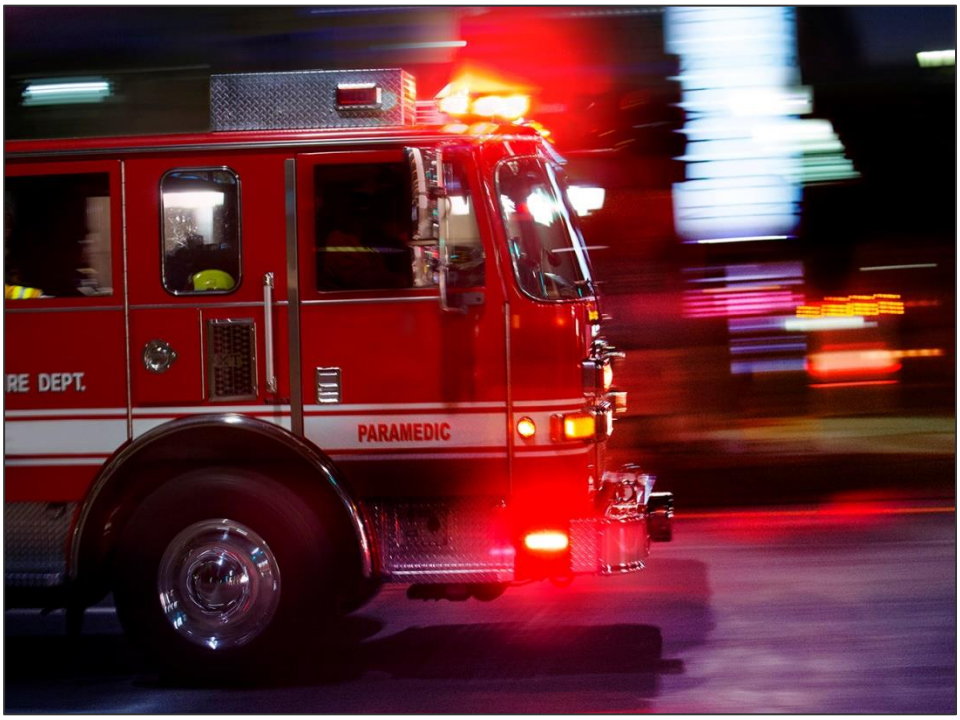
CENTER FOR PUBLIC SAFETY MANAGEMENT, LLC

# FIRE DEPARTMENT EMS REVIEW

## SALINAS, CALIFORNIA

**Final Report-December 2018**




CPSM®

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ICMA

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

# THE ASSOCIATION & THE COMPANY

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

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

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

In 2014, as part of a restructuring at ICMA, the Center for Public Safety Management (CPSM) was spun out as a separate company. It is now the exclusive provider of public safety technical assistance for ICMA. CPSM provides training and research for the Association's members and represents ICMA in its dealings with the federal government and other public safety professional associations such as CALEA, PERF, IACP, IFCA, IPMA-HR, DOJ, BJA, COPS, NFPA, and others.

The Center for Public Safety Management, LLC, maintains the same team of individuals performing the same level of service as when it was a component of ICMA. CPSM's local government technical assistance experience includes workload and deployment analysis using our unique methodology and subject matter experts to examine department organizational structure and culture, identify workload and staffing needs, and align department operations with industry best practices. We have conducted more 305 such studies in 41 states and provinces and 215 communities ranging in population from 8,000 (Boone, Iowa) to 800,000 (Indianapolis, Ind.).

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

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# SECTION 1. EXECUTIVE SUMMARY

The Center for Public Safety Management LLC (CPSM) was retained by the City of Salinas to conduct a review of the EMS delivery system of the Salinas Fire Department (SFD). Specifically, CPSM was tasked with identifying any enhancements or modifications to the delivery system that could be considered in an effort to improve overall efficiencies and patient outcomes.

During the study, CPSM analyzed the department's historical workload, its deployment, staffing, and the training structure associated with the delivery of EMS, particularly its practice of providing ***EMS first response at an advanced life support (ALS) service level***. We also looked at several of the key interactions that are involved in this service, particularly the working relationship with the local ambulance provider, AMR, and the functional relationship with the Monterey 911 Communications Center. We also examined the regulatory and medical oversight provided by the Monterey County EMS Agency and its interaction with the SFD. In addition, CPSM examined firsthand the department's EMS operations, including response times, call durations, and EMS response patterns. Fire departments tend to deploy resources that generally are built around structural firefighting and wildland fire service responsibilities. Though EMS typically dominates the total call activity, the systems utilized by most fire service organizations, including the Salinas Fire Department, often do not reflect this distinction.

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 EMS workload and its deployment practices. The CPSM data section staff conducted an in-depth review of the SFD response activities, which included an analysis of call-type distributions and unit response statistics. This information was used in conjunction with information collected during on-site visits to determine if there were deployment options that could enhance overall service efficiencies and position the department in its utilization of existing resources to better manage combined EMS and fire service demands.

Project staff conducted site visits on **January 8-9, March 14-16, May 7-8, and again on August 7, 2018,** for the purpose of observing the fire department and agency-connected support functions, interviewing key department staff, and reviewing preliminary data and operations. Telephone conference calls as well as e-mail exchanges were conducted between CPSM project management staff, the city's fire department staff, and other key officials involved in EMS operations. CPSM will typically utilize national benchmarks that have been developed by organizations such as the National Fire Protection Association (NFPA), the American Public Communication Officers (APCO), the Center for Public Safety Excellence Inc. (CPSE), and the ICMA Center for Performance Measurement, as well as others in developing its analysis.

We found SFD employees to be highly skilled and extremely committed in serving the Salinas metropolitan area and adjacent areas of Monterey County. The city and the fire personnel with whom CPSM interacted are truly interested in serving the city to the best of their abilities. At the same time, the collaborations between the SFD and the contracted ambulance service (AMR), Monterey 911 Communications Center, and the County EMS Agency, though well established, we believe can be improved. The department is challenged to appropriately staff and deploy the needed resources while containing costs. Though these aspects of service delivery are difficult to navigate, they are not insurmountable. CPSM will provide a series of justifications that provide a substantive basis for ***SFD to alter its current practice of providing ALS 1st response and move instead to an EMT-Enhanced 1st Response (BLS) deployment.***

## RECOMMENDATIONS

The SFD provides excellent EMS services to its citizens, local businesses, and visitors to the area. However, the nature of EMS in America is rapidly evolving and as more evidence-based research becomes available, we are observing that two widely-held EMS system response beliefs have been challenged by this research. ***First;*** *that faster response times improve patient outcomes* and ***Second;*** *that more paramedics in an EMS system result in a higher the level of care*. The costs associated with maintaining ALS 1st response capabilities by SFD's primary response units is significant, more than $500,000 annually. Alternative deployment models that utilize ***EMT-Enhanced 1st Response (BLS)*** have been documented to achieve comparable patient outcomes with significant reductions in the associate operating and capital costs.

***Eighteen*** recommendations are listed below and in the applicable sections within this report. The recommendations are aimed at providing the City of Salinas with a series of service delivery alternatives that we believe will provide a ***more sustainable and cost-effective service delivery model*** that is better suited in meeting the City's short and long-term service goals.

These recommendations are listed in the order in which they appear in the report.

1. The SFD should require all employees to maintain the necessary recordkeeping for those EMS continuing education hours needed for EMT and paramedic certification. (See p. 10.)
2. The SFD should move to an online EMS training format for the required EMS continuing education requirements. (See p. 11.)
3. The City of Salinas should renegotiate the current EMT and paramedic provisions in the labor agreement to clearly indicate that it is the employee's responsibility to maintain their certification as a condition of employment. (See p. 13.)
4. The SFD should discontinue its role as an authorized entity in the delivery and issuance of EMS continuing education credits. (See p. 13.)
5. In cooperation with Monterey County EMS and AMR, the SFD should consider changing its ALS first response services to an EMT-Enhanced first response. (See p. 19.)
6. Salinas should consider a phased-in approach to change its EMS service level from ALS to EMT-Enhanced first response. (See p. 19.)
7. The SFD should work with local healthcare and community stakeholders on a gap analysis to determine the roles that a SFD-based community paramedicine program might fill in Salinas. (See p. 22.)
8. The Salinas Fire Department should consider the utilization of two-person EMS squad units to handle EMS and non-emergency service calls in the city's busiest service districts. (See p. 25.)
9. Salinas should consider the option of deploying a third two-person EMS squad on a peak-period basis as a roving unit. (See p. 26.)
10. As the initial step in altering EMS service delivery, Salinas should acquire three EMS squad units. (See p. 27.)
11. The City of Salinas should meet with the firefighters' labor union to develop the terms and conditions for operating peak-period EMS squad units along with the associated work schedule and wage scale. (See p. 28.)
12. For a minimum of 12 months, SFD should monitor the types of patient interactions that occur for both ALS first response squads and EMT-Enhanced engines and ladders. (See p. 28.)

13. Salinas should work with Monterey County 911 Emergency Communications, County EMS, and AMR in implementing an effective call screening and call prioritization process that is capable of supporting emergency medical dispatching for a minimum of 90 percent of its incoming EMS calls. (See p. 31.)
14. Salinas should alter its response pattern when EMS calls are screened sufficiently by AMR dispatchers to be classified as priority 3. (See p. 32.)
15. SFD and AMR should institute a radio communication system that allows for direct unit-to-unit communication while operating jointly in a two-tiered EMS response system. (See p. 33.)
16. SFD, working with the County EMS (LEMSA) and other local stakeholders, should develop a clinical performance dashboard to monitor compliance with clinical bundles. (See p. 36.)
17. SFD should continue to monitor and report on a regular basis its service performance and comparisons through ESO Solutions. (See p. 38.)
18. SFD, working with the County EMS (LEMSA) and other local stakeholders, should develop a patient experience reporting process and dashboard to monitor the patients' perceptions of the services being provided. (See p. 39.)

# SECTION 2. PROJECT OVERVIEW

This report is intended to provide an independent review of the emergency medical services (EMS) delivery system provided by the Salinas Fire Department (SFD). The intent is to give city officials, including fire officials, an impartial and outside perspective regarding this critical service responsibility. More importantly, the project seeks to evaluate the current EMS deployment strategies and provide a series of options that may be considered as the fire department, administrative officials, and the City Council look towards the future.

EMS has evolved over the past 30-years and has now become the predominant workload for most fire departments, including the Salinas Fire Department. In Salinas, EMS accounts for more than 75 percent of the overall fire department workload and this service dominates the volume of individual contacts between the SFD and Salinas citizens. All SFD personnel are now required to be trained as Emergency Medical Technicians (EMTs) and more than 25 percent of the department's line staff are certified as Paramedics. The initial training requirements for EMT licensure, along with continuing education requirements, are strictly monitored and more regulated than firefighting training requirements. Up until June 2018, the Salinas Fire Department staffed and equipped all of its responding fire units (engines and ladder trucks) to deliver advanced life support (ALS) services. After June 2018, in an effort to reduce overtime costs, engines are being staffed and equipped to operate at the ALS level and ladder trucks have moved to provide basic life support (BLS) services.

Salinas operates in what is called a ***Two-Tiered EMS Delivery System***. In this arrangement the fire department is the primary first responder for EMS calls and a private ambulance provider (AMR) is a co-responder. The fire department will typically arrive first on scene, provide the initial patient assessment, and begin treatment. AMR co-responds to all EMS calls and is responsible for taking over patient care, along with transport of the patient to the most appropriate medical receiving facility. Once AMR assumes patient care, the SFD unit is typically released from the scene and returns to its assigned response area. There are occasions, in the care of the most critical patients, in which a SFD employee will accompany the AMR ambulance during transport. CPSM estimates that on approximately 9 percent of the ambulance 911 transports, an SFD employee accompanies the AMR staff during the transport. In addition to transport services, AMR also provides ***inter-facility transport services***. These services typically are nonemergency in nature and involve the movement of non-ambulatory patients from one medical facility to another. Patients who access the EMS system through the 911 network and who are transported by AMR are charged a transport fee that ranges from $2,300 to more than $4,000 depending on the level of care and the distance of the transport.

The state of affairs in the delivery of prehospital emergency medical care is changing dramatically and in a rapid fashion. The changes in the medical insurance industry, including Medicare, Medicaid. Medi-Cal, and employer-paid insurance coverage, have altered the approach to medical care including prehospital care and emergency medical transports. The public has recognized the benefits of utilizing the 911 system to access rapid and professional prehospital care. Subsequently, the volume of 911 calls have been skyrocketing across the nation and these increases often inundate first responders and hospital emergency departments. Much of the call volume associated with 911 calls are not true medical

emergencies and frequently involve public assists, substance abuse calls, and calls involving mental health and other efforts that require social service assistance rather than emergency medical care. In numerous systems across the nation, we are observing that many calls are non-emergency and do not necessitate a "HOT" response. Recent data from the MedStar system in Fort Worth, Texas, reveals that only 28 percent of its alarm activity is classified as life-threatening or Priority 1 calls. In other words, this analysis indicates that 72 percent of the call activity is non–life-threatening or non-emergency in nature.

### TABLE 2-1: Analysis of Response Modes Utilizing a Dispatcher Call-Screening Process (MedStar/Fort Worth, TX)*

| Response Priority | # of Calls | Percent of Total |
|---|---|---|
| Priority 1 – Life-threatening | 2,622 | 28.0 |
| Priority 2 - Non–life-threatening | 4,408 | 47.1 |
| Priority 3 - Low acuity emergency | 2,337 | 24.9 |

*__Note:__ Response summary for MedStar units in August of 2018 involving 9,367 calls

Consequently, 911 call centers across the nation are refining their ability to screen incoming calls in an effort to determine the nature and severity of the incident from the information given by the caller. With this information in hand, agencies are able to alter their response so as to better match the level of response with the true nature and severity of the call. In addition, many communities are establishing new programs involving the delivery of ***Community Paramedicine*** or ***Community Health Initiatives.*** These programs are aimed at reducing the number of 911 transports to hospital emergency departments in an effort to divert non-emergency patient requests to those social service outlets that are better suited to provide the level of care that is required.

Subsequently, it will be the primary effort of this report to identify those EMS service delivery options that will enable the Salinas Fire Department to continue in its efforts to best serve the community and at the same time better manage its resources while fulfilling its combined mission of providing emergency medical first response and fire protection services.

# SECTION 3. REVIEW OF EMS SERVICE DELIVERY, DEPLOYMENT, AND TRAINING

## DEPLOYMENT AND STAFFING

The SFD operates from six fire stations, each providing full-time emergency response to an array of fire, EMS, and other calls for assistance. SFD operates with a minimum daily staffing of 25 personnel who are operational on a 24-hour basis, 365 days each year. In June 2018, the minimum staffing level was reduced from 27 personnel to 25 personnel in an effort to reduce overtime costs. Table 3-1 identifies the equipment and how the 25 personnel are currently assigned on a daily basis to each fire station.

### TABLE 3-1: SFD Fire Stations, Response Units, and Assigned Personnel

| Station # | Response Units | Assigned Personnel |
|---|---|---|
| 1 | 1 Engine<br>1 Ladder Truck<br>1 Command/BC | 3<br>3<br>1 |
| 2 | 1 Engine | 3 |
| 3 | 1 Engine | 3 |
| 4 | 1 Engine | 3 |
| 5 | 1 Engine<br>1 Ladder Truck | 3<br>3 |
| 6 | 1 Engine | 3 |

SFD operates in a three-platoon system in which crews are on duty for 48 consecutive hours followed by 96 hours off for relief. The SFD delivers field operations and emergency response services through a traditional paramilitary structure with clearly defined levels of authority. The Deputy Fire Chief, who works Monday through Friday, but responds to major incidents at any time, is the ranking officer in charge of all field operations. The Operations Division utilizes three middle managers (Battalion Chiefs) who supervise their individual shifts for both emergency command functions and administrative oversight when on duty. Captains serve as first-line supervisors for each responding unit; in addition technical specific staff assume roles as Drivers, Firefighter/Paramedics, and Firefighter/EMTs.

SFD responded to 13,696 calls in the 12-month evaluation period of July 1, 2016, through June 30, 2017, as recorded in the Monterey County 911's computer-aided dispatch (CAD) system and the SFD's National Fire Incident Reporting System (NFIRS). Table 3-2 shows the overall call activity and the distribution of the various call types for the City of Salinas.

### TABLE 3-2: Call Types

| Call Type | Number of Calls | Calls per Day | Call Percentage |
|---|---|---|---|
| Breathing difficulty | 727 | 2.0 | 5.3 |
| Cardiac and stroke | 664 | 1.8 | 4.8 |
| Fall and injury | 1,162 | 3.2 | 8.5 |
| Illness and other | 3,390 | 9.3 | 24.8 |
| MVA | 1,296 | 3.6 | 9.5 |
| Overdose and psychiatric | 1,028 | 2.8 | 7.5 |
| Seizure and unconsciousness | 662 | 1.8 | 4.8 |
| **EMS Total** | **8,929** | **24.5** | **65.2** |
| False alarm | 736 | 2.0 | 5.4 |
| Good intent | 434 | 1.2 | 3.2 |
| Hazard | 490 | 1.3 | 3.6 |
| Outside fire | 313 | 0.9 | 2.3 |
| Public service | 1,112 | 3.0 | 8.1 |
| Structure fire | 122 | 0.3 | 0.9 |
| **Fire Total** | **3,207** | **8.8** | **23.4** |
| Canceled | 1,537 | 4.2 | 11.2 |
| Mutual aid | 23 | 0.1 | 0.2 |
| **Total** | **13,696** | **37.5** | **100.0** |

## Workload

CPSM conducted an extensive analysis of the emergency response workload handled by the SFD. We examined the call activities of each unit that was operational during the 12-month evaluation period. Workload was measured in two ways: first by total runs handled by the individual units and then by the deployed time each unit spent on these calls. It is important to note that for any given call there can be multiple runs. For example, on a single structure fire call there are at least six units that respond, creating six runs (four engines, one ladder, one Battalion Chief). Subsequently, for the total 13,696 calls handled by SFD units there were an associated 15,996 runs generated. Table 3-3 provides a detailed look at the runs handled by the various response units in the SFD system, along with deployed time.

## TABLE 3-3: Run Workloads by SFD Units

| Station | Unit Id | Unit Type | Avg. Deployed Min. per Run | Total Annual Hours | Avg. Deployed Min. per Day | Total Annual Runs | Avg. Runs per Day |
|---|---|---|---|---|---|---|---|
| 1 | BAT1 | Battalion Chief | 44.5 | 496.5 | 81.6 | 670 | 1.8 |
| | E1 | Engine | 22.4 | 1,051.6 | 172.9 | 2,811 | 7.7 |
| | Reserve* | Engine | 31.1 | 359.7 | 59.1 | 695 | 1.9 |
| | T1 | Ladder | 23.7 | 505.9 | 83.2 | 1,282 | 3.5 |
| | **Total** | | **26.5** | **2,413.8** | **396.8** | **5,458** | **15.0** |
| 2 | E2 | Engine | 21.7 | 822.4 | 135.2 | 2,278 | 6.2 |
| | Reserve* | Engine | 22.1 | 221.8 | 36.5 | 603 | 1.7 |
| | **Total** | | **21.7** | **1,044.2** | **171.6** | **2,881** | **7.9** |
| 3 | E3 | Engine | 22.6 | 564.8 | 92.8 | 1,499 | 4.1 |
| | OES323 | Engine | 27.4 | 9.1 | 1.5 | 20 | 0.1 |
| | Reserve* | Engine | 20.2 | 22.9 | 3.8 | 68 | 0.2 |
| | **Total** | | **22.6** | **596.8** | **98.1** | **1,587** | **4.3** |
| 4 | CR4 | ARFF | 22.1 | 1.5 | 0.2 | 4 | 0.0 |
| | E4 | Engine | 24.3 | 483.9 | 79.5 | 1,196 | 3.3 |
| | Reserve* | Engine | 23.4 | 267.9 | 44.0 | 688 | 1.9 |
| | **Total** | | **23.9** | **753.3** | **123.8** | **1,888** | **5.2** |
| 5 | E305 | Brush | 44.7 | 54.3 | 8.9 | 73 | 0.2 |
| | E5 | Engine | 24.5 | 552.9 | 90.9 | 1,356 | 3.7 |
| | Reserve* | Engine | 28.1 | 46.4 | 7.6 | 99 | 0.3 |
| | T2 | Ladder | 26.7 | 240.0 | 39.5 | 540 | 1.5 |
| | **Total** | | **25.9** | **893.7** | **146.9** | **2,068** | **5.7** |
| 6 | E6 | Engine | 23.1 | 317.2 | 52.1 | 824 | 2.3 |
| | Reserve* | Engine | 20.7 | 435.5 | 71.6 | 1,264 | 3.5 |
| | **Total** | | **21.6** | **752.7** | **123.7** | **2,088** | **5.7** |
| Reserve | T4 | Ladder | 138.5 | 60.0 | 9.9 | 26 | 0.1 |
| | **Total** | | **138.5** | **60.0** | **9.9** | **26** | **0.1** |
| **Total** | | | **24.4** | **6,514.6** | **1,070.9** | **15,996** | **43.8** |

***NOTE:** Reserve units are not additional units but are typically used as replacement units which are staffed and operated by the same personnel and placed into service when the primary unit is unavailable due to repairs or maintenance.

From this analysis we can see that the average run activity for individual units ranges from a high of 9.6 per day by Engine-1, to a low of 1.5 runs per day by Ladder-2. Typically, we would consider it a ***very high workload*** for a single unit when that unit responds to more than 3,500 runs annually. In the Salinas system, Engine-1 is responding to more than 3,500 runs annually (approximately 3,506). In addition to the number of runs, we also look at the in-service times for these calls. This tells us the actual amount of time that units are actively engaged in response activities. In the Salinas system, the average call duration for all calls was 24.4 minutes. EMS calls on average lasted 23.4 minutes and fire calls lasted 28.6 minutes. These call durations are very consistent with many fire agencies across the nation who operate in a two-tiered EMS delivery system. It must also be noted that these average call durations include the associated travel time it takes to get to the scene along with the dispatch time and crew turnout. On average in the Salinas system, these combined times for these segments of a response are about seven to

eight minutes for each call. Subsequently, the typical on-scene time for Salinas units was approximately 15 to 20 minutes.

In our analysis it was determined that the busiest unit in the system (Engine-1) was engaged in response activities, on average, 3.9 hours for each 24-hour period. Ladder-2 was again the least busy unit, engaging in response activities, on average, 39 minutes each 24-hour period. The other units in the system had in-service times that generally were in the two-hour range for each 24-hour period. Typically, in-service times that approach six to eight hours in a 24-hour work cycle will result in a higher percentage of overlapping calls. When calls overlap, the primary response unit is unavailable and a secondary unit must pick up the call. This can result in a delay or an extended response time unless a roving unit has back-filled the station or there is a secondary units assigned to that district that can respond without delay.

It is also important to note that EMS calls accounted for approximately 70 percent of the in-service time for SFD response units, while structure and outside fire calls accounted for approximately 8 percent of the total in-service times. Canceled calls, which are primarily EMS-related, accounted for approximately 6.4 percent of the total in-service time, and were not included in these totals.

What stands out in this analysis is the ***under-utilization of the two ladder trucks*** operated by the SFD. During the evaluation period the ladder trucks were staffed with eight personnel (Ladder staffing was reduced from 4-personnel to 3-personnel in June 2018). The 4-person allocation accounted for nearly 30 percent of the daily on-duty workforce at the time of our analysis (8/27=29.6 percent). However, the combined run activity for the two ladder trucks at this time was only 1,822 runs or approximately 11.4 percent of the total run activity. In further refining our look at this response activity, it was found that the two ladder trucks responded to a total of 118 structure fires, which equates to only 6.5 percent of their combined run activity. This indicates that the overwhelming response activity of the two ladder trucks was for non-fire related call activity. In addition, SDF does not keep records that indicate the number of times the ladder trucks were actually used in providing their specialized service, either an elevated rescue, conducting ventilations, or producing an elevated master stream.

In our analysis, ladder personnel were used primarily to supplement scene operations and the ladder trucks were merely the transport mechanism to get these personnel and equipment to the scene. In contrast to the relatively low utilization levels of the two ladder trucks, two of the SFD units (Engine-1 and Engine-2), were utilized extensively. Engine-1 responded to 3,506 calls and Engine-2 responded to 2,881 calls. The combined workload for these two units accounts for nearly 40 percent of the total run activity handled by the entire SFD fleet. CPSM believes that this workload imbalance should be further evaluated and alternative deployment options should be considered that would better serve the community and improve overall efficiencies.

## EMS TRAINING, RECERTIFICATION, AND CONTINUING EDUCATION

EMS training and scope of practice guidelines are established by state statute and are administered by the California Emergency Medical Services Authority (EMSA). EMSA has authorized the creation of Local EMS Agencies (LEMSAs) to administer the day-to-day management and oversite of EMS operations in either regional or countywide geographic subareas. Monterey County has established the Monterey County EMS Agency as a part of the County Health Department to serve as the LEMSA for Monterey County. The County EMS Agency employs a Medical Director who is responsible for the supervision of patient care, ensuring quality assurance, and authorizing the training requirements for all EMTs and Paramedics operating in the county. Service agencies in Monterey County must enter into a ***provider service***

***agreement*** that stipulates the level of care that can be provided and a series of requirements involving continuing education, reporting and record keeping, equipment and medications to be carried, and the quality assurance processes. Local providers, like the Salinas Fire Department, are required to enter into individual provider agreements in order to deliver both basic and advanced life support services in their respective communities.

The Salinas Fire Department has assigned a 40-hour ***EMS Officer*** who is responsible for the administrative oversight of EMS delivery in the fire department. This individual, who holds the rank of Captain, works in close cooperation with field supervisors and individual paramedics to ensure that the terms of the EMS provider agreement are adhered to. This includes the oversight of patient care (through a quality assurance review process) along with maintaining the required records for the continuing education training requirements. Under these guidelines, Paramedics are required to complete 48 hours of continuing education in specified fields along with the completion of a skills verification testing process every two years. If these procedures are not documented in a field setting, Paramedics can complete a skills lab or take refresher courses that include these skill assessments (i.e., CPR, ACLS PHTLS, PALS, PEPP, and BTLS). EMTs are required to complete 24 hours of continuing education training every two years, along with the completion of a skills verification testing process and the maintenance of a valid CPR card.

Local agencies operating under the Monterey County EMS provider agreements have various options in meeting the continuing education training requirements. These include both real-time classroom instruction, in-serve clinical reviews, and the use of approved online training applications. The Salinas Fire Department has chosen to utilize a hands-on training approach for the majority of its continuing education requirements. In this process, employees while on duty receive classroom instruction for an array of subject matter. This instruction is typically delivered by the EMS Officer or an assigned instructor. SFD has designated three on-duty EMS training instructors (shift personnel) who assist the EMS Officer in the delivery of these training programs along with other EMS support and logistical duties. In addition, SFD employees utilize the online training application, ***Target Solutions***, for a portion of the EMS training requirements. For EMS coursework that is delivered in a classroom setting, a roster is maintained for the participating employees and the hours assigned for the training class are logged and reported by the training staff. For training that is completed through the Target Solution online format, once this training is successfully completed the individual records and the allotted hours are later compiled by the SFD training staff.

The process being used for the delivery of the continuing education training for nearly 100 employees over a two-year period and maintaining the record keeping through a roster sign-in sheet is an arduous and archaic process. The Salinas Fire Department has chosen to manage the training record keeping primarily by its training officer and clerical staff. CPSM believes that the central oversight of both training delivery and the record keeping of an individual employee's continuing education hours is unnecessary and extremely inefficient. Many fire agencies that we have observed have chosen to make it the employee's responsibility to complete the necessary training requirements and log their continuing education hours into an automated record-keeping system. Maintaining EMT certification is a job requirement and a condition of employment in Salinas, as it is in most fire departments across the nation. A paramedic certification entitles employees to an additional pay supplement (typically over $11,000 annually) and is also an employee classification that requires certification. Fire department employees are well-versed in the utilization of online record-keeping systems and it appears unnecessary for this oversight to be the responsibility of the training staff rather than the individual employee.

***Recommendation: The SFD should require all employees to maintain the necessary record keeping for those EMS continuing education hours needed for EMT and Paramedic certification. (Recommendation No. 1.)***

CPSM believes that shifting the responsibility for EMS continuing education record keeping from the training staff to the employee is a much more accountable and efficient process. The training staff can then focus on skills assessments and new areas of instruction that may not be available through an online format. SFD may still choose to provide periodic reminders or credit hour summaries, but the process of completing and recording the required training should be an individual responsibility.

The utilization of an online training platform such as Target Solutions is very viable and is an effective training tool. CPSM believes that the overwhelming majority of the continuing education requirements should be obtained through an online format. We also feel that the skills verification and testing process should be the primary focus of the training staff, along with any individual remediation efforts that are needed.

***Recommendation: SFD should move to an online EMS training format for the required EMS continuing education requirements. (Recommendation No. 2.)***

There are numerous online EMS and fire training applications. These applications offer an array of training scenarios and expertise that go well beyond the abilities of in-house instruction. SFD is fortunate that the LEMSA provides significant latitude in the training applications that can be used and does not restrict the amount of hours that can be obtained through an online format.

# SECTION 4. 2018 SUSPENSION OF EMS CONTINUING EDUCATION AUTHORIZATION

In November 2017, the Monterey County Emergency Medical Services Agency (LEMSA) requested verification from the SFD of specific paramedic continuing education course records involving ALS skills maintenance and Paramedic accreditation. This inquiry specifically referenced the recertification of 23 SFD Paramedics in the three-year period between 2015 and 2018. In April 2018, the City of Salinas was again notified by the County LEMSA, informing both the city and its fire department of the pending suspension of its authorization to continue in its status as an EMS continuing education provider. On May 17, 2018 SFD surrendered its CE provider approval because of its inability to provide the requested documentation and training records involving the above-mentioned 23 SFD paramedics. As a result if this action, SFD was no longer authorized to deliver and issue continuing education credit for its EMS training. The city was also notified in May 2018 by the California Emergency Medical Services Authority (EMSA) that it had initiated an investigation regarding the alleged training violations.

The training violations in question involved what is called "***infrequently used skills testing***" and that dated back to January 1, 2015. This skills testing involves the demonstration of such procedures as the intubation of children, performing a cricothyrotomy, knowing how to perform a thoracentesis, along with other advanced and otherwise infrequently used paramedic procedures. SFD was required to maintain these training records for a four-year period. As a result of the SFD's inability to produce the requested documentation, the training division conducted a series of additional training and testing sessions for the affected personnel in January 2018.

Following these notifications, the city hired an ***outside legal group*** to conduct an investigation of the various training violations and alleged reporting infractions. In November 2018, this investigation was completed and a report was generated which ***sustained*** a number of these charges. In November of 2018 the County LEMSA conducted an audit of the SFD's CE provider requirements. This review indicated that ***SFD was in full compliance with the CE provider requirements and was re-instated effective December 10, 2018, to provide EMS continuing education training.*** At the time of the writing of this report, the State EMSA had not completed its investigation, nor had it released any of its findings or actions.

The paramedic training investigation and subsequent findings placed both the city administration and its fire department leadership in a very precarious position. The community extends a significant trust to its fire department personnel and affords them considerable respect and courtesies as a result of their services. The city residents expect propriety and professionalism in the level of oversight of its municipal leaders, particularly when their public safety is involved. This level of trust was shaken by these allegations and SFD was required to take swift and decisive actions to rectify the situation. The resulting 6-month suspension of SFD's CE provider authorization is an embarrassment to the fire department and this perception will no doubt be compounded if any administrative sanctions are imposed by the State EMS oversight agency.

CPSM has reviewed this issue in-depth and believes that a key factor that contributed to these violations stem from the level of responsibility that was given to the EMS Officer of the Salinas Fire Department. As indicated earlier, the fire department has only one person, its EMS Officer who is assigned with the oversight of EMS field training. This responsibility is significant given overwhelming and perhaps compromising tasks in both the delivery of the necessary EMS training and the verification of the sufficiency of this training in meeting certification

requirements. Having the same person responsible for both delivering the training and also ensuring that the training is sufficient to meet recertification requirements appears to eliminate the necessary checks and balances in the system. These responsibilities also place significant pressure on this individual because of the far-reaching financial impacts if an employee loses his or her certification. In an earlier recommendation, CPSM expressed its belief that the responsibility for insuring that fire department employees receive the necessary continuing education credits for EMS recertification, should be ***borne by the employee rather than the EMS Officer***. CPSM believes that many of the training violations would have been avoided if the EMS Officer was not responsible for the delivery of EMS recertification training.

Fire departments across the nation often agree to provisions in their collective bargaining agreements that require cities or other governing entities to pay for all costs associated with the maintenance of EMS re-certifications for their employees. This typically would include the costs associated with the delivery of this training along with any overtime costs for those employees who participate in these required training activities outside of their normal work schedule. This is the approach that has been taken by the SFD, and CPSM believes that it is this philosophy that to a great extent has contributed to the EMS training violations.

The difficulty now is how to change the interpretations in the current labor agreement regarding EMS recertification and instead make it the sole responsibility of the employee to obtain the certifications necessary to operate legally as an EMT or Paramedic. The current language in the collective bargaining agreement specifically states that the city will pay all costs associated with EMS recertification, including any overtime costs involving this training. However, the contract goes on to state that the maintenance of EMS certification is a condition of employment. CPSM believes that this ***ambiguity***, coupled with the recent EMS training violations, has created sufficient cause to renegotiate these provisions. We further believe that clarification is needed in the contract language that specifically states that all certified firefighters are required to maintain their EMS certifications and remove any language the states or infers that it is the city's role to either provide this training or pay any costs associated with the employee obtaining this training.

> ***Recommendation: The City of Salinas should renegotiate the current EMT and Paramedic provisions in the labor agreement to clearly indicate that it is the employee's responsibility to maintain his or her EMS certification as a condition of employment. (Recommendation No. 3.)***

In this context, the employee is responsible for ensuring that his or her certifications are valid and up to date and it becomes the city's responsibility to maintain proof of these certifications for all personnel who are employed by the city. The city may continue to make available online services or contracted in-service training forums to on-duty employees, but CPSM believes that the SFD EMS Officer and its shift training staff should discontinue its delivery of EMS continuing education training and no longer operate as an authorized entity in issuing EMS continuing education credits.

> ***Recommendation: The SFD should discontinue its role as an authorized entity in the delivery and issuance of EMS continuing education credits. (Recommendation No. 4.)***

By removing the EMS Officer and the field training instructors from EMS continuing education training, CPSM believes this will free up these personnel to supervise other critical aspects of EMS delivery. CPSM does not recommend the elimination of these positions or assignments. We feel there is ample workload to justify these assignments in the following areas:

- Managing the quality assurance/quality improvement process.
- Liaising with medical control and area hospitals.
- Protocol development and training.
- Providing logistical support for equipment and supplies.
- Providing training on new equipment or new procedures.
- Providing new employee training and orientation.
- Reviewing incident and patient reports.
- Conducting employee performance assessments.
- Providing remediation in addressing performance deficiencies to justify these assignments.

In addition, as the city and the SFD considers the implementation of two-person EMS squads and the utilization of peak-period and part-time personnel, CPSM believes this will create additional responsibilities for the existing EMS Officer and shift training staff.

# SECTION 5. ALTERNATIVE EMS FIRST RESPONSE OPTIONS

EMS in America is rapidly evolving as more evidence-based research becomes available on the efficacy and effectiveness of traditional EMS models. Two widely-held EMS system response beliefs have been challenged by this research:

- Faster response times improve patient outcomes.
- The more paramedics in an EMS system the higher the level of care.

## RESPONSE TIMES

Four recent studies evaluated the impact of response times on patient outcomes and their findings consistently point to the fact that there is very little, if any association, between EMS response times and patient outcomes.[1] Further, a 2008 statement developed by the Consortium of U.S. Metropolitan Municipalities EMS Medical Directors published in *Pre-hospital Emergency Care Journal* contains the following:

> *"Over-emphasis upon response-time interval metrics may lead to unintended, but harmful, consequences (e.g., emergency vehicle crashes)."*[2]

Evolved EMS systems have revised response configurations based on quality emergency medical dispatch processes, de-emphasizing speed as a proxy for quality service. These systems liberally use non-lights and siren responses and reserve precious ALS first response resources for the few calls in which the rapid arrival of an EMS unit may make a life or death difference. The key component in making this distinction is the utilization of an effective and coordinated call screening and emergency medical dispatching process.

### ALS First Response

As EMS systems were initially developed, the concept of a Paramedic on every call seemed logical. This concept led to the development of ALS first response. It is thought that the evidence for an ALS first response model was derived from early research that showed improved cardiac arrest outcomes with an ALS response time of eight minutes or less.[3] At the time of this study (1979), only Paramedics could perform defibrillation. Today, automated external defibrillators (AEDs) are commonplace and are used effectively by bystanders. In fact, most current research indicates that the initiation of CPR and AED use by bystanders are the most significant survival predictors for out-of-hospital cardiac arrest (OHCA) victims.[4]

Conversely, there have been several published studies that indicate that when there is an excess of Paramedics on an EMS call, and there are more Paramedics operating in an EMS

1. See: https://www.ncbi.nlm.nih.gov/pubmed/15995089
https://www.ncbi.nlm.nih.gov/pubmed/19731155
https://www.ncbi.nlm.nih.gov/pubmed/12217471
https://www.ncbi.nlm.nih.gov/pubmed/11927452
2. *Prehospital Emergency Care* 2008;12:141–151
3. JAMA. 1979 May 4;241(18):1905-7
4. https://www.ncbi.nlm.nih.gov/pubmed/28427882

system, there is a ***negative*** impact on patient outcomes.[5] While initially this may seem counter-intuitive, the reality is that the performance of critical ALS skills requires regular practice on real patients. When Paramedics are assigned to every response vehicle and they are assigned to every service district in the jurisdiction, there is very little likelihood that an individual Paramedic assigned to the slower service response areas will encounter a high number of critical patients that require these advanced services. However, when Paramedics are utilized selectively and assigned to only the most critical patients, the frequency with which they use advanced medical procedures and critical treatment protocols is expanded dramatically. Think of it this way: If you need to select a cardiac surgeon, are you likely to choose the surgeon that conducts one procedure a month or the one who conducts 20 procedures a month? The ability to develop and maintain critical life-saving skills are enhanced and more readily monitored when these services are provided by a limited number of individuals.

The position statement referenced earlier by the Consortium of U.S. Metropolitan Municipalities' EMS Medical Directors contains the following provision:

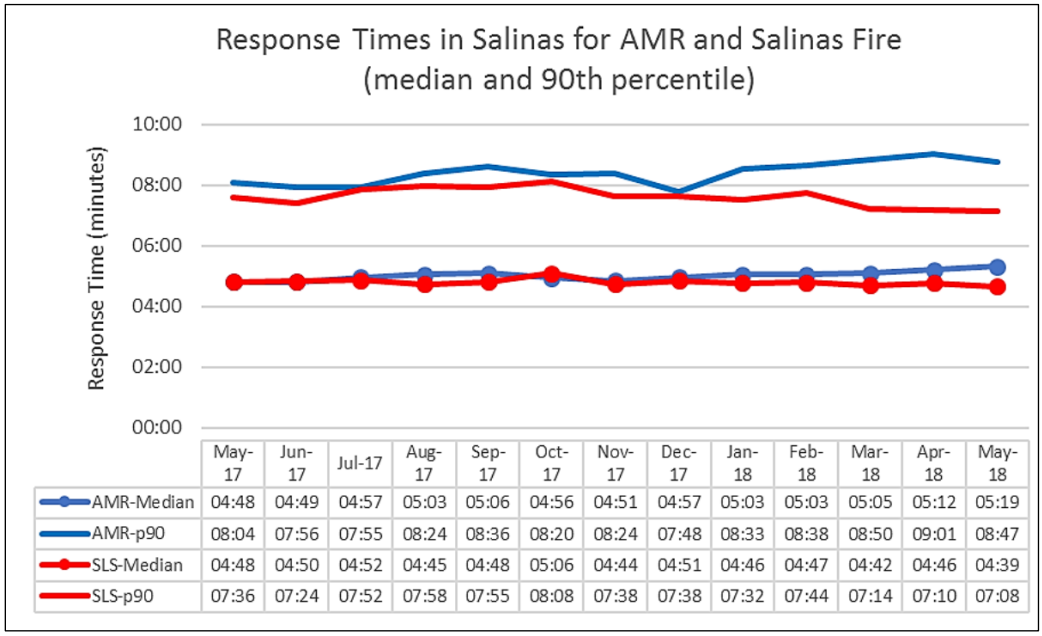
> *"As more paramedics are added to a particular system, however, the frequency with which each individual paramedic has the opportunity to assess and manage critically ill or injured patients in the primary or "lead" paramedic role may decrease. Pragmatically, considering that ALS cases constitute a small minority of all EMS 9-1-1 responses, adding more paramedics into the system may actually reduce an individual paramedic's exposure to critical decision-making and clinical skill competencies."*[6]

Interestingly, EMS systems that are widely recognized for their exceptional outcomes on critical patients, such as Seattle (King County) and Milwaukee, actually limit the number of Paramedics operating in these EMS systems. The theory is it is better to have a few, very well-experienced Paramedics than a large number of Paramedics who rarely practice critical skills.

The number of Paramedics operating and providing ALS first response is very high in the Salinas system. Prior to June 2018, SFD operated all its first response apparatus (six engines and two ladders) as ALS first responders. In addition, AMR ambulances also provide ALS first response to calls in the city. In June 2018, SFD ladder trucks were allowed to move to a BLS first response status, if overtime was required to maintain Paramedics on these units. This change was made in an effort to reduce the overtime costs associated with maintaining Paramedics on each of the ladder trucks. In a 12-month review of arrival times for both AMR first responders and the SFD, the median difference in the arrival times for these units was 46 seconds. Though average arrival times varied by month, these differences ranged from a low of 3 seconds to a high of 1 minute, 51 seconds. Figure 5-1 is a representation of arrival times for these two agencies.

5. See: https://www.ncbi.nlm.nih.gov/pubmed/19499471
https://www.ncbi.nlm.nih.gov/pubmed/18584496
6. *Prehospital Emergency Care* 2008;12:141–151.

## FIGURE 5-1: SFD and AMR Arrival Time Analysis (May 2017 – May 2018)




| | May-17 | Jun-17 | Jul-17 | Aug-17 | Sep-17 | Oct-17 | Nov-17 | Dec-17 | Jan-18 | Feb-18 | Mar-18 | Apr-18 | May-18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AMR-Median | 04:48 | 04:49 | 04:57 | 05:03 | 05:06 | 04:56 | 04:51 | 04:57 | 05:03 | 05:03 | 05:05 | 05:12 | 05:19 |
| AMR-p90 | 08:04 | 07:56 | 07:55 | 08:24 | 08:36 | 08:20 | 08:24 | 07:48 | 08:33 | 08:38 | 08:50 | 09:01 | 08:47 |
| SLS-Median | 04:48 | 04:50 | 04:52 | 04:45 | 04:48 | 05:06 | 04:44 | 04:51 | 04:46 | 04:47 | 04:42 | 04:46 | 04:39 |
| SLS-p90 | 07:36 | 07:24 | 07:52 | 07:58 | 07:55 | 08:08 | 07:38 | 07:38 | 07:32 | 07:44 | 07:14 | 07:10 | 07:08 |

In light of these outcomes, CPSM questions the necessity of the current deployment strategy from the perspective of both effective patient care and efficient resource management. According to the protocols established by the Monterey County LEMSA, even on the most life-threatening type of calls (cardiac arrest), basic life support (BLS) treatments such as CPR and defibrillation are the initial treatment modalities for patient care. Figure 5-2 is a reproduction of Protocol Number C-2, which guides the initial treatment regimens during cardiac arrest. This protocol, which is followed by both SFD first responders and AMR, BLS care is the initial treatment guideline for patient care. The initiation of ALS treatments such as IV initiation and epinephrine administration occurs after the initiation of CPR and defibrillation.

## -FIGURE 5-2: Monterey County Protocol for Cardiac Arrest

**Monterey County EMS System Policy**

Protocol Number: C-2
Effective Date: 7/1/2018
Review Date: 6/30/2021

**CARDIAC ARREST-VENTRICULAR FIBRILLATION/PULSELESS VENTRICULAR TACHYCARDIA**

**BLS CARE**

Routine Medical Care

**CPR**. Rotate provision of compressions to prevent rescuer fatigue in order to maintain adequate chest compressions. Follow AHA guidelines for rate and depth of compressions as well as for ventilations. The ratio of compressions to ventilations shall be 30/2. If the patient is intubated, ventilate the patient every 5-6 seconds.

**Apply AED** immediately when available. Continue chest compressions during application of the AED pads.

**Continue CPR** for two minutes even if shock is delivered.

**AED rhythm check and assess for spontaneous circulation**

**Continue resuscitation efforts** if no return of spontaneous circulation.

If return of spontaneous circulation, treat the patient based on condition.

## EMT-Enhanced Clinical Protocols

With the reality that both AMR and SFD units are achieving rapid response times, it is logical to question the benefit for maintaining ALS response capabilities on all units operated by the Salinas Fire Department. In addition, and as mentioned above, we are also seeing a trend towards EMT-Enhanced clinical protocols that allow BLS first responders to provided expanded levels of care and are effectively able to deliver the types of treatment regimens that are in effect improving overall patient outcomes.

The Monterey County LEMSA has recognized the patient safety and clinical value of some EMS procedures that had historically been reserved for ALS providers only, and is now allowing these procedures to be administered by EMTs under their EMT-Enhanced clinical protocols. These skills include:

- Supraglottic airways for the management of respiratory arrest.
- Administration of intranasal naloxone.
- Administration of epinephrine by auto-injector for suspected anaphylaxis and/or severe asthma.
- Continuous Positive Airway Pressure (CPAP) for severe respiratory compromise

These EMT-Enhanced skills would be used in conjunction with other treatment modalities to effectively treat the most life-threatening, time-sensitive EMS calls such as cardiac arrest, severe allergic reaction, and serious respiratory compromise. We expect this trend to continue and we anticipate that the levels of care and the procedures that will allowed to be administered by EMTs with some specialized training and guidance will continue to expand into the future. Interestingly, a large national study was recently published that reveals the use of supraglottic airways (a procedure done by EMTs in the management of cardiac arrests) has resulted in a significant improvement in 72-hour outcomes of cardiac arrest victims.[7]

In summary, the following factors combine to provide ample justification for the SFD, in cooperation with Monterey County EMS and AMR, to consider the use of EMT-Enhanced first response in place of the full Paramedic first response:

- Minimal arrival time differences between the SFD and AMR first responders.
- Protocol requirements that specify "BLS before ALS" treatments.
- The adoption of EMT-Enhanced clinical protocols.
- EMT-Enhanced level skills are much easier to maintain and less risky to administer.

***Recommendation: In cooperation with Monterey County EMS and AMR, the SFD should consider changing its ALS first response services to an EMT-Enhanced first response. (Recommendation No. 5.)***

## ALS vs EMT-Enhanced FIRST Response

Perhaps the most critical determination in the deployment of SFD resources relates to the level of care that is provided on EMS responses. As the data has indicated, there are minimal differences in the arrival times for SFD and AMR units, typically two minutes or less. Considering the prescribed treatment procedures and logical patient care progression, the initial patient assessments and treatment are generally BLS in nature and when needed, followed by a more advanced level of care (ALS). Combine this occurrence with the most recent national findings, which are consistently indicating that there is little if any improvement in clinical outcomes with a more rapid delivery of ALS care when BLS is being provided in a timely fashion. Salinas's residents are fortunate to have a significant concentration of service providers in a relatively small geographic area. In addition, the data is indicating that the volume of true advanced medical emergencies are only a small percentage of the overall call activity (usually less than 10 percent). For all of these reasons it is both prudent and reasonable to question if the continued maintenance of ALS capability is warranted for SFD's first response activities.

The costs associated with the delivery of ALS care versus EMT-Enhanced first response is significant. CPSM estimates that it is costing the city in excess of ***$500,000 annually to provide ALS care***. The majority of these cost are associated with the pay that is required under the current labor agreement for those employees who maintain Paramedic certification (approximately $300,000 annually). In addition, the minimum staffing requirements that are currently in place require that a minimum of six Paramedics be on duty at all times. CPSM estimates that this provision is resulting in an additional $100,000 to $125,000 in annual overtime costs. There are also additional cost associated with ALS supplies, equipment, medications, and training costs that further boost annual operating costs by an estimated $75,000 to $100,000. The actual savings that can be realized are dependent upon a number of factors. However, when evaluating

7. https://www.jems.com/articles/2018/08/eti-vs-sga-the-verdict-is-in.html

these cost savings over a ***ten-year projection***, CPSM believes that there is the ability to realize ***savings in amounts that approach $3 to $4 million*** in this timeframe.

These factors combined is the basis upon which we recommend that the City of Salinas re-evaluate its practice of providing EMS first response at the ALS level. However, considering the difficulties in making this change, CPSM believes that it is best that SFD consider a phased process to implement these changes.

> ***Recommendation: Salinas should consider a phased-in approach to change its EMS service level from ALS to EMT-Enhanced first response. (Recommendation No. 6.)***

The rational for phasing in these service changes is based on a number of considerations:

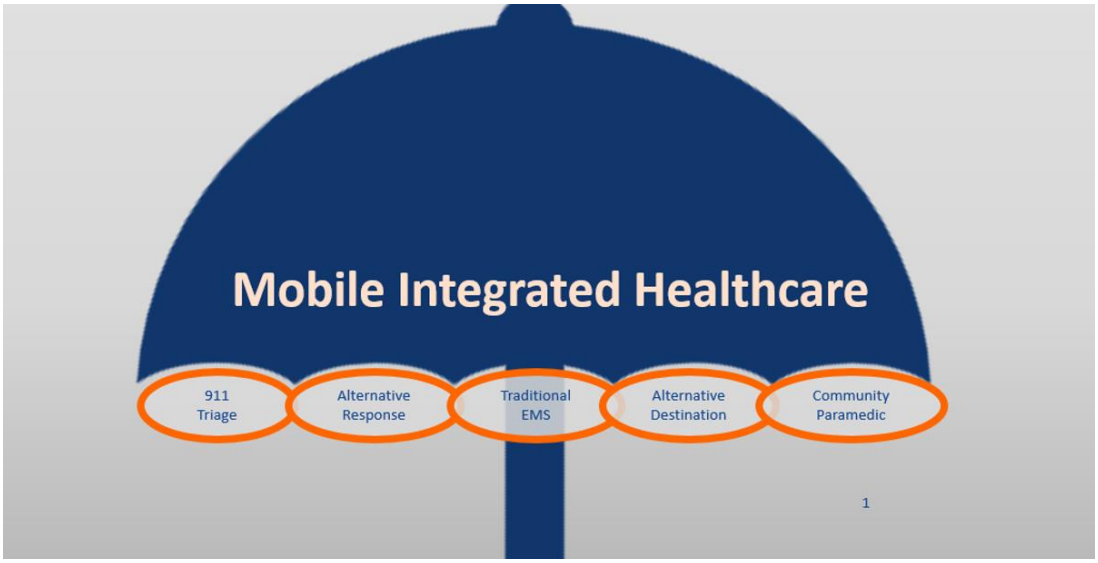
- First: The current collective bargaining agreement specifies the number of assigned Paramedics and their pay increment. It may be necessary to renegotiate this provision prior to changing the current deployment practices.
- Second: The dispatch call-screening process is not sufficiently prioritizing all EMS service requests to properly modify EMS response activities. Indications are that both AMR and County EMS will be changing the call-screening process in 2019.
- Third: The purchase, acquisition, and deployment of two-person EMS squad units should be an integral part of this evolution. The budgetary and procurement processes will likely necessitate that these acquisitions occur in 2019.
- Fourth: It is necessary to coordinate any change in EMS service delivery with both AMR and County EMS prior to implementation. This dialog is compounded by the current RFP for an ambulance provider and the paramedic fraud investigations that was ongoing at the time this report was written.
- Fifth: Internal training, deployment, and operational considerations should be established prior to making any changes in service delivery. We expect that these changes can be implemented within a six-month time frame, but they would be dependent upon the completion of several of the previous considerations identified above.

## COMMUNITY HEALTH PARAMEDICINE

One of the fastest growing value-added service enhancements in EMS is the development of Mobile Integrated Healthcare / Community Paramedicine (MIH/CP) programs. MIH/CP is comprised of a suite of potential services that EMS could provide to fill gaps in the local healthcare delivery system. In essence, MIH/CP is intended to better manage the increasing EMS call volume and better align the types of care being provided with the needs of the patient. To be effective, MIH/CP is commonly accomplished in a collaborative approach with healthcare and social service agencies within the community.

In 2009 there were four programs like this in the country, but a recent survey by the National Association of EMTs[8] identified more than 250 active MIH/CP programs operating across the U.S.

### FIGURE 5-3: MIH Services Infographic




In this report, CPSM is recommending the use of two-person EMS squad units. We also believe that the ***EMS squads could serve a dual role***, responding to EMS requests and also providing community paramedic services. We think that there are also opportunities to collaboratively fund the community paramedicine program with assistance from local stakeholders who seek to manage the navigation of patient treatment options more efficiently.

In California, the implementation of MIH/CP services by EMS providers has been challenging. Current state legislation limits the role of EMS providers to only services provided subsequent to an emergency call, or during an inter-facility medical transport. In November 2014, the California Office of Statewide Health Planning and Development (OSHPD) approved an application from the California Emergency Medical Services Authority to establish a Health Workforce Pilot Project to facilitate the implementation of 12 community paramedicine pilot programs in California. New legislation was introduced in 2018 (AB-3115) that continued to place limits on MIH/CP programs in the state. This legislation was vetoed by Governor Brown with an explicit emphasis that further efforts were needed to expand and not restrict the introduction of MIH/CP programs in the state.

8. http://www.naemt.org/docs/default-source/2017-publication-docs/mih-cp-survey-2018-04-12-2018-web-links-1.pdf?Status=Temp&sfvrsn=a741cb92_2

***Recommendation: The SFD should work with local healthcare and community stakeholders on a gap analysis to determine roles that a SFD-based community paramedicine program might fill in Salinas. (Recommendation No. 7.)***

Further, CPSM believes that SFD should partner with County EMS (LEMSA) and local advocacy groups to support the approval of enabling community paramedicine legislation in California. In the meantime, SFD should consider the types of outreach that are allowable under current legislative restrictions and pursue avenues to better address the types of care and social services in the community that best fits the host of patient needs that are being encountered.

# SECTION 6. ALTERNATIVE EMS DEPLOYMENT OPTIONS

EMS is the predominant workload for the Salinas Fire Department, accounting for more than 75 percent of its workload and an estimated 9,700 unit responses annually. In addition to these EMS-related calls, SFD responds to more than 3,500 additional requests annually for other non-fire related incidents involving public assists, good intent requests, and canceled calls that are primarily EMS in nature. In total, CPSM estimates that SFD units are responding to ***more than 13,200 calls annually that are non-fire related***. SFD handles all of its emergency and non-emergency responses with a fleet of fire apparatus that includes six fire engines and two ladder trucks. This workload puts considerable wear and tear on these apparatus. CPSM estimates the combined service miles traveled annually by the SFD fleet is in the range of 60,000 to 75,000 miles, with several of the busier units (Engine-1 and Engine-2) each amassing as much as 15,000 miles annually.

In a 2004 survey of 360 fire departments in urban, suburban, and rural settings across the nation, Pierce Manufacturing reported on the average life expectancy for fire pumpers.[9] The results are shown in Table 6-1.

### TABLE 6-1: Fire Pumper Life Expectancy by Type of Jurisdiction

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

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

In many urban settings in which fire apparatus are responding to EMS and service-related call activities, CPSM has observed that most first-line engines are needing replacement in a 12 to 15 year time frame. Given the current workload, SFD's busiest apparatus are expected to have odometer readings in excess of ***180,000 miles in a 12-year time frame***. In most systems, if financial resources are available, fire engines are replaced and moved to reserve status when their odometer readings reach 120,000 to 150,000 miles.

Fire apparatus are extremely expensive vehicles to purchase and maintain. The types of apparatus used in Salinas are estimated to have a replacement cost of more than $500,000 for each engine and more than $1 million for each ladder truck. In addition, the operating and maintenance cost for these units is considerable and they require specialized mechanical expertise. Because of the high replacement cost for these apparatus and the ongoing operating and maintenance costs, many agencies have gone to the use of ***alternative response vehicles*** in an effort to reduce the wear and tear on these larger apparatus and prolong their useful life expectancy. Alternative response vehicles can vary in their design and chassis types but generally are commercially available light trucks in a one-ton chassis configuration with either a pick-up or SUV body design. These vehicles are often equipped with after-market outside compartmentation and interior storage areas. Vehicles with these chassis designs are

9. Fire Apparatus Duty Cycle White Paper, Fire Apparatus Manufacturer's Association. August 2004.

readily available through state bid procurement programs and with the added compartmentation, lighting, radio systems, and painting may be acquired for costs that range from $50,000 to $75,000.

### FIGURE 6-1: Alternative Response Vehicle


There is a significant cost benefit in utilizing smaller, more fuel-efficient vehicles for the more frequent EMS and public service call activity. CPSM estimates that the operating and maintenance costs can be ***five times higher*** for engines and ladder trucks than for smaller EMS squad vehicles. In addition, the smaller units are more maneuverable and can achieve faster response times than the larger fire apparatus, especially ladder trucks. There is also the benefit of perception in the community in responding an alternative response vehicle to EMS calls rather than larger fire apparatus. Two notable communities that have opted for the use of alternative response vehicles are Tualatin Valley Fire Rescue (***CARS Program***) and the Shreveport Fire Department (***SPRINT Program***). An analysis of repair costs for fire apparatus compared to lighter weight alternative response vehicles offers a striking contrast. The cost comparisons shown in Table 6-2 were utilized by the Shreveport Fire Department in helping to make its decision to initiate its SPRINT program.

### TABLE 6-2: Fire Apparatus vs. Small Vehicle Maintenance/Response Cost Comparison

| Service | Fire Apparatus (Engine) | Alternative Response Vehicle |
|---|---|---|
| Oil and filter change | $175 | $25.95 |
| Set of tires | $1,800 | $625 |
| Complete brake job | $3,600 | $270 |
| Battery replacement | $429 | $53.95 |
| Alternator replacement | $1,195 | $125 |
| Windshield replacement | $2,400 | $600 |
| Fuel efficiency | 3-5 MPG | 15-20 MPG |

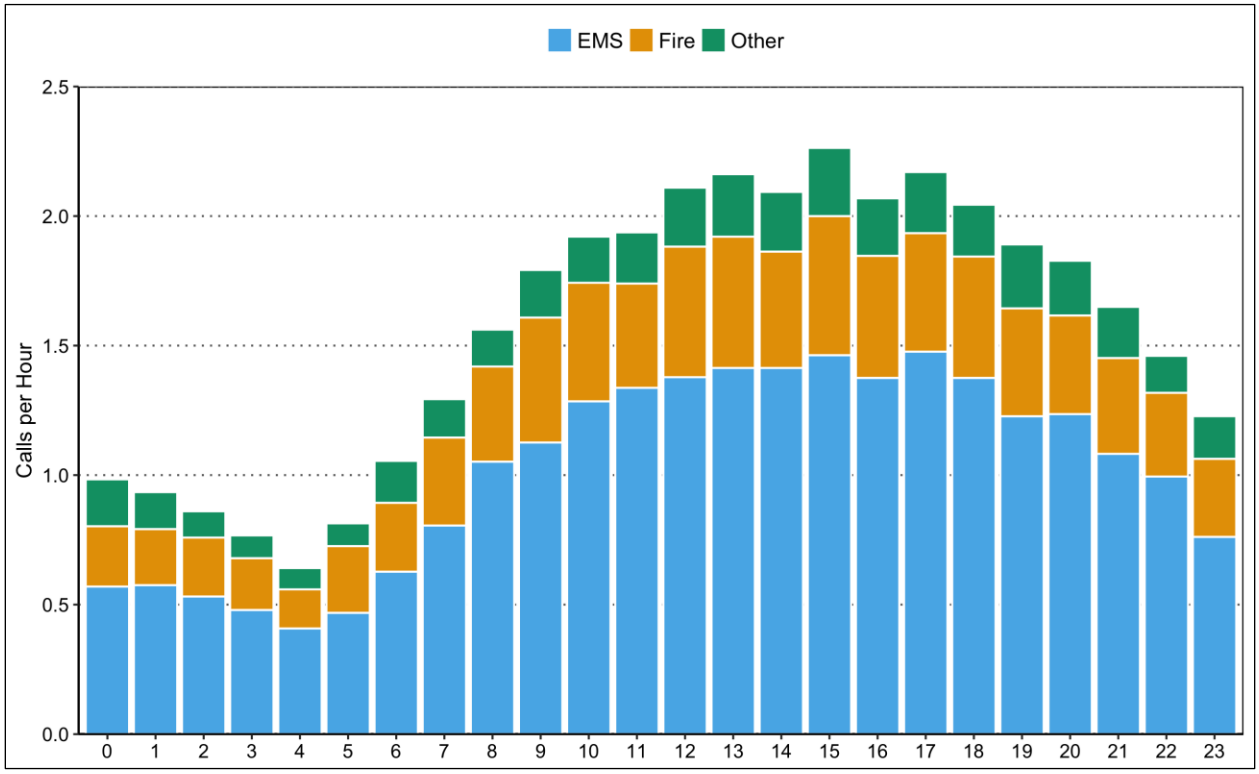
Squad and SUV-type response vehicles can be expected to be operational for seven to eight years or approximately 100,000 to 120,000 miles in a first-line status. Given the economic comparison between engines and alternative response vehicles and the added fact that two-person EMS squads operate with fewer personnel, it is apparent that from both an economic and operational perspective the use of two-person EMS squads is very applicable for the Salinas system.

> ***Recommendation: The Salinas Fire Department should consider the utilization of two-person EMS squad units to handle EMS and non-emergency service calls in the city's busiest service districts. (Recommendation No. 8.)***

For staffing the two-person EMS squad units, CPSM believes that SFD should reallocate the existing personnel assigned to the two ladder trucks rather than hire addition personnel. There are a number of options for the reallocation of the ladder personnel to staff EMS squad units. One option is to move both ladder companies to a ***cross-staffing model*** with two of the existing engine companies. In the cross-staffing configuration, the same personnel are assigned to either an engine or a ladder truck. Depending on the nature of the call they would respond on the most appropriate apparatus. This would free up six personnel each day and a total of 18 personnel across the three shifts. Another option is the utilization of a ***Quint apparatus***. This type of apparatus has both the capabilities of a fire engine and a ladder truck in one vehicle. It can pump water, has an on-board water supply, and has an automatic ladder system that can provide high-rise rescue or produce an elevated master stream. A slight modification to the quint concept is to operate one ladder as a quint and the second ladder in a cross-staffing model. Either option will provide the needed staffing to operate two-person squad units but the quint concept would require the purchase of one or two quint apparatus, which are comparably priced with the current ladder trucks and would thus require an extensive capital expenditure.

In considering the option for operating the two-person EMS squad units, we would recommend that two units be operational on a 24-hour basis. These units should be deployed at the busiest stations in the city (stations 1 & 2). In addition, we would also recommend that ***a third two-person EMS squad be deployed on a peak-period basis***. This unit would be operational seven days each week but would only be in service for the historically busiest parts of the day (typically from 9:00 a.m. to 8:00 p.m.). Figure 6-2 shows the hourly call distribution in the Salinas system.

**FIGURE 6-2: Calls by Hour of Day**




## Observations:

- Total calls between 11:00 p.m. to 7:00 a.m. account for 19.7 percent of the annual call activity.
- Total calls between 9:00 a.m. to 8:00 p.m. account for 63.9 percent of the annual call activity.

In addition, we would suggest that the peak-period EMS squad also be a ***roving unit***. As a roving unit this vehicle would not be assigned to a single geographic area of the city but instead would be deployed throughout the city whenever a primary response unit (engine or EMS squad) is assigned to an incident. The roving EMS squad would automatically back-fill areas of the city whenever the primary unit is unavailable because of an assignment or when the primary units is otherwise unavailable (i.e., training, repairs, meetings, etc.). The roving EMS squad will also be available to pick up assignments as it moves around the city and can be assigned to a call to which it is the closest available unit or to provide additional staffing during a fire or larger incident.

> ***Recommendation: Salinas should consider the option of deploying a third two-person EMS squad on a peak-period basis as a roving unit. (Recommendation No. 9.)***

The implementation of an alternate work schedule to accommodate peak-period staffing is likely to require negotiations and agreement with the firefighter's labor union. However, we would recommend that the city also pursue the option for using ***part-time or on-call employees*** to fill a portion of the peak-period assignments. As described in our overtime study, personnel who have recently completed the fire training academy may be considered to fill these part-time or on-call positions as they await to be hired into full-time positions.

We would also recommend that the SFD seek voluntary assignments to the peak-period units from full-time permanent employees, who may wish to move to work schedule that is something other than the current 48-96 schedule.

There are a number of work schedule options that can be utilized for staffing the peak-period unit. CPSM believes that an eight-day cycle in which two shifts are each assigned to four, 10- to 12-hour tours is a viable option. In this rotation, each crew would work four consecutive 10- to 12-hour tours, followed by four days off. This schedule will advance one day each week so that the duty days would rotate throughout out the year. Table 6-3 provides an example of the eight-day cycle that may be utilized for this scheduling.

### TABLE 6-3: Eight-day Peak-period Work Schedule

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| A-Shift | A-Shift | A-Shift | A-Shift | B-Shift | B-Shift | B-Shift |
| B-Shift | A-Shift | A-Shift | A-Shift | A-Shift | B-Shift | B-Shift |
| B-Shift | B-Shift | A-Shift | A-Shift | A-Shift | A-Shift | B-Shift |
| B-Shift | B-Shift | B-Shift | A-Shift | A-Shift | A-Shift | A-Shift |

Alternative work schedules have been found to be appealing to certain segments of the workforce for a number of reasons. Single parents who choose to be home every night often prefer a non–24-hour work schedule. In addition, there are employees who may choose not to work the 48-hour schedule because of the fatigue factor or who simply do not want to respond to calls throughout the night. In addition, new employees can be placed on the peak-period schedule initially and then as 48-hour assignments open up, they may be reassigned upon request.

The introduction of the two-person EMS squads is the most critical aspect of this service evolution. CPSM believes that the design and acquisition of these vehicles should be the ***first priority*** in making this service change. The EMS squads, whether operated at the EMT-Enhanced level or at an ALS level, will provide greater mobility, improve personnel productivity, and reduce the wear and tear on expensive fire apparatus. For this reason, we are recommending that SFD move to acquire three EMS squad units to begin this process.

> ***Recommendation: As the initial step in altering EMS service delivery, Salinas should acquire three EMS squad units. (Recommendation No. 10.)***

As the city moves to improve the dispatch call-screening process and addresses contractual stipulations regarding the number of deployed paramedics, CPSM believes that the city should move forward as soon as possible in the acquisition of these vehicles. We recommend that two of the EMS squads be operated initially as ALS first responders on a 24-hour basis. We recommend that these units be deployed from the two core fire stations (stations 1 and 2) and cover larger service areas. We would suggest a service response zone for these units that extends at least three miles from these station locations. In addition, we recommend that the SFD begin the steps necessary to initiate the deployment of a third EMS squad that will operate during peak periods for 10- to 12-hour assignments. This peak-period unit can be operated from station 4 but should be used in a roving and move-up status as previously described. The implementation of an alternative work schedule and the utilization of part-time, on-call personnel will require negotiations and agreement with the firefighters' labor union prior to

implementation. However, CPSM believes that these provisions are critical to the long-term operations of the fire department and should be initiated as soon as possible.

***Recommendation: The City of Salinas should meet with the firefighters' labor union to develop the terms and conditions for operating peak-period EMS squad units along with the associated work schedule and wage scale. (Recommendation No. 11.)***

Once the two-person EMS squads are operational, CPSM recommends that the service level provided by responding engines and ladder trucks be changed to EMT-Enhanced first response. In this deployment strategy, engines and ladders will operate at the EMT-Enhanced first response level while the two-person EMS squads will operate at the ALS level. For a period of no less than 12 months, SFD should monitor EMS response activities and track the types of patient care initiated by both ALS squads and EMT-Enhanced engines and ladders.

***Recommendation: For a minimum of 12 months, SFD should monitor the types of patient interactions that occur for both ALS first response squads and EMT-Enhanced engines and ladders. (Recommendation No. 12.)***

In this analysis we would recommend that the following types of patient conditions be tracked and recorded. Though this list may not capture all the call types and patient conditions that can be encountered, it is intended to be a guide to help gauge the range of severity levels of the patient being treated. Ultimately, this information will assist in determining the most effective deployment strategy for Salinas. The following lists provide several examples of the types of break-outs that can be utilized to assess patient contacts. We expect that SFD may modify or adjust these sample groupings as needed:

| **Life-threatening Emergencies Requiring ALS Intervention** |
|---|
| Cardiac or respiratory arrest |
| Severe trauma involving large-volume blood loss, internal injuries or head injuries |
| Electrocution or drownings |
| Shock or unconsciousness |
| Other acute and life-threatening medical disorders |
| Other life-threatening injuries or trauma |
| **Non–life-threatening Emergencies Requiring ALS Intervention** |
| Cardiac arrhythmias |
| Respiratory difficulties |
| Acute intoxication/disorientation |
| Serious medical conditions |
| Child birth, labor, pregnancy disorder/complication |
| Infectious disease, exposures |
| High-level pain requiring medications |
| Other patient conditions that require the administration of medications |
| **BLS Emergencies** |
| Minor wounds, abrasions, cuts, sprains, strains, etc. |
| Unknown medical disorders w/o distressed vital signs |
| Minor falls or injuries |
| Patient referred for further medical evaluation |

| Non-emergency/patient assists |
|---|
| Lift assists |
| Long-term aliments or non-emergency patient complaints |
| Mental health or elderly confusion |
| Medication inquiries |
| Social service referrals |
| Domestic disputes w/o injury |
| Drug or alcohol intoxication w/o medical complications |

In addition, we would recommend the tracking of those calls in which advanced treatment protocols (ALS procedures) are administered ***prior to the arrival*** of AMR units. These include:

| ALS Treatments Administered Prior to AMR's Arrival |
|---|
| Establishing an IV |
| Endotracheal Intubation |
| Other ALS procedures |

Table 6-4 is the recommended deployment that CPSM believes should be established during this initial phase of operation.

### TABLE 6-4: Initial Deployment Model: Utilizing Three EMS Squad Units and Peak-period Staffing

| Station # | Response Units | Assigned Personnel |
|---|---|---|
| 1 | 1 Engine<br>1 EMS Squad<br>1 Command/BC | 3<br>2<br>1 |
| 2 | 1 Engine/Ladder Cross Staffing<br>1 EMS Squad | 3<br>2 |
| 3 | 1 Engine | 3 |
| 4 | 1 Engine<br>1 Peak-Period EMS Squad* | 3<br>2* |
| 5 | 1 Engine/Ladder Cross Staffing | 3 |
| 6 | 1 Engine | 3 |
| **6 Stations** | **10 First Response Units w/Peak Unit<br>*9 First Response Units without Peak Unit** | **25 Minimum Staffing w/Peak Unit<br>*23 Minimum Staffing without Peak Unit** |

During the initial phase of operations, CPSM believes that the daily minimum number of on-duty paramedics can be reduced to three paramedics (one assigned to each of the squad units). Once the 12-month evaluation period is completed, SFD should review the clinical findings regarding patient care and response activities and on the basis of these findings determine if the EMT-Enhanced first response model is appropriate for all SFD first response units (engines, ladders, and squads).

# SECTION 7. EMERGENCY MEDICAL DISPATCHING AND RESPONSE PRIORTIZATIONS

The Monterey County Emergency Communications Department (ECD) provides the city's 911 emergency communications, and is responsible for the dispatching and radio communications for the following agencies:

| | |
|---|---|
| City of Carmel-by-the-Sea | City of Del Rey Oaks |
| City of Gonzales | City of Greenfield |
| City of King | City of Marina |
| City of Monterey City | Pacific Grove |
| City of Salinas | City of Sand |
| City of Seaside | City of Soledad |
| Greenfield Fire Protection District | Monterey County Regional Fire Protection District |
| North County Fire Protection District | Monterey Regional Airport District |
| Salinas Valley State Prison | Soledad Correctional Training Facility |
| California State University-Monterey Bay | |

The ECD also serves as the 911 answering point, meaning that it receives calls from the public and then notifies the respective agencies regarding the nature of the call. For those calls received by the ECD that are EMS-related, the Center will first notify the respective first response agency of an EMS-related call in their jurisdiction and then transfer the caller to an AMR dispatcher who is located in the Monterey Center. At that point the AMR dispatchers will conduct an ***emergency medical dispatch (EMD)*** utilizing the ***Medical Priority Dispatching System (MPDS)***, Paramount Version 13.1. In this system a series of pre-established questions are asked of the caller to determine the nature and severity of the call. On the basis of the caller's responses to these scripted questions, the software categorizes calls as Priority 1, 2, or 3 (high, medium, or low severity), and this information is utilized in determining the response patterns for AMR units. In addition, the software generates ***EMD response determinant codes*** which is a further refinement of the call severity that then recommends the most appropriate response pattern.

Currently, AMR estimates that it is only able to fully screen and prioritize approximately 38 percent to 40 percent of incoming calls. For those calls that the AMR dispatcher is unable to obtain the necessary information to complete the call screening process, the call will default to a Priority 1 status and the responding units will respond with lights and sirens (a "HOT" response). This default response will typically occur if the AMR dispatcher is unable to speak with someone who is in attendance with the patient or the caller cannot observe or communicate effectively the patient's condition. Though AMR enters its call priorities into the Monterey CAD system, ***this information is not utilized by SFD response units*** to either alter its response mode or cancel its response. Subsequently, SFD units are running "HOT" on virtually ***all*** EMS responses.

CPSM has been advised that AMR is making efforts to increase its call screening capture rate to 70 percent of the calls received. In addition, Monterey County EMS has indicated that it is moving towards the implementation of the priority dispatching system for all first responders, including SFD, and expects implementation of this process by July 2019.

***Recommendation: Salinas should work with Monterey County 911 Emergency Communications, County EMS, and AMR in implementing an effective call-screening and call-prioritization process that is capable of conducting emergency medical dispatching for a minimum of 90 percent of its incoming EMS calls. (Recommendation No. 13.)***

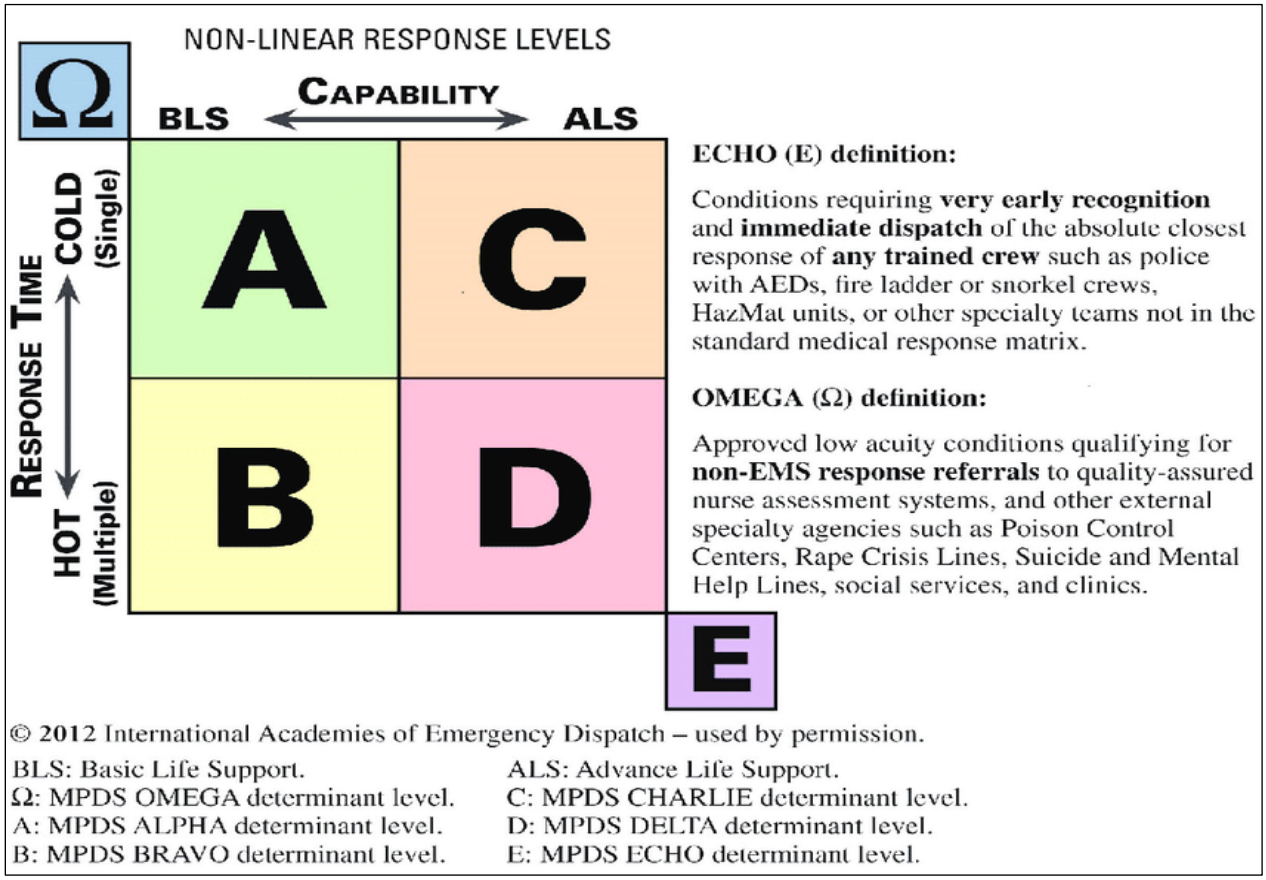
The effort to screen calls effectively so that the most appropriate resources respond is not only important from a resource management perspective, but is also of critical concern from the perspective of responder safety. In a recent report compiled by the National Highway Traffic Safety Administration (NHTSA), entitled: "Lights and Sirens Use by Emergency Medical Services (EMS): Above All Do No Harm,"[10] revealed that HOT responses are inherently dangerous, do not result in changes of patient outcomes, and should be limited to only time-life critical events. The study goes on to recommend that HOT responses should be less than 50 percent of all EMS responses.

Our observations and national statistics indicate that when medical priority dispatching systems are fully functional, the number of priority 1 calls that necessitate a "HOT" response are dramatically reduced. We have also observed in some urban EMS delivery systems that responding fire officers and paramedics are given the latitude to alter their mode of response on the basis of the dispatch call-screening process and dispatcher notes.[11] As a result of this discretion, the ensuing response patterns have been altered so that "HOT" responses are being reduced to nearly 20 percent of the total call activity.[12]

In addition to modifying the response mode, there is also the option to actually ***eliminate*** the fire department's response completely for those very minor EMS call types or public assist calls in which a single ambulance response is sufficient. This point is critical, as government entities are frequently faced with requests for additional EMS response capabilities because of the volume of EMS call activity. Figure 7-1 is a graphic developed by the International Academies of Emergency Dispatch that provides guidance regarding the mode of response and resources deployed on the basis of the call-screening and call-prioritization process.

10. https://www.ems.gov/pdf/Lights_and_Sirens_Use_by_EMS_May_2017.pdf
11. See Sugar Land Fire-Rescue, a suburb of Houston TX.
12. Ibid.

**FIGURE 7-1: MDPS Response Matrix**




In the current call-screening process, in which only 40 percent of the calls are being fully screened, AMR estimates that nearly 28 percent of these calls are being classified as priority 3 calls. CPSM believes that when a call is classified as a priority 3, SFD should alter its response pattern. We also believe that when the call-screening process is improved and more calls are being fully screened, the number of priority 3 calls will more than double.

***Recommendation: Salinas should alter its response pattern when EMS calls are screened sufficiently by AMR dispatchers to be classified as priority 3. (Recommendation No. 14.)***

In addition to improving the call-screening and call-prioritization process, it is also critical that there be improvements in the direct radio communications between SFD and AMR units. SFD and AMR currently operate on different radio frequencies and unit-to-unit communications is not occurring on a regular basis. Though a countywide mutual aid channel is available, it is not a monitored channel and is only used during large-scale disasters or multi-agency operations. CPSM believes it is imperative that AMR and SFD units are able to talk directly to each other and have the ability to monitor each other's radio traffic. This is beneficial in advising each other regarding the location of the patient, any scene hazards, and additional equipment requests and to notify the other agency regarding the upgrade or downgrade of response patterns. In the current system, in order for fire and ambulance personnel to communicate with each other, they must relay this information through multiple dispatchers. This causes added delay and the possibility of miscommunications. CPSM believes that while AMR and SFD are operating jointly in

an emergency setting they should have direct radio communications and operate on a common channel.

***Recommendation: SFD and AMR should institute a radio communication system that allows for direct unit-to-unit communication while operating jointly in a two-tiered EMS response system. (Recommendation No. 15.)***

The ability to have unit-to-unit communication is essential for field personnel operating in a public safety environment. The safety and effectiveness of scene operations requires that there be reliable communication links between all affected personnel. CPSM believes that the current communications process between AMR and SFD personnel is a serious detriment to personnel safety, and clinical and operational effectiveness.

# SECTION 8. EMS PERFORMANCE MEASURES AND MONITORED SERVICE OUTCOMES

Fire and EMS service delivery needs to be planned and managed so that these efforts achieve specific, agreed-upon results. This requires establishing a set of goals for the activities of any given program. Determining how well an organization or program is doing requires that these goals be measurable and that they are measured against desired results and national indices. This is the goal of performance measurement.

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

The need to continually assess performance requires adding new words and definitions to the fire service lexicon. Fire administrators need to be familiar with the different tools available and the consequences of their use. In *Managing the Public Sector*, business professor Grover Starling applies the principles of performance measurement to the public sector. He writes that the consequences to be considered for any given program include:

**Administrative feasibility**: How difficult will it be to set up and operate the program?

**Effectiveness**: Does the program produce the intended effect in the specified time? Does it reach the intended target group?

**Efficiency**: How do the benefits compare with the costs?

**Equity**: Are the benefits distributed equitably with respect to region, income, gender, ethnicity, age, and so forth?

**Political feasibility**: Will the program attract and maintain key actors with a stake in the program area?[13]

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

Within the fire service, performance measures tend to focus on inputs (the amount of money and resources spent on a given program or activity) and short-term outputs (the number of fires, number of EMS calls, response times, etc.). One of the goals of any performance measurement system should be also to include efficiency and cost-effectiveness indicators, as well as explanatory information on how these measures should be interpreted. An explanation of these types of performance measures are shown in Table 8-1.

13. Grover Starling, *Managing the Public Sector*, (Cengage Learning), 396.

## TABLE 8-1: The Five GASB Performance Indicators[14]

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

One of the most important elements of performance measurement within the fire service is to describe service delivery performance in a way that both citizens and those providing the service have the same understanding. The customer will ask, "Did I get what I expected?" the service provider will ask, "Did I provide what was expected?"

Ensuring that the answer to both questions is "yes" requires alignment of these expectations and the use of understandable terms. The author of the "Leadership" chapter of the 2012 edition of ICMA's *Managing Fire and Emergency Services* "Green Book" explains how jargon can get in the way:

> *Too often, fire service performance measures are created by internal customers and laden with jargon that external customers do not understand. For example, the traditional fire service has a difficult time getting the public to understand the implications of the "time temperature curve" or the value of particular levels of staffing in the suppression of fires. Fire and emergency service providers need to be able to describe performance in a way that is clear to customers, both internal and external. In the end, simpler descriptions are usually better.*[15]

As referenced earlier in this report, EMS leaders, public policy makers, and even the citizenry being served have generally regarded that a "faster" EMS service equates to a "better" EMS system. However, the growing body of research is indicating that response times greater than five minutes for the most critical of our EMS response requests – cardiac arrest – has minimal, if any, impact on patient outcomes.

Additionally, as the healthcare landscape continues to change dramatically, it will be increasingly difficult to prove the true value of EMS to stakeholders based solely on how fast an apparatus gets to the patient.

14. From Harry P. Hatry et al., eds. *Service Efforts and Accomplishments Reporting: Its Time Has Come* (Norwalk, CT: GASB, 1990).
15. I. David Daniels, "Leading and Managing," in *Managing Fire and Emergency Services* (ICMA: Washington, DC: 2012), 202.

This means that an important approach to measuring system quality is needed, one that is clinically based and patient focused, in essence, providers need to ***measure what matters in terms of clinical quality and patient experience of care***.

## Clinical Perspective

EMS is healthcare, and until recently, EMS Quality Assurance/Quality Improvement (QA/QI) measures have focused more on procedural success (IV start rate success, endotracheal success rates, etc.) as opposed to successfully complying with ***evidence-based clinical bundles*** of care that make a difference in the patient's outcome. Though it is important to know and monitor specific procedural performance, CPSM believes it is more important that agencies look the entire treatment regimen (evidence-based clinical bundles) in developing measures of overall system performance.

> ***Recommendation: SFD, working with the County EMS (LEMSA) and other local stakeholders, should develop a clinical performance dashboard to monitor compliance with clinical bundles. (Recommendation No. 16.)***

These reports should track the frequency in which the appropriate clinical bundle is completed. These outcomes should be reported on a regular basis (no less than quarterly), distributed publicly, and used as a basis for continuous quality improvement.

Some of the recommended clinical bundles could be:

### *Cardiac Arrest Clinical Bundle Measures*

- Response interval < 5 minutes for CPR/AED.
- Bystander CPR rate.
- Bystander AED rate.
- Appropriate airway management.
- End-tidal $CO_2$ monitored.
- Pit crew/focused CPR.
- Compression rate, depth, and lean.
- Transport to "Resuscitation Center."
- ROSC percentage.
- Survival to discharge (e.g., overall, Utstein).

### *ST-Elevation Myocardial Infarction (STEMI) Clinical Bundle Measures*

- Recognition.
- ASA administration.
- NTG administration.
- Appropriate analgesia given.
- Two pain scores recorded.
- Sp02 recorded.
- ECG acquired.

- ECG acquired within X minutes (e.g., 5-10).
- 12L acquired.
- 12L transmitted.
- Scene time (e.g., < 10 minutes).

### *Stroke Clinical Bundle Measures*

- Time last seen normal.
- Use of a prehospital stroke scale (e.g., NHS, FAST, MEND, CPSS, LAPSS, MASS).
- Glucose documented.
- Blood pressure documented.
- Appropriate $O_2$/airway management.
- Scene time (e.g., < 10 minutes).

### *Trauma Alert Bundle*

- Over-triage rate.
- Under-triage rate.
- Scene time (e.g., < 10 minutes).

### *Hypoglycemia Clinical Bundle*

- Glucose recorded before treatment.
- Hypoglycemia corrected through treatment.
- Glucose recorded after treatment.
- Correct disposition (e.g., transport, referral, home).

## ESO Solutions

The SFD utilizes ESO Solutions as its electronic patient care report (ePCR) platform. ESO is an industry leader not only in patient care reporting software, but also as a clinical data analytics provider. This year, ESO released its ***ESO EMS Index***, which is an analysis of key performance indicators (KPIs) for EMS quality metrics. The dataset is real-world data, compiled and aggregated from more than 1,000 agencies across the United States that use ESO's products and services. These data are based on 5.02 million patient encounters between January 1, 2017, and December 31, 2017, representing a full calendar year. The Index tracks performance of EMS agencies nationwide across five metrics:

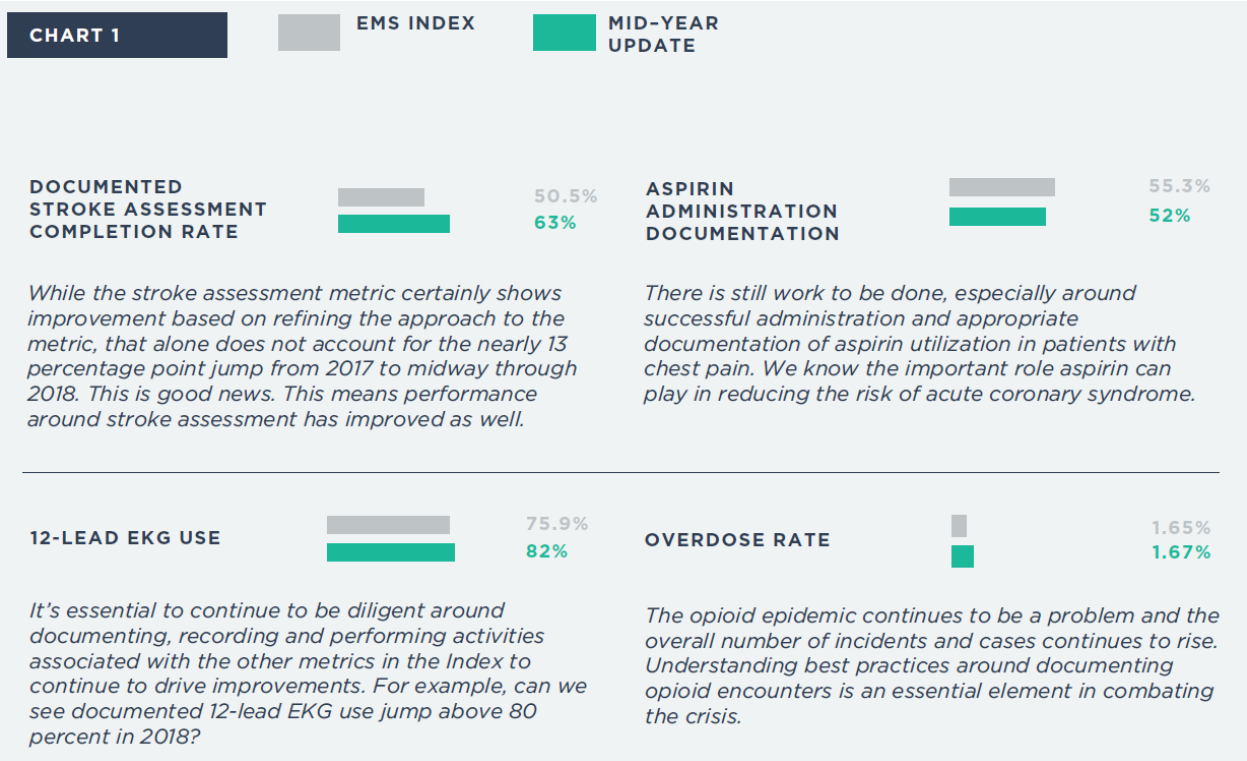
- Stroke assessment and documentation.
- Overdose events.
- End-tidal carbon dioxide ($ETCO_2$) monitoring.
- 12-lead electrocardiogram (EKG) use.
- Aspirin administration for chest pain.

This report is beginning to serve as a benchmark comparator for EMS agencies across the country for several important measures of clinical quality. SFD utilizes ESO Solutions and reports its clinical activities into this database. However, this information is not reported regularly or

distributed back to employees or city administration. CPSM believes that these reports should be reported on a regular basis (no less than quarterly), distributed publicly, and used as a basis for continuous quality improvement.

***Recommendation: SFD should continue to monitor and report on a regular basis its service performance and comparisons through ESO Solutions. (Recommendation No. 17.)***

### FIGURE 8-1: ESO EMS Index Example




## Patient Perspective

Patients rarely know if the clinical care provided to them was consistent with sound medical protocol and guidelines, but they do know if the EMS providers were nice to them. What matters to the patient are things such as: Did the providers address them by name?, Did they put a blanket on them?, Did they explain everything that was happening?, and, Did they seem concerned about them and their anxiety?

Patient experience scores are valuable measures of the performance of the EMS system providers. They are also one of the measures that other healthcare providers are evaluated on, and even paid more or less based on these scores.

Many EMS systems are implementing comprehensive ***patient experience surveys***, using external survey agencies, as a performance metric. One such survey provider, EMS Survey Team, currently conducts standardized, external patient experience surveys which enable providers to benchmark themselves against other agencies, and to themselves over time. It also provides a

mechanism to identify and recognize high-performing EMTs and Paramedics, as well as providers who might benefit from additional customer service training.

The EMS Survey Team process includes patient experience questions for the field medics (EMTs or Paramedics), dispatch personnel, and billing office personnel. While Salinas may be appropriately interested in the patient experience scores for their field EMS personnel, the city may wish to collaborate with Monterey County and the ambulance provider to analyze the patient's experience across the spectrum of the EMS response.

Here are some examples of patient experience questions:

**Medic Analysis:**

- Extent to which the EMS provider arrived in a timely manner.
- Care shown by the EMS providers who arrived.
- Degree to which the medics took your problem seriously.
- Degree to which the medics listened to you and/or your family.
- Medical skill of the medics.
- Extent to which the medics kept you informed about your treatment.
- Extent to which medics included you in the treatment decisions.
- Degree to which the medics relieved your pain or discomfort.
- Extent to which medics cared for you as a person.

**Dispatch Analysis:**

- Helpfulness of the person you called for EMS.
- Concern shown by the person you called for EMS.
- Extent to which you were told what to do until EMS arrived.

> ***Recommendation: The SFD, working with the County EMS (LEMSA) and other local stakeholders, should develop a patient experience reporting process and dashboard to monitor patients' perceptions of the services being provided. (Recommendation No. 18.)***

Once again CPSM believes that these reports should be reported on a regular basis (no less than quarterly), distributed publicly and used as a basis for continuous quality improvement.

# SECTION 9. DATA ANALYSIS

This data analysis examines all calls for service between July 1, 2016, and June 30, 2017, as recorded in the Monterey County 911's computer-aided dispatch (CAD) system and the Salinas Fire Department's National Fire Incident Reporting System (NFIRS).

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

During the year covered by this study, SFD operated out of six stations, utilizing six engines, two ladder trucks, one ARFF unit, one brush engine, one OES engine, reserve units, battalion chiefs, and administrative units.

During the study period, the SFD responded to 13,696 calls, of which 65.2 percent were EMS calls. The total combined workload (deployed time) for all SFD units was 6,515 hours. The average dispatch time for the first arriving unit was 0.8 minutes and the average response time of the first arriving SFD unit was 5.7 minutes. The 90th percentile dispatch time was 1.2 minutes and the 90th percentile response time was 8.0 minutes.

## METHODOLOGY

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

We received CAD data and NFIRS data for the Salinas Fire Department. We first matched the NFIRS and CAD data based on incident time stamps and the incident numbers provided. Then, we classified the calls in a series of steps. We first used the NFIRS incident type to identify canceled calls and to assign EMS, motor vehicle accident (MVA), and fire category call types. EMS calls were then assigned detailed categories based on the NFIRS primary impression when available and the NFIRS chief complaint for remaining calls. Mutual aid calls were identified based on the information recorded in the NFIRS mutual aid field.

Finally, units with no corresponding call, and units with no en route or arrival time, were removed. Then, calls with no responding SFD units were removed. In addition, a total of 34 incidents to which the command or administrative units were the sole responders are not included in the analysis sections of the report. However, the workload of administrative units is documented in Attachment II.

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

## AGGREGATE CALL TOTALS AND RUNS

During the year studied, SFD responded to 13,696 calls. Of these, 122 were structure fire calls and 313 were outside fire calls within SFD's jurisdiction.

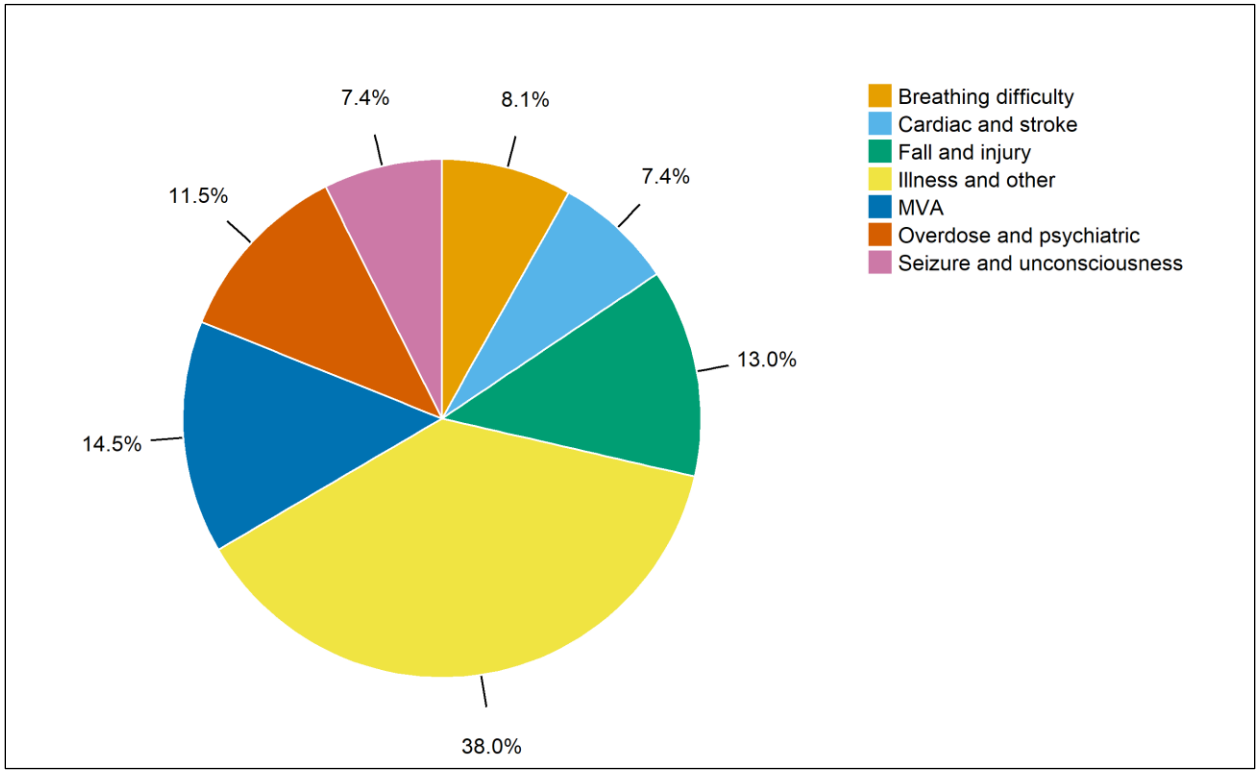
### Calls by Type

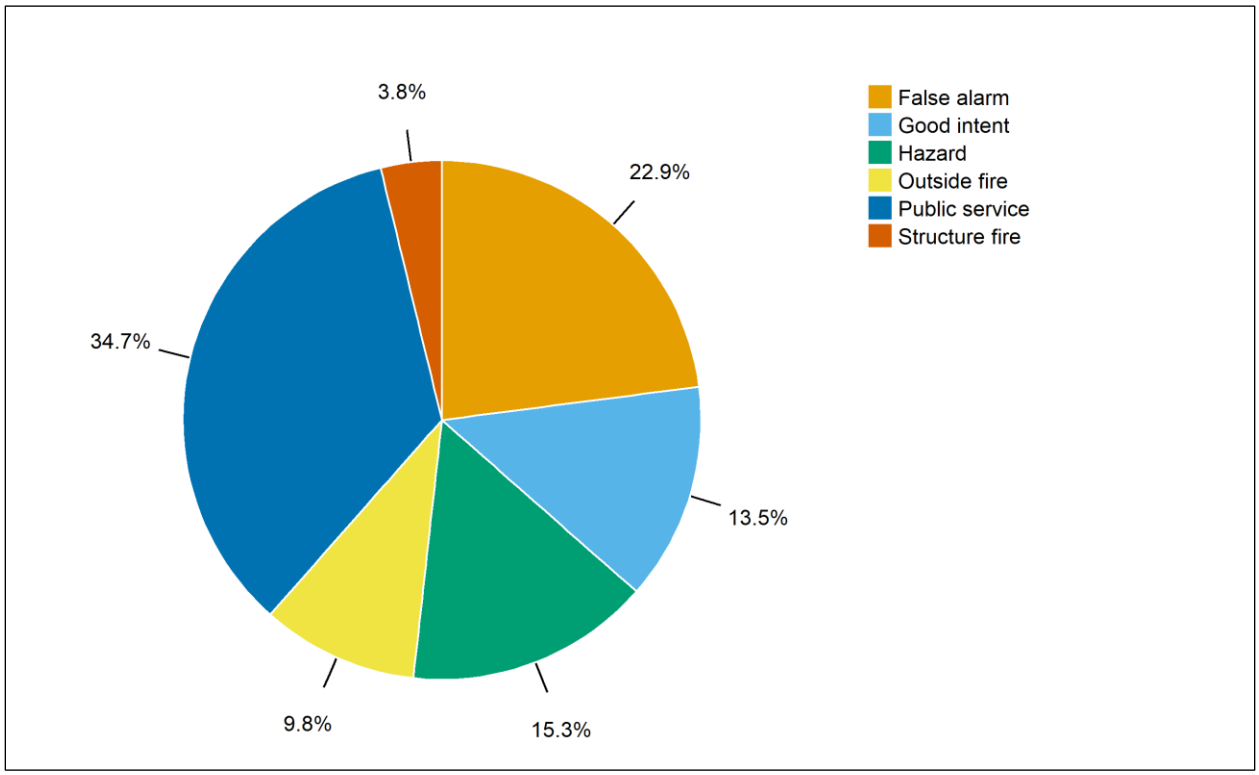
Table 9-1 and Figure 9-1 show the number of calls by call type, average calls per day, and the percentage of calls that fall into each call type category for the 12-month period studied.

#### TABLE 9-1: Call Types

| Call Type | Number of Calls | Calls per Day | Call Percentage |
|---|---|---|---|
| Breathing difficulty | 727 | 2.0 | 5.3 |
| Cardiac and stroke | 664 | 1.8 | 4.8 |
| Fall and injury | 1,162 | 3.2 | 8.5 |
| Illness and other | 3,390 | 9.3 | 24.8 |
| MVA | 1,296 | 3.6 | 9.5 |
| Overdose and psychiatric | 1,028 | 2.8 | 7.5 |
| Seizure and unconsciousness | 662 | 1.8 | 4.8 |
| **EMS Total** | **8,929** | **24.5** | **65.2** |
| False alarm | 736 | 2.0 | 5.4 |
| Good intent | 434 | 1.2 | 3.2 |
| Hazard | 490 | 1.3 | 3.6 |
| Outside fire | 313 | 0.9 | 2.3 |
| Public service | 1,112 | 3.0 | 8.1 |
| Structure fire | 122 | 0.3 | 0.9 |
| **Fire Total** | **3,207** | **8.8** | **23.4** |
| Canceled | 1,537 | 4.2 | 11.2 |
| Mutual aid | 23 | 0.1 | 0.2 |
| **Total** | **13,696** | **37.5** | **100.0** |

## FIGURE 9-1: EMS and Fire Calls by Type



## Observations:

### *Overall*

- The department received an average of 37.5 calls per day, including 4.2 canceled and 0.1 mutual aid calls.
- EMS calls for the year totaled 8,929 (65 percent of all calls), an average of 24.5 calls per day.
- Fire calls for the year totaled 3,207 (23 percent of all calls), an average of 8.8 calls per day.

### *EMS*

- Illness and other calls were the largest category of EMS calls at 38 percent of EMS calls, an average of 9.3 calls per day.
- Cardiac and stroke calls made up 7 percent of EMS calls, an average of 1.8 calls per day.
- Motor vehicle accidents made up 15 percent of EMS calls, an average of 3.6 calls per day.

### *Fire*

- Public service calls were the largest category of fire calls at 35 percent of fire calls, an average of 3.0 calls per day.
- False alarm calls made up 23 percent of fire calls, an average of 2.0 calls per day.
- Structure and outside fire calls combined made up 14 percent of fire calls, an average of 1.2 calls per day.

## Calls by Type and Duration

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

### TABLE 9-2: Calls by Type and Duration

| Call Type | Less than 30 Minutes | 30 Minutes to One Hour | One to Two Hours | More Than Two Hours | Total |
|---|---|---|---|---|---|
| Breathing difficulty | 567 | 141 | 12 | 7 | 727 |
| Cardiac and stroke | 418 | 199 | 39 | 8 | 664 |
| Fall and injury | 919 | 217 | 20 | 6 | 1,162 |
| Illness and other | 2,950 | 383 | 41 | 16 | 3,390 |
| MVA | 854 | 363 | 67 | 12 | 1,296 |
| Overdose and psychiatric | 813 | 198 | 14 | 3 | 1,028 |
| Seizure and unconsciousness | 524 | 126 | 12 | 0 | 662 |
| **EMS Total** | **7,045** | **1,627** | **205** | **52** | **8,929** |
| False alarm | 645 | 77 | 9 | 5 | 736 |
| Good intent | 406 | 22 | 2 | 4 | 434 |
| Hazard | 354 | 91 | 36 | 9 | 490 |
| Outside fire | 183 | 92 | 28 | 10 | 313 |
| Public service | 936 | 134 | 29 | 13 | 1,112 |
| Structure fire | 43 | 31 | 21 | 27 | 122 |
| **Fire Total** | **2,567** | **447** | **125** | **68** | **3,207** |
| Canceled | 1,469 | 37 | 16 | 15 | 1,537 |
| Mutual aid | 17 | 3 | 0 | 3 | 23 |
| **Total** | **11,098** | **2,114** | **346** | **138** | **13,696** |

## Observations:

### *EMS*

- A total of 8,672 EMS calls (97 percent) lasted less than one hour, 205 EMS calls (2 percent) lasted one to two hours, and 52 EMS calls (1 percent) lasted two or more hours.
- On average, there were 0.7 EMS calls per day that lasted more than one hour.
- A total of 617 cardiac and stroke calls (93 percent) lasted less than one hour, 39 cardiac and stroke calls (6 percent) lasted one to two hours, and 8 cardiac and stroke calls (1 percent) lasted two or more hours.
- A total of 1,217 motor vehicle accident calls (94 percent) lasted less than one hour, 67 motor vehicle accident calls (5 percent) lasted one to two hours, and 12 motor vehicle accident calls (1 percent) lasted two or more hours.

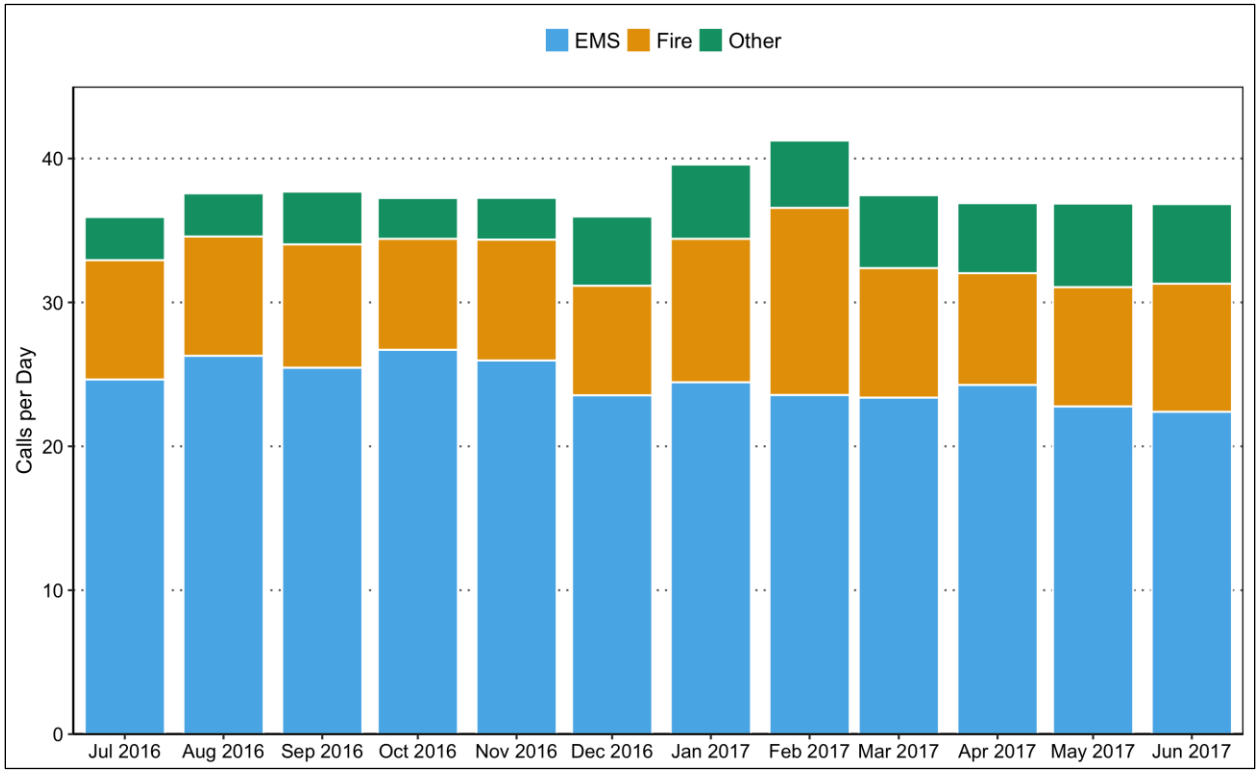
### *Fire*

- A total of 3,014 fire calls (94 percent) lasted less than one hour, 125 fire calls (4 percent) lasted one to two hours, and 68 fire calls (2 percent) lasted two or more hours.
- On average, there were 0.5 fire calls per day that lasted more than one hour.
- A total of 722 false alarm calls (98 percent) lasted less than one hour, 9 false alarm calls (1 percent) lasted one to two hours, and 5 false alarm calls (1 percent) lasted two or more hours.
- A total of 275 outside fire calls (88 percent) lasted less than one hour, 28 outside fire calls (9 percent) lasted one to two hours, and 10 outside fire calls (3 percent) lasted two or more hours.
- A total of 74 structure fire calls (61 percent) lasted less than one hour, 21 structure fire calls (17 percent) lasted one to two hours, and 27 structure fire calls (22 percent) lasted two or more hours.

## Average Calls per Day and per Hour

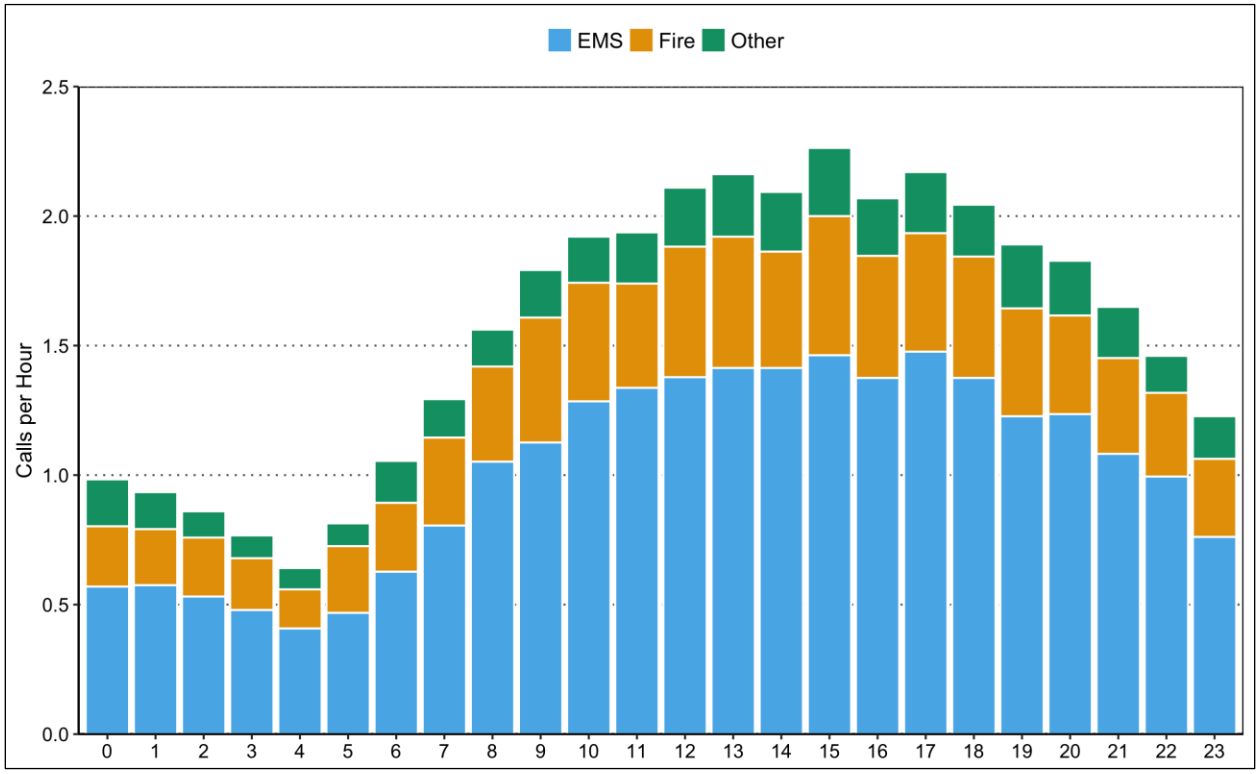
Figure 9-2 shows the monthly variation in the average daily number of calls handled by the SFD during the year studied. Similarly, Figure 9-3 illustrates the average number of calls received each hour of the day over the course of the year.

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




**Note:** While calls per day were highest in February, this was due to 165 calls that resulted from a storm that occurred on February 17th.

**FIGURE 9-3: Calls by Hour of Day**




## Observations:

### *Average Calls per Month*

- Average EMS calls per day ranged from 22.4 in June 2017 to 26.7 in October 2016.
- Average fire calls per day ranged from 7.6 in December 2016 to 13.0 in February 2017.
- Average other calls per day ranged from 2.8 in October 2016 to 5.8 in May 2017.
- Average calls per day overall ranged from 35.9 in July 2016 to 41.3 in February 2017.
- After excluding February 17, 2017, the average calls per day in February was 36.7.

### *Average Calls per Hour*

- Average EMS calls per hour ranged from 0.4 between 4:00 a.m. and 5:00 a.m. to 1.5 between 5:00 p.m. and 6:00 p.m.
- Average fire calls per hour ranged from 0.2 between 4:00 a.m. and 5:00 a.m. to 0.5 between 3:00 p.m. and 4:00 p.m.
- Average other calls per hour ranged from 0.1 between 4:00 a.m. and 5:00 a.m. to 0.3 between 3:00 p.m. and 4:00 p.m.
- Average calls per hour overall ranged from 0.6 between 4:00 a.m. and 5:00 a.m. to 2.3 between 3:00 p.m. and 4:00 p.m.

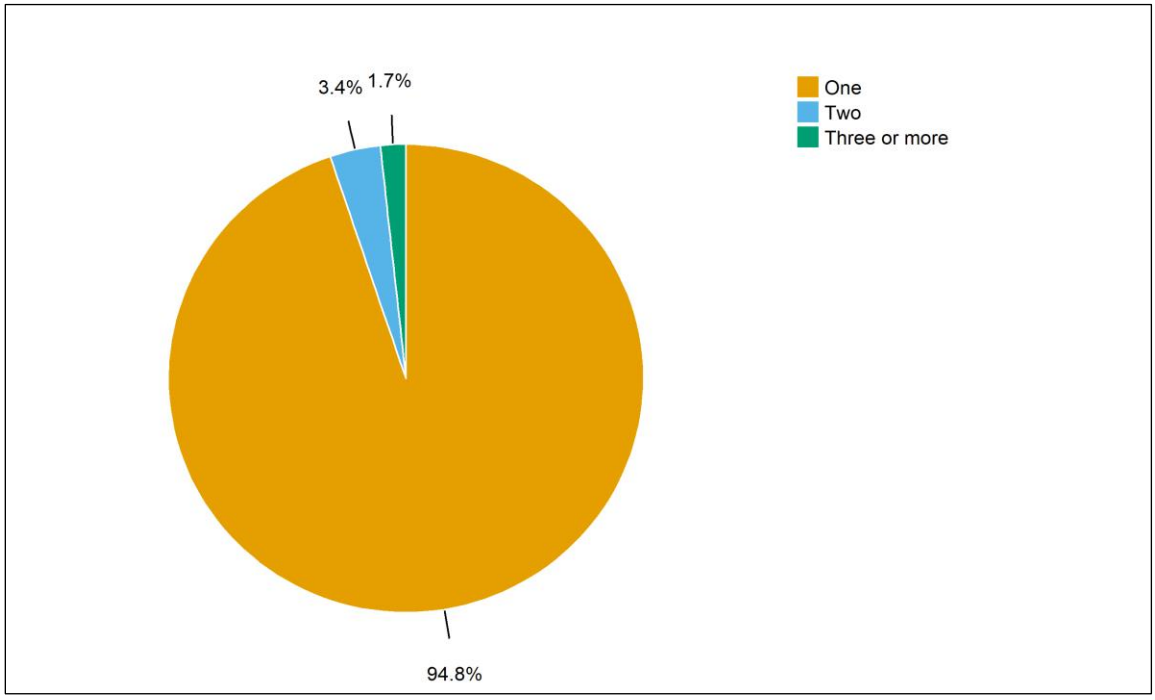
## Units Dispatched to Calls

Table 9-3 details the number of SFD calls with one, two, or three or more units dispatched overall and broken down by call type. Figure 9-4 illustrates the data from Table 9-3 for EMS calls, and Figure 9-5 does the same for fire calls.

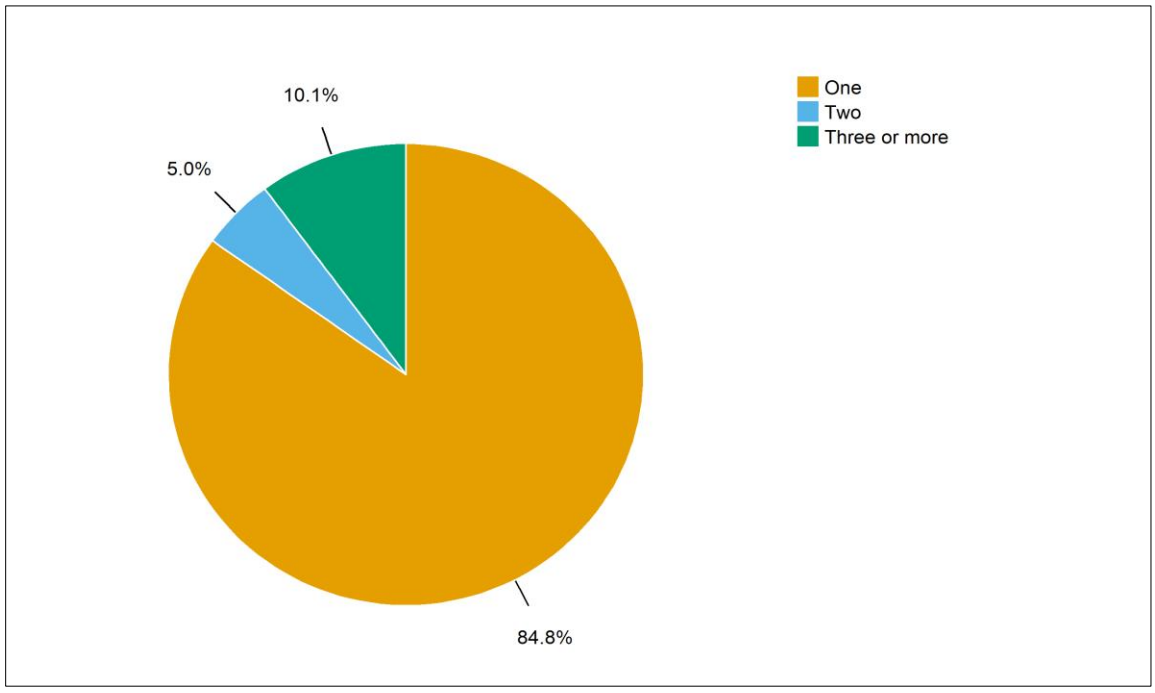
### TABLE 9-3: Calls by Call Type and Number of Units Dispatched

| Call Type | Number of Units | | | Total Calls |
|---|---|---|---|---|
| | One | Two | Three or More | |
| Breathing difficulty | 721 | 6 | 0 | 727 |
| Cardiac and stroke | 642 | 19 | 3 | 664 |
| Fall and injury | 1,074 | 74 | 14 | 1,162 |
| Illness and other | 3,289 | 92 | 9 | 3,390 |
| MVA | 1,098 | 76 | 122 | 1,296 |
| Overdose and psychiatric | 1,007 | 17 | 4 | 1,028 |
| Seizure and unconsciousness | 637 | 23 | 2 | 662 |
| **EMS Total** | **8,468** | **307** | **154** | **8,929** |
| False alarm | 673 | 29 | 34 | 736 |
| Good intent | 385 | 17 | 32 | 434 |
| Hazard | 416 | 32 | 42 | 490 |
| Outside fire | 182 | 32 | 99 | 313 |
| Public service | 1,047 | 48 | 17 | 1,112 |
| Structure fire | 18 | 3 | 101 | 122 |
| **Fire Total** | **2,721** | **161** | **325** | **3,207** |
| Canceled | 1,437 | 54 | 46 | 1,537 |
| Mutual aid | 14 | 5 | 4 | 23 |
| **Total** | **12,640** | **527** | **529** | **13,696** |
| **Percentage** | **92.3** | **3.8** | **3.9** | **100.0** |

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




## FIGURE 9-5: Calls by Number of Units Dispatched – Fire Calls



## Observations:

### *Overall*

- On average, 1.2 units were dispatched to all calls; for 92 percent of calls only one unit was dispatched.
- Overall, three or more units were dispatched to 4 percent of calls.

### *EMS*

- On average, 1.1 units were dispatched per EMS call.
- For EMS calls, one unit was dispatched 95 percent of the time, two units were dispatched 3 percent of the time, and three or more units were dispatched 2 percent of the time.

### *Fire*

- On average, 1.4 units were dispatched per fire call.
- For fire calls, one unit was dispatched 85 percent of the time, two units were dispatched 5 percent of the time, and three or more units were dispatched 10 percent of the time.
- For outside fire calls, three or more units were dispatched 32 percent of the time.
- For structure fire calls, three or more units were dispatched 83 percent of the time.

## WORKLOAD: RUNS AND TOTAL TIME SPENT

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

### Runs and Deployed Time – All Units

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

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

| Call Type | Avg. Deployed Min. per Run | Total Annual Hours | Percent of Total Hours | Avg. Deployed Min. per Day | Total Annual Runs | Avg. Runs per Day |
|---|---|---|---|---|---|---|
| Breathing difficulty | 25.8 | 315.9 | 4.8 | 51.9 | 736 | 2.0 |
| Cardiac and stroke | 31.5 | 365.4 | 5.6 | 60.1 | 697 | 1.9 |
| Fall and injury | 24.3 | 519.1 | 8.0 | 85.3 | 1,280 | 3.5 |
| Illness and other | 21.3 | 1,249.4 | 19.2 | 205.4 | 3,521 | 9.6 |
| MVA | 24.9 | 712.2 | 10.9 | 117.1 | 1,714 | 4.7 |
| Overdose and psychiatric | 23.9 | 419.7 | 6.4 | 69.0 | 1,055 | 2.9 |
| Seizure and unconsciousness | 23.9 | 278.9 | 4.3 | 45.8 | 700 | 1.9 |
| **EMS Total** | **23.9** | **3,860.5** | **59.3** | **634.6** | **9,703** | **26.6** |
| False alarm | 18.4 | 269.2 | 4.1 | 44.3 | 876 | 2.4 |
| Good intent | 14.6 | 135.6 | 2.1 | 22.3 | 558 | 1.5 |
| Hazard | 25.4 | 282.2 | 4.3 | 46.4 | 667 | 1.8 |
| Outside fire | 28.9 | 309.4 | 4.7 | 50.9 | 642 | 1.8 |
| Public service | 21.1 | 430.1 | 6.6 | 70.7 | 1,224 | 3.4 |
| Structure fire | 78.4 | 730.7 | 11.2 | 120.1 | 559 | 1.5 |
| **Fire Total** | **28.6** | **2,157.2** | **33.1** | **354.6** | **4,526** | **12.4** |
| Canceled | 14.4 | 414.3 | 6.4 | 68.1 | 1,729 | 4.7 |
| Mutual aid | 130.5 | 82.7 | 1.3 | 13.6 | 38 | 0.1 |
| **Total** | **24.4** | **6,514.6** | **100.0** | **1,070.9** | **15,996** | **43.8** |

## Observations:

### *Overall*

- Total deployed time for the year was 6,515 hours. The daily average was 17.8 hours for all units combined.
- There were 15,996 runs, including 38 runs dispatched for mutual aid calls. The daily average was 43.8 runs.

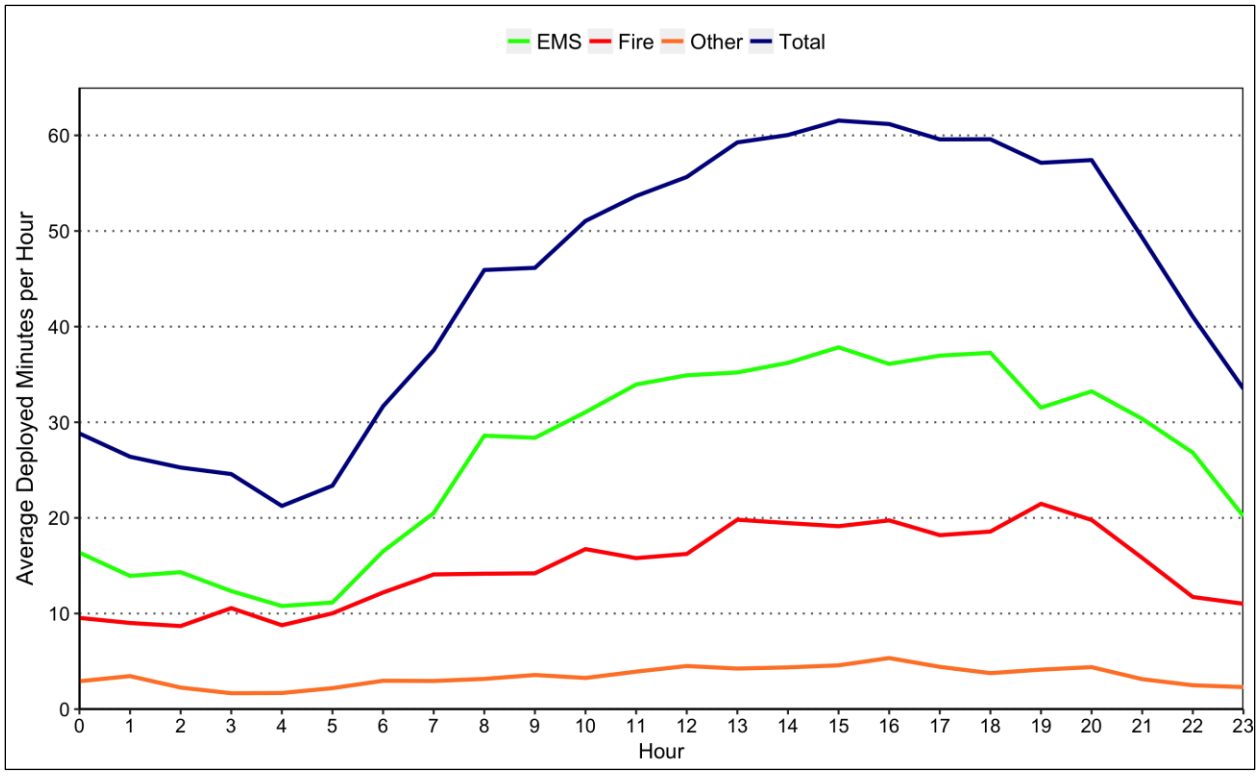
### *EMS*

- EMS runs accounted for 59 percent of the total workload.
- The average deployed time for EMS runs was 23.9 minutes. The deployed time for all EMS runs averaged 10.6 hours per day.

### *Fire*

- Fire runs accounted for 33 percent of the total workload.
- The average deployed time for fire runs was 28.6 minutes. The deployed time for all fire runs averaged 5.9 hours per day.
- There were 1,201 runs for structure and outside fire calls combined, with a total workload of 1,040 hours. This accounted for 16 percent of the total workload.
- The average deployed time for outside fire runs was 28.9 minutes per run, and average deployed time for structure fire runs was 78.4 minutes per run.

**FIGURE 9-6: Average Deployed Minutes by Hour of Day**



## TABLE 9-5: Average Deployed Minutes by Hour of Day

| Hour | EMS | Fire | Other | Total |
|---|---|---|---|---|
| 0 | 16.4 | 9.5 | 2.9 | 28.8 |
| 1 | 13.9 | 9.0 | 3.5 | 26.4 |
| 2 | 14.3 | 8.7 | 2.3 | 25.3 |
| 3 | 12.4 | 10.6 | 1.7 | 24.6 |
| 4 | 10.8 | 8.8 | 1.7 | 21.2 |
| 5 | 11.2 | 10.0 | 2.2 | 23.4 |
| 6 | 16.5 | 12.2 | 3.0 | 31.7 |
| 7 | 20.5 | 14.1 | 2.9 | 37.5 |
| 8 | 28.6 | 14.2 | 3.2 | 45.9 |
| 9 | 28.4 | 14.2 | 3.6 | 46.1 |
| 10 | 31.1 | 16.7 | 3.3 | 51.1 |
| 11 | 33.9 | 15.8 | 3.9 | 53.7 |
| 12 | 34.9 | 16.2 | 4.5 | 55.6 |
| 13 | 35.2 | 19.8 | 4.2 | 59.3 |
| 14 | 36.2 | 19.5 | 4.4 | 60.0 |
| 15 | 37.8 | 19.1 | 4.6 | 61.5 |
| 16 | 36.1 | 19.7 | 5.3 | 61.2 |
| 17 | 37.0 | 18.2 | 4.4 | 59.6 |
| 18 | 37.3 | 18.6 | 3.8 | 59.6 |
| 19 | 31.5 | 21.5 | 4.1 | 57.1 |
| 20 | 33.2 | 19.8 | 4.4 | 57.4 |
| 21 | 30.4 | 15.8 | 3.1 | 49.3 |
| 22 | 26.8 | 11.7 | 2.5 | 41.0 |
| 23 | 20.2 | 11.0 | 2.3 | 33.5 |
| **Daily Avg.** | **634.5** | **354.7** | **81.7** | **1,071.0** |

## Observations:

- Hourly deployed time was highest during the day from 1:00 p.m. to 7:00 p.m., averaging between 59 minutes and 62 minutes.
- Average deployed time peaked between 3:00 p.m. and 4:00 p.m., averaging 62 minutes.
- Hourly deployed time was lowest between 4:00 a.m. and 5:00 a.m., averaging 21 minutes.

## Workload by Unit

Table 9-6 provides a summary of workload by unit overall. Tables 9-7 and 9-8 provide a more detailed view of workload, showing unit runs broken out by run type (Table 9-7) and the resulting daily average deployed time by run type (Table 9-8).

The total work done by reserve engines was significant, but reserve engines are not uniquely tied to a specific station. For each day a reserve unit worked, we identified its primary station using several clues. First, we looked for days where a single primary engine had no runs and assigned the reserve unit to this primary engine's station. On days when multiple primary engines had no runs, we looked at the most common first due area where a specific reserve unit responded throughout the day and assigned it to the appropriate station. In this section, reserve engine work is combined under a single "Reserve" unit for each station. Attachment IV shows each reserve engine separately.

Finally, the department tracks each platoon's Battalion Chief under a separate unit id. In this report, all three Battalion Chiefs are combined as unit BAT1.

## TABLE 9-6: Call Workload by Unit

| Station | Unit Id | Unit Type | Avg. Deployed Min. per Run | Total Annual Hours | Avg. Deployed Min. per Day | Total Annual Runs | Avg. Runs per Day |
|---|---|---|---|---|---|---|---|
| 1 | BAT1 | Battalion Chief | 44.5 | 496.5 | 81.6 | 670 | 1.8 |
| | E1 | Engine | 22.4 | 1,051.6 | 172.9 | 2,811 | 7.7 |
| | Reserve* | Engine | 31.1 | 359.7 | 59.1 | 695 | 1.9 |
| | T1 | Ladder | 23.7 | 505.9 | 83.2 | 1,282 | 3.5 |
| | **Total** | | **26.5** | **2,413.8** | **396.8** | **5,458** | **15.0** |
| 2 | E2 | Engine | 21.7 | 822.4 | 135.2 | 2,278 | 6.2 |
| | Reserve* | Engine | 22.1 | 221.8 | 36.5 | 603 | 1.7 |
| | **Total** | | **21.7** | **1,044.2** | **171.6** | **2,881** | **7.9** |
| 3 | E3 | Engine | 22.6 | 564.8 | 92.8 | 1,499 | 4.1 |
| | OES323 | Engine | 27.4 | 9.1 | 1.5 | 20 | 0.1 |
| | Reserve* | Engine | 20.2 | 22.9 | 3.8 | 68 | 0.2 |
| | **Total** | | **22.6** | **596.8** | **98.1** | **1,587** | **4.3** |
| 4 | CR4 | ARFF | 22.1 | 1.5 | 0.2 | 4 | 0.0 |
| | E4 | Engine | 24.3 | 483.9 | 79.5 | 1,196 | 3.3 |
| | Reserve* | Engine | 23.4 | 267.9 | 44.0 | 688 | 1.9 |
| | **Total** | | **23.9** | **753.3** | **123.8** | **1,888** | **5.2** |
| 5 | E305 | Brush | 44.7 | 54.3 | 8.9 | 73 | 0.2 |
| | E5 | Engine | 24.5 | 552.9 | 90.9 | 1,356 | 3.7 |
| | Reserve* | Engine | 28.1 | 46.4 | 7.6 | 99 | 0.3 |
| | T2 | Ladder | 26.7 | 240.0 | 39.5 | 540 | 1.5 |
| | **Total** | | **25.9** | **893.7** | **146.9** | **2,068** | **5.7** |
| 6 | E6 | Engine | 23.1 | 317.2 | 52.1 | 824 | 2.3 |
| | Reserve* | Engine | 20.7 | 435.5 | 71.6 | 1,264 | 3.5 |
| | **Total** | | **21.6** | **752.7** | **123.7** | **2,088** | **5.7** |
| Reserve | T4 | Ladder | 138.5 | 60.0 | 9.9 | 26 | 0.1 |
| | **Total** | | **138.5** | **60.0** | **9.9** | **26** | **0.1** |
| **Total** | | | **24.4** | **6,514.6** | **1,070.9** | **15,996** | **43.8** |

***NOTE:** Reserve units are not additional units but are typically used as replacement units which are staffed and operated by the same personnel and placed into service when the primary unit is unavailable due to repairs or maintenance.

## TABLE 9-7: Total Annual Runs by Run Type and Unit

| Station | Unit Id | Unit Type | EMS | False Alarm | Good Intent | Hazard | Outside Fire | Public Service | Structure Fire | Canceled | Mutual Aid | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BAT1 | Battalion Chief | 232 | 32 | 36 | 56 | 111 | 30 | 96 | 72 | 5 | 670 |
| | E1 | Engine | 1,814 | 142 | 85 | 52 | 67 | 159 | 55 | 427 | 10 | 2,811 |
| | Reserve* | Engine | 455 | 28 | 26 | 14 | 19 | 31 | 18 | 103 | 1 | 695 |
| | T1 | Ladder | 625 | 30 | 61 | 115 | 32 | 195 | 67 | 152 | 5 | 1,282 |
| | **Total** | | **3,126** | **232** | **208** | **237** | **229** | **415** | **236** | **754** | **21** | **5,458** |
| 2 | E2 | Engine | 1,519 | 117 | 92 | 72 | 60 | 166 | 61 | 190 | 1 | 2,278 |
| | Rese | Engine | 429 | | 18 | 19 | 19 | 32 | 11 | 40 | 1 | 603 |
| | **Total** | | **1,948** | **151** | **110** | **91** | **79** | **198** | **72** | **230** | **2** | **2,881** |
| 3 | E3 | Engine | 865 | 121 | 43 | 61 | 60 | 106 | 53 | 185 | 5 | 1,499 |
| | OES323 | Engine | 4 | 1 | 1 | 9 | 1 | 2 | 0 | 1 | 1 | 20 |
| | Reserve | Engine | 49 | 1 | 1 | 3 | 4 | 3 | 1 | 5 | 1 | 68 |
| | **Total** | | **918** | **123** | **45** | **73** | **65** | **111** | **54** | **191** | **7** | **1,587** |
| 4 | CR4 | ARFF | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 4 |
| | E4 | Engine | 738 | 85 | 43 | 60 | 48 | 72 | 31 | 118 | 1 | 1,196 |
| | Reserve | Engine | 430 | 28 | 17 | 31 | 32 | 52 | 29 | 69 | 0 | 688 |
| | **Total** | | **1,169** | **113** | **60** | **93** | **80** | **124** | **60** | **188** | **1** | **1,888** |
| 5 | E305 | Brush | 3 | 1 | 4 | 6 | 47 | 4 | 2 | 4 | 2 | 73 |
| | E5 | Engine | 883 | 106 | 51 | 28 | 61 | 84 | 42 | 100 | 1 | 1,356 |
| | Reserve | Engine | 58 | 6 | 3 | 8 | 4 | 8 | 3 | 9 | 0 | 99 |
| | T2 | Ladder | 223 | 35 | 21 | 66 | 24 | 96 | 49 | 26 | 0 | 540 |
| | **Total** | | **1,167** | **148** | **79** | **108** | **136** | **192** | **96** | **139** | **3** | **2,068** |
| 6 | E6 | Engine | 538 | 44 | 23 | 20 | 17 | 80 | 11 | 90 | 1 | 824 |
| | Reserve | Engine | 821 | 65 | 33 | 44 | 36 | 101 | 28 | 133 | 3 | 1,264 |
| | **Total** | | **1,359** | **109** | **56** | **64** | **53** | **181** | **39** | **223** | **4** | **2,088** |
| Reserve | T4 | Ladder | 16 | 0 | 0 | 1 | 0 | 3 | 2 | 4 | 0 | 26 |
| | **Total** | | 16 | 0 | 0 | 1 | 0 | 3 | 2 | 4 | 0 | 26 |
| **Total** | | | **9,703** | **876** | **558** | **667** | **642** | **1,224** | **559** | **1,729** | **38** | **15,996** |

## TABLE 9-8: Daily Average Deployed Minutes by Run Type and Unit

| Station | Unit Id | Unit Type | EMS | False Alarm | Good Intent | Hazard | Outside Fire | Public Service | Structure Fire | Canceled | Mutual Aid | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BAT1 | Battalion Chief | 16.6 | 4.6 | 1.6 | 3.7 | 8.8 | 4.0 | 18.4 | 13.0 | 11.0 | 81.6 |
| | E1 | Engine | 121.1 | 6.7 | 3.2 | 4.1 | 5.4 | 9.2 | 9.1 | 13.5 | 0.5 | 172.9 |
| | Reserve | Engine | 32.0 | 1.4 | 0.9 | 0.9 | 0.8 | 2.0 | 17.0 | 4.0 | 0.1 | 59.1 |
| | T1 | Ladder | 39.5 | 1.2 | 2.4 | 7.9 | 1.8 | 11.3 | 12.8 | 6.1 | 0.1 | 83.2 |
| | **Total** | | **209.2** | **13.9** | **8.1** | **16.7** | **16.7** | **26.5** | **57.3** | **36.6** | **11.7** | **396.8** |
| 2 | E2 | Engine | 95.1 | 5.6 | 3.4 | 4.1 | 4.0 | 8.3 | 8.5 | 6.0 | 0.1 | 135.2 |
| | Reserve | Engine | 27.6 | 1.7 | 0.5 | 1.0 | 1.4 | 2.0 | 1.4 | 0.9 | 0.0 | 36.5 |
| | **Total** | | **122.7** | **7.2** | **3.9** | **5.1** | **5.4** | **10.2** | **9.9** | **7.0** | **0.1** | **171.6** |
| 3 | E3 | Engine | 53.0 | 6.3 | 1.8 | 4.6 | 4.2 | 5.9 | 10.7 | 6.2 | 0.2 | 92.8 |
| | OES323 | Engine | 0.3 | 0.0 | 0.1 | 0.7 | 0.1 | 0.2 | 0.0 | 0.1 | 0.1 | 1.5 |
| | Reserve | Engine | 2.7 | 0.1 | 0.0 | 0.2 | 0.4 | 0.1 | 0.0 | 0.1 | 0.0 | 3.8 |
| | **Total** | | **56.0** | **6.4** | **1.9** | **5.5** | **4.7** | **6.2** | **10.8** | **6.4** | **0.3** | **98.1** |
| 4 | CR4 | ARFF | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 |
| | E4 | Engine | 51.1 | 3.1 | 1.7 | 3.3 | 4.6 | 4.1 | 6.2 | 4.4 | 1.0 | 79.5 |
| | Reserve | Engine | 28.1 | 1.0 | 0.5 | 1.7 | 3.2 | 2.1 | 5.5 | 1.9 | 0.0 | 44.0 |
| | **Total** | | **79.3** | **4.2** | **2.2** | **5.1** | **7.7** | **6.2** | **11.7** | **6.4** | **1.0** | **123.8** |
| 5 | E305 | Brush | 0.3 | 0.0 | 0.1 | 0.1 | 4.6 | 0.2 | 3.1 | 0.1 | 0.3 | 8.9 |
| | E5 | Engine | 59.4 | 7.3 | 2.4 | 1.9 | 5.7 | 5.3 | 5.9 | 3.0 | 0.0 | 90.9 |
| | Reserve | Engine | 5.1 | 0.2 | 0.1 | 0.6 | 0.3 | 0.7 | 0.3 | 0.2 | 0.0 | 7.6 |
| | T2 | Ladder | 13.9 | 0.9 | 1.2 | 5.9 | 1.5 | 6.0 | 9.1 | 0.9 | 0.0 | 39.5 |
| | **Total** | | **78.7** | **8.4** | **3.8** | **8.5** | **12.2** | **12.2** | **18.4** | **4.3** | **0.3** | **146.9** |
| 6 | E6 | Engine | 36.0 | 1.6 | 1.1 | 1.9 | 1.6 | 3.7 | 2.5 | 3.8 | 0.1 | 52.1 |
| | Reserve | Engine | 50.7 | 2.5 | 1.2 | 3.6 | 2.5 | 5.6 | 2.0 | 3.5 | 0.1 | 71.6 |
| | **Total** | | **86.7** | **4.1** | **2.3** | **5.5** | **4.1** | **9.3** | **4.4** | **7.3** | **0.2** | **123.7** |
| Reserve | T4 | Ladder | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 7.7 | 0.1 | 0.0 | 9.9 |
| | **Total** | | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 7.7 | 0.1 | 0.0 | 9.9 |
| **Total** | | | **634.6** | **44.3** | **22.3** | **46.4** | **50.9** | **70.7** | **120.1** | **68.1** | **13.6** | **1,070.9** |

## Observations:

**NOTE:** Reserve units are not additional units but are typically used as replacement units which are staffed and operated by the same personnel and placed into service when the primary unit is unavailable due to repairs or maintenance.

- E1 made the most runs (2,811or an average of 7.7 per day) and had the highest total annual deployed time (1,051.6 hours or an average of 2.9 hours per day).
  - EMS calls accounted for 65 percent of its total runs and 70 percent of its deployed time.
  - Structure and outside fire calls accounted for 4 percent of its total runs and 8 percent of its deployed time.
- T2 made the most runs of the ladder trucks (1,282 or an average of 3.5 runs per day) and had the highest total annual deployed time of the ladder trucks (505.9 hours or an average of 3.5 hours per day).
  - EMS calls accounted for 41 percent of its total runs and 35 percent of its deployed time.
  - Structure and outside fire calls accounted for 27 percent of its total runs and 14 percent of its deployed time.
- Station 1 was the busiest station with 34 percent of all runs (5,458 runs) and 37 percent of the department's total deployed time (2,414 hours).
  - EMS calls accounted for 57 percent of the station's total runs and 53 percent of its deployed time.
  - Structure and outside fire calls accounted for 9 percent of the station's total runs and 19 percent of its deployed time.

## ANALYSIS OF CALL FREQUENCY

There is significant variability in the number of calls from hour to hour. One special concern relates to the resources available for hours with the heaviest workload and overlapping calls.

An overlapping call is defined as a call that starts while another call is still active. The call that was already active is not counted as an overlapping call. A call's start time is based on the dispatch time for the first non-administrative unit and is considered active until the latest clear time of any non-administrative unit that responded to the call. Each call is counted only once, even if it overlaps with multiple other calls. In the analysis, if calls overlap for fewer than 30 seconds they are counted as non-overlapping calls.

Table 9-9 shows the number of hours in the year in which there were zero to six or more calls during the hour. Table 9-10 shows the 10 one-hour intervals which had the most calls during the year.

Table 9-11 shows how often a unit from each SFD station was available to respond to calls in their first due area and how often the unit arrived first to those calls. Six calls to which BAT1 was the only unit to respond are not included in Table 9-11's totals. Finally, Table 9-12 shows the frequency of overlapping calls and total hours spent on overlapping calls during the study period.

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

| Calls in an Hour | Frequency | Percentage |
|---|---|---|
| 0 | 2,199 | 25.1 |
| 1 | 2,691 | 30.7 |
| 2 | 1,924 | 22.0 |
| 3 | 1,131 | 12.9 |
| 4 | 510 | 5.8 |
| 5 | 213 | 2.4 |
| 6+ | 92 | 1.1 |

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

| Hour | Number of Calls | Number of Runs | Total Deployed Hours |
|---|---|---|---|
| 2/17/2017, 5:00 a.m. to 6:00 a.m. | 25 | 27 | 22.5 |
| 2/17/2017, 6:00 a.m. to 7:00 a.m. | 23 | 27 | 9.0 |
| 2/17/2017, 9:00 a.m. to 10:00 a.m. | 17 | 18 | 3.9 |
| 2/17/2017, 7:00 a.m. to 8:00 a.m. | 14 | 14 | 9.1 |
| 2/17/2017, 10:00 a.m. to 11:00 a.m. | 12 | 13 | 4.2 |
| 2/17/2017, 2:00 p.m. to 3:00 p.m. | 11 | 11 | 4.3 |
| 2/17/2017, noon to 1:00 p.m. | 10 | 10 | 3.2 |
| 2/20/2017, 11:00 a.m. to noon | 9 | 12 | 4.3 |
| 1/18/2017, 7:00 p.m. to 8:00 p.m. | 9 | 12 | 3.8 |
| 2/17/2017, 5:00 p.m. to 6:00 p.m. | 8 | 11 | 4.5 |

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

## TABLE 9-11: Station Availability to Respond to Calls

| Station | Calls in Area | Total Arrivals | First Due Responded | First Due Arrived | First Due First | Percent Responded | Percent Arrived | Percent First |
|---|---|---|---|---|---|---|---|---|
| 1 | 4,357 | 4,069 | 3,866 | 3,600 | 3,578 | 88.7 | 87.9 | 82.1 |
| 2 | 2,737 | 2,623 | 2,181 | 2,105 | 2,097 | 79.7 | 79.9 | 76.6 |
| 3 | 1,314 | 1,228 | 1,103 | 1,006 | 990 | 83.9 | 80.6 | 75.3 |
| 4 | 1,874 | 1,783 | 1,500 | 1,421 | 1,410 | 80.0 | 79.1 | 75.2 |
| 5 | 1,355 | 1,292 | 1,237 | 1,184 | 1,171 | 91.3 | 90.6 | 86.4 |
| 6 | 1,997 | 1,909 | 1,604 | 1,530 | 1,511 | 80.3 | 79.2 | 75.7 |
| **Total** | **13,634** | **12,904** | **11,491** | **10,846** | **10,757** | **84.3** | **83.4** | **78.9** |

**Note:** For each station, we count the number of calls occurring within its first due area. Then, we count the number of calls to where at least one SFD unit responded. Next, we focus on units from the first due station to see if any units responded, arrived, or arrived first.

## TABLE 9-12: Frequency of Overlapping Calls

| First Due Station | Scenario | Number of Calls | Percent of Calls | Total Hours |
|---|---|---|---|---|
| 1 | No overlapped call | 3,554 | 81.4 | 1472.4 |
| | Overlapped with one call | 720 | 16.5 | 147.2 |
| | Overlapped with two calls | 76 | 1.7 | 12.4 |
| | Overlapped with three calls | 14 | 0.3 | 1.3 |
| | Overlapped with four calls | 4 | 0.1 | 0.7 |
| 2 | No overlapped call | 2,439 | 88.8 | 890.0 |
| | Overlapped with one call | 275 | 10.0 | 58.1 |
| | Overlapped with two calls | 28 | 1.0 | 4.9 |
| | Overlapped with three calls | 2 | 0.1 | 0.1 |
| | Overlapped with four calls | 2 | 0.1 | 0.2 |
| 3 | No overlapped call | 1,229 | 93.5 | 513.2 |
| | Overlapped with one call | 79 | 6.0 | 17.6 |
| | Overlapped with two calls | 6 | 0.5 | 0.7 |
| | Overlapped with three calls | 1 | 0.1 | 0.0 |
| 4 | No overlapped call | 1,699 | 90.5 | 700.1 |
| | Overlapped with one call | 167 | 8.9 | 33.8 |
| | Overlapped with two calls | 10 | 0.5 | 1.1 |
| | Overlapped with three calls | 1 | 0.1 | 0.0 |
| 5 | No overlapped call | 1,267 | 92.9 | 563.3 |
| | Overlapped with one call | 92 | 6.7 | 21.0 |
| | Overlapped with two calls | 5 | 0.4 | 0.5 |
| 6 | No overlapped call | 1,832 | 91.6 | 716.4 |
| | Overlapped with one call | 157 | 7.9 | 34.4 |
| | Overlapped with two calls | 11 | 0.6 | 2.0 |

## Observations:

- On February 17, 2017, there was a windstorm in Salinas that caused significant damage. The fire department responded to 165 calls on that day. The majority of these calls (73 percent) were comprised of 63 hazard calls and 58 public service calls.
- The hour with the most calls was 5:00 a.m. to 6:00 a.m. on February 17, 2017. The hour's 25 calls involved 27 individual dispatches resulting in 22.5 hours of deployed time. These 25 calls included 16 hazard calls and 9 public service calls.
- Overall, units responded to calls in their first due areas 84 percent of the time and were first to arrive 79 percent of the time.
  - A unit from station 5 responded to calls in its first due area most often (91 percent of calls) and was first to arrive to calls in its first due area most often (86 percent of calls).
  - A unit from station 2 responded to calls in its first due area least often (80 percent of calls).

- A unit from station 4 was first to arrive to calls in its first due area least often (75 percent of calls).

- During the year studied, between 7 percent and 19 percent of calls in a station's first due area overlapped with at least one other call.
  - Calls overlapped in station 1's area most often (19 percent) and in station 3's area least often (7 percent).
  - The most calls that any call overlapped with was four, which occurred four times in station 1's area and twice in station 2's area.

# RESPONSE TIME

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

In this analysis, we included all calls to which at least one non-administrative SFD unit responded, while excluding canceled and mutual aid calls. Also, the battalion chief was treated as an administrative unit for this portion of the analysis. In addition, non-emergency calls and calls with a total response time of more than 30 minutes were excluded. Finally, we focused on units that had complete time stamps, that is, units with all components recorded, so that we could calculate each segment of response time.

Based on the methodology above, we excluded 1,560 canceled and mutual aid calls, 36 non-emergency calls, 15 calls to which the battalion chief was the only responding unit, 353 calls where no units recorded a valid on-scene time, 50 calls where the first arriving unit response was greater than 30 minutes, and 990 calls where one or more segments of first arriving unit's response time could not be calculated due to missing data. As a result, in this section, a total of 10,692 calls are included in the analysis.

## Response Time by Type of Call

Table 9-13 provides average dispatch, turnout, travel, and total response time for the first arriving unit to each call in the city, broken out by call type. Figures 9-7 and 9-8 illustrate the same information. Table 9-14 gives the 90th percentile time broken out in the same manner. A 90th percentile time means that 90 percent of calls had response times at or below that number. For example, Table 9-14 shows a 90th percentile response time of eight minutes which means that 90 percent of the time a call had a response time of no more than eight minutes.

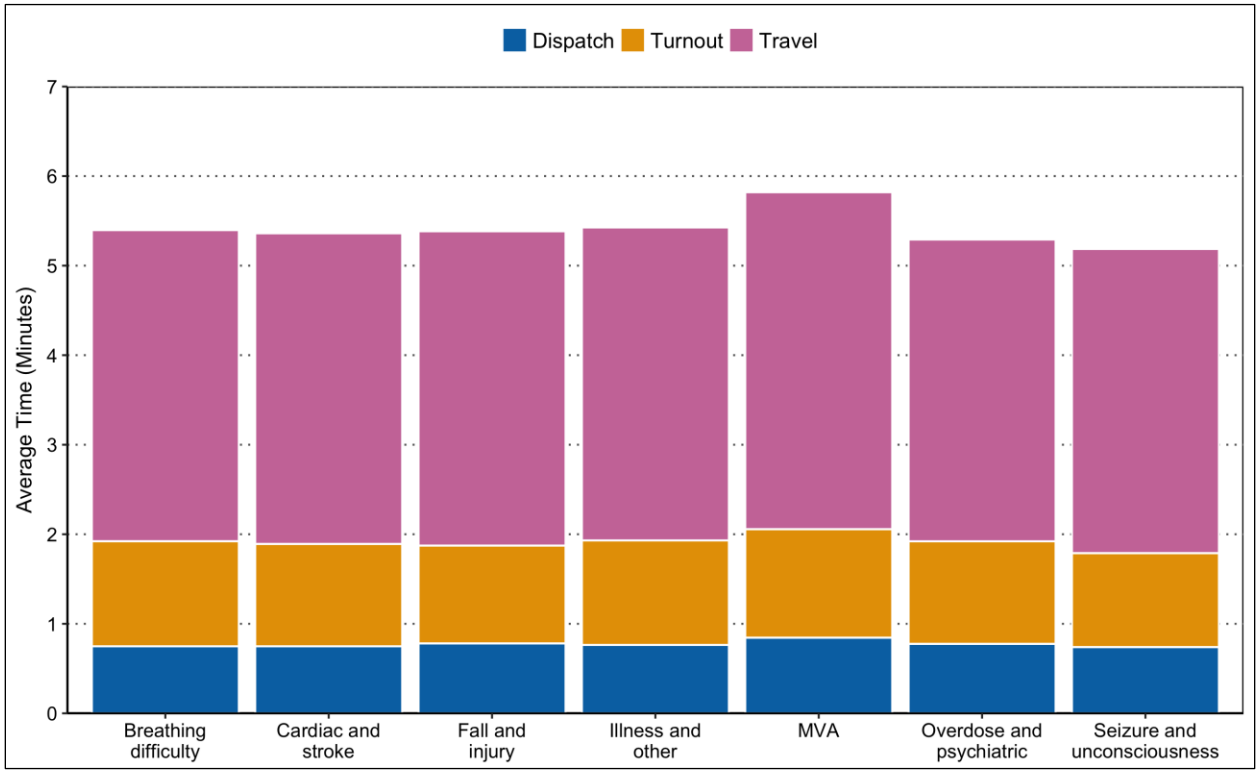
## TABLE 9-13: Average Response Time of First Arriving Unit, by Call Type (Minutes)

| Call Type | Dispatch | Turnout | Travel | Total | Number of Calls |
|---|---|---|---|---|---|
| Breathing difficulty | 0.7 | 1.2 | 3.5 | 5.4 | 670 |
| Cardiac and stroke | 0.7 | 1.1 | 3.5 | 5.4 | 605 |
| Fall and injury | 0.8 | 1.1 | 3.5 | 5.4 | 1,060 |
| Illness and other | 0.8 | 1.2 | 3.5 | 5.4 | 2,997 |
| MVA | 0.8 | 1.2 | 3.8 | 5.8 | 1,114 |
| Overdose and psychiatric | 0.8 | 1.1 | 3.4 | 5.3 | 920 |
| Seizure and unconsciousness | 0.7 | 1.0 | 3.4 | 5.2 | 607 |
| **EMS Total** | **0.8** | **1.2** | **3.5** | **5.4** | **7,973** |
| False alarm | 0.8 | 1.4 | 4.1 | 6.4 | 651 |
| Good intent | 0.9 | 1.3 | 3.5 | 5.8 | 369 |
| Hazard | 1.1 | 1.3 | 4.3 | 6.7 | 378 |
| Outside fire | 1.0 | 1.4 | 4.2 | 6.6 | 291 |
| Public service | 1.0 | 1.3 | 4.4 | 6.7 | 918 |
| Structure fire | 1.1 | 1.4 | 3.2 | 5.7 | 112 |
| **Fire Total** | **1.0** | **1.3** | **4.1** | **6.4** | **2,719** |
| **Total** | **0.8** | **1.2** | **3.7** | **5.7** | **10,692** |

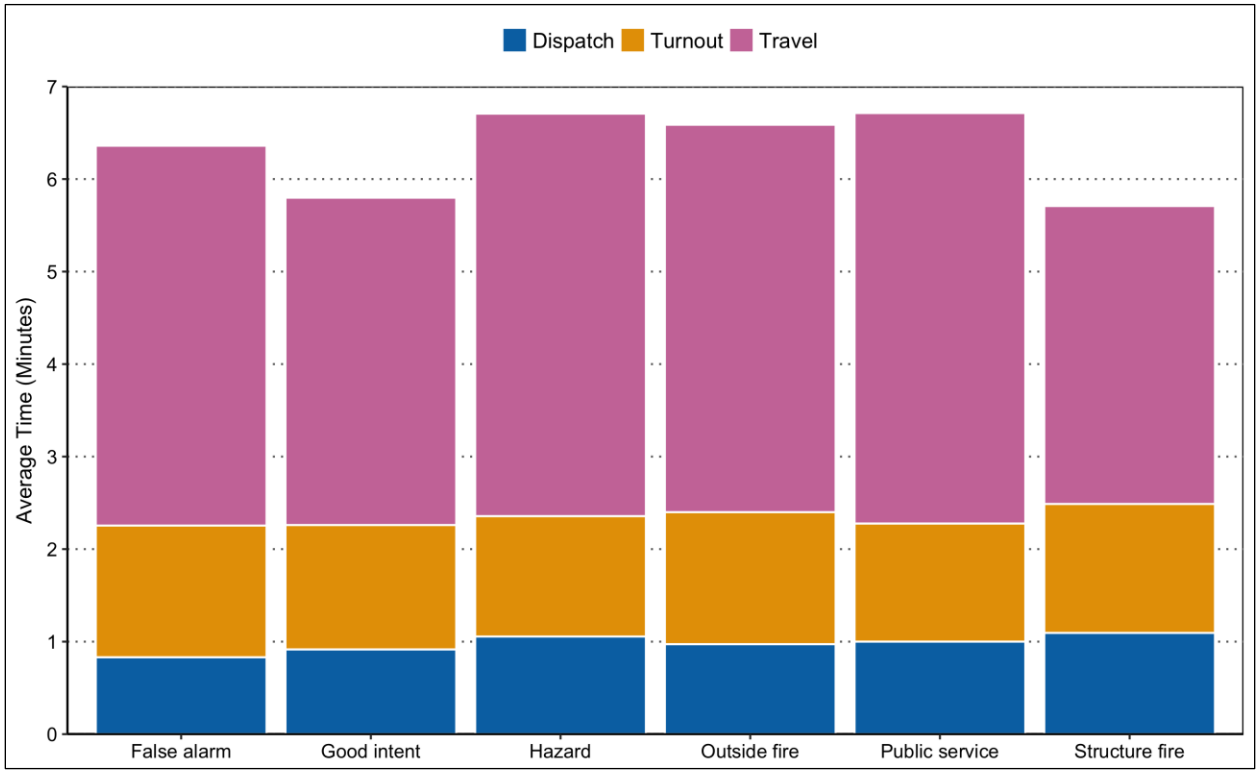
## TABLE 9-14: 90th Percentile Response Time of First Arriving Unit, by Call Type (Minutes)

| Call Type | Dispatch | Turnout | Travel | Total | Number of Calls |
|---|---|---|---|---|---|
| Breathing difficulty | 1.1 | 2.0 | 5.2 | 7.3 | 670 |
| Cardiac and stroke | 1.1 | 2.0 | 5.2 | 7.3 | 605 |
| Fall and injury | 1.2 | 1.8 | 5.2 | 7.3 | 1,060 |
| Illness and other | 1.1 | 2.0 | 5.4 | 7.5 | 2,997 |
| MVA | 1.4 | 1.9 | 6.1 | 8.6 | 1,114 |
| Overdose and psychiatric | 1.1 | 2.0 | 5.1 | 7.3 | 920 |
| Seizure and unconsciousness | 1.1 | 1.7 | 5.1 | 7.1 | 607 |
| **EMS Total** | **1.1** | **1.9** | **5.4** | **7.5** | **7,973** |
| False alarm | 1.2 | 2.1 | 6.3 | 8.9 | 651 |
| Good intent | 1.5 | 2.2 | 5.9 | 8.4 | 369 |
| Hazard | 1.7 | 2.1 | 7.3 | 10.3 | 378 |
| Outside fire | 1.6 | 2.3 | 6.5 | 9.5 | 291 |
| Public service | 1.5 | 2.1 | 7.5 | 10.3 | 918 |
| Structure fire | 1.5 | 2.2 | 4.6 | 7.5 | 112 |
| **Fire Total** | **1.5** | **2.2** | **6.8** | **9.5** | **2,719** |
| **Total** | **1.2** | **2.0** | **5.7** | **8.0** | **10,692** |

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




## FIGURE 9-8: Average Response Time of First Arriving Unit, by Call Type – Fire



## Observations:

- The average dispatch time was 0.8 minutes.
- The average turnout time was 1.2 minutes.
- The average travel time was 3.7 minutes.
- The average response time was 5.7 minutes.
- The average response time was 5.4 minutes for EMS calls and 6.4 minutes for fire calls.
- The average response time for structure fires was 5.7 minutes, and for outside fires was 6.6 minutes.
- The 90th percentile dispatch time was 1.2 minutes.
- The 90th percentile turnout time was 2.0 minutes.
- The 90th percentile travel time was 5.7 minutes.
- The 90th percentile response time was 8.0 minutes.
- The 90th percentile response time was 7.5 minutes for EMS calls and 9.5 minutes for fire calls.
- The 90th percentile response time for structure fires was 7.5 minutes, and for outside fires was 9.5 minutes.

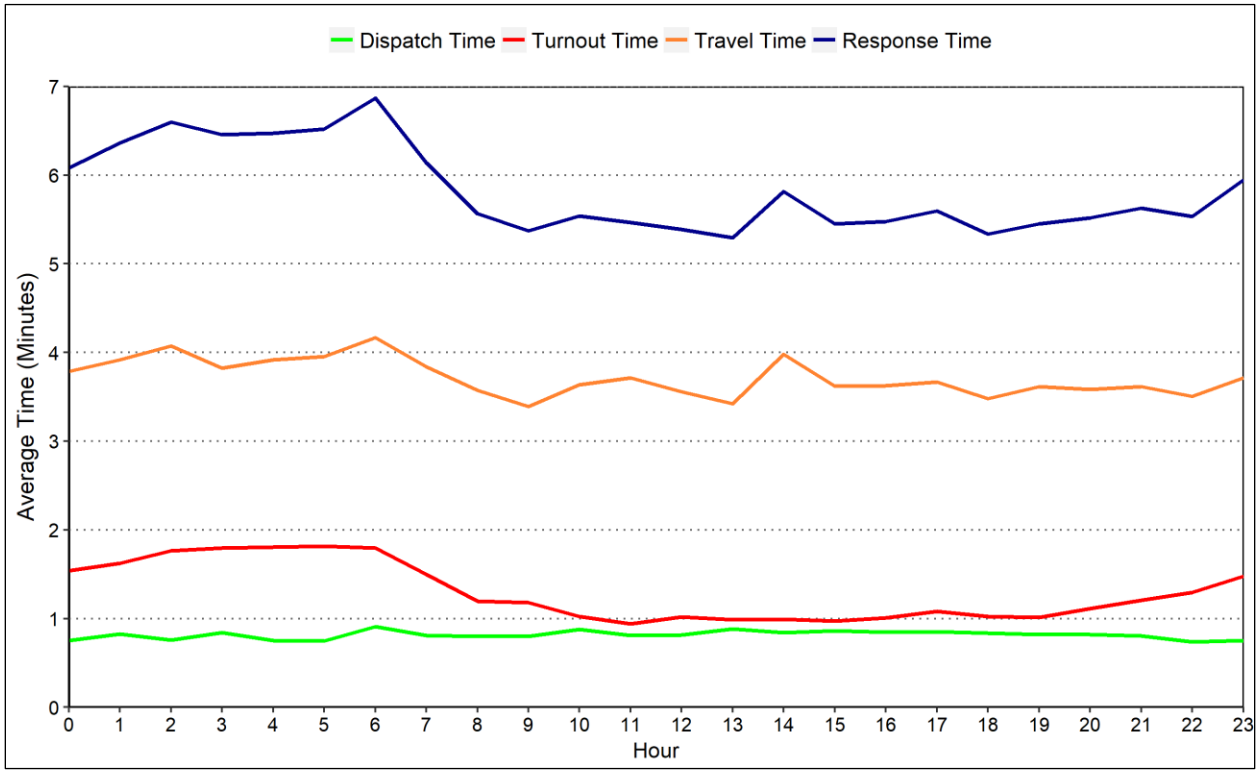
## Response Time by Hour

Average dispatch, turnout, travel, and total response time by hour for calls are shown in Table 9-15 and Figure 9-9. The table also shows 90th percentile response times.

### TABLE 9-15: Average and 90th Percentile Response Time of First Arriving Unit, by Hour of Day (Minutes)

| Hour | Dispatch | Turnout | Travel | Response Time | 90th Percentile Response Time | Number of Calls |
|---|---|---|---|---|---|---|
| 0 | 0.8 | 1.5 | 3.8 | 6.1 | 8.5 | 284 |
| 1 | 0.8 | 1.6 | 3.9 | 6.4 | 8.5 | 268 |
| 2 | 0.8 | 1.8 | 4.1 | 6.6 | 8.4 | 257 |
| 3 | 0.8 | 1.8 | 3.8 | 6.5 | 8.2 | 237 |
| 4 | 0.8 | 1.8 | 3.9 | 6.5 | 8.7 | 192 |
| 5 | 0.7 | 1.8 | 4.0 | 6.5 | 8.3 | 231 |
| 6 | 0.9 | 1.8 | 4.2 | 6.9 | 9.4 | 290 |
| 7 | 0.8 | 1.5 | 3.8 | 6.1 | 8.5 | 363 |
| 8 | 0.8 | 1.2 | 3.6 | 5.6 | 7.6 | 451 |
| 9 | 0.8 | 1.2 | 3.4 | 5.4 | 7.5 | 510 |
| 10 | 0.9 | 1.0 | 3.6 | 5.5 | 7.7 | 536 |
| 11 | 0.8 | 0.9 | 3.7 | 5.5 | 7.8 | 552 |
| 12 | 0.8 | 1.0 | 3.6 | 5.4 | 7.6 | 592 |
| 13 | 0.9 | 1.0 | 3.4 | 5.3 | 7.6 | 590 |
| 14 | 0.8 | 1.0 | 4.0 | 5.8 | 8.7 | 569 |
| 15 | 0.9 | 1.0 | 3.6 | 5.5 | 7.9 | 612 |
| 16 | 0.8 | 1.0 | 3.6 | 5.5 | 8.1 | 575 |
| 17 | 0.8 | 1.1 | 3.7 | 5.6 | 8.2 | 627 |
| 18 | 0.8 | 1.0 | 3.5 | 5.3 | 7.5 | 596 |
| 19 | 0.8 | 1.0 | 3.6 | 5.4 | 7.6 | 532 |
| 20 | 0.8 | 1.1 | 3.6 | 5.5 | 7.4 | 538 |
| 21 | 0.8 | 1.2 | 3.6 | 5.6 | 7.4 | 489 |
| 22 | 0.7 | 1.3 | 3.5 | 5.5 | 7.5 | 449 |
| 23 | 0.8 | 1.5 | 3.7 | 5.9 | 8.1 | 352 |

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




## Observations:

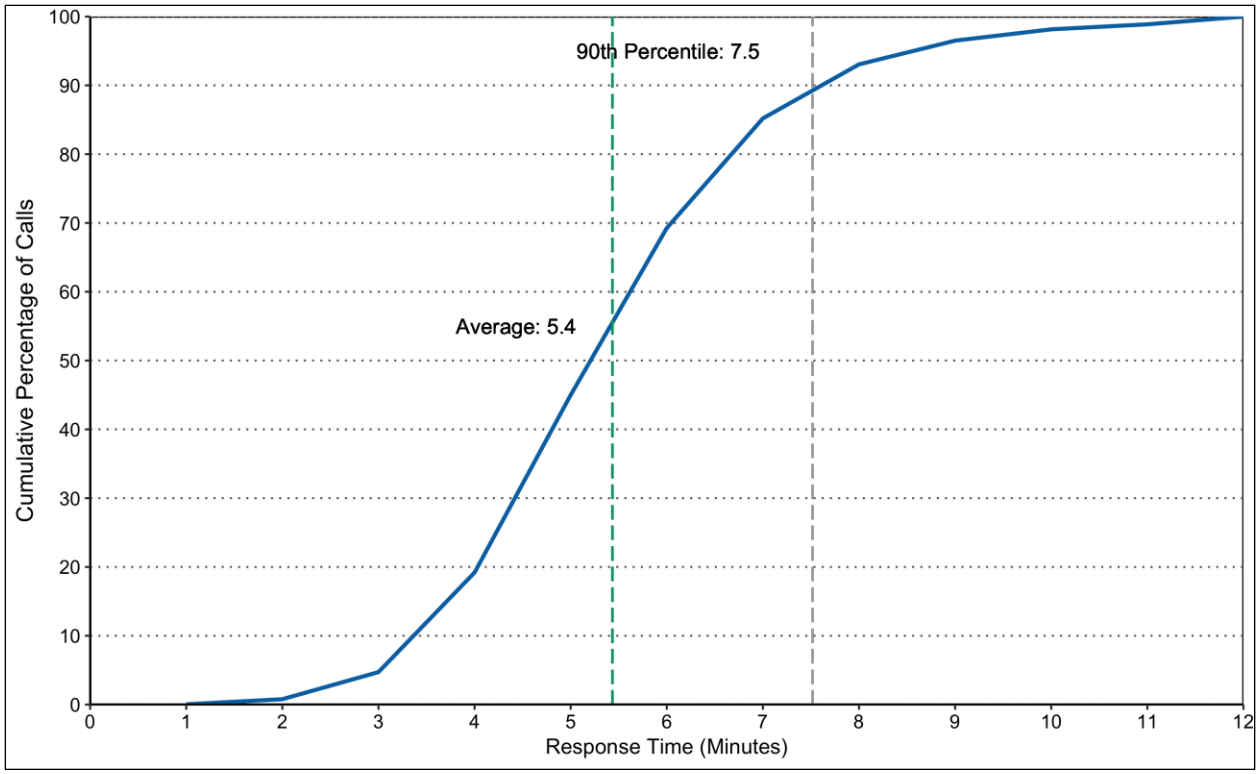
- Average dispatch time was between 0.7 minutes (5:00 a.m. to 6:00 a.m. and 10:00 p.m. to 11:00 p.m.) and 0.9 minutes (multiple hours).
- Average turnout time was between 0.9 minutes (11:00 a.m. to noon) and 1.8 minutes (2:00 a.m. to 7:00 a.m.).
- Average travel time was between 3.4 minutes (9:00 a.m. to 10:00 a.m. and 1:00 p.m. to 2:00 p.m.) and 4.2 minutes (6:00 a.m. to 7:00 a.m.).
- Average response time was between 5.3 minutes (1:00 p.m. to 2:00 p.m. and 6:00 p.m. to 7:00 p.m.) and 6.9 minutes (6:00 a.m. to 7:00 a.m.).
- 90th percentile total response time by hour ranged from 7.4 minutes (8:00 p.m. to 10:00 p.m.) to 9.4 minutes (6:00 a.m. to 7:00 a.m.).

## Response Time Distribution

Here, we present a more detailed look at how response times to calls are distributed. The cumulative distribution of total response time for the first arriving unit to EMS calls is shown in Figure 9-10 and Table 9-16. Figure 9-11 and Table 9-17 show the same information for structure and outside fires combined.

The cumulative percentages here are read in the same way as a percentile. In Figure 9-10, the 90th percentile of 7.5 minutes means that 90 percent of EMS calls had a response time of 7.5 minutes or less. In Table 9-16, the cumulative percentage of 93.1, for example, means that 93.1 percent of EMS calls had a response time under eight minutes.

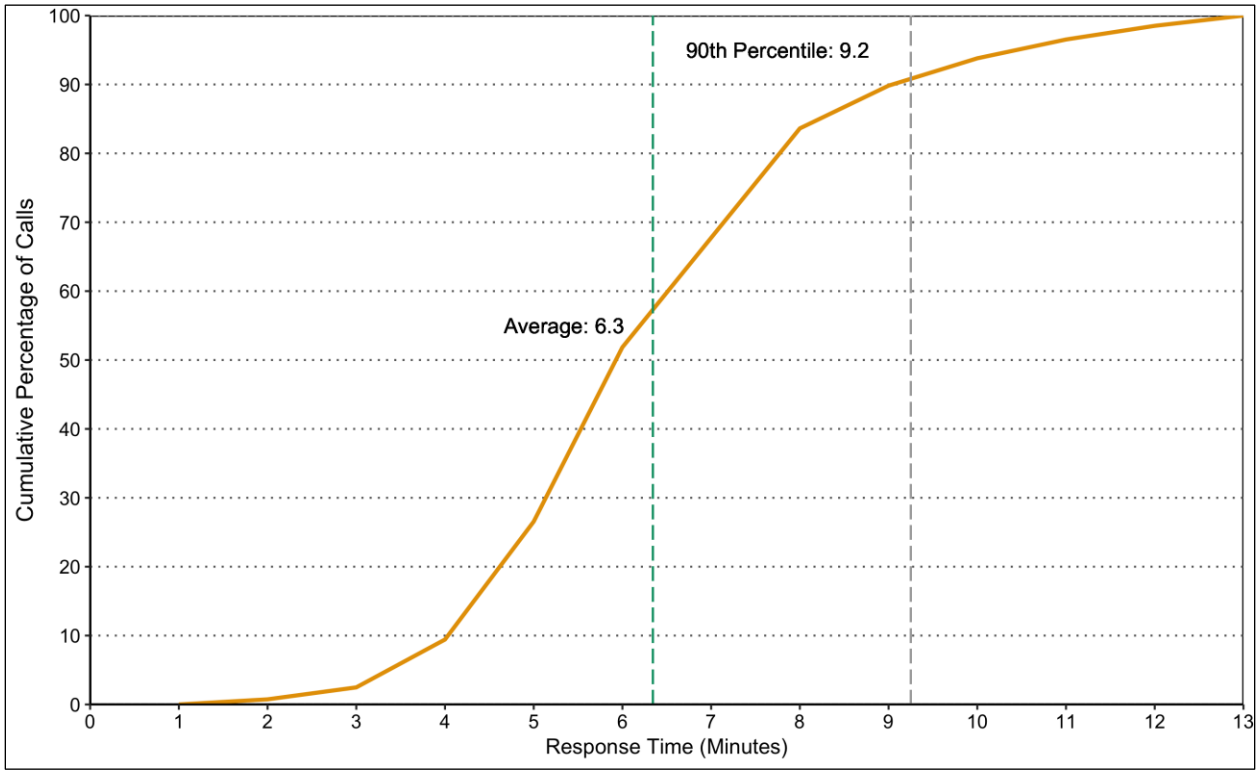
### FIGURE 9-10: Cumulative Distribution of Response Time – First Arriving Unit – EMS



## TABLE 9-16: Cumulative Distribution of Response Time – First Arriving Unit – EMS

| Response Time (minute) | Frequency | Cumulative Percentage |
|---|---|---|
| 0 - 1 | 3 | 0.0 |
| 1 - 2 | 59 | 0.8 |
| 2 - 3 | 314 | 4.7 |
| 3 - 4 | 1,154 | 19.2 |
| 4 - 5 | 2,057 | 45.0 |
| 5 - 6 | 1,935 | 69.3 |
| 6 - 7 | 1,271 | 85.2 |
| 7 - 8 | 626 | 93.1 |
| 8 - 9 | 275 | 96.5 |
| 9 - 10 | 131 | 98.1 |
| 10 - 11 | 58 | 98.9 |
| 12+ | 90 | 100.0 |

## FIGURE 9-11: Frequency Distribution of Response Time – First Arriving Unit – Outside and Structure Fires



## TABLE 9-17: Cumulative Distribution of Response Time – First Arriving Unit – Outside and Structure Fires

| Response Time (minute) | Frequency | Cumulative Percentage |
|---|---|---|
| 0 - 1 | 0 | 0.0 |
| 1 - 2 | 3 | 0.7 |
| 2 - 3 | 7 | 2.5 |
| 3 - 4 | 28 | 9.4 |
| 4 - 5 | 69 | 26.6 |
| 5 - 6 | 102 | 51.9 |
| 6 - 7 | 64 | 67.7 |
| 7 - 8 | 64 | 83.6 |
| 8 - 9 | 25 | 89.8 |
| 9 - 10 | 16 | 93.8 |
| 10 - 11 | 11 | 96.5 |
| 11 - 12 | 8 | 98.5 |
| 13+ | 6 | 100.0 |

## Observations:

- For 93 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 52 percent of structure and outside fire calls, the response time of the first arriving unit was less than 6 minutes.

## TABLE 9-18: Actions Taken Analysis for Structure and Outside Fire Calls

| Action Taken | Number of Calls | |
|---|---|---|
| | Outside Fire | Structure Fire |
| Assistance, other | 2 | 0 |
| Contain fire (wildland) | 4 | 0 |
| Control fire (wildland) | 4 | 0 |
| Control traffic | 6 | 0 |
| Enforce codes | 2 | 1 |
| Extinguishment by fire service personnel | 190 | 54 |
| Fire control or extinguishment, other | 24 | 7 |
| Fires, rescues & hazardous conditions, other | 1 | 0 |
| Forcible entry | 4 | 4 |
| Incident command | 7 | 3 |
| Information, investigation & enforcement, other | 2 | 4 |
| Investigate | 157 | 63 |
| Investigate fire out on arrival | 18 | 11 |
| Notify other agencies. | 6 | 1 |
| Operate apparatus or vehicle | 1 | 1 |
| Provide advanced life support (ALS) | 3 | 0 |
| Provide apparatus | 3 | 1 |
| Provide equipment | 3 | 3 |
| Provide first aid & check for injuries | 1 | 3 |
| Provide information to public or media | 12 | 1 |
| Provide manpower | 2 | 1 |
| Provide water | 3 | 1 |
| Refer to proper authority | 14 | 4 |
| Remove hazard | 2 | 5 |
| Salvage & overhaul | 93 | 44 |
| Search | 2 | 4 |
| Search & rescue, other | 1 | 0 |
| Secure property | 1 | 0 |
| Ventilate | 2 | 19 |
| **Total** | **570** | **238** |

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

## Observations:

- Out of 313 outside fires, 190 were extinguished by fire service personnel, which accounted for 61 percent of outside fires.
- Out of 122 structure fires, 54 were extinguished by fire service personnel, which accounted for 44 percent of structure fires.

## ATTACHMENT II

### TABLE 9-19: Workload of Administrative Units

| Unit ID | Unit Type | Annual Hours | Annual Runs |
|---|---|---|---|
| BAT4 | BC/Fire Marshal | 45.4 | 26 |
| BAT5 | BC of Training/Special Ops | 11.1 | 27 |
| CMD5 | Mobile Command | 105.6 | 1 |
| DEPCH1 | Deputy Chief | 209.0 | 56 |
| EMS1 | EMS Officer | 1.4 | 2 |
| PR1 | Prevention | 1.8 | 5 |
| PR2 | Prevention | 1.2 | 2 |
| TRN1 | Training | 6.1 | 6 |

## ATTACHMENT III

### TABLE 9-20: Content and Property Loss – Structure and Outside Fires

| Call Type | Property Loss | | Content Loss | |
|---|---|---|---|---|
| | Loss Value | Number of Calls | Loss Value | Number of Calls |
| Outside fire | $457,399 | 55 | $24,370 | 23 |
| Structure fire | $867,090 | 37 | $374,427 | 42 |
| **Total** | **$1,324,489** | **92** | **$398,797** | **65** |

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

## Observations:

- Out of 313 outside fires, 55 had recorded property loss, with a combined $457,399 in losses.
- 23 outside fires had content loss with a combined $24,370 in losses.
- Out of 122 structure fires, 37 had recorded property loss, with a combined $867,090 in losses.
- 42 structure fires had content loss with a combined $374,427 in losses.
- The average total loss for all structure fires was $10,176.
- The average total loss for structure fires with loss was $24,343.

### TABLE 9-21: Total Fire Loss Above and Below $20,000

| Call Type | No Loss | Under $20,000 | $20,000 plus |
|---|---|---|---|
| Outside fire | 251 | 54 | 8 |
| Structure fire | 71 | 40 | 11 |
| **Total** | **322** | **94** | **19** |

## Observations:

- 251 outside fires and 71 structure fires had no recorded loss.
- 8 outside fires and 11 structure fires had $20,000 or more in loss.
- The highest total loss for a structure fire was $325,000.
- The highest total loss for an outside fire was $80,000.

## ATTACHMENT IV

### TABLE 9-22: Call Workload by Unit – Reserve Engine Detail

| Station | Unit Id | Unit Type | Avg. Deployed Min. per Run | Total Annual Hours | Avg. Deployed Min. per Day | Total Annual Runs | Avg. Runs per Day |
|---|---|---|---|---|---|---|---|
| 1 | BAT1 | Battalion Chief | 44.5 | 496.5 | 7.6 | 670 | 1.8 |
| | E1 | Engine | 22.4 | 1,051.6 | 16.1 | 2,811 | 7.7 |
| | E101 | Reserve Engine | 19.7 | 55.2 | 0.8 | 168 | 0.5 |
| | E102 | Reserve Engine | 24.2 | 141.7 | 2.2 | 352 | 1.0 |
| | E103 | Reserve Engine | 25.8 | 73.2 | 1.1 | 170 | 0.5 |
| | E104 | Reserve Engine | 5,226.8 | 87.1 | 1.3 | 1 | 0.0 |
| | E105 | Reserve Engine | 37.1 | 2.5 | 0.0 | 4 | 0.0 |
| | T1 | Ladder | 23.7 | 505.9 | 7.8 | 1,282 | 3.5 |
| | **Total** | | 26.5 | 2,413.8 | 37.1 | 5,458 | 15.0 |
| 2 | E2 | Engine | 21.7 | 822.4 | 12.6 | 2,278 | 6.2 |
| | E101 | Reserve Engine | 22.3 | 116.6 | 1.8 | 313 | 0.9 |
| | E102 | Reserve Engine | 21.8 | 104.4 | 1.6 | 288 | 0.8 |
| | E103 | Reserve Engine | 22.0 | 0.7 | 0.0 | 2 | 0.0 |
| | **Total** | | 21.7 | 1,044.2 | 16.0 | 2,881 | 7.9 |
| 3 | E3 | Engine | 22.6 | 564.8 | 8.7 | 1,499 | 4.1 |
| | E101 | Reserve Engine | 14.9 | 0.5 | 0.0 | 2 | 0.0 |
| | E102 | Reserve Engine | 20.2 | 13.8 | 0.2 | 41 | 0.1 |
| | E103 | Reserve Engine | 20.9 | 7.6 | 0.1 | 22 | 0.1 |
| | E105 | Reserve Engine | 18.1 | 0.9 | 0.0 | 3 | 0.0 |
| | OES323 | OES Engine | 27.4 | 9.1 | 0.1 | 20 | 0.1 |
| | **Total** | | 22.6 | 596.8 | 9.2 | 1,587 | 4.3 |
| 4 | CR4 | ARFF | 22.1 | 1.5 | 0.0 | 4 | 0.0 |
| | E4 | Engine | 24.3 | 483.9 | 7.4 | 1,196 | 3.3 |
| | E101 | Reserve Engine | 25.5 | 13.2 | 0.2 | 31 | 0.1 |
| | E102 | Reserve Engine | 23.7 | 89.5 | 1.4 | 227 | 0.6 |
| | E103 | Reserve Engine | 21.4 | 6.4 | 0.1 | 18 | 0.0 |
| | E105 | Reserve Engine | 22.5 | 68.9 | 1.1 | 184 | 0.5 |
| | E203 | Reserve | 23.7 | 90.0 | 1.4 | 228 | 0.6 |
| | **Total** | | 23.9 | 753.3 | 11.6 | 1,888 | 5.2 |
| 5 | E5 | Engine | 24.5 | 552.9 | 8.5 | 1,356 | 3.7 |
| | E101 | Reserve Engine | 31.0 | 39.3 | 0.6 | 76 | 0.2 |
| | E102 | Reserve Engine | 18.7 | 7.2 | 0.1 | 23 | 0.1 |
| | E305 | Brush Engine | 44.7 | 54.3 | 0.8 | 73 | 0.2 |
| | T2 | Ladder | 26.7 | 240.0 | 3.7 | 540 | 1.5 |
| | **Total** | | 25.9 | 893.7 | 13.7 | 2,068 | 5.7 |

| Station | Unit Id | Unit Type | Avg. Deployed Min. per Run | Total Annual Hours | Avg. Deployed Min. per Day | Total Annual Runs | Avg. Runs per Day |
|---|---|---|---|---|---|---|---|
| 6 | E6 | Engine | 23.1 | 317.2 | 4.9 | 824 | 2.3 |
| | E101 | Reserve Engine | 20.4 | 319.0 | 4.9 | 938 | 2.6 |
| | E102 | Reserve Engine | 22.0 | 105.1 | 1.6 | 287 | 0.8 |
| | E103 | Reserve Engine | 17.6 | 11.4 | 0.2 | 39 | 0.1 |
| | **Total** | | 21.6 | 752.7 | 11.6 | 2,088 | 5.7 |
| Reserve | T4 | Ladder | 138.5 | 60.0 | 0.9 | 26 | 0.1 |
| | **Total** | | 138.5 | 60.0 | 0.9 | 26 | 0.1 |
| **Total** | | | 24.4 | 6,514.6 | 100.0 | 15,996 | 43.8 |

**Note:** E203 is a CAD identifier for a reserve unit and does not refer to a specific physical unit. Some units had so few runs that the average runs per day, when rounded to the nearest one-tenth, appear to be zero.

**Reserve units** are not additional units but are typically used as replacement units which are staffed and operated by the same personnel and placed into service when the primary unit is unavailable due to repairs or maintenance.

## TABLE 9-23: Total Annual Runs by Run Type and Unit – Reserve Engine Detail

| Station | Unit Id | Unit Type | EMS | False Alarm | Good Intent | Hazard | Outside Fire | Public Service | Structure Fire | Canceled | Mutual Aid | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BAT1 | Battalion Chief | 232 | 32 | 36 | 56 | 111 | 30 | 96 | 72 | 5 | 670 |
| | E1 | Engine | 1,814 | 142 | 85 | 52 | 67 | 159 | 55 | 427 | 10 | 2,811 |
| | E101 | Reserve Engine | 113 | 3 | 8 | 2 | 5 | 6 | 5 | 25 | 1 | 168 |
| | E102 | Reserve Engine | 226 | 17 | 13 | 7 | 9 | 17 | 10 | 53 | 0 | 352 |
| | E103 | Reserve Engine | 113 | 8 | 5 | 5 | 5 | 8 | 2 | 24 | 0 | 170 |
| | E104 | Reserve Engine | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| | E105 | Reserve Engine | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 |
| | T1 | Ladder | **625** | **30** | **61** | **115** | **32** | **195** | **67** | **152** | **5** | **1,282** |
| | **Total** | | 3,126 | 232 | 208 | 237 | 229 | 415 | 236 | 754 | 21 | 5,458 |
| 2 | E2 | Engine | 1,519 | 117 | 92 | 72 | 60 | 166 | 61 | 190 | 1 | 2,278 |
| | E101 | Reserve Engine | 209 | 18 | 13 | 6 | 14 | 19 | 5 | 29 | 0 | 313 |
| | E102 | Reserve Engine | 218 | 16 | 5 | 13 | 5 | 13 | 6 | 11 | 1 | 288 |
| | E103 | Reserve Engine | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | **Total** | | **1,948** | **151** | **110** | **91** | **79** | **198** | **72** | **230** | **2** | **2,881** |
| 3 | E3 | Engine | 865 | 121 | 43 | 61 | 60 | 106 | 53 | 185 | 5 | 1,499 |
| | E101 | Reserve Engine | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | E102 | Reserve Engine | 27 | 1 | 0 | 3 | 4 | 0 | 0 | 5 | 1 | 41 |
| | E103 | Reserve Engine | 19 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 22 |
| | E105 | Reserve Engine | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 |
| | OES323 | OES Engine | 4 | 1 | 1 | 9 | 1 | 2 | 0 | 1 | 1 | 20 |
| | **Total** | | **918** | **123** | **45** | **73** | **65** | **111** | **54** | **191** | **7** | **1,587** |

| Station | Unit Id | Unit Type | EMS | False Alarm | Good Intent | Hazard | Outside Fire | Public Service | Structure Fire | Canceled | Mutual Aid | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | CR4 | ARFF | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 4 |
| | E4 | Engine | 738 | 85 | 43 | 60 | 48 | 72 | 31 | 118 | 1 | 1,196 |
| | E101 | Reserve Engine | **17** | **0** | **1** | **1** | **2** | **4** | **2** | **4** | **0** | **31** |
| | E102 | Reserve Engine | 140 | 8 | 10 | 15 | 8 | 12 | 10 | 24 | 0 | 227 |
| | E103 | Reserve Engine | 9 | 1 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 18 |
| | E105 | Reserve Engine | 121 | 8 | 3 | 10 | 13 | 7 | 3 | 19 | 0 | 184 |
| | E203 | Reserve | 143 | 11 | 3 | 5 | 9 | 25 | 14 | 18 | 0 | 228 |
| | **Total** | | **1,169** | **113** | **60** | **93** | **80** | **124** | **60** | **188** | **1** | **1,888** |
| 5 | E5 | Engine | 883 | 106 | 51 | 28 | 61 | 84 | 42 | 100 | 1 | 1,356 |
| | E101 | Reserve Engine | 46 | 4 | 3 | 8 | 4 | 6 | 2 | 3 | 0 | 76 |
| | E102 | Reserve Engine | 12 | 2 | 0 | 0 | 0 | 2 | 1 | 6 | 0 | 23 |
| | E305 | Brush Engine | 3 | 1 | 4 | 6 | 47 | 4 | 2 | 4 | 2 | 73 |
| | T2 | Ladder | 223 | 35 | 21 | 66 | 24 | 96 | 49 | 26 | 0 | 540 |
| | **Total** | | **1,167** | **148** | **79** | **108** | **136** | **192** | **96** | **139** | **3** | **2,068** |
| 6 | E6 | Engine | 538 | 44 | 23 | 20 | 17 | 80 | 11 | 90 | 1 | 824 |
| | E101 | Reserve Engine | 609 | 51 | 23 | 26 | 29 | 76 | 22 | 99 | 3 | 938 |
| | E102 | Reserve Engine | 188 | 13 | 10 | 13 | 5 | 21 | 6 | 31 | 0 | 287 |
| | E103 | Reserve Engine | 24 | 1 | 0 | 5 | 2 | 4 | 0 | 3 | 0 | 39 |
| | **Total** | | **1,359** | **109** | **56** | **64** | **53** | **181** | **39** | **223** | **4** | **2,088** |
| Reserve | T4 | Ladder | 16 | 0 | 0 | 1 | 0 | 3 | 2 | 4 | 0 | 26 |
| | **Total** | | **16** | **0** | **0** | **1** | **0** | **3** | **2** | **4** | **0** | **26** |
| **Total** | | | **9,703** | **876** | **558** | **667** | **642** | **1,224** | **559** | **1,729** | **38** | **15,996** |

**Note:** E203 is a CAD identifier for a reserve unit and does not refer to a specific physical unit.

**Reserve units** are not additional units but are typically used as replacement units which are staffed and operated by the same personnel and placed into service when the primary unit is unavailable due to repairs or maintenance.

## TABLE 9-24: Daily Average Deployed Minutes by Run Type and Unit – Reserve Engine Detail

| Station | Unit Id | Unit Type | EMS | False Alarm | Good Intent | Hazard | Outside Fire | Public Service | Structure Fire | Canceled | Mutual Aid | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BAT1 | Battalion Chief | 16.6 | 4.6 | 1.6 | 3.7 | 8.8 | 4.0 | 18.4 | 13.0 | 11.0 | 81.6 |
| | E1 | Engine | 121.1 | 6.7 | 3.2 | 4.1 | 5.4 | 9.2 | 9.1 | 13.5 | 0.5 | 172.9 |
| | E101 | Reserve Engine | 6.9 | 0.2 | 0.2 | 0.1 | 0.2 | 0.4 | 0.4 | 0.6 | 0.1 | 9.1 |
| | E102 | Reserve Engine | 16.4 | 0.9 | 0.5 | 0.4 | 0.4 | 1.0 | 2.1 | 1.6 | 0.0 | 23.3 |
| | E103 | Reserve Engine | 8.3 | 0.4 | 0.1 | 0.5 | 0.2 | 0.6 | 0.2 | 1.8 | 0.0 | 12.0 |
| | E104 | Reserve Engine | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14.3 | 0.0 | 0.0 | 14.3 |
| | E105 | Reserve Engine | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| | T1 | Ladder | 39.5 | 1.2 | 2.4 | 7.9 | 1.8 | 11.3 | 12.8 | 6.1 | 0.1 | 83.2 |
| | **Total** | | **209.2** | **13.9** | **8.1** | **16.7** | **16.7** | **26.5** | **57.3** | **36.6** | **11.7** | **396.8** |
| 2 | E2 | Engine | 95.1 | 5.6 | 3.4 | 4.1 | 4.0 | 8.3 | 8.5 | 6.0 | 0.1 | 135.2 |
| | E101 | Reserve Engine | 14.0 | 0.8 | 0.4 | 0.3 | 1.2 | 1.2 | 0.7 | 0.7 | 0.0 | 19.2 |
| | E102 | Reserve Engine | 13.4 | 0.9 | 0.1 | 0.8 | 0.2 | 0.7 | 0.7 | 0.3 | 0.0 | 17.2 |
| | E103 | Reserve Engine | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| | **Total** | | **122.7** | **7.2** | **3.9** | **5.1** | **5.4** | **10.2** | **9.9** | **7.0** | **0.1** | **171.6** |
| 3 | E3 | Engine | 53.0 | 6.3 | 1.8 | 4.6 | 4.2 | 5.9 | 10.7 | 6.2 | 0.2 | 92.8 |
| | E101 | Reserve Engine | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| | E102 | Reserve Engine | 1.4 | 0.1 | 0.0 | 0.2 | 0.4 | 0.0 | 0.0 | 0.1 | 0.0 | 2.3 |
| | E103 | Reserve Engine | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 1.3 |
| | E105 | Reserve Engine | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| | OES323 | OES Engine | 0.3 | 0.0 | 0.1 | 0.7 | 0.1 | 0.2 | 0.0 | 0.1 | 0.1 | 1.5 |
| | **Total** | | **56.0** | **6.4** | **1.9** | **5.5** | **4.7** | **6.2** | **10.8** | **6.4** | **0.3** | **98.1** |

| Station | Unit Id | Unit Type | EMS | False Alarm | Good Intent | Hazard | Outside Fire | Public Service | Structure Fire | Canceled | Mutual Aid | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | CR4 | ARFF | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 |
| | E4 | Engine | 51.1 | 3.1 | 1.7 | 3.3 | 4.6 | 4.1 | 6.2 | 4.4 | 1.0 | 79.5 |
| | E101 | Reserve Engine | 1.1 | 0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.6 | 0.1 | 0.0 | 2.2 |
| | E102 | Reserve Engine | 9.8 | 0.3 | 0.3 | 0.8 | 0.6 | 0.5 | 1.7 | 0.7 | 0.0 | 14.7 |
| | E103 | Reserve Engine | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.1 | 0.0 | 1.1 |
| | E105 | Reserve Engine | 7.8 | 0.3 | 0.1 | 0.7 | 1.3 | 0.2 | 0.3 | 0.6 | 0.0 | 11.3 |
| | E203 | Reserve | 8.7 | 0.4 | 0.1 | 0.2 | 1.1 | 1.0 | 2.8 | 0.5 | 0.0 | 14.8 |
| | **Total** | | **79.3** | **4.2** | **2.2** | **5.1** | **7.7** | **6.2** | **11.7** | **6.4** | **1.0** | **123.8** |
| 5 | E5 | Engine | 59.4 | 7.3 | 2.4 | 1.9 | 5.7 | 5.3 | 5.9 | 3.0 | 0.0 | 90.9 |
| | E101 | Reserve Engine | 4.3 | 0.2 | 0.1 | 0.6 | 0.3 | 0.6 | 0.3 | 0.1 | 0.0 | 6.5 |
| | E102 | Reserve Engine | 0.8 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 | 0.0 | 1.2 |
| | E305 | Brush Engine | 0.3 | 0.0 | 0.1 | 0.1 | 4.6 | 0.2 | 3.1 | 0.1 | 0.3 | 8.9 |
| | T2 | Ladder | 13.9 | 0.9 | 1.2 | 5.9 | 1.5 | 6.0 | 9.1 | 0.9 | 0.0 | 39.5 |
| | **Total** | | **78.7** | **8.4** | **3.8** | **8.5** | **12.2** | **12.2** | **18.4** | **4.3** | **0.3** | **146.9** |
| 6 | E6 | Engine | 36.0 | 1.6 | 1.1 | 1.9 | 1.6 | 3.7 | 2.5 | 3.8 | 0.1 | 52.1 |
| | E101 | Reserve Engine | 37.3 | 1.8 | 0.8 | 1.7 | 2.1 | 4.3 | 1.8 | 2.6 | 0.1 | 52.4 |
| | E102 | Reserve Engine | 12.1 | 0.7 | 0.4 | 1.7 | 0.3 | 1.1 | 0.2 | 0.9 | 0.0 | 17.3 |
| | E103 | Reserve Engine | 1.3 | 0.0 | 0.0 | 0.2 | 0.1 | 0.2 | 0.0 | 0.1 | 0.0 | 1.9 |
| | **Total** | | **86.7** | **4.1** | **2.3** | **5.5** | **4.1** | **9.3** | **4.4** | **7.3** | **0.2** | **123.7** |
| Reserve | T4 | Ladder | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 7.7 | 0.1 | 0.0 | 9.9 |
| | **Total** | | **1.9** | **0.0** | **0.0** | **0.0** | **0.0** | **0.1** | **7.7** | **0.1** | **0.0** | **9.9** |
| **Total** | | | **634.6** | **44.3** | **22.3** | **46.4** | **50.9** | **70.7** | **120.1** | **68.1** | **13.6** | **1,070.9** |

**Note:** E203 is a CAD identifier for a reserve unit and does not refer to a specific physical unit. Some units had so little total deployed time that the average deployed minutes per day, when rounded to the nearest one-tenth, appear to be zero.

**Reserve units** are not additional units but are typically used as replacement units which are staffed and operated by the same personnel and placed into service when the primary unit is unavailable due to repairs or maintenance.