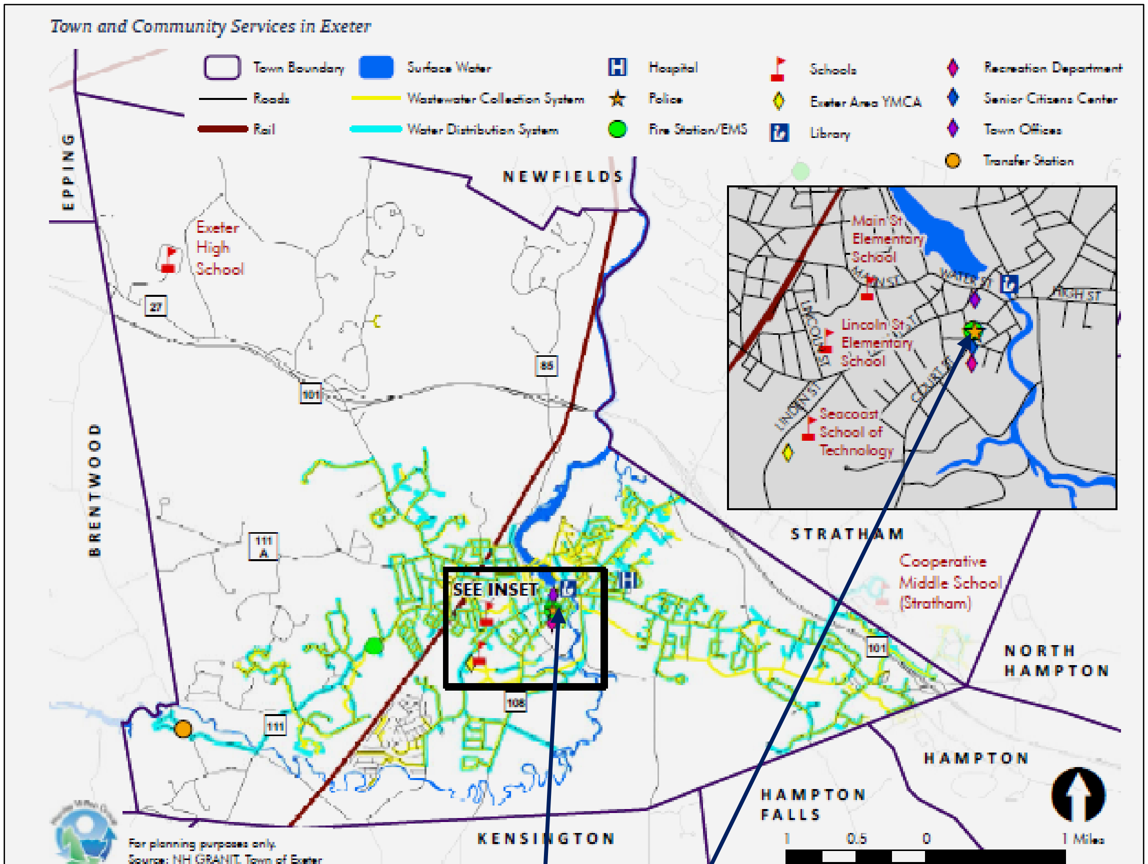
FIGURE 4-2: Town of Exeter Boundaries with Fire Station Location



Exeter Fire Department

20 Court Street

FIGURE 4-3: Town of Exeter Land Use Map

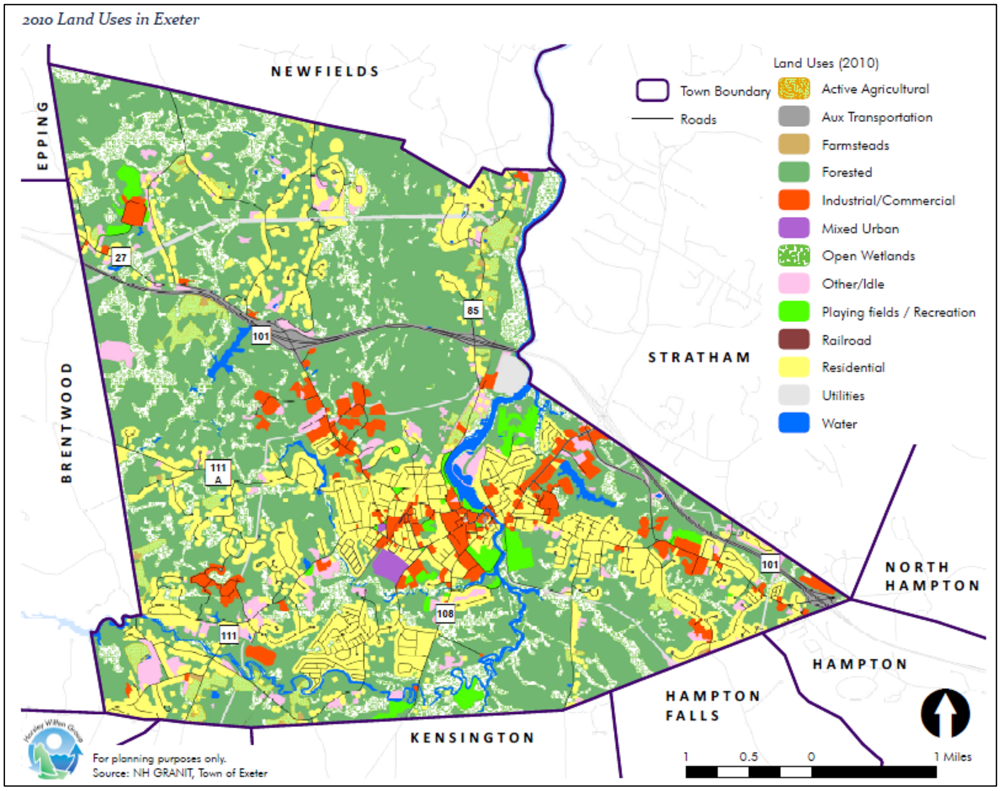
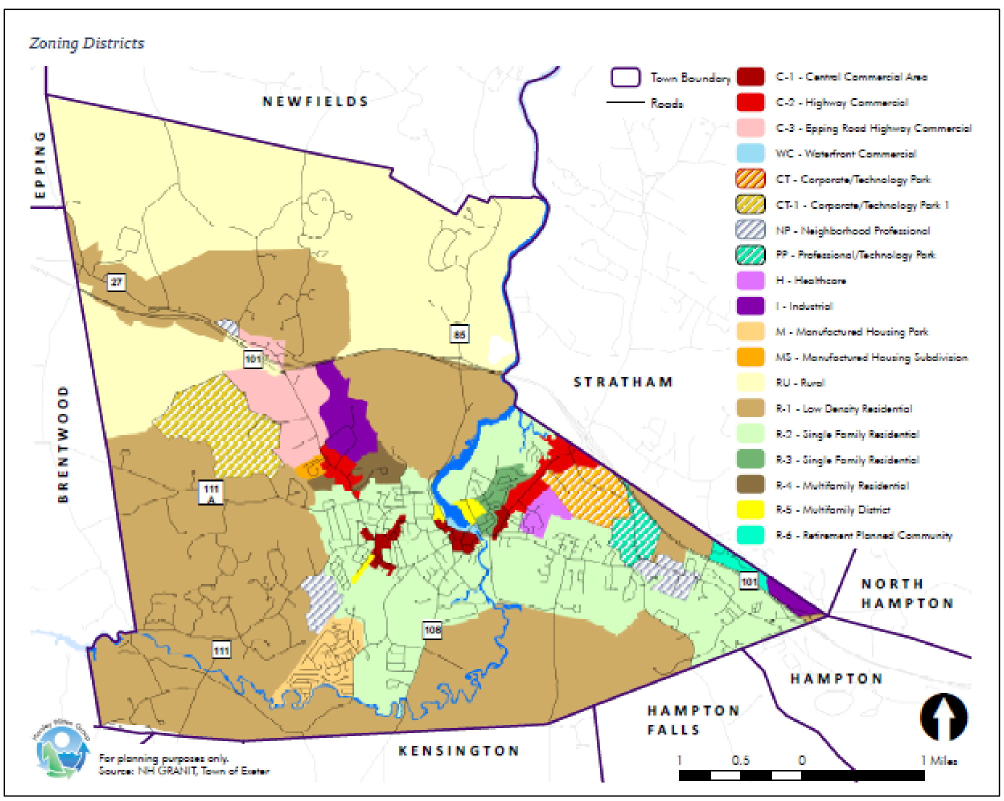


FIGURE 4-4: Town of Exeter Zoning Districts



FIRE AND EMS STAFFING AND RESPONSE METHODOLOGIES

Fire, rescue, and emergency medical system (EMS) incidents, and the fire department's ability to respond to, manage, and mitigate them effectively, efficiently, and safely, are mission-critical components of the emergency services delivery system. In fact, fire, rescue, and EMS operations provide the primary, and certainly most important, basis for the very existence of the fire department.

Nationwide, fire departments are responding to more EMS calls and fewer fire calls, particularly fire calls that result in active firefighting operations by responders. This is well documented in both national statistical data, as well as in CPSM fire studies. Exeter's experience is consistent with these trends. Nationally, improved building construction, code enforcement, automatic sprinkler systems, and aggressive public education programs have contributed to a decrease in serious fires and, more importantly, fire deaths among civilians.

These trends and improvements in the overall fire protection system notwithstanding, fires still do occur, and the largest percentage of those occur in residential occupancies, where they place the civilian population at risk. Although they occur with less frequency than they did several decades ago, when they occur today they grow much quicker and burn more intensely than they did in the past due to building construction features, more flammable interior finishes and furniture, and in the case of localities such as Exeter with older buildings, multiple renovations that have led to hidden voids and spaces that act as channels for fire and smoke. As will be discussed later in this section, ***it is imperative that the fire department is able to assemble an effective response force (ERF) within a reasonable time period in order to successfully mitigate these incidents with the least amount of loss possible.***

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*, 2020 edition (National Fire Protection Association, Quincy, Mass.) outlines organization and deployment of operations by career, and primarily career fire and rescue organizations.[18] It serves as a benchmark to measure staffing and deployment of resources to certain structures and emergencies.

NFPA 1710

NFPA standards are consensus standards and not the law. Many cites and countries strive to achieve these standards to the extent possible without an adverse impact to the community. Cities and communities must decide on the level of service and compliance they can deliver based on budgetary constraints and operational capabilities. Questions of legal responsibilities are often discussed in terms of compliance with NFPA Standards.

NFPA 1710 was the first organized approach to defining levels of service, deployment capabilities, and staffing levels for substantially career departments. Research work and empirical studies in North America were used by NFPA committees for the basis for developing response times and resource capabilities for those services as identified by the fire department.[19]

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18. NFPA 1710 is a nationally recognized standard, but it has not been adopted as a mandatory regulation by the federal government or the State of New Hampshire. It is a valuable resource for establishing and measuring performance objectives for the Town of Exeter but should not be the only determining factor when making local decisions about the town's fire and EMS services.
19. NFPA, Origin and Development of the NFPA 1710, 1710-1

Law and Regulations, NFPA 1710, and Four-Person Staffing

Users of NFPA standards should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of its codes, standards, recommended practices, and guides, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.[20]

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 details staffing levels for fire departments in terms of fire, EMS, and special operation incidents.

According to NFPA 1710, fire departments should base their capabilities on a formal community risk assessment, as discussed in this report, and taking into consideration:[21]

- Life hazard to the population protected.
- Provisions for safe and effective firefighting performance conditions for the firefighters.
- Potential property loss.
- Nature, configuration, hazards, and internal protection of the properties involved.
- Types of fireground tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene.

According to NFPA 1710, if a community follows this standard, engine companies shall be staffed with a minimum of four on-duty members[22] and ladder companies shall be staffed with four on-duty members.[23] In some cases, staffing for engines and ladders should be increased to five and six based on geographical isolation and tactical hazards.[24] This staffing configuration is designed to ensure a fire department can complete the critical tasking necessary on building fires and other emergency incidents simultaneously rather that consecutively, and efficiently assemble an effective response force.

Code of Federal Regulations, NFPA 1500, and Two-In/Two-Out

EFD responds to structural fires with seven, six, or five firefighters, depending on staffing levels at the moment of the call for a building fire. EFD must provide the minimum number of firefighters on the initial response in order to comply with CFR 1910.134, and NFPA 1500 regarding two-in/two-out rules and initial rapid intervention team (IRIT).

CFR 1910.134: Procedures for interior structural firefighting. The employer shall ensure that:

(i) At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times;

(ii) At least two employees are located outside the IDLH atmosphere; and

(iii) All employees engaged in interior structural firefighting use SCBAs.[25]

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20. Notice and disclaimer of liability concerning the use of NFPA standards, stds_admin@nfpa.org
21. NFPA 1710, 5.2.1.1, 5.2.2.2
22. NFPA 1710, 5.2.3.1.1
23. NFPA 1710, 5.2.3.2.1
24. NFPA 1710, 5.2.3.1.2, 5.2.3.1.2.1.,5.2.3.2.2.,5.3.2.3.2.2.1
25. CFR 1910.134 (g) 4

According to the standard, one of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.

NFPA 1500 has similar language as CFR 1910.134 to address the issue of two-in/two-out by stating *the initial stages of the incident where only one crew is operating in the hazardous area of a working structural fire, a minimum of four individuals shall be required consisting of two members working as a crew in the hazardous area and two standby members present outside this hazard area available for assistance or rescue at emergency operations where entry into the danger area is required.*[26]

NFPA 1500 also speaks to the utilization of the two-out personnel in context of the health and safety of the firefighters working at the incident. *The assignment of any personnel including the incident commander, the safety officer, or operations of fire apparatus , shall not be permitted as standby personnel if by abandoning their critical task(s) to assist, or if necessary, perform rescue, the clearly jeopardize the safety and health of any firefighter working at the incident.*[27]

In order to meet CFR 1910.134, and NFPA 1500, EFD must utilize two personnel to commit to interior fire attack while two firefighters remain out of the hazardous area or Immediately dangerous to life and health (IDLH) area to form the IRIT, while attack lines are charged and a continuous water supply is established.

However, NFPA 1500 allows for fewer than four personnel under specific circumstances. It states, *Initial attack operations shall be organized to ensure that if on arrival at the emergency scene, initial attack personnel find an imminent life-threatening situation where immediate action could prevent the loss of life or serious injury, such action shall be permitted with fewer than four personnel.*[28]

CFR 1910.134 also states that nothing in section (g) is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.[29]

Ultimately, on-duty fire department staffing is a local government decision. EFD utilizes a cross-staffing model for staffing its engine, ladder, and ambulance companies. Given the current staffing configuration, EFD does not meet the standards as set forth by NFPA 1710 in terms of four-person staffing for its apparatus.

It is also important to note that the OSHA standard (and NFPA 1710) specifically references "interior firefighting." Firefighting activities that are preformed from the exterior of the building are not regulated by this portion of the OSHA standard. However, in the end, the ability to assemble adequate personnel, along with appropriate apparatus to the scene of a structure fire, is critical to operational success and firefighter safety.

As well, how and where personnel and companies are located, and how quickly they can arrive on scene play major roles. The reality is that EFD relies heavily on the assistance of automatic aid companies, and given its nature of cross-staffing units, unit reliability can vary from incident to incident. EFD's somewhat isolated location in relation to mutual aid companies will continue to impact assembling enough personnel and resources to the scene.

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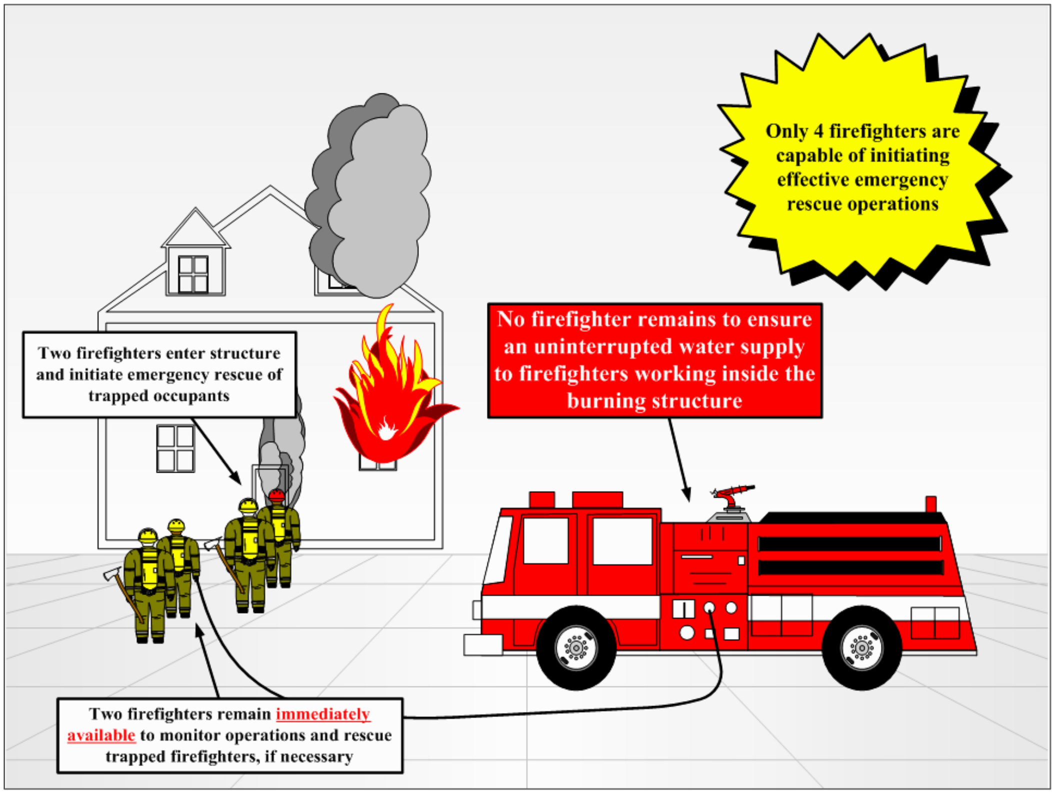
26. NFPA 1500, 2018, 8.8.2.
27. NFPA 1500, 2018, 8.8.2.5.
28. NFPA 1500, 2018 8.8.2.10.
29. CFR 190.134, (g).

FIGURE 4-5: OSHA "Two-In/Two-Out"



We note, given the distance of response, a Durham Fire Department crew, in automatic aid to EFD, can serve as a rapid intervention crew (RIC); however, they cannot serve as an initial rapid intervention crew (IRIC). Therefore, interior vs exterior attacks that do not involve life safety have to be considered.

Fire Operations

If a fire grows to an area in excess of 2,000 square feet, or extends beyond the building of origin, it is most probable that additional personnel and equipment will be needed, as initial response personnel will be taxed beyond their available resources. From this perspective it is critical that EFD and mutual/automatic aid units respond quickly and initiate extinguishment efforts as rapidly as possible after notification of an incident. It is, however, difficult to determine in every case the effectiveness of the initial response in limiting the fire spread and fire damage. Many variables will impact these outcomes, including:

- The time of detection, notification, and ultimately response of fire units.
- The age and type of construction of the structure.
- The presence of any built-in protection (automatic fire sprinklers) or fire detection systems.
- The contents stored in the structure and its flammability.
- The presence of any flammable liquids, explosives, or compressed gas canisters.
- 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 may need to focus on the protection of nearby or adjacent structures (exterior exposures) with the goal being to limit the spread of the fire beyond the building of origin, and sometimes the exposed building. This is often termed ***protecting exposures***. When the scope 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***, also sometimes referred to as a ***transitional 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. A transitional attack is most applicable in smaller structures, typically single-family, one-story detached units that are smaller than approximately 2,500 square feet in total floor area. For fires in larger structures, the defensive type, exterior attacks generally involve the use of master streams capable of delivering large volumes of water for an extended period of time.

Recent studies by UL have evaluated the effectiveness of interior vs. exterior attacks in certain simulated fire environments. These studies have found the exterior attack to be equally effective in these simulations.[30] 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 collapse. From CPSM's perspective, there is an increased likelihood an EFD single response crew of three to four personnel will encounter a significant and rapidly developing fire situation. This situation can occur during times of multiple incident activity when the EMS unit may be committed on another emergency, or when there is a reliance on mutual/automatic aid companies responding to the incident that have longer response times to arrive on the scene. ***It is prudent, therefore, that the EFD build at least a component of its training and operating procedures around the tactical concept of this occurring.***

NFPA 1710 addresses standards for an effective response force across several types of occupancies.

An effective response force (ERF) is defined as the minimum number of firefighters and equipment that must reach a specific emergency incident location within a maximum

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30. "Innovating Fire Attack Tactics," U.L.COM/News Science, Summer 2013.

prescribed travel [driving] time. The maximum prescribed travel time acts as one indicator of resource deployment efficiency.

NFPA 1710 provides a staffing deployment model and critical tasking guidelines for four specific occupancies. These occupancies are:

- Single-family dwelling.
- Open-air strip mall.
- Garden-style apartment
- High-rise.

The Center for Public Safety Excellence (CPSE) has also established benchmarks regarding staffing and deployment. CPSE sets standards for agencies desiring accreditation through the Commission on Fire Accreditation International (CFAI). CFAI uses standards set forth in its *Community Risk Assessment Manual: Standards of Cover*, sixth edition, to provide guidance in staffing and deployment to agencies desiring accreditation through core competencies.

Core Competency 2C.4

Core competency 2C.4 requires that the agency conduct a critical task analysis of each risk category and risk class to determine the first due and effective response force capabilities, and to have a process in place to validate and document the results. The process considers the number of personnel needed to perform the necessary emergency scene operations. Completion of the process also helps to identify any gaps in the agency's emergency scene practices.

EFD Staffing Matrix

The EFD has four shifts, A, B, C, and D. Two of the shifts, B and D, are staffed with seven members and A and C shifts are staffed with six members. All shifts adhere to a five-person minimum staffing. The following table details the positions and qualifications for each shift.

TABLE 4-1: EFD Shift Matrix

A Shift	B Shift	C Shift	D Shift
Lieutenant/AEMT	Lieutenant/AEMT	Lieutenant/AEMT	Lieutenant/AEMT
Crew Chief/Medic	Crew Chief/Medic	Crew Chief/Medic	Crew Chief/Medic
FF/Paramedic	FF/AEMT	FF/AEMT	FF/AEMT
FF/AEMT	FF/Paramedic	FF/AEMT	FF/Paramedic
FF/AEMT	FF/AEMT	FF/Paramedic	FF/Paramedic
FF/Paramedic	FF/AEMT	FF/Paramedic	FF/AEMT
-	FF/Paramedic	-	FF/Paramedic

The EFD utilizes a cross-staffing model for virtually every piece of apparatus. The department can staff an engine, ladder, and two ambulances, depending on call type. All units cannot be staffed at one time, and only shifts with seven on duty can staff the engine, ladder, and one ambulance simultaneously. Generally, two apparatus are staffed by on-duty personnel and that can be staffed in a variety of ways depending on the type of call (fire or EMS), and whether the call for service is a single call type or a simultaneous call when another unit is already assigned to a call.

The shifts keep apparatus staffing consistent as possible by following Exeter Fire Department General Order #GEN-02, Emergency Response Guidelines. This General Order stipulates what personnel go on what incident and apparatus type based on the variables of maximum shift strength, and minimum staffing. These variances change the response matrix considerably on a day-to-day basis.

While all the firefighters rotate, the lieutenant is the only position that does not move unless there are two ALS EMS ambulance calls simultaneously, then the lieutenant would respond on the ambulance if the shift is at minimum staffing.

The following table details the combinations for cross-staffing that the EFD utilizes for fire responses based on the number of on-duty staffing available. The subsequent table details the staffing matrix for: a single EMS call, two simultaneous EMS calls, and a single EMS call with a simultaneous fire call.

TABLE 4-2: Distribution of Personnel (7/6 maximum, 5 minimum) for: Fire

Fire Response (7)		Fire Response (6)		Fire Response (5)	
	1 Officer 3 Firefighters		1 Officer 3 Firefighters		1 Officer 2 Firefighters
	3 Firefighters		2 Firefighters		2 Firefighters

TABLE 4-3: Distribution of Personnel (7/6 maximum, 5 minimum) for: Single EMS Call, Two EMS Calls, and Single EMS with Simultaneous Fire Call

Ambulance Response (7)		Ambulance Response (6)		Ambulance Response (5)	
First EMS Call					
	2 Firefighters *3 for ALS calls		2 Firefighters *3 for ALS calls		2 Firefighters *3 for ALS calls
Second EMS Call					
	2 Firefighters *3 for ALS calls		2 Firefighters *3 for ALS calls		2 Firefighters *3 for ALS calls
First EMS Call and Simultaneous Fire Call					
	1 Officer 1 or 2 Firefighters		1 Officer 1 Firefighter		1 officer

While Exeter FD has done a good job with cross-staffing over the years, this system will be difficult to sustain as the population ages and the risks associated with new garden-style apartments, senior living, multifamily housing units, and commercial structures increase in the town.

Additional off-duty personnel, at the request of the officer-in-charge (OIC), are requested to respond to the station in circumstances where on-duty crews are assigned to incidents. These requests vary depending on the on-duty staffing and type of call that units are being assigned to. At least three personnel are requested when the station is empty and on-duty staff are assigned to incidents. Exeter Dispatch sends out the request for off-duty personnel to respond to the station and receives responses from available call-back personnel. Dispatch then advises whether personnel are needed depending on the number of responses received. *See the section on Dispatch Procedures for further information on this process.*

In times when the station is unoccupied due to response to incidents and additional calls for service are received, the dispatcher will contact the OIC on the scene and ask if they are able to take the pending call or should a call-back be initiated for additional personnel. This is at times difficult as the OIC may be engaged in emergency operations and/or critical tasks and not able to answer the request from dispatch. However, if an on-scene unit or units can be released, the OIC can have the unit or units assigned to the next call for service without the need to initiate call-back of personnel. The following table outlines the call-back station coverage matrix.

TABLE 4-4: Personnel Call Back Station Coverage Matrix

Call Type	Number of EFD Staff Called Back
Second medic call or second fire call	3
MVA with patient injury	3
MVA without personnel injury	0 or at incident commander request
All nonstructural fires	0 or at incident commander request
Mutual aid med call with medic intercept	3
Mutual aid fire alarm (still and box)	0
Mutual aid structural fire (to scene or station coverage)	3
Mutual aid rapid intervention team	3

The fire chief and two assistant chiefs do provide command oversight during the day and evening hours and can coordinate staffing levels and call backs to the station if needed. Additional personnel are filled by off-duty career firefighters and call-back personnel. The call-back personnel are volunteers whose availability varies and this is reported to be unreliable. There are so few call-back members that this resource is almost nonexistent.

NFPA 1710 Critical Tasks, and Effective Response Force

Critical tasks are those activities that must be conducted in a timely manner by responders at emergency incidents to control the situation and stop loss. Critical tasking for fire operations is the minimum number of personnel needed to perform the tasks required to effectively control a fire. To be effective, critical tasking must assign enough personnel so that all identified functions can be performed simultaneously. However, it is important to note that secondary support functions may be handled by initial response personnel once they have completed their primary assignment. Thus, while an incident may end up requiring a greater commitment of resources or a specialized response, a properly executed critical task analysis will provide adequate resources to immediately begin bringing the incident under control.

The specific number of people required to perform all the critical tasks associated with an identified risk is referred to as an Effective Response Force (ERF). The goal is to deliver an ERF within a prescribed time frame. NFPA 1710 provides a benchmark for effective response forces.

The following will outline how critical tasking and assembling an effective response force is first measured in in NFPA 1710, and how the EFD is benchmarked against this standard. This includes single-family dwelling buildings, open-air strip mall buildings, apartment buildings, and high-rise buildings.

Single-Family Dwelling: NFPA 1710, 5.2.4.1

The initial full alarm assignment to a structural fire in a typical 2000 square-foot, two-story, single family dwelling without a basement and with no exposures must provide for a minimum of 16 members (17 if an aerial device is used). The following figure illustrates this and the next table outlines the critical task matrix.

FIGURE 4-6: Effective Response Force for Single-Family Dwelling Fire

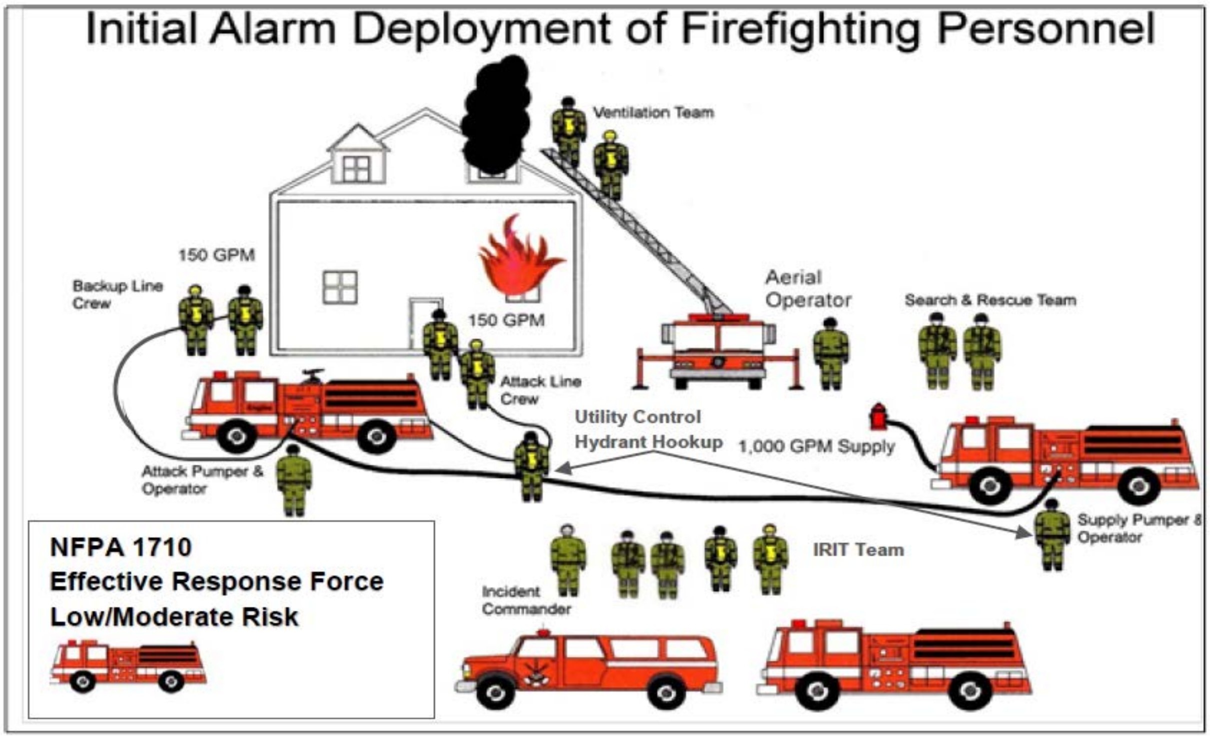

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TABLE 4-5: Effective Response Force for Single-Family Dwelling Fire

Critical Tasks	Personnel
Incident Command	1
Continuous Water Supply	1
Fire Attack via Two Handlines	4
Hydrant Hook Up - Forcible Entry - Utilities	2
Primary Search and Rescue	2
Ground Ladders and Ventilation	2
Aerial Operator if Aerial is Used	1
Establishment of IRIC (Initial Rapid Intervention Crew)	4
Total Effective Response Force	**16** (17 If aerial is used)

The following table outlines the how the EFD is able to assemble an effective response force for a single-family dwelling fire.

TABLE 4-6: EFD Effective Response Force for Single-Family Dwelling Fire

Apparatus	Personnel
EFD Chief Officer	1
EFD Engine	4
EFD Truck/Ladder	2
Newmarket Engine	3
Kingston Engine	3
Durham RIC*	4
Total ERF	**17****

* Durham's rapid intervention team (RIC) is not part of the initial attack due to time and distance and therefore serves as a rapid intervention crew (RIC), not an IRIT.

** EFD meets the minimum requirements of NFPA 1710 since fire departments shall be permitted to use established automatic aid and mutual aid agreements to comply with section 5.2 of this standard.[31]

Note: EFD will tone out all permanent and call personnel if it is a working fire. EFD would respond five from call-back personnel if available and mutual aid jurisdictions of North Hampton, Hampton, and Newfield would be requested to send ten additional personnel for a total of 15 to the alarm.

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31. NFPA 1710. 5.2.1.3

Open-Air Strip Mall, NFPA 5.4.2

The initial full alarm assignment to a structural fire in a typical open-air strip center ranging from 13,000 square feet to 196,000 square feet in size must provide for a minimum of 27 members (28 if an aerial device is used). The following table outlines the critical tasking matrix for this type of fire.

TABLE 4-7: Effective Response Force for Open-Air Strip Mall Fire

Critical Tasks	Personnel
Incident Command	2
Continuous Water Supply	2
Fire Attack via Two Handlines	6
Hydrant Hook Up - Forcible Entry - Utilities	3
Primary Search and Rescue	4
Ground Ladders and Ventilation	4
Aerial Operator if Aerial is Used	1
Establishment of IRIC (Initial Rapid Intervention Crew)	4
Medical Care Team	2
Total Effective Response Force	**27** (28 If aerial is used)

The following table outlines the how the EFD is able to assemble an effective response force for an open-air strip mall fire.

TABLE 4-8: EFD Effective Response Force for Open-Air Strip Mall Fire

Apparatus	Personnel
Chief Officer	1
EFD Engine	4
EFD Truck/Ladder	2
Newmarket Engine	3
Kingston Engine	3
Durham RIC*	4
Total ERF	**17****

* Durham's rapid intervention team (RIC) is not part of the initial attack due to time and distance and therefore serves as a rapid intervention crew (RIC), not an IRIT.

** EFD **does not meet** the minimum requirements of NFPA 1710 for the Initial alarm assignment for open-air strip shopping center.

Note: EFD will tone out all permanent and call personnel if it is a working fire. EFD would respond five if available and mutual aid jurisdictions of North Hampton, Hampton, and Newfield would be requested to send ten additional personnel for a total of 15. However, this does not satisfy the initial ERF requirements as set forth by NFPA 1710.

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Apartment Building

The initial full alarm assignment to a structural fire in a typical 1,200 square-foot apartment within a three-story, garden-style apartment building must provide for a minimum of 27 members (28 if an aerial device is used). The following table outlines the critical tasking matrix for this type of building fire.

TABLE 4-9: Effective Response Force for Apartment Building Fire

Critical Tasks	Personnel
Incident Command	2
Continuous Water Supply	2
Fire Attack via Two Handlines	6
Hydrant Hook Up - Forcible Entry - Utilities	3
Primary Search and Rescue	4
Ground Ladders and Ventilation	4
Aerial Operator if Aerial is Used	1
Establishment of IRIC (Initial Rapid Intervention Crew	4
Medical Care Team	2
Total Effective Response Force	**27** (28 If aerial is used)

The following table outlines the how the EFD is able to assemble an effective response force for an apartment building fire.

TABLE 4-10: EFD Effective Response Force for Apartment Building Fire

Apparatus	Personnel
Chief Officer	1
EFD Engine	4
EFD Truck/Ladder	2
Newmarket Engine	3
Kingston Engine	3
Durham RIC*	4
Total	17**

* Durham's rapid intervention team (RIC) is not part of the initial attack due to time and distance and therefore serves as a rapid intervention crew (RIC), not an IRIT.

** EFD **does not meet** the minimum requirements of NFPA 1710 for the Initial alarm assignment for Apartment Fires.

Note: EFD will tone out all permanent and call personnel if it is a working fire. EFD would respond five if available and mutual aid jurisdictions of North Hampton, Hampton, and Newfield would be requested to send ten additional personnel for a total of 15. However, this does not satisfy the initial ERF requirements as set forth by NFPA 1710.

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High Rise, NFPA 1710 5.2.4.4

The initial full alarm assignment to a fire in a building where the highest floor is greater than 75 feet above the lowest level of fire department vehicle access must provide for a minimum of 42 members (43 if the building is equipped with a fire pump). The following table outlines the critical tasking matrix for this type of building fire.

TABLE 4-11: Effective Response Force for High-Rise Fire Matrix

Critical Tasks	Personnel
Incident Command	2
Continuous Water Supply	1 FF for continuous water; if fire pump exists, 1 additional FF required.
Fire Attack via Two Handlines	4
One handline above the Fire Floor	2
Establishment of IRIC (Initial Rapid Intervention Crew)	4
Primary Search and Rescue Teams	4
Entry Level Officer with Aide near entry point of Fire Floor	2
Entry Level Officer with Aide near the entry point above the Fire Floor	2
Two Evacuation Teams	4
Elevation Operations	1
Safety Officer	1
FF two floors below fire to coordinate staging	1
Rehabilitation Management	2
Officer and FFs to manage vertical ventilation	4
Lobby Operations	1
Transportation of Equipment below Fire Floor	2
Officer to Management Base Operations	1
Two ALS Medical Care Teams	4
Total Effective Response Force	**42** (43) If building is Equipped with Pump

The following table outlines how the EFD is able to assemble an Effective Response Force for an apartment building fire.

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TABLE 4-12: EFD Effective Response Force for High Rise Building

Apparatus	Personnel
Chief Officer	1
EFD Engine	4
EFD Truck/Ladder	2
Newmarket Engine	3
Kingston Engine	3
Durham RIC*	4
Total	17**

***** Durham's rapid intervention team (RIC) is not part of the initial attack due to time and distance and therefore serves as a rapid intervention crew (RIC), not an IRIT.

** EFD **does not meet** the minimum requirements of NFPA 1710 for the Initial alarm assignment for High Rise Fires.

Note: EFD will tone out all permanent and call personnel if it is a working fire. EFD would respond five personnel if available and mutual aid jurisdictions of North Hampton, Hampton, and Newfield would be requested to send ten additional personnel for a total of 15. However, this does not satisfy the initial ERF requirements as set forth by NFPA 1710.

Conclusion

EFD meets the effective response force (ERF) for a fire in a single-family dwelling but does not meet the ERF in an open air strip shopping center, an apartment, and a high-rise structure. Not meeting the ERF means that the critical tasks as outlined for these individual structures cannot be completed simultaneously and must be completed by automatic aid and mutual aid companies.

EMS Operations

Emergency medical service (EMS) operations are an important component of the comprehensive emergency services delivery system in any community. Together with the delivery of police and fire services, it forms the backbone of the community's overall public safety net. As will be noted in several sections of this report, the EFD, like many, if not most, fire departments respond to significantly more emergency medical incidents and low acuity incidents than actual fires or other types of emergency incidents.

The EMS component of the emergency services delivery system is more heavily regulated than the fire side. In addition to National Fire Protection Association (NFPA) Standard 1710, *Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2016 Edition), NFPA 450 *Guidelines for Emergency Medical Services (EMS) and Systems*, (2009 edition), provides a template for local stakeholders to evaluate EMS operations and to make improvements based on that evaluation. The Commission on Accreditation of Ambulance Services (CAAS)[32] also promulgates standards that are applicable to its accreditation process for ambulance services. In addition, the State of New Hampshire, Department Safety, Division of Fire Standards and

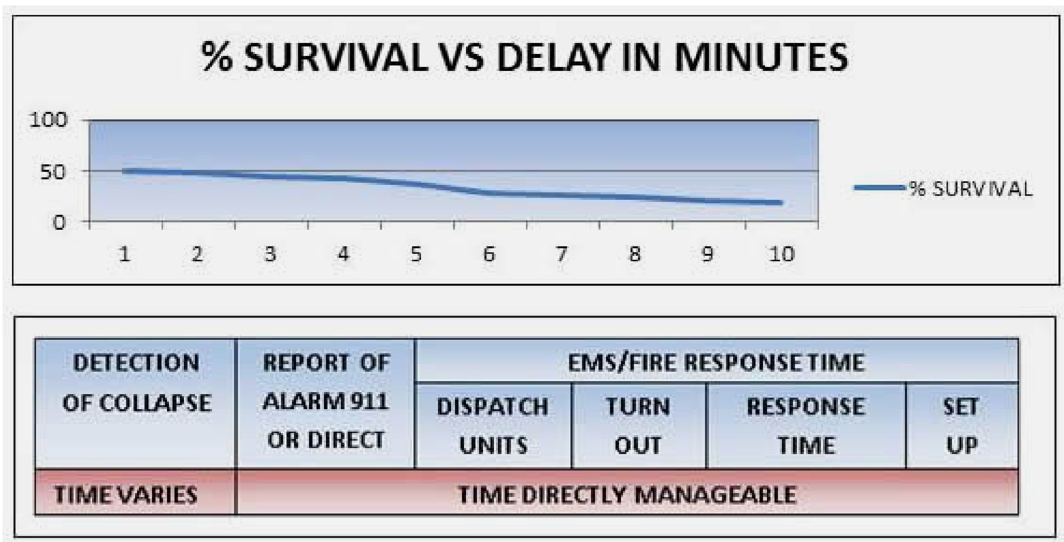
32. The Commission on Accreditation of Ambulance Services (CAAS) is an independent commission that established a comprehensive series of standards for the ambulance service industry.

Training and Emergency Medical Services, Bureau of Emergency Medical Services,[33] regulates EMS agencies, and certain federal Medicare regulations are also applicable.

As a percentage of overall incidents responded to by the emergency agencies in most communities, it could be argued that EMS incidents constitute the greatest number of "true" emergencies, where intervention by trained personnel does truly make a difference, sometimes literally between life and death.

Heart attack and stroke victims require rapid intervention, care, and transport to a medical facility. The longer the time duration without care, the less likely the patient is to fully recover. Numerous studies have shown that irreversible brain damage can occur if the brain is deprived of oxygen for more than four minutes. In addition, the potential for successful resuscitation during cardiac arrest decreases exponentially with each passing minute that cardiopulmonary resuscitation (CPR), or cardiac defibrillation, is delayed (see following figure).

FIGURE 4-7: Cardiac Arrest Survival Timeline



The figure illustrates that the potential for successful resuscitation during cardiac arrest decreases exponentially, by 7 percent to 10 percent, with each passing minute that cardiopulmonary resuscitation (CPR) or cardiac defibrillation and advanced life support intervention is delayed. The figure also illustrates few attempts at resuscitation after 10 minutes are successful.

EFD is responsible for both BLS and ALS responses in the Town of Exeter as well as EMS ground transportation. The department also has an Emergency Medical Services Division run by the assistant chief of training with the assistance of a department paramedic. Both are responsible for the oversight of the care given by the responders. Exeter Hospital provides the Medical Director and is in close contact with EFD. The following table depicts EFD EMS ground transport by call type and Table 4-14 depicts the various time components for EMS ground transportation by the EFD.

33. https://www.nh.gov/safety/divisions/fstems/ems/

TABLE 4-13: Transport Calls by Call Type

Call Type	Number of Calls			Percent of Call Type Transported
	Non-transport	Transport	Total	
Breathing difficulty	5	93	98	94.9
Cardiac and stroke	12	147	159	92.5
Fall and injury	58	213	271	78.6
Illness and other	335	665	1,000	66.5
MVA	62	37	99	37.4
Overdose and psychiatric	26	153	179	85.5
Seizure and unconsciousness	7	72	79	91.1
EMS Total	**505**	**1,380**	**1,885**	**73.2***
Fire & Other Total	**754**	**60**	**814**	**7.4**
Total	**1,259**	**1,440****	**2,699**	**53.4**

Note: *73 percent of EFD EMS incidents are transported to the hospital.
** On average, four calls/day required transport.

TABLE 4-14: Time Component Analysis for Ambulance Transport Runs by Call Type

Call Type	Average Time Spent per Run (Min.)				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	17.6	5.9	14.1	43.9	93
Cardiac and stroke	19.8	6.3	16.7	49.2	148
Fall and injury	14.5	5.8	12.8	39.2	213
Illness and other	15.6	5.8	13.9	41.5	665
MVA	12.3	6.4	21.6	47.0	40
Overdose and psychiatric	14.7	5.4	14.6	40.2	154
Seizure and unconsciousness	17.3	5.6	15.1	43.1	72
EMS Total	**15.9**	**5.8**	**14.4**	**42.2**	**1,385**
Fire & Other Total	**13.4**	**9.2**	**16.4**	**47.9**	**60**
Total	**15.8**	**6.0**	**14.5**	**42.5**	**1,445**

This table tells us that: the average time spent on-scene for a transport call was 15.8 minutes (exceptional efficiency); the average travel time from the scene of the call to the hospital was 6.0 minutes; the average deployed time spent on transport calls was 42.5 minutes; the average deployed time at the hospital was 14.5 minutes (exceptional efficiency).

Exeter Emergency Communications has grouped its EMS calls for service in the following categories as established by the primary PSAP in Concord: Omega, Alpha, Bravo, Charlie, Delta, Echo. These designations range in severity from lowest to highest, Omega being the lowest, Echo being the most severe. The public safety answering point (PSAP) located in Concord also utilizes this system when it reports and transfers calls to Exeter's Emergency Communication Center (ECC).

EFD utilizes this terminology to determine the staffing of the incident, which in turn determines the response levels, from hot (lights and siren) to cold (non-emergency response). It also determines how EFD staffs the ambulance once the incident is received.

EFD responds two personnel on an ambulance, one EMT-A and one paramedic, unless the call classification is Charlie, Delta, or Echo, then a third member is added. An engine or a squad will be added in cases of a vehicle extrication or needed manpower for the incident. As previously discussed in the fire department staffing metrics, it is recommended that all ALS calls for service be staffed with two personnel and assisted by the engine company, which can add additional staff to the call if needed on scene and during transport.

Currently, if staffing is at the minimum of five, the two members off the ladder company will take the ambulance and leave the ladder unstaffed. In incidents that may require ALS, a member also responds on the ambulance off the engine, leaving the engine with two personnel.

Figure 4-8 illustrates this recommended EMS response model.

Figure 4-9 illustrates the average number of EMS units per call the EFD responded during the data analysis period, which as discussed in this report has an effect on available human resources to respond fire apparatus when simultaneous fire/EMS calls occur.

FIGURE 4-8: EMS Response Model Recommendations

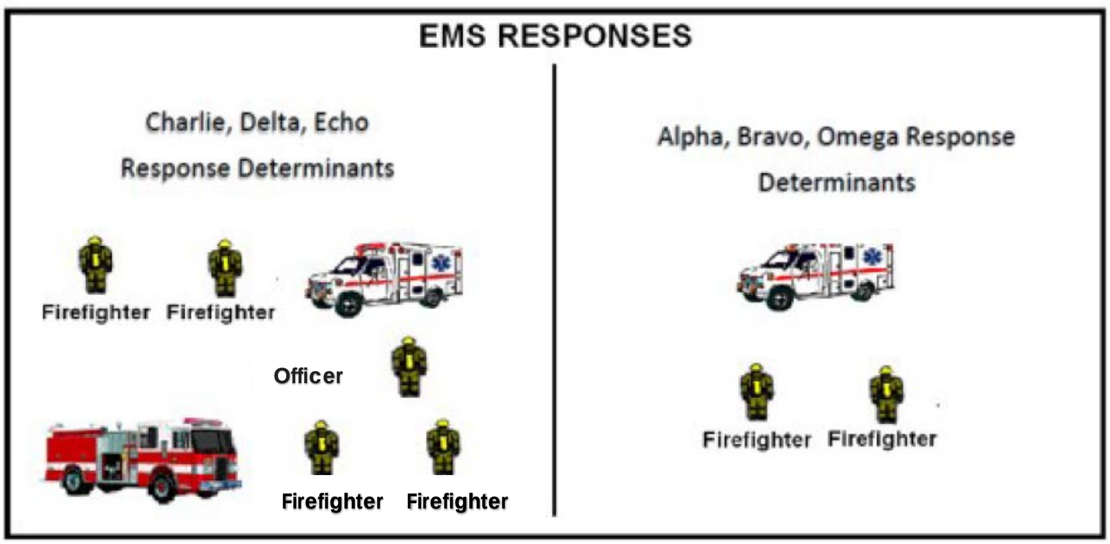


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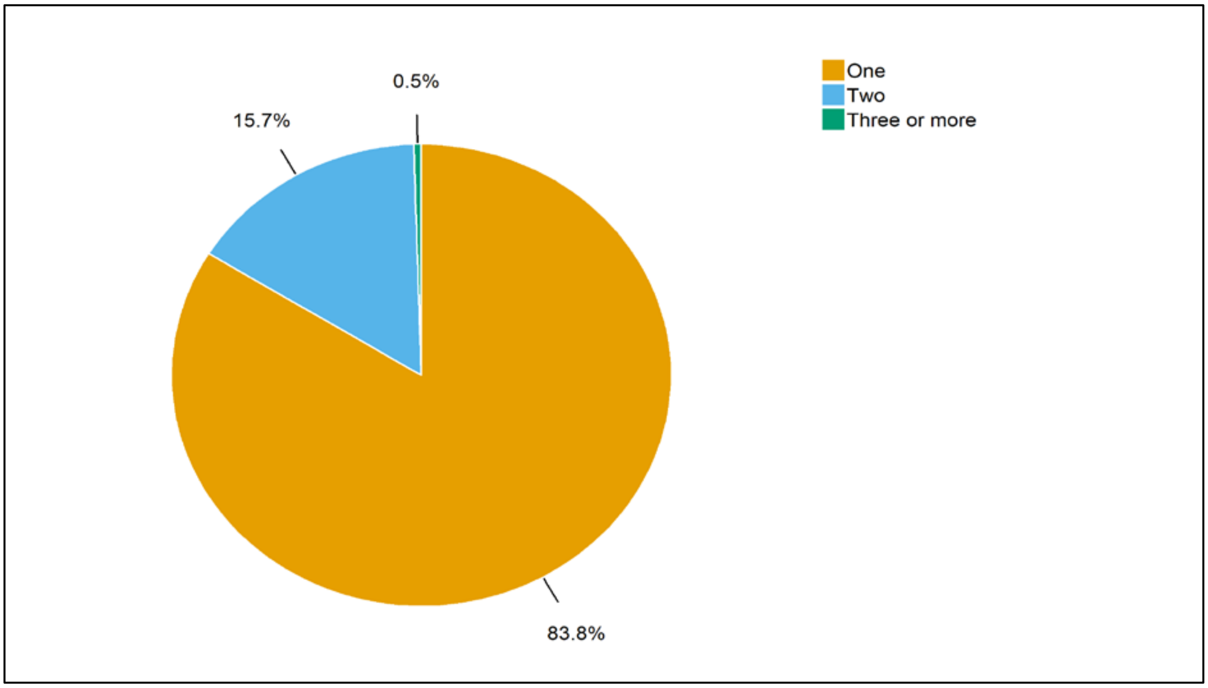
FIGURE 4-9: Calls by Number of Units Arriving – EMS



- The above figure tells us that for EMS calls, one unit was dispatched nearly 84 percent of the time, two units were dispatched just under 16 percent of the time, and three or more units were dispatched less than 1 percent of the time.

In the long term, EFD will need to move away from the cross-staffing model as the number of incidents increase. In a recent article, Steven Knight, PhD, stated that, "There are limitations on cross-staffing units. Once the call volume becomes too frequent or the rate of simultaneous calls rises, then each respective unit needs to be separately staffed."[34] Knight goes on to say that each agency can establish its own benchmarks for cross-staffing effectiveness, however, he suggests a good benchmark to evaluate the effectiveness of cross-staffing is no more than five calls per day and a call concurrency rate of no more than 15 percent.

Recommendations:

- EFD should engage the Seacoast Chief Fire Officers Mutual Aid District (SCFO) agreement jurisdictions and begin to create automatic aid agreements with mutual aid companies in order to address the effective response force requirements for open-air strip center, apartment, and high-rise structure fire incidents. (Recommendation No. 8.)
- EFD should evaluate the minimum number of firefighters to initially send to an incident in order to comply with CFR 1910.134 and NFPA in terms of two-in/two-out requirements. (Recommendation No. 9.)
- CPSM recommends that EFD hire two firefighters immediately to staff the A and C shifts with seven members each. This will provide consistency between the shifts and give A and C shifts

34. Alternate Deployment Models for the Fire Service, *Fire Rescue1*, Jun 2018, Steven Knight PhD.

one additional firefighter to cover vacancies created by leave, injury, illness, and military assignments. (Recommendation No. 10.)

- CPSM recommends that the town review budget expenditures for overtime vs. hiring full-time staff. In 2019, EFD spent $240,733.48 on overtime encompassing 11 categories. While not all OT expenditures can be eliminated by additional staffing, OT for recall, sick leave coverage, personnel coverage, and vacation can be reduced. The budget for 2019 details an increase of 88 percent in OT for vacation; in the 2020 preliminary budget, there is a 34.6 percent increase for vacation coverage and an OT increase for sick leave at 24.4 percent. Hiring full-time staff could result in a reduction of these OT expenditures. (Recommendation No. 11.)
- CPSM recommends that EFD develop a strategic funding plan to increase the levels of staffing on all four shifts. Increasing staffing levels will not eliminate, but will reduce, the number of combinations on cross-staffing and will enable a consistent service level. Full-time staffing for the EFD is recommended to be eight on each shift, with a minimum staffing of seven staff on each shift. Minimum staffing of seven would allow the engine to be staffed with three personnel, and the ladder with four. Ladder personnel will then cross-staff the first EMS call for service with two personnel. A second EMS call would require the two remaining members from the ladder to respond the second ambulance. This will leave the engine with a staffing of three personnel. Under this staffing model, there will be times when the ladder will be staffed with four or two for fire response, which enhances the ability to perform critical tasks simultaneously rather than consecutively. (Recommendation No. 12.)
- CPSM recommends that under the current staffing model, an engine be assigned to priority medical calls with the ambulance. This eliminates responding three members on the initial response ambulance. Thirty-two percent of EFD medical calls are dispatched as a priority incident, which prompts the response of three personnel on the ambulance. The better practice would be to respond with two on the ambulance and respond the engine to assist with a staff of three. If the incident turns out to be a true priority call, a member of the engine would then drop off the engine and ride with the ambulance to the hospital. The engine would remain in service with two personnel; however, staffing would be back at three within the hour given that 93 percent of all medical calls for EFD last less than an hour. In many instances, a call dispatched as an ALS call is less severe than what is initially dispatched; therefore, the need for an additional paramedic or firefighter on the ambulance is often not required. (Recommendation No. 13.)

ANALYSIS OF EFD STAFFING STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS

Given the current staffing and deployment model, It is important to examine the strengths, weaknesses, opportunities, and threats (SWOT) of the model, and evaluate how these elements tie back to the current service level of the EFD.

Strengths

Apparatus

All fire and rescue apparatus are in good condition and well taken care of. Capital schedules are in place for vehicle replacement. This is a best practice for EFD.

Equipment

All equipment is in good condition, and up to date. Each firefighter has two sets of PPE, which aids in the reduction of exposure to carcinogens. This is a best practice for EFD.

Hospital and EMS System

The hospital system is strong with Exeter Hospital, a community-based hospital that receives the majority of EFD transports. Additional hospital care is provided by Portsmouth Regional Hospital. Two ambulances serve Exeter and are staffed with at least one paramedic and EMT to provide ALS care.

Personnel

Personnel are well-trained and really like working for Exeter FD. There are some Issues with morale in terms of staffing, however, the crews really do a great job cross-staffing and handling the calls with the available staffing. They are pleased with the equipment and resources the department provides.

Weaknesses

Officer-in-Charge (OIC) Decision-making Model

Relying on an engine company officer to make decisions on what calls can be handled next while working an incident can be complex. The officer may find it difficult to give the current incident his/her undivided attention while making decisions on resourcing the next call for service. This practice could lead to clearing units prematurely in order to respond to the next call for service.

Mutual Aid Companies

EFD relies heavily on the assistance from automatic and mutual aid companies. EFD needs assistance from automatic aid companies to meet the ERF on a single-family structure. Heavy reliance on these companies poses a risk at times when they are not available to assist. EFD should continue to engage in automatic aid agreements with all available resources in the Seacoast Chief Fire Officers Mutual Aid District (SCFO).

Call-Back Personnel Declining

The practice of calling back volunteers (call personnel) is a model that is no longer dependable, as the number of personnel has declined rapidly. The volunteers are few and their availability is unpredictable. Required and increased training levels are making it difficult for volunteers to participate in many career fire departments. The availability of career members to call back is also declining. Career members are looking for more time off away from the job to combat stress, decompress, and devote time to family activities. Crew fatigue can set in if firefighters are constantly asked to work hours outside of their own shifts. As this trend continues, the availability of members to come back to work on recall will be limited.

Inconsistent Staffing on Two of Four Shifts

Two of the shifts are staffed with six personnel, while the other two are at seven. The lack of an additional firefighter on the lower-staffed shifts leads to an increase in overtime for coverage of vacation, sick, worker’s compensation, and long-term illnesses.

Ambulance Staffing

EFD should staff ALS calls with two members on the ambulance and have the engine assist to comply with NFPA 1710, 5.3.3. 3.2, which requires four personnel on ALS calls, two paramedics and two EMT Basic members. If the call is not priority in nature, the engine can clear or provide the additional firefighter if the condition of the patient warrants. This will keep the engine at three personnel more often and thus better prepared to handle the next call for service.

Building and Infrastructure

The current station is no longer adequate to house fire department staff and police officers. Lack of office and workspace, shower facilities, bunkrooms, failing infrastructure, and lack of any ADA compliance are at a critical juncture. A new public safety center should be considered.

Unscheduled Leave

During 2019, long-term absence was noted regarding worker's compensation Injury/Illness, military duty, and long-term sick leave, all of which resulted in significant overtime expenditures.

Opportunities

Addition of Two Firefighters

The addition of two firefighters to the A and C shifts will equalize staffing among the four shifts and provide an additional member to cover absences created by vacation, sick leave, worker's comp, military duty, and long-term illnesses.

Strategic Staffing Model

EFD and the town should begin the processes of planning and funding of additional fire personnel. While this is a significant budget commitment, it is time to begin with a strategic plan and begin discussions on the implementation of additional FTEs for the department. The current cross-staffing model with a minimum staffing of five firefighters will not be sufficient to handle the potential commercial and residential growth along with the fire load in the community.

Evaluation of EMS Fees

The department should set a periodic schedule to evaluate its EMS fees to ensure they are within market in the region. This could provide additional revenue and assist in funding items and programs within the department

ALS staffing Model

The department could adjust ALS staffing to a maximum of two member, one certified as a paramedic, and begin the process of assisting the ambulance with an engine. This will eliminate committing an additional firefighter to an ALS call where their skills may not be needed.

Eliminate Floater Positions (Article 7.4.2, Collective Bargaining Unit)

Because the Fire Chief has assigned all employees to a shift, and does not currently utilize the modified scheduling provisions of the current Collective Bargaining Agreement (Article 7.4.2), there is an opportunity if additional staffing is added to eliminate this article from future collective bargaining agreements.

Shift Schedule Model Change

One method to increase staffing per shift would be to utilize existing staff in a different shift model. This can be accomplished by changing the shift scheduling model from a four-shift, 42-hour/week schedule to a three-shift, 56-hour/week schedule.

Under the current four-shift, 42-hour/week schedule, two shifts are staffed with six personnel and two shifts are staffed with seven personnel. If the model were to be changed to a three-shift, 56-hour/week schedule, one shift would have eight personnel and two shifts would have nine personnel.

Of course, any model change of this magnitude would have to be bargained and costed. Regarding costing, the same Fair Labor Standards Act (FSLA) law applies to the three-shift, 56-hour/week schedule.

Threats

Increase in EMS incidents

Currently, EMS accounts for 48 percent of all calls for service. As the town gets older and the population increases, the demand for EMS calls for service will likely increase. EFD should be prepared to respond to the increase of EMS calls for service in the upcoming years.

Population is Aging

Exeter has become a popular destination for assisted and long-term care facilities. Riverwoods and others are undergoing expansion and enlarging their campuses. While EMS can see an increase in calls for service the centers are also considered in the high-risk category in terms of risk assessment. EFD must be ready to respond to the challenges of these facilities and others like them.

Cross-staffing Matrix

Cross-staffing can be an effective way to provide staffing to fire departments. However, cross-staffing every apparatus, especially at minimum staffing levels, can produce crew fatigue as there are insufficient members to distribute the workload to other shift members.

Risk Assessment

A comprehensive risk assessment and standards of cover (SOC) need to be completed for the community. Phillips Exeter Academy, assisted living centers, hospitals, and the regional high school all posed significant threats during an emergency response. These treats should be assessed and an action plan developed in terms of the proper emergency response and the coverage needs to respond and mitigate these risks.

The following table captures each component of the EFD staffing SWOT analysis.

TABLE 4-15: SWOT Analysis for EFD Staffing and Deployment

Strengths	Weaknesses
Apparatus Equipment Hospital, EMS System Personnel	OIC Decision Model Mutual Aid Companies Call-Back Personnel Declining Inconsistent Staffing Ambulance Staffing Building and Infrastructure
Opportunities	**Threats**
Addition of Two Firefighters Strategic Staffing Model Evaluate EMS fees ALS Staffing Model Shift Model Change	Increase in EMS Incidents Population Increasing in Age Cross-staffing Matrix Risk Assessment

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SECTION 5. RESPONSE TIME ANALYSIS

MEASURING RESPONSE TIMES

Response times are typically the primary measurement for evaluating fire and EMS services. Response times can be used as a benchmark to determine how well a fire department is currently performing, to help identify response trends, and to predict future operational needs. Achieving the quickest and safest response times possible should be a fundamental goal of every fire department. 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.[35] 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.

There is no "right" amount of fire protection and EMS delivery. It is a constantly changing level based on such things as the expressed needs of the community, community risk, and population growth. Thus, in looking at response times it is prudent to design a deployment strategy around the actual circumstances that exist in the community and the fire problem that is identified to exist. The strategic and tactical challenges presented by the widely varied hazards that the department protects against need to be identified and planned for through a community risk analysis planning and management process as identified in this report. It is ultimately the responsibility of elected officials to determine the level of risk that is acceptable to their respective community. It would be imprudent, and probably very costly, to build a deployment strategy that is based solely upon response times.

Response times for fire incidents is generally based on the concept of "flashover." A **flashover** is the near-simultaneous ignition of most of the directly exposed combustible material in an enclosed area. When certain organic materials are heated, they undergo thermal decomposition and release flammable gases. Flashover occurs when the majority of the exposed surfaces in a space are heated to their auto ignition temperature and emit flammable gases. "Flashover is the transition phase in the development of a contained fire in which surfaces exposed to thermal radiation, from fire gases in excess of 600 degrees Celsius, reach ignition temperature more or less simultaneously and fire spreads rapidly throughput the space."[36]

Flashover is not time-dependent. Some flashovers can occur within three minutes from ignition; others may take considerably longer. Flashover times are more dependent on the size of the compartment, the fuel load within the compartment, and the construction of the compartment. Again, these variables cannot be seen from outside the structure, so the interior firefighters and officers have to be constantly aware of them.[37]

When the fire does reach this extremely hazardous state, initial firefighting forces are often overwhelmed, a larger and more destructive fire occurs, the fire escapes the room and possibly

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35. 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*.
36. National Institute of Standards and Technology, Definition of Flashover.
37. *Fire Engineering*, June 2010, "Understanding Flashover."

even the building of origin, and significantly more resources are required to affect fire control and extinguishment.

Flashover occurs more quickly and more frequently today and is caused at least in part by the introduction of significant quantities of plastic- and foam-based products into homes and businesses (e.g., furnishings, mattresses, bedding, plumbing and electrical components, home and business electronics, decorative materials, insulation, and structural components). These materials ignite and burn quickly and produce extreme heat and toxic smoke.

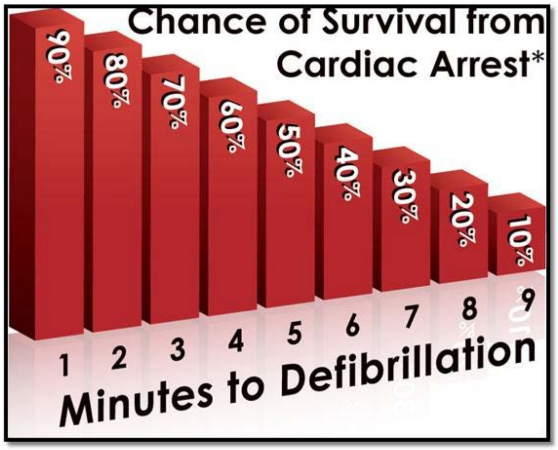
As a benchmark, for an urban community and as described in the staffing analysis section above, NFPA 1710 recommends the entire initial response of between 14 and 43 personnel, depending on occupancy type, be on scene within eight minutes of dispatch. It is also important to keep in mind that once units arrive on scene there is a time lag before water reaches the fire as crews and companies have several tasks to complete in the initiating action period immediately after arrival at the scene. ***NFPA 1710 recommends that units be able to commence an initial attack within two minutes of arrival, 90 percent of the time.***

The ability to quickly deploy adequate fire staff prior to flashover thus limits the fire's extension beyond the room or area of origin. Regarding the risk of flashover, the authors of an IAFF report conclude: Clearly, an early aggressive and offensive initial interior attack on a working structural fire results in greatly reduced loss of life and property damage. Consequently, given that the progression of a structural fire to the point of "flashover" (the very rapid spreading of the fire due to super-heating of room contents and other combustibles) generally occurs in less than ten minutes, two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of its origin as possible.[38]

Since the 1970s, arriving within eight minutes of receipt of an emergency call, 90 percent of the time, has been the recognized benchmark for determining the quality of an EMS system. Today, the national standard of care benchmark based on stroke and cardiac arrest protocols has evolved to have an emergency response unit on scene at a medical emergency within six minutes of receipt of the call. Paragraph 4.1.2.1(4) of NFPA 1710 recommends that for EMS incidents a unit with first responder or higher-level trained personnel and equipped with an AED should arrive on scene within six minutes of the receipt of the emergency call (at the dispatch center), and four minutes of response. An advanced life support (ALS) unit should arrive on scene within ten minutes (eight minutes of response). According the NFPA 1710, "This requirement is based on experience, expert consensus, and science. Many studies note the role of time and the delivery of early defibrillation in patient survival due to heart attacks and cardiac arrest, which are the most time-critical, resource-intensive medical emergency events to which fire departments respond." CAAS recommends that an ambulance arrive on scene within eight minutes, fifty-nine seconds (00:08:59) of dispatch. However, research in EMS indicates that if emergency medical intervention is delayed as long as nine minutes, patient survival of cardiac arrests approaches zero[39] (see following figure).

38. *Safe Fire Fighter Staffing: Critical Considerations*, 2nd ed. (Washington, DC: International Association of Fire Fighters, 1995), 5.
39. Eisenberg, M.S., et al., "Predicting Survival from Out-of-Hospital Cardiac Arrest: A Graphic Model," *Annals of Emergency Medicine*; November 1993; pp. 1652-1658.

FIGURE 5-1: Cardiac Arrest Survival Probability by Minute



Typically, fewer than 10 percent of 9-1-1 patients have time-sensitive ALS needs. But, for those patients that do, time can be a critical issue of morbidity and mortality. For the remainder of those calling 9-1-1 for a medical emergency, though they may not have a medical necessity, this 90 percent still expect rapid customer service. Response times for patients and their families are often the most important issue regarding the use the fire department’s services and are what most often refer to when they “rate” their local emergency responders. Regardless of the service delivery model, appropriate response times are more than a clinical issue; they are also a customer service issue.

According to the U.S. Department of Transportation (DOT) *Emergency Vehicle Operators Course Instructor's Manual*, "a TRUE EMERGENCY is a situation in which there is a high probability of death or serious injury to an individual or significant property loss, and action by (you) an emergency vehicle operator may reduce the seriousness of the situation."

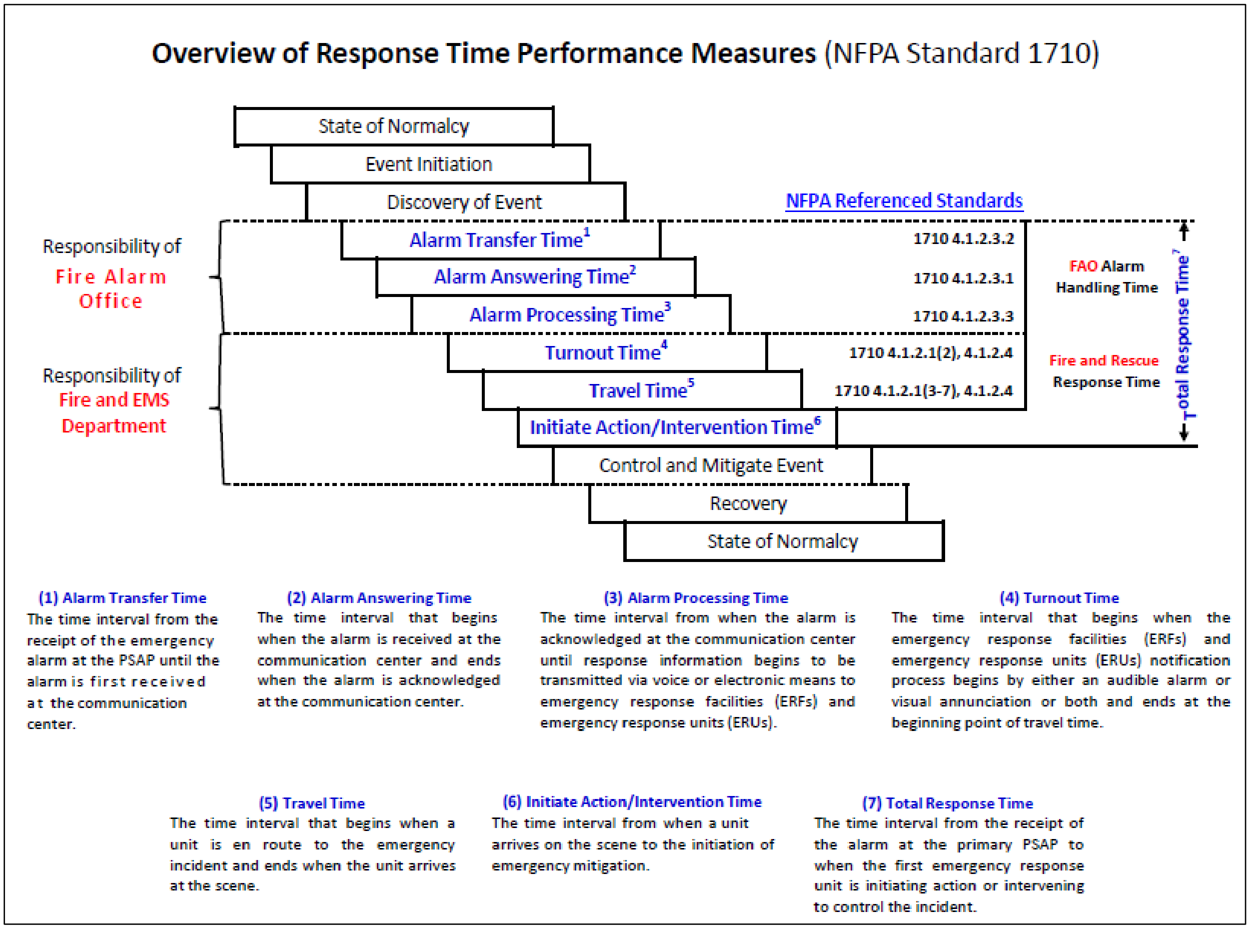
In addition, a true emergency is when an illness or injury places a person’s health or life in serious jeopardy and treatment cannot be delayed. Examples include difficulty breathing, chest pain, a head injury, or ingestion of a toxic substance.[40]

If a person is experiencing severe pain, that is also an indicator of an emergency. Again, the frequencies of these types of calls are infrequent as compared to the routine, low-priority EMS incident responses. In some cases, these emergencies often make up no more than 5 percent of all EMS calls.[41]

Another important factor in the whole response time question is what we term “**detection time**.” This is the time it takes to detect a fire or a medical situation and notify 911 to initiate the response. In many instances, particularly at night or when automatic detection systems (fire sprinklers and smoke detectors) are not present or inoperable, the detection process can be extended. Fires that go undetected and are allowed to expand in size become more destructive and are difficult to extinguish. The following figure illustrates the overview of response time performance and identifies responsibility of the key components of the emergency communications center and the fire and rescue department.

40. Mills-Peninsula Health Blog, Bruce Wapen, MD.
41. www.firehouse.com/apparatus/article/10545016/operations-back-to-basics-true-emergency-and-due-regard

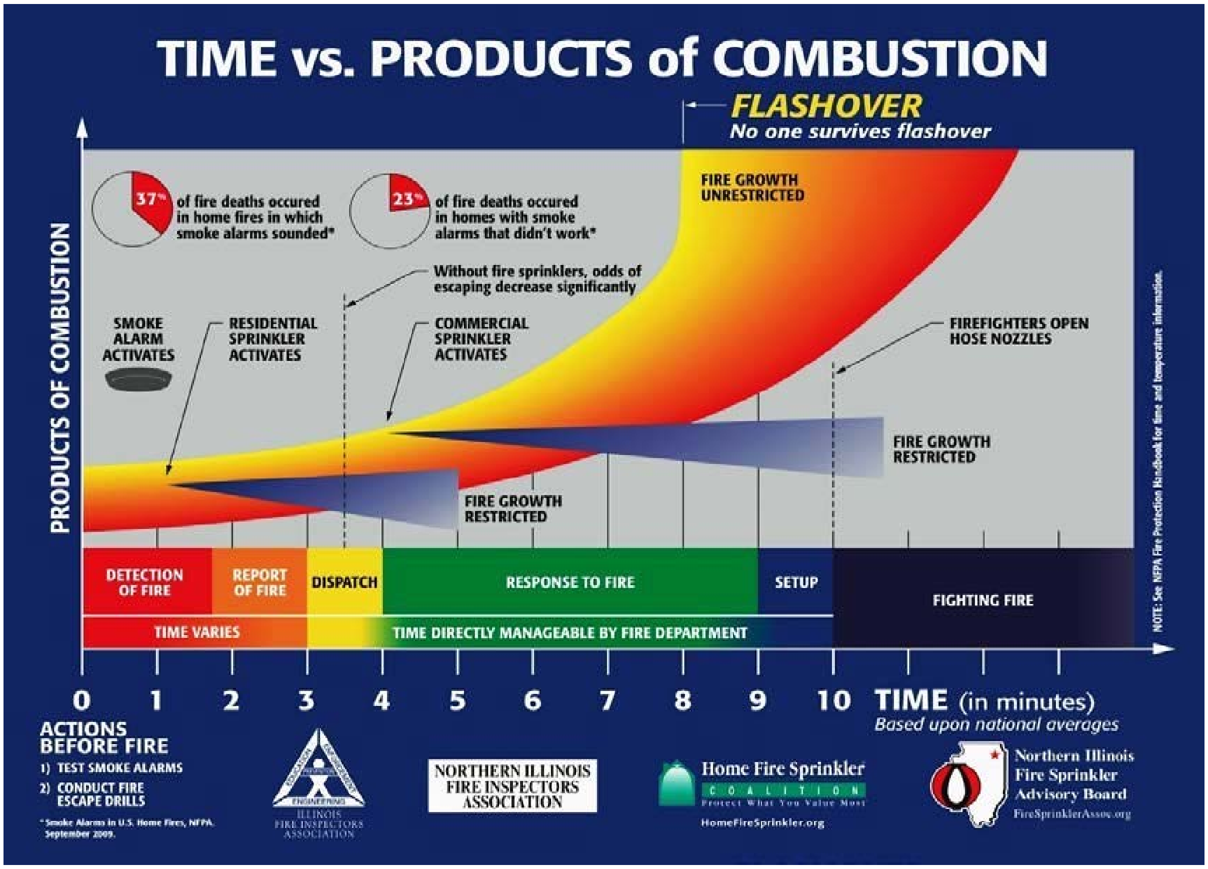
FIGURE 5-2: Response Time Performance Measures



The next three figures illustrate the importance of understanding the concepts of response time as discussed above.

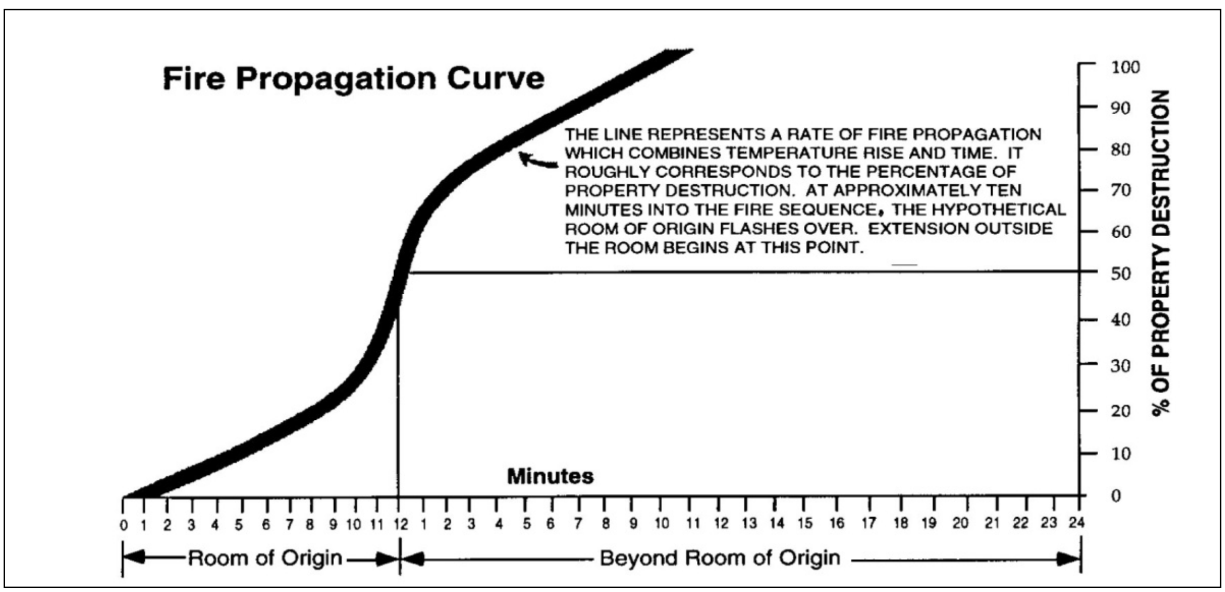
Figure 5-3 illustrates the time progression of a fire from inception (event initiation) through flashover. The time-versus-products of combustion curve shows activation times and effectiveness of residential sprinklers (approximately one minute), commercial sprinklers (four minutes), flashover (eight to ten minutes), and firefighters applying first water to the fire after notification, dispatch, response, and set up (ten minutes). It also illustrates that the fire department's response time to the fire is one of the only aspects of the timeline that the fire department can exert direct control over. Figure 5-4 shows the fire propagation curve relative to fire being confined to the room of origin or spreading beyond it and the percentage of destruction of property by the fire.

FIGURE 5-3: Fire Growth from Inception to Flashover



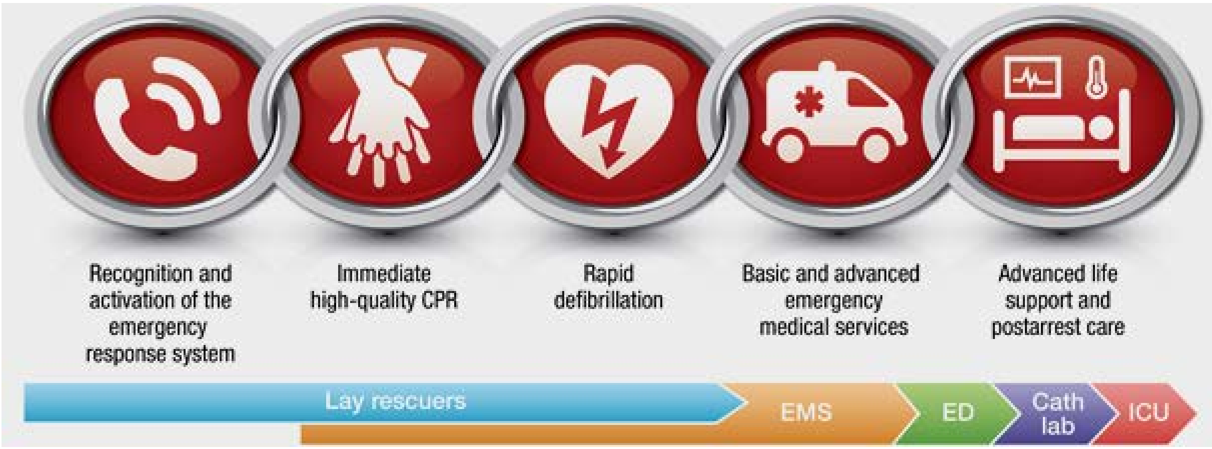
Source: From Northern Illinois Fire Sprinkler Advisory Board.

FIGURE 5-4: Fire Propagation Curve



The following figure illustrates the out of hospital chain of survival, which is a series of actions that, when put in motion, reduce the mortality of sudden cardiac arrest. Adequate response times coupled with community and public access defibrillator programs potentially can impact the survival rate of sudden cardiac arrest victims by deploying early CPR, early defibrillation, and early advanced care provided in the prehospital setting.

FIGURE 5-5: Sudden Cardiac Arrest Chain of Survival



From: "Out of Hospital Chain of Survival," http://cpr.heart.org/AHAECC/CPRAndECC/AboutCPRFirstAid/CPRFactsAndStats/UCM_475731_Out-of-hospital-Chain-of-Survival.jsp

There is no "right" amount of fire protection and EMS delivery. It is a constantly changing level based on such things as the expressed needs of the community, community risk, and population growth. So, in looking at response times it is prudent to design a deployment strategy around the actual circumstances that exist in the community and the fire problem that is identified to exist. The strategic and tactical challenges presented by the widely varied hazards that the department protects against need to be identified and planned for through a community risk analysis planning and management process as identified in this report. It is ultimately the responsibility of elected officials to determine the level of risk that is acceptable to their respective community. It would be imprudent, and probably very costly, to build a deployment strategy that is based solely upon response times.

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

Dispatch time (alarm processing time) is the difference between the time a call is received and the time a unit is dispatched. Dispatch time includes call processing time, which is the time required to determine the nature of the emergency and types of resources to dispatch. ***Turnout time*** is when the emergency response units are notified of the incident and ends when travel time begins. **Travel Time** is the difference between the time the unit is en route and arrival on scene. ***Response time*** is the total time elapsed between receiving a call to arriving on scene.

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 to with lights and sirens (Code 3).

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*, 2020 Edition, the alarm processing time or dispatch time should be less than or equal to 64 seconds 95 percent of the time. NFPA 1710 also states that turnout time should be less than or equal to 80 seconds (1.33 minutes) for fire and special operations 90 percent of the time and 60 seconds (1.0 minutes) for EMS. As noted above, turnout time is the segment of total response time that the fire department has the most ability to control. Travel time shall be less than or equal to 240 seconds for the first arriving engine company 90 percent of the time and the second due engine 360 seconds 90 percent of the time. The standard further states the initial first alarm assignment should be assembled on scene in 480 seconds, 90 percent of the time for low/medium hazards and 610 seconds for high-rise or high hazards. Note that NFPA 1710 response time criterion is a benchmark for service delivery and not a CPSM recommendation.

Table 5-1 provides an analysis of EFD average response times and Table 5-2 provides analysis of 90th percentile response times, which is the strictest measurement of fire and rescue response times. A 90th percentile time means that 90 percent of calls had response times at or below that number. For example, Table 5-2 shows a 90th percentile response time for EMS calls of 6.4 minutes, which means that 90 percent of the time an EMS call had a response time of no more than 6.4 minutes.

TABLE 5-1: Average Response Time of First Arriving Unit, by Call Type

Call Type	Time (Min.)				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.2	2.0	4.3	7.5	95
Cardiac and stroke	1.0	2.0	4.3	7.4	154
Fall and injury	1.0	2.1	4.1	7.2	255
Illness and other	1.2	2.1	4.1	7.4	949
MVA	1.3	2.2	4.1	7.7	86
Overdose and psychiatric	1.3	1.8	3.6	6.8	169
Seizure and unconsciousness	1.4	1.9	3.2	6.4	74
EMS Total	**1.2**	**2.0**	**4.0**	**7.3**	**1,782**
False alarm	1.2	2.1	3.0	6.3	302
Good intent	1.1	2.1	3.3	6.5	35
Hazard	1.4	2.3	3.6	7.2	107
Outside fire	0.5	2.6	4.1	7.1	18
Public service	1.7	1.9	4.7	8.3	41
Structure fire	1.0	2.3	3.5	6.8	20
Fire Total	**1.2**	**2.1**	**3.3**	**6.7**	**523**
Total	**1.2**	**2.1**	**3.9**	**7.2**	**2,305**

TABLE 5-2: 90th Percentile Response Time of First Arriving Unit, by Call Type

Call Type	Time (Min.)				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	3.5	3.5	6.2	10.1	95
Cardiac and stroke	3.1	3.8	6.8	9.6	154
Fall and injury	3.1	4.1	6.7	9.9	255
Illness and other	3.2	4.1	6.4	10.3	949
MVA	3.6	3.9	7.7	11.0	86
Overdose and psychiatric	3.2	3.7	6.2	10.3	169
Seizure and unconsciousness	3.5	4.3	5.0	9.2	74
EMS Total	**3.2**	**4.0**	**6.4**	**10.1**	**1,782**
False alarm	3.4	3.9	6.6	9.6	302
Good intent	3.7	4.0	5.5	8.8	35
Hazard	4.1	4.6	6.5	9.8	107
Outside fire	3.2	4.4	6.3	10.6	18
Public service	4.4	4.3	8.0	13.6	41
Structure fire	2.9	4.1	5.5	9.4	20
Fire Total	**3.7**	**4.0**	**6.6**	**9.8**	**523**
Total	**3.4**	**4.0**	**6.4**	**10.0**	**2,305**

The conclusions we can reach from these two tables are:

- The average dispatch time was 1.2 minutes.
  - The 90th percentile dispatch time was 3.4 minutes. ***In terms of meeting the benchmark time, EFD is not NFPA 1710 compliant.***
- The average fire turnout time was 2.1 minutes.
  - The 90th percentile fire turnout time was 4.0 minutes. ***In terms of meeting the benchmark time, EFD is not NFPA 1710 compliant (NFPA 1710 compliance time is 80 seconds).***
- The average fire travel time was 3.3 minutes.
  - The 90th percentile fire travel time was 6.6 minutes. ***In terms of meeting the benchmark time, EFD is not NFPA 1710 compliant (this is affected by the current single station location).***
- The average EMS turnout time was 2.0 minutes.
  - The 90th percentile EMS turnout time was 4.0 minutes. ***In terms of meeting the benchmark time, EFD is not NFPA 1710 compliant (NFPA compliance time is 60 seconds).***
- The average EMS travel time was 4.0 minutes.
  - The 90th percentile EMS travel time was 6.4 minutes. ***In terms of meeting the benchmark time, EFD is not NFPA 1710 compliant (this is affected by the current single station location).***

ASSESSMENT OF FIRE STATION RESPONSE ZONE

Travel time is key to understanding how fire and EMS station location influences a community's aggregate response time performance. Travel time can be mapped when existing and proposed station locations are known. The location of responding units is one important factor in response time; reducing response times, which is typically a key performance measure in determining the efficiency of department operations, often depends on this factor. The goal of placement of a single fire station or creating a network of responding fire stations in a single community is to optimize coverage with short travel distances when possible, while giving special attention to natural and manmade barriers, and response routes that can create response-time problems.[42] This goal is generally budget-driven and based on demand intensity of fire and EMS incidents, which for this report were mapped earlier.

As already discussed, the EFD responds from a single fire station located in the downtown, south-central portion of the town. As discussed above, NFPA 1710 outlines national consensus travel time benchmarks of less than or equal to 240 seconds for the first arriving engine company 90 percent of the time and the arrival of the second due engine in 360 seconds, 90 percent of the time. NFPA further outlines that the initial first alarm assignment should be assembled on scene in 480 seconds, 90 percent of the time for low/medium hazards and 610 seconds for high-rise or high hazards. Hazards are outlined above as well in the community risk analysis section.

This section expands on the travel times outlined above, depicting how travel times of 240 seconds and 480 seconds look when mapped from the current fire station location. This mapping includes travel time utilizing existing town streets. The GIS data for streets includes speed limits for each street segment and allows for "U-turns" for dead end streets and intersections. This analysis is not all inclusive as it does not contemplate traffic, weather, and such things as road obstructions caused by construction, public transportation movement, and the like.

It is, however, important to note that while GIS-drawn, theoretical travel times do reflect favorably on the adequacy of station facilities and their corresponding locations within the town to support efficient fire and EMS response, the benefits of favorable travel time findings are only meaningfully realized when apparatus can be predictably staffed for response.

As the initial, second, and sometimes third arriving EFD fire and EMS apparatus responds from a single location, we will illustrate the 240 second travel time bleeds. As the EFD typically utilizes automatic and mutual aid to assemble the first alarm assignment, we will illustrate the 480 second travel time response bleeds from the EFD station and the automatic and mutual aid stations.

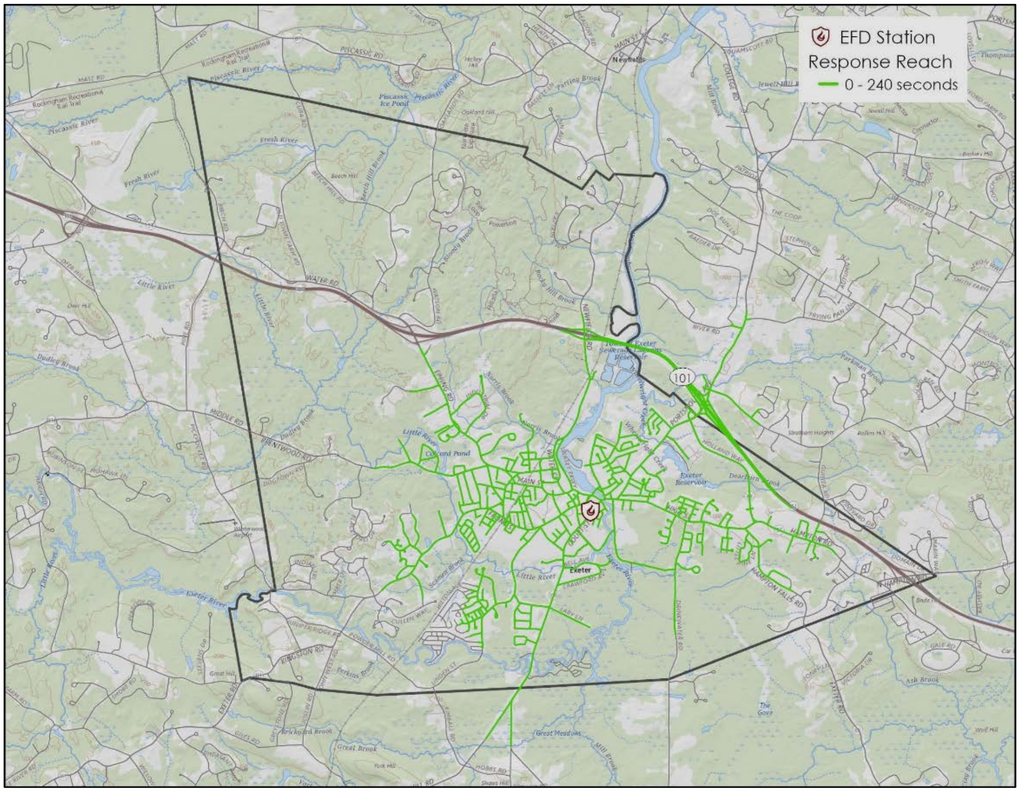
Figure 5-6 illustrates the 240-seconds travel time response bleed from the EFD fire station.

Figure 5-7 illustrates the 480-seconds travel time response bleed from the EFD fire station.

As one can see, the 240-seconds travel time response bleed is concentrated in the central and southeast portions of the town. This is also where the demand intensity is highest for fire and EMS incidents. At 480 seconds, most of the town is covered from the EFD fire station, with the exception of the northwest and northeast portions of the town.

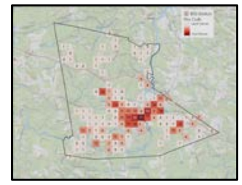
42. NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2010 Edition, 122.

FIGURE 5-6: 240-Seconds Travel Time from EFD Station



Call Demand

Fire



EMS

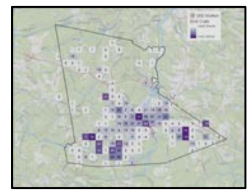
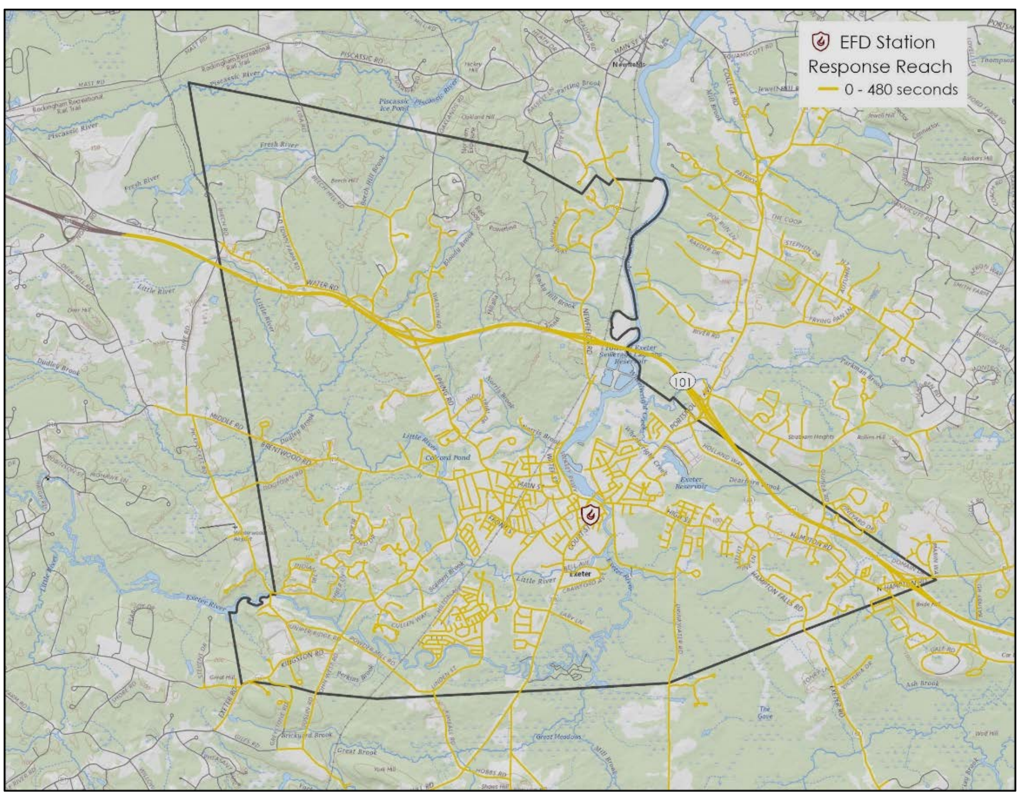


FIGURE 5-7: 480-Seconds Travel Time from EFD Station



Automatic and Mutual Aid

The EFD does participate in automatic and mutual aid with contiguous and non-contiguous towns in the county, as well as towns and cities in Maine and Massachusetts through the SeaCoast Mutual Aid District Interlocal Agreement.

The EFD receives automatic aid (fire apparatus is sent on the initial alarm) from Newmarket, East Kingston, and Durham (Strafford County) on all reported building fires. The EFD receives mutual aid (fire apparatus is sent when requested on first alarm assignments) from North Hampton, Hampton, and Newfields. Figure 5-8 details the location of stations from which automatic and mutual aid is provided.

Figure 5-9 illustrates 240-seconds travel time and Figure 5-10 illustrates the 480-seconds travel time from these automatic/mutual aid station locations.

Only Newfields, a 100 percent volunteer fire department can effectively penetrate the Exeter town corporate limits in both of these time spans that is 240 seconds or 480 seconds. North Hampton and Hampton can reach the outermost perimeter of the southeast portion of Exeter in 480 seconds. With regards to NPFA 1710, 2020 edition, the Newfields station is also the only automatic/mutual aid company able to reach significant areas of the town in 360 seconds (standard time of the second arriving engine apparatus).

None of the remaining automatic/mutual aid stations reach Exeter in 480 seconds {the NFPA standard time to assemble on scene the initial first alarm assignment to structure fires (non-high-rise/high hazard).

The distances that mutual aid companies must travel are a concern for EFD; North Hampton and Hampton Fire Departments supply an engine on working fires and which have response times of 10 to 15 minutes to Exeter. These elongated times can impact fire suppression activities, especially in rural areas of the town that lack a hydrant system.

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FIGURE 5-8: Mutual and Automatic Aid Stations Location Map

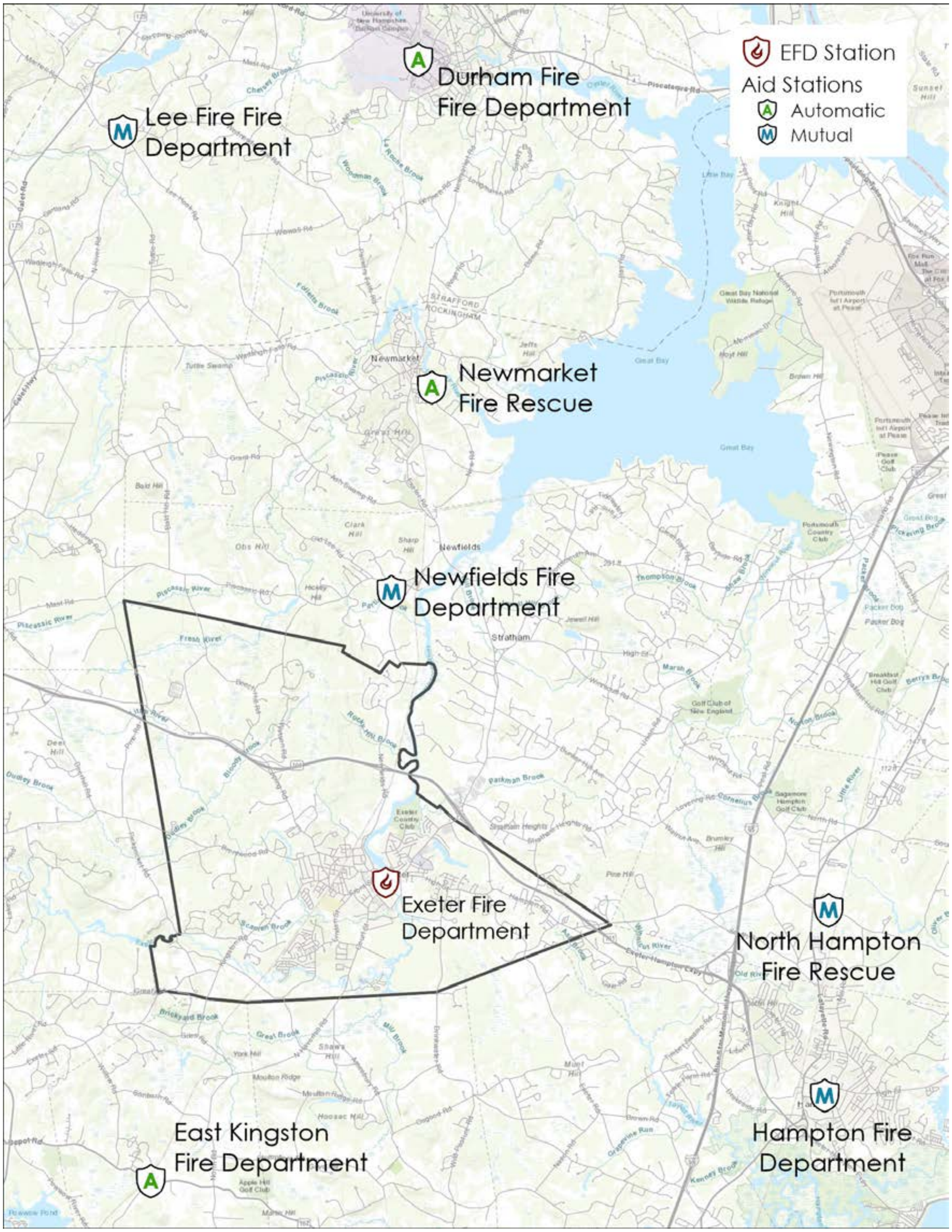


FIGURE 5-9: 240-Seconds Travel Time Bleeds, Mutual and Automatic Aid Stations

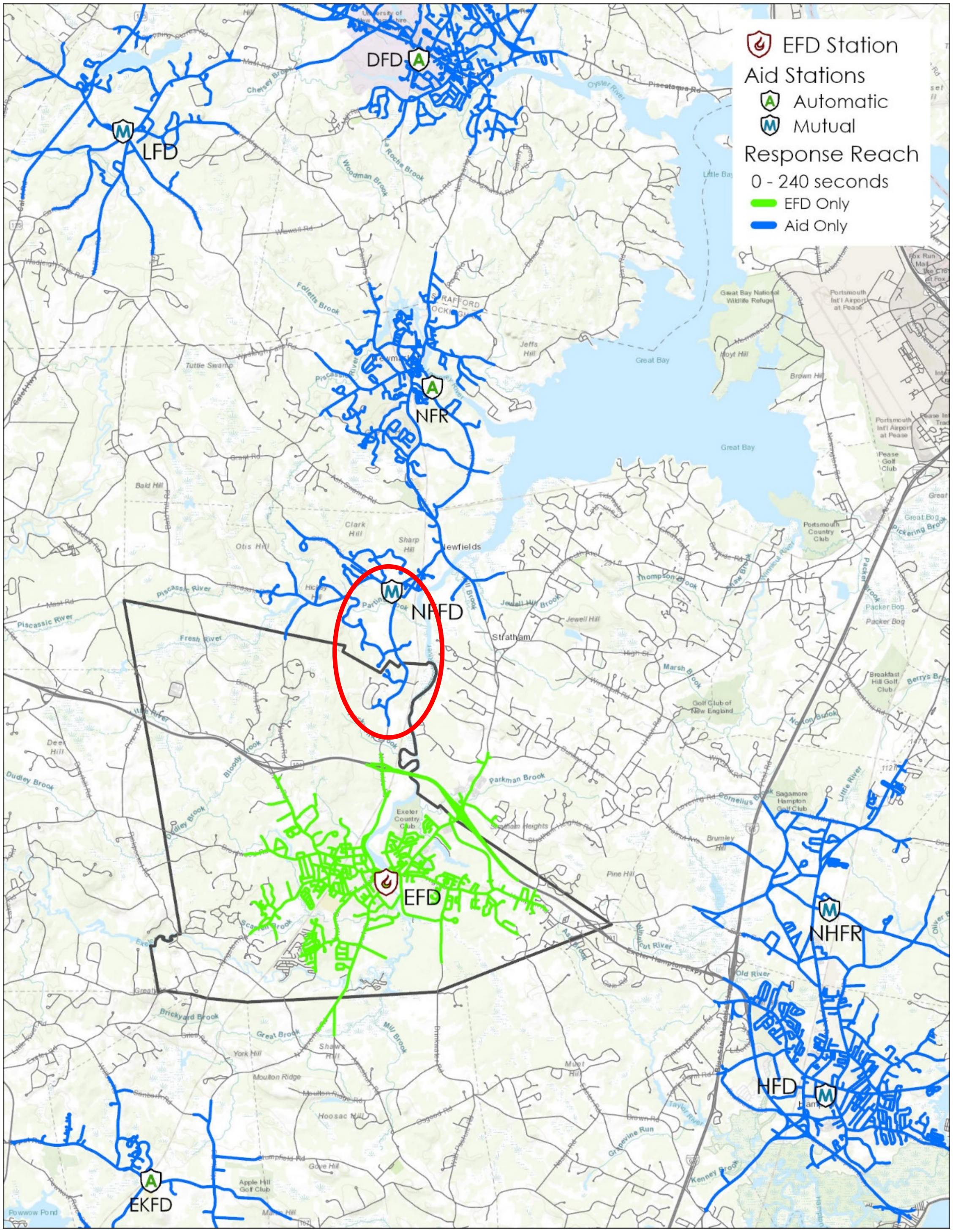
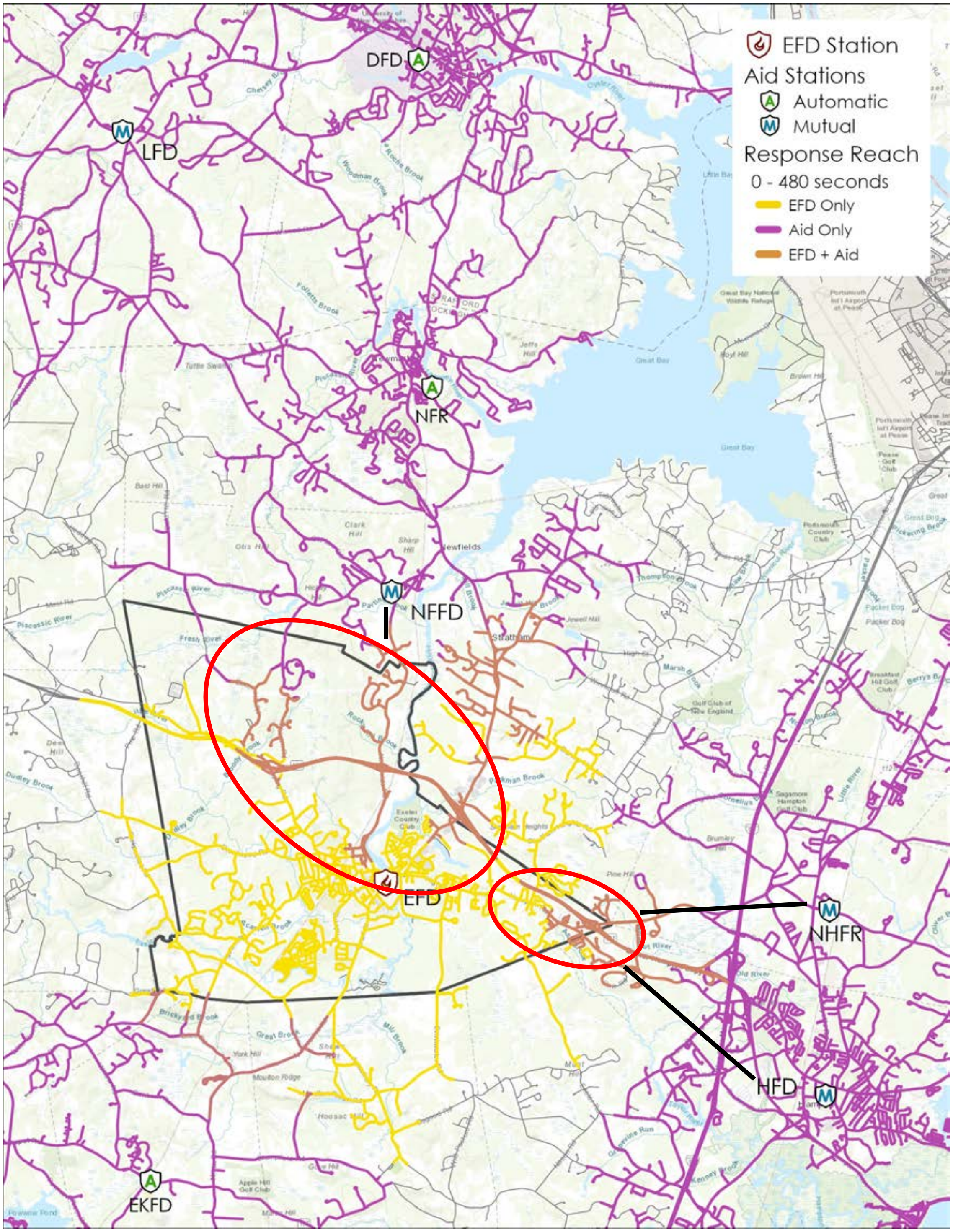


FIGURE 5-10: 480-Seconds Travel Time Bleeds, Mutual and Automatic Aid Stations



Resiliency

Resiliency as defined by the Center for Public Safety Excellence (CPSE) in the FESSAM 9th edition: "an organization's ability to quickly recover from an incident or events, or to adjust easily to changing needs or requirements." Greater resiliency can be achieved by constant review and analysis of the response system and focuses on three key components:

- Resistance: The ability to deploy only resources necessary to safely and effectively control an incident and bring it to termination, which is achieved through the development and implementation of critical tasking and its application to the establishment of an effective response force for all types of incidents (see Section 4 above).
- Absorption: The ability of the agency to quickly add or duplicate resources necessary to maintain service levels during heavy call volume or incidents of high resource demand. This is outlined above in this section (automatic/mutual aid), and Section 4 above.
- Restoration: The agency's ability to quickly return to a state of normalcy.

Resistance is controlled by the EFD through staffing and response protocol, and with EFD resources dependent on the level of staffing available at the time of the alarm.

Absorption is accomplished through initial responding units available to respond by the EFD and through automatic/mutual aid companies responding from neighboring jurisdictions.

Restoration is managed by EFD staff recall to staff fire and EMS units, automatic/mutual aid, and efficient work on incidents for a quick return to service.

Regarding restoration, the following three tables analyze the frequency of overlapping calls that occur in Exeter, the frequency by number of hours that units are dedicated to a single or multiple incidents, as well as the ability of EMS transport units to return to service (state of normalcy).

TABLE 5-3: Frequency of Overlapping Calls

Scenario	Number of Calls	Percent of All Calls	Total Hours
No overlapped call	2,278	84.4	1,246.1
Overlapped with one call	394	14.6	109.7
Overlapped with two calls	25	0.9	4.9
Overlapped with three calls	2	0.1	0.1

TABLE 5-4: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	6,494	74.1
1	1,874	21.4
2	355	4.1
3+	37	0.4
Total	**8,760**	**100.0**

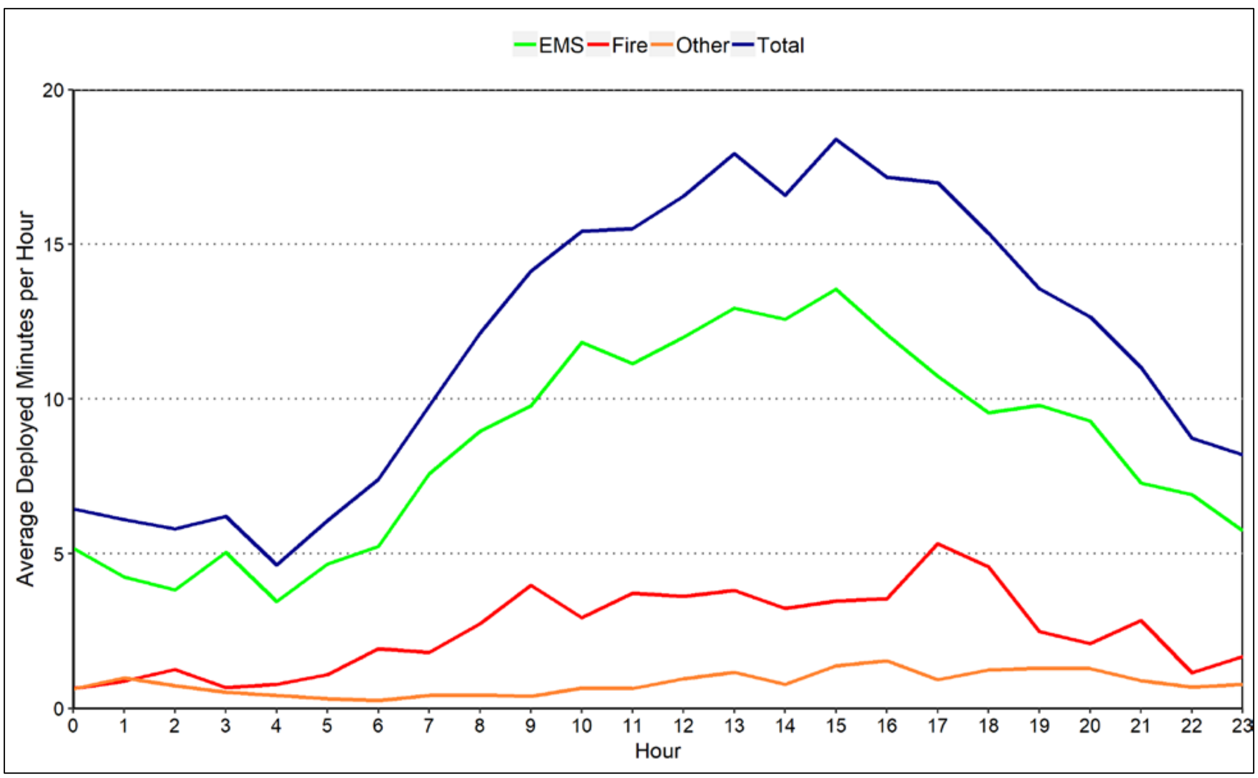
TABLE 5-5: Time Component Analysis for Ambulance Transport Runs by Call Type

Call Type	Average Time Spent per Run (Min.)				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	17.6	5.9	14.1	43.9	93
Cardiac and stroke	19.8	6.3	16.7	49.2	148
Fall and injury	14.5	5.8	12.8	39.2	213
Illness and other	15.6	5.8	13.9	41.5	665
MVA	12.3	6.4	21.6	47.0	40
Overdose and psychiatric	14.7	5.4	14.6	40.2	154
Seizure and unconsciousness	17.3	5.6	15.1	43.1	72
EMS Total	**15.9**	**5.8**	**14.4**	**42.2**	**1,385**
Fire & Other Total	**13.4**	**9.2**	**16.4**	**47.9**	**60**
Total	**15.8**	**6.0**	**14.5**	**42.5**	**1,445**

Note: The average unit deployed time per run is lower than average call duration for some call types because call duration is based on the longest deployed time of any of the units responding to the same call, which may include an engine or ladder. Total deployed time is greater than the combination of on-scene, transport, and hospital wait times as it includes turnout, initial travel, and hospital return times.

The following figure illustrates the average deployed minutes by hour of day, and shows the peak times of the day a call is likely to occur.

FIGURE 5-11: Average Deployed Minutes by Hour of Day



Regarding the EFD's resiliency to respond to calls, analysis of these tables and figure tell us:

- 84 percent of the time there was a single call (no call overlap).
- 74 percent of the time a call lasted less than 1 hour.
- 14 percent of the time a call was overlapped with a single call.
- Less than one-half percent of the time, a call lasted more than 3 hours; just under 1 percent of the time a call lasted 2 hours.
- The average time spent on-scene for a transport call was 15.8 minutes.
- The average travel time from the scene of the call to the hospital was 6.0 minutes.
- The average deployed time spent on transport calls was 42.5 minutes.
- The average deployed time at the hospital was 14.5 minutes, which accounted for approximately 34 percent of the average total deployed time for a transport call.
- Hourly deployed time was highest during the day from noon to 6:00 p.m., averaging between 17 minutes and 18 minutes.
- The average deployed time peaked between 3:00 p.m. and 4:00 p.m., averaging 18 minutes.
- The average deployed time was lowest between 4:00 a.m. and 5:00 a.m., averaging 5 minutes.

On average, about 84 percent of the time, the EFD does not have a resiliency issue. A resiliency issue occurs about 16 percent of the time. Generally, on a fire incident, available EFD staffing and resources are committed, because the daily staffing allows for the deployment of an EMS transport unit and one to two fire units, depending on the type of call for service. If a duplicate EMS incident occurs, fire staffing is depleted. The reliance on EFD staff recall and automatic/mutual aid companies increases when even one EFD recourse is committed. This is typically how the EFD manages restoration when EFD units are committed and Exeter resources are depleted, that is, through staff recall and automatic/mutual aid.

Recommendations:

- CPSM recommends the EFD establish and measure a turnout time goal for fire and EMS responses that aligns more closely with the NFPA 1710 national consensus benchmark.[43] (Recommendation No. 14.)
- CPSM recommends that when considering an additional fire station, or the relocation of the current fire station (thus maintaining a single fire station response location), that consideration be given to a location that reduces travel time so that the department aligns more closely with the NFPA 1710 national consensus benchmark.[44] (Recommendation No. 15.)
- CPSM recommends that automatic aid agreements be established with North Hampton, Hampton, and Newfields so that any delay in assembling an effective response force for multicompany responses is minimized. (Recommendation No. 16.)

43. CPSM is not recommending the adoption of the NFPA standard, but rather identifying a national consensus standard benchmark from which goals and objectives can be logically developed and measured against.
44. Ibid.

SECTION 6. FACILITY DISCUSSION

Fire facilities must be designed and constructed to accommodate current and forecasted future trends in fire service vehicle type and manufactured dimensions. A facility must have sufficiently-sized bay doors, circulation space between garaged vehicles, departure and return aprons of adequate length and turn geometry to ensure safe response, and floor drains and oil separators to satisfy environmental concerns. Station vehicle bay areas should also consider future tactical vehicles that may need to be added to the fleet to address forecasted response challenges, even if this consideration merely incorporates civil design that ensures adequate parcel space for additional bays to be constructed in the future.

Personnel-oriented needs in fire facilities must permit performance of daily duties in support of response operations. For personnel, fire facilities must have provisions for vehicle maintenance and repair; storage areas for essential equipment and supplies; space and amenities for administrative work, training, physical fitness, laundering, meal preparation, and personal hygiene/comfort, and—where a fire department is committed to minimize "turnout time"—bunking facilities.

A fire department facility may serve as a de facto "safe haven" during local community emergencies, and also serve as likely command center for large-scale, protracted, campaign emergency incidents. Therefore, design details and construction materials and methods should embrace a goal of building a facility that can perform in an uninterrupted manner despite prevailing climatic conditions and/or disruption of utilities. Programmatic details, like the provision of an emergency generator connected to automatic transfer switching, even going as far as providing tertiary redundancy of power supply via a "piggyback" roll-up generator with manual transfer (should the primary generator fail), provide effective safeguards that permit the fire department to function fully during local emergencies when response activity predictably peaks.

Personnel/occupant safety is a key element of effective station design. This begins with small details like the quality of finish on bay floors and nonslip treads on stairwell steps to decrease tripping/fall hazards, or use of hands-free plumbing fixtures and easily disinfected surfaces/countertops to promote infection control. It continues with installation of specialized equipment such as an exhaust recovery system to capture and remove cancer-causing byproducts of diesel fuel exhaust emissions. A design should thoughtfully incorporate best practices for achieving a safe and hygienic work environment.

Ergonomic layout and corresponding space adjacencies in a fire station should seek to limit the travel distances between occupied crew areas to the apparatus bays. Likewise, it should carefully consider complementary adjacencies, like lavatories/showers in proximity of bunk rooms, and desired segregations, like break rooms or fitness areas that are remote from sleeping quarters. Furnishings, fixtures, and equipment selections should provide thoughtful consideration of the around-the-clock occupancy inherit to fire facilities. Durability is essential, given the accelerated wear and life cycle of systems and goods in facilities that are constantly occupied and operational.

In summary, sound community fire-rescue protection requires the strategic distribution of fire station facilities to ensure that effective service area coverage is achieved, that predicted response travel times satisfy prevailing community goals and national best practices, and that the facilities are capable of supporting mission-critical personnel and vehicle-oriented requirements and needs. Additionally, depending on a fire-rescue department's scope of services, size, and complexity, other facilities may be necessary to support emergency communications, personnel training, fleet and essential equipment maintenance and repair, and supply storage and distribution.

National standards such as NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness Program*, outlines standards that transfer to facilities such as infection control, personnel and equipment decontamination, cancer prevention, storage of protective clothing and employee fitness. NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Firefighting and Proximity Fire Fighting*, further delineates laundering standards for protective clothing and station wear. Laundry areas in fire facilities continue to evolve and are being separated from living areas to reduce contamination. Factors such as wastewater removal and air flow need to be considered in a facility design.

The same discussion and uniqueness for fire facilities is prevalent in law enforcement facilities as well. Law enforcement facilities are inherently highly secure facilities for obvious reasons, and need adequate common areas for staff such as locker rooms/showers and break and fitness areas; conference and community rooms; visitor staff and agency vehicle parking; evidence processing and storage area; records processing and storage area; separate square footage for investigations, patrol, and specialty functions etc.; training area; logistics and equipment storage; decontamination room; and sally port/holding cells. As with a fire facility, a police facility must be designed and constructed to accommodate current and forecasted future trends, as well as a 24/7 operation that sustain constant use. This list is not all inclusive and may differ from agency to agency depending on needs.

The EFD operates out of a two-story public safety facility at 20 Court St., in downtown Exeter. The facility is approximately 18,000 square feet in size and was constructed in 1979. The facility is shared by the Exeter Police Department (EPD), Emergency Communications Center (ECC), and the EFD.

The EPD utilizes approximately 6,000 square feet on two levels of the facility. The EPD's area includes a sally port, a small detention area for persons awaiting processing and transport to the county jail, storage area, locker rooms, interview area, and administrative offices.

The ECC area includes an emergency communications work area that is approximately 520 square feet in size and includes two dispatch consoles, a small bathroom, and a computer server/storage area.

The EFD utilizes approximately 11,560 square feet of the public safety facility. This includes 6,400 square feet for apparatus storage and response area on the ground floor, and 5,160 square feet on the second floor where EFD administrative offices, a combination training room/emergency operations center, dormitories, bathroom, day room/kitchen, and storage areas are located. The ground floor apparatus storage and response houses four Type 1 engine apparatus, one 109-foot aerial apparatus, two ALS ambulances, and one Type 6 forestry engine apparatus. Fire staff personal protective gear and other relevant supplies and equipment are located on the ground floor as well.

The EFD utilizes exterior parking to locate apparatus and response trailers that do not fit inside the public safety facility. This includes a utility pick-up truck, one 49-foot fire alarm lift truck, a boat, and several response trailers to include a technical rescue trailer, hazardous materials response trailer, and a shelter/POD trailer.

The current facility has several challenging issues that include:

- A general lack of administrative space for both fire and police. This was observed by CPSM staff and confirmed through discussion with staff on duty while CPSM staff toured the facility. Several EFD and EPD offices are congested and have been established by erecting walls in open areas. This has created a cut-up office/administrative area for both departments and there is limited to no space for expansion.
- The EFD training room doubles as the Emergency Operations Center (EOC), which in smaller operations is acceptable. However, this is not a best practice as an EOC should be ready, set up, and accessible to activate during an emergency.
- The EFD portion of the facility has only one shower area for the five to eight staff on duty. There is no gender-separate shower facility and all on-duty staff cannot shower efficiently if they have been exposed to products of combustion or other contaminants. Additionally, there is no gender-specific and separate bunkroom facility. Although there are separate bunkroom areas, theses bunkrooms have two beds and at full staffing may not accommodate gender separation adequately. EPD gender-separate locker space is also limited.
- Storage areas have reached capacity for both the EFD and EPD.
- There is very little to no ADA accommodation.
- The EFD apparatus garage area is at capacity. No additional fleet can be added or stored under current conditions.
- The town's backbone for IT is located in a closet/storage area in this facility. Space is limited for expansion.
- The ECC area is undersized. The current space is too limited for any expansion of consoles and hardware.

Additional Facility Discussion

The town advised CPSM that there has been and still remains contemplation of adding an additional fire station, which would improve service levels in terms of response times. This, of course, is dependent on the location of an additional fire facility and what areas of the town the EFD is considering. Another option that has been discussed is the relocation of the public safety facility out of the downtown corridor to a new facility. This is being considered since the departments have outgrown the current facility, and the congestion that occurs downtown can hamper response of emergency units.

Regarding the EFD, the following two figures review where the demand for service is and what the response travel times are to the entire town from the current fire facility. The demand maps illustrate that fire and EMS incident demand is highest in the core downtown area, with additional higher demand in the central, southeast, and southwest portions of the town (that is, built upon areas south of Route 101). The response maps illustrate that the core incident demand and population density are serviced within 240 seconds of travel time from the current EFD facility, and almost all of the town is serviced within 480 seconds of travel time, other than the northeast portion. As the report highlighted in the previous section, according to NFPA 1710, travel time shall be less than or equal to 240 seconds for the first arriving engine company 90 percent of the time and the second due engine 360 seconds 90 percent of the time. Additionally, the initial first alarm assignment should be assembled on scene in 480 seconds, 90 percent of the time for low/medium hazards.

FIGURE 6-1: Fire and EMS Demand

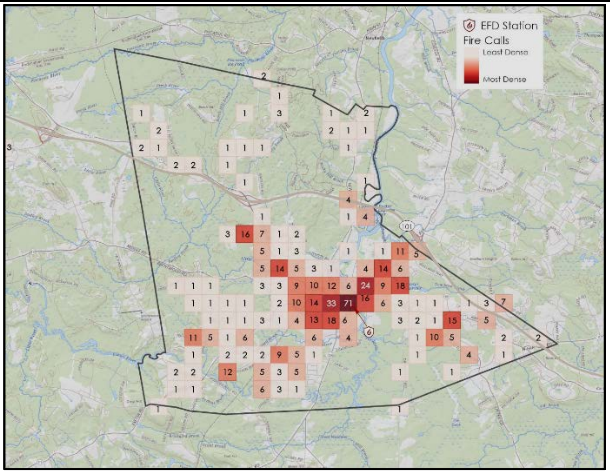
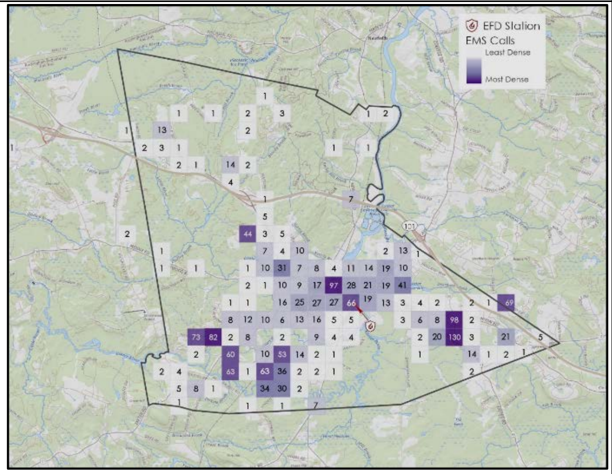
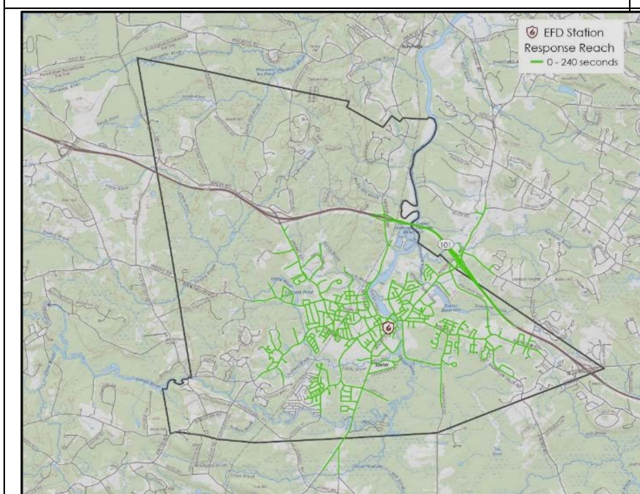
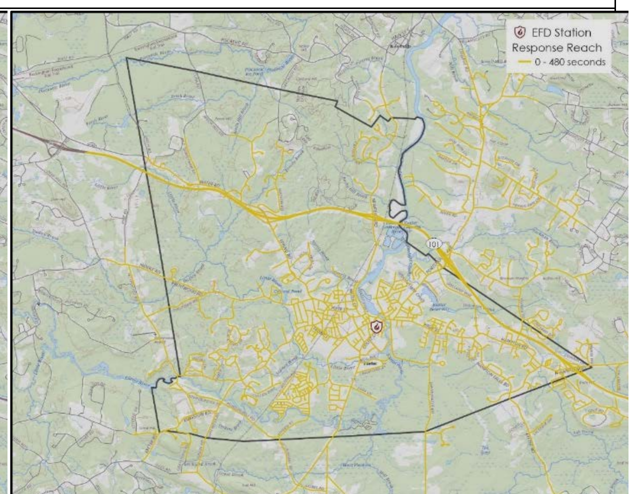
Fire Demand	EMS Demand
	

FIGURE 6-2: Travel Time of 240- and 480-Seconds from the Current EFD Facility

240-Seconds Travel Time	480-Seconds Travel Time
	

The town needs to complete a space needs assessment for fire, police, the emergency operations center, and emergency communications along with a location study for a facility to adequately house and accommodate necessary parking for fire, police, emergency communications, and the emergency operations center. There are additional critical factors to consider when determining the next location for a new fire station or combined public safety facility (should the town move in this direction). These factors include the time-distance from the station to the points that are to be served, to include those of high demand, high value, and high risk.

CPSM provides the following options with regards to the current public safety facility and construction of a new facility (combined public safety, or police, or fire):

- Construct a new public safety facility to adequately accommodate contemporary police, fire, EMS, emergency communications, and emergency management operations.

- Construct a new fire station large enough to accommodate a contemporary fire, EMS, and emergency management operation. Rehabilitate the existing public safety building to accommodate a contemporary police and emergency communications operation.
- Construct a new police station large enough to accommodate police and emergency communications. Rehabilitate the existing public safety building to accommodate a contemporary fire, EMS, and emergency management operation.

When considering these options, a thorough review of the literature should be conducted to include NFPA standards that reference fire station design and the International Association of Chiefs of Police, *Police Facility Planning Guidelines* manual as starting points.

The following figures illustrate the three facility location options the town has identified. The town can choose to exercise any of the options outlined above regarding what type of facility to place on another optional site. The purpose of this discussion is not to recommend a single option, as community expectations and input, internal stakeholder input, a separate facility needs assessment and site review, and availability of funds all have substantial weight in the decision-making process.

This study identifies commonalities in agency needs that should be considered as well when contemplating efficiencies of a new facility. Examples of this are:

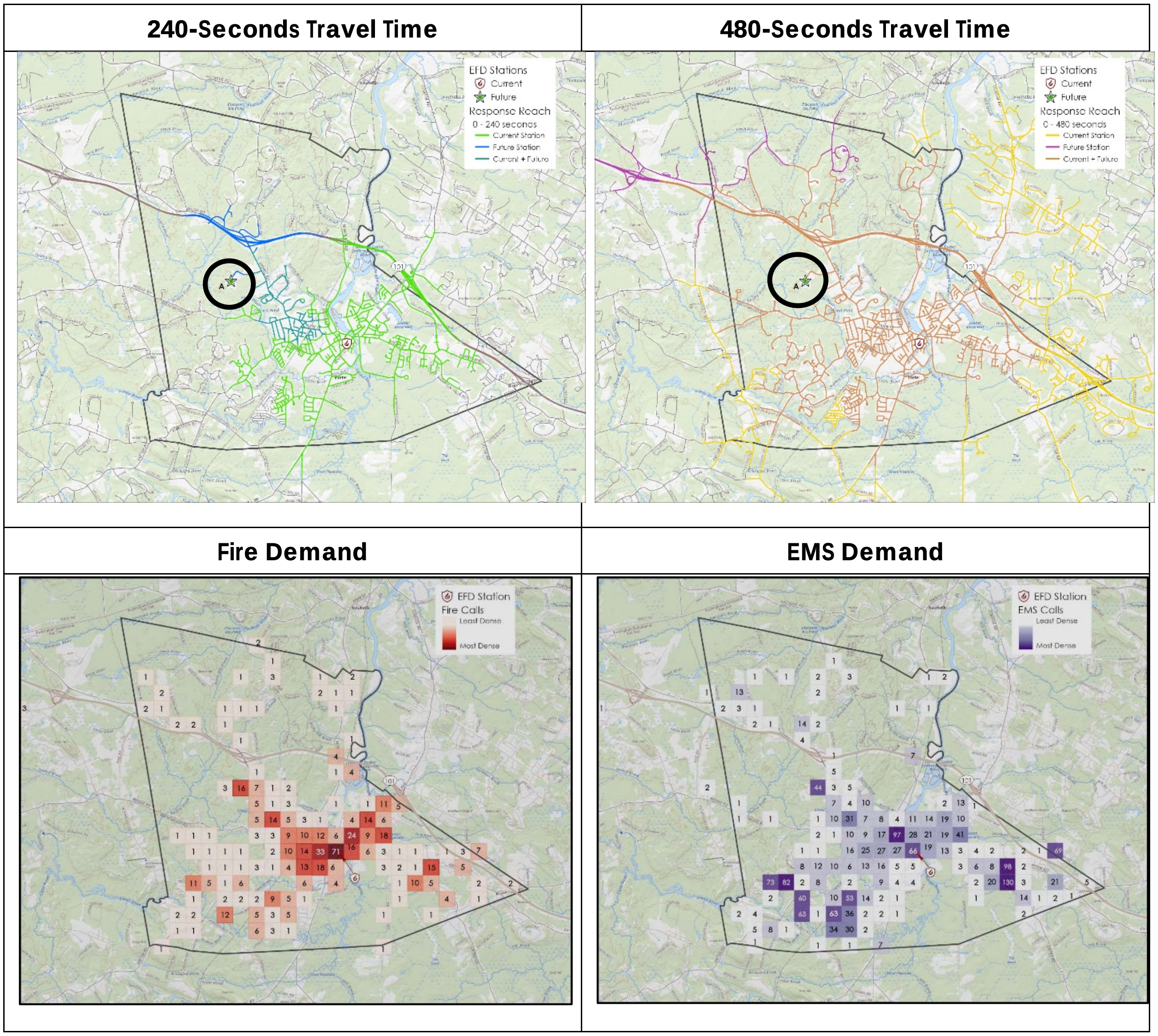
- A single building would require a single design and architectural fee, as well as single-site construction costs. If a decision is made to build a single new police or fire facility and renovate the existing facility for the other department, this would require an additional design and architectural fee, and of course the added renovation/construction costs.
- Commonalities of needs between police and fire include such things as training space, fitness and well-being space, decontamination and uniform laundry space, community room space, conference room space, locker room/shower space, visitor parking, and closed cover parking for equipment and vehicles to name a few. A combined public safety facility can accommodate joint use of these areas.
- The emergency communications center is central to both agencies' missions.
- Emergency management is central to both agencies' missions.

The remainder of this section is dedicated to analyzing the response of the EFD, whether it be from a combined public safety building or from a separate and new facility. The analysis looks at call demand and the travel time to various segments of the town from the location options.

The following three figures illustrate three new facility location options the town has identified, travel times from these locations of 240 and 480 seconds, and existing EMS and fire call demand.

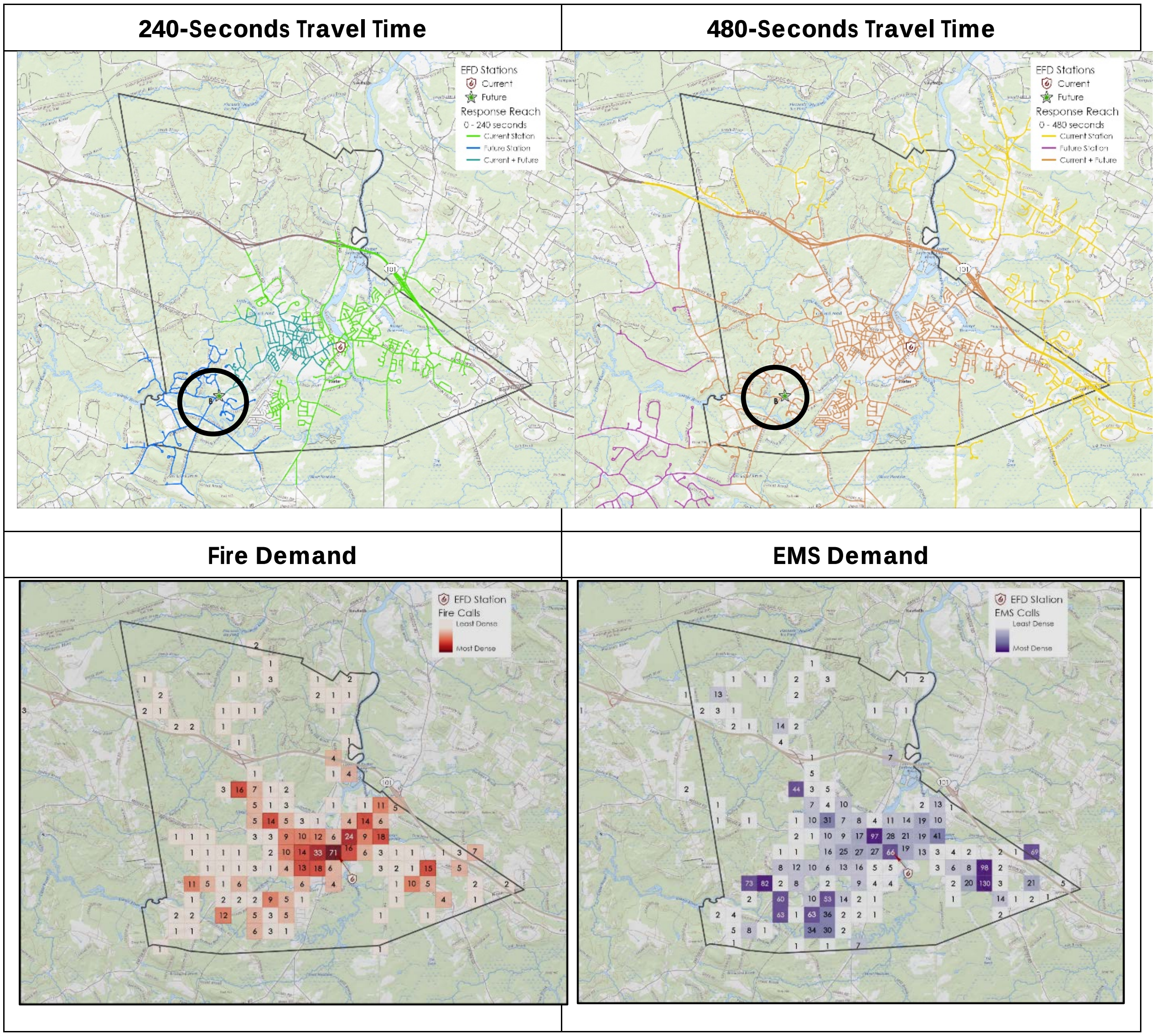
§ § §

FIGURE 6-3: Alternate Public Safety Building Location: Option A



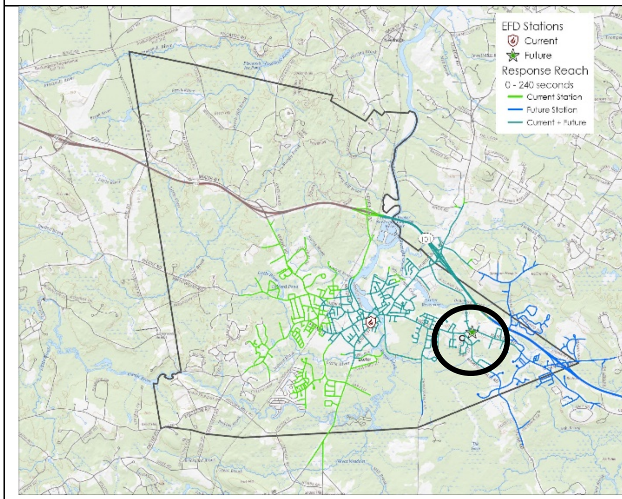
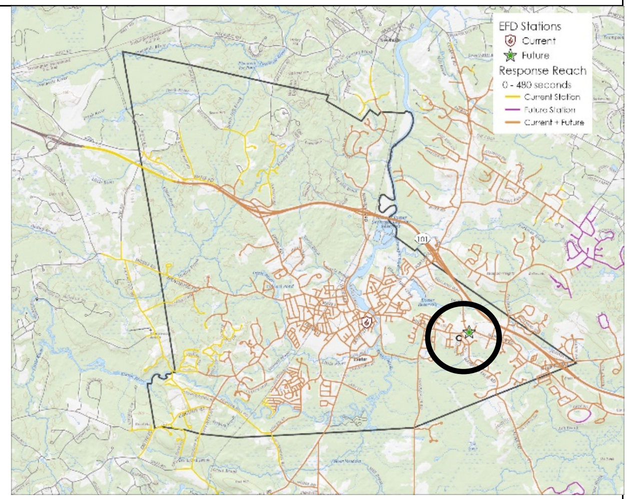
Option A is more centrally located within the town. From a fire department response standpoint, this location can enable service to some of the core demand for fire and EMS within 240 seconds (northwest portion of highest demand area), all of the core demand area for fire and EMS within 480 seconds, as well as almost all of the town within 480 seconds.

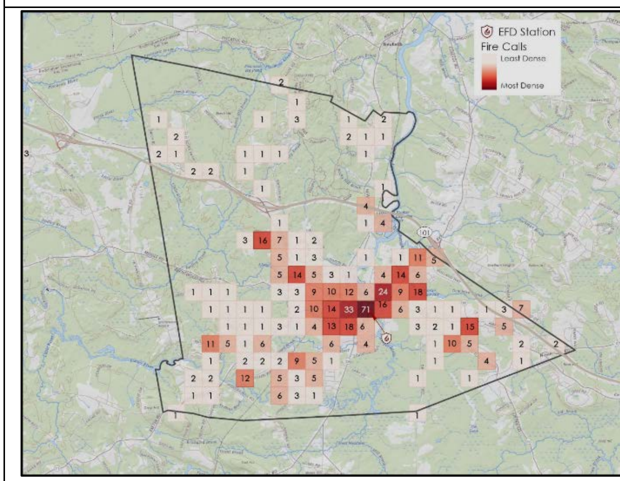
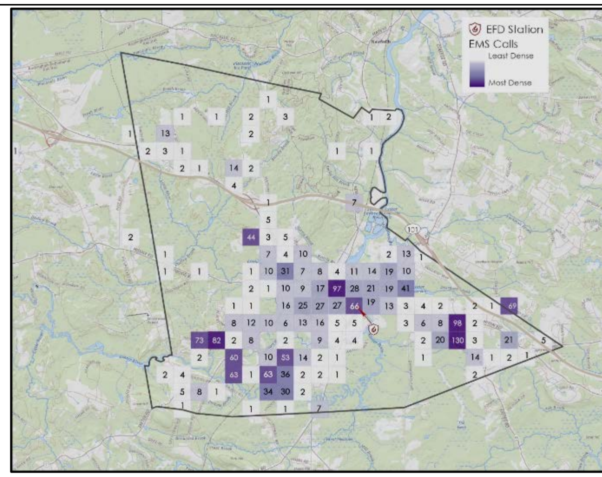
FIGURE 6-4: Alternate Public Safety Building Location: Option B



Option B is located in the southwest portion the town. From a fire department response standpoint, this location can enable service to the western portion of the core demand area for fire and EMS within 240 seconds, all of the core demand for fire and EMS within 480 seconds, as well as almost all of the town within 480 seconds.

FIGURE 6-5: Alternate Public Safety Building Location: Option C

240-Seconds Travel Time	480-Seconds Travel Time
	

Fire Demand	EMS Demand
	

Option C is located in the southeast portion the town. From a fire department response standpoint, this location can enable service to almost all of the core demand area for fire and EMS within 240 seconds, all of the core demand for fire and EMS within 480 seconds, as well as almost all of the town within 480 seconds.

An analysis of each option shows that, from a fire protection and EMS perspective, Option C provides the optimal response location for the current, core demand area for fire and EMS. However, this location may create unintended consequences for travel of fire apparatus north and west of the facility during congested times of the day.

An alternate concept could also be contemplated wherein a new facility is staffed while the current public safety facility is maintained with unmanned fire apparatus for callback staffing when needed. Under this scenario, Option A potentially may provide the greatest utility for fire and EMS service delivery, combined with maintaining the current public safety facility for use of additionally staffed units (future considerations), or for staffing with call back personnel, as is common on certain incidents. This would provide the greatest coverage for fire and EMS service delivery. Additionally, and for longer term planning considerations for when there may be increased built upon property and population/demand increases, Options A and C expand service delivery coverage for Fire and EMS even more, providing response coverage at increased levels, with units responding into the dense core downtown area as opposed to out of and through heavier traffic patterns, to incidents in other areas of the town. Of course, this would mean two new public safety facilities (one combined police and fire and one fire).

Recommendation:

- CPSM recommends the town complete a space needs assessment for fire, police, emergency operations center, and emergency communications along with a location study for a facility to adequately house and accommodate necessary parking for fire, police, emergency communications, and the emergency operations center. Once these studies are completed, CPSM further recommends the town consider the concept of a single public safety building if the concept proves to be cost efficient, as such a facility would meld joint use areas where applicable for staff and cost efficiencies. (Recommendation No. 17.)

SECTION 7. DATA ANALYSIS

INTRODUCTION

This data analysis examines all calls for service involving the Exeter Fire Department between September 1, 2018, and August 31, 2019, as recorded in the Exeter Police Department's computer-aided dispatch (CAD) system and the EFD's National Fire Incident Reporting System (NFIRS).

This analysis is made up of five parts. The first part focuses on call types and dispatches. The second part explores the time spent and workload of individual units. The third part presents an analysis of the busiest hours in the year studied. The fourth part provides a response time analysis of EFD units. The fifth and final part is an analysis of unit transports.

During the year covered by this study, EFD operated out of one station, utilizing three engines, two ambulances, one forestry truck, one fire alarm truck, one ladder truck, one squad, and one utility unit, as well as three command vehicles and one fire prevention unit.

During the study period, the Exeter Fire Department handled 3,917 calls, of which 48 percent were EMS calls. These calls included 1,190 fire prevention and nonemergency calls, as well as an additional 28 calls that were removed during data processing. The total combined workload (deployed time) for all EFD units excluding the removed calls was 1,736.2 hours. The average dispatch time for the first arriving unit was 1.2 minutes and the average response time of the first arriving EFD unit was 7.2 minutes. The 90th percentile dispatch time was 3.4 minutes and the 90th percentile response time was 10.0 minutes.

Methodology

In this report, CPSM analyzes calls and runs. A call is an emergency service request or incident. A run is a dispatch of a unit (i.e., a unit responding to a call). Thus, a call may include multiple runs.

We received CAD data, NFIRS data, and NHTEMSIS data for the Exeter Fire Department. We first matched the NFIRS, NHTEMSIS, and CAD data based on incident numbers provided. Then, we classified the calls in a series of steps. We first used the NFIRS incident type to identify canceled calls and to assign EMS, motor vehicle accident (MVA), and fire category call types when available. When the NFIRS incident type was not available, we instead used the call description as recorded in the CAD data. EMS calls were then assigned detailed categories based on the working diagnosis or dispatch reason of the call as recorded in NHTEMSIS. A further explanation for how call types were assigned is available in Attachment V. Mutual aid calls were identified based on the information recorded in the CAD data's jurisdiction and call description fields.

695 incidents found in the CAD data described as "Fire, Dept. Business / Non Emer." were not included in this study, as this designation is used to alert dispatch that apparatus is on air but not on a call. Table 7-1 breaks down the remaining 3,917 calls by call type.

At this point, we removed several types of calls and runs from all other analyses in the first five sections of the report. 1,190 fire prevention and nonemergency service calls, and 1,235 runs associated with these calls, were removed here. These calls are further examined in Attachment II. Next, we removed 70 remaining units without an en route and arrive time; these had a combined workload of 3.8 hours over the course of the year. After excluding these units, 17 calls had no additional responding units and were also removed. Lastly, we removed 80 responding administrative units, as well as 11 associated calls for which the only responding units were administrative units. The workload of all administrative units in the original 3,917 calls is documented in Attachment III. Due to these exclusions, after an initial analysis of calls by type, the rest of the first five sections of the report focuses on the remaining 2,699 calls.

In this report, canceled and mutual aid calls are included in all analyses other than the response time analyses.

AGGREGATE CALL TOTALS AND RUNS

During the year studied, EFD handled 3,917 calls. Of these, 22 were structure fire calls and 23 were outside fire calls within EFD's jurisdiction.

Calls by Type

The following table and two figures show the number of calls by call type, average calls per day, and the percentage of calls that fall into each call type category for the 12-month period studied.

TABLE 7-1: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Breathing difficulty	98	0.3	2.5
Cardiac and stroke	159	0.4	4.1
Fall and injury	271	0.7	6.9
Illness and other	1,004	2.8	25.6
MVA	100	0.3	2.6
Overdose and psychiatric	179	0.5	4.6
Seizure and unconsciousness	79	0.2	2.0
EMS Total	**1,890**	**5.2**	**48.3**
False alarm	339	0.9	8.7
Good intent	42	0.1	1.1
Hazard	128	0.4	3.3
Outside fire	23	0.1	0.6
Public service	135	0.4	3.4
Structure fire	22	0.1	0.6
Fire Total	**689**	**1.9**	**17.6**
Canceled	33	0.1	0.8
Fire prevention	289	0.8	7.4
Mutual aid	115	0.3	2.9
Nonemergency service calls	901	2.5	23.0
Other Total	**1,338**	**3.7**	**34.1**
Total	**3,917**	**10.7**	**100.0**

FIGURE 7-1: EMS Calls by Type

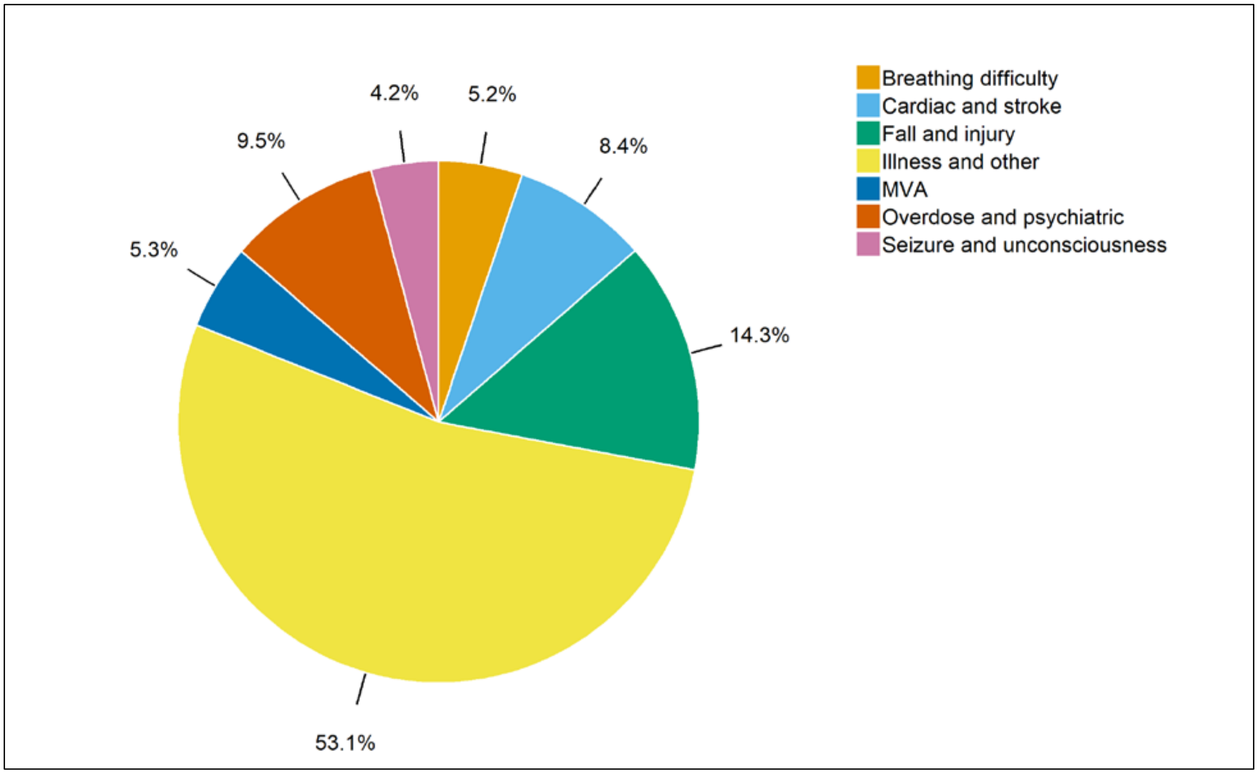
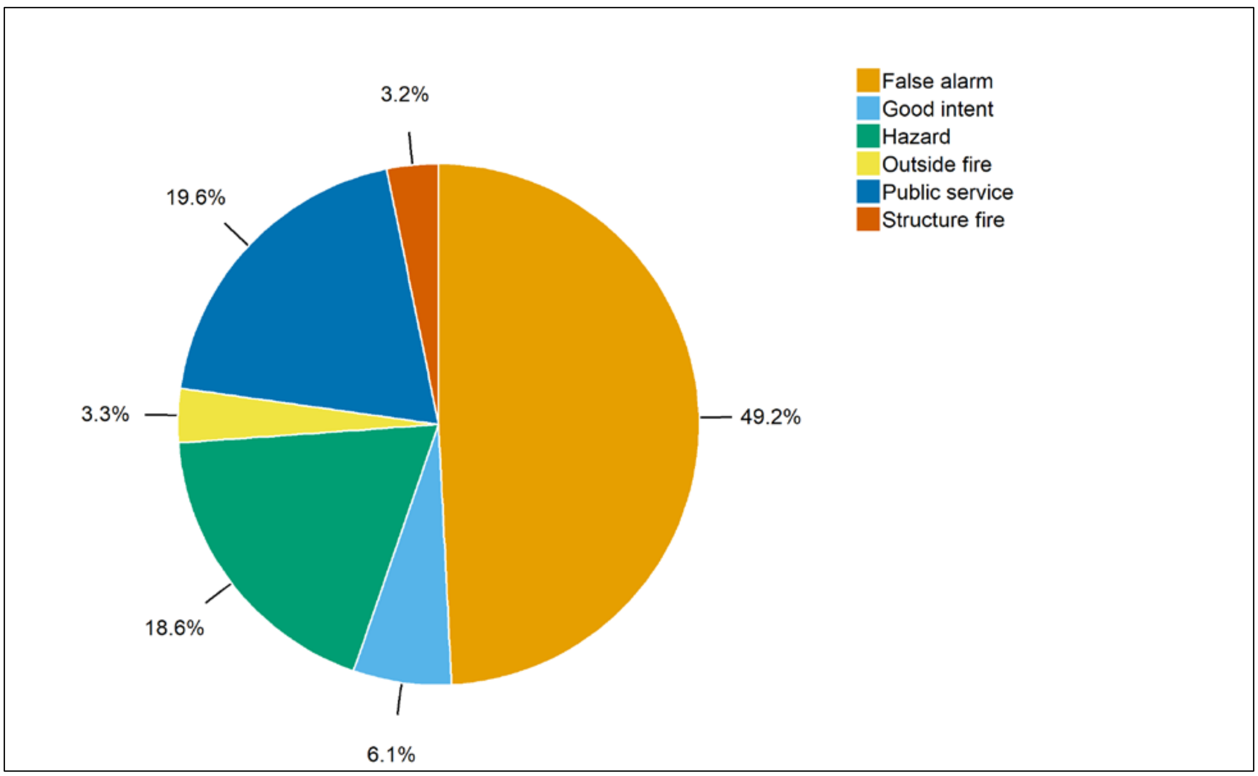


FIGURE 7-2: Fire Calls by Type



Observations:

Overall

- The department handled an average of 10.7 calls per day, including 0.1 canceled calls, 0.8 fire prevention calls, 0.3 mutual aid calls, and 2.5 nonemergency service calls.
- EMS calls for the year totaled 1,890 (48 percent of all calls), an average of 5.2 per day.
- Fire calls for the year totaled 689 (18 percent of all calls), an average of 1.9 per day.

EMS

- Illness and other calls were the largest category of EMS calls at 53 percent of EMS calls, an average of 2.8 calls per day.
- Cardiac and stroke calls made up 8 percent of EMS calls, an average of 0.4 calls per day.
- Motor vehicle accidents made up 5 percent of EMS calls, an average of 0.3 calls per day.

Fire

- False alarm calls were the largest category of fire calls at 49 percent of fire calls, an average of 0.9 calls per day.
- Structure and outside fire calls combined made up 7 percent of fire calls, an average of 0.1 calls per day, or one call every 8 days.

Calls by Type and Duration

From this point forward, we exclude several types of calls, as described in the methodology section. We excluded 1,190 fire prevention and nonemergency service calls. In addition, 17 calls were excluded as no unit recorded an en route or arrival time. Finally, 11 calls were excluded as their only responding units were administrative. As a result, 2,699 calls remain.

The following table shows the duration of calls by type using three duration categories: less than 30 minutes, 30 minutes to one hour, and more than one hour.

TABLE 7-2: Calls by Type and Duration

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One or More Hours	Total
Breathing difficulty	14	78	6	98
Cardiac and stroke	12	121	26	159
Fall and injury	97	160	14	271
Illness and other	409	539	52	1,000
MVA	60	29	10	97
Overdose and psychiatric	66	101	12	179
Seizure and unconsciousness	14	58	7	79
EMS Total	**672**	**1,086**	**127**	**1,885**
False alarm	319	17	1	337
Good intent	39	3	0	42
Hazard	100	19	8	127
Outside fire	16	6	1	23
Public service	110	6	5	121
Structure fire	10	5	7	22
Fire Total	**594**	**56**	**22**	**672**
Canceled	28	3	0	31
Mutual aid	40	42	29	111
Total	**1,334**	**1,187**	**178**	**2,699**

Observations:

EMS

- A total of 1,758 EMS calls (93 percent) lasted less than one hour, and 127 EMS calls (7 percent) lasted one or more hours.
- On average, there were 0.3 EMS calls per day that lasted more than one hour.
- A total of 133 cardiac and stroke calls (84 percent) lasted less than one hour, and 26 cardiac and stroke calls (16 percent) lasted one or more hours.
- A total of 89 motor vehicle accidents (90 percent) lasted less than one hour, and 10 motor vehicle accidents (10 percent) lasted one or more hours.

Fire

- A total of 650 fire calls (97 percent) lasted less than one hour, and 22 fire calls (3 percent) lasted one or more hours.
- On average, there were 0.1 fire calls per day that lasted more than one hour.
- A total of 15 structure fire calls (68 percent) lasted less than one hour, and 7 structure fire calls (32 percent) lasted one or more hours.
- A total of 22 outside fire calls (96 percent) lasted less than one hour, and 1 outside fire call (4 percent) lasted one or more hours.
- A total of 337 false alarm calls (99 percent) lasted less than one hour, and 1 false alarm call (less than 1 percent) lasted one or more hours.

Average Calls per Day and per Hour

The following figure shows the monthly variation in the average daily number of calls handled by the EFD during the year studied. Similarly, Figure 7-4 illustrates the average number of calls received each hour of the day over the course of the year.

FIGURE 7-3: Average Calls per Day, by Month

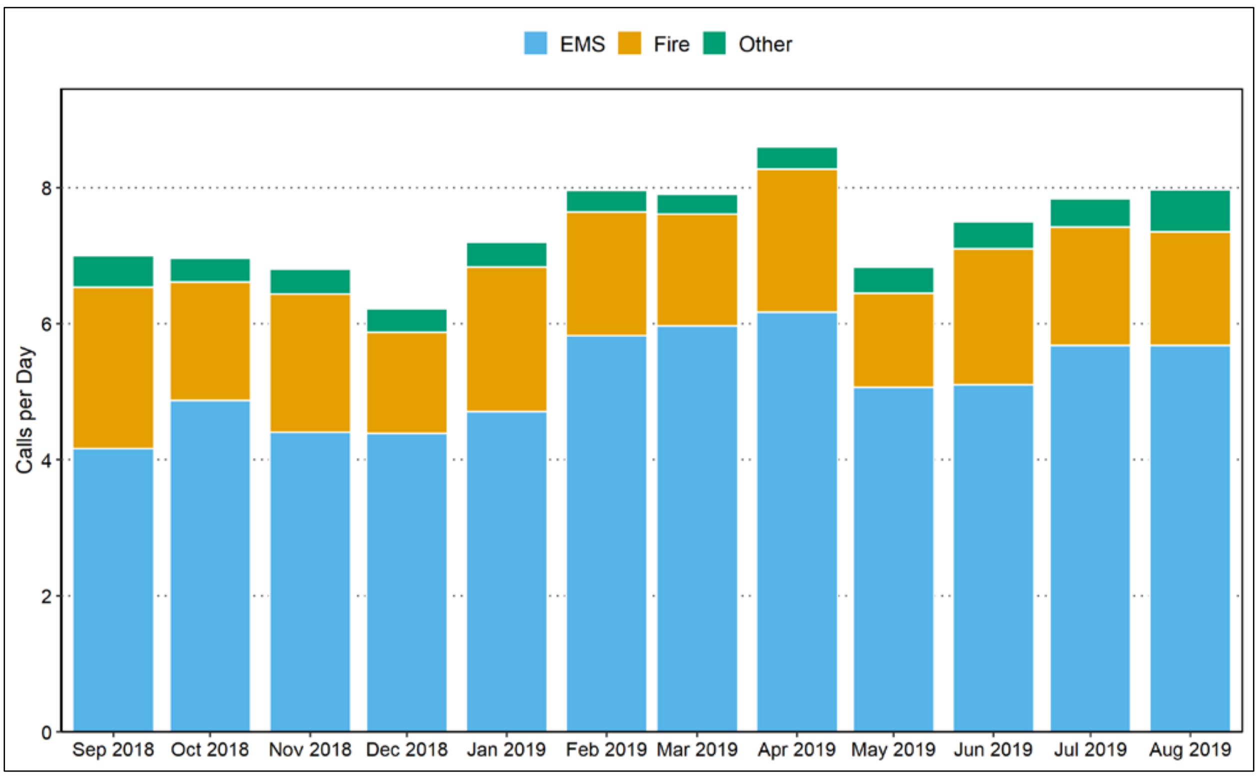
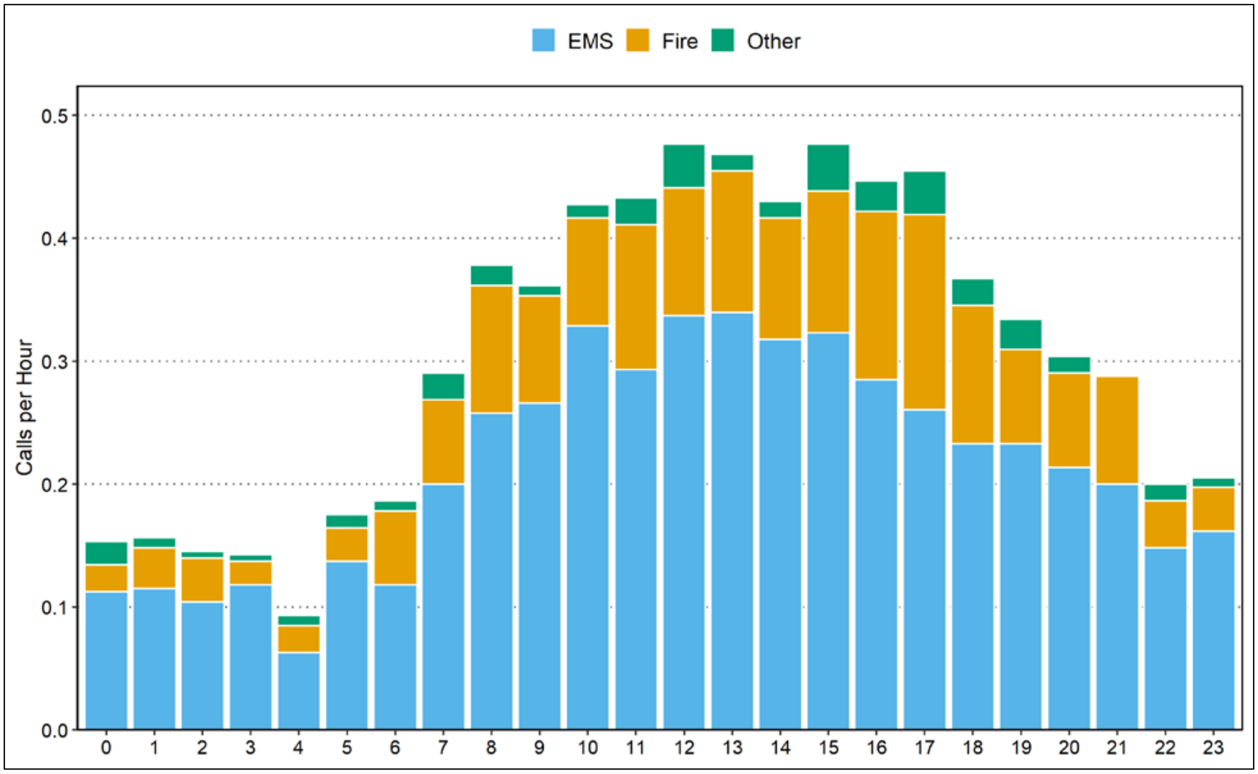


FIGURE 7-4: Calls by Hour of Day



Observations:

Average Calls per Month

- Average EMS calls per day ranged from 4.2 in September 2018 to 6.2 in April 2019.
- Average fire calls per day ranged from 1.4 in May 2019 to 2.4 in September 2018.
- Average other calls per day ranged from 0.3 in March 2019 to 0.6 in August 2018.
- Average calls per day overall ranged from 6.2 in December 2018 to 8.6 in April 2019.

Average Calls per Hour

- Average EMS calls per hour ranged from 0.06 between 4:00 a.m. and 5:00 a.m. to 0.34 between 1:00 p.m. to 2:00 p.m.
- Average fire calls per hour ranged from 0.02 between 3:00 a.m. and 4:00 a.m. to 0.16 between 5:00 p.m. and 6:00 p.m.
- Average other calls per hour ranged from less than 0.01 between 2:00 a.m. and 4:00 a.m. to 0.04 between 3:00 p.m. to 4:00 p.m.
- Average calls per hour ranged from 0.09 between 4:00 a.m. and 5:00 a.m. to 0.48 between noon and 1:00 p.m. and between 3:00 p.m. and 4:00 p.m.

Units Dispatched to Calls

The following table and two figures detail the number of EFD calls with one, two, or three or more units dispatched overall and broken down by call type.

TABLE 7-3: Calls by Call Type and Number of Units Dispatched

Call Type	Number of Units			Total Calls
	One	Two	Three or More	
Breathing difficulty	79	19	1	98
Cardiac and stroke	114	45	0	159
Fall and injury	258	13	0	271
Illness and other	916	83	1	1,000
MVA	4	88	7	99
Overdose and psychiatric	148	30	1	179
Seizure and unconsciousness	61	18	0	79
EMS Total	**1,580**	**296**	**9**	**1,885**
False alarm	100	232	5	337
Good intent	16	24	2	42
Hazard	66	59	2	127
Outside fire	11	10	2	23
Public service	104	16	1	121
Structure fire	3	10	9	22
Fire Total	**300**	**351**	**21**	**672**
Canceled	17	14	0	31
Mutual aid	105	5	1	111
Total	**2,002**	**666**	**31**	**2,699**
Percentage	**74.2**	**24.7**	**1.1**	**100.0**

FIGURE 7-5: Calls by Number of Units Arriving – EMS

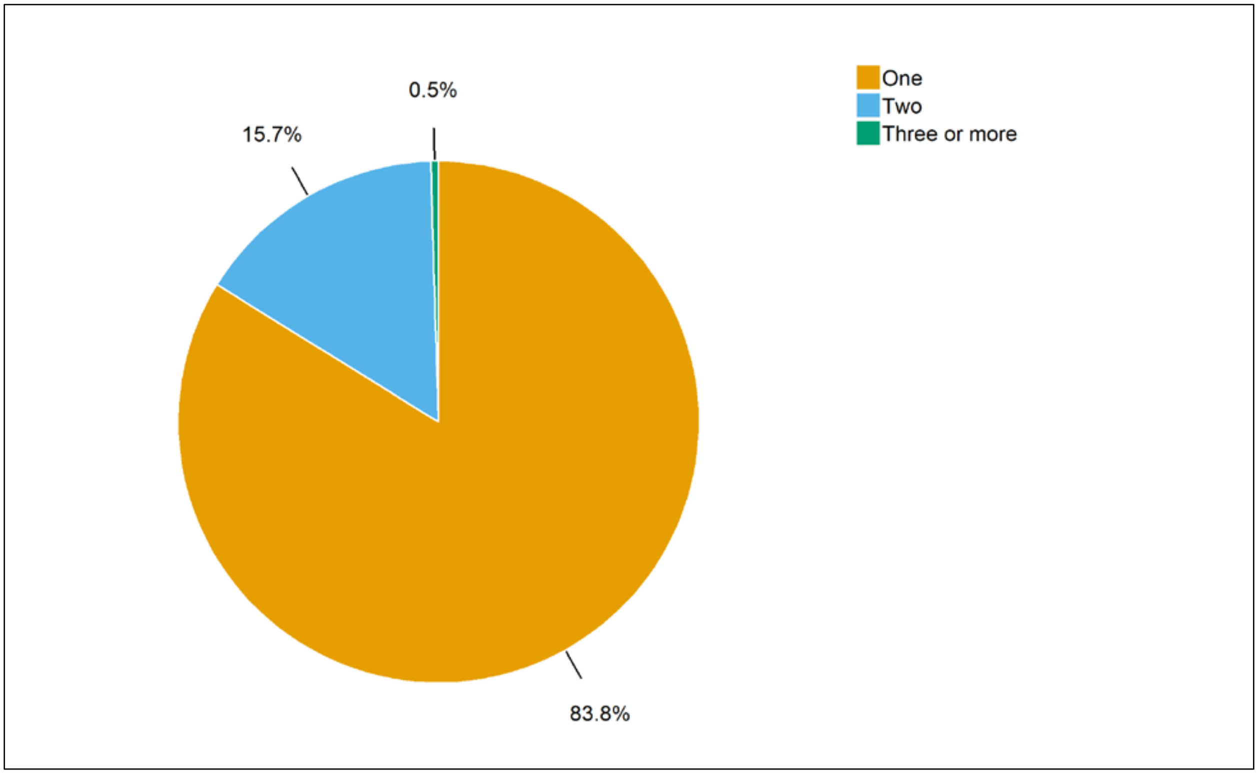
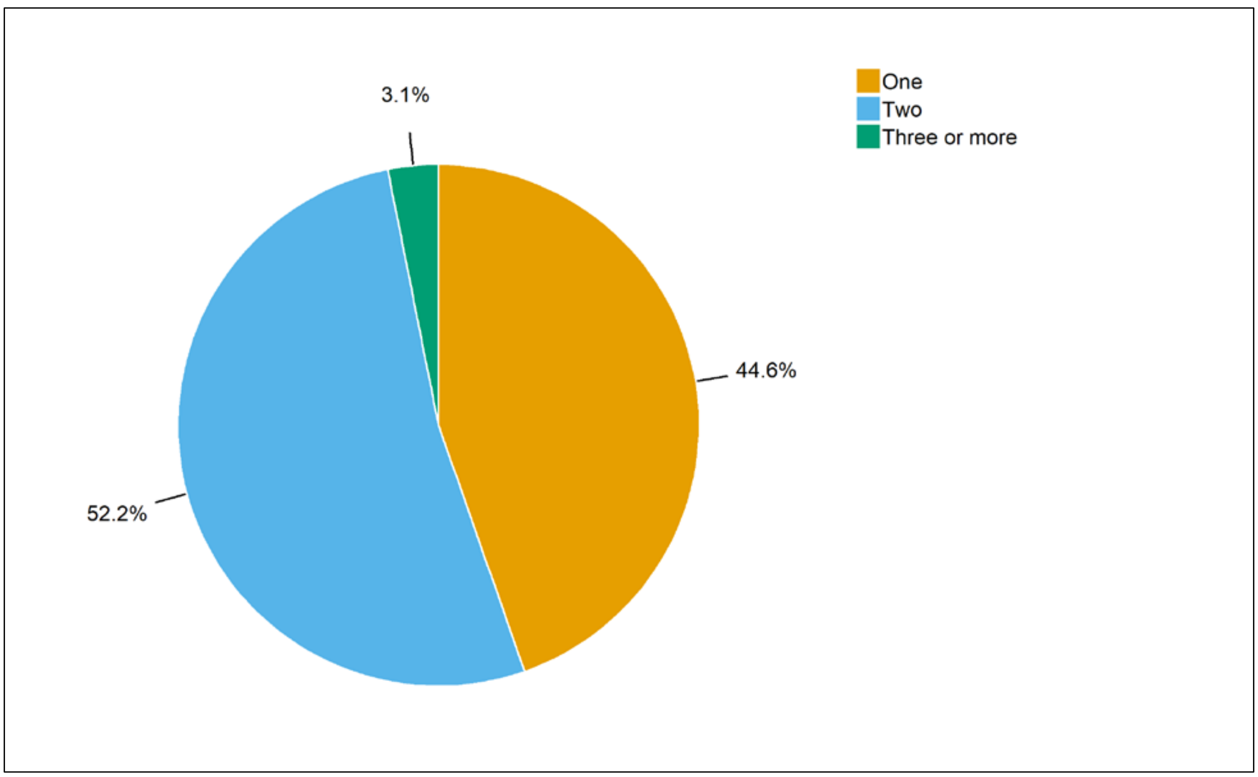


FIGURE 7-6: Calls by Number of Units Arriving – Fire



Observations:

Overall

- On average, 1.3 units were dispatched to all calls; for 74 percent of calls only one unit was dispatched.
- Overall, three or more units were dispatched to 1 percent of calls.

EMS

- For EMS calls, one unit was dispatched 84 percent of the time, two units were dispatched 16 percent of the time, and three or more units were dispatched less than 1 percent of the time.
- On average, 1.2 units were dispatched per EMS call.

Fire

- For fire calls, one unit was dispatched 45 percent of the time, two units were dispatched 52 percent of the time, and three or more units were dispatched 3 percent of the time.
- On average, 1.6 units were dispatched per fire call.
- For outside fire calls, three or more units were dispatched 9 percent of the time.
- For structure fire calls, three or more units were dispatched 41 percent of the time.

WORKLOAD: RUNS AND TOTAL TIME SPENT

The workload of each unit is measured in two ways: runs and deployed time. The deployed time of a run is measured from the time a unit is dispatched through the time the unit is cleared. Because multiple units respond to some calls, there are more runs than calls and the average deployed time per run varies from the total duration of calls.

Runs and Deployed Time – All Units

Deployed time, also referred to as deployed hours, is the total deployment time of all units deployed on all runs. The following table shows the total deployed time, both overall and broken down by type of run, for EFD units during the year studied.

TABLE 7-4: Annual Runs and Deployed Time by Run Type

Call Type	Deployed Minutes per Run	Total Annual Hours	Percent of Total Hours	Deployed Minutes per Day	Total Annual Runs	Runs per Day
Breathing difficulty	38.9	76.6	4.4	12.6	118	0.3
Cardiac and stroke	43.0	146.2	8.4	24.0	204	0.6
Fall and injury	33.5	158.7	9.2	26.1	284	0.8
Illness and other	32.7	590.8	34.1	97.1	1,085	3.0
MVA	26.8	90.7	5.2	14.9	203	0.6
Overdose and psychiatric	34.6	121.8	7.0	20.0	211	0.6
Seizure and unconsciousness	36.8	59.4	3.4	9.8	97	0.3
EMS Total	**33.9**	**1,244.1**	**71.8**	**204.5**	**2,202**	**6.0**
False alarm	15.6	150.3	8.7	24.7	580	1.6
Good intent	15.2	17.7	1.0	2.9	70	0.2
Hazard	24.4	77.7	4.5	12.8	191	0.5
Outside fire	26.8	16.5	1.0	2.7	37	0.1
Public service	24.1	56.3	3.3	9.3	140	0.4
Structure fire	56.1	52.3	3.0	8.6	56	0.2
Fire Total	**20.7**	**370.9**	**21.4**	**61.0**	**1,074**	**2.9**
Canceled	10.8	8.1	0.5	1.3	45	0.1
Mutual aid	55.7	109.5	6.3	18.0	118	0.3
Other Total	**43.3**	**117.6**	**6.8**	**19.3**	**163**	**0.4**
Total	**30.2**	**1,732.6**	**100.0**	**284.8**	**3,439**	**9.4**

Observations:

Overall

- The total deployed time for the year was 1,732.6 hours. The daily average was 4.7 hours for all units combined.
- There were 3,439 runs, including 45 runs dispatched for canceled calls and 118 runs dispatched for mutual aid calls. The daily average was 9.4 runs.

EMS

- EMS runs accounted for 72 percent of the total workload.
- The average deployed time for EMS runs was 33.9 minutes. The deployed time for all EMS runs averaged 3.4 hours per day.

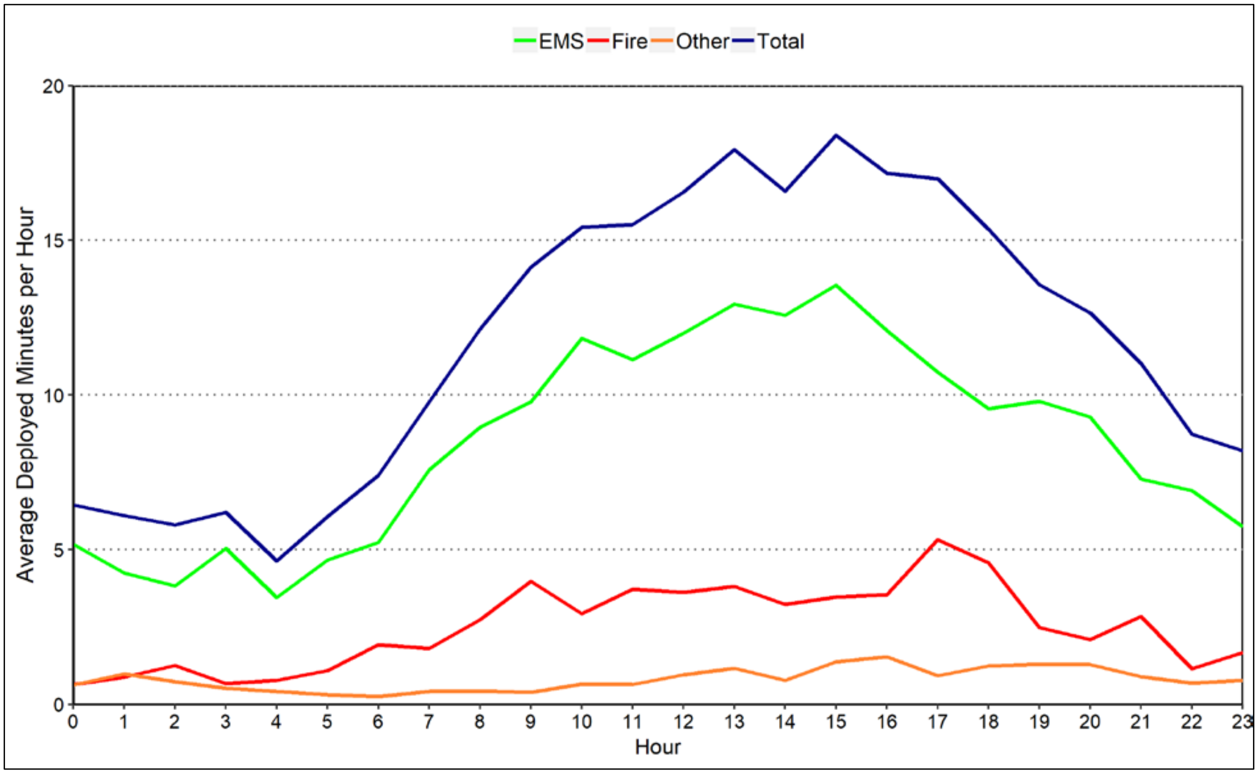
Fire

- Fire runs accounted for 21 percent of the total workload.
- The average deployed time for fire runs was 20.7 minutes. The deployed time for all fire runs averaged 1.0 hours per day.
- There were 93 runs for structure and outside fire calls combined, with a total workload of 68.8 hours. This accounted for 4 percent of the total workload.
- The average deployed time for outside fire runs was 26.8 minutes per run, and the average deployed time for structure fire runs was 56.1 minutes per run.

TABLE 7-5: Average Deployed Minutes by Hour of Day

Hour	EMS	Fire	Other	Total
0	5.2	0.6	0.6	6.4
1	4.2	0.9	1.0	6.1
2	3.8	1.3	0.7	5.8
3	5.0	0.7	0.5	6.2
4	3.4	0.8	0.4	4.6
5	4.7	1.1	0.3	6.1
6	5.2	1.9	0.2	7.4
7	7.6	1.8	0.4	9.8
8	9.0	2.7	0.4	12.1
9	9.8	4.0	0.4	14.1
10	11.8	2.9	0.7	15.4
11	11.1	3.7	0.6	15.5
12	12.0	3.6	1.0	16.6
13	12.9	3.8	1.2	17.9
14	12.6	3.2	0.8	16.6
15	13.6	3.5	1.4	18.4
16	12.1	3.5	1.5	17.2
17	10.7	5.3	0.9	17.0
18	9.6	4.6	1.2	15.4
19	9.8	2.5	1.3	13.6
20	9.3	2.1	1.3	12.7
21	7.3	2.8	0.9	11.0
22	6.9	1.2	0.7	8.7
23	5.7	1.7	0.8	8.2
Total	**203.3**	**60.2**	**19.2**	**282.8**

FIGURE 7-7: Average Deployed Minutes by Hour of Day



Observations:

- Hourly deployed time was highest during the day from noon to 6:00 p.m., averaging between 17 minutes and 18 minutes.
- The average deployed time peaked between 3:00 p.m. and 4:00 p.m., averaging 18 minutes.
- The average deployed time was lowest between 4:00 a.m. and 5:00 a.m., averaging 5 minutes.

Workload by Unit

Table 7-6 provides a summary of each unit's workload overall. Tables 7-7 and 7-8 provide a more detailed view of workload, showing each unit's runs broken out by run type (Table 7-7) and the resulting daily average deployed time by run type (Table 7-8).

TABLE 7-6: Call Workload by Unit

Unit ID	Unit Type	Avg. Deployed Min. per Run	Total Annual Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
19A1	Ambulance	35.6	1,064.7	175.0	1,794	4.9
19A2	Ambulance	34.3	153.2	25.2	268	0.7
19E2	Engine	19.1	233.1	38.3	732	2.0
19E4	Engine	27.6	40.0	6.6	87	0.2
19E5	Engine	59.7	44.8	7.4	45	0.1
19F1	Forestry truck	18.5	3.1	0.5	10	0.0
19FA	Fire alarm truck	30.1	2.0	0.3	4	0.0
19L1	Ladder truck	23.0	109.4	18.0	286	0.8
19S3	Squad	22.6	73.1	12.0	194	0.5
19U1	Utility	29.3	9.3	1.5	19	0.1
Total		**30.2**	**1,732.6**	**284.8**	**3,439**	**9.4**

Observations:

- 19A1 made the most runs (1,794, or an average of 4.9 runs per day) and had the highest total annual deployed time (1064.7 hours, or an average of 2.9 hours per day).
  - EMS calls accounted for 90 percent of runs and 92 percent of total deployed time.
  - Structure and outside fire calls accounted for less than 1 percent of runs and 1 percent of total deployed time.
- 19E2 made the second-most runs (732, or an average of 2.0 runs per day) and had the second-highest total annual deployed time (233.1 hours, or an average of 0.6 hours per day).
  - EMS calls accounted for 28 percent of runs and 28 percent of total deployed time.
  - Structure and outside fire calls accounted for 5 percent of runs and 11 percent of total deployed time.

TABLE 7-7: Total Annual Runs by Run Type and Unit

Unit ID	Unit Type	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Canceled	Mutual Aid	Total
19A1	Ambulance	1,621	27	7	26	2	25	5	9	72	1,794
19A2	Ambulance	251	4	0	2	0	4	0	1	6	268
19E2	Engine	203	281	29	78	17	83	21	15	5	732
19E4	Engine	18	25	8	13	7	6	5	4	1	87
19E5	Engine	1	7	0	3	0	2	6	7	19	45
19F1	Forestry truck	0	2	1	0	5	0	1	1	0	10
19FA	Fire alarm truck	1	0	0	2	0	1	0	0	0	4
19L1	Ladder truck	0	208	16	23	4	7	16	4	8	286
19S3	Squad	102	25	9	40	2	6	0	4	6	194
19U1	Utility	5	1	0	4	0	6	2	0	1	19
Total		**2,202**	**580**	**70**	**191**	**37**	**140**	**56**	**45**	**118**	**3,439**

TABLE 7-8: Daily Average Deployed Minutes by Run Type and Unit

Unit ID	Unit Type	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Canceled	Mutual Aid	Total
19A1	Ambulance	161.9	1.1	0.2	1.6	0.2	1.1	0.7	0.5	7.6	175.0
19A2	Ambulance	23.0	0.1	0.0	0.1	0.0	1.5	0.0	0.0	0.4	25.2
19E2	Engine	10.5	12.2	1.2	5.6	1.2	3.8	2.8	0.4	0.5	38.3
19E4	Engine	1.1	1.0	0.4	0.5	0.6	1.9	0.9	0.1	0.1	6.6
19E5	Engine	0.1	0.3	0.0	0.2	0.0	0.1	1.6	0.1	5.0	7.4
19F1	Forestry truck	0.0	0.1	0.0	0.0	0.3	0.0	0.1	0.0	0.0	0.5
19FA	Fire alarm truck	0.1	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.3
19L1	Ladder truck	0.0	8.8	0.7	1.8	0.3	0.3	2.1	0.1	4.0	18.0
19S3	Squad	7.4	1.1	0.4	2.4	0.1	0.2	0.0	0.1	0.2	12.0
19U1	Utility	0.4	0.0	0.0	0.4	0.0	0.2	0.4	0.0	0.1	1.5
Total		**204.5**	**24.7**	**2.9**	**12.8**	**2.7**	**9.3**	**8.6**	**1.3**	**18.0**	**284.8**

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 7-9 shows the number of hours in the year in which there were zero to three or more calls during the hour. Table 7-10 examines the number of times a call overlapped with another call. Table 7-11 shows the 10 one-hour intervals which had the most calls during the year.

TABLE 7-9: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	6,494	74.1
1	1,874	21.4
2	355	4.1
3+	37	0.4
Total	**8,760**	**100.0**

TABLE 7-10: Frequency of Overlapping Calls

Scenario	Number of Calls	Percent of All Calls	Total Hours
No overlapped call	2,278	84.4	1,246.1
Overlapped with one call	394	14.6	109.7
Overlapped with two calls	25	0.9	4.9
Overlapped with three calls	2	0.1	0.1

TABLE 7-11: Top 10 Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Deployed Hours
7/23/2019, 4:00 p.m. to 5:00 p.m.	4	6	2.6
7/6/2019, 3:00 p.m. to 4:00 p.m.	4	6	1.6
9/20/2018, noon to 1:00 p.m.	4	5	2.5
4/3/2019, 9:00 p.m. to 10:00 p.m.	4	4	3.0
2/13/2019, 1:00 p.m. to 2:00 p.m.	3	6	1.6
9/5/2018, 7:00 p.m. to 8:00 p.m.	3	5	2.7
1/21/2019, 5:00 p.m. to 6:00 p.m.	3	5	2.5
2/1/2019, 2:00 p.m. to 3:00 p.m.	3	5	1.5
10/8/2018, 3:00 p.m. to 4:00 p.m.	3	5	1.5
6/10/2019, 11:00 a.m. to noon	3	5	0.9

Note: Total deployed hours is a measure of the total time spent responding to calls received in the hour, and which may extend into the next hour or hours. The number of runs and deployed hours only includes EFD units.

Observations:

- During 37 hours (0.4 percent of all hours), three or more calls occurred; in other words, the department responded to three or more calls in an hour roughly once every 10 days.
  - The highest number of calls to occur in an hour was 4, which happened 4 times.
- One of the two hours with the most calls and most associated runs was 4:00 p.m. to 5:00 p.m. on July 23, 2019.
  - The hour's 4 calls involved 6 individual dispatches resulting in 2.6 hours of deployed time. These 4 calls included two illness and other calls, one overdose and psychiatric call, and one public service call.
- The other hour with the most calls and most associated runs was 3:00 p.m. to 4:00 p.m. on July 6, 2019.
  - The hour's 4 calls involved 6 individual dispatches resulting in 1.6 hours of deployed time. These 4 calls included three false alarm calls and one MVA call.

RESPONSE TIME

In this part of the analysis we present response time statistics for different call types. We separate response time into its identifiable components. *Dispatch time* is the difference between the time a call is received and the time a unit is dispatched. Dispatch time includes call processing time, which is the time required to determine the nature of the emergency and types of resources to dispatch. *Turnout time* is the difference between dispatch time and the time a unit is en route to a call's location. *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.

In this analysis, we included all 2,699 calls to which at least one non-administrative EFD unit responded, while excluding canceled and mutual aid calls. In addition, non-emergency calls and calls with a total response time of more than 30 minutes were excluded. Finally, we focused on units that had complete time stamps, that is, units with all components recorded, so that we could calculate each segment of response time.

Based on the methodology above, we excluded 142 canceled and mutual aid calls, 21 calls where no units recorded a valid on-scene time, 5 calls where the first arriving unit response was greater than 5 minutes, 51 nonemergency calls, and 175 calls where one or more segments of the first arriving units' response time could not be calculated due to missing or faulty data. As a result, in this section, a total of 2,305 calls are included in the analysis.

Response Time by Type of Call

Table 7-12 provides average dispatch, turnout, travel, and total response time for the first arriving unit to each call in the city, broken out by call type. Figures 7-8 and 7-9 illustrate the same information. Table 7-13 gives the 90th percentile time broken out in the same manner. A 90th percentile time means that 90 percent of calls had response times at or below that number. For example, Table 7-13 shows a 90th percentile response time of 10.0 minutes which means that 90 percent of the time a call had a response time of no more than 10.0 minutes.

TABLE 7-12: Average Response Time of First Arriving Unit, by Call Type

Call Type	Time (Min.)				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.2	2.0	4.3	7.5	95
Cardiac and stroke	1.0	2.0	4.3	7.4	154
Fall and injury	1.0	2.1	4.1	7.2	255
Illness and other	1.2	2.1	4.1	7.4	949
MVA	1.3	2.2	4.1	7.7	86
Overdose and psychiatric	1.3	1.8	3.6	6.8	169
Seizure and unconsciousness	1.4	1.9	3.2	6.4	74
EMS Total	**1.2**	**2.0**	**4.0**	**7.3**	**1,782**
False alarm	1.2	2.1	3.0	6.3	302
Good intent	1.1	2.1	3.3	6.5	35
Hazard	1.4	2.3	3.6	7.2	107
Outside fire	0.5	2.6	4.1	7.1	18
Public service	1.7	1.9	4.7	8.3	41
Structure fire	1.0	2.3	3.5	6.8	20
Fire Total	**1.2**	**2.1**	**3.3**	**6.7**	**523**
Total	**1.2**	**2.1**	**3.9**	**7.2**	**2,305**

FIGURE 7-8: Average Response Time of First Arriving Unit, by Call Type – EMS

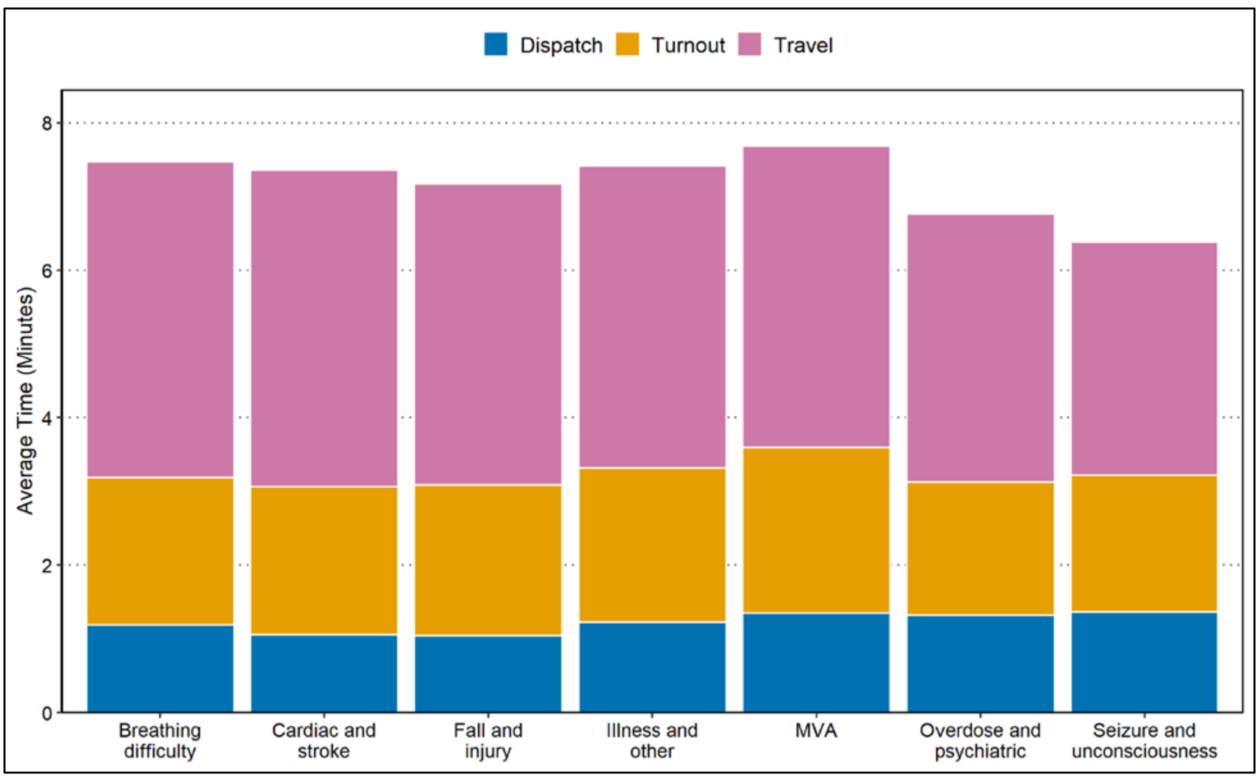


FIGURE 7-9: Average Response Time of First Arriving Unit, by Call Type – Fire

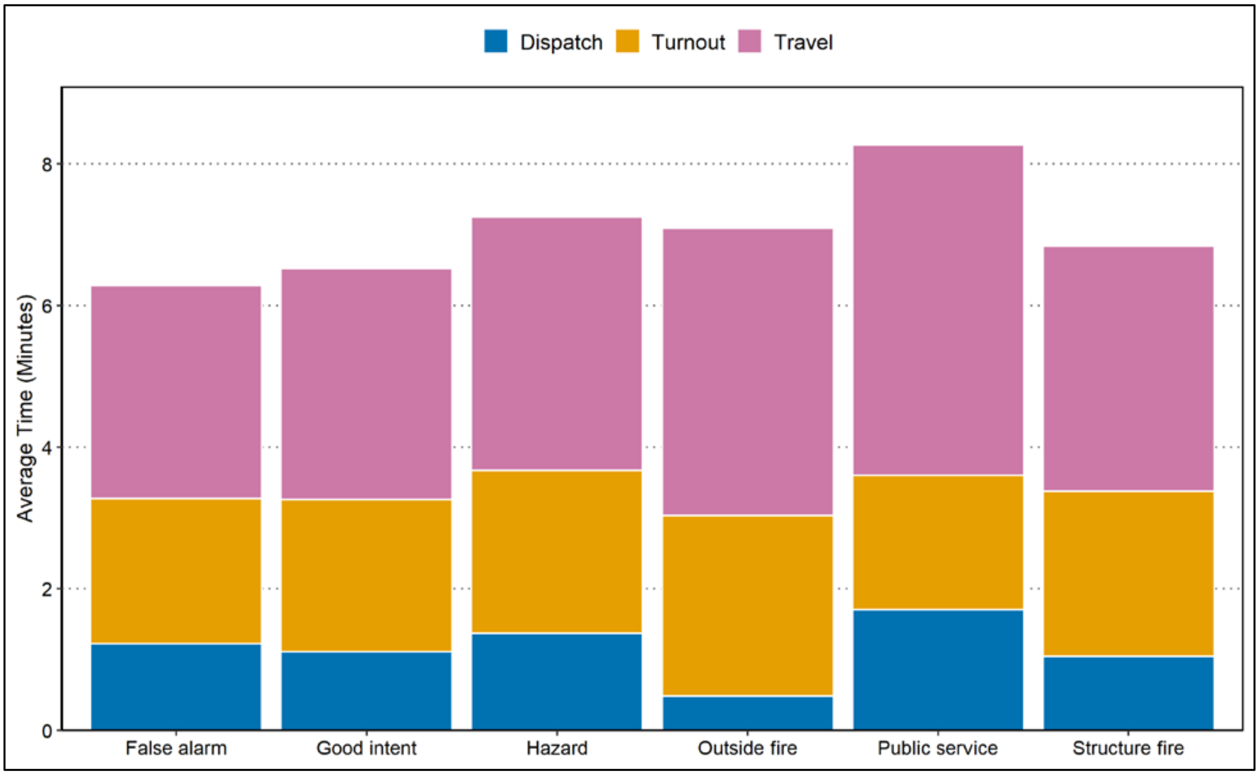


TABLE 7-13: 90th Percentile Response Time of First Arriving Unit, by Call Type

Call Type	Time (Min.)				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	3.5	3.5	6.2	10.1	95
Cardiac and stroke	3.1	3.8	6.8	9.6	154
Fall and injury	3.1	4.1	6.7	9.9	255
Illness and other	3.2	4.1	6.4	10.3	949
MVA	3.6	3.9	7.7	11.0	86
Overdose and psychiatric	3.2	3.7	6.2	10.3	169
Seizure and unconsciousness	3.5	4.3	5.0	9.2	74
EMS Total	**3.2**	**4.0**	**6.4**	**10.1**	**1,782**
False alarm	3.4	3.9	6.6	9.6	302
Good intent	3.7	4.0	5.5	8.8	35
Hazard	4.1	4.6	6.5	9.8	107
Outside fire	3.2	4.4	6.3	10.6	18
Public service	4.4	4.3	8.0	13.6	41
Structure fire	2.9	4.1	5.5	9.4	20
Fire Total	**3.7**	**4.0**	**6.6**	**9.8**	**523**
Total	**3.4**	**4.0**	**6.4**	**10.0**	**2,305**

Observations:

- The average dispatch time was 1.2 minutes.
- The average turnout time was 2.1 minutes.
- The average travel time was 3.9 minutes.
- The average total response time was 7.2 minutes.
- The average response time was 7.3 minutes for EMS calls and 6.7 minutes for fire calls.
- The average response time was 7.1 minutes for outside fires and 6.8 minutes for structure fires.
- The 90th percentile dispatch time was 3.4 minutes.
- The 90th percentile turnout time was 4.0 minutes.
- The 90th percentile travel time was 6.4 minutes.
- The 90th percentile total response time was 10.0 minutes.
- The 90th percentile response time was 10.1 minutes for EMS calls and 9.8 minutes for fire calls.
- The 90th percentile response time was 10.6 minutes for outside fires and 9.4 minutes for structure fires.

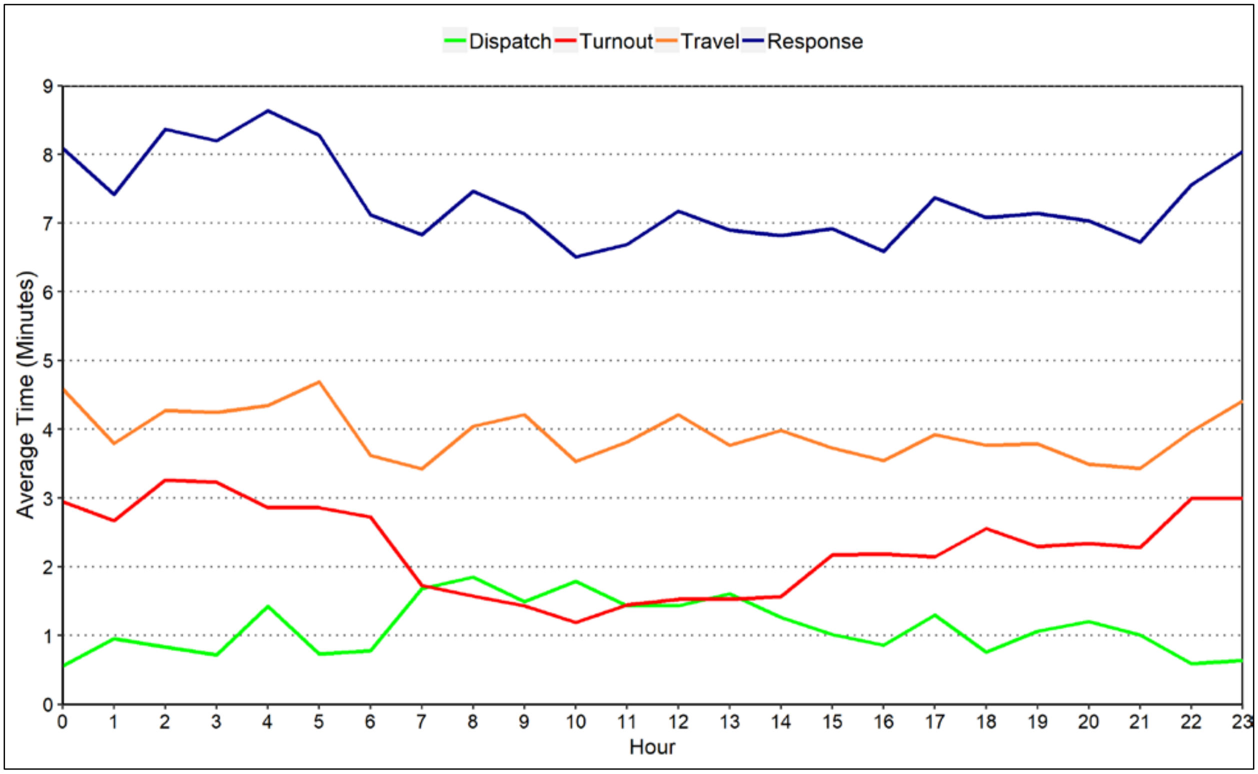
Response Time by Hour

Average dispatch, turnout, travel, and total response time by hour for calls are shown in the following table and figure. The table also shows 90th percentile response times.

TABLE 7-14: Average and 90th Percentile Response Time of First Arriving Unit, by Hour of Day

Hour	Time (Min.)					Number of Calls
	Dispatch	Turnout	Travel	Response	90th Percentile Response	
0	0.6	2.9	4.6	8.1	10.5	44
1	1.0	2.7	3.8	7.4	9.4	52
2	0.8	3.3	4.3	8.4	11.4	51
3	0.7	3.2	4.2	8.2	10.5	50
4	1.4	2.9	4.3	8.6	10.8	31
5	0.7	2.9	4.7	8.3	11.4	59
6	0.8	2.7	3.6	7.1	9.6	62
7	1.7	1.7	3.4	6.8	9.0	90
8	1.8	1.6	4.0	7.5	10.2	120
9	1.5	1.4	4.2	7.1	9.8	120
10	1.8	1.2	3.5	6.5	9.3	138
11	1.4	1.4	3.8	6.7	9.7	135
12	1.4	1.5	4.2	7.2	10.3	143
13	1.6	1.5	3.8	6.9	10.0	149
14	1.3	1.6	4.0	6.8	10.1	129
15	1.0	2.2	3.7	6.9	9.2	133
16	0.9	2.2	3.5	6.6	10.0	135
17	1.3	2.1	3.9	7.4	10.6	134
18	0.8	2.6	3.8	7.1	9.5	104
19	1.1	2.3	3.8	7.1	9.9	108
20	1.2	2.3	3.5	7.0	9.3	95
21	1.0	2.3	3.4	6.7	9.3	92
22	0.6	3.0	4.0	7.6	10.6	63
23	0.6	3.0	4.4	8.0	10.9	68
Total	**1.2**	**2.1**	**3.9**	**7.2**	**10.0**	**2,305**

FIGURE 7-10: Average Response Time of First Arriving Unit, by Hour of Day



Observations:

- Average dispatch time was between 0.6 minutes (midnight to 1:00 a.m.) and 1.8 minutes (8:00 a.m. to 9:00 a.m.).
- Average turnout time was between 1.2 minutes (10:00 a.m. to 11:00 a.m.) and 3.3 minutes (2:00 a.m. to 3:00 a.m.).
- Average travel time was between 3.4 minutes (7:00 a.m. to 8:00 a.m.) and 4.7 minutes (5:00 a.m. to 6:00 a.m.).
- Average response time was between 6.5 minutes (10:00 a.m. to 11:00 a.m.) and 8.6 minutes (4:00 a.m. to 5:00 a.m.).
- The 90th percentile response time was between 9.0 minutes (7:00 a.m. to 8:00 a.m.) and 11.4 minutes (2:00 a.m. to 3:00 a.m.).

Response Time Distribution

Here, we present a more detailed look at how response times to calls are distributed. The cumulative distribution of total response time for the first arriving unit to EMS calls is shown in the following figures and tables. Figure 7-11 shows response times for the first arriving EFD unit to EMS calls as a frequency distribution in whole-minute increments, and Figure 7-12 shows the same for the first arriving unit to outside and structure fire calls.

The cumulative percentages here are read in the same way as a percentile. In Figure 7-11, the 90th percentile of 10.1 minutes means that 90 percent of EMS calls had a response time of 10.1 minutes or less. In Table 7-15, the cumulative percentage of 64.4, for example, means that 64.4 percent of EMS calls had a response time under 8 minutes.

FIGURE 7-11: Cumulative Distribution of Response Time – First Arriving Unit – EMS

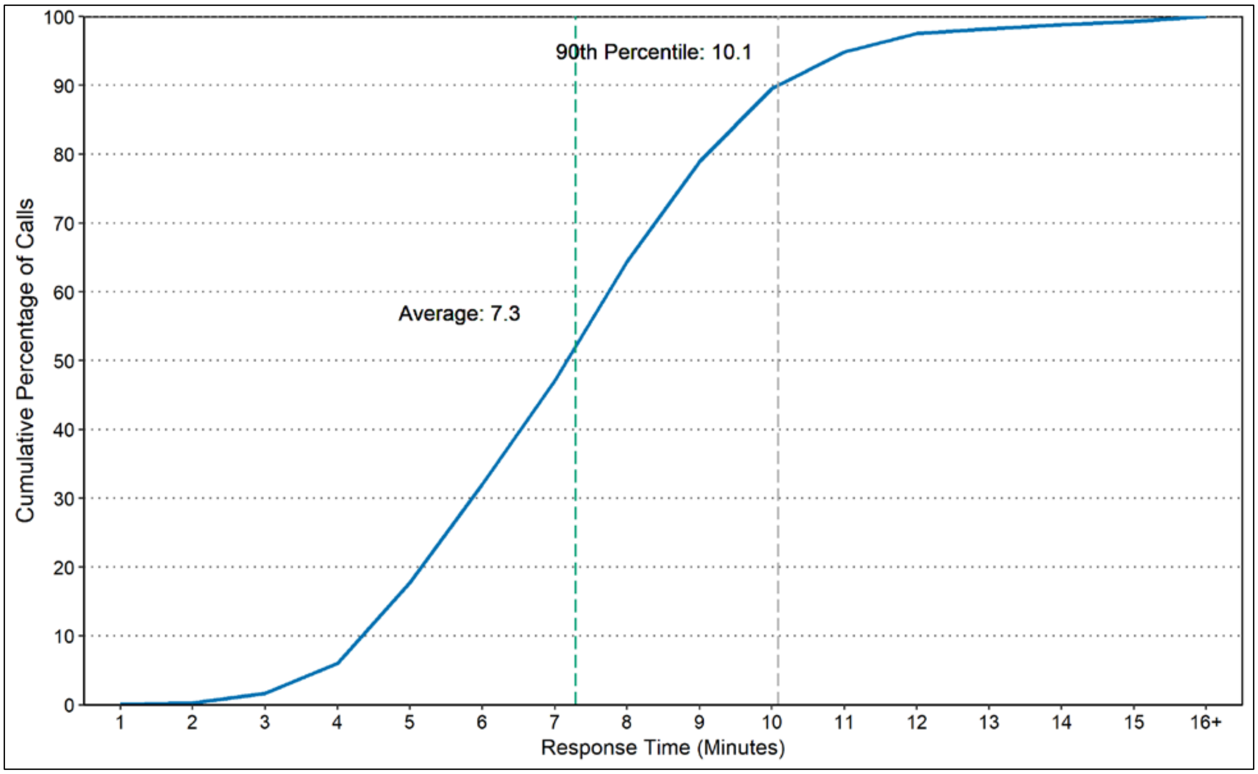


FIGURE 7-12: Cumulative Distribution of Response Time – First Arriving Unit – Outside and Structure Fires

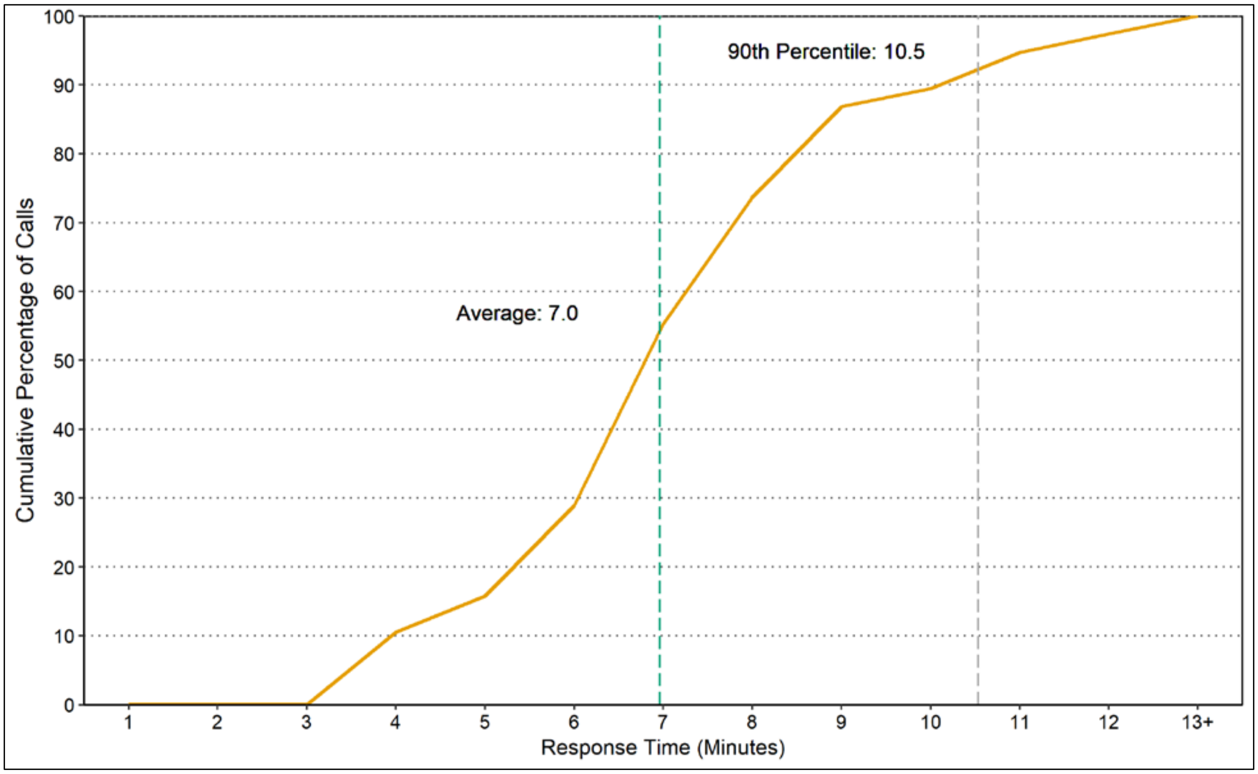


TABLE 7-15: Cumulative Distribution of Response Time – First Arriving Unit – EMS

Response Time (minute)	Frequency	Cumulative Percentage
1	1	0.1
2	3	0.2
3	26	1.7
4	78	6.1
5	208	17.7
6	255	32.0
7	268	47.1
8	308	64.4
9	259	78.9
10	189	89.5
11	95	94.8
12	48	97.5
13	12	98.2
14	11	98.8
15	8	99.3
16+	13	100.0

TABLE 7-16: Cumulative Distribution of Response Time – First Arriving Unit – Outside and Structure Fires

Response Time (minute)	Frequency	Cumulative Percentage
1	0	0.0
2	0	0.0
3	0	0.0
4	4	10.5
5	2	15.8
6	5	28.9
7	10	55.3
8	7	73.7
9	5	86.8
10	1	89.5
11	2	94.7
12	1	97.4
13+	1	100.0

Observations:

- For 64 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 74 percent of outside and structure fire calls, the response time of the first arriving unit was less than 8 minutes.

TRANSPORT CALL ANALYSIS

In this section we present an analysis of EFD unit activity that involved transporting patients, the variations by hour of day, and the average time for each stage of transport service. We identified transport calls by requiring that at least one responding EFD ambulance had recorded both "beginning to transport" time and "arriving at the hospital" time. Based on these criteria, note that 60 non-EMS calls that resulted in transports are included in this analysis.

Transport Calls by Type

The following table shows the number of calls by call type broken out by transport and non-transport calls.

TABLE 7-17: Transport Calls by Call Type

Call Type	Number of Calls			Conversion Rate
	Non-transport	Transport	Total	
Breathing difficulty	5	93	98	94.9
Cardiac and stroke	12	147	159	92.5
Fall and injury	58	213	271	78.6
Illness and other	335	665	1,000	66.5
MVA	62	37	99	37.4
Overdose and psychiatric	26	153	179	85.5
Seizure and unconsciousness	7	72	79	91.1
EMS Total	**505**	**1,380**	**1,885**	**73.2**
Fire & Other Total	**754**	**60**	**814**	**7.4**
Total	**1,259**	**1,440**	**2,699**	**53.4**

Observations:

- Overall, 73 percent of EMS calls that EFD responded to involved transporting one or more patients.
- On average, there were approximately 4 calls per day that involved transporting one or more patients.

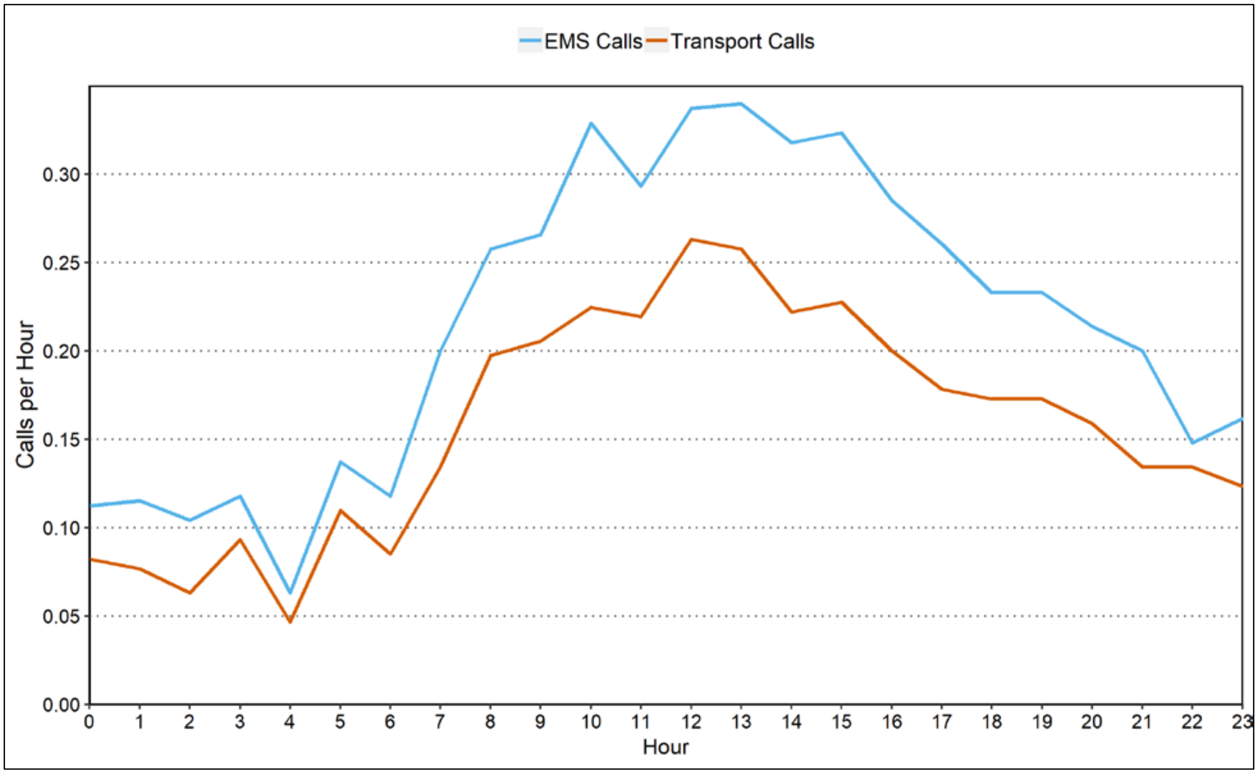
Average Transport Calls per Hour

The following table and figure show the average number of EMS calls received each hour of the day over the course of the year and the average number of transport calls. Transport calls categorized as fire, mutual aid, or canceled have been excluded from the table.

TABLE 7-18: Transport Calls per Day, by Hour

Hour	Number of EMS Calls	Number of Transport Calls	Transport Calls per Day	EMS Calls per Day	Conversion Rate
0	41	30	0.1	0.1	73.2
1	42	28	0.1	0.1	66.7
2	38	23	0.1	0.1	60.5
3	43	34	0.1	0.1	79.1
4	23	17	0.1	0.0	73.9
5	50	40	0.1	0.1	80.0
6	43	31	0.1	0.1	72.1
7	73	49	0.2	0.1	67.1
8	94	72	0.3	0.2	76.6
9	97	75	0.3	0.2	77.3
10	120	82	0.3	0.2	68.3
11	107	80	0.3	0.2	74.8
12	123	96	0.3	0.3	78.0
13	124	94	0.3	0.3	75.8
14	116	81	0.3	0.2	69.8
15	118	83	0.3	0.2	70.3
16	104	73	0.3	0.2	70.2
17	95	65	0.3	0.2	68.4
18	85	63	0.2	0.2	74.1
19	85	63	0.2	0.2	74.1
20	78	58	0.2	0.2	74.4
21	73	49	0.2	0.1	67.1
22	54	49	0.1	0.1	90.7
23	59	45	0.2	0.1	76.3

FIGURE 7-13: Average Transport Calls per Day, by Hour



Observations:

- Average hourly transport calls per day peaked between noon and 1:00 p.m., averaging 0.3 calls per day.
- Average hourly transport calls per day was lowest between 4:00 a.m. and 5:00 a.m., averaging fewer than 0.1 calls per day.

Transport Calls by Type and Duration

The following table shows the average duration of transport and non-transport EMS calls by call type.

TABLE 7-19: Transport Call Duration by Call Type

Call Type	Non-transport		Transport	
	Average Duration	Number of Calls	Average Duration	Number of Calls
Breathing difficulty	17.9	5	43.9	93
Cardiac and stroke	31.5	12	49.2	147
Fall and injury	16.0	58	39.3	213
Illness and other	18.6	335	41.6	665
MVA	24.1	62	50.1	37
Overdose and psychiatric	22.4	26	40.3	153
Seizure and unconsciousness	17.4	7	43.2	72
EMS Total	**19.4**	**505**	**42.4**	**1,380**
Fire & Other Total	**23.4**	**754**	**48.1**	**60**
Total	**21.8**	**1,259**	**42.6**	**1,440**

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

Observations:

- The average duration was 19.4 minutes for a non-transport EMS call.
- The average duration was 42.4 minutes for an EMS call where one or more patients were transported to a hospital.

Transport Time Components

The following table gives the average deployed time for an ambulance on a transport call, along with three major components of the deployed time: on-scene time, travel to hospital time, and at-hospital time.

The on-scene time is the interval calculated from when a unit arrives on-scene until it departs for the hospital. Travel to hospital time is the interval measured from the time the unit departs the scene until it arrives at the hospital. At-hospital time is the time it takes for patient turnover at the hospital.

The 1,440 transport calls resulted in 1,446 transports, since more than one transport may occur on a call. One run was excluded from this analysis as it had identical "arrive at hospital" and "clear hospital" time stamps.

TABLE 7-20: Time Component Analysis for Ambulance Transport Runs by Call Type

Call Type	Average Time Spent per Run (Min.)				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	17.6	5.9	14.1	43.9	93
Cardiac and stroke	19.8	6.3	16.7	49.2	148
Fall and injury	14.5	5.8	12.8	39.2	213
Illness and other	15.6	5.8	13.9	41.5	665
MVA	12.3	6.4	21.6	47.0	40
Overdose and psychiatric	14.7	5.4	14.6	40.2	154
Seizure and unconsciousness	17.3	5.6	15.1	43.1	72
EMS Total	**15.9**	**5.8**	**14.4**	**42.2**	**1,385**
Fire & Other Total	**13.4**	**9.2**	**16.4**	**47.9**	**60**
Total	**15.8**	**6.0**	**14.5**	**42.5**	**1,445**

Note: The average unit deployed time per run is lower than average call duration for some call types because call duration is based on the longest deployed time of any of the units responding to the same call, which may include an engine or ladder. Total deployed time is greater than the combination of on-scene, transport, and hospital wait times as it includes turnout, initial travel, and hospital return times.

Observations:

- The average time spent on scene for a transport call was 15.8 minutes.
- The average travel time from the scene of the call to the hospital was 6.0 minutes.
- The average deployed time spent on transport calls was 42.5 minutes.
- The average deployed time at the hospital was 14.5 minutes, which accounts for approximately 34 percent of the average total deployed time for a transport call.

ATTACHMENT I: ACTIONS TAKEN ANALYSIS

TABLE 7-21: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Outside Fire	Structure Fire
Action taken, other	5	0
Enforce codes	1	0
Extinguishment by fire service personnel	12	6
Fire control or extinguishment, other	1	2
Forcible entry	0	1
Incident command	20	21
Investigate	16	17
Provide information to public or media	1	1
Refer to proper authority	0	1
Restore fire alarm system	0	2
Salvage & overhaul	1	2
Search	0	1
Ventilate	3	6

Note: Totals are higher than the total number of structure fire and outside fire calls because some calls had more than one action taken.

Observations:

- Out of 23 outside fires, 12 were extinguished by fire service personnel, which accounted for 52.2 percent of outside fires.
- Out of 22 structure fires, 6 were extinguished by fire service personnel, which accounted for 27.3 percent of structure fires.

ATTACHMENT II: FIRE PREVENTION AND NON-EMERGENCY SERVICE CALLS

Over the course of the year covered by this study, the EFD handled 1,190 fire prevention or non-emergency service calls. In this attachment, we further examine these calls.

Figure 7-14 shows the monthly variation in the average daily number of fire prevention and nonemergency service calls handled by EFD during the year studied. Similarly, Figure 7-15 illustrates the average number of calls handled each hour of the day over the course of the year.

FIGURE 7-14: Calls by Month - Fire Prevention and Non-emergency Service Calls

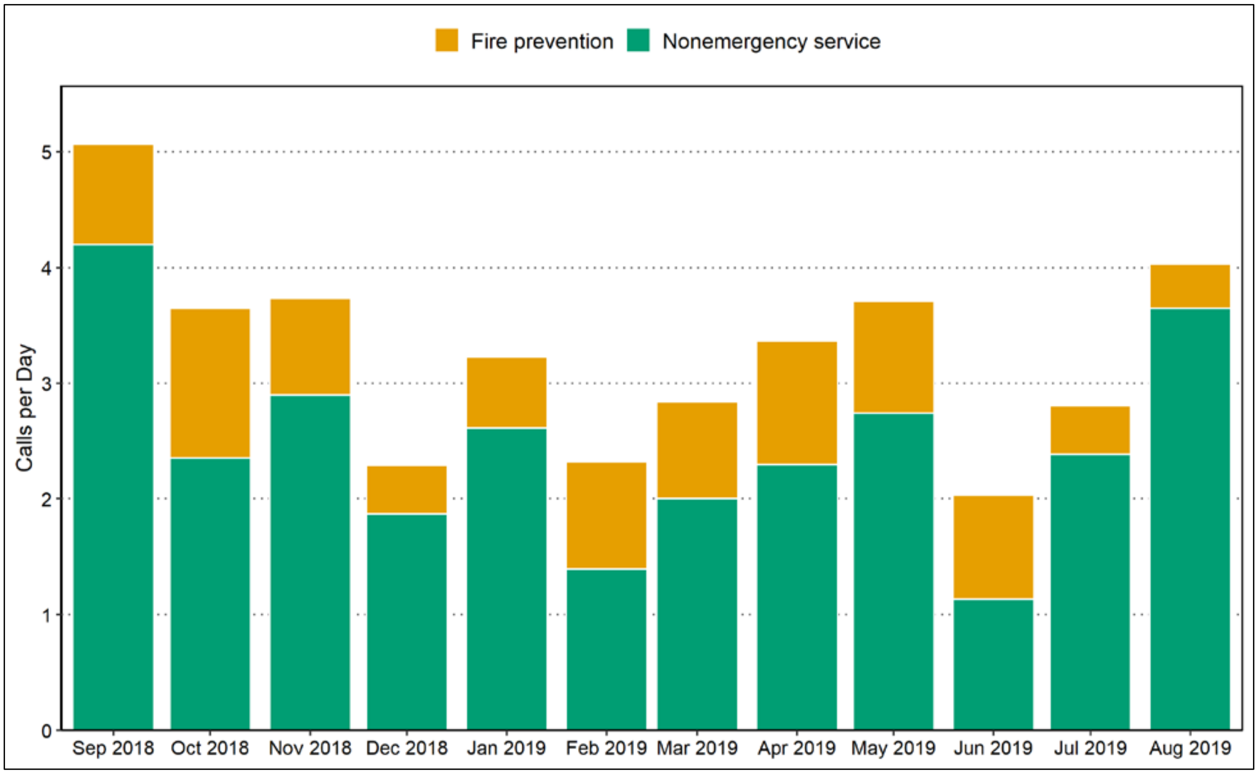
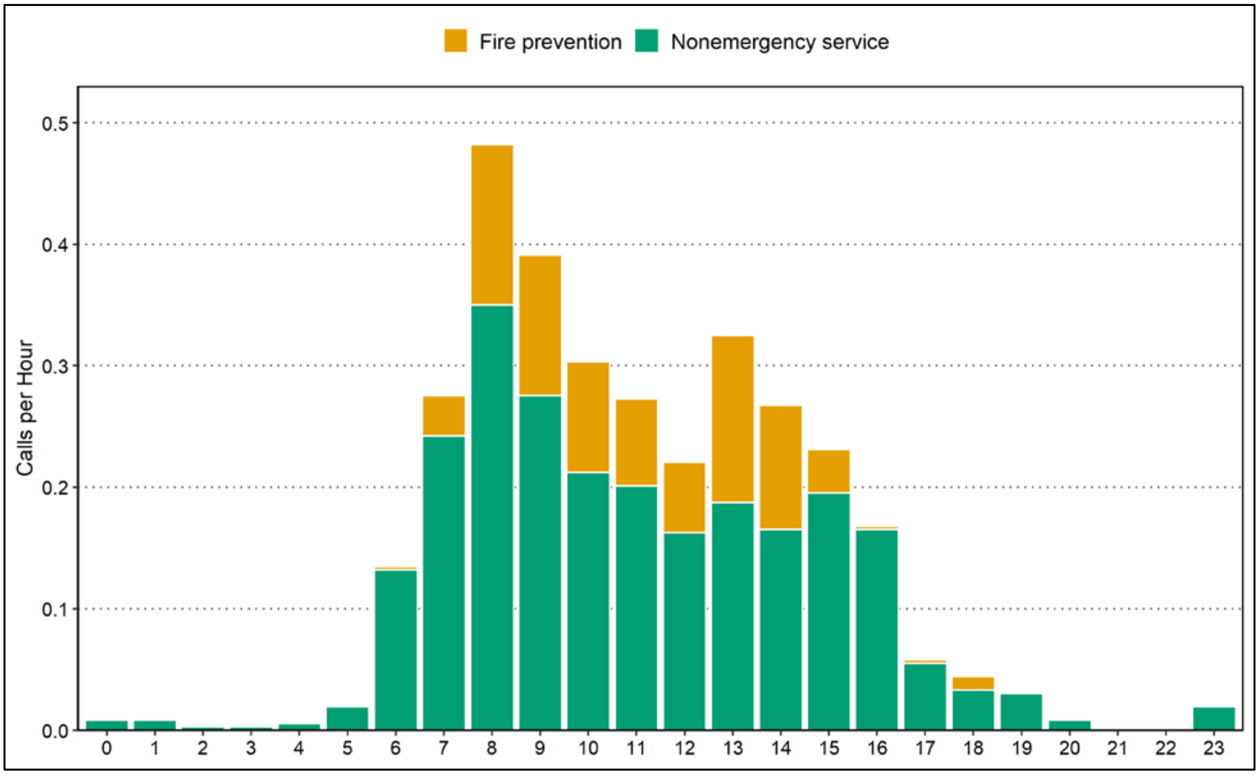


FIGURE 7-15: Calls by Hour of Day - Fire Prevention and Non-emergency Service Calls



Observations:

Average Calls per Month

- Average fire prevention calls per day ranged from 0.4 in August 2019 to 1.3 in October 2018.
- Average non-emergency service calls per day ranged from 1.1 in June 2019 to 4.2 in September 2018.
- Average fire prevention and non-emergency service calls combined ranged from 2.0 in June 2019 to 5.1 in September 2018.

Average Calls per Hour

- Average fire prevention calls per hour ranged from none between 7:00 p.m. to 5:00 a.m. to 0.13 between 1:00 p.m. and 2:00 p.m.
- Average non-emergency service calls per hour ranged from less than 0.01 between 2:00 a.m. and 4:00 a.m. to 0.35 between 8:00 a.m. to 9:00 a.m.
- Average fire prevention and non-emergency service calls combined ranged from none between 9:00 p.m. to 11:00 p.m. to 0.48 between 8:00 a.m. to 9:00 a.m.

The following table provides a summary of the runs for each unit performing either fire prevention or nonemergency service calls.

TABLE 7-22: Runs by Unit - Fire Prevention and Non-emergency Service

Unit ID	Unit Type	Fire Prevention	Non-emergency Service	Total	Average per Day
19A1	Ambulance	32	57	89	0.2
19A2	Ambulance	1	7	8	0.0
19C1	Command vehicle	2	1	3	0.0
19C2	Command vehicle	1	0	1	0.0
19C3	Command vehicle	40	6	46	0.1
19E2	Engine	46	96	142	0.4
19E4	Engine	1	12	13	0.0
19E5	Engine	0	5	5	0.0
19F1	Forestry truck	3	29	32	0.1
19FA	Fire alarm truck	5	86	91	0.3
19L1	Ladder truck	2	8	10	0.0
19S3	Squad	0	12	12	0.0
19U1	Utility	7	539	546	1.5
1909	Fire prevention	190	47	237	0.7
Total		**330**	**905**	**1,235**	**3.4**

- 19U1 made the most runs (546, or an average of 1.5 runs per day).
- 1909 made the second-most runs (237, or an average of 0.7 per day).

ATTACHMENT III: ADMINISTRATIVE WORKLOAD

TABLE 7-23: Workload of Administrative Units

Unit ID	Unit Type	Annual Hours	Annual Runs
19C1	Command vehicle	26.9	13
19C2	Command vehicle	15.6	16
19C3	Command vehicle	35.5	67
1909	Fire prevention vehicle	178.8	262

Note: Table 7-22 includes runs and workload from non-emergency and fire prevention calls.

ATTACHMENT IV: FIRE LOSS

TABLE 7-24: Content and Property Loss – Structure and Outside Fires

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Outside fire	$347,750	10	$55,300	4
Structure fire	$367,150	6	$108,300	8
Total	**$714,900**	**16**	**$163,600**	**12**

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

TABLE 7-25: Total Fire Loss Above and Below $20,000

Call Type	No Loss	Under $20,000	$20,000 plus
Outside fire	11	9	3
Structure fire	12	6	4
Total	23	15	7

Observations:

- Out of 23 outside fires, 10 had recorded property loss, with a combined $347,750 in losses.
- Four outside fires had content loss with a combined $55,300 in losses.
- The highest total loss for an outside fire was $300,000.
- Out of 22 structure fires, 6 had recorded property loss, with a combined $367,150 in losses.
- Eight structure fires had content loss with a combined $108,300 in losses.
- The average total loss for structure fires with loss was $47,545.
- The highest total loss for a structure fire was $180,000.

ATTACHMENT V: CALL TYPE DISTRIBUTION

When available, NFIRS data serves as our primary source for assigning call categories. For 994 of the 3,917 calls, NFIRS incident type codes were used to identify EMS and canceled calls, and to assign call types to fire calls and to motor vehicle accidents. We did not have NFIRS incident type codes for the remaining 2,923 calls, so we instead used the type description from the computer-aided dispatch (CAD) data to assign a call category.

To further assign sub-categories to medical calls, we first used the working diagnosis of each call as recorded in the New Hampshire Trauma and EMS Information System (NHTEMSIS). When this information was missing or unavailable, we instead used the dispatch reason of the call as recorded in NHTEMSIS if available; otherwise the medical call was classified as “illness and other.”

Mutual aid given calls were then identified using the jurisdiction of the call as identified in the CAD data, as well as the description of the call. Canceled aid given calls were categorized as canceled calls.

The count columns in the following tables reflect the number of calls that were assigned call types from a specific incident type code or call description and does not reflect the total number of calls that had that type code or call description.

TABLE 7-26: NFIRS Call Types Descriptions

Call Type	Incident Type Code	Incident Type Description	Count
Canceled	611	Dispatched and canceled en route.	25
	622	No incident found on arrival at dispatch address.	6
False alarm	700	False alarm or false call, other.	1
	712	Direct tie to fire department, malicious false alarm. Includes malicious alarms transmitted via fire alarm system directly tied to the fire department, not via dialed telephone.	4
	730	System or detector malfunction, other.	9
	731	Sprinkler activated due to the failure or malfunction of the sprinkler system. Includes any failure of sprinkler equipment that leads to sprinkler activation with no fire present.	7
	732	Extinguishing system activation due to malfunction.	1
	733	Smoke detector activation due to malfunction.	29
	734	Heat detector activation due to malfunction.	2
	735	Alarm system activation due to malfunction.	72
	736	Carbon monoxide detector activation due to malfunction.	12
	740	Unintentional transmission of alarm, other.	9
	741	Sprinkler activation (no fire), unintentional. Includes testing the sprinkler system without fire department notification.	10
	743	Smoke detector activation (no fire), unintentional. Includes proper system responses to environmental stimuli such as non-hostile smoke.	44
	744	Detector activation (no fire), unintentional. A result of a proper system response to environmental stimuli such as high heat conditions.	3
	745	Alarm system activation (no fire), unintentional.	113
	746	Carbon monoxide detector activation (no carbon monoxide detected).	19
Good intent	600	Good intent call, other.	9
	650	Steam, other gas mistaken for smoke, other.	1
	651	Smoke scare, odor of smoke, not steam (652).	25
	652	Steam, vapor, fog, or dust thought to be smoke.	3
	661	EMS call where injured party has been transported by a non-fire service agency or left the scene prior to arrival.	1
	671	Hazardous material release investigation with no hazardous condition found. Includes odor of gas with no leak/gas found.	2

Call Type	Incident Type Code	Incident Type Description	Count
Hazard	213	Overpressure rupture of pressure or process vessel from steam.	1
	400	Hazardous condition (no fire), other.	1
	410	Combustible and flammable gas or liquid spills or leaks, other.	1
	411	Gasoline or other flammable liquid spill.	5
	412	Gas leak (natural gas or LPG). Excludes gas odors with no source found (671).	35
	413	Oil or other combustible liquid spill.	1
	420	Toxic chemical condition, other.	1
	421	Chemical hazard (no spill or leak). Includes the potential for spills or leaks.	1
	424	Carbon monoxide incident. Excludes incidents with nothing found (736 or 746).	23
	440	Electrical wiring/equipment problem, other.	16
	441	Heat from short circuit (wiring), defective or worn insulation.	1
	442	Overheated motor or wiring.	3
	443	Breakdown of light ballast.	1
	444	Power line down.	25
	445	Arcing, shorted electrical equipment.	4
	461	Building or structure weakened or collapsed.	3
	480	Attempted burning, illegal action, other.	3
Illness and other	331	Lock-in.	5
	340	Search for lost person, other.	1
	341	Search for person on land.	1
	353	Removal of victim(s) from stalled elevator.	9
	360	Water and ice-related rescue, other.	1
	371	Electrocution or potential electrocution. Excludes people trapped by power lines (372).	1
	372	Trapped by power lines. Includes people trapped by downed or dangling power lines or other energized electrical equipment.	1
MVA	322	Motor vehicle accident with injuries. Includes collision with other vehicle, fixed objects, or loss of control resulting in leaving the roadway.	53
	324	Motor vehicle accident with no injuries.	44

Call Type	Incident Type Code	Incident Type Description	Count
Outside fire	100	Fire, other	6
	130	Mobile property (vehicle) fire, other.	4
	131	Passenger vehicle fire. Includes any motorized passenger vehicle, other than a motor home (136)	4
	140	Natural vegetation fire, other.	2
	142	Brush or brush-and-grass mixture fire. Includes ground fuels lying on or immediately above the ground such as duff, roots, dead leaves, fine dead wood, and downed logs.	1
	151	Outside rubbish, trash, or waste fire not included in 152-155. Excludes outside rubbish fires in a container or receptacle (154).	1
	154	Dumpster or other outside trash receptacle fire. Includes waste material from manufacturing or other production processes.	1
	160	Special outside fire, other.	3
Public service	500	Service call, other.	4
	511	Lock-out. Includes efforts to remove keys from locked vehicles. Excludes lock-ins (331).	40
	520	Water problem, other.	6
	522	Water or steam leak. Includes open hydrant.	3
	531	Smoke or odor removal. Excludes the removal of any hazardous materials.	4
	550	Public service assistance, other.	5
	551	Assist police or other governmental agency.	2
	553	Public service. Excludes service to governmental agencies (551 or 552).	5
	561	Unauthorized burning. Includes fires that are under control and not endangering property.	10
	800	Severe weather or natural disaster, other.	1
	900	Special type of incident, other.	2
	911	Citizen's complaint.	1
Structure fire	110	Structure fire, other (conversion only)	1
	111	Building fire. Excludes confined fires (113-118).	6
	113	Cooking fire involving the contents of a cooking vessel without fire extension beyond the vessel.	8
	114	Chimney or flue fire originating in and confined to a chimney or flue. Excludes fires that extend beyond the chimney (111 or 112).	4
	116	Fuel burner/boiler, delayed ignition or malfunction, where flames cause no damage outside the fire box.	1
	121	Fire in mobile home used as a fixed residence. Includes mobile homes when not in transit and used as a structure for residential purposes; and manufactured homes built on a permanent chassis.	2

TABLE 7-27: CAD Type Descriptions

Call Type	CAD Type Description	Count
Canceled	911 Hang up	2
False alarm	Alarm, residence	1
	Fire, box received	3
Fire prevention	Follow-up investigation	2
	Insp fire alarm acceptance	16
	Insp fire alarm maintenance	17
	Insp fire drill	53
	Insp inspection	172
	Insp oil burner inspection	15
	Insp public education	13
	Insp tank removal inspection	1
Good intent	Fire, smoke in area	1
Hazard	Fire, power lines down	1
	Fire, odor investigation	1
MVA	Fire motor vehicle accident	1
	Motor vehicle accident	2
Nonemergency service	Fire, alarm box detail	705
	Fire, permits issued	196
Outside fire	Fire, brush	1
Public service	Assist fire department	1
	Assist other agency	1
	Assist rescue	1
	Fire, assist police department	2
	Fire, lock out	2
	Fire, public assist	36
	Fire, service calls n/c	4
	Fire, investigation	1
	Motor vehicle stop	1
	Suspicious activity	1
	Theft	1
	Welfare check	1

TABLE 7-28: NHTEMSIS Working Diagnoses for EMS Calls

Call Type	NHTEMSIS Working Diagnosis	Count
Breathing difficulty	Pulmonary Emboli (I26)	3
	Respiratory Distress Unknown Cause (J98.9)	39
	Respiratory: Asthma, Reactive Airway Disease (J45.901)	6
	Respiratory: COPD (Emphysema / Chronic Bronchitis) (J44.1)	33
	Respiratory: Lower Respiratory Infection (J22)	13
	Respiratory: Upper Respiratory Infection (J06.9)	2
Cardiac and stroke	Cardiac: Cardiac Arrest (I46.9)	19
	Cardiac: Chest Pain, Acute Coronary Syndrome (I20.0)	45
	Cardiac: CHF (Congestive Heart Failure) (I50.9)	11
	Cardiac: Non-ST elevation (NSTEMI) Myocardial Infarction (I21.4)	3
	Cardiac: Rhythm Disturbance (Tachy, Brady, Ectopy, Other) (I49.9)	39
	Cardiac: ST elevation (STEMI) myocardial infarction of anterior wall (I21.0)	2
	Cardiac: ST elevation (STEMI) myocardial infarction of other sites (I21.2)	1
	Embolism / Thrombosis, Acute (I82.90)	2
	Stroke / CVA (163.9)	29
	TIA (Transient Ischemic Attack) (G45.9)	8
Fall and injury	Burns (T30.0)	1
	Disruption of wound, varicose vein, skin tear, unspecified (T81.30)	9
	Sexual Abuse/Rape (Suspected) (T76.2)	1
	Trauma or Injury (Ankle) (S99.91)	10
	Trauma or Injury (Brain/TBI) (S06.9)	1
	Trauma or Injury (Cervical/C-Spine) (S14.10)	3
	Trauma or Injury (Concussion WITH LOC) (S06.0X9A)	6
	Trauma or Injury (Concussion withOUT LOC) (S06.0X0A)	2
	Trauma or Injury (Dislocation of Hip) (M24.35)	8
	Trauma or Injury (Dislocation of Joint not otherwise listed) (M24.30)	1
	Trauma or Injury (Elbow) (S59.90)	2
	Trauma or Injury (External Genitals) (S39.94)	1
	Trauma or Injury (Eye or Orbit) (S05)	3
	Trauma or Injury (Face) (S09.93)	12
	Trauma or Injury (Foot) (S99.92)	5
	Trauma or Injury (Head/Scalp) (S09.90)	43
	Trauma or Injury (Hip) (S79.91)	45
	Trauma or Injury (Knee) (S80.91)	9
	Trauma or Injury (Low Back / Lumbar Spine) (S39.92)	10
	Trauma or Injury (Lower Leg) (S89.9)	6
	Trauma or Injury (Neck, Anterior or Lateral) (S19.9)	3
	Trauma or Injury (Nose) (S09.92)	4
	Trauma or Injury (Pelvis) (S39.93)	7
	Trauma or Injury (Shoulder or Upper Arm) (S49.9)	12

Call Type	NHTEMSIS Working Diagnosis	Count
	Trauma or Injury (Thigh /Upper Leg) (S79.92)	6
	Trauma or Injury (Thoracic Spine) (S24.109)	2
	Trauma or Injury (Thorax / Chest) (S29.9)	6
	Trauma or Injury (Wrist, Hand, or Fingers) (S69.9)	14
	Trauma or Injury(Forearm) (S59.91)	5
Illness and other	Abdominal Pain / Problems (R10.0)	67
	Allergic Reaction (Localized) (T78.40)	9
	Anaphylaxis (T78.2)	12
	Back Pain (Non-Traumatic) (M54.9)	33
	Brief Resolved Unexplained Event (BRUE) (R68.13)	1
	Cancer (Complications Related to) (D49)	5
	Cellulitis (Complications Related to) (L03.90)	2
	Chest Pain, Non-Cardiac (R07.89)	34
	Dehydration (E86.0)	10
	Dental Pain or Problems (K08.9)	3
	Diabetic: HYPERglycemia (E13.65)	9
	Diabetic: HYPOglycemia (E13.64)	22
	Diarrhea, unspecified (R19.7)	7
	Electrocution (T75.4)	1
	Epistaxis / Nose Bleed (Non-Traumatic) (R04.0)	16
	Fever (Unknown Cause) (R50.9)	15
	Foreign body in Esophagus/GI Tract/Rectum (T18.9)	1
	General Malaise (Unknown Cause) (R53.81)	18
	GI Bleed (K92.2)	9
	GI Infection, Virus or Food Poisoning (A09)	10
	GU: Hematuria (R31)	7
	GU: Kidney Stones / Renal Colic (N20.0)	4
	GU: Other Urinary Problem, unspecified (N39.9)	3
	GU: UTI / Urinary Tract Infection (N39.0)	6
	Heat Exhaustion / Stroke (T67.0)	1
	HYPERtension (I10)	24
	HYPOtension (I95.9)	10
	Implanted Device Malfunction or Complications (Z45.89)	1
	Infection / Infectious Disease (unspecified) (B99.9)	6
	Influenza / Flu Like Illness (J11)	12
	Nausea/Vomiting (Unknown Etiology) (R11)	41
	Neurological Disorder or Infection (G98.8)	8
	No Apparent Illness or Injury- No Transport (Z00.00)	188
	No Apparent Illness or Injury-Transport Requested (Z71.1)	35
	No Apparent Illness or Injury-Transported for Safety/Protocol (Z00.129)	5
	OB: Child Birth / Labor and Delivery (Normal / UNComplicated) (O80)	1
	Obvious Death (R99)	4

Call Type	NHTEMSIS Working Diagnosis	Count
	Pain: Arm Pain (Non-Traumatic) Unspecified Cause or Location (M79.603)	7
	Pain: Chronic Pain, Unspecified (G89.2)	11
	Pain: Eye Pain (Non-Traumatic) (H57.10)	3
	Pain: Headache or Migraine (R51)	13
	Pain: Leg Pain (Non-Traumatic) Unspecified Cause or Location (M79.606)	29
	Pain: Location Not Otherwise Listed (Non-Traumatic) (G89.1)	27
	Pneumothorax (Medical, Non-Traumatic) (J93.9)	1
	Poisoning: Adverse Effect of Medication (Accidental) (T50.99)	5
	Sepsis (A41.9)	22
	Vaginal Bleeding (N93.9)	2
	Vertigo / Dizziness (Complications Related To) Unknown Etiology (H81.3)	25
	Weakness (Unable to Diagnosis Specific Cause) (R53.1)	99
Overdose and psychiatric	Alcohol Abuse and Effects (F10)	19
	Altered Mental Status (Unknown Cause) (R41.82)	44
	Anxiety Attack / Acute Stress Reaction (F43.9)	31
	Drug Overdose / Abuse: Cocaine (T40.5X1A)	1
	Drug Overdose / Abuse: Hallucinogens, LSD and Mushrooms (T40.9)	1
	Drug Overdose / Abuse: Heroin (Known or Suspected) (T40.1X1A)	6
	Drug Overdose / Abuse: Marijuana / Spice or Other Synthetic Cannabis (T40.7X1A)	2
	Drug Overdose / Abuse: Opiates/Narcotics (Non-Heroin / Unknown) (T40.2X1A)	8
	Drug Overdose / Abuse: Other Illicit Drug (Not Otherwise Specified) (F19.129)	7
	Suicide or Intentional Self-Harm (T14.91)	9
	Psychiatric / Behavioral Problem (F99)	43
Seizure and unconsciousness	Seizures: Nonstatus Seizures, Unspecified Type (G40.909)	13
	Seizures: Status Seizures, Generalized / Tonic-Clonic (G40.901)	10
	Syncope / Fainting (R55)	47
	Unconscious / Coma (Non-Overdose, Unknown Etiology) (R40.2)	9

TABLE 7-29: NHTEMSIS Dispatch Reasons for EMS Calls

Call Type	NHTEMSIS Dispatch Reason	Count
Breathing difficulty	Breathing Problems (6)	1
	Choking (11)	1
Fall and injury	Falls (17)	11
	Hemorrhage / Laceration / Bleeding (21)	1
	Lift / Invalid Assist	22
Illness and other	Abdominal Pain / Problems (1)	2
	Chest Pain (Non-Traumatic) (10)	3
	Fever (26)	1
	Interfacility Transfer / Medical Transport (33)	2
	Medical Alarm (32)	2
	No other Appropriate Choice	4
	Standby	1
	Unknown Problem / Person Down (32)	1
Overdose and psychiatric	Altered Mental Status (26)	1
	Overdose / Misuse of Meds / Poisoning (23)	1
	Psychiatric / Behavioral / Suicide Attempt (25)	6

SECTION 8. NORTHBOROUGH, MA

The Town asked CPSM to benchmark this analysis against a similar size town or city CPSM has completed a similar analysis for. The Town Manager suggested the fire and EMS analysis CPSM completed for the town of Northborough, MA in 2015.

CPSM completed a fire, EMS and operational study for the Town of Northborough, MA in May, 2015. The Town of Northborough is located in Worchester County, approximately 10 miles northeast of Worcester, 30 miles west of Boston, and 190 miles from New York City. Northborough has a land area of approximately 18.72 sq. miles[45] (Exeter is approximately 20 sq. miles). The population in 2015 was 14,523[46] (Exeter's estimated 2018 population is 15,317). Northborough, like Exeter has a variety of industry including a mix of retail establishments and restaurants. The Northborough region is well connected by rail and highway to the ports, airports, and intermodal facilities of Boston and Providence. CSX provides freight service to Northborough[47]. Commuter service is available through the Massachusetts Bay Transit Authority (MBTA) and Amtrak.

Northborough operates under a Selectman-Town Administrator form of government. Article II, Section 2-1 of the Town Charter establishes the legislative body is an Open Town Meeting comprised of all registered voters of the town of Northborough[48]. Article III, Section 3-2 provides that the governing body of the town is comprised of five elected members of the town's select board who serve three (3) year staggered terms[49].

In 2015, the Northborough Fire Department (NFD) fire chief directed the overall operations of the department, much like in the EFD. Shift captains, who also worked 24-hour shifts, supervised individual and assigned career and volunteer firefighter/paramedic personnel as well as fire prevention activities. In total there were seventeen full-time operational personnel assigned to four operational shifts: four on three shifts and five on the fourth shift. Comparatively, the EFD has twenty-six operational personnel assigned to four shifts: six on two shifts and seven on two shifts.

In 2015, Northborough firefighters provided a dual role in both fire suppression/prevention and fire-based emergency medical ambulance transportation (as done in Exeter). Typically when an EMS alarm occurs, NFD sends two of these personnel on the medic unit and one in a utility vehicle. The utility vehicle is usually the officer (captain) - or a paramedic. This deployment methodology leaves one fire fighter/paramedic at the station which is not adequate for additional fire or EMS calls for service. On fire incidents, dependent on type, in 2015 the NFD responded one or two pieces of fire apparatus with the available shift staffing. Comparatively, the EFD utilizes a cross-staffing model for virtually every piece of apparatus. The department can staff an engine, ladder, and two ambulances, depending on call type. All units cannot be staffed at one time, and only shifts with seven on duty can staff the engine, ladder, and one ambulance simultaneously. Generally in Exeter, two apparatus are staffed by on-duty personnel and that can be staffed in a variety of ways depending on the type of call (fire or EMS), and whether the call for service is a single call type or a simultaneous call when another unit is already assigned to a call.

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45 http://www.town.northborough.ma.us/Pages/NorthboroughMA_EconomicDevelopment/Overview.pdf
46 http://www.town.northborough.ma.us/Pages/NorthboroughMA_EconomicDevelopment/Overview.pdf
47 Northborough, Massachusetts Open Space and Recreation Plan, August 2010
48 Town Charter, Town of Northborough, Massachusetts
49 Town Charter, Town of Northborough, Massachusetts

In 2015, fire services in Northborough were provided from one station. The fire station is located near center of the town, and appropriately in the center of the most densely built upon area of the town (much like Exeter). At the time of the 2015 study, the NFD deployed two traditional engine companies (pumper apparatus), one engine/tender (engine with a 2,000 gallon tank for non-hydranted areas), one tower ladder (aerial ladder with a platform component), and one rescue engine (pumper apparatus carrying technical rescue equipment), and two forestry/brush units. CPSM did not note any major concerns with traffic congestion, road access, or travel times from this single station concept in Northborough.

Northborough like Exeter has built upon areas that are served by hydrants and those that are not. Additionally Northborough has areas of tree lines and brush that require specialized forestry firefighting equipment, much like Exeter. As an all-hazards response agency, the NFD also deployed watercraft and associated equipment trailers for breathing air supply, technical rescue and hazardous materials equipment to mitigate these types of emergencies. The NFD compliment of fire apparatus is also much like the EFD in that both have pumper apparatus, an aerial apparatus and specialty equipment.

In 2015, the ISO PPC rating for the town of Northborough was a Class 3/3Y. Comparatively the Town of Exeter's ISO rating is a Class 3/3Y. This rating was achieved in November 2019. Northborough also has a robust automatic/mutual aid program in place with contiguous and non-contiguous communities who provide timely response into the town. In comparison the EFD does not, which is discussed in this report.

In the one year data analysis period, the NFD responded to 687 fire related incidents. Of those sixteen were structural fires, thirty-eight were outside fires, and the remaining fire incidents (633) consisting of hazards, false alarms, good intent, and public service calls for service. Comparatively, in the one year data analysis period for this report, the EFD responded to 689 fire related incidents. Of those twenty-two were structural fires, twenty-three were outside fires, and the remaining fire incidents (644) consisting of hazards, false alarms, good intent, and public service calls for service.

Regarding EMS incidents, in the one year data analysis period, the NFD responded to 1214 EMS related incidents. Comparatively, in the one year data analysis period for this report, the EFD responded to 1890 EMS related incidents.

In 2015, the emergency management function resided in the fire department and the emergency communications function resided in the police department. Comparatively this is how the Town of Exeter operates. The fire and police departments in Northborough however are in separate facilities on separate parcels of land. The NFD facility like the current EFD facility did have storage issues, no gender separation for operational personnel, and administrative work space deficiencies.

Regarding the Northborough Emergency Communications Center, CPSM found the ECC is staffed with one dispatcher around the clock. The staffing of a single dispatcher had been in place since 1968. This lone dispatcher was responsible for answering and processing e-911 calls, monitoring the fire alarm console, answering and routing police administrative calls, monitoring the police lock-up holding area via ECC console video camera, handling walk-in issues/complaints from the public via a window from within the ECC, and normal dispatcher emergency and non-emergency radio duties with the above named agencies. While conducting the analysis, CPSM observed the single dispatcher assist two customers at the window as an incoming administrative call rang, was answered, and then the dispatcher returned to the window to finish assisting the two customers. While at the window a police radio transmission occurred, which was taken care of as the customer issue at the window was cleared.

In 2015, the CPSM observations raised a concern that the lone dispatcher may be assisting a customer at the window or making notification of a critical issue in the police holding area and an emergent radio transmission or incoming e-911 call occurred, and a delay in processing either event may occur. CPSM noted similar concerns with staffing for Exeter in this report.

In 2015, CPSM provided staffing alternatives to the Town of Northborough aimed at providing the ability to respond to staff a single fire response with a single fire apparatus and a single EMS response with a single EMS apparatus concurrently. The additional staff (one per shift) was recommended for 12-hour periods during peak response times. With the addition of one person per shift during peak periods, two persons would be left at the station which would allow an additional ambulance to be deployed or for staffing of initial response fire vehicles.

Comparatively, CPSM recommends Exeter hire two firefighters immediately to staff the A and C shifts with seven members. CPSM also recommends that EFD develop a strategic funding plan to increase the levels of staffing on all four shifts. Increasing staffing levels will not eliminate, but will reduce, the number of combinations on cross-staffing and will enable a consistent service level. Full-time staffing for the EFD is recommended to be eight on each shift, with a minimum staffing of seven staff on each shift. Minimum staffing of seven would allow the engine to be staffed with three personnel, and the ladder with four. Ladder personnel will then cross-staff the first EMS call for service with two personnel. A second EMS call would require the two remaining members from the ladder to respond the second ambulance. This will leave the engine with a staffing of three personnel. Under this staffing model, there will be times when the ladder will be staffed with four or two for fire response, which enhances the ability to perform critical tasks simultaneously rather than consecutively. CPSM also recommends that under the current EFD staffing model, an engine be assigned to priority medical calls with the ambulance. This eliminates responding three members on the initial response ambulance. Thirty-two percent of EFD medical calls are dispatched as a priority incident, which prompts the response of three personnel on the ambulance. The better practice would be to respond with two on the ambulance and respond the engine to assist with a staff of three. If the incident turns out to be a true priority call, a member of the engine would then drop off the engine and ride with the ambulance to the hospital. The engine would remain in service with two personnel; however, staffing would be back at three within the hour given that 93 percent of all medical calls for EFD last less than an hour. In many instances, a call dispatched as an ALS call is less severe than what is initially dispatched; therefore, the need for an additional paramedic or firefighter on the ambulance is often not required.

CPSM staffing recommendations are based on the many factors identified in this report.

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