CENTER FOR PUBLIC SAFETY MANAGEMENT, LLC

Station Feasibility and Fire & EMS Operational Analysis

Pelham Fire Department
Pelham, AL

Final Report-November 2023

Pelham
A path apart.

PELHAM FIRE DEPARTMENT

CPSM®

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

THE ASSOCIATION & THE COMPANY

The International City/County Management Association is a 109-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 over 425 such studies in 46 states and provinces and over 300 communities ranging in population from 3,300 (Lewes, DE) to 800,000 (Indianapolis, Ind.).

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SECTION 1. EXECUTIVE SUMMARY

The Center for Public Safety Management (CPSM) was retained by the City of Pelham, AL to conduct a station feasibility, fire, and EMS operational analysis. This analysis was specifically designed to provide the city with a comprehensive and unbiased review of facilities (non-mechanical assessment), facility locations and deployment effectiveness, current Fire and EMS operations and how these components may be developed over the mid and long terms to provide a more effective fire, EMS and emergency management service, and an assessment of the current EMS ground transport system provided to the city by a private vendor.

To begin the analysis, project staff requested certain documents, data, and information from the city. The project staff used this information/data to familiarize themselves with the fire and EMS provider's operations. The provided information was supplemented with information collected during an on-site visit in February 2023, where CPSM interacted with city and Pelham Fire Department (PFD) staff, visited each fire facility, reviewed fleet, and equipment, met with the Pelham 911-Center staff, and completed an extensive tour of the city visualizing building, transportation, and other community risk. Additionally, CPSM staff held virtual and phone stakeholder meetings with city leadership, the private EMS ground transport provider (Regional Paramedical Services-RPS), the PFD staff, and the Pelham Medical Director. Information gleaned from these stakeholder meetings is included in this assessment.

Our report includes a comprehensive operational workload and response time data analysis. The data analysis performed for this project provided technical support to recommendations and deployment strategies based on call demand, call type, resiliency, and response travel times. As well the data analysis links to the GIS mapping CPSM utilized extensively in this report.

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

Throughout our analysis, and more specifically when analyzing the operational deployment of resources, CPSM utilized two national benchmarks: the Insurance Services Office - Public Protection Classification (ISO-PPC) rating system, and NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*. Both are important national benchmarks. Although both are focused on fire protection, it is important to understand they are independent of one another.

The Insurance Services Office (ISO), a subsidiary of Verisk Analytics is a national, not-for-profit organization that collects and evaluates information from communities across the United States regarding their capabilities to combat building fires. The Verisk hazard mitigation team collects and evaluates information regarding the community's capabilities to provide municipal fire protection. This information is analyzed further utilizing the Fire Suppression Rating System from which individual section credits and points are tabulated and a Public Protection Classification for the community is assigned. Classifications range from 1 through 10, with one being the highest rating a community can achieve.[1] The City of Pelham has achieved a Class 2 rating, which is in the upper third of ratings, and an achievement to be proud of.

1. Verisk's Community Hazard Mitigation Services (isomitigation.com)

It is important also to understand the PPC is not just a fire department classification, but a compilation of community services that include the fire department, the emergency communications systems, and the water supply system. Our review of the current City of Pelham ISO-PPC report reveals a highly rated emergency communications system; a highly rated water supply system; a well rated community risk reduction division (fire prevention component of the PFD); and a high rated fire suppression component that has room for improvement in deployment, which, as outlined herein, can be enhanced over the mid to long term. We have made specific recommendations related to the current ISO-PPC report.

FACT SHEET

KEY REQUIREMENTS FOR EMERGENCY SERVICES IN NFPA 1710

The minimum requirements for provision of emergency services by career fire departments can be found in NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.*

NFPA 1710 addresses the structure and operation of organizations providing such services, which include fire suppression and other assigned emergency response responsibilities such as EMS and special operations.

The requirements intend to provide effective, efficient, and safe protective services to help prevent fires, reduce risk to lives and property, deal with incidents that occur, and help prepare for anticipated incidents.

The requirements are listed in NFPA 1710 for fire department service deployment based on the type of occupancy, along with the appropriate response staffing levels for each. The minimum staffing level for each occupancy is listed below. For the full breakdown of staffing requirements by position, refer to the subsections specific to each occupancy in 5.2.4.

KEY REQUIREMENTS

Occupancy Type: Single-Family Dwelling
Deployment: Minimum of 16 members or 17 if aerial device is used

The initial full alarm assignment to a structure fire in a typical 2000 ft² (186 m²), two-story, single-family dwelling without a basement and with no exposures must provide for a minimum of 16 members (17 if an aerial device is used).

Occupancy Type: Garden-Style Apartment
Deployment: Minimum of 27 members or 28 if aerial device is used

The initial full alarm assignment to a structure fire in a typical 1200 ft² (111 m²) apartment within a three-story, garden-style apartment building must provide for a minimum of 27 members (28 if an aerial device is used).

Occupancy Type: Open-Air Strip Mall
Deployment: Minimum of 27 members or 28 if aerial device is used

The initial full alarm assignment to a structure fire in a typical open-air strip shopping center ranging from 13,000 ft² to 196,000 ft² (1203 m² to 18,209 m²) in size must provide for a minimum of 27 members (28 if an aerial device is used).

Occupancy Type: High-Rise
Deployment: Minimum of 42 members or 43 if building is equipped with fire pump

The initial full alarm assignment to a fire in a building with the highest floor greater than 75 ft (23 m) above the lowest level of fire department vehicle access must provide for a minimum of 42 members (43 if the building is equipped with a fire pump).

NFPA 1710 outlines the organization and deployment of operations by career, and primarily career fire and rescue organizations.[2] This standard serves as a benchmark to measure staffing and deployment of resources to certain structures and emergencies. Specific components of NFPA 1710 that are germane to staffing and deployment of resources include the assembling of an Effective Response Force (ERF -staffing to perform Critical Tasks on the fireground) for certain building risks, and response times (call processing or dispatch time; turnout time; and travel time to the scene).

Our analysis reveals areas of improvement in call processing times conducted in the city's communications center; turnout times by PFD staff; and response travel times that have the potential to be improved over the long term. CPSM has made recommendations to address response travel times that are more realistic for a city such as Pelham.

Critical tasks are those activities that must be conducted on time and preferably simultaneously by responders at emergency incidents to control the situation and minimize/stop loss (property and life-safety). Critical tasking for fire operations is the minimum number of personnel needed to perform the tasks needed to effectively control and mitigate a fire or other emergency. To be effective, critical tasking must assign enough personnel so that all identified functions can be performed simultaneously. The specific number of people required to perform all the critical tasks associated with an identified risk or incident type is referred to as an *Effective Response Force* (ERF).

2. NFPA 1710 is a nationally recognized standard, but it has not been adopted as a mandatory regulation by the federal government or the State of Alabama. It is a valuable resource for establishing and measuring performance objectives for the PFD but should not be the only determining factor when making local decisions about the city's fire and EMS services.

The goal is to deliver an ERF within a prescribed time period. NFPA 1710 provides the benchmarks for ERF's for single family dwellings (low risk), open air strip mall/commercial building (moderate risk); and garden style apartments (moderate risk). CPSM conducted an analysis of how the PFD benchmarks against this standard and each building risks. Our analysis includes the use of mutual/automatic aid from neighboring jurisdictions, which the PFD reciprocates to. We have made recommendations related to the current PFD daily operational staffing complement, which includes augmenting specialty company staffing (Quint) and resource deployment, which is also designed as an effectiveness strategy.

A significant component of this report is the completion of an *All-Hazard Risk Assessment of the Community*. The *All-Hazard Risk Assessment of the Community* contemplates many factors that cause, create, facilitate, extend, and enhance risk in and to a community. The service demands of Pelham are numerous for the PFD and include Advanced Life Support (ALS) EMS first response, fire, technical rescue, hazardous materials, density challenges (some vertical), and transportation emergencies to include vehicle traffic and rail, mountainous terrain, wildland/urban interface, two major petroleum pipelines, and other non-emergency responses typical of urban and suburban city fire departments.

The fleet analysis revealed Pelham works collaboratively with the city when determining the replacement of the PFD heavy apparatus. Under this partnership a useful life expectancy methodology that considers NFPA 1901, *Standard for Automotive Fire Apparatus* is used as the guiding documents that outline the PFD replacement process. CPSM provided recommendations regarding the fleet, however these recommendations are designed to ensure to the extent possible, and based on funding, the replacement schedule for heavy fire apparatus aligns closer with NFPA 1901, as this standard has a significant focus on continual industry advances in vehicle and occupant safety.

The facility analysis focused on location of each station as it relates to travel times (benchmarked against NFPA 1710), and distribution (benchmarked against the ISO-PPC standards for Engine and Ladder deployment). Each of these benchmarks (NFPA 1710; ISO-PPC) focus on proximity of fire protection assets (staffing and apparatus) to building risks. The NFPA standard also looks at proximity of the first arriving fire suppression unit to an EMS incident.

The ISO-PPC evaluation system establishes the distribution of engine and ladder companies within built-upon areas (deployment analysis). For full credit in the Fire Suppression Rating Schedule (FSRS), a jurisdiction's fire protection area with residential and commercial properties should have a first-due engine company within 1.5 road miles of built-upon land and a ladder or service company within 2.5 road miles of built-upon land.[3]

CPSM visited each fire facility for the purpose of evaluating use of space, operational functionality, and if contemporary fire and EMS service best practices are in place such as carbon monoxide vehicle exhaust capture systems, decontamination areas, separated sleeping areas, ergonomics, and separation of living and employee fitness space from vehicle and storage space.

Fire department facilities are exposed to some of the most intense and demanding uses of any public local government facility, as they are occupied 24 hours a day. Personnel-oriented needs in fire facilities must enable performance of daily duties in support of response operations. For personnel, fire facilities must have provisions for vehicle maintenance and repair; storage areas

3. Insurance Services Office, ISO Mitigation, Deployment Analysis.

for essential equipment and supplies; and space and amenities for administrative work, training, physical fitness, laundering, meal preparation, and personal hygiene/comfort.

CPSM makes recommendations and provides considerations for station locations aimed at improving response effectiveness, and as much as possible, improving response travel times. This does include the potential relocation of some facilities, and the construction of new facilities.

Also included are assessments of the training and education and community risk reduction components of the PFD. CPSM found these components to be fully engaged in their assigned activities. CPSM was impressed with the commitment to training and the ISO-PPC score the PFD received in this category. The community risk reduction division, like many around the country, wears many hats (fire prevention, fire investigation, life safety public education) and does not have the staffing to keep up with building and occupancy inspections. CPSM provides recommendations for improvements with these two necessary components of a fire and EMS department.

The provision of efficient and effective Emergency Medical Services (EMS) is a vital aspect of any community's public safety infrastructure. As the City of Pelham experiences growth and evolving healthcare needs, it becomes increasingly important to assess and optimize its EMS service delivery. The primary objective of the EMS analysis was to evaluate the existing EMS service delivery model in Pelham and identify potential areas for improvement. The EMS analysis was conducted through a combination of data analysis, stakeholder interviews, and benchmarking against industry best practices. Data pertaining to call volumes, response times, transport destinations, and resource utilization was collected and analyzed. Interviews with key stakeholders, to include RPS and the Pelham Medical Director, were conducted to gain insights into the current challenges and opportunities for improvement. The findings and recommendations will help ensure that Pelham residents receive timely and high-quality emergency medical care, promoting the overall health and safety of the community.

Specific findings regarding EMS includes:

- At the time of this review, CPSM assesses there are significant risks and weaknesses operationally in the existing EMS System model for the City of Pelham. This includes:
  - The City is operating without a contract with RPS.
  - Without a contract with RPS, the city does not have a foundation for accountability of EMS transport response times, level of provider training, level of care, or level or resiliency (overlapping calls).
  - Without a contract and level of response effort or performance with RPS, the PFD EMS tiered response structure is often adjusted to handle lower acuity calls for service due to the reliability of RPS.
- CPSM assesses, at the time of this review, the current EMS Delivery system is limited in transport capable units available in Pelham, with staffing configurations that do not always provide for ALS capability (there may be a BLS unit response), or the RPS unit may not have a full crew response (driver only).
- At the time of this review, CPSM assesses that RPS has the fleet, logistics, and clinical oversight to conduct valued EMS services to the communities they serve. However, it is also noted that at the time of this report, RPS cannot always deploy necessary resources to service the high demand generated in Pelham to a higher level. Further, because there is no contract between RPS and the City, they are not required to.

- It is assessed RPS's Medical Direction program /practices are consistent with current EMS best practices for EMS Physician engagement, clinical oversight, and program development.
- CPSM assesses at the time of our review Regional Paramedical Services training program ensures regular, routine, and validation-based training. The standards from RPS's QA/QI Review and evaluation-led training are consistent with Industry practices and are aligned with CAAS accreditation standards for a consistent QA/QI Training Program.
- CPSM's assessment finds the PFD has sufficient capabilities to respond to EMS calls in their current non-transport capacity. While additional resources will be needed to expand or enhance current EMS service delivery to assume transport function, if the city chooses this as an alternative to the current, the infrastructure of the organization is well-positioned to establish an expanded EMS service line.
- CPSM's assessment finds the current EMD system to dispatch fire and EMS ground transport units can be used more effectively to determine which EMS responses are time-sensitive and if the presence of a medical first response unit could make an impact on patient outcomes. The effective use of this system would preserve crucial first response medical units for those responses that are time sensitive and that are real emergencies.
- The current EMS system in Pelham is enhanced with the augmentation of "Medic 96" which can immediately respond to life critical call types as a 1st tier EMS responder and provide a continuum of care by providing a Paramedic licensed provider to RPS when RPS needs assistance during transport of high acuity patients, and when RPS responds with a driver only.
- It is assessed the City of Pelham Fire Departments' Medical Direction program /practices are consistent with current EMS best practices for EMS Physician engagement, clinical oversight, and program development.
- The PFD currently staffs an EMS QRV (Medic 96) with two personnel (at least one is a Paramedic). The PFD can easily shift these two personnel and staff an EMS ground transport unit 24/7/365. Depending on the model adopted by the city (one additional peak time ambulance or one additional 24/7/365 ambulance), the FTE enhancement for one additional ambulance is either four (peak time ambulance 7/12/365) or six (24/7/365 second ambulance). Additionally, the city is receiving three ambulances from the County, which will reduce start-up costs.

In summation, CPSM found the PFD and city administrative staff we interacted with to be fully engaged with this project. The PFD is a well-functioning, professional, and focused Fire and EMS agency, and has many elements of a contemporary fire department. The current EMS ground transport delivery system, however, requires attention and in some cases action if the city desires a consistent approach to this important public safety function.

This report contains a series of observations, planning objectives, and recommendations which are intended to assist the PFD and the city deliver services more efficiently and effectively. Recommendations and considerations for continuous improvement of services are presented here. CPSM recognizes there may be recommendations and considerations offered that first must be budgeted, or for which processes must be developed prior to implementation.

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Recommendations

1. CPSM recommends deficiencies in the 2022 ISO-PPC report should be included in any planning the PFD conducts in the near and mid-terms. This should include planning to add another ladder apparatus in the Station 2/4 districts, and consideration to adjust station locations to close response gaps.
2. CPSM recommends the PFD continue to support and budget for external training opportunities on a state (Alabama Fire College) and national level (National Fire Academy and Emergency Management Institute). CPSM further recommends the PFD continue with its robust training program to sustain maximum credit points on future ISO-PPC community rating evaluations.
3. CPSM recommends the city and PFD consider including in any future planning a focus on Community Risk Reduction that includes the expansion of public life safety education staff and programs over the midterm; over the short term a comprehensive fire prevention code enforcement plan that ensures the completion of required annualized inspections, and which details the remaining occupancy types and schedule identifying a bi-annual or tri-annual inspection of these occupancies; the expansion of fire code enforcement staff that matches the growth and demand of inspectable properties and plans review over the near, mid, and longer terms.
4. CPSM recommends the city create a full-time Emergency Management Planner position. This action is recommended and necessary as there are deficiencies in the current Emergency Management program to include no city Emergency Operations Plan with Emergency Support Functions annexes, and as there is a critical need for continuous planning and preparation, project management, collaboration with city, county, and state officials, and development and sustainment of required and ancillary written plans required in the emergency management discipline. Pelham can be subject to environmental and other emergencies that evolve into federally declared emergencies and thus should put more resources into this program.
5. CPSM recommends the Emergency Management function begin the process of implementing the National Incident Management System (NIMS) to include developing and implementing a plan and training city officials and staff to the appropriate NIMS levels.
6. CPSM recognizes the City has existing individual department plans, which should be used as the basis to formulate an overarching and formal Continuity of Operations Plan (COOP) that is all-hazards and that has the ability to ensure the effects of any interruption in a City office, system, operation, and staffing before or during an event are successfully managed and the City is able to perform all essential functions.
7. CPSM recommends the City maintain an Emergency Operations Center or Emergency Management Operations area that can quickly become operational, with minimal set-up, and is capable of supporting necessary emergency support functions to handle a multi-agency emergency 24-hours/day if necessary. The EOC should have the ability to be quickly relocated if compromised, and should contain, at a minimum, equipment, materials, and infrastructure as outlined in the Emergency Operations Center section of this report.
8. CPSM recommends apparatus and major apparatus components such as the motor, fire pump, aerial ladder assembly and hydraulics, chassis, and chassis components such as brakes, wheels, and steering equipment be maintained in accordance with manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis.

- Further, apparatus components requiring annualized testing either fixed or portable such as fire pumps, aerial ladder and aerial ladder assemblies, ground ladders, self-contained breathing apparatus to include personnel fit-testing, and fire hose should be tested in accordance with manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis.

9. CPSM recommends a heavy fire apparatus replacement plan that aligns with NFPA 1901 in that no heavy fire apparatus exceed 25 years of service and considers refurbishment as outlined herein. CPSM further recommends, given the demand on the current apparatus, the city continue with the fire apparatus replacement plan of fifteen years of frontline service, but reduce the reserve status to 5 years for a twenty-year lifecycle. To extend the life of frontline apparatus, CPSM also recommends a rotation of busiest to slowest stations for engine apparatus over the life of each unit.
10. CPSM recommends the PFD monitor population and growth impacts and include these factors in any planning the PFD conducts in the near, mid, and long terms. Increases in development and annexation will potentially increase call demand and will impact the deployment analysis in future ISO-PPC community ratings, and the ability of the PFD to meet NFPA deployment benchmarks.
11. The PFD and City should consider a staffing of four on Quint 91 so that the apparatus can function as designed (engine and ladder simultaneously when needed). A staffing configuration will allow for a pump operator and aerial operator, and a team of two for assigned critical tasking either as an engine crew or truck crew, or other configurations deemed appropriate and safe, working in two teams of two. This additional staffing has two alternatives. Alternative 1: utilize existing staffing and assign one of the additional personnel on each shift to Quint 91. This will reduce the additional personnel to cover scheduled and unscheduled leave from six to five and may increase overtime. Alternative 2: add three FTEs to the PFD and assign these FTEs to Quint 91. Each alternative has a cost. Considering salary + benefits for a single firefighter, reducing the additional personnel on each shift potentially is less expensive in totality across the three shifts.
12. CPSM recommends the City and the PFD, over the mid-term, consider locating an additional Quint apparatus in the northern and high demand/density area of the city (Station 2). A Quint apparatus located in this area of the city would be most beneficial when contemplating the fire protective services of existing building risks and planned mixed use, commercial, and industrial growth. Also, an additional ladder apparatus will improve deficiencies in the current Insurance Services Office Public Protection Classification analysis as outlined in this report. Immediate staffing for this apparatus is already in place, as staffing will transfer from the existing engine at Station 2 to the Quint apparatus. This apparatus will function as the current Quint 91 (engine or ladder). CPSM further recommends the City and PFD consider a staffing of four on this Quint, so that the apparatus can function as designed (engine and ladder simultaneously when needed). Alternatives for the addition of one extra person per shift are: Alternative 1: utilize existing staffing and assign one of the additional personnel on each shift to this Quint apparatus. This will reduce the additional personnel to cover scheduled and unscheduled leave from five to four and likely will increase overtime (five to four if this alternative is utilized to upstaff Quint 91). Alternative 2: add three FTEs to the PFD and assign these FTEs to this Quint. As in the previous recommendation, each alternative has a cost.

13. The PFD should consider adopting 4-minute response travel times measured at the 90th percentile in the core areas of Station 1, 2, and 4 response district, which is west of Interstate 65 and north to south along U.S. 31, and areas of Station 3 and Station 5 within the 4-miunte travel time bleed; 6-minutes at the 90th percentile for areas east of Interstate 65 and north to south along Highway 11, and Buck Creek.
14. The city should consider a station configuration model that maximizes response travel time and positions stations to effectively service their district in the current and for the future, and that provides timely assistance to surrounding districts when calls overlap and during multi-unit responses such as structural fires. This may include a four station model that merges Stations 2 and 4, a five station model that relocates Stations 1 and 2, or a six station model that relocates Station 2 and locates a new Station 6.
15. CPSM recommends that at a minimum, and as the City and Regional Paramedical Services continue a relationship for EMS ground transport, even if during an interim period, that the City of Pelham and Regional Paramedical Services (RPS) relationship be codified through a formal Level of Effort contract.
16. CPSM recommends the City, as a first alternative, conduct an RFP process for an EMS ground transport provider. If this effort does not produce a satisfied result, CPSM recommends the city bring the EMS transport service in-house and consider as a first alternative the placement of EMS transport service on the PFD as they have the current staffing to staff an initial ambulance 24/7/365, and the administrative and logistical staff in place begin this transition. When considering both alternatives, the City should explore the implementation of a priority medical dispatch system designed to process incoming 911 EMS calls in a manner where an appropriate call determinant by acuity level (low, mid, high) is developed, and subsequently routed to the radio telecommunicator who will then dispatch the appropriate resource(s) to the call, therefore establishing a true tiered response approach to EMS calls in Pelham.

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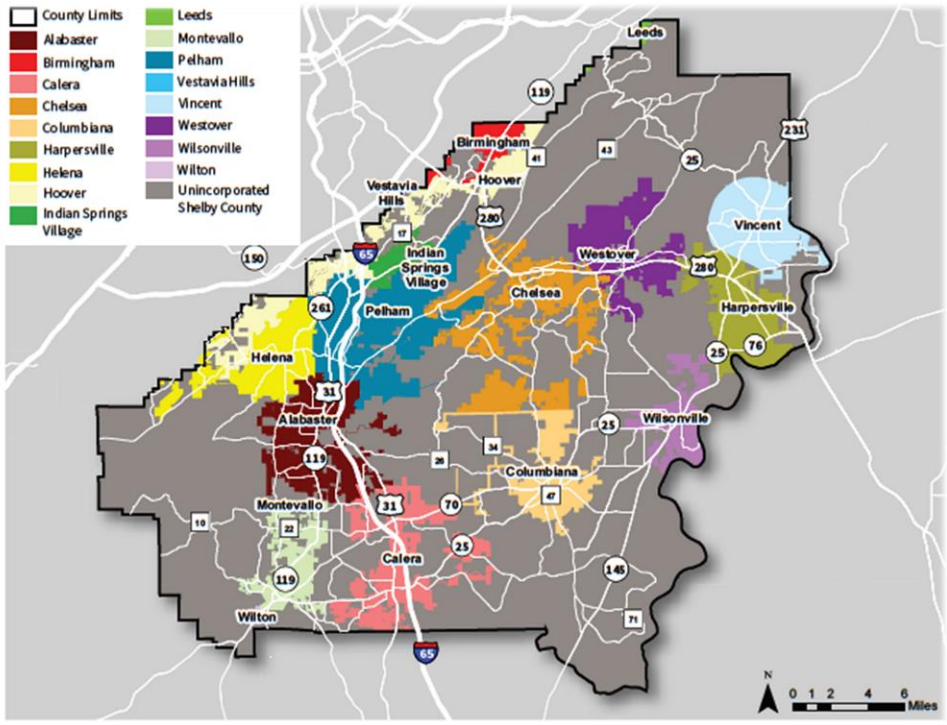
SECTION 2. AGENCY REVIEW, CHARACTERISTICS AND PROGRAMS

City of Pelham and PFD Overview

Pelham is located in central-west Shelby County, AL and is included in the Birmingham statistical area. Pelham is contiguous with areas of unincorporated Shelby County, as wells as the cities of Alabaster to the south, Helena to the southwest, Hoover to the west, Chelsea to the east and the Town of Indian Springs Village to the northwest. Oak Mountain State Park is located in and serves as a boundary in the northeast quadrant of the city. The total area of the city is just over 38 square miles, and the 2020 decennial census population is 24,318.

Figure 1: City of Pelham and Surrounding Jurisdictions[4]



The city operates under the Mayor/Council form of government. In this form of government, the Mayor serves as the policy head for the city, and the City Council serves as the legislative body for the community. An appointed City Manager is responsible for and manages the day-to-day operations of the governmental functions of the city, which is also carried out through department heads and city employees. All department heads, with the exception of the Police and Fire Chiefs, are appointed by the City Manager. The Mayor appoints the Police and Fire Chiefs with City Council approval.[5]

4. Shelby County Comprehensive Plan, 2023.
5. City of Pelham, AL.

The Pelham Fire Department (PFD) is a career fire department that employs full-time administrative, community risk reduction, training, support staff, and operational officers and firefighters. The PFD deploys four engine companies, one truck company (Quint apparatus), one EMS quick response vehicle staffed to the Advanced Life Support (ALS) level, one operational Battalion Chief, one special operations unit, one Haz-Mat primary response unit, one Haz-Mat support unit (Haz-Mat units are cross-staffed), one brush truck (cross-staffed), and two marine units (cross staffed) from five operational stations. The operational Battalion Chief serves as the city-wide on-duty operational command officer providing day-to-day operational supervision to assigned stations, as well as serving as the incident commander on assigned incident responses.

The one truck company at Station 1 is a Quint (apparatus that has a fire pump; hose; water tank; engine and truck company equipment; and an elevated aerial device), which means it responds primarily as an engine company, but can serve as a ladder (truck) company as needed.

There are 72 positions assigned to shift operations (24 per shift). The deployment model includes minimum staffing of three personnel assigned to each engine company and the Quint company, two assigned to the quick response EMS unit, and one assigned to the Battalion Chief unit, which totals eighteen personnel and represents the minimum daily staffing model. There are an additional six personnel assigned to each shift who are utilized each day to cover scheduled and unscheduled leave. There are three operational shifts or platoons who work a rotating on/off duty schedule that includes 24-hours on duty.

Administrative, EMS oversight, training and support services staff and functions operate from Station 1, which includes administrative office space. The Office of the Fire Marshal operates out of Station 3.

The PFD is led by a Fire Chief who has overall responsibility for the management and leadership of the department. The Fire Chief is assisted by a Deputy Chief who is a direct report. Additional support to the Fire Chief includes civilian administrative support and technical uniform staff that have assignments to include training, EMS, and day-to day administrative, management, and technical work that an all-hazards agency such as the PFD includes. The Fire Chief's staff includes four fire and EMS officers (Deputy Chief, Training Officer, EMS Director, Fire Marshal), and one civilian staff member (administrative assistant). The Fire Chief also serves as the Emergency management Coordinator for the City.

The Deputy Chief manages the three operational shifts as described above. This includes all operational components and staffing. There is one operational Battalion Chief on duty each day. Additionally, the Fire Marshal reports to the Deputy Chief.

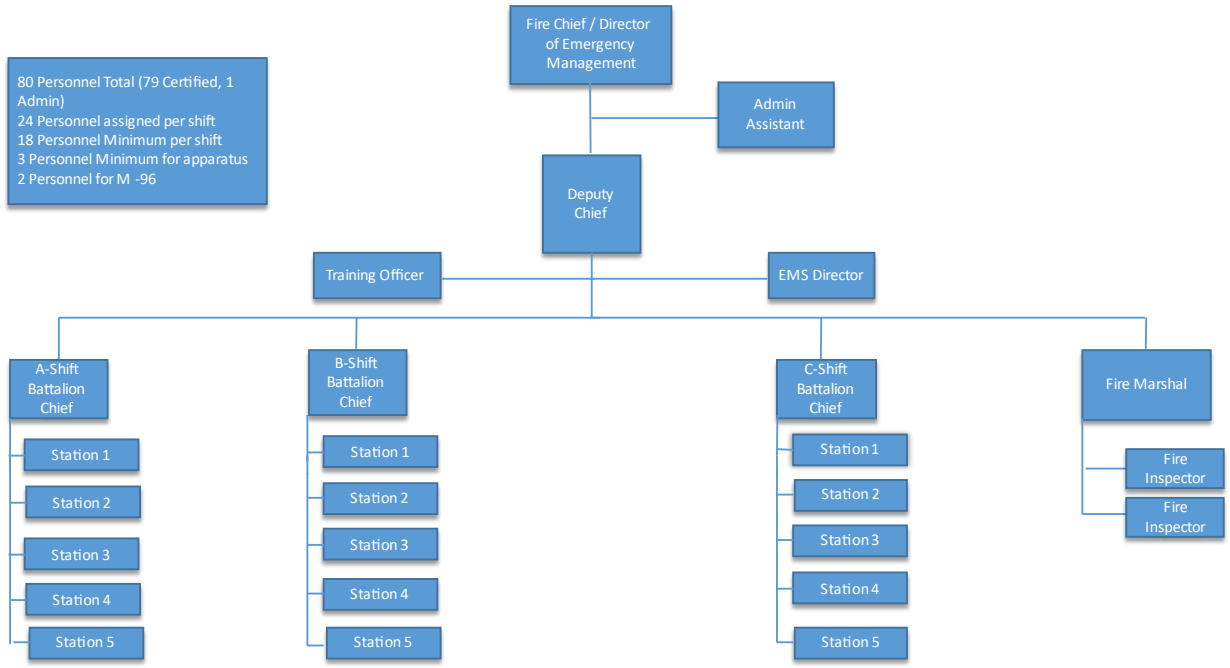
The Training Officer and EMS Director manage the planning and implementation of assigned programs. For the Training Officer this includes planning for and implementing department wide training and education and liaison with regional and state partners to ensure the department meets and/or exceeds required and contemporary training required of their positions. The EMS Director manages all EMS activities to include quality assurance of patient care, liaison with the private EMS provider and the department's Medical Director, plan and implement protocols, guidelines, and associated training, and other associated EMS program work.

The Fire Marshal manages the community risk reduction (fire prevention) and fire origin and cause to include arson investigation programs. The community risk reduction component is responsible for fire prevention code enforcement, fire protection plans review, and fire and life safety education. This division includes two additional positions (Fire Inspector) to assist with the program work as described above.

The key elements of the PFD include:

- Fire protective services.
- EMS first-tier response (ALS level).
- Fire prevention, fire code enforcement, fire protection plans review.
- Fire cause and origin/arson investigation.
- Technical rescue/surface water response and mitigation.
- Hazardous materials response and mitigation (regional and state level).
- Community outreach and life safety education.
- Employee training and education.
- Fleet, facility, and logistical support and management.
- Special event support.

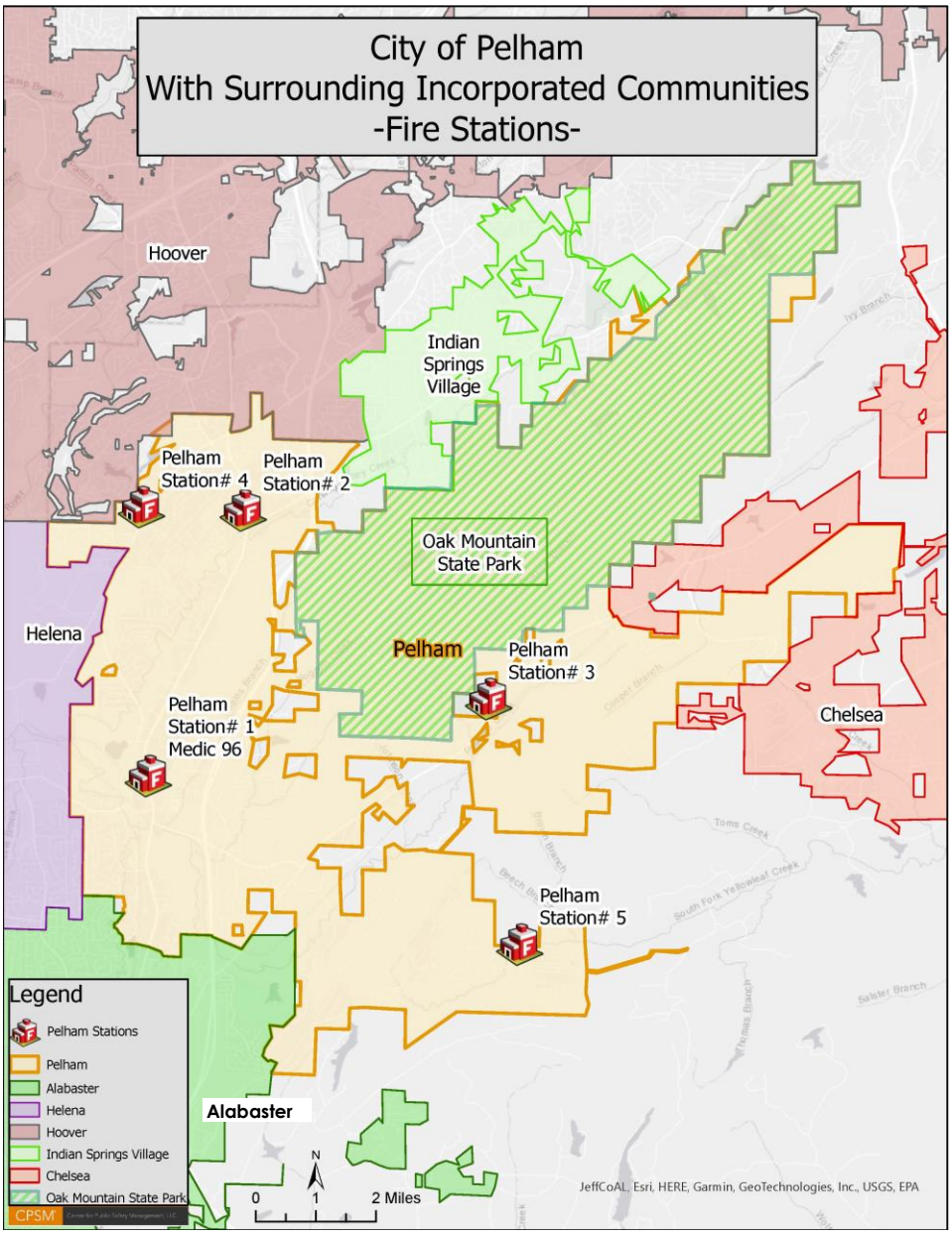
Figure 2: PFD Organizational Chart



PFD Service Area and Call Demand

The service area for the PFD includes 38 square miles of urban and suburban neighborhoods that includes single and multi-family residential buildings of varying number of floors and heights; commercial buildings; industrial buildings; parks; local roads and limited access highways; and rail. Pelham also includes a large state park and remote built upon areas.

Figure 3: City of Pelham Boundaries and Fire Station Locations



PFD Fire and EMS Resources

Station 1
Battalion 90
Quint 91
Medic 96
Spec Ops 1

Station 2
Engine 92
Spec Ops 2

Station 3
Engine 93
Haz-Mat 1
Brush 3
Haz-Mat Support Unit

Station 4
Engine 94
Marine 90
Marine 94
Medical Support Unit

Station 5
Engine 95
Brush 95
Service 90

Engine Company personnel cross-staff Spec Ops 1, Spec Ops 2, Haz-Mat 1, Haz-Mat Support Unit, Brush 3, Marine 90 & 94, Medical Support Unit, and Brush 95. This is common in fire departments the size of PFD.

The service demands on the department generated from the service area are numerous and include EMS first response; fire suppression; technical rescue; hazardous materials; transportation emergencies, hiking trail and other park emergencies, surface water emergencies, and other non-emergency responses typical of an urban/suburban fire departments.

CPSM analyzed PFD workload for a one year period (January 1, 2022-December 31, 2022). In all, the PFD responded to 3,977 incidents during this time period as outlined in the next Table.

Table 1: PFD Fire Incident Workload by Call Type

Call Type	Total Calls	Calls per Day
False alarm	306	0.8
Good intent	68	0.2
Hazard	35	0.1
Outside fire	50	0.1
Public service	632	1.7
Structure fire	43	0.1
Technical rescue	9	0.0
Fire subtotal	**1,143**	**3.1**

29% of all calls

Table 2: PFD EMS Workload by Call Type

Call Type	Total Calls	Calls per Day
Breathing difficulty	210	0.6
Cardiac and stroke	311	0.9
Fall and injury	429	1.2
Illness and other	960	2.6
MVA	136	0.4
Overdose and psychiatric	172	0.5
Seizure and unconsciousness	275	0.8
EMS subtotal	**2,493**	**6.8**

63% of all calls

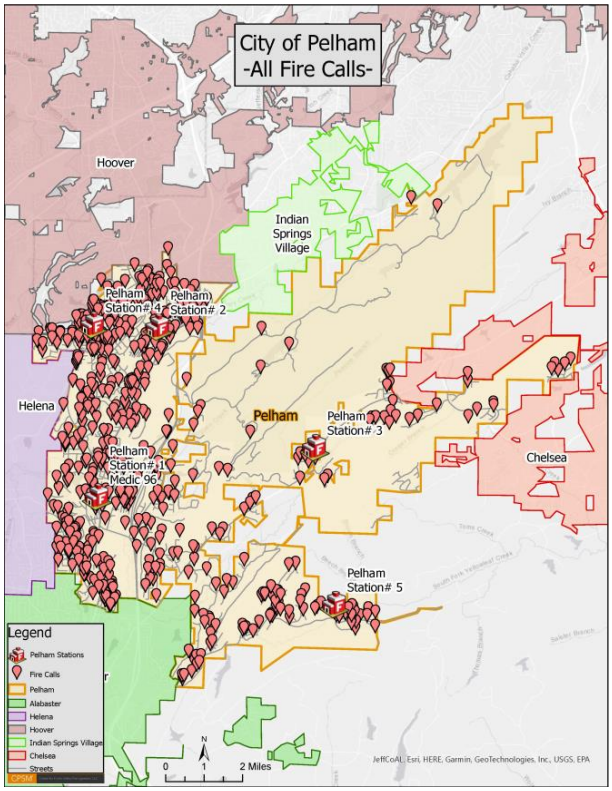
Included in the overall workload are cancelled calls, which are calls the PFD was dispatched to, and were cancelled enroute or prior to responding (issue resolved and PFD not needed). There were 48 canceled calls during the study period. Additionally, the PFD provided 167 automatic/mutual aid responses to neighboring jurisdictions. There were also 126 special detail incidents recorded in the study period.

Analyzing where the Fire and EMS incidents occur, and the demand density of Fire and EMS incidents, helps to determine adequate fire management zone resource assignment and deployment. The following figures illustrate all Fire and EMS demand in the city.

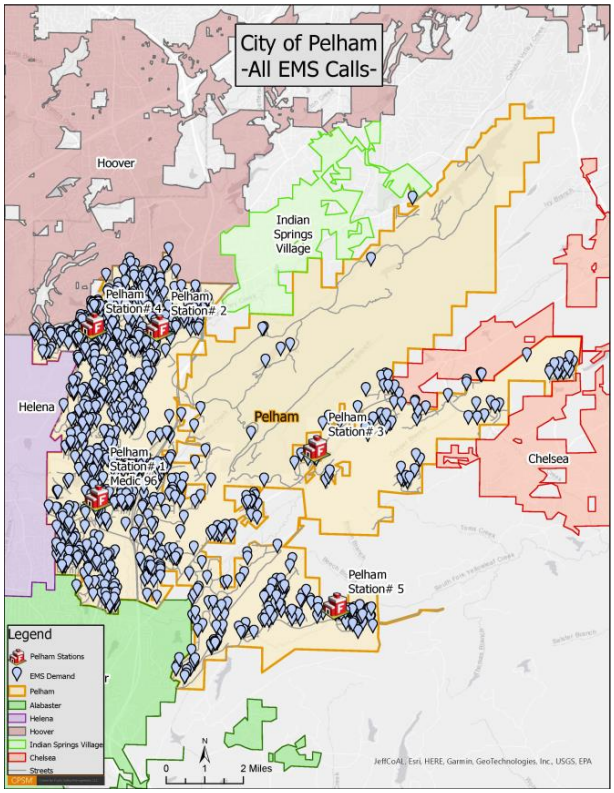
As indicated in the demand maps below, all fire districts with the exception of Stations 3 and 5 have densified fire and EMS call demand. Stations 1, 2, and 4 have the highest workload in terms of single fire suppression/EMS runs. Stations 1 has the highest workload overall but houses two units that are city-wide (Battalion 90 and Medic 96). The highest density of calls is north-south and spreading east-west along U.S. 31.

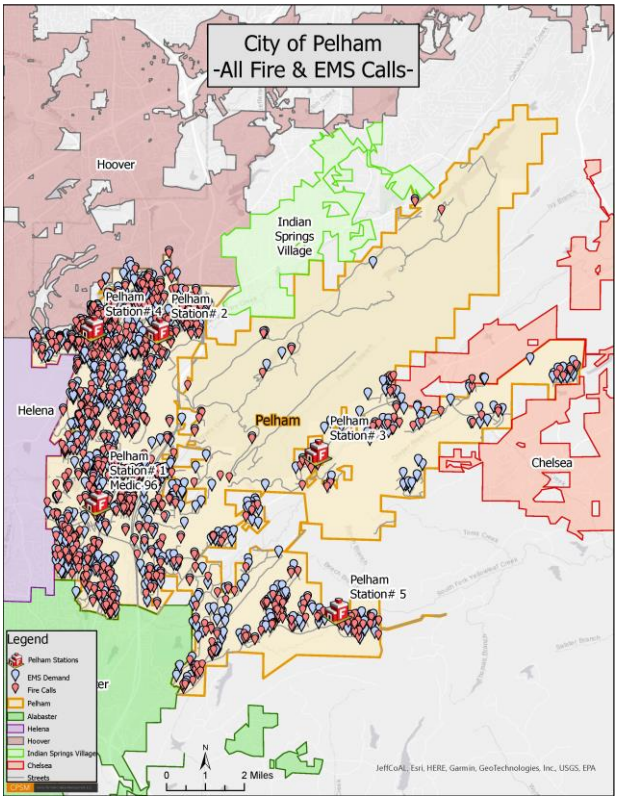
Figure 4: Fire, EMS, MVA Call Demand

Fire Demand



EMS Demand





ISO-PPC Community Rating

In 2022, the City of Pelham received a Class 2/2X Public Protection Classification (PPC) rating from the Insurance Services Office (ISO), a subsidiary of Verisk Analytics. The Verisk hazard mitigation team collects and evaluates information from communities across the United States regarding their capabilities to provide municipal fire protection. This information is analyzed utilizing the Fire Suppression Rating System from which individual section credits and points are tabulated and a Public Protection Classification for the community is assigned. Classifications range from 1 through 10, with one being the highest rating a community can achieve.[6]

It is important to understand the PPC is not just a fire department classification, but a compilation of community services that include the fire department, the emergency communications systems, the water supply system that includes an evaluation of available water matched to the amount needed to suppress fires (referred to as fire flow), and community efforts to reduce the risk of fire, including fire prevention codes and enforcement, public fire safety education, and fire investigation programs.[7]

A lower PPC does not always guarantee a lower property insurance rating as many factors feed into the formulas insurance companies utilize to determine rates. However, a PPC rating of 1, 2, or 3 alerts the property insurance underwriter that the service area of that fire department is well-equipped, positioned, and staffed to extinguish, mitigate, and prevent fires. Additionally, although insurance companies may use the Verisk-ISO-PPC information when deciding property insurance premiums, Verisk-ISO has nothing to do with insurance premium pricing.

A community's PPC grade depends on:

- **Needed Fire Flows** (building locations used to determine the theoretical amount of water necessary for fire suppression purposes).
  - The basic fire flow for Pelham was determined to be 3500 gallons per minute (GPM).
- **Emergency Communications** (10 percent of the evaluation).
  - 9.76/10.00 credits earned.
- **Fire Department** (50 percent of the evaluation).
  - 36.87/50 credits earned.
- **Water Supply** (40 percent of the evaluation).
  - 37.18/40 credits earned.
- **Community Risk Reduction** (Additional credits received for Fire Prevention/Inspection, Public Education, and Fire Investigation activities)
  - 4.64/5.50 credits earned.

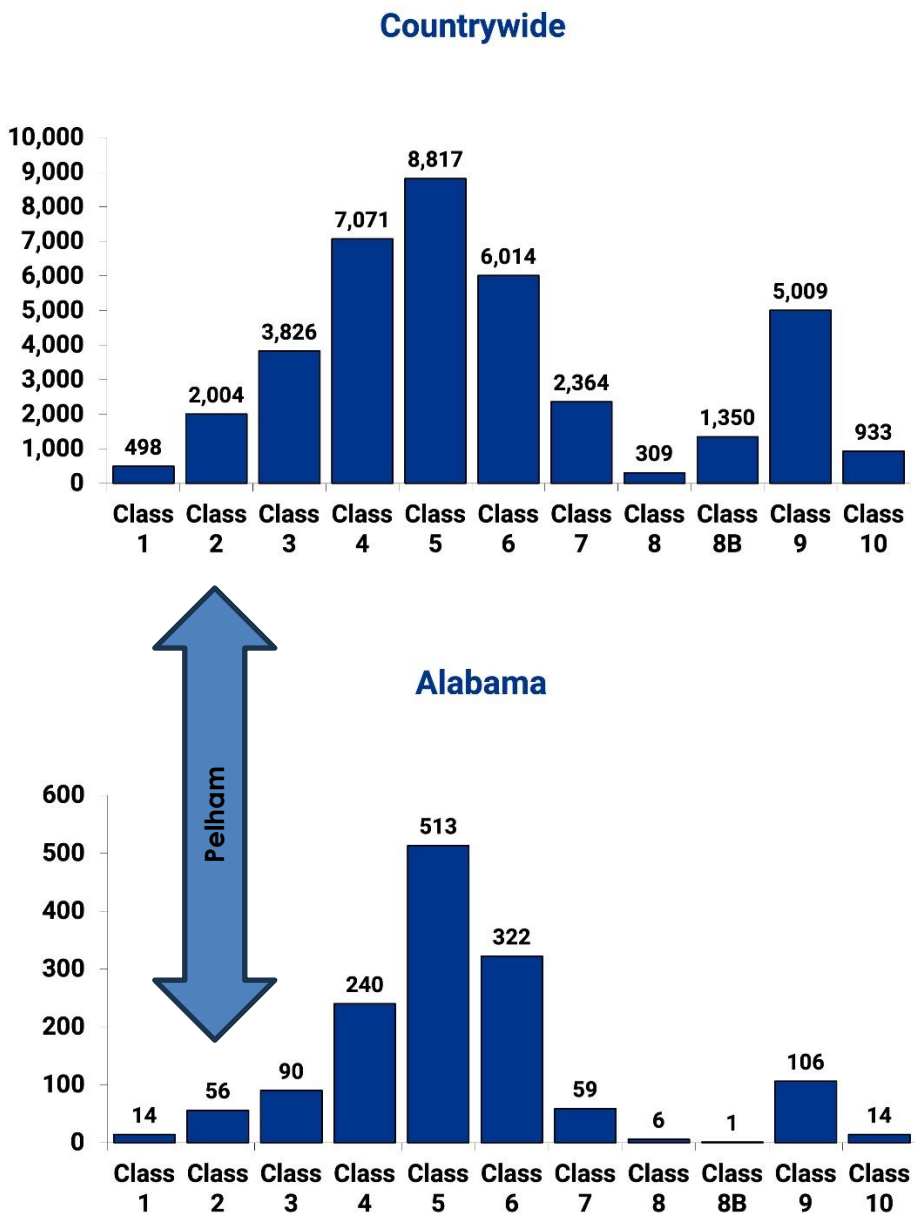
Overall, the community PPC rating yielded 84.61 earned credit points/105.50 credit points available. There was a 3.84 point diversion reduction assessed as well, which is automatically calculated based on the relative difference between the fire department and water supply scores. **80.00 points or more qualify a community for a rating of 2.**

6. Verisk's Community Hazard Mitigation Services (isomitigation.com)
7. ibid

Pelham has a double rating of 2/2X. The first number is the class applicable to properties that are within five road miles of a fire station and within 1,000 feet of a credible water source. The second number indicates those properties within five road miles of a fire station but outside of 1,000 feet of a credible water source.

The following Figures illustrate the PPC ratings across the United States and in Alabama.

Figure 5: PPC Ratings in the United States and Alabama[8]



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

The next Table outlines credits earned by the PFD.

Table 3: Pelham Earned Credit Overview

FSRS Component	Earned Credit	Credit Available
414. Credit for Emergency Reporting	2.85	3
422. Credit for Telecommunicators	4.00	4
4.32. Credit for Dispatch Circuits	2.91	3
440. Credit for Emergency Communications	**9.76**	**10**
513. Credit for Engine Companies	6.00	6
523. Credit for Reserve Pumpers	0.50	0.50
532. Credit for Pump Capacity	3.00	3
549. Credit for Ladder Service	1.58	4
553. Credit for Reserve Ladder and Service Trucks	0.00	0.50
561. Credit for Deployment Analysis	6.70	10
571. Credit for Company Personnel	8.18	15
581. Credit for Training	8.91	9
730. Credit for Operational Considerations	2.00	2
590. Credit for Fire Department	**36.87**	**50**
616. Credit for Supply System	27.18	30
621. Credit for Fire Hydrants	3.00	3
631. Credit for Inspection and Flow Testing	7.00	7
640. Credit for Water Supply	**37.18**	**40**
Divergence	**-3.84**	-
1050. Community Risk Reduction	**4.64**	5.50
Total Credit	**84.61**	**105.50**

Areas of scoring that should be reviewed further internally by the city and the PFD for improvement and to sustain the current rating include:

- Credit for Ladder Service: #549 (1.58/4.00).

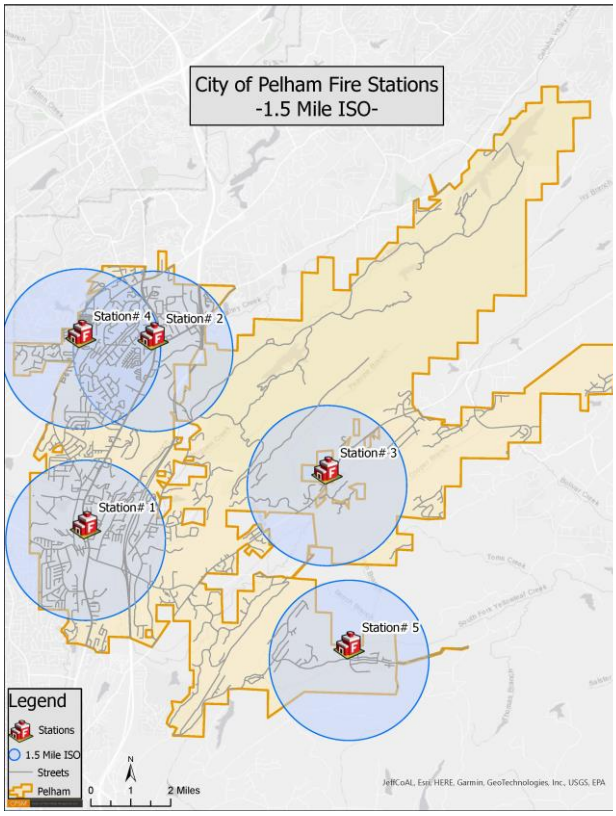
  This item reviews the number of response areas within the city with five buildings that are three or more stories (or 35 or more feet in height), or with five buildings that have a needed fire flow greater than 3,500 gallons per minute, or a combination of these two criterion. The number of ladder companies in the city is compared to the number needed and credit is given. The PFD deploys one Quint apparatus as a combination engine/ladder response platform from Station 1. Station 2 does not have a ladder apparatus and has commercial buildings that meet one or more of the criteria outlined above. The PFD receives credit for one ladder company.

- Credit for Deployment Analysis: #561 (6.70/10 credits).

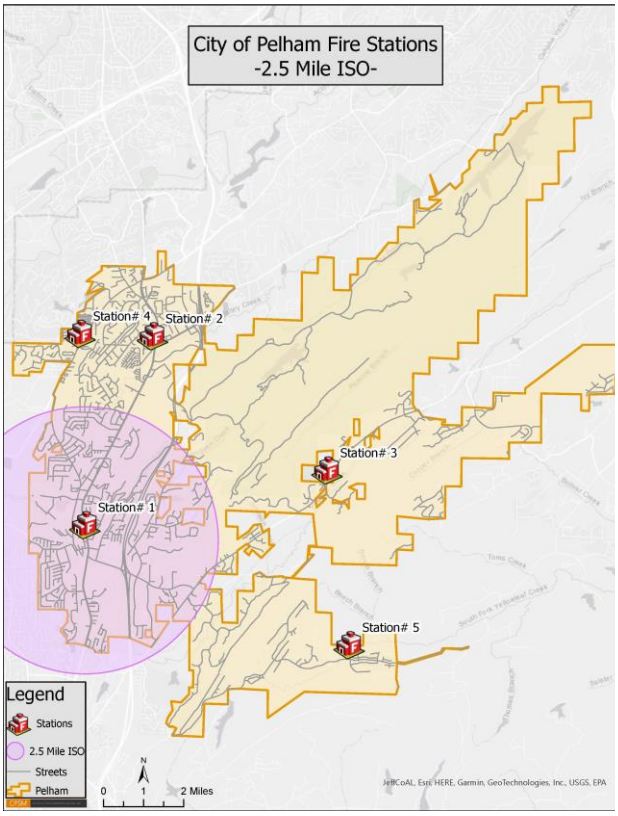
  This category contemplates the number and adequacy of engine and ladder companies to cover the built-upon areas of the city. Credits for engine companies (#513 - 6.00/6.00) and ladder companies (#549 – 1.58/4.00) are considered in this rating section. The ISO benchmark is one engine company sighted for every 1.5 miles of built upon land, and a ladder company sighted for every 2.5 miles of built upon land.

Figure 6: Pelham Ladder and Engine Apparatus Coverage-ISO Benchmark

Pelham Engine Company
1.5 Mile Benchmark



Pelham Ladder Company
2.5 Mile Benchmark



In analysis of these two maps, while there is an overlap in the Stations 2 and 4 areas, there is a minor gap between these two districts and the Station 1 district. The Station 1, 2, and 4 districts are the most built upon areas of the city-currently. The Station 3 and 5 districts have gaps as well. The triangle between Stations 1, 3, and 5 represent the largest 1.5 mile deficiency gap in the engine company analysis. Although not heavily built upon now, there is planned and potential for development in the future.

- The ladder company gaps exist because there is only one ladder company in service in the city. The gap of most concern is the Stations 2 and 4 districts, which are densely built upon.

  Credit for Company Personnel: #571 (8.18/15.00 credits).

  - This category contemplates the average number of existing firefighters able to respond to structure fires. PFD minimum staffing is 18/day. The ISO-PPC credit in this category is 19.38 personnel on average per day. This category links to the deployment analysis.

    As will be discussed later in this report, Pelham is considering adding EMS ground transport units, and may opt to add this service under the fire department. For the ISO-PPC analysis, firefighters staffing ambulances are counted towards the daily staffing regimen, however they receive credit to the extent they are available to respond to fire calls. In Pelham, EMS incidents account for 63% of all calls.

The PFD is to be commended for achieving 8.91 credits/9.00 for training. This is an outstanding score in this category and directly reflects the commitment the department has for preparedness and response to emergencies.

The City is to be commended for the commitment it takes to maintain a high performing municipal water supply utility (fire hydrants in the ISO-PPC analysis). The city achieved maximum credit points for hydrant placement, inspection, and flow testing. Additionally, the 911 PSAP, which is a division in the Pelham Police Department achieved near maximum credit points for emergency communications. The commitment to ensure contemporary emergency reporting components, dispatch circuits, CAD system, and facility are maintained, and ensuring appropriate telecommunicator staffing resulted in 9.76/10.00 credit points for this category.

Recommendation:

CPSM recommends deficiencies in the 2022 ISO-PPC report should be included in any planning the PFD conducts in the near and mid-terms. This should include planning to add another ladder apparatus in the Station 2/4 districts, and consideration to adjust station locations to close response gaps.

Training and Education

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

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

Certain Occupational Safety and Health Administration (OSHA) regulations dictate that minimum training must be completed on an annual basis. The state of Alabama does not operate an approved state OSHA program for public employees at the state or political sub-division (e.g.: municipal level). OSHA Regulations and Standards Regulated employers located in the state of Alabama are governed by the Federal OSHA health and safety standards found in the 29 Code of Federal Regulations (CFR). As such, the PFD should ensure the following are included in the training matrix and program requirements for all uniform personnel:

- Annual review of the respiratory protection standard, self-contained breathing apparatus (SCBA) refresher and user competency training, SCBA fit testing (29 CFR 1910.134).
- Annual Blood Borne Pathogens Training (29 CFR 1910.1030).

Other training requirements the PFD must manage include:

- The ISO-PPC has certain training requirements for which fire departments receive credit during the ISO-PPC review.
- Fire and EMS training requirements governed by the Alabama Personnel Standards and Education Commission (Fire) and Alabama Office of EMS (EMS) for initial and maintenance of required position certifications.
    - Fire certifications include but are not limited to Firefighter I/II; Emergency Vehicle Operator Course; Fire Apparatus Operator (Aerial/Pumper); Fire Inspector (I, II, III); Fire and Emergency Services Instructor (I, II, III); Fire Investigator (I, II); Fire Officer (I, II, III, IV); Hazardous Materials (practitioner and specialist levels); Technical Rescue (various disciplines); and Public Life Safety Educator.
    - EMS certifications and licensing includes EMT, Advanced EMT, Intermediate EMT, and Paramedic.

Because so much depends upon the ability of the emergency responder to effectively deal with an emergency, education and training must have a prominent position within an emergency responder's schedule of activities when on duty. Education and training programs also help to create the character of a fire service organization. Agencies that place a real emphasis on their training tend to be more proficient in performing day-to-day duties. The prioritization of training also fosters an image of professionalism and instills pride in the organization. Overall, the PFD has a planned training program and there exists a dedicated effort focused on a wide array of training activities for all three shifts. This is noted in the ISO-PPC evaluation as well.

Training and education in the PFD are managed by a Training Officer who reports to the Deputy Chief. The Training Officer is supported by station officers and department instructors when implementing training programs. Together this group coordinates and implements the various Fire and EMS training for the department. The EMS Director and Medical Director /coordinate EMS training. The Medical Director participates in EMS instruction as well. The PFD also invites in external instructors for specialty training as needed/requested.

PFD training typically takes place on-site at PFD fire stations and is led by station officers. This is typical in fire departments across the country. Multicompany training and specific building or risk training occurs on-site of the actual building or identified risk. Much of the multi-company live fire company level practical training is developed and coordinated by station officers and the Training Coordinator.

The PFD also utilizes the Shelby County Regional Fire and Emergency Medical Training Center. The Alabama State Fire College offers certification courses here. The regional training center includes:

- Classrooms for instruction
- 5-story fire tower
- Class A burn building
- Confined Space props
- Drafting tank for rural pump operations training
- Self-Contained Breathing Apparatus Maze
- Fire props: attic, bedroom, and kitchen

- Elevator shaft rescue prop
- Rope rescue rigging built-in to the fire tower roof
- Fire, vehicle rescue, Haz-Mat, technical rescue, and other fire/EMS related props

The PFD has incorporated into their policies and procedures required training for fire and EMS. There are many operational policies and procedures that incorporate training, ***which is a best practice.*** This training is completed as initial, recertification, and continuing education. For incumbents, the training is conducted at the station level and/or regional fire training facility. Recruits receive initial training during the recruit school/academy. More specifically, Chapters 5 and 6 of the PFD Policy Manual spell out detailed training for EMS and fire specific situations, responses, and positions with the predominate focus on incumbents. New employees either come to the PFD with required fire and EMS certifications and then complete an orientation of the city and the PFD prior to being assigned. Those that may have just fire or EMS certifications attend the appropriate training to meet the standards of the state and the PFD in the discipline they may be lacking.

Professional development occurs outside of the required state certifications. Department staff can participate in training opportunities at the national Fire Academy in Emmitsburg, MD, as well as Alabama Fire College course offerings. Staff must be approved for these courses and any cost or time off must be approved as well.

As discussed in this report, the PFD achieved near maximum credit points for the training section of the ISO-PPC community evaluation. This is attributed to the commitment of PFD leadership and personnel to focus on preparedness and effectively mitigating emergencies.

Recommendation:

CPSM recommends the PFD continue to support and budget for external training opportunities on a state (Alabama Fire College) and national level (National Fire Academy and Emergency Management Institute). CPSM further recommends the PFD continue with its robust training program to sustain maximum credit points on future ISO-PPC community rating evaluations.

Community Risk Reduction

Community Risk Reduction activities are important undertakings of a modern-day fire department. A comprehensive fire protection system in every jurisdiction should include, at a minimum, the key functions of fire prevention, code enforcement, inspections, and public education. Preventing fires before they occur, and limiting the impact of those that do, should be priority objectives of every fire department.

Fire investigation is a mission-important function of fire departments, as this function serves to determine how a fire started and why the fire behaved the way it did, providing information that plays a significant role in future fire prevention efforts.

Educating the public about fire safety and teaching them appropriate behaviors on how to react should they be confronted with a fire or other life safety emergency is also an important life-safety program deliverable of the fire department.

Fire suppression and response, although necessary to protect property, have negligible impact on preventing fire. Rather, it is public fire education, fire prevention, and built-in fire protection systems that are essential elements in protecting citizens from death and injury due to fire, smoke

inhalation, and carbon monoxide poisoning. The fire prevention mission is of utmost importance, as it is the only area of service delivery that dedicates 100 percent of its effort to the reduction of the incidence of fire.

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

The Fire Marshal (Captain) and two fire inspectors staff the Office of the Fire Marshal. Together these positions handle cause and origin fire investigations and fire code enforcement, plans review, and related fire code work. There are no positions dedicated to public life safety education and no dedicated position to assist with the administrative functions of the community risk reduction division.

At the time of this analysis the PFD Fire Marshal's Office was utilizing the following Building and Fire Codes:

- International Fire Code, 2021 edition.
- International Building Code, 2021 edition.
- The National Electrical Code.
- The International Mechanical Code.
- The International Plumbing Code.
- The International Property Maintenance Code.
- Existing Building Code.
- City Ordinances.
- Other codes and standards as adopted by the Alabama State Fire Marshal's Office.

At the time of this report, there were 2,400 occupancies in Pelham that require fire code inspections. Annualized inspections are required pursuant to the adopted fire code and the Alabama Administrative Code and the Code of Alabama for certain public assembly, educational, high hazard, institutional occupancies, and other specified occupancies. These may include occupancy inspections and/or inspection of fire protection system inspection/testing documents to ensure compliance with the fire code.

According to the Fire Marshal it takes 40-minutes per life safety inspection; 3-hours to complete a target hazard inspection; 3 to 4-hours to complete a plan review; 2-hours to complete a design meeting; and 30-minutes to complete a burn permit. Although the Fire Marshal develops an annual inspection plan, the office is not always at a full-staff model to complete all community risk reduction work.

The next table provides a historical analysis of PFD fire code inspections.

Table 4: PFD Fire Marshal's Office Fire Inspections Completed

2019	2020	2021	2022
850	350	580	498

The investigation of the cause and origin of fires is also an important part of a comprehensive fire prevention system. Determining the cause of fires can help with future prevention efforts. Officers on scene initiate the fire origin and cause determination process. When needed, particularly when the on-scene officers cannot determine the origin and cause of the fire, or they believe a crime has been committed, the Office of the Fire Marshal is notified and will respond to determine the cause and origin of the fire. The next table provides a historical analysis of PFD fire investigations.

Table 5: PFD Fire Marshal's Office Fire Investigations

2019	2020	2021	2022
6	2	4	5

The Fire Marshal's Office also conducts building plan reviews to ensure fire protection and fire code elements are met pursuant to the adopted fire and building code. These include:

- Access Control/Egress Delay
- Automatic Extinguishing Systems/Non-Sprinkler
- Fire Sprinkler Systems
- Fire Alram and Fire Detection Systems
- Fire Protection Pumps and Related Equipment
- Standpipe Systems

The next table provides a historical analysis of PFD plan reviews.

Table 6: PFD Fire Marshal's Office Plan Reviews

2019	2020	2021	2022
97	149	165	96

It should be noted that many plan reviews, particularly those involving fire protection systems, site plan review, and fire department ingress and egress require a final fire inspection, which are coordinated and conducted by the Office the Fire Marshal as well.

Neither the Office of the Fire Marshal nor the PFD has a robust life safety education component. As stated earlier, educating the public about fire safety, and teaching them appropriate behaviors on how to react should they be confronted with a fire or other life safety emergency is an important program deliverable of the fire department.

The next table provides a historical analysis of PFD life safety education.

Table 7: PFD Fire Marshal's Office Life Safety Education (count in persons)

2019	2020	2021	2022
0	2	10	11

The Office of the Fire Marshal in Pelham conducts regular fire code inspections and re-inspections, plans review, and plans review inspections, issues permits as required, and answering fire code complaints. According to the Fire Marshal, not all occupancies in Pelham are inspected annually, which is reflected in the data provided. It is important that occupancies requiring annualized inspections be completed as a priority, however the fire code/community risk reduction program cannot end there. Through a realistic and comprehensive fire code inspection plan, those occupancies not included as required in the annual inspection plan, should be inspected bi-annually or others tri-annually as allowable though local and state laws. This will ensure these occupancies are inspected on a regular basis.

Recommendation:

CPSM recommends the city and PFD consider including in any future planning a focus on Community Risk Reduction that includes the expansion of public life safety education staff and programs over the midterm; over the short term a comprehensive fire prevention code enforcement plan that ensures the completion of required annualized inspections, and which details the remaining occupancy types and schedule identifying a bi-annual or tri-annual inspection of these occupancies; the expansion of fire code enforcement staff that matches the growth and demand of inspectable properties and plans review over the near, mid, and longer terms.

Emergency Management

Emergency management is the discipline of dealing with and avoiding risks. Its role in the community is to assess and prepare for current risk conditions, to proactively take steps to mitigate those risks, and to respond/recover should an emergency situation occur. Further, through the crucial roles of planning and preparedness and the coordination of response and management of resources, emergency management plays a major role in mitigating the impacts of disasters.

Pursuant to Sec. 11-7(2) of the Pelham Code of Ordinances, the Mayor, as the Chief Elected Official of the City, has the authority to issue a proclamation declaring a state of emergency when needed and required. Pursuant to Sec. 11-7(3) of the Pelham Code of Ordinances, once a declared state of emergency is made, the state of emergency through and by the City Council, is *subject to ratification, alteration, modification, or repeal by the Pelham City Council as soon as the Pelham City Council can convene.* The Mayor, through the Pelham Code of Ordinances, appoints the Emergency Management Coordinator. Emergency management for Pelham is currently coordinated by the Fire Chief.

The emergency management community consists of many organizations (local, state, military, nonprofit, federal, and private). Examples of organizations that interact with a local Emergency Management office include: the Federal Emergency Management Agency (FEMA), local fire and EMS agencies, local public works departments, emergency communications centers (i.e., 911-dispatch), emergency management agencies at the municipal and state level, public health agencies, Coast Guard, National Guard, local and state law enforcement, public works, non-profits, and the American Red Cross.

Most recently (since 2020) the City of Pelham has participated in four federal declarations:

- FEMA 4632-DR-AL (2 counties, including Shelby) 12/21/2021, related to severe storms and flooding; Individual Assistance and Public Assistance Categories A-G.
- FEMA 4596-DR-AL (8 counties, including Shelby) 04/26/2021, related to severe storms, straight line winds, and tornadoes; Individual and Public Assistance.
- FEMA 4563-DR-AL (State of Alabama) 09/14/2020, related to Hurricane Sally; Public Assistance Category B.
- FEMA 45803-DR-AL (State of Alabama) 03/13/2020, related to Covid-19 Pandemic; Individual and Public Assistance Category B.

CPSM reviewed the city's Individual Mitigation Action Plan, which is incorporated in the Shelby County Hazards Mitigation Plan and found the content valid.[9] The city currently does not have an emergency response/operations plan and no emergency support functions plan. The city utilizes the county's Emergency Response Plan. The difference between an Emergency operations Plan and a Hazards Mitigations Plan is:

- Emergency Operations Plan (EOP): outlines the prevention, mitigation, preparedness, response, and recovery phases from potential natural or manufactured disasters or emergencies. An EOP assigns responsibilities to individuals or groups and determines how actions, internally and externally, will be coordinated. Emergency Support Functions (ESFs) make up the individuals and groups assigned to an Emergency Operations Center and/or incident and provide a structure for coordinating interagency support.[10]
- Hazards Mitigation Plan (HMP): outlines long term strategies for reducing the risk and impact of natural disasters through the identification, assessment, and prioritization of hazards and vulnerabilities that affect a community.[11]

Emergency Operations Center (EOC)

The City Emergency Operations Center (EOC) is roll-call room located in the Pelham Police Department headquarters. The room is used regularly for roll call and training and is not set up for immediate EOC use. According to PFD officials, this area can however be set up quickly to serve as an EOC.

During an emergency, particularly one that involves multiple agencies and where a central command and control in accordance with the Emergency Operations Plan is established and implemented, a functional area (operations room) is required for the assembling of Emergency Support Function (ESF) personnel. This area requires enough room so that individual ESFs can plan and direct their sections and includes communication via telephone and computer software available at each ESF, functioning utilities with uninterrupted power supply and emergency generator, and located in a facility that is accessible to staff and with adequate parking. Ideally an EOC is set up and functional at a moment's notice. Additional areas for consideration include planning areas, facilities to include areas to rest for 24-hour operations, and a break area away from the operations room for nourishment.

Staffing, equipment, materials, and infrastructure considerations required in the set-up and continual operation of an EOC are many yet scalable to the size of the EOC, whether it is a

9. Hazard Mitigation Plan, Shelby County, AL, 2022.
10. Developing and Maintaining Emergency Operations Plans, FEMA, 2010.
11. Local Mitigation Planning Handbook, FEMA, 2023.

permanent facility/area or a shared space, and what may work best for the locality, in this case the City of Pelham.

FEMA has published a quick reference guide for the location, set-up, operations, suggested staffing, equipment, materials, and infrastructure of an EOC. This manual can be accessed and downloaded as a guide for city officials as they continue to make improvements to their existing EOC, and for use should the City at some point in the future consider relocating the EOC. The link to this document is:

https://www.fema.gov/sites/default/files/documents/fema_eoc-quick-reference-guide.pdf

National Incident Management System (NIMS)

While threat/hazard-based planning is conducted by the City, Pelham may not be fully compliant with the National Incident Management System (NIMS) training components for employees with response and/or EOC assignments. The primary components are Fundamentals and Concepts, Resource Management, Command and Coordination and Communications and Information Management. The NIMS training classes listed below are designed to educate response personnel in the fundamentals of incident management, as well as the application of the NIMS components in their home jurisdiction.

NIMS guides all levels of government, nongovernmental organizations, and the private sector to work together to prevent, protect against, mitigate, respond to, and recover from incidents.[12]

NIMS provides stakeholders across the entire community with the shared vocabulary, systems, and processes to successfully deliver the capabilities described in the National Preparedness System. In addition to the benefits of a coordinated response as outlined above, federal preparedness and other federal grants (including state pass-through in some instances) to a local entity is contingent on that entity being NIMS compliant.

The City of Pelham should be NIMS compliant. To become compliant with NIMS training, CPSM recommends the following training:

- NIMS ISC-100: Introduction to Incident Command System
  - All City employees with response and/or EOC assignments, and public safety staff.
  - Independent study program offered through FEMA's Emergency Management Institute. http://training.fema.gov.nims
- NIMS ISC-200: ICS for Single Resources and Initial Action Incidents
  - All City employees with response and/or EOC assignments, and public safety staff.
  - Independent study program offered through FEMA's Emergency Management Institute. http://training.fema.gov.nims
- NIMS ICS-300: Intermediate Incident Command System for Expanding Incidents
  - Employees and public safety staff who are decision makers, serve on respective agency unified command, and or may staff state or local emergency operations center.
  - In-class multi-day course. Courses are offered at locations in Alabama throughout the year.

[12]. National Incident Management System | FEMA.gov

- NIMS ICS-400: Advanced Incident Command System for Complex Incidents
  - Employees and public safety staff who are decision makers, serve on respective agency unified command, and or may staff state or local emergency operations center.
  - In-class multi-day course. Courses are offered at locations in Alabama throughout the year.
- NIMS ISC-700: National Incident Management System, An Introduction
  - All City employees with response and/or EOC assignments, and public safety staff.
  - Independent study program offered through FEMA's Emergency Management Institute. http://training.fema.gov.nims
- NIMS ISC-800: National Response Framework, An Introduction
  - All City employees with response and/or EOC assignments, and public safety staff.
  - Independent study program offered through FEMA's Emergency Management Institute. http://training.fema.gov.nims

Continuity of Operations Plan (COOP)

Another important document the City should maintain is a Continuity of Operations Plan (COOP). A COOP is important to any organization, especially local governments that operate financial and human resources systems, facilities, public operations, and vital community services. A COOP is developed to serve as a roadmap that builds the organization's plan to prepare for, react to, and respond to any event that disrupts one or more operation, facility, service, or line of succession. COOP planning includes:

- Essential Functions – The critical activities performed by organizations, especially after a disruption of normal activities.
- Orders of Succession – Provisions for the assumption of senior agency offices during an emergency if any of those officials are unavailable to execute their duties.
- Delegations of Authority – Identification, by position, of the authorities for making policy determinations and decisions at the executive, middle management, and operational levels, and all other organizational locations. Generally, pre-determined delegations of authority will take effect when normal channels of direction have been disrupted and will lapse when these channels have been reestablished.
- Continuity of Facilities – Locations, other than the primary facility, used to carry out essential functions, particularly in a continuity event. Continuity Facilities, or "Alternate facilities," refers to not only other locations, but also nontraditional options such as working at home, ("teleworking"), telecommuting, and mobile-office concepts.
- Continuity of Communications – Communications that provide the capability to perform essential functions, in conjunction with other agencies, under all conditions.
- Vital Records Management – The identification, protection, and ready availability of electronic and hard-copy documents, references, records, information systems, and data management software and equipment needed to support essential functions during a continuity situation.
- Human Capital – During a continuity event, emergency employees and other special categories of employees are activated by an agency to perform assigned response duties.

- Devolution of Control and Direction – Capability to transfer statutory authority and responsibility for essential functions from an agency's primary operating staff and facilities to other agency employees and facilities.
- Reconstitution – The process by which agency personnel resume normal agency operations from the original or replacement primary operating facility.[13]

Recommendations:

- CPSM recommends the city create a full-time Emergency Management Planner position. This action is recommended and necessary as there are deficiencies in the current Emergency Management program to include no city Emergency Operations Plan with Emergency Support Functions annexes, and as there is a critical need for continuous planning and preparation, project management, collaboration with city, county, and state officials, and development and sustainment of required and ancillary written plans required in the emergency management discipline. Pelham can be subject to environmental and other emergencies that evolve into federally declared emergencies and thus should put more resources into this program.
- CPSM recommends the Emergency Management function begin the process of implementing the National Incident Management System (NIMS) to include developing and implementing a plan and training city officials and staff to the appropriate NIMS levels.
- CPSM recognizes the City has existing individual department plans, which should be used as the basis to formulate an overarching and formal Continuity of Operations Plan (COOP) that is all-hazards and that has the ability to ensure the effects of any interruption in a City office, system, operation, and staffing before or during an event are successfully managed and the City is able to perform all essential functions.
- CPSM recommends the City maintain an Emergency Operations Center or Emergency Management Operations area that can quickly become operational, with minimal set-up, and is capable of supporting necessary emergency support functions to handle a multi-agency emergency 24-hours/day if necessary. The EOC should have the ability to be quickly relocated if compromised, and should contain, at a minimum, equipment, materials, and infrastructure as outlined in the Emergency Operations Center section of this report.

PFD Fleet

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

The PFD has a modern fleet of frontline heavy fire apparatus and light vehicles (road and water). The fleet includes administrative vehicles and light response vehicles for specialty fire and EMS incidents. The PFD also has reserve engine apparatus. PFD apparatus maintenance is performed by a vendor who specializes in fire and EMS apparatus work. This combination of maintenance and repair work is common practice across the country. The intricacies and scope of fire pumps and fire pump controls, aerial ladder hydraulic systems and controls, and apparatus electrical

13. coop_brochure.pdf (fema.gov)

control systems (the main components outside of the motor, chassis, and drive train) are best left in the hands of specialists for diagnosis, maintenance, and repair.

Table 8: PFD Frontline Fire Apparatus

Unit Number	Year of Purchase
Quint 91	2015
Engine 92	2018
Engine 93	2016
Engine 94	2021
Engine 95	2021
Hazmat 1	2019
Medic 96 (QRV)	2014
Brush 3	1997
Brush 5	2004

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

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

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

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

Many departments use a 10-5 rule (10 years front-line service, then 5 years of reserve service) when programming replacement of fire apparatus such as engines, ladders, water tenders,

heavy rescues, and heavy squad type haz-mat vehicles. Annex D of the current NFPA 1912 edition states:

> *To maximize firefighter capabilities and minimize risk of injuries, it is important that fire apparatus be equipped with the latest safety features and operating capabilities. In the last 10 to 15 years, much progress has been made in upgrading functional capabilities and improving the safety features of fire apparatus. Apparatus more than 15 years old might include only a few of the safety upgrades required by the recent editions of the NFPA fire department apparatus standards or the equivalent Underwriters Laboratories of Canada (ULC) standards. Because the changes, upgrades, and fine tuning to NFPA 1901, Standard for Automotive Fire Apparatus have been truly significant, especially in the area of safety, fire departments should seriously consider the value (or risk) to firefighters of keeping fire apparatus more than 15 years old in first-line service.*
>
> *It is recommended that apparatus more than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status, be upgraded in accordance with NFPA 1912, and incorporate as many features as possible of the current fire apparatus standard. This will ensure that, while the apparatus might not totally comply with the current editions of the automotive fire apparatus standards, many of the improvements and upgrades required by the current editions of the standards are available for firefighters who use the apparatus.*

According to information provided, the PFD rotates frontline apparatus to reserve status at the 15 year mark. The apparatus then remains in reserve for ten years and is retired at 25-years.

Recommendation:

- CPSM recommends apparatus and major apparatus components such as the motor, fire pump, aerial ladder assembly and hydraulics, chassis, and chassis components such as brakes, wheels, and steering equipment be maintained in accordance with manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis.

  Further, apparatus components requiring annualized testing either fixed or portable such as fire pumps, aerial ladder and aerial ladder assemblies, ground ladders, self-contained breathing apparatus to include personnel fit-testing, and fire hose should be tested in accordance with manufacturer and industry specifications and standards. All testing records should be maintained in a common records management system for continuous review and analysis.

- CPSM recommends a heavy fire apparatus replacement plan that aligns with NFPA 1901 in that no heavy fire apparatus exceed 25 years of service and considers refurbishment as outlined herein. CPSM further recommends, given the demand on the current apparatus, the city continue with the fire apparatus replacement plan of fifteen years of frontline service, but reduce the reserve status to 5 years for a twenty-year lifecycle. To extend the life of frontline apparatus, CPSM also recommends a rotation of busiest to slowest stations for engine apparatus over the life of each unit.

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SECTION 3. COMMUNITY RISK PROFILE

Population and Growth

The U.S. Census Bureau indicates the population of the City of Pelham in 2020 was 24,318. This is an almost 14 percent increase in population since the 2010 census of 21,352. The city has over 38 square miles of land mass. The population density is 626 people per square mile. This is an increase of 79 people per square mile over the 2010 census numbers.

In terms of fire and EMS risk, the age and socio-economic profiles of the population can have an impact on the number of requests for fire and EMS services. Evaluation of the number of seniors and children by fire management zones can provide insight into trends in service delivery and quantitate the probability of future service requests. In a 2021 National Fire Protection Association (NFPA) report on residential fires, the following key findings were identified for the period 2015–2019:[14]

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

In Pelham, the following age and socioeconomic factors are considered herein when assessing and determining risk for fire and EMS preparedness and response:[15]

- Children under the age of five represent 5.4 percent of the population.
- Persons under the age of 18 represent 22.8 percent of the population.
- Persons over the age of 65 represent 17.7 percent of the population.
- Female persons represent 52.4 percent of the population.
- There are 2.60 persons per household in Pelham.
- The median household income in 2020 dollars was $81,606.

14. M. Ahrens, R. Maheshwari "Home Fire Victims by Age and Gender," Quincy, MA: NFPA, 2021.
15. U.S. Census Bureau QuickFacts: Pelham, AL

- People living in poverty make up 4.1 percent of the population.
- Persons without health insurance under the age of 65, 2017-2021: 6.2 percent.

White alone (not Hispanic or Latino) make up 70.7 percent of the population. Hispanic or Latino represent 12.5 percent of the population. The remaining percentage of population by race includes Black or African American alone at 12.3 percent, Asian alone at 2.6 percent, two or more races at 5.7 percent, and American Indian or Alaska Native alone at 0.3 percent.

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

Regarding future growth, the City of Pelham *2020 Plan Pelham* outlines future growth vision, type, and potential annexation for city consideration and action.

The *2020 Plan Pelham Comprehensive Plan* outlines the current and future land use for the city and includes:[16]

- Suburban Residential

  The Suburban Residential land use classification is intended to accommodate low to medium density residential properties and subdivisions (single-family detached uses sitting on lots of 0.45 acres or larger).

- Traditional Residential

  This land use category is intended to accommodate traditional residential neighborhoods, with a more compact mix of uses at moderate to high densities. Besides residential uses, other uses could include schools, civic buildings and commercial buildings located in walking distance of private homes. Residential types include a mixture of single-family detached and multi-unit attached housing types and sizes, with lot sizes averaging 0.44 acres or less (larger single-family lot sizes can exist, but they are not the primary residential type in the neighborhood).

- Institutional

  The Institutional land use classification includes both public and privately owned or operated civic uses.

- Neighborhood Commercial

  The Neighborhood Commercial land use category is intended to provide spaces for small scale retail and service developments that serve the convenience needs of neighboring residents. This Comprehensive Plan calls for areas of neighborhood commercial to support the residential areas near State Route 261, County Road 11, County Road 33, and the northern city limits of Pelham along State Route 119.

- General Commercial

  General Commercial areas are located throughout the city to serve the day-to-day commercial needs of surrounding neighborhoods, or to serve as regional commercial areas. The Future Land Use Plan envisions an expansion of the General Commercial areas that currently exist along U.S. 31(Pelham Parkway).

16. *Plan Pelham*, City of Pelham Comprehensive Plan, 2020.

- Mixed-Use

  The Mixed-use category is intended to provide an integrated mix of land uses either vertically (one use located above another) or horizontally (side-by-side). Typically, mixed-use buildings feature commercial on the ground floor, with office or residential uses on the upper floors.

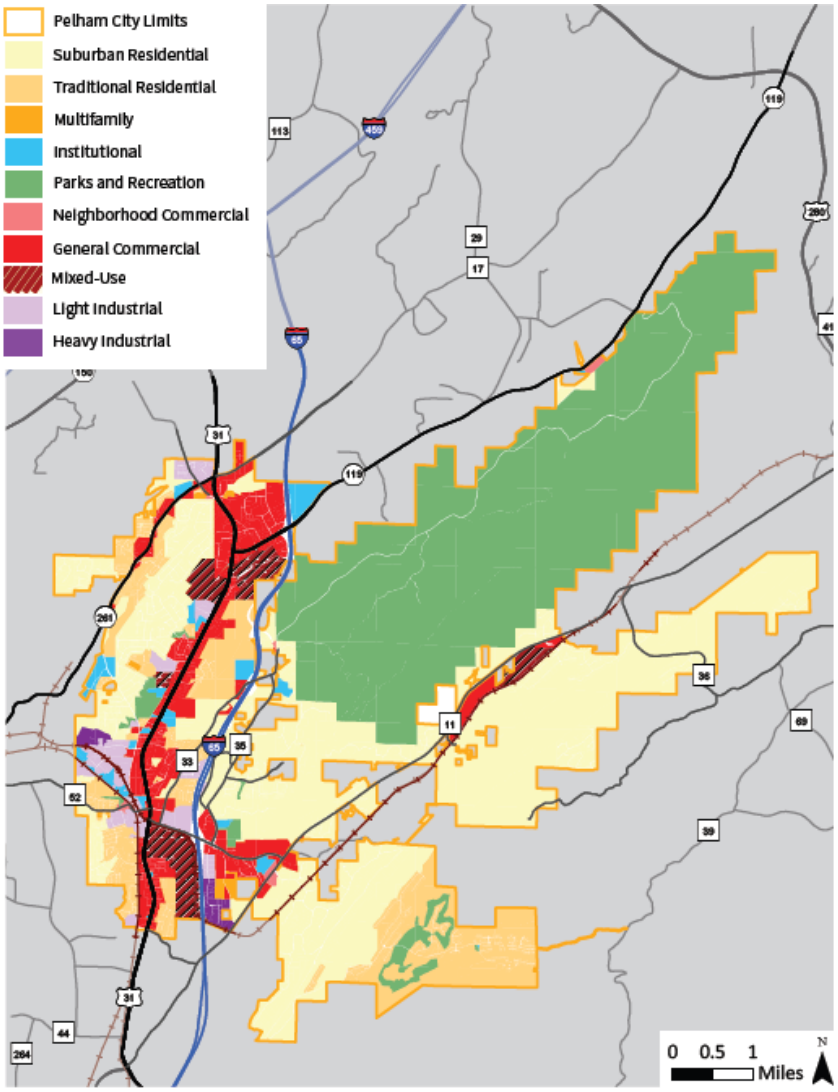
- Light Industrial

  The Light Industrial land use category is intended for lower intensity industrial uses that do not create significant negative impacts on the environment or surrounding area. Parks and Open Space.

- Heavy Industrial

  The Heavy Industrial classification is intended for sites that provide a full range of medium to heavy industrial uses and activities such as manufacturing, warehousing, industrial processing, resource and energy production and general service and distribution that can generate substantial impacts on the surrounding area.

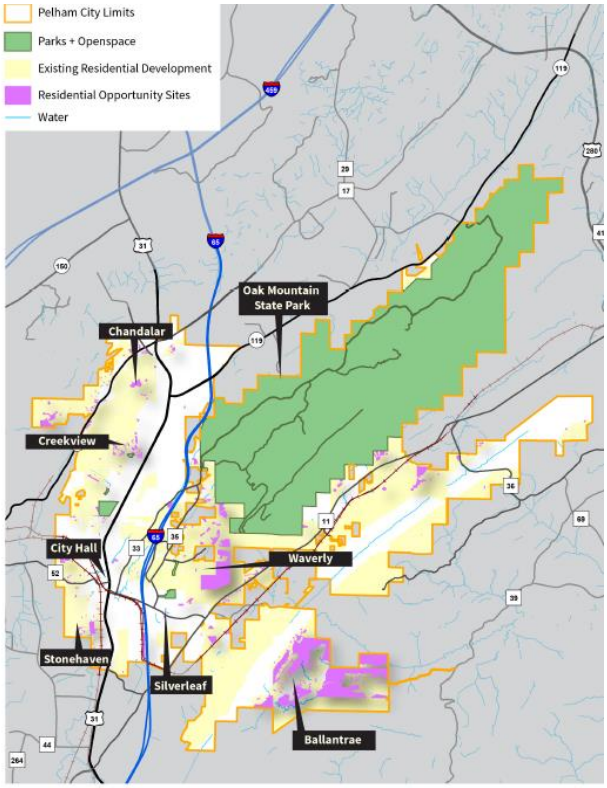
Figure 7: *Pelham Plan*-2020 Comprehensive Plan Future Land Use Map



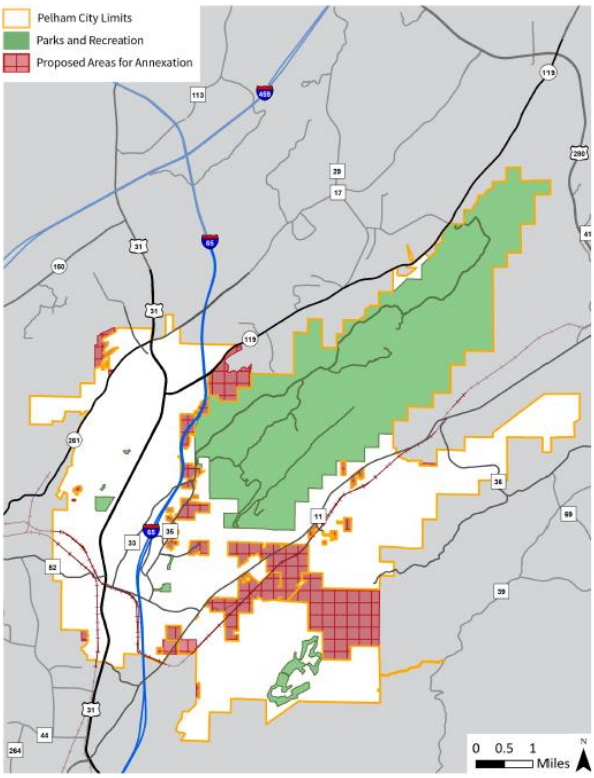
The next maps illustrate potential unincorporated areas of Shelby County the city may consider annexing and areas within the city where there are areas that have opportunity for residential development. Finally a map illustrating mixed use future planning. Any future development will drive up fire and EMS demand, may change the community risk profile, and may change or add to PFD deployable assets.

Figure 8: *Pelham Plan*-2020 Comprehensive Plan Future Opportunities

Residential Opportunities Map



Potential Areas for Annexation



Recommendation:

CPSM recommends the PFD monitor population and growth impacts and include these factors in any planning the PFD conducts in the near, mid, and long terms. Increases in development and annexation will potentially increase call demand and will impact the deployment analysis in future ISO-PPC community ratings, and the ability of the PFD to meet NFPA deployment benchmarks.

Environmental Risk

The City of Pelham is prone to and will continue to be exposed to certain environmental hazards and risks that may impact the community and which will create call demand for the PFD. The most common natural hazards prevalent to the region, according to the Shelby County Hazard Mitigation Action Plan, include:[17]

17. Shelby County, AL Hazard Mitigation Action Plan, 2022 Update.

Hazard	Exposure	Risk Threat
Drought	Yes	Moderate-Slight

The National Weather Service (NWS) Climate Prediction Center (CPC) defines drought as a deficiency of moisture that results in adverse impact on people, animals, or vegetation over a sizeable area. Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. In general, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector. Drought is possible throughout the Shelby County planning area to include Pelham.

Hazard	Exposure	Risk Threat
Earthquake	Yes	Low-Moderate

An earthquake is sudden motion or trembling caused by an abrupt release of accumulated strain in the tectonic plates that comprise the earth's crust." The tectonic plates continually bump, slide, catch, and hold as they move past each other which causes stress to accumulate along faults. When this stress exceeds the elastic limit of the rock, an earthquake occurs, immediately causing sudden ground motion and seismic activity. Earthquakes have occurred in Shelby County (the last was in 2005). The largest earthquake in Alabama occurred in Shelby County in 1916.

Hazard	Exposure	Risk Threat
Extreme Temperature	Yes	Moderate-Minimal

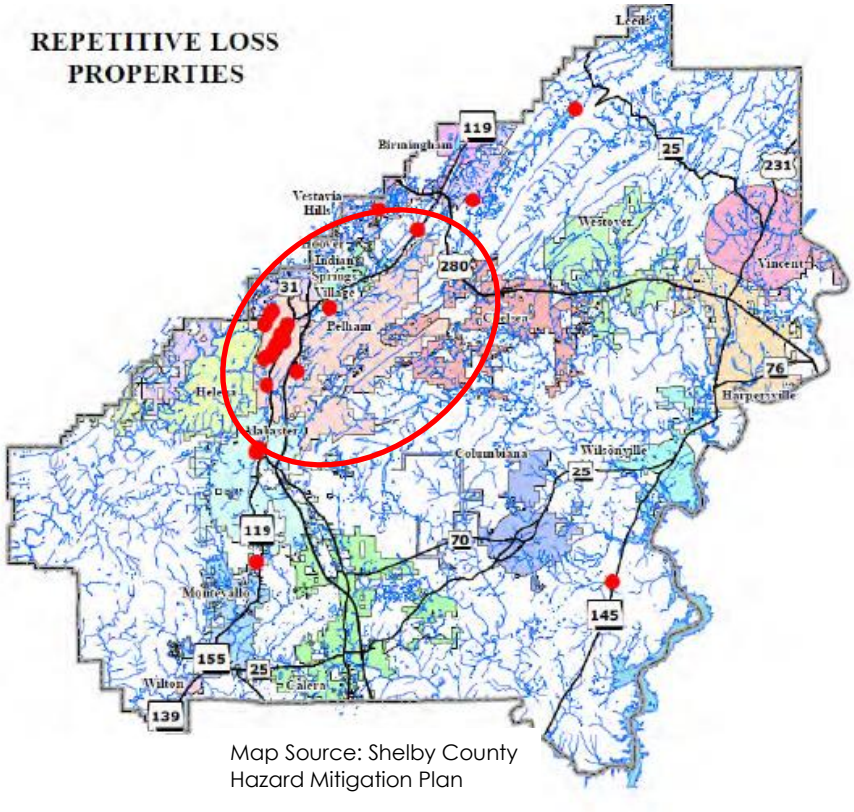
Extreme temperatures include both cold and hot events, which can have a significant impact on human health, commercial/agricultural businesses, and primary and secondary effects on infrastructure (e.g., burst pipes and power failure). The annual probability of extreme temperatures occurring is medium and covers the Shelby County planning area to include Pelham.

Hazard	Exposure	Risk Threat
Flooding	Yes	Moderate-High

Flooding is an overflowing of water onto normally dry land and is one of the most significant and costly natural disasters. The principal types of floods are dam or levee failure, flash floods, riverine floods, and storm surge flooding. Flooding identification includes*: Dam/Levee failure; flash floods after heavy rain; and riverine flooding from precipitation. According to the Shelby County Hazard Mitigation Plan the Cities of Pelham and Alabaster have the most risk of flooding from the Cahaba River tributaries. The major areas prone to flooding in Pelham are along Bishop Creek, Buck Creek and Peavine Creek. These floodplains generally follow a northeastern to southwestern direction through the valleys; however, the flood prone areas are not static, and can expand as land uses change over time. Developments increase the number of impervious surfaces, which serve to increase the rate and velocity of surface water runoff into the streams and creeks of Pelham. The Flooding impact of Yellowleaf Creek is a familiar feature of the Chelsea area.*

Repetitive flood losses in Shelby County, and in particular Pelham are illustrated in the next figure.

Figure 9: Shelby County Repetitive Flood Losses



Map Source: Shelby County Hazard Mitigation Plan

Hazard	Exposure	Risk Threat
Hail	Yes	Moderate-Minimal

Hailstones are products of thunderstorms and are developed by downdrafts and updrafts that develop inside cumulonimbus clouds of a thunderstorm, where super cooled water droplets exist. The transformation of droplets to ice requires a temperature below 32 degrees and a catalyst in the form of tiny particles of solid matter, or freezing nuclei. Continued deposits of super cooled water cause the ice crystals to grow into hailstones. Hailstorms occur most frequently in Shelby County during the late spring and early summer, when the jet stream moves northward across the Great Plains. During this period, extreme temperature changes occur from the surface up to the jet stream, resulting in the strong updrafts required for hail formation.

Hazard	Exposure	Risk Threat
High Winds	Yes	High-High

Wind is defined as the motion of air relative to the earth's surface. In the mainland United States, the mean annual wind speed is reported to be eight to 12 mph, with frequent speeds of 50 mph and occasional wind speeds greater than 70 mph. High Winds are generally the result of thunderstorms, tornadoes, and tropical storms/hurricanes. There have been 45 High Wind thunderstorm events since 2016, a period of 6 years. This results in an average of 7.5 events per year. Overall, the frequency of future occurrences of thunderstorms in Shelby County will continue and the risk is considered high. Eight tornadoes have impacted Shelby County since 2016, a period of 6 years. This results in a tornado event every 1.3 years resulting in a high risk and high vulnerability. The entire county is at equal risk of future occurrences.

Hazard	Exposure	Risk Threat
Ice/Snowstorms	Yes	Moderate-Moderate

Winter storms produce an array of hazardous weather conditions including heavy snow, blizzards, freezing rain, ice pellets, and extreme cold. The extreme cold associated with winter storms is a deceptive killer as it indirectly causes injury and death resulting from exhaustion and overexertion, asphyxiation, hypothermia, and frostbite from wind chill. Severe winter storms are extra-tropical cyclones (storms that form outside of the warm tropics) fueled by strong temperature gradients and an active upper-level jet stream. Sixteen ice/snowstorm events have occurred in Shelby County since 1962, a period of 60 years. *This results in the probability of an Ice/Snow event occurring about every 4 years. The probability of future winter storm events is moderate to high, with the vulnerability of loss being low. The entire county is at equal risk.*

Hazard	Exposure	Risk Threat
Landslides/Mudslides	Yes	Low-Minimal

Landslides (rockslides, mudslides, etc.) are among the most common natural hazards. Unlike most natural hazards, however, most damage is not caused by extreme events, but by uncounted (and often unreported) minor events. The hazards associated with landslides are as diverse as the types of failure. Falls may damage roads or buildings at the base of a steep slope, injure climbers, or remain on a road as a hazard to transportation. In addition to the direct hazards of a landslide moving out from under or onto structures or utilities, there is a major indirect hazard. Large slides generally do not stop moving until they reach the bottom of a valley where they block streams, usually resulting in flooding and damage to the ecology. Mudslides/landslides have not been a significant risk in Shelby County.

Hazard	Exposure	Risk Threat
Lightning	Yes	Moderate-Low

Lightning is generally associated with thunderstorms and is an electrical discharge that results from the buildup of positive and negative charges. When the buildup becomes strong enough, lightning appears as a "bolt." This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches a temperature approaching 50,000 degrees in a split second. Lightning events can occur anywhere in the planning area.

Hazard	Exposure	Risk Threat
Wildfires	Yes	Moderate-Moderate

A wildfire is any instance of uncontrolled burning in grasslands, forests, and brush land. A Wildfire is further defined as an uncontrolled fire spreading through vegetative fuels, possibly consuming structures (FEMA, 2001). Wildfires often begin unnoticed and spread quickly. The Federal Emergency Management Agency's (FEMA) Fire Management Assistance Grant Program (FMAGP) indicates that a wildfire is also known as a forest fire, vegetation fire, grass fire, or brush fire, is an uncontrolled fire requiring suppression action. The probability of future wildfire events is high with the vulnerability low however, as population expands the vulnerability could raise to medium. Historic occurrences Shelby County fire departments have responded to and suppressed an average of 75 Wildland fires per year over the last 10 years.

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Building and Target Hazard Risk

A community risk and vulnerability assessment will evaluate the community, and regarding buildings, it will review all buildings and the risks associated with each property and then classify the property as either a high, medium, or low-hazard depending on factors such as the life and building content hazard and the potential fire flow and staffing required to mitigate an emergency in the specific property. According to the NFPA *Fire Protection Handbook*, these hazards are defined as:

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

Medium-hazard occupancies: Apartments, Condos, mixed use residential, offices, and mercantile and industrial occupancies that may require extensive rescue by firefighting forces.

Low-hazard occupancies: One-, two-, or three-family dwellings and scattered small business and industrial occupancies.[18]

Pelham has the following building types.

- Single family housing units: 73% of housing unit types. (Mobile Homes: 8% of housing unit types)
- Multifamily housing units (townhomes, duplexes, etc.): 15% of housing unit types.
- Apartment building units–garden style (2 + stories): 3% of housing unit types.
- 1,500 Commercial/industrial structures.
- 52 Strip malls.
- Assisted Living, educational and day-care facilities.
- Multi-story Hotel/Motel buildings.

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

Pelham has a variety of target hazards that have been assigned a hazard class by the PFD and which include:

High Hazard

- Hospital.
- Commercial facilities that include assisted living/nursing/development disability.
- Residential facilities for senior/assisted living.
- Public and private educational and day care facilities.
- Facilities classified as high hazard due to processes/hazardous materials use.
- Petroleum Products Pipeline Transportation Faccilities (2)

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

Medium Hazard

- Commercial/Mercantile properties that store or use materials that are flammable and/or hazardous.
- Businesses/Occupancies classified as Public Assembly.
- Shopping centers/retail suites/strip malls.
- Mixed Use buildings with residential over retail.
- Large footprint buildings.
- Medical facilities.
- Single Family-Dwellings over 3,000 square feet, particularly those built with light frame construction-with or without a basement.

The greatest amount of building risk in Pelham is of a low hazard (single family dwellings-predominately wood frame construction). Pelham does have high risk/vulnerable population risks (nursing/assisted living facilities, hospital, medical facilities), educational facilities and multifamily residential structures (apartments). All of these building risks present the PFD with life-safety concerns. The industrial and mercantile building risk, and large footprint commercial buildings while a lower life safety risk, is generally a higher hazard risk based on processes, storage, and overall occupancy type.

Transportation Risk

The Pelham road transportation system is typical of suburban/urban municipalities and includes:

- Arterials: High to moderate traffic volumes with moderate speeds. Connects different areas of the city.
- Collectors: Provide access to and from neighborhoods and commercial areas with moderate volume and moderate speed.
- Local roads: provides access to residential and businesses with low volume and low speed; 2 lanes.
- Interstate with main lanes and access ramps; lanes, speed, and volume may vary.

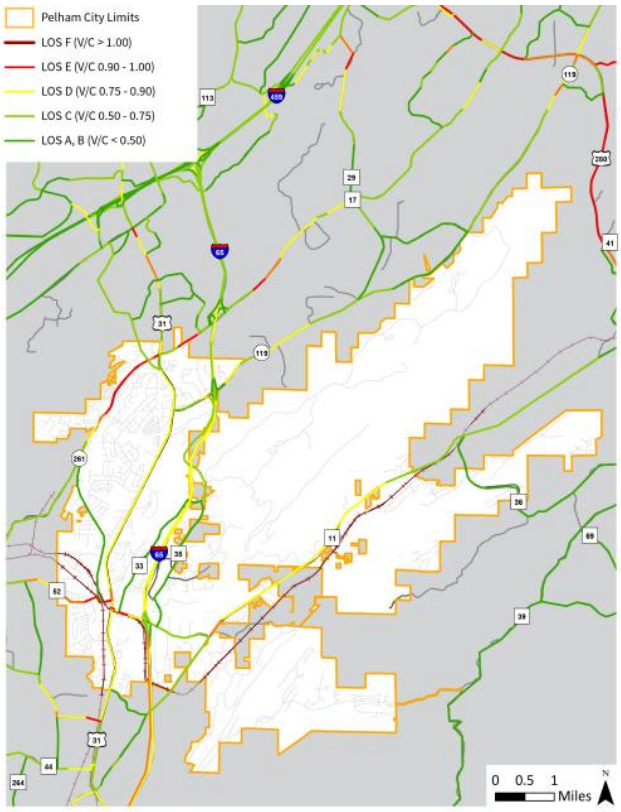
The Pelham Comprehensive plan provides a Level of Service (LOS) analysis. LOS is a term that analyzes traffic flow and assigned a grade from A to F (a grading scale similar to the educational grading scale where A is the highest achievement). In road vernacular, an A-grade signals the road has very good traffic flow. An F-grade signals the road has heavy volume and a high level of congestion.

The next figures illustrate the main road network in Pelham and the LOS from the 2020 Pelham Comprehensive Plan. There are 273 miles of roadway in the city.

To note, the City of Pelham received notification on June 5, 2023, that it will receive $41,766,038 in federal grant funds to eliminate the two existing at-grade railroad crossings on County Road 52, which is identified in the Pelham 2020 Comprehensive Plan as a significant traffic issue in the city.

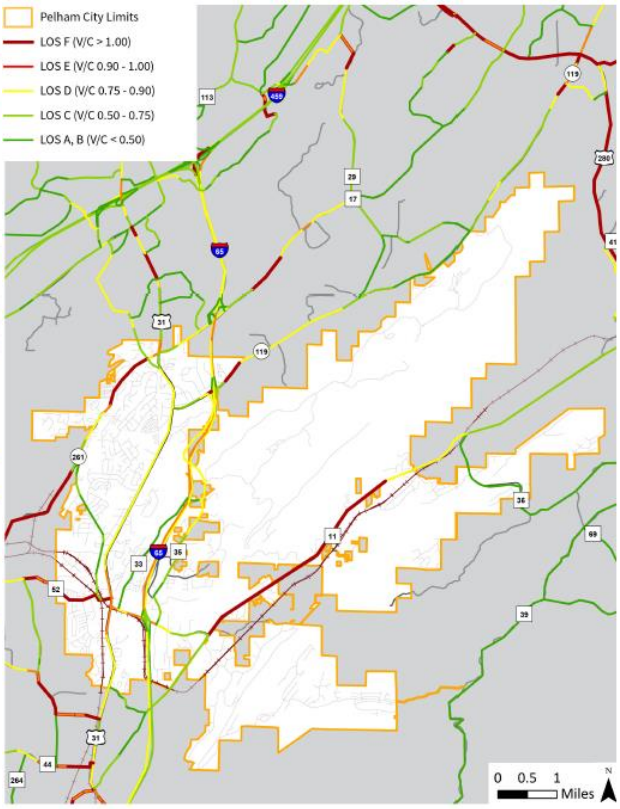
Figure 10: Pelham Road Network[19]

Pelham Roadways LOS: 2015	Pelham Roadways LOS: 2040



Segments shown in red represent areas where roadway level of service is beginning to fall below minimum acceptable conditions. Significant congestion currently exists along State Route 261 (Helena Road) between Interstate 65 and Bearden Road, and at the intersection of U.S. 31 (Pelham Parkway) and County Road 52. As one of the only east-west corridors between Pelham and Helena, County Road 52 carries very high commuter volumes to and from its interchange with Interstate 65. However, its present alignment renders it incapable of adequately carrying this traffic. Because it crosses two major railroads at-grade, heavy freight traffic frequently shuts down the corridor. Furthermore, the cumbersome intersection with U.S. 31 does not provide sufficient turning queue lengths, causing significant spill-back into surrounding intersections.

Map and Information Source: City of Pelham Comprehensive Plan, 2020



The 2040 roadway level of service map shows significant deteriorations in traffic conditions, even when taking into account currently programed capacity expansion projects (i.e., road widenings). This is largely a result of development pressure outpacing road construction resources. Significant new residential development is expected to continue along CR-11 in both Pelham and Chelsea, causing the road to reach failing conditions north of County Road 52 by 2040. Likewise, residential construction is expected to continue in Helena and Alabaster, placing even greater strains on State Route 261 and County Road 52.

Map and Information Source: City of Pelham Comprehensive Plan, 2020

19. *Plan Pelham*, City of Pelham Comprehensive Plan, 2020.

The road and transportation network described herein poses risks for a vehicular accident, some at medium to greater than medium speeds, as well as vehicular-versus-pedestrian risks. There are additional transportation risks since tractor-trailers and other commercial vehicles traverse the roadways of Pelham to deliver mixed commodities to business locations. Fires involving these products can produce smoke and other products of combustion that may be hazardous to health.

Pelham also has extensive rail transportation risks. Freight rail includes east-west and north-south track that carries two Class I railroads through Pelham. Railroads operating in Pelham include:

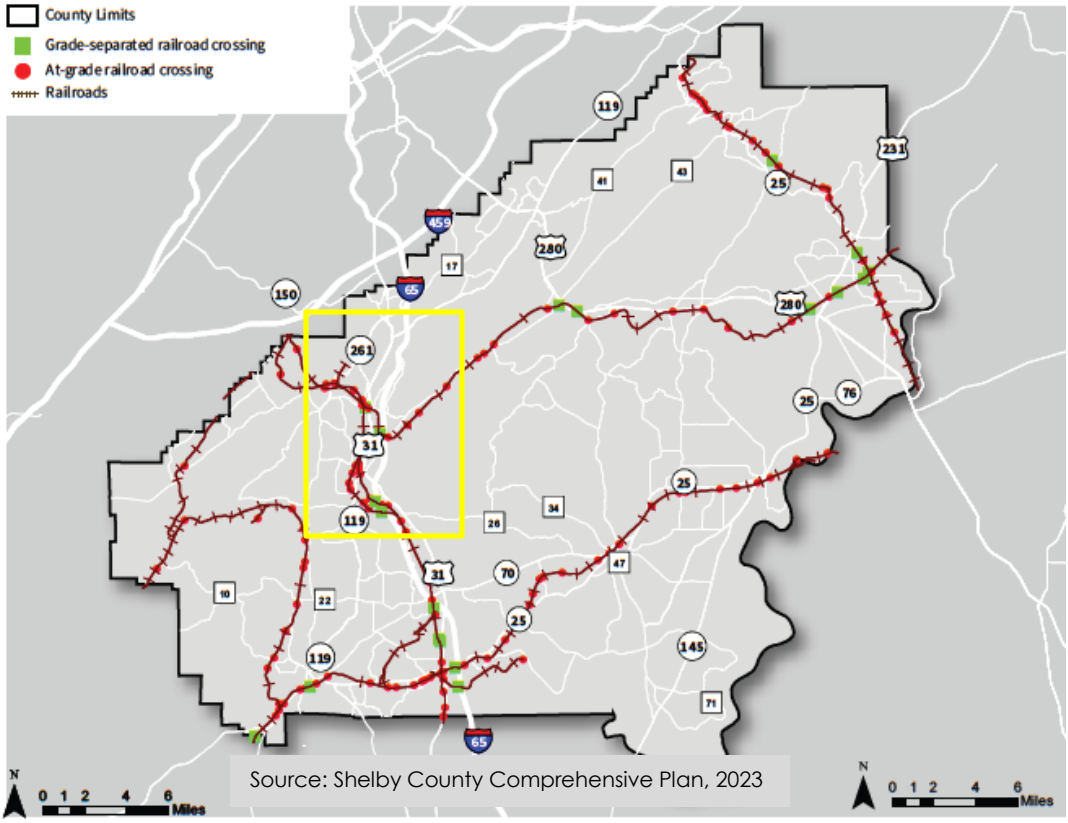
- CSX Transportation
- Norfolk Southern Railway

Typical consists for both railroads include: chemicals (some hazardous); food products in various forms; lumber and paper products; equipment; plastic resins; textiles; pipe; electronics; scrap metals, and aggregates such as stone and sand.

There are several at-grade vehicle/rail crossings in Pelham. The two at-grade crossings outlined above frequently restrict and impeded traffic flow on County Road 52 where it intersects with U.S. 31. This at-grade crossing rail obstruction to traffic also hampers emergency vehicle traffic, extending response travel times.

Fires involving the potential commodities passing through and stored in sidings in Pelham can produce smoke and other products of combustion risks that may be hazardous to health. Hazardous materials (existing or waste) themselves present hazards to health risks if being transported and involved in a rail accident.

Figure 11: Rail Routes in Pelham and At-Grade Crossings



Source: Shelby County Comprehensive Plan, 2023

An additional transportation risk in Pelham includes the Colonial Pipeline tank farm and distribution site on Highway 52 E just west of Interstate 65, and Plantation Pipeline Company tank farm and distribution site located on Highway E east of U.S. 31. Both sites store and transfer petroleum products. These sites and their distribution network of underground transportation pipelines that traverse Pelham represent fixed and transportation risks to include fire and Hazardous Materials containment and mitigation.

Fire and EMS Incident Risk

An indication of the community's overall Fire and EMS risk is the type and number of Fire and EMS-related incidents the Fire and EMS department responds to. CPSM conducted a data analysis for this project that included PFD units incident response types and workload.

The next Table details the call types and call type totals for these types of fire-related risks between January 1, 2022, and December 31, 2022. During this time period PFD responded to 3,977 overall calls for service. The next table includes all calls the PFD responded to. PFD responded to 167 mutual aid calls outside of Pelham.

TABLE 9: Fire and EMS Calls by Type

Call Type	Total Calls	Calls per Day
Breathing Difficulty	210	0.6
Cardiac and Stroke	311	0.9
Fall and Injury	429	1.2
Illness and Other	960	2.6
MVA	136	0.4
Overdose and Psychiatric	172	0.5
Seizure and Unconsciousness	275	0.8
EMS subtotal	**2,493**	**6.8**
False Alarm	306	0.8
Good Intent	68	0.2
Hazard	35	0.1
Outside Fire	50	0.1
Public Service	632	1.7
Structure Fire	43	0.1
Technical Rescue	9	0.0
Fire subtotal	**1,143**	**3.1**
Aid Given	167	0.5
Canceled	48	0.1
Special Detail	126	0.3
Total	**3,977**	**10.9**

- 63 percent of the Fire and EMS calls in Pelham are EMS related.
- Motor vehicle accidents make up 3 percent of EMS related calls.
- Illness and Other and Fall and Injury make up the largest percentage of EMS related calls for service (35 percent).
- High Acuity call types make up 20 percent of EMS related calls.

- 29 percent of the Fire and EMS calls in Pelham are Fire related.
- 1 percent of Fire and EMS calls in Pelham are cancelled prior to responding or while enroute.
- Hazard, Structure and Outside fire calls make up 3 percent of Fire calls in Pelham.
- False alarms make up 8 percent of fire related calls (greatest percentage).
- Public Service calls make up the largest percentage of Fire related calls for service (16 percent).

PFD Resiliency

Resiliency is an organization's ability to quickly recover from an incident or event, or to adjust easily to changing needs or requirements. Greater resiliency can be achieved by constant review and analysis of the response system and focuses on three key components:

- Resistance: The ability to deploy only resources necessary to control an incident and bring it to termination safely and effectively.
- Absorption: The ability of the agency to quickly add or duplicate resources necessary to maintain service levels during heavy call volume or incidents of high resource demand.
- Restoration: The agency's ability to quickly return to a state of normalcy.

For the CPSM data analysis study period, PFD Fire and EMS units responded to 3,997 calls for service. The following tables and figure analyze PFD resiliency. In this analysis, CPSM included all calls that occurred inside and outside Pelham (to include cancelled calls). We did this because responses outside of the city (although few) and canceled calls impact the resiliency of the department to respond to calls.

The first table examines the workload in terms of runs for each station. Station 1 has the highest workload. Each station's availability to respond to calls in their first due area is examined in the second table. The lower the availability percentage the less resilient the entire station's fire management zone (district) is. Station 2 has the least resiliency. Station 5 is the most resilient.

Table 10: Station Workload (Runs) *Primary Units Highlighted*

Station	Unit	Type	Runs	Runs per Day
FD1	B90	BC	775	2.1
	Q91	Quint	1,326	3.6
	M96	Medic	931	2.6
	SO1	SOV	35	0.1
	Other	Other	2	0.0
	Total		**3,069**	**8.4**
FD2	92	Engine	997	2.7
	Other	Other	6	0.0
	Total		**1,003**	**2.7**
FD3	93	Engine	589	1.6
	BR3	Brush	24	0.1
	HZ1	Haz Mat	14	0.0
	Other	Other	3	0.0
	Total		**630**	**1.7**
FD4	94	Engine	970	2.7
	M90	Water Rescue	10	0.0
	Other	Other	6	0.0
	Total		**986**	**2.7**
FD5	95	Engine	317	0.9
	S90	Service	12	0.0
	Other	Other	3	0.0
	Total		**332**	**0.9**
Floating /Reserve	EMS2	Stand by Medic	213	0.6
	Other	Other	14	0.0
	Total		**227**	**0.6**
Total			**6,247**	**17.1**

Table 11: Station Availability to Respond to Calls

Station	Calls in Area	First Due Responded	Percent Responded	First Due Arrived	Percent Arrived	First Due First	Percent First
FD1	1,261	1,203	95.4	1,195	94.8	1,173	93.0
FD2	940	765	81.4	756	80.4	724	77.0
FD3	435	378	86.9	375	86.2	362	83.2
FD4	840	748	89.0	744	88.6	728	86.7
FD5	293	276	94.2	276	94.2	275	93.9
Total	**3,769**	**3,370**	**89.4**	**3,346**	**88.8**	**3,262**	**86.5**

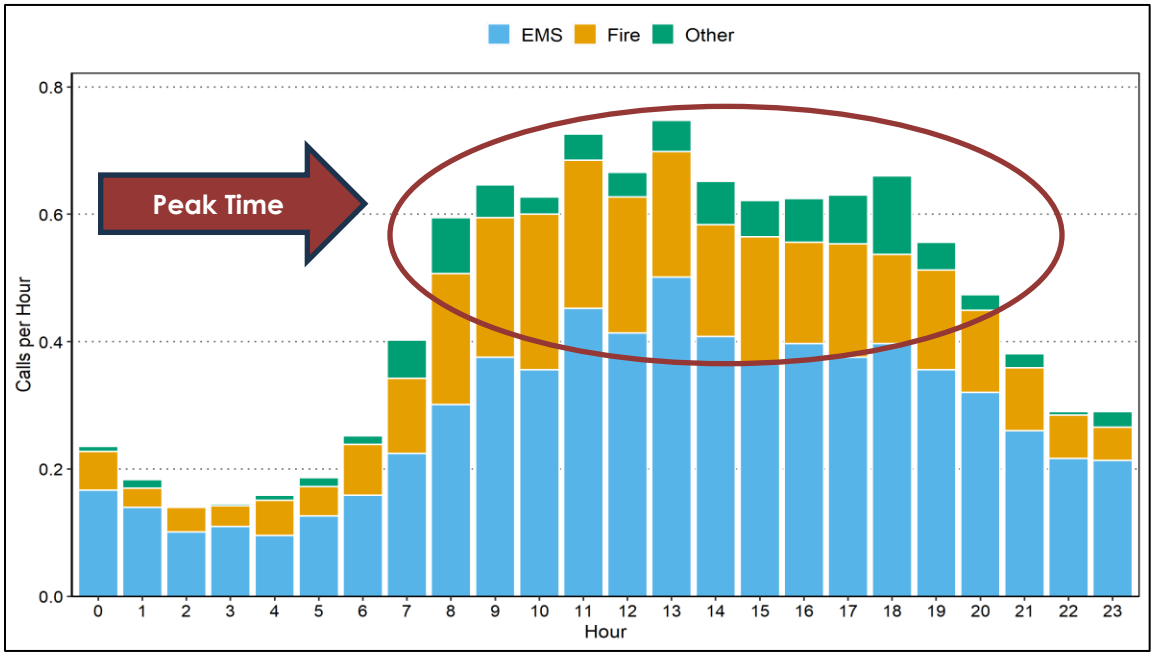
The next resiliency measure is the frequency distribution of calls, or how many calls are occurring in an hour. The next table tells us that citywide, 24 percent of the time there is one overlapping call and 9 percent of the time there are two or more concurrent or overlapping calls.

Table 12: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	5,808	66.3
1	2,132	24.3
2	650	7.4
3	141	1.6
4+	29	0.3
Total	**8,760**	**100.0**

The next figure looks at when calls are occurring over a 24-hour period. In Pelham, the peak time for calls is between the hours of 8:00 a.m. and 8:00 pm.

Figure 12: Average Calls by Hour of Day



The next table looks at frequency of overlapping calls in each fire management zone.

Table 13: Frequency of Overlapping Calls for Each Station

Station Area	Scenario	Number of Calls	Percent of All Calls
FD1	No overlapped call	1,170	92.1
	Overlapped with one call	98	7.7
	Overlapped with two calls	2	0.2
FD2	No overlapped call	849	89.1
	Overlapped with one call	90	9.4
	Overlapped with two calls	13	1.4
	Overlapped with three calls	1	0.1
FD3	No overlapped call	429	97.3
	Overlapped with one call	12	2.7
FD4	No overlapped call	802	94.6
	Overlapped with one call	46	5.4
FD5	No overlapped call	294	98.7
	Overlapped with one call	4	1.3

Stations 1 and 2 have the lowest percentage of no overlapped calls, meaning they frequently have concurrent calls. Stations 3, 4, and 5 have higher percentages of no overlapping calls meaning they have concurrent calls less frequently.

The next table looks at the duration of calls, a measure that contributes to overlapping calls in a fire management zone, particularly those that last one or more hours.

In Pelham:

- 68 percent of all calls were handled in 30 minutes or less
- 26 percent of all calls were handled in 30 minutes to one hour
- 3 percent of all calls were handled in one to two hours
- 3 percent of all calls were handled in two or more hours.

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Table 14: Calls by Type and Duration

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	Two or More Hours	Total
Breathing difficulty	125	84	1	0	210
Cardiac and stroke	187	122	2	0	311
Fall and injury	257	160	10	2	429
Illness and other	604	306	40	10	960
MVA	104	29	3	0	136
Overdose and psychiatric	103	67	2	0	172
Seizure and unconsciousness	162	112	1	0	275
EMS subtotal	**1,542**	**880**	**59**	**12**	**2,493**
False alarm	272	30	3	1	306
Good intent	62	6	0	0	68
Hazard	25	9	0	1	35
Outside fire	36	9	3	2	50
Public service	550	65	11	6	632
Structure fire	28	6	2	7	43
Technical rescue	8	1	0	0	9
Fire subtotal	**981**	**126**	**19**	**17**	**1,143**
Aid given	139	20	6	2	167
Canceled	46	2	0	0	48
Special detail	2	7	19	98	126
Total	**2,710**	**1,035**	**103**	**129**	**3,977**

The next Table examines the number of arriving units (typically dispatched to a call).

In Pelham:

- 74 percent of calls had one unit assigned.
- 18 percent of calls had two units assigned.
- 7 percent of calls had three units assigned.
- 1 percent of calls had four or more units assigned.

The PFD does not have resistance issues based on the response matrix. There are resistance issues however on EMS calls with the private ambulance provider, as there is no Emergency Medical Dispatch system in place to screen calls and dispatch the most appropriate resource for low, mid, and high acuity EMS calls. This is discussed later in this report.

Overall, 26 percent of calls involved two or more PFD units. EMS calls make up the highest percentage of two or more units responding (31 percent of all EMS calls).

Table 15: Calls by Call Type and Number of Arriving PFD Units

Call Type	Number of Units				Total Calls
	One	Two	Three	Four or More	
Breathing difficulty	100	104	5	1	210
Cardiac and stroke	203	98	10	0	311
Fall and injury	341	69	12	7	429
Illness and other	823	109	22	3	957
MVA	44	42	43	6	135
Overdose and psychiatric	118	39	13	1	171
Seizure and unconsciousness	79	101	86	8	274
EMS subtotal	**1,708**	**562**	**191**	**26**	**2,487**
False alarm	216	46	40	0	302
Good intent	58	8	0	1	67
Hazard	26	3	3	3	35
Outside fire	32	11	4	2	49
Public service	591	34	1	2	628
Structure fire	21	4	4	13	42
Technical rescue	9	0	0	0	9
Fire subtotal	**953**	**106**	**52**	**21**	**1,132**
Aid given	40	12	0	0	52
Canceled	21	2	1	0	24
Special detail	108	14	3	1	126
Total	**2,830**	**696**	**247**	**48**	**3,821**
Total Percentage	**74.1**	**18.2**	**6.5**	**1.3**	**100.0**

Overall, the PFD has moderate resiliency issues at Stations 1 and 2 in terms of workload (Station 1 data accounts for three primary units: B90, Quint 91, Medic 96). Stations 3 and 4 have moderate resiliency issues when analyzing this station's ability to arrive first in its fire management zone. ***Stations 1 and 2 have the lowest percentage of no overlapped calls, meaning they more frequently have concurrent calls.*** All stations have concurrent calls that occur although Station 5's overlapping calls are few. When call concurrency goes beyond two calls in an hour, the fire management zone may not have a resource in the district station, as no station other than Station 1 has more than two staffed primary response units.

The workload of all companies in terms of runs (calls where there are more than one unit responding) will have an effect on resiliency, as demand in Stations 1, 2, and 4 overall is higher than other stations.

The PFD's ability to absorb multiple calls and restore response capabilities to a state of normal can be challenging at certain times such as during working structural fires and other multi-company responses (runs). Stations 1, 2, and 4 should be monitored as they have the lowest percentage of no overlapped calls. Stations 2, 3, and 4 should also be monitored, as they are below the 90th percentile of arriving first in their fire management zone.

RPS EMS Resiliency

We look at EMS resiliency much the same way as we did with PFD resiliency to respond to fire and EMS calls in the city.

TABLE 16: Annual Workload by Dispatch Zone

Dispatch Zone	Annual Runs	Runs Per Day
Chilton	96	0.3
Jefferson	107	0.3
Shelby	978	2.7
Shelby/Chilton	1,182	3.2
St. Clair	23	0.1
Total	**2,386**	**6.5**

The largest percentage of RPS unit responses in Pelham originated from the Shelby or Shelby/Chilton dispatch zone.

The next resiliency measure is the frequency distribution of calls, or how many calls are occurring in an hour. The next table tells us that for RPS, 24 percent of the time there is one overlapping call and 4 percent of the time there are two or more concurrent or overlapping calls.

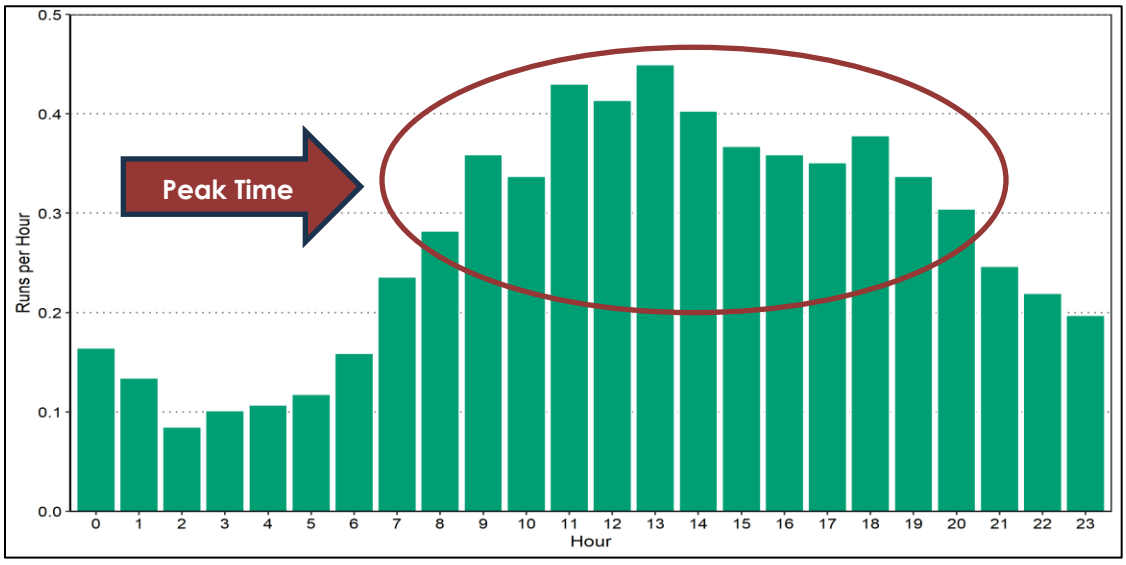
TABLE 17: Frequency of Overlapping Runs by Year

Scenario	Number of Runs	Percent of All Runs
No overlap	1,729	72.5
Overlap with one run	554	23.2
Overlap with two runs	98	4.1
Overlap with three runs	5	0.2

Runs in an Hour	Frequency	Percentage
0	6,771	77.3
1	1,631	18.6
2	320	3.7
3+	38	0.4
Total	**8,760**	**100.0**

The next figure looks at when calls are occurring over a 24-hour period. In Pelham, the peak time for calls is between the hours of 8:00 a.m. and 8:00 pm.

FIGURE 13: Average Runs by Hour of Day



The next tables analyze RPS transport resiliency. We first look at the call to transport conversion rate. This table shows that RPS converts 59 percent of calls to transport. There is only moderate resiliency with this conversion rate.

Table 18: EMS Call to Transport Conversion Rate

Run Type	Number of Runs			Conversion Rate
	Non-Transport	Transport	Total	
Breathing difficulty	85	168	253	66.4
Cardiac and stroke	106	229	335	68.4
Fall and injury	224	233	457	51.0
Illness and other	240	402	642	62.6
MVA	123	69	192	35.9
Overdose and psychiatric	69	128	197	65.0
Seizure and unconsciousness	124	186	310	60.0
Total	**971**	**1,415**	**2,386**	**59.3**

The next table examines the time components for transport once the unit arrives on scene. The Table tells us that RPS is efficient on scene. Much of this is due to the fire department first-tier response matrix where a fire unit typically arrives first on scene and begins patient assessment and patient care. Many times, the patient is ready to be packaged and transferred to RPS for transport when RPS arrives.

TABLE 19: Time Component Analysis for Transport Runs by Type (Minutes)

Run Type	Average Time Spent per Run				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	12.1	18.3	36.5	84.2	168
Cardiac and stroke	11.8	16.8	37.3	82.6	229
Fall and injury	13.1	17.8	40.3	89.3	233
Illness and other	11.6	18.6	35.8	83.0	402
MVA	10.5	16.9	32.9	73.5	69
Overdose and psychiatric	11.6	15.9	37.3	81.2	128
Seizure and unconsciousness	11.8	17.0	36.7	81.9	186
Total	**11.9**	**17.6**	**37.0**	**83.3**	**1,415**

The at-hospital times create resiliency issue (average of 37 minutes) in that it adds to the other deployed time components (on-scene and travel to hospital). When added to the RPS average response time of 18-minutes, the total deployment time for an RPS ambulance is 101 minutes or 1 hour 41 minutes. Depending on how many staffed RPS units are available, RPS has significant restoration/resiliency issues.

RPS has moderate resiliency challenges based on the number of ambulances they may have staffed at any time during a 24-hour period. This is impacted when calls overlap (24 percent of the time) and hospital off-load times (37 minutes/transport).

Automatic and Mutual Aid

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

The PFD participates in automatic and mutual aid with contiguous and surrounding municipalities. This aid is both received and reciprocated with PFD providing resources external to Pelham when needed. Aid given and received can be either emergency response of fire suppression, EMS ground transport, special or technical services, or command staff.

The following represent automatic/mutual aid Pelham partners with, and the apparatus the automatic/mutual aid departments respond to Pelham with:

- Alabaster Fire Department (Engine and Ladder company)
- Hoover Fire Department (Engine company)
- Chelsea Fire Department (Engine company)
- North Shelby Fire District (Engine company)
- Helena Fire Department (Engine company)

Figure 14: Pelham Automatic/Mutual Aid Partners

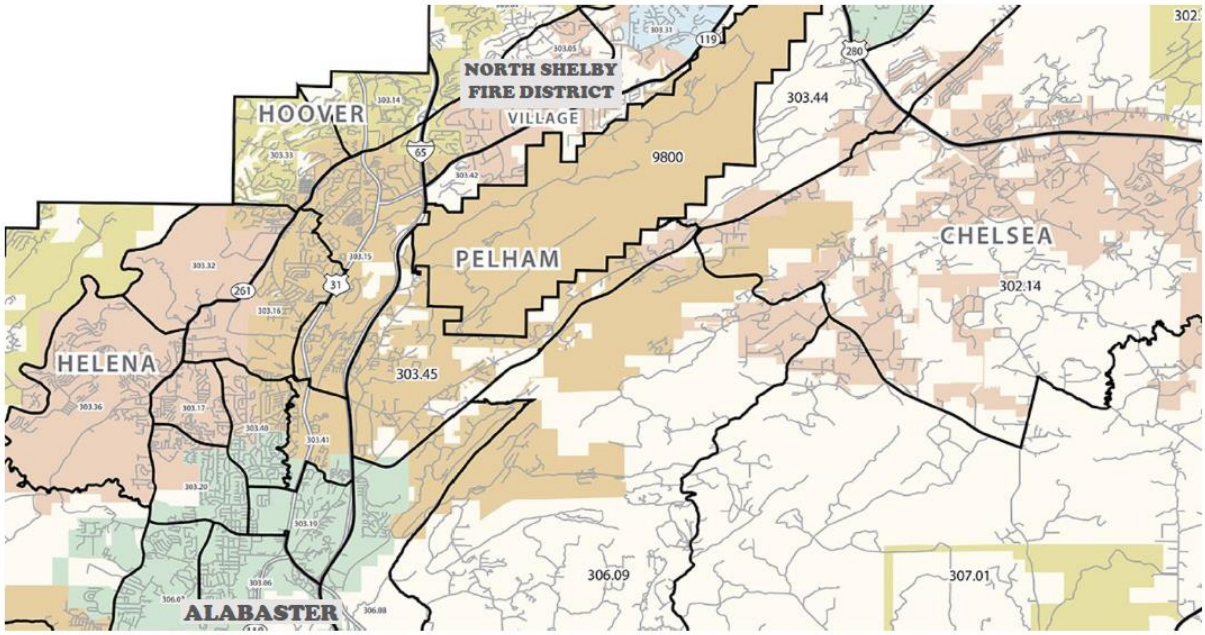
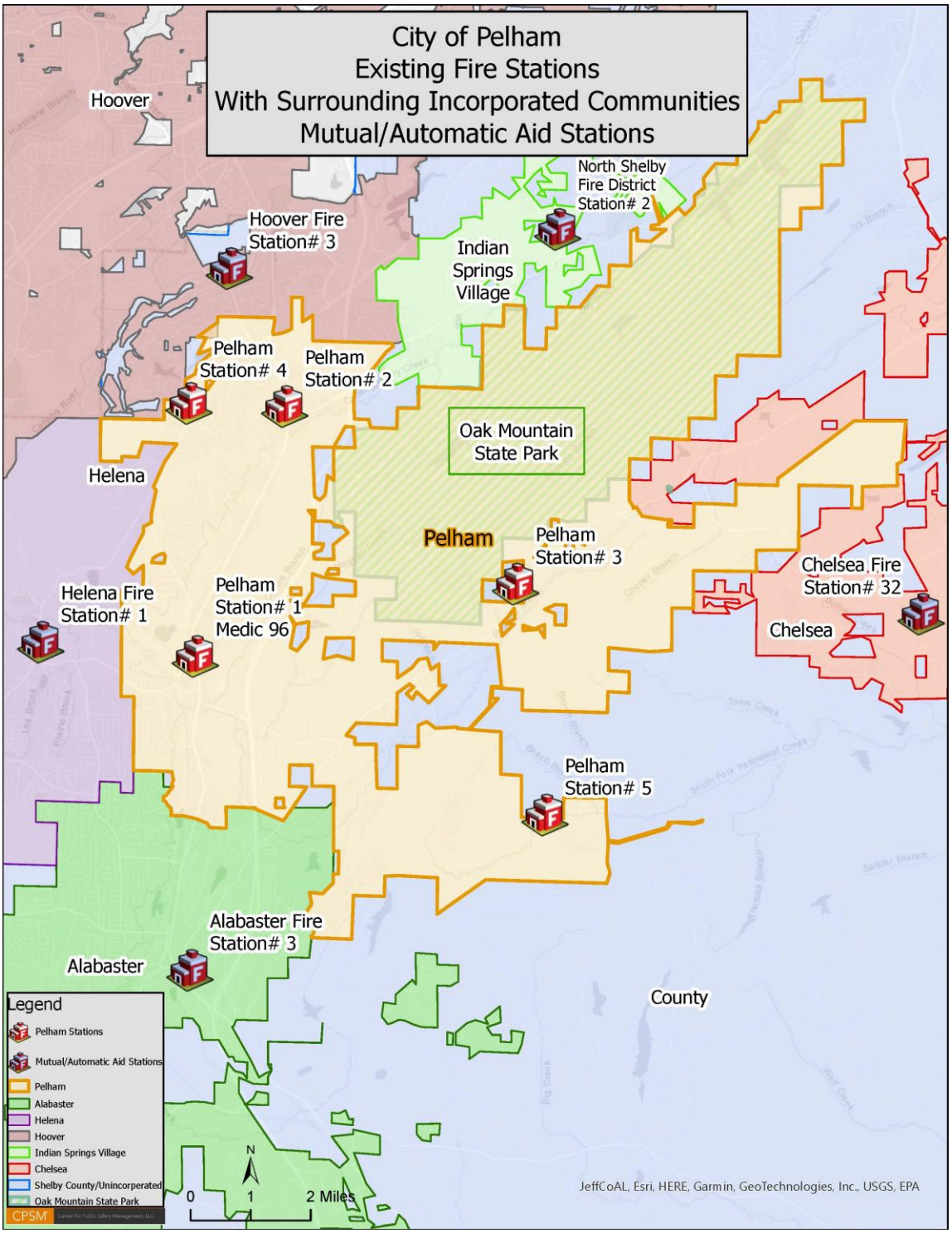


Figure 15: Pelham Automatic/Mutual Aid Station Locations



Three-Axis Risk Analysis

A comprehensive risk assessment is a critical aspect of assessing and creating a deployment analysis to meet the community's risk and can assist the PFD in quantifying the risks that it faces. Once those risks are known and understood, the department is better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned.

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

Table 20: Event Probability

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

Table 21: Impact on PFD

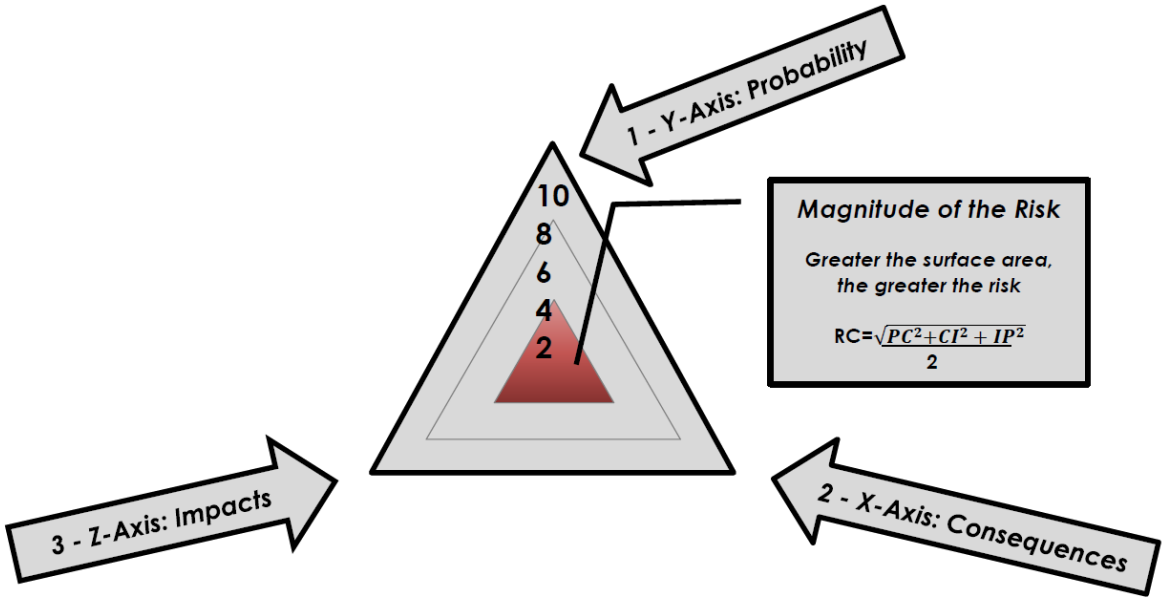
Impact	Impact Categories	Description	Risk Score
Insignificant	Personnel and Resources	One apparatus out of service for period not to exceed one hour.	**2**
Minor	Personnel and Resources	More than one but not more than two apparatus out of service for a period not to exceed one hour.	**4**
Moderate	Personnel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

Table 22: Consequence to Community Matrix

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

Prior risk analysis has only evaluated two factors of risk: probability and consequence. Contemporary risk analysis considers the impact of each risk to the fire and EMS organization, thus creating a three-axis approach to evaluating risk as depicted in the following Figure. A contemporary risk analysis now includes probability, consequences to the community, and impact on the organization, in this case the PFD. In this analysis, information presented and reviewed in this section (Community Risk Profile) has been considered. Risk is categorized as Low, Moderate, High, or Special.

Figure 16: Three-Axis Risk Calculation (RC)



The following factors/hazards were identified and considered:

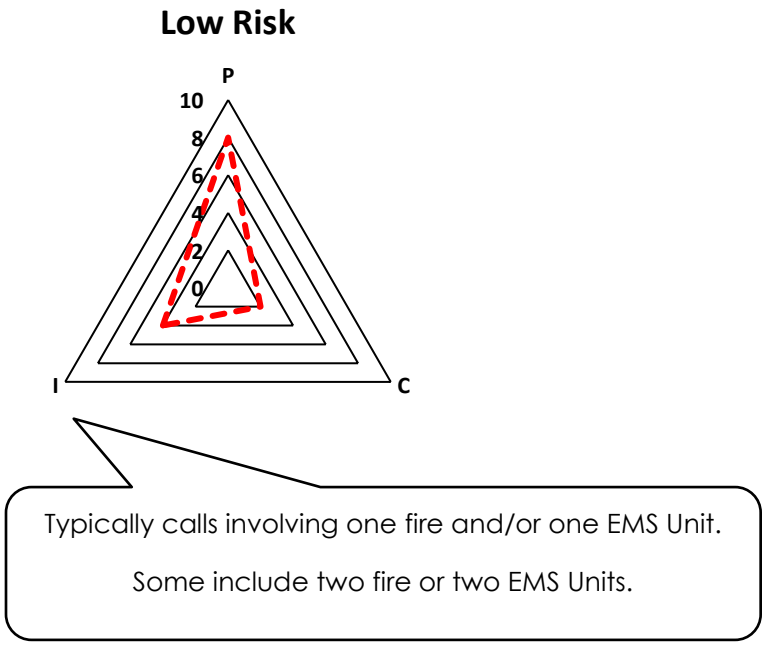
- **Demographic factors** such as age, socio-economic, vulnerability.
- **Natural hazards** such as flooding, snow and ice events, wind events, summer storms.
- **Manufactured hazards** such as transportation risks (road and rail) and target hazards.
- **Structural/building risks**.
- **Fire and EMS incident numbers and density**.
- **Resiliency.**

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

Low Risk

- Automatic fire/false alarms.
- Low-acuity BLS EMS Incidents.
- Low-risk environmental event.
- Motor vehicle accident (MVA)-no entrapment, 1-2 patients, low hazards.
- Good intent/hazard/public service fire incidents with no life-safety exposure.
- Outside fires such as grass, rubbish, dumpster, vehicle with no structural/life-safety exposure.
- Low-acuity surface water incident.

Figure 17: Low Risk



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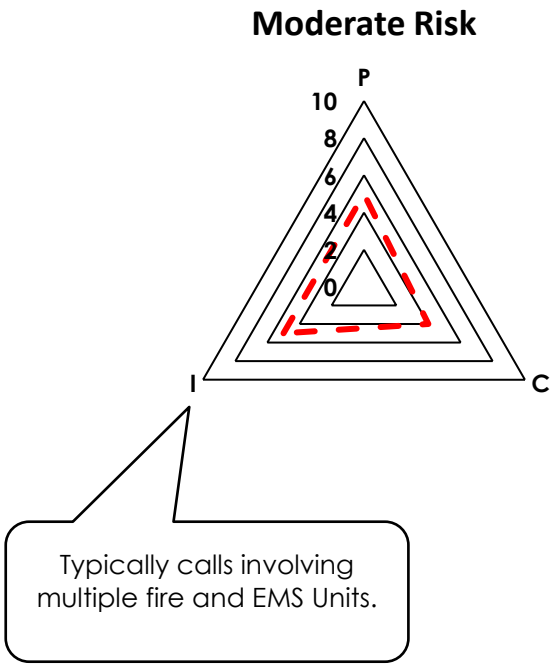
Moderate Risk

- Fire incident in a single-family dwelling where fire and smoke or smoke is visible, indicating a working fire.
- Suspicious substance investigation involving multiple fire companies and law enforcement agencies.
- ALS EMS incident.
- MVA with entrapment of passengers.
- Grass/brush fire with structural endangerment/exposure.
- Low-angle rescue involving ropes and rope rescue equipment and resources.
- Higher-acuity surface water incident.
- Good intent/hazard/public service fire incidents with life-safety exposure.
- Rail or road transportation event with no release of product or fire, and no threat to life safety

Figure 18: Moderate Risk



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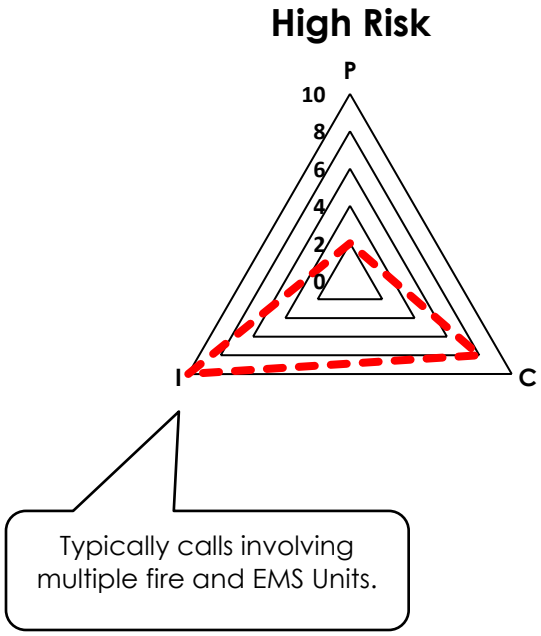
High Risk

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

Figure 19: High Risk



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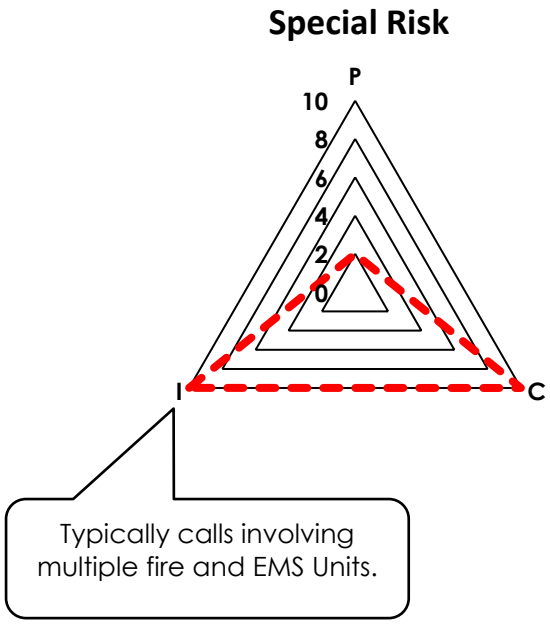
Special Risk

- Working fire in a structure of more than three floors.
- Fire at an industrial building or complex with hazardous materials.
- Fire in an occupied targeted hazard with special life-safety risks such as age, medical condition, or other identified vulnerabilities.
- Mass casualty incident of more than 25 patients.
- Rail or transportation incident that causes life-safety exposure or threatens life safety through the release of hazardous smoke or materials and evacuation of residential and business occupancies.
- Explosion in a building that causes exposure to persons or threatens life safety or outside of a building that creates exposure to occupied buildings or threatens life safety.
- Massive estuary flooding, fire in an occupied public assembly or medical institution, high-impact environmental event, pandemic.
- Mass gathering with threat fire and threat to life safety or other civil unrest, weapons of mass destruction release.

Figure 20: Special Risk



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SECTION 4. FIRE OPERATIONS ANALYSIS

Staffing and Deploying Fire and EMS Resources

When exploring staffing and deployment of fire departments it is prudent to design an operational strategy around the actual circumstances that exist in the community and the fire and risk problems that are identified. The strategic and tactical challenges presented by the varied hazards that a department protects against need to be identified and planned for through a community risk analysis planning and management process as completed in this report.

Effectively managing a fire department requires an understanding of and an ability to demonstrate how changes to resources will affect community outcomes. It is imperative that fire department leaders, as well as policy makers, know how fire department resource deployment in their local community affects community outcomes in three important areas: firefighter injury and death; civilian injury and death; and property loss. If fire department resources (both mobile and personnel) are deployed to match the risk levels inherent to hazards in the community, it has been scientifically demonstrated that the community will be far less vulnerable to negative outcomes in all three areas.[20]

Even with a thorough risk evaluation, staffing fire and EMS companies continues to remain a hotly debated topic among firefighters and governmental leadership since risk assessment models include high risk / low frequency situations. While there are situations that may be low frequency, they can and do occur and thus require operational readiness to mitigate.

While NFPA 1710 and OSHA provide guidelines as to the level of staffing and response of personnel, the acceptance of these guidelines varies from state to state and local government to local government. NFPA 1710 addresses recommended staffing in terms of four types of occupancies. The needed staffing to accomplish the critical tasks for each specific occupancy are determined to be the *Effective Response Force* (ERF). The ERF for each of these occupancies is detailed in NFPA 1710 (2020 edition), Section 5.2.4, Deployment. OSHA is specific to operating in immediately dangerous to life or health (IDLH) environments, where there is a requirement of two firefighters outside of the building or entry point to the IDLH, while there are two firefighters operating inside the building or other vessel that has an IDLH.

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

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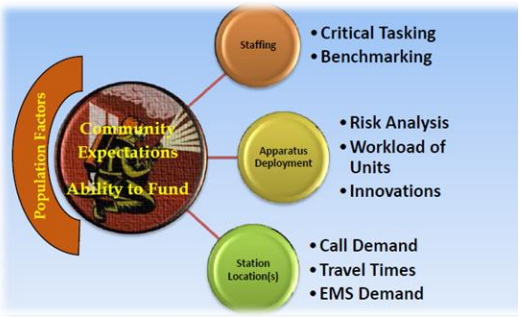
20. Fire Service Deployment, Assessing Community Vulnerability, Metropolitan Chiefs, 2011.



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

In addition to metrics, staffing is also linked to station location, what type of apparatus is responding, whether engine, ladder, or specialty piece such as a rescue company. These combined factors help to determine what level of fire and EMS service is going to be delivered in terms of workforce, response time, and resources. Linked to these components of staffing and deployment are 11 critical factors that drive various levels and models from which fire and EMS departments staff and deploy. These factors are:

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

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

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

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

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

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

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

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

Innovations in Staffing and Deployable Apparatus: The fire department's ability and willingness to develop and deploy innovative apparatus. Compressed air foam systems, deploying quick response vehicles (light vehicles equipped with medical equipment and some light fire suppression capabilities) on those calls (typically the largest percentage) that do not require heavy fire apparatus.

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

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

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

Deployable Resources

The PFD service area has a mix of industrial, commercial, public assembly, professional office buildings, multifamily and single-family residential structures, some mixed use, transportation risks, and healthcare facilities. The service area has a diverse mix of buildings ranging from new to older construction with single and/or mixed occupancy types, some with multiple stories and access issues. The built upon area is largely urban and suburban.

As discussed, the PFD responds with fire suppression apparatus with crews from five fire station locations deploying fire, rescue, and specialty units. The PFD also utilizes mutual/automatic aid from contiguous jurisdictions to assist in strategic areas of the city and to augment the assembling of an Effective Response Force. The PFD primary deployable resources include:

Engine Companies, which are primarily designed for firefighting operations, the transport of crew members, hose (fire attack and larger supply), tank water, ground ladders, self-contained breathing apparatus, and storage of an assortment of hand tools used for a broad spectrum of fire operational tasks. As engines are often utilized as first response units on EMS calls, they also carry an assortment of EMS gear to treat patients and provide life-saving measures prior to the arrival of EMS transport units. The PFD engines are set up for this as well and are staffed with advanced emergency medical technicians. Staffing complements for engine apparatus are discussed below. PFD currently responds to emergencies with an inventory of seven frontline engines.

Quint Companies, which is primarily designed for firefighting operations to offer both engine and ladder operations. A quint includes a hydraulically operated aerial ladder, fire pump, water tank, fire hose, and ground ladders. Quint apparatus transport crew members, a broad spectrum of engine company tools and equipment as well as ground ladders, self-contained breathing apparatus, various forcible entry tools, ventilation equipment, and hydraulic rescue

tools, and other equipment to deal with an assortment of fires and technical rescues. As Quints are typically the single piece of fire apparatus assigned to a station they are often utilized as first response units on EMS calls, so they carry an assortment of EMS gear to treat patients and provide life-saving measures prior to the arrival of EMS transport units. The PFD currently responds to emergencies with an inventory of four Quint apparatus. When needed, and based on current staffing levels, (three Quint apparatus have a minimum staffing of 3; two Quint apparatus have a minimum staffing of 4), the Quints may only be capable of performing either engine or ladder company functions.

Haz-Mat Company, which is primarily staffed and equipped for emergency response to incidents involving hazardous materials at fixed sites and those involving all modes of transportation. Haz-Mat personnel are trained to technician and specialist levels and specialize in controlling and mitigating hazardous material incidents.

Brush/Wildland Units, is a combination of an all-terrain vehicle, mini-pumper, and a wilderness rescue vehicle, used to fight brush and wildfires. It is sometimes also known as a brush truck. This type of vehicle is designed to assist in fighting wildfires by transporting firefighters to the scene and providing them with access to the fire, along with water or other brush/wild land firefighting equipment.

Command Vehicles, which are typically SUV-type vehicles with command centers built into the cargo compartment, are designed to carry a command level officer to the scene and equipped with radio and command boards as well scene personnel-tracking equipment and associated gear. The PFD has two operations command vehicles assigned to the shift Battalion Chiefs while on duty, and other command capable units assigned to the Fire Chief and Assistant Fire Chiefs. Operational Battalion Chiefs respond to fire and EMS incidents and establish command and control of the incident.

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

The next table outlines the PFD's minimum staffing matrix. As a note, there are twenty-four personnel assigned to each shift. Minimum staffing is eighteen as outlined in the next table, which essentially is three per heavy fire apparatus, two assigned to the EMS quick response vehicle, and one assigned Battalion Chief-shift commander. Additional staff are utilized to cover scheduled and unscheduled leave, and other shift vacancies.

There are times when not all additional staff is utilized to cover shift vacancies. When this occurs, the additional staff is assigned to field operations in the following order:

- Engine 5: due to remoteness from other responding companies.
- Quint 91: due to the dual operation of this apparatus.
- Station 3: to bolster the Haz-Mat response.

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Table 23: PFD Minimum Staffing Matrix

Station	Apparatus	Minimum Staffing
Station 1	Quint 91 Medic 96 Battalion 90	3 2 1
Station 2	Engine 92 Spec Ops 2	3 Cross Staff
Station 3	Engine 93 Haz-Mat 1 Haz-Mat Support Brush 3	3 Cross Staff Cross Staff Cross Staff
Station 4	Engine 94 Marine 90, 94 Medical Support Unit	3 Cross Staff Cross Staff
Station 5	Engine 95 Brush 5 Service 90	3 Cross Staff Cross Staff

Effective Response Force and Critical Tasking

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*, 2020 edition, outlines organization and deployment of operations by career, and primarily career fire and rescue organizations. It serves as a benchmark to measure staffing and deployment of resources to certain structures and emergencies. Questions of legal responsibilities are often discussed in terms of compliance with NFPA standards. NFPA standards are consensus standards and not the law. Many cities and counties strive to achieve these standards to the extent possible without an adverse financial impact on the community. Cities and communities must decide on the level of service and compliance they can deliver based on budgetary constraints and operational capabilities.

NFPA 1710 details staffing levels for fire departments in terms of fire, EMS, and special operation incidents. According to NFPA 1710, fire departments should base their capabilities on a formal community risk assessment, as discussed in this report, and taking into consideration:[21]

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

21. NFPA 1710, 5.2.1.1, 5.2.2.2

NFPA 1710 addresses standards for an *Effective Response Force* across several types of occupancies. An effective response force (ERF) is defined as the minimum number of firefighters and equipment that must reach a specific emergency incident location within a maximum prescribed travel [driving] time. The maximum prescribed travel time acts as one indicator of resource deployment efficiency.

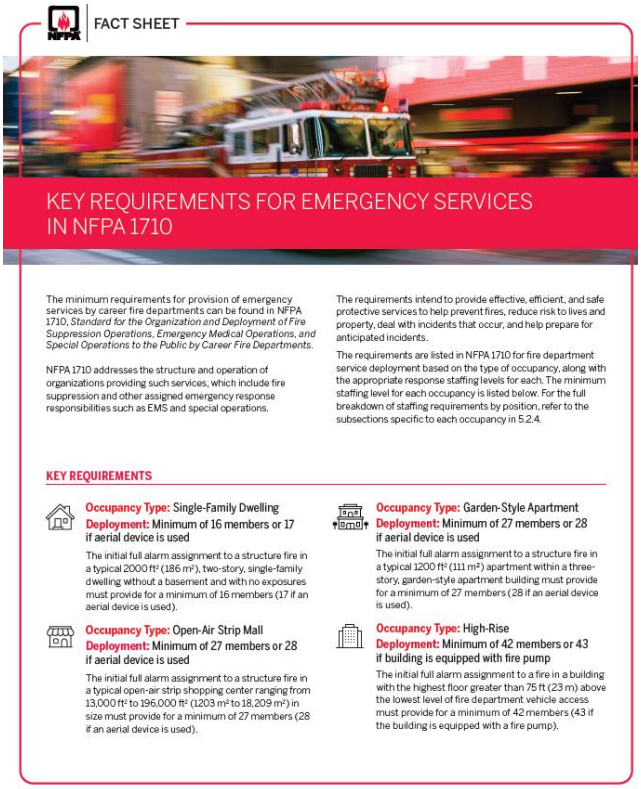
NFPA 1710 provides a staffing deployment model and critical tasking guidelines for four specific occupancies. These occupancies are:

- Single-Family Dwelling.
- Open-Air Strip Mall/Commercial Building.
- Garden Style Apartment.
- High Rise (there are no high structures in Pelham).

The Center for Public Safety Excellence (CPSE) has also established benchmarks regarding staffing and deployment. CPSE sets standards for agencies desiring accreditation through the Commission on Fire Accreditation International (CFAI). CFAI uses standards set forth in the *Quality Improvement for the Fire and Emergency Services* manual, to provide guidance in staffing and deployment to agencies desiring accreditation through Core Competencies.

Fire Critical Tasking

Both CPSE and the NFPA have defined *critical tasking*. CPSE defines critical tasking as the application of tasks assigned to the human and physical resources that are minimally required to effectively mitigate pain, suffering, and loss of life and/or property. Critical tasking is relevant to risk classifications and risk categories.[22]



FACT SHEET

KEY REQUIREMENTS FOR EMERGENCY SERVICES IN NFPA 1710

The minimum requirements for provision of emergency services by career fire departments can be found in NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.*

NFPA 1710 addresses the structure and operation of organizations providing such services, which include fire suppression and other assigned emergency response responsibilities such as EMS and special operations.

The requirements intend to provide effective, efficient, and safe protective services to help prevent fires, reduce risk to lives and property, deal with incidents that occur, and help prepare for anticipated incidents.

The requirements are listed in NFPA 1710 for fire department service deployment based on the type of occupancy, along with the appropriate response staffing levels for each. The minimum staffing level for each occupancy is listed below. For the full breakdown of staffing requirements by position, refer to the subsections specific to each occupancy in 5.2.4.

KEY REQUIREMENTS

Occupancy Type: Single-Family Dwelling
Deployment: Minimum of 16 members or 17 if aerial device is used

The initial full alarm assignment to a structure fire in a typical 2000 ft² (186 m²), two-story, single-family dwelling without a basement and with no exposures must provide for a minimum of 16 members (17 if an aerial device is used).

Occupancy Type: Open-Air Strip Mall
Deployment: Minimum of 27 members or 28 if aerial device is used

The initial full alarm assignment to a structure fire in a typical open-air strip shopping center ranging from 13,000 ft² to 196,000 ft² (1203 m² to 18,209 m²) in size must provide for a minimum of 27 members (28 if an aerial device is used).

Occupancy Type: Garden-Style Apartment
Deployment: Minimum of 27 members or 28 if aerial device is used

The initial full alarm assignment to a structure fire in a typical 1200 ft² (111 m²) apartment within a three-story, garden-style apartment building must provide for a minimum of 27 members (28 if an aerial device is used).

Occupancy Type: High-Rise
Deployment: Minimum of 42 members or 43 if building is equipped with fire pump

The initial full alarm assignment to a fire in a building with the highest floor greater than 75 ft (23 m) above the lowest level of fire department vehicle access must provide for a minimum of 42 members (43 if the building is equipped with a fire pump).

Critical tasks as defined by NFPA 1710 are those activities that must be conducted on time by responders at emergency incidents to control the situation and stop loss. Critical tasking for fire operations is the minimum number of personnel needed to perform the tasks needed to effectively control and mitigate a fire or other emergency. To be effective, critical tasking must assign enough personnel so that all identified functions can be performed simultaneously. However, it is important to note that initial response personnel may manage secondary support functions once they have completed their primary assignment. Thus, while an incident may end up requiring a greater commitment of resources or a specialized response, a properly executed critical tasking assignment will provide adequate resources to immediately begin bringing the incident under control.

22. Center for Public Safety Excellence, Quality Improvement for the Fire and Emergency Services, 2020

There are over 90 Core Competencies required for a department to achieve accreditation status as defined by CPSE. Competency 2C.4 is under the heading of Current Deployment and Performance and addresses critical tasking.

> *Criterion 2C: Current Deployment and Performance*
>
> *The agency identifies and documents the nature and magnitude of the service and deployment demands within its jurisdiction. Based on risk categorization and service impact considerations, the agency's deployment practices are consistent with jurisdictional expectations and with industry research. Efficiency and effectiveness are documented through quality response measurements that consider overall response, consistency, reliability, resiliency, and outcomes throughout all service areas. The agency develops procedures, practices, and programs to appropriately guide its resource deployment.*[23]
>
> *Core Competency 2C.4*
>
> *A critical task analysis of each category and risk class is conducted to determine the first due and effective response force capabilities, and a process is in place to validate and document the results. Core competency 2C.4 requires that the agency conduct a critical task analysis of each risk category and risk class to determine the first-due and effective response force capabilities, and to have a process in place to validate and document the results. The process considers the number of personnel needed to perform the necessary emergency scene operations. Completion of the process also helps to identify any gaps in the agency's emergency scene practices.*

The specific number of people required to perform all the critical tasks associated with an identified risk or incident type is referred to as an Effective Response Force (ERF). The goal is to deliver an ERF within a prescribed period.

The PFD has a response matrix for structure fires that includes:

- Battalion Chief 1 staff
- Engines: 3 9 staff (assumption is minimum staffing)
- Quint 3 staff (assumption is minimum staffing)
- Medic 96 2 staff
- Service 90 3 staff (assumption is all personnel respond-E5 responds if in 5's district)

Building the Effective Response Force

The following discussion and tables will outline how critical tasking and assembling an effective response force is first measured in NFPA 1710, and how the PFD is benchmarked against this standard for the building types existing in Pelham. This discussion will cover single-family dwelling buildings, open-air strip mall buildings, apartment buildings, and high-rise buildings as outlined in the NFPA standard.

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23. Center for Public Safety Excellence, Quality Improvement for the Fire and Emergency Services, 2020

Single-Family Dwelling: NFPA 1710, 5.2.4.1

The initial full alarm assignment (ERF) to a structural fire in a typical 2,000 square-foot, two-story, single-family dwelling without a basement and with no exposures must provide for a minimum of 16 members (17 if an aerial device is used). The next table outlines the critical task matrix. Single family dwellings represent the majority of building risk in Pelham.

Table 24: Effective Response Force for Single-Family Dwelling Building

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

Note: Single-family dwellings in Pelham greater than 3,000 square feet with a basement should be considered a more moderate risk, particularly if built with lightweight wood-frame construction.

The next table outlines how the PFD assembles staffing and deployable resources as measured against NFPA 1710 benchmarking for an effective response force for a single-family dwelling fire.

Table 25: PFD Effective Response Force for Single-Family Dwelling Building

Apparatus	Personnel
PFD Battalion Chief	1
PFD Engine	3
PFD Engine	3
PFD Engine	3
PFD Quint	3
Service 90 if not Station 5's district	3*
Medic 90	2
Total PFD Effective Response Force	**18**

*If the incident is in Station 5's district, an additional engine is dispatched to maintain the 4 engine (staff) and Quint response matrix.

As a single responding agency, the PFD meets the minimum benchmarks of NFPA 1710 for an effective response force for a single-family dwelling fire. NFPA 1710 permits fire departments to use established automatic/mutual aid agreements to comply with section 5.2 of this standard as well, and the PFD utilizes aid when necessary.

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Open-Air Strip Mall/Commercial Building, NFPA 5.4.2

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

Table 26: Effective Response Force for Open-Air Strip Mall/Commercial Building

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

The next table outlines how the PFD assembles staffing and deployable resources as measured against NFPA 1710 benchmarking for an effective response force for an open-air strip mall and commercial building fires.

Table 27: PFD Effective Response Force for Open-Air Strip Mall/Commercial Building

Apparatus	Personnel
PFD Battalion Chief	1
PFD Engine	3
PFD Engine	3
PFD Engine	3
PFD Quint	3
Service 90 if not Station 5's district	3*
Medic 90	2
Total PFD Effective Response Force	**18**

*Engine/Truck 1 is staffed with 4; Truck 5 is staffed with 4; Battalion 1 is staffed with 2

The PFD does not meet the minimum benchmarks of NFPA 1710 for an effective response force for an open-air strip mall/commercial building, however the PFD response can effectively begin the critical tasks assignments with the initial alarm assignment and does rely on automatic mutual aid to complete the critical tasking assignments on their arrival. NFPA 1710 permits fire departments to use established automatic aid and mutual aid agreements to comply with section 5.2 of this standard as well, and the PFD utilizes aid when necessary.

Apartment Building, NFPA 1710, 5.2.4.3

The initial full alarm assignment (ERF) to a structural fire in a typical 1,200 square-foot apartment within a three-story, garden-style apartment building must provide for a minimum effective response force (ERF) of 27 members (28 if an aerial device is used).

The next table outlines the critical tasking matrix for this type of building fire.

Table 28: Effective Response Force for Apartment Building

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

The next table outlines how the PFD assembles staffing and deployable resources as measured against NFPA 1710 benchmarking for an effective response force for an apartment building or other multi-unit housing type building fire.

Table 29: PFD Effective Response Force for Apartment Building Fire

Apparatus	Personnel
PFD Battalion Chief	1
PFD Engine	3
PFD Engine	3
PFD Engine	3
PFD Quint	3
Service 90 if not Station 5's district	3*
Medic 90	2
Total PFD Effective Response Force	**18**

The PFD does not meet the minimum benchmarks of NFPA 1710 for an effective response force for an open-air strip mall/commercial building, however the PFD response can effectively begin the critical tasks assignments with the initial alarm assignment and does rely on automatic mutual aid to complete the critical tasking assignments on their arrival. NFPA 1710 permits fire departments to use established automatic aid and mutual aid agreements to comply with section 5.2 of this standard as well, and the PFD utilizes aid when necessary.

CPSM evaluated the PFD's current deployment of apparatus and staffing as it compares to national standards (NFPA 1710 and ISO-PPC). The ISO-PPC credit for engine companies meets the number required for the city, fire flow, and equipment as the PFD received 6.00/6.00 credits for engines. Because the engines are positioned in proximity (1.5 miles) of the highest density of built upon land (currently), credit deficiency was not excessive in the overall deployment analysis.

The ISO-PPC credit for ladder apparatus is 1.58/4.00. The city is deficient in this score, even with additional ladder service through automatic/mutual aid. The ISO-PPC contemplates *the number of response areas within the city with 5 buildings that are 3 or more stories or 35 feet or more in height, or with 5 buildings that have a Needed Fire Flow greater than 3,500 gpm, or any combination of these criteria.*[24] The PFD deploys one Quint apparatus (ladder truck) as a single housed fire apparatus unit in Station 91. While Quint apparatus is efficient in that a department can deploy an aerial truck with a fire pump, water tank, and hose, unless this apparatus is staffed with a minimum of four or five, when it arrives first or even sometimes second on a building fire the officer has flexibility as to what function the apparatus and crew will initially and sometimes continually operate as.

When a Quint apparatus is deployed with a staffing of three, a choice must be made as to what function (engine or ladder) this apparatus will function as. The driver/operator can effectively operate the fire pump or the aerial device but not both safely and effectively as they are separated by distance and apparatus location. The officer and jump seat firefighter deploy as a team of two to either engage engine company functions by stretching a hose line, or a truck company to complete ventilation, search and rescue, or other truck company critical tasking.

An additional firefighter (staffing of four) allows for a pump operator and aerial operator, and a team of two for assigned critical tasking either as an engine crew or truck crew, or other configurations deemed appropriate and safe, working in two teams of two.

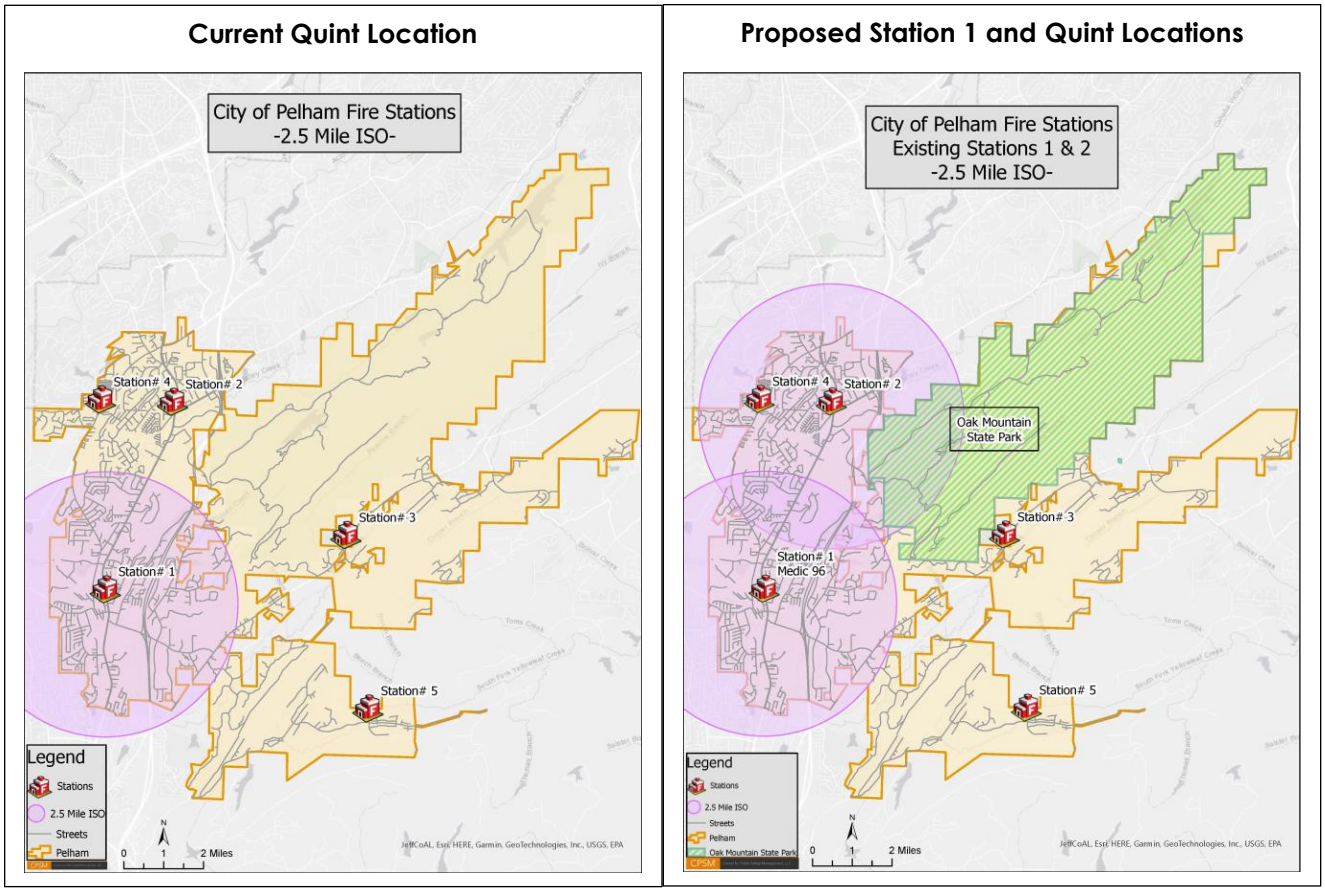
Recommendation:

The PFD and City should consider a staffing of four on Quint 91 so that the apparatus can function as designed (engine and ladder simultaneously when needed). A staffing configuration will allow for a pump operator and aerial operator, and a team of two for assigned critical tasking either as an engine crew or truck crew, or other configurations deemed appropriate and safe, working in two teams of two. This additional staffing has two alternatives. Alternative 1: utilize existing staffing and assign one of the additional personnel on each shift to Quint 91. This will reduce the additional personnel to cover scheduled and unscheduled leave from six to five and may increase overtime. Alternative 2: add three FTEs to the PFD and assign these FTEs to Quint 91. Each alternative has a cost. Considering salary + benefits for a single firefighter, reducing the additional personnel on each shift potentially is less expensive in totality across the three shifts.

The next step for the PFD is to consider and strategically plan for, over the mid-term, is to locate an additional Quint apparatus in the northern and high demand/density area of the city (Station 2). The next figures illustrate the Station 2 location and how this will be most beneficial for ladder apparatus coverage when benchmarked against the ISO-PPC.

24. Public Protection Classification Summary Report, Pelham, Al.

Figure 21: Current and Proposed Quint Apparatus: Station 2 with ISO-PPC 2.5 Mile Benchmark



Recommendation:

CPSM recommends the City and the PFD, over the mid-term, consider locating an additional Quint apparatus in the northern and high demand/density area of the city (Station 2). A Quint apparatus located in this area of the city would be most beneficial when contemplating the fire protective services of existing building risks and planned mixed use, commercial, and industrial growth. Also, an additional ladder apparatus will improve deficiencies in the current Insurance Services Office Public Protection Classification analysis as outlined in this report. Immediate staffing for this apparatus is already in place, as staffing will transfer from the existing engine at Station 2 to the Quint apparatus. This apparatus will function as the current Quint 91 (engine or ladder). CPSM further recommends the City and PFD consider a staffing of four on this Quint, so that the apparatus can function as designed (engine and ladder simultaneously when needed). Alternatives for the addition of one extra person per shift are: Alternative 1: utilize existing staffing and assign one of the additional personnel on each shift to this Quint apparatus. This will reduce the additional personnel to cover scheduled and unscheduled leave from five to four and likely will increase overtime (five to four if this alternative is utilized to upstaff Quint 91). Alternative 2: add three FTEs to the PFD and assign these FTEs to this Quint. As in the previous recommendation, each alternative has a cost.

SECTION 5. PFD FACILITY AND RESPONSE TIME ANALYSIS

Sound community fire-rescue protection requires the strategic distribution of an adequate number of station facilities to ensure that effective service area coverage is achieved, that predicted response travel times satisfy prevailing community goals and national best practices, and that the facilities are capable of supporting mission-critical personnel and vehicle-oriented requirements and needs.

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

Fire department facilities are exposed to some of the most intense and demanding uses of any public local government facility, as they are occupied 24 hours a day. Personnel-oriented needs in fire facilities must enable performance of daily duties in support of response operations. For personnel, fire facilities must have provisions for vehicle maintenance and repair; storage areas for essential equipment and supplies; and space and amenities for administrative work, training, physical fitness, laundering, meal preparation, and personal hygiene/comfort.

As discussed, the PFD responds from four fire facilities. Fire administration is located in Station 1 and includes fire administration and associated programs. The office of the Fire Marshal is located at Station 3.

CPSM visited each fire facility for the purpose of evaluating use of space, operational functionality, and if contemporary fire and EMS service best practices are in place such as carbon monoxide vehicle exhaust capture systems, decontamination areas, separated sleeping areas, ergonomics, and separation of living and employee fitness space from vehicle and storage space.

The following table describes each fire facility related to operational use and functionality.

Table 30: PFD Station Facilities

Station 1: 3162 Pelham Pkwy. **Year Built: 1996** **Square Feet: 7,296** **Bays: 3** 	**General Comments** ▪ Limited office space. ▪ Gender separation-bunkrooms. ▪ No gender separation- bathrooms/showers. ▪ Fitness area-apparatus floor. ▪ PPE storage-in fixed lockers-limited ventilation. Cage system coming. ▪ No decon area. ▪ Vehicle CO capture system. ▪ Living space separated from fleet area. ▪ Adequate day room/dining/kitchen areas. ▪ Limited training area. ▪ Lack of storage. ▪ PPE extractor/dryer. ▪ Station wear washer/dryer.

Station 2: 2298 Pelham Pkwy. **Year Built: 1979** **Square Feet: 4,800 Bays: 2** 	**General Comments** ▪ Under renovation at time of site visit: Water damage/mold. ▪ No gender separation-bunkrooms. ▪ No gender separation-bathrooms. ▪ Fitness area-apparatus floor. ▪ Wood lockers for PPE storage-no air flow. Adding cages as part of renovation. ▪ No decon area. ▪ Vehicle CO capture system. ▪ Living space separated from fleet area. ▪ Adequate day room/office/dining/kitchen areas. ▪ Limited storage. ▪ PPE extractor/dryer. ▪ Station wear washer/dryer.
Station 3: 5962 County Rd. 11 **Year Built: 2022** **Square Feet: 13,500 Bays: 4** 	**General Comments** ▪ Gender separate bunkrooms. ▪ Gender separate bathrooms. ▪ Fitness area-separate room, climate controlled. ▪ Gear racks in separate room-good air flow. ▪ Decon area. ▪ Vehicle CO capture system. ▪ Living space separated from fleet area. ▪ Adequate day room/office/dining/kitchen areas. ▪ Adequate storage. ▪ PPE Extractor. ▪ Station wear washer/dryer. ▪ Smoke Detectors throughout.
Station 4: 100 N. Chandalar Dr. **Year Built: 1989** **Square Feet: 3,900 Bays: 2** 	**General Comments** ▪ Modified gender separation-bunkroom. ▪ No gender separated bathrooms. ▪ Fitness area-apparatus floor. ▪ Gear racks in apparatus bay-moderate air flow. ▪ No decon area. ▪ Vehicle CO capture system. ▪ Living space separated from fleet area. ▪ Adequate day room/office/dining/kitchen areas. ▪ Limited storage. ▪ Station wear washer/dryer. ▪ Station has been renovated.

Station 5: 1601 Ballantrae Club Dr. Year Built: 2005 Square Feet: 5,680 Bays: 2 	**General Comments** ▪ Modified gender separated bunkrooms. ▪ Gender separated bathrooms. ▪ Fitness area-apparatus bay. ▪ PPE cages in apparatus bay-good air flow. ▪ No decon area. ▪ Vehicle CO capture system. ▪ Living space separated from fleet area. ▪ Adequate day room/dining/kitchen areas. ▪ Limited storage. ▪ Station wear washer/dryer. ▪ Smoke Detectors. ▪ Bathrooms undergoing renovation. ▪ HVAC life-cycle replacement scheduled.

In addition to the general comments for each facility, during our facility review we noted:

- Some stations have smoke detectors; none have carbon monoxide detectors (that were noted by CPSM).
- The PFD has and continues to renovate facilities that have a focus on improving the living spaces in each fire station, and the health and safety of staff.

Decisions on replacing facilities (those not recommended to be re-located) are better made by an engineer who specializes in facility assessments to include mechanical systems and structural components. In general however, a building goes through a life cycle that includes general maintenance/repair and some mechanical component replacement in the first 16 years of facility life; the next phase in the building life cycle (age 17-29) goes beyond the general maintenance and repair and includes larger replacement items such as roofs and HVAC systems, windows, apparatus aprons, exterior finish upgrades, obsolete electrical components, and major living space renovation due to expansion of services; the next phase (age 30-49) include replacement of building components that were replaced in earlier years (1-16), interior and exterior renovations, and continuation of replacement of mechanical system components (plumbing, electrical, HVAC). Facilities that remain active after 50 years of age, while still functional, will continue to need regular maintenance and repair, continued cosmetic updating, and replacement of mechanical and structural components that were replaced in previous life cycle segment years.[25]

The four PFD fire facilities range in age from 1979-2022 and fall into a building life cycle range as follows:

Age 10-16 years: 1- Station 3 which opened in 2022.

Age 17-29 years: 3- Station 1 (1996), Station 4 (1989), and Station 5 (2005).

Age 30-49 years: 1- Station 2 (1979)

Age 50+: None

25. What happens over the life of a building, Albrice, 2010.

Three of the five stations fall into the 17-29 year life cycle range. One station falls into the 10-16 year life cycle, and one station falls into the 30-49 year life cycle. The PFD has two facilities that have moderate-considerable age (Stations 1 and 4), and one that has considerable age (Station 2). Therefore, the city and PFD should continue to plan and budget for major renovations (interior and exterior) and maintenance as described above and/or facility replacement.

When siting fire stations for the most efficient response, several factors must be considered. These include the road network the assigned apparatus will use to serve the response district the station is built to serve, which directly ties to response travel time. Travel time is key to understanding how fire and EMS station location influences a community's aggregate response time performance. NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*, establishes benchmark travel times for first arriving fire units as:

- ≤ 240 seconds for the first arriving engine company to a fire suppression incident 90 percent of the time.
- ≤ 240 seconds for the first arriving engine company to an EMS incident with automated external defibrillator (AED) or higher level capability.

The location of responding units is one key factor in response time; reducing response times, which is typically a key performance measure in determining the efficiency of department operations, often depends on this factor. The goal of placement of a single fire station or creating a network of responding fire stations in a single community is to optimize coverage with short travel distances, when possible, while giving special attention to natural and manufactured barriers, and response routes that can create response-time problems.[26]

An additional benchmark, and as discussed previously, is the ISO Public Protection Classification rating system. Under this system, one element a jurisdiction is graded on is the distribution within built-upon areas of engine companies and ladder companies (deployment analysis). For full credit in the Fire Suppression Rating Schedule (FSRS), a jurisdiction's fire protection area with residential and commercial properties should have a first-due engine company within 1.5 road miles and a ladder service company within 2.5 road miles.[27] As engine and ladder companies both respond from fire facilities, and because engine companies are the more prevalent fire suppression company, fire facilities are predictably sited based on the response needs of engine companies. PFD engine and ladder company ISO benchmarks are illustrated in the next figure. As reviewed previously, these two maps tell us there are deficiencies in both the engine and ladder company deployment to built upon land.

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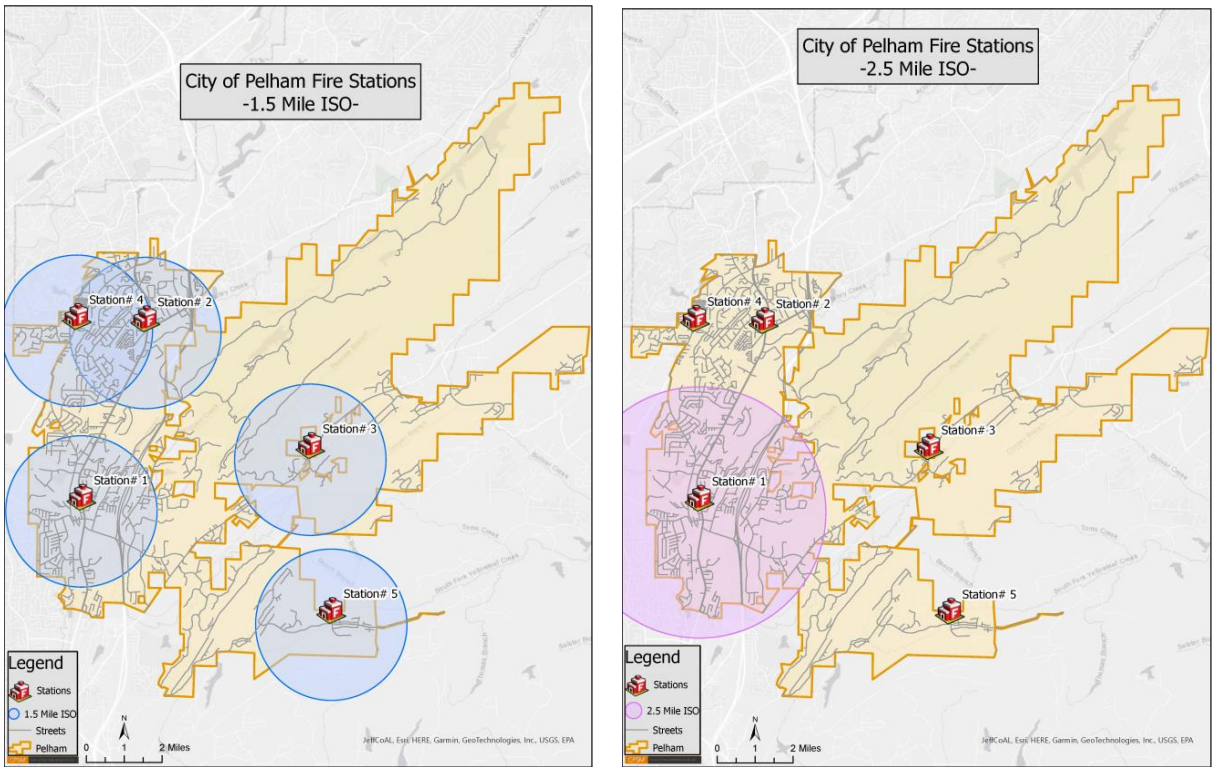
26. NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2020 Edition.
27. Insurance Services Office, ISO Mitigation, Deployment Analysis.

Figure 22: ISO Engine and Ladder Benchmark-PFD



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

To review, the maps in the next figure illustrate fire and EMS demand. In each, demand is most concentrated in the Stations 1, 2, and 4 districts. Because of the demand, current zoning, potential growth, moderate resiliency, and in some cases extended travel times in these areas, this is where CPSM concentrated analysis of potential future fire facility sites.

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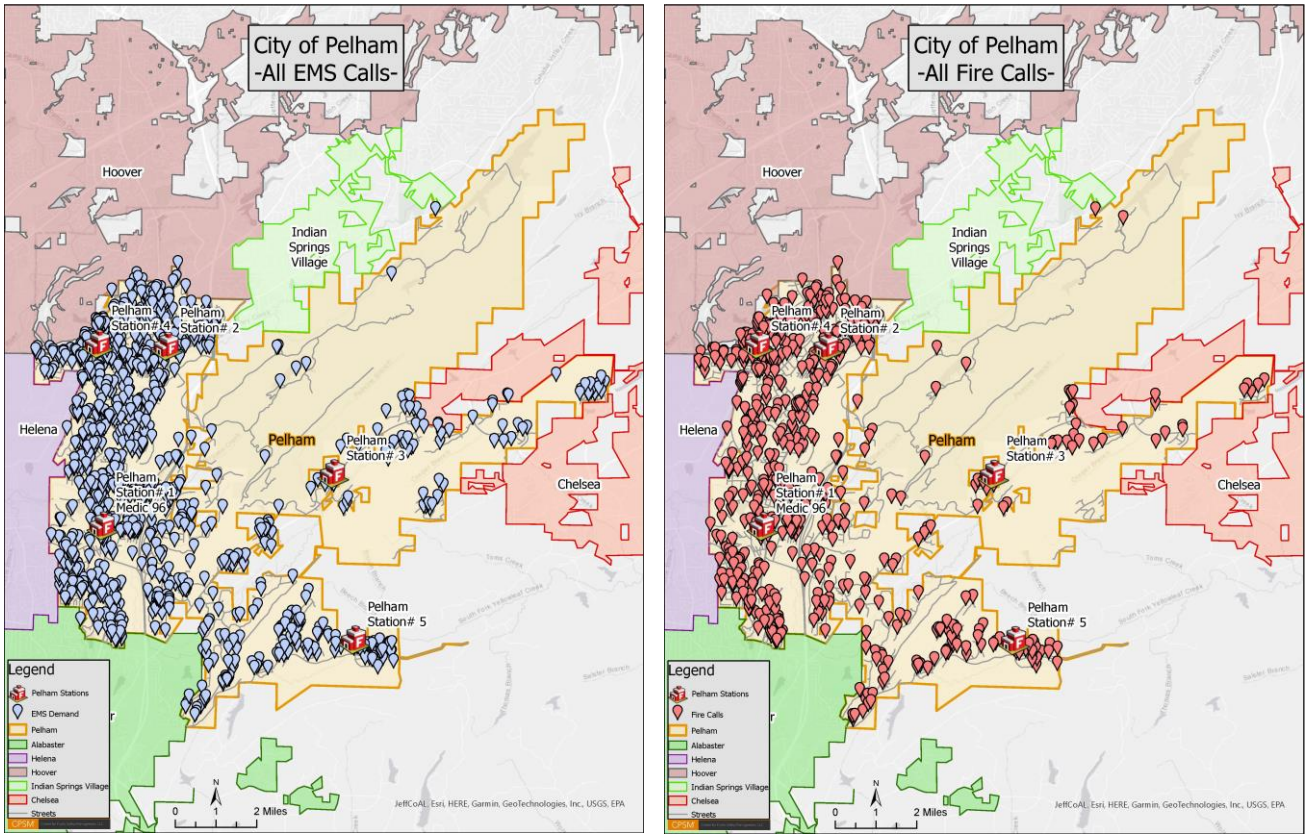
Figure 23: Fire and EMS Demand



Next, we review the PFD response times. As the PFD is a career agency, the benchmarked standard for response times is NFPA 1710. This is a practical application in the suburban and urban areas of service. However, and as indicated above, because the PFD also serves low density suburban areas, using the 1710 standard for response travel is not practical in all districts or parts of some districts that are outside of the densified urban/suburban areas. In these areas (Stations 3 and 5), it is more practical to utilize travel times of 6-minutes for structural fires and EMS calls.

The next table analyzes the average and 90th percentile dispatch, turnout, travel, and total response times for calls, broken out by district (Stations 1 to 5). As a note, the 90th percentile is the standard utilized by NFPA for predominantly career departments.

At the 90th percentile overall, the PFD's travel time in 6.7 minutes (all districts-all calls) and 6.3 minutes for structural fires. In the less densified fire districts with large coverage areas (Stations 3 and 5), the 90th percentile travel time is 12.1 for Station 3 and 7.1 minutes for Station 5 (all calls). This is depicted in the next table. Because of this dichotomy in response travel times, CPSM will also illustrate GIS analysis of facility locations at the 4 and 6 minute times.

Table 31: Average and 90th Percentile Response Time by First Due Area (minutes)

Station Area	Average Response Time				90th Percentile Response Time				Call Count
	Dispatch	Turnout	Travel	Total	Dispatch	Turnout	Travel	Total	
FD1	1.4	1.4	3.5	6.2	2.2	2.1	5.4	8.4	807
FD2	1.5	1.3	3.8	6.6	2.4	1.9	6.2	9.4	582
FD3	1.4	1.4	6.0	8.8	2.3	2.1	12.1	14.7	283
FD4	1.4	1.3	3.2	5.9	2.1	2.0	5.0	8.2	561
FD5	1.4	1.6	4.3	7.3	2.0	2.4	7.1	10.1	183
Total	**1.4**	**1.4**	**3.8**	**6.6**	**2.2**	**2.1**	**6.5**	**9.5**	**2,416**

The next two tables break out average and 90th percentile by call types.

Table 32: Average Response Time of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch	Turnout	Travel	Total	Call Count
Breathing difficulty	1.3	1.4	3.9	6.6	193
Cardiac and stroke	1.2	1.4	3.6	6.2	276
Fall and injury	1.3	1.4	4.2	6.9	384
Illness and other	1.4	1.4	3.9	6.7	679
MVA	2.3	1.2	3.1	6.6	117
Overdose and psychiatric	1.3	1.4	3.7	6.5	152
Seizure and unconsciousness	1.3	1.2	3.7	6.2	251
EMS subtotal	**1.4**	**1.4**	**3.8**	**6.6**	**2,052**
False alarm	1.5	1.3	4.0	6.8	249
Hazard	1.4	1.6	4.1	7.1	28
Outside fire	1.5	1.4	4.3	7.1	41
Structure fire	1.6	1.4	3.6	6.6	37
Technical rescue	1.4	1.4	4.4	7.1	9
Fire subtotal	**1.5**	**1.3**	**4.0**	**6.9**	**364**
Total	**1.4**	**1.4**	**3.8**	**6.6**	**2,416**

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Table 33: 90th Percentile Response Time of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch	Turnout	Travel	Total	Call Count
Breathing difficulty	1.9	2.2	6.5	9.7	193
Cardiac and stroke	1.9	2.2	5.6	8.6	276
Fall and injury	2.1	2.1	7.5	10.1	384
Illness and other	2.2	2.1	6.8	9.5	678
MVA	3.4	1.8	4.8	9.6	117
Overdose and psychiatric	2.2	2.1	5.9	9.5	152
Seizure and unconsciousness	1.9	1.9	5.9	8.8	251
EMS subtotal	**2.2**	**2.1**	**6.4**	**9.4**	**2,051**
False alarm	2.3	1.9	6.7	9.8	250
Hazard	2.5	2.6	7.2	10.3	28
Outside fire	2.5	1.7	6.7	9.8	41
Structure fire	2.5	2.4	6.3	9.9	37
Technical rescue	2.1	2.0	19.9	23.5	9
Fire subtotal	**2.4**	**2.0**	**6.7**	**10.0**	**365**
Total	**2.2**	**2.1**	**6.5**	**9.5**	**2,416**

In review of the above tables:

- The 90th percentile dispatch time (alarm handling) was 2.2 minutes (132 seconds).
  - The NFPA 1710 dispatch time or call processing time standard is 64-seconds 90 percent of the time and not more than 106-seconds 95 percent of the time. For special calls, the dispatch time or call processing is 90-seconds 90 percent of the time and not more than 120-seconds 95 percent of the time. The greatest majority of PFD calls for service are outside of the special call type.
- The 90th percentile turnout time was 2.1 minutes (126 seconds).
  - The NFPA turnout time is 60-seconds for EMS response and 80-seconds for fire and special call responses.
- The 90th percentile overall travel time was 6.5 minutes.
- The 90th percentile overall EMS travel time was 6.6 minutes.
- The 90th percentile overall structure fire travel time was 6.3 minutes.

The NFPA 1710 travel time standard is 240 seconds or 4-minutes.

The next figures analyze the PFD' s current facility locations and travel times, and facility locations that may be considered in to improve response time in areas of the city that have elevated concentration of calls and extended travel times. This analysis includes 4, and 6 minute response times.

We start with the base NFPA 1710 4-minute (240 seconds) travel time analysis of current facility locations. At the 4-minute travel time benchmark, large areas of each district are not covered by existing stations.

Figure 24: Current PFD Facilities 4-Minute Travel Times

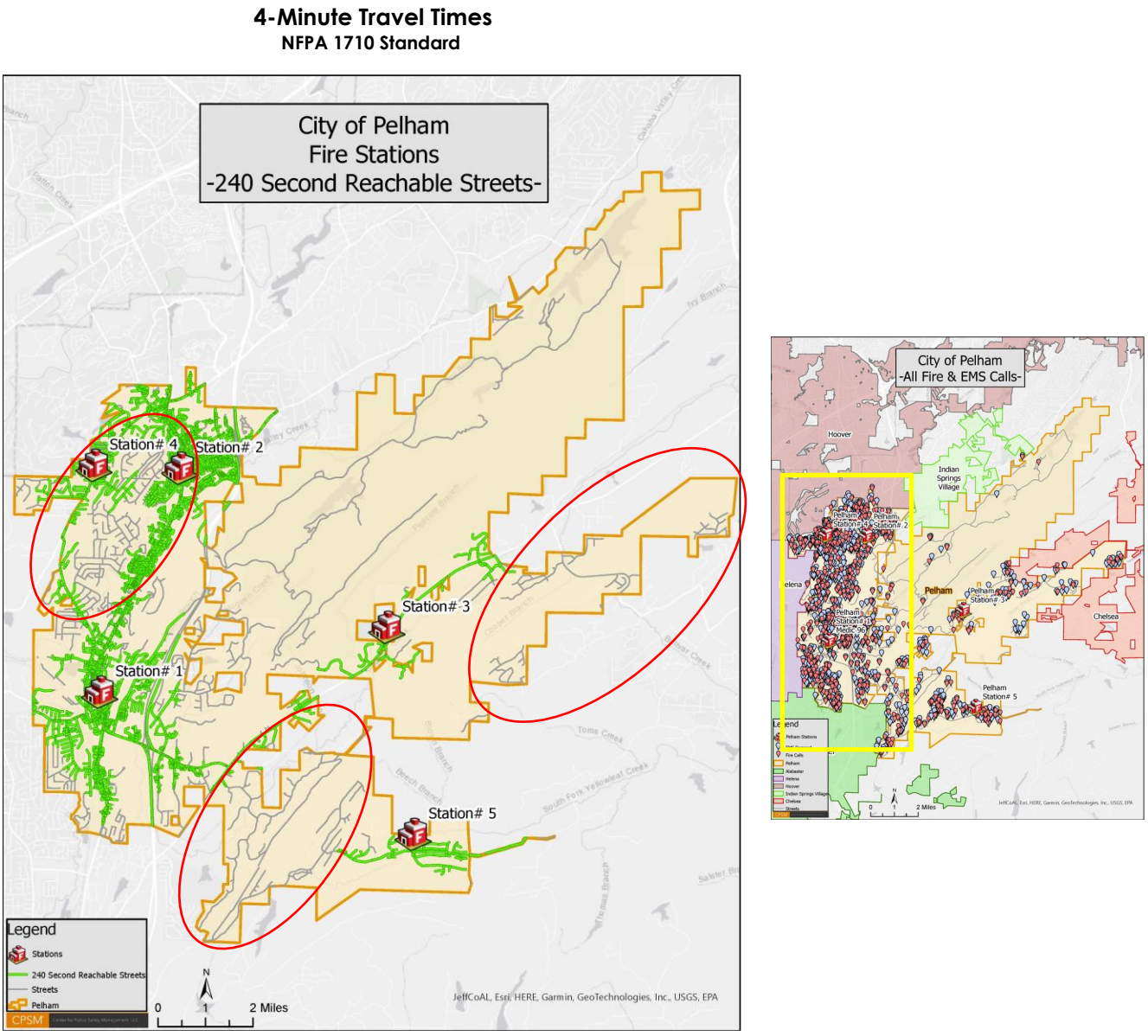

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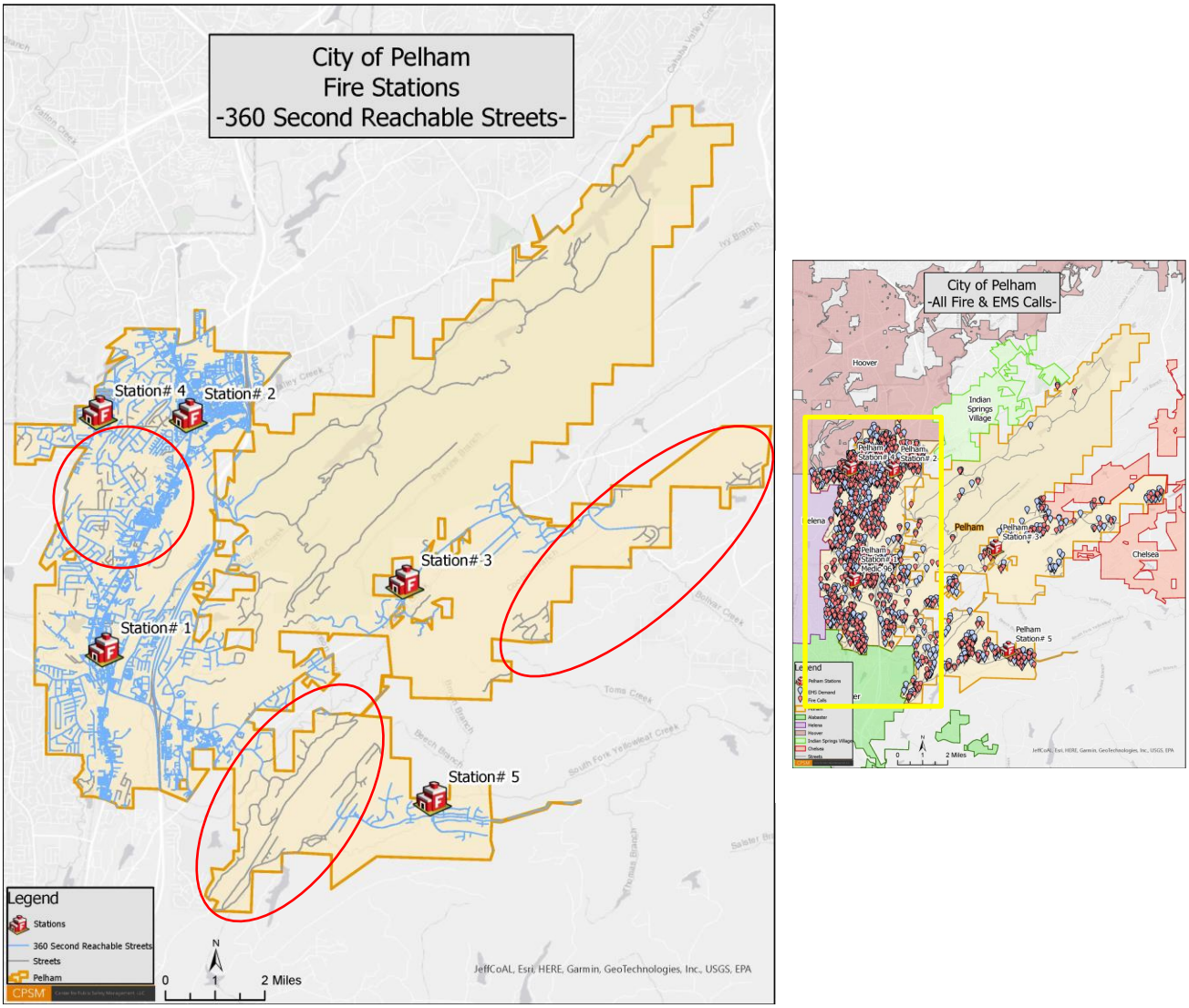
Figure 25: Current PFD Facilities 6-Minute Travel Times

6-Minute Travel Times



In analysis of the 4 and 6 minute travel times from current stations:

- At four minute travel time bleeds, all stations have deficiencies in coverage where the highest concentration of calls occur. Overall, Stations 1 and 2 have the highest percentage of overlapped calls, followed by Station 4 adding to service delivery response time challenges.
- At six minute travel time bleeds, all stations have improvement where the highest concentration of calls occurs. The gap along Weatherly Club Drive, and Weatherly Way to the east of Highway 11 is not covered at 6-munites and has moderate fire and EMS demand.

Further Considerations for Fire and EMS Response Times

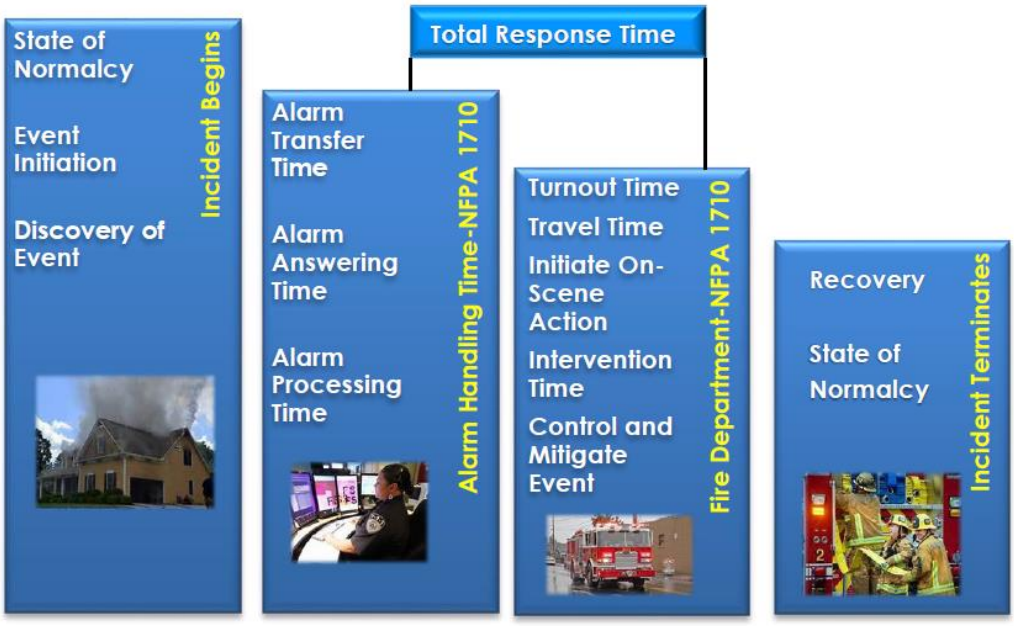
Response times are typically the primary measurement for evaluating fire and EMS services. Response times can be used as a benchmark to determine how well a fire department is currently performing, to help identify response trends, and to predict future operational needs. Achieving the quickest and safest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

However, the actual impact of a speedy response time is limited to very few incidents. For example, in a full cardiac arrest, analysis shows that successful outcomes are rarely achieved if basic life support (CPR) is not initiated within four to six minutes of the onset. However, cardiac arrests occur very infrequently; on average, these incidents make up 1 percent to 1.5 percent of all EMS incidents.[28] There are also other EMS incidents that are truly life-threatening, and the time of response can clearly impact the outcome. These involve cardiac and respiratory emergencies, full drownings, obstetrical emergencies, allergic reactions, electrocutions, and severe trauma (often caused by gunshot wounds, stabbings, and severe motor vehicle accidents, etc.). Again, the frequency of these types of calls is limited.

An important factor in the whole response time question is what we term "**detection time**." This is the time it takes to detect a fire or a medical situation and notify 911 to initiate the response. In many instances, particularly at night or when automatic detection systems (fire sprinklers and smoke detectors) are not present or are inoperable, the detection time can be extended. Fires that go undetected and are allowed to expand in size become more destructive and are difficult to extinguish.

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

Figure 26: Incident Cascade of Events



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

Travel time is key to understanding how fire and EMS station location influences a community's aggregate response time performance. Travel time can be mapped when existing and proposed station locations are known. The location of responding units is one key factor in response time; reducing response times, which is typically a key performance measure in determining the efficiency of department operations, often depends on this factor.

The goal of placement of a single fire station or creating a network of responding fire stations in a single community is to optimize coverage with short travel distances, when possible, while giving special attention to natural and manmade barriers, and response routes that could create response-time problems.[29] This goal is generally budget-driven and based on demand intensity of fire and EMS incidents, travel times, and identified risks.

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

When the fire does reach this extremely hazardous state, initial firefighting forces are often overwhelmed, larger and more destructive fire occurs, the fire escapes the room and possibly even the building of origin, and significantly more resources are required to affect fire control and extinguishment.

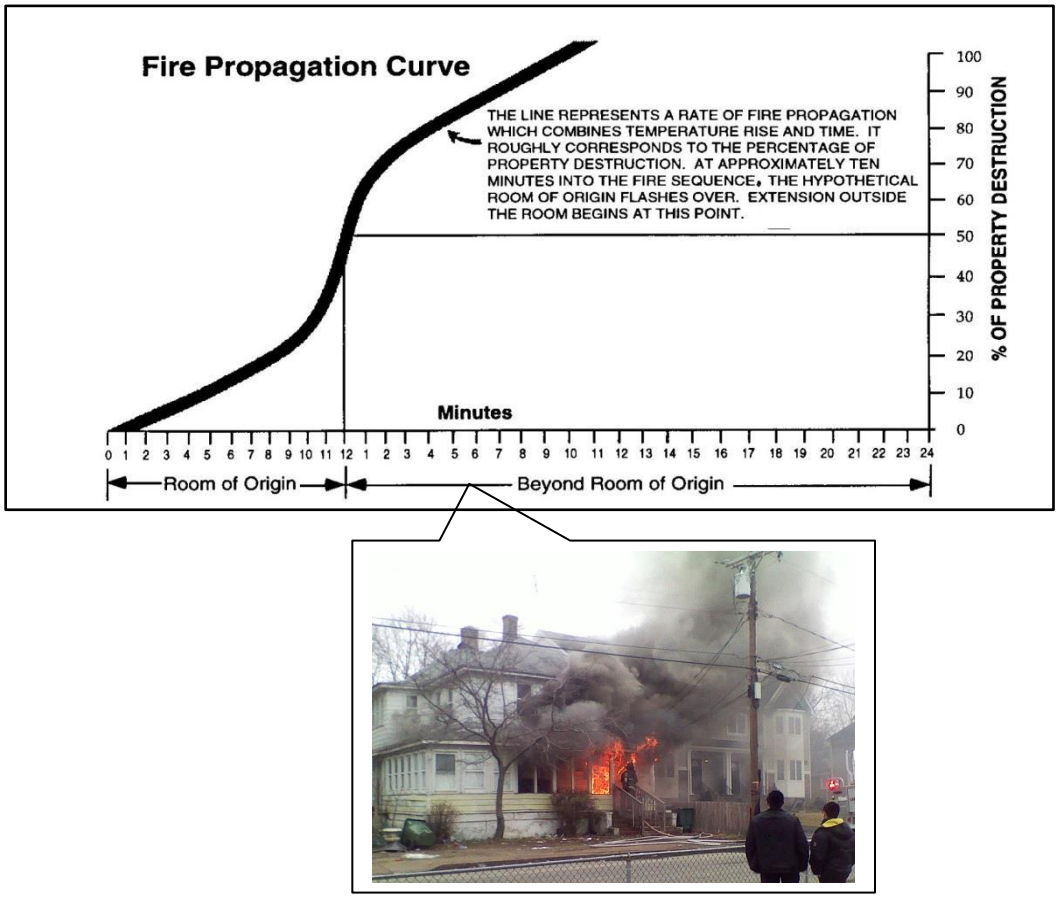
Flashover occurs more quickly and more frequently today and is caused at least in part by the introduction of significant quantities of plastic- and foam-based products into homes and businesses (e.g., furnishings, mattresses, bedding, plumbing and electrical components, home and business electronics,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

The following figure shows the fire propagation curve relative to fire being confined to the room of origin or spreading beyond it and the percentage of destruction of property by the fire. As described in the figure, at approximately the ten-minute mark of fire progression, the fire flashes over (due to superheating of room contents and other combustibles) and extends beyond the room of origin at about the twelve-minute mark, thus increasing proportionately the destruction to property and potential endangerment of life.

The ability to quickly deploy adequate fire staff prior to flashover thus limits the fire's extension beyond the room or area of origin. Fire propagation curve science establishes that temperature rise and time within in a room on fire corresponds with property destruction and potential loss of life, if present.[30]

29. NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2020 Edition.
30. Clinton Smoke, *Company Officer*, 2nd ed. (Clifton Park, NY: Delmar, 2005).

Figure 27: Fire Propagation Curve[31]



Regarding the risk of flashover, the authors of an IAFF report conclude:

> *Clearly, an early aggressive and offensive initial interior attack on a working structural fire results in greatly reduced loss of life and property damage. Consequently, given that the progression of a structural fire to the point of "flashover" (the very rapid spreading of the fire due to super-heating of room contents and other combustibles) generally occurs in less than 10 minutes, two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of its origin as possible.*[32]

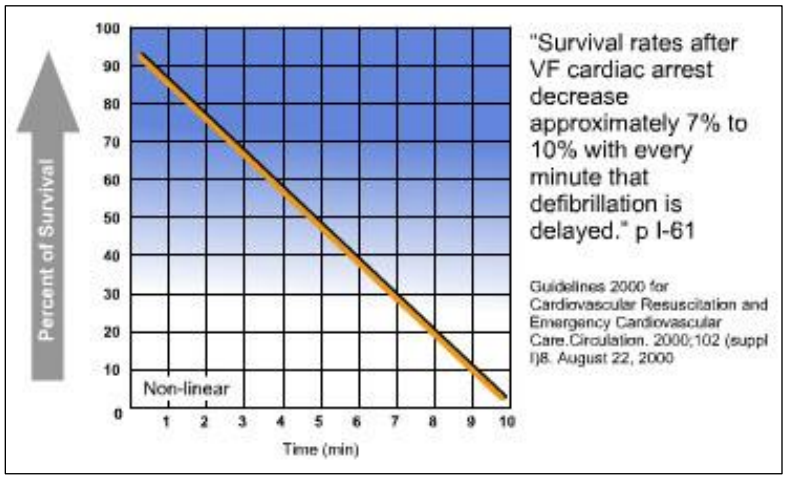
EMS response times are measured differently than fire service response times. Where the fire service uses NFPA 1710 and 1720 as response time benchmarking documents, the focus with EMS is and should be directed to the evidence-based research relationship between clinical outcomes and response times. Much of the current research suggests response times have little impact on clinical outcomes outside of a small segment of call types. These include cerebrovascular accidents (stroke), injury or illness compromising the respiratory system, injury or illness compromising the cardiovascular system to include S-T segment elevation emergencies,

31. John C. Gerard and A. Terry Jacobsen, "Reduced Staffing: At What Cost?" *Fire Service Today* (September 1981), 15–21.
32. *Safe Fire Fighter Staffing: Critical Considerations*, 2nd ed. (Washington, DC: IAFF), 5.

and certain obstetrical emergencies. Each requires rapid response times, rapid on-scene treatment and packaging for transport, and rapid transport to the hospital.

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

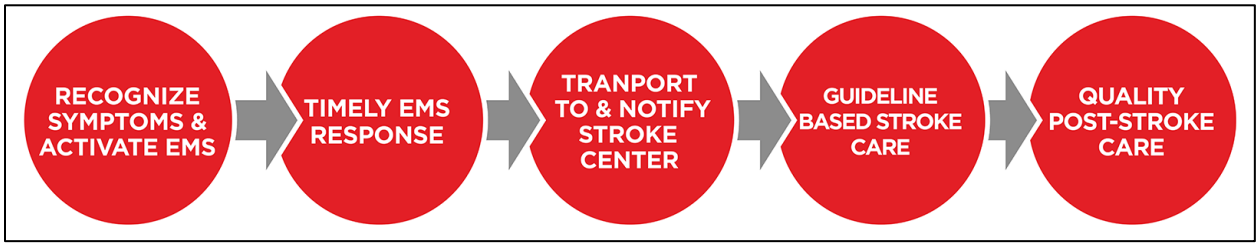
Figure 28: Cardiac Arrest Survival Probability by Minute



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

In addition, a true emergency is when an illness or injury places a person's health or life in serious jeopardy and treatment cannot be delayed. Examples include severe trauma with cardiovascular system compromise, difficulty breathing, chest pain with S-T segment elevation (STEMI), a head injury, or ingestion of a toxic substance.[33] The next figure illustrates the out-of-hospital chain of survival for a stroke emergency, which is a series of actions that, when put in motion, reduce the mortality of a stroke emergency.

Figure 29: Cerebrovascular Emergency (Stroke) Chain of Survival



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

33. Mills-Peninsula Health Blog, Bruce Wapen, MD.

If a person is experiencing severe pain, that is also an indicator of an emergency. Again, the frequency of these types of calls is limited as compared to the routine, low-priority EMS incident responses. In some cases, these emergencies often make up no more than 5 percent of all EMS calls.[34]

Cardiac arrest is one emergency for which EMS response times were initially built around. Science tells us that the brain begins to die without oxygenated blood flow at the four- to six-minute mark. Without immediate cardiopulmonary resuscitation (CPR) and rapid defibrillation, the chances of survival diminish rapidly at the cessation of breathing and heart pumping activity. For every minute without CPR and/or defibrillation, chances of survival decrease 7 to 10 percent. Further, only 10 percent of victims who suffer cardiac arrest outside of the hospital survive.[35]

It is important to understand that measuring and analyzing response times and response time coverage are measurements of performance. When we discussed community risk, we identified that the PFD, like most other fire departments in the nation, is an all-hazards response agency. While different regions of the country respond to different environmental risks, the majority of hazards that fire departments confront remain the same. Linking response data to community risks lays the foundation for future fire department planning in terms of fire station location, the need for additional fire stations, and staffing levels whether supplied by the fire department or a combination of a jurisdiction's fire department plus automatic aid.

Managing fire department response capabilities to the identified community's risk focuses on three components, which are:

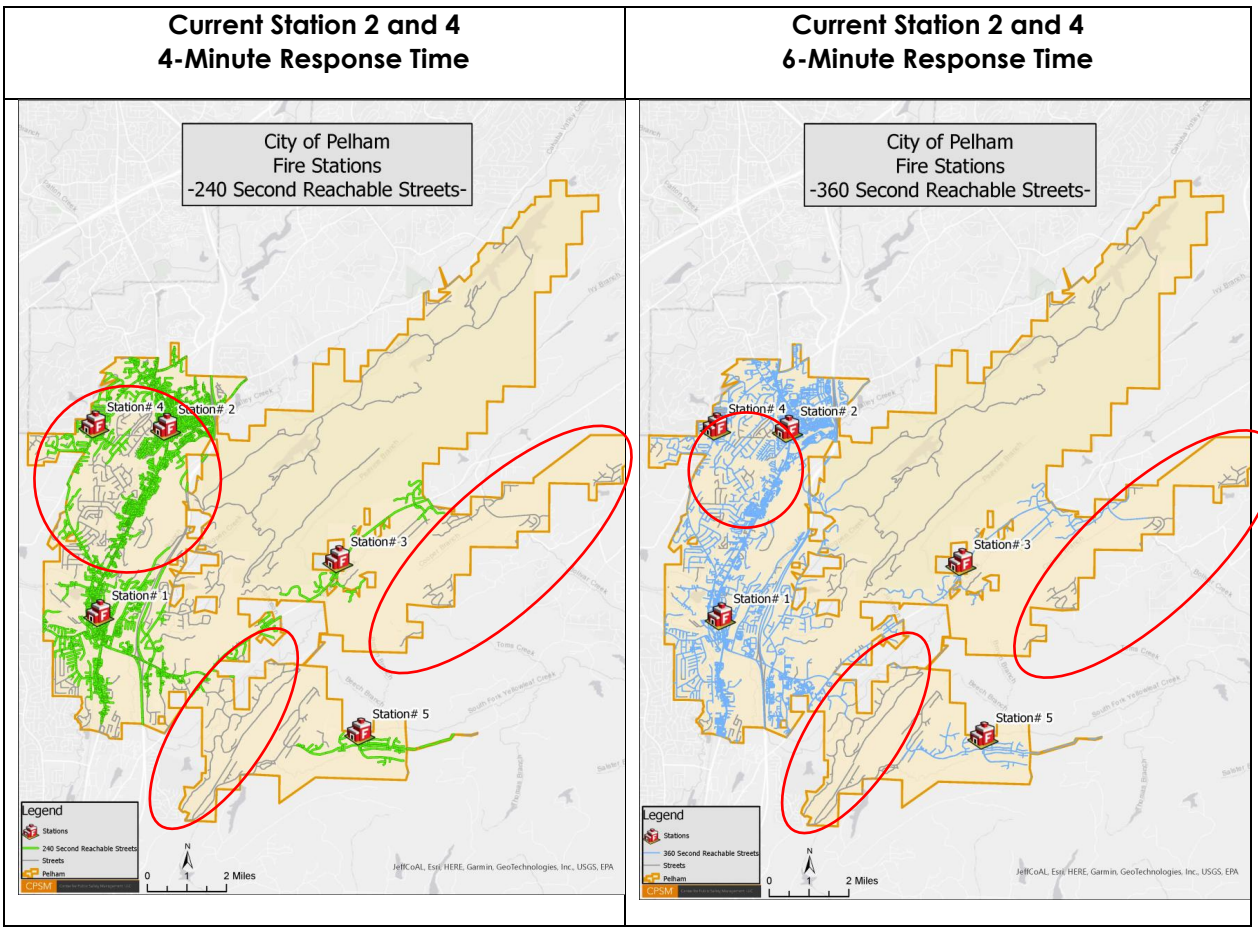
- Having a full understanding of the total risk in the community and how each risk impacts the fire department in terms of resiliency, what the consequences are to the community and fire department should a specific risk or combination of two or more occur and preparing for and understanding the probability that the risk may occur.
- Linking risk to the deployment of resources to effectively manage every incident. This includes assembling an Effective Response Force for the response risk in measurable times benchmarked against NFPA standards, deploying the appropriate apparatus (engines, ladders, heavy rescues, ambulances), and having a trained response force trained to combat a specific risk.
- Understanding that each element of response times plays a role in the management of community risk. Low response times of the initial arriving engine and low time to assemble an Effective Response Force on fire and other incidents are associated with positive outcomes.

CPSM was asked to evaluate the feasibility of combining two stations into one. The next set of maps analyzes this deliverable.

First, we analyzed combining Stations 2 and 4 at U.S. 31 and County Road 275.

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

Figure 30: Current Station Configurations: 4 and 6-Minute Travel Time Bleeds



In the current station configuration, there are gaps at 4-minutes and 6-minutes between Helena Road and U.S. 31, southeast of Station 1 and west of Station 5, and east of Station 3.

The next figure illustrates response time travel bleeds with a combined Stations 2 and 4 at U.S. 31 and County Road 275.

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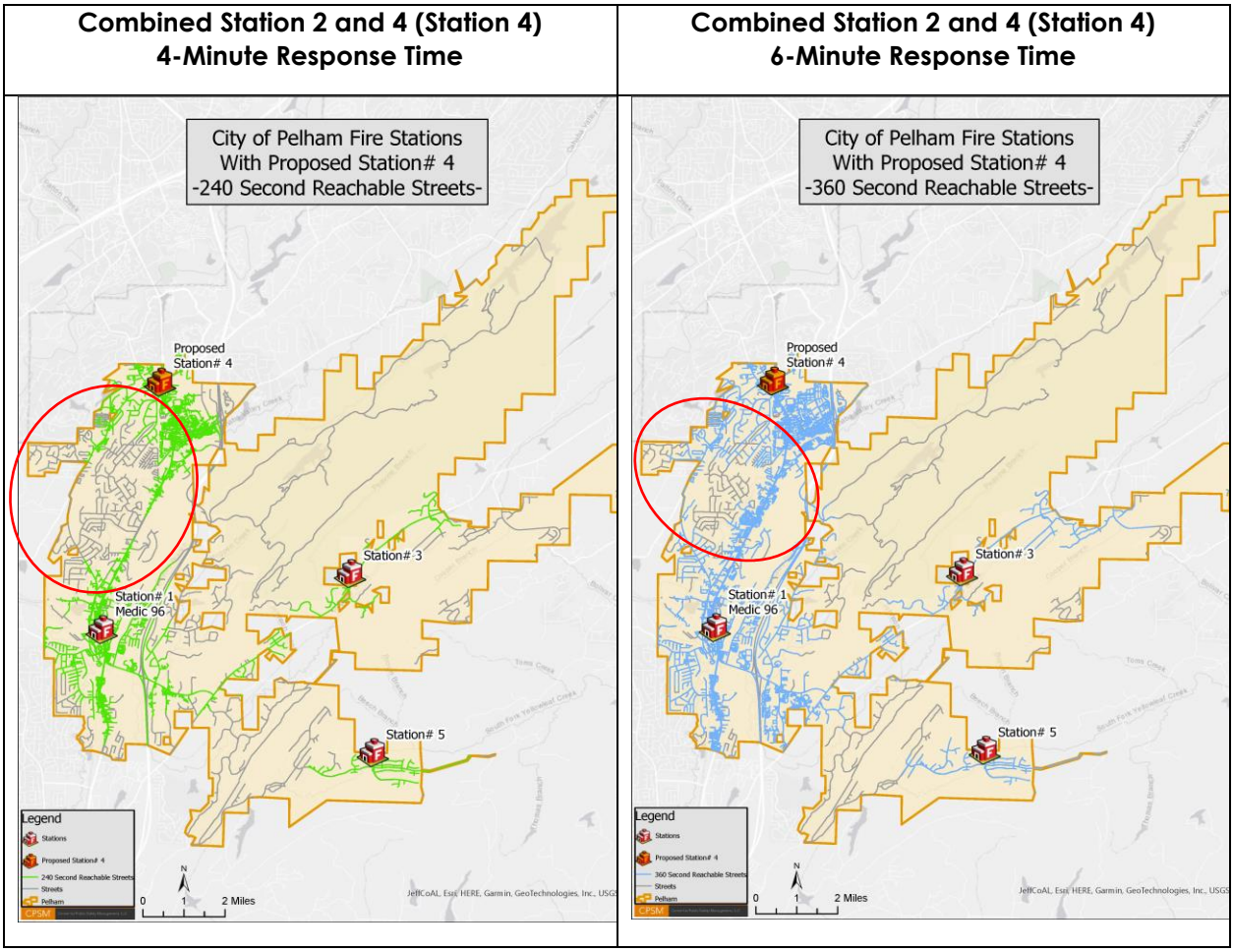
Figure 31: Current Stations 1, 3, 5 and Combined Stations 2 and 4: 4 and 6-Minute Travel Time Bleeds



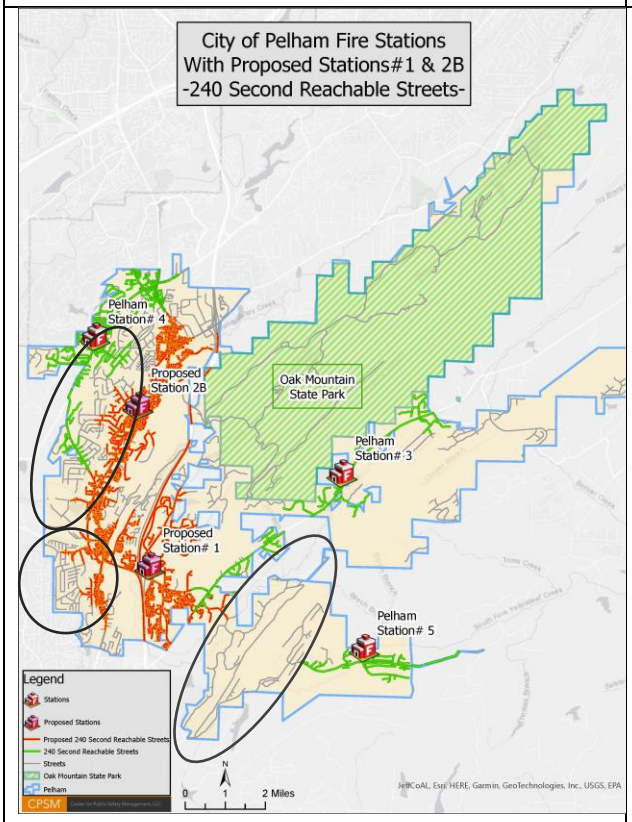
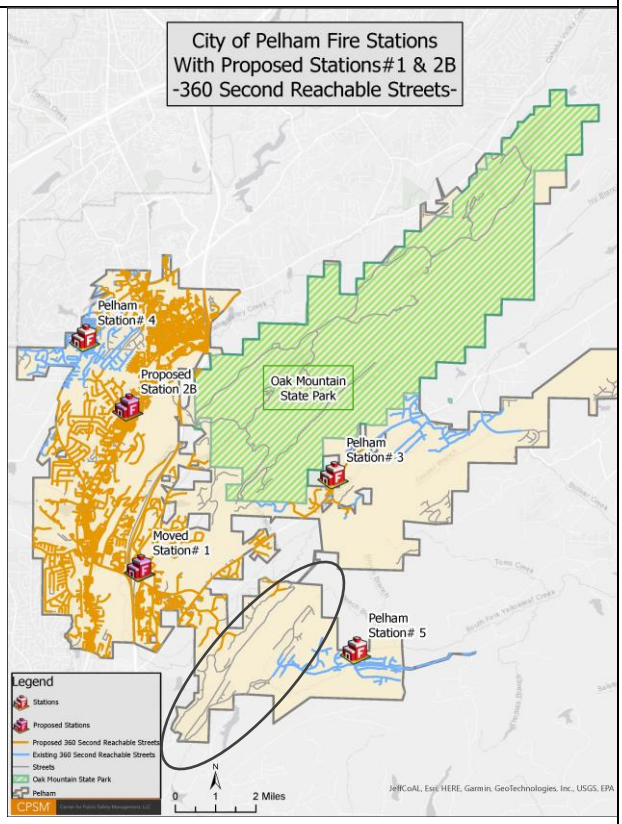
In this scenario, there is no improvement in the response time gap in the high demand area west of U.S. 31. This location creates deficiencies south along Helena Road at the 4-minute travel time bleed. This scenario does however meet the needs of combining/rebuilding the two oldest stations in the facility inventory (Station 2-built in 1979; Station 4 built in 1989) and moving to a 4-station model. Additionally, this moves Station 2 away from the Cahaba Valley Creek, which historically has risen above and out of its banks. Station 2 is precariously close to this creek.

Given the following factors, CPSM did not see opportunity to combine other stations:

- Station 1 is in a central-south location that serves a high demand area. Any movement north creates travel time deficiencies south and east.
- Station 3 is new and was located in its current district due to projected growth.
- Station 5 was built in 2005 and serves a suburban and light suburban moderate demand district. Moving Station 5 to the west and down the mountain would create travel time issues to its current district.

CPSM did see an opportunity to close the gap in response travel time in two areas. This includes moving Station 2 south to the area of U.S. 31 and Chandalar Drive and relocating Station 1 to the area of Highway 52 and Highway 11.

Figure 32: Feasibility of Relocating Stations 1 and 2

Relocating Station 1 and Station 2 4-Minute Response Time	Relocating Station 1 and Station 2 6-Minute Response Time
	

When benchmarked against the 4-minute standard, areas to the south and northeast of the current Station 1 become deficient. Likewise, areas to the northeast of Station 2 become deficient. However, there is improvement to the west of U.S. 31 in a high demand area. At the 6-minute benchmark, there is improvement to deficient 4-minute travel time benchmark areas, including west of U.S. 31 but little improvement east of Highway 11 along Weatherly Club Drive, and Weatherly Way. This model maintains the 5-station inventory.

Finally, we looked at a six Station model that moves Station 2 to Chandalar Drive and U.S. 31 and locates a new station at Highway 11 and Highway 52 E. This model provides the greatest coverage at 4 and 6-miunte travel times, however, the response time gap east of Interstate 65 and west of Station 5 has only moderate improvement.

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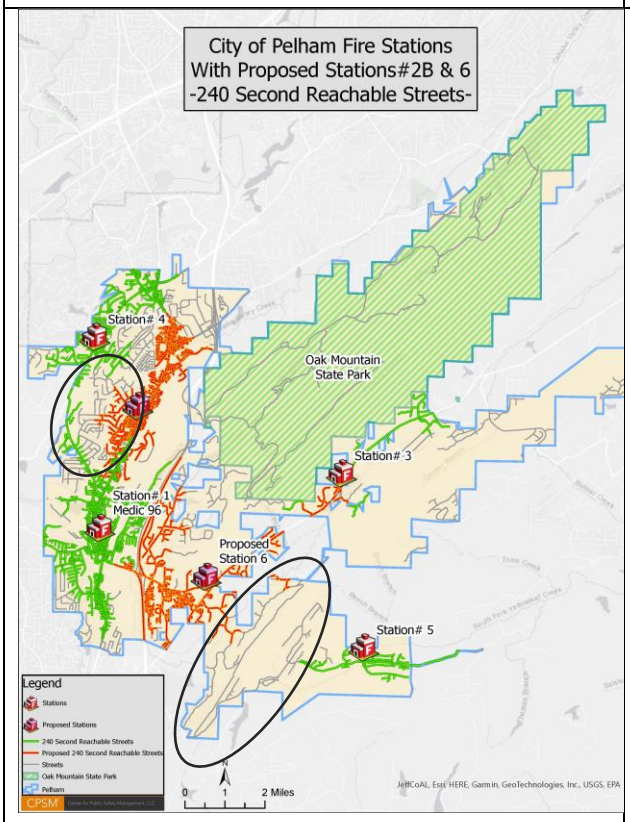
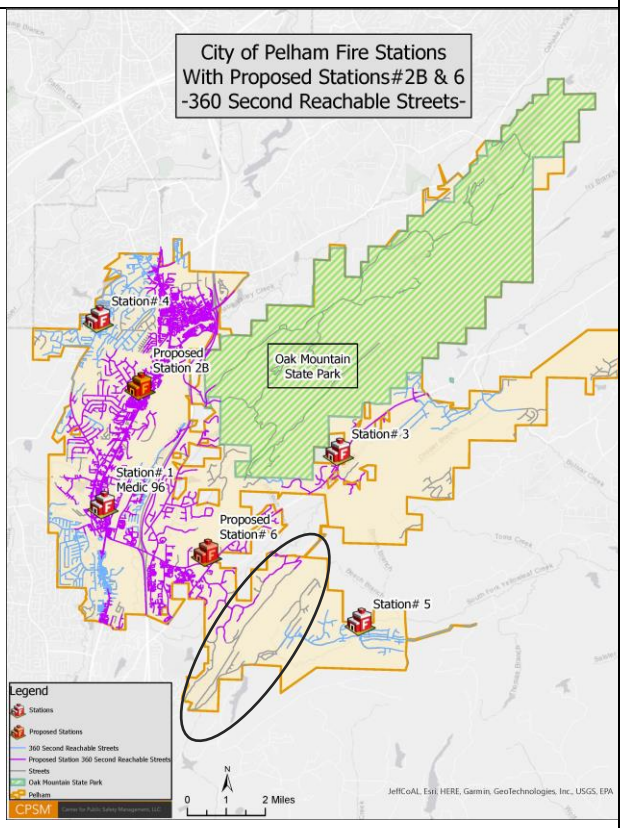
Figure 33: Feasibility of Relocating Station 2 and Locating a New Station 6

Relocating Station 2 and New Station 6 4-Minute Response Time	Relocating Station 2 and New Station 6 6-Minute Response Time
	

Given these circumstances CPSM recommends:

- The PFD should consider adopting 4-minute response travel times measured at the 90th percentile in the core areas of Station 1, 2, and 4 response district, which is west of Interstate 65 and north to south along U.S. 31, and areas of Station 3 and Station 5 within the 4-miunte travel time bleed; 6-minutes at the 90th percentile for areas east of Interstate 65 and north to south along Highway 11, and Buck Creek.
- The city should consider a station configuration model that maximizes response travel time and positions stations to effectively service their district in the current and for the future, and that provides timely assistance to surrounding districts when calls overlap and during multi-unit responses such as structural fires. This may include a four station model that merges Stations 2 and 4, a five station model that relocates Stations 1 and 2, or a six station model that relocates Station 2 and locates a new Station 6.

SECTION 6. EMS ANALYSIS

The provision of efficient and effective Emergency Medical Services (EMS) is a vital aspect of any community's public safety infrastructure. As the City of Pelham experiences growth and evolving healthcare needs, it becomes increasingly important to assess and optimize its EMS service delivery. The primary objective of this technical review is to evaluate the existing EMS service delivery model in Pelham and identify potential areas for improvement. The review will examine various aspects, including ambulance deployment, staffing levels, response times, and resource allocation. By conducting a comprehensive analysis, this review seeks to enhance the overall quality and efficiency of EMS services in the city.

The review was conducted through a combination of data analysis, stakeholder interviews, and benchmarking against industry best practices. Data pertaining to call volumes, response times, transport destinations, and resource utilization was collected and analyzed. Interviews with key stakeholders were conducted to gain insights into the current challenges and opportunities for improvement.

This technical review of EMS service delivery in Pelham aims to provide evidence-based recommendations for enhancing the provision of emergency medical care. By examining key areas such as ambulance deployment, staffing levels, response time optimization, and resource allocation, this review will serve as a foundation for informed decision-making and the continuous improvement of EMS services. The findings and recommendations will help ensure that Pelham residents receive timely and high-quality emergency medical care, promoting the overall health and safety of the community.

EMS Performance

Units of local governments make substantial annual investments in their emergency medical service (EMS) systems. That investment is typically divided up between the 9-1-1 communications center, the fire department's non-transport medical first response efforts, and EMS ground transport whether an in-house agency or contracted service.

In evaluating the current performance of EMS in Pelham, it is important to understand the evolution of EMS since its modern application spans several decades. The need for increased coordination in patient care and higher quality care at lower costs has made it essential for EMS agencies to have in-place quality control or quality improvement programs that rely on key performance indicators to continuously monitor the system's overall performance and the effectiveness of the different prehospital measurements.

For this systematic review, we can place performance into two categories of Clinical and Operations. Each area of performance is primarily related to an operational element of performance, while the other clinical category focuses on areas of performance that impact patient outcomes.

Clinical Review

- Medical Direction / Oversight

  EMS Medical Direction is supported by the agency/organization's Medical Director(s), who are directly responsible for protecting the public and have the authority to grant or suspend medical credentials for all EMS providers in the system. The Medical Director's oversight of the

patient care aspects of an EMS system is called medical direction. Off-line protocols and standards of care are developed by the Medical Director, but the term for general oversight offered by the Medical Director is medical direction. EMS medical directors support EMS personnel and first responders through training, protocol development, and resource deployment advice.

The role of medical direction in EMS is an important one and includes several key functions:

- Clinical oversight: Medical directors provide clinical oversight and guidance to EMS personnel, ensuring that they are following the latest medical protocols and providing the best possible care to patients.
- Protocol development: Medical directors are responsible for developing and updating medical protocols for EMS agencies based on the latest medical research and best practices.
- Quality assurance: Medical directors monitor and evaluate the quality of care provided by EMS personnel, identifying areas for improvement, and implementing changes to improve patient outcomes.
- Continuing education: Medical directors provide ongoing education and training to EMS personnel, ensuring that they stay up to date with the latest medical advances and best practices.
- Collaboration: Medical directors work closely with other healthcare providers, including hospitals and other emergency medical responders, to ensure that patients receive the best possible care throughout the entire continuum of care.
- Medical Protocols

  EMS protocols are the recognized clinical operating procedures/guidelines and standards that all emergency medical services professionals, such as paramedics and emergency medical technicians (EMTs), must follow for patient assessment, treatment, transportation, and delivery of definitive care. Medical Direction typically creates medical protocols in accordance with state and local regional EMS boards and are based on industry best practices of evidence-based best prehospital care.

- CQI Programming

  The Continuous Quality Improvement (CQI) Program is an ongoing, continuous evaluation of system performance to determine how the system, and providers within the system, are functioning. This insight allows Medical Direction and EMS providers to improve operational performance and, most importantly, patient outcomes. Continuous Quality Improvement is a never-ending process in which all levels of healthcare workers are encouraged to team together to develop and enhance the system within which they work. Based on EMS community collaboration and a shared commitment to excellence, the CQI process identifies areas for improvement within the EMS System. The CQI process identifies training opportunities, highlights outstanding clinical performance, audits compliance with the treatment protocols, and reviews specific illnesses or injuries along with their associated treatments.

- Training

  Training, also known as continuing education, is required for workers to stay current with the latest developments, skills, and new technologies required for their EMS certifications. Continuing education is required to comply with laws, remain licensed or certified, or maintain membership in an association or licensing body.

- Credentialling

  Credentialing in EMS is the process of professional certification that provides a mechanism for individuals or agencies to demonstrate that they possess the knowledge and skills necessary to lead various levels of an EMS organization. This proficiency is demonstrated through education and experience that is validated through an independent evaluation process. Examples of Accreditation include The Commission on Ambulance Accreditation (CAAS) and the Center for Public Safety Excellence (CPSE).

- QA/QI Program

  EMS agencies have an obligation to maintain a Quality Improvement (QI) or Quality Assurance (QA) program. Medical direction generally requires this program and identified processes. These programs are linked to patient-care report reviews for compliance with protocols and policies. QA and QI are used to assess the current quality and develop, implement, and measure an improvement process. A QA/QI program focuses on desired health outcomes for patients and is utilized to improve outcomes based on process and evidence.

- Medical Equipment Capabilities

  EMS equipment is typically regulated through a state-level office of Emergency Medical Services or Department of Public Health and is required to follow stated regulations before an ambulance can be licensed and continue to be licensed to operate. Spot inspections throughout the state may occur, and equipment shall be in working order. Failure to comply can result in loss of licensure, penalties, fees, etc. In Alabama this is the Department of Health, Office of EMS.

Operational Review

- Staffing Model

  EMS Staffing Models are based on the needs of the communities in which services are provided and may be based on call demand, time of day/night calls for service are occurring, response time, coverage area(s), and Unit Hour Utilization (UHU) in busy systems.

- Response Times

  Response Time is defined as "beginning with the initial receipt of an emergency ambulance call … and ending when the ambulance arrives at the location." Ambulance services are measured on the time it takes from receiving a 911 call to the vehicle arriving at the patient's location. As discussed above, EMS response times are measured differently than fire service response times. Where the fire service uses NFPA 1710 and 1720 as response time benchmarking documents, EMS' focus is and should be directed to the evidence-based research relationship between clinical outcomes and response times. Communities often work with Medical Direction and establish community-based response time performance goals.

- Deployment Model

  In the "static deployment model," units are stationed at a fixed location. When dispatched they leave a coverage gap until they return to their home base after service. The dynamic deployment model redeploys idle ambulances to different locations in a community based on historical demand data. System Status Management (SSM) is the process and implementation of strategically positioning ambulances in geographic locations during various times of the day based on historical data that can aid in predicting operational demands. The goal of

system status management is to: minimize response times by deploying EMS resources strategically. SSM is utilized more commonly used in high-performance systems that have more than two ambulance operations.

- Emergency Communications

  EMS Emergency Communication falls under three categories. With EMS these typically are Medical Priority Dispatch System (MPDS), Criterion-Based Dispatch, and Computer-Aided Call Handling (CACH).

- Logistics and Supply Chain

  Logistics is the process of planning, managing, and controlling the efficient flow of relief, information, and services from the origin to the destination to meet the urgent needs of affected people under emergency conditions. Health emergencies increasingly drive unprecedented demand for effective supply chains to support emergency response. Under the current situation with our nationwide issue involving logistics and the supply chain, it is imperative to plan and prepare for alternative solutions to needs.

- Fleet

  A safe and well-functioning fleet is critical to ensure the safety and well-being of clinicians in the field as well as providing reliable and consistent service to the patients, facilities, and communities served. Fleet maintenance and replacement cycles are determined by the agency/organization itself unless otherwise specified by local, state, or national regulations. Many communities follow industry standards for the EMS fleet, as outlined in this report.

- Administrative

  EMS Administration manages teams, optimizes operations, and facilitates communications. Administratively, they are responsible for the organization's standard operating procedures or standard operating guidelines inside and out. In addition, they are responsible for knowing EMS policy and practice at the federal, state, and local levels.

  While these categories are broad in the description, they encapsulate multiple functions and operational layers that all contribute to the overall performance of an EMS System of operations.

Review of Current EMS Ground Transport System

In Pelham, residents and visitors are provided EMS Services by the PFD (first tier EMS response at the Advanced Life Support (ALS) level and Regional Paramedical Services, Inc. (RPS) who provides EMS ground transport-predominately at the ALS level.

EMS agency providers are promulgated Under Alabama Code Chapter 420-2-1.

RPS is a Licensed EMS Provider by the Alabama State Department of Health, Office of Emergency Medical Services and is an authorized Basic & Advanced Life Support Agency in good standing. RPS is an accredited private EMS agency suggesting that the agency has met the necessary standards and criteria to provide high-quality emergency medical care to patients.

An accredited EMS agency typically undergoes a rigorous evaluation process to ensure that it meets the necessary requirements for providing emergency medical services. This evaluation

process may include a review of the agency's policies and procedures, staffing qualifications, medical equipment, and facilities.

Having adequate resources means that the agency has a sufficient response plan (staffing, equipment, and facilities) to provide effective emergency medical care. This may include having enough trained personnel, such as paramedics and EMTs, and a range of medical equipment, such as ambulances, defibrillators, and oxygen supplies. Additionally, having modern facilities, such as well-equipped ambulance stations, can support effective emergency response.

Overall, being an accredited private EMS agency with adequate resources is a positive indicator that Regional Paramedical Services is prepared to provide high-quality emergency medical care to patients in the regions it serves. This can potentially lead to better patient outcomes and improved community health and safety.

Emergency Medical Service (EMS) delivery in Pelham provides a comprehensive essential service to all residents and visitors. The program includes two tiers of medical services as outlined above. To note, the RPS ground transport component is being provided in Pelham *without a formal contract* in place. This report is based on complete and valuable cooperation from the City, RPS, and the Medical Director.

One of the fastest-growing value-added service enhancements in EMS is that of Mobile Integrated Healthcare/Community Paramedicine (MIH/CP) programs. An MIH/CP program is comprised of a suite of potential services that EMS could provide to fill gaps in the local healthcare delivery system. In essence, such a service 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, an MIH/CP program is commonly accomplished through a collaborative approach with healthcare and social service agencies within the community.

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

RPS is currently not providing Mobile Integrated Healthcare. However, RPS is participating in alternative transport/treatment and release programs (ET3) within its current operational posture.

There is not one perfect system model but rather a host of local factors determining the right delivery method for a community.

At the time of this review, CPSM assesses there are significant risks and weaknesses operationally in the existing EMS System model for the City of Pelham. This includes:

- The City is operating without a contract with RPS.
- Without a contract with RPS, the city does not have a foundation for accountability of EMS transport response times, level of provider training, level of care, or level or resiliency (overlapping calls).
- Without a contract and level of response effort or performance with RPS, the PFD EMS tiered response structure is often adjusted to handle lower acuity calls for service due to the reliability of RPS.

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Available RPS Resources in Pelham

As discussed, the current EMS delivery system in Pelham includes a tiered level of response to include a private third party treatment/transport service (RPS) complimented by an all-ALS capable PFD response, which staffs a dedicated unit, "Medic 96." For low acuity calls a typical PFD response is the engine company in one of the five assigned fire districts (in District 1, Medic 96 handles the majority of the responses leaving Quint 91 available for fire incidents). If the EMS call is of a higher tier (high acuity which may need ALS interventions), Medic 96 will respond along with the engine company in the assigned district. This is done as the PFD will assist RPS with an additional paramedic on high acuity responses, or when RPS responds with a BLS unit or driver only. Utilizing a paramedic from Medic 96 leaves the engine company in service in their assigned district (it is PFD policy that minimum staffing on engine companies or the Quint is three personnel-see previous *Effective Response Force* discussion).

RPS has a single station in Pelham. However, without a contract that identifies the level of effort or level of performance in Pelham, this unit can and does respond to any other area in Shelby County, or perhaps beyond in the RPS service area, leaving Pelham vulnerable to the first or potential overlapped call(s) in the city.

A tiered EMS (Emergency Medical Services) response system is a system that categorizes medical emergencies based on their severity and provides a corresponding level of response. This system is designed to ensure that patients receive the appropriate level of care based on their medical condition and the available resources required to treat them.

In a tiered EMS response system, medical emergencies are typically classified into one of three tiers:

- Tier 1: Basic Life Support (BLS) - This tier of response is appropriate for medical emergencies that do not require advanced medical interventions. BLS responders typically have training in Medical First Responder or Emergency Medical Technician-Basic, and the use of automated external defibrillators (AEDs) and certain airway adjuncts.
- Tier 2: Advanced Life Support (ALS) - This tier of response is appropriate for medical emergencies that require advanced medical interventions, such as the administration of medications, airway-intubation, and advanced airway management. ALS responders typically have more extensive medical training, including Emergency Medical Technician-Advanced and Paramedics.
- Tier 3: Critical Care Transport (CCT) - This tier of response is appropriate for medical emergencies that require the highest level of care, such as patients with severe trauma or critical illnesses. CCT responders typically have extensive training in critical care and are equipped with advanced medical equipment, such as ventilators and infusion pumps.

The tiered EMS response system allows for a coordinated and efficient response to medical emergencies, ensuring that patients receive the appropriate level of care and that resources are used effectively. Additionally, this system helps to reduce response times and improve patient outcomes.

Having a good complement of EMS resources is critical for ensuring that residents of a city receive timely and effective emergency medical care. In the event of a medical emergency, a city with good EMS resources can respond quickly and efficiently, potentially saving lives and improving patient outcomes.

We assess, at the time of this review, the current EMS Delivery system is limited in transport capable units available in Pelham, with staffing configurations that do not always provide for ALS capability (there may be a BLS unit response), or the RPS unit may not have a full crew response (driver only).

EMS (Emergency Medical Services) agencies have faced numerous challenges in the wake of the COVID-19 pandemic. Some of the most significant challenges include:

- Increased demand for services: EMS agencies have seen an increase in demand for services due to COVID-19-related illnesses and hospitalizations. This has put a strain on the resources of many agencies as they try to meet the needs of more patients with limited staff and equipment.
- PPE and supply chain issues: EMS agencies have had to deal with shortages of personal protective equipment (PPE) and other medical supplies due to disruptions in the global supply chain. This has made it difficult for agencies to protect their staff and provide the necessary medical care for patients.
- Staffing shortages: Many EMS agencies have experienced staffing shortages due to illness and quarantine requirements related to COVID-19. This has made it challenging to maintain normal service levels and respond to emergencies quickly.
- Mental health and wellness of EMS personnel: EMS personnel have been exposed to high levels of stress and trauma due to the COVID-19 pandemic. This has put them at increased risk for mental health issues such as anxiety, depression, and post-traumatic stress disorder (PTSD).
- Financial challenges: EMS agencies have had to deal with financial challenges due to the pandemic, including increased costs for PPE and other supplies, lost revenue from canceled elective procedures, and decreased funding from local governments.

Overall, EMS agencies have faced significant challenges in the post-COVID era. Addressing these challenges will require collaboration between agencies, local governments, and healthcare providers to ensure that patients receive the necessary care and support and EMS that personnel are protected and supported in their vital work.

At the time of this review, CPSM assesses that RPS has the fleet, logistics, and clinical oversight to conduct valued EMS services to the communities they serve. However, it is also noted that at the time of this report, RPS cannot deploy resources to service the high demand generated in Pelham to a higher level. Further, because there is no contract between RPS and the City, they are not required to.

RPS Medical Direction

Current EMS clinical treatment is authorized and directed by an agency/board appointed physician who is the *Primary Medical Director* dedicated to medical direction, clinical oversight, EMS Education, and various other EMS-related projects that are consistent with industry best practices for a valued EMS system such as Regional Paramedical Services.

The Primary Medical Director at the time of this report is Dr. Jeffery Kerby, M.D., Ph. D. FACS. Dr. Kerby is an experienced EMS Medical Director.

In addition to serving as the EMS Medical Director for Regional Paramedical Services, Dr. Kerby also serves the University of Alabama at Birmingham as Brigham Family Endowed Professor in Trauma and Acute Care Surgery, Director of the Division of Trauma and Acute Care Surgery,

and most recently in 2022 became the Chair of the American College of Surgeons Committee on Trauma.

These intersections provide for a high level of EMS Physician involvement in addition to medical direction, clinical oversight, and training. This high level of engagement was evident by a documented and outlined robust training program, QA/QI monitoring, staff/physician engagement, and protocol development.

It is assessed RPS's Medical Direction program /practices are consistent with current EMS best practices for EMS Physician engagement, clinical oversight, and program development.

Training Quality Assurance/Quantity Improvement (QA/QI)

Training and quality improvement are essential hallmarks of liability prevention and risk management. For instance, ambulance-related vehicle accidents are a common risk area. Well-run driver training is essential, as are periodic updates and training refreshers. Becoming familiar with your response area can help avoid response delays, wrong turns, and last-minute maneuvers that can create risk. In addition, individual providers can help themselves by doing their "homework"—knowing their system's protocols and avoiding unjustified protocol deviations can help keep them out of hot water with their employer, medical director, and state EMS office.

EMS (Emergency Medical Services) Training QA/QI (Quality Assurance/Quality Improvement) is an essential process that helps to ensure that EMS personnel receive high-quality training and that their skills are maintained and improved over time.

The QA/QI process involves several steps:

- Establishing performance standards: This involves defining the performance standards for EMS personnel, including the skills and knowledge required to provide effective emergency medical care.
- Monitoring performance: EMS agencies should regularly monitor the performance of their personnel to ensure that they are meeting the established performance standards. This may involve reviewing patient care reports, observing personnel in action, and reviewing other performance metrics.
- Identifying areas for improvement: Based on performance monitoring, EMS agencies should identify areas for improvement and develop plans to address any deficiencies in training or skills.
- Implementing improvements: EMS agencies should implement improvements to their training programs and other systems based on their performance monitoring and identification of areas for improvement.
- Evaluating effectiveness: After implementing improvements, EMS agencies should evaluate the effectiveness of their changes and make further adjustments as needed to ensure that EMS personnel are receiving the best possible training and support.

The QA/QI process is critical for ensuring that EMS personnel are well-trained and prepared to provide effective emergency medical care. By regularly monitoring performance and making improvements to training programs and other systems, EMS agencies can ensure that their personnel are providing high-quality care to patients in their communities.

Our review of RPS reveals a dedicated training division and a Quality Committee that drives education initiatives. Current training is provided on a routine basis and addresses both BLS and ALS-specific training opportunities.

RPS Clinical Committee ensures yearly skills reviews and is engaged in all levels of EMS education for RPS providers.

CPSM assesses at the time of our review Regional Paramedical Services training program ensures regular, routine, and validation-based training. The standards from RPS's QA/QI Review and evaluation-led training are consistent with Industry practices and are aligned with CAAS accreditation standards for a consistent QA/QI Training Program.

Strengths and Weaknesses of the Current EMS Model

EMS delivery services are vulnerable to economic and other forces, and the community must address the reality that they are expensive to maintain, and if not committed, the system can be left inadequate to meet the growing healthcare needs of the citizenry being served.

Strengths

- Regional Paramedical Services (RPS), Inc. has been incorporated since July 7, 1987. This history and experience afford RPS and the City of Pelham an EMS System that has many strengths. The current Medical Direction is engaged. RPS currently provides services Pelham with one static location within the city, which houses one licensed ambulance staffed with two personnel to include an EMT-Basic and an EMT-Advanced or EMT-Paramedic provider.
- RPS is accredited by the Commission on Accreditation of Ambulance Services (CAAS), with its most recent renewal for reaccreditation being granted in 2022. The Commission on Accreditation of Ambulance Services (CAAS) encourages and promotes quality patient care across America's medical transportation system. Through an independent commission, CAAS has established a comprehensive series of standards for the ambulance service industry.
- At the time of this review, it was noted and reported that RPS participates in the State of Alabama's Alternate Treatment and Transport program under the Centers for Medicare and Medicaid (CMS), otherwise known as the ET3 Pilot Program. Emergency Triage, Treat, and Transport (ET3) is a voluntary, five-year payment model that will provide greater flexibility to ambulance care teams to address emergency health care needs of Medicare Fee-for-Service (FFS) beneficiaries following a 911 call. The model will allow beneficiaries to access the most appropriate emergency services at the right time and place. As a result, the ET3 Model aims to improve quality and lower costs by reducing avoidable transport to the ED and unnecessary hospitalizations following those transports.
- The PFD staffs all fire suppression with at least one Paramedic. Therefore, all fire unit responses are capable of stabilizing and treating patients to a high level prior to RPS arrival, in conjunction with RPS, and riding along with RPS on higher acuity patients, or as the lead Paramedic to ensure a continuum of care until the patient is transferred to the hospital Emergency Department.

Weaknesses

- RPS is currently dispatched through the RPS dispatch center. For calls originating in Pelham, the Pelham 911-Center serves as the primary PSAP. As will be reviewed later in this section, the Pelham 911-Center utilizes an emergency medical dispatch (EMD) program that is limited to

pre-arrival instructions and does not determine the priority/acuity of the call (low, mid, or high acuity).

There are more aggressive EMS systems such as Priority Solutions® Medical Priority Dispatch System® (MPDS) for Emergency Medical Dispatch (EMD) or any other emergency medical dispatch system.

The MPDS system is a highly respected EMD system and is used by progressive EMS dispatch agencies. In a smaller EMS Operational System with limited resources, having the ability to prioritize resources becomes highly valuable. It is noteworthy that at the time of this review, it was reported that the county operates under a policy of "*No Stacking;*" in other words, all calls are essentially treated as a priority, and a resource is immediately sent without screening.

- During our assessment, it was noted that RPS does not provide aggressive community outreach programs or have much community involvement. One such solution involves mobile integrated health (MIH), a patient-centered model conducted outside the boundaries of a traditional hospital campus that integrates in-person and digital resources. This emerging care-delivery platform offers resource coordination among hospitals, first responders, providers, and other medical stakeholders. While we support these patient center community-focused programs, these initiatives should not take priority or be confused with normal EMS operations.
- During our review and meetings with RPS and the PFD, we assessed the current number of available RPS operational units creates a potential operational risk. The current allotted fleet of one ambulance does not allow for a readily available backup unit, as other RPS system units, if available, are delayed for response due to geographical location and current system workload.
- The current EMS service delivery in the City of Pelham is provided as an informal "Handshake" agreement lacking a formal contractual relationship. This is assessed as not only a weakness but also poses certain risks such as the lack of mutually agreeable and defined terms for service.

Table 34: RPS EMS Strengths and Weaknesses

Strengths	Weaknesses
■ Long-established history of EMS ground transport history-established in 1987. ■ CAAS Accreditation. ■ Regional EMS provider with multiple units deployed in the region. ■ Active Medical Direction. ■ Established QA/QI Training Standards ■ PFD -100% ALS resource response as a 1st Tier agency.	■ Primary EMS dispatch Shelby. County PSAP does not use an EMD system that truly prioritizes EMS calls for service. ■ No current community-based health program (MIH / CP/ Nurse Triage). ■ RPS assigns one ambulance in Pelham-not 100% dedicated to remaining in Pelham and handles regional calls as well due to system demand. ■ No Established performance standards for a response within the City of Pelham. ■ No Contractual Relationship with Pelham.

Pelham Fire Department EMS Capabilities

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

Nationwide, fire departments are responding to more EMS calls and fewer fire calls, particularly fires that result in active firefighting operations by responders. This is well documented in both national statistical data, as well as CPSM fire studies. These trends and improvements in the overall fire protection system, notwithstanding, fires still do occur, occur with greater frequency in older, depressed urban areas, and the largest percentage of those occur in residential occupancies where they place the civilian population at risk. Although they occur with less frequency than they did several decades ago, when they occur today, they grow much quicker and burn more intensely than they did in the past, which leads to an increased ERF as discussed previously.

EMS is a vital component of the comprehensive emergency services delivery system in any community. Together with the delivery of police and fire services, it forms the backbone of the community's overall public safety net.

In terms of overall incidents responded to by the emergency agencies in most communities, it could be argued that EMS incidents constitute the greatest number of "true" emergencies, where intervention by trained personnel makes a difference, sometimes literally between life and death. Heart attack and stroke victims require rapid intervention, care, and transport to a medical facility. The longer the time duration without care, the less likely the patient is to fully recover. Contemporary pre-hospital clinical care deploys many clinical treatments one will receive in the emergency department, truly matching the long-time EMS saying, "we bring the emergency room to you."

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

- Basic Life Support (BLS), which is an emergency response by a ground transport unit (and crew) and the provision of medically necessary supplies and services occurs.
- Advanced Life Support, Level 1 (ALS1), which is the transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including the provision of an ALS assessment or at least <u>one</u> ALS intervention.
- Advanced Life Support, Level 2 (ALS2), which is the transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including:
    - *At least three separate administrations of one or more medications by intravenous push/bolus or by continuous infusion (excluding crystalloid fluids) or*

- *(2) ground ambulance transport, medically necessary supplies and services, and the provision of at least one of the ALS2 procedures listed below:*

  a. Manual defibrillation/cardioversion.

  b. Endotracheal intubation.

  c. Central venous line.

  d. Cardiac pacing.

  e. Chest decompression.

  f. Surgical airway.

  g. Intraosseous line.

The next set of Tables reviews the current critical tasking for the PFD continuum of care. As indicated above, the critical tasking is based on the current CMS ground transport definition of ambulance services.

Table 35: BLS Critical Tasking

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

Resource Deployment

1 Transport Ambulance

Table 36: ALS1Critical Tasking

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

Resource Deployment

1 Transport Ambulance
1 PFD Fire Crew

Table 37: ALS2 Critical Tasking

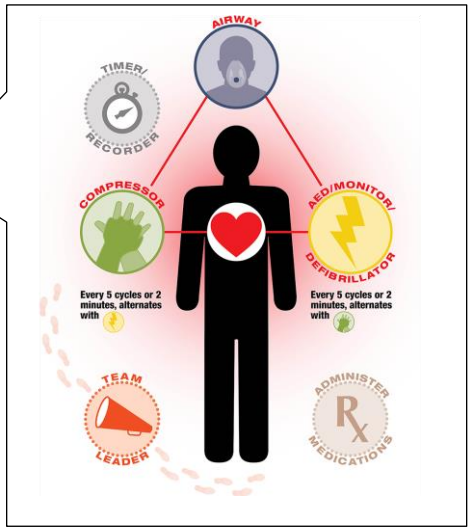
Critical Task	# Responders
Incident Command	1
Primary Patient Care	1
Secondary Patient Care	1
Tertiary Patient Care Provider	2
Vehicle Operations	1
Effective Response Force	6

Resource Deployment

1 Transport Ambulance
1 EMS Supervisor
1 PFD Fire Unit

Table 38: Pulseless/Non-Breathing Critical Tasking

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



Resource Deployment

1 Transport Ambulance
1 EMS Supervisor
1 PFD Fire Unit

The PFD has a response matrix for EMS incidents that includes:

Low Acuity EMS Call

- One ALS Engine (3 staff)

High Acuity EMS Call

- One ALS Engine
- Medic 96

CPSM's assessment finds the PFD has sufficient capabilities to respond to EMS calls in their current non-transport capacity. While additional resources will be needed to expand or enhance current EMS service delivery to assume transport function, if the city chooses this as an alternative to the current, the infrastructure of the organization is well-positioned to establish an expanded EMS service line.

The PFD is dispatched by the Pelham 911-Center, which is located in the Pelham Police Department. The Pelham 911-Center has an emergency medical dispatch (EMD) program that has been developed by the Alabama 911-Board and Alabama Office of EMS. The program used provides directions for call-takers to give pre-arrival instructions. It does not determine if the incident is low, mid, or high acuity.

As discussed earlier, an EMD system utilizes clinical protocols and call taking processes to assign a response determinant or code to an EMS request generated in the 911-Center. These response determinants or codes are used in EMS systems to determine the priority of a response, and the appropriate level of care likely necessary to meet the patient's clinical needs. The response determinants also aid in informing the responding units specifically what type of medical call to which they are responding. If approved by local protocol, an EMD system can also be used to assign *response priorities* and *modes of response* such as lights and siren or a cold response without lights and siren (low acuity calls), as well as make determinations regarding the response configuration for the EMS response (ambulance only; engine and ambulance).

Appropriate use of an EMD system typically includes the active engagement of a physician Medical Director, and a robust quality assurance (QA) process, which helps assure that EMD call taking, EMD determinant or code assignments, and pre-arrival instructions if included in the program, are being conducted appropriately and reliably.

Many EMS systems across the country are using EMD, to reduce the incidence of HOT responses so as to make providers and the public safer, as well as preserve crucial first medical response resources for 911 medical calls that are time-sensitive (cardiac arrest, choking, heart attack, etc.). Lights and siren (HOT) responses dramatically increase the risk of crashes and injuries to responding personnel and the public. In February 2022, 14 national EMS associations, including the International Association of Fire Chiefs, and the National Association of EMS Physicians, published a joint position statement ***encouraging EMS systems to reduce HOT responses to less than 30 percent of EMS calls, and less than 5 percent of ambulance transports***.[36]

CPSM's assessment finds the current EMD system to dispatch fire and EMS ground transport units can be used more effectively to determine which EMS responses are time-sensitive and if the presence of a medical first response unit could make an impact on patient outcomes. The effective use of this system would preserve crucial first response medical units for those responses that are time sensitive and that are real emergencies.

Use of Medic 96 on EMS Calls: Quick Response Vehicles Staffed

The PFD ALS Quick Response Vehicle (QRV - Medic 96) is a specialized vehicle used by the fire department to provide advanced medical care and support to patients during emergencies. The PFD QRV carries advanced medical equipment and supplies, such as defibrillators, oxygen tanks, and medications, and is staffed by trained EMS personnel, such as paramedics and EMTs.

The purpose of the PFD QRV is to provide rapid medical intervention and support to patients in need, particularly in situations where time is of the essence, such as in cardiac arrest or other life-threatening emergencies. Because QRVs are smaller and more maneuverable than traditional ambulances, they can often arrive on the scene more quickly and provide immediate care to patients while waiting for an ambulance to arrive.

In addition to providing advanced medical care, a QRV can also be used to support other fire department operations, such as responding to hazardous materials incidents or assisting with search and rescue operations and structural fire incidents.

As discussed earlier, and important to reiterate here, for low acuity calls a typical PFD response is the engine company in one of the five assigned fire districts (in District 1, Medic 96 handles the majority of the responses leaving Quint 91 available for fire incidents). If the EMS call is of a higher tier (high acuity which may need ALS interventions), Medic 96 will respond along with the engine company in the assigned district. This is done as the PFD will sometimes assist RPS with an additional paramedic on high acuity responses, or when RPS responds with a BLS unit or driver only. Utilizing a paramedic from Medic 96 leaves the engine company in service in their assigned district (it is PFD policy that minimum staffing on engine companies or the Quint is three personnel-see previous *Effective Response Force* discussion).

Overall, the PFD QRV is an important tool for providing advanced medical care and support during emergencies. By having trained EMS personnel and advanced medical equipment readily available, the PFD can and does improve patient outcomes.

36. https://www.hmpgloballearningnetwork.com/site/emsworld/news/top-ems-groups-issue-joint-statement-ls-responses

The current EMS system in Pelham is enhanced with the augmentation of "Medic 96" which can immediately respond to life critical call types as a 1st tier EMS responder and provide a continuum of care by providing a Paramedic licensed provider to RPS when RPS needs assistance during transport of high acuity patients, and when RPS responds with a driver only.

PFD Medical Direction

As discussed previously, EMS Medical Direction is the process by which medical oversight and guidance are provided to EMS personnel and agencies. Medical Direction is typically provided by licensed physicians who specialize in emergency medicine or another relevant field and who have experience and training in EMS.

Overall, EMS Medical Direction plays a critical role in ensuring that EMS personnel are well-trained, equipped, and supported to provide high-quality emergency medical care to patients. By providing clinical oversight, developing protocols, ensuring quality assurance, providing continuing education, and collaborating with other healthcare providers, medical directors can help to improve patient outcomes and promote better community health and safety.

The Primary Medical Director at the time of this report is Dr. Shea Duerring, MD, FAAP, FACEP, FAEMS, an experienced EMS Medical Director who also provides Medical Direction for Alabaster and Rocky Ridge Fire Departments.

In addition to serving as the EMS Medical Director for Pelham, Dr. Duerring also serves in the Alabama Office of Emergency Medical Services as the Assistant State EMS Medical Director for Pediatrics. Additionally, Dr. Duerring is also an Assistant Professor of Pediatric Emergency Medicine at The University of Alabama at Birmingham.

These intersections provide for a high level of EMS Physician involvement in addition to medical direction, clinical oversight, and training. This high level of engagement was evident by a documented and outlined robust training program, QA/QI monitoring, staff/physician engagement, and protocol development.

It is assessed the City of Pelham Fire Departments' Medical Direction program /practices are consistent with current EMS best practices for EMS Physician engagement, clinical oversight, and program development.

Contract Review for EMS Ground Transport Services

At the time of this review, it was noted by both RPS and City Administration that there is no current contract between RPS and the City, nor has there ever been. It was described in interviews that it has always been a "handshake" agreement. This is not standard practice, nor is it a recommended practice not to have a contract, as this creates service delivery and liability risk. It was also noted that under the current "handshake" agreement, RPS provides EMS ground transport without a City subsidy, meaning they are providing their services to the City without financial support, and rely on ground transport revenues to support their efforts.

There are typically two types of contracts for EMS ground transport services. These are: "***Level of Effort***" or "***Level of Performance"*** contracts. A "***Level of Effort"*** contract consists of a written agreement (contract) that describes the scope of work in general terms and requires the contractor to provide a specified level of effort (number of hours, number of units, or percentage of effort) over a stated period of time.

It is more common for ambulance providers and jurisdictions to operate under a ***"Performance-Based or Level of Performance"*** agreement (contract), which specifies desired performance levels for key clinical, experiential, and response time metrics. For example, when mutually agreed upon between both parties could include a specific number of ambulances and performance level indicators (i.e., response time metrics/posture, level of care providers, quality improvement/quality insurance metrics involving patient care outcomes, community paramedicine etc.).

The standard contract practice typically involves communities contracting with private firms for EMS ground transport services and either provide a direct subsidy to ensure the level of effort or level of performance established in an agreement can be met or have a greater chance of being met, or they provide direct assets to offset costs for the private firm such as ambulances and equipment, facilities to respond from. In most cases, EMS ground transport revenues cannot support an EMS system entirely to perform at a high level of response time performance and/or established and agreed-upon level of effort.

Consequentially, allowing a third-party EMS agency to operate within your county/city without a written contract allows for no control, accountability, or guarantee that they will continue to answer calls and provide services. Under the current EMS ground transport arrangement, this leaves Pelham vulnerable, as there is no written contract to guarantee that an ambulance will arrive and that they will be provided with a certain level of staffing and care. Additionally, PFD staff rides along with RPS staff and on RPS ambulances, sometimes assuming the lead Paramedic role, without clear lines of responsibility, medical malpractice coverage while riding in the RPS ambulance, workers compensation should there be an occurrence where the PFD staff member is injured in the RPS ambulance and any other situation where a typical contract would delineate. This can potentially create liability and litigation for the City.

Recommendation:

CPSM recommends that at a minimum, and as the City and Regional Paramedical Services continue a relationship for EMS ground transport, even if during an interim period, that the City of Pelham and Regional Paramedical Services (RPS) relationship be codified through a formal Level of Effort contract.

Determining the Number of EMS Ground Transport Units Needed

Determining the number of ambulances, a community needs is a complex process that requires consideration of a range of factors. Listed below are the key factors to consider when determining the number of ambulances, a community needs:

- Population: The size of the community and its population is a key factor in determining the number of ambulances needed. The more people there are in a community, the greater the demand for emergency medical services is likely to be.
- Call volume: The number of emergency medical calls that a community receives is another important factor in determining the number of ambulances needed. Communities with high call volumes require more ambulances to respond to emergencies in a timely manner. This is linked to the resiliency of the EMS ground transport system.
- Response times: The amount of time it takes for an ambulance to arrive at the scene of an emergency is a factor in determining the number of ambulances needed. Longer response times to higher acuity calls potentially affect patient outcomes.

- Geographic area: The size and layout of a community's geographic area will also impact the number of ambulances needed. Communities with larger, populated geographic areas may require more ambulances to cover the response area.
- Transport times: The time it takes to transport patients to hospitals or other medical facilities is another important factor in determining the number of ambulances needed. Communities with longer transport times may require more ambulances to ensure that patients receive timely care. This is linked to the resiliency of the EMS ground transport system.
- Staffing levels: The number of EMS personnel available for staffing ambulances is another important consideration. Communities with higher staffing levels may be able to support more ambulances than those with lower staffing levels.
- The use of an Emergency Medical Dispatch system that utilizes call-takers to establish proper call determinants by acuity (low, mid, high), and that dispatches the appropriate resource(s) to the medical call. This is linked to the resiliency of the EMS ground transport system and the 1st tier response system-typically the local fire department.

The current RPS data for Pelham is depicted in the next tables and figure.

Table 39: RPS Runs by Type

Run Type	Total Runs	Percent of Total	Arriving Runs	Percent Arriving	Transport Runs	Percent Transport
Breathing difficulty	253	10.6	221	87.4	168	66.4
Cardiac and stroke	335	14.0	293	87.5	229	68.4
Fall and injury	457	19.2	328	71.8	233	51.0
Illness and other	642	26.9	519	80.8	402	62.6
MVA	192	8.0	119	62.0	69	35.9
Overdose and psychiatric	197	8.3	176	89.3	128	65.0
Seizure and unconsciousness	310	13.0	256	82.6	186	60.0
Total	**2,386**	**100.0**	**1,912**	**80.1**	**1,415**	**59.3**

Table 40: Frequency of Overlapping Runs by Year

Scenario	Number of Runs	Percent of All Runs	Total Hours
No overlap	1,729	72.5	1,633.8
Overlap with one run	554	23.2	261.2
Overlap with two runs	98	4.1	31.8
Overlap with three runs	5	0.2	1.7

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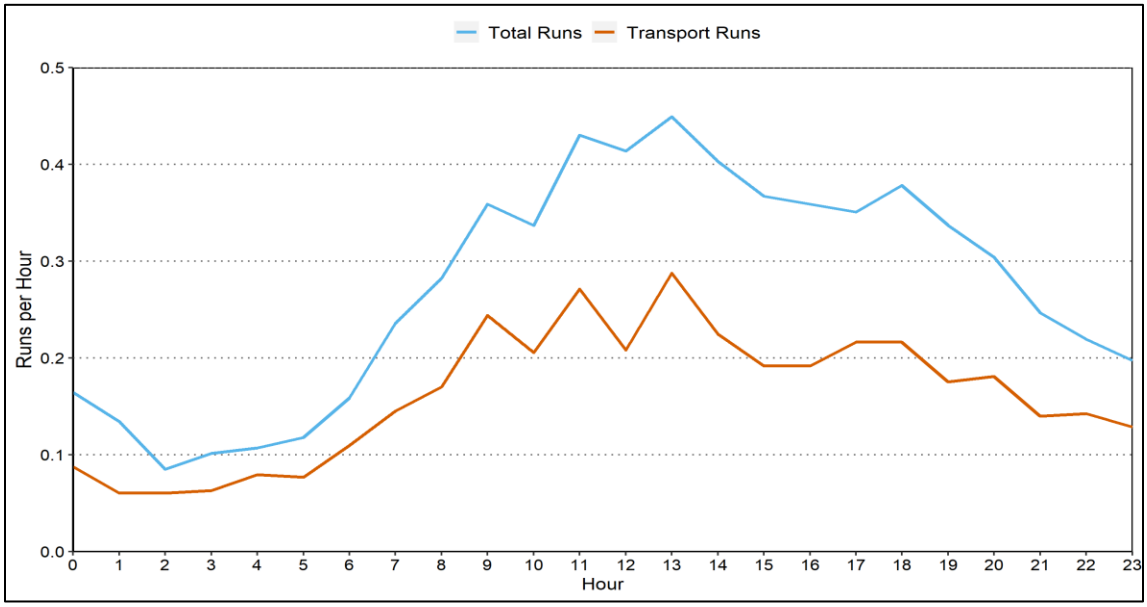
Table 41: Run Duration by Type and Transport

Run Type	Non-transport		Transport	
	Duration (minutes)	Number of Runs	Duration (minutes)	Number of Runs
Breathing difficulty	20.7	85	84.2	168
Cardiac and stroke	21.7	106	82.6	229
Fall and injury	17.2	224	89.3	233
Illness and other	17.0	240	83.0	402
MVA	13.9	123	73.5	69
Overdose and psychiatric	22.8	69	81.2	128
Seizure and unconsciousness	18.3	124	81.9	186
Total	**18.1**	**971**	**83.3**	**1,415**

Figure 34: Average EMS Transport Runs per Day by Hour



To note: RPS ground transports average 83 minutes in duration and spans more than one hour in the day.

This data tells us that:

- RPS units arrived to 80 percent of the calls to which they were dispatched. For the remaining 20%, the caller cancelled units, or RPS was canceled by the 1st tier responders.
- Of the calls RPS arrived on, 59 percent were transported to a medical facility. Links to resiliency of the transport system.
- 28 percent of RPS calls overlap with another call. 23 percent of calls overlap with one call. Links to resiliency of the transport system.
- Non-transport calls average 18-minutes/call. Transport calls average 83-munites/call. Links to resiliency of the transport system.

- EMS transport is at peaks between 9:00 am and 2:00 pm, and again between 4:00 pm and 6:00 pm.

There are numerous deployment models that can be utilized and integrated into an EMS agency's operational needs. Each has its own positives and negatives and must be balanced with the key elements of service deliverables, response time performance, and funding. In terms of efficient and effective deployment in the City within the context of this report, RPS must meet all operational needs and performance criteria that support the EMS transport functions while taking into consideration community expectations. In addition to meeting these key elements, the RPS deployment model must also be operated in a fiscally sustainable fashion, both short and long-term.

EMS deployment models are used to determine the best locations for ambulances and EMS crews to be stationed in order to provide timely responses to emergency medical calls. There are several different models that can be used, including:

- Grid deployment: This model involves dividing a community into a grid and stationing ambulances at key intersections within the grid. This approach is often used in urban areas with a high call volume.
- Cluster deployment: This model involves stationing ambulances at strategic locations around a community, such as fire stations. This approach is often used in suburban or rural areas with lower call volumes.
- Dynamic deployment: This model involves using real-time data to determine the best locations for ambulances to be stationed based on current call volume and response times. This approach is often used in urban areas with high demand and variable call volumes by time of day.

Regardless of the deployment model used, response times are a critical factor in determining the effectiveness of EMS services. Response time is the time it takes for an ambulance or EMS crew to arrive at the scene of an emergency. The goal of EMS agencies is to achieve response times that are fast enough to provide timely care to patients in need.

Response times can be affected by a range of factors, including the deployment model used, the location of the emergency, traffic conditions, and weather. In general, response times are considered to be effective if the ambulance arrives at the scene of an emergency within eight minutes of receiving the call.

However, it is important to note that response times alone do not necessarily indicate the quality of care provided by EMS crews. Other factors, such as the training and experience of EMS personnel, the quality of equipment and supplies, and the availability of advanced medical care, can also impact patient outcomes. As such, it is important to consider a range of factors when evaluating the effectiveness of EMS services in a community.

Regional Paramedical Services (RPS) is the primary ground transport responder to EMS requests in the City of Pelham. While this is typically adequate for most EMS calls, there are some EMS response types that are time-life critical, such as a cardiac arrest or severe airway compromise. When these calls occur, due to the limited first response resources, RPS relies on their overall agency resources that can be leveraged when resources are stretched.

The current deployment model is station-based static deployment, whereby units return to their base of operations after returning to service from a response. Based upon a detailed data

analysis, we assess whether a Static Deployment Model is consistent with current system needs, as evidenced by the response performance analysis provided in this report.

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

That said, there are no national response time benchmarks for EMS. EMS response times are typically established by the local jurisdiction.

RPS response times are depicted in the next set of tables. As a note, the standard for response time is typically at the 90th percentile.

Table 42: RPS Average Response Time (Minutes) by Run Type

Run Type	Dispatch	Turnout	Travel	Total	Total Runs
Breathing difficulty	2.0	1.7	15.1	18.8	221
Cardiac and stroke	1.8	2.0	14.0	17.7	293
Fall and injury	1.8	1.8	14.9	18.5	327
Illness and other	2.3	1.9	14.3	18.5	515
MVA	1.9	1.4	11.5	14.8	119
Overdose and psychiatric	2.0	1.6	14.4	18.0	176
Seizure and unconsciousness	2.4	2.0	13.7	18.1	254
Total	**2.0**	**1.8**	**14.2**	**18.1**	**1,905**

Table 43: RPS 90th Percentile Response Time (Minutes) by Run Type

Run Type	Dispatch	Turnout	Travel	Total	Total Runs
Breathing difficulty	4.2	4.0	23.9	29.9	221
Cardiac and stroke	2.8	5.6	23.7	28.2	293
Fall and injury	3.3	4.3	24.2	29.0	327
Illness and other	3.9	5.1	24.4	30.1	515
MVA	4.3	4.9	21.1	25.2	119
Overdose and psychiatric	3.3	4.6	23.1	28.7	176
Seizure and unconsciousness	4.4	5.2	22.7	28.7	254
Total	**3.6**	**4.8**	**23.8**	**28.9**	**1,905**

Table 44: PFD Average and 90th Percentile Response Time of First Arriving Unit, by Area (Minutes)

Station Area	Average Response Time				90th Percentile Response Time				Call Count
	Dispatch	Turnout	Travel	Total	Dispatch	Turnout	Travel	Total	
FD1	1.4	1.4	3.5	6.2	2.2	2.1	5.4	8.4	807
FD2	1.5	1.3	3.8	6.6	2.4	1.9	6.2	9.4	582
FD3	1.4	1.4	6.0	8.8	2.3	2.1	12.1	14.7	283
FD4	1.4	1.3	3.2	5.9	2.1	2.0	5.0	8.2	561
FD5	1.4	1.6	4.3	7.3	2.0	2.4	7.1	10.1	183
Total	**1.4**	**1.4**	**3.8**	**6.6**	**2.2**	**2.1**	**6.5**	**9.5**	**2,416**

Table 45: RPS Time Component Analysis for Transport Runs by Type (Minutes)

Run Type	Average Time Spent per Run				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	12.1	18.3	36.5	84.2	168
Cardiac and stroke	11.8	16.8	37.3	82.6	229
Fall and injury	13.1	17.8	40.3	89.3	233
Illness and other	11.6	18.6	35.8	83.0	402
MVA	10.5	16.9	32.9	73.5	69
Overdose and psychiatric	11.6	15.9	37.3	81.2	128
Seizure and unconsciousness	11.8	17.0	36.7	81.9	186
Total	**11.9**	**17.6**	**37.0**	**83.3**	**1,415**

This data tells us that:

- The average response time for RPS is 18 minutes (14 minute travel time). The 90th percentile response time is 29 minutes (24 minute travel time).
- The PFD average response time is 7 minutes (4 minute travel time). The 90th percentile response time is 9.5 minutes (6.5 minute travel time).
- The RPS travel time to the hospital is 18 minutes; the overall transport time on average is 83 minutes.

It is important to note that from the data, the PFD have a faster travel time to incidents based on volume and strategically placed stations. On average, the PFD is on scene for ten minutes prior to RPS arrival. At the 90th percentile, the PFD is on scene for 17.5 minutes prior to RPS arrival. This shows the importance of a tiered EMS response system, and of an aggressive Emergency Medical Dispatch System.

The data also tells us Pelham needs:

- At a minimum, one EMS transport unit 24/7/365. There are, however, resiliency issues built into this model. These include:

- Overlapping calls during times the lone ambulance is on a transport (currently 24 percent of calls). RPS currently averages 55 minutes once they begin the transport until they clear from the receiving medical facility.
- Reliance on mutual aid to assist Pelham EMS transport capabilities, regardless of where they may come from, is limited to the mutual aid partner's availability.

- Therefore, the city needs an additional ambulance at a minimum between the hours of 8:00 am and 8:00 pm. This is dependent on establishing reliable mutual aid with surrounding EMS ground transport partners, to include RPS, who are willing and able to supplement EMS ground transport in Pelham.
- The most dependable model for the city to ensure the greatest majority of the initial and overlapped calls are handled in a responsive manner, is to have two staffed EMS ground transport units available 24/7/365.

EMS Ground Transport Alternatives

The City of Pelham is considering alternative approaches to EMS ground transport. There are several approaches a locality may consider and include the following.

- Private third party EMS ground transport provider.

This is the model the City is currently using. A third party EMS ground transport provider, (typically through a contractual arrangement with the local government), provides EMS ground transport through a Level of Effort or Level of Performance.

- Alternative one for the City is to maintain the status quo with RPS.
- Alternative two for the City is to solicit additional private ambulance services through the Request for Proposal (RFP) process. CPSM recommends if the City chooses this alternative, the City specifies the terms and conditions for the type of service they seek, that being either a Level of Effort or Level of Performance as outlined herein.

Pros for this alternative include:

- The City has an established contract for the provision of EMS ground transport.
- The City will receive three ambulances from the County. The City can structure the contract for personnel services only, while maintaining the transportation infrastructure. With this, the City's cost for EMS ground transport potentially will be limited to personnel costs and private ambulance station costs.

Cons include:

- The City has no control over personnel and personnel costs.
- Unless specified in the contract, the City potentially will have no control over personnel assigned, quality of service, and direct connection to the service.

- Assign and implement an EMS ground transport component in the PFD.

There are several potential benefits to a city fire department assuming EMS (Emergency Medical Services) operations. These include:

- Improved response times: Fire departments are often located strategically throughout a community, which means they can potentially respond to medical emergencies more quickly than traditional ambulance services. By assuming EMS operations, a city fire department may be able to provide faster response times and improve patient outcomes dependent on the number of ambulances are implemented in the system.
- Enhanced training and resources: Fire departments often have extensive training and resources related to emergency response and medical care, which can be leveraged to improve EMS operations. Fire department personnel may have additional training in areas such as search and rescue, hazardous materials response, and incident command, which can be valuable in emergency medical situations.
- Cost savings: By assuming EMS operations, a city fire department may be able to streamline operations and reduce costs associated with EMS services. This could be achieved by sharing resources and equipment, reducing duplication of efforts, and improving overall efficiency.
- Improved coordination: With a fire department assuming EMS operations, there can be improved coordination between EMS and fire services, which can lead to more efficient and effective emergency responses. This coordination can also lead to more seamless transitions of care for patients from the scene of an emergency to the hospital.
- Improved community engagement: Fire departments are often highly visible and trusted community organizations. By assuming EMS operations, a fire department can increase its community engagement and improve its overall reputation within the community.

While there are potential benefits to a fire department assuming EMS (Emergency Medical Services) responsibilities, there are also several challenges that must be considered. Some of these challenges include:

- Training and certification: Firefighters may require additional training and certification to provide EMS services. This can include training in advanced life support, medications, and other medical procedures. Ensuring that all personnel are properly trained and certified can be a significant challenge for fire departments.
- Staffing: Providing EMS services requires additional personnel, which can strain the resources of a fire department. Fire departments may need to hire additional staff, which can be costly and time-consuming.
- Equipment and supplies: Providing EMS services requires specialized equipment and supplies, such as ambulances, advanced life support systems, defibrillators, and oxygen tanks. Fire departments may need to purchase or lease additional equipment and supplies to provide EMS services.
- Coordination with other agencies: Providing EMS services requires coordination with other agencies, such as hospitals and other emergency medical responders. Fire departments may need to develop new relationships and protocols for working with these agencies.
- Liability: Providing EMS services can increase a fire department's liability, as the risk of medical errors or malpractice can be higher than in traditional fire suppression operations. Fire departments may need to invest in additional med-mal liability insurance or take other steps to mitigate this risk.
- Cost: Providing EMS services can be costly, particularly in terms of staffing, training, and equipment. Fire departments may need to carefully consider the costs associated with assuming EMS responsibilities and develop strategies for managing these costs.

- EMS ground transport rarely pays for the service-this revenue does however offset costs.

The PFD currently staffs an EMS QRV (Medic 96) with two personnel (at least one is a Paramedic). The PFD can easily shift these two personnel and staff an EMS ground transport unit 24/7/365. Depending on the model adopted by the city (one additional peak time ambulance or one additional 24/7/365 ambulance), the FTE liability for one additional ambulance is either four (peak time ambulance 7/12/365) or six (24/7/365 second ambulance). Additionally, the city is receiving three ambulances from the County, which will reduce start-up costs.

- Create a City EMS Department.

This alternative creates an additional department in the city to deliver EMS ground transport services as follows:

- One EMS ground transport unit 24/7/365.
- A second EMS ground transport unit 7/12/365 (Peak Time) or 24/7/365.
- EMS department Director, officers, administrative and logistics staff.

In the current situation, there are few Pros to this model as Pelham as a government is small and funds are limited. Pros include:

- A separate City department provides EMS service as a local government department, where control over the service is managed as part of the city government. This is the case as well if EMS was implemented as a component in the PFD.
- The city is receiving three ambulances from the County, which will reduce start-up costs.
- The City will generate EMS ground transport revenues, which will offset (not pay entirely for) expenses for the City EMS ground transport department.

Cons include:

- Establishing a new city department and the additional costs included with this.
    - Some costs will duplicate with the PFD
    - If implemented in the PFD the overall hierarchy, logistical functions, and stations are already in place.

- Contract with other municipalities for EMS ground transport service.

Pros for this alternative include:

- The City has an established contract for the provision of EMS ground transport.
- The City will receive three ambulances from the County. With this, the City's cost for EMS ground transport potentially will be limited to maintaining the ambulances and providing equipment and supplies.
- The City contracts for the personnel hours and certification level required to fulfill their needs.

Cons include:

- The City has no control over personnel and personnel costs.
- Unless specified in the contract, the City potentially has no control over personnel assigned, quality of service, and direct connection to the service.

Recommendation:

CPSM recommends the City, as a first alternative, conduct an RFP process for an EMS ground transport provider. If this effort does not produce a satisfied result, CPSM recommends the city bring the EMS transport service in-house and consider as a first alternative the placement of EMS transport service on the PFD as they have the current staffing to staff an initial ambulance 24/7/365, and the administrative and logistical staff in place begin this transition. When considering both alternatives, the City should explore the implementation of a priority medical dispatch system designed to process incoming 911 EMS calls in a manner where an appropriate call determinant by acuity level (low, mid, high) is developed, and subsequently routed to the radio telecommunicator who will then dispatch the appropriate resource(s) to the call, therefore establishing a true tiered response approach to EMS calls in Pelham.

End of Technical Report