CENTER FOR PUBLIC SAFETY MANAGEMENT, LLC

Fire Organizational and Performance Analysis Report

Biddeford, Maine

Final Report-February 2023

CPSM®

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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 108-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 341 such studies in 42 states and provinces and 246 communities ranging in population from 8,000 (Boone, Iowa) to 800,000 (Indianapolis, Ind.).

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SECTION 1. INTRODUCTION

The City of Biddeford contracted with the Center for Public Safety Management LLC (CPSM) to complete an analysis of the city's fire department.

The service demands and challenges generated by the community are numerous for the fire department and include EMS first response and ground transport (including interfacility transfers); fire; technical rescue; water emergencies; severe weather; density challenges downtown; transportation emergencies to include vehicle traffic, mass transit utilizing bus transportation and commuter rail; wildland fires; and other non-emergency responses typical of coastal suburban fire departments.

A significant component of this report is the completion of an organizational analysis that includes a labor-management analysis; the organizational structure; effective communication; strategic and succession planning; and time allocation of all personnel. The organizational analysis and recommendations are focused on organizational improvement and sustainability of personnel.

Another significant component of the analysis is the risk profile of the community, which contemplates many factors that cause, create, facilitate, extend, and enhance risk in and to a community. The risk profile is an important component of this report as it links directly to staffing and deployment of fire and EMS assets in the community.

The response time and staffing components discussion of this report are designed to examine the current level of service provided by the Biddeford Fire Department (BFD) 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. This analysis and self-review are intended to help the department meet community expectations and mitigate emergencies effectively and efficiently.

Other significant components of this report are an analysis of the current deployment of resources and the performance of these resources in terms of response times and the BFD fire management zone, which is the entire city; a comprehensive review of the current ISO Public Protection Classification report; 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; community risk reduction; fleet; and EMS ground transport.

Based upon CPSM's detailed assessment of the BFD, it is our conclusion that the department, overall, provides quality fire, EMS, and rescue services. The BFD staff are professional and dedicated to the mission of the department. This was apparent during our discussions as staff were quite focused on creating a positive future for the agency. The BFD does, however, have significant labor-management issues that need to be addressed and managed. CPSM provides several recommendations to assist with this.

This report also contains a series of observations and planning objectives and recommendations. These are intended to help BFD 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 that may need to be budgeted and/or bargained, or for which processes must be developed prior to implementation.

RECOMMENDATIONS

Time Allocation and Department Organization

(See pp. 9-13.)

1. CPSM recommends the BFD adopt the concepts of a Functional Organizational Chart, the Time Allocation Model, and the proposed organizational chart to ensure a more efficient alignment of organizational resources, and the effective use of all members of the organization in order to achieve the organization's mission and core values.

Strategic Planning

(See pp. 14-15.)

2. CPSM recommends the BFD undertake a strategic planning process that is inclusive of the entire department and the community; reexamine the mission, vision, and values statements; incorporate measurable and obtainable goals and objectives; and provide for an annual review and report to the organization and community that outlines the plan's progress.

Succession Planning

(See pp. 15-16.)

3. CPSM recommends the BFD work with the collective bargaining unit and the city's Human Resources Director to develop a succession plan that is diverse, includes the entire organization, and has a focus on preparing current and future members to take on additional roles and responsibilities, and as well as prepares members for advancement and promotion into key roles in the organization.

Policies and Procedures

(See pp. 16-17.)

4. CPSM recommends the BFD contract with a consulting firm to revamp the current department Standard Operating Guidelines, Procedures, and Directives, utilizing department-wide stakeholder input. Such an effort should have a focus on reducing the number of policies and procedures through merging, removing, and development of new policies and procedures to meet the Biddeford Fire Department's needs and that are consistent with fire and EMS department best practices.

Labor-Management Analysis

(See pp. 17-19.)

As there is a mix of current and historical organizational morale, communication, trust, transparency, and emotional intelligence issues between labor and fire administration, CPSM recommends:

5. The city and the IAFF should continue to work collaboratively through monthly organizational meetings that include BFD leadership, and the IAFF and its members.

   CPSM further recommends these meetings should be scheduled at a neutral site and on alternate shift days each month so that members working different shifts have the ability to attend without interruption of calls. These meetings should be kept to one hour and be focused on resolving organizational conflict, issues, and to deescalate problems. CPSM strongly recommends these meetings be mediated by a neutral party who specializes in labor-management conflict resolution.

ISO Analysis

(See pp. 20-23.)

6. CPSM recommends the BFD review and address, to the extent possible, deficiencies in the Fire Department section of the current ISO-Public Protection Classification report as outlined in this report. Special attention should be given to developing methods and opportunities for members to achieve the training as required in the ISO analysis, as it is focused on firefighter safety, improved competencies, and overall improved fireground effectiveness and functionality.

External Collaboration

(See pp. 23-26.)

7. As many of the mutual, automatic, and other aid agreements outlined in this report are in excess of ten years old, CPSM recommends the BFD conduct a comprehensive review of all response and use agreements. This review should include the construction of new agreements where applicable, which should more clearly define service level response (automatic or mutual aid) and reciprocal equipment or services the BFD will obligate. CPSM further recommends that each agreement have a sunset date that will require future review and updating to address any changes in services received or provided.

Training

(See pp. 29-30.)

8. CPSM recommends the City of Biddeford consider exploring the possibility of working with neighboring jurisdictions to develop and construct a Regional Fire Training Center. Regional partnerships such as this typically include an Interlocal Agreement detailing the cost sharing responsibilities and other details as to the use and maintenance of the facility.

Fleet

(See pp. 30-34.)

CPSM recommends the BFD and the city monitor the current fire apparatus replacement plan and adjust as relevant to each apparatus based on wear and tear, maintenance records, and funding availability, and to the extent possible develop an apparatus replacement plan that aligns closer to recommendations with NFPA 1901, *Standard for Automotive Fire Apparatus*.

Planning objectives should include:

9. Apparatus should not exceed 15 years of service on the front line. Once an apparatus reaches this age, one alternative is the apparatus undergoes a Level 1 refurbishing in accordance with NFPA 1912, *Standard for Fire Apparatus Refurbishing* (current standard), or the apparatus is replaced if maintenance records and wear and tear warrant replacement.
10. Apparatus greater than 25 years old should be removed from service.
11. Apparatus and major apparatus components such as the motor, fire pump, aerial ladder assembly and hydraulics, chassis, and chassis components such as brakes, wheels, and steering equipment should be maintained in accordance with manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis.
12. Apparatus components requiring annualized testing either fixed or portable such as fire pumps, aerial ladder and aerial ladder assemblies, ground ladders, self-contained breathing apparatus to include personnel fit-testing, and fire hose should be tested in accordance with

manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis.

Facilities and Response Time

(See pp. 34-51.)

13. CPSM recommends that in the near term, the city continue to plan for a proposed station east of Station 1 to improve response times to the south central, southeast, and coastline built-upon areas of the city.

14. CPSM further recommends that staffing this station include one ambulance and one engine, which can be accomplished in the following ways:

- Alternative 1: Staff the station with 3 per shift (1 Captain, 2 FF PMs/shift, or 12 total positions). Staff would then cross staff both the engine and ambulance on a first call basis. This could be achieved with 12 new positions, or 4 new positions and the movement of 8 positions (2 per shift) from Station 1, or 8 new positions and the movement of 4 positions (1 per shift) from Station 1. Any combination of the aforementioned can be implemented incrementally following the recommendation of 3 per shift to staff an engine and ambulance when the station opens.

- Alternative 2: Staff the station with 5 per shift (1 Captain, 4 FF PMs/shift, or 20 total positions). Under this alternative, the staffing matrix is 3 assigned to the engine and 2 assigned to the ambulance. This could be achieved with 20 new positions, or 12 new positions and the movement of 8 positions (2 per shift) from Station 1, or 8 new positions and the movement of 12 positions (3 per shift) from Station 1. Any combination of the aforementioned can be incrementally implemented over the longer term following the recommendation of 3 per shift to staff an engine and ambulance when the station opens.

Fire Service Trends

(See pp. 51-53.)

15. CPSM recommends the BFD continue to make consistent efforts to initiate and follow best practices with current and emerging trends in the fire service, including the health and wellness of firefighters (specifically employee mental health and medical physicals) and structural firefighting gear containing Per-and Polyfluoroalkyl Substances (PFAS).

Staffing and Deployment

(See pp. 75-95.)

16. CPSM recommends the BFD, to the extent possible and if practical depending on available automatic and mutual aid resources, work with regional Fire Chiefs to increase response resources to strip mall/commercial, apartment, and high-rise fire responses that align more closely with the NFPA 1710 standard.

17. CPSM further recommends that due to factors listed herein, and to increase BFD resources to be able to assemble an Effective Response Force, the city develop a one- to five-year funding plan to increase staffing and apparatus response by increasing staffing at the Central Fire station by two per shift (eight total personnel) so that minimum daily fire suppression staffing can be increased to ten total. This would increase fire suppression staffing by two per shift, which will minimize cross-staffing between ladder and EMS resources and will make available additional staffing for a third EMS call without depleting fire suppression resources. This staffing can be added incrementally over two budget cycles by adding one person per shift per budget cycle.

Factors on which these recommendations are based include:

- Demand for emergency services on the BFD.
- Population density, which includes substantial current and projected vertical density structures, many involving assisted and/or senior living.
- Current and future residential-over-commercial buildings.
- Other building risks identified in this report, particularly in the Central Fire Station downtown response zone.
- The BFD cross-staffs the ladder apparatus, squad apparatus, second engine, and third ambulance with available daily staff, which has its efficiencies, but lacks in effectiveness when an apparatus is responding with a lone driver, or a fire or specialty apparatus responds with a crew of two. This is illuminated in the critical tasking discussion.
- Mutual/automatic aid response resources have extended response times due to the location of these assets as well as potentially not being available due to providing emergency services in their own community.
- Response capability resiliency.

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SECTION 2. ANALYSIS METHODOLOGY

Data Analysis

The CPSM Fire and EMS Team used numerous sources of data to support our conclusions and recommendations for the Biddeford Fire Department (BFD). Information was obtained from the city and department along with numerous sources of internal information garnered from a CPSM document/information request. Internal sources included data from the computer-aided dispatch (CAD) system for response time and workload information, and the department's National Fire Incident Reporting System (NFIRS) records management system for calls for service.

Interviews

This study relied extensively on intensive interviews and interaction with department personnel and the city. On-site and in-person interviews to include virtual meetings were conducted with the senior department leadership, collective bargaining unit executive board members and state representative, and company personnel regarding the administration and operations of the department.

Document Review

CPSM Fire Team consultants were furnished with numerous reports and summary documents by the BFD. Information on department planning; staffing and deployment of resources; mutual aid; policies and procedures; community risk, fire code enforcement, public education; fleet and facilities; training; and additional performance information were reviewed by fire project team staff. Follow-up phone calls, emails and virtual meetings were used to clarify information as needed.

Operational/Administrative Observations

Over the course of the analysis, numerous observations were conducted. These included observations of fire and EMS operations; department leadership; community risk reduction; fleet schedules and overall facility usefulness in a contemporary fire department; administrative functions; deployment of apparatus from a coverage perspective as benchmarked against national standards; and operational staffing benchmarked against national standards as it relates to assembling an effective response force. The CPSM Fire and EMS Team engaged all facets of department operations from a ground floor perspective and as well from a leadership and management perspective.

Staffing Analysis

In virtually all CPSM fire and EMS studies, we are asked to identify appropriate staffing and resource deployment levels. This is the case in this study as well. In this report we discuss operational workload; critical tasking; assembling an effective response force; operational deployment, current and future station locations, and the feasibility of additional deployable assets to improve response coverage; and other factors to be considered in establishing appropriate staffing levels. Staffing recommendations are based upon our comprehensive evaluation of all relevant factors and are benchmarked against national standards such as the National Fire Protection Association (NFPA) 1710 Standard, ISO Public Protection Classification rating system, and the Center for Public Safety Excellence, Standards of Cover.

SECTION 3. AGENCY REVIEW AND CHARACTERISTICS

DEPARTMENT OVERVIEW AND ORGANIZATIONAL ANALYSIS

The Biddeford Fire Department (BFD) is a predominately career fire department (there are some call members as well) and serves more than 22,500 permanent residents and businesses in a land area of approximately 30 square miles. Biddeford is a coastal resort city that sees a seasonal influx of visitors. Additionally, Biddeford is home to a campus of the University of New England, a 540-acre site that offers a broad educational environment in undergraduate, graduate, and professional programs.

The Fire Chief oversees the daily operations of the department and reports directly to the City Manager. The Chief is assisted administratively and operationally by an assistant fire chief, a deputy chief, a division chief, and an office manager. Additional administrative staff (who are not full-time personnel) include a department chaplain, department medical director, and fire department museum curator.

Fire and EMS operations personnel are deployed on four shifts or platoons on a rotational schedule of 24 hours on and 72 hours off. The BFD is funded for a staff of 48 operational shift, full-time personnel. These personnel are concentrated in the central fire station, which includes the administrative offices as well. Operational personnel staff/cross-staff the department's response fleet as necessary to match the incident.

Call force members work out of the central fire station and a sub-station as needed to assist the full-time staff. Call force members receive directions from a district chief who reports to the operational division chief. Call force members receive an annual stipend for participation and additional stipend for response to working incidents.

Primary fire suppression, EMS, and specialty services are provided, as noted above, out of one central fire station. From this station, a crew of 12 (at maximum staffing) deploy two first-line advanced life support (ALS) EMS transport units, engine and ladder apparatus, and a heavy rescue and brush truck. Not all of these apparatus are typically staffed; depending on the incident the appropriate units are cross-staffed and deployed. It is important to note that there typically are not 12 personnel on duty. CPSM was advised that because of scheduled and unscheduled leave, and vacancies due to turnover in the department (retirements, resignations, other separation) there typically are 8 to 10 personnel on duty pers shift. At this level of personnel, the department staffs two ambulances, one engine, and assigns a driver to the aerial and heavy rescue apparatus (total of eight personnel). If there are additional personnel, they are assigned to cross-staff various units based on the incident response. Call force personnel assist in filling out riding assignments if in the station or respond to the station to staff apparatus to maintain coverage in the city.

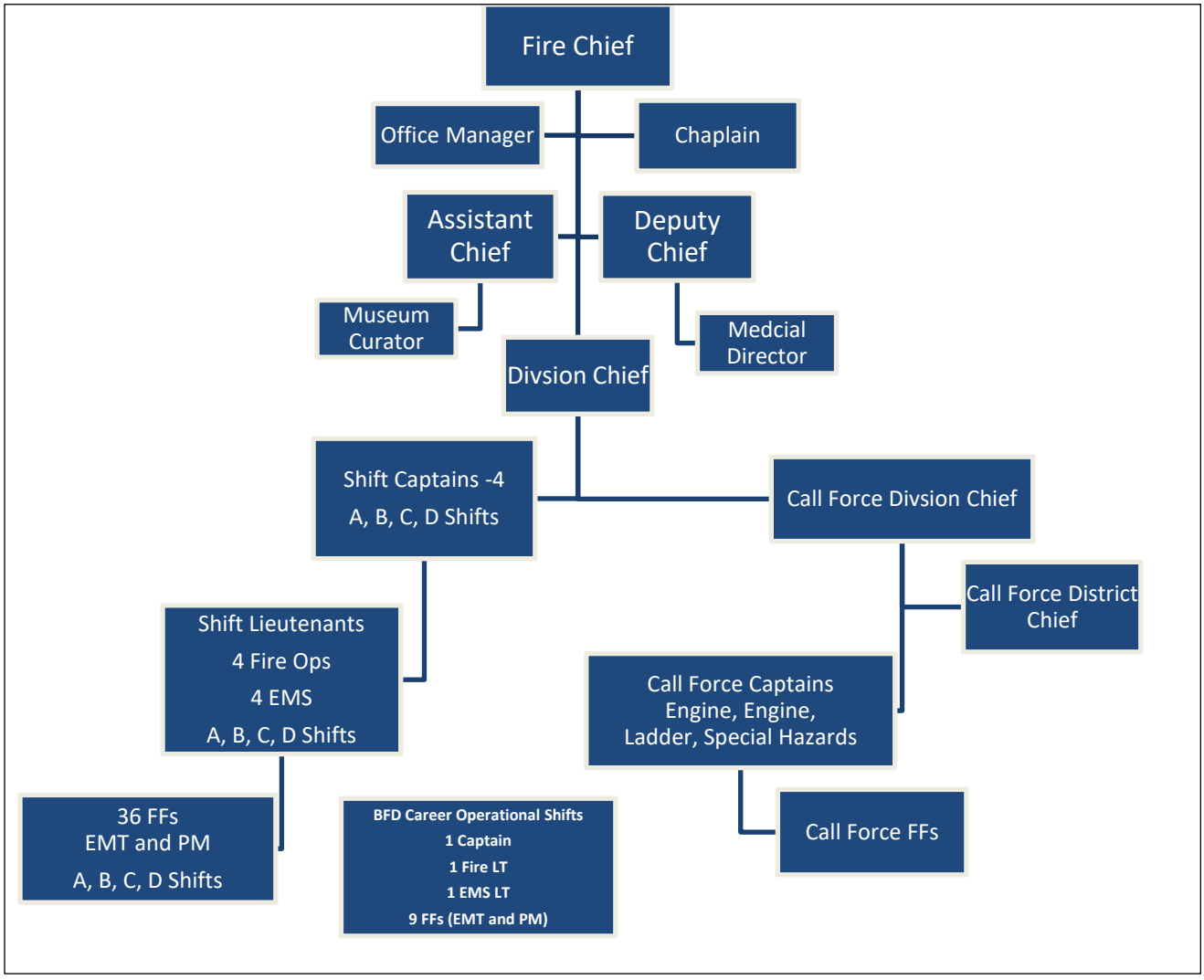
The BFD utilizes a traditional organizational structure that focuses on the core mission of emergency services delivery. This structure provides a division of responsibility for critical day-to-day functions and identifies each functional division/program under the purview of the organization. This structure also distributes authority so that service is delivered in a timely, orderly,

and effective manner, with leadership and accountability identified from the top of the organization to company-level officers.[1]

Like many communities across the country, Biddeford has over the years expanded both its fire service delivery area and the types of services that its fire department provides. Technical rescue and hazardous materials (hazmat) are among the BFD's expanded deployable services, delivered through a regional effort in which the department participates. This regional effort significantly enhances capabilities the city may not otherwise realize if it had to provide these services completely on its own.

Although the department's current organizational chart illustrates the structural hierarchy of the organization and traditional organizational roles, it does not include functional information about what services each level provides or is expected to execute, which is important and is causing some consternation between fire administration field operations.

FIGURE 3-1: BFD Organization Chart



1. Dennis Compton and John Granito, eds., *Managing Fire and Rescue Services* (Washington, DC: International City/County Management Association, 2002), 115.

During our stakeholder interviews with operational staff, it became clear that the Fire Chief's office is involved in day-to-day operations to a level where operational line officers and staff feel micro-managed regarding company level activities. While this is sometimes common in small departments, one reason for this is the Fire Chief may not understand where in the organization he/she fits, as well as having a full understanding of where all members of the organization fit.

There are two management principles that can assist with this organizational dilemma. The first is the implementation of a functional table of the organization, which links back to an organizational table of the organization, and which better serves the organization through division of labor, trust, and empowerment. The second is the use of time allocation principles. Time allocation principles outline the percentage of time each member of the organization should be spending during the workday in operating the system, improving the system, or creating the future.

FUNCTIONAL TABLE OF THE ORGANIZATION

A functional table of the organization will provide a clear picture of the leadership functions at each level, and as well will illustrate the work of leadership to be performed at every level in the organization. Integrating the functional table of the organization with the traditional organizational model (typically a scalar model) directs leadership's attention from that of a specific focus of an individual to one of leadership viewed from an organizational perspective. This breaks down organizational silos and creates leadership teams within each organizational component, which promotes lateral team building between organizational divisions.

Additionally, a functional table of the organization illustrates to the community a clear picture of what and where key services of the organization are located within an organization. In this type of chart, each task or functional area becomes a focal point. Specialization is centralized and employees who are doing these specialized jobs or tasks are identified. A functional chart will enable the BFD to better visualize its division of responsibilities and offers a high level of transparency to both internal and external stakeholders.

The next figure outlines a basic fire department functional organizational table with the four key elements of the chief's office, fire suppression and rescue, training and education, and community risk reduction.

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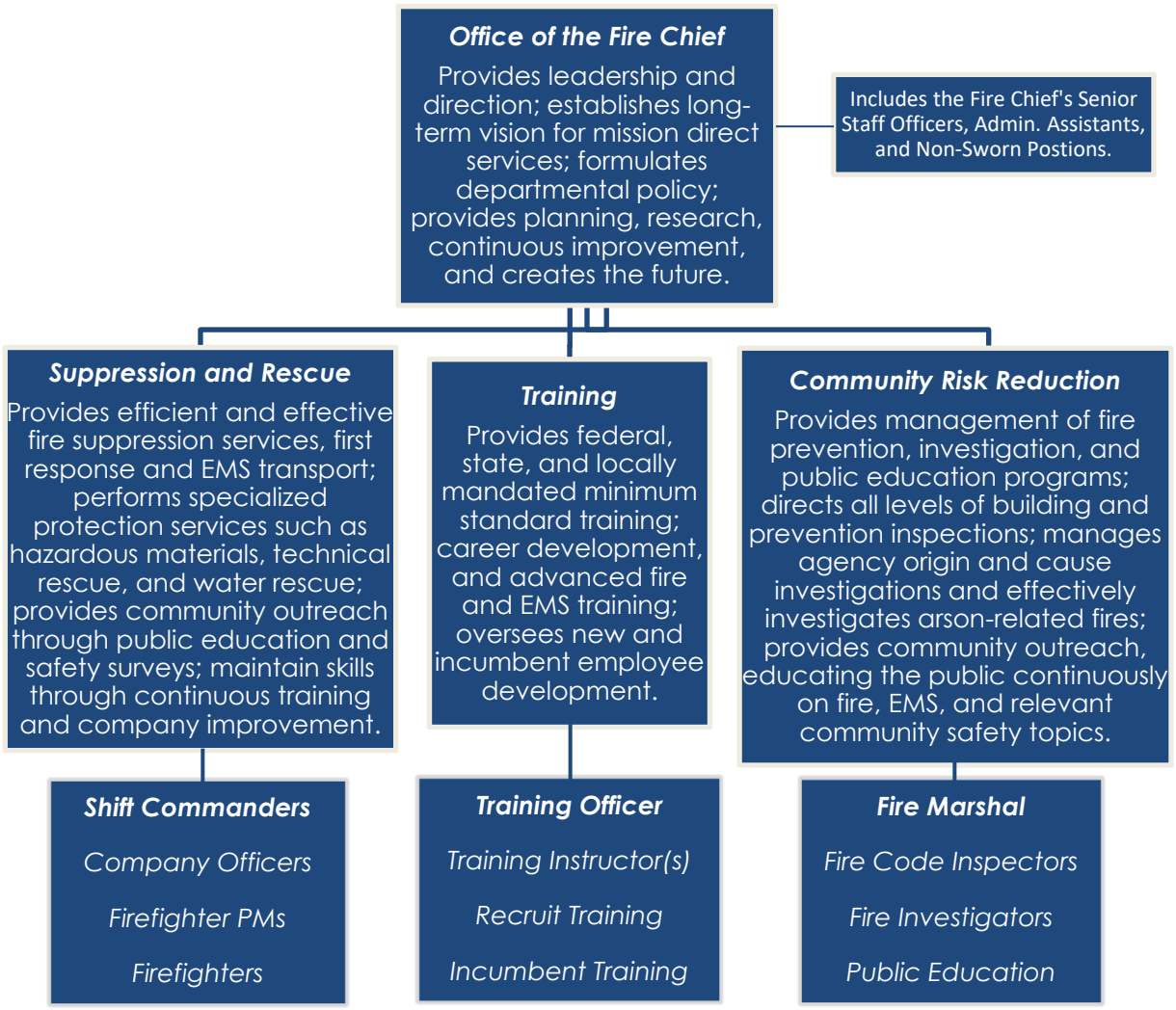
FIGURE 3-2: Sample Functional Table of the Organization



TIME ALLOCATION PRINCIPLES

To effectively operate in an organization, an employee must understand his or her role and, as importantly, where he/she should allocate his/her time during the workday or shift to be most effective. Understanding this concept is essential in an organization such as the BFD, which has a compact organizational chart. Managers and firefighters have a responsibility to understand their organizational roles and responsibilities and to effectively perform the tasks related to these roles and responsibilities. One would not expect senior-level officers to spend as much time operating the system as a frontline service provider does. Conversely, one would not expect a first-line or midlevel officer to spend as much time as a senior-level officer planning for the future of the organization. In this way, each level of the organization has a different set of priorities and employees at each level should allocate their time accordingly.

Three segments of organizational time allocation are central to achieving the goals and objectives of any organization and, more importantly, to enable the organization to fulfill its

mission and realize its vision. These segments are (1) operating the system; (2) improving the system; and (3) creating the future.

Operating the system is that time during the workday that an organizational member is implementing service deliverables, touching those components of the organization that make it go.

Improving the system is the time during the workday that an organizational member spends seeking ways to make service deliverables and organizational components more efficient, or, more simply put, better.

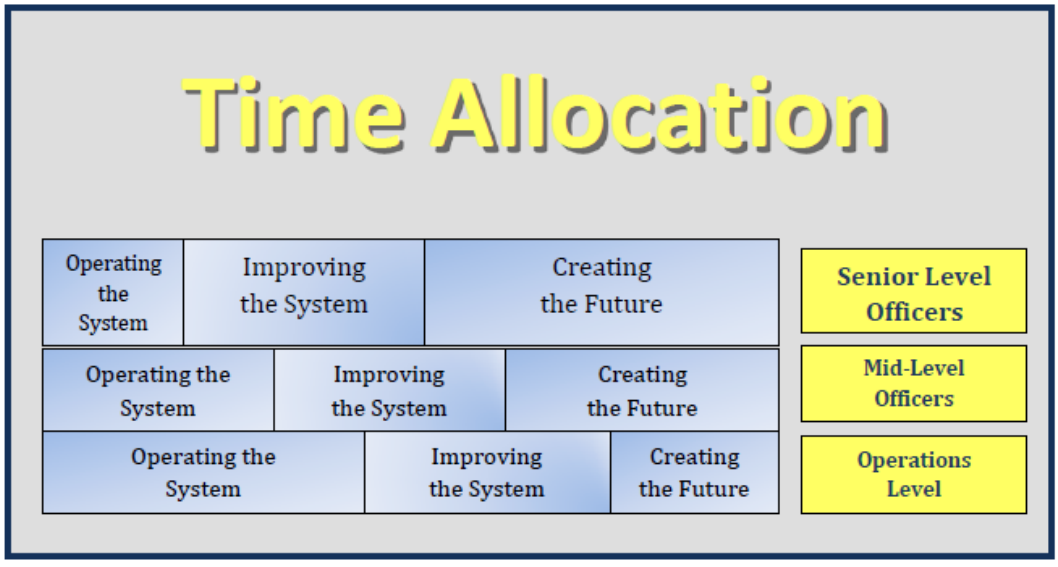
Creating the future is that critical piece of time allocation when an organizational member develops goals and objectives that link to strategic planning and considers the vision of the organization in a way that focuses on successful, effective outcomes.

Ideally, even in a compact organization such as the BFD, it is critical that the appropriate time be spent at the appropriate level in the organization to continuously operate the system, make improvements, and create the future. Given this, it is recommended that the BFD organize the department so as to optimize and empower subordinate officers to the Fire Chief to include senior level chief officers and company officers within the leadership and management of all department operations. This includes separating the Fire Chief from direct control of all officers as depicted in the current organizational chart to an organizational model that clearly identifies the role of the Chief as one of leadership of the entire organization and delegates basic day-to-day company level tasks and responsibilities to other levels in the department.

In the time allocation model, each level in the organization spends a percentage of their day either *Operating the System*, *Improving the System*, or *Creating the Future*. Where a staff member may spend their time is directly tied to the position in the organization they fill.

The next figure illustrates the Time Allocation Model. This is followed by a proposed organizational chart to link to this model, and which facilitates current and future organizational challenges.

FIGURE 3-3: Time Allocation Model



In the BFD, senior level officers include the fire chief, assistant fire chief, deputy fire chief, division chiefs (career and call force), and the medical director. These positions should spend the majority of their time creating the future for the department, the next greatest portion of their time improving the system, and the least amount of time operating the system. When senior management delves into operating the system more than improving the system and creating the system, several things occur. Those charged with operating the system do not feel trusted or empowered to carry out their assigned duties. They feel micro-managed and this increases stress in the organization. When senior leaders spend more time operating the system, they can sabotage an organization's morale and undermine growth. When senior managers operate the system too much it fosters an environment where employees are not trusted to do the job properly, so employees disengage. Based on stakeholder interviews, these are symptoms that are present in the BFD.

Middle managers in the BFD include the career shift captains and the call force district chief. These positions allocate their time evenly across the three categories of creating the future for the department, improving the system, and operating the system. In this scenario these positions plan, organize, lead, and evaluate the shift operations for career and call force staff. This level in the organization is important in that it creates the conduit of information between those who operate the system and those who improve the system and create the future. This level of the organization should be linked to committees, processes, and continuous improvement of the organization on a regular basis. They should also be included in strategic planning concepts through input and development of goals and objectives. Importantly, this level manages and leads those who operate the system and is responsible for ensuring this level of the organization is continuously prepared to respond and mitigate emergencies.

Those who operate the system in the BFD include lieutenants and firefighters. These positions should be allocating their time in reverse of senior leadership. This includes the greatest percentage of the day spent operating the system, the next greatest percent improving the system, and the least amount of time creating the future. While it is natural for this level of the organization to spend most of their time operating the system (preparation and response to emergencies), they are a valuable resource and should not be ignored when systems, processes, equipment, and response require improvement. Equally, when strategic goals and objectives are developed, this level operates the very pieces of the organization for which goals and objectives are being developed. Inclusion of this level empowers and creates trust and buy-in to organizational concepts and strategies.

CPSM proposes an organizational chart that links the functional organization and time allocation concepts to an organizational chart aimed at leading and managing the organization from a decentralized perspective that empowers all members of the organization and builds trust throughout the organization.

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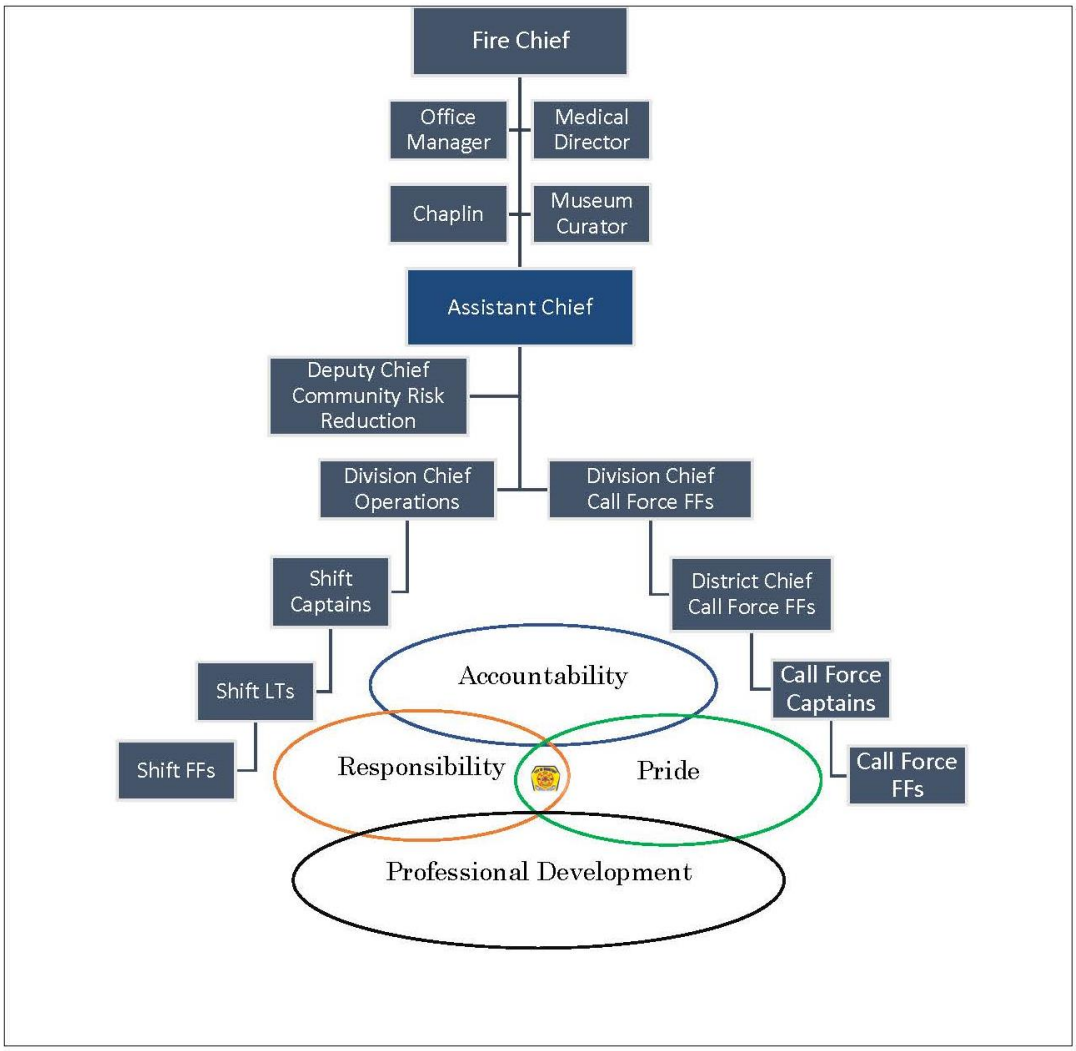
FIGURE 3-4: Proposed BFD Organizational Chart



In this proposed organizational chart, the assistant fire chief is responsible for the management and direction of the BFD's day-to-day operations. When linked to the functional table of organization and the time allocation model, this organizational chart expands the role of the assistant fire chief to manage the operational specific programs and collateral duties. This decentralizes the day-to-day operational management from the Chief, who should be concentrating on improving the system and creating the future of the BFD.

Time Allocation and Organizational Recommendation:

- CPSM recommends the BFD adopt the concepts of a Functional Organizational Chart, the Time Allocation Model, and the proposed organizational chart to ensure a more efficient alignment of organizational resources, and the effective use of all members of the organization in order to achieve the organization's mission and core values. (Recommendation No. 1.)

STRATEGIC PLANNING

Strategic planning is an important process for an organization, as it serves as a clear and concise roadmap for the future. This process can be challenging because strategic planning requires an honest assessment of the department's current state of performance and a realistic understanding of ways to improve. While the BFD has strategic goals, as an organization it has not taken the necessary steps to pursue this process as a means toward continuous improvement. Staff stakeholder interviews revealed a sense that there is no department vision or strategic vision, and there is a need for new core values. The development of this vision and values must have input from the entire organization. Defining clear goals and objectives for any organization through a formal strategic planning document establishes a resource that any member of the organization, or those external to the organization, can view and determine in what direction the organization is heading, and as well how the organization is planning to get there.

The strategic planning process addresses the following:

As mentioned above, strategic planning requires an honest assessment of the department's current state of performance. For continuous improvement, the BFD should start with an analysis of the department's strengths, weaknesses, opportunities, and threats (commonly referred to as a SWOT analysis). Then, a review of the department's current mission, vision, and values statements should be undertaken, followed by an update of those statements utilizing department-wide input to align more clearly with current and anticipated future perspectives. With department-wide input, the department should develop goals and objectives that align with the SWOT analysis, updated mission, vision, and values, guided by a gap analysis that should be conducted.

Suggested steps for a successful approach to the strategic planning process include: [2]

Purpose-Mission: This is the statement that describes why an organization exists. This statement should describe what customer needs are intended to be met and with what services. The organization should agree on what the mission statement/purpose is, understanding that this will evolve over the years as the organization evolves.

2. McNamara, C. (1996-2007) *Basic Overview of Various Strategic Planning Models*. Adapted from the Field Guide to Nonprofit Strategic Planning and Facilitation. (Minneapolis, MN: Authenticity Consulting, LLC.)

Selection of goals and objectives the organization must meet to accomplish its mission: Goals and objectives are general statements about what an organization needs to accomplish to meet its purpose, or mission, and address major issues it faces. This requires organizational input.

Identify specific approaches or strategies that must be implemented to reach each goal: The strategies are often what change the most as the organization eventually conducts more robust strategic planning, particularly by more closely examining the external and internal organizational environments. This requires organizational input.

Identify specific actions to implement each strategy: Specific activities each division or major function must undertake to ensure it is effectively implementing each goal must be identified. Goals and objectives should be clearly worded to the extent that staff and the community can assess if the goals have been met or not. Ideally, top management develops specific committees that each have a work plan or set of objectives. This requires organizational input.

Monitor and update the plan: Regularly reflect on the extent to which the goals and objectives are being met and whether action plans are being implemented. Perhaps the most important feedback is positive feedback from customers, both internal and external. This requires an annual review and report to the organization and community on each goal and objective and how the strategies to accomplish the goal are progressing.

Strategic Planning Recommendation:

- CPSM recommends the BFD undertake a strategic planning process that is inclusive of the entire department and the community; reexamine the mission, vision, and values statements; incorporate measurable and obtainable goals and objectives; and provide for an annual review and report to the organization and community that outlines the plan's progress. (Recommendation No. 2.)

SUCCESSION PLANNING

During our analysis, CPSM did not identify a clear organizational succession plan within the BFD. Additionally, there is not a career path program that outlines expectations to help to prepare staff for advancement at various levels in the organization, to include middle and senior management. One important piece for the organization, which is experiencing turnover of personnel at all ranks, is to implement programs that identify the future leaders of the organization; that is, programs that go beyond the technical courses for career advancement preparation. A key to this is to develop and implement a formal succession plan, focused on developing potential successors to ensure organizational leadership stability, and also serve as a retention plan. This type of planning is typically designed to identify, develop, and nurture potential future leaders.

There are a few examples of succession planning that work well in fire departments:

- Development-Based Processes: A succession planning model that equips an employee or group of employees for future roles and responsibilities through diverse organizational program exposure and assignments.
- Replacement Planning: A process of identifying replacement staff for key positions and functions and developing these employees over the short term.

- Career Path Training: A program that identifies technical and organizational development courses and/or formal education that must be completed as employees prepare to elevate responsibility or position in the organization. Ideally the officer candidate for any officer level in the department is experienced and has the foundational technical and formal education and training to be successful with each new level promoted to. To ensure this and to ensure the BFD is preparing future officers, a formal program that identifies those foundational technical and organizational courses germane to each level in the organization should be selected and implemented. A growing number of fire departments are employing task books for personnel who aspire to (or in some cases have already been promoted to) higher rank. For the BFD, task books would be appropriate for firefighters, lieutenants, and captains. The successful completion of any task book can be considered as a prerequisite for promotion to higher rank including captain, or alternatively, can be a required element of the post-hire/promotional evaluation process.
- Succession Planning: A more future-focused process of categorizing the knowledge, skills, and abilities needed to perform organizational functions. Linked to this is the development of a plan that has the intent of preparing multiple employees to potentially perform those functions and which creates opportunity for advancement in the organization.

Critical to the success of succession planning is the engagement and commitment of the senior leaders to the program, as well as the commitment of other members of the organization to their own personal and professional development. To be a part of the succession plan, one must commit to one's own professional development to be able to compete for and fill critical organizational leadership roles.

Succession Planning Recommendation:

- CPSM recommends the BFD work with the collective bargaining unit and the city's Human Resources Director to develop a succession plan that is diverse, includes the entire organization, and has a focus on preparing current and future members to take on additional roles and responsibilities, and as well as prepares members for advancement and promotion into key roles in the organization. (Recommendation No. 3.)

DEPARTMENT POLICIES AND PROCEDURES

The BFD operates under policy guidance from the city regarding employment, human resources, and related municipal matters. In addition, the fire department operates under policies and procedures that are specific to its internal operations.

Fire departments typically manage and direct operational practices by way of Standard Operating Procedures (SOPs) or Standard Operating Guidelines (SOGs). The BFD operates in this same manner through department SOGs, joint guidelines and procedures between the BFD and the Saco Fire Department for joint responses, department SOPs, and various hazmat and pandemic response plans that are categorized as policies. The policies and procedures are current, with the oldest dating to 2018.

Overall, we found there are several hundred BFD policies and procedures in place, most of which are oriented to operations. Although these policies and procedures are necessary and establish the basis for all department operations in the station and on the emergency scene, CPSM found that, due to the large number of these documents, understanding and following all policies can be cumbersome and complicated. This was mentioned during stakeholder meetings as well. Moreover, stakeholders discussed the challenge of learning, understanding,

and being held accountable to so many guidelines, polices, and procedures while also being held accountable for day-to-day duties. While CPSM agrees that SOGs, SOPs, and other administrative directives are important because they establish baseline management and operational practices, CPSM is also in agreement that in the BFD there are too many.

The BFD has an opportunity for continuous improvement in order to avoid apathy by employees in learning and understanding all departmental SOGs, SOPs, and directives. CPSM suggests combining/merging many of the current guidelines and procedures to reduce the number overall and create a system that is more easily learned, followed, and accepted. There are professional consulting firms that specialize in public safety policy and procedure development and re-tooling. Such a firm will utilize current department policies and procedures along with department stakeholder input to merge, remove, and develop new policies and procedures that meet the department's needs and that are consistent with fire and EMS department best practices.

Policies and Procedures Recommendation:

- CPSM recommends the BFD contract with a consulting firm to revamp the current department Standard Operating Guidelines, Procedures, and Directives, utilizing department-wide stakeholder input. Such an effort should have a focus on reducing the number of policies and procedures through merging, removing, and development of new policies and procedures to meet the Biddeford Fire Department's needs and that are consistent with fire and EMS department best practices. (Recommendation No. 4.)

LABOR-MANAGEMENT ANALYSIS

Labor-management relations in the BFD are currently stressed, which has led to an adversarial relationship and divide between labor and management. According to stakeholders, the actions of fire administration are a root cause of morale issues in the labor force, and they assert this has led to staff leaving the department, recruitment of new employees to be impeded, and lack of desire by staff to seek promotion. This situation has not, however, affected the day-to-day service delivery by on-duty staff as they proudly maintain a can-do attitude.

CPSM held numerous stakeholder meetings with the labor group as well as with management. These included both virtual and in-person meetings. During the labor stakeholder meetings some common themes or organizational stressors that frequently came up were:

- Lack of trust between the labor group and fire administration.
- Communication gaps between the labor group and fire administration.
- Fire administration has no strategic plan for the department; the department needs a new vision statement. Current vision is based on what everyone else is doing.
- There is no shared mission, vision, or values between the labor group and fire administration.
- Due to turnover, the department is always hiring and training new employees. This affects professional development for incumbent employees as training funds are largely dedicated to new recruits.
- The captains and lieutenants do not have the freedom to make functional or operational changes; they must follow guidelines and procedures.

- Labor input is not valued.
- There is no succession planning.

During stakeholder meetings with the Fire Chief, it became evident to CPSM that the Fire Chief understands the relationship issues with labor and communicated the need to continue to seek improvement in labor-management issues through regular meetings with the IAFF President.

In our review of the issues and concerns presented, we understood the root causes and challenges of the current labor-management dilemma to be as follows:

Morale; Ineffective Organizational Communication

Effective communication is the key to overcoming conflict. Sharing organizational information and making staff aware of the organizational impacts and the bigger picture would help to increase morale and create strong foundations. It is important to bring staff together to seek constructive input so as a leader, one can see situations from diverse perspectives.

Trust and Transparency

Trust is built through open communication, disclosure, and sharing of information. Being truthful and recognizing others who show the same level of transparency develops an open organizational culture. Leaders play a key role in this and should actively reach out to stakeholders to set a positive example. Different people share information and are convinced in different manners, making it vital across the organization for staff to understand and embrace emotional intelligence.

Lack of Strategic Planning and Department Vision

Leadership must clearly and regularly communicate the organizational purpose and the role every member has in the organization. Every organizational member must know where they fit and how they should be spending their time. To be successful, leadership should not always be focused on the short term, it is equally important to see and develop the organization's ability to think and plan for the longer term. It is vital that every staff member understands the role they will play in developing the long-term plan. It is the leader's responsibility to create the vision and the future of the organization and create the nexus between his/her vision with the organization.

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We have already discussed several organizational instruments the BFD should explore and that would benefit the labor-management issues described herein. These include the recognition and adoption of the concepts of a functional table of the organization that clearly defines the functions of positions and divisions of the organization; the concepts of the time allocation model that defines how members of the organization by rank should be spending their work day; the development and implementation of a strategic plan (with organizational input) that would include revisions to the mission, values, and vision statements of the organization; and the development and implementation of a succession plan aimed at developing the future of the organization.

In any employee relations issue or conflict, perception is as important as reality. For many employees, their perceptions drive how they think, act, and how they fulfill their job responsibilities. Perceptions are further formed from leadership styles, communication styles and/or gaps, as well as what organizational role they fill. Regardless of whether the issue or conflict is based on perception or reality, it cannot be ignored and must be dealt with head-on and corrected to sustain a desirable workplace. CPSM understands that some of the issues and conflict raised by organizational members may be based on perception; however, because

these perceptions have lingered, they have become reality and organizational members have responded as indicated herein.

Labor-Management Recommendations:

As there is a mix of current and historical organizational morale, communication, trust, transparency, and emotional intelligence issues between labor and fire administration, CPSM recommends:

- The city and the IAFF should continue to work collaboratively through monthly organizational meetings that include BFD leadership, and the IAFF and its members. CPSM further recommends these meetings should be scheduled at a neutral site and on alternate shift days each month so that members working different shifts have the ability to attend without interruption of calls. These meetings should be kept to one hour and be focused on resolving organizational conflict, issues, and to deescalate problems. CPSM strongly recommends these meetings be mediated by a neutral party who specializes in labor-management conflict resolution. (Recommendation No. 5.)

SECTION 4. SUPPORT SYSTEMS AND INFRASTRUCTURE ANALYSIS

ISO ANALYSIS

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.

ISO conducts field evaluations in an effort to rate communities and their relative ability to provide fire protection and mitigate fire risk. This evaluation allows ISO to determine and publish the Public Protection Classification (PPC). 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 (score from 1 to 10). This is an analysis of the structural fire suppression delivery system in a community.

Class 1 (highest classification/lowest numerical score) represents an exemplary community 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 a compilation of community services that include the fire department, the emergency communications center, and the community's potable water supply system operator.[3]

A favorable PPC numerical rating potentially may translate into lower insurance premiums for business owners and homeowners. This more favorable classification makes the community more attractive from an insurance risk perspective. How the PPC for each community affects business and homeowners can be complicated because each insurance underwriter is free to utilize the information as they deem appropriate. Overall, many factors feed into the compilation of an insurance premium, not just the PPC.

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). Biddeford's needed fire flow is 3,500 gallons per minute. This is based on the fifth-largest needed fire flow in the city.
- **Emergency Communications** (10 percent of the evaluation).
- **Fire Department** (50 percent of the evaluation).
- **Water Supply** (40 percent of the evaluation).

The City of Biddeford has an ISO rating of ***Class 02/2y***. The first number indicates a fire suppression system is present that includes a creditable dispatch center, fire department, and water supply (fire hydrants). The second number is the class that applies to properties within five road miles of a fire station but beyond 1,000 feet of a creditable water supply (fire hydrant). The city's ISO rating was effective October 1, 2020.

The City of Biddeford's 2020 ISO report included the following credit points by major category:

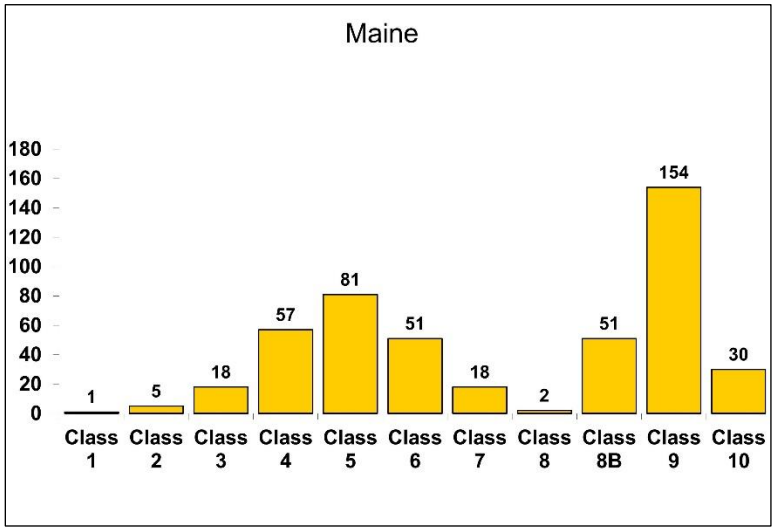
3. BFD ISO PPC report Effective October 1, 2020.

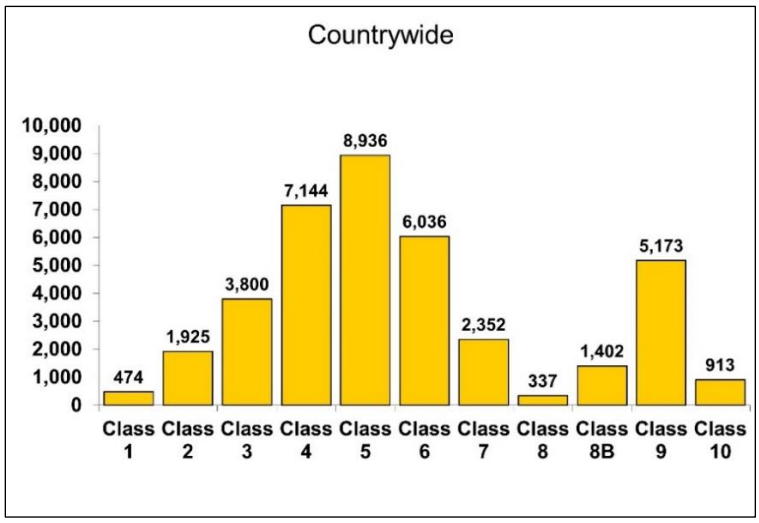
- **Emergency Communications**: 8.00 earned credit points/10.00 credit points available.
- **Fire Department**: 44.94 earned credit points/50.00 credit points available.
- **Water Supply:** 28.93 earned credit points/40.00 credit points available.
- **Community Risk Reduction** (Fire Prevention/Inspection, Public Education, and Fire Investigation activities): 3.29 earned credit points/5.50 credit points available.

Overall, the community PPC rating yielded 81.65 earned credit points/105.50 credit points available. There was a 3.51 point diversion reduction assessed as well, which is automatically calculated based on the relative difference between the fire department and water supply scores. **80.00 points or more qualify a community for a rating of 2/2y.**

The following figures illustrate the PPC ratings across the United States and in Maine.

FIGURE 4-1: PPC Ratings in the United States and Maine[4]





Biddeford has a Class 2/2y Community Rating

4. https://www.isomitigation.com/ppc/program-works/facts-and-figures-about-ppc-codes-around-the-country/

The following table outlines the scoring for the three City of Biddeford ISO-FSRS components.

TABLE 4-1: Biddeford ISO Earned Credit Overview

FSRS Component	Earned Credit	Credit Available
414. Credit for Emergency Reporting	2.10	3
422. Credit for Telecommunicators	4.00	4
4.32. Credit for Dispatch Circuits	1.90	3
440. Credit for Emergency Communications	**8.00**	**10**
513. Credit for Engine Companies	6.00	6
523. Credit for Reserve Pumpers	0.00	0.50
532. Credit for Pump Capacity	3.00	3
549. Credit for Ladder Service	4.00	4
553. Credit for Reserve Ladder and Service Trucks	0.00	0.50
561. Credit for Deployment Analysis	5.70	10
571. Credit for Company Personnel	17.30	15
581. Credit for Training	6.94	9
730. Credit for Operational Considerations	2.00	2
590. Credit for Fire Department	**44.94**	**50**
616. Credit for Supply System	20.34	30
621. Credit for Fire Hydrants	3.0	3
631. Credit for Inspection and Flow Testing	5.59	7
640. Credit for Water Supply	**28.93**	**40**
Divergence	**-3.51**	-
1050. Community Risk Reduction	**3.29**	5.50
Total Credit	**81.65**	**105.50**

Areas of scoring that should be reviewed further internally by the city and the BFD, and which can have the most impact on individual areas evaluated and scored that connect to total section scoring include:[5]

- Deployment analysis: #561 (5.70/10 credits).
  - This category contemplates the percentage of built-upon area that first due engines cover (1.5 miles) and first due ladders cover (2.5 miles). The analysis shows that just over 50 percent of the built-upon area of the city is within 1.5 miles of engine apparatus and 2.5 miles of ladder apparatus. *This category has an expanded discussion later in this report.*
- Training: #581 (B) Company Training (11.91/25 credits).
  - For maximum credit, each firefighter should receive 16 hours per month in structure fire-related subjects as outlined in the NFPA 1001 standard. The BFD is not meeting this section to its fullest potential.

5. Public Protection Classification Summary Report, Biddeford, MA, 2019.

- Training: #581 (H) Pre-Fire Planning Inspections (7.47/12 credits).
  - For maximum credit, company members should annually make pre-fire planning inspections of each commercial, industrial, institutional, and other similar type building (all buildings except one- to four-family dwellings). Pre-fire planning inspections are company level walk-throughs of commercial, industrial, institutional, hotels/motels, and larger footprint buildings to become familiar with floor plans, hose connections, means of egress, concentrations of population, hazardous materials storage, and the like. Typically, fire departments have templates they fill in while conducting these pre-fire plan inspections that include pertinent owner/occupant information, sketched floor plans, hydrant locations, fire department connections, elevator locations, hazardous storage, or process locations in the building, etc. Another purpose of a pre-fire plan is its use when an actual incident is occurring at the target hazard site or building. In this case the incident commander has at his/her disposal vital information that he/she can reference when making incident decisions. A record of inspections is important as well to gain appropriate credits.

ISO Analysis Recommendation:

- CPSM recommends the BFD review and address, to the extent possible, deficiencies in the Fire Department section of the current ISO-Public Protection Classification report as outlined in this report. Special attention should be given to developing methods and opportunities for members to achieve the training as required in the ISO analysis, as it is focused on firefighter safety, improved competencies, and overall improved fireground effectiveness and functionality. (Recommendation No. 6.)

EXTERNAL AGENCY COLLABORATION

Automatic aid is a system whereby fire, rescue, and EMS units respond automatically to another community through agreement based on closeness of resources. Mutual aid is a system whereby surrounding communities provide fire, rescue, and EMS resources to another community through agreement and specific request (not automatically). In an automatic aid scenario, resources from neighboring jurisdictions are built into run cards in the home jurisdiction for again, an automatic response; this aid is designed to supplement and bolster the Effective Response Force of the home jurisdiction.

The BFD has several agreements with the fire departments in the region for mutual and automatic aid, mutual aid upon request, hazardous materials (hazmat) response, and wildland fire response.

The next table describes these agreements, who they are with and for what, and when they were implemented.

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TABLE 4-2: Biddeford Agreements for Fire and Related Response

Agency	Agreement Components
Town of Arundel	Automatic Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.
City of Saco	Automatic Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.
Town of Scarborough	Automatic Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.
Old Orchard Beach	Automatic Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.
Goodwins Mills	Automatic Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.
Lyman and Dayton Fire Commission	Mutual Fire Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.
Town of Kennebunk	Mutual Fire Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.
Town of Kennebunkport	Mutual Fire Aid. Reciprocal agreement to assist each municipality when requested and if requested personnel and equipment can be spared by the requested municipality.

The next figure illustrates the location of the primary aid departments.

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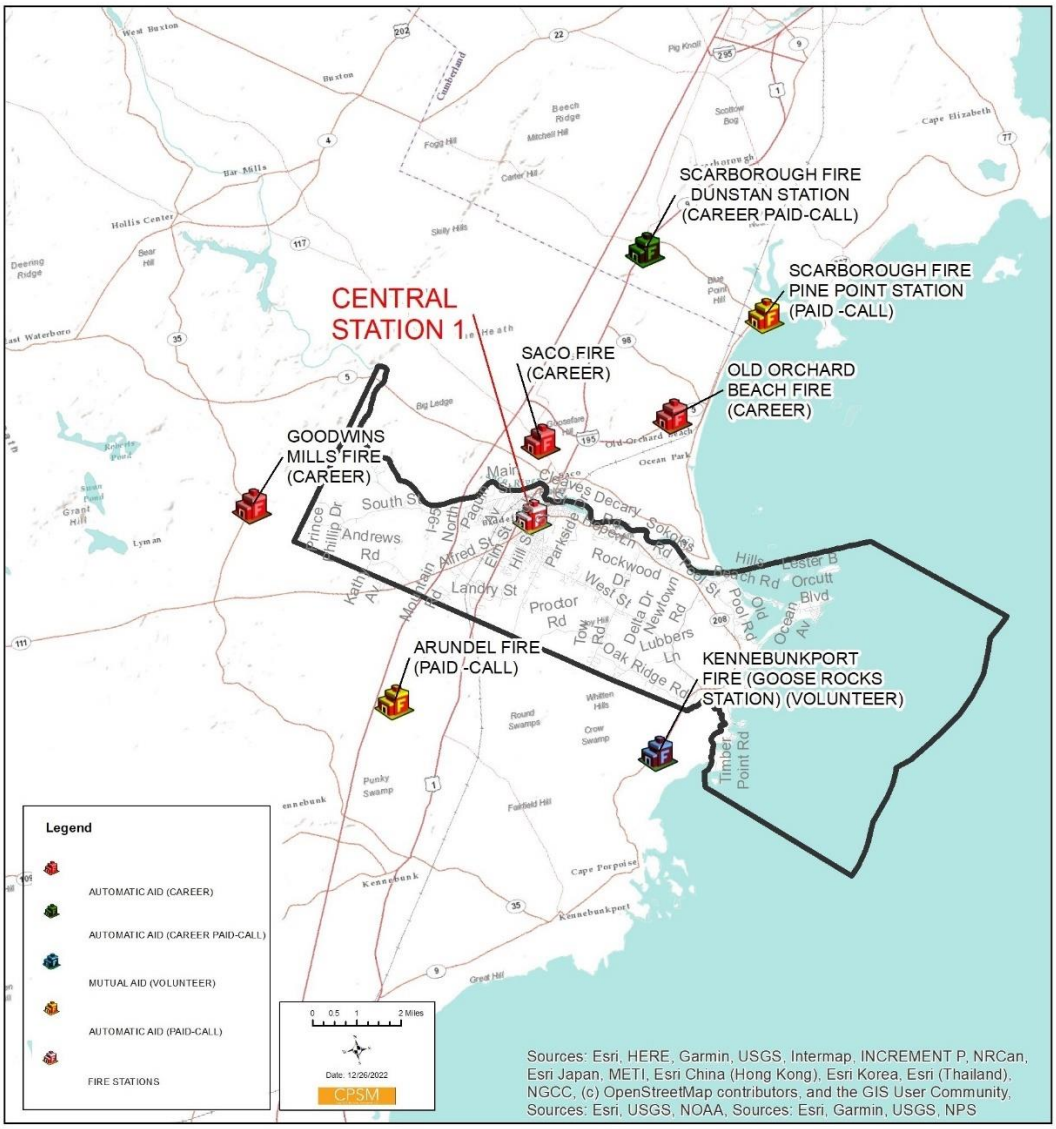
FIGURE 4-2: Primary Automatic and Mutual Aid Locations



The BFD also has response agreements with the county, state, and federal agencies as outlined in the next table.

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TABLE 4-3: Response Agreements with County, State, and Federal Agencies

Agency	Agreement Components
York County	Mutual Aid for Hazmat Response. BFD to provide staff and county response assets for hazmat decontamination as part of the York County Technical Level Hazmat Team.
York County	Incident Management Team. BFD to provide staff support to staff the York County Incident Management Team as needed throughout York County during a disaster or other county emergency.
Southern Maine Medical Center	The BFD to provide decontamination services with trained personnel to Southern Maine Medical Center in the event of a Hazardous Materials incident involving medical patients being brought to the Medical Center.
York County	Agreement to provide for the establishment and implementation of a regional mutual aid agreement for disaster preparedness and response in the case of a disaster that may overwhelm any one municipality. The BFD would send assets and personnel to the extent possible and within available resources.
Saco River and Ocean Operation Agreement	Provision of marine multi-mission rescue response utilizing on-duty BFD and Saco Fire Department personnel and the Saco River patrol boat and all equipment.
U.S. Coast Guard	Agreement to allow the BFD to utilize VHF-FM marine band channel 81 in communicating with Coast Guard assets.

Collaboration Recommendation:

- As many of the mutual, automatic, and other aid agreements outlined in this report are in excess of ten years old, CPSM recommends the BFD conduct a comprehensive review of all response and use agreements. This review should include the construction of new agreements where applicable, which should more clearly define service level response (automatic or mutual aid) and reciprocal equipment or services the BFD will obligate. CPSM further recommends that each agreement have a sunset date that will require future review and updating to address any changes in services received or provided. (Recommendation No. 7.)

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COMMUNITY RISK REDUCTION

Community Risk Reduction activities are important undertakings of a modern-day fire department. A comprehensive fire protection system in every jurisdiction should include, at a minimum, the key functions of fire prevention, code enforcement, inspections, and public education. Preventing fires before they occur, and limiting the impact of those that do, should be priority objectives of every fire department. Fire investigation is a mission-important function of fire departments, as this function serves to determine how a fire started and why the fire behaved the way it did, providing information that plays a significant role in fire prevention efforts. Educating the public about fire safety and teaching them appropriate behaviors on how to react should they be confronted with a fire is also an important life safety responsibility of the fire department.

Fire suppression and response, although necessary to protect property, have minor impacts on preventing fires. Rather, it is public fire education, fire prevention, and built-in fire protection systems that are essential elements in protecting citizens from death and injury due to fire, smoke inhalation, and carbon monoxide poisoning. The fire prevention mission is of utmost importance, as it is the only area of service delivery that dedicates 100 percent of its effort to the reduction of the incidence of fire.

Fire prevention is a key responsibility of every member of the fire department; fire prevention activities should include all personnel. On-duty personnel can be assigned the responsibility for "in-service" inspections to identify and mitigate fire hazards in buildings, to familiarize firefighters with the layout of buildings, identify risks that may be encountered during firefighting operations, and to develop pre-fire plans; the BFD does this currently. On-duty personnel in many departments are also assigned responsibility for permit inspections and public fire safety education activities.

Fire prevention should be approached in a truly systematic manner, and many community stakeholders have a personal stake and/or responsibility in these endeavors. A significant percent of all the requirements found in building/construction and related codes are related in some way to fire protection and safety. Various activities such as plan reviews, permits, and inspections are often spread among different departments in the municipal government and are often not coordinated as effectively as they should be. Every effort should be made to ensure these activities are managed effectively between departments.

FIGURE 4-3: BFD Fire Safety Trailer

The BFD has a comprehensive Community Risk Reduction program that includes fire prevention, life safety, and community outreach.

The department utilizes a state-of-the-art mobile Fire Safety Trailer (see Figure) that was proudly designed and built by the BFD firefighters.

The Fire Safety Trailer provides the community with a unique education tool for people of all ages. BFD also supports and provides life-safety education programs such as Learn Not to Burn, Juvenile Fire setter Program, and Public Safety Education.

The BFD Fire Prevention, Inspection and Investigation Division is under the direction of the Deputy Fire Chief. This office provides inspection services in such areas as commercial and industrial properties, new building construction, wood stoves, and chimneys.

The department conducts and documents fire prevention, life safety, and community risk reduction activities. The next table documents that BFD conducted more than 2,100 community risk reduction activities in 2021.

TABLE 4-4: BFD Prevention Activities, 2021

Description of Activities	# of Activities
Burning Permits	1,913
Blasting Permits	12
Construction Plans Reviews/Solar Arrays	20
Dry Hydrant Inspections	12
Evacuation Drills	8
Evacuation Plans Reviews	4
Extinguishing Systems Inspections	4
Fire Safety Inspections	50
Fire Alarm Tests	14
Knox Box Inspections	10
Building Maps Review	4
Occupancy Permit Inspections	5
Sprinkler Inspections Reviews	40
Chimney/Wood Stove/Pellet Stove Inspections	2
Tier II Hazmat Inspections	13
Vacant Building Inspections	3
Juvenile Fire setter Interventions	2
Fire Education Classes	2
Fire Investigations	15
Public Safety Lectures	6
EMS Student Ride Along	6
Public CPR/AED Classes	15
Fire Station Tours/Safety Lectures	2
Community Contact/Prevention Details	12
Total	**2,174**

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EDUCATION AND TRAINING

Training is, without question, one of the most essential functions that a fire department should be performing on a regular basis. One could even make a credible argument that training is, in some ways, more important than emergency responses because a department that is not well trained, prepared, and operationally ready will be unable to fulfill its emergency response obligations and mission. Education and training are vital at all levels of fire service operations to ensure that are necessary functions are completed correctly, safely, and effectively. A comprehensive, diverse, and ongoing training program is critical to the fire department's level of success.

An effective fire department training program must cover all the essential elements of that department's core missions and responsibilities. The level of training or education required, given a set of tasks, varies with the jobs to be performed. The program must include an appropriate combination of technical/didactic training, manipulative or hands-on/practical evolutions, and training assessment to gauge the effectiveness of these efforts. Most of the training, but particularly the practical, standardized, hands-on training evolutions should be developed based upon the department's own operating procedures and operations while remaining cognizant of widely accepted practices and standards that could be used as a benchmark to judge the department's operations for any number of reasons.

All career fire departments are responsible for:

- Training (fire and EMS) and professional development for all department personnel.
- Facilitating high-level patient care through EMS training, including certification classes, annual refresher training, and quality management of patient care.
- Oversight of Occupational Health and Safety provisions, including those covering Personal Protective Equipment.
- Specialized training such as technical rescue and hazmat response.
- Compliance with standards compliance, including those set forth by the National Fire Protection Association (NFPA), ISO, the Occupational Safety and Health Administration (OSHA), and other regulatory agencies.
- EMS continuing education in accordance with state agencies and the department Medical Director.
- Onboarding of new firefighters and the continual development of existing personnel.

The BFD provides staff with many training opportunities as indicated below. Included in this training is a monthly training outline that includes fire and EMS classroom and hands-on training for all incumbents. BFD staff meet state EMS training and certification requirements through the National Registry or State of Maine EMS Bureau. Many of the fire training classes are provided by the Maine Fire Service Institute and include firefighter, officer, instructor, and fire and life safety educator courses.

BFD staff provided the following information regarding departmental training:

- Department training and company level training occurs at the central station and at different locations within the city, depending on the subject.
- The BFD does not have a training center. To provide necessary annual live fire drills, the BFD must schedule one of the state-approved facilities outside of the city limits.
- The BFD utilizes Vector Solutions (formerly Target Solutions) as a didactic/virtual platform for department training. This platform assists staff with the delivery and documentation of required annuals, fire, and EMS continuing education. The software can also be used as a tool for official communications that require firefighter acknowledgement of receipt.
- The BFD allows staff to attend training courses at the National Fire Academy (NFA) in Emmittsburg, Maryland. Approval is based on the request and course type. The department averages three staff members per year that participate in NFA classes. All levels of staff are able to attend.
- Staff attend a variety of state fire and professional development courses. All staff are encouraged to attend depending on departmental staffing needs.
- Onsite training at the BFD Central Fire Station is provided by administration, company officers, shift staffing, and external instructors.
- Historically, the department only hired staff that had a paramedic license. Recent hiring challenges have prompted the department to consider changing this procedure. The department currently hires staff that are at the Advanced EMT level. The department strives to hire Firefighter II certified candidates; however, the department will hire staff who do not have firefighting certification.
    - All new hires complete a 12-week recruit school. If they do not have firefighter certification, they complete Basic Firefighting or Firefighter 1 training during the recruit school. Staff who do not have Firefighter 1 and 2 certification are required to attend a state-approved certification class to obtain this certification.

Training Recommendation:

- CPSM recommends the City of Biddeford consider exploring the possibility of working with neighboring jurisdictions to develop and construct a Regional Fire Training Center. Regional partnerships such as this typically include an Interlocal Agreement detailing the cost sharing responsibilities and other details as to the use and maintenance of the facility. (Recommendation No. 8.)

FLEET ANALYSIS

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 BFD currently operates a fleet of frontline fire and rescue apparatus that includes:

- Three engine apparatus.
    - 2008 model: 1,000 gallon tank; 1,500 gpm pump.

- 2008 model: 1,000 gallon tank; 1,500 gpm pump.
- 1995 model: 1,000 gallon tank; 1,500 gpm pump.

- One squad-engine
  - 2005 model: 1,000 gallon tank; 1,500 gpm pump; class B foam tank, vehicle extrication and light technical rescue equipment.
- One ladder apparatus.
  - 2013 model: 100-foot aerial tower; 250 gallon tank; 1,500 gpm pump.
- One special hazards apparatus.
  - 2003 model: heavy rescue, extrication, and specialty rescue equipment.
- Brush apparatus.
  - 2008 model: Type IV bush truck, 250 gallon tank.
- EMS ground transport.
  - 2016 model: Type 1.
  - 2017 model: Type 1.
  - 2020 model: Type 1.

The BFD also has an assortment of command and light response vehicles to include watercraft and special equipment trailers.

BFD apparatus maintenance is performed by the fleet maintenance shop in the city's public works department. When needed the maintenance shop utilizes a private vendor that specializes in fire apparatus-specific maintenance. This combination of maintenance and repair work is common practice across the country.

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, dependable, and operationally capable response fleet.

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 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."

A primary 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.

Many departments use a 10-5 rule (10 years frontline service, then 5 years of reserve service) when programming replacement of fire apparatus such as engines, ladders, water tenders, heavy rescues, and heavy squad type hazmat vehicles. Annex D of the current NFPA 1912 edition states:

To maximize fire fighter capabilities and minimize risk of injuries, it is important that fire apparatus be equipped with the latest safety features and operating capabilities. In the last 10 to 15 years, much progress has been made in upgrading functional capabilities and improving the safety features of fire apparatus. Apparatus more than 15 years old might include only a few of the safety upgrades required by the recent editions of the NFPA fire department apparatus standards or the equivalent Underwriters Laboratories of Canada (ULC) standards. Because the changes, upgrades, and fine tuning to NFPA 1901, Standard for Automotive Fire Apparatus, have been truly significant, especially in the area of safety, fire departments should seriously consider the value (or risk) to fire fighters of keeping fire apparatus more than 15 years old in first-line service.

It is recommended that apparatus more than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status, be upgraded in accordance with NFPA 1912, and 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 editions of the automotive fire apparatus standards, many of the improvements and upgrades required by the current editions of the standards are available for firefighters who use the apparatus.

Under the NFPA1912 standard there are two types of refurbishments a fire department can choose. These are Level 1 and Level 2 refurbishments. According to NFPA 1912, a Level 1 refurbishment includes *the assembly of a new fire apparatus by the use of a new chassis frame, driving and crew compartment, front axle, steering and suspension components, and the use of either new components or components from existing apparatus for the remainder of the apparatus.* A Level 2 refurbishment includes *the upgrade of major components or systems of a fire apparatus with components or systems of a fire apparatus that comply with the applicable standards in effect at the time the original apparatus was manufactured.*

A few important points to note regarding the NFPA 1912 standard regarding the refurbishment of heavy fire apparatus. These are:[6]

6. NFPA 1912 Standard for Fire Apparatus Refurbishing, 2016 Edition.

- Apparatus that was not manufactured to applicable NFPA fire apparatus standards or that is 25 years old should be replaced. The BFD has an apparatus that exceeds 25 years of age, and a replacement engine has been ordered at the time of this report. Some departments will utilize vehicles (front-line but not regularly utilized) for longer than 25 years. CPSM does not recommend this practice; however, CPSM understands the financial burden of replacing heavy fire apparatus. It is up to the department and municipality regarding the management of older fire apparatus and the risks they may pose to firefighters and the public who share the road with them.
- A vehicle that undergoes a Level 1 refurbishing receives a new make and model designation and a new Certificate of Origin for the current calendar year. Apparatus receiving a Level 1 refurbishing are intended to meet the current edition of the NFPA automotive fire apparatus standard. *This is the optimal level of refurbishing*.
- A vehicle that has undergone a Level 2 refurbishing retains its original make and model identification as well as its original title and year of manufacture designation. Apparatus receiving Level 2 refurbishing are intended to meet the NFPA automotive fire apparatus standard in effect when the apparatus was manufactured.

The Fleet Maintenance Division, with BFD input, has a fleet replacement plan for heavy fire apparatus and ambulances that is broken down as follows:

- Engines: Replacement at 15 to 20 years.
- Aerial: Replacement at 20 years.
- Service Vehicles: Replacement at 15 years.
- Brush Truck: Replacement at 17 years.
- Ambulances: Replacement at 9 years.

Fleet Recommendations:

CPSM recommends the BFD and the city monitor the current fire apparatus replacement plan and adjust as relevant to each apparatus based on wear and tear, maintenance records, and funding availability, and to the extent possible develop an apparatus replacement plan that aligns closer to recommendations with NFPA 1901, *Standard for Automotive Fire Apparatus*.

Planning objectives should include:

- Apparatus should not exceed 15 years of service on the front line. Once an apparatus reaches this age, one alternative is the apparatus undergoes a Level 1 refurbishing in accordance with NFPA 1912, *Standard for Fire Apparatus Refurbishing* (current standard), or the apparatus is replaced if maintenance records and wear and tear warrant replacement. (Recommendation No. 9.)
- Apparatus greater than 25 years old should be removed from service. (Recommendation No. 10.)
- Apparatus and major apparatus components such as the motor, fire pump, aerial ladder assembly and hydraulics, chassis, and chassis components such as brakes, wheels, and steering equipment should be maintained in accordance with manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis. (Recommendation No. 11.)

- Apparatus components requiring annualized testing either fixed or portable such as fire pumps, aerial ladder and aerial ladder assemblies, ground ladders, self-contained breathing apparatus to include personnel fit-testing, and fire hose should be tested in accordance with manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis. (Recommendation No. 12.)

FACILITY AND RESPONSE TIME ANALYSIS

Sound community fire protection and first-response EMS requires the strategic distribution of an adequate number of 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.

The BFD responds from one primary fire facility (central fire station). The BFD also has a second station where call force members respond and staff an engine apparatus when needed. There is also a reserve engine available at this station for response during working incidents. The fire administration services are located in the central fire station.

TABLE 4-5: BFD Facilities

Station Identifier	Location Bldg. Specifics	Additional Information
Central Fire Station Station 1	152 Alfred Street ■ 16,000 square feet (estimated). ■ 5 apparatus bays ■ 1 service bay	■ Fire Administrative Offices are located here. ■ No room for additional apparatus/storage expansion. ■ Gender separation. ■ Built in 1990.
Pool Station Station 2	25 L.B. Orcutt Blvd. ■ 3,572 square feet. ■ 3 apparatus bays	■ Call force District Chief office located here. ■ Station owned by a private group. ■ No sleeping quarters, showers, or gender separation. ■ Built in 1954.

Fire facilities must be designed and constructed to accommodate both current and forecast trends in fire service vehicle type and manufactured dimensions. A facility must have sufficiently sized bay doors, circulation space between garaged vehicles, and departure and return aprons of adequate length and turn geometry to ensure safe response.

Fire department facilities are exposed to some of the most intense and demanding uses of any public local government facility, as they are occupied 24 hours a day. Personnel-oriented needs in fire facilities must enable 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; and space and amenities for administrative work, training, physical fitness, laundering, meal preparation, and personal hygiene/comfort.

Costs to operate and maintain the fire facilities include utilities (water, electric, heating and cooling) as well as regular upkeep and maintenance. The department's FY 2023 budget includes $78,000 for utility costs and facility maintenance. During the on-site visit CPSM found a well maintained central fire station, which has the normal wear and tear of a fire station that is 32 years of age. Station 2, as noted above, has no sleeping quarters and limited bathroom facilities and is not suitable for 24-hour operations.

The location of responding units is one key 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 manufactured barriers, and response routes that can create response-time problems.[7]

An additional benchmark is the ISO Public Protection Classification rating system. Under this system, one element a jurisdiction is graded on is the distribution within built-upon areas of engine companies and ladder companies (deployment analysis). For full credit in the Fire Suppression Rating Schedule (FSRS), a jurisdiction's fire protection area with residential and commercial properties should have a first-due engine company within 1.5 road miles and a ladder service company within 2.5 road miles.[8] As engine and ladder companies both respond from fire facilities, and because engine companies are the more prevalent fire suppression company, fire facilities are predictably sited based on the response needs of engine companies.

Finally, the current and potential for future demand for service is a consideration for the siting of fire facilities. Demand is the number and types of calls for services provided by the entire fire department. When demand is evaluated, it is important the number of incidents is not confused with the number of unit responses. An emergency call may require the response of more than one unit, but only one incident number is generated. This is a direct accelerator of demand. CPSM measures a call as a single event, which may be handled by a single unit, and a run as a response made by a unit to a call that involves more than one unit.

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.

However, 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 to six minutes of the onset. However, cardiac arrests occur very infrequently on the whole of EMS incidents. There are also other EMS incidents that are truly life-threatening, and the time of response can clearly impact the outcome. These involve cardiac and respiratory emergencies, full drownings, obstetrical emergencies, allergic reactions, electrocutions, and severe trauma (often caused by gunshot wounds, stabbings, and severe motor vehicle accidents, etc.). Again, the frequency of these types of calls is limited.

7. 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.
8. ISO Mitigation, Deployment Analysis.

An 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.

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.

The NFPA 1710 standard for these components of response times is shown below.

In the first component, **dispatch time**, the standard calls for the event to be processed and dispatched in:

- ≤ 64 seconds 90 percent of the time.
- ≤ 106 seconds 95 percent of the time.
- Special call types:
  - ≤ 90 seconds 90 percent of the time.
  - ≤ 120 seconds 99 percent of the time.

The next component of response time is **turnout time**, an aspect of response which is controlled by the responding fire department. NFPA 1710 states that turnout time shall be:

- ≤ 80 seconds for fire and special operations 90 percent of the time.
- ≤ 60 seconds for EMS responses.

The last component of response time is **travel time,** an aspect of response time that is affected by factors such as station location, road conditions, weather, and traffic control systems. NFPA 1710 states that travel time for the first arriving fire suppression unit to a fire incident shall be:

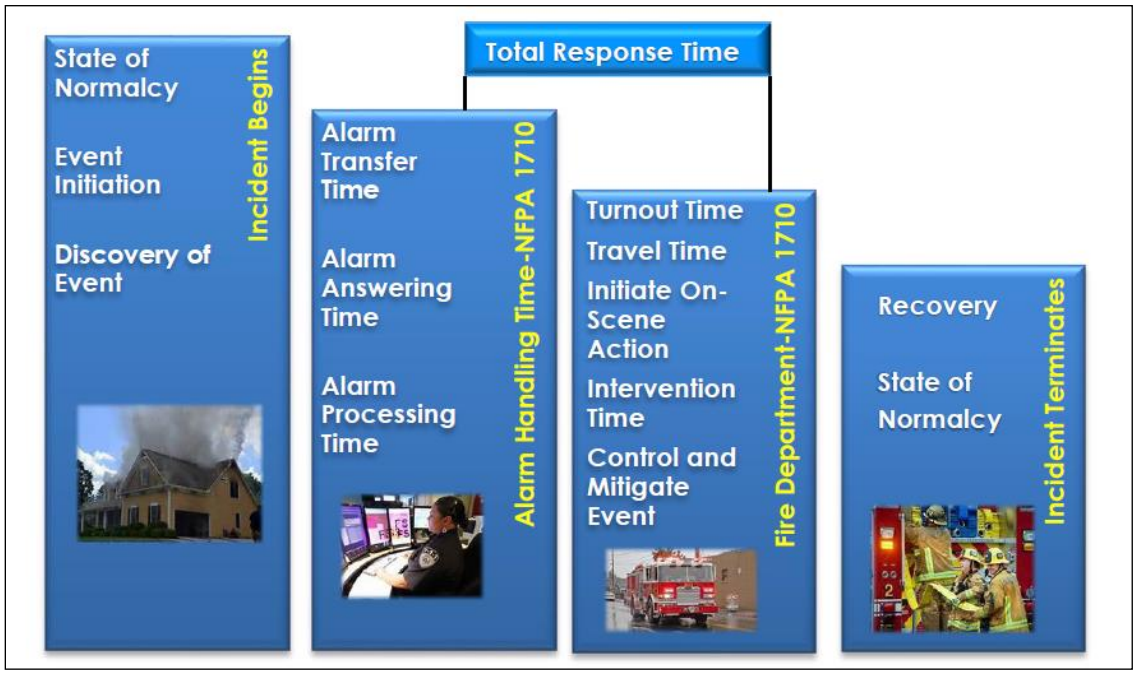
- ≤ 240 seconds for the first arriving engine company to a fire suppression incident 90 percent of the time.
- ≤ 360 seconds for the second company 90 percent of the time.
- ≤ 480 seconds to assemble the initial first alarm assignment on scene 90 percent of the time for low/medium hazards, and 610 seconds for high-rise fire incidents 90 percent of the time.

For EMS incidents the standard NFPA 1710 standard establishes a travel time of:

- ≤ 240 seconds for the first arriving engine company with automated external defibrillator (AED) or higher level capability.
- ≤ 480 seconds or less travel time of an Advanced Life Support (ALS) unit at an EMS incident where the service is provided by the fire department provided a first responder with an AED or basic life support unit arrived in 240 seconds or less travel time.

The next figure provides an overview of the fire department incident cascade of events and further describes the total cascade of events and their relationship to the total response time of a fire incident.

FIGURE 4-4: Incident Cascade of Events



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 key factor in reducing response times, which is typically a key performance measure in determining the efficiency of department operations, and often depends on this factor.

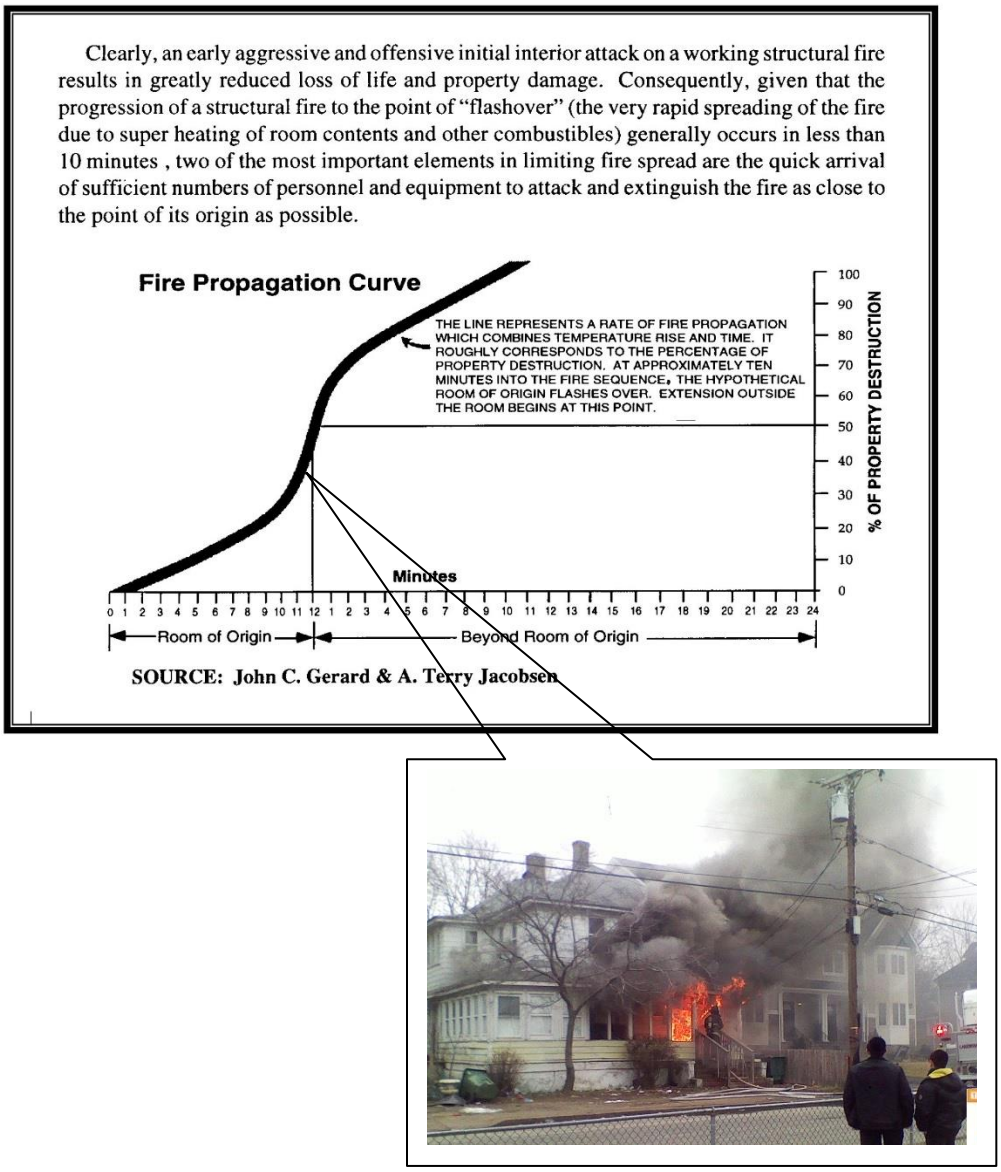
When discussing response times for fire incidents, established criteria are linked to the concept of "flashover." This is the state at which super-heated gases from a fire are released rapidly, causing the fire to burn freely, and become so volatile that the fire reaches an explosive state (simultaneous ignition of all the combustible materials in a room). In this situation, usually after an extended period (often eight to twelve minutes after ignition but times as quickly as five to seven minutes), and a combination of the right conditions (fuel and oxygen), the fire expands rapidly and is much more difficult to contain.

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

The following figure 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. As described in the figure, at approximately the ten-minute mark of fire progression, the fire flashes over (due to superheating of room contents and other combustibles) and extends beyond the room of origin.

FIGURE 4-5: Fire Propagation Curve



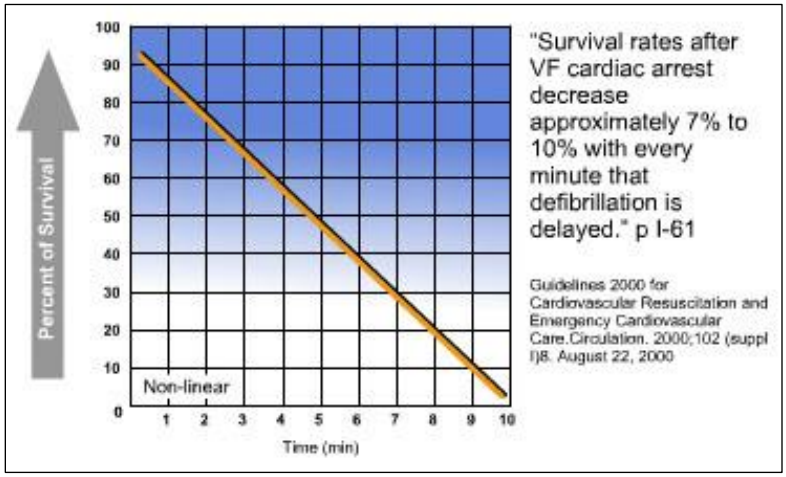
The ability to quickly deploy adequate fire staff prior to flashover thus limits the fire's extension beyond the room or area of origin. The fire propagation curve science establishes that temperature rise and time within in a room on fire corresponds with property destruction and potential loss of life if present.[9]

9. Clinton Smoke, *Company Officer*, 2nd ed. (Clifton Park, NY: Delmar, 2005).

EMS response times are measured differently than fire service response times. Where the fire service uses NFPA 1710 and 1720 as response time benchmarking documents, EMS' focus is and should be directed to the evidence-based research relationship between clinical outcomes and response times. Much of the current research suggests response times have little impact on clinical outcomes outside of a small segment of call types. These include cerebrovascular accidents (stroke), injury or illness compromising the respiratory system, injury or illness compromising the cardiovascular system to include S-T segment elevation emergencies, and certain obstetrical emergencies. Each requires rapid response times, rapid on-scene treatment, and rapid transport to the hospital.

The next figure illustrates the chance of survival from the onset of cardiac arrest, largely due to ventricular fibrillation in terms of minutes without emergency defibrillation delivered by the public or emergency responders. The graphic has not changed over time since first published by the American Heart Association in 2000.

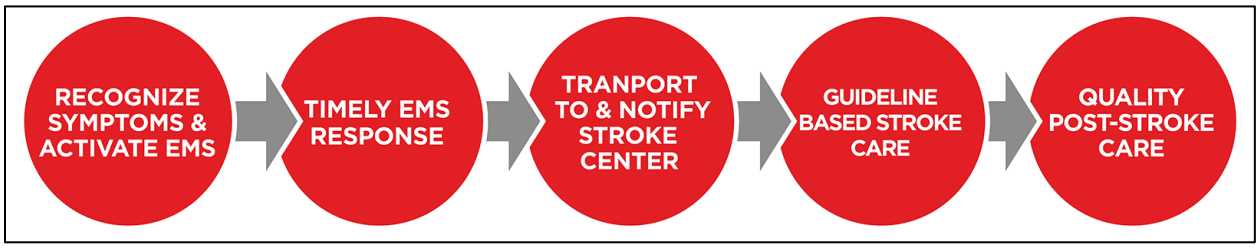
FIGURE 4-6: Cardiac Arrest Survival Probability by Minute



Typically, a low percentage of 911 patients have time-sensitive and advanced life support (ALS) needs. But, for those patients who do have such needs, time can be a critical issue of morbidity and mortality. For the remainder of those calling 911 for a medical emergency, though they may not have a medical necessity, they still expect rapid customer service. Regardless of the service delivery model, appropriate response times are more than a clinical issue; they are also a customer service issue and should not be ignored.

The next figure illustrates the out-of-hospital chain of survival for a stroke emergency, which is a series of actions that, when put in motion, reduce the mortality of a stroke emergency.

FIGURE 4-7: Cerebrovascular Emergency (Stroke) Chain of Survival



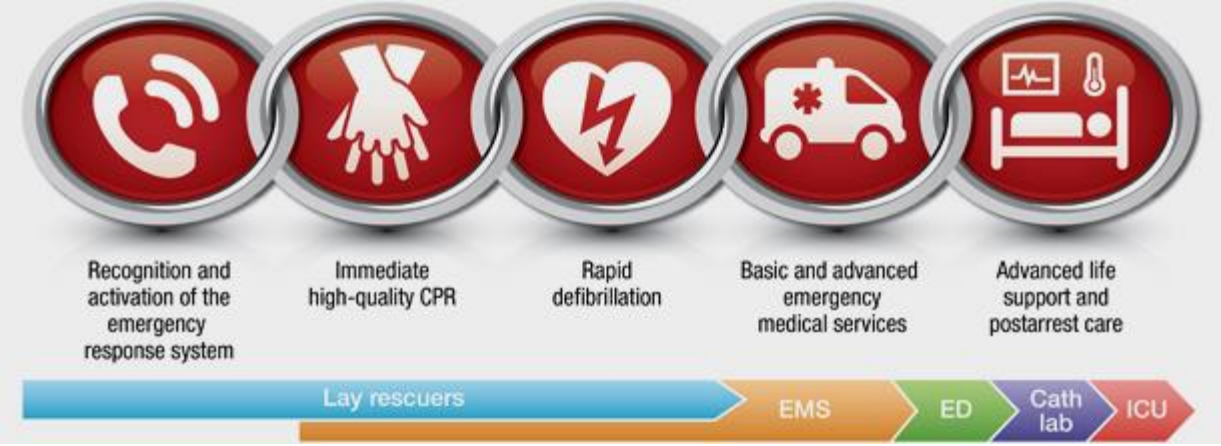
Source: https://nhcps.com/lesson/acls-acute-stroke-care/

If a person is experiencing severe pain, that is also an indicator of an emergency. Again, the frequency of these types of calls is limited 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.[10]

Cardiac arrest is one emergency for which EMS response times were initially built around. Science tells us that the brain begins to die without oxygenated blood flow at the four- to six-minute mark. Without immediate cardiopulmonary resuscitation (CPR) and rapid defibrillation, the chances of survival diminish rapidly at the cessation of breathing and heart pumping activity. For every minute without CPR and/or defibrillation, chances of survival decrease 7 to 10 percent. Further, only 10 percent of victims who suffer cardiac arrest outside of the hospital survive.[11]

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 EMS 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 life support care provided in the prehospital setting.

FIGURE 4-8: 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

The next table depicts the BFD's turnout, travel, and total response times as an average and at the 90th percentile as benchmarked against the NFPA 1710 standard.

10. www.firehouse.com/apparatus/article/10545016/operations-back-to-basics-true-emergency-and-due-regard
11. American Heart Association. *A Race Against the Clock, Out of Hospital Cardiac Arrest*. 2014

TABLE 4-6: Response Time of First Arriving Unit, by Call Type (Minutes)

Call Type	Average Response Time				90th Percentile Response Time				Number of Calls
	Dispatch	Turnout	Travel	Total	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.9	0.9	2.8	5.6	2.8	1.8	4.6	7.8	330
Cardiac and stroke	2.1	0.9	2.8	5.7	3.4	1.7	5.5	8.5	297
Fall and injury	2.7	0.8	3.8	7.4	4.2	1.9	7.5	12.2	661
Illness and other	2.4	0.8	3.6	6.8	3.7	1.8	7.4	11.2	1,221
MVA	3.2	1.3	3.4	7.9	5.5	2.6	6.5	12.0	162
Nonemergency*	1.8	0.9	4.1	6.9	3.0	2.1	6.3	9.8	605
OD*	5.9	0.9	3.0	9.9	14.5	1.9	5.3	17.8	125
Seizure and UNC*	2.3	0.8	3.2	6.3	3.6	1.8	6.3	10.0	290
EMS Subtotal	**2.4**	**0.9**	**3.5**	**6.9**	**3.8**	**1.9**	**6.7**	**10.9**	**3,691**
False alarm	2.2	1.2	4.3	7.7	3.6	2.3	9.0	12.8	439
Good intent	6.3	1.2	3.7	11.3	15.4	2.5	7.0	18.7	76
Hazard	2.4	1.3	5.1	8.7	4.0	2.6	10.1	14.1	151
Outside fire	2.5	1.1	4.4	8.0	4.4	1.9	7.2	12.2	21
Public service	2.4	1.1	4.2	7.7	4.2	2.4	8.0	12.5	328
Structure fire	2.7	1.1	3.3	7.1	4.0	2.0	6.2	11.0	40
Technical rescue	2.6	2.0	5.5	10.1	6.1	3.9	11.1	16.4	19
Fire Subtotal	**2.6**	**1.2**	**4.3**	**8.1**	**4.5**	**2.4**	**8.9**	**13.9**	**1,074**
Total	**2.5**	**1.0**	**3.7**	**7.1**	**3.9**	**2.0**	**7.2**	**11.8**	**4,765**

This table tells us that at the 90th percentile:

- Dispatch time was 3.9 minutes, which does not meet the NFPA 1710 standard.
- Turnout time was 2.0 minutes (EMS-1.9 minutes; Fire-2.4 minutes). Neither meet the NFPA 1710 standard of 1 minute for EMS calls and 1 minute 20 seconds for fire calls).
- The 90th percentile travel time for structure fires was 6.2 minutes. *This does not meet the NFPA 1710 standard.*

The next figures and table outline the BFD's current stations as benchmarked against the NFPA 1710 standard, the ISO standard for engine company and ladder company placement, and how the response coverage improves to the eastern areas of the city with a proposed station on Route 9 near the University of New England. Data and GIS observations tell us:

- At 240 seconds of travel time there are gaps in coverage from the BFD central station to areas of the city east, west, and south. Some of these are due to the road network while others are due to the singular location of a fire facility in the more densified downtown and central area of the city.
- There is built-upon land that is beyond the reach of the 240-second travel time standard and where fire and EMS demand is occurring. The most concentrated demand, however, is served within 240 seconds of travel time from the BFD central station.
- As the BFD response is from a single station, the 360-seconds standard for the second arriving fire suppression unit is measured from mutual and automatic aid stations. Response gaps under this standard exist and present some challenges for the BFD in terms of response

capabilities and the arrival of the second fire suppression unit should BFD resources be committed on other incidents.

- At 480 seconds, the standard for the arrival of the first alarm assignment, response coverage is widely improved.
- The BFD's deficiencies in the NFPA 1710 240-seconds first due fire unit travel time and the ISO 1.5-mile engine company benchmark are closely related and should be included in any current and future station placement planning.
- The ISO 2.5-mile ladder company benchmark services the densest built-upon land.

The next table outlines the workload of primary response units from Station 1 in terms of runs and the overall call workload of the city and the relationship to the importance of all components of response times.

TABLE 4-7: Workload by Unit

Unit	Unit Type	Total Runs	Runs per Day
B20	Brush truck	1,157	3.2
E24	Engine	364	1.0
E26	Engine	1,079	3.0
EM10	Ambulance	1,737	4.8
EM12	Ambulance	1,202	3.3
EM14	Ambulance	2,348	6.4
SH34	Heavy rescue	168	0.5
SQ28	Engine	332	0.9
TR32	Aerial	510	1.4
Total		**9,122**	**25.0**

The ambulances combined represent the greatest share of workload for the BFD.

Call Type	Total Calls
Breathing difficulty	338
Cardiac and stroke	325
Fall and injury	688
Illness and other	1,309
MVA	204
Nonemergency transfer	651
Overdose and psychiatric	150
Seizure and unconsciousness	299
EMS Subtotal	**3,964**

Call Type	Total Calls
False alarm	467
Good intent	245
Hazard	177
Outside fire	24
Public service	456
Structure fire	44
Technical rescue	24
Fire Subtotal	**1,437**

The greater fire and EMS demand is concentrated in the central area of the city, with moderate demand to the east of central Biddeford and along the coast.

FIGURE 4-9: Travel time of 240 Seconds and the ISO 1.5-Mile Benchmark, Current Station

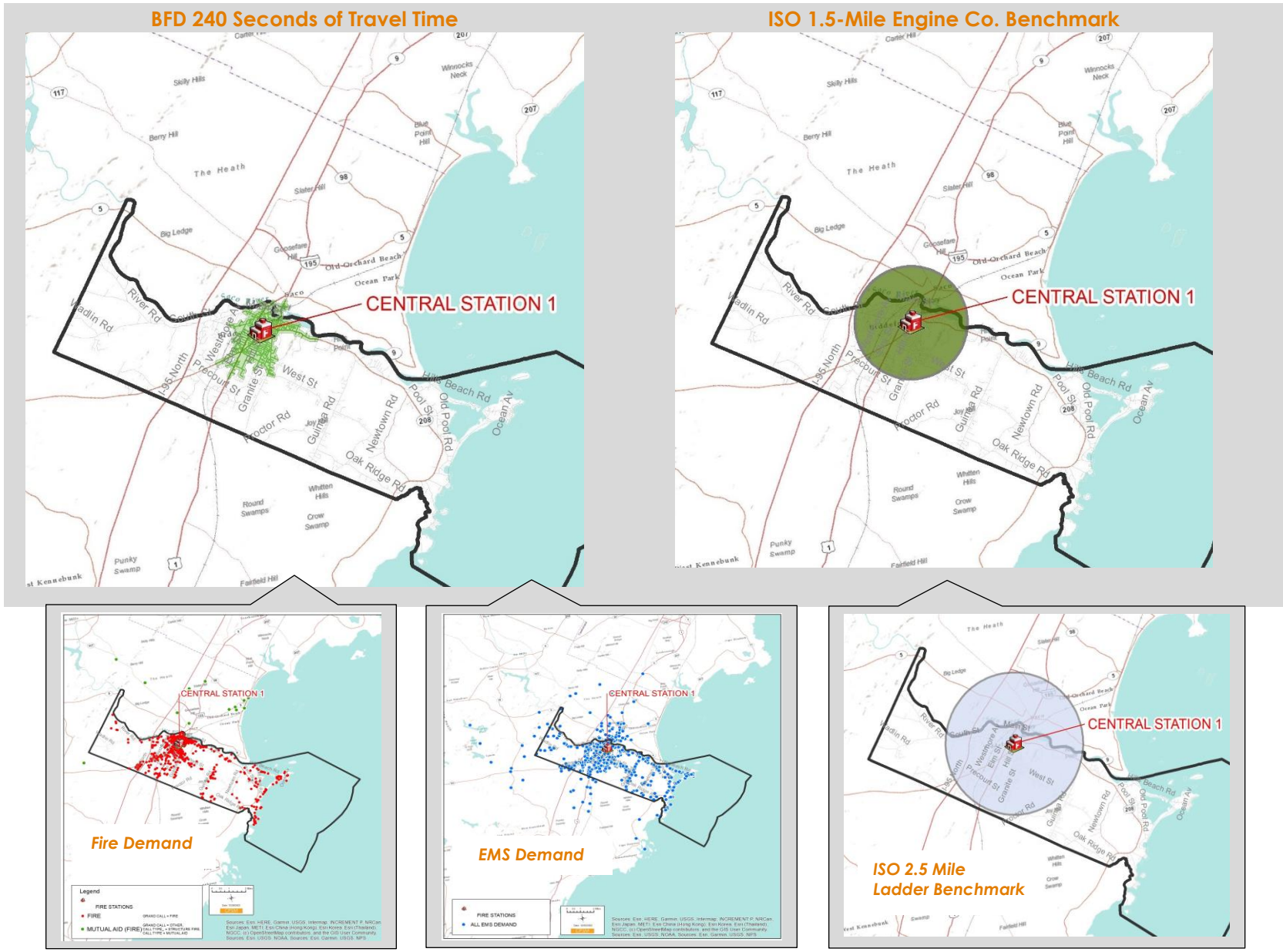
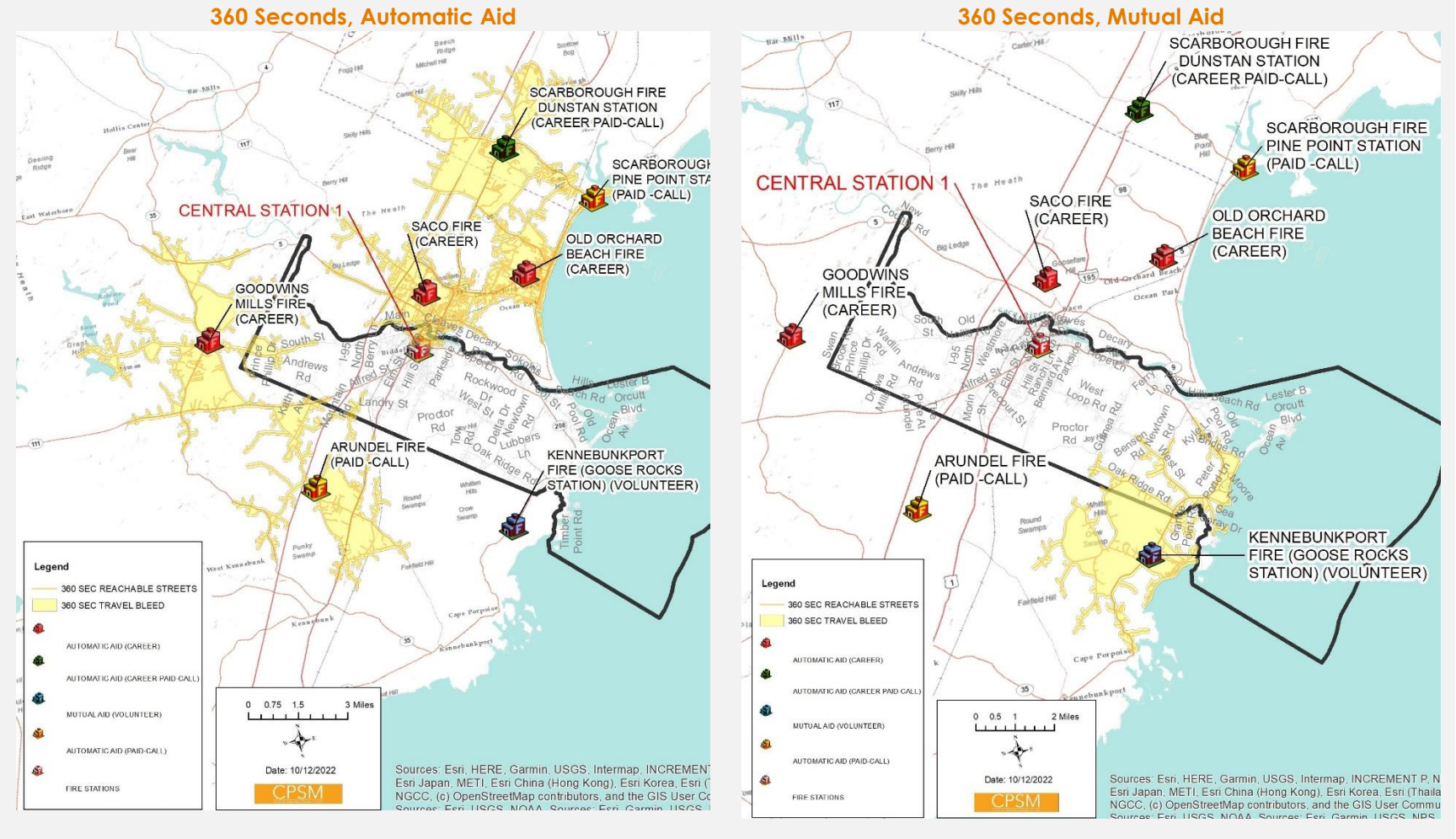
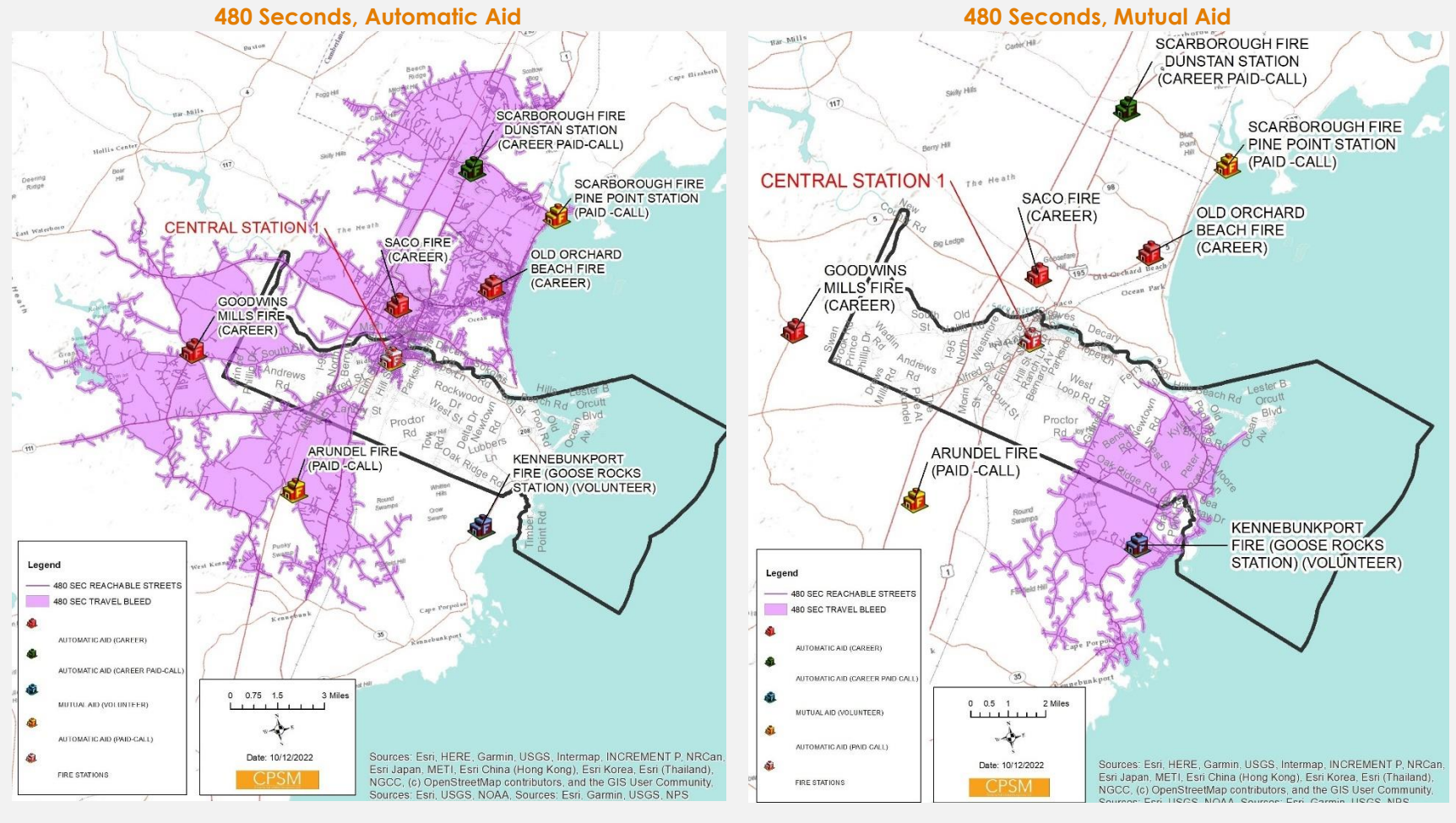


FIGURE 4-10: Automatic and Mutual Aid, 360 Seconds Travel Time Bleeds



Automatic aid travel time is challenging and provides some responsiveness in the north central area of the city from Saco, the western edge of the city from Goodwin Mills, and on the south central edge of the city from Arundel. Kennebunkport provides good response time into the coastal area of the city as well as the southeast areas. Kennebunkport, however, is volunteer and to meet the travel time benchmark to assist the BFD members would have to be in the station at the time of the alarm.

FIGURE 4-11: Automatic and Mutual Aid, 480 Seconds Travel Time Bleeds

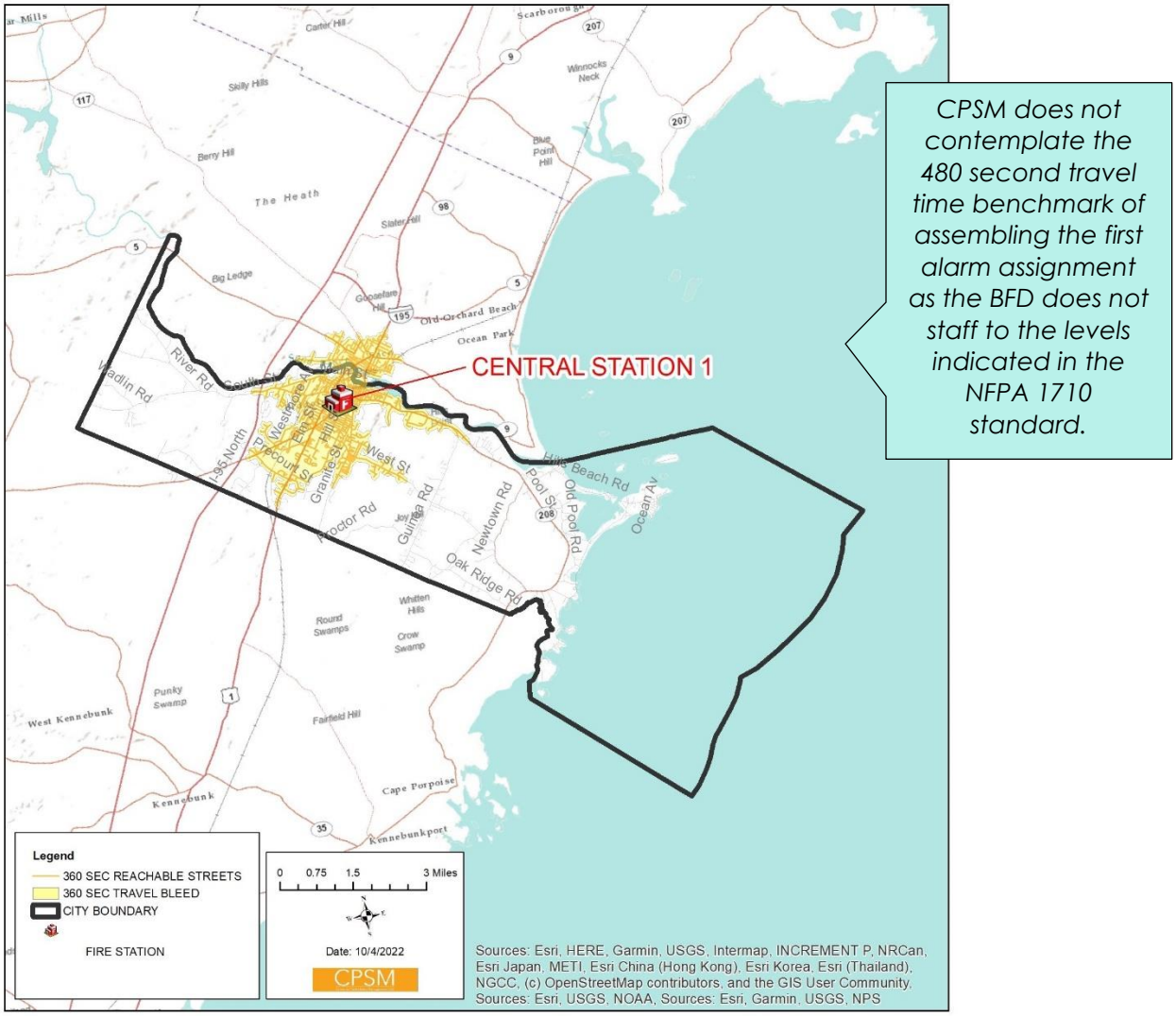


At 480 seconds, automatic aid travel time provides some improved responsiveness in the north central area of the city from Saco, the western edge of the city from Goodwins Mills, and on the south central edge of the city from Arundel. Kennebunkport provides improved response at the 480 seconds travel time benchmark into the coastal area and southeast areas of the city. As with other NFPA benchmarking, Kennebunkport is volunteer and to meet the travel time benchmark to assist the BFD would have to be in the station at the time of the alarm.

There is ongoing discussion within the city on the construction of a new fire station in the eastern portion of the city. The purpose of the station would be to better serve this area in terms of response time for fire and EMS resources, and to provide additional resource capacity for the BFD. As already discussed, the BFD has challenges meeting the 240-seconds NFPA travel time benchmark and the ISO 1.5-mile engine company benchmark (for response to built-upon land).

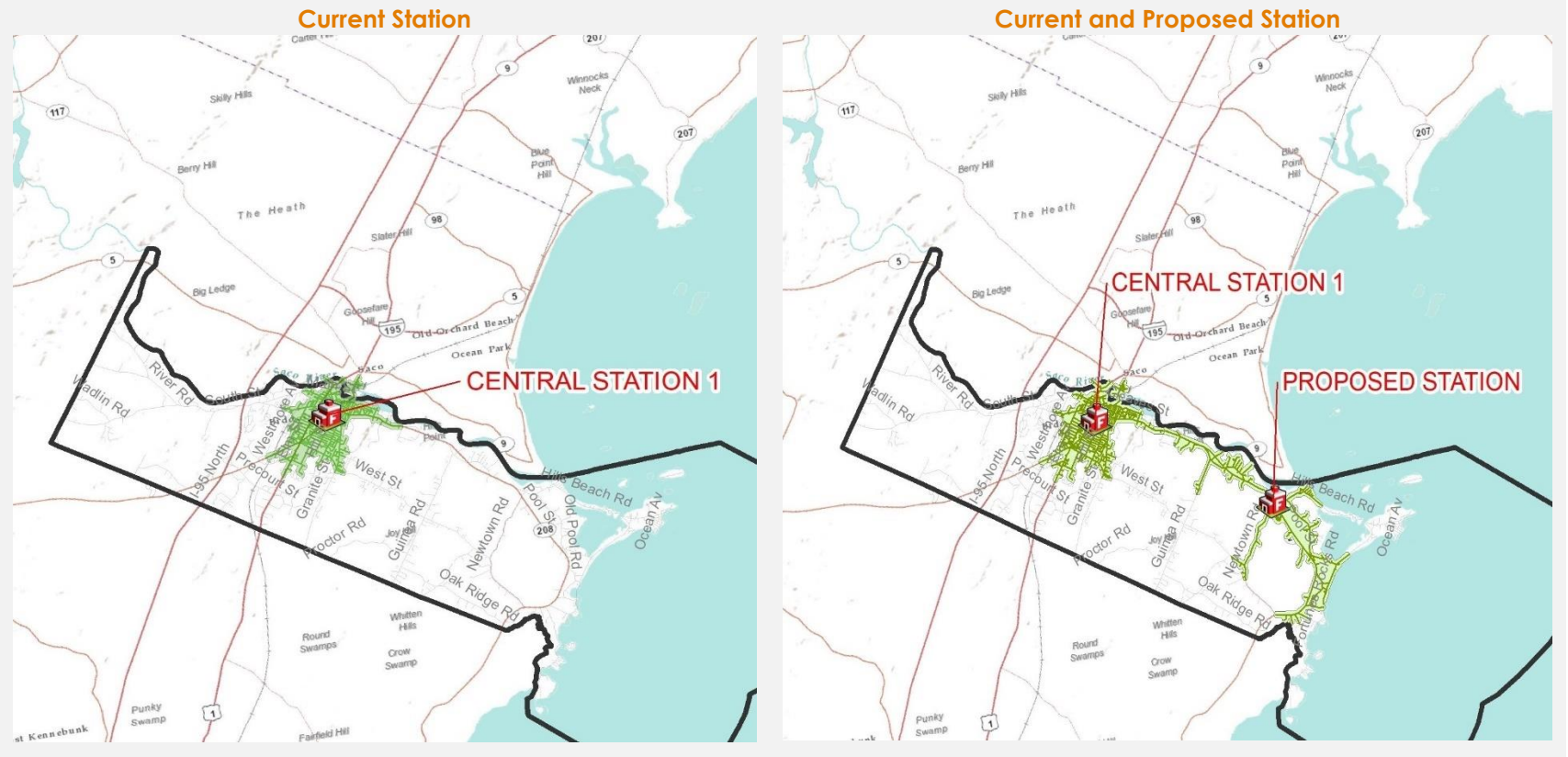
Further, the BFD is challenged as a stand-alone department with the second arriving fire suppression unit on a structural fire when EMS units are committed with BFD resources and staffing levels are at minimum, or when a single fire unit is committed either on a call in Biddeford, or on a mutual aid run. As illustrated above, automatic, and mutual aid departments offer limited responsiveness when benchmarked against the standard. CPSM is mindful, though, that the BFD has enough fire suppression companies that, if all staff are in the station in the station at the same time, would at a minimum satisfy the unit component of the NFPA 1710 standard for the second arriving fire suppression unit. The 360 second travel time component is limited to the central portion of the city as illustrated in the next figure.

FIGURE 4-12: BFD Station 1, 360 Seconds Travel Time Bleeds



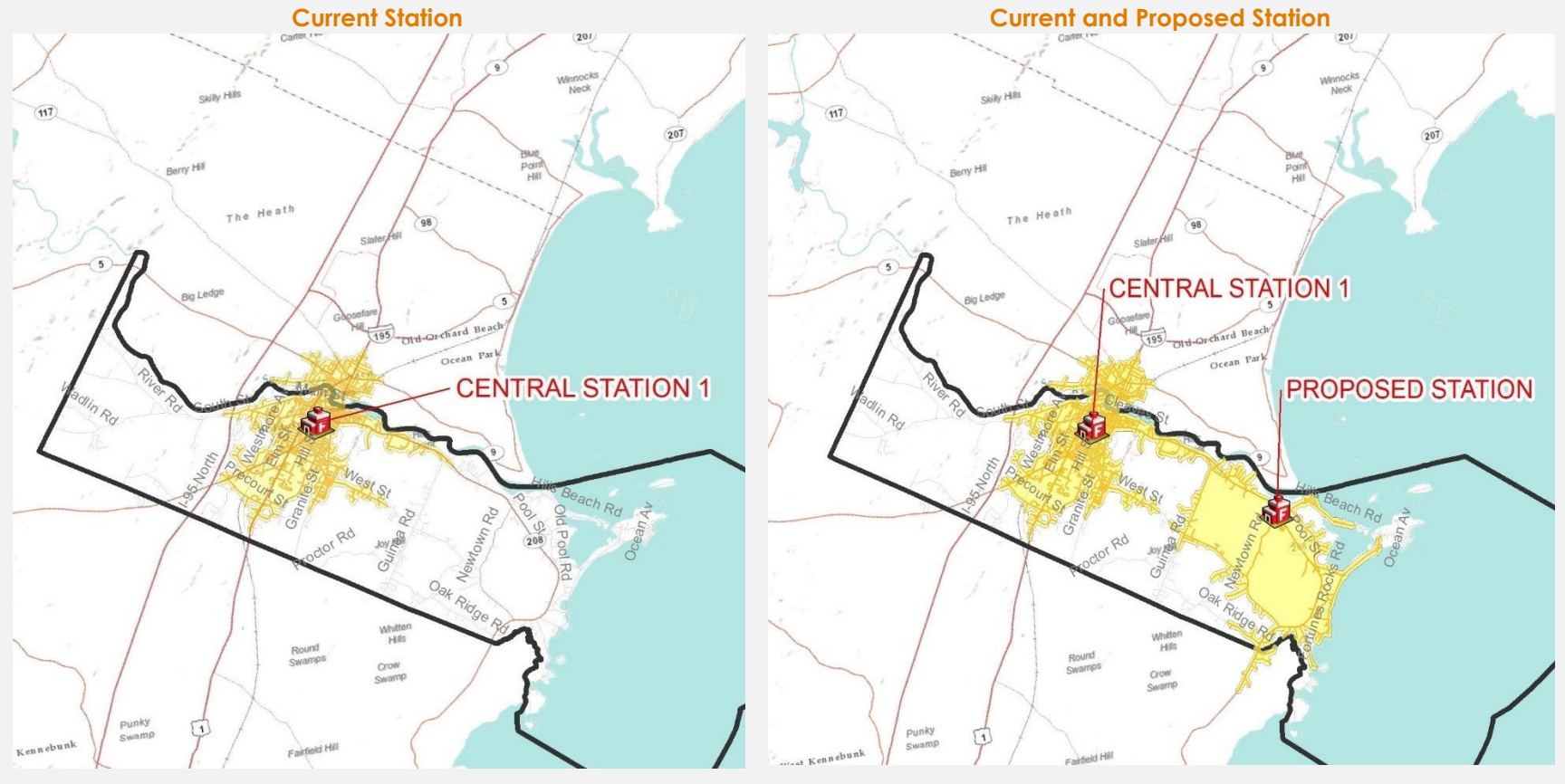
The next set of maps illustrates the response improvement in the eastern area of the city with the proposed station in the area of Route 9 and University of New England.

FIGURE 4-13: Current and Proposed Station, 240 Seconds Travel Time



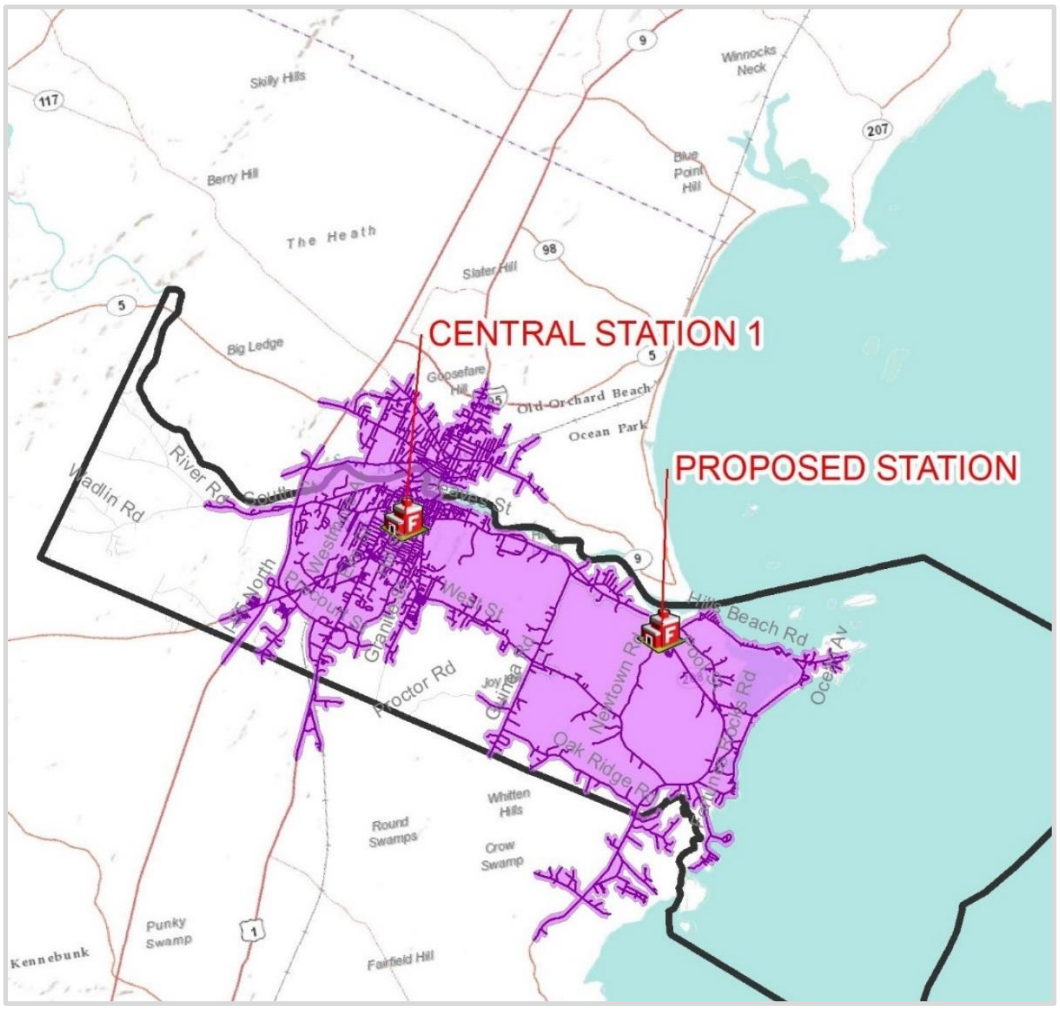
With the proposed Route 9 station, at 240 seconds of travel time there is marked improvement east of Station 1 along the Route 9 corridor and the southeast and far east coastline.

FIGURE 4-14: Current and Proposed Station, 360 Seconds Travel Time



With the proposed Route 9 station, at 360 seconds of travel time there is improvement along the Route 9 corridor and the southeast area of the city for initial response and west of the proposed station assisting the Station 1 companies on multi-unit responses.

FIGURE 4-15: Current and Proposed Station, 480 Seconds Travel Time

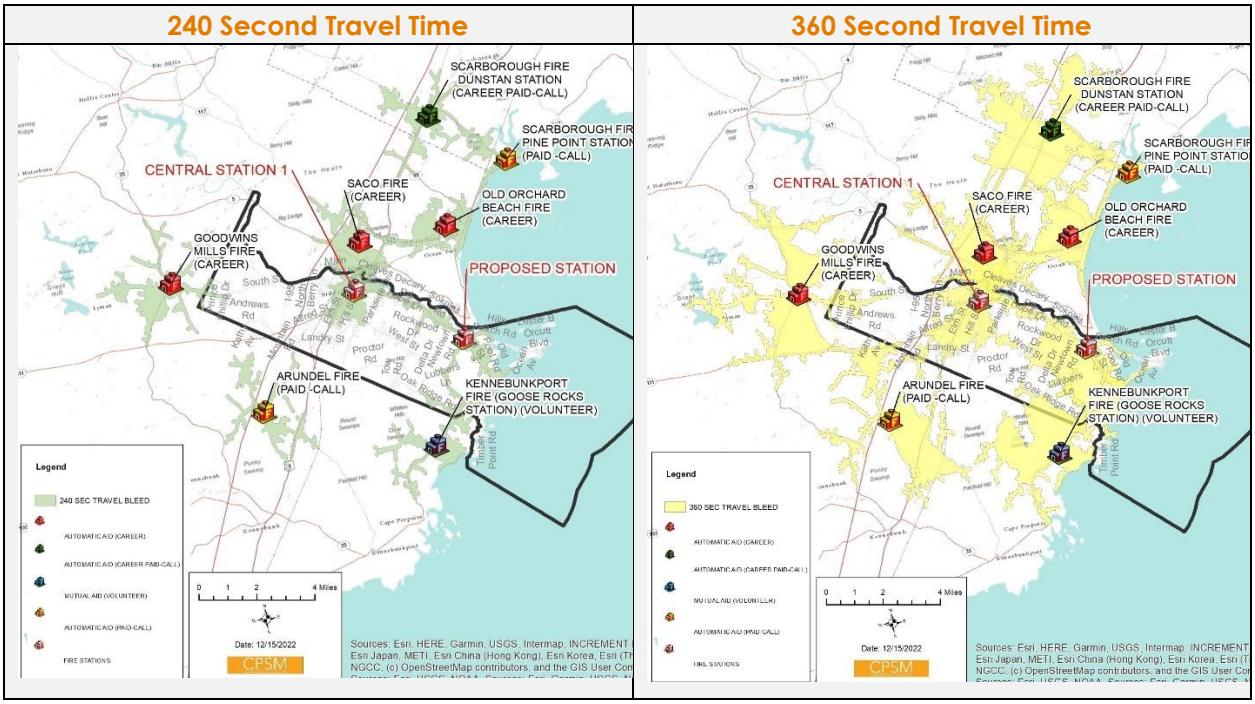


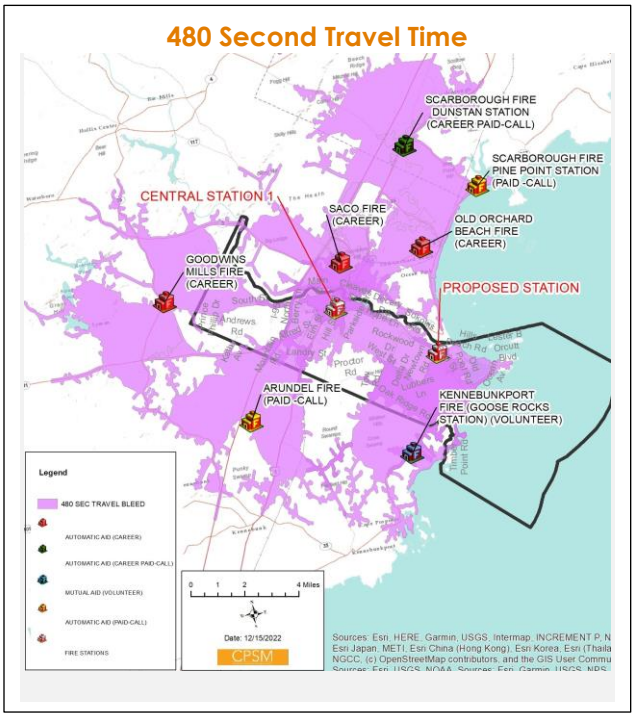
With the proposed Route 9 station, at 480 seconds of travel time there is significant improvement along the Route 9 corridor, the southeast area of the city, and the entire coastline for initial response and west of the proposed station assisting the Station 1 companies on multi-unit responses.

Finally, we analyze the 240-, 360-, and 480-seconds travel time benchmarking with BFD Station 1, the proposed Route 9 station, and automatic and mutual aid stations.

At 240 seconds the response standard remains the same as with the two BFD stations. At 360 seconds there is some improvement to the west (Goodwins Mills), south (Arundel), and southeast (Kennebunkport-Goose Rocks Station, if members are in station or have a rapid turnout time) areas of the city.

FIGURE 4-16: Current and Proposed Station, Automatic and Mutual Aid Stations: 240, 360, and 480 Seconds Travel Time





Facility and Response Time Recommendations:

- CPSM recommends that in the near term, the city continue to plan for a proposed station east of Station 1 to improve response times to the south central, southeast, and coastline built-upon areas of the city. (Recommendation No. 13.)
- CPSM further recommends that staffing this station include one ambulance and one engine, which can be accomplished in the following ways: (Recommendation No. 14.)
  - Alternative 1: Staff the station with 3 per shift (1 Captain, 2 FF PMs/shift, or 12 total positions). Staff would then cross staff both the engine and ambulance on a first call basis. This could be achieved with 12 new positions, or 4 new positions and the movement of 8 positions (2 per shift) from Station 1, or 8 new positions and the movement of 4 positions (1 per shift) from Station 1. Any combination of the aforementioned can be implemented incrementally following the recommendation of 3 per shift to staff an engine and ambulance when the station opens.
  - Alternative 2: Staff the station with 5 per shift (1 Captain, 4 FF PMs/shift, or 20 total positions). Under this alternative, the staffing matrix is 3 assigned to the engine and 2 assigned to the ambulance. This could be achieved with 20 new positions, or 12 new positions and the movement of 8 positions (2 per shift) from Station 1, or 8 new positions and the movement of 12 positions (3 per shift) from Station 1. Any combination of the aforementioned can be incrementally implemented over the longer term following the recommendation of 3 per shift to staff an engine and ambulance when the station opens.

FIRE SERVICE TRENDS

The fire service is focusing attention on several issues that have the potential to have significant effects into the next decade and perhaps beyond. These include:

- A heightened focus on firefighter health and safety, especially cardiac-related illness, cancer and cancer prevention, and firefighter mental health. A 2021 National Fire Protection Association (NFPA) report showed the following:[12]
  - 135 on-duty deaths in 2021 (65 from COVID and 70 from other conditions).
    - 35 on-duty deaths were volunteer firefighters and 27 were career.
  - 89 firefighters and 16 EMTs and paramedics died as the result of suicide.

    Recognition of the importance of behavioral health programs and peer support for firefighters has become widespread in recent years. As with heart disease and cancer, this is a problem that follows firefighters after their careers end, whether in retirement or some other form of separation from the fire service.
  - The IAFF lists 81 deaths in 2021 from cancer.
    - The National Institute for Occupational Safety and Health (NIOSH) concludes from two studies that firefighters face a 9 percent increase in cancer diagnoses and a 14 percent increase in cancer-related deaths compared to the general population in the U.S.

12. Fahy & Petrillo (2021). *Firefighter Fatalities in the US in 2021.* National Fire Protection Association.

- There were 31 sudden cardiac deaths with onset while the victim was on duty, accounting for the largest percentage of deaths while on duty in 2021.

  From 1977 through 1986, an average of 60 firefighters per year suffered sudden cardiac deaths while on duty. Despite this reduction, sudden cardiac death continues to be the number one cause of on-duty firefighter fatalities in the U.S. and, in almost every year, it has accounted for the single largest share of deaths in the year.

- Structural firefighting gear containing Per and Polyfluoroalkyl Substances (PFAS).[13,14]

  Recent studies have determined PFAS are present in all three layers of firefighter structural ensemble (coat and pants). PFAS are used in the treatment and construction of the firefighter coat and pant ensemble, especially to increase water resistance on the outer shell and the moisture barrier. PFAS has been identified as 'possibly carcinogenic' to humans by the International Agency for Research on Cancer (IARC).

  The International Association of Fire Fighters (IAFF) and Metropolitan Fire Chiefs Association (Metro Chiefs) have come together to notify members of the adverse health risks from firefighter turnout gear. Identifying safe and effective PFAS-free materials for turnout gear is a long and challenging process. Until PFAS is fully removed from turnout gear, the IAFF and Metro Chiefs are asking firefighters to reduce exposure to PFAS in turnout gear by using the following precautions:

  - *Turnout gear should NOT be taken into firehouse living areas.*
  - *When transporting gear in personal vehicles, it should be in a sealed container or bag, and preferably NOT transported in the passenger compartment.*
  - *Apparatus cabs should be cleaned regularly and after every fire.*
  - *Wash your hands after handling turnout gear.*
  - *Legacy turnout gear should be replaced as new PFAS-free technologies become available.*
  - *Do not wear turnout gear on responses where this level of protection is not necessary.*

- Electrification of fire apparatus.

  An emerging trend across the nation and certainly in the fire service is the electrification of fire apparatus. Distinct advantages of these apparatus include zero emissions, reduced noise, reduced fuel costs, and little compromise with power and functionality. One leading fire apparatus manufacturer includes a system that combines electric power with internal combustion power for extended operations inherent to fire operations.

- Fire station design.[15]

  Contemporary fire station design includes consideration of:

  - Designs inclusive of all genders with appropriate separation.

13. French, L. (2020). *Study finds high levels of PFAS in turnout gear*. https://www.firerescue1.com/
14. *PFAS and Fire Fighter Turnout Gear* (2022). International Association of Fire Fighters.
15. Trevor & Bergstrom (2022). *Nine major trends shaping modern fire station design*.

- Designs that make employee health a priority and that include passive station/unit alerting, controlling of dangerous contaminants not only in the living area but work areas outside of the living area, employee fitness, and infection control.
- Proper siting that anticipates growth and the current and future road network.
- Green design that includes energy efficiencies and systems that promote lower energy bills and water usage.
- Co-location with other public services.
- Performance-based stations designed to get crews to the apparatus and through the doors quicker (one-story facilities, if possible, with folding rather than overhead doors).
- More community connection. Constructing fire stations that include community rooms available for community meetings and that can also be used for training rooms for the fire department or other local government departments/agencies.
- Increasing construction costs.

Fire Service Trends Recommendation:

- CPSM recommends the BFD continue to make consistent efforts to initiate and follow best practices with current and emerging trends in the fire service, including the health and wellness of firefighters (specifically employee mental health and medical physicals) and structural firefighting gear containing Per-and Polyfluoroalkyl Substances (PFAS). (Recommendation No. 15.)

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SECTION 5. RISK PROFILE

POPULATION AND DEMOGRAPHICS

The U.S. Census Bureau indicates the population of the City of Biddeford in 2020 was 22,515. This is a little more than a one percent increase in population since the 2010 census of 21,277. The city has 30.09 square miles of land mass. The population density is 750 people per square mile. This is an increase of 42 people per square mile over the 2010 census numbers.

In terms of fire and EMS risk, the age and socio-economic profiles of the population can have an impact on the number of requests for fire and EMS services. Evaluation of the number of seniors and children in the community can provide insight into trends in service delivery and quantify the probability of future service requests. In a 2021 National Fire Protection Association (NFPA) report on residential fires, the following key findings were identified for the period 2015–2019:[16]

- Males were more likely to be killed or injured in home fires than females and accounted for larger percentages of victims (57 percent of the deaths and 55 percent of the injuries).
- The largest number of deaths (19 percent) in a single age group was among people ages 55 to 65.
- 59 percent of the victims of fatal home fires were between the ages of 39 and 74, and three of every five (62 percent) of the non-fatally injured were between the ages of 25 and 64.
- Slightly over one-third (36 percent) of the fatalities were aged 65 or older; only 17 percent of the non-fatally injured were in that age group.
- Children under the age of 15 accounted for 11 percent of the home fire fatalities and 10 percent of the injuries. Children under the age of 5 accounted for 5 percent of the deaths and 4 percent of the injuries.
- Adults of all ages had higher rates of non-fatal fire injuries than children.
- Smoking materials were the leading cause of home fire deaths overall (23 percent) with cooking ranking a close second (20 percent).
- The highest percentage of fire fatalities occurred while the person was asleep or physically disabled and not in the area of fire origin, key factors to vulnerable populations.

In Biddeford, the following age and socioeconomic factors are considered herein when assessing and determining risk for fire and EMS preparedness and response:[17]

- Children under the age of five represent 4.4 percent of the population.
- Persons under the age of 18 represent 14.5 percent of the population.
- Persons over the age of 65 represent 17.0 percent of the population.
- Female persons represent 51.6 percent of the population.
- There are 2.15 people per household in Biddeford.

16. M. Ahrens, R. Maheshwari. "Home Fire Victims by Age and Gender," Quincy, MA: NFPA, 2021.
17. U.S. Census Bureau QuickFacts: Biddeford, ME.

- The median household income in 2020 dollars was $54,915.
- People living in poverty make up 10.0 percent of the population.

Black or African American alone represent 2.5 percent of the population. The remaining percentage of population by race includes White alone at 88.6 percent, American Indian or Alaska Native alone at 0.1 percent, Asian alone at 2.8 percent, two or more races at 3.8 percent, and Hispanic or Latino at 3.1 percent.

The demographics in Biddeford overall pose a low/balanced risk in totality. While not a high risk, a single call involving vulnerable population (fire or EMS) poses a higher risk on that particular response. Through pre-fire planning and response district knowledge of residential and other structures housing vulnerable population as identified above, the BFD will have the necessary situational awareness and be better prepared on arrival at the incident.

ENVIRONMENTAL FACTORS

The City of Biddeford is prone to and will continue to be exposed to certain environmental hazards that may impact the community. The most common natural hazards prevalent to the region, according to the York County Hazard Mitigation Plan and the Biddeford Hazard Assessment includes:[18, 19]

High Probability Events

- Severe Winter Storms
  - Winter storms include ice, snow, strong winds, coastal erosion, and extreme low temperatures. These storms create transportation hazards, increase the risk of carbon monoxide exposure and illness, frostbite and hypothermia, property damage, power outages, and increase in fire risk as there is an increase in alternative heating devices.
- Severe Spring/Summer Storms
  - Severe storms include heavy rain, urban flooding, lightning, hail, and strong winds and wind gusts. These storms create transportation hazards (land and marine), property damage, power outages, and associated fire and EMS incident risks.
- Flooding
  - Overflow of water out of the banks of rivers, brooks, streams and creeks onto land areas. In Biddeford, this includes the Saco River and Little River and tributaries. Vulnerable areas of the city include Rotary Park, and Pine, Maple, and South Streets. Vulnerable ocean flooding areas include Mile Stretch Road, Fortunes Rocks Road, Ocean Ave., and the Granite Point Road areas. Biddeford has areas that are in a 100-year floodplain (Saco River and its tributaries) and areas that also have velocity hazard due to wave action from coastal storms. Flooding from dam failure may affect Biddeford as well (there is one dam in the city and others within proximity), although dam failure in itself is a low probability risk.

18. York County Hazard Mitigation Plan, 2022.
19. Biddeford Fire Department Hazard Assessment, 2018.

Medium Probability Events

- Coastal Storms
  - High winds, rain, coastal erosion.
- Wildfire/Forest Fire
  - Burning of trees, underbrush, and other natural surface fuels. May include wildland/urban interface.

Low Probability Event

- Drought
  - Deficiency in precipitation over an extended period of time. Prolonged drought potentially has an effect on vegetation (increase in brush and wild fires) and water supply.
- Hurricane/Tropical Storm/Tropical Remnants/Sub-Tropical Systems
  - Heavy rain, strong winds, coastal erosion.

TRANSPORTATION FACTORS

Street Network

The street network in Biddeford includes I-95 (one interchange), which is a high-speed, high-capacity, and limited access highway; arterial streets such as US 1, Routes 9, 111, and 208, which carry high volumes of traffic with synchronized signals; collector streets, which provide connection to arterial roads and public local street networks as well as residential and commercial land uses; and public and private local streets, which provide a direct road network to property and move traffic through neighborhoods.

Mass Transit Systems

The Biddeford, Saco, Old Orchard Beach Transit system provides public transportation via bus with three routes (Orange, Silver, Purple) that have stops in Biddeford.

The Amtrak Downeaster traverses Biddeford (north-south). Daily service occurs from Brunswick, Maine, to Boston, Mass. (and the reverse), with a stop in Saco.

Freight Rail

The Central Maine & Quebec Railway (a subsidiary of Canadian Pacific Railway) utilizes the north-south track that traverses Biddeford to transport lumber, gravel, grain, petroleum products, and chemicals. Fire involving these products can produce smoke and other products of combustion risks that may be hazardous to health. Hazardous materials create hazardous to health conditions as well as fire, smoke and vapor plumes, containment, and related public safety concerns. Rail lines in Biddeford utilize at-grade crossings, which pose a transportation risk.

The road and transportation network described herein poses risks for a vehicular accident, some at medium to greater than medium speeds, as well as vehicular-versus-pedestrian-bicycle risks. There are additional transportation risks since tractor-trailer and other commercial vehicles traverse the roadways of Biddeford to deliver mixed commodities to business locations. Fires or releases of products involving these products can produce vapors, smoke, and other products of combustion that may be hazardous to health. Additionally, there is risk for a mass casualty incident involving mass transit buses either on specific bus routes/roads in the city or utilizing the road network in the city for stops in jurisdictions external to Biddeford.

BUILDING AND TARGET HAZARD FACTORS

A community risk and vulnerability assessment is used to evaluate the community, and regarding buildings, it will review all buildings and the risks associated with each property and then classify 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 (vulnerable population) or large fire-potential occupancies.

Medium-hazard occupancies: Apartments (includes townhomes, condos, residential over commercial), 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.[20]

Biddeford has the following building types.

- Single-family homes, 4,868 total (highest total building count). Predominate construction type: ordinary wood construction Type V.
- Multi-family, 2,867 total units (varying number of vertical floors). Predominate construction type: ordinary wood construction Type V.
- Mixed use, 55 total. Predominate construction type: Type III.
- Apartments, 1,973 total units (varying number of vertical floors). Predominate construction type: ordinary wood construction Type V; Type III, Type IV.
- Commercial structures, 422 total. Predominate construction type: Type II.
- There is one high-rise building (six-story senior living). Predominate construction type: Type I.
- Strip malls, 8 total. Predominate construction type: Type II.

The predominant building type/building risk in Biddeford is single-family detached dwellings (a low-hazard occupancy). The primary construction type for residential structures in Biddeford is Type V, which does not require a fire resistance rating for any of the building elements (typically wood frame).

Multifamily buildings and apartments also exist in Biddeford. Typical construction includes wood frame, ordinary (block/brick) construction non-fire resistive, and heavy timber (renovated mill buildings). Some apartment complexes include a multibuilding footprint. The city does have an assortment of manufactured homes as well, which are typically made of light metal/wood construction with various exterior coverings.

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

Strip malls and commercial buildings are predominately constructed of non-combustible walls, partitions, columns, floors, and roofs, and may contain metal floors and metal roofs with masonry or tilt-slab walls.

In terms of identifying target hazards, consideration must be given to the activities that take place (public assembly, life safety vulnerability, manufacturing, processing, etc.), the number and types of occupants (elderly, youth, handicapped etc.), and other specific aspects related to the construction of the structure.

The City of Biddeford has a variety of target hazards that meet an established hazard class:

High Hazard

- Assisted living/nursing facilities.
- Educational facilities.
- Hospital.
- High-rise residential.

Medium Hazard

- Multifamily dwelling buildings.
- Commercial and industrial facilities and sites, particulalry those storing or having processes involving hazardous materials.
- Residential over commercial mixed-use buildings.
- University residence halls (when occupied).

The greatest building risk by number of buildings in Biddeford are of a low to moderate hazard. **(Single family dwellings, predominately of wood frame construction, are low hazard. *Those with basements and more than 2,000 square feet should be considered moderate hazards.*)** Biddeford does have high-risk/vulnerable population risks (nursing/assisted living facilities), places of public assembly, schools, and multifamily residential structures (apartments/condos), All of these building risks present the BFD with life-safety concerns and challenges of direct access and density. The industrial and mercantile building risk, while a lower life safety risk, is generally a higher hazard risk based on processes, storage, and overall occupancy type.

FIRE AND FIRE-RELATED RISKS

An indication of the community's fire risk is the type and number of fire-related incidents the fire department responds to. CPSM conducted a data analysis for this project to analyze the Biddeford Fire Department's incident responses and workload.

The following table details the call types and call type totals for these types of fire-related risks between July 1, 2021, and June 30, 2022.

TABLE 5-1: Fire Call Types During One-Year Period Studied

Call Type	Total Calls	Calls per Day
False alarm	467	1.3
Good intent	245	0.7
Hazard	177	0.5
Outside fire	24	0.1
Public service	456	1.2
Structure fire	44	0.1
Technical rescue	24	0.1
Fire Total	**1,437**	**3.9**

This table tells us:

- Fire calls totaled 1,437 (25 percent of all calls that include EMS, canceled, and mutual aid).
- False alarm calls made up 32 percent of fire calls.
- Structure and outside fire calls combined made up 5 percent of fire-related calls, or an average of 0.2 calls per day.
- Overall, there were 3.9 fire-related responses per day.

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.

The following table outlines the call types and call type totals for these types of EMS risks between July 1, 2021, and June 30, 2022.

TABLE 5-2: EMS Call Types During One-Year Period Studied

Call Type	Total Calls	Calls per Day
Breathing difficulty	338	0.9
Cardiac and stroke	325	0.9
Fall and injury	688	1.9
Illness and other	1,309	3.6
MVA	204	0.6
Nonemergency transfer	651	1.8
Overdose and psychiatric	150	0.4
Seizure and unconsciousness	299	0.8
EMS Subtotal	**3,964**	**10.9**

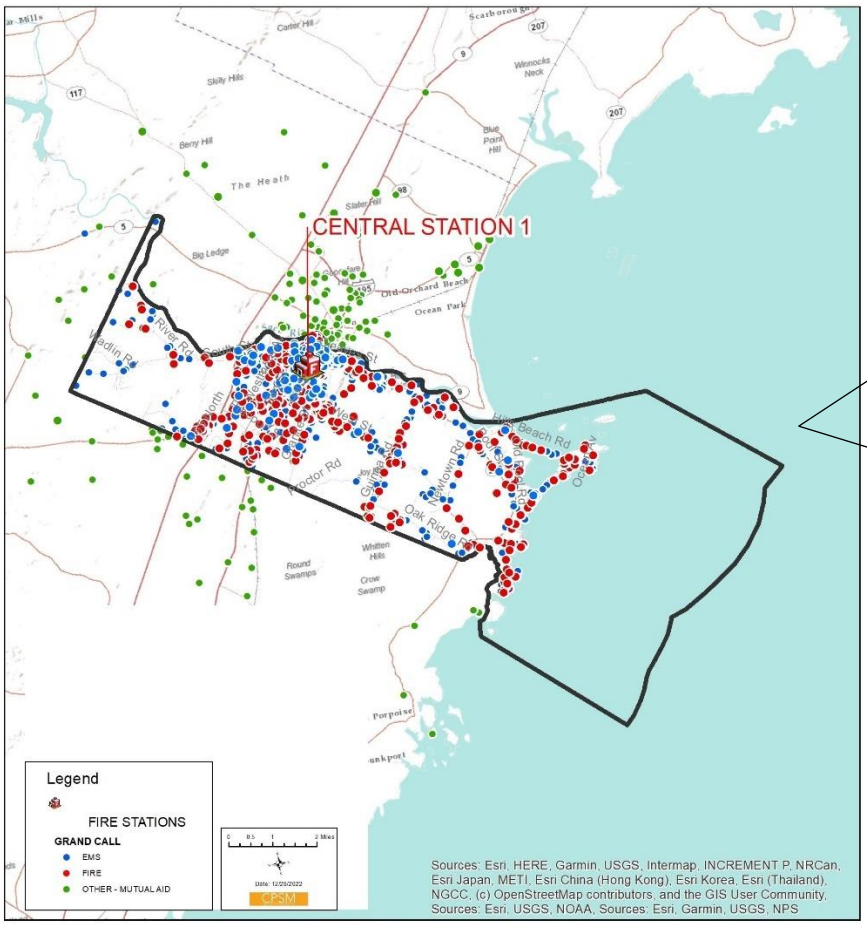
This tables tells us:

- EMS calls totaled 3,964 (69 percent of all calls that include fire, canceled, and mutual aid), an average of 5.2 calls per day.
- Illness and other calls were the largest category of EMS calls at 33 percent of EMS calls.
- Motor vehicle accidents (MVA) made up 4 percent of EMS calls.
- Cardiac and stroke and breathing difficulty (higher-acuity calls) calls made up 17 percent of EMS calls.
- On average, three calls per day were higher-acuity calls for service (cardiac, stroke, breathing difficulty, seizure and unconscious), with some illness or other call types reaching higher-acuity status after initial assessment by BFD crews.

FIRE AND EMS INCIDENT DEMAND

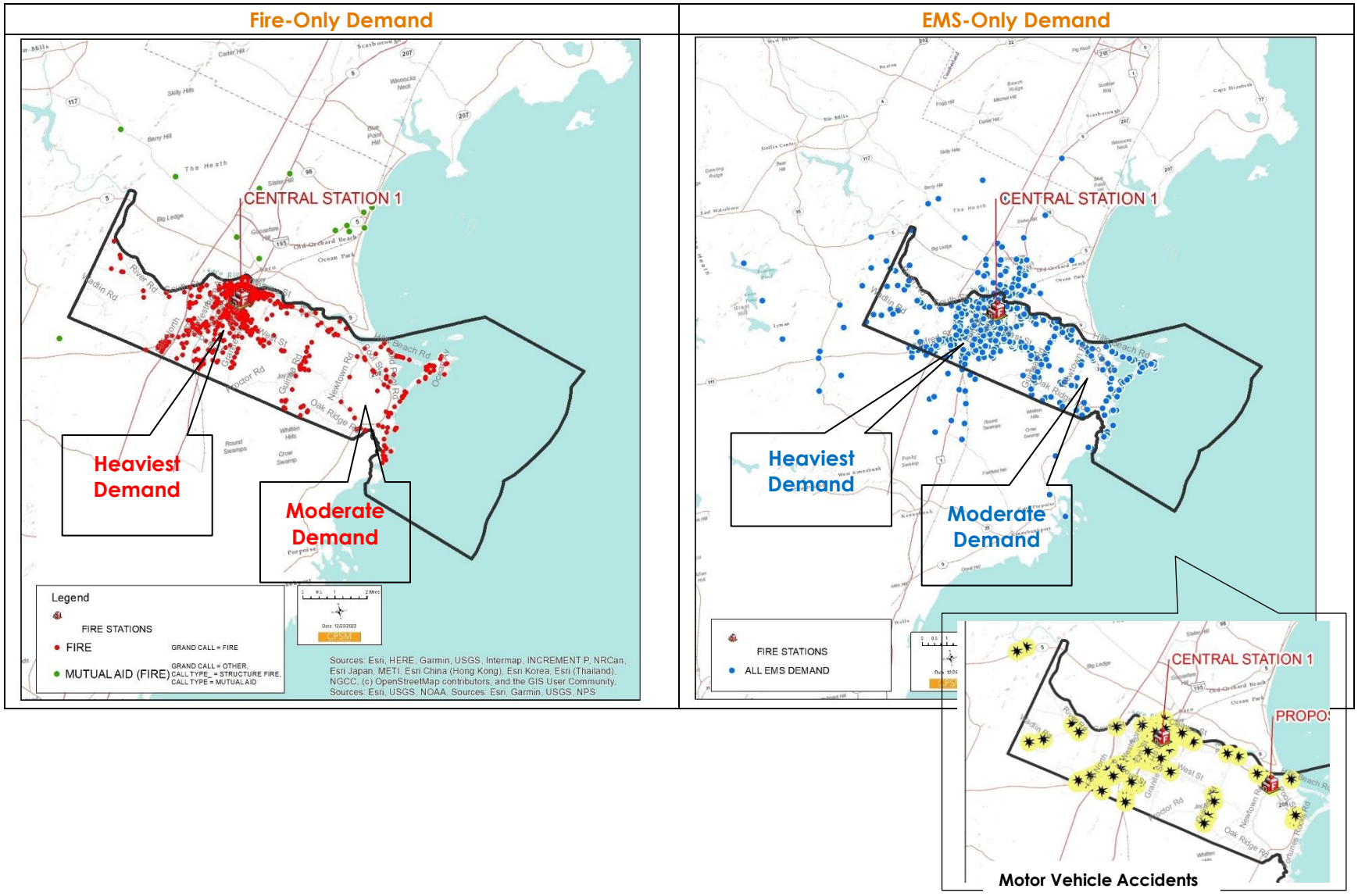
Analyzing where the fire and EMS incidents occur, and the demand density of fire and EMS incidents, helps to determine adequate fire management zone resource assignment and deployment. The following figures illustrate fire and EMS demand in a more defined manner by specific call types.

FIGURE 5-1: All Demand: Fire and EMS Incidents by Location



Fire and EMS demand is concentrated in the central and more densified area of the city and within proximity of the Central Fire Station. There are also concentrations of demand in the eastern areas of the city along developed road networks and along the coast.

FIGURE 5-2: Fire and EMS Demand Breakout by Location



COMMUNITY PROPERTY AND CONTENTS LOSS FROM FIRE

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 2021 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. Key findings from this report include:[21]

- Public fire departments responded to 1,338,500 fires in 2020, a 7.5 percent increase from the previous year.
- 490,500 fires occurred in structures (37 percent). Of these fires, 379,500 occurred in residential structures and 86,000 occurred in apartments or multifamily structures.
- 2,230 civilian fire deaths occurred in residential fires, and 350 deaths occurred in apartments or multifamily structures.
- Home fires were responsible for 11,500 civilian injuries.
- An estimated $21.9 billion in direct property damage occurred as a result of fire in 2020 (includes fires in the California wildland-urban interface and a large loss naval ship fire in California).

The following table shows overall fire loss in Biddeford in terms of dollars for 2017 through 2021. This information should be reviewed regularly and discussed in accordance with response times to actual fire incidents, company level training, effectiveness on the fireground, and effectiveness of incident command. Property loss information should also be included in any strategic planning discussions regarding response times, training, incident command, staffing, and deployment of resources.

TABLE 5-3: Property and Content Loss in Biddeford, 2017–2021

2017	2018	2019	2020	2021
$113,506	$1,530,630	$290,190	$833,770	$1,324,230

- In all years, fire in or to a building represented the largest fire loss in the aggregate.
- In 2018, there was a single large fire loss (fire in or to a building $707,760).
- In 2020, there were two moderate-high fire losses (fire in or to a building, $241,300 and 322,750).
- In 2021, there were two moderate-high fire losses (fire in or to a building, $272,500 and 350,600), and a large loss on the Maine Turnpike ($307,000).

21. *Fire Loss in the United States During 2020*, National Fire Protection Association.

RESILIENCY

Resiliency as defined by the Center for Public Safety Excellence (CPSE) in the *Fire and Emergency Service Self-Assessment Manual* (FESSAM), 9th edition, is: "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 control an incident and bring it to termination safely and effectively.
- 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.
- Restoration: The agency's ability to quickly return to a state of normalcy.

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

Absorption is accomplished through availability to respond by BFD units and through call force resources and regional auto/mutual aid resources. This is aided through the computer-aided dispatch at the fire dispatch center.

Restoration is managed by BFD unit availability as simultaneous calls occur, the availability of regional auto/mutual aid resources, and call/pool and recall of personnel to staff fire units during campaign events when warranted, and backfilling BFD stations when needed.

Between July 1, 2021, and June 30, 2022, BFD's fire units responded to 5,721 calls. The following tables and figures analyze BFD resiliency. In this analysis, CPSM included all calls that occurred inside and outside Biddeford. We did this because responses outside of the city impact the resiliency of the department to respond to calls inside of the city. This includes EMS ground transport interfacility transfers.

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TABLE 5-4: Annual Runs and Deployed Time by Run Type

Run Type	Minutes per Run	Annual Hours	Percent of Hours	Minutes per Day	Annual Runs	Runs per Day
Breathing difficulty	30.8	333.5	7.1	54.8	649	1.8
Cardiac and stroke	33.7	394.1	8.4	64.8	701	1.9
Fall and injury	33.6	526.8	11.2	86.6	941	2.6
Illness and other	34.5	1,018.7	21.6	167.5	1,774	4.9
MVA	25.1	206.9	4.4	34.0	494	1.4
Nonemergency transfer	58.5	736.3	15.6	121.0	755	2.1
Overdose and psychiatric	30.0	125.5	2.7	20.6	251	0.7
Seizure and unconsciousness	29.8	297.7	6.3	48.9	599	1.6
EMS Subtotal	**35.4**	**3,639.4**	**77.3**	**598.3**	**6,164**	**16.9**
False alarm	15.1	250.6	5.3	41.2	994	2.7
Good intent	26.7	139.8	3.0	23.0	314	0.9
Hazard	27.2	138.2	2.9	22.7	305	0.8
Outside fire	28.8	21.6	0.5	3.6	45	0.1
Public service	16.7	178.9	3.8	29.4	644	1.8
Structure fire	38.8	108.7	2.3	17.9	168	0.5
Technical rescue	25.3	25.7	0.5	4.2	61	0.2
Fire Subtotal	**20.5**	**863.6**	**18.3**	**142.0**	**2,531**	**6.9**
Canceled	7.5	22.8	0.5	3.8	182	0.5
Mutual aid	45.1	184.3	3.9	30.3	245	0.7
Other Subtotal	**29.1**	**207.1**	**4.4**	**34.0**	**427**	**1.2**
Total	**31.0**	**4,710.2**	**100.0**	**774.3**	**9,122**	**25.0**

The table above tells us:

- EMS ground transport interfacility transfers make up the longest incident responses at just under one-hour per transfer. This commits one ambulance and a crew of two for this response at an average of two transfers per day.
- Mutual aid is the next highest incident commitment at almost one response per day with a 45-minute time commitment per response.
- Structure fires represent the highest commitment in fire related runs at 39 minutes per incident.

TABLE 5-5: Workload by Unit

Unit	Unit Type	Minutes per Run	Total Hours	Total Percentage	Minutes per Day	Total Runs	Runs per Day
B20	Brush truck	14.7	283.0	6.0	46.5	1,157	3.2
E22	Pool Station Engine	19.4	34.5	0.7	5.7	107	0.3
E24	Engine	18.5	112.4	2.4	18.5	364	1.0
E26	Engine	19.2	344.4	7.3	56.6	1,079	3.0
EM10	Ambulance	42.9	1,241.2	26.4	204.0	1,737	4.8
EM12	Ambulance	38.9	778.6	16.5	128.0	1,202	3.3
EM14	Ambulance	39.1	1,529.2	32.5	251.4	2,348	6.4
H204	Hazmat decon	184.3	3.1	0.1	0.5	1	0.0
M202	Boat	18.3	2.1	0.0	0.4	7	0.0
RN18	Utility truck	57.1	10.5	0.2	1.7	11	0.0
S206	Rehab bus	87.0	7.2	0.2	1.2	5	0.0
SH34	Heavy rescue	24.9	69.6	1.5	11.4	168	0.5
SQ28	Engine	21.2	117.5	2.5	19.3	332	0.9
SV4	Service pickup	20.0	31.0	0.7	5.1	93	0.3
TR32	Aerial	17.1	144.9	3.1	23.8	510	1.4
U710	Utility truck	50.1	0.8	0.0	0.1	1	0.0
Total		**31.0**	**4,710.2**	**100.0**	**774.3**	**9,122**	**25.0**

The table above tells us:

- The ground transport units are the busiest with 5,287 aggregate runs (generally a crew of two for each run).
- The brush truck is the busiest fire unit with 1,157 runs.
- The engines (24, 26, SQ28) aggregately made 1,775 runs (generally a crew of three for each run).
- The pool station engine made 107 runs.

The next tables look at overlapping and distribution of calls by time of day.

TABLE 5-6: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	4,691	53.6
1	2,781	31.7
2	988	11.3
3	242	2.8
4	53	0.6
5	4	0.0
6+	1	0.0
Total	**8,760**	**100.0**

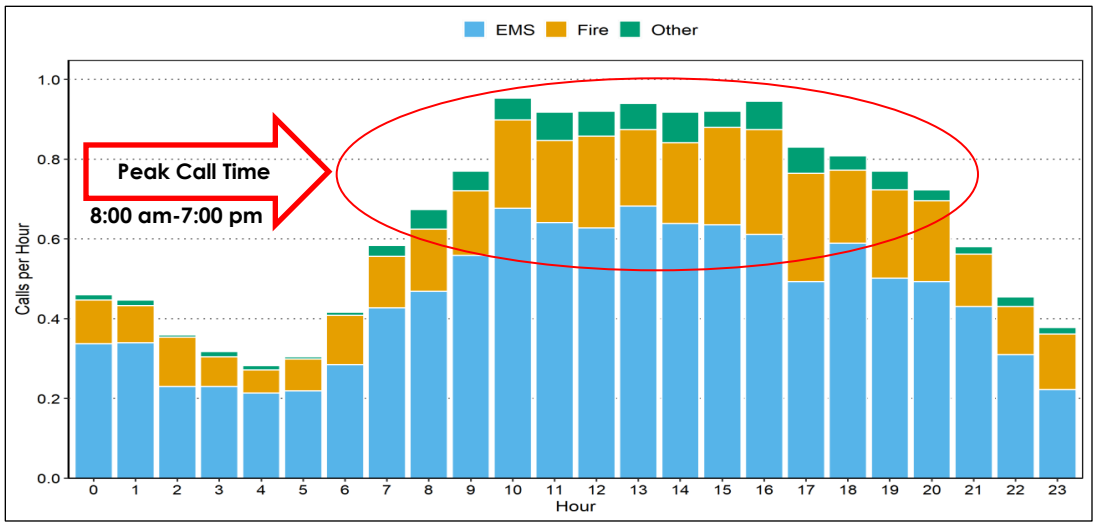
TABLE 5-7: Frequency of Overlapping Calls

Scenario	Number of Calls	Percent of Calls
No overlapped call	3,543	61.9
Overlapped with one call	1,832	32.0
Overlapped with two calls	316	5.5
Overlapped with three calls	30	0.5

The above tables tell us:

- The greatest percentage of the time there were no calls in an hour (53.6 percent)
- 14.7 percent of the time there was an overlapping call (11.3 percent of the time two calls occurred in an hour), which can impact resources if an ambulance is committed to an interfacility transfer or one or more units are committed on a mutual aid incident.
- 62 percent of all calls did not have an overlapped call.

FIGURE 5-3: Calls by Hour of Day



The BFD overall has moderate issues with resiliency when ambulance ground transport units are committed to interfacility transfers (58 minutes on average per call) and when fire and/or EMS units are committed to mutual/auto aid (45 minutes on average for one or multiple BFD units).

Although there can be more than one call in an hour for the BFD, the percentage overall is low. The workload of all companies in terms of runs (calls where there are more than one unit responding) can have an effect on resiliency; however, that does not appear in the data. Affecting resiliency are the calls that require more than one unit anywhere in the city. Some of these calls involve longer travel distances as there is only one station in the city, which can affect resiliency as well.

The BFD's ability to absorb multiple calls and restore response capabilities to a state of normal can be challenging at certain times such as during working structural fires, winter/summer storm events, and when units are committed to interfacility transfers.

THREE-AXIS RISK ANALYSIS

A comprehensive risk assessment is a critical aspect of creating standards of cover and can assist the BFD in quantifying the risks that it faces. Once those risks are known as described herein, the department is better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned.

Risk is often categorized in three ways: the probability the event will occur in the community, consequence of the event on the community, and the impact on the fire department. The following three tables look at the probability of the event occurring which ranges from unlikely to frequent; consequence to the community, which is categorized as ranging from insignificant to catastrophic; and the impact to the organization, which ranges from insignificant to catastrophic.

TABLE 5-8: 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 5-9: Consequence to Community Matrix

Impact	Consequence 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	■ A 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. ■ A 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	■ A very large number of people in affected area(s) impacted with significant numbers of fatalities, large number of people requiring hospitalization; serious injuries with long-term effects. General and widespread displacement for prolonged duration; extensive personal support required. Extensive damage to properties in affected area requiring major demolition. ■ Serious damage to infrastructure. Significant disruption or loss of key services for a prolonged period. ■ Community unable to function without significant support. ■ Significant long-term impact on environment and/or permanent damage.	**10**

TABLE 5-10: Impact on BFD

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 percent of available resources committed to incident for over 30 minutes.	**6**
Significant	Personnel and Resources	More than 75 percent of available resources committed to an incident for over 30 minutes.	**8**
Catastrophic	Personnel, Resources, and Facilities	More than 90 percent of available resources committed to an incident for more than two hours or event which limits the ability of resources to respond.	**10**

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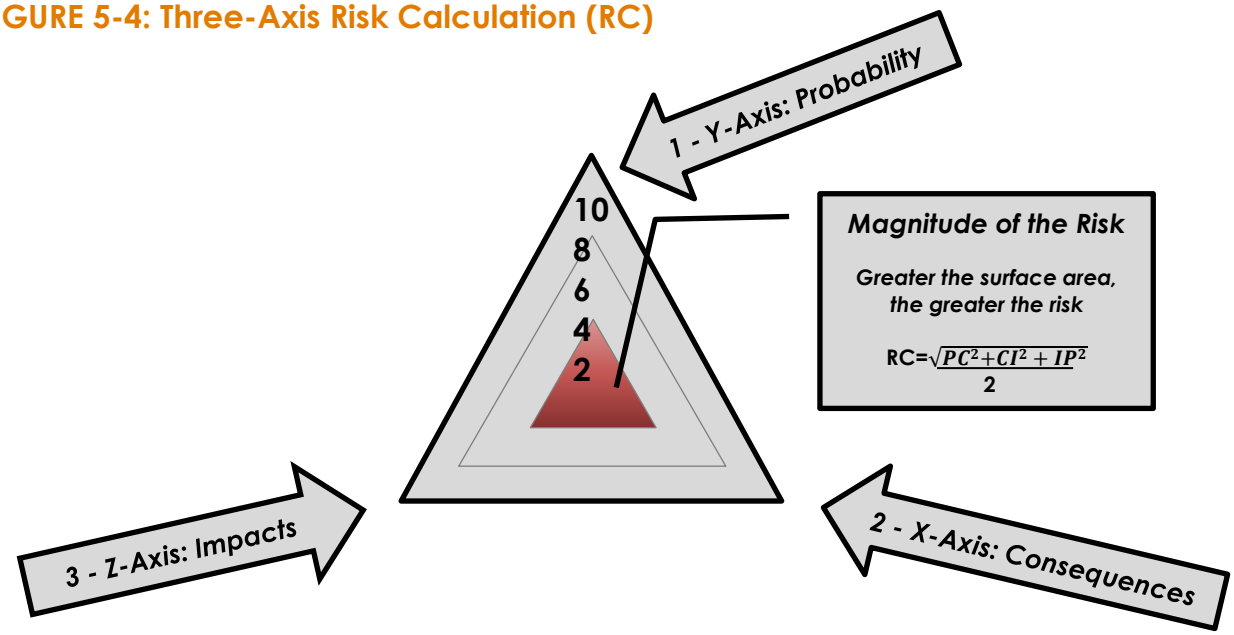
Prior risk analysis has only attempted to evaluate two factors of risk: probability and consequence. Contemporary risk analysis considers the impact of each risk to the organization, thus creating a three-axis approach to evaluating risk as depicted in the following figure. ***A contemporary risk analysis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

FIGURE 5-4: Three-Axis Risk Calculation (RC)



The following factors/hazards for Biddeford were identified and considered:

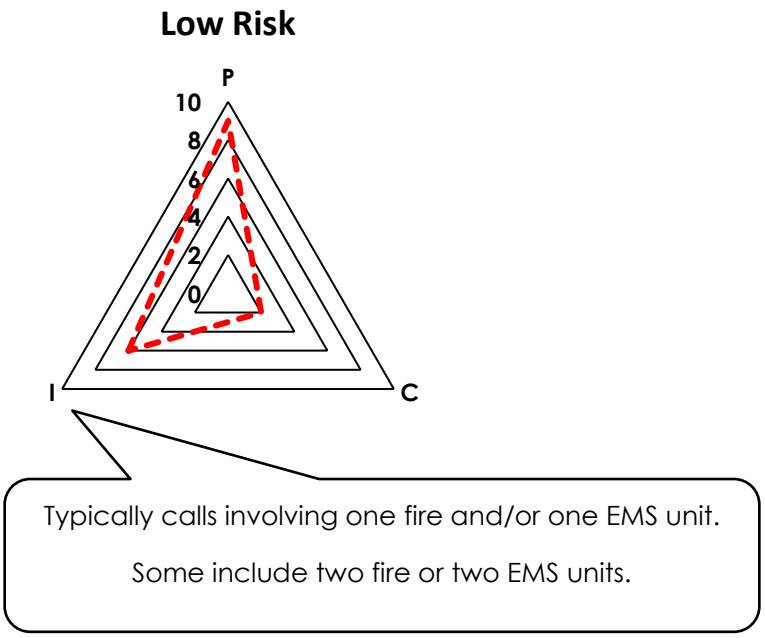
- **Demographic factors** such as age, socio-economic, vulnerability.
- **Natural hazards** such as flooding, winter/summer storm events, coastal events, wildland fires.
- **Manufactured hazards** such as rail lines, roads and intersections, target hazards.
- **Structural/building risks**.
- **Mass transit and transportation risks**.
- **Fire and EMS incident types and demand**.
- **Resiliency.**

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

Low Risk

- Automatic fire/false alarms.
- Low-acuity BLS EMS Incidents.
- Low-risk environmental event.
- Motor vehicle accident (MVA).
- 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 5-5: Low Risk



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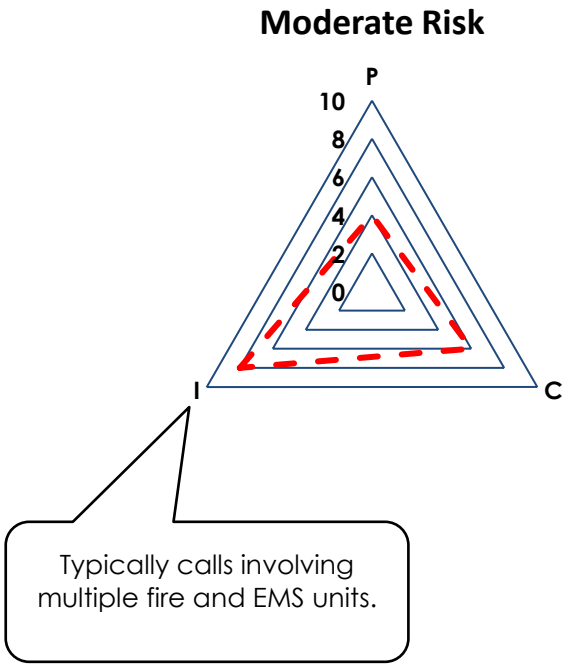
Moderate Risk

- 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.
- MVA with entrapment of passengers.
- Grass/brush fire with structural endangerment/exposure.
- Low-angle rescue that involves ropes and rope rescue equipment and resources.
- Surface water rescue.
- Good intent/hazard/public service fire incidents with life-safety exposure.
- Rail event with no release of product or fire, and no threat to life safety

FIGURE 5-6: Moderate Risk



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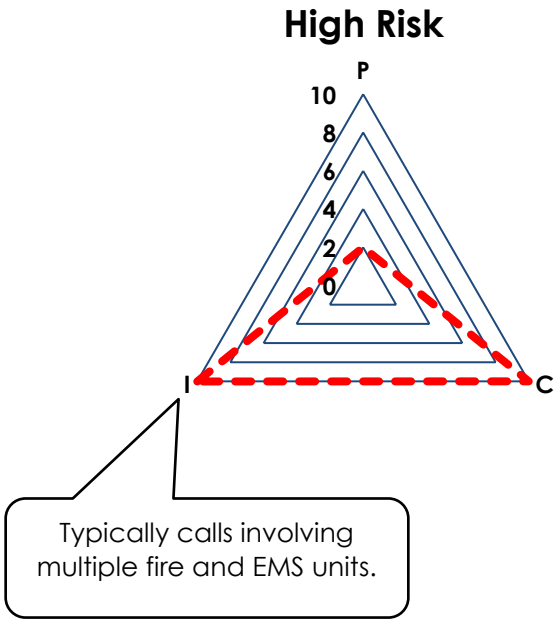
High Risk

- 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 multiple injuries.
- Industrial leak of hazardous materials that causes exposure to persons or threatens life safety.
- Weather events that create widespread flooding, heavy snow, heavy winds, building damage, and/or life-safety exposure.

FIGURE 5-7: High Risk



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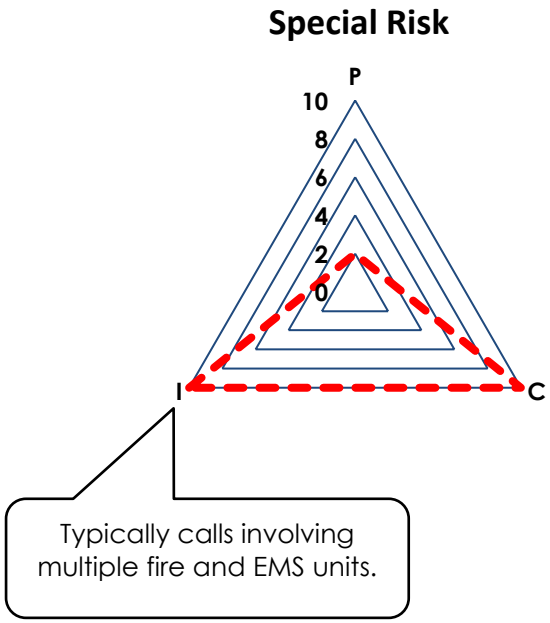
Special Risk

- 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 and evacuation of residential and business occupancies.
- 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.
- Massive river/estuary flooding, fire in a correctional or medical institution, high-impact environmental event, pandemic.
- Mass gathering with threat of fire and threat to life safety or other civil unrest, weapons of mass destruction release.

FIGURE 5-8: Special Risk



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SECTION 6. OPERATIONAL ANALYSIS

STAFFING AND DEPLOYMENT

In the course of examining staffing and deployment of a fire department, it is prudent to design an operational strategy around the actual circumstances that exist in the community and the fire and risk problems that are identified. The strategic and tactical challenges presented by the widely varied hazards that a department protects against need to be identified and planned for through a community risk analysis planning and management process as completed in this report. It is ultimately the responsibility of elected officials to decide the level of risk that is acceptable to their community. Once the acceptable level of risk has been decided, then operational service goals can be established. Whether looking at acceptable risk, or level of service goals, it would be imprudent, and probably very costly, to build a deployment strategy that is based solely on response times and emotion.

The staffing of fire and EMS companies is a never-ending focus of attention among fire service and governmental leadership. While NFPA 1710 and OSHA provide guidelines (and to some extent the law, specifically OSHA in OSHA states) as to the level of staffing and response of personnel, the adoption of these documents varies from state to state and department to department. NFPA 1710 addresses the recommended staffing in terms of specific types of occupancies and risks. The needed staffing to conduct the critical tasks for each specific occupancy and risk are determined to be the Effective Response Force (ERF). The ERF for each of these occupancies is detailed in NFPA 1710 (2020 edition), section 5.2.4, Deployment.

The fire service has experienced tremendous technological advances in equipment, procedures, and training over the past 50 years. Better personal protective equipment (PPE), the widespread use of self-contained breathing apparatus (SCBA), large diameter hose, better and lighter hand lines and nozzles, and thermal imaging cameras are just a few of the numerous advances in equipment and procedures that have allowed firefighters to perform their duties more effectively, efficiently, safely, and with fewer personnel. However, the fact remains that the emergency scene in general, and the fireground involving a structure fire, is a dynamic, dangerous, frequently unpredictable, and rapidly changing environment where conditions can deteriorate very quickly and can place firefighters in extreme personal danger, particularly if there are not enough on scene to handle all the critical tasks.

Even with the many advances in technology and equipment, the fireground is an unforgiving and dynamic environment where firefighters must complete critical tasks simultaneously. Lightweight wood construction, truss roofs, dwellings and buildings with basements, increased setbacks making accessibility to the building difficult, and large footprint commercial buildings and estate homes are examples of the challenges that firefighting forces are met with when mitigating structural fires. Newly constructed homes are larger than much of the older home stock in a community. Newer homes tend to incorporate open floor plans, with large spaces that contribute to rapid fire spread. The challenge of rapid fire spread is exacerbated by the use of lightweight roof trusses, vinyl siding, and combustible sheathing. The result is that more personnel are required to mitigate the incidents safely and effectively in these structures. Providing adequate staffing through an Effective Response Force for these environments depends on many factors.

The operations necessary to successfully extinguish a structure fire, and do so effectively, efficiently, and safely, requires a carefully coordinated and controlled plan of action where

certain operations such as venting ahead of the advancing interior hose line(s) must be carried out with a high degree of precision and timing. Multiple operations, frequently where seconds count, such as search and rescue operations and trying to cut off a rapidly advancing fire, must also be conducted simultaneously. If there are not enough personnel on the incident initially to perform all the critical tasks, some tasks will, out of necessity, be delayed. This can result in an increased risk of serious injury, or death, to building occupants and firefighters, as well as increased property damage.

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. CPSM has developed metrics it follows and recommends that communities consider when making recommendations regarding staffing and deployment of fire resources.

Staffing is one component and the type of apparatus the personnel are deployed on and from where (station locations) are the other two components that determine how fire and EMS services are delivered. 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 discussed below.

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. The City of Biddeford had not completed a comprehensive analysis of these elements prior to this study. However, part of CPSM's analysis involved the completion of a community fire risk and target hazard analysis.

Fire Risk and Vulnerability of the Community: 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 drive 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 all 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. Many uninsured or underinsured patients rely on emergency departments for their primary and emergency 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.

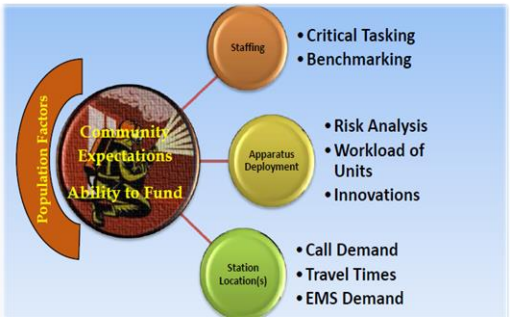
NFPA Standards, ISO, OSHA Requirements (and other national benchmarking). CPSM considers national benchmarks, standards, and applicable laws when making recommendations or alternatives regarding the staffing and deployment of fire and EMS resources.

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 collect an effective response force as benchmarked against national standards when confronted with the need to perform required critical 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, such as compressed air foam systems, or 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.

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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.

BFD responds with fire suppression apparatus and EMS transport units with crews from two fire station locations. However, the central station houses all 24/7 career firefighters. BFD also relies to some extent on auto/mutual aid companies for fire and EMS service delivery, particularly to collect the appropriate effective response force for single family, multifamily, vertically dense, commercial, and other building types. Emergency response units include:

Engine Companies, which are primarily designed 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. As 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 BFD engines are set up for this as well and are staffed with advanced emergency medical technicians. Staffing complements for engine apparatus are discussed below. BFD responds to emergencies with an inventory of one staffed engine.

Squad Company, which is primarily designed 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. These engine apparatus also carry an assortment of electric and hydraulic vehicle extrication tools and equipment, as well as other supplementary equipment utilized on a vehicle extrication/rescue incident. BFD currently cross-staffs one squad apparatus.

Ladder Company, which is also primarily designed for firefighting operations but differs from 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. Ladder trucks also transport 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.

The BFD currently responds to emergencies with an inventory of one ladder truck with a minimum of one firefighter assigned with others potentially available by cross-staffing apparatus. 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.

Special Hazards-Rescue Company, which is also primarily designed for firefighting operations and transports crew members, self-contained breathing apparatus, various hand and forcible entry tools, ventilation equipment, hydraulic rescue tools as well as other specialty equipment such as rope and rope equipment, vehicle stabilization devices, various mechanical cutting and burning tools, water rescue, and other specialty tools and equipment to deal with an assortment of fire and technical rescue incidents. The BFD currently responds to emergencies with an inventory of one rescue truck that is cross staffed primarily with a driver and available crew.

Brush Truck is a combination of an all-terrain vehicle, mini-pumper, and a wilderness rescue vehicle and is used to fight wildfires. This type of vehicle is designed to assist in fighting wildfires by transporting firefighters to the scene and providing them with access to the fire, along with water or other brush/wildland firefighting equipment. The BFD currently responds to emergencies with an inventory of one brush truck that is cross staffed with available crew.

EMS Ground Transport Units, which are primarily designed to respond to EMS calls for service with crew members and provide on-scene treatment and then transport while continuing care to the hospital emergency department. Equipment includes both basic and advanced life support targeted at timely intervention and patient stabilization. BFD currently responds to emergencies with an inventory of two staffed ambulances with a potential of a third depending on available staffing. All are staffed with paramedics/advanced emergency medical technicians.

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 and equipped with radio and command boards as well scene personnel-tracking equipment and associated gear. BFD has one command vehicle assigned to the shift captain, the Fire Chief, and the assistant chief. These personnel are responsible for responding to fire and EMS incidents and establishing command and control of the incident.

BFD has four shifts, A, B, C, and D. The work schedule for operations firefighters is 24 hours on, then 72 hours off. All shifts are staffed daily with a minimum of 8 members (not including the shift captain). When fully staffed, the shift would have 11 firefighters assigned to apparatus in accordance with department policy. The following table details the positions for each shift.

TABLE 6-1: BFD Shift Matrix, Central Station Minimum Staffing & Assignments

Apparatus	Staffing	Total Staff
Engine	■ Officer in Charge (OIC) ■ Driver/Operator ■ Firefighter or Firefighter Paramedic *Responds with Squad 28 for motor vehicle accidents, or other hazardous environments as directed by the OIC.*	**3**
Ambulance–First Out	■ Firefighter or Firefighter Paramedic (Driver) ■ Firefighter or Firefighter Paramedic (Technician) *On reported Biddeford structure fires, technician position swings to engine company for staffing of four. The driver responds with an ambulance.*	**2**
Ambulance–Second Out	■ Firefighter or Firefighter Paramedic ■ Firefighter or Firefighter Paramedic *Crew swings to ladder company positions for all fire calls. The ambulance remains in service on non-emergency details.*	**2**
Ladder ■ **Special Hazards Unit** ■ **Brush Truck** ■ **Squad 28 (Engine specialty rescue equipment)**	■ Driver *Driver to swing to Special Hazards for motor vehicle accidents, water emergencies, and those responses that require the Special Hazards' unit equipment; swings to Brush 20 when needed. In out-of-district fires, the ladder driver will take Squad 28 as the second engine. Remaining ladder crew will respond with ladder apparatus if qualified.*	**1**

NFPA 1710

National Fire Protection Association (NFPA) standards are consensus standards and are not mandated nor are they the law. Many cites and countries strive to achieve these standards to the extent possible without an adverse fiscal impact to the community. Cities and communities must decide on the level of service they can deliver based on several factors as discussed herein, including budgetary considerations. Questions of legal responsibilities are often discussed in terms of compliance with NFPA Standards. Again, these are national consensus standards, representing best practices and applied science and research.

NFPA 1710 outlines organization and deployment of operations by career, and primarily career fire and rescue organizations.[22] It serves as a benchmark to measure staffing and deployment of resources to certain structures and emergencies.

22. 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 Maine. It is a valuable resource for establishing and measuring

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 as the basis for developing response times and resource capabilities for those services as identified by the fire department.[23]

According to NFPA 1710, fire departments should base their capabilities on a formal all-hazards community risk assessment, as discussed earlier in this report, and taking into consideration:[24]

- 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.

Moreover, the fire department's ability to assemble an Effective Response Force (ERF) to complete the critical tasks required to safely mitigate the incident is paramount for successful operations.

EFFECTIVE RESPONSE FORCE AND CRITICAL TASKING

Critical tasks are those activities that must be conducted on time by responders at emergency incidents to control the situation and stop loss. Critical tasking for fire and EMS operations involves the minimum number of personnel needed to perform the tasks needed to effectively control and mitigate a fire or other emergency. 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 initial response personnel may manage secondary support functions 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 tasking assignment 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 or incident type is referred to as an *Effective Response Force* (ERF). The goal is to deliver an ERF within a prescribed period. NFPA 1710 provides the benchmarks for the assembling of an effective response force.

The following discussion and tables will outline how critical tasking and assembling an effective response force is first measured in NFPA 1710, and how the BFD is benchmarked against this standard for the building types existing in Biddeford. This discussion will cover single-family dwelling buildings, open-air strip mall buildings, and apartment buildings as outlined in the NFPA standard. As mentioned already in this report, the BFD relies on automatic and mutual aid to assemble an Effective Response Force.

performance objectives for the City of Biddeford but should not be the only determining factor when making local decisions about the city's fire services.
23. NFPA, Origin and Development of the NFPA 1710, 1710-1.
24. NFPA 1710, 5.2.1.1, 5.2.2.2

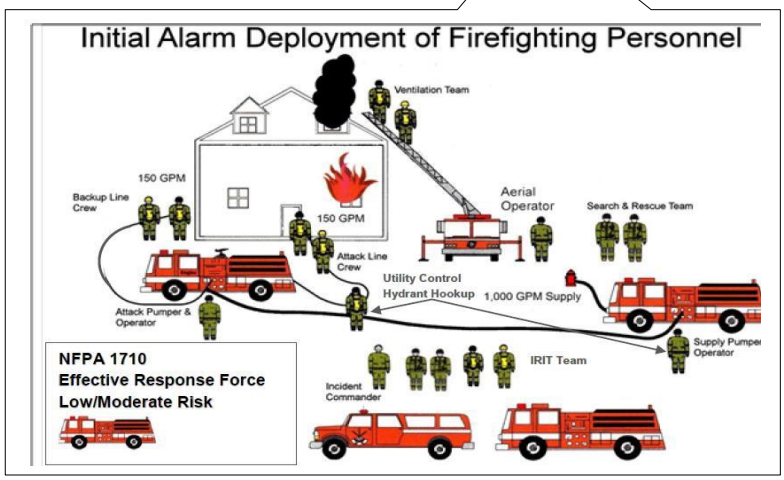
Single-Family Dwelling: NFPA 1710, 5.2.4.1

The initial full alarm assignment (ERF) to a structural fire in a typical 2,000 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 subsequent table outlines the critical task matrix.

TABLE 6-2: NFPA 1710 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**

Note: Single-family dwellings in Biddeford greater than 2,000 square feet should be considered a more moderate risk, particularly if built with lightweight wood-frame construction.



The next table outlines how BFD is able to assemble an ERF for a single-family dwelling fire.

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TABLE 6-3: BFD Effective Response Force for Single-Family Dwelling Fire

BFD Response Matrix	Personnel
BFD Engine	3
Automatic/Mutual Aid Engine(s) Depending on Availability	3 to 9
BFD Truck/Ladder	1
BFD Ambulance	2
BFD Ambulance Depending on Availability	2
Total ERF for BFD	**8 to 17****

Note: ** Depending on availability of internal and external fire resources, BFD may meet 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 (NFPA 1710.5.2.1.3)**, that is if auto/mutual aid companies are available, and BFD ambulance crews are available. As noted, call/pool members work out of the central fire station and a sub-station as needed assisting the full-time staff. Pool members receive direction from a district chief who reports to the operational division chief. Pool members receive an annual stipend for participation and additional stipend for response to working incidents. Primary fire suppression, EMS, and specialty services are provided, as noted above, out of one central fire station. Accordingly, pool staff are NOT included in any of the BFD response matrix presented.

Open-Air Strip Mall/Commercial Building, NFPA 1710 5.2.4.2

The initial full alarm assignment to a structural fire in a typical open-air strip mall/commercial building 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 next table outlines the critical tasking matrix for this type of building.

TABLE 6-4: NFPA 1710 Effective Response Force for Open-Air Strip Mall / Commercial 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 next table outlines the BFD's ability to assemble an ERF for an open-air strip mall or commercial building fire.

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TABLE 6-5: BFD Effective Response Force for Open-Air Strip Mall / Commercial Building Fire

BFD Response Matrix	Personnel
BFD Engine	3
Automatic/Mutual Aid Engine(s) Depending on Availability	3 to 9
BFD Truck/Ladder	1
BFD Ambulance	2
BFD Ambulance Depending on Availability	2
Total ERF for BFD	**8 to 17****

Note: ** BFD **does not** meet the minimum requirements of NFPA 1710 for the Initial alarm assignment for open-air strip shopping center fire based on the current response matrix.

Apartment Building, NFPA 1710 5.2.4.3

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 next table outlines the critical tasking matrix for this type of building fire, which would include renovated mill buildings located in Biddeford.

TABLE 6-6: NFPA 1710 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 next table outlines the BFD's ability to assemble an ERF for an apartment building fire.

TABLE 6-7: BFD Effective Response Force for Apartment Building Fire

BFD Response Matrix	Personnel
BFD Engine	3
Automatic/Mutual Aid Engine(s) Depending on Availability	3 to 98
BFD Truck/Ladder	1
BFD Ambulance	2
BFD Ambulance Depending on Availability	2
Total ERF for BFD	**8 to 17****

Note: ** BFD **does not meet** the minimum requirements of NFPA 1710 for the Initial alarm assignment for an apartment building fire based on the current response matrix.

The city has one building (Ledgewood Apartments, 9 Graham St.) that is close to the standard for a high-rise (six story on front elevation) apartment building with vulnerable population.[25] For incidents in this building that involve fire and smoke, the BFD should develop a response matrix that is at a minimum the same as that for an apartment building fire response (28 personnel), and have a response plan to expand the incident to 42 personnel as outlined in the next table (Effective Response Force for Special Risk/High-Rise Buidling Fire).

The next table outlines an effective response force for a special risk/high-rise building fire response.

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25. NFPA definition of high rise building: the highest floor is greater than 75 feet above the lowest level of fire department vehicle access

TABLE 6-8: NFPA 1710 Effective Response Force for Special Risk/High-Rise Fire

Critical Tasks	Personnel
Incident Command	2
Continuous Water Supply	1/1- 1 FF for continuous water. If fire pump exists an additional FF will be required for a total of 2.
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 Manage Base Operations	1
Two ALS Medical Care Teams	4
Total Effective Response Force	**42 (43) If building is Equipped with Pump**

Regarding the implementation of an ERF and its aggregate effect on fireground operations, there has been much research done by fire departments on the effects of various staffing levels. These studies have consistently confirmed that company efficiency and effectiveness decrease substantially, and injuries increase, when company staffing falls below four personnel. A comprehensive yet scientifically conducted, verified, and validated study titled *Multiphase Study on Firefighter Safety and the Deployment of Resources* was performed by the National Institute of Standards and Technology (NIST) and Worcester Polytechnic Institute (WPI), in conjunction with the International Association of Fire Chiefs, the International Association of Fire Fighters, and the Center for Public Safety Excellence. For the first time, quantitative evidence was produced regarding the impact of crew size on accomplishing critical tasks. Additionally, continual research from UL has provided tactical insights that shed further light on the needs related to crew size and firefighter safety. This body of research includes:

- An April 2010 report on *Residential Fireground Field Experiments* from the National Institute of Standards and Technology (NIST).
- An April 2013 report on *High-Rise Fireground Field Experiments* from the National Institute of Standards and Technology (NIST-HR).
- A December 2010 report on the *Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction* (UL).

As stated, these studies' findings have a direct impact on the exercise of critical tasking. For example, as UL studied the impact of ventilation on fire behavior, it was able to obtain empirical data about the effect of water application on fire spread and occupant tenability. The research clearly indicates that the external application of a fire stream, especially a straight stream, does not "push fire" or decrease tenability in any adjacent rooms. Therefore, during the deployment of resources for the critical task of fire attack, consideration must be given to the option of applying water to the fire from the exterior when able. This approach enables a fire attack that can begin prior to the establishment of an IRIT (Initial Rapid Intervention Team) as well as decreases the time to get water on the fire, which has the greatest impact on occupant survivability.

The NIST studies examined the impact of crew size and stagger on the timing of fireground task initiation, duration, and completion. Although each study showed crew size as having an impact on time-to-task, consideration must be given to what tasks were affected and to what extent. For example, on average, four-person crews operating at a low-hazard structure fire completed all fireground tasks 5.1 minutes faster, or 25 in percent less time, than three-person crews.

- Four-person firefighting crews were able to complete 22 essential firefighting and rescue tasks in a typical residential structure 30 percent faster than two-person crews and 25 percent faster than three-person crews.
- The four-person crews were able to deliver water to a similar-sized fire 15 percent faster than the two-person crews and 6 percent faster than three-person crews, steps that help to reduce property damage and reduce danger/risks to firefighters. The latter time represents a difference of 34 seconds.
- Four-person crews were able to complete critical search and rescue operations 30 percent faster than two-person crews and 6 percent faster than three-person crews. The latter time represents a difference of 23 seconds. The "rescue time" difference from a four-person to a three-person crew is seven seconds.

When considering critical tasking for the deployment of an ERF for fire suppression operations, the BFD will not be able to handle most incidents with just its own resources. But that is the case for surrounding departments as well, making automatic and mutual aid that much more significant. For larger, more significant, or complex incidents, the BFD directly relies on resources from surrounding automatic and mutual aid partners. It is also unlikely that the department would be capable of handling two simultaneous or significant incident responses. It is also important to note that the impact of crew size as it relates to all risk categories should be considered when designing response matrixes. As the BFD is typically staffed with eight personnel on a daily basis, this will ultimately present some significant operational challenges and concerns (as it does in many other communities that utilize similar staffing models) regarding the response to building fire incidents.

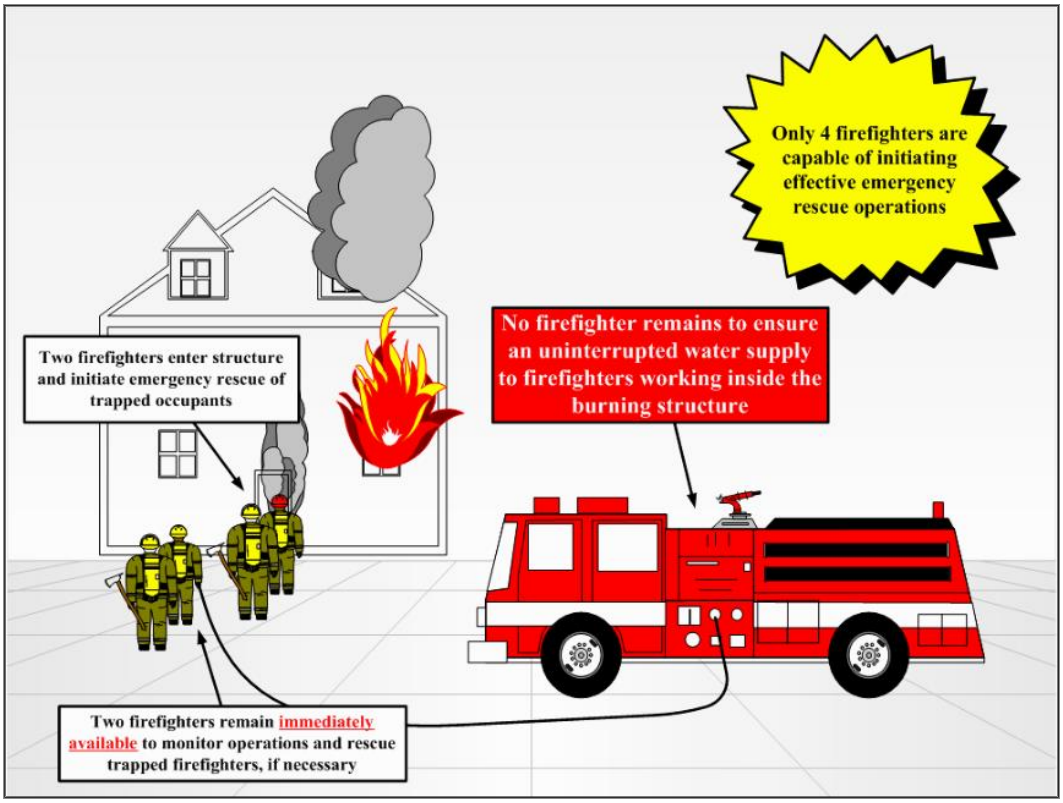
TWO-IN / TWO-OUT

There is no Maine or federal requirement that specifies staffing levels on fire apparatus. The closest thing that approaches a requirement for staffing levels is the OSHA 29 CFR 1910.134 standard, often referred to as the ***"Two-in/Two-out"*** guideline. This standard, which is a safety mandate that has application to municipal firefighting, requires the use of four personnel (two inside the structure and two outside the structure) when conducting interior firefighting activities in a hazardous work environment (that is, an environment that is immediately dangerous to life or health, or IDLH). **It is important to note that the potential for an IDLH atmosphere to exist is not**

just limited to structure fires. They can exist on natural gas leaks, carbon monoxide incidents, confined space emergencies, chemical spills, and even automatic fire alarm activations where there is an actual fire in progress.

The following figure illustrates one example of how this standard is intended to be implemented.

FIGURE 6-1: OSHA "Two-in/Two-out" Rule Illustrated



The OSHA requirement has two key provisions that allow considerable flexibility regarding staffing:

- One provision specifies that the four personnel who engage in interior firefighting are required at the incident (assembled) and are not a staffing requirement for the individual responding unit.
- The second provision is that an exception is provided when crews are performing rescue operations where there is the potential for serious injury or death of the occupants. In this case the standard allows the entry of two personnel to conduct the rescue activity without two firefighters outside immediately available to monitor operations and rescue trapped firefighters, if necessary.

In addition, the 2018 edition of NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness*, section 8.8.2, states: "In the initial stages of an incident where only one crew is operating in the hazardous area at a working structure fire, a minimum of four individuals shall be required, consisting of two individuals working as a crew in the hazardous area and two individuals present outside this hazardous area available for assistance or rescue at emergency operations where entry into the danger area required." This standard also stipulates the

utilization of a standby crew member assigned another task (i.e., apparatus operator) is allowable so long as abandoning his/her task does not jeopardize the operating crews.

As with the OSHA standard, NFPA 1500 does support entry into a hazardous area with less than four personnel assembled if initial attack personnel find an imminent life-threatening situation where the immediate action could prevent loss of life or serious injury.

The Center for Public Safety Excellence (CPSE) has also established benchmarks regarding staffing and deployment. CPSE sets standards for agencies seeking and achieving accreditation through the Commission on Fire Accreditation International (CFAI). CFAI uses standards set forth in the *Community Risk Assessment Manual: Standards of Cover*, 6th edition, to provide guidance in staffing and deployment to agencies desiring accreditation through Core Competencies.

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.

From a practical standpoint, staffing engines with three personnel rather than four forces the company officer to be actively involved in hands-on tasks such as stretching a line, rather than performing size-up and other important initial fireground actions. Company officers are working supervisors. They form an integral part of their company, and it is often necessary for them to assume hands-on involvement in operations, particularly with companies that are minimally staffed, while simultaneously providing oversight and direction to their personnel. During structure fires and other dangerous technical operations, it is imperative that these officers accompany, and operate with, their crew to monitor conditions, provide situation reports, and assess progress toward incident mitigation. During structure fires they operate inside of the fire building. Company officers need to be able to focus on the completion of specific tasks that have been assigned to their respective companies, such as interior fire attack, rescue, ventilation, and/or water supply.

When companies are staffed with three rather than four personnel, the company officer often needs to either function as the nozzle person while the other firefighter backs him/her up and helps with advancing the line, or, if the roles are reversed and the captain is assisting with line advancement they cannot monitor the conditions at the nozzle—and closest to the fire—as they should. Ideally, one firefighter should be the nozzle operator, the company officer should be right alongside of, or behind the nozzle, providing direction and evaluating conditions, and the third firefighter can be further back assisting with advancing the line. This is particularly important for fires on the second and third floors of buildings where the lines must frequently be advanced up narrow and winding stairways. When short staffed in fire conditions such as this, two companies often must be deployed to get a single line in service, which can then impact the completion of additional critical tasks.

CPSM advocates for structural fire tactics and strategies that are both safe and effective, but sometimes staffing levels can make that dual goal difficult to achieve. Initiating offensive operations with fewer than four firefighters or the ability to place four or more on scene within the prescribed timelines outlined in national standards such as NFPA 1710 will place firefighters at a high level of risk; delaying operations until additional staffing arrives places occupants in greater danger and can increase property damage.

Ultimately, on-duty fire department staffing is a local government decision. It is also important to note that the OSHA standard (and NFPA 1500/1710/1720) specifically references "interior firefighting." Firefighting activities that are performed 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**. How and where personnel and resources are located, and how quickly they can arrive on scene, play major roles in safe operations.

EMS TRANSPORT AND EMS CRITICAL STAFFING

EMS is a vital 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.

In terms 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 makes 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. Contemporary pre-hospital clinical care deploys many clinical treatments one will receive in the Emergency Department, truly matching the long-time EMS saying, "we bring the Emergency Room to you."

Critical tasks by specific call type in EMS-only agencies assisted by fire departments are not as well-defined as critical tasks in the fire discipline. Notwithstanding, critical tasking in EMS is typical of that in the fire service in that there are certain critical tasks that need to be completed either in succession or simultaneously. EMS on-scene service delivery is based primarily on a focused scene assessment, patient assessment, and then followed by the appropriate basic and advanced clinical care through established medical protocols. Thus, EMS critical tasking is typically developed (in fire-based EMS Standards of Cover documents) in accord with the U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services (CMS) as:

- Basic Life Support (BLS), which is an emergency response by a ground transport unit (and crew) and the provision of medically necessary supplies and services.
- Advanced Life Support, Level 1 (ALS1), which is the transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including the provision of an ALS assessment or at least one ALS intervention.
- Advanced Life Support, Level 2 (ALS2), which is the transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including:
  - (1) at least three separate administrations of one or more medications by intravenous push/bolus or by continuous infusion (excluding crystalloid fluids), or
  - (2) ground ambulance transport, medically necessary supplies and services, and the provision of at least one of the ALS2 procedures listed below:
    - a. Manual defibrillation/cardioversion.
    - b. Endotracheal intubation.
    - c. Central venous line.
    - d. Cardiac pacing.

- e. Chest decompression.
- f. Surgical airway.
- g. Intraosseous line.

The next set of tables provides recommended critical tasking for the BFD continuum of care. As indicated above, this critical tasking is based on the current CMS ground transport definition of ambulances services.

TABLE 6-9: BLS Critical Tasking

Critical Task	# Responders
Primary Patient Care Incident Command	1
Secondary Patient Care Vehicle Operations	1
Effective Response Force	**2**

Resource Deployment:
1 Transport Ambulance

TABLE 6-10: ALS1 Critical Tasking

Critical Task	# Responders
Incident Command	1
Primary Patient Care	1
Secondary Patient Care	2
Vehicle Operations	1
Effective Response Force	**5**

Resource Deployment:
1 Transport Ambulance
1 BFD Fire Crew

TABLE 6-11: ALS2 Critical Tasking

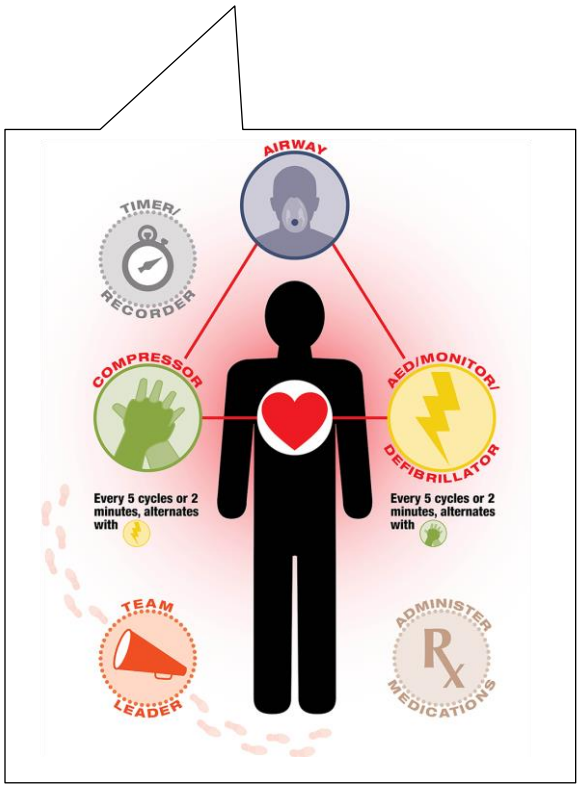
Critical Task	# Responders
Incident Command	1
Primary Patient Care	1
Secondary Patient Care	1
Tertiary Patient Care	2
Vehicle Operations	1
Effective Response Force	**6**

Resource Deployment:
1 Transport Ambulance
1 EMS Supervisor
1 BFD Fire Unit

TABLE 6-12: Pulseless/Non-Breathing Critical Tasking

Critical Task	# Responders
Incident Command	1
Primary Patient Care	1
Secondary Patient Care	1
Tertiary Patient Care	2
Vehicle Operations	1
Effective Response Force	**6**

Resource Deployment:
1 Transport Ambulance
1 EMS Supervisor
1 BFD Fire Unit



As noted herein, the BFD is responsible for advanced and basic life support EMS ground transportation in the city. The BFD staffs two ambulances around the clock, and if needed due to the workload, staffs a third with available fire staffing.

The following table depicts BFD EMS ground transport by call type. This table tells us that of EMS calls handled by BFD transport units, almost 75 percent convert to transports.

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TABLE 6-13: Calls by Type and Transport

Call Type	Number of Calls			Conversion Rate
	Non-Transport	Transport	Total	
Breathing difficulty	57	281	338	83.1
Cardiac and stroke	61	264	325	81.2
Fall and injury	257	431	688	62.6
Illness and other	324	985	1,309	75.2
MVA	139	65	204	31.9
Non-emergency transfer	46	605	651	92.9
Overdose and psychiatric	47	103	150	68.7
Seizure and unconsciousness	70	229	299	76.6
EMS Subtotal	**1,001**	**2,963**	**3,964**	**74.7**

The next table outlines transport time components. The overall average time spent per run ultimately affects the resiliency of the BFD for other call types and deployment patterns, since the typical daily staffing is eight. Additionally, the call-out figure below the table tells us that 68 percent of the time a single unit responds to EMS calls and 32 percent of the time two units respond,

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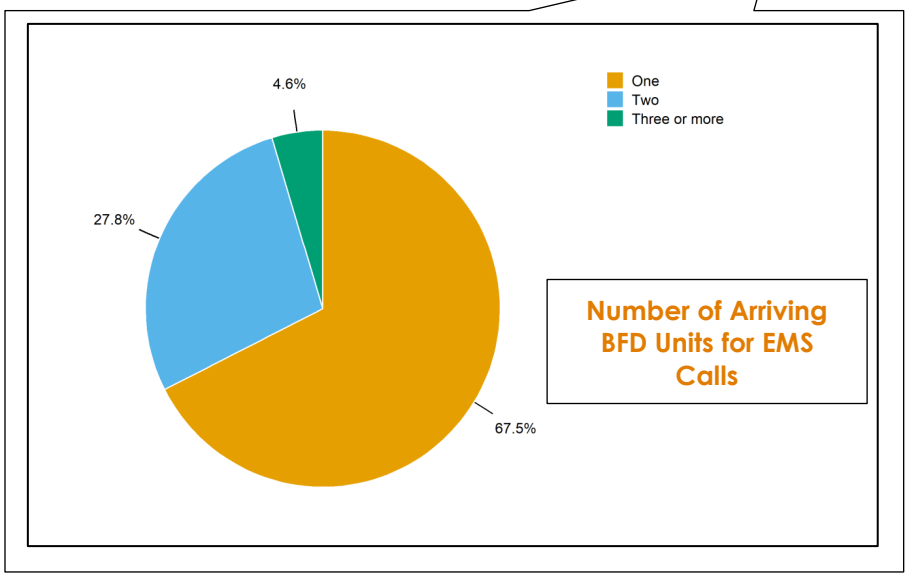
TABLE 6-14: Time Component Analysis for Ambulance Transport Runs by Call Type

Call Type	Average Time Spent Per Run, in Minutes			
	On Scene	Traveling to Hospital	At Hospital	Deployed
Breathing difficulty	13.0	8.2	28.6	53.6
Cardiac and stroke	13.3	10.2	33.3	60.5
Fall and injury	13.6	9.1	28.9	56.3
Illness and other	12.5	8.5	25.3	50.9
MVA	12.2	10.8	35.2	63.2
Nonemergency transfer	15.5	14.1	35.3	69.9
Overdose and psychiatric	12.6	6.5	28.0	51.5
Seizure and unconsciousness	13.5	7.9	31.5	56.9
EMS Subtotal	**13.5**	**9.8**	**29.7**	**57.4**



Interfacility Transports

The National Institutes of Health (NIH) provides the following summary of Interfacility Transports in America.

> *Interfacility transport is defined as the transport of patients between two healthcare facilities. The process is generally accomplished through ground transportation or air vehicles. Interfacility transport is a crucial part of today's healthcare system that allows facilities to transfer patients needing specialized care that cannot be adequately performed at their current facility. Financial constraints of integrated hospital systems and managed care organizations also necessitate the use of interfacility transport to help maintain high practice standards and reduce financial burdens. The use of emergency medical services (EMS) interfacility transport ensures that a patient receives the care they need in a time-efficient and safe manner. For clinicians, understanding the role EMS services play in transport is essential for the proper use and referral.*

Many fire and emergency services departments across the nation are tasked with providing interfacility transport services for local hospitals for a variety of reasons, mostly due to a lack of private ground transport providers. For the hospitals, they receive a consistently high level of patient care and customer service as that is the culture of the fire service. Firefighters and fire medics take pride in their belief that they exist to serve others and have taken an oath to that ethos.

For fire departments, interfacility transports provide additional opportunities to serve their citizens as well as provide an additional revenue stream to offset EMS costs. These funds potentially reduce the tax burden of the general population by helping to offset their taxes or fees paid for EMS services.

If a fire department utilizes on-duty emergency response crews and ambulances for these transports, this could create an unintended negative downstream impact to the community it serves. Ambulances utilized for non-emergency interfacility transport are not available to respond to time-sensitive 911-emergency medical needs of the community while performing that task. However, the local hospitals as well as the majority of their patients are also members of that locality and thus the fire department's customers as well.

If the local governing officials approve this concept of operations, it is the responsibility of the fire department to balance the needs of all of its customers. This requires funding and staffing of ambulances to provide both services (911 and interfacility) safely and while meeting their customers' needs and expectations.

The City of Biddeford and its fire department address this via policy. The Biddeford Fire Department Interfacility Transport Policy provides the parameters for providing these services for Southern Maine Health Care while reducing the risks associated with ambulances not being available. It provides the following policy guidance:

> *The Biddeford Fire Department will perform transfers from Southern Maine Health Care to Maine Medical Center. In addition, emergency transfers will be performed from Southern Maine Health Care to any medical facility destination that is requested from the Southern Maine Medical Center attending physician.*
>
> *Upon the request for an emergency transfer from Southern Maine Health Care to any medical facility north of Portland or south of Sanford, Fire Alarm will be instructed to transmit a firefighter call-back for two personnel to Central Station to staff apparatus not to include the third ambulance. These transfers will only be conducted if SMHC has no other agency that can complete the transfer and will be approved by the OIC after consulting the SMHC charge nurse.*
>
> *Only one ambulance will perform an emergency transfer north of Portland or south of Sanford at a time. If an ambulance is returning from an extended transfer that is north of Portland or south of Sanford and is south of Portland and north of Sanford, the next request for an emergency transfer from Southern Maine Health Care to a medical facility north of Portland and south of Sanford may be filled.*
>
> *A second transfer request from Southern Maine Health Care to Maine Medical Center will be granted when an ambulance is on an emergency transfer that is north of Portland or south of Sanford.*

As BFD's EMS service demand continues to increase due to population growth, the current EMS transport capability is being stressed, as is ambulance availability for both emergency responses and non-emergency interfacility transports. There can also be negative impacts on firefighters

when the numbers of emergency calls become so great that they cannot adequately rest, decompress, and relieve the stress associated with mitigating life-threatening emergencies. Mentally and physically exhausted firefighters are also prone to making mistakes or injuring themselves.

During the one-year study period of response data for this report, the BFD responded to 651 interfacility transfers. This represented 11 percent of all calls and 16 percent of EMS calls. Of the 651 responses, 93 percent converted to an actual transport and averaged 70 minutes per call (the highest time on task for all calls). Based on this data, the department's current staffing and the impact on overall fire and EMS response resiliency, it is imperative the BFD monitor the number, length of overall response, and impacts of interfacility transfers on personnel and service delivery levels.

Staffing and Deployment Recommendations:

- CPSM recommends the BFD, to the extent possible and if practical depending on available automatic and mutual aid resources, work with regional Fire Chiefs to increase response resources to strip mall/commercial, apartment, and high-rise fire responses that align more closely with the NFPA 1710 standard. (Recommendation No. 16.)
- CPSM further recommends that due to factors listed herein, and to increase BFD resources to be able to assemble an Effective Response Force, the city develop a one- to five-year funding plan to increase staffing and apparatus response by increasing staffing at the Central Fire station by two per shift (eight total personnel) so that minimum daily fire suppression staffing can be increased to ten total. This would increase fire suppression staffing by two per shift, which will minimize cross-staffing between ladder and EMS resources and will make available additional staffing for a third EMS call without depleting fire suppression resources. This staffing can be added incrementally over two budget cycles by adding one person per shift per budget cycle. (Recommendation No. 17.)

  Factors on which these recommendations are based include:

  - Demand for emergency services on the BFD.
  - Population density, which includes substantial current and projected vertical density structures, many involving assisted and/or senior living.
  - Current and future residential-over-commercial buildings.
  - Other building risks identified in this report, particularly in the Central Fire Station downtown response zone.
  - The BFD cross-staffs the ladder apparatus, squad apparatus, second engine, and third ambulance with available daily staff, which has its efficiencies, but lacks in effectiveness when an apparatus is responding with a lone driver, or a fire or specialty apparatus responds with a crew of two. This is illuminated in the critical tasking discussion.
  - Mutual/automatic aid response resources have extended response times due to the location of these assets as well as potentially not being available due to providing emergency services in their own community.
  - Response capability resiliency.

SECTION 7: DATA ANALYSIS

This data analysis examines all calls for service between July 1, 2021, and June 30, 2022, as recorded in the Biddeford Police Department's computer-aided dispatch (CAD) system and backed by National Fire Incident Reporting System (NFIRS) data from the BFD.

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 the 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 the studied agency's units. The fifth part examines ambulance transport.

Between July 1, 2021, and June 30, 2022, the BFD responded to 5,721 calls, of which 69 percent were EMS calls. The total combined workload (deployed time) for BFD units for the year was 4,714.5 hours. In responding to calls that involved the fire department, the average dispatch time was 2.5 minutes, and the average response time was 7.1 minutes. The 90th percentile dispatch time was 3.9 minutes and the 90th percentile response time was 11.8 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 linked the CAD and NFIRS data sets. Then, we classified the calls in a series of steps. We first used the NFIRS incident type to identify canceled calls, motor vehicle accidents (MVA), and fire category call types. Calls identified by NFIRS as EMS calls, along with any calls that lacked a matching NFIRS record, were categorized using the CAD system's incident descriptions. We describe the method of call categorization in Attachment IV. The BFD's primary service area is the City of Biddeford. All BFD's responses beyond the City of Biddeford were identified as aid given.

We received records for a total of 5,882 calls that were responded to by BFD units in the studied period. We removed all runs without an en route or arrival timestamp. As a result, 157 calls were removed. Finally, A total of four incidents to which administrative units were the sole responders are not included in the analysis sections of the report. However, the workload of administrative units is documented in Attachment I.

CALL TOTALS

Between July 1, 2021, and June 30, 2022, BFD responded to 5,725 calls. Of these, 44 were structure fire calls and 24 were outside fire calls within the City of Biddeford.

Calls by Type

Table 7-1 shows the number of calls that BFD responded to by call type, average calls per day, and the percentage of calls that fall into each call type category. Figures 7-1 and 7-2 show the percentage of calls that fall into each EMS (Figure 7-1) and fire (Figure 7-2) type category.

TABLE 7-1: Calls by Type

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	338	0.9	5.9
Cardiac and stroke	325	0.9	5.7
Fall and injury	688	1.9	12.0
Illness and other	1,309	3.6	22.9
MVA	204	0.6	3.6
Nonemergency transfer	651	1.8	11.4
Overdose and psychiatric	150	0.4	2.6
Seizure and unconsciousness	299	0.8	5.2
EMS Subtotal	**3,964**	**10.9**	**69.3**
False alarm	467	1.3	8.2
Good intent	245	0.7	4.3
Hazard	177	0.5	3.1
Outside fire	24	0.1	0.4
Public service	456	1.2	8.0
Structure fire	44	0.1	0.8
Technical rescue	24	0.1	0.4
Fire Subtotal	**1,437**	**3.9**	**25.1**
Canceled	130	0.4	2.3
Mutual aid	190	0.5	3.3
Total	**5,721**	**15.7**	**100.0**

FIGURE 7-1: EMS Calls by Type

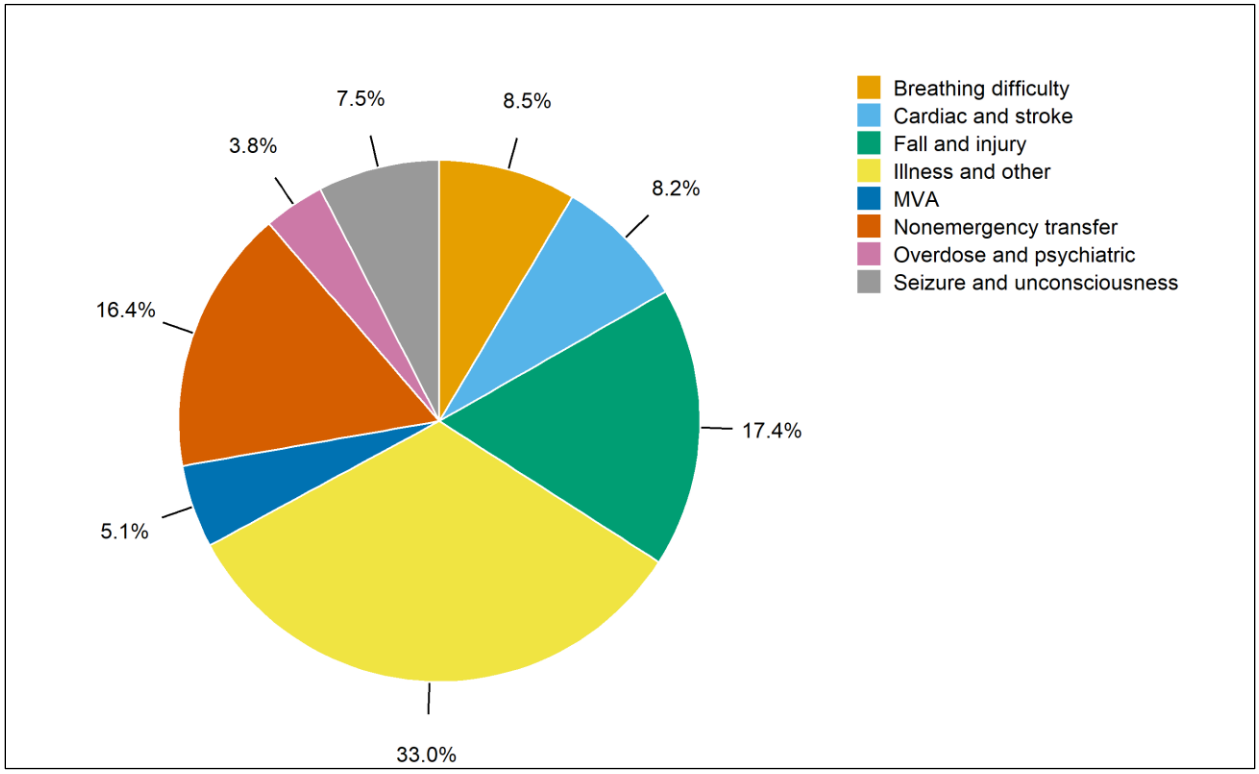
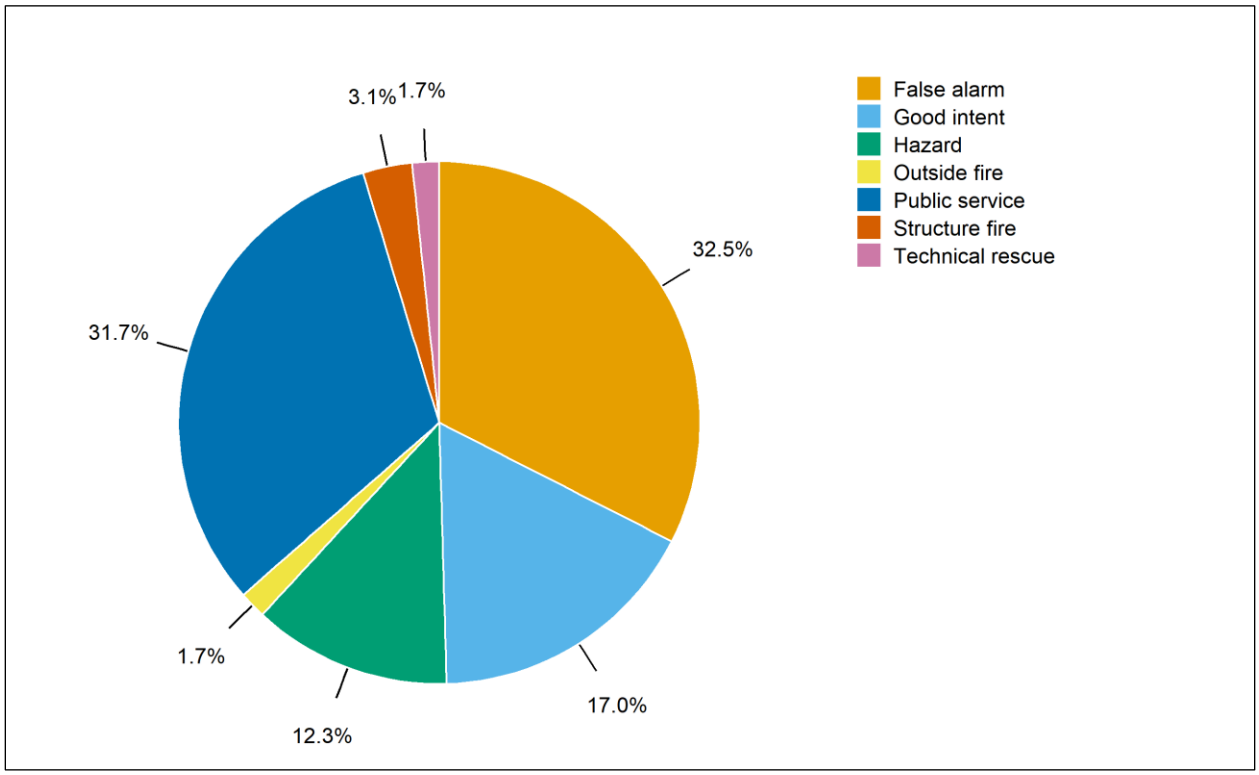


FIGURE 7-2: Fire Calls by Type



Observations:

- BFD responded to an average of 15.7 calls, including 0.4 canceled and 0.5 mutual aid calls, per day.
- EMS calls for the year totaled 3,964 (69 percent of all calls), an average of 10.9 per day.
  - Illness and other calls were the largest category of EMS calls at 33 percent of EMS calls, an average of 3.6 calls per day.
  - Cardiac and stroke calls made up 8 percent of EMS calls, an average of 0.9 calls per day.
  - Motor vehicle accidents made up 5 percent of EMS calls, an average of 0.6 calls per day.
- Fire calls for the year totaled 1,437 (25 percent of all calls), an average of 3.9 per day.
  - False alarm calls were the largest category of fire calls at 32 percent of fire calls, an average of 1.3 calls per day.
  - Structure and outside fire calls combined made up 5 percent of fire calls, an average of 0.2 calls per day, or one call every 5 days.

Calls by Type and Duration

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

TABLE 7-2: Calls by Type and Duration

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	Two or More Hours	Total
Breathing difficulty	82	160	95	1	338
Cardiac and stroke	63	144	106	12	325
Fall and injury	277	256	140	15	688
Illness and other	459	578	263	9	1,309
MVA	117	54	26	7	204
Nonemergency transfer	71	199	359	22	651
Overdose and psychiatric	60	55	33	2	150
Seizure and unconsciousness	84	119	94	2	299
EMS Subtotal	**1,213**	**1,565**	**1,116**	**70**	**3,964**
False alarm	418	46	3	0	467
Good intent	135	83	25	2	245
Hazard	132	30	13	2	177
Outside fire	16	5	1	2	24
Public service	406	43	7	0	456
Structure fire	22	14	5	3	44
Technical rescue	16	4	3	1	24
Fire Subtotal	**1,145**	**225**	**57**	**10**	**1,437**
Canceled	123	4	2	1	130
Mutual aid	63	63	58	6	190
Total	**2,544**	**1,857**	**1,233**	**87**	**5,721**

Observations:

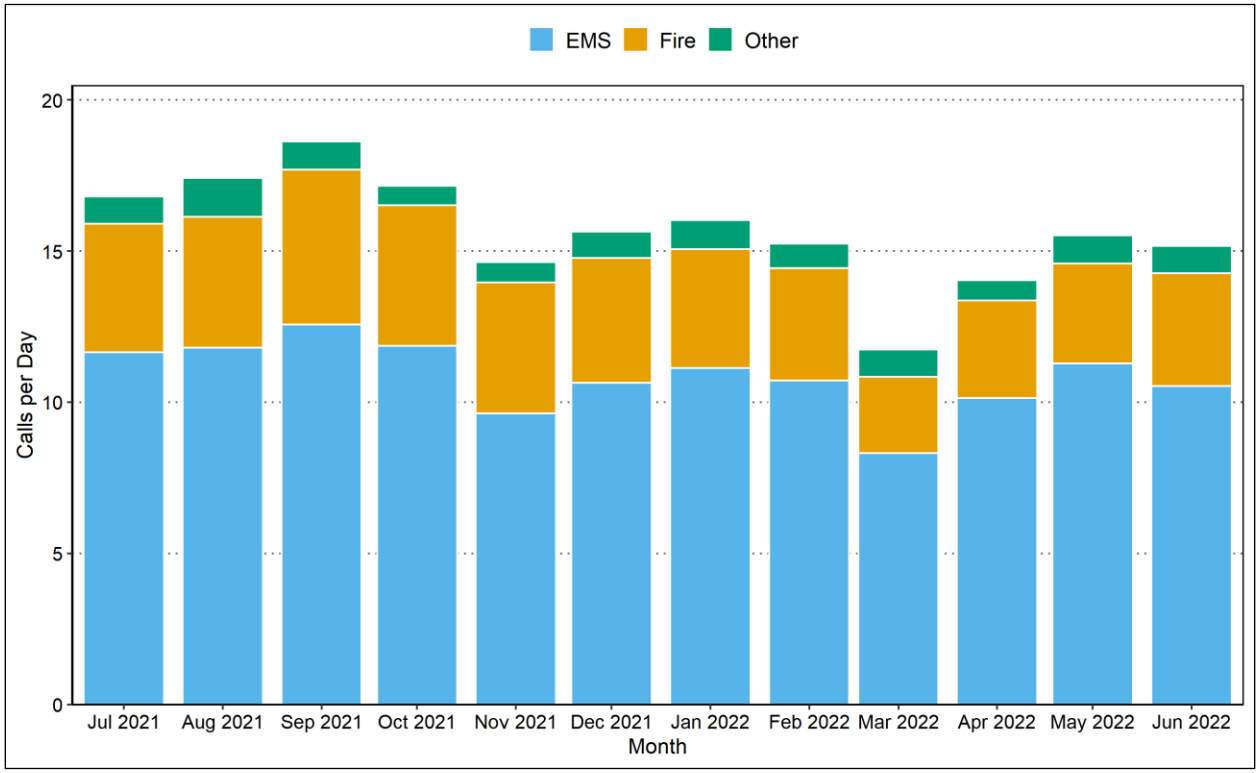
- A total of 2,778 EMS calls (70 percent) lasted less than one hour, 1,116 EMS calls (28 percent) lasted one to two hours, and 70 EMS calls (2 percent) lasted two or more hours.
  - On average, there were 3.2 EMS calls per day that lasted more than one hour.
  - A total of 207 cardiac and stroke calls (64 percent) lasted less than one hour, 106 cardiac and stroke calls (33 percent) lasted one to two hours, and 12 cardiac and stroke calls (4 percent) lasted two or more hours.
  - A total of 171 motor vehicle accidents (84 percent) lasted less than one hour, 26 motor vehicle accidents (13 percent) lasted one to two hours, and 7 motor vehicle accidents (3 percent) lasted two or more hours.
- A total of 1,370 fire calls (95 percent) lasted less than one hour, 57 fire calls (4 percent) lasted one to two hours, and 10 fire calls (1 percent) lasted two or more hours.
  - On average, there were 0.2 fire calls per day that lasted more than one hour.

- A total of 464 false alarm calls (99 percent) lasted less than one hour, and 3 false alarm calls (1 percent) lasted one to two hours.
- A total of 21 outside fire calls (88 percent) lasted less than one hour, 1 outside fire call (4 percent) lasted one to two hours, and 2 outside fire calls (8 percent) lasted two or more hours.
- A total of 36 structure fire calls (82 percent) lasted less than one hour, 5 structure fire calls (11 percent) lasted one to two hours, and 3 structure fire calls (7 percent) lasted two or more hours.

Calls by Month and Hour of Day

Figure 7-3 shows the monthly variation in the average daily number of calls handled by BFD between July 1, 2021, and June 30, 2022. Similarly, Figure 7-4 illustrates the average number of calls received each hour of the day.

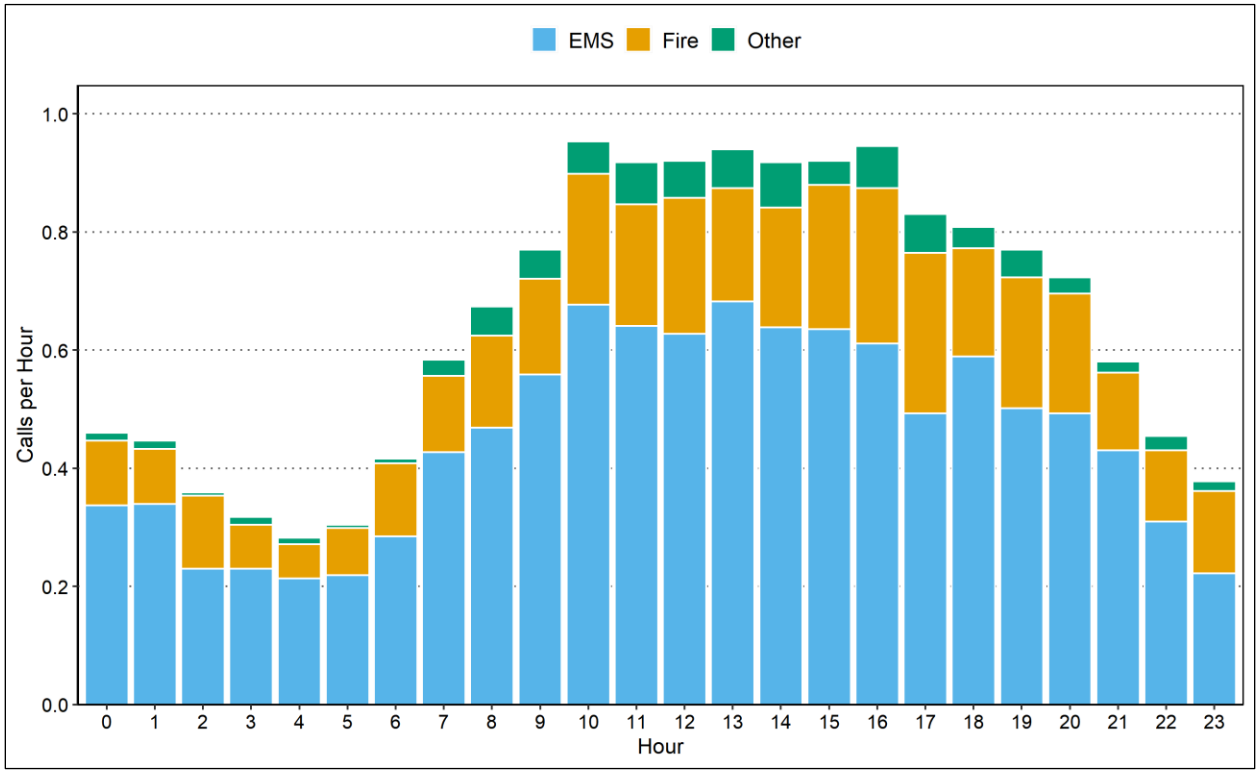
FIGURE 7-3: Calls per Day by Month



Observations:

- Average EMS calls per day ranged from 8.3 in March 2022 to 12.6 in September 2021.
- Average fire calls per day ranged from 2.5 in March 2022 to 5.1 in September 2021.
- Average other calls per day ranged from 0.6 in October 2021 to 1.3 in August 2021.
- Average calls per day overall ranged from 11.7 in March 2022 to 18.6 in September 2021.

FIGURE 7-4: Average Calls by Hour of Day



Observations:

- Average EMS calls per hour ranged from 0.2 between 4:00 a.m. and 5:00 a.m. to 0.7 between 1:00 p.m. and 2:00 p.m.
- Average fire calls per hour ranged from 0.1 between 4:00 a.m. and 5:00 a.m. to 0.3 between 5:00 p.m. and 6:00 p.m.
- Average other calls per hour ranged from less than 0.1 between 2:00 a.m. and 3:00 a.m. and between 5:00 a.m. and 6:00 a.m. to 0.1 between 2:00 p.m. and 3:00 p.m.
- Average calls per hour overall ranged from 0.3 between 4:00 a.m. and 5:00 a.m. to 0.9 between 10:00 a.m. and 11:00 a.m.

Units Arriving at Calls

In this section, we limit ourselves to calls where a unit from BFD arrives. For this reason, there are fewer calls in Table 7-3 than in Table 7-2. Table 7-3, along with Figures 7-5 and 7-6, detail the number of calls with one, two, and three or more BFD units arriving at a call, broken down by call type.

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

Call Type	Number of Units			Total Calls
	One	Two	Three or More	
Breathing difficulty	108	221	9	338
Cardiac and stroke	90	187	47	324
Fall and injury	544	133	9	686
Illness and other	1,045	227	28	1,300
MVA	57	100	44	201
Nonemergency transfer	603	42	2	647
Overdose and psychiatric	98	37	14	149
Seizure and unconsciousness	116	150	30	296
EMS Subtotal	**2,661**	**1,097**	**183**	**3,941**
False alarm	239	150	71	460
Good intent	211	27	4	242
Hazard	136	22	17	175
Outside fire	14	8	2	24
Public service	373	60	19	452
Structure fire	5	8	31	44
Technical rescue	13	6	4	23
Fire Subtotal	**991**	**281**	**148**	**1,420**
Canceled	24	6	1	31
Mutual aid	165	10	7	182
Total-Percentage	**68.9**	**25.0**	**6.1**	**100.0**
Total	**3,841**	**1,394**	**339**	**5,574**

FIGURE 7-5: Number of Arriving BFD Units for EMS Calls

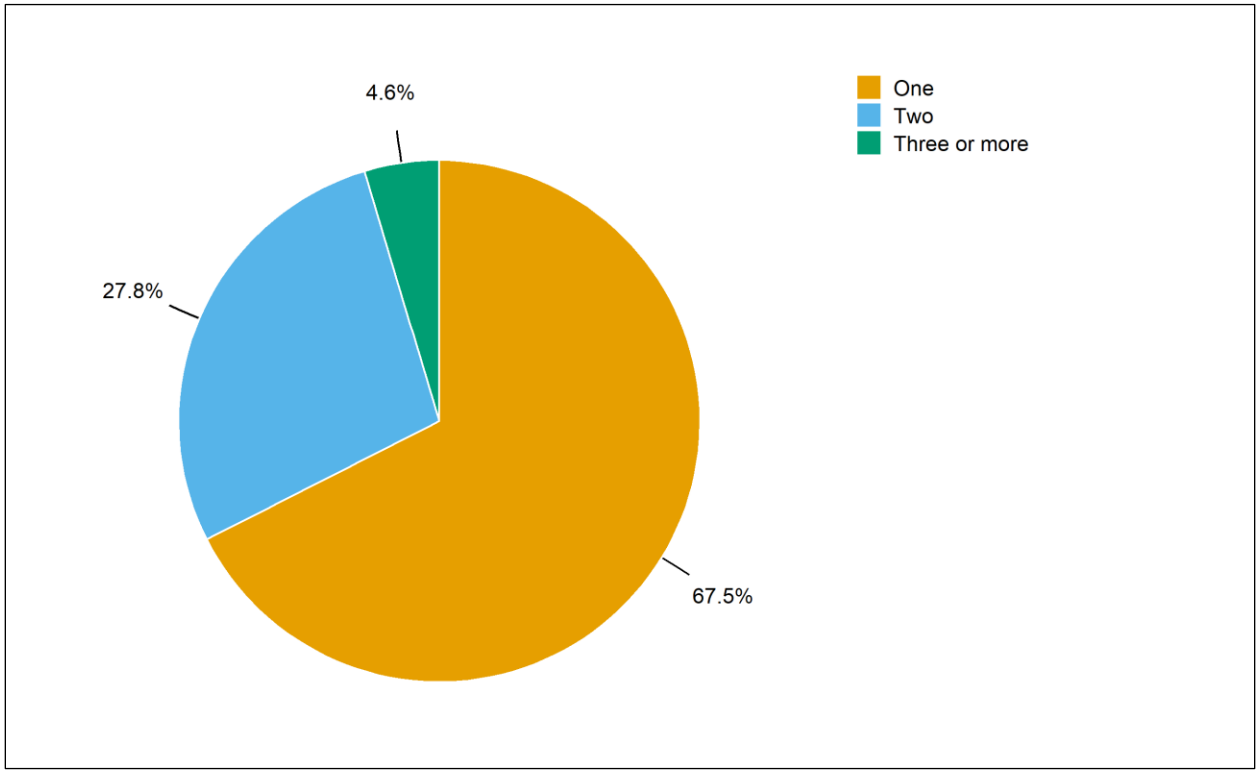
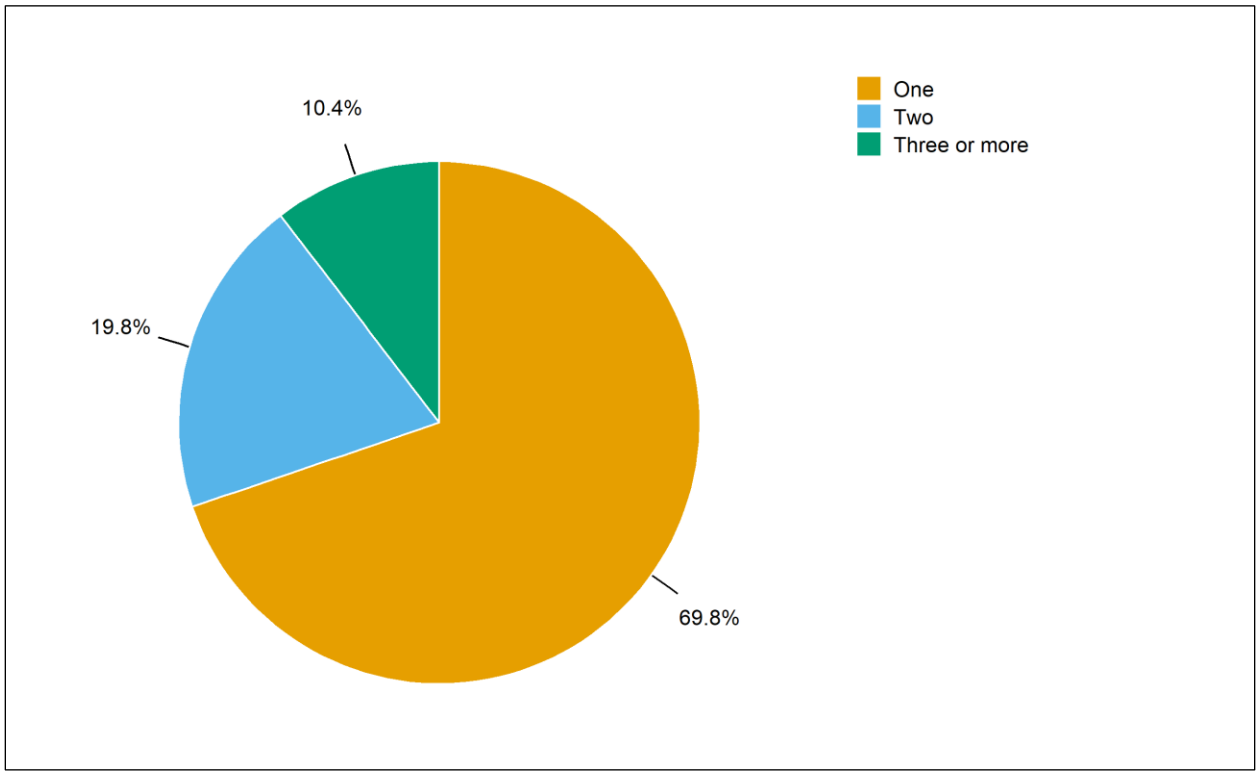


FIGURE 7-6: Number of Arriving BFD Units for Fire Calls



Observations:

Overall

- On average, 1.4 units arrived per call; for 69 percent of calls, only one BFD unit arrived.
- Overall, three or more units arrived at 6 percent of calls.

EMS

- On average, 1.4 units arrived per EMS call.
- For EMS calls, one unit arrived 68 percent of the time, two units arrived 28 percent of the time, and three or more units arrived 5 percent of the time.

Fire

- On average, 1.4 units arrived per fire call.
- For fire calls, one unit arrived 70 percent of the time, two units arrived 20 percent of the time, and three or more units arrived 10 percent of the time.
- For outside fire calls, three or more units arrived 8 percent of the time.
- For structure fire calls, three or more units arrived 70 percent of the time.

WORKLOAD: RUNS AND TOTAL TIME SPENT

The workload of BFD's units 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 (9,122) than calls (5,721) and the average deployed time per run varies from the average duration per call.

Runs and Deployed Time

Deployed time, also referred to as deployed hours, is the total deployment time of BFD units deployed on all runs. Table 7-4 shows the total deployed time, both overall and broken down by type of run, for all non-administrative BFD units. Table 7-5 and Figure 7-7 present the average deployed minutes by hour of day.

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

Run Type	Minutes per Run	Annual Hours	Percent of Hours	Minutes per Day	Annual Runs	Runs per Day
Breathing difficulty	30.8	333.5	7.1	54.8	649	1.8
Cardiac and stroke	33.7	394.1	8.4	64.8	701	1.9
Fall and injury	33.6	526.8	11.2	86.6	941	2.6
Illness and other	34.5	1,018.7	21.6	167.5	1,774	4.9
MVA	25.1	206.9	4.4	34.0	494	1.4
Nonemergency transfer	58.5	736.3	15.6	121.0	755	2.1
Overdose and psychiatric	30.0	125.5	2.7	20.6	251	0.7
Seizure and unconsciousness	29.8	297.7	6.3	48.9	599	1.6
EMS Subtotal	**35.4**	**3,639.4**	**77.3**	**598.3**	**6,164**	**16.9**
False alarm	15.1	250.6	5.3	41.2	994	2.7
Good intent	26.7	139.8	3.0	23.0	314	0.9
Hazard	27.2	138.2	2.9	22.7	305	0.8
Outside fire	28.8	21.6	0.5	3.6	45	0.1
Public service	16.7	178.9	3.8	29.4	644	1.8
Structure fire	38.8	108.7	2.3	17.9	168	0.5
Technical rescue	25.3	25.7	0.5	4.2	61	0.2
Fire Subtotal	**20.5**	**863.6**	**18.3**	**142.0**	**2,531**	**6.9**
Canceled	7.5	22.8	0.5	3.8	182	0.5
Mutual aid	45.1	184.3	3.9	30.3	245	0.7
Other Subtotal	**29.1**	**207.1**	**4.4**	**34.0**	**427**	**1.2**
Total	**31.0**	**4,710.2**	**100.0**	**774.3**	**9,122**	**25.0**

Observations:

Overall

- The total deployed time for the year was 4,710.2 hours. The daily average was 12.9 hours for all units combined.
- There were 9,122 runs, including 182 runs dispatched for canceled calls and 245 runs dispatched for mutual aid calls. The daily average was 25.0 runs.

EMS

- EMS runs accounted for 77 percent of the total workload.
- The average deployed time for EMS runs was 35.4 minutes. The deployed time for all EMS runs averaged 10.0 hours per day.

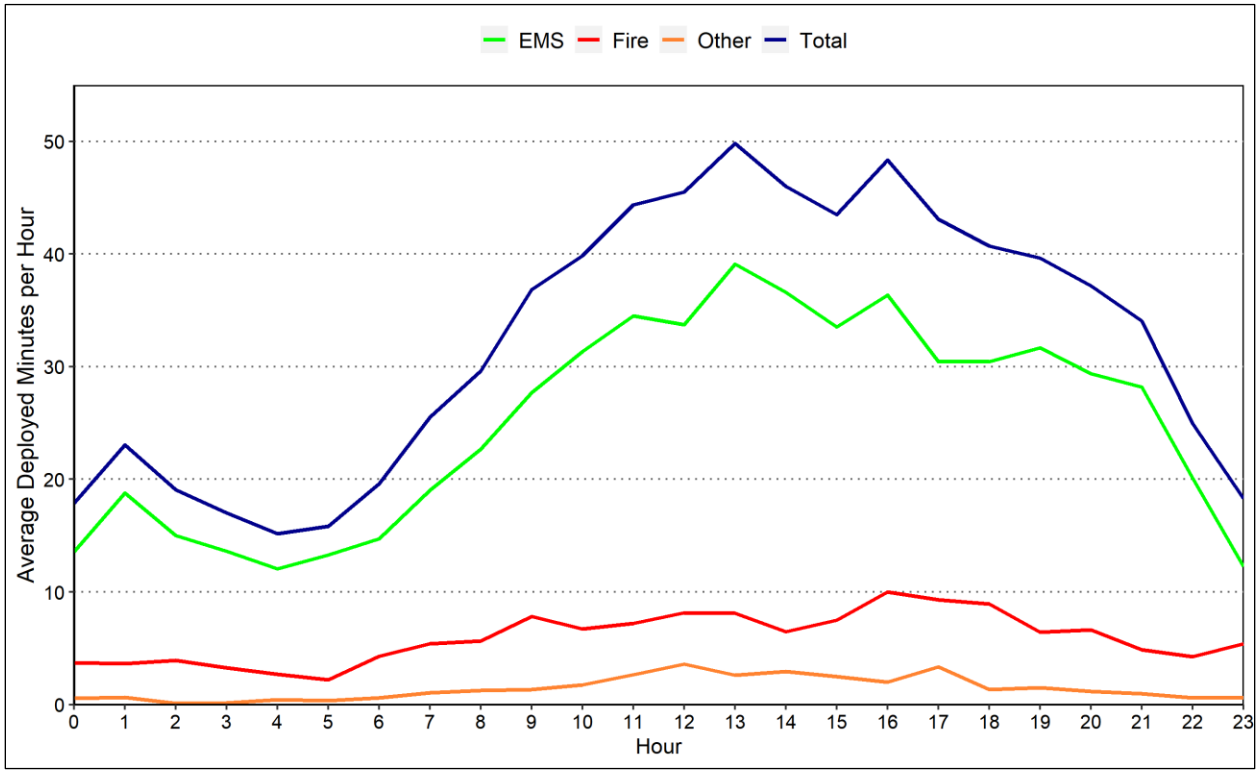
Fire

- Fire runs accounted for 18 percent of the total workload.
- The average deployed time for fire runs was 20.5 minutes. The deployed time for all fire runs averaged 2.4 hours per day.
- There were 213 runs for structure and outside fire calls combined, with a total workload of 130.3 hours. This accounted for 3 percent of the total workload.
- The average deployed time for outside fire runs was 28.8 minutes per run, and the average deployed time for structure fire runs was 38.8 minutes per run.

TABLE 7-5: Deployed Minutes by Hour of Day

Hour	EMS	Fire	Other	Total
0	13.6	3.7	0.6	17.9
1	18.8	3.6	0.7	23.1
2	15.0	3.9	0.1	19.1
3	13.6	3.3	0.2	17.0
4	12.0	2.7	0.4	15.2
5	13.3	2.2	0.4	15.8
6	14.7	4.3	0.6	19.6
7	19.0	5.4	1.1	25.5
8	22.7	5.6	1.3	29.6
9	27.7	7.8	1.3	36.8
10	31.3	6.7	1.8	39.8
11	34.5	7.2	2.6	44.4
12	33.7	8.2	3.6	45.5
13	39.1	8.1	2.6	49.8
14	36.5	6.5	3.0	45.9
15	33.5	7.4	2.5	43.4
16	36.3	9.8	2.0	48.2
17	30.4	9.1	3.3	42.9
18	30.5	8.8	1.3	40.5
19	31.7	6.4	1.5	39.6
20	29.4	6.6	1.2	37.2
21	28.2	4.9	1.0	34.0
22	20.1	4.2	0.6	24.9
23	12.3	5.4	0.6	18.3
Total	**598.0**	**142.0**	**34.1**	**774.1**

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



Observations:

- The hourly deployed time was highest during the day from 11:00 a.m. to 5:00 p.m., averaging between 44 minutes and 50 minutes.
- The average deployed time peaked between 1:00 p.m. and 2:00 p.m., averaging 50 minutes.
- The average deployed time was lowest between 4:00 a.m. and 5:00 a.m., averaging 15 minutes.

Workload by Unit

Table 7-6 provides a summary of each BFD unit's workload for the period between July 1, 2021, and June 30, 2022. Tables 7-7 and 7-8 provide a more detailed view of the workload, showing each unit's runs broken out by run type (Table 7-7) and its daily average deployed time by run type (Table 7-8).

TABLE 7-6: Workload by Unit

Unit	Unit Type	Minutes per Run	Total Hours	Total Percentage	Minutes per Day	Total Runs	Runs per Day
B20	Brush truck	14.7	283.0	6.0	46.5	1,157	3.2
E22	Volunteer Engine	19.4	34.5	0.7	5.7	107	0.3
E24	Engine	18.5	112.4	2.4	18.5	364	1.0
E26	Engine	19.2	344.4	7.3	56.6	1,079	3.0
EM10	Ambulance	42.9	1,241.2	26.4	204.0	1,737	4.8
EM12	Ambulance	38.9	778.6	16.5	128.0	1,202	3.3
EM14	Ambulance	39.1	1,529.2	32.5	251.4	2,348	6.4
H204	Hazmat decon	184.3	3.1	0.1	0.5	1	0.0
M202	Boat	18.3	2.1	0.0	0.4	7	0.0
RN18	Utility truck	57.1	10.5	0.2	1.7	11	0.0
S206	Rehab bus	87.0	7.2	0.2	1.2	5	0.0
SH34	Heavy rescue	24.9	69.6	1.5	11.4	168	0.5
SQ28	Engine	21.2	117.5	2.5	19.3	332	0.9
SV4	Service pickup	20.0	31.0	0.7	5.1	93	0.3
TR32	Aerial	17.1	144.9	3.1	23.8	510	1.4
U710	Utility truck	50.1	0.8	0.0	0.1	1	0.0
Total		**31.0**	**4,710.2**	**100.0**	**774.3**	**9,122**	**25.0**

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

Unit	EMS	Other	Rescue	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Total
B20	938	10	5	29	31	60	10	69	5	1,157
E22	31	5	0	35	3	16	3	5	9	107
E24	128	15	9	124	5	28	5	31	19	364
E26	460	43	8	317	29	80	11	97	34	1,079
EM10	1,428	104	6	36	67	7	2	80	7	1,737
EM12	942	48	3	37	74	5	1	88	4	1,202
EM14	1,882	114	2	53	91	19	2	159	26	2,348
H204	0	1	0	0	0	0	0	0	0	1
M202	0	2	3	2	0	0	0	0	0	7
RN18	5	1	2	0	0	1	0	2	0	11
S206	0	3	0	0	0	0	0	0	2	5
SH34	55	47	5	10	1	22	3	22	3	168
SQ28	211	13	0	45	4	20	4	15	20	332
SV4	21	6	3	19	2	18	0	23	1	93
TR32	63	15	15	287	7	29	4	53	37	510
U710	0	0	0	0	0	0	0	0	1	1
Total	**6,164**	**427**	**61**	**994**	**314**	**305**	**45**	**644**	**168**	**9,122**

TABLE 7-8: Deployed Minutes per Day by Run Type and Unit

Unit	EMS	Other	Rescue	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Total
B20	35.1	0.6	0.6	1.1	1.1	3.5	0.9	3.2	0.5	46.5
E22	1.6	0.4	0.0	1.3	0.2	0.9	0.2	0.3	0.9	5.7
E24	6.1	1.0	0.4	4.9	0.1	2.1	0.3	1.4	2.1	18.5
E26	19.8	2.7	0.5	16.3	1.1	7.0	0.9	4.9	3.4	56.6
EM10	180.9	10.5	0.7	1.3	5.9	0.6	0.1	3.3	0.7	204.0
EM12	112.0	4.1	0.2	1.3	5.9	0.4	0.4	3.2	0.6	128.0
EM14	223.0	7.9	0.1	1.6	8.2	1.4	0.2	6.6	2.4	251.4
H204	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
M202	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.4
RN18	0.8	0.0	0.3	0.0	0.0	0.2	0.0	0.4	0.0	1.7
S206	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.2
SH34	4.0	3.2	0.3	0.4	0.0	1.9	0.2	0.8	0.7	11.4
SQ28	11.8	1.2	0.0	2.1	0.2	1.5	0.2	0.8	1.7	19.3
SV4	0.8	0.8	0.2	0.8	0.1	1.0	0.0	1.2	0.3	5.1
TR32	2.5	0.5	0.9	10.0	0.2	2.3	0.2	3.4	3.8	23.8
U710	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total	**598.3**	**34.0**	**4.2**	**41.2**	**23.0**	**22.7**	**3.6**	**29.4**	**17.9**	**774.3**

Observations:

- Ambulances made the most runs (5,287, or an average of 14.5 runs per day) and had the highest total annual deployed time (3,549.0 hours, or an average of 9.7 hours per day).
  - EMS calls accounted for 80 percent of runs and 88 percent of total deployed time.
  - Fire calls accounted for 1 percent of runs and 1 percent of total deployed time.
  - EM14 made the most runs (2,348, or an average of 6.4 runs per day) and had the highest total annual deployed time (1,529.2 hours, or an average of 4.2 hours per day).
- Engines made the second most runs (1,882, or an average of 5.2 runs per day) and had the second-highest total annual deployed time (608.9 hours or an average of 1.7 hours per day).
  - EMS calls accounted for 44 percent of runs and 39 percent of total deployed time.
  - Fire calls accounted for 6 percent of runs and 10 percent of total deployed time.
  - E26 was the busiest engine with 1,079 runs (3.0 per day) and 344 deployed hours (57 minutes per day).

ANALYSIS OF BUSIEST HOURS

In this analysis, we included all 5,721 calls given in Table 7-2. For these calls, 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 between July 1, 2021, and June 30, 2022. Table 7-9 shows the number of hours in which there were zero to five or more calls during the hour. Table 7-10 shows the ten one-hour intervals which had the most calls during the studied period. Table 7-11 examines the number of times a call overlapped with another call in each station area.

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

Calls in an Hour	Frequency	Percentage
0	4,691	53.6
1	2,781	31.7
2	988	11.3
3	242	2.8
4	53	0.6
5	4	0.0
6+	1	0.0
Total	**8,760**	**100.0**

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

Hour	Number of Calls	Number of Runs	Total Deployed Hours
9/3/2021, 2:00 p.m. to 3:00 p.m.	6	9	3.8
9/18/2021, 5:00 p.m. to 6:00 p.m.	5	11	1.7
12/16/2021, 4:00 p.m. to 5:00 p.m.	5	9	4.5
7/16/2021, 11:00 a.m. to noon	5	6	1.5
1/17/2022, 9:00 a.m. to 10:00 a.m.	5	6	1.1
11/9/2021, 7:00 a.m. to 8:00 a.m.	4	9	3.9
7/30/2021, 4:00 p.m. to 5:00 p.m.	4	8	3.1
8/27/2021, 2:00 p.m. to 3:00 p.m.	4	8	2.2
7/8/2021, 10:00 a.m. to 11:00 a.m.	4	7	4.0
10/19/2021, 7:00 a.m. to 8:00 a.m.	4	7	3.2

Note: Total deployed hours are a measure of the total time spent responding to calls received in the hour. The deployed time from these calls may extend into the next hour or hours.

TABLE 7-11: Frequency of Overlapping Calls

Scenario	Number of Calls	Percent of Calls	Total Hours
No overlapped call	3,543	61.9	2,587.9
Overlapped with one call	1,832	32.0	621.5
Overlapped with two calls	316	5.5	57.5
Overlapped with three calls	30	0.5	4.5

Observations:

- During 6 hours (less than 0.1 percent of all hours), 5 or more calls occurred; in other words, the department responded to five or more calls in an hour roughly once every 61 days.
  - The highest number of calls to occur in an hour was 6, which happened once.
- The hour with the most calls was 2:00 p.m. to 3:00 p.m. on September 3, 2021.
  - The hour's 6 calls involved 9 individual dispatches resulting in 3.8 hours of deployed time.
  - These 6 calls included one breathing difficulty call, one cardiac and stroke call, one fall and injury call, one illness and other call, one non-emergency transfer call, and one seizure and unconsciousness 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 the 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 calls within the City of Biddeford to which at least one non-administrative unit arrived. In addition, calls with a total response time exceeding 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, for all 5,721 calls in the studied period, we excluded 190 aid-given calls, 130 canceled calls, and 636 calls where one or more segments of the first arriving unit's response time could not be calculated due to missing or faulty data. As a result, in this section, a total of 4,758 calls are included in the analysis.

Response Time by Type of Call

Table 7-12 breaks down the average and 90th percentile dispatch, turnout, travel, and total response times by call type. A 90th percentile means that 90 percent of calls had response times at or below that number. For example, Table 7-12 shows an overall 90th percentile response time of 11.8 minutes, which means that 90 percent of the time, a call had a response time of no more than 11.8 minutes. Figures 7-8 and 7-9 illustrate the same information. Table 7-12 compares the average and 90th percentile response times to calls that occurred in Biddeford, broken out by grand call type (i.e., EMS and fire).

TABLE 7-12: Response Time of First Arriving Unit, by Call Type (Minutes)

Call Type	Average Response Time, Min.				90th Percentile Response Time, Min.				Number of Calls
	Dispatch	Turnout	Travel	Total	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.9	0.9	2.8	5.6	2.8	1.8	4.6	7.8	330
Cardiac and stroke	2.1	0.9	2.8	5.7	3.4	1.7	5.5	8.5	297
Fall and injury	2.7	0.8	3.8	7.4	4.2	1.9	7.5	12.2	661
Illness and other	2.4	0.8	3.6	6.8	3.7	1.8	7.4	11.2	1,221
MVA	3.2	1.3	3.4	7.9	5.5	2.6	6.5	12.0	162
Nonemergency*	1.8	0.9	4.1	6.9	3.0	2.1	6.3	9.8	605
OD*	5.9	0.9	3.0	9.9	14.5	1.9	5.3	17.8	125
Seizure and UNC*	2.3	0.8	3.2	6.3	3.6	1.8	6.3	10.0	290
EMS Subtotal	**2.4**	**0.9**	**3.5**	**6.9**	**3.8**	**1.9**	**6.7**	**10.9**	**3,691**
False alarm	2.2	1.2	4.3	7.7	3.6	2.3	9.0	12.8	439
Good intent	6.3	1.2	3.7	11.3	15.4	2.5	7.0	18.7	76
Hazard	2.4	1.3	5.1	8.7	4.0	2.6	10.1	14.1	151
Outside fire	2.5	1.1	4.4	8.0	4.4	1.9	7.2	12.2	21
Public service	2.4	1.1	4.2	7.7	4.2	2.4	8.0	12.5	328
Structure fire	2.7	1.1	3.3	7.1	4.0	2.0	6.2	11.0	40
Technical rescue	2.6	2.0	5.5	10.1	6.1	3.9	11.1	16.4	19
Fire Subtotal	**2.6**	**1.2**	**4.3**	**8.1**	**4.5**	**2.4**	**8.9**	**13.9**	**1,074**
Total	**2.5**	**1.0**	**3.7**	**7.1**	**3.9**	**2.0**	**7.2**	**11.8**	**4,765**

Note: *Nonemergency= Nonemergency transfer; *OD= Overdose and psychiatric; *UNC=Unconsciousness.

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

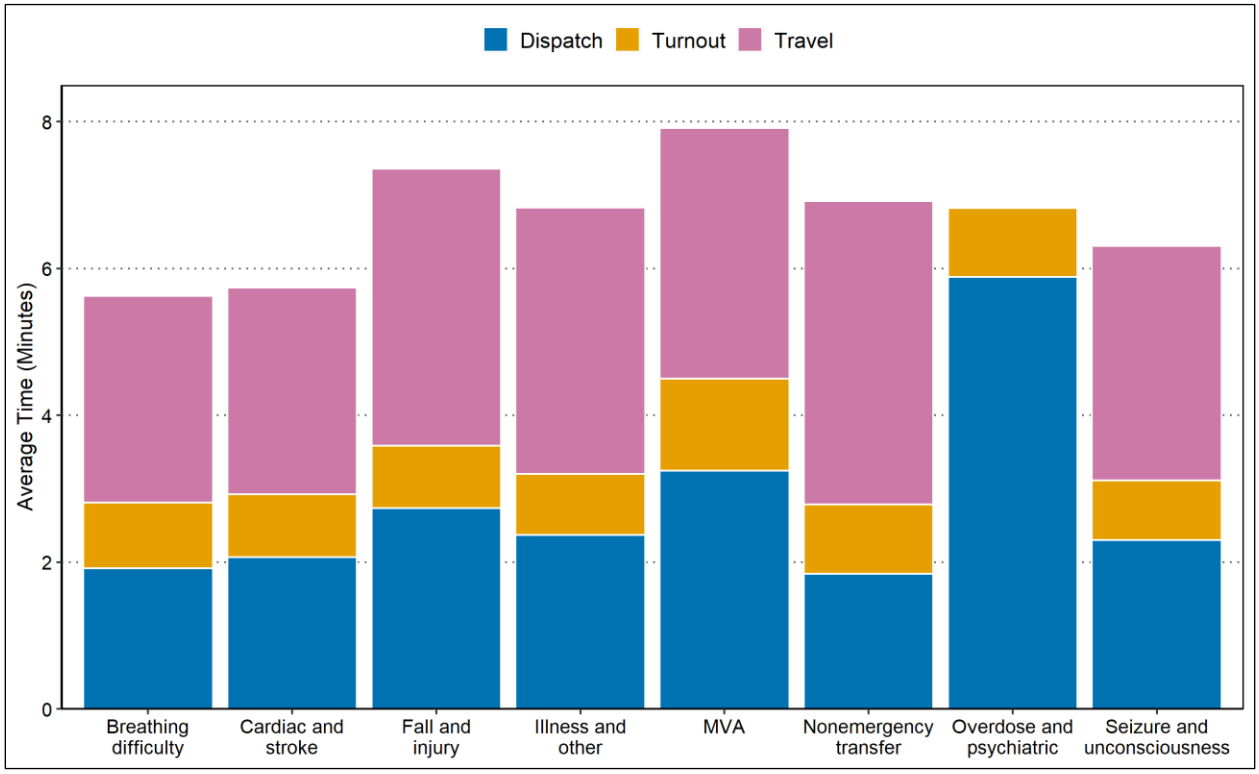
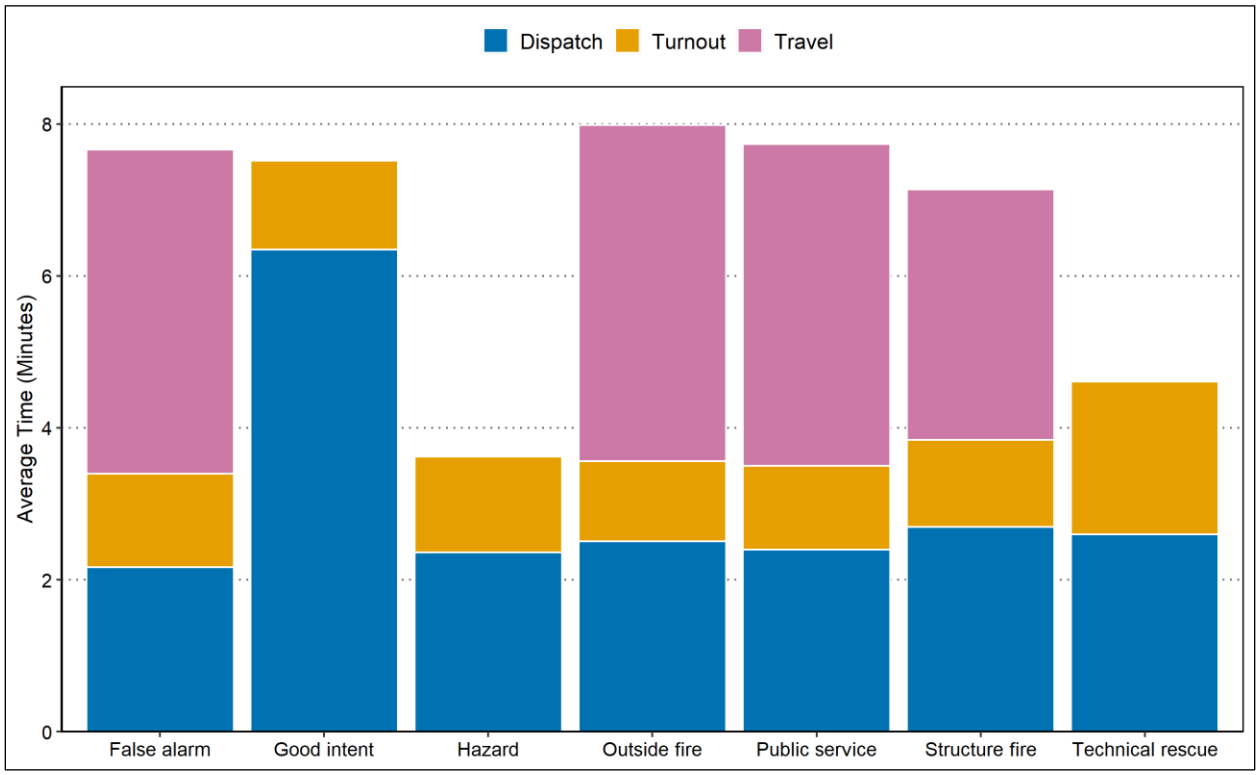


FIGURE 7-9: Average Response Time of First Arriving Unit, by Call Type – Fire



Observations:

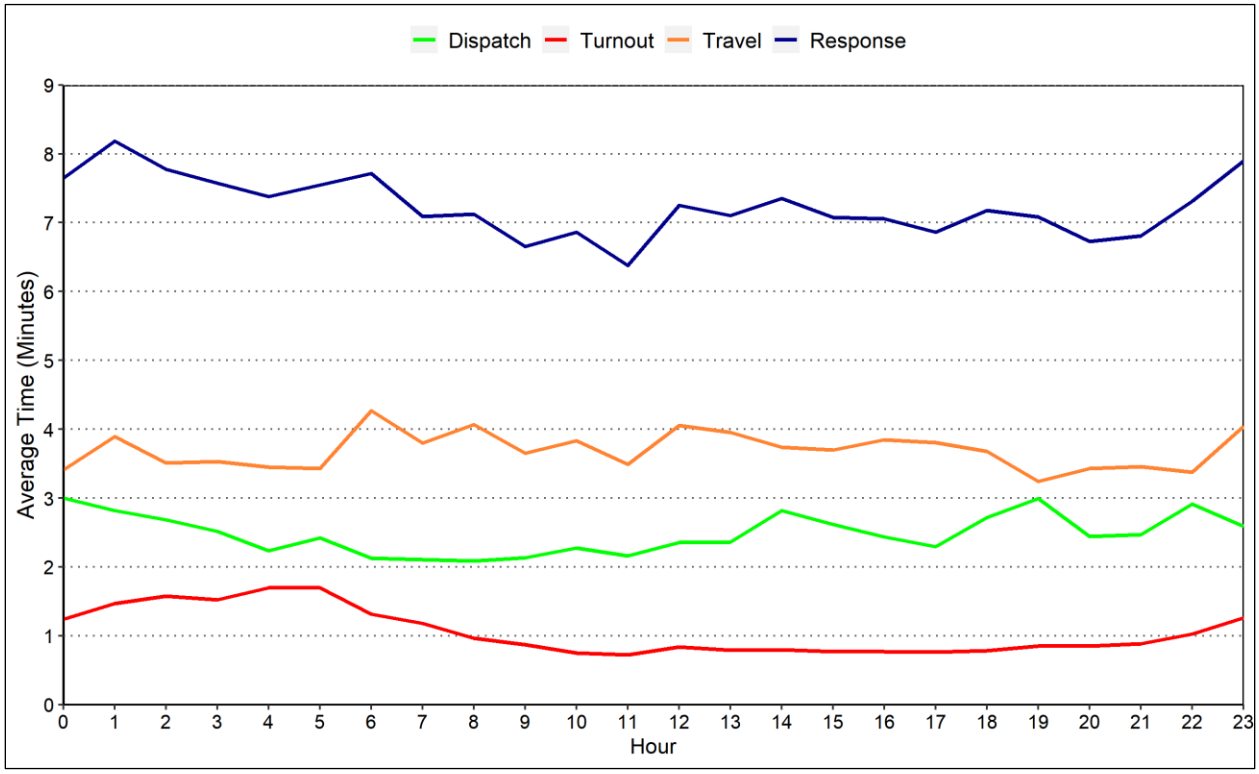
- The average dispatch time was 2.5 minutes.
- The average turnout time was 1.0 minutes.
- The average travel time was 3.7 minutes.
- The average total response time was 7.1 minutes.
- The average response time was 6.9 minutes for EMS calls and 8.1 minutes for fire calls.
- The average response time was 8.0 minutes for outside fires and 7.1 minutes for structure fires.
- The 90th percentile dispatch time was 3.9 minutes.
- The 90th percentile turnout time was 2.0 minutes.
- The 90th percentile travel time was 7.2 minutes.
- The 90th percentile total response time was 11.8 minutes.
- The 90th percentile response time was 10.9 minutes for EMS calls and 13.9 minutes for fire calls.
- The 90th percentile response time was 12.2 minutes for outside fires and 11.0 minutes for structure fires.

Table 7-13 shows the average response time by the time of day. The table also shows 90th percentile response times. Figure 7-10 shows the average response time by the time of day.

TABLE 7-13: Average and 90th Percentile Response Time of First Arriving Unit, by Hour of Day

Hour	Time in Minutes					Number of Calls
	Dispatch	Turnout	Travel	Response Time	90th Percentile Response Time	
0	3.0	1.2	3.4	7.6	11.9	148
1	2.8	1.5	3.9	8.2	13.5	138
2	2.7	1.6	3.5	7.8	12.0	115
3	2.5	1.5	3.5	7.6	12.3	101
4	2.2	1.7	3.4	7.4	13.3	89
5	2.4	1.7	3.4	7.5	11.1	101
6	2.1	1.3	4.3	7.7	12.4	137
7	2.1	1.2	3.8	7.1	11.2	182
8	2.1	1.0	4.1	7.1	11.6	201
9	2.1	0.9	3.7	6.7	10.3	238
10	2.3	0.7	3.8	6.9	11.0	285
11	2.2	0.7	3.5	6.4	10.1	277
12	2.4	0.8	4.1	7.3	11.9	264
13	2.4	0.8	4.0	7.1	11.2	286
14	2.8	0.8	3.7	7.4	11.8	280
15	2.6	0.8	3.7	7.1	11.7	281
16	2.4	0.8	3.8	7.1	11.1	273
17	2.3	0.8	3.8	6.9	11.9	238
18	2.7	0.8	3.7	7.2	12.3	256
19	3.0	0.8	3.2	7.1	12.2	238
20	2.4	0.8	3.4	6.7	11.3	223
21	2.5	0.9	3.5	6.8	11.2	175
22	2.9	1.0	3.4	7.3	11.3	134
23	2.6	1.3	4.0	7.9	13.8	105
Total	**2.5**	**1.0**	**3.7**	**7.1**	**11.8**	**4,765**

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



Observations:

- Average dispatch time was between 2.1 minutes (8:00 a.m. to 9:00 a.m.) and 3.0 minutes (midnight to 1:00 a.m.).
- Average turnout time was between 0.7 minutes (11:00 a.m. to noon) and 1.7 minutes (5:00 a.m. to 6:00 a.m.).
- Average travel time was between 3.2 minutes (7:00 p.m. to 8:00 p.m.) and 4.3 minutes (6:00 a.m. to 7:00 a.m.).
- Average response time was between 6.4 minutes (11:00 a.m. to noon) and 8.2 minutes (1:00 a.m. to 2:00 a.m.).
- The 90th percentile response time was between 10.1 minutes (11:00 a.m. to noon) and 13.8 minutes (11:00 p.m. to midnight).

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 Figure 7-11 and Table 7-14. Figure 7-11 shows response times for the first arriving 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 10.9 minutes means that 90 percent of EMS calls had a response time of 10.9 minutes or less. In Table 7-14, the cumulative percentage of 75.0, for example, means that 75.0 percent of EMS calls had a response time under 8 minutes.

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

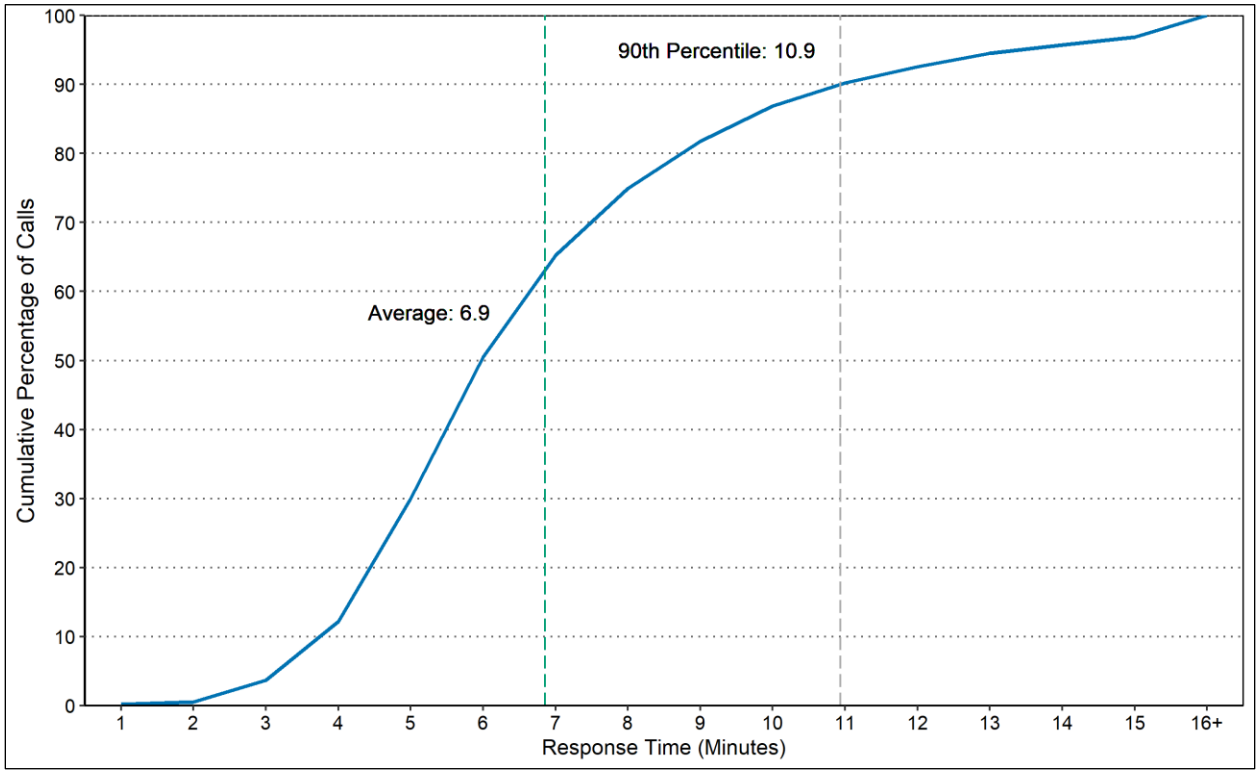


TABLE 7-14: Cumulative Distribution of Response Time – First Arriving Unit – EMS

Response Time (minute)	Frequency	Cumulative Percentage
1	6	0.2
2	12	0.5
3	118	3.7
4	316	12.2
5	656	30.0
6	760	50.6
7	543	65.3
8	356	75.0
9	252	81.8
10	186	86.8
11	124	90.2
12	89	92.6
13	71	94.5
14	47	95.8
15	40	96.9
16+	115	100.0

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

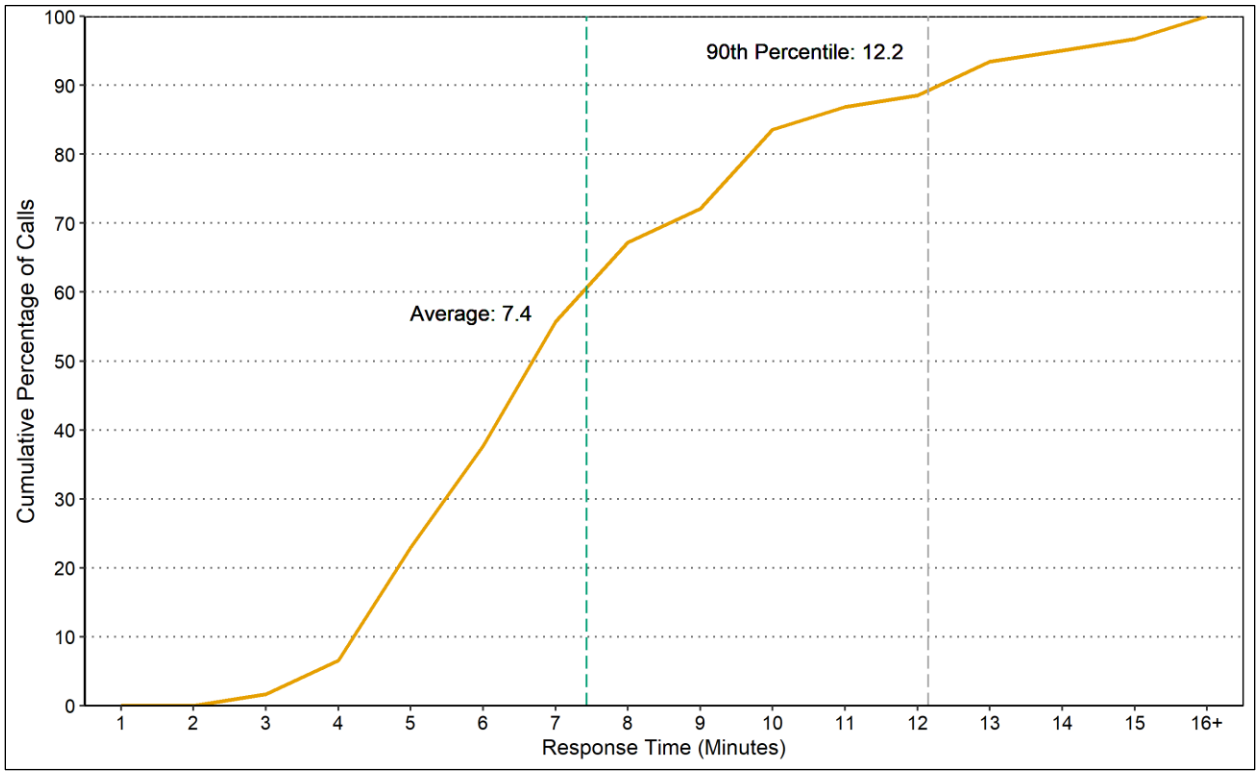


TABLE 7-15: Cumulative Distribution of Response Time, First Arriving Unit, Outside and Structure Fires

Response Time (minute)	Frequency	Cumulative Percentage
1	0	0.0
2	0	0.0
3	1	1.6
4	3	6.6
5	10	23.0
6	9	37.7
7	11	55.7
8	7	67.2
9	3	72.1
10	7	83.6
11	2	86.9
12	1	88.5
13	3	93.4
14	1	95.1
15	1	96.7
16+	2	100.0

Observations:

- For 75.0 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 67.2 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 the agency's unit activity that involved transporting patients, the variations by hour of day, and the average time for each stage of transport service. The geographical distribution of transport calls with patient transport is also examined.

We identified transport calls by requiring that at least one responding ambulance record both a "beginning to transport" time and an "arriving at the hospital" time.

Transport Calls by Type

Table 7-16 shows the number of calls by call type broken out by transport and non-transport calls.

TABLE 7-16: Calls by Type and Transport

Call Type	Number of Calls			Conversion Rate
	Non-Transport	Transport	Total	
Breathing difficulty	57	281	338	83.1
Cardiac and stroke	61	264	325	81.2
Fall and injury	257	431	688	62.6
Illness and other	324	985	1,309	75.2
MVA	139	65	204	31.9
Nonemergency transfer	46	605	651	92.9
Overdose and psychiatric	47	103	150	68.7
Seizure and unconsciousness	70	229	299	76.6
EMS Subtotal	**1,001**	**2,963**	**3,964**	**74.7**
Fire & Other Subtotal	**1,533**	**224**	**1,757**	**12.7**
Total	**2,534**	**3,187**	**5,721**	**55.7**

Observations:

- Overall, 75 percent of EMS calls involved transporting one or more patients.
- On average, there were approximately 9 calls per day that involved transporting one or more patients.

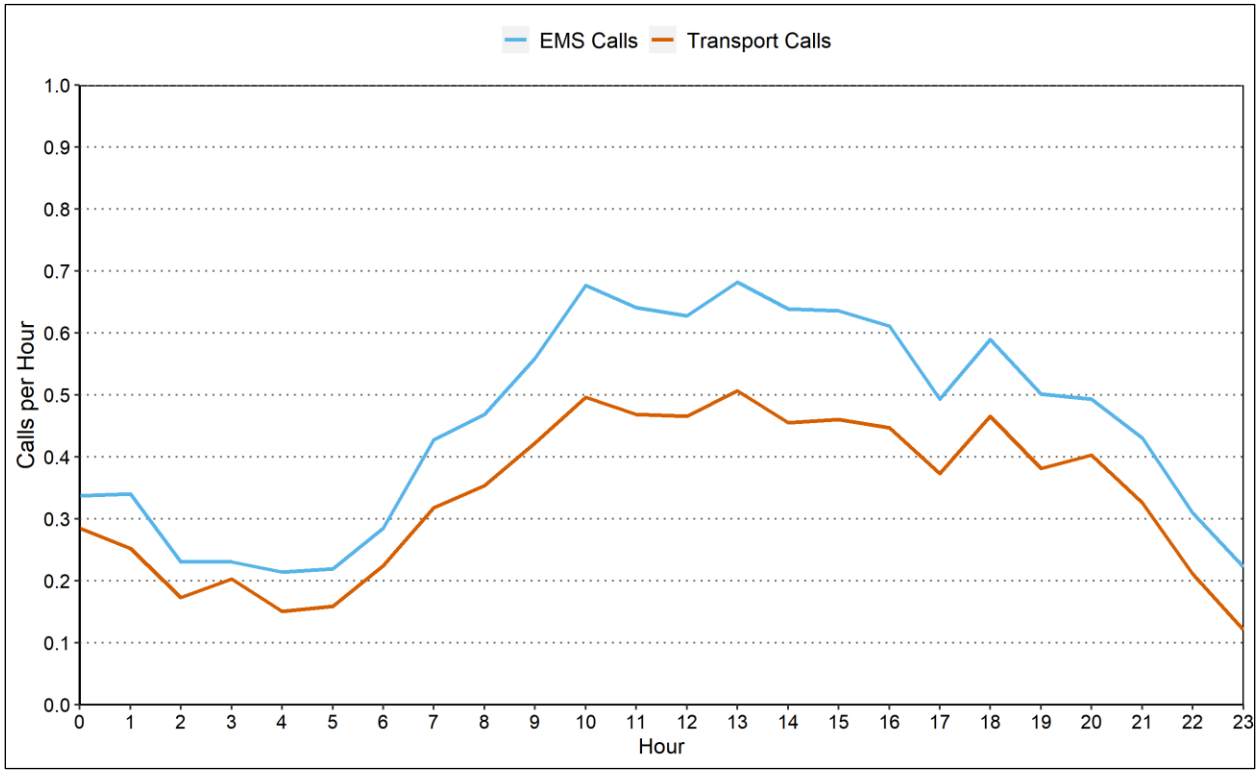
Average Transport Calls By Hour

Table 7-17 and Figure 7-13 show the average number of transport calls received each hour of the day for the year and the average number of transport calls.

TABLE 7-17: EMS Transport Calls by Hour

Hour	Total Calls		Calls per Day		Conversion Rate
	EMS	Transport	EMS	Transport	
0	123	104	0.3	0.3	84.6
1	124	92	0.3	0.3	74.2
2	84	63	0.2	0.2	75.0
3	84	74	0.2	0.2	88.1
4	78	55	0.2	0.2	70.5
5	80	58	0.2	0.2	72.5
6	104	82	0.3	0.2	78.8
7	156	116	0.4	0.3	74.4
8	171	129	0.5	0.4	75.4
9	204	154	0.6	0.4	75.5
10	247	181	0.7	0.5	73.3
11	234	171	0.6	0.5	73.1
12	229	170	0.6	0.5	74.2
13	249	185	0.7	0.5	74.3
14	233	166	0.6	0.5	71.2
15	232	168	0.6	0.5	72.4
16	223	163	0.6	0.4	73.1
17	180	136	0.5	0.4	75.6
18	215	170	0.6	0.5	79.1
19	183	139	0.5	0.4	76.0
20	180	147	0.5	0.4	81.7
21	157	119	0.4	0.3	75.8
22	113	77	0.3	0.2	68.1
23	81	44	0.2	0.1	54.3
Total	**3,964**	**2,963**	**10.9**	**8.1**	**74.7**

FIGURE 7-13: Average EMS Transport Calls per Hour



Observations:

- EMS calls per hour were highest during the day from 10:00 a.m. to 5:00 p.m., averaging between 0.61 and 0.68 calls per hour.
- EMS calls per hour peaked between 1:00 p.m. and 2:00 p.m., averaging 0.68 calls per hour.
- EMS calls per hour were lowest between 4:00 a.m. and 5:00 a.m., averaging 0.21 calls per hour.
- Transport calls per hour were highest during the day from 10:00 a.m. to 5:00 p.m., averaging between 0.45 and 0.51 calls per hour.
- Transport calls per hour peaked between 1:00 p.m. and 2:00 p.m., averaging 0.51 calls per hour.
- Transport calls per hour were lowest between 11:00 p.m. and midnight, averaging 0.12 calls per hour.
- The hourly transport conversion rate peaked between 3:00 a.m. and 4:00 a.m. at 88 percent.
- The hourly transport conversion rate was lowest between 11:00 p.m. and midnight at 54 percent.

Calls by Transport, Type, and Duration

The next table shows the average duration of transport calls by call type.

TABLE 7-18: Call Duration by Call Type and Transport

Call Type	Non-transport		Transport	
	Average Duration in Min.	Number of Calls	Average Duration in Min.	Number of Calls
Breathing difficulty	21.4	57	53.8	281
Cardiac and stroke	29.6	61	60.9	264
Fall and injury	22.7	257	56.5	431
Illness and other	22.2	324	51.1	985
MVA	23.9	139	68.3	65
Nonemergency transfer	21.0	46	70.4	605
Overdose and psychiatric	22.4	47	52.1	103
Seizure and unconsciousness	21.7	70	57.0	229
EMS Subtotal	**22.9**	**1,001**	**57.8**	**2,963**
Fire & Other Subtotal	**22.6**	**1,533**	**55.9**	**224**
Total	**22.7**	**2,534**	**57.7**	**3,187**

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 of a non-transport EMS call was 22.9 minutes.
- The average duration for an EMS call where one or more patients were transferred to a hospital was 57.8 minutes.

Transport Time Components

The next 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 from the unit arriving on-scene time through the time the unit departs the scene for the hospital. Travel to hospital time is the interval from the time the unit departs the scene to travel to the hospital through the time the unit arrives at the hospital. At-hospital time is the interval from the time the unit arrives at the hospital until the unit is cleared.

TABLE 7-19: Time Component Analysis for Ambulance Transport Runs by Call Type

Call Type	Average Time Spent per Run, Minutes				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	13.0	8.2	28.6	53.6	281
Cardiac and stroke	13.3	10.2	33.3	60.5	265
Fall and injury	13.6	9.1	28.9	56.3	432
Illness and other	12.5	8.5	25.3	50.9	987
MVA	12.2	10.8	35.2	63.2	73
Nonemergency transfer	15.5	14.1	35.3	69.9	604
Overdose and psychiatric	12.6	6.5	28.0	51.5	103
Seizure and unconsciousness	13.5	7.9	31.5	56.9	229
EMS Subtotal	**13.5**	**9.8**	**29.7**	**57.4**	**2,974**
Fire & Other Subtotal	**12.3**	**9.7**	**26.4**	**54.9**	**224**
Total	**13.4**	**9.8**	**29.5**	**57.2**	**3,198**

Note: Average unit deployed time per run is lower than the 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. 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 13.4 minutes.
- The average travel time from the scene of the call to the hospital was 9.8 minutes.
- The average deployed time at the hospital was 29.5 minutes, which accounts for approximately 51 percent of the average total deployed time for a transport call.
- The average total deployed time spent on transport calls was 57.2 minutes.

ATTACHMENT I: ADDITIONAL PERSONNEL

The next table illustrates the workload of BFD's administrative units between July 1, 2021, and June 30, 2022.

TABLE 7-20: Workload of Administrative Units

Unit	Type	Annual Hours	Annual Runs
C1	Chief	17.4	28
C2	Asst. Chief	26.7	43
C3	Deputy Chief	22.5	32
CDS	Code enforcement	0.7	1
FP	Fire police	3.7	1
SV3	Service 3	1.7	2

ATTACHMENT II: ACTIONS TAKEN

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

Action Taken	Number of Calls	
	Outside Fire	Structure Fire
Action taken, other	0	10
Assistance, other	4	0
Cancelled en route	1	7
Emergency medical services, other	0	1
Extinguishment by fire service personnel	14	18
Fire control or extinguishment, other	4	4
Hazardous condition, other	0	1
Incident command	9	28
Investigate	13	34
Notify other agencies.	1	0
Provide advanced life support (ALS)	1	1
Provide apparatus	0	2
Provide basic life support (BLS)	0	1
Provide equipment	0	1
Provide first aid & check for injuries	1	1
Provide workforce	0	3
Provide water	0	1
Refer to proper authority	1	0
Rescue, remove from harm	0	1
Restore fire alarm system	0	6
Salvage & overhaul	3	7
Search & rescue, other	0	1
Standby	1	6
Transport person	1	2
Ventilate	0	21
Total	**54**	**157**

Note: Totals are higher than the total number of structure and outside fire calls because some calls recorded multiple actions taken.

Observations:

- Out of 24 outside fires, 14 were extinguished by fire service personnel, which accounted for 58 percent of outside fires.
- Out of 44 structure fires, 18 were extinguished by fire service personnel, which accounted for 41 percent of structure fires.

ATTACHMENT III: FIRE LOSS

Table 7-22 presents the number of outside and structure fires, broken out by levels of fire loss. Table 7-23 shows the amount of property and content loss for outside and structure fires inside the City of Biddeford between July 1, 2021, and June 30, 2022.

TABLE 7-22: Total Fire Loss Above and Below $25,000

Call Type	No Loss	Under $25,000	$25,000 plus	Total
Outside fire	15	7	2	24
Structure fire	22	19	3	44
Total	**37**	**26**	**5**	**68**

TABLE 7-23: 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	$99,510	9	$5,000	4
Structure fire	$270,200	17	$71,100	13
Total	**$369,710**	**26**	**$76,100**	**17**

Note: The table includes only fire calls with a recorded loss greater than 0.

Observations:

- 15 outside fires and 22 structure fires had no recorded loss.
- 2 outside fires and 3 structure fires had $25,000 or more in losses.

Structure fires:

- The highest total loss for a structure fire was $250,000.
- The average total loss for all structure fires was $7,757.
- 13 structure fires recorded a content loss with a combined $71,100 in losses.
- The average total loss for structure fires with loss was $15,514.
- Out of 44 structure fires, 17 had recorded property loss, with a combined $270,200 in losses.

Outside fires:

- The highest total loss for an outside fire was $52,500.
- 4 outside fires recorded a content loss with a combined $5,000 in losses.
- Out of 24 outside fires, 9 had recorded property loss, with a combined $99,510 in losses.

ATTACHMENT IV: CALL TYPE IDENTIFICATION

When available, NFIRS data serves as our primary source for assigning call categories. In this analysis, NFIRS incident type codes were used to assign call types for 1,519 fire category calls, motor vehicle accidents, and canceled calls. For 3,001 EMS calls that either did not have corresponding NFIRS incident types or had generic medical descriptions (e.g., 321), we instead used the chief complaint descriptions from the computer-aided dispatch (CAD) data to assign a call category. Finally, the remaining 723 calls were categorized using the reason text description from the computer-aided dispatch (CAD) data to assign a call category.

Tables 7-24, 7-25, and 7-26 illustrate the method used to identify the category of calls based on NFIRS type code, CAD nature, and the reason description, respectively. Table 7-24 includes call types that were assigned based on the CAD nature. We identified 190 aid given calls, 288 non-emergency transfer calls, and 10 "Illness and other" calls (Table 7-2) independently and thus excluded them from these tables.

TABLE 7-24: Fire, MVA, and Canceled Call Types by NFIRS Incident Type Code and Description

Call Type	Incident Type Code	Incident Type Description	Count
Canceled	611	dispatched and canceled en route. incident cleared or canceled prior to arrival of the responding unit. if a unit arrives on the scene, fill out the applicable code.	130
False Alarm	700	false alarm or false call, other.	460
	730	system or detector malfunction, other.	1
	740	unintentional transmission of alarm, other.	3
Good Intent	631	authorized controlled burning. includes fires that are agricultural in nature and managed by the property owner. excludes unauthorized controlled burning (561) and prescribed fires (632).	7
	651	smoke scare, odor of smoke, not steam (652). excludes gas scares or odors of gas (671).	22
Hazard	400	hazardous condition (no fire), other.	7
	411	gasoline or other flammable liquid spill (flash point below 100 degrees f at standard temperature and pressure (class i)).	24
	412	gas leak (natural gas or lpg). excludes gas odors with no source found (671).	13
	422	chemical spill or leak. includes unstable, reactive, explosive material.	3
	424	carbon monoxide incident. excludes incidents with nothing found (736 or 746).	41
	441	heat from short circuit (wiring), defective or worn insulation.	18
	444	power line down. excludes people trapped by downed power lines (372).	69
	480	attempted burning, illegal action, other.	2

Call Type	Incident Type Code	Incident Type Description	Count
MVA	322	motor vehicle accident with injuries. includes collision with other vehicle, fixed objects, or loss of control resulting in leaving the roadway.	168
	323	motor vehicle/pedestrian accident (mv ped). includes any motor vehicle accident involving a pedestrian injury.	3
Outside Fire	100	fire, other	1
	131	passenger vehicle fire. includes any motorized passenger vehicle, other than a motor home (136) (e.g., pickup trucks, sport utility vehicles, buses).	13
	140	natural vegetation fire, other.	3
	141	forest, woods, or wildland fire. includes fires involving vegetative fuels, other than prescribed fire (632), that occur in an area in which development is essentially nonexistent, except for roads, railroads, power lines, and the like. also includes forests managed for lumber production and fires involving elevated fuels such as tree branches and crowns. excludes areas in cultivation for agricultural purposes such as tree farms or crops (17x series).	3
	150	outside rubbish fire, other.	3
	154	dumpster or other outside trash receptacle fire. includes waste material from manufacturing or other production processes. excludes materials that are not rubbish or have salvage value (161 or 162).	1
Public Service	511	lock-out. includes efforts to remove keys from locked vehicles. excludes lock-ins (331).	22
	522	water or steam leak. includes open hydrant. excludes overpressure ruptures (211).	24
	531	smoke or odor removal. excludes the removal of any hazardous materials.	44
	550	public service assistance, other.	312
	551	assist police or another governmental agency. includes forcible entry and the provision of lighting.	31
	561	unauthorized burning. includes fires that are under control and not endangering property.	23
Structure Fire	111	building fire. excludes confined fires (113–118).	22
	113	cooking fire involving the contents of a cooking vessel without fire extension beyond the vessel.	18
	114	chimney or flue fire originating in and confined to a chimney or flue. excludes fires that extend beyond the chimney (111 or 112).	1
	116	fuel burner/boiler, delayed ignition, or malfunction, where flames cause no damage outside the fire box.	3
Technical Rescue	340	search for a lost person, other.	1
	353	removal of victim(s) from stalled elevator.	13

Call Type	Incident Type Code	Incident Type Description	Count
	354	trench/below-grade rescue.	2
	361	swimming/recreational water areas rescue. includes pools and ponds. excludes ice rescue (362).	8
Total			**1,519**

TABLE 7-25: Call Types by CAD Chief Complaint Description

Call Type	Chief Complaint Description	Count
Breathing Difficulty	breathing problems	327
	choking	11
Cardiac and Stroke	cardiac or respiratory arrest / death	50
	chest pain / chest discomfort (non-traumatic)	157
	heart problems / a.i.c.d.	26
	heart rate number known (from device)	4
	heart rate reported (per device)	2
	pacemaker	1
	stroke (cva) / transient ischemic attack (tia)	79
	suspected cardiac arrest (3rd/4th party)	1
	unwitnessed cardiac arrest (time unknown)	2
	witnessed or just occurred cardiac arrest	3
Fall and Injury	animal bite	1
	assault	2
	burns (scalds) / explosion (blast)	2
	eye problems / injuries	2
	falls	486
	gunshot wound	1
	head visible (crowning)	1
	hemorrhage (bleeding) / lacerations	72
	non-traumatic (medical) bleeding	14
	sexual assault	1
	stab / gunshot / penetrating trauma	3
	stabbing	1
	traumatic (injury) bleeding	2
	traumatic injuries (specific)	37
False Alarm	alarm – private caller	2
Good Intent	language not understood (no interpreter in center)	1
	lift assist	27
	service call	19
Illness and Other	abdominal pain / problems	102
	allergic reaction	14
	allergies (reactions) / envenomations (stings, bit	3
	back pain (non-traumatic or non-recent trauma)	68
	diabetic problems	62
	expected death	2
	headache	28
	labor (contractions) in progress	2
	medical alarm (alert) notification	48

Call Type	Chief Complaint Description	Count
	miscarriage	2
	obvious death (suspected)	6
	pregnancy / childbirth / miscarriage	12
	pregnancy problem (no contractions or birth)	4
	sick person (specific diagnosis)	545
	unknown problem (person down)	20
MVA	motorcycle (single)/motorcycle vs. vehicle	1
	motorcycle (solitary)	1
	single vehicle collision	1
	traffic collision / transportation incident	1
	vehicle vs. pedestrian/bicycle	4
Nonemergency Transfer	interfacility evaluation	131
	interfacility evaluation / transfer	193
	interfacility transfer	39
Overdose and Psychiatric	overdose / poisoning (ingestion)	55
	psychiatric / abnormal behavior / suicide attempt	18
	suicide threatened	3
Seizure and Unconsciousness	absence seizure (petit mal/staring spell)	1
	atypical (abnormal) seizure mentioned	1
	convulsions / seizures	46
	focal seizure (localized twitching and conscious)	2
	generalized seizure (not focal or impending)	69
	impending seizure (aura/premonition)	5
	unconscious / fainting (near)	175
Total		**3,001**

TABLE 7-26: Call Types by Reason Text

Call Type	Reason Text	Count
Fall and Injury	assault	21
	domestic complaints	27
	domestic violence assault	2
	fights	11
	rape	1
	sex offenses	1
False Alarm	911 misuse	1
Good Intent	animal complaint	1
	assist citizen	2
	check welfare	94
	check welfare / disturbance	1
	disturbance / noise	17
	lift assist	4
	out for follow up	1
	public assist	2
	service call	12
	service call- life assist	1
	suspicion	22
	trespassing	12
Illness and Other	bolo	3
	burglary	2
	crime threat / terrorizing	2
	criminal mischief	1
	death attended & unattended	6
	evaluation	1
	juvenile offenses	5
	medical	324
	medical w/ assist	2
	medical w/ engine	20
	missing person	3
	motor vehicle theft	1
	oper after suspension	1
	paperwork	1
	prisoner process	1
	pro-active response team	1
	robbery	1
	shoplifting	2
	traffic offenses	6
	viol of bail conditions	6
	warrant arrest	2

Call Type	Reason Text	Count
MVA	cruiser accident	1
	vehicle crash - fire / ems	7
	vehicle crash - police only	17
Overdose and Psychiatric	attempted/threatened suicide	30
	drinking in public	1
	drug	4
	drunkenness	12
	mental illness cases	24
	operating under influence	3
Total		**723**

- END -