Fire and Emergency Medical Services Operations and Data Analysis Miami Beach, Florida

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Center for Public Safety Management

CPSM
Center for Public Safety Management, LLC

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

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General Information

About ICMA

The International City/County Management Association (ICMA) is a 100-year-old nonprofit professional association of local government administrators and managers, with approximately 9,000 members located in 28 countries.

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

ICMA advances the knowledge of local government best practices across a wide range of platforms, including publications, research, training, and technical assistance. Our work includes both domestic and international activities in partnership with local, state, and federal governments, as well as private foundations. For example, we are involved in a major library research project funded by the Bill & Melinda Gates Foundation and are providing community policing training in El Salvador, Mexico, and Panama with funding from the United States Agency for International Development. We have personnel in Afghanistan helping to build wastewater treatment plants and have teams working with the United States Southern Command (SOUTHCOM) in Central America on conducting assessments and developing training programs for disaster preparedness.

Center for Public Safety Management

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

The Center for Public Safety Management, LLC (CPSM) is the exclusive provider of public safety technical assistance for ICMA and continues to provide training and research for the association's members and represents ICMA in its transactions with the federal government and other public safety professional associations.

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 as well as industry best practices. We have conducted over 175 such studies in 35 states and 135 communities ranging in size from 8,000 population Boone, IA to 800,000 population Indianapolis, IN.

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

Methodology

The ICMA Center for Public Safety Management team follows a standardized approach to conducting analyses of fire, police, and other departments involved in providing services to the public. We have developed this approach by combining the experience sets of dozens of subject matter experts in the areas of police, fire, and EMS. Our collective team has several hundred years of experience leading and managing public safety agencies, and conducting research in these areas for cities in and beyond the United States.

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

The CPSM team begins most projects by extracting calls for service and raw data from a public safety agency's computer-aided dispatch system. The data are sorted and analyzed for comparison with nationally developed performance indicators. These performance indicators (e.g., response times, workload by time, multiple-unit dispatching) are valuable measures of agency performance regardless of departmental size. The findings are shown in tables and graphs organized in a logical format. Despite the size and complexity of the documents, a consistent approach to structuring the findings allows for simple, clean reporting. The categories for the performance indicators and the overall structure of the data and documents follow a standard format, but the data and recommendations are unique to the organization under scrutiny.

The team conducts an operational review in conjunction with the data analysis. The performance indicators serve as the basis for the operational review. The review process follows a standardized approach comparable to that of national accreditation agencies. Before the arrival of an on-site team, agencies are asked to provide the team with key operational documents (policies and procedures, asset lists, etc.). The team visits each City to interview fire agency management and supervisory personnel, rank-and-file officers, and local government staff.

The information collected during the site visits and through data analysis results in a set of observations and recommendations that highlight the strengths, weaknesses, and opportunities of—and threats to—the organizations and operations under review. To generate recommendations, the team reviews operational documents; interviews key stakeholders; observes physical facilities; and reviews relevant literature, statutes and regulations, industry standards, and other information and/or materials specifically included in a project's scope of work.

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

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

ICMA/CPSM Project Contributors

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City of Miami Beach

The city of Miami Beach, Florida is located in Miami-Dade County, and is situated on a barrier island surrounded by the Atlantic Ocean and Biscayne Bay, with access to the mainland via four causeways.[1] The city is approximately 13 miles east of Miami International Airport (MIA). Miami Beach has a land area of approximately 7.63 sq. miles;[2] 10 sq. miles of water; and 63.26 miles of water frontage.[3] The Bureau of Economic and Business Research estimated the population to be 90,848 as of April 1, 2013.[4]

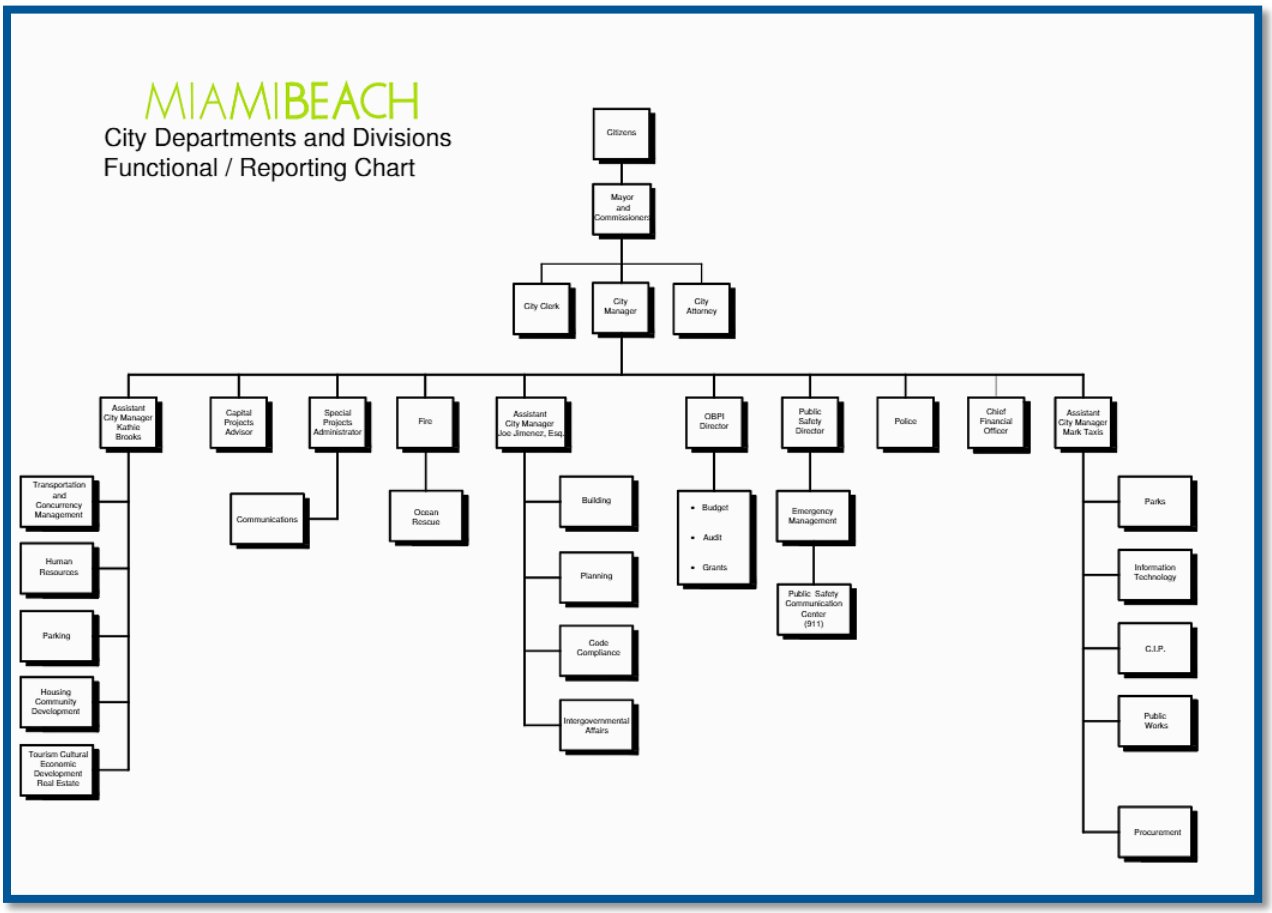
The city provides a full range of services, including public protection, recreation, cultural services, sanitation, water, sewer, storm water, community services, and street and road construction and maintenance.[5] Miami Beach's largest economic industry is tourism, with substantial spending attributed to hotel, food, beverage, and retail.[6] Diversification is essential for economic health and as such, the city of Miami Beach has become a "leading multi-industry business center with entertainment, health care, culture, and professional services industries."[7]

Miami Beach operates under a commission-manager form of government. Under this form of government the powers of the elected and appointed officials are segregated for the purpose of providing a fair balance between the political leaders who set the policy for the city, and the apolitical managerial leadership of an appointed official, educated in public management and who carries out this policy and manages the city's day-to-day operations. In this form of government, the

[1] Miami Beach Fire Rescue Department, Standards of Response Coverage, March 2014.
[2] http://quickfacts.census.gov/qfd/states/12/1245025.html
[3] Miami Beach Fire Rescue Department, Standards of Response Coverage, March 2014.
[4] http://www.bebr.ufl.edu/content/florida-estimates-population-2013-table-1-free
[5] City of Miami Beach, Comprehensive Annual Financial Report, FY Ended 2013.
[6] Ibid.
[7] Ibid.

effectiveness of the city's executive team should never be undermined as a result of direct staff communication with the political leadership. Thereby the balance between the political leadership and the managerial leadership is maintained. Article II, Section 2.01 of the City Charter sets forth the composition of the commission. There are six commissioners and a mayor who are all elected at large. Section 2.02 of the City Charter provides that the commissioners shall serve four-year staggered terms and the mayor shall serve a two-year term.[8] Figure 1 illustrates the city's chart of the organization.

Figure 1: City of Miami Beach Organization Chart



Article IV, Section 4.02 of the City Charter provides for a city manager who shall be appointed by the city commission.[9] He/she is the chief administrative officer of the city, overseeing the daily operations of the organization. The city manager effectuates the policy, plans, and/or programs established by the commission.

[8] City Charter, City of Miami Beach, Florida.
[9] City Charter, City of Miami Beach, Florida.

Introduction

The Center for Public Safety Management (CPSM), LLC, was retained by the city of Miami Beach to complete a comprehensive analysis of the city's fire department. This analysis is designed to provide the city with a thorough and unbiased review of services provided by the Miami Beach Fire Department (MBFD). The report further provides a benchmark of the MBFD's existing service delivery performance as analyzed in the accompanying comprehensive data analysis, which was performed utilizing information provided by the MBFD. *This data analysis in itself provides significant value to the city as it now has a workload analysis from which to move forward with future planning efforts.* Also included in this report is the use of geographic information systems (GIS) data mapping to support the operational discussion and recommendations.

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

Project staff conducted a site visit on November 12 and 13, 2014, for the purpose of observing fire department and agency-connected supportive operations, interviewing key department staff, and reviewing preliminary data and operations. Telephone conference calls were conducted as were e-mail exchanges between CPSM project management staff, the city, and the MBFD so that CPSM staff could affirm the project scope and elicit further discussion regarding this operational analysis.

Recommendations and considerations for continuous improvement of services are presented in the conclusion of this report. The recommendations are based on best practices derived from the National Fire Protection Association, Center for Public Safety Excellence, CPSM, U.S. Fire Administration, International Association of Emergency Managers, and FEMA, to name a few, as well as the knowledge of CPSM reviewers. Supporting information for these recommendations is detailed within the report.

Miami Beach Fire Department

Organization

The MBFD service delivery model includes three very distinct services: fire services, emergency medical services (EMS) transport, and ocean rescue services. Although combined in one agency, these three services deploy resources under separate but combined service delivery systems that encompass three very different employee skill and interest sets that are not always combined in fire departments.[10]

MBFD fire and EMS personnel are trained to the paramedic certification level and provide advanced life support (ALS), doing so from both fire and EMS service delivery response assets. In addition to fire and emergency medical services, the MBFD also provides a full-service fire prevention/life safety inspection program; response to technical rescue incidents such as auto extrication, high angle rescue, and structural collapse; support services such as fleet maintenance, department logistical support and supply-chain management, and training and education. The 2014/2015 fiscal year budget for the department is just over $63 million in expenditures and includes 306 full-time and 47 part-time budgeted employees. Fire prevention office revenues are estimated at just over $4 million and are reflected in the fire department budget. EMS transport revenues are estimated at more than $1 million for the current fiscal year.

The MBFD has a traditional organizational structure as illustrated in Figure 2. A fire chief directs the overall operations of the department and is directly assisted by an assistant chief of administration and a division chief of operations. The assistant chief serves as the second-in-command and manages the lion's share of divisions in the agency other than that of the fire chief. Both the assistant chief and division chief of operations have division chiefs as direct reports. Each division chief has either programmatic or programmatic and operational staff to carry out the mission of the department. The division chief of operations commands the largest division in the department, as this division provides operational response to fire and EMS calls for service from the department's four stations. Figure 3 illustrates the operations division organizational chart.

[10] Ocean rescue services are not included in this analysis.

Figure 2: MBFD Table of Organization

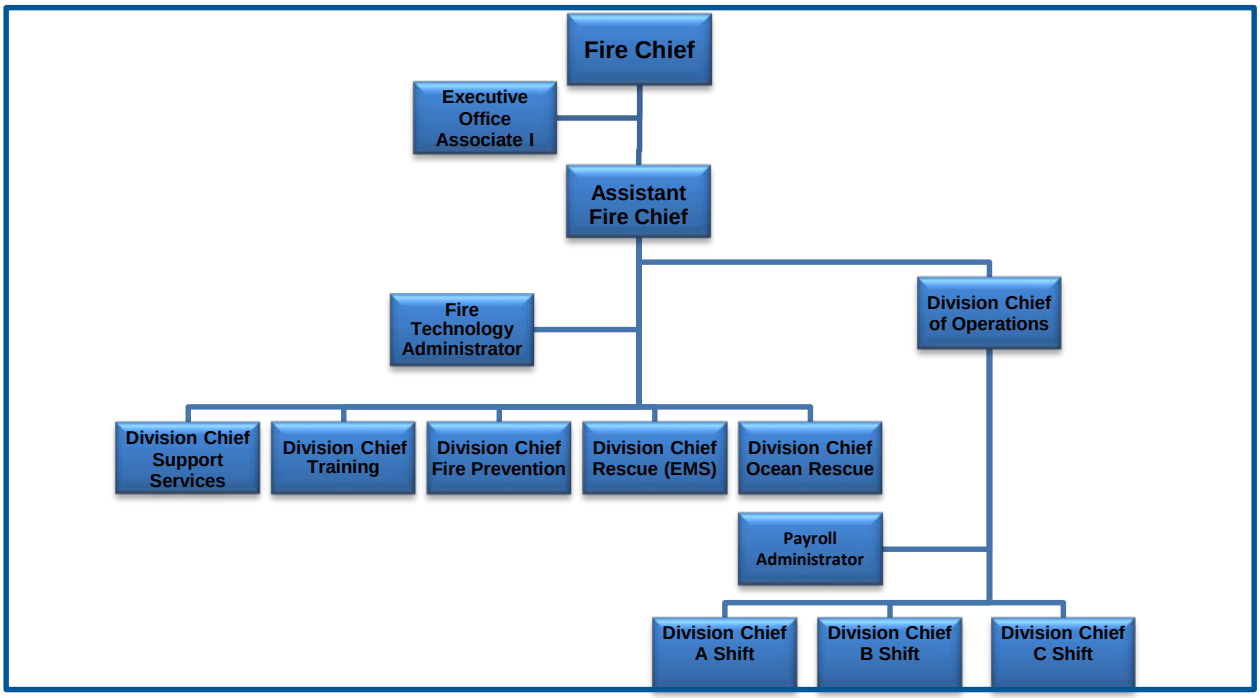
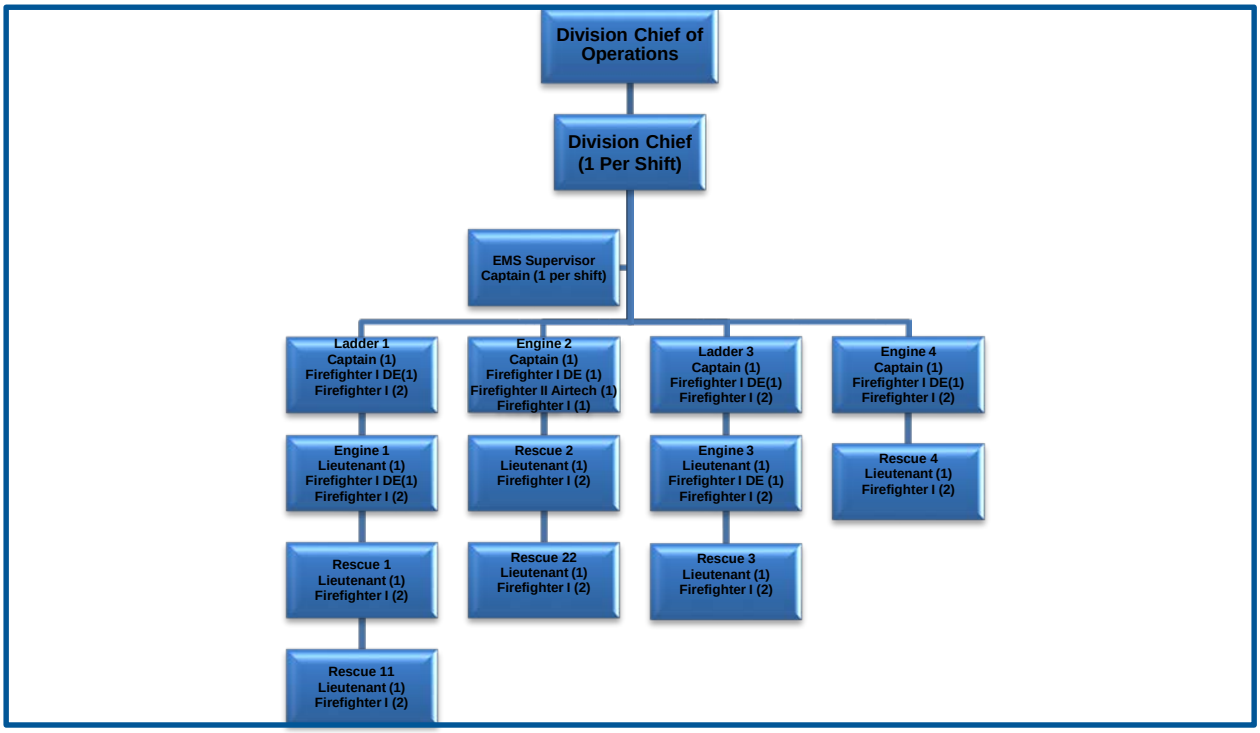


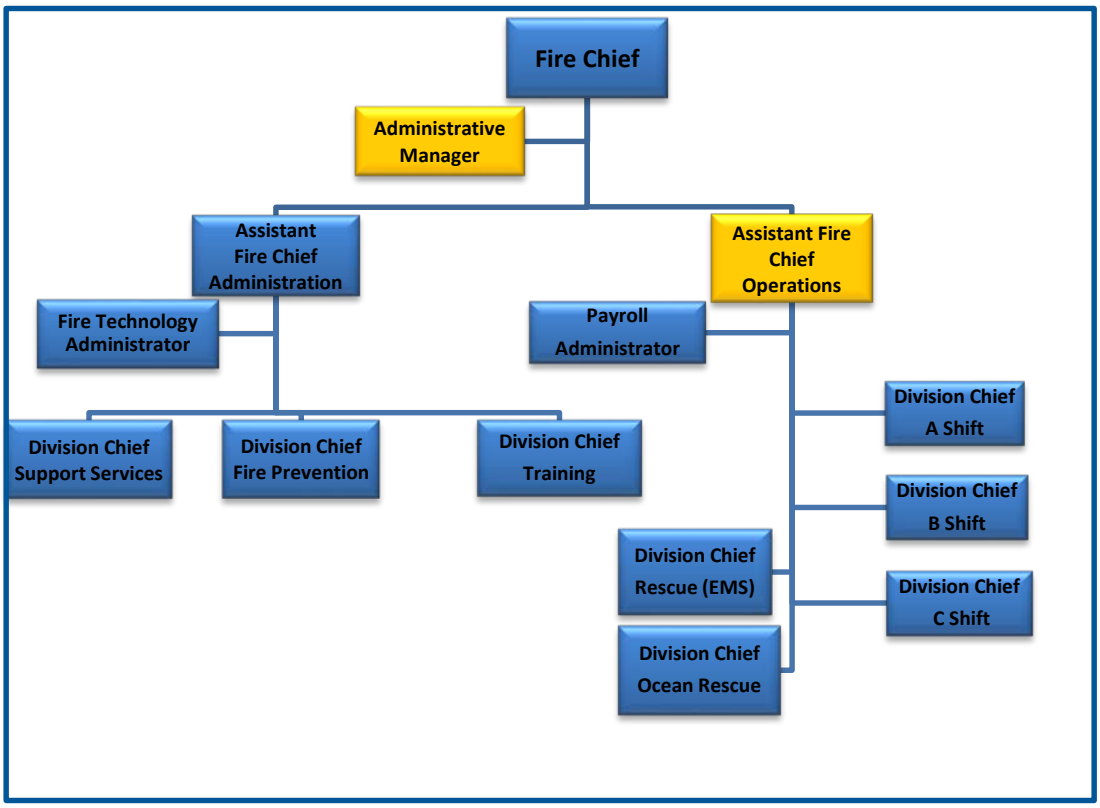
Figure 3: MBFD Operations Division Table of Organization



With a view toward balancing the management and leadership of the organization, the fire chief discussed with CPSM project staff a proposed organizational chart that upgrades the division chief of operations to an assistant chief level position, and that further aligns like program and division functions more appropriately for an organization the size of the MBFD. This proposed organizational structure aligns all operational divisions under the assistant chief of operations and all administrative and support divisions under the current assistant chief of operations. There is also one additional proposed title change and this is to change the current executive office associate I to administrative manager. The change would also vest this position with the responsibility of ensuring standards and accreditation compliance.

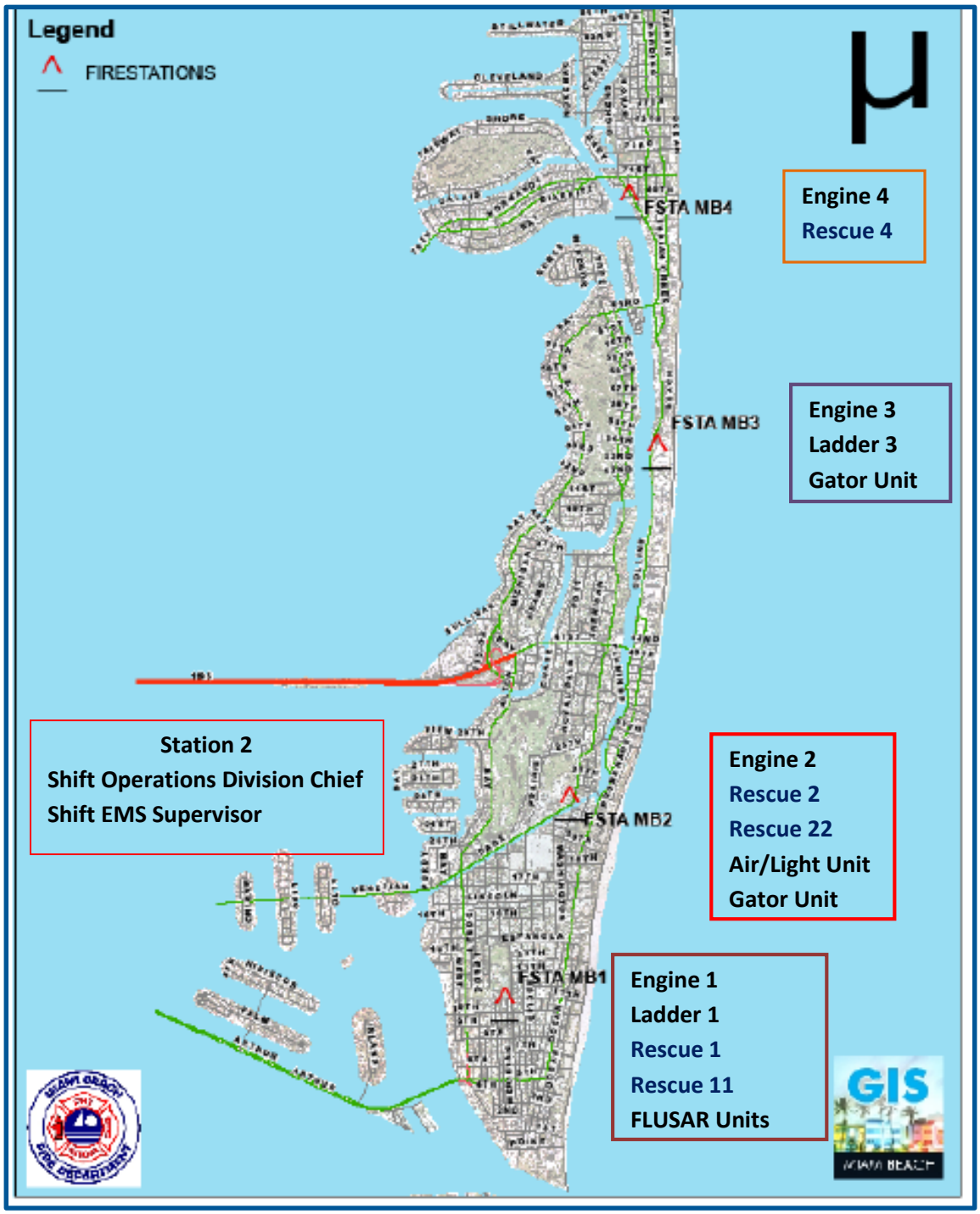
This type of organizational structure is a more contemporary and necessary approach to managing a complex and accredited fire-EMS department such as the MBFD. There are no additional positions associated with the proposed organizational structure change. There are some salary and benefit costs associated with the two proposed title and job description/responsibility upgrades; however, ***CPSM supports and recommends these changes as they provide continuous improvement to the organization; they functionally align programs and divisions for a more effective and accountable organizational management and leadership structure; and they put in place the best practice commitment of a dedicated resource to ensure the agency's accreditation and standards are complied with and maintained.*** Figure 4 illustrates the proposed organizational chart. The gold boxes indicates the proposed position title changes.

Figure 4: MBFD Proposed Table of Organization



The department operates out of four stations that are strategically sited throughout the community to provide an effective response time to constituents. From these stations fire, EMS, and special operations crews and equipment are deployed. Figure 5 illustrates the location of the four current fire stations.

Figure 5: MBFD Station Locations



Fire Services

Fire services are provided from the four stations as illustrated in Figure 5. Station 2 serves as the central station location; it houses and deploys fire suppression, EMS transport, and specialty units with assigned crews, and the department's fleet maintenance facility. Fire administration is also located in the complex.

The MBFD deploys four engine companies (pumper apparatus), two ladder companies (aerial ladder), one air/light apparatus (custom squad-type apparatus carrying a breathing air compressor, scene lighting, and other associated equipment for special operations incidents). As an all-hazards response agency, the MBFD also deploys gator vehicles for special events and for emergency deployment on the beach. As a part of the Florida Urban Search and Rescue (FLUSAR) system, the MBFD deploys associated equipment trailers that are available to respond with technical rescue and other specialized equipment in Miami Beach and as assigned for deployment in the state as well. The MBFD also deploys sufficient equipment on first response fire vehicles and personnel are trained to mitigate minor hazardous materials incidents.

Table 1 depicts fire call types by category to which MBFD responded during the one-year data study period (Oct. 1, 2013 to Sept. 30, 2014) of this project. Call percentages in the table represent that of the overall call count (including EMS calls for service).

Table1: Fire Calls by Call Type

Call Type	Number of Calls	Calls per Day	Call Percentage
Structure fire	87	0.2	0.4
Outside fire	156	0.4	0.7
Hazard	441	1.2	1.9
False alarm	3,653	10.0	15.4
Good intent	169	0.5	0.7
Public service	1,187	3.3	5.0
Fire Total	**5,693**	**15.6**	**24.0**

This table shows that the largest percentage of calls for fire service are those classified as false alarm, which are generally fire alarm calls that are the result of defective alarm components or malicious alarm activation. The second largest percentage of fire calls for service are those classified as public service, which include lock-outs, assist police, water evacuation from a structure, smoke scare, etc. Combined, actual fire calls (structure and outside) represent the smallest percentage of fire calls for service (total of 1.1 percent).

Table 2 examines the actions taken by the MBFD on fire incident types and shows that: 24 of the 87 structure fire calls were extinguished by fire service personnel either by hand lines and water from pumper apparatus or other methods such as fire extinguishers; and 59 of 156 outside fire calls

were extinguished by MBFD personnel. Other actions were also taken to control or mitigate hazards, investigate the call for service for services needed, and other such actions as necessary.

Table 2: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Structure fire	Outside fire
Fire control or extinguishment, other	10	12
Extinguishment by fire service personnel	24	59
Salvage & overhaul	3	1
Confine fire (wildland)	0	1
Control fire (wildland)	0	1
Rescue, remove from harm	0	1
Emergency medical services, other	0	1
Remove hazard	2	1
Ventilate	16	1
Establish safe area	0	1
Restore fire alarm system	1	0
Remove water	1	0
Provide water	0	1
Notify other agencies	0	1
Enforce codes	0	1
Investigate	15	35
Investigate fire out on arrival	8	13
Standby	0	2
Action taken, other	0	2
No action recorded	7	22
Total	**87**	**156**

Aggregately, the MBFD took action and/or provided service on 212 of 243 actual fire calls for service (structure and outside fires) or 87% of the time.

Emergency Medical Services

Emergency medical services are also provided from each of the four stations illustrated in Figure 5. From each of these stations the primary EMS apparatus is a Type I advanced life support transport-capable unit. One crew that is staffed at a minimum with three personnel (lieutenant/paramedic and two firefighter/paramedics) responds the EMS transport unit on EMS and specific fire/technical rescue-related incidents. Stations 1 and 2 deploy two EMS transport units each due to the high demand in these response zones. Each engine and ladder company are considered advanced life support (ALS) capable response units as they deploy with paramedic staff and carry ALS equipment. When the fire units arrive first they are able to deliver prehospital EMS care at the

highest levels until the EMS transport unit arrives. EMS transport units are also upstaffed (additional units placed in service) during special events, which typically occur on the weekends.

The primary receiving hospitals for the MBFD are Mount Sinai Medical Center, located within the city limits, and Ryder Trauma Center, located in the city of Miami. MBFD medical protocols (basic and advanced) are reviewed periodically and revised every two years to ensure the overall EMS service delivery system remains current and state-of-the-art. Paramedics operate under the license of the medical director as is customary across the state and nationally. The MBFD also has in place a robust quality assurance (QA)/quality improvement (QI) program for EMS that includes a review of each patient report by the shift EMS supervisor and a review of exceptional reports during the monthly QA meeting. The monthly QA meetings are attended by an EMS supervisor, the medical director, EMS coordinator, and personnel from one station (fire and EMS). The results of these QA reviews and subsequent recommendations are communicated to the department for review and action if necessary. This is a best practice.

Table 3 depicts EMS call types by category to which MBFD responded during the one-year data study period (Oct. 1, 2013, to Sept. 30, 2014) of this project. Call percentages in the table represent that of the overall call count (including fire calls for service).

Table 3: EMS Calls by Call Type

Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	1,556	4.3	6.6
Seizure and unconsciousness	1,821	5.0	7.7
Breathing difficulty	1,377	3.8	5.8
Overdose and psychiatric	270	0.7	1.1
MVA	884	2.4	3.7
Fall and injury	2,701	7.4	11.4
Illness and other	9,044	24.8	38.2
EMS Total	**17,653**	**48.4**	**74.5**

Table 3 illustrates that illness and other, and fall and injury call types represented the highest percentage of EMS responses for the MBFD during the study period (67 percent of EMS calls). Typically, these calls are, on average, the basic life support or the more basic of the advanced life support call types.

Table 4 analyzes EMS calls for service according to patient transport. In this table we see that, overall, 43 percent of EMS calls to which MBFD responded involved transporting a patient. Cardiac and stroke calls had the highest transport rates, averaging 53.8 percent. This is typical in departments for which CPSM has analyzed transport data.

Table 4: Transport Calls by Call Type

Call Type	Number of Calls			Transport Rate
	Non-Transport	Transport	Total	
Cardiac and stroke	719	837	1,556	53.8
Seizure and unconsciousness	1,025	796	1,821	43.7
Breathing difficulty	683	694	1,377	50.4
Overdose and psychiatric	144	126	270	46.7
MVA	532	352	884	39.8
Fall and injury	1,777	924	2,701	34.2
Illness and other	5,342	3,702	9,044	40.9
EMS Total	**10,222**	**7,431**	**17,653**	**42.1**
Fire Total	**5,657**	**36**	**5,693**	**0.6**

Note: Fire transport calls are those fire category calls to which rescue units responded and transported patients.

It is important to review the time an EMS transport unit spends on a transport call, since in general an MBFD unit is away from the response zone or city (if the receiving hospital is outside of the city) while transporting. It can be seen that in each category of call and time component in Table 5 (on-scene time; travel time to hospital; at hospital and travel back to station time) the times are very efficient and support an effective EMS service delivery system. Of special note is the time spent at the hospital and then travel back to the station. This time (average of fifteen minutes) is exceptional and demonstrates professional behavior and accountability on the part of EMS transport unit crews.

Table 5: Time Component Analysis for Ambulance Transport Runs

Call Type	Average Deployed Minutes per Run	Average On-scene Time	Average Travel to Hospital Time	Average at Hospital and Travel back to Station Time	Sample Size
Cardiac and stroke	45.7	18.7	7.3	15.1	837
Seizure and unconsciousness	45.6	18.1	7.5	15.3	796
Breathing difficulty	47.9	19.1	7.8	16.5	694
Overdose and psychiatric	44.5	16.7	7.5	15.6	126
MVA	44.1	13.8	8.1	17.8	375
Fall and injury	41.1	13.6	8.0	14.8	932
Illness and other	43.1	16.0	7.7	14.6	3710
Total	**43.9**	**16.4**	**7.7**	**15.1**	**7,470**

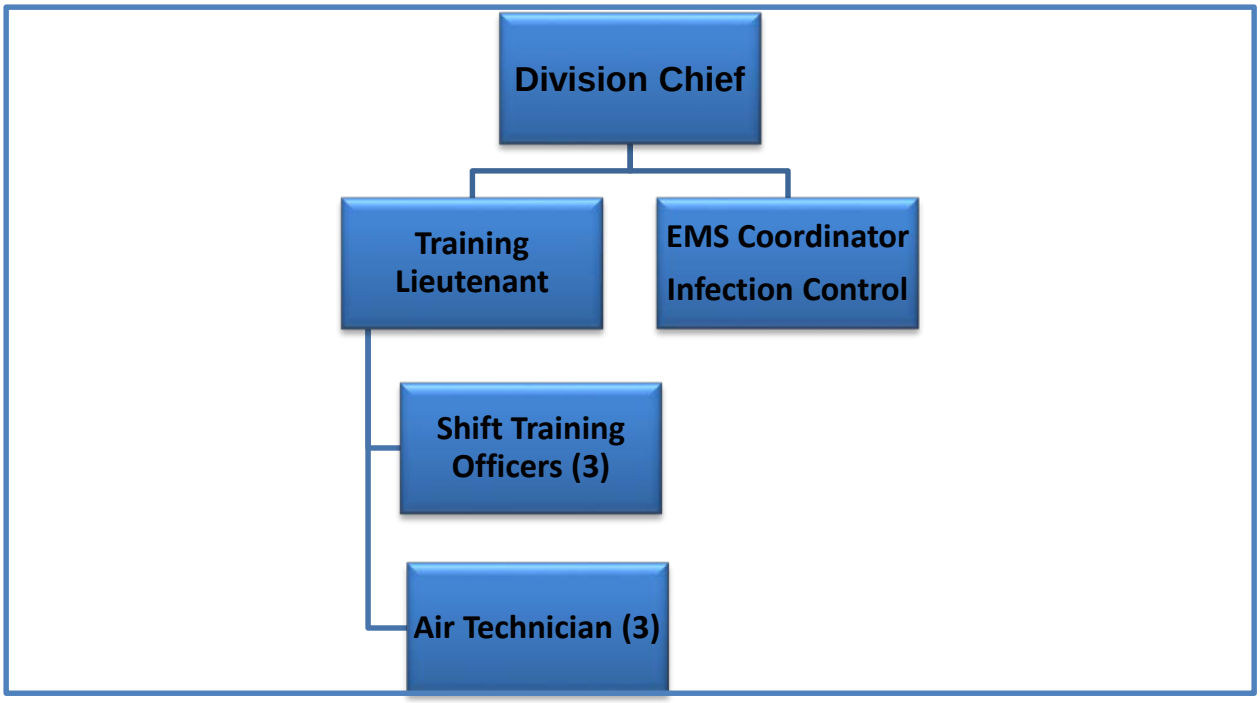
Training and Education

A deputy chief manages the training division and is assisted by a training officer (lieutenant), EMS coordinator, three shift training officers, and three air technicians. The division handles fire, EMS, technical rescue, HazMat, entry level, and incumbent continuing education. Prior to December 2014, this division was included with logistics and supply-chain management as a single division titled support services. Figure 6 illustrates the division organizational chart.

The basic training plan for the department is formalized and guided by standard operating guideline (SOG) 112.09. This SOG prescribes three levels of training the department manages throughout a calendar year. These are: level 1–company training, level 2–departmentwide/mandated training, and level 3–specalty training. An annual training calendar is distributed outlining level 2 and 3 training so that personnel may prepare and plan appropriately to complete this training. On a monthly basis the training lieutenant prepares the level 1 monthly training topic and objectives (drill call) and distributes this to each company officer for completion. This training regimen is in place to meet ISO and accreditation compliance.

In addition to the training described above, the department has a comprehensive EMS continuing education program in place that includes a daily EMS training requirement; training to meet state recertification requirements and compliance; clinical competency training; and simulation manikin (SimMan) training that provides life-like, full-scale patient training to include diagnosis, live intervention, and patient management.

Figure 6: MBFD Training Division Table of Organization



The department also has in place an officer resource manual designed to assist new and veteran officers with the day-to-day tasks and responsibilities of the position. The training division is developing a driver/operator resource manual that is designed to serve the same purpose as the officer resource manual. The division chief of training is also developing leadership training for the officer corps. Lastly, the department will be implementing the Target Solutions training program. This program enhances compliance training by offering continuing education and discipline-specific training, tracks individual employee on-line and instructor-led training, and can be used to communicate general information to every member of the department. This training solution is utilized by fire and EMS departments across the country.

Included in the training division is the breathing air program. This entails the annual self-contained breathing apparatus (SCBA) employee mask fit-testing, SCBA repair, and third-party SCBA equipment testing and repair management. The division chief has oversight of the program and each operational shift has a technician who serves as the operational component of the program.

Members of the MBFD are trained to awareness levels in hazardous materials and technical recuse. Also, all MBFD officers have been trained in the *Blue Card Command Certification Program.* This program is a state-of-the-art training and certification system that teaches company and command officers how to standardize local incident operations across their organization.

Fire Prevention

The fire prevention division is under the command of a deputy chief. This division is responsible for enforcing the Florida Fire Prevention Code and accomplishes this through two primary inspection sections. These sections are fire code maintenance inspections of current properties, and plans review and inspection of new construction. The fire code maintenance component also coordinates and manages the engine company inspection program, which is designed to carry out inspections of the common areas of residential properties that are five stories or less. Guidelines and procedures for the fire prevention division are supported through the 400 series of the MBFD standard operating guidelines. In all, the department has sixteen SOGs dedicated to fire prevention, fire investigation, and public education.

The fire prevention division is charged with permitting, reviewing plans of, and inspecting the many special events that occur in the city. Additionally, this division issues occupancy load documentation to public assembly occupancies, fire protection analysis, flow testing of fire hydrants, and conducts life safety inspections of nightclubs and places of public assembly. Three members of the fire prevention division are certified fire investigators and therefore are available to conduct fire cause and origin investigations as well. Figure 7 illustrates the table of organization for the fire prevention division.

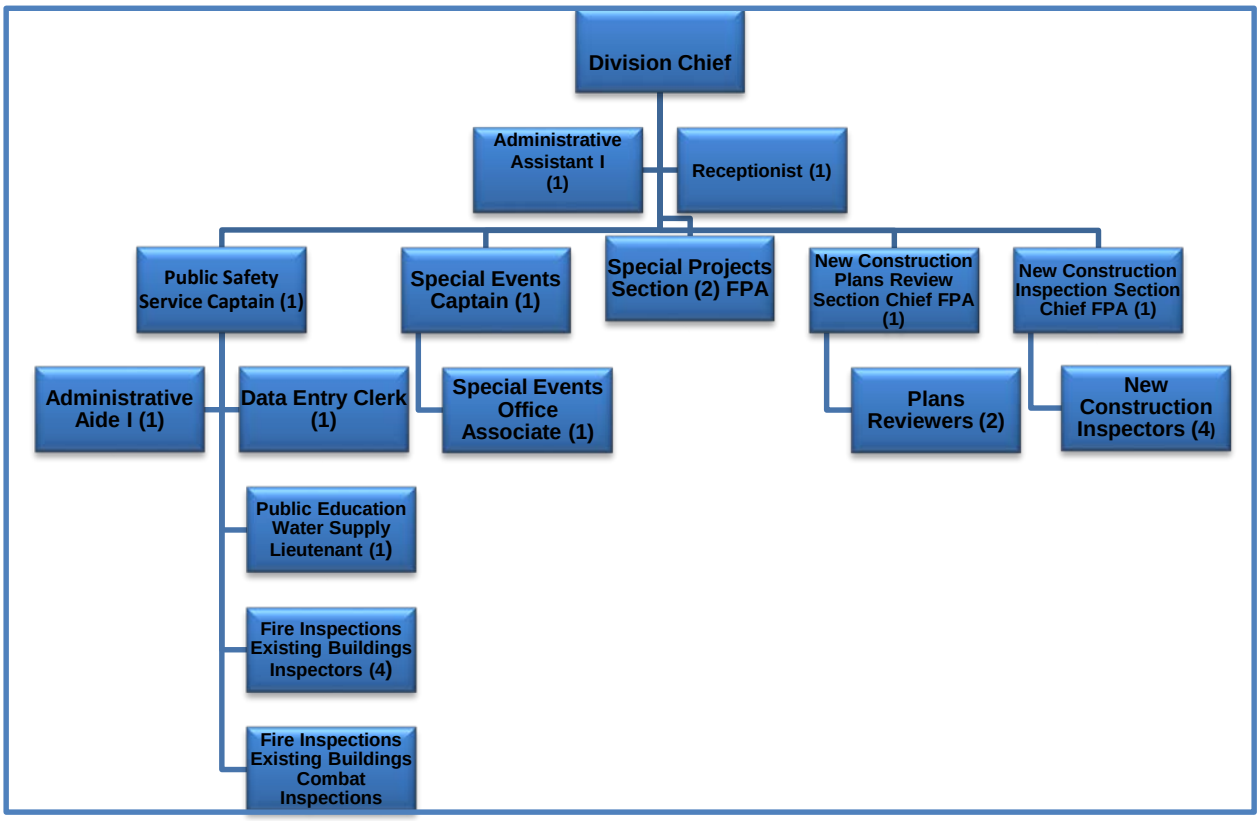
The deputy chief of fire prevention is new to the MBFD but not the fire service, having served in the city of Miami Department of Fire-Rescue for many years. This deputy chief brings with him many years of fire prevention and life safety experience and a new vision for the MBFD fire prevention

division. This vision includes: annual inspections of all inspectable properties in the city; twenty-five day turnaround on all plan reviews; and transitioning a field inspection paper system to an electronic fire prevention records management system.

CPSM supports this vision and, specifically, transitioning the fire prevention division to field electronic inspection reporting. Utilizing a paper-based system to track and record fire prevention inspections, violations, and corrective actions creates inefficiency and ineffectiveness.

Therefore, it is recommended the fire prevention division transition to an efficient, automated records management system for fire prevention and code enforcement activities.

Figure 7: MBFD Fire Prevention Division Table of Organization



Internal Planning

Organizing and managing a contemporary fire and emergency medical services agency requires results-oriented and well-thought-out and achievable goals and objectives. In addition, to determine how well an organization or program is doing requires that these goals be measurable and that they are measured against desired results. Included in a fire organization's key internal planning components should be a formal strategic plan, community risk and vulnerability assessment and plan, Standards of Response Coverage, performance measures, and a succession plan.

Department Accreditation and Insurance Services Office Rating

An available tool and best practice that involves a comprehensive assessment of a fire department is the accreditation program managed by the Center for Public Safety Excellence (CPSE). This national program provides an analytical self-assessment process to evaluate ten categories of an agency's performance. During this process, the department examines more than 240 separate performance indicators, 98 of which are considered core or required competencies. There are currently 197 fire departments in the United States and Canada which are accredited.

Included within the ten accreditation categories is an expectation for the fire department to analyze itself by planning zones, to identify the hazards posed within each planning zone, to rank hazards by potential severity, and to ensure that the appropriate resources are available to manage the hazards. The MBFD has recognized the importance of community risk assessment planning by seeking accreditation through the CPSE. The department was first accredited in 2004 and reaccredited in 2009. Included in the department's application for reaccreditation is the most recent *Integrated Risk Management Plan: Standards of Response Cover.* This document serves as a deployment analysis to assist the MBFD in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations, in addition to homeland security issues.

The MBFD collects and analyzes data specific to the characteristics of the community and applies the findings to organizational planning. The department completed a comprehensive analysis of risks, and the associated identified needs are integrated into the standards of response cover. The department identified nonfire risks, deployment strategies, and operational methods for those risks. Significant nonfire risks include EMS, hazardous materials, technical rescue, and other service calls.[11]

The MBFD initially achieved accreditation in 2004, and was reaccredited in 2009 and again in 2014. In review of the recent reaccreditation process and the current Standards of Response Cover document, CPSM recognizes the comprehensive and dedicated approach the department has committed to this process. In fact, the MBFD's Standards of Response Cover document is the most

[11] Commission on Fire Accreditation International, *Fire and Emergency Services Self-Assessment Manual*, Las Vegas Fire & Rescue, (December 2011).

all-encompassing document CPSM has reviewed to date. This document can serve as a model for other agencies to emulate.

The Insurance Services Office (ISO) is a for-profit subsidiary of Verisk Analytics Company. ISO provides services relating to risk analysis by gathering information through community assessments and providing the information to the insurance industry. The data have historically been used to develop insurance premiums for both residential and commercial policies. The ISO's Fire Suppression Rating Schedule (FSRS) is analyzed to assign a locality's Public Protection Classification (PPC).[12] The FSRS is a manual of the criteria that measure the tools (assets and practices) in a community's arsenal to fight fires. The schedule contains a point system from 0 to 100. Every ten points is a "Class." The grade is presented as a class from 1 to 10: Class 1 is the highest class; a rating of Class 9 is considered the "lowest recognized protection." A Class 10 does not meet the minimum criteria established by the ISO. The city of Miami Beach has a Public Protection Classification of 1. Table 6 depicts the PPC classifications by point value. The national distribution of PPC classifications is illustrated in Figure 8.

TABLE 6: PPC Classification

PPC	Points
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.00
8	20.00 to 29.99
9	10.00 to 19.99
10	0.00 to 9.99

Some significant changes made recently to the ISO grading schedule focus attention on areas that have been proven effective in fire suppression, as well as on fire prevention, public fire education, and fire investigation. The grading schedule also has been revised to align the schedule's requirements to nationally accepted standards. The revised grading schedule makes increased reference to the national consensus standards of the National Fire Protection Association (NFPA), American Water Works Association (AWWA), and Association of Public-Safety Communications Officials International (APCO). The new schedule recognizes proactive efforts to reduce fire risk and frequency.

[12] ISO Mitigation Online, About ISO (2012), http://www.isomitigation.com/docs/about0001.html (accessed on October 31, 2012).

The ISO schedule continues to evaluate three major categories of fire suppression: the fire department, emergency communications, and water supply. In addition, it includes a new community risk reduction section that recognizes community efforts to reduce losses through fire prevention. The addition of the new risk reduction section represents a major shift in emphasis in the grading schedule, giving incentives to communities that strive to reduce fire severity proactively through a structured program of fire prevention activities. Examples of fire prevention programs include wildland-urban interface ordinances, certificate of occupancy inspections, and inspections of fire prevention equipment.

The fire department section, which carries a 50+ point weighting in the schedule's grading, now recognizes fire departments that use various methods to solve the critical issues of economic constraints and firefighter recruitment and retention. The schedule provides additional credit for automatic-aid personnel and equipment, including an increase in the automatic-aid factor for fire departments that operate with common fireground procedures. In addition, the schedule offers credit to fire departments that develop and use standard operating procedures and incident management systems.

The schedule considers a fire department's deployment analysis, based on NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Department*, 2010 Edition, as a potential alternative to the ISO's traditional road-mile distribution. This criterion establishes optimal distances for standard response districts around each fire station of 1.5 road miles for an engine company and 2.5 road miles for a ladder service company. The new ISO schedule shifts the emphasis away from the number of apparatus and equipment carried to the proper deployment of those resources.

The ISO uses a fire risk analysis based on the ability of a fire department to bring a certain volume of water (fire flow) to a structural fire within a certain time frame that is presumed by an optimal distance (road-mile distribution). In the 2010 Miami Beach ISO report, this risk analysis is based on five listed structures located in the city. As the fire department reviews its deficiencies in order to improve its next grading it should evaluate the fire flow needs of these structures in correlation with its current resource deployment.

The ISO has modified its apparatus equipment list to include only items specified in NFPA 1901, *Standard for Automotive Fire Apparatus*. This change better aligns the schedule with consensus standards and allows additional flexibility to revise the equipment lists if there are significant changes to NFPA 1901.

While the total credit points for the existing major categories remain unchanged, there have been changes that increase or decrease the point weights for some sections.

The total credit points remain as they were prior to the 2012 changes, namely:

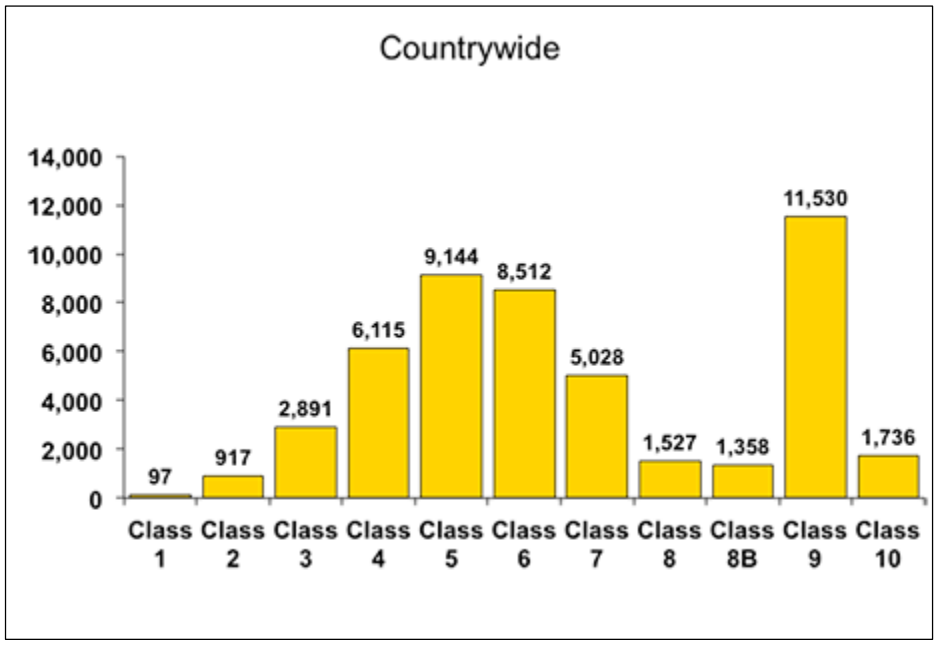
- Fire Department: 50+ points
- Emergency Communications: 10 points

- Water Supply: 40 points.

The community risk reduction section has a weight of 5.5 points, resulting in a revised 105.5+ available points. The inclusion of the new section with its extra points allows recognition of communities that include effective fire prevention practices.

It is notable that of the approximately 30,125 fire departments in the nation, only 97 were able to achieve a PPC rating of 1. In addition, there are only 197 internationally accredited fire departments. As such, it is evident that the city of Miami Beach Fire Department represents one of the premiere fire and rescue agencies in the nation; it is a true asset to the community.

FIGURE 8: National PPC Distribution



Source: ISO Mitigation Online, About *ISO* (2012), http://www.isomitigation.com/docs/about0001.html.

CPSM recommends the MBFD continue as an accredited fire department utilizing the five-year self-analysis reaccreditation process for continuous improvement.

Strategic Planning

The development of a long-range fire protection and prevention comprehensive strategic plan is an essential component of any successful and effective fire-rescue organization. The MBFD developed and implemented such a document during its initial accreditation process, and then updated the document in 2014.

The MBFD strategic planning document contains information derived from the department's annual operating and capital budgets, and the Standards of Response Cover from the accreditation process.

Specifically, this planning document includes a determination of who the department's customers are; internal and external stakeholder expectations; identification of services provided; and eleven specific goals and accompanying enabling objectives, critical tasks, and timeline to accomplish the objective. The eleven goals aptly cover the breadth of the department and the community.

Succession Planning

Succession planning is a systematic approach to developing potential successors to ensure organizational leadership stability. Successful succession planning identifies, develops, and nurtures potential future leaders. It is critical for the long-term success of any organization that such a process occurs.

Critical to the success of succession planning is the engagement and commitment of the senior leaders to the program, as well as a 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 process to be able to compete for and fill critical organizational leadership roles.

The MBFD has developed a draft succession plan. This plan is designed to prepare the organization for pending retirements and to successfully prepare and transition employees into promoted positions. The plan is further designed to ensure staff is trained and capable to fill any vacant position that occurs in the department. This includes any civilian, specialty, and officer position.

The draft succession plan includes specific sections relating to: training, qualifications, and evaluation that focus on how to develop employees who desire to be the department's future supervisors, managers, and leaders; employee relations that focus on building a strong effort to support and respond to employees' needs, and to build morale and loyalty; the MBFD image, which emphasizes the internal and external representation of the department; and the development of an infrastructure to support the plan.[13] Supporting the draft succession plan are recommendations to each document section that support and ensure a successful implementation of the plan.

CPSM commends the agency for proactively developing the draft succession plan and recommends the plan be formalized and implemented in its entirety for continuous organizational improvement.

Infrastructure Overview

Fleet

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.

[13] Miami Beach Fire Rescue Department Draft Succession Plan.

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

The MBFD operates an array of vehicles to include operational first response heavy fire apparatus and EMS transport units, staff vehicles, and specialty response trailers and vehicles. In addition to primary response fire and EMS units the MBFD also maintains a fleet of reserve or backup apparatus as well, which is critically important to sustain uninterrupted incident response to calls for service. Maintenance and repair of MBFD fire-rescue vehicles is performed in-house and managed by a fleet maintenance supervisor who manages two fleet mechanics. This organizational component is located in the support services division, which is managed by a deputy chief.

The current MBFD emergency response fleet consists of:

- Four frontline engine apparatus.
    - Three reserve engine apparatus.
- Two frontline ladder apparatus.
    - One reserve ladder apparatus.
- One frontline air/light truck.
- Six frontline EMS transport units.
    - Six reserve EMS transport units.
- Six gator units (beach rescue and special events).
- Two command vehicles (Shift Operations Division Chief/EMS Supervisor).

As noted above, in addition to these day-to-day emergency response units the MBFD fleet also includes staff vehicles and specialty response trailers and vehicles.

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 well-documented emergency vehicle replacement plan ensures ongoing preservation of a safe, reliable, and operationally capable response fleet. A plan must also schedule future capital outlay in a manner that is affordable to the community. The MBFD has such a plan in place, which is a best practice.

The MBFD also utilizes the National Fire Protection Agency (NFPA) apparatus standard as a guide for procurement and replacement schedule. 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 standard's committee membership is

made up of representatives from the fire service, manufacturers, consultants, and special interest groups. The committee monitors various issues and problems that occur with fire apparatus and attempts to develop standards that address those issues. A primary interest of the committee over the past years has been improving firefighter safety and reducing fire apparatus crashes.

The Annex Material in NFPA 1901 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, 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."*
>
> *"Apparatus that were not manufactured to the applicable apparatus standards or that are over 25 years old should be replaced."*

The impetus for these recommended service life thresholds is continual advances in occupant safety. Despite good stewardship and maintenance of emergency vehicles in sound operating condition, older vehicles simply do not incorporate the many advances in occupant safety like 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.

There are no published standards for ambulance replacement. NFPA 1917, *Standard for Automotive Ambulances*, serves the same principles as NFPA 1901 but only for new ambulances contracted to be built on or after January 1, 2013, and is not retroactive. In departments CPSM has reviewed and have knowledge of, the general rule of thumb for ambulance replacement is between five and eight years of service, dependent on chassis demand, which is generally measured in miles and maintenance costs. Busier communities replace ambulances sooner, sometimes after a four- to six-year lifespan. When replaced the ambulance then usually serves as a reserve for another two to four years, depending on the year replaced and serviceability at the time of replacement.

CPSM recommends the MBFD follow the current and effective heavy fire apparatus and EMS transport unit replacement schedule. By doing so, the fleet will be sustained and ready for response, and the department will avoid costly repair and maintenance costs by caused overextending frontline service, and will also avoid the impact of replacing these vehicles all at once as opposed to a planned and properly budgeted replacement process.

Facilities

Sound community fire-rescue protection requires the strategic distribution of an adequate number of station facilities. Proper siting and adequacy 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.

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

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

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

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

Ergonomic layout and corresponding space adjacencies in a fire station should seek to limit the travel distances between occupied crew areas to the apparatus bays. Likewise, it should carefully consider complementary adjacencies, like lavatories/showers in proximity of bunk rooms, and desired segregations, like break rooms or fitness areas that are remote from sleeping quarters.

CPSM staff visited the four MBFD fire stations. Stations 2 and 4 are the newest, constructed in 2008 and 2006, respectively. These two stations had the usual wear and tear a 24/7 facility would be expected to have. Station 3, an older facility, showed extreme wear and tear and the need for renovation with regards to living quarters and exterior finish. In conversation with senior staff it was found that the current fiscal year budget has funds allotted for remodeling of lavatories and living quarters, and repair/painting of the exterior of station 3.

Station 1 was found to be in need of complete renovation or, if funding allows, the construction of a new facility. In discussion with senior staff, CPSM was informed that the current building is valued at $1.7 million and repairs/renovations have been estimated at $1.8 million by the city's property management division. Understanding this imbalance and that this may not be the best use of available funding, the MBFD and the city's property management division are working toward a facility replacement solution, understanding this creates a more substantial return on investment. This realization is driving a more in-depth review of the replacement option and, as such, both agencies are working with an external engineer and architect on a suitable replacement plan. Siting is one concern, as the station has a strategic location to provide service, but available land in the immediate proximity of station 1 is not in the city's favor. Options for available land and the potential to demolish the current facility and rebuild a new facility on the current site are being considered.

CPSM recommends the city continue to programmatically and fiscally support the maintenance, repair, and, when needed, the renovation of stations 2, 3, and 4. With regards to station 1, CPSM further recommends the city consider the most efficient and effective option (complete renovation or replacement) as determined through internal and external engineering and architectural analysis, and as funding may allow.

Operational Analysis

Current Staffing Matrix

As already discussed, the MBFD deploys fire and EMS resources from four strategically located fire stations. The operational deployment consists of suppression and rescue division personnel assigned to one of three platoons. This includes minimum staffing as described below as well as additional personnel assigned to each shift to backfill vacancies that occurs from scheduled and unscheduled leave. This overstaffing is in place to alleviate dependency on using overtime to sustain minimum staffing.

Each platoon is scheduled twenty-four hours on duty followed by forty-eight hours off duty. Each shift is under the overall command of the shift division chief who reports to the division chief of operations. The EMS operational personnel, while part of the rescue (EMS) division, currently are accountable to the on-duty shift division chief. Each unit is under the command of an officer (captain or lieutenant) who serves as the first-line supervisor. See Figure 4 regarding the proposed organizational chart change that places all operational components under the command of an assistant chief of operations.

Minimum staffing for operational units, which is supported by the community risk assessment and critical tasking identified in the MBFD Standards of Response Cover document is as follows:

- **Station 1**
  - Engine 1: 1 Lieutenant, 1 Driver/Engineer, 2 FF
  - Ladder 1: 1 Captain, 1 Driver/Engineer, 2 FF
  - Rescue 1: 1 Lieutenant, 2 FF/Paramedics
  - Rescue 11: 1 Lieutenant, 2 FF/Paramedics
- **Station 2**
  - Engine 2: 1 Captain, 1 Driver/Engineer, 2 FF
  - Rescue 2: 1 Lieutenant, 2 FF/Paramedics
  - Rescue 22: 1 Lieutenant, 2 FF/Paramedics
  - Shift Division Chief: 1 Operational Division Chief
  - EMS Supervisor: 1 EMS Captain
- **Station 3**
  - Engine 3: 1 Lieutenant, 1 Driver/Engineer, 2 FF
  - Ladder 3: 1 Captain, 1 Driver/Engineer, 2 FF
  - Rescue 3: 1 Lieutenant, 2 FF/Paramedics

- **Station 4**
  - Engine 4: 1 Captain, 1 Driver/Engineer, 2 FF
  - Rescue 4: 1 Lieutenant, 2 FF/Paramedics

Based on the risk and critical tasking identified in the MBFD Standards of Response Cover, CPSM does not recommend any changes to this minimum staffing model. Additional response units are discussed later in this section.

Population, Growth, Demand for Services, and Operational Workload

Demand for fire and EMS response is a key component in the staffing and deployment decision-making process. Staffing to meet demand either by geography or by peak demand periods are important considerations. It is essential this component be monitored and reviewed on a regular basis to ensure staffing and deployment of resources is adequately meeting demand, and that the most appropriate resources are being deployed.

Figure 9 illustrates the time of day calls are occurring, while Table 7 depicts the aggregate of fire and EMS call types. Figures 10 and 11 illustrate demand and the distribution of all fire and EMS incidents that occurred during the data analysis study period, which was between Oct. 1, 2013, and Sept. 30, 2014.

Figure 9: Call Distribution by Hour of Day

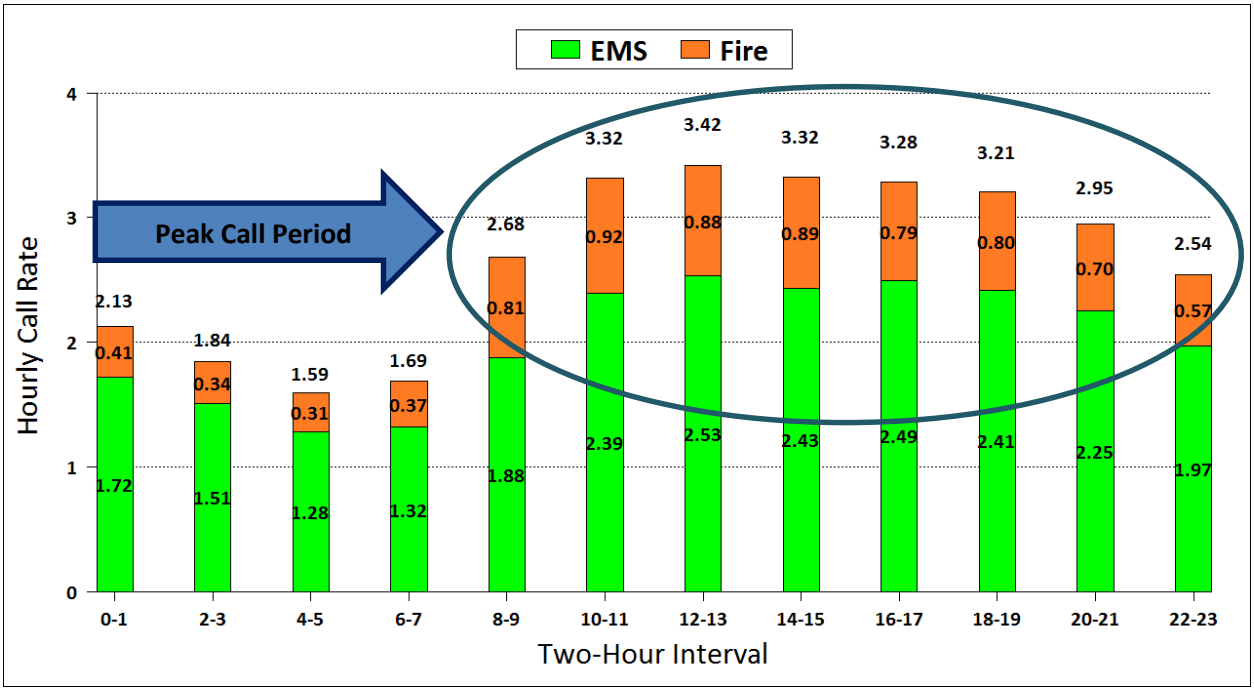
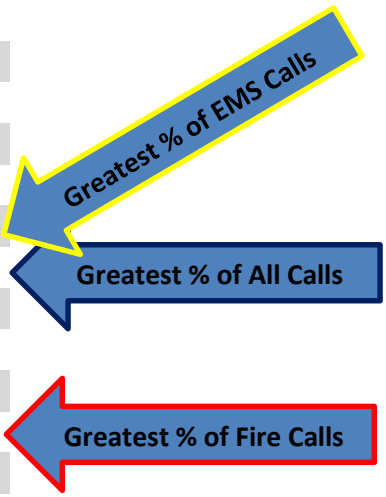


Figure 9 tells us that call rates were highest during the day between 8:00 a.m. and midnight, averaging between 2.54 and 3.42 calls per hour and call rates were lowest between 2:00 a.m. and 8:00 a.m., averaging between 1.59 and 1.84 calls per hour.

Table 7 shows the aggregate incident call count for the data analysis study period. Table 7 tells us: MBFD responded to an average of 64.9 calls per day; EMS calls for the year totaled 17,653 (75 percent of all calls), averaging 48.4 calls per day; fire calls for the year totaled 5,693 (24 percent of all calls), averaging 15.6 calls per day; and structure and outside fires combined for a total of 243 calls during the year, averaging 0.6 calls per day.

Table 7: Call Types, All Calls

Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	1,556	4.3	6.6
Seizure and unconsciousness	1,821	5.0	7.7
Breathing difficulty	1,377	3.8	5.8
Overdose and psychiatric	270	0.7	1.1
MVA	884	2.4	3.7
Fall and injury	2,701	7.4	11.4
Illness and other	9,044	24.8	38.2
EMS Total	**17,653**	**48.4**	**74.5**
Structure fire	87	0.2	0.4
Outside fire	156	0.4	0.7
Hazard	441	1.2	1.9
False alarm	3,653	10.0	15.4
Good intent	169	0.5	0.7
Public service	1,187	3.3	5.0
Fire Total	**5,693**	**15.6**	**24.0**
Canceled	347	1.0	1.5
Total	**23,693**	**64.9**	**100.0**



Figures 10 and 11 illustrate the geographic demand for fire and EMS services, respectively. In both maps it can be seen that demand is greatest in the southern area of the city, the middle and mid-eastern areas of the city, and the northeastern area of the city. Overall, however, demand is high throughout the city with the exception of certain areas of the city that border the western coastline areas. In these maps, a demand block is equal to 0.1 (1/10th) square mile.

The greatest concentration of EMS calls is in station 1's response zone (1,015 in a single demand block, for example). Station 2 has a heavy demand for EMS calls just south of the station. For this reason, station 1 and station 2 each deploy two ambulances. Station 3 has the least overall amount of EMS demand; however, there is a heavy concentration in demand just south of the station. This response zone is served with a single ambulance. Station 4 has a heavy concentration of EMS demand, but deploys only one ambulance, a situation that is addressed later in this report.

Fire service calls follow the same demand patterns. The greatest number of fire services calls are also in station 1's response zone (337 in a single demand block, for example).

Figure 10: Fire Demand

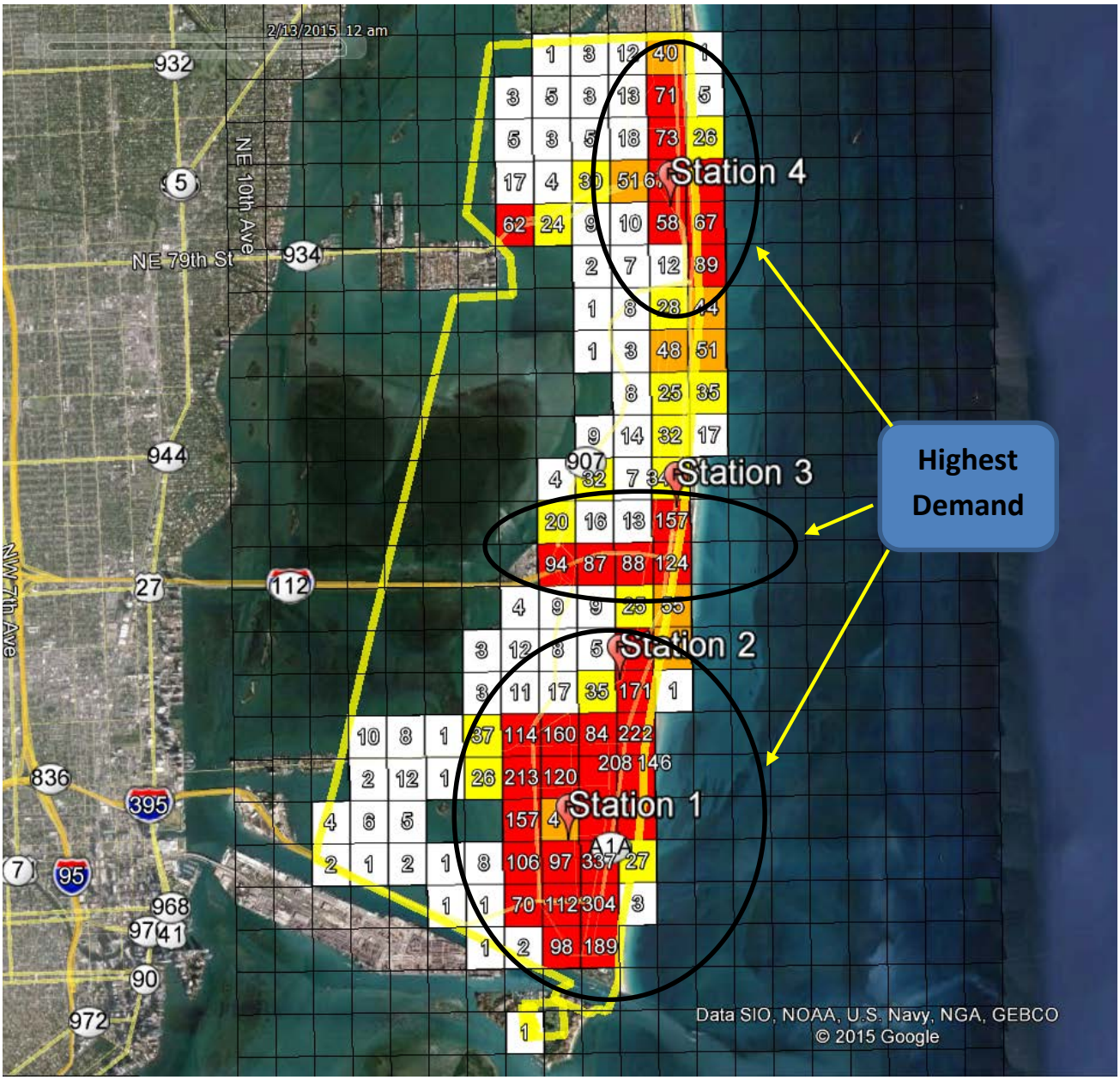
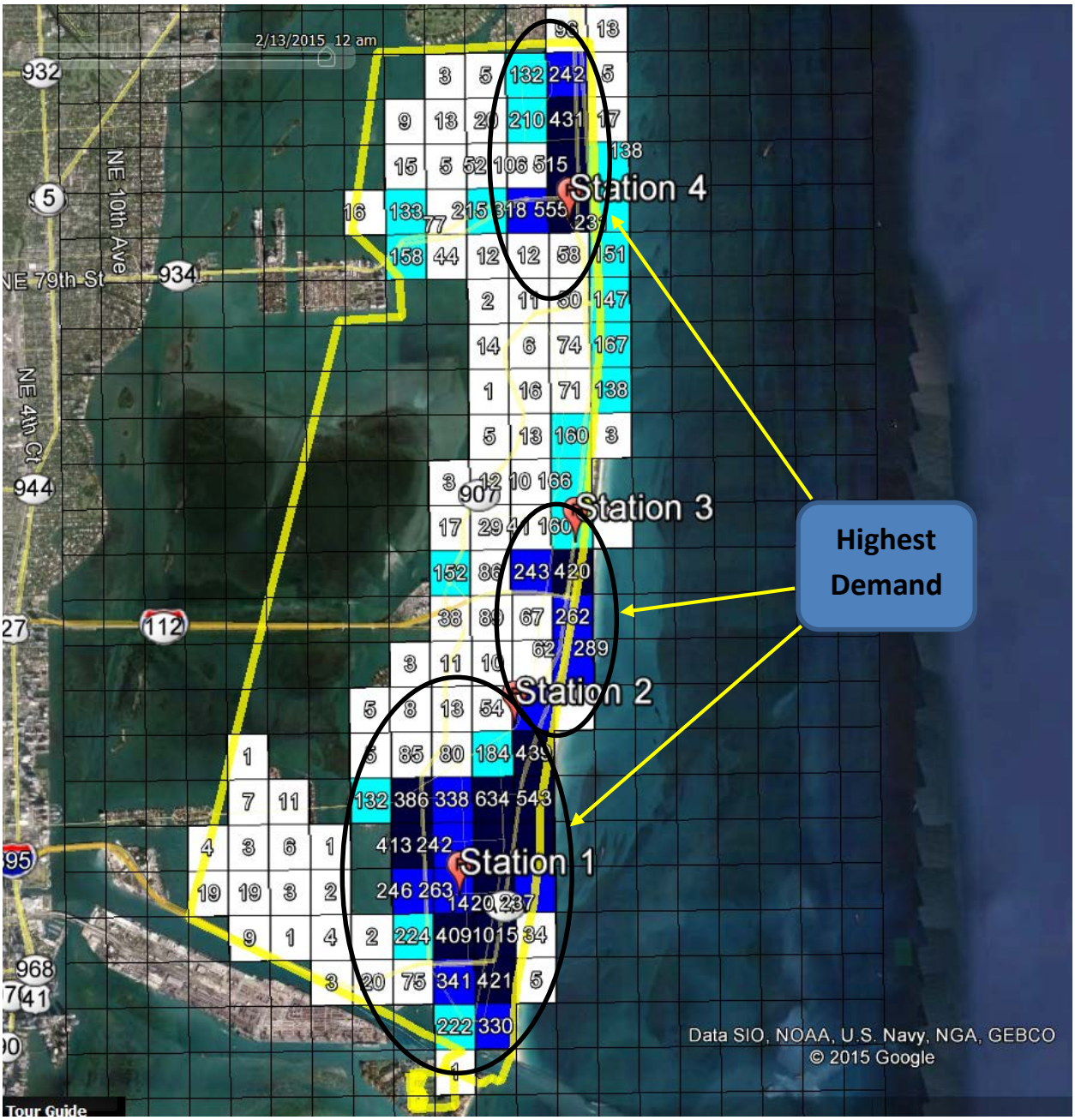


Figure 11: EMS Demand



Demand translates to workload for fire and EMS units, and this workload is a factor when considering the addition or reduction of deployable resources. The more demand in a certain response zone the more likely simultaneous calls will occur. Deploying two rescue units each from stations 1 and 2 is intended to reduce response gaps created by high demand and simultaneous EMS calls for service. Inevitably, however, rescues and sometimes engines and ladders cross response zones as demand increases (this is especially the case with rescues due to demand). Table 8 looks at the workload of all fire and EMS units.

TABLE 8: Call Workload by Unit

Station	Unit Report	Description	Average Deployed Minutes per Run	Annual Hours	Annual Number of Runs	Deployed Minutes per Day	Runs per Day
1	R1	Rescue Zone 1	24.4	1,448	3,557	238.1	9.7
	R11	Rescue Zone 1	27.1	1,509	3,336	248.1	9.1
	E1	Engine Zone 1	15.4	814	3,163	133.8	8.7
	L1	Ladder Zone 1	15.9	268	1,007	44.0	2.8
2	R2	Rescue Zone 2	25.5	1,354	3,189	222.5	8.7
	R22	Rescue Zone 2	25.2	1,343	3,193	220.7	8.7
	E2	Engine Zone 2	15.8	789	3,002	129.8	8.2
	CPT5	EMS Supervisor	14.6	278	1,137	45.6	3.1
	300	Shift Division Chief	17.4	155	535	25.4	1.5
3	R3	Rescue Zone 3	30.8	1,286	2,508	211.4	6.9
	E3	Engine Zone 3	15.8	562	2,129	92.4	5.8
	L3	Ladder Zone 3	14.8	157	635	25.7	1.7
4	R4	Rescue Zone 4	31.4	1,847	3,525	303.6	9.7
	E4	Engine Zone 4	19.4	648	2,002	106.5	5.5

Table 8 tells us: Rescue 1 made the most runs, averaging 9.7 runs per day; Rescue 4had the greatest deployed time, averaging 303.6 minutes (5 hours and 4 minutes) per day; and of the four engines, Engine 1 made the most runs, averaging 8.7 runs per day. Looking further into this table tells us that station 1's rescue units aggregately averaged 18.8 runs per day and station 2's rescue units aggregately averaged 17.4 runs per day.

The impacts of growth on fire and emergency medical services vary; however, as population increases generally the calls for service increase, primarily with regards to EMS. CPSM recommends the MBFD stay focused on the city's growth and the type of growth/construction that is occurring with regard to the risk this growth may or may not create, attendant population increase, and effects on call demand in the city, as these factors should correlate directly to future deployment of services.

Station and Response Time Analysis

This section of the report discusses response time from current stations. Response time and travel time from each station, when coupled with demand for service, are the appropriate drivers for making deployment decisions.

Dispatch time is the difference between the unit dispatch time and call received time of the first arriving unit. *Turnout time* is the difference between the unit time en route and the unit dispatch time. ***The fire department has the greatest control over these segments of the total response time.*** *Travel time* is the time interval that initiates when the unit is en route to the call and ends when the unit arrives at the scene. Response time (or total response time) is the time interval that begins when the call is received by the primary dispatch center and ends when the dispatched unit arrives on the scene to initiate action.

Most jurisdictions report all available response data at the mean or average. While the average provides easily understood statistics, a more conservative and stricter measure of total response time is the 90th percentile measurement. Simply explained, for 90 percent of calls, the first unit arrives within a specified time. A less conservative measure of typical performance is the average. For comparative purposes, the average (mean) in a normal distribution of data will be represented near the 50th percentile. The average is more susceptible to influence from outliers such as zero response times (walk-ins) and delayed responses, so the average will generally reside between the 40th and 60th percentiles.

According to NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments,* 2010 Edition, where the primary public safety answering point is the communications center, the alarm processing time or dispatch time should be less than or equal to 60 seconds 90 percent of the time.[14] This standard also states that the turnout time should be less than or equal to 60 seconds for emergency medical services 90 percent of the time, and travel time shall be less than or equal to 240 seconds for the first responder basic life support (BLS) 90 percent of the time. The standard further states that the travel times for advanced life support (ALS) service should be 480 seconds 90 percent of the time. Fire responses are afforded an additional 20 seconds (80 seconds) for turnout time due to the impact of donning personal protective gear prior to beginning the travel segment while maintaining the same dispatch and travel requirements as the BLS EMS recommendations. Lastly, the standard states the fire department shall have the capability to deploy an initial first alarm assignment within a 480- second travel time.

The NFPA 1710 response time criterion is utilized by CPSM as a benchmark for service delivery and in the overall staffing and deployment of a fire department. It is not a CPSM recommendation as a single criterion. There are several factors as discussed in this report that CPSM recommends be included in staffing and deployment decisions, such as understanding the fire risk and incident demand of the community, travel times from fire facilities, unit workload, and critical tasking. The

[14] NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments,* 2010 Edition, 7.

MBFD has captured these criteria and others through the development and implementation of a Standards of Response Cover document and as an accredited agency.

Table 9 depicts average dispatch, turnout, travel, and total response times of first arriving MBFD units for fire and EMS category calls. Table 10 depicts the 90th percentile response time (NFPA 1710 benchmark).

TABLE 9: Average Response Time Components of First Arriving Unit, in Minutes

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	0.8	1.6	3.0	5.5	1,462
Seizure and unconsciousness	0.8	1.5	3.0	5.3	1,668
Breathing difficulty	0.8	1.7	3.0	5.5	1,274
Overdose and psychiatric	0.9	1.7	3.3	5.9	161
MVA	0.5	1.5	3.1	5.2	406
Fall and injury	0.7	1.7	3.1	5.4	2,154
Illness and other	0.8	1.6	3.1	5.5	8,020
EMS Total	**0.8**	**1.6**	**3.1**	**5.5**	**15,145**
Structure fire	0.8	1.7	2.6	5.1	67
Outside fire	1.0	1.7	3.0	5.8	97
Hazard	1.0	1.7	3.4	6.1	371
False alarm	0.6	1.6	3.8	6.0	3,321
Good intent	0.9	1.9	2.8	5.6	140
Public service	1.0	1.7	3.9	6.6	1,055
Fire Total	**0.8**	**1.6**	**3.7**	**6.1**	**5,051**
Total	**0.8**	**1.6**	**3.2**	**5.6**	**20,196**

TABLE 10: 90th Percentile Response Time Components of First Arriving Unit, in Minutes

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	1.4	2.5	4.7	7.5	1,462
Seizure and unconsciousness	1.5	2.4	4.7	7.3	1,668
Breathing difficulty	1.4	2.6	4.7	7.5	1,274
Overdose and psychiatric	1.6	2.5	4.6	7.6	161
MVA	1.2	2.5	5.4	8.0	406
Fall and injury	1.3	2.6	4.8	7.6	2,154
Illness and other	1.4	2.5	4.8	7.6	8,020
EMS Total	**1.4**	**2.5**	**4.8**	**7.6**	**15,145**
Structure fire	1.4	2.4	3.9	7.2	67
Outside fire	2.0	2.9	5.4	8.4	97
Hazard	1.8	2.7	5.9	8.9	371
False alarm	1.2	2.4	6.5	9.0	3,321
Good intent	1.5	2.8	4.7	7.6	140
Public service	1.9	2.7	6.7	10.2	1,055
Fire Total	**1.4**	**2.5**	**6.4**	**9.2**	**5,051**
Total	**1.4**	**2.5**	**5.2**	**8.0**	**20,196**

When comparing average response time components with the 90th percentile components, the following is observed:

- The average dispatch time was 0.8 minutes.
  - The 90th percentile dispatch time was 1.4 minutes.
- The average turnout time was 1.6 minutes.
  - The 90th percentile turnout time was 2.5 minutes.
- The average overall travel time was 3.2 minutes.
  - The 90th percentile overall travel time was 5.2 minutes.
- The average response time for EMS calls was 5.5 minutes.
  - The 90th percentile response time for EMS calls was 7.6 minutes.
- The average response time for fire category calls was 6.1 minutes.
  - The 90th percentile response time for fire category calls was 9.2 minutes.
- The average travel time for structure fire calls was 2.6 minutes.
  - The 90th percentile travel time for structure fire calls was 3.9 minutes.

- The average travel time for EMS calls was 3.1 minutes.
    - The 90th percentile travel time for EMS calls was 4.8 minutes.

In every example above, at the 90th percentile there is a gap between the NFPA 1710 benchmark and what is actually occurring in Miami Beach. Dispatch time is only slightly higher at the 90th percentile; however, turnout time at the 90th percentile is more than one minute in excess of the 1710 benchmark. Although overall travel time exceeds the 90th percentile benchmark, the benchmark is met for structure fires and is only slightly higher for EMS calls for service, which is expected due to the high EMS demand in some areas of the city. ***It is recommended that the MBFD in conjunction with the emergency communications center, continue with its comprehensive performance-based management strategy for all elements of response time, and focus on continuous improvement in dispatch and turnout times, as these are most controllable from a human perspective.***

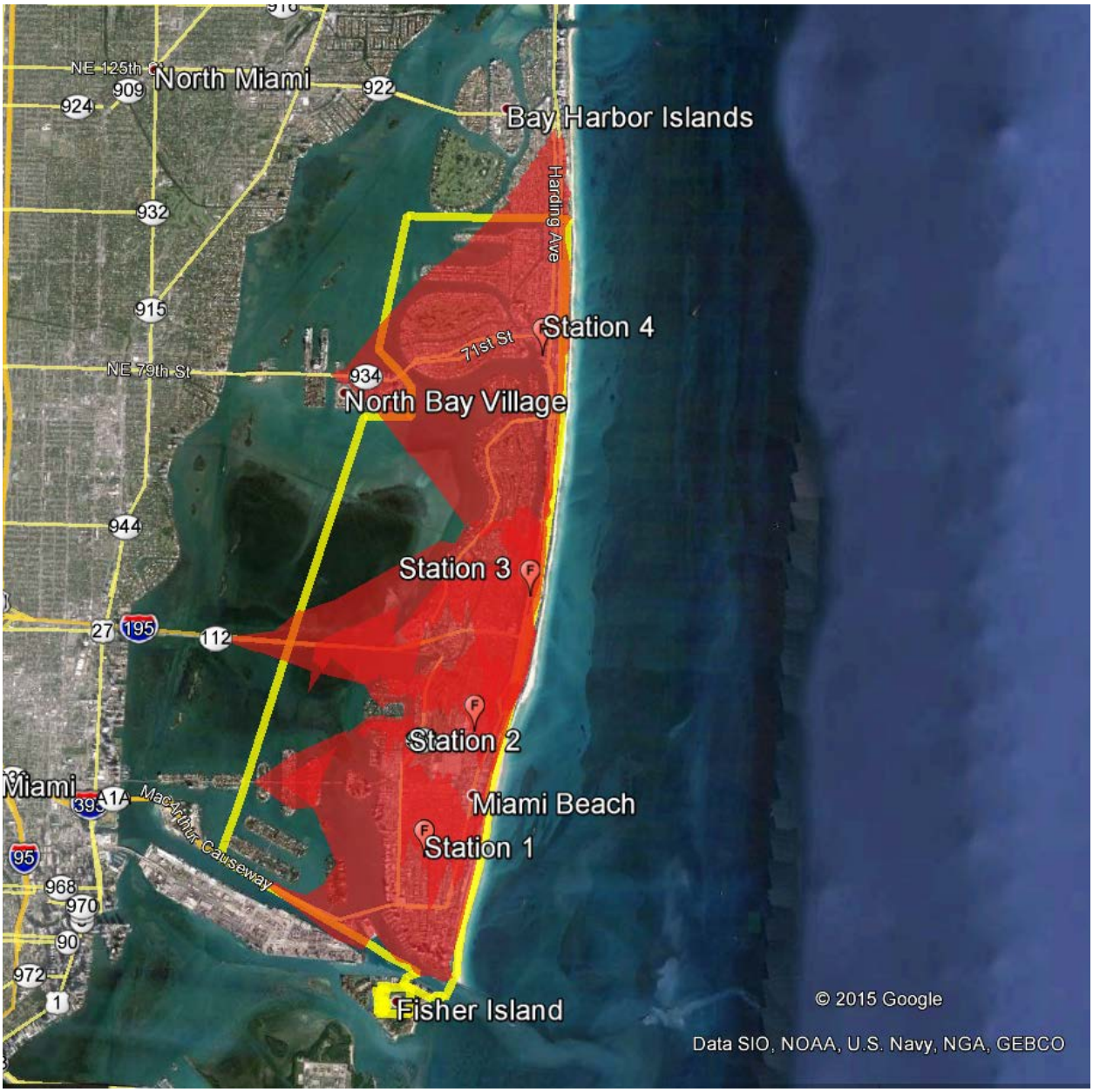
Current Station and Response Time Analysis

The location of responding units is one important factor in response time; reducing response times, which is one of the key performance measures in determining the efficiency of department operations, is often dependent on this factor. A community with a network of several responding fire stations seeks to optimize coverage with short travel distances while giving special attention to natural and manmade barriers and response routes that can create response-time problems.[15]

Travel time is analyzed further through geographic information system (GIS) mapping, as illustrated in the next set of figures. Figures 12 and 13 utilize GIS mapping to illustrate response time probabilities, showing 240-second and 480-second travel time bleed comparisons, respectively (which are NFPA 1710 benchmarks). These comparisons are made by using the existing road network from each MBFD fire station.

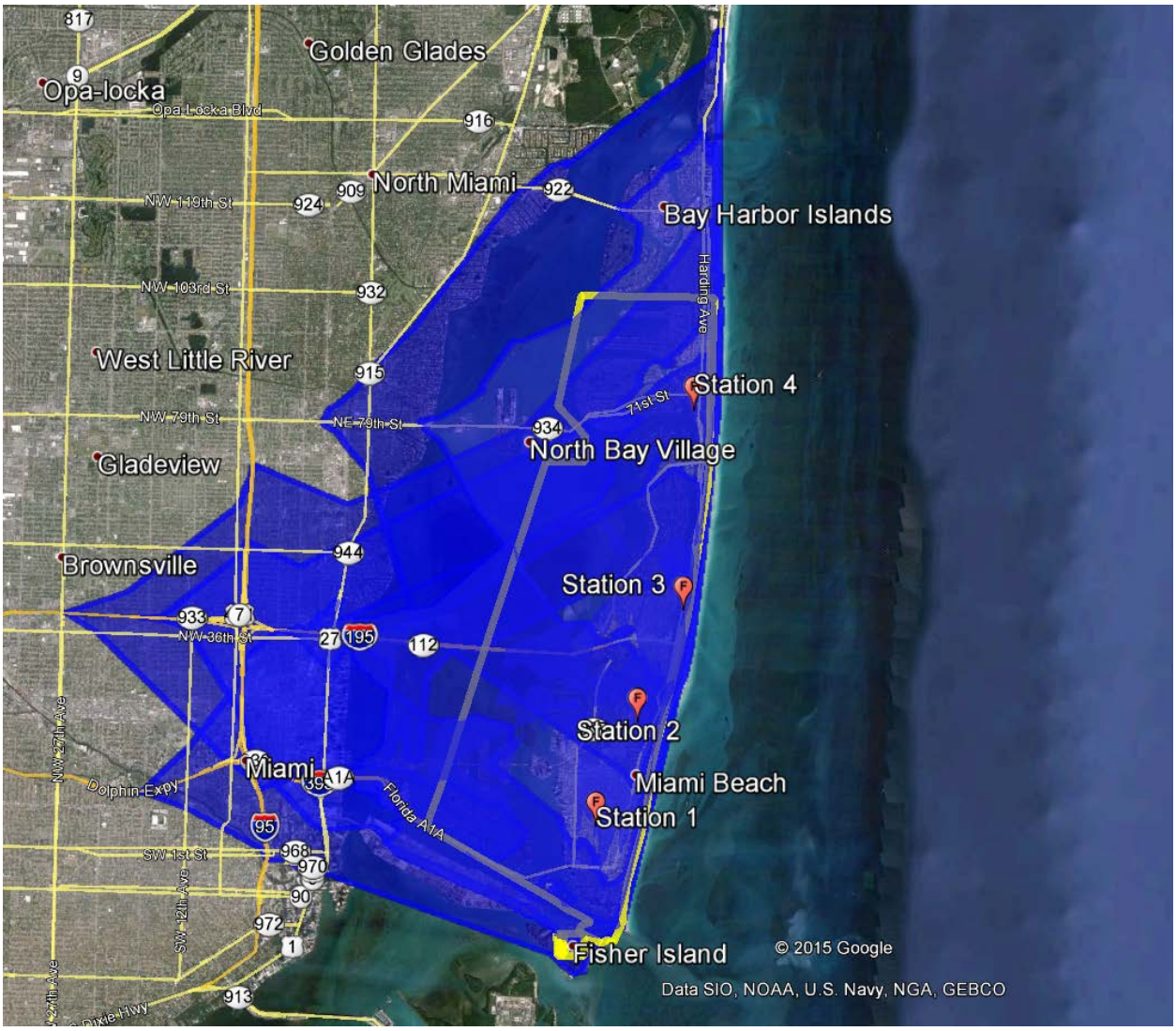
[15] NFPA 1710, 122.

Figure 12: 240-Second Travel Time Bleeds–Stations 1, 2, 3, 4



Within the current station deployment system of the MBFD, one can see in Figure 12 that at the 240-second travel time, the city is nearly 100 percent covered.

Figure 13: 480-Second Travel Time Bleeds–Stations 1, 2, 3, 4



Within the current station deployment system of the MBFD, one can see in Figure 13 that at the 480-second travel time, the city is 100 percent covered.

The next set of maps links demand to travel times. Figure 14 overlays the 240-second travel time bands over fire demand and Figure 15 overlays the 480 second travel time bands over fire demand. Again, this shows excellent travel times from each station when measured against these benchmarks. Linking EMS demand to travel times illustrates the same results, as indicated in Figures 16 and 17.

Figure 14: 240-Second Travel Time Bleeds and Fire Demand, Stations 1, 2, 3, 4

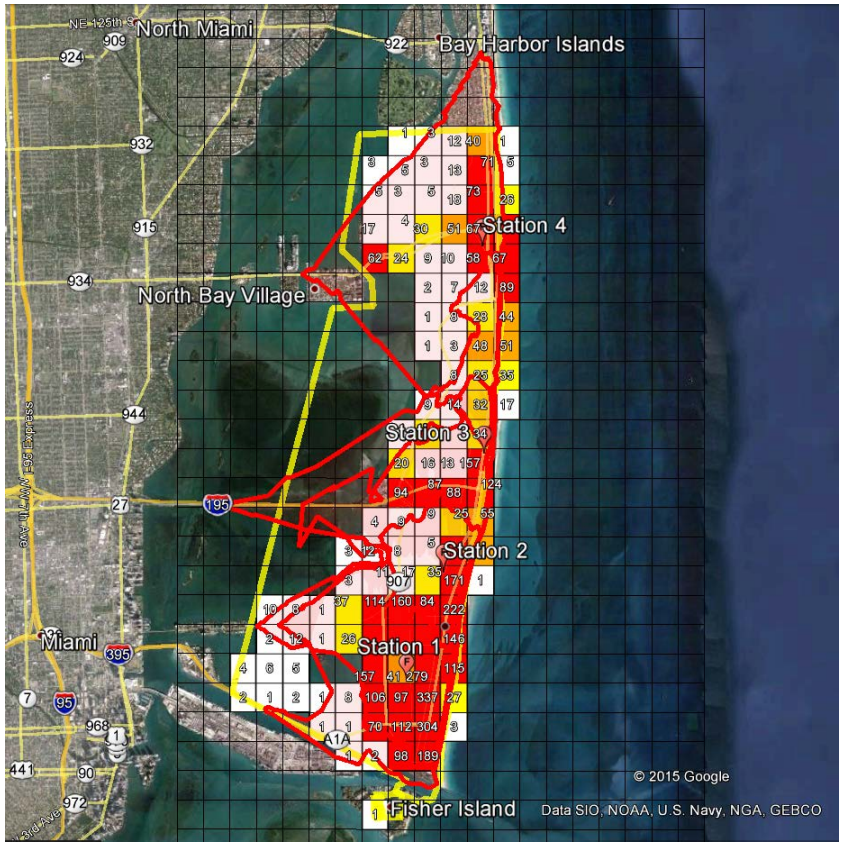


Figure 15: 480-Second Travel Time Bleeds and Fire Demand, Stations 1, 2, 3, 4

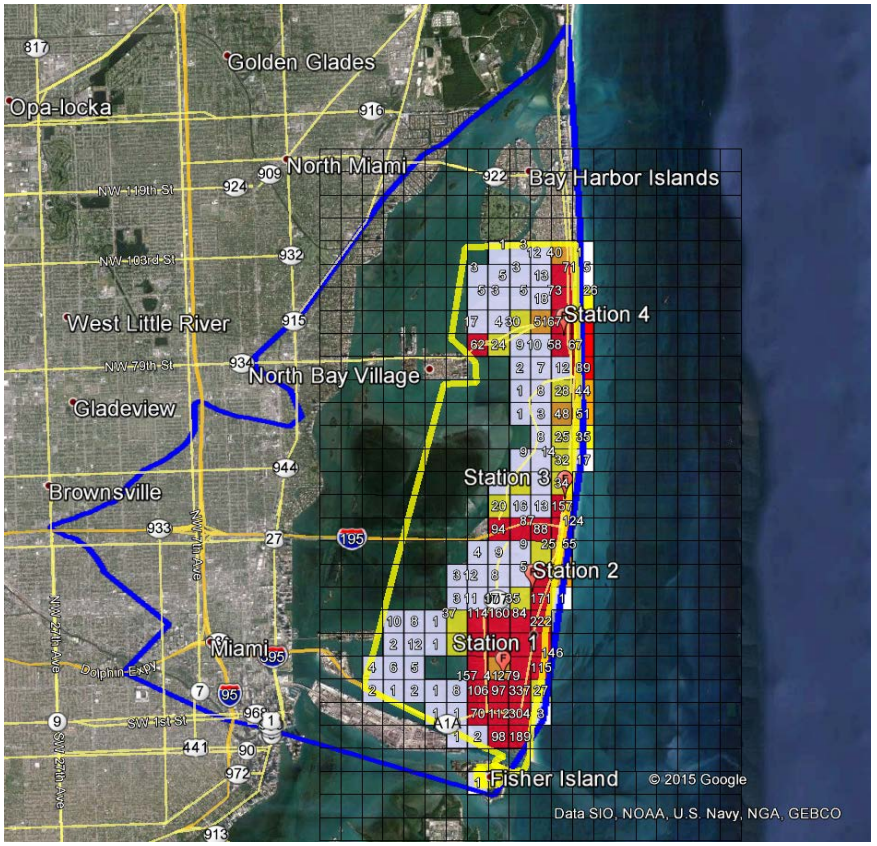


Figure 16: 240-Second Travel Time Bleeds and EMS Demand, Stations 1, 2, 3, 4

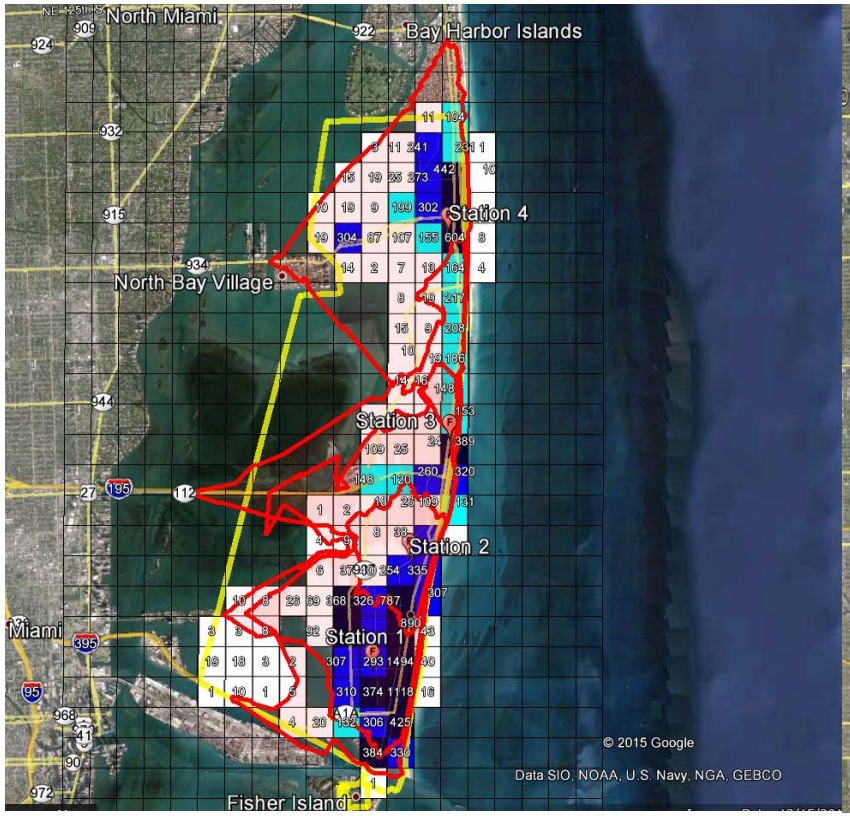
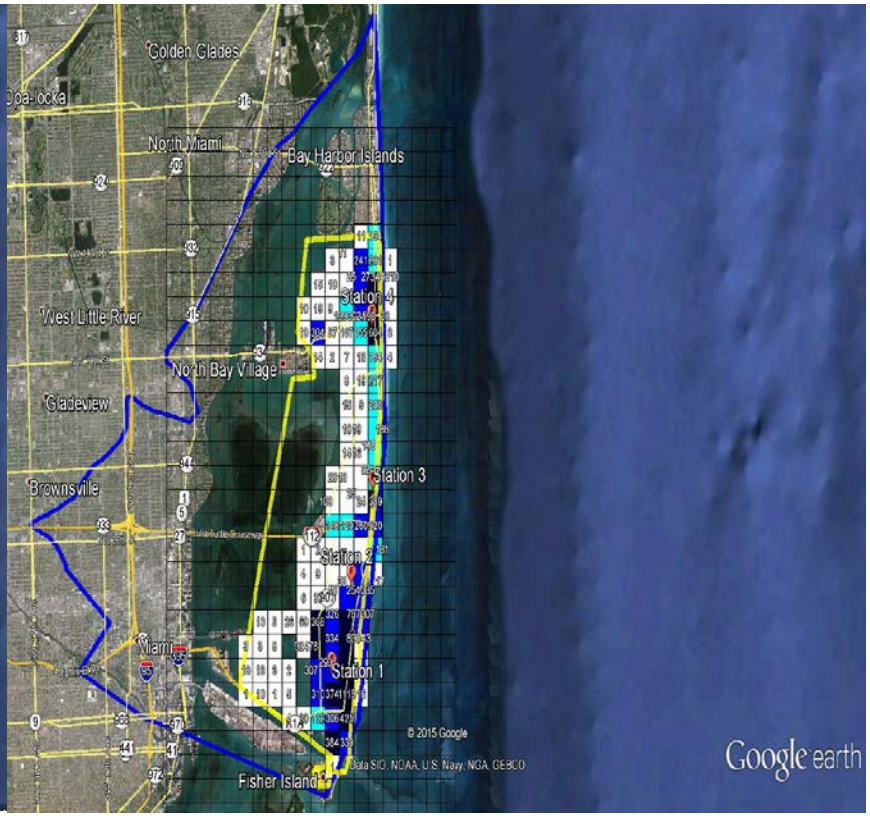


Figure 17: 480 Second Travel Time Bleeds and EMS Demand, Stations 1, 2, 3, 4



Staffing and Deployment Considerations

The MBFD, through its Standards of Response Cover, which includes a risk assessment and critical tasking components, combined with its historical assessment of demand in neighborhoods and city commercial and industry locations, places predetermined amounts of personnel, equipment, and apparatus at the scene of any emergency to ensure life safety, property conservation, and incident stabilization. To accomplish this response to calls for service, the MBFD staffs pumpers (engines) and ladders (aerial apparatus) each with a minimum staff of four. Analysis in this report and a review of the Standards of Response Cover document suggests that four-person staffing is appropriate for the critical tasks required to mitigate the associated risks in the city and ***CPSM does not recommend a change to this model.*** This model allows for the required surge capacity an urban department such as Miami Beach's needs to effectively mitigate fire and other calls for service.

The MBFD provides a level of hazardous material (first responder response and mitigation) and technical rescue response through the Florida Urban Search and Rescue program. These programs are not centralized so that the appropriate coordination, unit training, and equipment inventory management can effectively occur. While there are hazardous materials and technical rescue specialty teams available from the city of Miami and Miami-Dade County, the MBFD should be poised to adequately assess and effectively begin mitigation efforts of these types of incidents in the short term until more robust resources arrive. As such, ***CPSM recommends these programs and equipment be centralized at station 3, where the demand for service is the least in the city, so that the programs can be further coordinated and expanded to meet the identified risk in the MBFD Standards of Response Cover document. CPSM further recommends the air unit apparatus be relocated from station 2 to station 3, be adequately equipped with first response HazMat and appropriate level of technical rescue equipment and be available to respond as a squad unit and continue to support the breathing air capability as well. CPSM does not recommend staffing the squad/air unit 24/7 with a separate crew, but rather recommends that the MBFD cross-staff this unit with a crew from station 3 when this unit is needed for response. Future staffing of this unit should be based on demand for these types of service and a measured effectiveness of the cross-staffing model.***

The demand for emergency medical services is high as depicted in the tables and figures in this report. In the highest demand areas the MBFD aptly deploys two rescues from two of its stations (1 and 2). Station 3 has the lowest demand and currently is able to maintain effective service with one rescue. Station 4 has high demand in certain demand blocks and which is on par with demand blocks in the southern portion of the city. Planned redevelopment in the northern area of the city where station 4 is located potentially will drive demand up even higher. For this reason ***CPSM recommends the MBFD begin to plan now for the deployment of a second rescue from station 4. The deployment of this additional resource should be based on current and future demand, future redevelopment and population growth, and maintaining effective response times for EMS transport units.***

The city of Miami Beach is located on a series of natural and man-made barrier islands between the Atlantic Ocean and Biscayne Bay, which many miles of coastline in the city and accompanying piers, structures, and nautical vessels (some inhabited), all of which require unique response capabilities to mitigate EMS and fife services. ***While there are regional nautical vessel emergency response assets available from the city of Miami and Miami-Dade County, due to its extensive and built-upon coastline, the city of Miami Beach should begin now to plan for an adequate EMS and fire services nautical response vessel. This vessel should be capable of delivering sufficient crew members and firefighting capability as an initial response unit. CPSM does not recommend staffing this unit 24/7, but rather recommends the MBFD cross-staff this unit with a rescue crew from station 4, linking this nautical asset staffing with the additional rescue unit staffing discussed herein. With the addition of an additional rescue unit at station 4, if needed the nautical EMS and fire services unit can be deployed by one of the two rescue crews at station 4, leaving two crews (engine and rescue) for land deployment of resources.***

Conclusion

The Miami Beach Fire Department provides emergency medical and fire services to the citizens and visitors of the city of Miami Beach, and to neighboring jurisdictions when requested, through a career fire and EMS department. CPSM found the service provided by the MBFD to be professional and respected in the community and within the region. The fire chief and his senior staff are quite knowledgeable, experienced, and engaged in the betterment of the department and in continuous improvement of services provided. Services provided beyond the typical fire and EMS service delivery include ocean rescue, fire prevention and investigation, specialty response services to include the Florida Urban Search and Rescue program, fleet maintenance, supply-chain-management, and training and education.

The MBFD is an accredited agency through the Center for Public Safety Excellence, which is a national best practice. As such, CPSM found the MBFD internal planning elements such as strategic and succession planning to be appropriate and well done. In fact, the Standards of Response Cover document developed by the MBFD is the most comprehensive reviewed to date by CPSM. In terms of the organization's structure, CPSM does recognize the need to better manage the organization through aligning operations-based divisions and programs under a senior operations position, and has made a recommendation to support this organizational change.

CPSM found that staffing and deploying of resources is consistent with an urban, densely populated, and vertical city such as Miami Beach. The deployment and staffing of resources matches the identified risk and is designed to provide the surge capacity needed in an urban/vertical response area. EMS calls for service demand is such that CPSM recommends planning for an additional EMS transport unit (rescue) to be deployed from station 4. Other asset planning and relocation to provide specific and specialty response services are identified and have accompanying recommendations.

Recommendations for consideration are listed below in the order they appear in the report. CPSM recognizes there may be recommendations and considerations offered that have to be budgeted for, and/or for which processes must be developed prior to implementation. These recommendations are based on best practices derived from the National Fire Protection Association, Center for Public Safety Excellence, CPSM, U.S. Fire Administration, International Association of Emergency Managers, and the Federal Emergency Management Agency (FEMA), to name a few, as well as the knowledge of CPSM reviewers. Supporting information for these recommendations is detailed within the report.

Considerations and Recommendations

- With a view toward balancing the management and leadership of the organization, the fire chief discussed with CPSM project staff a proposed organizational chart that upgrades the division chief of operations to an assistant chief level position, and that further aligns like program and division functions more appropriately for an organization the size of the MBFD. This proposed organizational structure aligns all operational divisions under the assistant chief of operations and all administrative and support divisions under the current assistant chief of operations. There is also one additional proposed title change, and this is to change the current executive office associate I to administrative manager, and also vest this position with the responsibility of ensuring standards and accreditation compliance.

  This type of organizational structure is a more contemporary and necessary approach to managing a complex and accredited fire-EMS department such as the MBFD. There are no additional positions associated with the proposed organizational structure change. There are some salary and benefit costs associated with the two proposed title and job description/responsibility upgrades; however, CPSM supports and recommends these changes, as they provide continuous improvement to the organization; they functionally align programs and divisions for a more effective and accountable organizational management and leadership structure; and they put in place the best practice commitment of a dedicated resource to ensure the agency's accreditation and standards are complied with and maintained.

- CPSM supports transitioning the fire prevention division to field electronic inspection reporting. Utilizing a paper-based system to track and record fire prevention inspections, violations, and corrective actions creates inefficiency and ineffectiveness.

  Therefore, it is recommended the fire prevention division transition to an efficient, automated records management system for fire prevention and code enforcement activities.

- The MBFD has developed a draft succession plan. This plan is designed to prepare the organization for pending retirements and to successfully prepare and transition employees into promoted positions. The plan is further designed to ensure staff is trained and capable to fill any vacant position that occurs in the department. This includes any civilian, specialty, and officer position.

  CPSM commends the agency for proactively developing the draft succession plan and recommends the plan be formalized and implemented in its entirety for continuous organizational improvement.

- CPSM recommends the MBFD follow the current and effective heavy fire apparatus and EMS transport unit replacement schedule. By doing so, the fleet will be sustained and ready for response, and the department will avoid costly repair and maintenance costs caused by overextending frontline service vehicles and will also avoid the impact of replacing these vehicles all at once as opposed to a planned and properly budgeted replacement process.

- CPSM recommends the city continue to programmatically and fiscally support the maintenance, repair, and, when needed, the renovation of stations 2, 3, and 4. With regards to station 1, CPSM further recommends the city consider the most efficient and effective option (complete renovation or replacement) as determined through internal and external engineering and architectural analysis, and as funding may allow.
- The impacts of growth on fire and emergency medical services vary; however, as population increases generally the calls for service increase, primarily with regards to EMS. CPSM recommends the MBFD stay focused on the city's growth and the type of growth/construction that is occurring with regard to the risk this growth may or may not create, the attendant population increase, and subsequent call demand in the city, as these factors should correlate directly to future deployment of services.
- The MDFD's travel and response times experience at the 90th percentile shows there is a gap between the NFPA 1710 benchmark and what is actually occurring in Miami Beach. Dispatch time is only slightly higher at the 90th percentile; however, turnout time at the 90th percentile is more than one minute in excess of the 1710 benchmark. Although overall travel time exceeds the 90th percentile benchmark, the benchmark is met for structure fires and is only slightly higher for EMS calls for service, which is expected due to the high EMS demand in some areas of the city. It is recommended that the MBFD, in conjunction with the emergency communications center, continue with its comprehensive performance-based management strategy for all elements of response time, and focus on continuous improvement in dispatch and turnout times, as these are most controllable from a human perspective.
- Analysis in this report and our review of the Standards of Response Cover document suggest that four-person staffing is appropriate for the critical tasks required to mitigate the associated risks in the city, and CPSM does not recommend a change to this model. This model allows for the required surge capacity a department such as Miami Beach's needs to effectively mitigate fire and other calls for service.
- CPSM recommends the hazardous materials and technical rescue programs and equipment be centralized at station 3, where the demand for service is the least in the city, so that the programs can be further coordinated and expanded to meet the identified risk in the MBFD Standards of Response Cover document. CPSM further recommends the air unit apparatus be relocated from station 2 to station 3, be adequately equipped with first response HazMat and appropriate level of technical rescue equipment and be available to respond as a squad unit and continue to support the breathing air capability as well. CPSM does not recommend staffing the squad/air unit 24/7 with a separate crew, but rather recommends that the MBFD cross-staff this unit with a crew from station 3 when this unit is needed for response. Future staffing of this unit should be based on demand for these types of service and a measured effectiveness of the cross-staffing model.
- CPSM recommends the MBFD begin to plan now for the deployment of a second rescue from station 4. The deployment of this additional resource should be based on current and future

demand, future redevelopment and population growth, and maintaining effective response times for EMS transport units.

- While there are regional nautical vessel emergency response assets available from the city of Miami and Miami-Dade County, due to its extensive and built-upon coastline, the city of Miami Beach should begin now to plan for an adequate EMS and fire services nautical response vessel. This vessel should be capable of delivering sufficient crew members and firefighting capability as an initial response unit. CPSM does not recommend staffing this unit 24/7, but rather recommends the MBFD cross-staff this unit with a rescue crew from station 4, linking this nautical asset staffing with the additional rescue unit staffing discussed herein. With the addition of an additional rescue unit at station 4, if needed the nautical EMS and fire services unit can be deployed by one of the two rescue crews at station 4, leaving two crews (engine and rescue) for land deployment of resources.

Appendix I: Data and Workload Analysis

Introduction

This data analysis was prepared as a key component of the study of the Miami Beach Fire Department (MBFD), which was conducted by the Center for Public Safety Management, LLC. This analysis examines all calls for service between Oct. 1, 2013, and Sept. 30, 2014, as recorded in the communication center.

This analysis is divided into five sections:

- The first section focuses on call types and dispatches.
- The second section explores time spent and workload of individual units.
- The third section presents an analysis of the busiest hours in a year.
- The fourth section provides a response time analysis of MBFD units.
- The fifth section primarily analyzes EMS transports.

During the period covered by this study, the department operated out of four stations. The department deploys six rescue units, four engines, two ladders, one EMS supervisor vehicle, and one division chief vehicle, 24 hours a day, 7 days a week. When needed, the department utilizes one support air truck and five gators. For special events, the department staffed paid on-call firefighters on additional units.

During the study period, the department responded to 23,693 calls, of which 74.5 percent were EMS calls. The total combined yearly workload (deployed time) for all MBFD units was 12,506 hours. The average estimated dispatch time of the first arriving MBFD unit was 0.8 minutes and the average response time of the first arriving MBFD unit was 5.6 minutes. The 90th percentile dispatch time was 1.4 minutes and the 90th percentile response time was 8.0 minutes. The department provided transport service on 7,467 calls, averaging 20.5 transport calls per day. For EMS calls, the transport rate was 42 percent.

Methodology

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

We received CAD data for the Miami Beach Fire Department along with its National Fire Incident Reporting System (NFIRS) data. We first removed incorrectly identified CAD calls — those that had no incident number assigned — and calls to which no MBFD unit responded; this information was reviewed by the fire department. Then, we classified the calls in a series of steps. We first used NFIRS incident type to assign EMS, MVA, fire category, and canceled call types. Then, for NFIRS EMS calls, we used the CAD call description to assign detailed EMS categories. A transport call was

identified by requiring at least one MBFD rescue unit with a recorded unit with an arriving at hospital time; this approach was approved by the fire department to be appropriate.

A total of 264 incidents to which administrative units (fire prevention units and chief units) or off-duty detailed units (staffed by paid on-call firefighters) were the sole responders are not included in the analysis sections of the report. However, the workload of administrative units and off-duty detailed units is documented in Attachment I.

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

In our data validation process, we have noticed **data issues** and recommend the agency address these in future operations:

- When we reviewed the PDF incident reports and CAD data, we noticed that some PDF reports have an earlier call received time recorded compared to the CAD data. MBFD investigated and concluded that the data were captured in a different system and it is technically not possible to extract the data for our analysis. Therefore, we would like to note that the actual response times might be longer than our reported response times.
- Only 1 call out of 243 structure and outside fire calls showed a record of property and content loss information; 12 percent of structure and fire calls do not have recorded actions taken. We recommend the fire department put in place a quality control process on NFIRS incident reports to ensure all relevant information is captured.

Aggregate Call Totals and Dispatches

In this report, each citizen-initiated emergency service request is a call. During the year studied, MBFD responded to 23,693 calls. Of these, 87 were structure fire calls and 156 were outside fire calls within MBFD jurisdiction. Each dispatched unit is a separate "run." As multiple units are dispatched to a call, there are more runs than calls. The department's total runs and workload are reported in the second section.

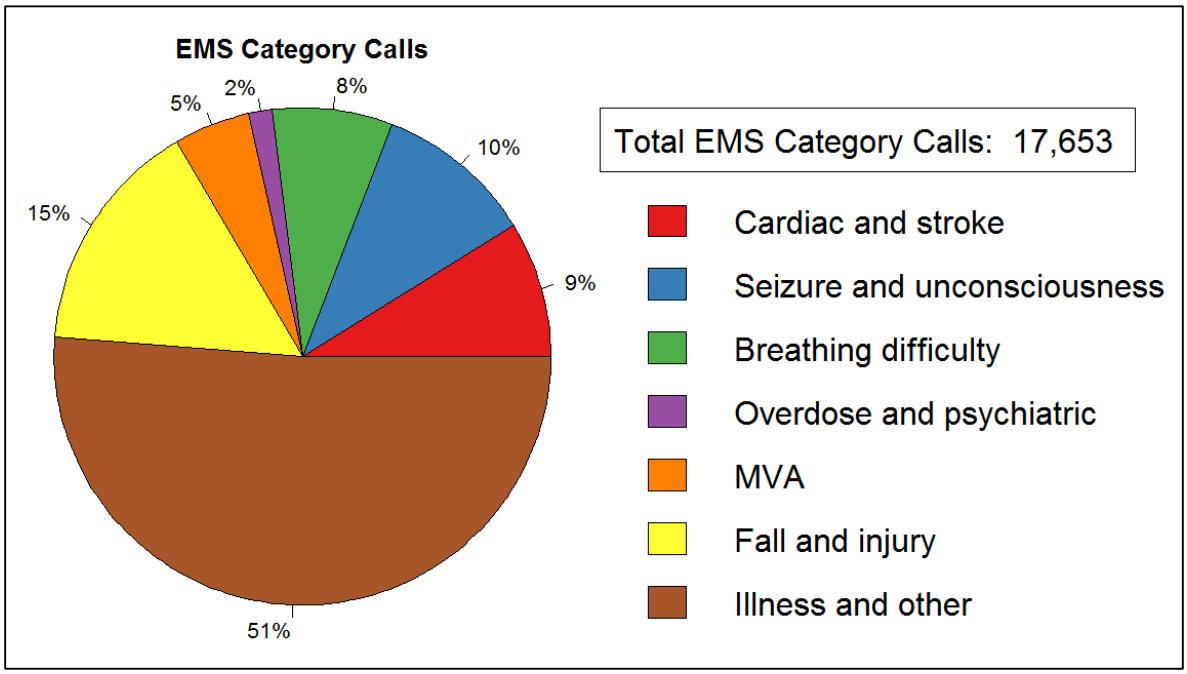
TABLE D-1: Call Types

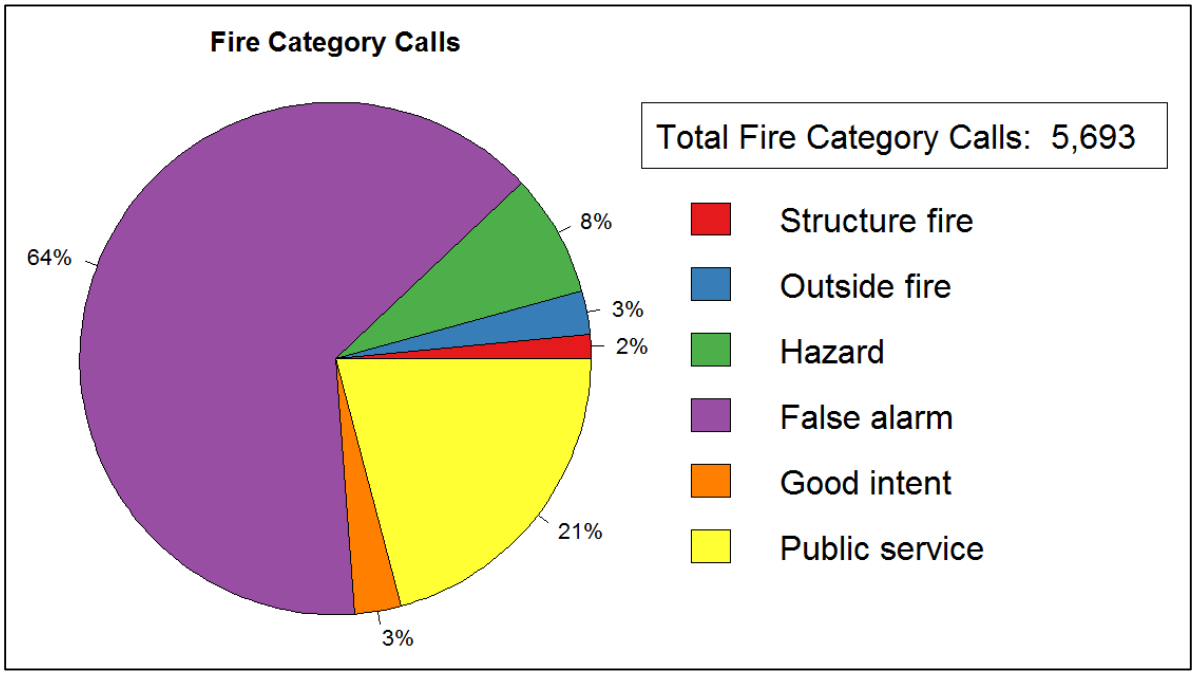
Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	1,556	4.3	6.6
Seizure and unconsciousness	1,821	5.0	7.7
Breathing difficulty	1,377	3.8	5.8
Overdose and psychiatric	270	0.7	1.1
MVA	884	2.4	3.7
Fall and injury	2,701	7.4	11.4
Illness and other	9,044	24.8	38.2
EMS Total	**17,653**	**48.4**	**74.5**
Structure fire	87	0.2	0.4
Outside fire	156	0.4	0.7
Hazard	441	1.2	1.9
False alarm	3,653	10.0	15.4
Good intent	169	0.5	0.7
Public service	1,187	3.3	5.0
Fire Total	**5,693**	**15.6**	**24.0**
Canceled	347	1.0	1.5
Total	**23,693**	**64.9**	**100.0**

Observations:

- The department responded to an average of 64.9 calls per day.
- EMS calls for the year totaled 17,653 (75 percent of all calls), averaging 48.4 calls per day.
- Fire calls for the year totaled 5,693 (24 percent of all calls), averaging 15.6 calls per day.
- Structure and outside fires combined for a total of 243 calls during the year, averaging 0.6 calls per day.
- Canceled calls totaled 347, averaging about one call per day.

FIGURE D-1: EMS and Fire Calls by Type





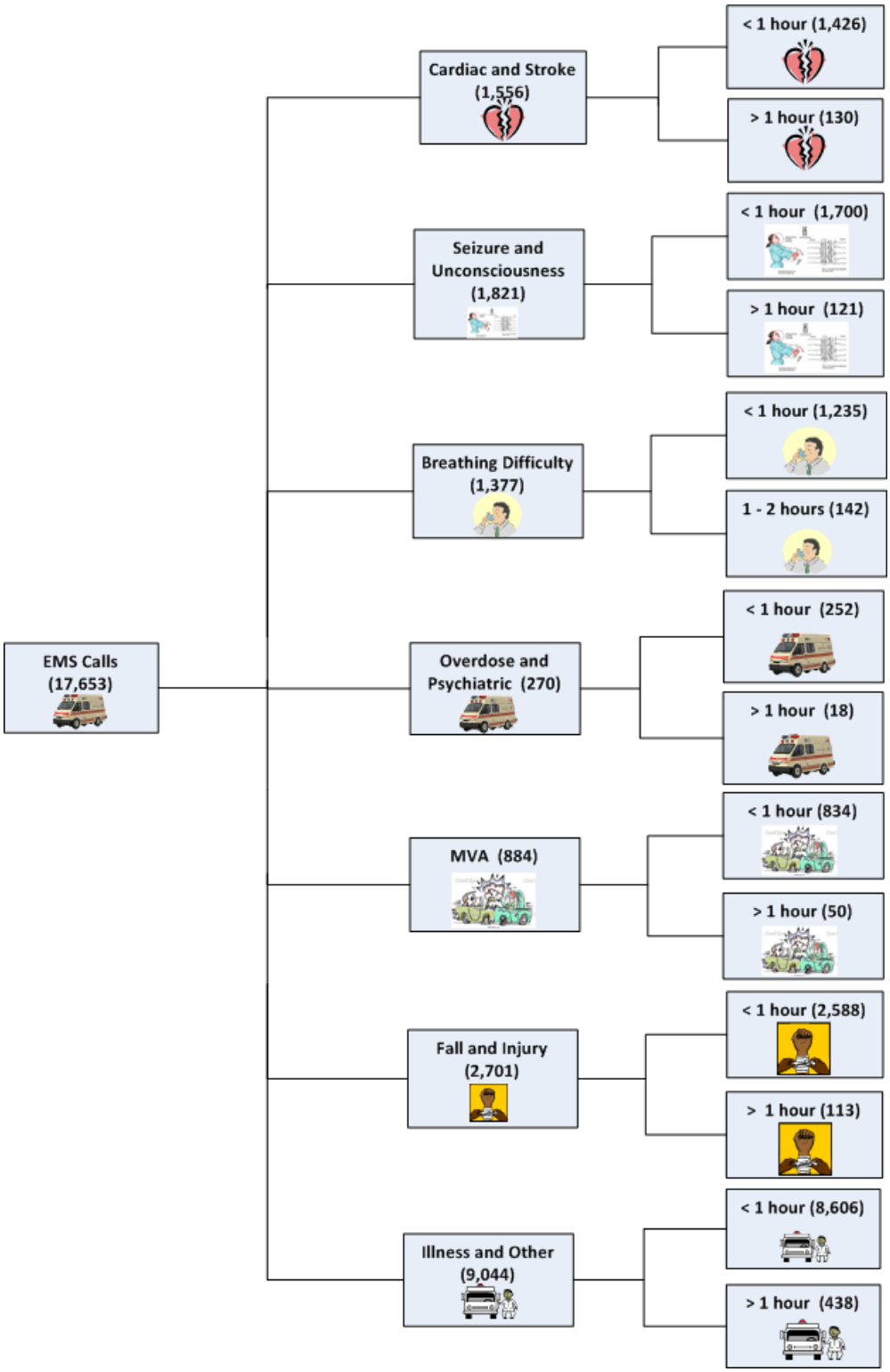
Observations:

- A total of 87 structure fire calls accounted for 2 percent of the fire category total.
- A total of 156 outside fire calls accounted for 3 percent of the fire category total.
- False alarm calls were the largest fire call category, making up 64 percent of the fire category total.
- Illness and other calls were the largest EMS call category and accounted for 51 percent of the EMS category total.
- Cardiac or stroke calls were 9 percent of the EMS category total.
- Motor vehicle accident calls were 5 percent of the EMS category total.

TABLE D-2: Calls by Type and Duration

Call Type	Less than One-half Hour	One-half to One Hour	One to Two Hours	Greater than Two Hours	Total
Cardiac and stroke	610	816	127	3	1,556
Seizure and unconsciousness	914	786	120	1	1,821
Breathing difficulty	561	674	139	3	1,377
Overdose and psychiatric	144	108	18	0	270
MVA	507	327	47	3	884
Fall and injury	1,771	817	107	6	2,701
Illness and other	4,956	3,651	430	7	9,044
EMS Total	**9,463**	**7,179**	**988**	**23**	**17,653**
Structure fire	39	13	25	10	87
Outside fire	113	32	9	2	156
Hazard	297	96	37	11	441
False alarm	3,346	256	48	3	3,653
Good intent	131	30	8	0	169
Public service	998	145	36	8	1,187
Fire Total	**4,924**	**572**	**163**	**34**	**5,693**
Canceled	345	2	0	0	347
Total	**14,732**	**7,753**	**1,151**	**57**	**23,693**

FIGURE D-2: EMS Calls by Type and Duration

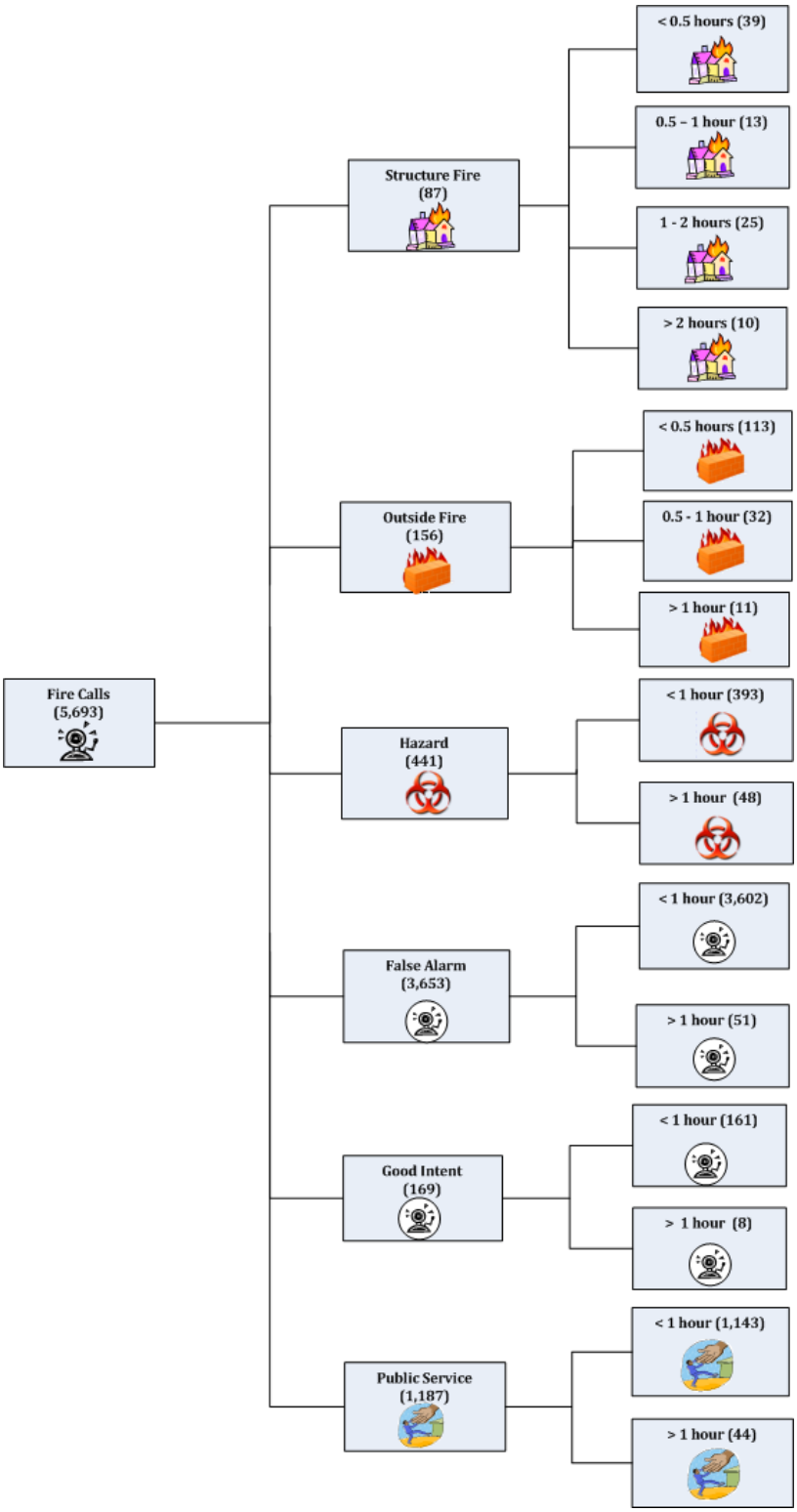


Note: Duration of a call is defined as the longest deployed time of any of the MBFD units responding to the same call.

Observations:

- A total of 9,463 EMS category calls (54 percent) lasted less than half an hour, 7,179 EMS category calls (41 percent) lasted between half an hour and one hour, and 1,011 EMS category calls (6 percent) lasted more than one hour. On average, there were 2.8 EMS category calls per day that lasted more than one hour.
- A total of 1,426 cardiac and stroke calls (92 percent) lasted less than one hour, and 130 cardiac and stroke calls (8 percent) lasted more than an hour.
- A total of 834 motor vehicle accident calls (94 percent) lasted less than one hour, and 50 motor vehicle accident calls (6 percent) lasted more than an hour.

FIGURE D-3: Fire Calls by Type and Duration

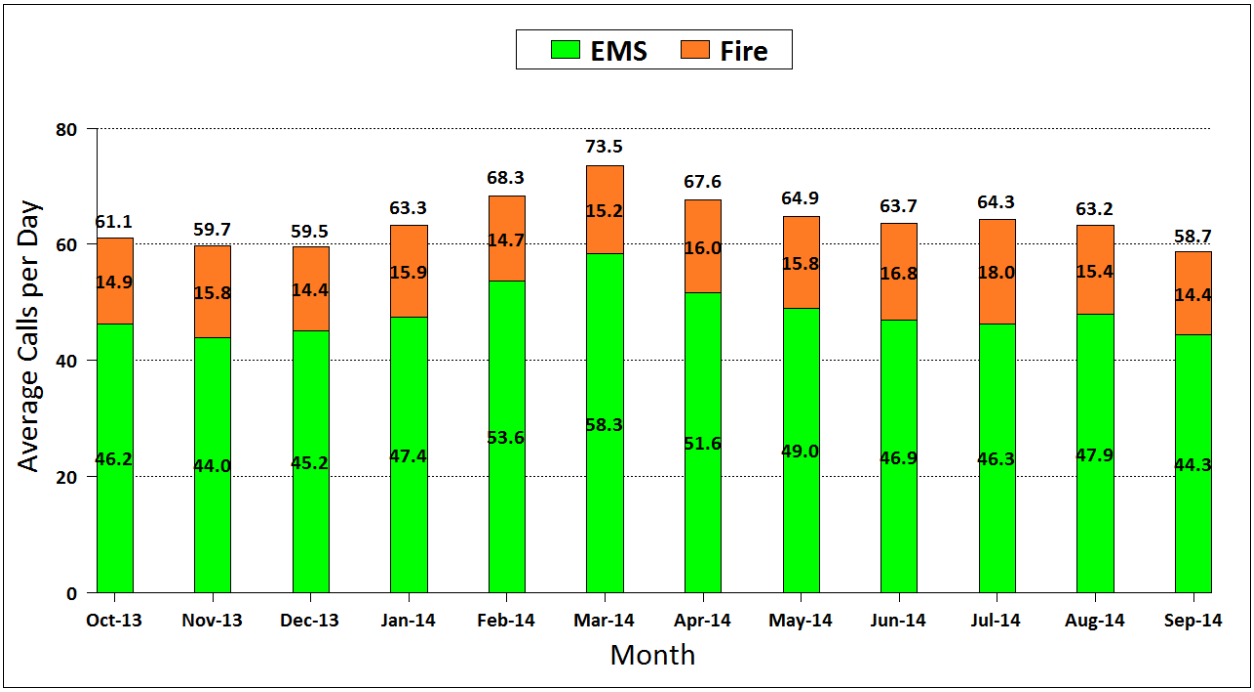


Note: Duration of a call is defined as the longest deployed time of any of the MBFD units responding to the same call.

Observations:

- A total of 5,496 fire category calls (97 percent) lasted less than one hour, 163 fire category calls (3 percent) lasted between one and two hours, and 34 fire category calls (1 percent) lasted more than two hours. On average, there were 0.5 fire category calls per day that lasted more than one hour.
- A total of 52 structure fire calls (60 percent of this category of call) lasted less than one hour, 25 structure fire calls (29 percent) lasted between one and two hours, and 10 structure fire calls (11 percent) lasted more than two hours.
- A total of 145 outside fire calls (93 percent of this category of call) lasted less than one hour, 9 outside fire calls (6 percent) lasted between one and two hours, and 2 outside fire calls (1 percent) lasted more than two hours.
- A total of 3,602 false alarm calls (99 percent of this category of call) lasted less than one hour, and 51 false alarm calls (1 percent) lasted more than an hour.

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



Observations:

- Average calls per day ranged from a low of 58.7 calls per day in September 2014 to a high of 73.5 calls per day in March 2014. The highest monthly average was 25 percent greater than the lowest monthly average.
- Average EMS calls per day ranged from a low of 44.0 calls per day in November 2013 to a high of 58.3 calls per day in March 2014. The highest monthly average was 33 percent greater than the lowest monthly average.
- Average fire calls per day ranged from a low of 14.4 calls per day in December 2013 to a high of 18.0 calls per day in July 2014. The highest monthly average was 25 percent greater than the lowest monthly average.
- The most calls responded to by MBFD in a single day were 105. That occurred on March 30, 2014. On that day, those 105 calls included 85 EMS calls, 1 hazardous condition call, 10 false alarm calls, 7 public service calls, and 2 canceled calls. Of the 85 EMS calls, 4 were cardiac and stroke calls, 12 were seizure and unconsciousness calls, 2 were breathing difficulty calls, 6 were overdose and psychiatric calls, 4 were MVA calls, 12 were fall and injury calls, and 45 were illness and other calls. The second highest total of calls in a single day was 97, which occurred on July 4, 2014.

FIGURE D-5: Calls by Hour of Day

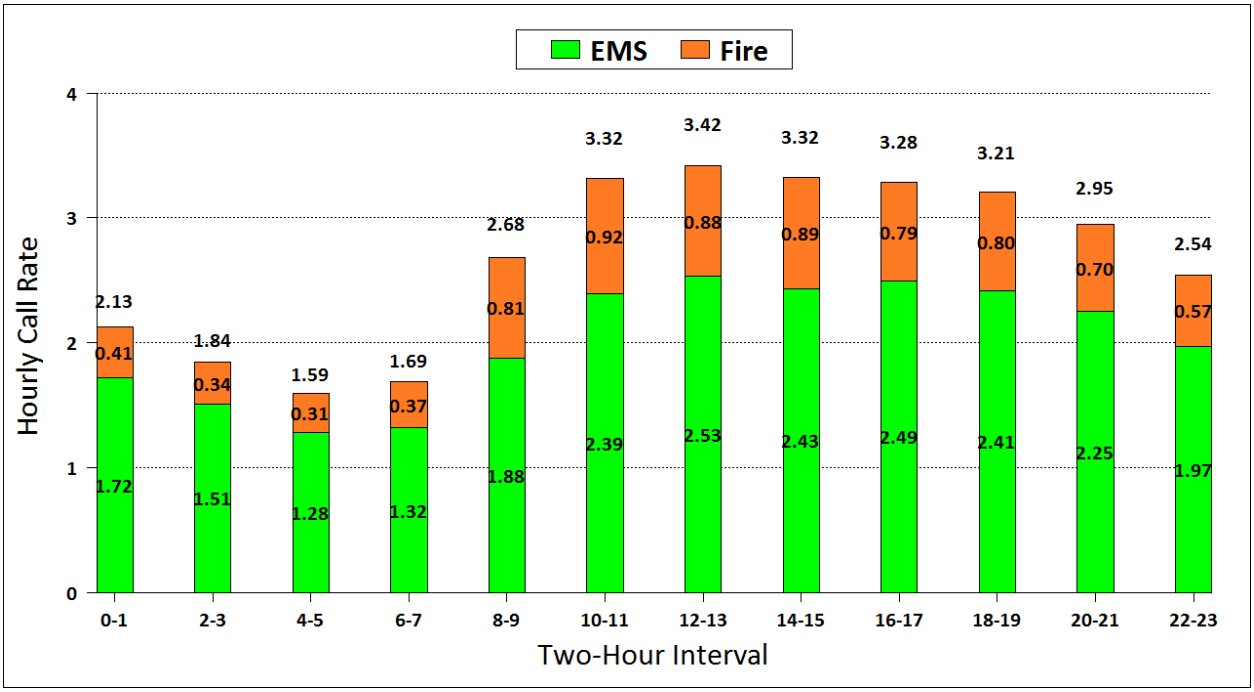


TABLE D-3: Calls by Hour of Day

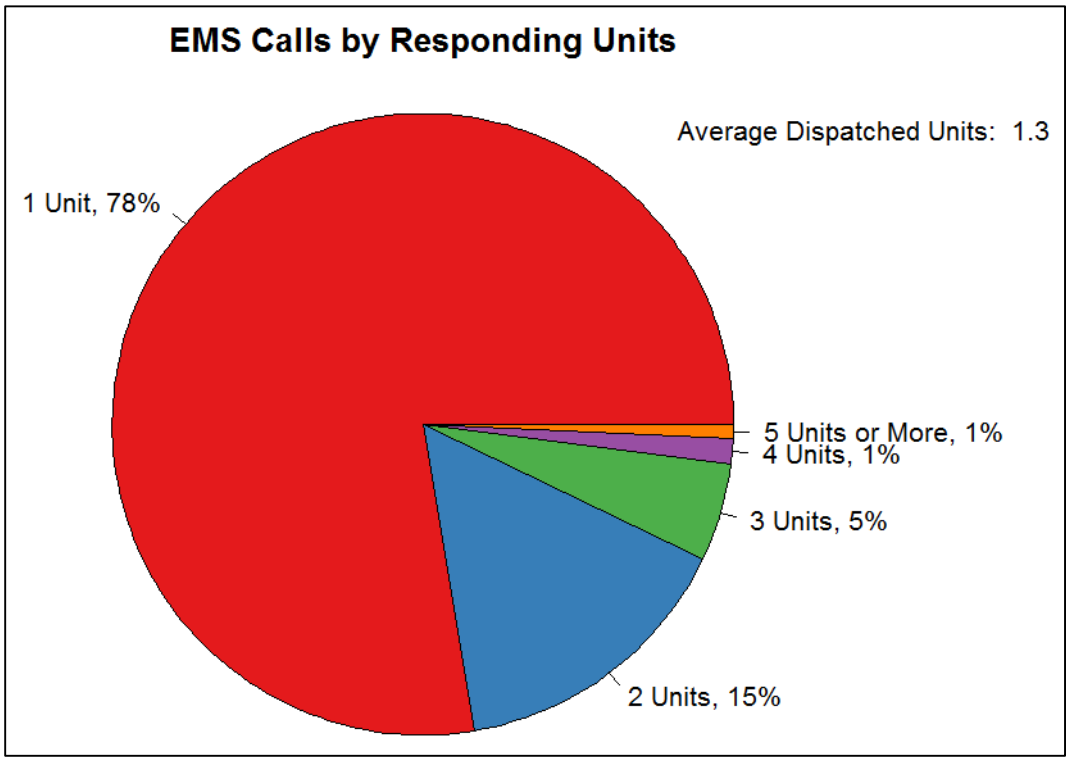
Two-Hour Interval	Hourly Call Rate		
	EMS	Fire	Total
0-1	1.72	0.41	2.13
2-3	1.51	0.34	1.84
4-5	1.28	0.31	1.59
6-7	1.32	0.37	1.69
8-9	1.88	0.81	2.68
10-11	2.39	0.92	3.32
12-13	2.53	0.88	3.42
14-15	2.43	0.89	3.32
16-17	2.49	0.79	3.28
18-19	2.41	0.80	3.21
20-21	2.25	0.70	2.95
22-23	1.97	0.57	2.54
Calls per Day	**48.36**	**15.60**	**63.96**

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

Observations:

- Hourly call rates averaged between 1.59 calls and 3.42 calls per hour.
- Call rates were highest during the day between 8:00 a.m. and midnight, averaging between 2.54 and 3.42 calls per hour.
- Call rates were lowest between 2:00 a.m. and 8:00 a.m., averaging between 1.59 and 1.84 calls per hour.

FIGURE D-6: Number of Units Dispatched to Calls



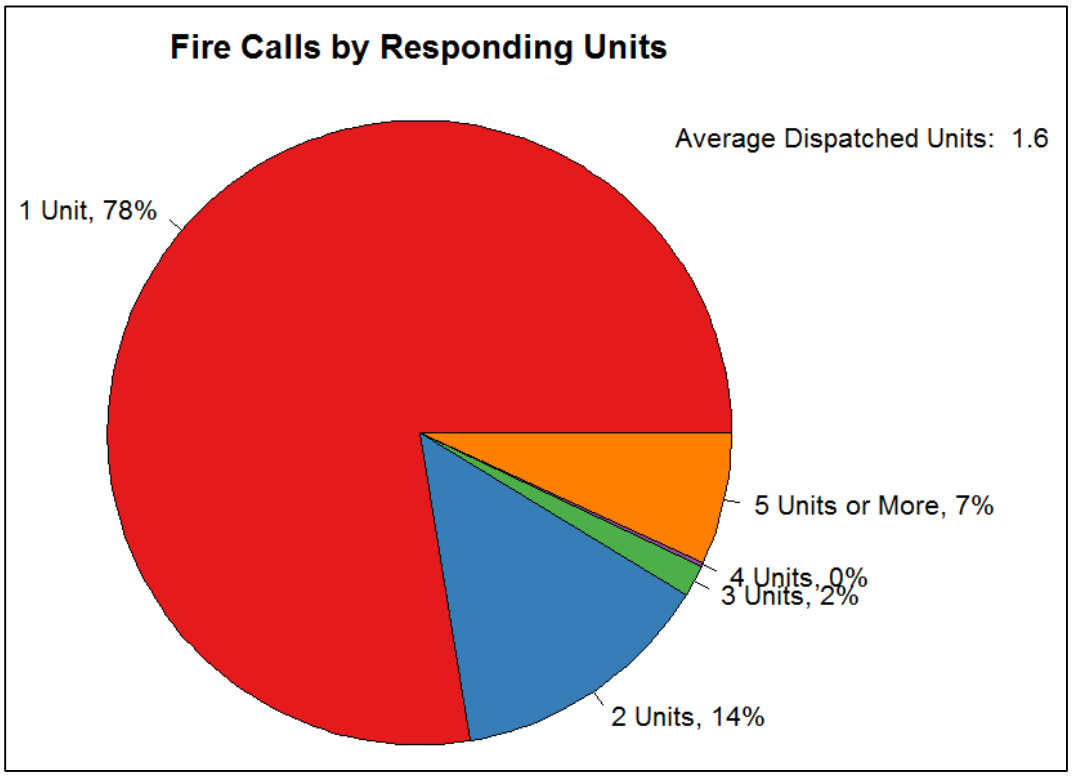


TABLE D-4a: Number of Units Dispatched to EMS Category Calls

Call Type	Number of Units					
	One	Two	Three	Four	Five or more	Total
Cardiac and stroke	1,197	244	96	17	2	1,556
Seizure and unconsciousness	1,416	286	96	19	4	1,821
Breathing difficulty	1,057	193	99	24	4	1,377
Overdose and psychiatric	183	44	27	9	7	270
MVA	420	182	172	75	35	884
Fall and injury	2,125	391	135	26	24	2,701
Illness and other	7,313	1,340	280	55	56	9,044
EMS Total	**13,711**	**2,680**	**905**	**225**	**132**	**17,653**
Percentage	**77.7**	**15.2**	**5.1**	**1.3**	**0.7**	**100.0**

Observations:

- On average, 1.3 units were dispatched per EMS category call. For EMS category calls, one unit was dispatched 78 percent of the time, two units were dispatched 15 percent of the time, three units were dispatched 5 percent of the time, four units were dispatched 1 percent of the time, and five or more units were dispatched 1 percent of the time.

TABLE D-4b: Number of Units Dispatched to Fire Category Calls

Call Type	Number of Units								
	One	Two	Three	Four	Five	Six	Seven	Eight or more	Total
Structure fire	16	1	1	1	0	2	42	24	87
Outside fire	89	30	8	1	0	2	14	12	156
Hazard	248	57	8	3	5	14	85	21	441
False alarm	3,113	447	43	4	0	5	30	11	3,653
Good intent	53	9	5	1	2	10	69	20	169
Public service	897	238	28	3	1	2	17	1	1,187
Fire Total	**4,416**	**782**	**93**	**13**	**8**	**35**	**257**	**89**	**5,693**
Percentage	**77.6**	**13.7**	**1.6**	**0.2**	**0.1**	**0.6**	**4.5**	**1.6**	**100.0**

Observations:

- On average, 1.6 units were dispatched per fire category call. For fire category calls, one unit was dispatched 78 percent of the time, two units were dispatched 14 percent of the time, and three or more units were dispatched 8 percent of the time.
- For structure fire calls, one unit was dispatched 18 percent of the time, two to six units were dispatched 6 percent of the time, seven units were dispatched 48 percent of the time, and eight or more units were dispatched 28 percent of the time.
- For outside fire calls, one unit was dispatched 57 percent of the time, two units were dispatched 19 percent of the time, three to six units were dispatched 7 percent of the time, seven units were dispatched 9 percent of the time, and eight or more units were dispatched 8 percent of the time.

TABLE D-5: Annual Deployed Time by Call Type

Call Type	Average Deployed Minutes per Run	Annual Hours	Percent of Total Hours	Deployed Hours per Day	Annual Number of Runs	Runs per Day
Cardiac and stroke	30.1	1,030	8.2	2.8	2,052	5.6
Seizure and unconsciousness	26.3	1,041	8.3	2.9	2,375	6.5
Breathing difficulty	30.3	937	7.5	2.6	1,856	5.1
Overdose and psychiatric	23.3	169	1.3	0.5	434	1.2
MVA	21.0	628	5.0	1.7	1,795	4.9
Fall and injury	22.2	1,312	10.5	3.6	3,548	9.7
Illness and other	25.2	4,814	38.5	13.2	11,445	31.4
EMS Total	**25.3**	**9,930**	**79.4**	**27.2**	**23,505**	**64.4**
Structure fire	36.8	331	2.6	0.9	541	1.5
Outside fire	18.4	119	0.9	0.3	386	1.1
Hazard	19.0	404	3.2	1.1	1,276	3.5
False alarm	13.8	1,032	8.3	2.8	4,483	12.3
Good intent	13.6	183	1.5	0.5	804	2.2
Public service	17.8	480	3.8	1.3	1,614	4.4
Fire Total	**16.8**	**2,548**	**20.4**	**7.0**	**9,104**	**24.9**
Canceled	3.7	28	0.2	0.1	454	1.2
Total	**22.7**	**12,506**	**100.0**	**34.3**	**33,063**	**90.6**

Note: Each dispatched unit is a separate "run." As multiple units are dispatched to a call, there are more runs than calls. Therefore, the department responded to 64.9 calls per day and had 90.6 runs per day.

Observations:

- Total deployed time for the year was 12,506 hours. The daily average was 34.3 hours per day for all units combined.
- The department made 33,063 runs during the year studied; the daily average was 90.6 runs for all units combined.
- Fire category calls accounted for 20.4 percent of the total workload.
- There were 927 runs for structure and outside fire calls, with a total workload of 450 hours. This accounted for 3.6 percent of the total workload. The average deployed time for structure fire calls was 36.8 minutes, and the average deployed time for outside fire calls was 18.4 minutes.
- EMS calls accounted for 79.4 percent of the total workload. The average deployed time for EMS calls was 25.3 minutes. The deployed hours for all units dispatched to EMS calls averaged 27.2 hours per day.

Workload by Individual Unit – Calls and Total Time Spent

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

TABLE D-6: Call Workload by Unit

Station	Unit Report	Description	Average Deployed Minutes per Run	Annual Hours	Annual Number of Runs	Deployed Minutes per Day	Runs per Day
1	R1	Rescue Zone 1	24.4	1,448	3,557	238.1	9.7
	R11	Rescue Zone 1	27.1	1,509	3,336	248.1	9.1
	E1	Engine Zone 1	15.4	814	3,163	133.8	8.7
	L1	Ladder Zone 1	15.9	268	1,007	44.0	2.8
	G1/G2/G3 /G6/G11	Gator 4WD	15.3	29	115	4.8	0.3
	810	Support Air Truck	42.2	21	30	3.5	0.1
2	R2	Rescue Zone 2	25.5	1,354	3,189	222.5	8.7
	R22	Rescue Zone 2	25.2	1,343	3,193	220.7	8.7
	E2	Engine Zone 2	15.8	789	3,002	129.8	8.2
	CPT5	EMS Supervisor	14.6	278	1,137	45.6	3.1
	300	Shift Division Chief	17.4	155	535	25.4	1.5
3	R3	Rescue Zone 3	30.8	1,286	2,508	211.4	6.9
	E3	Engine Zone 3	15.8	562	2,129	92.4	5.8
	L3	Ladder Zone 3	14.8	157	635	25.7	1.7
4	R4	Rescue Zone 4	31.4	1,847	3,525	303.6	9.7
	E4	Engine Zone 4	19.4	648	2,002	106.5	5.5

Observations:

- Rescue R1, made the most runs, averaging 9.7 runs and 238.1 minutes (3 hours and 58 minutes) of deployed time per day.
- Rescue R4 had the greatest deployed time, averaging 303.6 minutes (5 hours and 4 minutes) of deployed time per day.
- Of the four engines, E1 made the most runs, averaging 18.7 runs and 133.8 minutes (two hours and 14 minutes) of deployed time per day.
- Ladders L1 and L3 made 1,007 and 635 runs, respectively, averaging 2.8 and 1.7 runs per day.

- EMS supervisor (CPT50 made 1,137 runs, averaging 3.1 runs and 45.6 minutes of deployed time per day. Shift division chief (300) made 535 runs, averaging 1.5 runs and 25.4 minutes of deployed time per day.

FIGURE D-7: Deployed Hours by Hour of Day

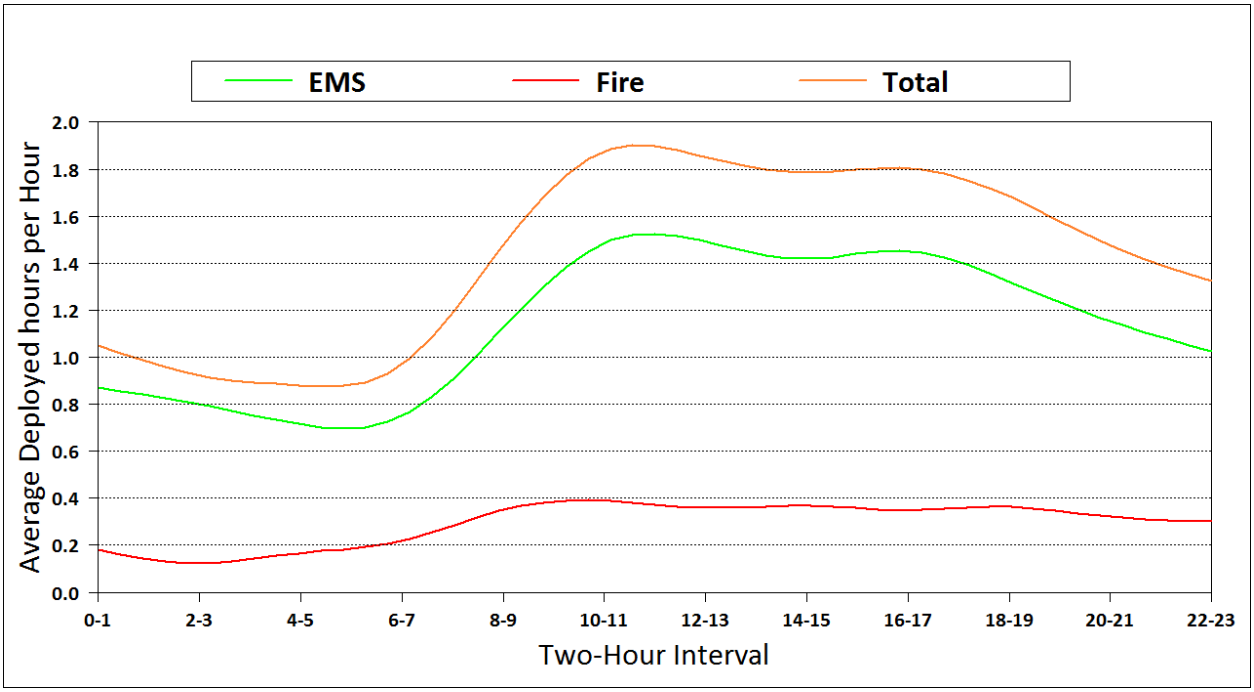


TABLE D-7: Deployed Hours by Hour of Day

Two-Hour Interval	EMS	Fire	Total
0-1	0.9	0.2	1.0
2-3	0.8	0.1	0.9
4-5	0.7	0.2	0.9
6-7	0.7	0.2	1.0
8-9	1.1	0.4	1.5
10-11	1.5	0.4	1.9
12-13	1.5	0.4	1.9
14-15	1.4	0.4	1.8
16-17	1.5	0.3	1.8
18-19	1.3	0.4	1.7
20-21	1.2	0.3	1.5
22-23	1.0	0.3	1.3
Total	**27.2**	**7.0**	**34.2**

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

Observations:

- Hourly deployed hours were highest during the day between 8:00 a.m. and 10:00 p.m., averaging between 1.5 hours and 1.9 hours. Average deployed hours peaked between 10:00 a.m. and 2:00 p.m., averaging about 1.9 hours.
- Hourly deployed hours were the lowest between midnight and 8:00 a.m., averaging between 0.9 and 1.0 hours.

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

Station	Unit ID	Unit Type	EMS	**Structure Fire**	**Outside Fire**	Hazard	False Alarm	Good Intent	Public Service	Canceled	**Total**	**Runs per Day**
1	R1	Rescue Zone 1	3,386	**22**	**7**	28	47	15	39	13	**3,557**	**9.7**
	R11	Rescue Zone 1	3,160	**15**	**11**	33	36	16	47	18	**3,336**	**9.1**
	E1	Engine Zone 1	873	**56**	**59**	203	1,420	77	378	97	**3,163**	**8.7**
	L1	Ladder Zone 1	312	**47**	**30**	111	316	64	102	25	**1,007**	**2.8**
	G1/G2/G3/ G6/G11	Gator 4WD	110	**1**	**0**	0	1	0	3	0	**115**	**0.3**
	810	Support Air Truck	5	**9**	**2**	3	1	7	3	0	**30**	**0.1**
2	R2	Rescue Zone 2	3,026	**20**	**8**	30	29	21	35	20	**3,189**	**8.7**
	R22	Rescue Zone 2	3,002	**18**	**11**	31	43	22	42	24	**3,193**	**8.7**
	E2	Engine Zone 2	848	**71**	**67**	225	1,242	114	339	96	**3,002**	**8.2**
	CPT5	EMS Supervisor	715	**69**	**33**	127	51	101	30	11	**1,137**	**3.1**
	300	Shift Division Chief	113	**69**	**31**	133	50	102	28	9	**535**	**1.5**
3	R3	Rescue Zone 3	2,369	**10**	**10**	13	26	19	52	9	**2,508**	**6.9**
	E3	Engine Zone 3	782	**73**	**51**	162	708	113	177	63	**2,129**	**5.8**
	L3	Ladder Zone 3	262	**24**	**16**	59	165	46	48	15	**635**	**1.7**
4	R4	Rescue Zone 4	3,373	**12**	**12**	25	22	26	42	13	**3,525**	**9.7**
	E4	Engine Zone 4	1,169	**25**	**38**	93	326	61	249	41	**2,002**	**5.5**

Observations:

- Rescue R1 had the most runs during the year and it averaged 9.7 runs per day. Most of the runs were EMS responses, accounting for 96 percent of its runs.
- Of the four engines, E1 had the most runs during the year and it averaged 8.7 runs per day. Fire category calls accounted for 69 percent of its total runs. It made 115 runs responding to structure and outside fire calls.

- L1 was dispatched more than L3. It made 1.007 runs during the year, averaging 2.8 runs per day. Fire category calls accounted for 67 percent of its runs. It made 77 runs responding to structure and outside fire calls.

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

Station	Unit ID	Unit Type	EMS	**Structure Fire**	**Outside Fire**	Hazard	False Alarm	Good Intent	Public Service	Canceled	**Total**	**Fire Category Calls Percentage**
1	R11	Rescue Zone 1	242.0	**1.2**	**0.4**	1.2	0.5	0.3	2.3	0.2	248.1	**2.4**
	R1	Rescue Zone 1	232.1	**1.8**	**0.3**	1.1	0.7	0.4	1.4	0.1	238.1	**2.5**
	E1	Engine Zone 1	31.3	**7.9**	**3.6**	14.0	55.4	3.2	17.4	0.9	133.8	**76.6**
	L1	Ladder Zone 1	10.3	**6.4**	**1.8**	7.0	11.6	2.3	4.3	0.2	44.0	**76.7**
	G1/G2/G3/ G6/G11	Gator 4WD	4.7	**0.0**	**0.0**	0.0	0.0	0.0	0.1	0.0	4.8	**2.7**
	810	Support Air Truck	0.3	**1.7**	**0.2**	0.1	0.0	0.1	1.1	0.0	3.5	**92.7**
2	R2	Rescue Zone 2	216.6	**1.7**	**0.1**	0.9	0.5	0.8	1.8	0.1	222.5	**2.7**
	R22	Rescue Zone 2	214.0	**1.6**	**0.3**	1.0	0.4	0.6	2.5	0.2	220.7	**3.0**
	E2	Engine Zone 2	33.3	**7.9**	**3.5**	13.7	48.0	5.0	17.3	1.0	129.8	**74.4**
	CPT5	EMS Supervisor	28.8	**5.1**	**1.4**	4.2	1.5	3.0	1.4	0.2	45.6	**36.8**
	300	Shift Division Chief	4.9	**6.5**	**1.5**	6.3	1.4	3.2	1.5	0.1	25.4	**80.7**
3	R3	Rescue Zone 3	207.8	**0.6**	**0.3**	0.3	0.4	0.8	1.2	0.0	211.4	**1.7**
	E3	Engine Zone 3	33.9	**6.1**	**2.7**	6.8	28.6	4.6	8.9	0.7	92.4	**63.3**
	L3	Ladder Zone 3	10.7	**2.3**	**0.6**	2.6	5.6	1.5	2.4	0.2	25.7	**58.6**
4	R4	Rescue Zone 4	299.5	**0.7**	**0.4**	0.8	0.2	0.8	1.2	0.1	303.6	**1.4**
	E4	Engine Zone 4	62.3	**2.7**	**2.5**	6.4	14.8	3.3	14.0	0.6	106.5	**41.5**

Observations:

- R4 was deployed the most time, averaging 304 minutes (5 hours and 4 minutes) per day. EMS calls accounted for 99 percent of its workload.
- Of the four engines, E1 had the most deployed time, averaging 134 minutes (2 hours and 14 minutes) per day. Fire category calls accounted for 77 percent of its workload.
- On average, L1 and L3 were deployed 44 and 26 minutes per day, respectively.

Analysis of Busiest Hours

There is significant variability in the number of calls from hour to hour. One special concern relates to the fire and EMS resources available for hours with the heaviest workload. We tabulated the data for each of the 8,760 hours in the year. Approximately once every 17.4 days, the Miami Beach Fire Department responded to ten and more calls in an hour. This occurred in 0.24 percent of the total number of hours in the year studied. We report the top ten hours with the most calls received and discuss the two hours with the most calls received.

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

Number of Calls in an Hour	Frequency	Percentage
0	854	9.75
1	1,724	19.68
2	1,878	21.44
3	1,707	19.49
4	1,153	13.16
5	738	8.42
6	386	4.41
7	176	2.01
8	83	0.95
9	40	0.46
10	15	0.17
11	4	0.05
12	2	0.02

Observations:

- During 21 hours (0.24 percent of all hours), ten or more calls occurred; in other words, the MBFD responded to ten and more calls in an hour roughly once every 17.4 days.
- During 92 percent of all hours, no more than five calls occurred in an hour.

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

Hour	Number of Calls	Number of Runs	Total Deployed Hours
3/30/2014, 5 a.m. to 6 a.m.	12	25	6.3
8/30/2014, 8 p.m. to 9 p.m.	12	19	5.6
2/20/2014, 9 a.m. to 10 a.m.	11	20	5.0
5/23/2014, 2 p.m. to 3 p.m.	11	20	4.0
8/23/2014, 12 p.m. to 1 p.m.	11	17	3.6
6/17/2014, 9 p.m. to 10 p.m.	11	12	6.9
4/15/2014, 7 p.m. to 8 p.m.	10	23	6.4
12/11/2013, 6 p.m. to 7 p.m.	10	19	4.7
2/22/2014, 4 p.m. to 5 p.m.	10	19	11.5
2/11/2014, 6 p.m. to 7 p.m.	10	18	9.1

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

Observations:

- The hour with the most calls and runs was 5:00 a.m. to 6:00 a.m. on March 30, 2014. The 12 calls involved 25 individual dispatches. These 12 calls included three seizure and unconsciousness calls, one fall and injury call, six illness and other calls, one hazardous condition call, and one false alarm call. The combined workload was 6.3 hours. The longest call lasted 31 minutes, and it was a hazardous condition call, which was responded to by seven MBFD units.
- The hour with the second most calls received was 8:00 p.m. to 9:00 p.m. on August 30, 2014. The 12 calls involved 19 individual dispatches. These 12 calls included one cardiac and stroke call, three fall and injury calls, six illness and other calls, and two false alarm calls. The combined workload was 5.6 hours. The longest two calls lasted 46 minutes, and both were illness and other calls.

TABLE D-12: Unit Workload Analysis between 5:00 a.m. and 6:00 a.m. on March 30, 2014

Hour	Station	1				2					3		4		Number of Busy Units
	Unit	R1	R11	E1	L1	R2	R22	E2	CPT5	300	R3	E3	R4	E4	
03/30/2014 5:00-6:00 a.m.	0–5					5.0	5.0								2
	5–10	4.9				5.0	5.0							4.0	4
	10–15	5.0				5.0	5.0							5.0	4
	15–20	5.0				5.0	5.0							0.5	4
	20–25	5.0	2.3			5.0	5.0								4
	25–30	5.0	5.0	2.1		5.0	5.0								5
	30–35	4.9	5.0	5.0	0.8	2.4	1.8								6
	35–40	5.0	4.8	5.0	2.1	3.2									5
	40–45	5.0	5.0	4.7		5.0									4
	45–50	5.0	5.0			5.0	2.3	3.6	3.4		1.2				7
	50–55	5.0	3.8	3.0	3.0	5.0	5.0	5.0	5.0	3.0		3.0			10
	55–60	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	2.5	5.0			11
	Total	49.9	35.9	22.7	10.9	55.6	44.1	13.6	13.4	8.0	3.7	8.0		9.5	

Note: The numbers in the cells are the deployed minutes within the five-minute block. The cell values greater than 2.5 are coded red. MBFD has 13 units staffed including one EMS supervisor and one shift division vehicle.

Observations:

- During this hour, 12 units made 25 runs and responded to 12 calls. These 12 calls included three seizure and unconsciousness calls, one fall and injury call, six illness and other calls, one hazardous condition call, and one false alarm call. The combined workload was 6.3 hours. The longest call lasted 31 minutes, and it was a hazardous condition call, which was responded to by seven MBFD units.
- During the busiest 10 minutes in the hour (5:50 a.m. to 6:00 a.m.), 10 or 11 units were deployed simultaneously.
- Four rescue units (R1, R11, R2, and R22) were each deployed more than 30 minutes in this hour.

TABLE D-13: Unit Workload Analysis between 8:00 p.m. and 9:00 p.m. on August 30, 2014

Hour	Station	1				2					3		4		Number of Busy Units
	Unit	R1	R11	E1	L1	R2	R22	E2	CPT5	300	R3	E3	R4	E4	
08/30/2014 8:00-9:00 p.m.	0–5	5.0		5.0	0.9	5.0							5.0	2.1	6
	5–10	0.7		3.8	0.1	5.0							5.0	5.0	6
	10–15			4.3		5.0	1.7				1.3		5.0	5.0	6
	15–20			5.0							5.0		5.0	5.0	4
	20–25			4.3							3.1		4.2	5.0	4
	25–30													5.0	1
	30–35						0.1						4.9	0.8	3
	35–40		3.7				3.2						5.0		3
	40–45		5.0										5.0	2.3	3
	45–50		4.9				3.2	2.0			1.2		5.0	4.2	6
	50–55					2.8	5.0	5.0			5.0		5.0	1.2	6
	55–60		4.3			5.0	5.0	2.6			5.0		5.0	5.0	7
	Total	5.7	17.9	22.4	1.0	22.8	18.2	9.6			20.6		54.1	40.6	

Note: The numbers in the cells are the deployed minutes within the five-minute block. The cell values greater than 2.5 are coded red. MBFD has 13 units staffed including one EMS supervisor and one shift division vehicle.

Observations:

- During this hour, 10 units made 25 runs and responded to 12 calls. These 12 calls included one cardiac and stroke call, three fall and injury calls, six illness and other calls, and two false alarm calls. The combined workload was 5.6 hours. The longest two calls lasted 46 minutes, and both were illness and other calls.
- During the busiest five minutes in the hour (8:55 p.m. to 9:00 p.m.), seven units were deployed simultaneously. During another 25 minute-window (8:00 p.m. to 8:15 p.m., and 8:45 p.m. to 8:55 p.m.), six units were deployed simultaneously.
- Two units (R4, and E4) in station 4 were each deployed more than 30 minutes in this hour.

Dispatch Time and Response Time

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

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

In this section, we focused on priority 1 calls, which were responded to by MBFD units with lights and sirens. We focused on units that had recorded completed time stamps, and used 20,196 EMS and fire category calls in the analysis. We provided analysis of average and 90th percentile statistics to measure response time performance. The average dispatch time was 0.8 minutes. The average turnout time was 1.6 minutes, and the average travel time was 3.2 minutes. The average response time for EMS calls was 5.5 minutes, and the average response time for fire category calls was 6.1 minutes. The average response time for structure fire calls was 5.1 minutes. The average response time for outside fire calls was 5.8 minutes. The 90th percentile response time was 8.0 minutes, which means that MBFD units had a response time of less than 8.0 minutes for 90 percent of these calls.

TABLE D-14: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	0.8	1.6	3.0	5.5	1,462
Seizure and unconsciousness	0.8	1.5	3.0	5.3	1,668
Breathing difficulty	0.8	1.7	3.0	5.5	1,274
Overdose and psychiatric	0.9	1.7	3.3	5.9	161
MVA	0.5	1.5	3.1	5.2	406
Fall and injury	0.7	1.7	3.1	5.4	2,154
Illness and other	0.8	1.6	3.1	5.5	8,020
EMS Total	**0.8**	**1.6**	**3.1**	**5.5**	**15,145**
Structure fire	0.8	1.7	2.6	5.1	67
Outside fire	1.0	1.7	3.0	5.8	97
Hazard	1.0	1.7	3.4	6.1	371
False alarm	0.6	1.6	3.8	6.0	3,321
Good intent	0.9	1.9	2.8	5.6	140
Public service	1.0	1.7	3.9	6.6	1,055
Fire Total	**0.8**	**1.6**	**3.7**	**6.1**	**5,051**
Total	**0.8**	**1.6**	**3.2**	**5.6**	**20,196**

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

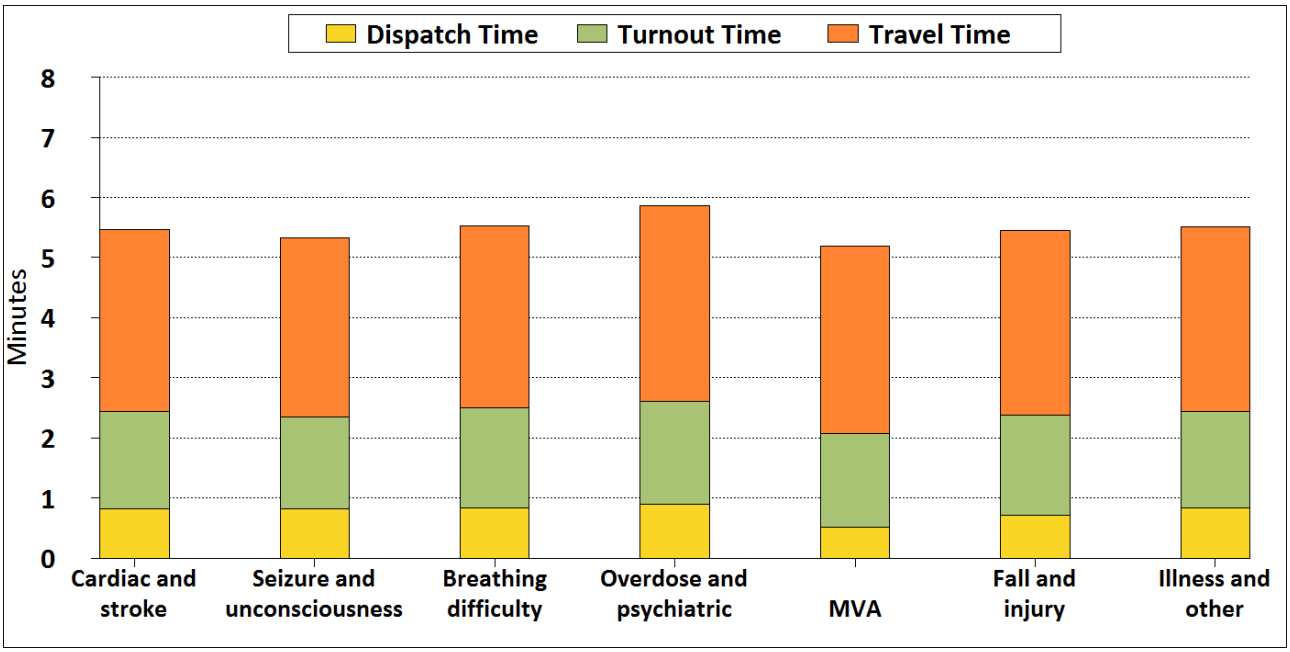
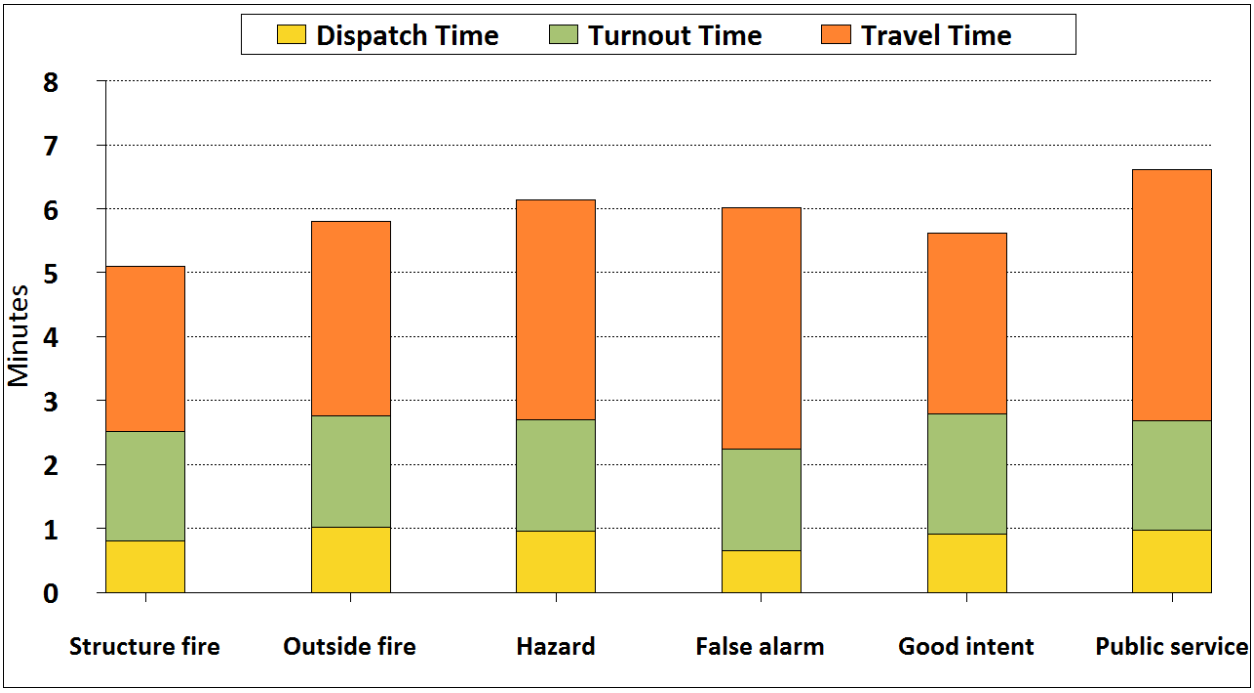


FIGURE D-9: Average Dispatch, Turnout, and Travel Times of First Arriving Unit, by Fire Call Type



Observations:

- The average dispatch time was 0.8 minutes.
- The average turnout time was 1.6 minutes.
- The average travel time was 3.2 minutes.
- The average response time for EMS calls was 5.5 minutes.
- The average response time for fire category calls was 6.1 minutes.
- The average response time for structure fire calls was 5.1 minutes.
- The average response time for outside fire calls was 5.8 minutes.

TABLE D-15: 90th Percentile Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	1.4	2.5	4.7	7.5	1,462
Seizure and unconsciousness	1.5	2.4	4.7	7.3	1,668
Breathing difficulty	1.4	2.6	4.7	7.5	1,274
Overdose and psychiatric	1.6	2.5	4.6	7.6	161
MVA	1.2	2.5	5.4	8.0	406
Fall and injury	1.3	2.6	4.8	7.6	2,154
Illness and other	1.4	2.5	4.8	7.6	8,020
EMS Total	**1.4**	**2.5**	**4.8**	**7.6**	**15,145**
Structure fire	1.4	2.4	3.9	7.2	67
Outside fire	2.0	2.9	5.4	8.4	97
Hazard	1.8	2.7	5.9	8.9	371
False alarm	1.2	2.4	6.5	9.0	3,321
Good intent	1.5	2.8	4.7	7.6	140
Public service	1.9	2.7	6.7	10.2	1,055
Fire Total	**1.4**	**2.5**	**6.4**	**9.2**	**5,051**
Total	**1.4**	**2.5**	**5.2**	**8.0**	**20,196**

Note: A 90th percentile value of 8.0 indicates that the total response time was less than 8.0 minutes for 90 percent of all calls. Unlike averages, the 90th percentile response time is not equal to the sum of the 90th percentile of dispatch time, turnout time, and travel time.

Observations:

- The 90th percentile dispatch time was 1.4 minutes.
- The 90th percentile turnout time was 2.5 minutes.
- The 90th percentile travel time was 5.2 minutes.
- The 90th percentile response time was 8.0 minutes.
- The 90th percentile response time for EMS calls was 7.6 minutes.
- The 90th percentile response time for fire category calls was 9.2 minutes.
- The 90th percentile response time for structure fire calls was 7.2 minutes.
- The 90th percentile response time for outside fire calls was 8.4 minutes.

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

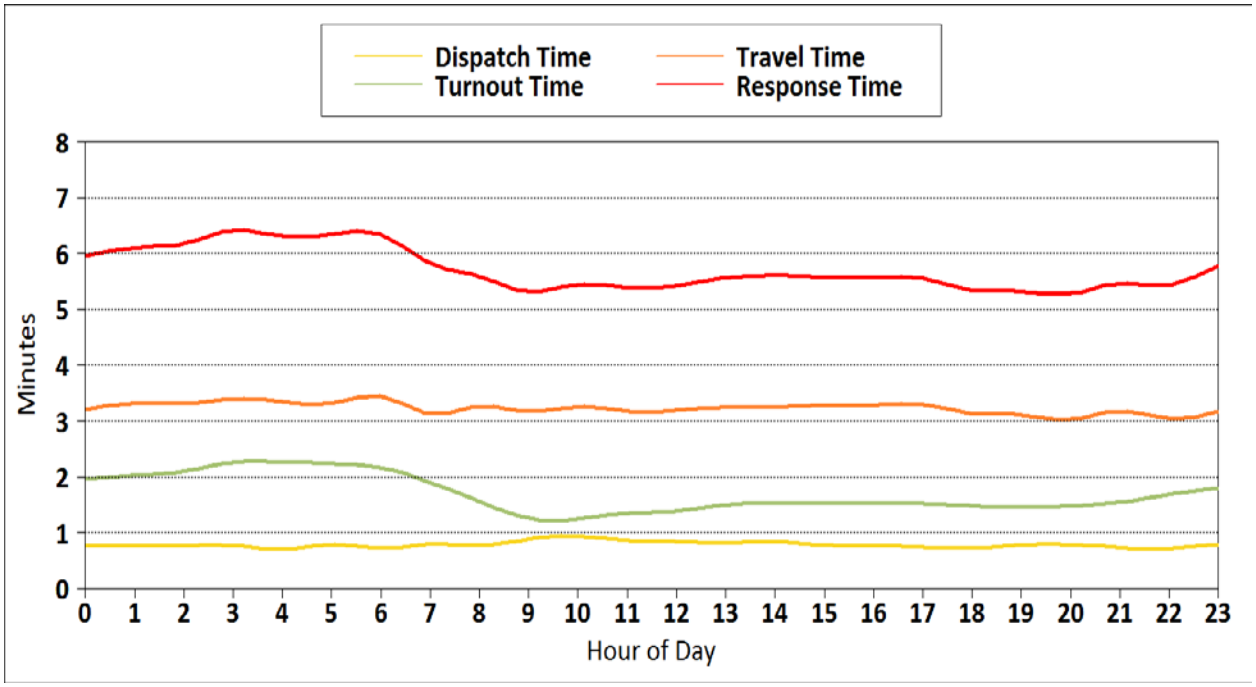


TABLE D-16: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Hour of Day

Hour	Dispatch Time	Turnout Time	Travel Time	Response Time	90th Percentile Response Time	Sample Size
0	0.8	2.0	3.2	5.9	7.7	705
1	0.8	2.0	3.3	6.1	8.1	636
2	0.8	2.1	3.3	6.2	8.2	632
3	0.8	2.3	3.4	6.4	8.6	545
4	0.7	2.3	3.4	6.3	8.3	508
5	0.8	2.2	3.3	6.4	8.3	498
6	0.7	2.2	3.5	6.3	8.4	456
7	0.8	1.9	3.1	5.8	8.0	626
8	0.8	1.6	3.3	5.6	8.1	769
9	0.9	1.3	3.2	5.3	7.9	946
10	0.9	1.2	3.3	5.4	8.3	1,091
11	0.9	1.4	3.2	5.4	8.1	1,040
12	0.8	1.4	3.2	5.4	7.9	1,045
13	0.8	1.5	3.3	5.6	8.2	1,108
14	0.8	1.5	3.2	5.6	8.1	1,054
15	0.8	1.5	3.3	5.6	8.0	1,031
16	0.8	1.5	3.3	5.6	8.0	1,004
17	0.7	1.5	3.3	5.6	8.1	1,059
18	0.7	1.5	3.1	5.3	7.5	1,025
19	0.8	1.4	3.1	5.3	7.4	973
20	0.8	1.5	3.0	5.3	7.5	934
21	0.7	1.5	3.2	5.5	7.5	904
22	0.7	1.7	3.0	5.4	7.5	842
23	0.8	1.8	3.2	5.8	7.8	765

Observations:

- Average dispatch time was between 0.7 and 0.9 minutes.
- Average turnout time was between 1.2 minutes and 2.3 minutes. The average turnout time peaked between midnight and 7:00 a.m., when it averaged between 2.0 minutes and 2.3 minutes.
- Average travel time was between 3.0 minutes and 3.5 minutes.
- Average response time was between 5.3 minutes and 6.4 minutes. The average response time peaked between 1:00 a.m. and 7:00 a.m., when it averaged more than 6 minutes. The 90th percentile response time was between 7.4 and 8.6 minutes.

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

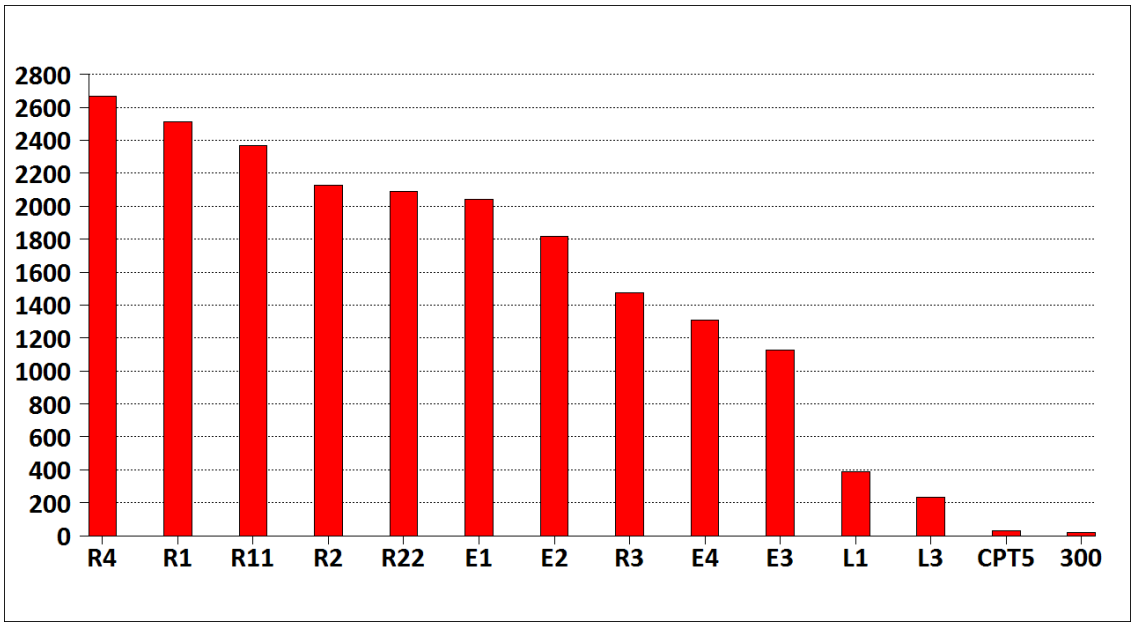


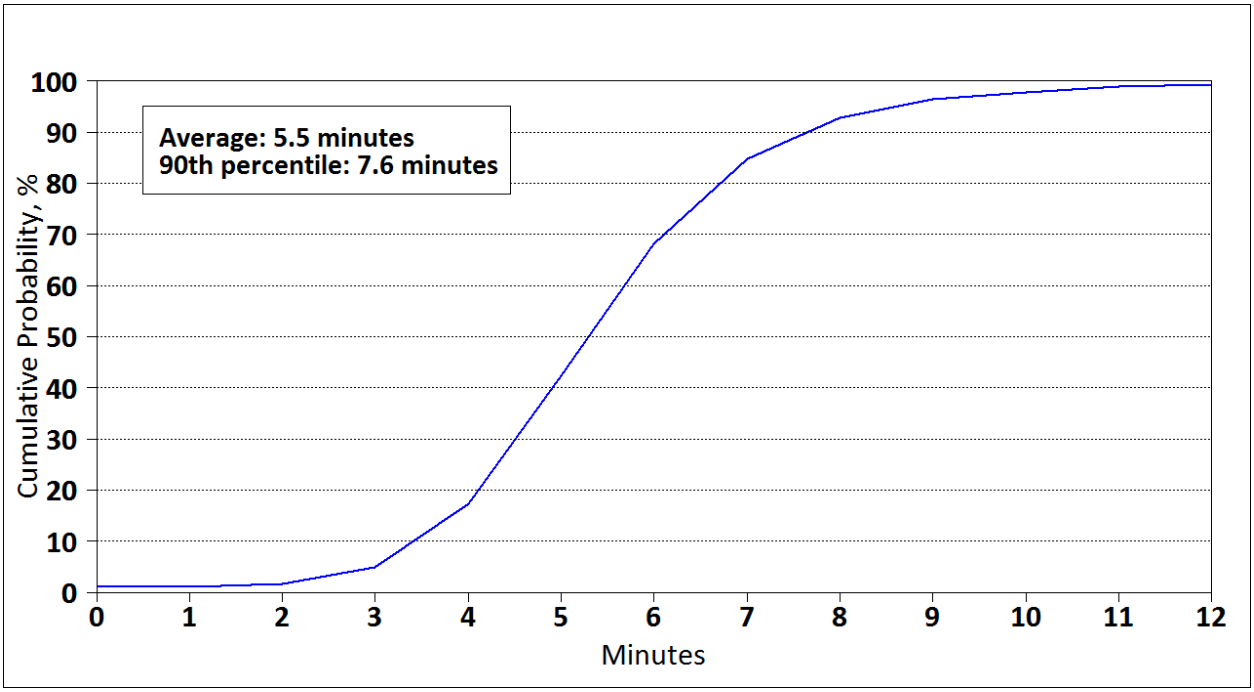
TABLE D-17: Number of Total Calls by First Arriving Units

Unit	EMS	Structure and Outside Fire	Other Fire	Total	Percentage	Cumulative Percentage
R4	2,637	6	22	2,665	13.2	13.2
R1	2,480	2	28	2,510	12.4	25.6
R11	2,344	3	21	2,368	11.7	37.3
R2	2,111	3	15	2,129	10.5	47.9
R22	2,071	3	18	2,092	10.4	58.2
E1	393	53	1,596	2,042	10.1	68.4
E2	344	42	1,429	1,815	9.0	77.3
R3	1,456	1	18	1,475	7.3	84.7
E4	730	18	559	1,307	6.5	91.1
E3	382	23	722	1,127	5.6	96.7
L1	87	3	298	388	1.9	98.6
L3	93	2	136	231	1.1	99.8
CPT5	15	3	12	30	0.1	99.9
300	2	2	13	17	0.1	100.0

Observations:

- R4 arrived first on scene most often, followed by R1, R11, R2, and R22. The top five units were all rescue units, and accounted for 58 percent of the first arrivals at calls.
- For structure and outside fire calls, E1 and E2 arrived first on scene most often.

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



Reading the CDF Chart: The vertical axis is the probability or percentage of calls. The horizontal axis is response time. For example, with regard to EMS calls, the 0.9 probability line intersects the graph at the time mark at about 7.6 minutes. This means that units had a response time of less than 7.6 minutes for 90 percent of these calls.

FIGURE D-13: Frequency Distribution Chart of Response Time of First Arriving Unit for EMS calls

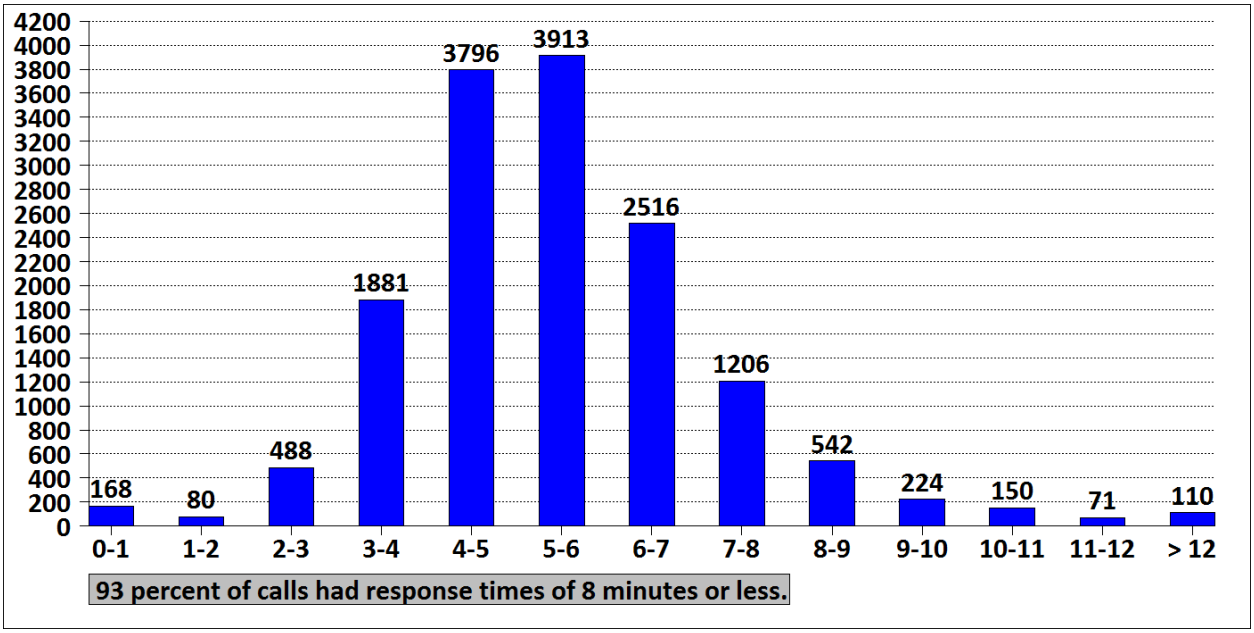


TABLE D-18: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for EMS Calls

Response Time (minute)	Frequency	Cumulative Percentage
0 - 1	168	1.1
1 - 2	80	1.6
2 - 3	488	4.9
3 - 4	1,881	17.3
4 - 5	3,796	42.3
5 - 6	3,913	68.2
6 - 7	2,516	84.8
7 - 8	1,206	92.8
8 - 9	542	96.3
9 - 10	224	97.8
10 - 11	150	98.8
11 - 12	71	99.3
12 - 13	34	99.5
13 - 14	21	99.6
14 - 15	15	99.7
15 - 16	40	100.0

Observations:

- The average response time of first arriving MBFD unit for EMS calls was 5.5 minutes.
- For 92.8 percent of EMS calls, the response time of the first arriving MBFD unit was less than or equal to 8 minutes.
- For 90 percent of EMS calls, the response time of the first arriving MBFD was less than 7.6 minutes.

TABLE D-19: Average Response Time for Structure and Outside Fire Calls by First Arriving Unit

Unit Type	First Arriving Unit	Outside Fire		Structure Fire		Total	
		Response Time	Number of Calls	Response Time	Number of Calls	Response Time	Number of Calls
EMS Supervisor	CPT5	3.3	1	5.0	2	4.4	3
Engine Zone 1	E1	6.4	32	5.0	21	5.8	53
Engine Zone 2	E2	5.5	26	4.6	16	5.1	42
Engine Zone 3	E3	5.8	14	6.3	9	6.0	23
Engine Zone 4	E4	5.6	13	4.6	5	5.3	18
Ladder Zone 1	L1	5.0	3	NA	0	5.0	3
Ladder Zone 3	L3	12.2	1	7.6	1	9.9	2
Rescue Zone 1	R1	2.9	1	4.9	1	3.9	2
Rescue Zone 1	R11	4.5	2	3.5	1	4.2	3
Rescue Zone 2	R2	NA	0	4.6	3	4.6	3
Rescue Zone 2	R22	6.2	2	5.3	1	5.9	3
Rescue Zone 3	R3	4.2	1	NA	0	4.2	1
Rescue Zone 4	R4	4.2	1	5.0	5	4.9	6
Shift Division Chief	300	NA	0	6.4	2	6.4	2
Total		**5.8**	**97**	**5.1**	**67**	**5.5**	**164**

Observations:

- For outside fire calls, the average response time of the first arriving unit was 5.8 minutes.
- For outside fire calls, Engine E1 was the first unit on scene most often and had an average response time of 6.4 minutes.
- For structure fire calls, the average response time of the first arriving unit was 5.1 minutes.
- For structure fire calls, Engine E1 was the first unit on scene most often and had an average response time of 5.0 minutes.

TABLE D-20: Average Response Time for Structure and Outside Fire Calls by Second Arriving Unit

Unit Type	Second Arriving Unit	Outside Fire		Structure Fire		Total	
		Response Time	Number of Calls	Response Time	Number of Calls	Response Time	Number of Calls
EMS Supervisor	CPT5	8.5	2	5.8	7	6.4	9
Engine Zone 1	E1	6.9	3	5.3	5	5.9	8
Engine Zone 2	E2	5.1	3	5.1	4	5.1	7
Engine Zone 3	E3	17.7	1	7.0	1	12.4	2
Engine Zone 4	E4	5.4	1	5.9	6	5.9	7
Ladder Zone 1	L1	9.4	5	5.0	6	7.0	11
Ladder Zone 3	L3	5.6	1	6.0	1	5.8	2
Rescue Zone 1	R1	5.7	1	5.8	4	5.8	5
Rescue Zone 1	R11	4.0	1	7.8	2	6.6	3
Rescue Zone 2	R2	NA	0	5.2	5	5.2	5
Rescue Zone 2	R22	NA	0	6.6	1	6.6	1
Rescue Zone 3	R3	6.1	1	7.1	2	6.8	3
Rescue Zone 4	R4	5.3	1	4.7	3	4.9	4
Shift Division Chief	300	9.6	1	5.1	5	5.8	6
Total		**7.6**	**21**	**5.6**	**52**	**6.2**	**73**

Observations:

- For outside fire calls, the average response time of the second arriving unit was 7.6 minutes, which was 1.8 minutes longer than the first arriving unit.
- For structure fire calls, the average response time of the second arriving unit was 5.6 minutes, which was 0.5 minutes longer than the first arriving unit.

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

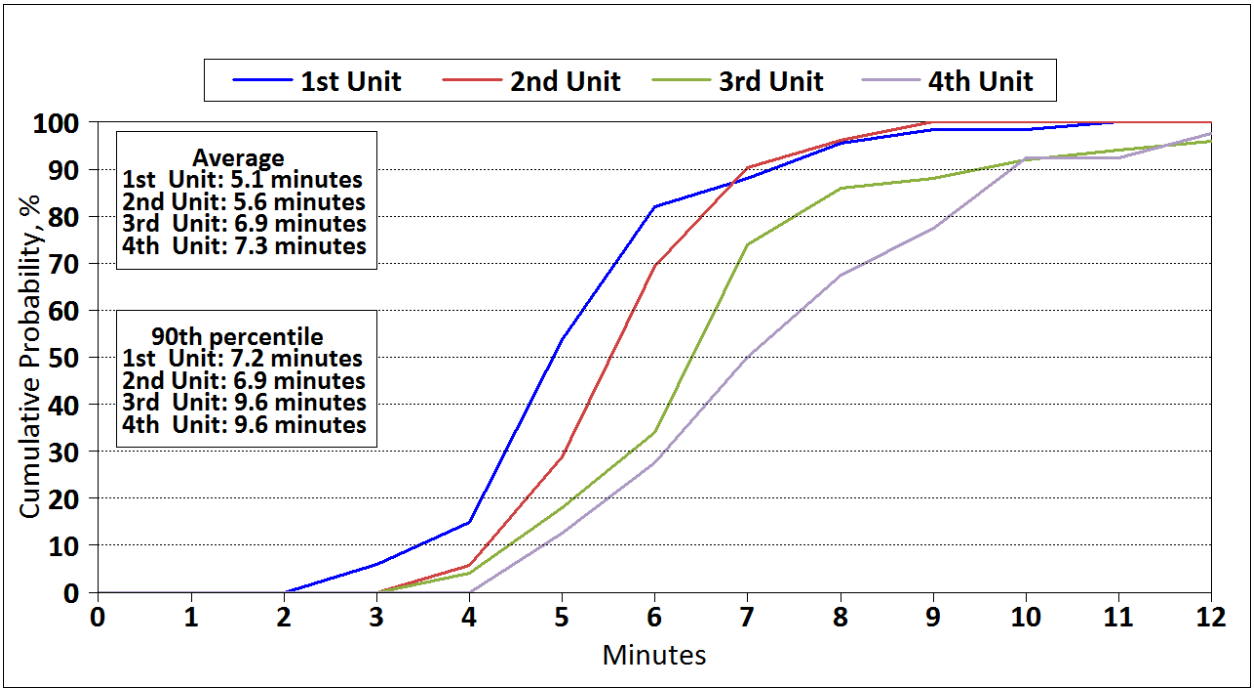


FIGURE D-15: Frequency Distribution Chart of Response Time of First Arriving Unit for Structure Fire Calls

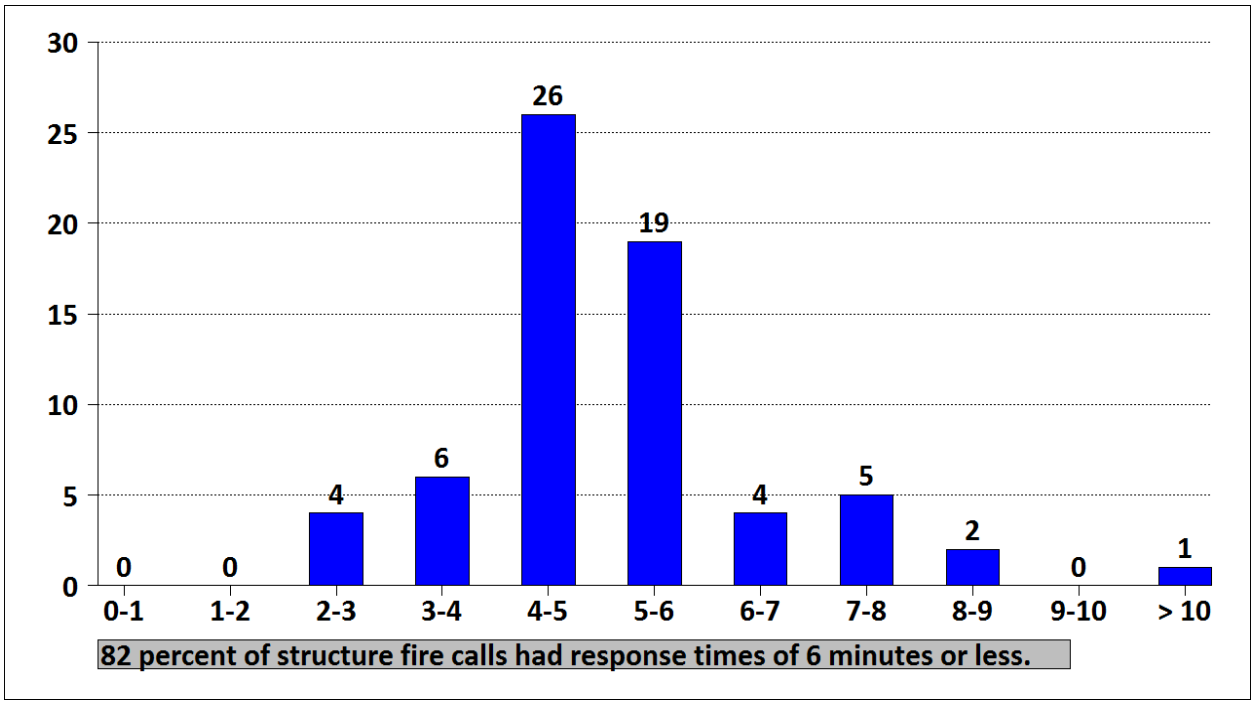


TABLE D-21: Cumulative Distribution Function (CDF) of Response Time of First, Second, Third, and Fourth Arriving Units for Structure Fire Calls

Response Time (minute)	1st Unit		2nd Unit		3rd Unit		4th Unit	
	Frequency	Cumulative Percent	Frequency	Cumulative Percent	Frequency	Cumulative Percent	Frequency	Cumulative Percent
0 - 1	0	0.0	0	0.0	0	0.0	0	0.0
1 - 2	0	0.0	0	0.0	0	0.0	0	0.0
2 - 3	4	6.0	0	0.0	0	0.0	0	0.0
3 - 4	6	14.9	3	5.8	2	4.0	0	0.0
4 - 5	26	53.7	12	28.8	7	18.0	5	12.5
5 - 6	19	82.1	21	69.2	8	34.0	6	27.5
6 - 7	4	88.1	11	90.4	20	74.0	9	50.0
7 - 8	5	95.5	3	96.2	6	86.0	7	67.5
8 - 9	2	98.5	2	100.0	1	88.0	4	77.5
9 - 10	0	98.5	0	100.0	2	92.0	6	92.5
10 - 11	1	100.0	0	100.0	1	94.0	0	92.5
11 - 12	0	100.0	0	100.0	1	96.0	2	97.5
> 12	0	100.0	0	100.0	2	100.0	1	100.0

Note: There are 15 structure fire calls which only had one MBFD unit responding, which caused the 90th percentile response time of the first arriving unit to be longer than the second arriving unit.

Observations:

- For structure fire calls, the average response time of the first arriving unit was 5.1 minutes.
- 82 percent of the time, the first arriving unit's response time was less than 6.0 minutes for structure fire calls.
- 90 percent of the time, the first arriving unit's response time was less than 7.2 minutes for structure fire calls.
- For structure fire calls, the average response time of the second, third, and fourth arriving units were 5.6, 6.9, and 7.3 minutes, respectively.
- For structure fire calls, the 90th percentile response time of the second, third, and fourth arriving units were 6.9, 9.6, and 9.6 minutes, respectively.

FIGURE D-16: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for Outside Fire Calls

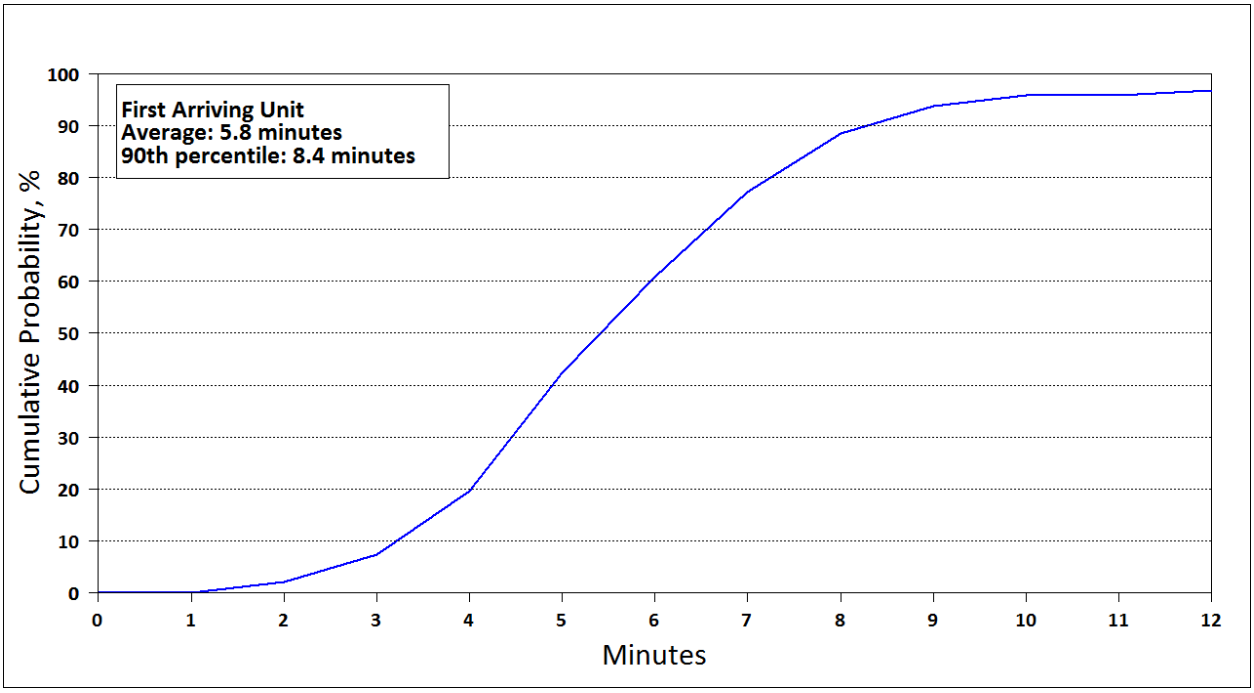


FIGURE D-17: Frequency Distribution Chart of Response Time of First Arriving Unit for Outside Fire Calls

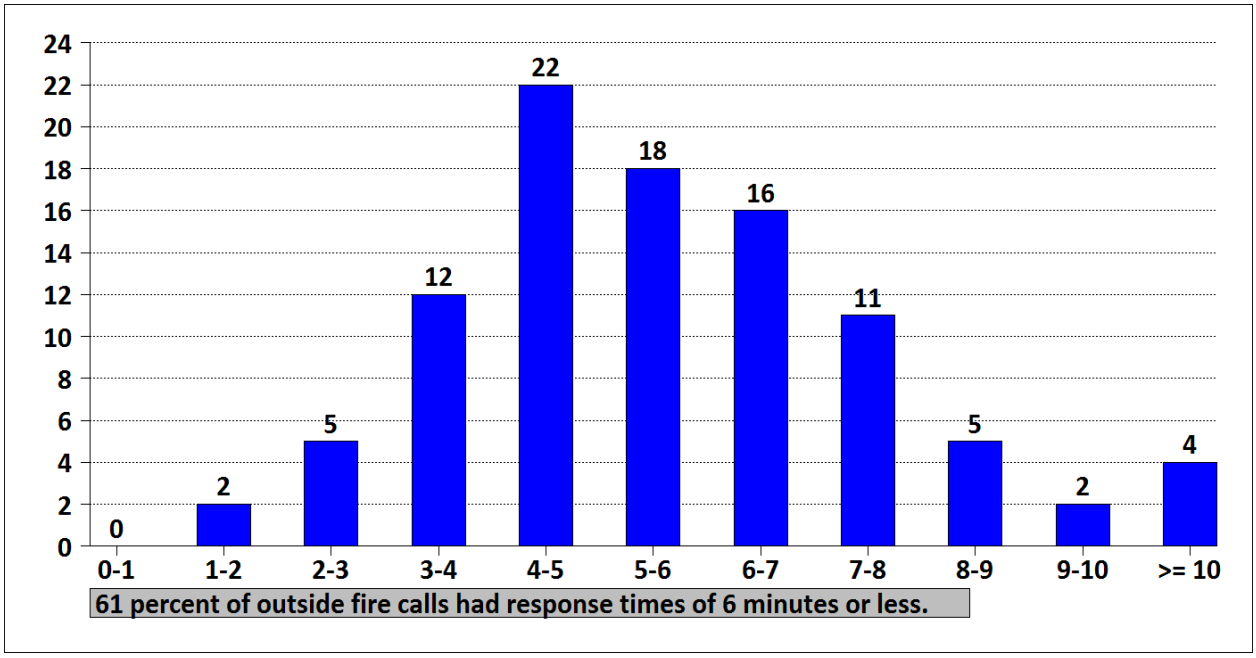


TABLE D-22: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for Outside Fire Calls

Response Time (minute)	Frequency	Cumulative Percentage
0 – 1	0	0.0
1 – 2	2	2.1
2 – 3	5	7.2
3 – 4	12	19.6
4 – 5	22	42.3
5 – 6	18	60.8
6 – 7	16	77.3
7 – 8	11	88.7
8 – 9	5	93.8
9 – 10	2	95.9
10 – 11	0	95.9
11 – 12	1	96.9
> 12	3	100.0

Observations:

- The average response time of the first arriving fire unit for outside fire calls was 5.8 minutes.
- 60.8 percent of the time, the first fire unit's response time for outside fire calls was less than 6 minutes.
- 90 percent of the time, the first fire unit's response time for outside fire calls was less than 8.4 minutes.

Transport Call Analysis

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

TABLE D-23: Transport Calls by Call Type

Call Type	Number of Calls			Transport Rate
	Non-transport	Transport	Total	
Cardiac and stroke	719	837	1,556	53.8
Seizure and unconsciousness	1,025	796	1,821	43.7
Breathing difficulty	683	694	1,377	50.4
Overdose and psychiatric	144	126	270	46.7
MVA	532	352	884	39.8
Fall and injury	1,777	924	2,701	34.2
Illness and other	5,342	3,702	9,044	40.9
EMS Total	**10,222**	**7,431**	**17,653**	**42.1**
EMS Daily Average	**28.0**	**20.4**	**48.4**	**NA**
Fire Total	5,657	36	5,693	0.6
Canceled	347	0	347	0.0
Total	**16,226**	**7,467**	**23,693**	**31.5**
Daily Average	**44.5**	**20.5**	**64.9**	**NA**

Note: Fire transport calls are those fire category calls to which rescue units responded to and transported patients.

Observations:

- Overall, 42 percent of EMS calls to which MBFD responded involved transporting patients.
- On average, MBFD responded to 48.4 EMS calls per day, and 20.4 involved transporting patients.
- Cardiac and stroke calls had the highest transport rates, averaging 53.8 percent.

TABLE D-24: Call Duration by Transport and EMS Call Type

Call Type	Nontransport		Transport	
	Duration	Number of Calls	Duration	Number of Calls
Cardiac and stroke	25.4	719	45.7	837
Seizure and unconsciousness	20.5	1,025	45.7	796
Breathing difficulty	25.1	683	48.0	694
Overdose and psychiatric	20.2	144	44.6	126
MVA	20.6	532	44.9	352
Fall and injury	17.7	1,777	41.8	924
Illness and other	19.5	5,342	43.1	3,702
EMS Total	**20.2**	**10,222**	**44.1**	**7,431**

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

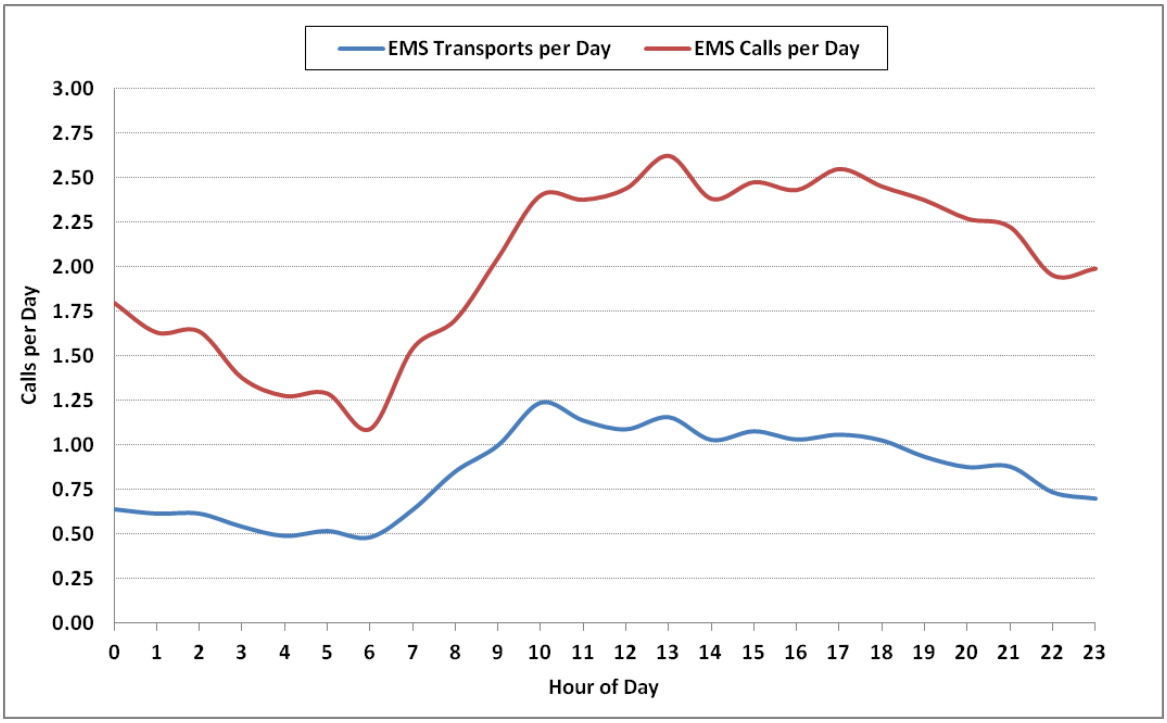
Observations:

- The average duration was 20.2 minutes for a nontransport EMS call.
- The average duration was 44.1 minutes for an EMS transport calls, which was 23.9 minutes longer than a nontransport EMS call.

TABLE D-25: Total and Number of EMS Transport Calls per Day, by Hour of Day

Hour	Number of EMS Transports	Number of EMS Calls	EMS Transports per Day	EMS Calls per Day	Transport Rate
0	233	657	0.64	1.80	35.5
1	224	596	0.61	1.63	37.6
2	224	598	0.61	1.64	37.5
3	197	503	0.54	1.38	39.2
4	178	466	0.49	1.28	38.2
5	188	471	0.52	1.29	39.9
6	175	398	0.48	1.09	44.0
7	232	563	0.64	1.54	41.2
8	311	622	0.85	1.70	50.0
9	365	749	1.00	2.05	48.7
10	453	877	1.24	2.40	51.7
11	416	868	1.14	2.38	47.9
12	398	891	1.09	2.44	44.7
13	423	958	1.16	2.62	44.2
14	376	870	1.03	2.38	43.2
15	394	904	1.08	2.48	43.6
16	377	888	1.03	2.43	42.5
17	387	931	1.06	2.55	41.6
18	375	895	1.03	2.45	41.9
19	341	867	0.93	2.38	39.3
20	320	829	0.88	2.27	38.6
21	321	812	0.88	2.22	39.5
22	268	713	0.73	1.95	37.6
23	255	727	0.70	1.99	35.1

FIGURE D-18: Number of EMS Transport Calls, by Hour of Day



Observations:

- Overall, 42 percent of EMS incidents to which MBFD responded involved transporting patients.
- On average, MBFD ambulances responded to 48.4 EMS calls per day, and provided 28.0 transports per day.
- MBFD-responded EMS call rates and transports were highest between 9:00 a.m. and 7:00 p.m., averaging between 1.0 and 1.24 EMS transports per hour. This peaked between 10:00 a.m. and 11:00 a.m.
- MBFD-responded EMS call rates and transports were lowest between midnight and 8:00 a.m., averaging between 0.48 and 0.64 EMS transports per hour.

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

TABLE D-26: Time Component Analysis for Rescue Transport Runs

Call Type	Average Deployed Minutes per Run	Average On Scene Time	Average Travel to Hospital Time	Average at Hospital and Travel back to Station Time	Sample Size
Cardiac and stroke	45.7	18.7	7.3	15.1	837
Seizure and unconsciousness	45.6	18.1	7.5	15.3	796
Breathing difficulty	47.9	19.1	7.8	16.5	694
Overdose and psychiatric	44.5	16.7	7.5	15.6	126
MVA	44.1	13.8	8.1	17.8	375
Fall and injury	41.1	13.6	8.0	14.8	932
Illness and other	43.1	16.0	7.7	14.6	3710
Total	**43.9**	**16.4**	**7.7**	**15.1**	**7,470**

Observations:

- MBFD rescue runs involving a transport averaged 43.9 minutes from dispatch to clear.
- On average, an MBFD rescue spent 16.4 minutes treating patients on scene, spent 7.7 minutes on the road to take patients to the hospital, and then spent 15.1 minutes at the hospital and traveling back to the station.

Attachment I uses CAD data to report the workload of administrative and off-duty units in the study period. Attachment II analyzes primary extinguishment actions taken by all MBFD units to mitigate structure and outside fire calls.

Attachment I: Workload of Administrative Units

Description	Annual Hours	Annual Number of Runs
Fire Chief	0.3	1
Assistant Fire Chief	2.9	2
Operations Chief	2.3	5
Support Services Chief	0.8	1
Off-Duty Detail Units	237.0	606
Fire Prevention Units	91.0	59

Attachment II: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Structure fire	Outside fire
Fire control or extinguishment, other	10	12
Extinguishment by fire service personnel	24	59
Salvage & overhaul	3	1
Confine fire (wildland)	0	1
Control fire (wildland)	0	1
Rescue, remove from harm	0	1
Emergency medical services, other	0	1
Remove hazard	2	1
Ventilate	16	1
Establish safe area	0	1
Restore fire alarm system	1	0
Remove water	1	0
Provide water	0	1
Notify other agencies.	0	1
Enforce codes	0	1
Investigate	15	35
Investigate fire out on arrival	8	13
Standby	0	2
Action taken, other	0	2
No action recorded	7	22
Total	**87**	**156**

Observations:

- A total of 37 structure fire calls were extinguished by fire service personnel, which accounted for 39 percent of structure fire calls in MBFD's jurisdiction.
- A total of 74 outside fire calls were extinguished by fire service personnel, which accounted for 47 percent of outside fire calls in MBFD's jurisdiction.