

Fire, EMS, and Emergency Management Assessment and Efficiency Study

Bethlehem, PA



CPSM[®]

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International City/County Management Association (ICMA)

The International City/County Management Association (ICMA) is a 110-year-old, non-profit 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 their 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.

Center for Public Safety Management

The ICMA Center for Public Safety Management (ICMA/CPSM) was launched by ICMA to provide support to local governments in the areas of law enforcement, fire, Emergency Medical Services (EMS), emergency management, and 911-Communication Centers. CPSM 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. Further, CPSM provides training and research for ICMA members and represents ICMA in its dealings with public safety professional associations such as CALEA, PERF, IACP, IAFC, PSHRA, DOJ, BJA, COPS, and NFPA.

In 2014 as part of a restructuring at ICMA, CPSM spun out of ICMA as a separate company and is now the exclusive provider of public safety technical assistance for ICMA. The *Center for Public Safety Management, LLC*, maintains the same team of individuals performing the same level of service that it had as an ICMA internal program.

As an organization, CPSM has more than 15 years of experience performing fire, EMS, law enforcement, and 911 Communication Center agencies nationwide using our unique methodology of aligning our comprehensive workload and response analysis with industry standards and best practices, and our client's issues and challenges. Our overall experience includes more than 500 such public safety studies in 46 states and provinces and 450+ communities ranging in population size from 269 (Bald Head, NC) to 4.4 million (Maricopa County, AZ).

The CPSM project teams offer years of practitioner, first line supervisory, middle management, and senior leadership experience in the fire, rescue, EMS, emergency management, law enforcement, and 911-Center disciplines; and a record of research, academic, teaching, and training. Our team comprises true industry subject matter experts, not research assistants, interns, or generic management consultants.



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The Center for Public Safety Management extends its sincere gratitude to the City of Bethlehem, Mayor Reynolds, the Bethlehem Fire Department and EMS Division, and the Bethlehem Fire Chief and EMS Director for their invaluable collaboration and support in the development of this Fire and EMS services analysis.

This undertaking represents a significant and forward-thinking commitment to public safety. A Fire and EMS services analysis document is more than a report, it is a comprehensive evaluation of current operations, current and future city growth, deployment strategies, and response performance. It provides a foundation that helps ensure resources are aligned with community needs, and service delivery is both effective and efficient.

The successful completion of this effort reflects a shared dedication to excellence, transparency, and continuous improvement on the part of the Bethlehem Fire Department and EMS Division. By engaging in this process, the City of Bethlehem and its leadership have demonstrated a proactive approach to safeguarding residents, strengthening emergency response capabilities, and planning responsibly for future growth.

This achievement will serve as a critical tool for informed decision-making, strategic planning, and maintaining a high standard of service for years to come. It stands as a testament to the professionalism, vision, and collaborative spirit of everyone involved.



PREFACE

The information presented in this report provides context regarding the provision of Fire and Emergency Medical Services, and the changing risks faced in communities. Understanding these trends is essential for evaluating contemporary service delivery models, assessing community expectations, and ensuring that Fire and EMS response agencies remain positioned to provide efficient, effective, and sustainable public safety services in an increasingly complex environment.

CPSM's recommendations contained within this report are grounded in a comprehensive research and analytical process that combines quantitative data analysis with recognized industry best practices. The study evaluates historical incident demand, response workload, unit utilization, and response time performance to develop an objective understanding of each organization's current capabilities and service delivery challenges (Fire and EMS).

This analysis includes the examination of staffing, resource deployment, supportive programs, call volumes, incident types, temporal demand patterns, simultaneous incidents, and deployment performance to determine how resources are utilized and where service and organizational gaps may exist. Findings are then benchmarked against applicable national standards, including those established by the National Fire Protection Association (NFPA), the Commission on Fire Accreditation International (CFAI), and other recognized public safety organizations. By comparing local performance to national benchmarks and industry best practices, CPSM is able to identify strengths, opportunities for improvement, and community and operational risks. The resulting recommendations are data-driven, evidence-based, and designed to provide the City with practical strategies that align resources, response capabilities, and organizational priorities with accepted national standards.

Evolution of Firefighting Practices

Firefighting practices in the United States have evolved significantly over the past several decades in response to changing community risks, advancements in technology, and shifting service demands. Historically, fire departments were primarily organized around the suppression of structure fires, with staffing, apparatus, training, and deployment models centered on extinguishment operations. During much of the twentieth century, structure fires occurred with far greater frequency, particularly in residential occupancies, due to limited fire protection systems, less stringent building codes, and lower public awareness regarding fire prevention practices. Over time, however, the fire service transitioned from a reactive suppression-focused profession to a broader all-hazards emergency response system emphasizing prevention, mitigation, emergency medical services (EMS), technical rescue, hazardous materials response, and community risk reduction (CRR).

National fire data demonstrates a measurable decline in structure fires and associated civilian fatalities over the past several decades. According to the National Fire Protection Association (NFPA), the estimated number of reported home fires in 2023 was approximately 55 percent lower than in 1980, while one- and two-family residential fires declined by roughly 57 percent during the same period. Additionally, NFPA reports indicate that total fires in the United States were approximately 54 percent lower in 2020 than in 1980, with civilian fire deaths and injuries declining by 46 percent and 50 percent, respectively. Although population growth, urban expansion, and increased development have elevated overall community risk exposure, the frequency and severity of fires have steadily diminished due to substantial improvements in prevention and protection strategies.

Several major factors have contributed to this decline in fire incidents. Enhanced public awareness and fire safety education campaigns have improved citizen understanding of smoke alarms, cooking safety, electrical hazards, and escape planning. Proactive inspection and code enforcement programs conducted by local fire departments have increased compliance with life safety standards in residential, commercial, and industrial occupancies. Modern building codes now require safer construction practices, including fire-resistant materials, compartmentalization features, and regulated electrical systems. The widespread adoption of automatic fire sprinkler systems, smoke alarms, and advanced detection technologies has also significantly reduced fire growth and improved occupant survivability. NFPA data further shows that fires involving electrical failure or malfunction have steadily declined since 1980, reflecting advances in electrical standards and safer building practices.

As fire incidents declined, fire departments across the nation adapted operationally and strategically to meet changing service demands. Today, EMS responses comprise the majority of incidents for many departments, often accounting for 70 to 85 percent of annual call volume. In addition, fire agencies increasingly emphasize community risk reduction initiatives designed to identify and mitigate hazards before emergencies occur. These programs may include public education, code enforcement, pre-incident planning, smoke alarm installation programs, fall prevention initiatives, wildfire mitigation, and data-driven risk analysis. Contemporary fire departments now function as comprehensive public safety organizations that balance suppression capabilities with prevention, preparedness, medical response, and resilience planning. ***This evolution reflects the modern fire service's commitment not only to responding to emergencies, but also to reducing the likelihood and impact of emergencies within the communities they serve.***

Advancements in Fire Prevention

Advancements in fire prevention over the past several decades have significantly improved life safety outcomes and reduced the frequency and severity of fire incidents throughout the United States. Modern fire protection strategies now integrate engineering controls, public education, code enforcement, and technological innovations to create a comprehensive approach to risk reduction. Fire departments, building officials, and national organizations such as the National Fire Protection Association and the U.S. Fire Administration have collectively advanced fire safety standards through updated building codes, enhanced fire suppression systems, and widespread public education initiatives. These efforts have fundamentally changed the fire environment and contributed to long-term declines in civilian fire deaths, injuries, and property loss.

One of the most significant advancements has been the institutionalization of fire and life safety education as a core function of the modern fire service. Fire departments increasingly recognize that preventing emergencies is equally as important as responding to them. As a result, many agencies have developed targeted community outreach and Community Risk Reduction (CRR) programs designed to address behavioral risks that commonly contribute to residential fires. Public education campaigns routinely focus on cooking safety, heating safety, electrical hazard awareness, smoke alarm maintenance, and the development and practice of home escape plans. According to the National Fire Protection Association, cooking remains the leading cause of reported home fires and home fire injuries in the United States, accounting for nearly half of all reported home fires annually. Educational efforts emphasizing safe cooking practices, proper use of portable heating devices, and residential electrical safety have become foundational components of local fire prevention strategies.

Advances in smoke alarm technology and escape planning education have also substantially improved survivability during residential fires. The National Fire Protection Association reports that

the risk of dying in a home fire is cut by approximately 55 percent when working smoke alarms are present. National campaigns such as Fire Prevention Week regularly promote home escape planning, encouraging families to develop and practice two ways out of every room and establish designated meeting locations outside the home. These initiatives are particularly important given the faster fire growth associated with modern synthetic furnishings and lightweight construction materials, which can significantly reduce available escape time during a fire event.

Inspection and code enforcement programs have also evolved into highly systematic and increasingly data-driven components of modern fire protection systems. Fire prevention bureaus now routinely utilize risk-based inspection schedules, occupancy hazard classifications, incident history analysis, and electronic records management systems to prioritize inspections and identify recurring hazards within communities. Routine inspections are conducted in commercial, industrial, institutional, and multifamily occupancies to ensure compliance with applicable fire and life safety codes. Key focus areas include means of egress and occupancy compliance, fire detection and suppression system operability, hazardous material storage and handling, fire alarm maintenance, emergency lighting, sprinkler system functionality, commercial cooking protection systems, electrical system safety, and fire department access requirements. These inspection programs are intended not only to identify violations, but also to proactively reduce conditions that increase the likelihood or severity of fire incidents.

The expansion of proactive inspection and enforcement activities has significantly reduced code deficiencies that historically contributed to fire loss and civilian casualties. Modern code enforcement practices help ensure that exits remain accessible, fire protection systems remain operational, hazardous materials are properly stored, and buildings maintain compliance with evolving life safety standards. In many jurisdictions, inspection programs are integrated with broader Community Risk Reduction strategies, allowing departments to analyze incident trends, identify high-risk occupancies, and allocate prevention resources more effectively. Collectively, these advancements demonstrate how the contemporary fire service has evolved beyond emergency response alone and now emphasizes prevention, mitigation, education, engineering, and enforcement as essential components of comprehensive public safety delivery.

For a community to ensure modern fire prevention advancements are actually in place and effective, it has to do more than simply “adopt new technology.” It requires a coordinated system of code adoption, regular and consistent code enforcement, infrastructure investment, and ongoing public engagement.

First, the foundation is adopting up-to-date fire and building codes. Most modern prevention advancements such as sprinkler requirements, smoke alarm standards, fire-resistive construction, and egress design are embedded in model codes published by organizations like the National Fire Protection Association and the International Code Council. Communities must formally adopt these codes through local ordinances and then periodically update them as standards evolve. Without this step, new technologies and practices never become enforceable requirements.

Second, consistent enforcement is critical. Having strong codes on paper is not enough. A community must invest in trained fire marshals, building inspectors, and plans reviewers who can ensure compliance during construction and renovation. This includes conducting inspections of commercial occupancies, schools, multifamily housing, and high-risk facilities, as well as verifying that systems like alarms and sprinklers are properly installed, tested, and maintained over time.

Third, communities must support built environment upgrades and retrofits. Much of the existing risk often lies in older structures that were built before modern codes required sprinklers, fire alarms, or fire-rated separations. Local governments can address this through retrofit ordinances, incentive programs, grant funding, or phased compliance requirements, especially in high-occupancy or high-hazard buildings.

Fourth, public education and community risk reduction programs are essential. Advancements in fire prevention are not limited to infrastructure; they also include human behavior. Programs that promote smoke alarm installation, home escape planning, cooking safety, and electrical fire prevention significantly reduce residential fire risk. Fire departments typically lead these efforts through Community Risk Reduction (CRR) initiatives.

Fifth, reliable infrastructure must support prevention systems. Sprinklers, hydrants, water supply capacity, and emergency communications systems all need to be designed and maintained to support modern fire protection strategies. Without adequate water distribution or system maintenance, even advanced suppression systems can fail to perform as intended.

Finally, data-driven planning and accountability ensure continued progress. Communities should track fire incidents, building loss trends, inspection outcomes, and system performance to identify gaps. This allows fire departments and municipal leaders to adjust code requirements, enforcement priorities, and public outreach strategies based on actual risk.

In short, ensuring fire prevention advancements are in place is an ongoing system of governance, staffing for enforcement, infrastructure, and education, not a one-time installation of technology.

Building Codes and Construction Practices

Modern building and fire codes have evolved substantially over the past several decades in response to catastrophic fire events, advances in engineering, and an increased understanding of fire behavior within the built environment. Contemporary regulatory frameworks are designed not only to reduce the likelihood of fire occurrence, but also to limit fire spread, protect structural integrity, and improve occupant survivability during emergencies. Organizations such as the International Code Council and the National Fire Protection Association continuously revise model building and fire codes to incorporate lessons learned from historical incidents, emerging technologies, and evolving construction practices. These codes are subsequently adopted and enforced at the state and local levels, forming the foundation of modern fire and life safety regulation.

Strengthened building and fire codes now emphasize several critical life safety principles. Fire-resistive construction requirements are intended to maintain structural stability during fire events and provide occupants with sufficient time to evacuate. Structural components such as walls, floors, ceilings, and support assemblies are increasingly required to meet specific fire-resistance ratings based on occupancy type and building height. Compartmentation strategies further limit fire and smoke spread by dividing buildings into fire-resistance-rated areas using fire walls, smoke barriers, and fire doors. These systems are designed to contain fires to the area of origin and reduce the risk of rapid extension throughout a structure. Modern codes also require redundant life safety systems, including automatic sprinkler systems, smoke detection devices, fire alarms, standpipe systems, emergency lighting, exit signage, and smoke control systems. Together, these requirements significantly enhance occupant survivability, improve firefighter operating conditions, and reduce overall fire growth potential.

Building codes have also expanded to address specialized hazards associated with high-occupancy structures, healthcare facilities, industrial occupancies, and hazardous material

storage. Modern code frameworks regulate occupant load calculations, travel distances to exits, fire department access, ventilation systems, and the protection of critical infrastructure systems. In many jurisdictions, code adoption now incorporates performance-based design approaches that utilize fire modeling, engineering analysis, and risk assessment methodologies to achieve equivalent or enhanced levels of fire protection beyond prescriptive minimum standards. These regulatory advancements reflect a broader shift toward data-driven and risk-informed fire protection strategies within the built environment.

Advances in building materials and construction practices have likewise influenced fire behavior and firefighting operations. Contemporary construction increasingly incorporates engineered materials, fire-rated assemblies, and treated products designed to improve fire resistance and compartmentation performance. Fire-rated gypsum systems, protected structural steel, fire-retardant-treated wood, and insulated glazing assemblies contribute to improved containment and reduced structural collapse potential. However, modern construction also presents new operational challenges for the fire service. The widespread use of lightweight construction methods engineered lumber products, open floor plans, and synthetic furnishings has altered fire dynamics significantly. Lightweight structural components can fail more rapidly under fire conditions, while synthetic materials typically produce higher heat release rates, faster fire growth, and increased toxic smoke production compared to legacy natural materials.

This duality within modern construction environments necessitates continuous adaptation in firefighting tactics, training, and operational decision-making. Fire departments must now account for faster flashover conditions, reduced structural stability timelines, and increasingly complex smoke and fire behavior during emergency operations. As a result, contemporary fire service training increasingly emphasizes modern fire dynamics research, coordinated fire attack, ventilation control, thermal imaging technology, and risk-based incident command strategies. The evolution of building codes and construction practices has unquestionably improved overall life safety; however, it has simultaneously introduced new hazards that require ongoing vigilance, education, and operational adaptation by the modern fire service.

For a community to ensure advancements in building codes and modern construction practices are actually implemented, it must establish a full lifecycle system that moves from adoption → enforcement → compliance → continual improvement. New technologies and safer construction methods only reduce risk when they are consistently required and verified in real-world building activity.

First, the community must formally adopt current model codes through local law. Most modern life-safety and construction advancements, such as enhanced fire-resistive construction, sprinkler requirements, smoke control systems, and modern egress design are developed through consensus standards and model codes published by organizations such as the International Code Council and the National Fire Protection Association. Local governments must adopt these codes into municipal ordinances and ensure they are updated on a regular cycle so that older, outdated requirements do not remain in force for decades.

Second, effective enforcement capacity is essential. This includes having qualified building officials, fire marshals, and plans examiners who are trained in current code provisions and modern construction systems. Without adequate staffing and technical expertise, even well-written codes fail to translate into safer buildings. Enforcement also includes systematic plan review before construction begins, ensuring designs comply with current fire and life safety standards.

Third, communities must maintain a strong inspection and compliance process throughout construction. Code compliance is not achieved by permitting alone; it must be verified during

framing, mechanical/electrical installation, fire protection system installation, and final occupancy approval. This ensures that key safety features—such as fire-rated assemblies, sprinkler systems, alarm systems, and compartmentation—are installed as designed and function as intended.

Fourth, coordination with planning and development processes is critical. Zoning decisions, land-use planning, and development approvals directly influence building types, density, and occupancy risk. When planning departments and building officials work in alignment, communities can better ensure that high-risk occupancies are paired with appropriate fire protection features and infrastructure capacity, such as water supply and hydrant coverage.

Fifth, communities must support ongoing professional training and certification for inspectors, engineers, architects, and contractors. Modern construction practices evolve rapidly—particularly in areas like mass timber construction, energy-efficient building envelopes, and integrated fire protection systems. Continuous education ensures that all parties understand not only code requirements but also the intent behind life safety provisions.

Sixth, retrofit strategies and code enforcement for existing buildings are necessary to address legacy risk. Many of the most significant fire and life safety hazards exist in older buildings that predate modern code requirements. Communities can address this through fire code enforcement, targeted retrofit ordinances for high-occupancy or high-risk buildings, and incentives or grant programs to encourage upgrades.

Finally, data-driven governance and periodic code updates ensure long-term effectiveness. Communities should analyze fire incidents, building performance data, and near-miss events to identify gaps in existing code provisions. This information can then inform local amendments and support the next cycle of code adoption, ensuring continuous improvement in building safety standards.

In short, ensuring modern building codes and construction practices are in place requires more than adoption, it requires sustained investment in enforcement, technical expertise, interagency coordination, and continuous updating aligned with evolving standards and construction technology.

Expansion of Fire Protection Technologies

The expansion of fire protection technologies has fundamentally transformed fire prevention, suppression, and life safety practices within modern communities. Advances in automatic suppression systems, fire detection technologies, monitoring systems, and integrated building safety features have significantly reduced the frequency of catastrophic fires and improved survivability for building occupants and emergency responders alike. Modern fire protection technologies are now widely incorporated into commercial, industrial, institutional, and increasingly residential occupancies as part of comprehensive fire and life safety strategies. These systems are designed to detect, control, and suppress fires during the earliest stages of development, thereby reducing fire growth, limiting smoke spread, and minimizing overall property damage.

Among the most impactful advancements has been the widespread implementation of automatic sprinkler systems. According to the National Fire Protection Association, automatic sprinklers substantially reduce civilian deaths, injuries, and property loss in reported structure fires. Sprinkler systems are specifically designed to activate individually in response to elevated temperatures near the fire source, allowing suppression efforts to begin before flashover conditions occur. By controlling fires in their incipient or growth stages, sprinkler systems significantly reduce heat release rates, limit smoke production, and slow fire extension.

throughout a structure. This early intervention improves occupant evacuation times, enhances firefighter safety, and reduces the likelihood of total building loss.

Automatic sprinkler systems have proven particularly effective in limiting flashover potential and containing fires to the area of origin. In many incidents, sprinkler activation either extinguishes the fire entirely or controls it until fire department personnel arrive on scene. NFPA research consistently demonstrates that buildings protected by both smoke alarms and automatic sprinkler systems experience far lower civilian fatality rates than non-sprinklered occupancies. In addition to reducing life loss, sprinkler systems substantially decrease economic impacts by limiting water damage, structural collapse, business interruption, and large-scale property destruction. These benefits have led to expanded code requirements for sprinkler protection in commercial occupancies, multifamily residential buildings, healthcare facilities, educational occupancies, and certain one- and two-family dwellings in jurisdictions adopting modern residential fire sprinkler provisions.

Detection and alarm systems have also seen substantial advancement, particularly in smoke detection technology, system integration, and communication reliability. Smoke detection has become more reliable and accessible due to improvements in sensor design, battery technology, and system diagnostics. Modern detectors are better able to identify combustion particles earlier in fire development while reducing nuisance alarms caused by non-emergency conditions. Interconnected alarm systems—now widely required in residential construction—ensure that when one detector activates, all alarms throughout the structure sound simultaneously, significantly improving occupant notification and reducing escape time delays. These systems provide earlier and more consistent warning, allowing for timely evacuation and faster emergency response intervention.

In addition, fire alarm systems increasingly incorporate advanced features such as carbon monoxide detection, voice evacuation messaging, and smart-home integration. Many systems are now capable of transmitting automatic emergency notifications to monitoring centers or directly to emergency communications centers, reducing dispatch times and improving situational awareness for responding units. When combined with sprinkler systems and other building safety technologies, modern detection and alarm systems form a critical layer of protection that enhances occupant survivability and supports more effective emergency operations.

The growing integration of fire protection technologies into the built environment represents one of the most important advancements in contemporary fire safety. However, these systems also require consistent inspection, maintenance, testing, and code enforcement to ensure operational reliability. ***As communities continue to grow and structures become increasingly complex, fire departments must maintain technical expertise related to suppression systems, alarm technologies, and modern building infrastructure. The expansion of these technologies has unquestionably improved fire outcomes nationwide and remains a cornerstone of contemporary fire and life safety strategy.***

Transformation of Fire Department Operations

Fire department operations have undergone a significant transformation over the past several decades, shifting from a primarily fire suppression-focused mission to a broad, service-oriented emergency response system. This evolution has been driven by changes in community risk profiles, advances in medical care, and the increasing complexity of emergencies faced by modern communities. As a result, fire departments now operate as integrated public safety organizations that balance fire suppression, emergency medical services, technical rescue, and disaster response within a unified operational model.

A major driver of this transformation is the growth of EMS responsibilities within the fire service. In many jurisdictions, emergency medical responses now account for the majority of all calls for service, far exceeding the number of structure fires. Fire departments have adapted by integrating EMS delivery into their core operations through cross-trained firefighter/EMTs and paramedics who can provide immediate care at the scene of medical emergencies. Many agencies have also implemented tiered response systems, pairing engine or ladder companies with transport ambulances or EMS units to improve efficiency and coverage. The expansion of advanced life support (ALS) capabilities within fire-based systems has further enhanced the ability to deliver time-sensitive medical interventions, improving patient outcomes and reinforcing the fire service's role as a critical component of the emergency medical system.

In addition to EMS integration, modern fire departments now operate under an all-hazards response model, reflecting the wide range of incidents that can impact a community. This model recognizes that fire departments are often the first-due resource not only for fires, but also for motor vehicle collisions, technical rescues, hazardous materials incidents, and natural or human-caused disasters. As a result, operational readiness requires a much broader skill set than in the past. Firefighters must maintain proficiency in specialized disciplines such as rope rescue, confined space operations, hazardous materials mitigation, and incident management systems. Departments must also ensure that equipment, staffing, and training programs are aligned to support these diverse response requirements.

This expanded mission has significantly increased the importance of ongoing training, resource allocation, and interagency coordination. Fire departments now routinely work alongside law enforcement, emergency management, public health agencies, and utility providers to manage complex incidents. The transformation of fire service operations reflects an adaptive response to evolving community needs, positioning modern fire departments as multi-functional emergency response organizations focused on both life safety and community risk reduction.

As fire department operations transform, governing bodies must adjust how they evaluate, fund, and oversee the organization because the modern fire service is no longer limited to traditional fire suppression. The shift toward EMS dominance, all-hazards response, and higher technical complexity changes what "adequate service" actually means in practice.

First, elected officials must consider service demand and workload reality, not legacy assumptions. In many communities, EMS calls now make up the majority of responses, meaning staffing, station placement, and response models must be evaluated based on medical call volume as much as fire risk. This directly affects decisions about whether the department is resourced as a fire-based EMS system, a transport-capable agency, or a first-response-only model supported by private EMS.

Second, governing bodies must evaluate staffing and deployment models in light of expanded roles. Modern firefighters are expected to perform advanced life support, technical rescue, hazardous materials response, and incident command functions. This requires appropriate staffing levels, shift design, and workload management to prevent fatigue and maintain performance. Decisions about minimum staffing per apparatus, peak-time coverage, and system redundancy become more critical as operational complexity increases.

Third, they must consider financial sustainability and cost structure changes. EMS-driven operations often require significant investment in training, certification, medical oversight, equipment replacement cycles, and quality assurance programs. At the same time, technical rescue and hazardous materials readiness require specialized apparatus and ongoing maintenance. Governing bodies must weigh these costs against competing municipal priorities

while recognizing that fire departments now function as multi-service emergency providers rather than single-purpose agencies.

Fourth, elected officials must ensure training, credentialing, and risk management systems are adequately supported. As service expectations expand, so does liability exposure. Paramedic-level care, extrication operations, and hazardous materials mitigation all carry higher risk profiles than traditional firefighting. This makes ongoing training, medical direction, standardized operating procedures, and safety programs essential components of organizational oversight.

Fifth, there must be attention to interagency coordination and system integration. Modern fire departments do not operate in isolation; they are part of a broader emergency response ecosystem involving hospitals, EMS transport providers, emergency management agencies, and law enforcement. Governing bodies should ensure communication systems and joint operating procedures are in place, so the system functions cohesively during both routine and large-scale incidents.

Finally, governing bodies should consider long-term community risk reduction and strategic alignment. As fire departments shift toward prevention, EMS, and all-hazards response, leadership must ensure the organization's strategic direction aligns with community growth, development patterns, and emerging risks such as aging populations or increased infrastructure complexity. This requires regular performance review, data-driven planning, and willingness to adjust service delivery models as community needs evolve.

In short, governing bodies must move from a traditional “fire suppression funding model” to a comprehensive public safety systems perspective, where fire, EMS, rescue, and emergency management are treated as interconnected components of community resilience.

Implications for the Fire Service

The continued decline in fire incidents is a positive indicator of improved building codes, fire prevention efforts, public education, and fire protection systems. However, this trend has significant implications for fire service operations and organizational structure. As structural fire responses decrease, many fire departments are experiencing a proportional shift in workload toward emergency medical services (EMS), technical rescue, hazardous conditions, and community risk reduction activities. This evolution requires departments to rethink traditional staffing models, deployment strategies, and performance expectations.

One of the most immediate operational impacts is the reallocation of resources toward EMS delivery and prevention-focused programs. In many jurisdictions, EMS now represents the majority of call volume, requiring fire agencies to maintain a high level of clinical proficiency, medical oversight, and system integration with hospitals and regional EMS providers. At the same time, prevention divisions are expanding their role in inspections, public education, and risk reduction initiatives, shifting the fire service further upstream in addressing hazards before they result in emergencies.

This changing risk profile also drives enhanced training requirements across multiple disciplines. Firefighters must maintain competency not only in fire suppression, but also in advanced life support (ALS), behavioral health response, technical rescue operations, and increasingly complex hazardous materials environments. The expectation of “all-hazards” readiness places greater demand on training budgets, time commitments, and certification maintenance, while also increasing the importance of cross-training and interoperability within and between agencies.

In response to these shifts, fire departments are placing increased emphasis on data-driven decision-making. Incident data, community risk assessments, and performance analytics are being used to guide deployment models, station location decisions, staffing levels, and program development. This approach supports more efficient use of limited resources and helps align service delivery with actual community risk rather than historical response patterns alone.

For governing bodies such as city councils, county commissions, and boards, these operational changes require careful consideration of funding priorities, service expectations, and long-term sustainability. Elected officials must balance the public expectation of rapid emergency response with the financial realities of maintaining dual-capability fire and EMS systems. This includes evaluating staffing models, apparatus replacement cycles, training investments, and the potential need for regional partnerships or alternative service delivery models. **Governing bodies must also ensure that policy decisions support both immediate response capacity and long-term community risk reduction goals, recognizing that reductions in fire incidents do not equate to reduced demand for fire and emergency services overall.**

Evolution of Emergency Medical Services

Emergency Medical Services (EMS) in the United States have undergone a remarkable transformation over the past half-century, evolving from a fragmented transportation-based function into a highly integrated component of the healthcare and public safety systems. Prior to the 1960s, ambulance services were frequently provided by funeral homes, law enforcement agencies, or volunteer organizations, with limited medical capabilities and little standardization in training, equipment, or patient care. The publication of *Accidental Death and Disability: The Neglected Disease of Modern Society* by the National Academy of Sciences in 1966 highlighted significant deficiencies in prehospital care and served as a catalyst for the development of modern EMS systems. Subsequent federal initiatives established national standards for training, communications, equipment, and emergency transportation, laying the foundation for today's EMS profession.

Throughout the 1970s and 1980s, EMS systems became increasingly sophisticated as Emergency Medical Technicians (EMTs) and paramedics assumed expanded clinical roles. Advanced Life Support (ALS) capabilities were introduced, allowing highly trained providers to perform cardiac monitoring, medication administration, airway management, and other life-saving interventions previously available only within hospital settings. Medical oversight, treatment protocols, quality improvement programs, and regional trauma systems further strengthened the delivery of prehospital care. Advances in telecommunications, dispatch systems, and mobile medical technology enabled EMS providers to deliver more timely and effective interventions, significantly improving patient outcomes for conditions such as cardiac arrest, trauma, stroke, and respiratory emergencies.

As fire incidents declined over the past several decades, many fire departments expanded their mission to include EMS delivery through first tier response and also ground transportation. Today, fire-based EMS systems constitute the predominant model in many communities, with emergency medical incidents representing the majority of annual call volume. In numerous jurisdictions, EMS responses account for 70 to 85 percent of all incidents, fundamentally altering the operational profile of the modern fire service. This transition has required significant investments in personnel training, medical equipment, ambulances, and clinical oversight, while also fostering closer collaboration between fire departments, hospitals, public health agencies, and emergency communications centers.

The role of EMS has continued to evolve beyond traditional emergency response. Modern EMS systems increasingly emphasize community paramedicine, mobile integrated healthcare,

behavioral health interventions, overdose prevention, and the reduction of unnecessary hospital utilization. Data-driven deployment models, evidence-based clinical practices, and advanced dispatch protocols have improved resource utilization and enhanced patient care delivery. In addition, EMS agencies are increasingly involved in public health initiatives, chronic disease management, fall prevention programs, and post-discharge follow-up services designed to address the social determinants of health and improve community wellness.

Technological advancements have further transformed EMS operations. Electronic patient care reporting systems, real-time cardiac monitoring, telemedicine, automated external defibrillators (AEDs), mechanical CPR devices, and advanced diagnostic capabilities have improved the quality and continuity of care. Emergency communications centers now employ sophisticated medical priority dispatch systems that provide pre-arrival instructions and prioritize resources based on patient acuity. These developments have enhanced clinical effectiveness while supporting more efficient utilization of limited emergency response resources.

Today, Emergency Medical Services are recognized as an essential component of the nation's healthcare infrastructure and public safety network. The evolution of EMS reflects a broader shift toward integrated, patient-centered, and prevention-oriented service delivery. As demographic changes, chronic disease prevalence, behavioral health challenges, and healthcare access issues continue to shape community needs, EMS systems will remain a critical and increasingly complex component of the modern all-hazards response environment.

NFPA Standards

The National Fire Protection Association (NFPA) develops consensus standards that establish widely recognized benchmarks for fire and life safety, emergency response, and fire service operations. NFPA standards are developed through a consensus-based process involving fire service professionals, technical experts, government representatives, industry stakeholders, and other interested parties. While NFPA standards are generally not laws or regulations by themselves, they provide authoritative guidance that is frequently referenced by jurisdictions, policymakers, accreditation organizations, and fire departments when establishing policies, evaluating performance, and making decisions about emergency service resources.

One of the most important standards for the career fire service is 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 provides performance-based benchmarks for the organization and deployment of career fire departments, including response times, staffing, deployment of resources, and the delivery of emergency services. These benchmarks are intended to help communities evaluate whether their fire department has sufficient personnel and resources to provide effective emergency response.

NFPA 1710 is particularly important because response time and staffing are directly connected to the effectiveness and safety of emergency operations. The standard establishes benchmarks for the arrival of initial and subsequent resources and identifies recommended staffing levels for different types of incidents. Adequate staffing is critical because many fireground tasks must occur simultaneously, including incident command, fire attack, search and rescue, ventilation, water supply, and emergency medical care. Insufficient staffing can delay these functions and increase risks to both the public and firefighters.

Municipalities commonly use NFPA 1710 as a planning and benchmarking tool when evaluating fire department deployment models, station locations, apparatus placement, minimum staffing, and overall service capacity. It can provide an objective framework for comparing existing

resources and response performance against nationally recognized fire service benchmarks. In this context, NFPA 1710 does not simply address how quickly an apparatus should arrive; it helps communities assess whether the right number of appropriately staffed resources can arrive within a timeframe that supports effective emergency operations.

While NFPA 1710's performance and staffing standards establish nationally recognized benchmarks for effective and safe fire and emergency service delivery, it is recognized that not every municipality has the financial resources, staffing capacity, geographic characteristics, or operational infrastructure necessary to consistently achieve these benchmarks. Many strive to, however, many fall short on response time standards for the first arriving fire unit and staffing as it relates to assembling an Effective Response Force.

These standards should therefore serve as important performance goals and planning benchmarks rather than being viewed as universally attainable requirements.

Municipalities should establish realistic, risk-based service delivery objectives that consider community hazards, available resources, fiscal sustainability, and regional response capabilities. Where NFPA benchmarks cannot consistently be achieved, municipalities should identify performance gaps, evaluate the associated risks, and pursue incremental improvements through staffing, deployment strategies, automatic aid, and regional partnerships to the greatest extent practicable, recognizing that the ability to achieve these benchmarks must be balanced with available financial resources, local funding capacity, competing municipal priorities, and the community's ability to sustain the associated costs over time.

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SECTION 1. EXECUTIVE SUMMARY

The Center for Public Safety Management, LLC (CPSM) conducted a comprehensive organizational and operational assessment of the City of Bethlehem's Fire Department (BFD), Emergency Medical Services (BEMS), and Emergency Management program. The purpose of this assessment was to evaluate the City's current emergency service delivery system, identify organizational strengths and operational challenges, benchmark performance against recognized industry best practices, and develop strategic recommendations that position the City to effectively meet current and future community needs.

CPSM's analysis included extensive review of operational data, response workload, deployment patterns, staffing, facilities, apparatus, call demand, organizational structure, emergency management capabilities, community demographics, and community risk characteristics. The assessment incorporated nationally recognized standards and guidance, including applicable National Fire Protection Association (NFPA) standards, Insurance Services Office (ISO) Fire Suppression Rating Schedule criteria, the Center for Public Safety Excellence (CPSE) Community Risk Assessment and Standards of Cover process, and current industry best practices as they apply to fire and EMS service delivery. The recommendations contained in this report are intended to provide City leadership with a practical implementation roadmap that balances operational effectiveness, firefighter and EMS provider safety, fiscal responsibility, and service expectations.

The City of Bethlehem presents a complex public safety environment. As Pennsylvania's seventh-largest city, Bethlehem encompasses nearly 20 square miles of dense urban development, historic neighborhoods, large institutional occupancies, industrial redevelopment areas, high-rise buildings, colleges and universities, healthcare facilities, freight rail corridors, and numerous special events that significantly increase both fire and emergency medical risk. While population growth has remained relatively modest, redevelopment, tourism, institutional expansion, and changing healthcare utilization patterns continue to increase demand for emergency services.

The Bethlehem Fire Department provides a strong foundation upon which to build. The City maintains an ISO Public Protection Classification of Class 2, reflecting a capable and well-managed fire protection system, water delivery system, and emergency communications. The City has invested in modern fire and EMS apparatus, maintains an effective Community Risk Reduction program, and benefits from experienced leadership and dedicated personnel committed to serving the community. Likewise, Bethlehem EMS has evolved into a high-performing municipal EMS system that delivers advanced prehospital care while operating in an increasingly demanding healthcare environment.

The assessment found, however, that both organizations are experiencing increasing operational demands that will require strategic investments to maintain current service levels and improve future system resiliency.

Like most modern fire departments throughout North America, emergency medical services now represent the predominant workload within Bethlehem's emergency response system. EMS incidents account for the largest percentage percent of all BEMS responses and continue to increase annually. Between 2019 and 2025, annual BEMS EMS call volume increased by more than 40 percent, reflecting both regional demographic trends and the growing reliance upon EMS as an entry point into the healthcare system.

Bethlehem EMS 10-Year Workload

Year	BEMS Responding	External Agency Only	Total Calls
2016	10,921	560	11,481
2017	11,373	625	11,998
2018	8,869	443	9,312
2019	8,608	552	9,160
2020	9,678	489	10,167
2021	11,125	716	11,841
2022	11,495	954	12,449
2023	11,393	824	12,217
2024	11,912	632	12,544
2025	12,260	637	12,897

Historical BEMS Call Workload

BEMS Responding = No Mutual Aid

External Agency Responding = Mutual Aid ambulances handled the call when BCEMS units were not available.

Although the EMS system continues to perform well, increasing call volume has created measurable workload pressures. Nearly two-thirds of all incidents occur simultaneously with one or more active EMS responses, reducing available ambulance resources, increasing reliance on mutual aid, and limiting system resiliency during periods of peak demand. These conditions are typical of urban EMS systems experiencing sustained growth and reinforce the need for continual evaluation of deployment strategies, staffing, ambulance availability, and operational performance.

CPSM concludes that Bethlehem EMS remains clinically strong, supported by engaged medical direction, comprehensive quality improvement processes, standardized statewide treatment protocols, and proactive fleet replacement planning. Opportunities exist to further strengthen the system through enhanced clinical training, creation of a full-time Clinical Coordinator position, improved integration of quality assurance findings into continuing education, expansion of Community Paramedicine and Mobile Integrated Healthcare initiatives, and development of a senior paramedic career development program to enhance supervisory resiliency.

One of the most significant organizational findings is the strategic importance of EMS within the City's overall public safety delivery system. Modern EMS systems require executive oversight comparable to that of fire suppression operations due to increasing clinical complexity, regulatory requirements, healthcare partnerships, reimbursement systems, accreditation activities, quality management, and workforce development. Given that EMS represents the majority of emergency service workload, CPSM recommends elevating the Bureau Head of EMS to the rank of Deputy Chief. This organizational change aligns executive leadership with operational realities, recognizes EMS as an equal component of the City's public safety mission, strengthens executive decision-making, and positions the organization to effectively manage future healthcare and emergency response challenges.

Within the Fire Department, CPSM found that existing deployment generally provides effective community coverage; however, staffing levels continue to present operational challenges. Daily staffing levels of two- and three-person companies limit the department's ability to assemble an Effective Response Force capable of safely and efficiently managing moderate- and high-risk structure fires. Crew size directly influences firefighter safety, operational effectiveness, and the

department's ability to complete critical fireground tasks within nationally recognized benchmarks.

Similarly, opportunities exist to improve staffing, training documentation, deployment analysis, and company personnel levels that would not only improve operational performance but also enhance future ISO evaluations. Continued investment in staffing and deployment will improve emergency response capability while supporting firefighter safety and long-term organizational resiliency.

The assessment also identified opportunities to strengthen integration between the Fire Department and EMS. Current dispatch protocols and collective bargaining provisions limit routine fire department participation on EMS incidents, despite evidence demonstrating the value of rapid firefighter intervention during time-sensitive medical emergencies. Expanding coordinated fire-EMS response to selected incident types, while maintaining efficient resource utilization, would improve patient outcomes and maximize the City's investment in cross-trained public safety personnel.

Bethlehem Fire 10-Year Call Workload

Call Type	Year									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Medical assist	1,933	2,317	1,789	1,125	951	1,108	1,111	1,048	1,222	1,316
MVA	357	355	262	296	295	370	349	325	419	370
EMS Subtotal	2,290	2,672	2,051	1,421	1,246	1,478	1,460	1,373	1,641	1,686
False alarm	1,034	1,083	867	872	1,012	1,089	1,115	1,129	1,226	1,334
Good intent	237	220	154	232	190	269	258	294	382	343
Hazard	394	380	352	331	399	418	457	454	500	439
Outside fire	106	85	62	64	96	85	98	97	95	67
Public service	433	416	285	418	346	361	319	359	452	302
Structure fire	118	73	76	61	95	89	80	76	81	93
Technical rescue	54	55	45	48	51	58	49	60	84	62
Fire Subtotal	2,376	2,312	1,841	2,026	2,189	2,369	2,376	2,469	2,820	2,640
Canceled	317	277	179	137	159	195	192	212	220	223
Mutual aid	40	29	24	39	28	37	42	44	41	54
Other Subtotal	357	306	203	176	187	232	234	256	261	277
Total	5,023	5,290	4,095	3,623	3,622	4,079	4,070	4,098	4,722	4,603

Community Risk Reduction remains one of Bethlehem's strongest organizational programs. The department maintains a comprehensive prevention strategy that includes fire inspections, public education, fire investigations, code enforcement, and community outreach. As redevelopment continues throughout the city and community risks evolve, maintaining adequate staffing within the Fire Marshal's Office will remain essential to preserving these proactive services that reduce emergency incidents before they occur.

The City's fire stations continue to provide an effective geographic distribution of resources on the north side; however, all four facilities are between 42 and 73 years old. While functional, aging facilities will require continued capital investment, modernization, and lifecycle planning to support future operational needs. Similarly, the City's apparatus replacement program has positioned the department with a modern frontline fleet, although corrosion associated with

winter operations suggests that future replacement schedules should remain conservative to maximize operational reliability and control maintenance costs.

Emergency management represents another area where the City is well positioned but would benefit from additional organizational investment. Bethlehem maintains a comprehensive Emergency Operations Plan that complies with FEMA guidance and Pennsylvania requirements, and the City has established strong interagency coordination capabilities. However, emergency management responsibilities are currently assigned as collateral duties to existing personnel whose primary responsibilities already demand significant attention. Increasing hazards, major special events, aging infrastructure, and expanding regulatory requirements support the creation of a dedicated full-time Emergency Manager to ensure continuous planning, preparedness, mitigation, grant administration, training, and recovery coordination. Additionally, the City should prioritize completion of a formal Continuity of Operations Plan (COOP) and achieve full National Incident Management System (NIMS) training compliance.

Overall, CPSM concludes that the City of Bethlehem possesses a strong and professionally managed emergency services system supported by experienced leadership, dedicated personnel, and a longstanding commitment to public safety. The recommendations contained within this report are not intended to correct systemic deficiencies, but rather to strengthen an already capable organization by aligning staffing, leadership, deployment, facilities, emergency management, and EMS resources with the evolving risks and service demands facing the community.

Implementation of these recommendations will improve operational resiliency, strengthen firefighter and provider safety, enhance clinical and emergency response performance, support future community growth, and ensure that the City of Bethlehem remains well positioned to provide exceptional fire, EMS, and emergency management services for decades to come.

Recommendations begin on the next page in the order they appear in the report.

Recommendations are presented as considerations for the City and the Bethlehem Fire Department and Bethlehem EMS Bureau.

CPSM understands that some recommendations have to be bargained with the respective collective bargaining groups and may also require funding over the near, mid, and longer terms.

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Recommendations

ISO Analysis

CPSM recommends:

1. That as the City and BFD continue to make improvements in staffing, training (specifically documentation), and deployment, that the BFD coordinate with ISO to pursue a future reevaluation. This will ensure that recent and ongoing enhancements are recognized and reflected in the community's PPC classification. An improved score is likely with these improvements.

BFD Training and Education

2. The BFD should continue analyzing formal training needs for the purpose of determining training program priorities for all ranks in the organization.

Based upon the results of the needs assessment, the BFD should begin the development of a comprehensive training program that addresses, but is not limited to – applicable OSHA training, recommended NFPA training, every operational mission and responsibility of the department, and specialized training including personnel/officer development. The majority of the training should be scheduled and coordinated at the administrative level rather than shift level and should comply with accepted and/or recommended practices and standards. Applicable training should include standardized evolutions and should be consistent with newly developed and/or updated operational guidelines and Standard Operating Procedures (SOPs).

3. The BFD continue to enhance its officer development program to the extent possible, and encourage officers to seek additional training and certifications such as:
 - NFA Command and Control for Company Level Officers.
 - NFA Command and Control of Incident Operations.
 - NFA Command and Control of Fire Department Operations at Target Hazards.
 - Incident Safety Officer.
4. The BFD should make a concerted effort to send as many officers as possible to the National Fire Academy (NFA). This should include the training Captain for various training-related classes, and the Deputy Chief/Fire Marshal and Fire Prevention Captain for fire prevention and community risk reduction classes. Any officers who meet the admissions criteria should be encouraged to enroll in the Academy's Executive Fire Officer Program.
5. The BFD should continue to look for opportunities to provide periodic joint training between the department and various agencies that provide automatic/mutual aid to the city, particularly the Allentown FD. Consideration should also be given to hosting large-scale exercises to assess and evaluate regional interoperability.



BFD – EMS First Response

CPSM recommends:

6. The BFD, BEMS, and Northampton County Emergency Communications Center work collaboratively to ensure that all EMS calls are properly categorized as to the correct EMD classification so the appropriate resources and personnel can be dispatched immediately and simultaneously.
7. **CPSM recommends further** that the BFD be dispatched simultaneously with BEMS to all Priority 1/High Acuity classification EMS calls. This is a patient care and potential lifesaving change in operations designed to get help to the patient in the quickest possible time.

BFD Community Risk Reduction

CPSM recommends:

8. The BFD develop a comprehensive fire prevention and code enforcement inspection plan in accordance with NFPA 1730: *Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations*, 2019 Edition. This plan should ensure adherence to all city ordinances related to fire prevention and code enforcement.

The inspection plan should clearly identify occupancy and use groups requiring annual inspections, as well as those that, while not requiring yearly inspections, should be reviewed on a biennial or triennial basis. ***Any internally recommended expansion of the Fire Marshal's Office inspection team should align with the city's increased demand, covering all inspectable properties and plan review requests to maintain compliance with the standard.***

Additionally, the comprehensive plan should include a methodology for quality assurance of fire prevention inspections and a consistent data management platform to record each inspection. This platform should serve both as a historical record and as a compliance tool to ensure that all required inspections are completed in accordance with the outlined schedule. This plan should also contemplate the delivery of Public Life Safety Education to the city's vulnerable population and those living in, learning in, and working in high-risk occupancies.

9. **CPSM further recommends** the BFD contemplate the implementation of remote fire prevention inspections in accordance with NFPA 915 *Standard for Remote Inspections and Testing*, 2024 edition and local and state laws.
10. The BFD conduct a comprehensive review of the city's actual costs for delivering fire prevention services. This review should include a complete cost analysis of all fire prevention activities, an evaluation of the city's adopted fire codes, and a comparative assessment of fees charged for similar services by other municipalities. The goal is to capture the full scope of services provided, including operational permits and inspections required as part of a comprehensive fire prevention program.
11. The City of Bethlehem should consider adopting or adjusting registration, inspection, and permit fees to help offset the actual costs of providing fire prevention and safety services. These fees should also account for inspections performed by in-service fire companies, ensuring that all aspects of the fire prevention program are adequately funded.

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12. To reduce the workload on the Fire Marshals Office, the BFD should consider implementing an in-service company inspection program as allowable through state statutes for low hazard Business, Mercantile, and Storage use groups, and any other lower hazard use group occupancies identified by the Fire Marshal's Office throughout the city. Appropriate training as certification should be provided to all operations staff.

Health, Safety and Wellness

CPSM recommends:

13. The BFD continue any current health, safety, and wellness program efforts, and continue with the development of a comprehensive health, safety, and wellness initiative program, to include updating current policies and guidelines as necessary, and to the extent the department is capable and with available funding, aligns with:
- NFPA 1550, Standard for Emergency Responder Health and Safety, 2024 edition. This document consolidates:
 - NFPA 1500, Standard on Fire Department Occupational Safety, Health, and Wellness Program.
 - NFPA 1521, Standard for Fire Department Safety Officer Professional Qualifications.
 - NFPA 1561, Standard on Emergency Services Incident Management System and Command Safety.
 - NFPA 1580 (to be released, 2025), Standard for Emergency Responder Occupational Health and Wellness. This document consolidates:
 - NFPA 1581, Standard on Fire Department Infection Control, 2022 edition.
 - NFPA 1582, Standard on Occupational Medical Program for Fire Departments.
 - NFPA 1583, Standard on Health-Related Fitness Programs for Fire Department Members.
 - NFPA 1584, Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises.
 - NFPA 1585, Standard for Exposure and Contamination Control, 2025 edition.
14. The BFD and IAFF Local 735 form a joint Labor Management Safety Committee focused on safety concerns within the Department including investigating accidents and injuries. The committee should include representation from stakeholders across all ranks of the Department and meet monthly.
15. **CPSM recommends further** that the oversight of all Health, Safety, and Wellness programs should continue to be assigned to the Training Captain who should chair any/all of the health, safety, and wellness committees, and actively participate in program development, implementation, and success. Additionally, a Health and Safety Officer program should be implemented to include a designated Health and Safety Officer for each shift (Captain level) to ensure program continuity, communication, and effectiveness. This could be the Field Incident Technician/Shift Safety Officer/Shift Training Officer.

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BFD Facilities

16. **CPSM recommends** the City of Bethlehem and BFD should, as part of any long range strategic and/or capital expenditure planning process, include as planning objectives the potential replacement, or at a minimum modifications and/or expansion of Stations 1, 5, and 6 with a focus on increased and better space utilization along with the inclusion of contemporary fire facility features that align with NFPA 1550 and NFPA 1851 facility and personnel safety features. **Financial impact: cost of materials and labor to meet the specifics of a facility renovation at the time of contract award. Cost of a new fire facility with living quarters and contemporary fire facility features: \$5 million-12-million depending on the year built, square footage, and cost labor and material at the time of construction.**

BFD Fleet

17. **CPSM recommends** the BFD should continue to include in all departmental capital budgeting planning over the near, mid, and long terms, planning objectives focused on following the NFPA 1900 standard for heavy fire apparatus fleet replacement (Optimal 12-13 years and no more than 15 years of frontline; 5-10 years reserve status) and include in this planning, an objective of not utilizing heavy fire apparatus once the apparatus reaches the 25-year age ceiling. Planning should also include the routine periodic replacement of command, staff, and utility vehicles and including them in the capital budget as appropriate.

Mutual and Automatic Aid

18. **CPSM recommends** that the BFD prioritize a regional planning effort that includes the implementation of automatic aid agreements with the City of Allentown and City of Easton (both career staffed agencies). Strengthening these relationships will bolster first-alarm structure fire responses, increase resiliency, and improve the BFD's ability to consistently assemble an Effective Response Force for structure fires particularly beyond single-family residential structures such as apartments, commercial buildings, high rises, and other larger structures.

Fire and EMS Demand Analysis

CPSM recommends that the City should fully enforce the current Emergency Alarm System ordinance. The enforcement program should also require timely inspection, testing, maintenance, and correction of alarm systems that generate recurring activations. Further, the BFD should maintain a database of repeat false alarm locations and periodically review the data to identify properties responsible for a disproportionate share of false alarm responses.

BFD Response Times

CPSM recommends:

19. In conjunction with the Northampton County Emergency Communications Center, the BFD should adopt a performance benchmark for dispatch time or call processing time that includes the call processing performance standards of 64-seconds at the 90th percentile for fire and fire-related calls, and a realistic performance benchmark for EMS calls that does not exceed 120 seconds.
20. The BFD should adopt a performance benchmark for turnout time of ≤ 80 seconds for fire and special operations and ≤ 60 seconds for EMS responses at the 90th percentile. **This is one part of total response time the BFD has the most direct control over.**

21. As travel time is affected by demand and workload on each station, road network, and traffic congestion, **CPSM recommends** the BFD adopt a 240 seconds travel time benchmark for the central core areas of each station district (+/- 2 miles travel distance) and 360 seconds travel time at the 90th percentile for low and medium hazards in the more distant areas of each district as a performance benchmark for the first arriving unit. This is a more realistic performance benchmark as the historical trends for travel time range from 5.8 minutes to 6.6 minutes over the ten-year period.
22. As part of any long term strategic and/or capital planning process that the City of Bethlehem should strongly consider the construction of an additional fire station in the southeastern area of the city, an area that is experiencing significant industrial, warehousing, and commercial growth and which is well outside of the benchmark NFPA 240 second travel time for the first arriving unit and the CPSM recommended 360 second benchmark for response travel time. Staffing this station with one engine can be neutral by moving Engine 3 to the new station. **Financial impact: cost of a new fire facility with living quarters and contemporary fire facility features: \$5 million-12-million depending on the square footage, year built and cost labor and material at the time of construction.**

BFD Effective Response Force and Critical Tasking

CPSM recommends:

23. As soon as possible the BFD expand the number of responding units and personnel through adjustments to current response matrixes and the use of automatic aid with the City of Allentown. With current staffing levels, any reported structure fire should result in the immediate dispatch of all on-duty BFD personnel and resources. This is especially important for moderate- and high-risk fire incidents. By leveraging automatic aid and adjusting initial alarm assignments to include all available BFD units, the department can improve its ability to assemble an ERF within recommended benchmark times for higher-risk occupancies such as open-air strip centers, commercial buildings, and multi-building, multi-floor residential complexes.

24. Over the near-mid-terms, the city should consider increasing minimum staffing on all fire suppression units to a minimum of three personnel. **Financial impact: \$1,357,323.**

- Ladder 1: 4 FF FTEs
- Ladder 2: 4 FF FTEs
- Engine 3: 4 FF FTEs

12 FF FTEs

Ladder 1-Upgrade four FTEs to Lieutenant-backfill with a new FF FTE.
Ladder 2-Upgrade four FTEs to Lieutenant-backfill with a new FF FTE.
Engine 3- Upgrade four FTEs to Lieutenant-backfill with a new FF FTE.

- Maintain minimum staffing of 3 on Engine 6
- Maintain minimum staffing of 3 on Engine 9

The overall goal is to increase minimum engine/ladder staffing on each shift to 22 personnel from the current minimum staffing of 19, and to maintain minimum staffing of 3 on Engine's 6 and 9. Increasing minimum on-duty staffing from 19 to 22 personnel per shift is intended to strengthen firefighter safety, improve emergency response effectiveness, and enhance the department's operational resilience. Additional staffing enables incident commanders to assemble a larger and more capable Effective Response Force (ERF) more quickly, allowing critical fireground tasks such as fire attack, search and rescue, ventilation, rapid intervention, water supply, and command to occur simultaneously rather than sequentially. This reduces the time required to control incidents, limits fire growth, and improves life safety outcomes for both firefighters and the public.

From a firefighter safety perspective, increasing staffing helps ensure compliance with nationally recognized safe operating practices by reducing the need for personnel to work short-handed, decreasing individual workload and fatigue, and providing sufficient resources for rapid intervention and personnel accountability. Adequate staffing also improves the department's ability to maintain safe operations during multiple or complex incidents without relying excessively on mutual aid.

A complement of 22 personnel per shift enhances the department's capacity to sustain service levels during periods of high call volume, supports employee wellness through reduced operational stress, and better positions the organization to meet current service demands while accommodating future community growth and increasing emergency response workload. **Under this recommendation the BFD would be staffed as follows:**

- Five engines staffed with three personnel: one officer and two firefighters (15 total).
- Two ladders staffed with three personnel: one officer and two firefighters (6 total).
- One Assistant Chief (1 total).

Minimum Staffing: 22 Total

25. Over the longer term, the city should consider increasing minimum staffing on all single house engines to a minimum of four personnel. **Financial impact: \$1,726,514.**

- Engine 5: 4 FF FTEs
- Engine 9: 4 FF FTEs
- Ladder 1: 4 FFs
- Ladder 2: 4 FFs

16 FF FTEs

**The two single house engine companies
should be considered priority**

Staffing single-company engine stations with a minimum of four personnel is essential because these companies do not have the immediate support of a co-located ladder company or additional apparatus. In stations housing both an engine and a ladder company, personnel can often provide limited immediate assistance to one another during the initial stages of an incident. Single-engine stations, however, must operate independently until additional resources arrive, making it critical that the first-arriving engine has sufficient personnel to perform the essential tasks necessary to stabilize the incident safely and effectively.

A four-person engine company provides the minimum staffing necessary to begin multiple fireground functions simultaneously, including establishing a water supply, deploying, and advancing hose lines, conducting initial size-up, supporting search and rescue operations, and preparing for firefighter safety functions such as rapid intervention and accountability. With fewer than four personnel, these critical tasks must be completed sequentially rather than concurrently, delaying fire attack, increasing fire growth, and extending the time occupants are exposed to hazardous conditions. The additional firefighter also reduces individual workload, improves crew integrity, and enhances compliance with nationally recognized fireground safety practices.

Under this recommendation the BFD would be staffed as follows:

- Three engines staffed with three personnel: one officer and two firefighters (9 total).
- Two engines staffed with four personnel: one officer and two firefighters (8 total).
- Two ladders staffed with four personnel: one officer and three firefighters (8 total).
- One Assistant Chief (1 total).

Minimum Staffing: 26 Total

In summary, CPSM recommends that the City should consider:

- Over the near-mid-terms – Increasing minimum staffing on all fire suppression units to a minimum of three personnel. This includes 12 new FTEs, and the upgrading of 12 FF positions to Lieutenant to ensure an officer on each apparatus. This increases minimum staffing on engines/ladders to 21 per shift (+ 3 from the current).
- Over the longer term, the city should consider increasing minimum staffing on all single house engines to a minimum of four personnel and the two ladder trucks to a minimum of 4 personnel. This includes 16 new FF FTEs. This increases minimum staffing on engines/ladders to 25 per shift (+ 4 from the near-mid-term recommendation and + 7 from the current engine/ladder staffing).

BEMS Stations

CPSM recommends that the City of Bethlehem and BEMS consider:

- 26.** Including EMS stations or space in any facilities long-range renovation planning that is focused on apparatus accommodations, crew facilities, technology infrastructure, and operational efficiency.

Any facility upgrades should include opportunities to enhance decontamination areas, infection-control measures, and secure medical supply storage. **Financial Impact dependent on space selected and needed upgrades to accommodate EMS crews and fleet as well as materials and labor cost at the time of the renovation.**

- 27.** Monitor future development, population growth, and EMS demand trends to determine whether additional EMS deployment locations may be warranted.
- 28.** Utilize GIS-based travel time modeling and system status analysis to periodically validate station locations and deployment effectiveness.

BEMS Call Demand

- 29. CPSM recommends** that Bethlehem EMS continue to monitor ambulance unit workload, overlapping call frequency, and Unit Hour Utilization trends to support long-term system resiliency planning. Attention should be given to periods where:

- System Utilization approaches or exceeds 0.45.
- Overlapping call frequency increases during peak demand hours.
- Response performance trends demonstrate sustained increases in travel or response times.

Periodically BEMS should evaluate geographic deployment patterns to ensure that ambulance placement aligns with evolving service demand and population distribution patterns.

BEMS Response Times

CPSM recommends the BEMS:

- 30.** Work with Northampton County 911 to establish response performance measures based on ProQA determinant levels and dispatch priority categories. Until this can be accomplished, continue utilizing Emergency Medical Dispatch protocols to align response modes with patient acuity and clinical necessity.

31. Continue monitoring turnout performance and evaluate opportunities to reduce turnout times for high-priority EMS incidents toward a ≤ 60 -second benchmark through enhanced station readiness procedures, performance monitoring, crew accountability measures, and periodic review of response initiation practices.
32. Periodically evaluate the relationship between dispatch priority, response mode, and patient acuity through the Quality Assurance/Quality Improvement process.
33. Evaluate dispatch processing, turnout, and travel time components collectively as part of a comprehensive system performance review.
34. Monitor overlapping incident frequency, unit-hour utilization, and ambulance availability to identify future deployment or staffing adjustments necessary to maintain service reliability.

BEMS Fleet

CPSM recommends that the City of Bethlehem and BEMS:

35. Continue the current planned ambulance replacement schedule and maintain orders sufficiently in advance to account for industry production delays.
36. Evaluate future opportunities for alternative-fuel, hybrid, or reduced-idle technologies as apparatus are replaced.

BEMS Mobile Integrated Health/Community Paramedicine

37. **CPSM recommends** that BEMS:

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| ■ Conduct analysis of frequent EMS users to identify repeat utilization patterns. | ■ Evaluate program performance metrics, including reduction in repeat EMS utilization and transport volume. |
| ■ Develop partnerships with local hospitals and public health agencies. | ■ Expand services incrementally based on demonstrated outcomes and system benefit. |
| ■ Initiate a pilot MIH program focused on post-discharge follow-ups and fall-risk prevention. | |

Expansion may include the addition of one Paramedic as the MIH Coordinator.

Financial impact: \$68,263.56 + \$32,534 fringe = \$100,798.00.

BEMS Staffing and Deployment

CPSM recommends:

38. The City of Bethlehem and BEMS consider expanding ambulance staffing to improve resiliency to include:
 - Upgrading the existing 0800–2200 daily peak time ambulance to 24-hour staffing.
Financial impact: Requires 4 Paramedics - $\$100,798 \times 4 + \$32,534 \text{ fringe} \times 4 = \underline{\$403,192.}$
 - Expand the three day/week 1100–2300 surge/peak time ambulance to seven day/week staffing during an appropriate 12-hour peak workload time period.
Financial impact: Requires 2 Paramedics - $\$100,798 \times 2 + \$32,534 \text{ fringe} \times 2 = \underline{\$201,596.}$

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39. To strengthen clinical training, quality improvement integration, and ongoing professional development, the city and Bethlehem EMS should consider establishing a full-time Clinical Coordinator position. **Financial impact (1-Paramedic): \$68,263.56 + \$32,534 fringe = \$100,798.00.**

Primary responsibilities should include:

- Coordinating QA/QI review processes.
- Developing targeted continuing education programs.
- Managing high-acuity, low-frequency training.
- Supporting protocol compliance monitoring.
- Assisting Medical Director engagement activities.

This role will significantly strengthen the connection between quality review findings and field-level training performance.

40. BEMS should expand direct Medical Director participation in structured training sessions, transitioning from primarily annual competency-based training to quarterly high-acuity scenario-based training programs.

Recommended training focus areas:

- Cardiac arrest management.
- Pediatric emergencies.
- Airway management.
- Major trauma care.
- High-risk clinical decision-making.

Increased physician involvement strengthens clinical alignment and enhances provider confidence.

41. BEMS should continue strengthening interagency collaboration. The strong partnership between BEMS and BPD should be maintained and further supported through:

- Joint training initiatives.
- Shared command structure alignment.
- Continued first responder capability development.

42. The City should consider adjusting the title of the Director of Emergency Medical Services to a Deputy Chief in the BFD organizational chart. As EMS represents the department's highest service demand and has become an equal pillar of the organization's public safety mission, executive-level leadership is necessary to provide strategic direction, clinical oversight, and organizational accountability.

A Deputy Chief of EMS should be responsible for the department's EMS system, including clinical quality improvement, medical direction coordination, regulatory compliance, workforce development, community health initiatives, data analytics, budget development, and strategic planning. This organizational change aligns the department's leadership structure with its operational realities, ensures EMS is represented in executive decision-making, strengthens coordination with healthcare and regional partners, and positions the department to effectively address the increasing complexity of emergency medical services while maintaining the highest standards of patient care and operational performance.

Emergency Management

CPSM recommends:

The City consider establishing a full-time Emergency Management Analyst/Planner position. This is necessary given the increasing complexity of emergency management responsibilities, including continuous planning and preparedness, interagency coordination, grant and project management, and the development and maintenance of required emergency management plans. The current structure, which distributes these responsibilities among existing personnel, limits the City's ability to sustain a comprehensive and proactive program. Given the potential for natural, technological, and human-caused incidents, including those that may result in federal disaster declarations, the City should dedicate sufficient resources to this function. **Financial impact: (1-Analyst): \$81,746 + \$32,534 fringe = \$114,289.00.**

- 43.** The City work to achieve and maintain full compliance with the National Incident Management System (NIMS). This includes developing a formal implementation plan and ensuring that all City personnel with emergency response and/or Emergency Operations Center (EOC) responsibilities receive appropriate NIMS training commensurate with their roles.
- 44.** The City consider maintaining a clearly defined and operationally ready Emergency Operations Center (EOC) capability. In accordance with the Emergency Operations Plan (EOP), the Mayor's Conference Room should serve as the initial location for policy-level coordination and executive decision-making. Concurrently, the primary EOC located within Police Headquarters should remain in a constant state of readiness for immediate activation with minimal setup.

CPSM further recommends the EOC should be capable of supporting multi-agency, 24-hour operations and must include adequate space, communications systems, technology, and infrastructure to support Emergency Support Functions (ESFs). It is essential that there be a clear delineation between the policy group (operating from the Mayor's Conference Room) and operational coordination (conducted within the EOC) to ensure efficient incident management in alignment with NIMS principles.

- 45.** The City should ensure the EOC can be relocated if the primary site becomes compromised and that it is equipped in accordance with best practices outlined in FEMA guidance.
- 46.** CPSM recognizes that the city has existing emergency response protocols (e.g., severe weather procedures) that provide a strong operational foundation. **CPSM recommends** these should be leveraged to develop a formal, all-hazards Continuity of Operations Plan (COOP). The COOP should ensure that essential City functions, personnel, systems, and operations can be maintained or rapidly restored during and after a disruption.

End of recommendations.

The main body of the report begins on the next page.

SECTION 2. COMMUNITY OVERVIEW

City of Bethlehem



The City of Bethlehem is located near the geographic center of the Lehigh Valley region in eastern Pennsylvania. In what is unusual in this area of the country, Bethlehem is located within two different counties, Northampton and Lehigh. Bethlehem is bisected by the Lehigh River a tributary of the Delaware River. It is located adjacent to Allentown and is approximately 48 miles north of Philadelphia, 89 miles northeast of Harrisburg and 81 miles west of New York City.

According to the United States Census Bureau, the city covers an area of 19.46 square miles of which 19.12 square miles is land, and 0.34 square miles is water. Of the city's area, approximately 15.07 square miles is located in Northampton County while the remaining 4.39 square miles is in Lehigh County. The city has a diverse mix of commercial, industrial, residential, and recreation areas.¹

Bethlehem had a 2020 population of 75,781, making it the seventh largest city in Pennsylvania. Approximately 74% of the city's population is in Northampton County and 24% is in Lehigh County. The 2020 population was an increase of just 799 (+1.1%) over the 2010 population of 74,982; however, it was an increase of 4,452 (+6.2%) over the 2000 census. The estimated population in 2024 was 79,453, an increase of 3,672 (+4.8%). With a population density of 3,965 people per square mile the city is classified as an urban community.²

The city is bordered to the north and east by Bethlehem Township, to the east by Freemansburg Boro, to the southeast, south, and southwest by Lower Saucon Township, to the south by Hellertown Boro, to the southwest by Fountain Hill Boro and Salisbury Township, to the west by the City of Allentown, and to the northwest by Hanover Township.

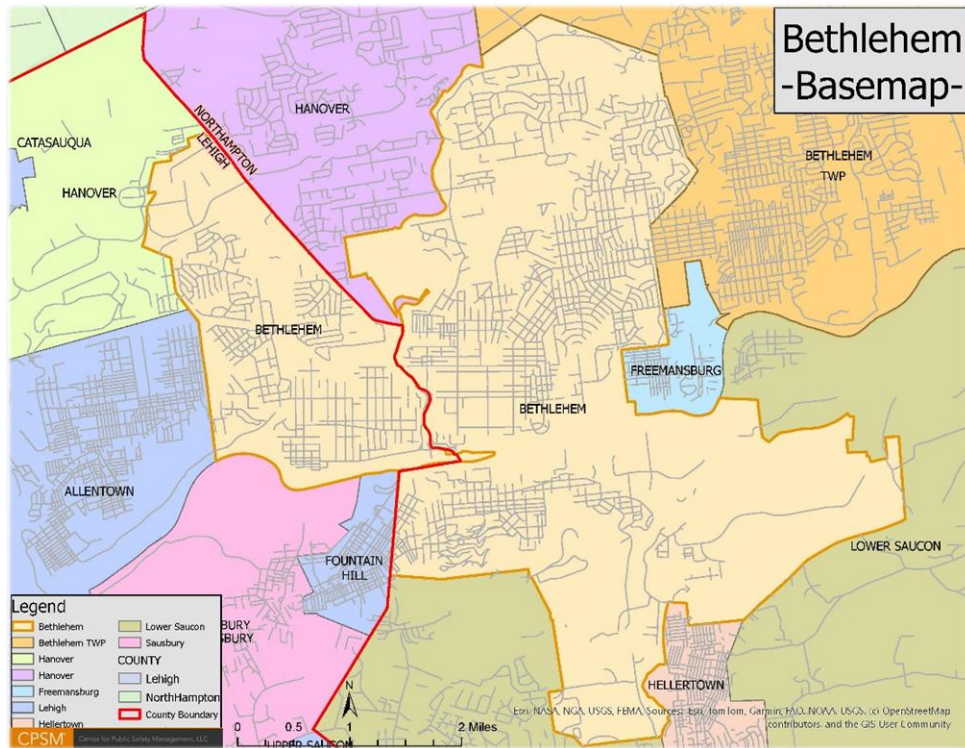
Bethlehem is divided into five main areas: Central Bethlehem/Center City, West Side, East Side, South Side, and North Side. Some sources suggest just four areas, grouping Central Bethlehem and the North Side into a single area. The West Side is located in Lehigh County, and the other four neighborhoods are in Northampton County.



1. <https://www.census.gov/quickfacts/fact/table/bethlehemcitypennsylvania/PST045224>

2. Ibid.

Figure 1: City of Bethlehem



The city has received accolades from the popular USA Today 10Best Readers' Choice voting. The USA Today 10Best Readers' Choice Award, has named Bethlehem Best Main Street in America in both 2025 and 2026, highlighting its landmarks, dining, and walkability.

They also named the Hotel Bethlehem the Best Historic Hotel for a 5th Consecutive Year recognized for its historic charm and service.

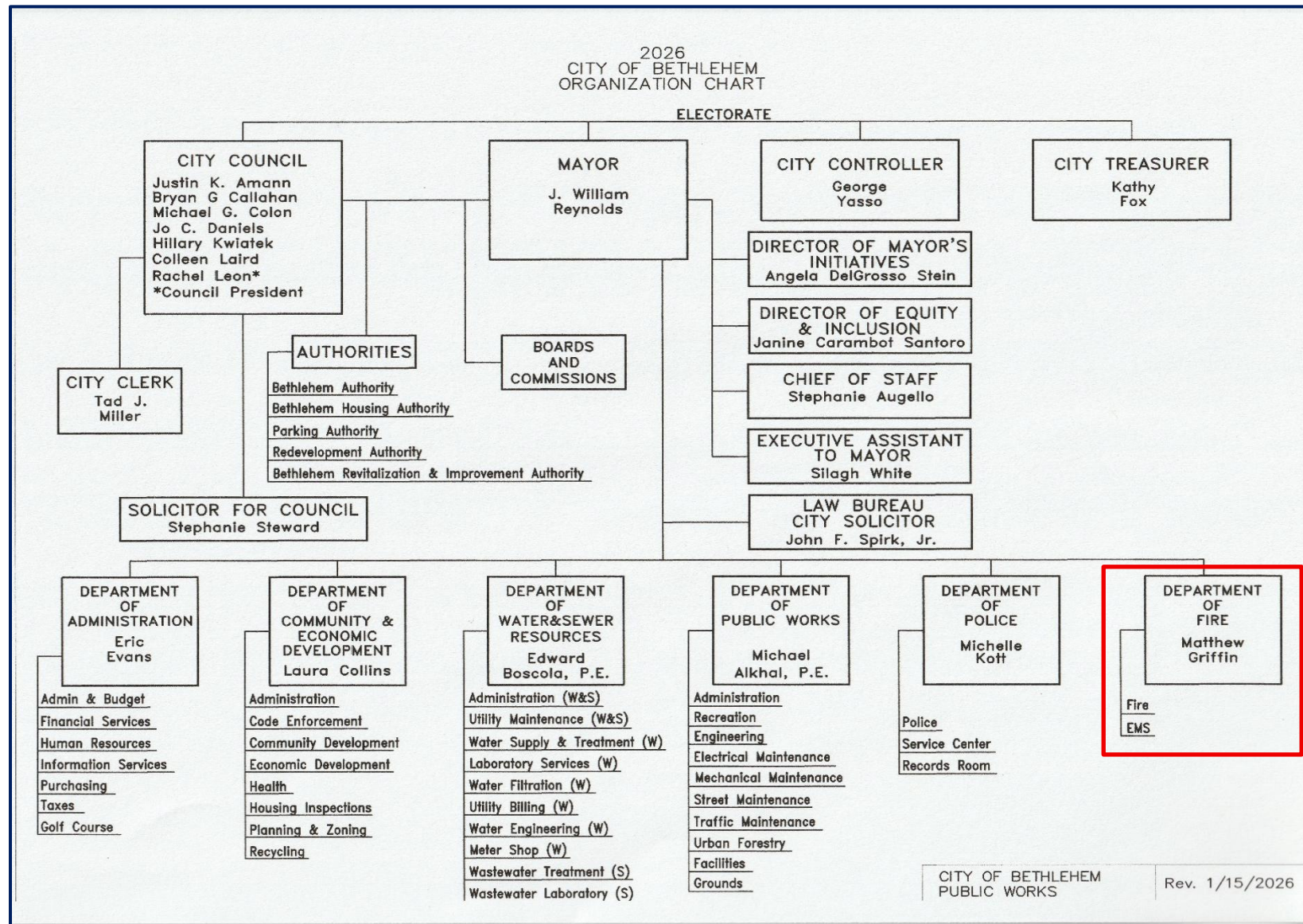
Governance

A mayor and a seven-person city council govern the City of Bethlehem. The Mayor serves as the city's chief executive officer. He is assisted in the day-to-day management of the city by a professional city administrator.

City Council is the legislative body of Bethlehem city government. The council is composed of seven members, who are elected to four-year terms. All council seats are determined by citywide elections; there are no districted council positions. The members of council serve staggered terms. Four members are elected in the same election cycle as the Mayor; the other three members are elected in the mid-point between those elections.

The next figure illustrates the city organizational structure and where the fire department and EMS division align.

Figure 2: City of Bethlehem Organizational Chart

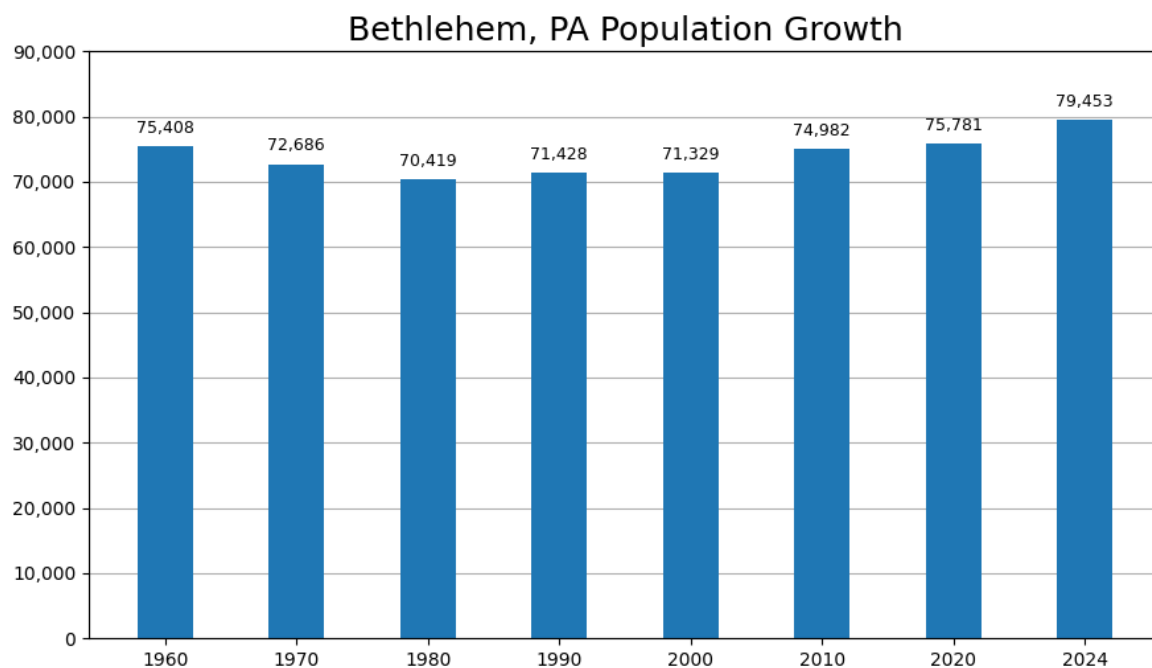


Population and Growth

The U.S. Census Bureau indicates the population of the City of Bethlehem, 2020 was 75,781. This represents an increase from the 2010 census population of 74,982. Reflecting a modest increase as the city has experienced moderate growth and redevelopment.³

The city experiences a steady flow of visitors throughout the year, particularly due to its historic attractions, cultural events, and festivals such as Musikfest and Christkindlmarkt. This consistent influx of tourists, along with commuters and students from local colleges and universities, creates periodic fluctuations in population levels. These variations are an important demographic factor influencing the demand for public facilities, infrastructure, and services, requiring the city to plan for both its permanent residents and the additional population present during peak tourism and event seasons.

Figure 3: City of Bethlehem PA Population Growth: 1960–2025



Current U.S. Census data tells us the 2025 estimated population is 79,644 inside a land mass of 19.12 square miles. The population/square mile is 4,165.

Land use within Bethlehem is diverse. Lower-density residential neighborhoods are primarily located in the northern and western sections of the city, while moderate- to high-density residential and multi-family housing are more concentrated in the central and south side areas. Historic districts and older housing stock, particularly on the South Side, present unique fire risk considerations.

Commercial, retail, and mixed-use developments are concentrated along major corridors such as Broad Street, Stefkou Boulevard, Linden Street, and Easton Avenue, as well as within the downtown areas. Industrial and warehouse use, including former and redeveloped steel production sites, are primarily located along the Lehigh River corridor. Additionally, institutional

3. U.S. Census Bureau. (2020). 2020 decennial census: Bethlehem City, Pennsylvania.

occupancies, including Lehigh University, Moravian University, and St. Luke's University Health Network, represent significant population and service demand centers within the city.⁴

Existing and Future Needs

As described in planning documents such as the City of Bethlehem Comprehensive Plan (City of Bethlehem, n.d.), Bethlehem is a largely built-out community, with limited vacant land available for large-scale new development. Even the former Bethlehem Steel property has experienced a significant level of redevelopment with available large parcels limited. Unlike rapidly expanding suburban areas, the city's historic development pattern, established neighborhoods, and constrained geography along the Lehigh River corridor limit opportunities for outward expansion. As a result, future growth is primarily driven by redevelopment, infill projects, and the adaptive reuse of former industrial properties, including sites associated with the former Bethlehem Steel plant.

While Bethlehem's population has remained relatively stable in recent years, demand for housing continues, influenced by regional growth in the Lehigh Valley and the presence of major institutions such as Lehigh University and Moravian University. Of the city's approximately 79,000 residents, a significant portion reside in owner-occupied housing, while a substantial percentage are renters, particularly in areas near the universities and downtown districts.

Vacant land within the city is limited and scattered, representing a small percentage of total land area, and is generally insufficient to support large-scale greenfield development. As a result, Bethlehem's future land use strategy focuses on redevelopment of underutilized parcels, increased density in appropriate areas, and mixed-use development along key corridors. Given current trends, the city is expected to meet future residential, commercial, and institutional needs through strategic redevelopment rather than expansion, while continuing to support economic growth and community services.

ISO-PPC Analysis

The City of Bethlehem currently holds a Public Protection Classification (PPC) rating of Class 2 (Insurance Services Office [ISO], 2022) from the Insurance Services Office (ISO), a subsidiary of Verisk Analytics. The current ISO PPC classification for the City of Bethlehem became effective September 1, 2022. The ISO evaluates communities across the United States on their ability to provide fire protection services. This evaluation is conducted using the Fire Suppression Rating Schedule (FSRS), which assigns points based on a community's fire protection capabilities. These points are then used to determine a PPC rating on a scale from 1 to 10, with Class 1 representing the highest level of fire protection.

It is important to note that the PPC rating is not solely a reflection of the fire department, but rather a comprehensive assessment of the community's overall fire protection system. This includes the Bethlehem Fire Department, the emergency communications system (Northampton County 911), and the water supply system, including the availability and distribution of fire hydrants and adequate fire flow. The evaluation also considers community risk reduction efforts such as fire prevention codes and enforcement, public fire safety education, and fire investigation programs.

The city's ISO-PPC report is current and within the normal cycle of ISO reporting.

4. City of Bethlehem. (n.d.). Comprehensive plan and community profile.

While a strong PPC rating can be an indicator of effective fire protection services, it does not automatically result in lower property insurance premiums, as insurance carriers use a variety of factors in their rate calculations. However, a PPC rating of Class 1, 2, or 3 signals to insurance underwriters that a community is well-equipped, properly distributed, and adequately staffed to respond to and mitigate fire incidents. Although insurance companies may consider ISO PPC data when determining premiums, ISO itself does not set or influence insurance rates.

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

The City of Bethlehem's 2022 ISO report included the following credit points by major category:

- Emergency Communications: 8.65 earned credit points out of 10.00 available.
- Fire Department: 36.33 earned credit points out of 50.00 available.
- Water Supply: 36.90 earned credit points out of 40.00 available.
- Community Risk Reduction (Fire Prevention, Public Education, and Fire Investigation): 5.30 earned credit points out of 5.50 available.

Overall, the community PPC rating yielded approximately 87.18 earned credit points out of 105.50 available, which establishes an ISO-PPC rating for the city of 2. This is a notable achievement.

A diversion factor may be applied as part of the ISO scoring methodology, which reflects the relationship between fire department resources and water supply capabilities. Strong fire resources are ineffective without adequate hydrants and water flow, while a robust water system is of little value without sufficient fire department capability. ISO applied its formula, which compares each score to its maximum possible credit, and this produced a deduction of -0.00 points from the city's overall rating. The lower the divergence the more aligned the water system and fire department are.

Under the ISO-PPC grading system, jurisdictions are evaluated on the distribution of engine and ladder companies within built-upon areas through deployment analysis. To receive full credit under the Fire Suppression Rating Schedule (FSRS), residential and commercial areas should be within 1.5 road miles of a first-due engine company and within 2.5 road miles of a ladder service company.

Because both engine and ladder companies respond from fire facilities, and engine companies are typically the more prevalent fire suppression resource, fire station locations are generally driven by engine company response needs.

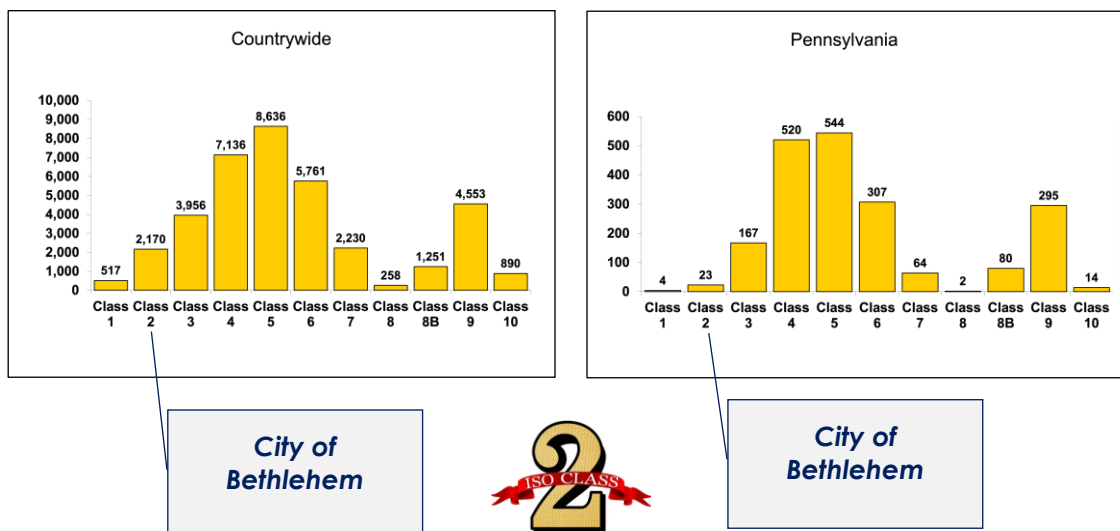
This comprehensive evaluation demonstrates a strong and well-balanced fire protection system within the City of Bethlehem.

The following table outlines the scoring for city's 2022 ISO-FSRS components. The figures following the ISO-PPC categorical scoring illustrate ISO-PPC ratings countrywide and in the Commonwealth of Pennsylvania.

Table 1: Bethlehem PA – ISO Earned Credit Overview, 2022⁵

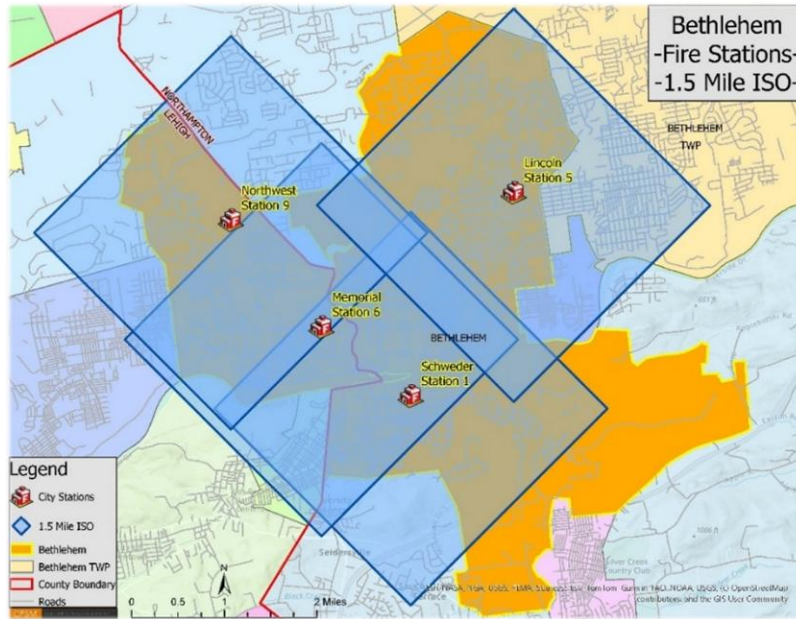
FSRS Component	Earned Credit	Credit Available
414. Credit for Emergency Reporting	3.00	3
422. Credit for Telecommunicators	3.67	4
432. Credit for Dispatch Circuits	1.88	3
440. Credit for Emergency Communications	8.55	10
513. Credit for Engine Companies	5.92	6
523. Credit for Reserve Pumpers	0.50	0.50
532. Credit for Pump Capacity	3.00	3
549. Credit for Ladder Service	3.93	4
553. Credit for Reserve Ladder and Service Trucks	0.16	0.50
561. Credit for Deployment Analysis	7.28	10
571. Credit for Company Personnel	9.38	15
581. Credit for Training	4.16	9
730. Credit for Operational Considerations	2.00	2
590. Credit for Fire Department	36.33	50
616. Credit for Supply System	28.30	30
621. Credit for Fire Hydrants	3.00	3.00
631. Credit for Inspection and Flow Testing	5.60	7
640. Credit for Water Supply	36.90	40
Divergence		-
1050. Community Risk Reduction	5.30	5.50
Total Credit	87.18	105.50

Figure 4: ISO PPC Ratings – Countrywide and Commonwealth of Pennsylvania



5. Insurance Services Office. (2022). Fire suppression rating schedule (FSRS). Verisk Analytics.

Figure 5: Bethlehem Engine 1.5 Mile Company Coverage

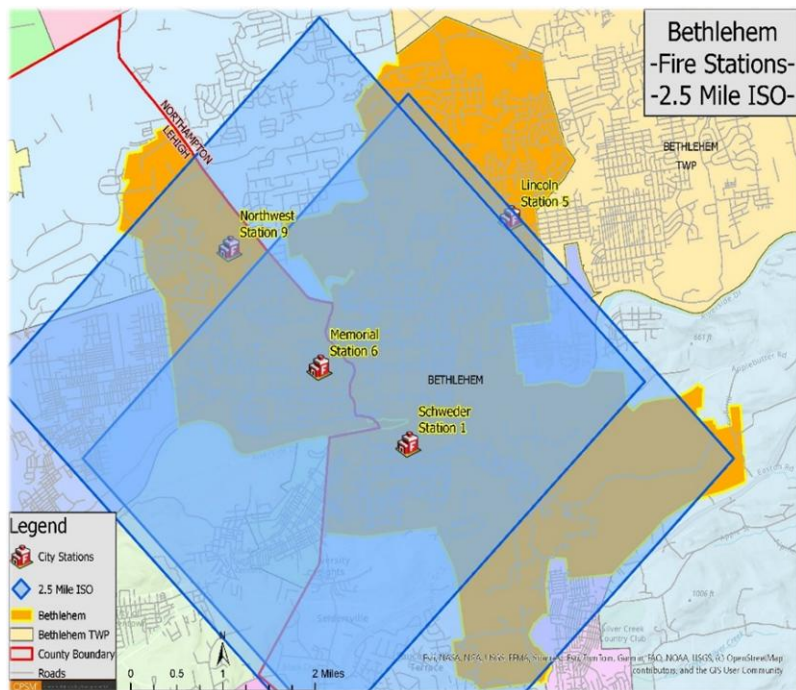


The figures to the left illustrate ISO-PPC engine and ladder company distribution in Bethlehem, Pennsylvania.

1.5 Mile Standard Analysis

This map indicates generally appropriate coverage for 1.5-mile engine company station placement across most built-upon areas.

Figure 6: Bethlehem 2.5 Mile Ladder Company Coverage



2.5 Mile Standard Analysis

Ladder company coverage within 2.5 miles is also largely adequate; however, minor gaps may exist in outlying or less densely developed portions of the city, where extended travel distances can affect optimal coverage.

The Bethlehem Fire Department (BFD) demonstrates solid performance across several evaluated categories in the ISO Public Protection Classification (PPC) review. While the department did not achieve maximum credit in training, the current score of 4.16 out of 9.00 indicates that a structured training program is in place and supporting operational readiness. Opportunities exist to enhance training documentation, frequency, and alignment with ISO criteria to improve this score.

The City of Bethlehem is to be commended for maintaining a strong municipal water supply system. The city achieved 36.90 out of 40.00 points in this category, including full credit for hydrant distribution and strong performance in inspection and flow testing. This level of performance reflects a reliable system capable of supporting fire suppression operations throughout the community.

Emergency communications capabilities are also well developed. The city earned 8.55 out of 10.00 points, reflecting effective emergency reporting, well-trained telecommunicators, and generally reliable dispatch systems. While this is a strong score, improvements to dispatch circuits may provide an opportunity to achieve full credit in the future.

Although the current ISO-PPC evaluation reflects a capable fire protection system, the City of Bethlehem and the BFD should internally review several areas to ensure continued improvement and to enhance future ISO scoring:

Ladder Service: Item #549 (3.93/4.00 credits).

This item evaluates the availability and distribution of ladder companies based on building height, fire flow requirements, and overall community risk. The BFD's score indicates that ladder service is generally well aligned with community needs. Continued maintenance of apparatus, staffing, and deployment practices will be important to sustain this level of performance.

Company Personnel: Item #571 (9.38/15.00 credits).

This item reviews the average number of firefighters and company officers available to respond to reported structure fires. The current score reflects moderate staffing levels when measured against ISO benchmarks during this evaluation time in 2022. On-duty staffing levels, accounting for leave and daily minimum staffing of 19, would directly influence this score if a reevaluation occurs today, thus possibly lowering this score in comparison with today's population and density. This remains an area where improvements could have a significant impact on both ISO credit and operational effectiveness.

Deployment Analysis: Item #561 (7.28/10.00 credits).

This item evaluates the distribution of engine and ladder companies relative to built-upon areas. The score indicates generally effective station placement, with some opportunities to further optimize coverage and reduce response distances in certain areas of the city.

Training: Item #581 (4.16/9.00 credits).

While training programs are in place, the score suggests that enhancements to training hours, company-level drills, facilities, or recordkeeping may be necessary to achieve additional credit.

CPSM recommends that as the City and BFD continue to make improvements in staffing, training (specifically documentation), and deployment that the BFD coordinate with ISO to pursue a future reevaluation. This will ensure that recent and ongoing enhancements are recognized and reflected in the community's PPC classification. An improved score is likely with these improvements.

§§§

End of Section

SECTION 3. COMMUNITY RISK PROFILE

This section provides a high-level assessment of the risk factors within the City of Bethlehem, response area. Several recommendations in this report are made, in part, by the findings of this risk overview. A key factor in determining acceptable levels of service, including deployment, and staffing for fire and emergency services, is the level of risk present within a community. Risk is influenced by a combination of factors, including the number and types of target hazards, life hazards, building construction, the presence of fire sprinklers and alarm systems, service demand, and socio-economic characteristics of the community.

Bethlehem is a mid-sized urban municipality located in both Northampton and Lehigh Counties, characterized by a mix of historic neighborhoods, densely populated residential areas, commercial corridors, and redeveloped industrial sites such as the former Bethlehem Steel property. The community includes a significant number of older structures, particularly in the South Side and historic districts, which may present increased fire risk due to age, construction type, and potential limitations in built-in fire protection systems. In contrast, newer developments, and institutional occupancies such as Lehigh University and St. Luke's University Health Network facilities often include modern fire protection features.⁶

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 quantify the probability of future service requests. In a 2021 National Fire Protection Association (NFPA) report on residential fires, the following key findings were identified for the period 2015–2019 (National Fire Protection Association [NFPA], 2021): ⁷

- 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 aged 55 to 65.
- Fifty-nine 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 related to vulnerable populations.

6. U.S. Census Bureau. (2024). American Community Survey 1-year estimates: Bethlehem City, Pennsylvania.

7. National Fire Protection Association. (2021). Fire loss in the United States during 2015–2019.

In Bethlehem, the following 2025 U.S Census Bureau data on age and socioeconomic factors are considered when assessing and determining risk for fire and EMS preparedness and response:

- Children under the age of five represent approximately 5.5 percent of the population.
- Persons under the age of 18 represent approximately 20.0 percent of the population.
- Persons over the age of 65 represent approximately 14.5 percent of the population.
- Female persons represent approximately 51.5 percent of the population.
- There are approximately 2.3 persons per household in Bethlehem.
- The median household income is approximately \$63,000.
- People living in poverty make up approximately 18.0 percent of the population.

Black or African American alone represents approximately 7.0 percent of the population (U.S. Census Bureau, 2021). The remaining population includes White alone at approximately 73.0 percent, Asian alone at approximately 3.0 percent, two or more races at approximately 4.0 percent, and Hispanic or Latino at approximately 29.0 percent.⁸

The demographics in Bethlehem overall pose a **moderate to elevated risk** in totality. While the senior population is lower than in retirement-based communities, the higher percentage of children, greater population density, and elevated poverty rate contribute to increased demand for EMS and fire services. A single call involving a vulnerable population (fire or EMS) presents a higher level of risk for that specific response.

Through pre-fire planning and response district knowledge of residential and other structures housing vulnerable populations as identified above, the Bethlehem Fire Department will have the necessary situational awareness and be better prepared upon arrival at incidents.

Certain socio-economic characteristics help identify individuals or target populations most likely to use and/or benefit from public sector programs and services, including community outreach initiatives (such as mobile integrated healthcare programs). This includes fire and EMS services, with a more significant demand typically placed on EMS.

An all-hazards Fire and EMS risk assessment is a comprehensive, participatory process used to evaluate hazards, vulnerabilities, and overall community risk. Its primary purpose is to generate data that supports informed decisions regarding planning and implementation of risk-reduction measures. In Bethlehem, service demand is influenced by a combination of permanent residents, a large student population, tourism, and major annual events such as Musikfest, which significantly increase population density and emergency service demand during peak periods. (Federal Emergency Management Agency [FEMA], 2023).⁹

A Community Risk Reduction (CRR) program builds on this assessment. CRR is a systematic process for identifying and prioritizing local risks and strategically investing resources to reduce their likelihood and impact. The CRR process typically involves four steps: conducting a Community Risk Assessment (CRA), developing a CRR plan, implementing the plan, and evaluating its effectiveness. (National Fire Protection Association [NFPA], 2023).

8. U.S. Census Bureau. (2025). American community survey 5-year estimates.

9. Federal Emergency Management Agency. (2023). National Incident Management System (3rd ed.).

The CRA serves as a comprehensive evaluation that identifies, prioritizes, and defines community-specific risks. It provides a detailed understanding of Bethlehem's unique risks, capabilities, and characteristics, forming the foundation of an effective CRR program. An all-hazards approach integrates emergency preparedness planning across all types of incidents, focusing on the capacities and capabilities critical to responding to a full spectrum of emergencies and disasters. In Bethlehem, this includes considerations such as transportation corridors (e.g., Route 22 and Interstate 78), rail lines, the Lehigh River, and the potential for weather-related events including flooding and winter storms. (FEMA, 2023; NFPA, 2023).¹⁰

The City of Bethlehem recognizes that hazards and risks currently exist within its service area and that these risks are likely to evolve as the city continues to grow and redevelop. Both current and future risks pose potential threats to the safety of residents, students, workers, and visitors, as well as to property and the environment. In simpler terms, hazards are the sources of danger in the community, while risk quantifies the potential severity and likelihood of that danger.

Modern risk assessing utilizes three factors when analyzing risk. These are:

- Probability or likelihood of an incident occurring, which defines the frequency of the various incidents fire departments respond to.
- Consequence (magnitude) of an incident on the community, which is the measure of the outcome of a fire, fire related, EMS, technical rescue, or Haz-Mat incident on the community.
 - Probability and Consequence combined identifies the risk based on the probability of an incident and the consequences on the community.
- Impact of an incident on the BFD as an emergency response agency and its ability to provide ongoing services to the remaining areas for service demand analysis.

Several factors directly influence Fire and EMS calls, linking to the probability of occurrence, consequences for the community, and overall impact on the city:

- Population and Demographics: Incident demand increases as the population grows. Age and socio-economic profiles also affect the number and type of service requests. Evaluating the distribution of seniors and children by fire management zones can help identify trends in service delivery and estimate the probability of future calls.
- Building and Target Hazard Risk: The presence of high-occupancy facilities, critical infrastructure, and structures with unique fire or life safety concerns elevates risk and can significantly increase the frequency, complexity, and severity of incidents.
- Transportation Infrastructure: Roads and rail networks can impact response times and accessibility for emergency services.
- Environmental Risks: Weather events, hazardous material releases, wildfires, earthquakes, and flooding all pose significant hazards that increase the likelihood and potential severity of incidents.

The City of Bethlehem identifies its community risk profile through regional planning efforts, including participation in the Lehigh Valley Hazard Mitigation Plan, coordinated by Northampton and Lehigh Counties. Bethlehem is primarily located in Northampton County, with a portion extending into Lehigh County, and works collaboratively with both counties to assess hazards and risks.

10. National Fire Protection Association. (2023).

The regional hazard mitigation plan includes multiple municipalities and partner agencies across the Lehigh Valley. Northampton County covers approximately 377 square miles and has a population of about 312,000 (2024 U.S. Census), while Lehigh County encompasses approximately 348 square miles with a population of about 375,000.¹¹ These plans provide the foundational framework for assessing Bethlehem's community risk, including natural hazards, infrastructure vulnerabilities, and long-term growth trends.¹²

Environmental Risks

The City of Bethlehem is prone to and will continue to be exposed to certain environmental hazards and risks that may impact on the community. The following covers environmental risks county-wide and risks specific to Bethlehem.

County	Flooding, winter storms and extreme cold, but also include tornadoes, severe thunderstorms and high winds, drought, extreme heat, hazardous materials incidents, cyber-attacks, and long-term power outages, especially outages during extended periods of extreme temperatures.
City	Tornadoes, downbursts, and other severe thunderstorms, floods, blizzards/winter storms, ice storms, drought, wildland fires, major structure and industrial fires, hazardous materials released to the air, ground, or water during transportation or at fixed locations, including potential radiological incidents, aircraft incidents, civil disturbances, active shooter incidents, and terrorism.

These life-threatening hazards can destroy property, disrupt the economy, lower the overall quality of life for individuals, and create significant demand for Bethlehem emergency services. The natural, manufactured, and technological hazards identified by the City of Bethlehem are reflected in its Emergency Operations Plan and supporting planning documents.

Figure 7: City of Bethlehem Hazard Assessment

BETHLEHEM, PA HAZARD RISK MATRIX <i>Assessing the Likelihood and Potential Impact of Hazards Affecting Bethlehem, Pennsylvania</i>			
	 SEVERE IMPACT Catastrophic or life-threatening consequences	 MODERATE IMPACT Significant impact to people, property, or operations	 LIMITED IMPACT Limited impact to people, property, or operations
 HIGH LIKELIHOOD Likely to occur within the next 1-5 years	- Large Hazardous Materials Incident (rail or highway – Norfolk Southern lines, Route 22 / I-78) - Major Industrial Fire (warehouses, distribution centers) HIGH RISK	- Major Highway Accident (I-78, Route 22 congestion corridors) - Multi-vehicle winter crash events HIGH RISK	- Wildland-Urban Interface Fire (South Mountain areas) - Small Hazardous Materials Spill - Extended Severe Storm (thunderstorms with outages) MODERATE RISK
 MODERATE LIKELIHOOD Possible to occur within the next 5-20 years	- Pandemic / Public Health Emergency - Major Infrastructure Failure (water, power grid) - Large Commercial Fire HIGH RISK	- Severe Thunderstorms - Flash Flooding (Monocacy Creek, Lehigh River) - Tornado (low frequency but possible) MODERATE RISK	- Winter Storms (snow/ice) - Extended Heat Waves - Cold Weather / Freeze Events LOW RISK
 LOW LIKELIHOOD Unlikely to occur within the next 20+ years	- Dam Failure (regional dams upstream) - Active Shooter Incident - Terrorism-related Event MODERATE RISK	Civil Unrest / Large Public Disturbance (events, festivals) LOW RISK	Rail Yard Derailment with Limited Hazard (Bethlehem rail corridors) LOW RISK

11. U.S. Census Bureau. (2024): Bethlehem city, Pennsylvania.

12. Northampton County Emergency Management Services. (2024). Lehigh Valley Hazard Mitigation Plan.

Bethlehem contains a diverse mix of residential, commercial, institutional, and industrial occupancies that present varying levels of fire and life safety risk to emergency responders and the community. Building and target hazards are defined as significant occupancies or structures capable of placing exceptional demands on fire department resources during emergencies. These properties are those in which a fire, hazardous materials incident, rescue, or other emergency event could rapidly overwhelm initial response capabilities and require additional staffing, specialized apparatus, and mutual aid resources to effectively mitigate the incident. Within Bethlehem, target hazards include hospitals, healthcare facilities, colleges and universities, schools, churches, high-density residential occupancies, warehouses, assembly occupancies, and industrial and manufacturing facilities associated with the city's commercial and industrial base.

The purpose of a community risk assessment is to evaluate the community as a whole by identifying the hazards associated with individual properties and occupancies and classifying them based on their relative risk. Properties are generally categorized as high-, medium-, or low-hazard occupancies depending on factors such as life safety risk, building construction, occupancy load, fire load, access limitations, and the level of fire department resources necessary to control an incident. According to the NFPA Fire Protection Handbook, these hazards are defined as:

- High-hazard occupancies: Schools, hospitals, nursing homes, high-rise buildings, industrial facilities, large assembly occupancies, and other occupancies involving vulnerable populations or significant fire potential.
- Medium-hazard occupancies: Multi-family residential buildings, including apartments, townhomes, and mixed-use occupancies, along with office, mercantile, and light industrial occupancies not typically requiring extensive rescue operations.
- Low-hazard occupancies: One-, two-, and three-family dwellings and scattered small commercial occupancies with lower life and fire risk profiles.

Contemporary residential development within Bethlehem also presents evolving operational challenges for emergency responders. Modern single-family homes exceeding approximately 3,000 square feet, commonly constructed with lightweight wood-frame systems and open floor plans, represent a growing medium-risk hazard profile. These homes frequently contain interconnected living spaces, engineered structural components, and concealed void spaces that can contribute to rapid fire growth and early structural compromise. Fire suppression operations in these occupancies often require increased staffing, coordinated ventilation and water application, and heightened situational awareness to control incidents safely and effectively. (NFPA, 2025).

The majority of Bethlehem's residential building stock consists of Type V wood-frame construction, including detached single-family homes, duplexes, and rowhomes constructed with wood framing, masonry veneers, or mixed exterior finishes. In many areas of the city, especially within older neighborhoods, closely spaced dwellings and attached residential structures increase the potential for rapid fire extension between buildings. While many residential occupancies are generally considered lower risk compared to large commercial or institutional properties, their combustible construction, density, and age-related factors continue to present significant operational considerations for the Bethlehem Fire Department. (NFPA, 2025).

Building inventory within Bethlehem includes a diverse range of residential, commercial, institutional, and industrial occupancies that contribute to the community's overall risk profile. Major occupancy classifications include:

- Single-family residential dwellings, including detached homes, attached row homes, twin homes, and manufactured housing where present.
- Multi-family residential occupancies, including apartment buildings, condominiums, townhouses, and mixed-use buildings with residential units located above commercial occupancies.
- Assisted living facilities, nursing homes, and senior care centers serving vulnerable populations requiring specialized evacuation and rescue considerations.
- Commercial, manufacturing, warehouse, and industrial structures associated with Bethlehem's retail, distribution, and industrial sectors.
- Strip malls, shopping centers, and mercantile occupancies distributed throughout the city's commercial corridors.
- Major healthcare facilities, including St. Luke's University Hospital–Bethlehem Campus, Lehigh Valley Health Network facilities, associated medical office buildings, and outpatient healthcare services.
- Educational occupancies, including Lehigh University, Moravian University, public and private schools, and daycare facilities.
- Large assembly occupancies such as churches, theaters, event venues, athletic facilities, and entertainment complexes capable of accommodating significant occupant loads.
- Historic commercial and residential structures located throughout Bethlehem's downtown and historic districts, many of which present unique fire protection and access challenges due to age, construction type, and close building spacing.
- Transportation and infrastructure-related occupancies, including parking structures, rail-related properties, and utility infrastructure supporting the region.

Bethlehem's diverse building inventory requires tailored pre-incident planning, risk assessment, and resource deployment strategies to ensure that hazards across the community are effectively managed. Building construction types play a critical role in determining how structures perform under fire conditions and directly influence firefighting tactics, occupant survivability, and overall community risk.

Construction classifications throughout Bethlehem range from fire-resistive and noncombustible construction found in institutional, healthcare, and newer commercial occupancies to ordinary construction, heavy timber, and Type V wood-frame buildings commonly found in the city's historic districts and residential neighborhoods. Each construction type possesses unique characteristics related to structural integrity, fire spread potential, collapse risk, and fire resistance. Understanding these differences enables fire and emergency services personnel to accurately assess hazards, anticipate fire behavior, and implement effective operational strategies during emergency incidents.¹³

The variety of building occupancies and construction types within Bethlehem requires the Bethlehem Fire Department to prepare for a broad spectrum of incidents, ranging from routine residential responses to complex emergencies involving large assembly occupancies,

¹³ CPSM on site observations, citywide tour.

institutional facilities, industrial properties, and mixed-use structures. Pre-incident planning, supported by occupancy-specific tactical considerations, is critical to ensuring effective emergency response throughout the community.

Based on these considerations, occupancies within Bethlehem can generally be categorized into hazard classes as follows:

High-Hazard Occupancies

- Hospitals, nursing homes, assisted living facilities, and occupancies serving vulnerable populations.
- Public and private educational institutions, including colleges, universities, schools, and daycare facilities.
- High-rise residential, commercial, and mixed-use buildings.
- Industrial and manufacturing facilities involving hazardous materials processing, storage, or specialized industrial operations.
- Warehouses and occupancies containing high-piled storage.
- Facilities involving cutting, welding, or other hot work operations.
- Structures or processes presenting explosion or combustible dust hazards.
- Large public assembly occupancies including theaters, arenas, houses of worship, entertainment venues, and event facilities.
- Historic structures with significant life safety challenges or limited fire protection features.

Medium-Hazard Occupancies

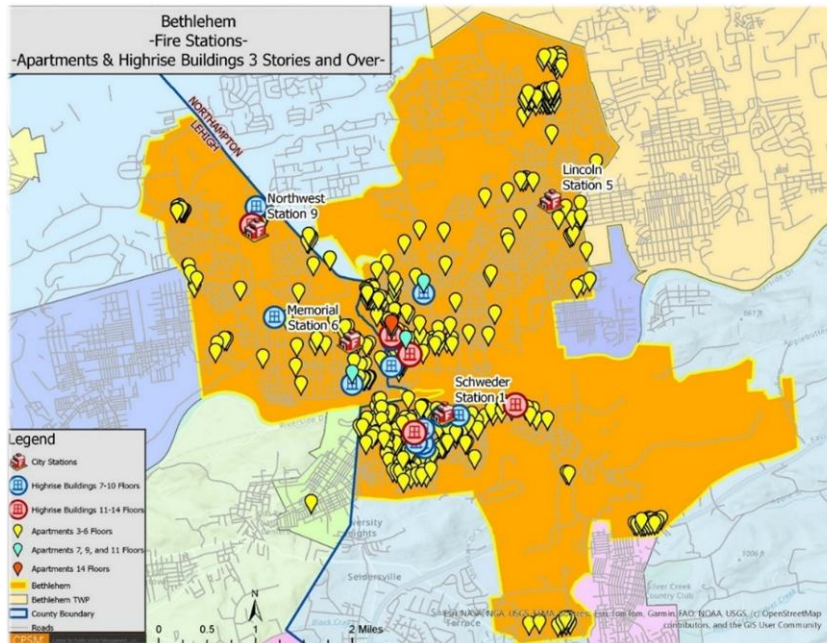
- Multifamily residential buildings, including apartments, condominiums, townhouses, and mixed-use occupancies.
- Medical office buildings, outpatient clinics, and healthcare support facilities.
- Restaurants, fitness centers, community centers, and other public assembly occupancies with moderate occupant loads.
- Shopping centers, retail stores, strip malls, and mercantile occupancies.
- Businesses involving commercial cooking operations.
- Large commercial and industrial occupancies without significant hazardous processes.
- Specialized storage facilities and distribution occupancies.
- Contemporary single-family homes exceeding approximately 3,000 square feet, particularly those utilizing lightweight wood-frame construction.

Low-Hazard Occupancies

- Single-family residential dwellings, duplexes, and smaller residential occupancies that generally present lower operational complexity.
- Small office buildings and limited retail occupancies without hazardous processes or significant occupant loads.
- Scattered small commercial occupancies with limited fire and life safety hazards.

Bethlehem contains a variety of occupancies and facilities that meet established target hazard classifications.

Figure 8: Apartments and Highrise Occupancies



High-Hazard Target Occupancies.

- Hospitals, assisted living facilities, nursing homes, and senior care facilities (institution class occupancies).
- Public and private educational facilities, including Lehigh University, Moravian University, schools, and daycare centers.
- Industrial and manufacturing occupancies involving hazardous materials or specialized industrial processes.
- Historic structures and densely built downtown occupancies with limited separation distances.
- High-rise residential and mixed-use buildings.
- Large public assembly occupancies including theaters, churches, event venues, and

Figure 9: Institution and Commercial Property Class Types

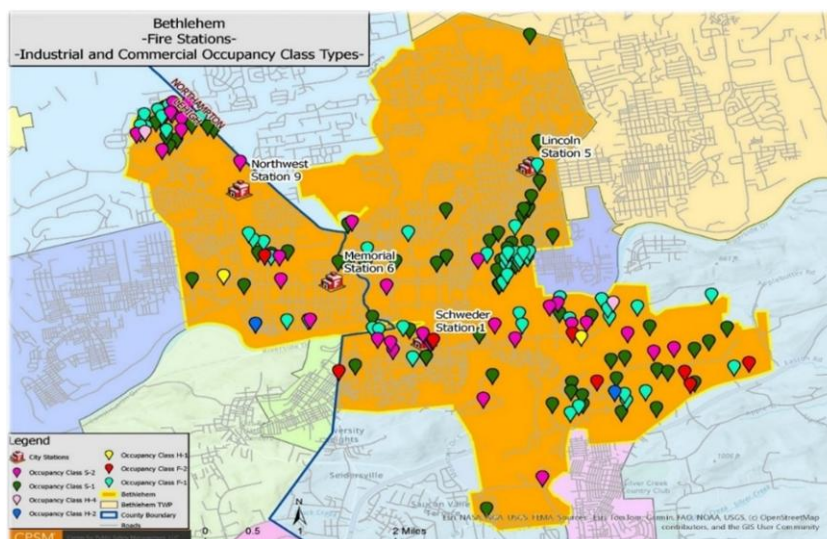
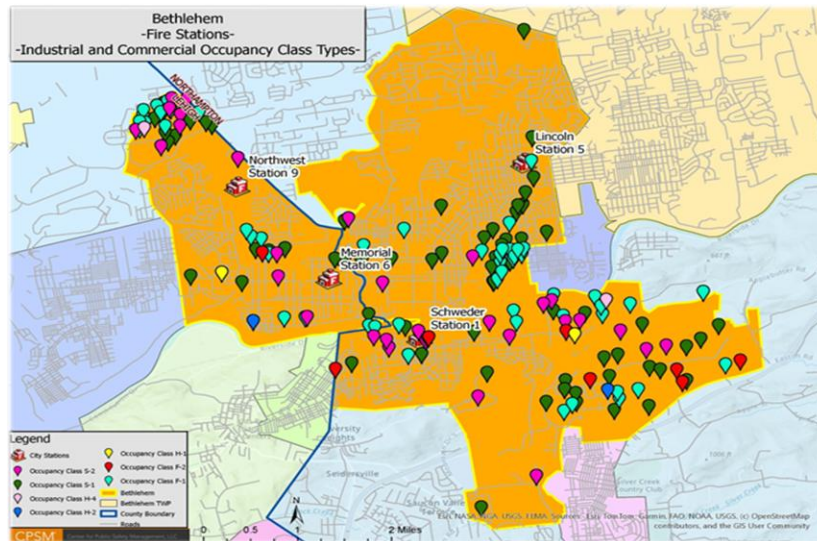


Figure 10: Industrial and Commercial Occupancies



Medium-Hazard Target Occupancies

- Multifamily residential buildings and mixed-use occupancies.
- Large footprint commercial and industrial buildings.
- Medical office buildings and outpatient healthcare facilities.
- Shopping centers, retail plazas, and strip malls.
- Restaurants and assembly occupancies.
- Large contemporary residential dwellings exceeding 3,000 square feet, particularly those built with lightweight wood-frame construction and open floor plans.

CPSM identified several manufactured home communities and Sears Kit-Home Community units within Bethlehem and the surrounding service area that present elevated fire and life safety concerns. Manufactured homes are generally more vulnerable to fire spread and severe weather impacts than traditional site-built residential structures due to lighter construction materials, limited compartmentalization, and reduced structural fire resistance. In addition, the close spacing commonly found within manufactured home communities can increase the potential for rapid fire extension between units, creating incidents that may quickly affect multiple households and complicate evacuation and suppression operations.

Additional community risk factors are present throughout portions of Bethlehem, particularly within the South Side and older urban neighborhoods of the city. The South Side contains some of the highest population densities within the community, with closely spaced residential occupancies, mixed-use buildings, student housing, and older multifamily structures concentrated along narrow urban corridors. These conditions increase the potential for rapid fire extension, higher occupant loads, and increased life safety concerns during emergency incidents.¹⁴

Economic conditions within portions of the city may also impact community vulnerability and emergency preparedness. Older housing stock, deferred maintenance, absentee property ownership, and limited financial resources can contribute to increased fire risk, code enforcement challenges, and higher demand for emergency medical and social services. Many residential and mixed-use buildings within Bethlehem were constructed decades ago and may contain aging electrical systems, legacy heating systems, combustible concealed spaces, and limited fire protection features compared to modern construction standards.

Infrastructure and access constraints throughout older sections of Bethlehem create additional operational challenges for emergency responders. Narrow streets, limited alley access, on-street

14. U.S. Census Bureau. (2024).

parking congestion, and intersections not originally designed for modern fire apparatus can delay response times and restrict positioning of large fire trucks and aerial apparatuses. Overhead utility lines, utility congestion, and aging infrastructure further complicate firefighting operations by limiting aerial ladder placement, creating electrical hazards, and reducing operational flexibility during incidents.

Topography also influences emergency response operations within Bethlehem. Steep grades, hillside neighborhoods, and elevation changes throughout portions of the city can affect apparatus access, water supply pressures, runoff conditions, and overall fireground operations. Combined, these factors contribute to a more complex urban risk environment requiring detailed pre-incident planning, adaptable response strategies, and continued investment in community risk reduction and infrastructure planning.

Transportation Risks

The City of Bethlehem's transportation infrastructure includes a diverse network of roadways, trails, and freight rail systems that support both local mobility and regional connectivity.

Roads

Primary access to and from Bethlehem is provided by several major highways, including U.S. Route 22, which runs east–west just north of the city, and Interstate 78, located to the south. Pennsylvania Route 378 serves as a key north–south corridor through the city, connecting Bethlehem to neighboring Allentown and providing access across the Lehigh River via the Hill-to-Hill Bridge. Additional arterial roadways such as Stefko Boulevard, Linden Street, Broad Street, and Schoenersville Road distribute traffic throughout the city and connect residential, commercial, and industrial areas. (Pennsylvania Department of Transportation [PennDOT], 2024).

Bethlehem's roadway network reflects its historic development patterns, with older sections of the city featuring a traditional grid layout, particularly in the downtown and South Side areas, while newer development in outlying areas exhibits more suburban, auto-oriented designs with cul-de-sacs and limited-access residential streets. The age of infrastructure in older areas often results in narrower road widths, limited shoulder space, on-street parking, and tighter turning radii, all of which can restrict apparatus movement and staging during emergency operations. Some dead-end streets and constrained roadways—particularly in older neighborhoods—can present access challenges for emergency responders.

Highways and major arterial roads carry significant volumes of high-speed traffic, including commercial trucking and transit vehicles. The Bethlehem Fire Department operates under mutual aid agreements with surrounding jurisdictions, including Allentown, Easton, Hanover Township, and Lower Saucon Township, to respond to incidents on major roadways such as Route 22, I-78, and Route 378 within their respective response areas. These high-speed corridors present elevated risks for multi-vehicle accidents, hazardous material incidents, and complex extrication scenarios.

Road conditions in Bethlehem are significantly impacted by seasonal weather, particularly winter snow and ice, which can reduce roadway capacity, narrow travel lanes, and increase the likelihood of traffic accidents. These conditions can also create operational challenges for emergency response, requiring additional caution, reduced travel speeds, and enhanced coordination by fire department personnel. Combined with factors such as roadway age, population density, topography, and overhead utility constraints, these conditions contribute to an increased hazard profile that must be considered in routine operations and safety planning.

Hazardous materials are substances that, due to their chemical, physical, or biological properties, can pose significant risks to life, health, property, and the environment if released. The Bethlehem region's industrial legacy and ongoing economic activity are supported by an extensive transportation network, including major highways and rail lines. Hundreds of hazardous materials shipments pass through Bethlehem and the surrounding Lehigh Valley each day. The presence of major transportation corridors such as Interstate 78, Route 22, and active Norfolk Southern rail lines increases the likelihood of a transportation-related hazardous materials incident. As a result, a major chemical spill or hazardous materials release is considered a credible and ongoing hazard for the city.

Trains – Freight

The primary commercial rail line running through the City of Bethlehem (approximately several miles in length) is owned and operated by Norfolk Southern Railway. This rail line is part of a larger regional network that connects the Lehigh Valley to major freight corridors across the Northeast and beyond. Within Bethlehem, the line serves as an important route for the movement of goods, linking local industries to national markets. Mainline tracks in the area are typically maintained to standards that allow freight trains to operate at moderate speeds, generally up to approximately 40–50 mph, depending on track classification and conditions. (Federal Railroad Administration [FRA], 2024).

Freight rail traffic in Bethlehem may include the transport of a diverse mix of commodities. These commonly include construction materials, chemicals, petroleum products, consumer goods, vehicles, and other industrial freight. Some shipments may include hazardous materials such as fuels, industrial chemicals, or other regulated substances. While rail is considered a relatively safe and efficient mode for moving such materials, the presence of hazardous freight does pose potential risks, including derailments, spills, fires, or exposure to toxic substances. These risks are mitigated through strict federal regulations, routine inspections, and coordinated emergency response planning involving local, state, and federal agencies. Nonetheless, proximity to active freight rail lines requires ongoing awareness and preparedness to address potential safety concerns.

Rail facilities in the Bethlehem area include multiple mainline tracks, sidings, and yard spaces used for staging locomotives, assembling trains, and performing maintenance on rail cars. These facilities also allow for operational flexibility, including the movement and repositioning of trains throughout the network. In some locations, rail configurations such as wye tracks or loop connections may be used to turn locomotives or redirect rail traffic efficiently. The rail line is crossed at multiple locations by roadways via bridges and, in some areas, at-grade crossings. Major roadway crossings include key local and regional routes that pass over or intersect the rail corridor, helping to maintain connectivity across the city. While grade-separated crossings (bridges) minimize conflicts between rail and vehicular traffic, at-grade crossings do exist in and around Bethlehem and can result in temporary traffic delays when trains are passing.

As a result, although much of the rail infrastructure is designed to reduce interference with vehicle circulation, freight rail operations can still impact traffic flow and may affect emergency response times at certain crossings. Ongoing coordination between rail operators and local emergency services is important to ensure timely response and to mitigate potential disruptions.



Historical Property Loss

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

In a 2025 report published by the National Fire Protection Association (NFPA) on trends and patterns of U.S. fire losses, it was determined that home fires continue to account for the majority of civilian fire deaths, civilian injuries, and property loss due to fire. (National Fire Protection Association [NFPA], 2025).¹⁵

Key findings from this report include:

- Public fire departments in the United States responded to approximately 1,388,000 fires in 2024.
- Approximately 470,500 fires occurred in structures (34 percent of all reported fires). Of these incidents, 351,000 occurred in residential structures and 76,000 occurred in multifamily residential structures.
- 3,000 civilian fire deaths occurred in residential fires, with 2,920 deaths occurring specifically in home structure fires.
- Home fires were responsible for approximately 8,920 civilian injuries.
- An estimated \$19.1 billion in direct property damage occurred as a result of fire in 2024.

The table below summarizes the overall fire loss in Bethlehem expressed in dollars, as assessed and estimated by the Bethlehem Fire Department (BFD). This data should be reviewed regularly and analyzed in the context of fire response times, company-level training, fireground effectiveness, and the performance of incident command. Property loss information should also be incorporated in resource deployment discussions to support informed decision-making and continual operational improvement.

Table 2: Historical Property and Content Loss in Bethlehem

2021	2022	2023	2024	2025
\$2,429,226.00	\$2,496,349.61	\$1,892,283.77	\$3,383,177.00	\$9,476,008.00

Estimated property loss from fire can vary significantly from year to year due to several contributing factors. The number and severity of fires annually have a direct influence on overall losses, as larger or more destructive incidents naturally result in higher estimates.

The type and value of property involved also impact overall losses, with fires in high-value commercial occupancies, historic structures, or densely populated residential areas often generating substantially greater losses than incidents occurring in lower-value properties.

In Bethlehem, factors such as aging housing stock, mixed-use occupancies, redevelopment activity, and fluctuating construction costs can further influence fire loss estimates. Changes in real estate values, replacement costs, and inflation may increase estimated losses even when the total number of fires remains relatively stable.

15. National Fire Protection Association. (2023). Community risk assessment standards and fire protection handbook. NFPA.

Understanding the overall health and social needs of the community is a fundamental component of effective EMS planning and response. EMS providers in Bethlehem, Pennsylvania must not only be aware of the types of medical emergencies likely to occur but also understand the broader social determinants of health, demographic trends, and specific needs of the populations they serve. (City Health Dashboard, 2025).¹⁶

Bethlehem has a diverse population of approximately 75,780 residents, with a median age in the mid-30s and a growing older adult population that contributes to increased demand for services related to chronic disease, falls, and cardiac events. The city reflects a mix of socioeconomic conditions, with median household incomes around \$75,000, yet has notable pockets of poverty that can impact access to preventative care and increase reliance on emergency services. Chronic health conditions such as heart disease, diabetes, and respiratory illness are prevalent, consistent with broader trends in Northampton and Lehigh Counties. Additionally, a significant Hispanic/Latino population and multilingual households highlight the importance of culturally competent care and language-accessible services within EMS delivery.

Factors such as age distribution, socioeconomic status, prevalence of chronic diseases, access to healthcare, language barriers, and cultural considerations all influence how the Bethlehem community experiences health risks and utilizes emergency medical services. By integrating this knowledge into operational planning, EMS agencies can allocate resources more effectively, develop targeted prevention and outreach programs, and deliver care that is responsive to the unique health challenges of the community.

For this section, EMS risk information for Bethlehem was gathered from the City Health Dashboard, maintained by the New York University School of Medicine, which provides comprehensive community health data for the 500 largest cities in the United States. Additional population and demographic data were obtained from the U.S. Census Bureau's American Community Survey (2023 1-year estimates) and the Centers for Disease Control and Prevention (CDC). Reviewing data specific to Bethlehem is essential, as these metrics directly influence EMS planning, resource allocation, and the delivery of emergency medical services tailored to the community's needs.

Relevant data when assessing EMS risk in a community includes:

- **Older Population:** Typically, older populations may have more chronic conditions and require more frequent medical care, while younger populations may face more trauma-related incidents. Understanding the age distribution within Bethlehem is essential for anticipating medical emergencies. In Bethlehem, the median age is approximately 35 years, and about 18% of the population is over the age of 65. This growing older adult population contributes to increased demand for EMS services related to falls, strokes, cardiac conditions, and other chronic health issues. These trends are consistent with regional EMS call patterns observed in Northampton and Lehigh Counties.
- **Racial and Ethnic Demographics:** Bethlehem's population is diverse, with approximately 67% White, 7% Black or African American, and about 30% identifying as Hispanic or Latino, along with smaller proportions of Asian and multiracial populations.

16. City Health Dashboard. (2025). Bethlehem, Pennsylvania community health data. New York University School of Medicine.

Understanding racial and ethnic demographics is important when assessing EMS risk, as different groups may experience varying health outcomes, access to care, and prevalence of certain medical conditions. Social determinants of health—such as income, housing stability, language barriers, and access to healthcare—often intersect with race and ethnicity and can influence the frequency and nature of EMS utilization. In Bethlehem, the significant Hispanic/Latino population highlights the need for language-accessible services and culturally competent care. Additionally, cultural beliefs and varying levels of trust in healthcare systems may impact on how individuals engage with emergency services.

By understanding these demographic factors, Emergency Medical Services in Bethlehem can better anticipate community needs, address potential disparities, ensure equitable and culturally responsive care, and strengthen trust within diverse populations—ultimately improving the effectiveness of emergency response and patient outcomes. In Bethlehem, Hispanic/Latino and Black or African American populations represent significant portions of the community's demographic composition. While the White population remains the majority, the Hispanic/Latino population—at approximately 30%—combined with the Black or African American population, represents a substantial share of the overall population.

Understanding all demographic groups is essential for effective EMS preparedness. Each population may have unique health risks, barriers to care, and cultural considerations that influence how and when emergency services are accessed. Recognizing these differences allows EMS providers in Bethlehem to better anticipate service demands, tailor outreach and education efforts, and deliver culturally competent care that meets the needs of the entire community.

- **Household Income:** Although the median household income in Bethlehem (approximately \$75,000) is lower than the Pennsylvania median household income (around \$78,000), an estimated 15% of the population lives below the poverty level. Within this group, children under the age of 18 experience higher rates of poverty (24%), and a portion of adults aged 65 and older also face economic challenges (14%). This population may experience barriers related to healthcare access, transportation, housing stability, and other social determinants of health.

In all communities, populations living at or below the poverty line often face increased challenges related to accessing routine healthcare, managing chronic conditions, and maintaining adequate nutrition. These disparities frequently result in increased reliance on public services, including EMS, as preventable or manageable conditions escalate into emergencies.

- **Lack of Healthcare:** In Bethlehem, approximately 7% of the population under age 65 is uninsured, which is comparable to or slightly above statewide averages. Uninsured or underinsured populations typically have a direct impact on EMS demand.

Lack of healthcare coverage is often associated with factors such as income level, employment status, education, and demographic disparities. It may also be influenced by language barriers and immigration status, particularly in communities with larger immigrant populations. Younger adults, especially those between the ages of 19 and 34, are statistically more likely to be uninsured. Additionally, certain urban neighborhoods may face greater challenges due to limited access to primary care providers.

For EMS systems in Bethlehem, these gaps in coverage can translate into increased demand. Individuals without insurance are more likely to delay or forgo preventive and routine care, leading to more severe medical emergencies when conditions worsen. As a result, EMS and emergency departments often become primary points of care, contributing to higher call

volumes, increased transport needs, and more frequent repeat utilization for ongoing health issues.

Additional Health and Social Determinants of Health: When evaluating EMS demand in Bethlehem, it is important to consider broader social determinants of health, which reflect how social, economic, and environmental conditions influence overall population health and health equity. These factors include economic stability, education access and quality, healthcare access, and neighborhood and built environment conditions. For Bethlehem:

- Approximately 10–12% of the population experiences food insecurity.

Food insecurity has a significant impact on health by limiting access to fresh, affordable, and nutritious foods. When healthy options are unavailable or unaffordable, individuals may rely on processed or low-quality food options, increasing the risk of obesity, diabetes, hypertension, and other chronic conditions. These conditions often contribute to increased EMS utilization. Food insecurity is also associated with higher stress levels, poorer child development outcomes, and difficulty managing chronic illness, all of which can lead to greater emergency care needs.

- 11% of the population has diabetes.
- 15% of the population experiences frequent mental distress.
- 7% of the population experiences independent living difficulty, particularly among older adults and individuals with disabilities.
- 39% of the population is classified as obese.
- 11% of the population experiences frequent physical distress.
- 30% of the population has high blood pressure.
- More than 50% of renters experience rent burden, meaning a significant portion of income is spent on housing, which can limit access to healthcare, medications, and healthy living conditions.
- 17% of public-school students experience chronic absenteeism, which is often associated with underlying health, social, or economic challenges.

These indicators highlight the complex interplay between social conditions and health outcomes in Bethlehem. Individually and collectively, these factors contribute to increased EMS demand by driving higher rates of chronic illness, behavioral health needs, and delayed access to routine care. Understanding these conditions allows EMS agencies to better anticipate service needs, support community paramedicine and prevention initiatives, and collaborate with public health and social service partners to improve overall community health and reduce avoidable emergency calls.

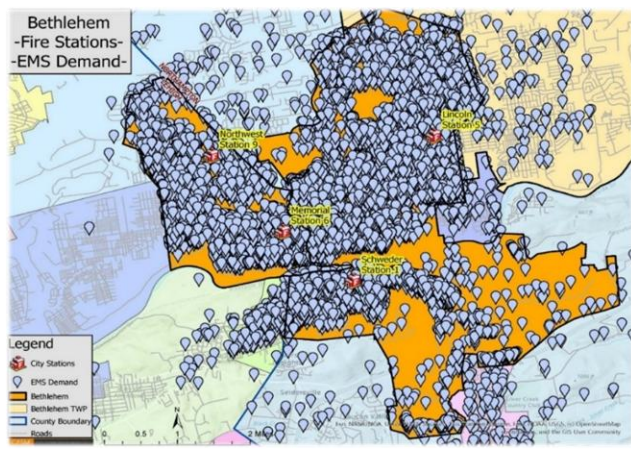
Community Social Vulnerability Index (SVI): According to the Centers for Disease Control and Prevention (CDC), the Social Vulnerability Index (SVI) measures a community's resilience to external stresses on human health, such as natural disasters or disease outbreaks. SVI values range from 0.0 (lowest vulnerability) to 1.0 (highest vulnerability) and are typically reported at the county level. (Centers for Disease Control and Prevention [CDC], 2024).

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Bethlehem is located primarily in Northampton County, with portions extending into Lehigh County. Northampton County has an SVI of approximately 0.39–0.45, indicating a moderate level of social vulnerability compared to other counties nationwide. Lehigh County has a similar SVI, generally in the moderate range (approximately 0.45–0.50).¹⁷

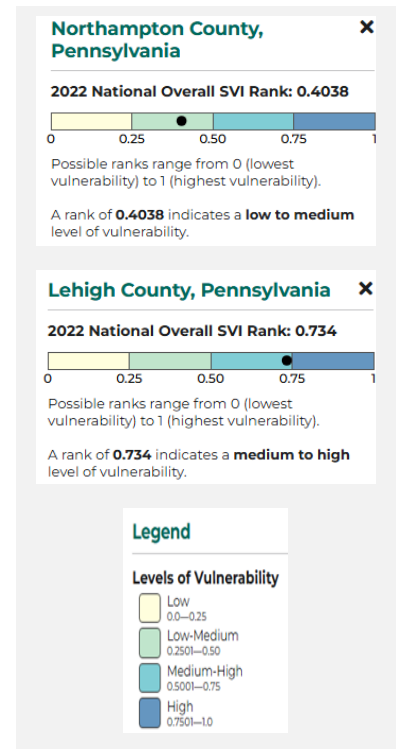
When compared to higher-vulnerability counties, these values suggest that while Bethlehem does not fall into the highest risk category, there are still notable social and economic factors that may impact community resilience and EMS demand.

Understanding SVI is important for EMS planning because it incorporates factors such as poverty, lack of vehicle access, crowded housing, minority status, and language barriers. Communities with higher SVI scores often experience greater challenges in accessing healthcare and recovering from emergencies, which can lead to increased reliance on EMS services. **By considering SVI, EMS agencies can better anticipate areas of higher need, prioritize resource allocation, and support targeted outreach and community risk reduction strategies.**



EMS Demand – City of Bethlehem

EMS demand is concentrated in the core central areas of the city as well northside, westside, and southwest. The southeast area of the city has moderate demand in built upon residential areas.



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End of Section

17. Centers for Disease Control and Prevention. (2024). Social Vulnerability Index (SVI).

SECTION 4. BETHLEHEM FIRE SERVICES

Department Overview



The Bethlehem Fire Department (BFD) is a fully career fire department that employs full-time administrative, community risk reduction, training, support staff, and operational officers and firefighters. Operationally, the BFD deploys five engine companies (one of which is a quint), two ladder companies (which are also quints), and several specialized units. There is one operational Assistant Chief on duty for each of the 9- or 15-hour shifts. The Assistant Chief serves as the city-wide on-duty operational command officer providing day-to-day operational supervision to each station and personnel, as well as serving as the incident commander on assigned incident responses. The BFD also has a separate EMS Division and is responsible for the city Office of Emergency Management operations also. Both of these functions are discussed separately in this report.

The BFD has a total of 106 authorized personnel, of which 96 are assigned to fire and EMS operations – 24 on each of the four operational shifts. The operational deployment model includes a normal daily staffing of two or three personnel assigned to each fire suppression unit. One is assigned to the Assistant Chief unit. Minimum daily staffing is 19 on duty personnel. The minimum daily staffing level allows five daily staffing positions to be used to cover scheduled and unscheduled leave (line positions are shifted to cover leave vacancies to minimize overtime).

The BFD is led by a Fire Chief who has overall responsibility for the day-to-day management and leadership of the department. The Fire Chief is assisted by a single Deputy Fire Chief who also serves as the Fire Marshal. There is also a Public Safety Business Manager (shared with Police and EMS,) and an Administrative Assistant who both assist with the myriad day-to-day administrative workload and tasks of a contemporary fire department.

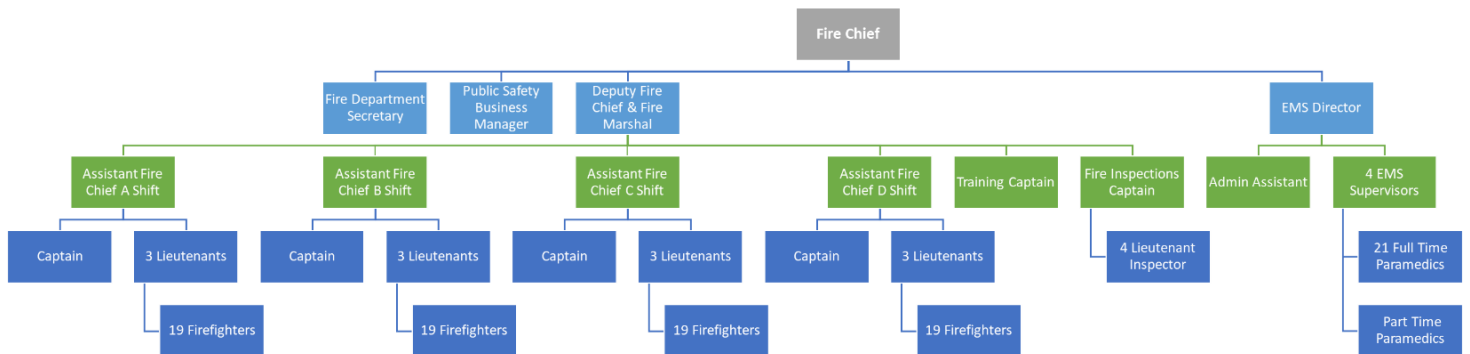
Each of the four operational shifts or platoons work a rotating on/off duty schedule that includes two – nine (9) hour days, followed by two fifteen (15) hour night shifts, followed by four (4) days off. 24-hours on duty. As previously discussed, there is one Assistant Chief on duty each day who manages the day-to-day shift operations. Each shift also has one Captain who is normally assigned as the officer on one of the companies. If the Assistant Chief is off, the Captain moves up and fills that position.

Each station except for Station 9 has a company officer (Lieutenant or Captain) on each shift who provides station level supervision. Whenever one of the shift officers is off, Station 9 operates without an officer. In this case, the Lieutenant or Captain at Station 6 provides supervision at both stations including responding to emergency incidents in a utility vehicle rather than on the apparatus. Each heavy fire apparatus has an assigned driver/operator who is responsible for the driving and operation of the apparatus. Each fire suppression company also has one firefighter/hose person assigned.

The Deputy Fire Chief is responsible for the Community Risk Reduction (Fire Prevention operations) function which includes fire prevention, fire investigations, public life safety education, plans review, permit issuance, and inspections in accordance with the fire prevention code. This CRR function is staffed with a Fire Prevention Captain and four Fire Lieutenants/Inspectors (5 total). The Training Division is staffed by a single Captain who is responsible for all department training.

The next figures outline the department organizational chart, key elements in service delivery, and mission statement.

Figure 11: Bethlehem Fire Department Organizational Structure



Key Elements of the Bethlehem Fire Department

Fire suppression and protective services

EMS first tier response to limited calls (BLS level)

Swift water, confined space, high angle, trench, structural collapse, vehicle rescue

Hazardous Device Mitigation/Bomb Squad

Fire prevention, fire code enforcement, fire protection plans review

Fire cause and origin/arson investigation Community outreach and life safety education

Hazardous materials Technician response and mitigation

Personnel training and education Emergency Management Coordination

Total Staffing-Uniform and Civilian: 106

The BFD has established organizational mission statement as shown below.

Mission Statement

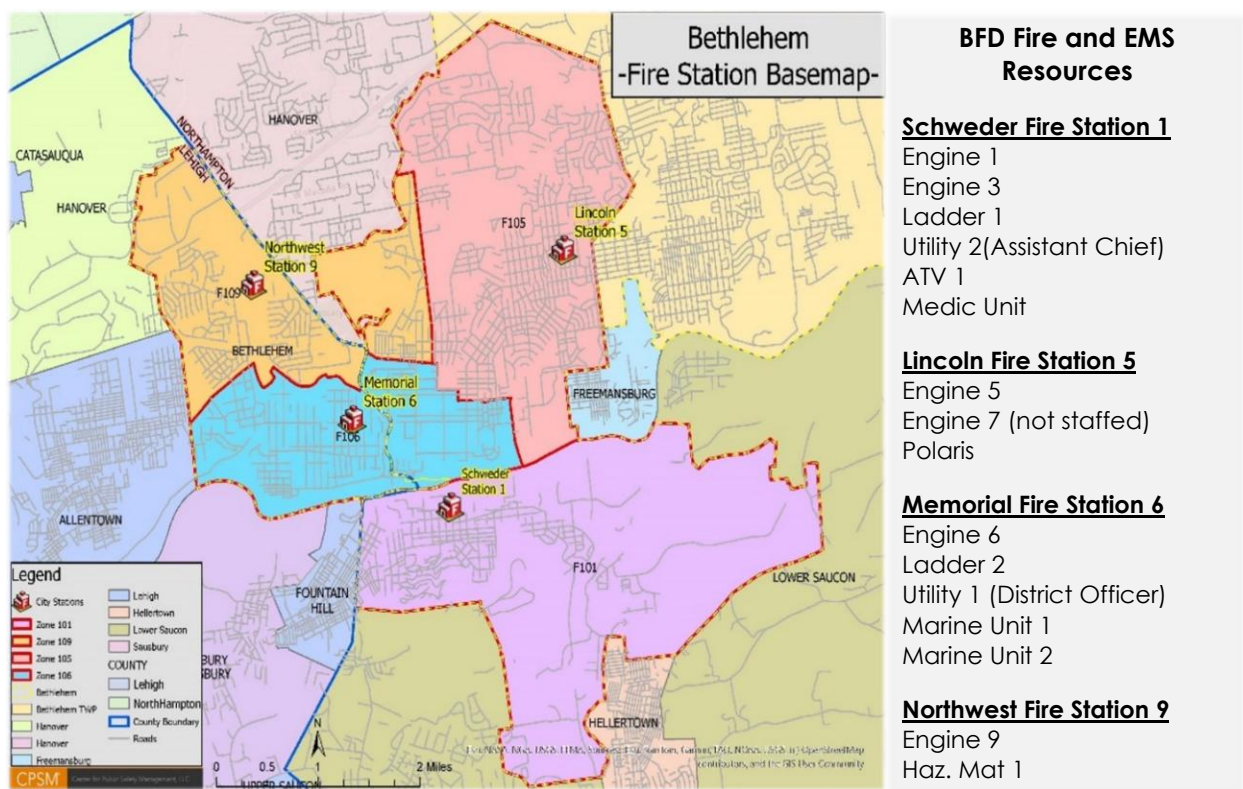
The primary mission of the City of Bethlehem Fire Department is to save lives and property of the residents and visitors that live, work and invest in the City of Bethlehem from these adverse effects of fire or exposure to other dangerous conditions.

The way that we shall accomplish this is by delivering the best possible service to our customers.

Service Area

The BFD service area for the BFD includes 19.46 square miles of primarily older urban neighborhoods that include closely spaced single and multi-family residential buildings of varying number of size and heights including row homes. Like many older northeastern cities, Bethlehem has an older center core and downtown area with numerous closely spaced, abutting, and even interconnected buildings. Many of these structures date to the later part of the 19th and early years of the 20th century. Interspersed throughout this area are newer and refurbished buildings and facilities. There are numerous commercial, assembly, and other types of occupancies located throughout the city including 17 high rise buildings. There is a growing inventory of large footprint industrial, manufacturing, and distribution buildings particularly in the southeast section of the city on the old Bethlehem Steel property. It also includes a limited amount of undeveloped land; parks and trails; freight rail; local roads and limited access highways; and contiguous urban and suburban municipalities.

Figure 12: City of Bethlehem with Fire Station Locations and First Due Response Areas



Training and Education

Education and training are vital at all levels of fire service operations to ensure that necessary functions at an incident are completed correctly, safely, and effectively. Comprehensive, diverse, and ongoing training is critical to a fire department's success.

Training is, without question, one of the most essential functions that a fire department can perform on a regular basis. One could even make a credible argument that training is, in some ways, more important than emergency responses as a department that is not well trained,

prepared, and operationally ready will be unable to fulfill its emergency response obligations and mission.

An effective fire department training program must cover all the essential elements of that department's core missions and responsibilities. The level of training or education required for 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.

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 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 BFD has a robust, and comprehensive training program and there exists a dedicated effort focused on a wide array of training activities. The program definitely appears to be headed in the right direction.

Firefighter training in Pennsylvania is regulated by the Office of the State Fire Commissioner (OSFC) through its Pennsylvania State Fire Academy. Title 35 of the Pennsylvania Consolidated Statutes legally mandates the State Fire Commissioner to implement a statewide firefighter training and certification program based on national consensus standards. The Academy and delegated authorities (such as community colleges and designated public safety centers) administer certifications to verify that personnel meet national safety and professional qualifications. Bucks County Community College provides the BFD with their National Board on Fire Service Professional Qualifications (NPFSPQ/Pro-Board) certifications.

The Training Captain manages training in the BFD. The Training Captain along with the senior command staff, and operational officers develop and deliver fire training for and to the BFD. They are assisted by other officers and when appropriate, outside subject matter experts (SMEs).

The Training Captain has an extensive portfolio of duties and responsibilities that he is responsible for. These include training program coordination and program management, facilities and resource coordination, recruitment, hiring, and academy coordination, certification and credential management, policy, and procedure development, and scheduling public education and community engagement events. He also serves as the BFD Safety Officer, Health and Safety Officer, Incident Safety Officer, and Accountability Officer. He is also a certified fire investigator and Deputy Fire Marshal.

New BFD recruits normally attend the Allentown Fire Department's 22-week Basic Firefighter Recruit Training Academy. Upon successful completion of the recruit academy the new firefighters receive extensive training in fire suppression, driving emergency vehicles, and they receive the Emergency Medical Technician-Basic certification.

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The BFD has training and certification requirements for each officer rank that are specified in civil service regulations or department procedures. These include:

Lieutenant

- ✓ Six Years as a BFD Firefighter.
- ✓ Fire Instructor I Certification within one year of promotion.
- ✓ Fire Officer I Certification within one year of promotion.

Captain

- ✓ Two years as BFD Lieutenant.
- ✓ Fire Officer II Certification within one year of promotion.
- ✓ Fire Instructor II Certification within one year of promotion.

Assistant Chief

- ✓ Two years as a BFD Captain.

Deputy Chief

- ✓ Two years as a BFD Assistant Chief or Captain.
- ✓ Incident Management System I-300 and I-400.
- ✓ Fire Officer 2.
- ✓ Fire Inspector 2.
- ✓ Fire Plans Examiner.
- ✓ Certified Fire Investigator.

Professional development for fire department officers and personnel is an important part of overall training. There are excellent opportunities for firefighters and officers to attend training on a wide range of topics outside of Bethlehem, including those offered at various county and state firefighting academies, at the National Fire Academy in Emmitsburg, Maryland, and at national conferences such as the Fire Department Instructor's Conference (FDIC), and Fire Rescue International. Beyond the practical benefits to be gained from personnel participating in outside training, encouraging personnel to earn and/or maintain various specialized certifications such as Fire Instructor or Fire Officer increases the positive professional perception of the organization and can help to demonstrate a commitment to continued excellence.

The ISO-Fire Suppression Rating Scale (ISO-FSRS) also specifies certain training requirements for which fire departments receive credit during the ISO-FSRS review. These include:

In the most recent ISO-PPC analysis, the BFD received just 4.16/9.00 credits for the training segment. The BFD received maximum points for training in the areas of New Driver and Operator Training, Existing Driver and Operator Training, Training on Hazardous Materials, and Recruit Training. It received no credit for Facilities and Use which requires each firefighter to receive 18 hours per year in structure fire related subjects as outlined in NFPA 1001. They received just 10.47 points out 25 possible points for Company Training, and nine out of 12 points in Classes for Officers. They also received 10.80 of 12 points for Pre-Fire Planning Inspections.

CPSM assesses that the BFD, although they are working diligently toward compliance the department does not currently meet these requirements. They do have a target to achieve the ISO standard of 16 hours of training per month (192 hours annually) per member.

CPSM assesses further that the BFD does not have any requirements for ongoing in-service company level training. This training is left up to the Assistant Chiefs and the company officers. CPSM was informed that a comprehensive training Standard Operating Procedure (SOP) is in the process of being developed as are lesson plans on various training topics. One of the goals will be for each member to meet the ISO training standard of a minimum of 156 hours of training per month. The department has also purchased books on company level training. However, it lacks basic training props and is looking for donations to be able to obtain materials for the construction of these necessary training aids. The Training Captain informed CPSM that the on-shift and specialized training schedules are in the process of being reconfigured.

As a best practice, there should be a goal for each shift to complete some type of company training every shift and platoon training every week, or at least several times a month. In-service training should be topic-specific to either teach or practice important skills and to allow crews to work together in simulated emergency situations. With any good fire department training program, at least 50 percent of the drills should include manipulative (hands-on) training to allow for the development of proficiency and to review critical skills. An area where CPSM noted a deficiency in training for the BFD was in the area of providing all companies and personnel with high-intensity training on various subjects, including periodic live fire training on at least a semi-annual basis. With the number of actual fires declining nationwide, CPSM encourages the BFD to move forward and attempt to provide all personnel with this type of training, including live fire, a minimum of twice per year, with quarterly being preferred.

CPSM recommends the BFD should continue analyzing formal training needs for the purpose of determining training program priorities for all ranks in the organization.

Based upon the results of the needs assessment, the BFD should begin the development of a comprehensive training program that addresses, but is not limited to – applicable OSHA training, recommended NFPA training, every operational mission and responsibility of the department, and specialized training including personnel/officer development. The majority of the training should be scheduled and coordinated at the administrative level rather than shift level and should comply with accepted and/or recommended practices and standards. Applicable training should include standardized evolutions and should be consistent with newly developed and/or updated operational guidelines and Standard Operating Procedures (SOPs).

CPSM recommends that the BFD continue to enhance its officer development program to the extent possible, and encourage officers to seek additional training and certifications such as:

- NFA Command and Control for Company Level Officers.
- NFA Command and Control of Incident Operations.
- NFA Command and Control of Fire Department Operations at Target Hazards.
- Incident Safety Officer.

CPSM recommends that the BFD should make a concerted effort to send as many officers as possible to the National Fire Academy (NFA). This should include the training Captain for various training-related classes, and the Deputy Chief/Fire Marshal and Fire Prevention Captain for fire prevention and community risk reduction classes. Any officers who meet the admissions criteria should be encouraged to enroll in the Academy's Executive Fire Officer Program.

CPSM recommends that the BFD should continue to look for opportunities to provide periodic joint training between the department and various agencies that provide automatic/mutual aid to the city, particularly the Allentown FD. Consideration should also be given to hosting large-scale exercises to assess and evaluate regional interoperability.

BFD – EMS First Response

Most fire departments today, including the BFD, have evolved into all-hazards emergency response agencies, with emergency medical services (EMS) representing a significant portion of their workload. Firefighters are trained and equipped to provide a wide range of medical interventions, including CPR, automated external defibrillation (AED), oxygen administration, bleeding control, naloxone administration, and other basic and advanced life support measures. Their ability to arrive quickly and initiate care is critical, as research consistently demonstrates that early intervention—particularly CPR and defibrillation—significantly improves patient survival outcomes.

Fire department resources are strategically distributed throughout the community and are designed for rapid emergency response, often allowing firefighters to arrive before ambulance units. This early response is particularly important during time-sensitive medical emergencies such as cardiac arrest, strokes, severe bleeding, overdoses, and airway compromise. Fire personnel also provide valuable additional staffing on EMS incidents, assisting with patient lifting and movement, CPR rotations, scene management, extrication, and other labor-intensive tasks that may exceed the capabilities of a two-person ambulance crew. Their involvement can improve operational efficiency, reduce on-scene times, and help maintain system coverage when ambulance resources are committed elsewhere.

Currently, BFD's EMS response is limited by dispatch protocols and labor agreement provisions. Northampton County 9-1-1 classifies EMS incidents broadly as either Basic Life Support (BLS) or Advanced Life Support (ALS), limiting the ability to differentiate response levels. Additionally, the labor agreement between the City and IAFF Local 735 restricts automatic fire department response to high acuity calls, which are among some of the most critical EMS incidents. As a result, BFD is not routinely dispatched to the full range of EMS incidents where early fire department intervention could provide operational and patient-care benefits.

The following tables provide a comparison between BFD and BEMS responses by dispatch classification for the previous three years.

Table 3: BFD Response to EMS Calls by Dispatch Level and Year

Type	Year									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ALS	1,692	1,955	1,513	950	725	805	797	780	822	836
BLS	0	0	0	32	37	53	34	60	102	90
MVA	357	355	262	296	295	370	349	325	419	370
Other	241*	362*	276*	143	189	250	280	208	298	390
Total	2,290	2,672	2,051	1,421	1,246	1,478	1,460	1,373	1,641	1,686

Note: *Other includes Alpha, Bravo, Charlie, Delta, and Echo calls before 2019. After 2019, the CAD system used only ALS and BLS in medical call descriptions.

Overall, BFD EMS responses decreased 26 percent.

Table 4: BEMS Response to EMS Calls by Dispatch Level and Year

Year	ALS	BLS	Other	Total	% of EMS Calls the BFD Responded to
2016	1,944	0	8,561*	10,505	22%
2017	2,165	0	8,677*	10,842	25%
2018	1,660	0	6,772*	8,432	24%
2019	4,274	3,342	540	8,156	17%
2020	4,793	3,704	658	9,155	14%
2021	5,169	4,209	893	10,271	14%
2022	5,416	4,314	960	10,690	14%
2023	4,910	4,217	1,469	10,596	13%
2024	5,093	4,230	1,885	11,208	15%
2025	5,249	4,103	2,125	11,477	15%

Note: *Other includes Alpha, Bravo, Charlie, Delta, and Echo calls before 2019. After 2019, the CAD system used only ALS and BLS in medical call descriptions. For all years, the motor vehicle accident calls are categorized as "Other."

Overall, BEMS responses increased 9 percent.

CPSM assesses that the current classification of EMS call responses and the current collective bargaining agreement regarding BFD responses to EMS calls impacts the overall first-tier response of the BFD to EMS incidents. This has the potential to negatively impact the dispatch of the appropriate types and numbers of resources and personnel to all high acuity EMS calls.

CPSM recommends that the BFD, BEMS, and Northampton County Emergency Communications Center work collaboratively to ensure that all EMS calls are properly categorized as to the correct EMD classification so the appropriate resources and personnel can be dispatched immediately and simultaneously.

CPSM recommends further that the BFD be dispatched simultaneously with BEMS to all Priority 1/High Acuity classification EMS calls. This is a patient care and potential lifesaving change in operations designed to get help to the patient in the quickest possible time.

Community Risk Reduction

Community Risk Reduction (CRR) is a core responsibility of the modern fire service. A comprehensive fire protection system should include, at minimum, the essential functions of fire prevention, code enforcement, inspections, and public education. Preventing fires before they occur and minimizing the impact of those that do must remain priority objectives for every fire department.

Fire investigation is a mission-critical component of this system. By determining how a fire started and why it behaved as it did, investigators provide valuable information that strengthens future prevention efforts and supports safer community outcomes.

Public education is equally vital. Educating residents on how to prevent fires and how to respond appropriately when one occurs is a fundamental life-safety obligation that directly reduces injury and loss of life.

While fire suppression and emergency response are indispensable for protecting property and mitigating incidents, they have minimal influence on preventing fires. True risk reduction comes from proactive measures such as public education, fire prevention, and built-in fire protection systems, all of which play essential roles in protecting the community from fire, smoke inhalation, and carbon monoxide hazards. Fire prevention, in particular, is the only service area devoted entirely to reducing the frequency of fire incidents.

Effective fire prevention requires a systematic, collaborative approach. Many community stakeholders have a direct role in these efforts, and a substantial portion of construction and building-code requirements relate to fire safety. However, responsibilities such as plan review, permitting, and inspections are often dispersed across multiple municipal departments, sometimes without adequate coordination. Ensuring these activities are efficiently managed and aligned across departments is essential to achieving a cohesive and effective CRR program.

The Bethlehem Fire Department's Fire Marshal's Office (FMO) is staffed by a Fire Marshal (Deputy Fire Chief), one Fire Prevention Captain, and four Fire Lieutenant/Inspectors positions. All FMO personnel are required to complete, at minimum, the Fire Lieutenant/Inspectors must have obtained Fire Inspector 1 Pro Board Certification and must be licensed through PA Dept. of Labor and Industry as Fire Inspector and complete 15 continuing education credit hours in a 4-year period to maintain their license. The Inspections Captain must provide proof of a minimum of two thousand (2,000) active hours of working experience within the last five (5) years conducting inspections as a Pennsylvania Department of Labor & Industry Certified Code Official in the Fire or Building Inspector Certification Category and possess a Fire Inspector 2 Pro Board Certification and Plans Examiner Pro Board Certification. The Deputy Fire Chief must possess the same qualifications as the Inspections Captain. In addition, they must be recognized as a Certified Fire Investigator through the Pro Board, IAAI, NAFI, or National Fire Academy.

The Fire Marshal, assisted by the Inspections Captain, oversees all CRR functions, provides field support, interprets codes and ordinances, and works closely with other city departments and community partners. The remaining staff primarily manage code enforcement, new construction inspections, annual inspections for licensed or permitted occupancies, change-of-use evaluations, and witnessing fire protection system testing.

Fire Code Enforcement

At the time of this analysis, the BFD FMO was operating under the 2018 International Fire Code (IFC) with local amendments tailored to the City of Bethlehem. The code cycle is regulated by the Pennsylvania Uniform Construction Code and has been adopted under the International Property Maintenance Code also with local amendments. As with all adopted codes, numerous other standards and references are incorporated by adoption. The codes were currently in the process of being updated to the 2021 IFC.

The FMO has no real involvement in building plans reviews which are managed by a third-party agency. However, they do conduct plan reviews for site plans. They will occasionally assist the Building Code Official with plans reviews and/or acceptance testing on large or complex fire protection systems. The overarching goal is to maintain fully operational life-safety systems across all occupancies in the community.

At the time of this analysis, it was reported to CPSM there were about 2,318 total buildings and 6,150 occupancies in Bethlehem that require fire prevention inspections. This does not include the growing number of Residential Rental Units (RRUs), also known as "Yellow Door" properties because of their distinctive yellow entry doors. These are rental properties owned by a company

called Amicus. They currently own 138 rental properties comprised of single-family dwellings, as well as multi-unit homes. They also own an 11-room rooming house. Each property has the potential to be occupied by up to 5 unrelated individuals – square footage of bedrooms would determine the maximum occupancy.

The concern with the RRUs is that they are not regulated or subject to routine fire prevention inspections. They are also not required to have important life safety systems such as enclosed stairways between floors, secondary means of egress from upper floors, monitored automatic fire detection/alarm systems, or automatic fire suppression/sprinkler systems.

The next table provides a historical analysis of BFD fire prevention inspections.

Table 5: BFD Fire Marshal's Office Fire Inspections Completed

Fire Inspection Type	2022	2023	2024	2025
Fire Prevention Inspections Conducted	2,374	1,828	1,378	1,132
Plans Reviews Completed	39	30	27	28

The table above tells us that fire inspections completed decreased each year totaling more than half from 2022 to 2025. Plans reviews also decreased each year. CPSM was informed that the Inspections Captain position was vacant for a significant period of time during these years. In addition, there was a significant level of turnover in the Lieutenant/Inspectors, which required training with the new personnel to ensure they had gained sufficient to operate independently.

There are many important reasons to conduct fire code compliance inspections in existing buildings. The most fundamental is to ensure that occupants, whether living, working, or visiting, are in an environment that is safe. As previously noted, certain occupancies such as healthcare facilities (hospitals, nursing homes, and similar institutions), schools, and daycare centers require specific inspections mandated by state laws, local ordinances, and adopted codes as they house vulnerable populations. In some cases, these inspections focus on specific building areas or must occur within defined time intervals. In contrast, many other types of businesses are not legally required to undergo periodic fire safety inspections.

Fire inspections also play a critical role in identifying violations and ensuring corrective actions are resolved through follow-up inspections. Within fire prevention, “enforcement” typically refers to inspectors conducting comprehensive walkthroughs of facilities to identify hazards or code violations. However, effective enforcement is not solely about identifying deficiencies; it also involves educating building owners and operators about the requirements and the intent of the fire code. This educational component supports long-term compliance, improves overall safety, and contributes significantly to reducing fire and life-safety risks. There is no Pennsylvania requirement for the frequency of routine fire inspection; however, city ordinance specifies annual inspections. ***The number of inspections and staffing of the FMO does not allow the BFD to meet this requirement.***

The NFPA has guidance for community risk reduction through the NFPA 1730 standard -Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations, 2019 Edition. This standard provides guidelines for fire prevention activities in a community. Chapter 6, Section 6.7 of NFPA 1730 establishes guidance on the minimum inspection frequency of inspectable occupancies in a jurisdiction, where not specified elsewhere.

- **High-Risk Occupancy:** An occupancy that has a history of high frequency of fires, high potential for loss of life or economic loss, or that has a low or moderate history of fires or loss of life, but the occupants have a high dependency on the built-in fire protection features or staff to assist in evacuation during a fire or other emergency.
- Examples of high-risk occupancies could include multiple-family dwellings, high-rise buildings, hotels, dormitories, lodging and rooming, assembly, childcare, detention, educational, health care, and industrial.
- **Moderate-Risk Occupancy:** An occupancy that has a history of moderate frequency of fires or a moderate potential for loss of life or economic loss.
- Examples of moderate-risk occupancies could include ambulatory health care and industrial occupancies that do not maintain, store, use, or manage hazardous materials in excess of exempt amounts.
- **Low-Risk Occupancy:** An occupancy that has a history of low frequency of fires and minimal potential for loss of life or economic loss.
- Examples of low-risk occupancies could include storage, mercantile, and business.
- **Critical Infrastructure:** The assets, systems, and networks, whether physical or virtual, that are so vital to the community that their damage or destruction would have a debilitating effect.

Examples of critical infrastructures could include water treatment plants, special structures, public safety buildings, and power plants.

The next table outlines a fire prevention inspection schedule-based occupancy risk classification as identified in NFPA 1730.

Table 6: NFPA1730 Occupancy Classifications and Inspection Frequency

Occupancy Risk Classification	Frequency
High	Annually
Moderate	Biennially*
Low	Triennially
Critical infrastructure	Per Authority Having Jurisdiction

*Some departments include Moderate Risk Occupancies on an annualized inspection frequency.

The basis for classifying occupancies is through a community risk assessment. The purpose of the risk assessment is to identify the needs and circumstances of the community.¹⁸ Additionally, occupancy classifications and use established through the Building Code utilized by the jurisdiction drives occupancy risk classification as well. Bethlehem, like other urban communities, includes all occupancy types as outlined next.¹⁹

- **Assembly Group A:** a use where people gather for the purpose of civic, social, religious function, recreation, food/drink consumption, or waiting for transportation.
- **Business Group B:** use of a building that functions as an office or a professional or service type transaction.

18. NFPA 1730, 2019 Edition.

19. International Building Code, 2021

- **Educational Group E:** use of a building where six or more people at any one time occupy a space for educational purposes through the 12th grade.
- **Factory Group F:** use of a building that involves assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair, and processing operations that would not otherwise be classified as a Group H or Group S occupancy.
- **High Hazard Group H:** use that involves the manufacturing, processing, generation, or storage of materials that can constitute a physical or health hazard. Group H occupancies are classified into 5 high hazard areas that identify the type of hazard for each group.
- **Institutional Group I:** a use in which care, or supervision is provided to people who are or are incapable of self-preservation without physical assistance or in which people are detained for penal or correctional purposes or in which the liberty of the occupants is restricted.
- **Mercantile Group M:** use that involves the display and sale of merchandise, stocking of goods, and is accessible to the public.
- **Residential Group R:** use of a building or structure intended for sleeping purposes when not classified as a Group I or when not regulated by the *International Residential Code (IRC)*.
- **Storage Group S:** a building or structure, or a portion thereof, that is used for storage purposes and that is not classified as a hazardous occupancy.
- **Utility and Miscellaneous Group U:** a building or structure that is used as an accessory or miscellaneous use not classified as any other specific occupancy.

Performing complex technical fire inspections is often time-consuming but an essential municipal code enforcement function. Communities with proactive inspection and code enforcement programs consistently experience lower fire losses because potential fire and life-safety hazards are identified and corrected before they can cause or contribute to an incident.

However, maintaining adequate staffing to conduct these inspections can be costly. To help offset these expenses, many jurisdictions, including the City of Bethlehem, apply registration or inspection fees to businesses.

One emerging trend in fire prevention is the adoption of Remote Video Inspection (RVI) programs. This approach offers an opportunity for the BFD to conduct certain fire prevention inspections remotely when appropriate. The National Fire Protection Association (NFPA) recently introduced NFPA 915, Standard for Remote Inspections and Testing, 2024 edition, which provides the framework for these practices. Under this standard, inspections can be performed off-site using a range of remote technologies, including wireless devices such as smartphones and tablets, digital tools like cameras and computers, traditional non-digital equipment such as film cameras or audio recorders, and even manned or unmanned aerial devices such as drones.

According to the NFPA, “RVI provides an effective alternative means for building inspection, enabling one or more parties to remotely perform an inspection of a building or building component.” The NFPA has released a new infographic that emphasizes the five key considerations for an RVI inspection program: procedures, communication, technology, verification, and completion.

The NFPA further states: “RVI provides an effective alternative means for building inspection, enabling one or more parties to remotely perform an inspection of a building, or building component. Just like traditional on-site or in person inspections, an RVI typically occurs as part of a jurisdiction’s permitting or inspection process. Virtual inspections are not intended to be less complete than an on-site inspection; they are meant to achieve the same (or enhanced) results as an on-site inspection.”

In accordance with NFPA 915:

- The provisions of the standard shall apply to all types of inspections and tests, automated inspections and testing, and distance monitoring as allowed by the authority having jurisdiction.
- The authority having jurisdiction shall determine applicability of the inspection or test, automated inspection and testing, and distance monitoring categories and conditions that will be allowed.

The intent of the standard is to leverage remote capabilities for inspectors, fire protection system contractors, and occupancy owners and/or tenants greater flexibilities and a more efficient fire prevention system overall. Long term, the use of a program such as this can help any fire prevention entity better manage often unrealistic inspection workloads.

Fire Investigation

Fire cause and origin investigations are a vital component of a comprehensive fire prevention program. Understanding how and why fires occur directly supports future prevention efforts. Initial origin and cause assessments are conducted by officers on scene, with the BFD Fire Marshal's Office (FMO) providing additional investigative support as needed. As of the time of this assessment the BFD had eight certified fire origin and cause investigators.

When a fire appears suspicious, the Fire Marshal's Office requests assistance from BPD. In these situations, the fire department investigates the fire-related elements while the police department manages the criminal aspects. The BFD has the ability under city ordinance for the Fire Marshal to request any technical assistance or outside resources needed for an investigation; however, this is rarely needed. The Bureau of Alcohol Tobacco and Firearms (ATF) has an Allentown field office with two Certified Fire Investigators (CFI's) assigned to it that can be requested as a resource. The ATF office in Reading has a K-9 that can be requested. The Pennsylvania State Police must be notified of any fire that involves a fatality.

The following table presents a historical review of fire investigations conducted by the BFD.

Table 7: BFD Fire Marshal's Office Fire Investigations

2022	2023	2024	2025
14	22	24	19

From 2022 to 2025, the BFD conducted a total of 79 fire investigations. These figures reflect a relatively stable investigative workload over the four-year period, with only minor year-to-year fluctuations. The increase in 2023 and 2024 may indicate an isolated increase in incidents requiring investigation, but overall, the data suggests consistent demand for origin and cause investigative resources within the department.

Public Life Safety Education

The BFD maintains public fire education program, which is a critical component of the city's overall fire prevention strategy, especially within residential areas where the fire related casualties are more prominent. This commitment is highly commendable and represents an effective use of time and resources. Because nearly 75 percent of all fires, fire fatalities, and fire-related injuries occur in residential settings where code enforcement has limited influence, public education becomes the fire service's most powerful tool for reducing risk. By shaping attitudes and behaviors related to fire safety, these educational efforts directly contribute to preventing fires and reducing associated losses.

BFD's public education initiatives include presentations for grade school students, fire station tours, school-based programs, smoke detector installations, and public relations programs. The BFD Training Captain leads and coordinates these life-safety education activities, with valuable support from field operations personnel.

The next table provides a historical analysis of life safety education sessions completed by the BFD Fire Marshal's Office and fire suppression companies.

Table 8: BFD Public Education Events Completed

Public Education/Relations Events Completed	2022	2023	2024	2025
Public Relations Programs	64	106	125	126
Supervised Fire Drills	9	24	21	11
Residential Smoke Detector Installations	42	51	73	31
Station Tours	19	12	15	12

All fire apparatus and medic units carry smoke detectors and spare batteries. ***The BFD is to be commended for this effort, which is a Best Practice.***

There are many effective avenues the BFD can use to share its fire safety and all-hazards messaging with the community. These include, but are certainly not limited to:

- Maximize BFD public appearances at community events.
- Add signs or marquees to fire stations with regular fire and life safety messages.
- Sustain and increase school presentations.
- Include fire safety messages in the city's community videos.
- Expand the department's social media presence to educate the community about BFD services and programs. Regularly post updates on platforms such as Facebook and Instagram, highlighting department events, disaster preparedness tips, and all-hazards injury prevention information. Consider a BFD YouTube page.
- Consider leveraging multiple communication channels to share fire safety and all-hazards messages, including social media platforms, signage and graphics on apparatus, department letterhead, official BFD newsletters, community bulletin boards, press releases, and the city or department website. Expanding outreach through these avenues can increase visibility, engage diverse audiences, and reinforce key safety messages throughout the community.
- Increased social media activity during holidays (when there is an uptick in cooking fires), prior to and during major weather events, during public education events (Facebook Live, for example), and live dispatch or live updates from PIO on incidents.

In summary, a comprehensive Community Risk Reduction (CRR) program is essential for proactively managing fire and life-safety risks within a community. Such a program enhances risk reduction, supports emergency preparedness, and strengthens overall community safety and resilience. **CPSM assesses** that the BFD currently has a robust CRR program encompassing all the key elements of an effective fire prevention and education strategy. The City of Bethlehem and BFD should be commended for those proactive efforts. However, meeting the staffing needs of the Fire Marshal's Office will remain an ongoing challenge for the department.

CPSM recommends that the BFD develop a comprehensive fire prevention and code enforcement inspection plan in accordance with NFPA 1730: *Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations*, 2019 Edition. This plan should ensure adherence to all city ordinances related to fire prevention and code enforcement.

The inspection plan should clearly identify occupancy and use groups requiring annual inspections, as well as those that, while not requiring yearly inspections, should be reviewed on a biennial or triennial basis. **Any internally recommended expansion of the Fire Marshal's Office inspection team should align with the city's increased demand, covering all inspectable properties and plan review requests to maintain compliance with the standard.**

Additionally, the comprehensive plan should include a methodology for quality assurance of fire prevention inspections and a consistent data management platform to record each inspection. This platform should serve both as a historical record and as a compliance tool to ensure that all required inspections are completed in accordance with the outlined schedule. This plan should also contemplate the delivery of Public Life Safety Education to the city's vulnerable population and those living in, learning in, and working in high-risk occupancies.

CPSM further recommends the BFD contemplate the implementation of remote fire prevention inspections in accordance with NFPA 915 *Standard for Remote Inspections and Testing*, 2024 edition and local and state laws.

CPSM recommends that the BFD conduct a comprehensive review of the city's actual costs for delivering fire prevention services. This review should include a complete cost analysis of all fire prevention activities, an evaluation of the city's adopted fire codes, and a comparative assessment of fees charged for similar services by other municipalities. The goal is to capture the full scope of services provided, including operational permits and inspections required as part of a comprehensive fire prevention program.

The City of Bethlehem consider adopting or adjusting registration, inspection, and permit fees to help offset the actual costs of providing fire prevention and safety services. These fees should also account for inspections performed by in-service fire companies, ensuring that all aspects of the fire prevention program are adequately funded.

CPSM recommends that to reduce the workload on the Fire Marshals Office, the BFD should consider implementing an in-service company inspection program as allowable through state statutes for low hazard Business, Mercantile, and Storage use groups, and any other lower hazard use group occupancies identified by the Fire Marshal's Office throughout the city. Appropriate training as certification should be provided to all operations staff.

Health, Safety, and Wellness

The prevention and reduction of accidents, injuries and occupational illnesses should be established goals of any fire-rescue department and should be primary considerations at all times (emergency and non-emergency activities). This concern for safety and health must apply to all members of the fire-rescue department and should include others who may be involved in fire department activities.

The BFD does and should continue to strive to make every reasonable effort to provide a safe and healthy work environment, recognizing the dangers involved in the types of service fire-rescue departments deliver. Included in this effort should be appropriate and continuous

training, supervision, procedures, program support, and review to achieve department health and safety objectives in all department functions and activities.

Firefighting and EMS service delivery are inherently dangerous activities occurring in environments over which the participants have no direct engineering control. NFPA 1550, *Standard for Emergency Responder Safety*, 2024 edition was developed to provide a “consensus standard for an occupational safety and health program for the fire service.” NFPA 1550 is intended to be an umbrella document, establishing the basic framework for a comprehensive safety and health program, and providing for its implementation and management.

In 2021, the NFPA produced The Fifth Needs Assessment of the U.S. Fire Service and revealed the following:

- 72 percent of departments lack a program to maintain basic firefighting fitness and health.
- 61 percent of departments do not provide medical and physical evaluations for all firefighters that comply with NFPA 1582: Standard on Comprehensive Occupational Medical Program for Fire Departments.
- 73 percent of departments lack a behavioral health program (larger departments are much more likely to have such a program).
- 56 percent of fire stations are not equipped for exhaust emissions control; this number rises to 82 percent in the smallest communities.
- Many departments do not engage in cancer prevention best practices.²⁰

A successful health, safety, and wellness program requires:

- Senior Management buy-in.
- The establishment of a Health Safety & Wellness Committee.
- Department needs assessment.
- The establishment of obtainable goals and objectives.
- The establishment of a budget for health, safety, and wellness.
- Implementation.
- Evaluation.²¹

Primary goals of a comprehensive health, safety, and wellness should include:

- Reducing injury leave and light duty due to on-the-job injuries.
- Potentially lowering workers' compensation and employee health care costs.
- Reducing injuries.²²

Firefighter injuries and deaths are devastating to families, fellow responders, local governments, and the community. The National Institute for Occupational Safety and Health (NIOSH) has

20. Creating a Health & Wellness Program for Your Department, Firehouse Magazine, October 2022.

21. Ibid

22. Ibid

studied firefighter fatality root causes, and found five key factors, which are commonly referred to as the NIOSH 5:

- Lack of fireground firefighter accountability.
- Lack of fireground communication methods.
- Lack of standard operating procedures related to response and fireground operations.
- Lack of incident management/command.
- Lack of appropriate risk assessment of the incident as whole, the building, the emergency scene, and basic fireground knowledge to understand the risk.

These five fireground factors should be etched into every firefighter's brain. A fire department training regimen, equipment, guidelines, and culture should center on these five factors. A lack of understanding of these five factors leads to sloppy, ineffective, and unsafe fireground operations. They should be taken seriously.

The BFD's Health and Safety Officer is the Training Captain, which is one of many responsibilities within his portfolio. He is supported by the Fire Chief and Deputy Chief, who provide broad oversight of personnel, policies, facilities, fleet, and equipment as part of the Department's health, safety, and wellness initiatives. Operational Assistant Chiefs further ensure that health and safety practices are consistently applied, with particular emphasis on incident-scene compliance.

All BFD personnel receive an annual medical evaluation that is close to what is recommended in NFPA 1582 *Standard on Occupational Medical Program for Fire Departments* compliant medical evaluation performed by Concentra. All BFD stations have at least some basic physical fitness equipment and personnel are permitted to work out while on duty. However, there is no mandatory physical fitness program.

The Department does not have its own internal Health and Safety Committee. The BFD does participate in the City Safety Committee which meets on a monthly basis.

The BFD, in conjunction with IAFF Local 735, maintains a Peer Support Group consisting of five certified members who focus on mental health and wellness. Each team member has completed four required certifications to operate in this role. The department also has additional outside resources available to assist members who require assistance or support.

Effectively managing the health, safety, and wellness components of a fire-rescue department requires significant staff time and consistent oversight at both the command and station levels, as these responsibilities extend across all emergency and non-emergency activities.

CPSM recommends the BFD to continue any current health, safety, and wellness program efforts, and continue with the development of a comprehensive health, safety, and wellness initiative program, to include updating current policies and guidelines as necessary, and to the extent the department is capable and with available funding, aligns with:

- NFPA 1550, Standard for Emergency Responder Health and Safety, 2024 edition. This document consolidates:
- NFPA 1500, Standard on Fire Department Occupational Safety, Health, and Wellness Program.
- NFPA 1521, Standard for Fire Department Safety Officer Professional Qualifications.
- NFPA 1561, Standard on Emergency Services Incident Management System and Command Safety.

- NFPA 1580 (to be released, 2025), Standard for Emergency Responder Occupational Health and Wellness. This document consolidates:
- NFPA 1581, Standard on Fire Department Infection Control, 2022 edition.
- NFPA 1582, Standard on Occupational Medical Program for Fire Departments.
- NFPA 1583, Standard on Health-Related Fitness Programs for Fire Department Members.
- NFPA 1584, Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises.
- NFPA 1585, Standard for Exposure and Contamination Control, 2025 edition.

CPSM recommends the BFD and IAFF Local 735 form a joint Labor Management Safety Committee focused on safety concerns within the Department including investigating accidents and injuries. The committee should include representation from stakeholders across all ranks of the Department and meet monthly.

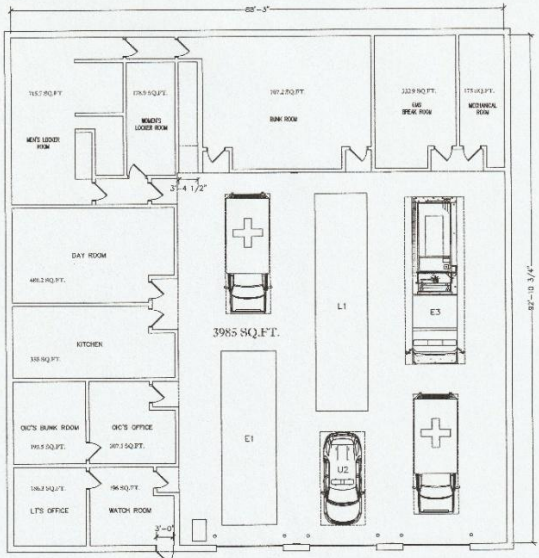
CPSM recommends further that the oversight of all Health, Safety, and Wellness programs should continue to be assigned to the Training Captain who should chair any/all of the health, safety, and wellness committees, and actively participate in program development, implementation, and success. Additionally, a Health and Safety Officer program should be implemented to include a designated Health and Safety Officer for each shift (Captain level) to ensure program continuity, communication, and effectiveness. This could be the Field Incident Technician/Shift Safety Officer/Shift Training Officer.

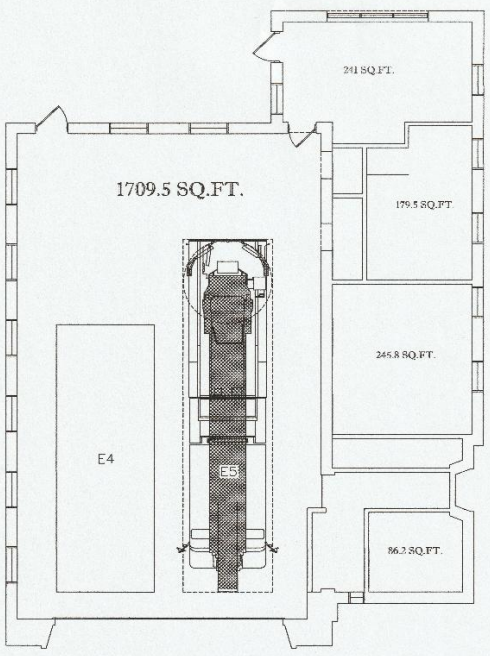
Facilities

Modern fire stations must be designed to support both current operations and future fire service needs. Facilities should be capable of accommodating existing and anticipated apparatus through appropriately sized vehicle bays, bay doors, circulation space, aprons, and site access geometry. Consideration should also be given to future fleet expansion and evolving response requirements by ensuring adequate site capacity for additional apparatus bays or support facilities. Beyond apparatus storage, stations must provide functional spaces that support daily operations, including vehicle maintenance, equipment storage, administrative work, training, physical fitness, laundering, meal preparation, and personnel living quarters. Because fire stations often serve as community safe havens and emergency command centers during disasters, they should be designed with resilient building systems, emergency power generation, and redundant utility capabilities to ensure uninterrupted operations during critical incidents.

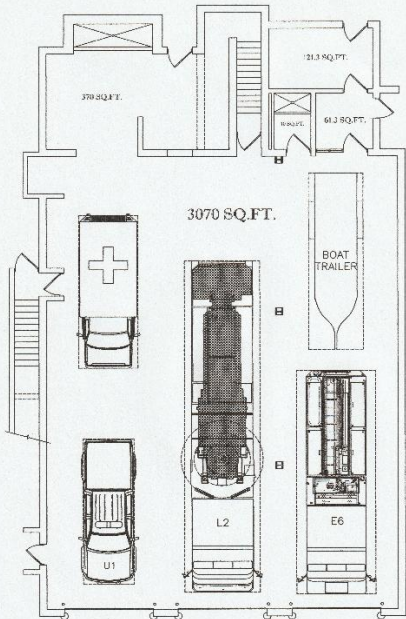
Personnel safety, health, and wellness are equally important considerations in fire station design. Facilities should incorporate features that reduce injury risks, improve infection control, and limit firefighter exposure to carcinogens and contaminants. This includes non-slip surfaces, hands-free fixtures, decontamination areas, dedicated laundry facilities, and exhaust capture systems. Station layouts should promote efficient response by minimizing travel distances between living quarters and apparatus bays while providing appropriate separation between sleeping, fitness, and common-use areas. National standards, including NFPA 1550 and NFPA 1851, provide guidance on firefighter health, wellness, contamination control, and protective equipment care that should be reflected in station design. Given that fire stations are occupied continuously and often expected to remain in service for 50 years or more, facilities must be durable, accessible, code-compliant, and strategically located to provide effective community coverage while supporting the operational, personnel, and emergency response needs of the department.

The BFD operates out of four operational facilities ranging in age from 42 years old to 73 years old. Station 1 is located in the southern part of the City. Station 5, 6, and 9 are located in the northern part of Bethlehem. All stations are staffed 24/7/365.

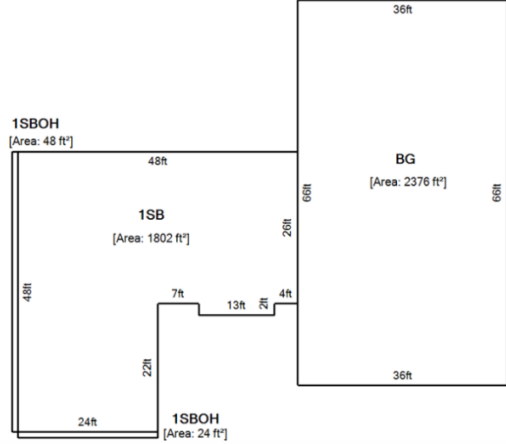
	Schweder Fire Station 1 Address: 419 East Fourth Street Year Built: 1984 Square Feet: Approximately 16,250 Apparatus Bays: 3 3 – 1.5 Deep Standard Number of Personnel on Shift: 10 (8 fire + 2 EMS)
	Station 1 Assigned Apparatus ✓ Engine 1 ✓ Engine 3 ✓ Ladder 1 ✓ Utility 2 (Assistant Chief) ✓ ATV 1 ✓ Medic Unit
CPSM found Station 1 to be clean and maintained in fair condition. However, Station 1 was constructed 42 years ago and is showing its age. The station has less than optimal space utilization, design, and flow paths and lacks many contemporary fire station features such as an automatic fire detection/alarm system or fire suppression (sprinkler) system. As configured, it is at maximum capacity for personnel living quarters, apparatus, and office space.	
	LINCOLN FIRE STATION 5 Address: 2412 Easton Avenue Year Built: 1953 Square Feet: Approximately 3,260 Apparatus Bays: 2 2 – Single Deep Standard Number of Personnel on Shift: 3

	Station 5 Assigned Apparatus ✓ Engine 5 ✓ Engine 7 (not staffed) ✓ Polaris
CPSM found Station 5 to be clean; however, the station is extremely small, cramped and lacks most modern features found in newer more functional stations such as an automatic fire detection/alarm system or automatic fire suppression (sprinkler) system. At 73 years old, it is showing its age with maintenance issues, and its small size has caused it to outlive its usefulness as a contemporary fire station. There is room for expansion or replacement of this station at its current site. There is no formal plan to renovate or construct a new station 5. According to BFD command staff, there have been preliminary discussion regarding the possibility of adding at least one additional bay to this station. This would allow the BFD to keep current Ladder 1 as a reserve when the new ladder arrives in 2027, as well as store other reserve apparatus.	

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	MEMORIAL FIRE STATION 6 Address: 512 West Broad Street Year Built: 1972 Square Feet: Approximately 9,500 Apparatus Bays: 3 3 – Single Deep Standard Number of Personnel on Shift: 8 (5 fire + 2 EMS)
	Station 6 Assigned Apparatus ✓ Engine 6 ✓ Ladder 2 ✓ Utility 1 (District Officer) ✓ Marine Unit 1 ✓ Marine Unit 2
CPSM found Station 6 to be clean and maintained in fair condition. However, Station 6 was constructed 54 years ago and is showing its age. The station has less than optimal space utilization, design, and flow paths and lacks many contemporary fire station features such as an automatic fire detection/fire alarm system or automatic fire suppression (sprinkler) system. As configured, this station is at maximum capacity for personnel living quarters, apparatus, and office space.	

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	NORTHWEST FIRE STATION 9 Address: 1665 Catasaqua Road Year Built: 1963 Square Feet: Approximately 4,178 Apparatus Bays: 2 2 – Single deep standard Number of Personnel on Shift: 2-3
	Station 9 Assigned Apparatus ✓ Engine 9 ✓ Haz. Mat 1 ✓ Engine 2 (Reserve) ✓ Engine 4 (Reserve)
CPSM found Station 9 to be clean and well maintained. However, Station 9 was constructed 63 years ago and would benefit from a renovation project. Some age-related maintenance issues notwithstanding, the station is more than adequate for the deployment of a single fire suppression unit. As with the other stations, it lacks many contemporary fire station features such as an automatic fire detection/fire alarm system or automatic fire suppression (sprinkler) system.	

CPSM assesses that the BFD's current stations are between 42 and 73 years old. 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.²³

CPSM recommends the City of Bethlehem and BFD should, as part of any long range strategic and/or capital expenditure planning process, include as planning objectives the potential replacement, or at a minimum modifications and/or expansion of Stations 1, 5, and 6 with a focus on increased and better space utilization along with the inclusion of contemporary fire facility features that align with NFPA 1550 and NFPA 1851 facility and personnel safety features. **Financial impact: cost of materials and labor to meet the specifics of a facility renovation at the time of contract award. Cost of a new fire facility with living quarters and contemporary fire facility features: \$5 million-12-million depending on the year built, square footage, and cost labor and material at the time of construction.**

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

A reliable, operationally ready fleet of fire-rescue apparatus is essential to the Bethlehem Fire Department's ability to provide effective emergency services to the community. The city's diverse geography, infrastructure, building stock, and hazard profile require a fleet capable of supporting a wide range of incidents, including fire suppression, emergency medical services, technical rescue operations, and hazardous materials responses. Large commercial occupancies, mid- and high-rise buildings, and other target hazards create operational demands that differ significantly from those associated with residential incidents. As a result, apparatus and equipment specifications must be carefully aligned with current operational requirements while also anticipating future community growth and service demands. Whenever practical, new apparatus should be designed to provide versatile, multi-functional capabilities that maximize operational effectiveness.

The acquisition, maintenance, and replacement of fire apparatus represent some of the most significant capital investments made by a fire department. While personnel deliver the services, emergency vehicles are the critical tools that transport firefighters, equipment, and resources to incidents. To ensure ongoing reliability and safety, fire departments should maintain a documented fleet replacement program that balances operational readiness with long-term financial planning.

NFPA 1900 provides guidance regarding apparatus design, safety features, and service life expectations, recommending that departments carefully evaluate apparatus older than 15 years for front-line service and replace vehicles exceeding 25 years of age. Advances in apparatus safety—including enclosed cabs, rollover protection, airbags, improved restraint systems, enhanced visibility, and carcinogen exposure reduction—have significantly improved firefighter safety and operational performance. Accordingly, fire departments must establish formal fleet management programs that include planned replacement schedules, preventive maintenance practices, equipment deployment standards, and comprehensive training to ensure safe, effective, and sustainable emergency response capabilities.

The current BFD fire apparatus fleet consists of seven (7) pumpers (4 front line, 3 reserve), one (1) 100' aerial ladder, one (1) 95' quint/adder tower, one (1) 107' quint/aerial ladder²⁴, one (1) Hazardous Materials response unit, one (1) bomb squad truck and multiple command, staff and utility vehicles used by chief officers, training, fire prevention, etc. It also includes several boats and special operations trailers.

The age of the major firefighting apparatus currently in service ranges from 2 years old for Engine 9, to 29 years old for Engine 4 which is a spare pumper. The apparatus fleet as a whole, even the older units in it all appear to be in good, well maintained, and with the equipment stowed in an orderly fashion. When considering apparatus usage, hours on the motor and pumps hours must be taken into consideration. Fire apparatus typically spend more time idling while at emergency scenes or throttled up when operating the fire pump. A rule of thumb that can be used is that each hour on the motor is the equivalent of thirty to thirty-five miles of actual road usage.

It is important to keep in mind that Bethlehem does have significant risk and as an urban community has many larger buildings that present more complex firefighting problems.

24. A quint fire truck is an apparatus that combines the equipment capabilities of a ladder truck and the water-pumping ability of a fire engine. As its name implies, it features five main tools to carry out firefighting functions: pump, water tank, fire hose, aerial device, and ground ladders.

The BFD currently operates a fleet of front-line, and reserve heavy fire apparatus as outlined in the following table.

Table 9: BFD Major Apparatus Fleet Listing and Age

UNIT #	YEAR	MAKE	MODEL/USE	PUMP SIZE (GPM)	TANK SIZE (GALLONS)
Engine 1	2012	Pierce Dash CF	Pumper	1,500	500
Engine 2	2000	E-One	Pumper	1,500	500
Engine 3	2021	Pierce Enforcer	Pumper	1,500	500
Engine 4	1997	E-One	Pumper	1,500	500
Engine 5	2020	Pierce Enforcer	107' Aerial Ladder/Quint	1,500	500
Engine 6	2020	Pierce Enforcer	Pumper	1,500	500
Engine 7	2009	KME Predator	Pumper	1,500	500
Engine 9	2023	Pierce Enforcer	Pumper	1,500	500
Ladder 1	2009	Pierce Arrow XT	100' Aerial Ladder		
Ladder 2	2016	Pierce Enforcer	95' Tower Ladder	2,000	250
Haz. Mat. 1	2014	Pierce Saber	Hazardous Materials Unit		
Haz. Mat. 2	2007	Ford F-550	Bomb Unit		

The City and BFD do have an aggressive apparatus replacement program. Since 2020 the City has appropriated \$8,597,000 for major apparatus replacements. The City of Bethlehem should be commended for appropriating funding for this ongoing apparatus replacement program which CPSM considers to be a Best Practice.

At the current time, the following vehicles are on order or preparing to be ordered.

- **2024** – Ordered a new pumper to replace the existing Engine 1. Delivery expected late in 2026 or early 2027.
- **2026** – Funding appropriated for a new pumper and ladder to replace existing units. Contracts for these vehicles are expected to be signed in Summer 2026 with delivery expected in 2029 or 2030.

As a note here, the BFD apparatus can be exposed to extreme environmental conditions in the winter that includes temperatures below freezing from December through March and annually snow and ice over the same time period. Roads are treated prior to and during snow and ice storms, which, along with the water from melting snow and ice, corrodes frame rails and other vulnerable metals used in the construction of the apparatus and ambulances. This may require adjusting normal frontline service to 12-13 years and a firmer no more than 15 years front-line service to avoid increased maintenance costs and downtime, and the impact of corrosion on chassis and body components.

Regardless of the replacement plan for fire apparatus, the reality is that it may be best to establish a life cycle for fire apparatus that would match the development of ongoing and sustainable replacement funding, while applying the methodology of determining the replacement date in real life, in an effort to achieve greater planning and cost efficiency where possible. **The City and BFD have done this at the current time for which they should be commended.**

One additional note here. Since the COVID 19 pandemic, heavy fire apparatus (engines, ladders, rescues) typically takes 36-48 months to deliver after an order is placed, depending on the manufacturer. This is reflected in the anticipated delivery times of the unit that ordered/will be ordered. There are some circumstances that can shorten this time frame; however, these are stock units that may not fit the department's needs and response profile. These lead times have to be considered as part of any fleet replacement program methodology and will require considerable forecasting moving forward.

CPSM assesses the BFD has a modern fire apparatus fleet with much of the front-line fleet replaced in the past six years and several additional vehicles ordered or funding is appropriated for procurement.

CPSM recommends the BFD should continue to include in all departmental capital budgeting planning over the near, mid, and long terms, planning objectives focused on following the NFPA 1900 standard for heavy fire apparatus fleet replacement (Optimal 12-13 years and no more than 15 years of frontline; 5-10 years reserve status) and include in this planning, an objective of not utilizing heavy fire apparatus once the apparatus reaches the 25-year age ceiling. Planning should also include the routine periodic replacement of command, staff, and utility vehicles and including them in the capital budget as appropriate.

Mutual and Automatic Aid

Mutual aid and automatic aid are critical components of modern fire and emergency service delivery, enabling jurisdictions to share resources and provide support when local capabilities are exceeded. **Mutual aid** involves neighboring departments responding upon request to assist with large, complex, or high-demand incidents, while automatic aid dispatches resources from adjacent jurisdictions simultaneously with local units based on predetermined response plans.

Automatic aid improves response times by ensuring the closest and most appropriate resources respond regardless of jurisdictional boundaries, while also helping to assemble the personnel and equipment needed to meet Effective Response Force (ERF) requirements for emergency incidents. Both systems enhance operational efficiency, improve service delivery, and are widely recognized as best practices within the fire service.

The Bethlehem Fire Department (BFD) participates in mutual aid on a limited basis, primarily due to the staffing characteristics of surrounding agencies and provisions contained within the current collective bargaining agreement. While the neighboring City of Allentown can provide a reliable response with career personnel, many surrounding departments rely on volunteer staffing, resulting in variable availability. Additionally, the labor agreement requires the recall of Bethlehem personnel when mutual aid resources are requested, which can limit the practical use of outside assistance. As a result, mutual aid is generally restricted to career departments and specialized resources from neighboring communities and regional partners. BFD both receives and provides mutual aid for fire suppression, technical services, command support, and station backfill assignments; however, the City and department currently operate without formal written mutual aid agreements, relying instead on established cooperative relationships and reciprocal assistance when needed.

The next table provides information the mutual aid that was provided to Bethlehem in each of the years from 2019 – 2025. This table includes only external agencies with arriving units and non-medical calls inside the City of Bethlehem.

Table 10: Aid Received Calls by External Agency and Year

Agency	2019	2020	2021	2022	2023	2024	2025
Bethlehem Twp VFC	6	5	3	4	6	1	4
Dewey FC 1	2	0	3	2	2	2	1
Easton FD	1	1	1	1	4	1	2
Freemansburg VFC 1	2	2	0	1	3	4	3
Hanover Twp VFC 1	6	9	8	5	3	4	5
Lower Saucon FD	7	0	1	7	7	9	7
Nancy Run FC	6	4	10	2	3	6	7
Palmer Municipal FD	2	0	0	0	1	1	1
Wilson Boro FD	0	1	1	0	0	1	1
Other*	7	2	4	4	2	7	6
Total	19	12	17	7	13	22	20

Note: *Other includes agencies with fewer than four calls over seven years. FC=Fire Company; FD=Fire Department; VFC=Volunteer Fire Company. For each column, the total number of calls is smaller than the sum of the individual rows, as some calls involved multiple agencies.

CPSM assesses that the mutual aid system which the BFD currently participates in is limited in practice due to limited staffing of surrounding fire departments and by the provisions in the current CBA. CPSM further concludes that automatic aid provides even greater operational value, particularly for a department, the size of the BFD. On incidents involving multi-family, industrial, commercial, or other higher-hazard occupancies, the BFD will not be able to assemble an Effective Response Force independently, without the use of automatic aid. This may even be true for fires in single family dwellings particularly if one or more BFD units are already committed to other calls.

CPSM recommends that the BFD prioritize a regional planning effort that includes the implementation of automatic aid agreements with the City of Allentown and City of Easton (both career staffed agencies). Strengthening these relationships will bolster first-alarm structure fire responses, increase resiliency, and improve the BFD's ability to consistently assemble an Effective Response Force for structure fires particularly beyond single-family residential structures such as apartments, commercial buildings, high rises, and other larger structures.

Fire Demand Analysis and Resiliency

Demand includes the types of calls to which fire and EMS units are responding to, the frequency, and the location of the calls. Demand drives workload and station staffing and location considerations. Higher population centers with increased demand require greater resources. High demand affects the resiliency of fire and EMS departments, which can translate into longer response times.

Technical Rescue incidents in Bethlehem will typically involve vehicle extrication. Depending on building type and height, these incident types may also involve elevator emergencies. Due to routine infrastructure work (traffic and utility) and potential growth, there is also the potential for trench and/or structural collapse, and rope rescue (moderate risk). The city's industrial occupancies present the potential for various types of complex technical rescue incidents involving confined spaces and/or machinery. There are numerous potential occupancies, that present similar risks.

Hazardous Materials or hazard calls for service may include transportation accidents with leaks/spills/release of hazardous materials on roadways (moderate risk), or on the railroad (low risk). Bethlehem has multiple fixed sites that store/use hazardous materials. Although they have their own hazardous materials response plan, should a significant incident occur, the BFD will likely require the response of additional regional specialized teams to assist with mitigating the hazard.

As with fire risks, an indication of the community's pre-hospital emergency medical risk is the type and number of EMS calls to which the fire department responds whether as the primary EMS service provider, or in a first responder or support role.

Between January 1, 2025, and December 31, 2025, BFD responded to 4,603 total incidents, an average of 12.3 per day. This includes 1,686 (36.6 percent) EMS/MVC related incidents, 2,640 (57.4 percent) fire incidents, and 274 mutual aid responses and cancelled calls (6.0 percent). Of the total incidents:

- 160 were actual fires (5.9 percent of fire calls/3.5 percent of all calls).
- 93 were structure fires (3.5 percent of fire incidents/2.0 percent of overall incidents).
- 62 were technical rescue incidents (2.3 percent of fire incidents/1.3 percent of overall incidents).

The following table and figures show the number of calls that the BFD responded to by call type, average calls per day, and the percentage of calls that fall into each call type category.

Table 11: BFD Calls by Type, Calls Per Day, and Percentage of Calls – 2025

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	73	0.2	1.6
Cardiac and stroke	150	0.4	3.3
Fall and injury	129	0.4	2.8
Illness and other	526	1.4	11.4
MVA	370	1.0	8.0
Overdose and psychiatric	72	0.2	1.6
Seizure and unconsciousness	366	1.0	8.0
EMS Subtotal	1,686	4.6	36.6
False alarm	1,334	3.7	29.0
Good intent	343	0.9	7.5
Hazard	439	1.2	9.5
Outside fire	67	0.2	1.5
Public service	302	0.8	6.6
Structure fire	93	0.3	2.0
Technical rescue	62	0.2	1.3
Fire Subtotal	2,640	7.2	57.4
Canceled	223	0.6	4.8
Mutual aid	54	0.1	1.2
Total	4,603	12.6	100.0

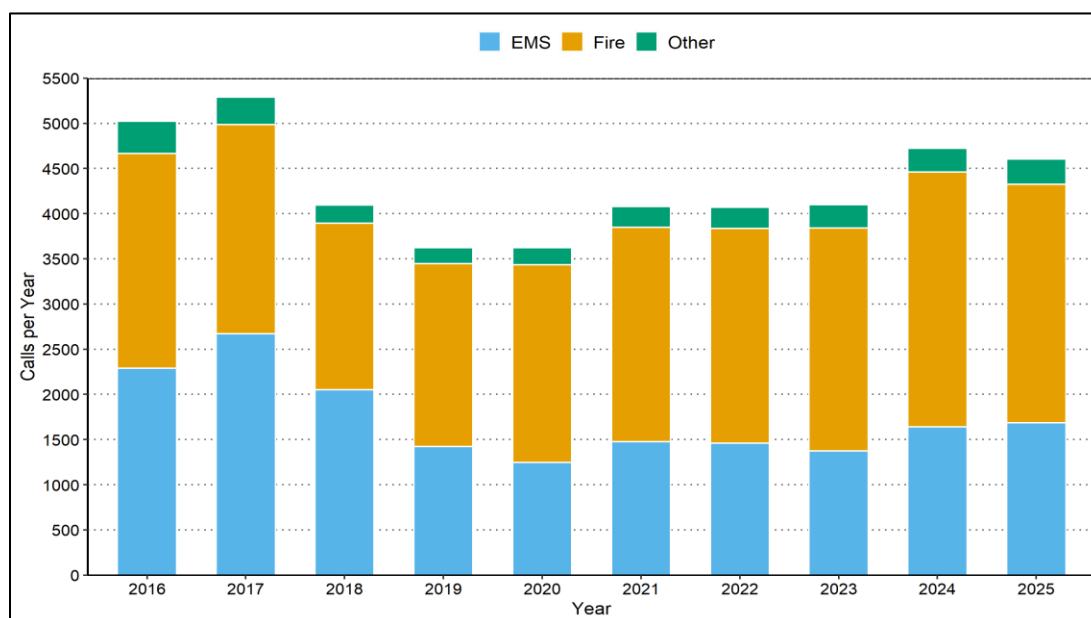
The next set of tables and figures examines BFD response activity over the ten-year period from 2016-2025. This information includes calls (a single call by Fire or EMS type) and runs (a single call that involves more than one unit response-or total workload). **Runs are the true workload of a fire department.**

The next table looks at BFD responses for the ten-year period from 2016 through 2025, broken out by call type. Calls to which no BFD unit went en route or arrived were eliminated.

Table 12: Calls by Type and Year

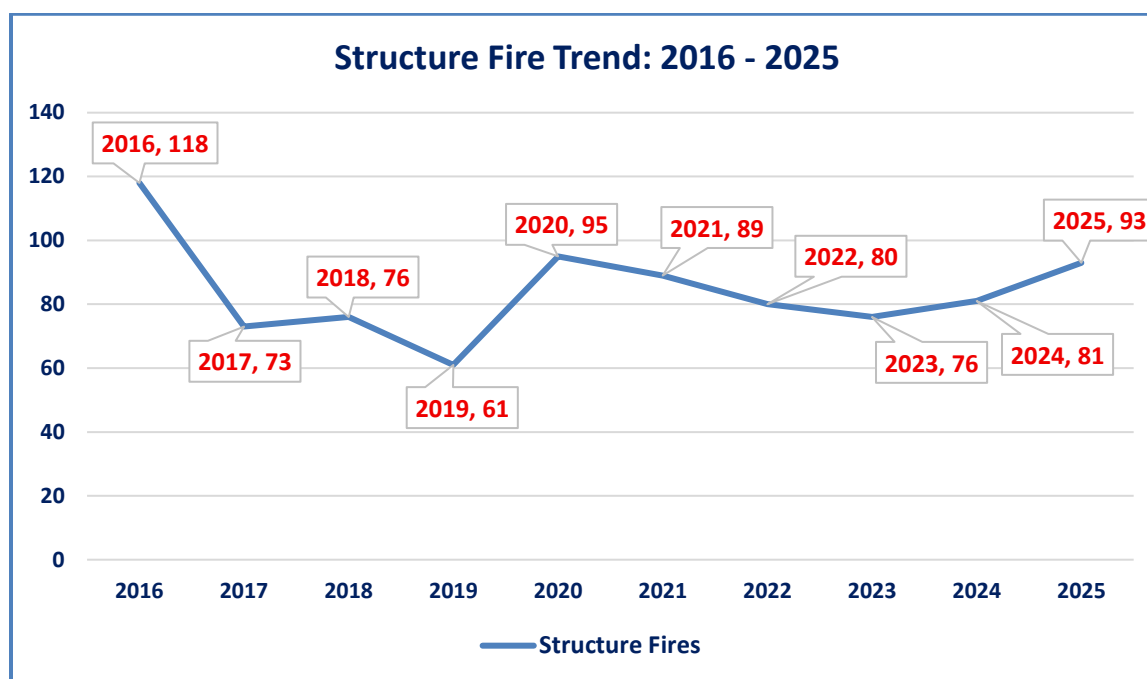
Call Type	Year									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Medical assist	1,933	2,317	1,789	1,125	951	1,108	1,111	1,048	1,222	1,316
MVA	357	355	262	296	295	370	349	325	419	370
EMS Subtotal	2,290	2,672	2,051	1,421	1,246	1,478	1,460	1,373	1,641	1,686
False alarm	1,034	1,083	867	872	1,012	1,089	1,115	1,129	1,226	1,334
Good intent	237	220	154	232	190	269	258	294	382	343
Hazard	394	380	352	331	399	418	457	454	500	439
Outside fire	106	85	62	64	96	85	98	97	95	67
Public service	433	416	285	418	346	361	319	359	452	302
Structure fire	118	73	76	61	95	89	80	76	81	93
Technical rescue	54	55	45	48	51	58	49	60	84	62
Fire Subtotal	2,376	2,312	1,841	2,026	2,189	2,369	2,376	2,469	2,820	2,640
Canceled	317	277	179	137	159	195	192	212	220	223
Mutual aid	40	29	24	39	28	37	42	44	41	54
Other Subtotal	357	306	203	176	187	232	234	256	261	277
Total	5,023	5,290	4,095	3,623	3,622	4,079	4,070	4,098	4,722	4,603

Figure 13: Trend in Call Volume by Type and Year



Overall, call volume was highest in 2017 (5,290) and lowest in 2019 (2,026) and 2020 (2,189). Calls also trended down beginning in 2018 and gradually increased in years 2021 to 2025. However, over the ten-year period, call volume remains lower since the peak in 2017 by 13%.

Figure 14: Structure Fire Trend: 2016 – 2025



Over a ten-year period (2016-2025), structure fires peaked in 2016 (118) and were at the lowest total in 2019 (61). The trend from 2019 is generally higher than the low in 2019 with dips in 2021, 2022, and 2023. In years 2024 and 2025 the trend for structure fires is up but less than the peak in 2016 by 21%.

The next table shows the number of EMS calls for each year, broken down by Advanced Life Support (ALS), Basic Life Support (BLS), and Motor Vehicle Accident (MVA) types.

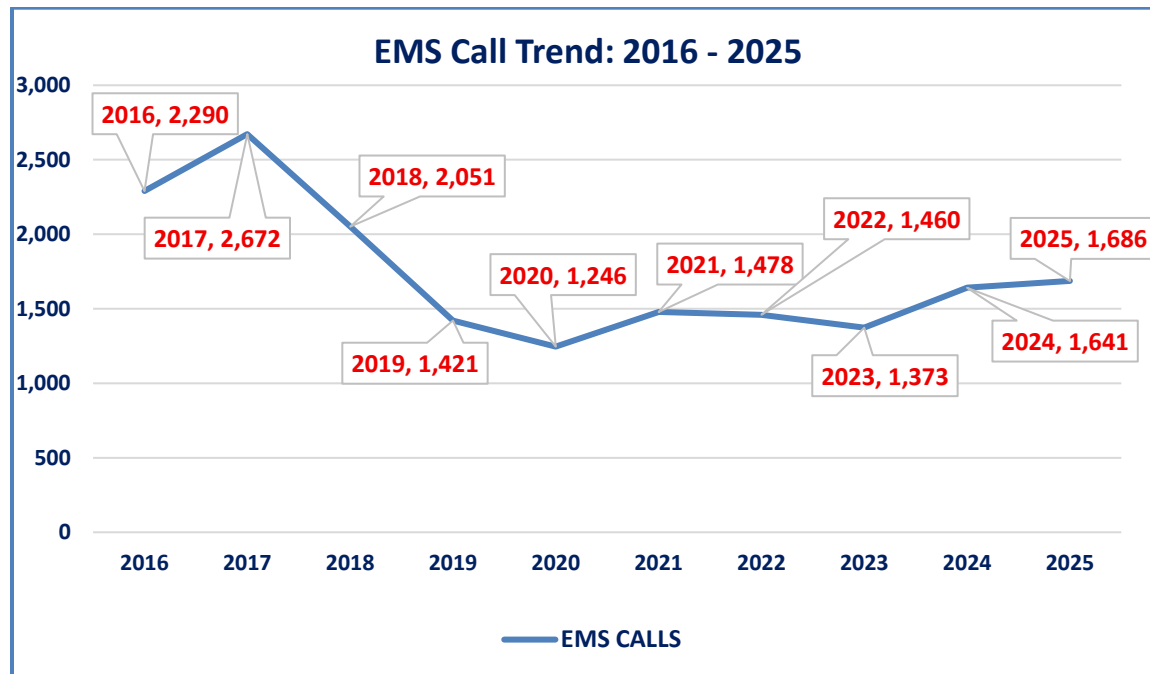
Table 13: EMS Calls by Type and Year

Type	Year									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ALS	1,692	1,955	1,513	950	725	805	797	780	822	836
BLS	0	0	0	32	37	53	34	60	102	90
MVA	357	355	262	296	295	370	349	325	419	370
Other	241*	362*	276*	143	189	250	280	208	298	390
Total	2,290	2,672	2,051	1,421	1,246	1,478	1,460	1,373	1,641	1,686

Note: *Other includes Alpha, Bravo, Charlie, Delta, and Echo calls before 2019. After 2019, the CAD system used only ALS and BLS in medical call descriptions.

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Figure 15: EMS Call Trend: 2016 – 2025



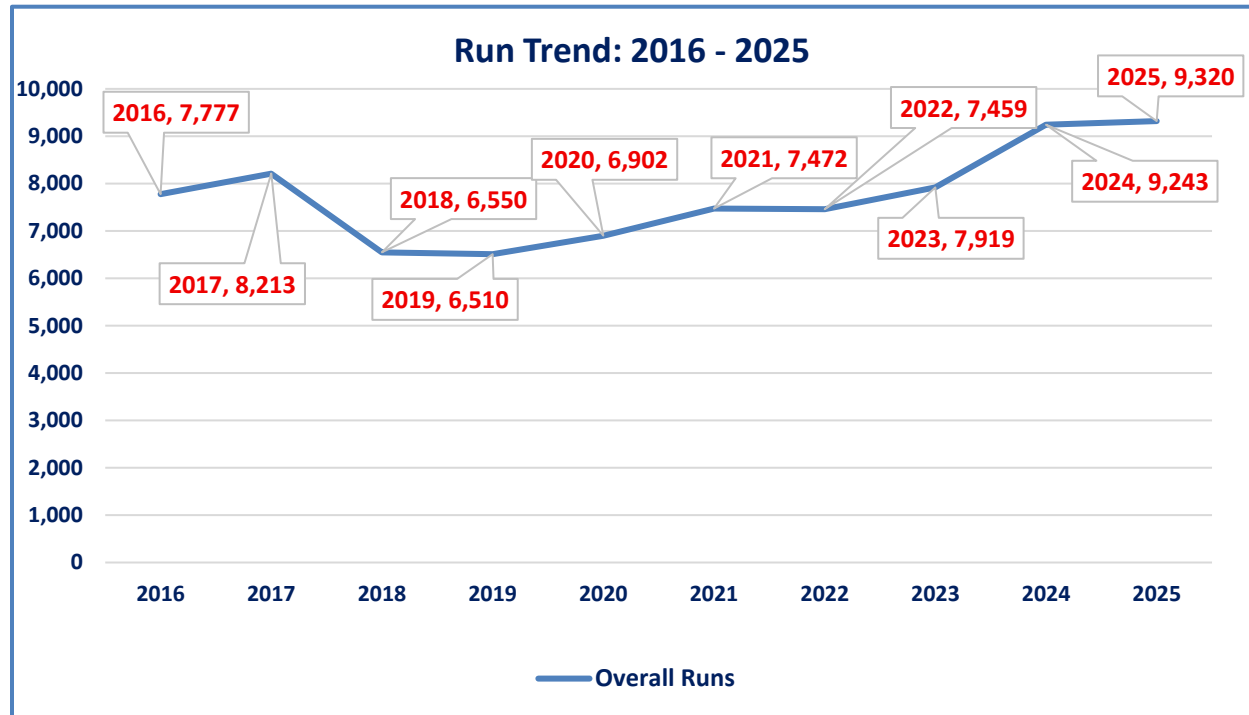
Over the ten-year period 2016-2025, BFD EMS calls peaked in 2017 (2,672) and were lowest in 2020 (1,246). From 2017 to 2020 BFD EMS calls trended down and shifted to trending up in 2021 and then down again in years 2022 and 2023. In years 2024 and 2025 BFD EMS calls have trended up again but are lower than the peak in 2017 by 37%.

The following set of tables and figures show the trend in runs by type over the ten-year period.

Table 14: Runs by Type and Year

Run Type	Runs									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Medical assist	2,025	2,465	1,895	1,243	1,029	1,229	1,190	1,169	1,364	1,488
MVA	545	536	425	515	506	633	592	612	777	732
EMS Subtotal	2,570	3,001	2,320	1,758	1,535	1,862	1,782	1,781	2,141	2,220
False alarm	1,973	2,217	1,825	2,002	2,236	2,406	2,504	2,692	2,962	3,285
Good intent	574	515	364	579	464	604	620	657	885	890
Hazard	775	822	740	719	898	903	962	1,059	1,119	1,134
Outside fire	205	170	131	144	219	176	221	209	228	169
Public service	627	647	475	609	603	612	511	615	800	544
Structure fire	509	348	334	328	504	443	382	368	421	463
Tech rescue	104	117	95	117	150	141	131	168	252	166
Fire Subtotal	4,767	4,836	3,964	4,498	5,074	5,285	5,331	5,768	6,667	6,651
Canceled	374	338	229	205	252	265	269	295	365	354
Mutual aid	66	38	37	49	41	60	77	75	70	95
Other Subtotal	440	376	266	254	293	325	346	370	435	449
Total	7,777	8,213	6,550	6,510	6,902	7,472	7,459	7,919	9,243	9,320

Figure 16: Run Trend by Year



Over the ten-year period 2016-2025, runs calls peaked in 2025 (9,320) and were lowest in 2019 (6,510). From the low year in 2019 the trend for runs workload has been up with a slight dip in 2023. Overall, from 2016 to 2025, the BFD run workload has increased 20%.

Table 15: Run Trend by Year by Station with Staffed Units

First Due Area	Runs									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Schweder Station ✓ 1 Asst. Chief ✓ 2 Engines ✓ 1 Ladder	2,710	2,302	1,692	1,739	1,890	2,034	2,229	2,086	2,332	2,529
Lincoln Station ✓ 1 Engine	1,479	1,592	1,303	1,178	1,298	1,412	1,265	1,336	1,763	1,697
Memorial Station ✓ 1 Engine ✓ 1 Ladder	2,192	2,649	2,209	2,189	2,217	2,404	2,325	2,611	3,166	3,091
Northwest Station ✓ 1 Engine	1,330	1,632	1,309	1,355	1,456	1,562	1,563	1,811	1,912	1,908
Mutual Aid	66	38	37	49	41	60	77	75	70	95

In analysis of the above table, other than in year 2016 (Schweder Station), the Memorial Station is the busiest station in the BFD in terms of runs. This is expected as the Memorial Station houses one engine, and one ladder-all staffed for response. Other than in year 2016 (Northwest Station), the Lincoln Station is the least busy station in the BFD in terms of runs. The Lincoln Station responds with one staffed unit.

False Alarm - Unnecessary Fire Alarm - System Responses

False alarms are a persistent challenge for fire departments nationwide and typically represent the largest category of non-fire or non-hazard incidents to which fire departments respond. In most communities, these calls are not malicious in nature; rather, they are commonly generated by malfunctioning, improperly maintained, overly sensitive, or otherwise problematic automatic fire alarm systems. While these activations are important from a life-safety perspective and must be treated as legitimate until firefighters determine otherwise, repeated false alarms can place a substantial demand on fire department resources.

False Alarms by Year

Year	Calls	Runs
2016	1,034	1,973
2017	1,083	2,217
2018	867	1,825
2019	872	2,002
2020	1,012	2,236
2021	1,089	2,406
2022	1,115	2,504
2023	1,129	2,692
2024	1,226	2,962
2025	1,334	3,285

Bethlehem, Pennsylvania provides a clear example of this issue. Over the ten-year period from 2016 through 2025, false alarms consistently represented a significant component of the Bethlehem Fire Department's non-fire and non-hazard workload. **Particularly noteworthy is the increase in false alarm activity in recent years. False alarm calls increased from 1,012 incidents in 2020 to 1,334 incidents in 2025, an increase of approximately 32 percent.** This growth occurred despite the fact that these incidents generally do not involve an actual fire or other emergency requiring the full response of fire suppression resources.

The operational consequences of this workload are important. A response to a false alarm still requires the dispatch, turnout, travel, and investigation of fire department personnel and apparatus. During the response, those resources may be unavailable for another emergency or may have to be committed to an incident that ultimately proves to be non-emergency in nature. Repeated

false alarms at the same properties can also consume significant staff time through investigations, follow-up inspections, coordination with alarm companies and property owners, and efforts to identify and correct the underlying problem.

False alarms also create a potential risk and resource-management issue. Firefighters must respond to an alarm as though a fire may actually exist until conditions are verified. This can result in emergency apparatus operating in traffic, personnel entering potentially hazardous environments, and multiple companies being committed to a property. Even when no fire is found, the cumulative impact of these responses can contribute to apparatus utilization, personnel workload, fuel consumption, overtime, and reduced system resiliency.

The Role of a Strong False Alarm Ordinance

One of the most effective tools available to a community for addressing recurring false alarms is a well-designed and consistently enforced false alarm ordinance. The objective should not be to discourage legitimate fire alarm systems or delay emergency responses. Instead, an effective ordinance creates an incentive for property owners, alarm companies, and system managers to maintain their systems properly and promptly correct recurring problems.

A strong ordinance typically establishes a graduated approach that may include:

- Registration and accountability for properties with monitored alarm systems.
- Clear definitions of what constitutes a false alarm or nuisance activation.
- Notification and corrective-action requirements after repeated activations.
- A reasonable number of warnings or allowances for isolated incidents.

- Escalating service fees or penalties for repeated false alarms during a defined period.
- Exemptions for legitimate circumstances outside the control of the property owner, such as severe weather, utility problems, or documented emergency conditions.
- Requirements for alarm system inspection, testing, maintenance, and repair when recurring activations occur.
- Authority for the fire department or fire official to require corrective action when a system demonstrates a persistent pattern of false activation.

The City of Bethlehem already provides an example of this graduated approach. Article 735 of the Bethlehem City Ordinances (Emergency Alarm System ordinance) establishes fees beginning with the third or fourth false alarm activation during a calendar year and increases the fee for the fifth and subsequent activations. The ordinance also provides for exemptions under certain extraordinary circumstances. In addition, violations can carry escalating penalties.

The underlying principle is important: the cost and administrative burden associated with repeated false alarms should ultimately encourage the responsible party to correct the problem rather than allowing the fire department to repeatedly absorb the operational consequences. A properly structured ordinance therefore serves as both a deterrent and a mechanism for improving fire protection system reliability.

For Bethlehem, the substantial increase from 1,012 false alarm calls in 2020 to 1,334 in 2025 suggests that continued attention to false alarm management is warranted. The City should periodically evaluate the effectiveness of its existing ordinance, including the frequency and location of repeat offenders, the number of incidents generated by individual properties, the amount of fire department time committed to these calls, and whether existing fees and penalties provide sufficient incentive for corrective action.

False alarms cannot and should not be eliminated entirely. Automatic detection systems are an essential component of modern fire protection, and every alarm must initially be treated as a potential emergency. However, a recurring malfunctioning alarm system is a preventable demand on the fire department. A strong, graduated, and consistently enforced false alarm ordinance can help shift responsibility for recurring activations toward the property owners and alarm system operators responsible for correcting them. In doing so, the community can preserve the value of automatic fire detection while reducing unnecessary fire department responses and improving the availability of resources for actual emergencies.

A comprehensive false alarm reduction program should include coordination among the BFD, property owners, alarm monitoring companies, and fire alarm service providers. The objective should be to identify and correct the underlying causes of recurring alarms rather than simply responding to them repeatedly. Reducing preventable false alarms will decrease unnecessary apparatus deployments, improve firefighter and public safety, reduce operational workload, and increase the availability of fire department resources for actual emergencies.

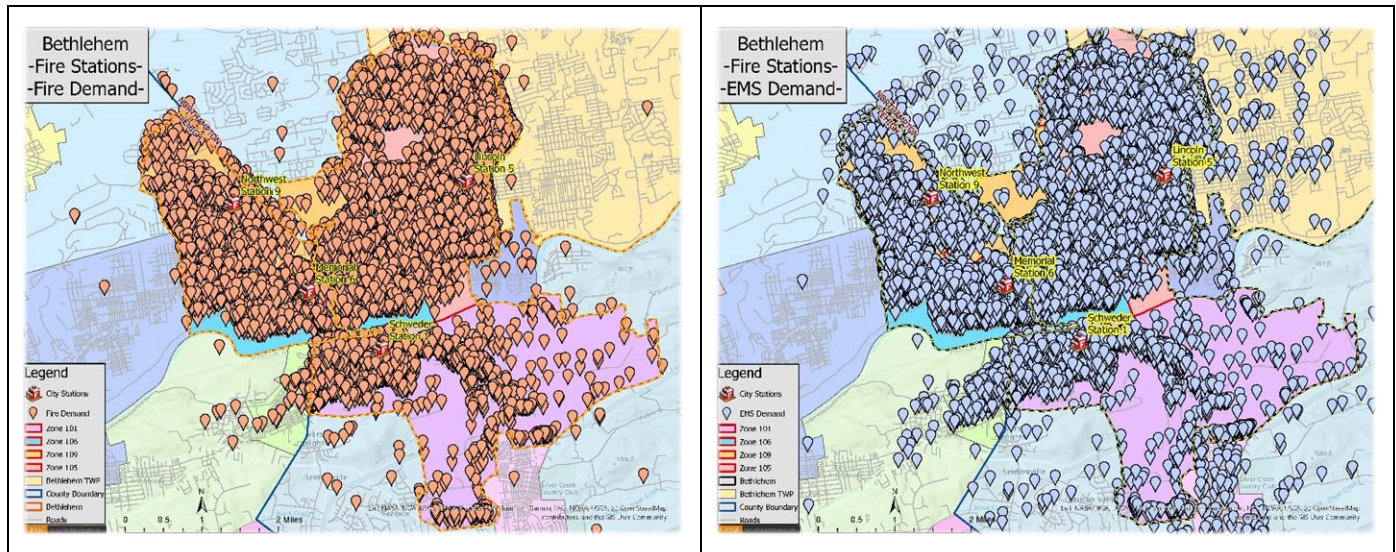
CPSM recommends that the City should fully enforce the current Emergency Alarm System ordinance. The enforcement program should also require timely inspection, testing, maintenance, and correction of alarm systems that generate recurring activations. Further, the BFD should maintain a database of repeat false alarm locations and periodically review the data to identify properties responsible for a disproportionate share of false alarm responses.

Fire and EMS Spatial Analysis

Understanding where emergency incidents occur is as important as understanding how quickly resources can respond to them. Spatial analysis of fire and EMS demand uses Geographic Information Systems (GIS) to examine the geographic distribution of emergency incidents throughout a community. By mapping historical call locations, fire departments can identify concentrations of demand, recurring service areas, emerging growth patterns, and locations that place the greatest demands on emergency resources.

Analyzing incident demand spatially provides valuable insight into the relationship between community risk, population density, development patterns, and emergency service workload. This information helps agencies evaluate whether current station locations, apparatus deployment strategies, and staffing levels align with where service demand actually occurs. When combined with travel-time and response performance analysis, spatial demand analysis provides a data-driven foundation for operational planning, resource allocation, station placement decisions, and future service delivery improvements.

Figure 17: Fire and EMS Demand



Both Fire and EMS demand is concentrated in the core central areas of the city as well northside, westside, and southwest. The southeast area of the city has moderate demand in built upon residential areas. EMS demand also includes BFD EMS division responses.

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.

By maintaining the strength and flexibility to manage both routine calls and unexpected surges, resistance becomes a critical component of a resilient fire and EMS system.

The next tables look at the frequency of overlapping calls overall in Bethlehem and then in each fire management zone. District 9 the Northwest area has the highest percentage of no overlapping calls, meaning they have a higher frequency of non-concurrent calls. Conversely this means they have the lowest percentage of overlapping calls. When coupled with incident/call type, resistance (response matrix), and station availability to respond to calls, the BFD is almost always able to absorb overlapping calls in a district without the need for mutual aid.

Table 16: Frequency of Overlapping Calls – City Wide

Scenario	Number of Calls	Percent of Calls	Total Hours
No overlapped call	3,448	74.9	1,595.9
Overlapped with one call	952	20.7	220.8
Overlapped with two calls	166	3.6	27.1
Overlapped with three calls	27	0.6	2.5
Overlapped with four calls	6	0.1	0.6
Overlapped with five calls	3	0.1	0.2
Overlapped with six calls	1	0.0	0.0

25.1% of all calls in Bethlehem are overlapped with one or more other calls.

Table 17: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	5,322	60.8
1	2,529	28.9
2	716	8.2
3	147	1.7
4+	46	0.5
Total	8,760	100.0

This resiliency measure is the frequency distribution of calls, or how many calls occur in an hour.

The table to the left tells us that citywide, 60.8 percent of the time there are no calls in an hour; 37.1 percent of the time there are one or two calls in an hour; and 2.2 percent of the time there are three or more calls occurring at either the same time or closely grouped.

Coupled with the table above there are only minor absorption resiliency issues.

Table 18: First Due Station Availability to Respond to Calls

First Due	Calls in Area	First Due Responded	Percent Responded	First Due Arrived	Percent Arrived	First Due First Unit	Percent First Unit
Schweder Station	1,262	1,252	99.2	1,251	99.1	1,246	98.7
Lincoln Station	924	856	92.6	848	91.8	815	88.2
Memorial Station	1,280	1,204	94.1	1,199	93.7	1,171	91.5
Northwest Station	847	765	90.3	748	88.3	644	76.0
Total	4,313	4,077	94.5	4,046	93.8	3,876	89.9

Note: For each station, we count the number of calls within its first due area where at least one unit arrived. Next, we focus on units from the first due station to see if any unit responded, arrived, or arrived first. Out of 4,603 total calls, 263 calls did not have an arriving BFD unit, out of which 141 were canceled calls, 27 were mutual aid calls, 52 were EMS calls, and 43 were fire-related calls.

Call frequency is a key indicator of fire department resilience, reflecting both the intensity of community demand and the system's ability to absorb and manage workload without degradation in service delivery. As call volume increases, so does the strain on personnel, apparatus, and supporting infrastructure, making frequency of incidents a central factor in assessing operational sustainability.

High call frequency can reduce system resilience by increasing unit hour utilization, limiting available resources for simultaneous incidents, and extending response times during peak demand periods. Conversely, lower, or well-distributed call frequency allows departments to maintain reserve capacity, ensuring that emergency resources remain available when multiple or high-acuity incidents occur. Spatial and temporal clustering of calls further compounds these effects by concentrating demand on specific stations or time periods.

Table 19: Frequency of Overlapping Calls by First Due Fire District

First Due Area	Scenario	Number of Calls	Percent of All Calls
Schweder Station 1	No overlapped call	1,257	92.5
	Overlapped with one call	93	6.8
	Overlapped with two calls	8	0.6
	Overlapped with three calls	1	0.1
Lincoln Station 5	No overlapped call	912	93.8
	Overlapped with one call	55	5.7
	Overlapped with two calls	5	0.5
Memorial Station 6	No overlapped call	1,222	91.3
	Overlapped with one call	110	8.2
	Overlapped with two calls	7	0.5
Northwest Station 9	No overlapped call	834	94.9
	Overlapped with one call	42	4.8
	Overlapped with two calls	1	0.1
	Overlapped with three calls	1	0.1
	Overlapped with four calls	1	0.1
Mutual Aid Area	No overlapped call	54	100.0

7.5% of calls in District 1 are overlapped with at least one other call.

6.2% of calls in District 5 are overlapped with at least one other call.

8.7% of calls in District 6 are overlapped with at least one other call.

5.1% of calls in Station 9 are overlapped with another call.

0% of mutual aid calls are overlapped with another call.

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

In Bethlehem:

- **93.7** percent of all calls were managed in less than one hour.
- **4.7** percent of all calls were managed in one to two hours.
- **1.6** percent of all calls were managed in two or more hours.

More than 90% of all calls are managed in 1 hour or less, increasing overall restoration resiliency.

Table 20: 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	49	21	3	0	73
Cardiac and stroke	75	55	16	4	150
Fall and injury	95	30	3	1	129
Illness and other	442	74	8	2	526
MVA	163	168	34	5	370
Overdose and psychiatric	59	12	1	0	72
Seizure and unconsciousness	278	74	13	1	366
EMS Subtotal	1,161	434	78	13	1,686
False alarm	1,181	126	19	8	1,334
Good intent	290	43	8	2	343
Hazard	192	176	59	12	439
Outside fire	26	25	13	3	67
Public service	234	37	17	14	302
Structure fire	46	20	9	18	93
Technical rescue	38	17	7	0	62
Fire Subtotal	2,007	444	132	57	2,640
Canceled	216	6	1	0	223
Mutual aid	39	6	6	3	54
Total	3,423	890	217	73	4,603
Total Percentage	74.4	19.3	4.7	1.6	100.0

The next table details the number of calls with one, two, three, four, or five or more BFD units arriving at a call, broken down by call type. This is limited to calls where a BFD unit arrives.

Table 21: Calls by Call Type and Number of Arriving BFD Units

Call Type	Number of Units					Total Calls
	One	Two	Three	Four	Five or More	
Breathing difficulty	66	5	0	0	0	71
Cardiac and stroke	132	12	1	0	0	145
Fall and injury	104	17	2	1	0	124
Illness and other	483	27	4	1	0	515
MVA	197	106	35	13	4	355
Overdose and psychiatric	62	7	0	1	0	70
Seizure and unconsciousness	329	22	1	2	0	354
EMS Subtotal	1,373	196	43	18	4	1,634
False alarm	320	575	358	59	3	1,315
Good intent	145	72	41	60	20	338
Hazard	163	111	61	61	36	432
Outside fire	21	22	12	8	3	66
Public service	170	75	22	20	5	292
Structure fire	10	18	20	17	28	93
Technical rescue	24	17	11	4	5	61
Fire Subtotal	853	890	525	229	100	2,597
Canceled	43	20	10	5	4	82
Mutual aid	16	7	1	1	2	27
Total	2,285	1,113	579	253	110	4,340
Total Percentage	52.6	25.6	13.3	5.8	2.5	100.0

Analysis of the table above indicates:

- On average, 1.8 BFD units arrived per call; for 53 percent of calls, only one unit arrived.
- For all calls, three or more units arrived 22 percent of the time.

For EMS Calls:

- On average, 1.2 units arrived per EMS call.
 - For EMS calls, one unit arrived 84 percent of the time, two units arrived 12 percent of the time, three units arrived three percent of the time, and four or more units arrived one percent of the time.

For Fire Calls:

- On average, 2.2 units arrived per fire call.
 - For fire calls, one unit arrived 33 percent of the time, two units arrived 34 percent of the time, three units arrived 20 percent of the time, four units arrived nine percent of the time, and five or more units arrived four percent of the time.
- For outside fire calls, three or more units arrived 35 percent of the time.
- For structure fire calls, three or more units arrived 70 percent of the time.

CPSM assesses that overall, the BFD has only minor resiliency issues across the department in terms of workload. Over the ten-year period Stations 1 and 6 alternated the most calls and runs while stations 5 and 9 were third and fourth

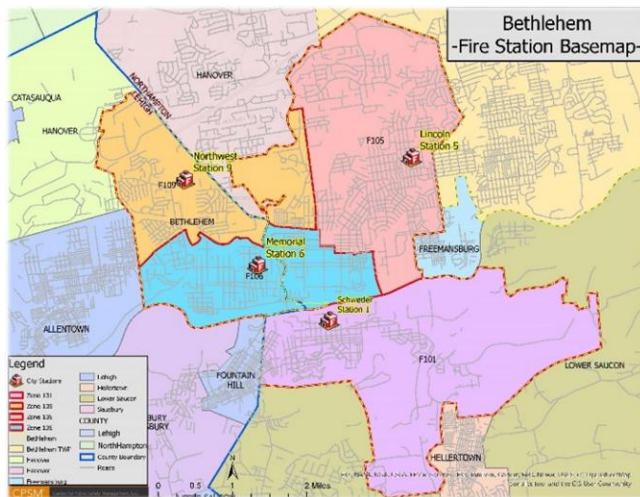
The overall frequency of concurrent calls is relatively low for a city the size of Bethlehem. This is likely the result of the BFD's limited involvement with EMS. No station had more than 8.7% of their calls overlapped with one or more other incidents. This indicates good resiliency across the city. Overall, with all stations except Station 9 arriving first due in their response district 88.2% of the time or more (Station 9 is at 76%), there are only relatively low absorption issues regarding unit availability to respond to calls across all districts. The BFD has no substantial resistance issues with the current response matrix.

Station Distribution and Response Time Analysis

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.²⁵ As discussed herein, the BFD responds with four fire facilities.

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.

25. NFPA 1710, 2020 Edition.



When analyzing fire stations for the most efficient response patterns, 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, and which directly ties to response travel time.

Lastly, response travel times are hampered by many things that include speed limit of roads traveled to the incident; road layout of a community; weather; road construction; at grade rail crossings; time of day traffic congestion to name the most notable impediments.

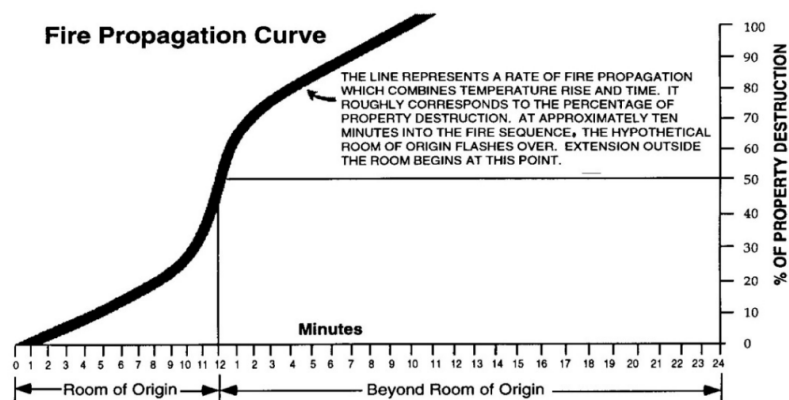
Response Times

Response time is one of the most important performance measures for fire and EMS services, serving as a benchmark for evaluating current service delivery, identifying coverage gaps, and planning for future operational needs. Fire departments strive to achieve the fastest safe response possible because outcomes for both fire suppression and medical emergencies are highly dependent on how quickly resources arrive on scene.

For fire incidents, response time is closely tied to the concept of flashover, which is the point at which most combustible materials within a compartment simultaneously ignite, causing rapid fire growth and dramatically increasing danger to occupants and firefighters. Modern homes and businesses contain large amounts of synthetic materials, plastics, and foam-based products that burn hotter and faster than traditional materials, causing flashover to occur more quickly than in the past. Once flashover occurs, initial firefighting crews can become overwhelmed, allowing the fire to extend beyond the room or structure of origin and requiring substantially greater resources to achieve control. This relationship between rapid response and fire growth underscores the importance of deploying sufficient resources quickly and assembling an Effective Response Force capable of controlling incidents before they escalate.

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.

Figure 18: Fire Propagation Curve



Source: John C. Gerard and A. Terry Jacobsen, "Reduced Staffing: At What Cost?" Fire

Response Time Benchmarks

A key factor influencing overall response time is what CPSM refers to as detection time the interval between the onset of a fire or medical emergency and the moment someone notifies 911. Detection time can be prolonged, especially at night or in buildings without functioning automatic detection systems such as smoke alarms or fire sprinklers. Fires that go undetected grow larger, cause more damage, and become more difficult to control. Similarly, medical or trauma emergencies that are not recognized quickly reduce the likelihood of positive clinical outcomes and full recovery.

For CPSM's data analysis, response time is composed of three measurable elements: dispatch time, turnout time, and travel time.

Dispatch time (alarm processing time) is the interval between when a call is received and when units are dispatched. It includes call processing, which is the period needed to identify the nature of the emergency and determine the appropriate resources.

The NFPA 1710 standard provides benchmarks for these components of response time, as detailed below.

The event is processed and dispatched in:

- ≤ 64 seconds 90 percent of the time.
- ≤ 106 seconds 95 percent of the time.

Special call types:

- ≤ 90 seconds 90 percent of the time.
- ≤ 120 seconds 99 percent of the time.

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

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

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

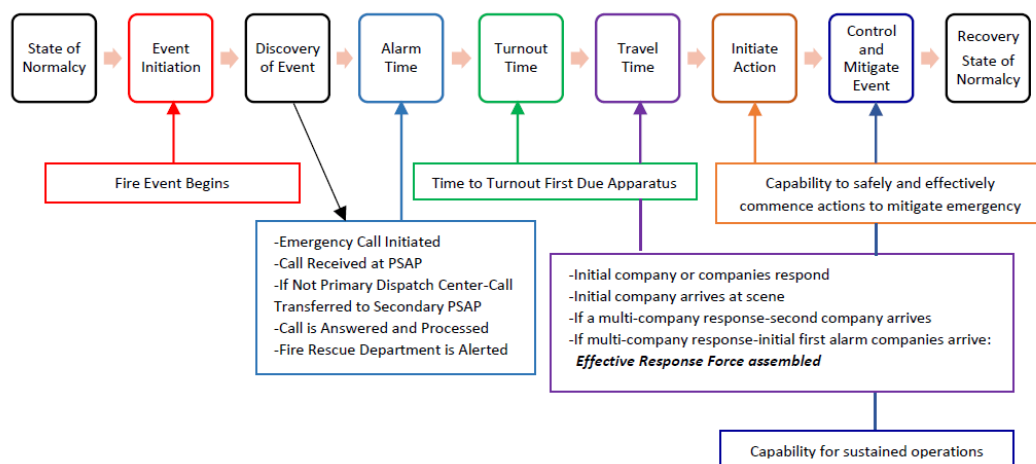
- ≤ 240 seconds for the first arriving engine company to a fire suppression incident 90 percent of the time.
- ≤ 360 seconds for the second company 90 percent of the time.
- ≤ 480 seconds to assemble the initial first alarm assignment on scene 90 percent of the time for low/medium hazards, and 610 seconds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

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

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

The next figures illustrate the cascade of events for a fire incident, which includes all components of response time performance.

Figure 19: Incident Cascade of Events: Fire Response



Travel time is a critical component of overall fire and EMS response performance and is heavily influenced by the location of fire stations and response units. By analyzing travel times from existing and proposed station locations, agencies can evaluate how effectively they provide service coverage throughout the community. Because travel time often represents the largest portion of total response time, station placement plays a significant role in determining operational efficiency and the ability to meet established response benchmarks.

The objective of fire station location planning is to optimize coverage by minimizing travel distances whenever possible while accounting for factors that can impede response, such as road networks, traffic patterns, rail crossings, waterways, and other natural or manmade barriers. The development of a station network is typically guided by available funding, community growth patterns, incident demand, travel-time analysis, and identified community risks to ensure that resources can be deployed quickly and effectively where they are needed most.

The next tables examine response times by call priority, call type, and by station. In this analysis, CPSM included all calls within the primary response area of the BFD to which at least one non-administrative unit responded while excluding canceled calls and calls with a total response time of more than 30 minutes. In addition, CPSM focused on units that had complete time stamps, that is, units with all components recorded, so that we could calculate each segment of response time. Finally, nonemergency calls such as low acuity calls were excluded from this analysis as they are typically managed with no red lights and siren. As a result, in this section, a total of 4,088 calls is included in the primary analysis for 1/1/2025 to 12/31/2025.

Table 22: Calls by Priority

Priority	Total Calls	Calls for Response Time Analysis
1	3,349	3,051
2	118	95
3	1,136	942
Total	4,603	4,088

“Priority 1” labels the most serious calls, whereas “Priority 3” labels the least serious calls.

Table 23: 90th Percentile Response Times, by Call Type (Minutes)

Call Type	90 th Percentile Response Time				Call Count
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	3.0	2.3	7.3	11.8	46
Cardiac and stroke	2.6	1.8	5.7	9.1	121
Fall and injury	4.7	2.5	7.7	13.4	65
Illness and other	3.8	2.4	7.7	12.8	182
MVA	8.0	2.0	6.8	15.0	328
OD	3.3	1.9	5.1	9.7	55
Seizure and UNC	2.6	1.9	5.8	8.9	313
EMS Subtotal	4.2	2.0	6.8	11.9	1,110
False alarm	2.6	2.1	5.7	9.5	1,075
Good intent	3.4	2.2	5.9	10.1	240
Hazard	8.4	2.2	6.2	15.1	355
Outside fire	2.2	2.2	6.3	10.4	59
Public service	7.5	2.3	7.0	15.9	82
Structure fire	3.2	1.8	5.3	8.8	87
Technical rescue	3.7	2.0	5.2	9.3	43
Fire Subtotal	3.2	2.2	6.0	10.5	1,941
Total	3.5	2.1	6.3	10.9	3,051

Note: OD=Overdose and psychiatric; UNC=Unconsciousness.

Detailed review of the above table tells us:

- The 90th percentile dispatch time (alarm handling) was **3.5** minutes (**210 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 Northampton County dispatch system does not meet this benchmark call processing standard.**
- The 90th percentile turnout time was 2.1 minutes (**126 seconds**).
 - ✓ The NFPA 1710 turnout time is 60 seconds for EMS response and 80 seconds for fire and special call responses. **The BFD does not meet the benchmark turnout time standard for Fire and EMS responses.** The BFD has the most direct control over this component.
- The 90th percentile travel time for EMS is 6.8 minutes (**408 seconds**).
- The 90th percentile travel time for Structure Fires is 5.3 minutes (**318 seconds**).
 - ✓ The NFPA 1710 travel time standard for structure fires is ≤ 240 seconds for the first arriving engine company to a fire suppression incident 90 percent of the time.
 - ✓ The NFPA 1710 travel time standard for EMS incidents is ≤ 240 seconds for the first arriving engine company with automated external defibrillator (AED) or higher-level capability.

The BFD does not meet the benchmark first unit travel time standards as outlined in NFPA 1710.

The next table breaks down the 90th percentile dispatch, turnout, travel, and total response times by the priority of calls within Bethlehem. A 90th percentile means that 90 percent of calls had a response time at or below that number. For example, the table shows an overall 90th percentile response time of 12.3 minutes, which means that 90 percent of the time, a call had a response time of no more than 12.3 minutes.

Table 24 90th Percentile Response Times (Minutes), by Priority

Priority	90 th Percentile Response Time				Call Count
	Dispatch	Turnout	Travel	Total	
1	3.5	2.1	6.3	10.9	3,051
2	8.4	2.3	7.8	15.4	95
3	5.6	2.6	8.7	15.8	942
Total	4.0	2.3	6.9	12.3	4,088

The table indicates that BFD's response times vary significantly by call priority.

The 90th percentile response times were **10.9, 15.4, and 15.8** minutes for Priority 1, 2, and 3 calls, respectively.

To get the most accurate analysis of the response times, CPSM focused on emergency responses. As a result, we analyzed the 3,051 calls assigned a priority 1 (critical) classification.

Table 25: 90th Percentile Response Time to Priority 1 Emergency Calls, by First Due Station Area (Minutes)

First Due Area	90 th Percentile Response Time				Call Count
	Dispatch	Turnout	Travel	Total	
Schweder Station	3.6	2.2	7.2	12.0	942
Lincoln Station	3.7	2.1	6.3	11.3	675
Memorial Station	3.6	2.2	5.0	10.0	843
Northwest Station	3.1	2.0	6.0	9.9	591
Subtotal	3.5	2.1	6.3	10.9	3,051

- ✓ Dispatch times range from 3.1 to 3.7 minutes (well above the NFPA standard).
- ✓ Turnout times are consistent across all stations ranging from 2.0 to 2.2 minutes (above the NFPA standard).
- ✓ Travel times range from 5.0 minutes for Memorial Station to 7.2 minutes for Schweder Station (above the NFPA standard).

Historical Response Times

For the ten-year dataset, response time analysis was conducted using the methodology outlined above. This included all incidents within the City to which at least one unit responded, while excluding canceled calls and any call with a total response time exceeding 30 minutes. Only units with complete time stamps were included to ensure accurate calculation of each response time component. The following table presents the trends in 90th percentile dispatch, turnout, travel, and total response times by year.

Table 26: 90th Percentile Response Times (Minutes) by Period

Year	90 th Percentile Response Time				Calls
	Dispatch	Turnout	Travel	Total	
2016	2.9	2.1	5.8	9.6	3,645
2017	2.7	2.1	6.0	9.5	3,897
2018	2.8	2.1	6.0	9.6	3,062
2019	4.5	2.4	6.2	12.0	2,744
2020	3.8	2.2	6.1	11.2	2,768
2021	3.8	2.2	6.2	11.3	2,999
2022	3.5	2.2	6.6	11.8	2,997
2023	3.9	2.2	6.1	11.1	2,804
2024	3.7	2.2	6.3	11.2	3,143
2025	3.5	2.1	6.3	10.9	3,051

Historically:

- Total response times at the 90th percentile increased from a low of 9.5 minutes in 2017 to a high of 12.0 minutes in 2019 before gradually decreasing to 10.9 minutes in 2025. CPSM was informed this coincides with the transfer of dispatch operations from the City of Bethlehem to Northampton County.
- Call processing/dispatch time increased from 2.7 minutes in 2017 to 4.5 minutes in 2019 before decreasing and being 3.5 minutes in 2025. CPSM was informed this coincides with the transfer of dispatch operations from the City of Bethlehem to Northampton County. At no time during the ten-year period was the BFD's emergency dispatch system close to the benchmark call processing and dispatch time under this standard.
- Turnout time over the ten-year period remained fairly consistent ranging from 2.1 minutes in several years to 2.4 minutes in 2019. The BFD still exceeds the benchmark times in this standard for EMS and fire responses. ***This is one part of total response time the BFD has the most direct control over.***
- The 90th percentile travel time ranged from 5.8 minutes in 2016 to 6.6 minutes in 2022. It decreased to 6.3 minutes in 2023 before increasing again to 6.3 minutes in 2024 and 2025. When benchmarked against the NFPA standard, the travel times consistently exceeded the standard.

In closing, 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 BFD, 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:

- Developing a comprehensive understanding of the community's total risk, including how each individual risk affects fire department resiliency, the potential consequences for both the

community and the department if a specific risk—or a combination of multiple risks—occurs, and the likelihood that these risks may materialize.

- Connecting identified risks to the strategic deployment of resources to manage incidents effectively. This includes attempting to assemble an Effective Response Force tailored to the specific risk within NFPA benchmarked response times or adopted times by the locality, deploying the appropriate apparatus (engines, ladders, heavy rescues, ambulances), and ensuring a response force trained to address the particular hazards involved.
- Recognizing that every component of response time influences the management of community risk. Faster arrival of the first engine and quicker assembly of an Effective Response Force for fire and other emergencies are strongly linked to improved outcomes.

Finally, as a community's expectations and desired level of service are unique, no two communities then will be alike. Response performance goals must be shaped to match community expectations, level of community risk, and the ability to pay for contemporary Fire and EMS resources required to achieve the level of service and performance expected by the community.

CPSM assesses that the BFD's emergency dispatch system does not meet the NFPA standard for call processing/dispatch times.

CPSM recommends in conjunction with the Northampton County Emergency Communications Center, the BFD should adopt a performance benchmark for dispatch time or call processing time that includes the call processing performance standards of 64-seconds at the 90th percentile for fire and fire-related calls, and a realistic performance benchmark for EMS calls that does not exceed 120 seconds.

CPSM assesses that the BFD also does not meet the NFPA standard for turnout times,

CPSM recommends that the BFD should adopt a performance benchmark for turnout time of ≤ 80 seconds for fire and special operations and ≤ 60 seconds for EMS responses at the 90th percentile. **This is one part of total response time the BFD has the most direct control over.**

CPSM assesses the BFD response travel times do not meet the NFPA 1710 benchmark standards. The ten-year 90th percentile travel times range from 5.8 to 6.6 minutes.

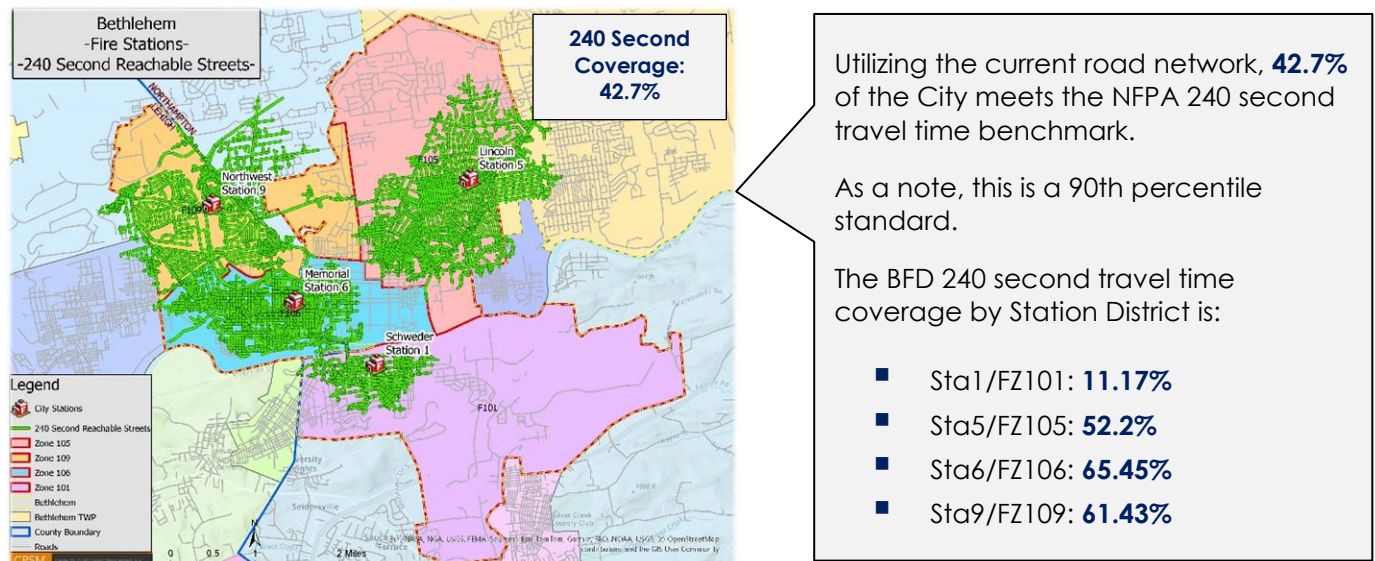
As travel time is affected by demand and workload on each station, road network, and traffic congestion, **CPSM recommends** the BFD adopt a 240 seconds travel time benchmark for the central core areas of each station district (+/- 2 miles travel distance) and 360 seconds travel time at the 90th percentile for low and medium hazards in the more distant areas of each district as a performance benchmark for the first arriving unit. This is a more realistic performance benchmark as the historical trends for travel time range from 5.8 minutes to 6.6 minutes over the ten-year period.

Response Time Spatial Analysis

Geographic Information Systems (GIS) provide a powerful analytical tool for evaluating fire department response capabilities and station distribution. By analyzing travel times spatially across a community, fire departments can identify areas that receive timely service, areas that experience extended response times, and locations where future growth may place additional demands on emergency resources. Unlike simple distance measurements, GIS-based travel-time modeling considers actual road networks, travel speeds, barriers, and access limitations to provide a more accurate representation of emergency response performance.

The next map presents spatial analysis for travel times from BFD stations. This map looks at the NFPA 240 second benchmark in totality (entire town coverage), then by district. When combining all stations, 42.7 percent of the city is covered when benchmarked against the NFPA 240 second first unit arrival standard utilizing the current road network.

Figure 20: BFD -All Stations: 240 Second Travel Time Bleeds (NFPA 1710 Benchmark)



Analysis of the 240-second travel times tell us:

The City, as a whole, has significant gaps in its ability to achieve the 240 second travel time benchmark. Individual station coverage ranges from 11.17% for Station 1's district to 65.45% for Station 6. As the demand maps indicate there is fairly high fire and EMS demand throughout the City, although it is somewhat more moderate in the southeastern quadrant.

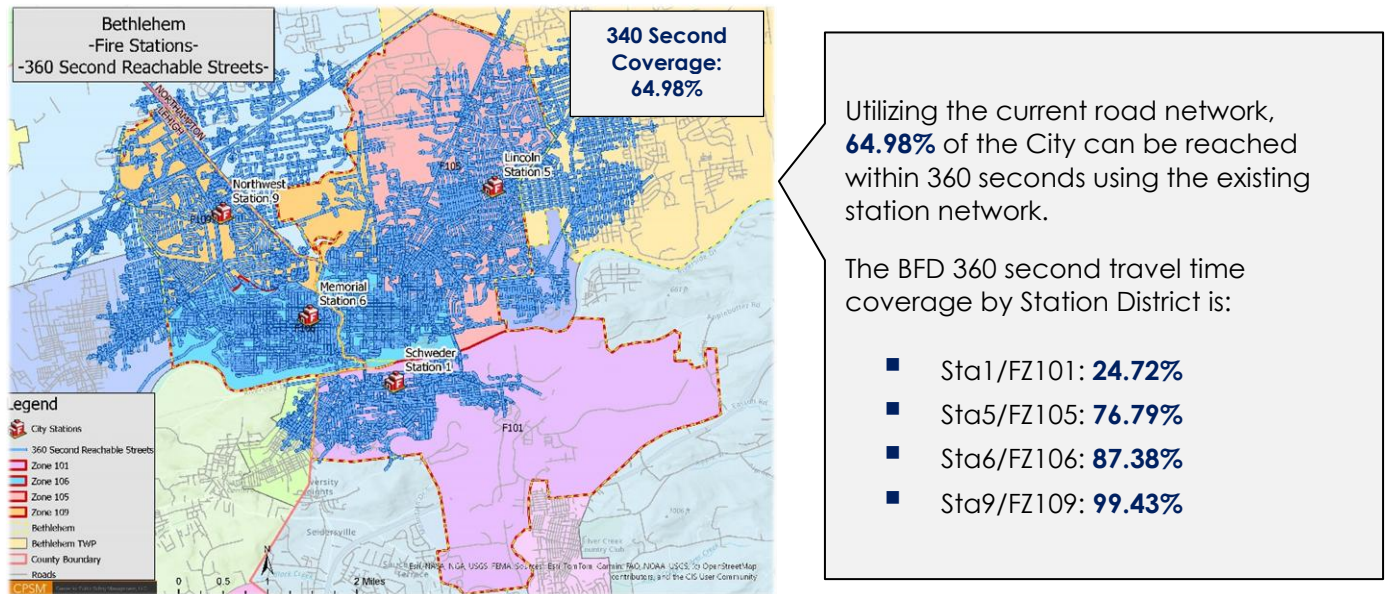
Previously CPSM recommended the BFD adopt a 240-second travel time benchmark for central core areas within each station district (approximately ± 2 miles of travel distance) and a 360-second travel time benchmark at the 90th percentile for low- and medium-hazard areas in the more geographically distant portions of each district, measured for the first arriving unit.

These benchmarks, as presented earlier, are recommended as more realistic and performance-appropriate standards based on historical response trends, which demonstrate average travel times ranging from approximately 5.8 to 6.6 minutes over the past ten years. Establishing tiered benchmarks that reflect both core and fringe service areas provides a more accurate and achievable framework for evaluating current performance and guiding future deployment and station location decisions.

The next map evaluates the NFPA 1710-360 second travel time benchmark as an alternative initial response travel time benchmark.

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Figure 21: BFD Districts: 360 Second Travel Time Reach



Analysis of the 360 second response time bleeds indicate nearly 2/3 of the city can be reached within 360 seconds from the exiting stations. The major gap area is the south side of the city where just under ¼ of the district is within reach. Conversely, Station 9's district in the northwest part of the City is nearly 100% covered.

CPSM assesses that based upon the GIS mapping the majority (57.3%) of the City of Bethlehem is not within the NFPA benchmark 240 second travel time from the nearest fire station. This coverage gap is especially acute in Station 1's first due area where 88.83% of the response district is more than a 240 second travel time from the station. Conversely, nearly 2/3 of the City is within a 360 second travel time from the existing fire stations.

CPSM recommends that as part of any long term strategic and/or capital planning process that the City of Bethlehem should strongly consider the construction of an additional fire station in the southeastern area of the city, an area that is experiencing significant industrial, warehousing, and commercial growth and which is well outside of the benchmark NFPA 240 second travel time for the first arriving unit and the CPSM recommended 360 second benchmark for response travel time. Staffing this station with one engine can be neutral by moving Engine 3 to the new station. **Financial impact: cost of a new fire facility with living quarters and contemporary fire facility features: \$5 million-12-million depending on the square footage, year built and cost labor and material at the time of construction.**

Effective Response Force and Critical Tasking

Even with the many advances in technology and equipment, the fireground is an unforgiving and dynamic environment where firefighters must complete critical tasks simultaneously. Lightweight wood construction, truss roofs, dwellings and buildings with basements, increased setbacks that make accessibility to the building difficult, and large footprint commercial buildings and estate homes are examples of the challenges that firefighting forces are met with when mitigating structural fires. Bethlehem is currently experiencing a moderate amount of new residential, multi-family, and large commercial construction. Most buildings constructed since 1980 most likely incorporate lightweight construction which contributes to rapid fire spread and the potential for early collapse of the entire structure. Large commercial buildings present

firefighters with different sets of hazards and risks. The challenge of rapid-fire spread is exacerbated by the use of lightweight roof trusses, vinyl siding, and combustible sheathing. The result is that more personnel are required to mitigate the incidents safely and effectively in these structures. Providing adequate staffing through an Effective Response Force for these environments depends on many factors.

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

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 fiscal 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:²⁶

- 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.

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.
- Garden Style Apartment.
- Open-Air Strip Mall/Commercial Building.
- High Rise.

26. NFPA 1710, 5.2.1.1, 5.2.2.2

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.

As already stated, for any given emergency to which BFD responds, there are critical tasks that must be completed. These tasks can range from the immediate rescue of trapped occupants within a burning structure to vehicle or water rescue when needed. A set of critical tasks have been developed in an effort to identify what resources are needed for each incident type. The following critical task analysis was performed independent of BFD policies; however, a comparison is provided.

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 intent of the risk management process is for the department to develop a standard level of safety while strategically aligning its resources with requests for service. Thus, the critical tasking presented herein will consider the ERF in relation to either a low-, moderate-, or high-risk classification.

When considering critical tasking for the deployment of an ERF for fire suppression operations, the BFD will not be able to manage most fire incidents other than a single-family dwelling fire with just its own resources. And for larger, more significant, or complex incidents, the department will need to consider resources from surrounding automatic and mutual aid partners.

It is also unlikely that the BFD would be capable of handling two simultaneous structure fires unless they are very small in scope and magnitude. It is also important to note that the impact of crew size as it relates to high-risk categories is greater than its low-risk implications and should be considered when staffing units. As all BFD's fire suppression resources are staffed with either two or three personnel, this potentially may create operational challenges (as it does in many other communities that utilize similar staffing models) when confronted with a building fire where the fire has already left the room of origin and is advancing in a free burning state.

Current daily staffing includes:

Assistant Chief: 1 Shift Commander E1: 1 officer & 2 FF E3: 2 FF's E5: 1 officer & 2 FF's Ladder 1: 2 FF's Ladder 2: 2 FF's	E6: 1 officer & 2FF's or 2 FFs E9: 1 officer & 2 FF's or 2 FF's depending on staffing level. An officer in a utility truck from Engine 6 covers district 6 & 9 based on officer staffing.
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Total on-duty staffing: Assistant Chief/engines/ladders: 19 when fully staffed.
Total on-duty when staffing at minimum at station 9: 18
Total on-duty when staffing at minimum at stations 6 and 9: 17

The following discussion and tables will outline how critical tasking and assembling an effective response force as recommended in NFPA 1710. Discussion later in this section will compare these benchmarks with operations in Bethlehem. This section will cover single-family dwelling buildings, open-air strip mall buildings, apartment buildings, and high-rise structures. It will also provide additional recommendations for critical tasking for other common types of emergencies that the BFD is called upon to mitigate.

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 for single family dwelling fires. **Single family dwellings represent the majority of building risk in Bethlehem.**

Table 27: 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)

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

Table 28: BFD Initial Response Force for Single-Family Dwelling Building

Apparatus	Personnel
BFD Assistant Chief	1
BFD Engine	2 – 3
BFD Engine	3
BFD Ladder	2
Total BFD Initial Response Force	8 – 9

As a single responding agency, the BFD's initial assignment is capable of initiating the primary critical tasks necessary to begin mitigating the incident. If all on duty resources are immediately available and dispatched on the initial response, and fully staffed the BFD meets this standard. NFPA 1710 also allows fire departments to rely on established automatic and mutual aid agreements to meet the requirements of Section 5.2, provided these resources are dispatched as part of the initial alarm.

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 29: 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 BFD 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 30: BFD Initial Response Force for Open-Air Strip Mall/Commercial Building

Apparatus	Personnel
BFD Assistant Chief	1
BFD Engine	2 – 3
BFD Engine	3
BFD Ladder	2
Total BFD Initial Response Force	8 – 9

As currently staffed, the BFD does not have sufficient resources available on duty to meet the minimum NFPA 1710 benchmarks for assembling an effective response force for an open-air strip mall or commercial building on a regular basis. The BFD's current initial assignment would not be capable of initiating many of the primary critical tasks necessary to begin mitigating the incident. If all on duty resources are immediately available and dispatched on the initial response and fully staffed the BFD can initiate the most urgent critical tasks. Even then the BFD is under resourced when compared to the NFPA 1710 benchmark. NFPA 1710 does allow fire departments to rely on established automatic and mutual aid agreements to meet the requirements of Section 5.2, provided these resources are dispatched as part of the initial alarm.

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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 31: 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 BFD assembles staffing and deployable resources as measured against NFPA 1710 benchmarking for an effective response force for an apartment building or other multi-unit, multi-floor residential building fire.

Table 32: BFD Initial Response Force for Apartment Building Fire

Apparatus	Personnel
BFD Assistant Chief	1
BFD Engine	2 – 3
BFD Engine	3
BFD Ladder	2
Total BFD Initial Response Force	8 – 9

As currently staffed, the BFD does not have sufficient resources available on duty to meet the minimum NFPA 1710 benchmarks for assembling an effective response force for an apartment building fire on a regular basis. The BFD's current initial assignment would not be capable of initiating many of the primary critical tasks necessary to begin mitigating the incident. If all on duty resources are immediately available and dispatched on the initial response and fully staffed the BFD can initiate the most urgent critical tasks. Even then the BFD is under resourced when compared to the NFPA 1710 benchmark. NFPA 1710 does allow fire departments to rely on established automatic and mutual aid agreements to meet the requirements of Section 5.2, provided these resources are dispatched as part of the initial alarm.

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High Rise, NFPA 5.2.4.4

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

Table 33: Effective Response Force for High-Rise Building

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

Table 34: BFD Initial Response Force for High Rise Building Fire

Apparatus	Personnel
BFD Assistant Chief	1
BFD Engine	2 – 3
BFD Engine	3
BFD Ladder	2
Total BFD Initial Response Force	8 – 9

A fire in this type of occupancy will require a significant response of mutual and automatic aid resources.

As currently staffed, the BFD does not have sufficient resources available on duty to meet the minimum NFPA 1710 benchmarks for assembling an effective response force for an apartment building fire. The BFD's current initial assignment would not be capable of initiating many of the primary critical tasks necessary to begin mitigating the incident unless all on duty units and personnel were available and dispatched on the initial alarm. Even then the BFD is under resourced when compared to the NFPA 1710 benchmark. NFPA 1710 does allow fire departments to rely on established automatic and mutual aid agreements to meet the requirements of Section 5.2, provided these resources are dispatched as part of the initial alarm.

As a single responding agency, the BFD's current response matrix to building fires is 3 fire suppression resources - 2 Engines, 1 Ladder, and 1 command officer/Assistant Chief for an Initial Response Force of 8-9 personnel initially dispatched.

The BFD benchmarks against the NFPA 1710 standard as outlined here:

Building Type	NFPA 1710 ERF*	BFD IRF**	BFD Deficiency
Single Family Dwelling	16 (17)	8/9	-8/8
Open-air strip center/commercial building	27 (28)	8/9	-19/19
Apartment Building	27 (28)	8/9	-19/19
High Rise Building	42 (43)	8/9	-34/35

* Number in parenthesis calculated when aerial ladder is deployed.

** Varies based upon whether Engine 9, which is normally staffed with just two personnel, is on the initial dispatch, and/or if Engine 6 is responding with a staffing of two.

CPSM assesses that the BFD is unable to assemble an Effective Response Force (ERF) on the initial alarm for a single-family dwelling fire utilizing the current response matrix. It also cannot assemble the recommended ERF for apartment and strip mall/commercial fires even if all on-duty resources are available to respond to the initial alarm. Finally, although the City has a significant number of high-rise buildings, the BFD – similar to many smaller and medium municipalities – is unable meet ERF benchmarks for that occupancy type. In situations where the ERF is not fully met, the units arriving on the initial alarm are still positioned to begin primary critical tasks necessary to start mitigating the incident provided that all on duty personnel and resources are available and dispatched on the initial alarm.

Two-In-Two-Out Standard

Another consideration, and one that links to critical tasking and assembling an Effective Response Force, is that of two-in/two-out regulations. Essentially, prior to starting any fire attack in an immediately dangerous to life and health (IDLH) environment (with no confirmed rescue in progress), the initial two-person entry team shall ensure that there are sufficient resources on-scene to establish a two-person initial rapid intervention team (IRIT) located outside of the building.

This critical tasking model outlined above has its genesis with the Occupational Safety and Health Administration, specifically 29 CFR 1910.134(g)(4). This standard is also cited in MIOSHA-STD-1208 (as amended April 26, 2021).

1910.134(g)(4): Procedures for interior structural firefighting. In addition to the requirements as set forth under paragraph (g)(3), interior structural fires, the employer shall ensure that:

- 1910.134(g)(4)(i)

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

- 1910.134(g)(4)(ii)

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

- 1910.134(g)(4)(iii)

All employees engaged in interior structural firefighting use SCBAs.

- ✓ Note 1 to paragraph (g): One of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.
- ✓ Note 2 to paragraph (g): Nothing in this section is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.

NFPA 1550, Standard for Emergency Responder Health and Safety, 2024 Edition, has similar language as CFR 1910.134(g)(4) to address the issue of two-in/two-out, stating the initial stages of the incident where only one crew is operating in the hazardous area of a working structural fire, a minimum of four individuals shall be required consisting of two members working as a crew in the hazardous area and two standby members present outside this hazard area available for assistance or rescue at emergency operations where entry into the danger area is required.

NFPA 1550 also speaks to the utilization of the two-out personnel in the context of the health and safety of the firefighters working at the incident. The assignment of any personnel including the incident commander, the safety officer, or operations of fire apparatus, shall not be permitted as standby personnel if by abandoning their critical task(s) to assist, or if necessary, perform rescue, this clearly jeopardizes the safety and health of any firefighter working at the incident.²⁷

In order to meet 1910.134(g)(4) (and MIOSHA), and NFPA 1550, the BFD must utilize two personnel to commit to interior fire attack while two firefighters remain out of the hazardous area or IDLH area to form the Initial Rapid Intervention Team (IRIT), while attack lines are charged, and a continuous water supply is established.

However, NFPA 1550 allows for fewer than four personnel under specific circumstances.²⁸

Initial attack operations shall be organized to ensure that, on arrival at the emergency scene, initial attack personnel find an imminent life-threatening situation where immediate action could prevent the loss of life or serious injury, such action shall be permitted with less than four personnel.

No exception as permitted above shall be allowed when there is no possibility to save lives.

The ability to assemble adequate personnel, along with appropriate apparatus to the scene of a structure fire, is critical to operational success and firefighter safety.

An important note here, that it was consistently reported to CPSM that the BFD makes every attempt to adhere to the provisions of the OSHA CFR and NFPA 1550 regarding the Two-In/Two-Out regulations, which stipulate that an interior fire attack should not be initiated until four personnel are assembled when there are no life-safety rescues to be made.

It is prudent to look beyond building fires when analyzing Effective Response Force. Other types of incidents, particularly those that could present responding personnel with an IDLH environment present to fire departments on a regular basis.

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27. NFPA 1550, 10.8.2.4, 2024 Edition.

28. NFPA 1550, 10.8.2.10, 2024 Edition.

Vehicle Fire

Initial BFD response to vehicle fires is one engine for most incidents. Once on scene the officer may special – call additional companies based on vehicle type (semi-truck, RV, etc.).

Table 35: Vehicle Fire

Critical Task	Needed Personnel No Exposures	Needed Personnel With Exposures/Life Hazards*
Incident Command	1	1
Pump Operator	1	1
Fire Attack Line	2	2
Backup Line/Secondary Attack Line	-	2
Water Supply	-	1
Check Fire Extension	-	2
Effective Response Force	4	9
BFD Response Provided	$\frac{3}{4}$	$\frac{3}{4}$

Note: *A reasonable alternative in this scenario is the dispatch/response of an initial first alarm structural fire assignment, or at a minimum, a “tactical box” of three fire suppression units, and one assistant chief. The same type of enhanced response assignment should also be considered for semi-trucks, buses, trains, etc.

Grass/Brush/Rubbish Fire

Initial response to outside grass/brush fires is a fire suppression unit. Once the company is on scene the officer may special call Brush 4 or additional needed resources.

Initial response to outside trash/rubbish fires is one fire suppression unit.

Table 36: Outside Fire – Grass/Brush/Rubbish

Critical Task	Needed Personnel
Incident Command	1
Pump Operator	1
Fire Attack Line	2
Effective Response Force	4
BFD Response Provided	$\frac{3}{4}$

Automatic Fire Alarm

The BFD normally dispatches a single fire suppression resource (Engine/Ladder) to automatic fire alarm systems. These types of responses need to be considered in the context of risk assessment and management. On one hand, consideration must be given to the potential risks, hazards, and even investigative complexity associated with various types of occupancies. Conversely, data and experience show that these system activations are rarely for an actual fire incident, and of those that are, they are often backed up by a phone call reporting a fire.

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Table 37: Fire Alarm System – Low Risk-No Confirmed Fire

Critical Task	Needed Personnel
Incident Command	1
Investigation	2-3
Effective Response Force	4
BFD Response Provided	$\frac{3}{4}$

Based upon needed personnel for an ERF for a low-risk fire alarm system, consideration should be given to maintaining the current initial response of:

1 Engine

Table 38: Fire Alarm System – Moderate Risk-No Confirmed Fire

Critical Task	Needed Personnel
Incident Command	1
Pump Operator	1
Investigation	3-4
Effective Response Force	5-6
BFD Response Provided	5

Based upon needed personnel for an ERF for a moderate risk fire alarm system, consideration should be given to increasing the initial response to:

■ 1 Engine, 1 Ladder

■ **Table 39: Fire Alarm System – High-Risk/High-Rise-No Confirmed Fire**

Critical Task	Needed Personnel
Incident Command	1
Pump Operator/Fire Department Connection	1
Investigation	3-4
Effective Response Force	5-6
BFD Response Provided	5

Based upon needed personnel for an ERF for a high-risk/ high-rise fire alarm system, consideration should be given to an initial response of:

■ 2 Engines, 1 Ladder

Gas Leak

BFD response to both interior gas leaks with 1 engine, 1 ladder and 1 district officer. For exterior gas leak the response is structural assignment:

Table 40: Natural Gas Leak – Interior and Exterior

Critical Task	Needed Personnel
Incident Command	1
Investigation/Air Monitoring	2
Pump Operator/Water Supply (If needed)	1
Protection Line (If needed)	2
Forcible Entry, Utility Control, Ventilation	2
Search and Rescue (If needed)	2
Establishment of an IRIT	2
Effective Response Force	12
BFD Response Provided Exterior	6
BFD Response Provided Exterior	8 – 9

Based upon needed personnel for an ERF for a natural gas leak, consideration should be given to an initial response of:

- 2 Engines, 1 Ladder, 1 Assistant Chief.

As indicated above, the ladders and often Engine 9 are staffed with just two firefighters who can operate as a crew without a first line supervisor. These personnel crew must depend on receiving instructions from the incident commander, the district officer, or one of the other officers. This structure severely strains the incident command system and could result in delays in critical tactical decisions concerning size-up, search and rescue, ventilation, and apparatus placement. CPSM believes that the performance of all fire suppression units could be improved if they are directly led and always supervised by a Fire Lieutenant.

Paragraph 3.3.15 on NFPA 1710 defines a company as “a group of members under direct supervision of and officer.”

Ultimately, decisions regarding on-duty fire department staffing rest with local government. It is important to recognize that OSHA regulations along with NFPA 1550 and 1710 specifically apply to interior firefighting operations; exterior-only fire operations are not governed by this portion of the OSHA standard, however there are hazards involved with these responses as well. The ability to assemble adequate personnel and appropriate apparatus at the scene of a structure fire and those incidents and hazards on the more routine fire department responses remains essential to operational effectiveness and firefighter safety. The placement of resources, station locations, and travel times all play significant roles in achieving this capability.

These factors must be carefully considered as Bethlehem determines its acceptable level of community fire risk, the financial resources available to invest in fire protection, and the staffing levels to meet those expectations. The City will need to weigh the cost-benefit of its current deployment model against potential alternative approaches.

CPSM recommends:

- As soon as possible the BFD expand the number of responding units and personnel through adjustments to current response matrixes and the use of automatic aid with the City of Allentown. With current staffing levels, any reported structure fire should result in the immediate dispatch of all on-duty BFD personnel and resources. This is especially important for moderate- and high-risk fire incidents. By leveraging automatic aid and adjusting initial alarm assignments to include all available BFD units, the department can improve its ability to

assemble an ERF within recommended benchmark times for higher-risk occupancies such as open-air strip centers, commercial buildings, and multi-building, multi-floor residential complexes.

- Over the near-mid-terms, the city should consider increasing minimum staffing on all fire suppression units to a minimum of three personnel.

- Ladder 1: 4 FF FTEs
- Ladder 2: 4 FF FTEs
- Engine 3: 4 FF FTEs
- Maintain minimum staffing of 3 on Engine 6
- Maintain minimum staffing of 3 on Engine 9

12 FF FTEs

Ladder 1-Upgrade four FTEs to Lieutenant-backfill with a new FF FTE.
Ladder 2-Upgrade four FTEs to Lieutenant-backfill with a new FF FTE.
Engine 3- Upgrade four FTEs to Lieutenant-backfill with a new FF FTE.

The overall goal is to increase minimum engine/ladder staffing on each shift to 21 personnel from the current minimum staffing of 19, and to maintain minimum staffing of 3 on Engine's 6 and 9. Increasing minimum on-duty staffing from 19 to 22 personnel per shift on engines/ladders is intended to strengthen firefighter safety, improve emergency response effectiveness, and enhance the department's operational resilience. Additional staffing enables incident commanders to assemble a larger and more capable Effective Response Force (ERF) more quickly, allowing critical fireground tasks such as fire attack, search and rescue, ventilation, rapid intervention, water supply, and command to occur simultaneously rather than sequentially. This reduces the time required to control incidents, limits fire growth, and improves life safety outcomes for both firefighters and the public.

From a firefighter safety perspective, increasing staffing helps ensure compliance with nationally recognized safe operating practices by reducing the need for personnel to work short-handed, decreasing individual workload and fatigue, and providing sufficient resources for rapid intervention and personnel accountability. Adequate staffing also improves the department's ability to maintain safe operations during multiple or complex incidents without relying excessively on mutual aid.

A complement of 21 company level personnel per shift enhances the department's capacity to sustain service levels during periods of high call volume, supports employee wellness through reduced operational stress, and better positions the organization to meet current service demands while considering community growth and increasing emergency response workload.

- ✓ Under this recommendation the BFD would be staffed as follows:

- Five engines staffed with three personnel: one officer and two firefighters (15 total).
- Two ladders staffed with three personnel: one officer and two firefighters (6 total).
- One Assistant Chief (1 total).

21 Company Level Total
22 Overall Total

- Over the longer term, the city should consider increasing minimum staffing on all single house engines and ladder companies to a minimum of four personnel.

- Engine 5: 4 FF FTEs
- Engine 9: 4 FF FTEs
- Ladder 1: 4 FFs
- Ladder 2: 4 FFs

8 FF FTEs

The two single house engine companies should be considered priority.

Staffing single-company engine stations with a minimum of four personnel is essential because these companies do not have the immediate support of a co-located ladder company or additional apparatus. In stations housing both an engine and a ladder company, personnel can often provide limited immediate assistance to one another during the initial stages of an incident. Single-engine stations, however, must operate independently until additional resources arrive, making it critical that the first-arriving engine has sufficient personnel to perform the essential tasks necessary to stabilize the incident safely and effectively.

A four-person engine company provides the minimum staffing necessary to begin multiple fireground functions simultaneously, including establishing a water supply, deploying, and advancing hose lines, conducting initial size-up, supporting search and rescue operations, and preparing for firefighter safety functions such as rapid intervention and accountability. With fewer than four personnel, these critical tasks must be completed sequentially rather than concurrently, delaying fire attack, increasing fire growth, and extending the time occupants are exposed to hazardous conditions. The additional firefighter also reduces individual workload, improves crew integrity, and enhances compliance with nationally recognized fireground safety practices.

✓ Under this recommendation the BFD would be staffed as follows:

- Three engines staffed with three personnel: one officer and two firefighters (9 total).
- Two engines staffed with four personnel: one officer and two firefighters (8 total).
- Two ladders staffed with four personnel: one officer and three firefighters (8 total).
- One Assistant Chief (1 total).

25 Company Level Total
26 Overall Total

In summary, CPSM recommends that the City should consider:

- Over the near-mid-terms – Increasing minimum staffing on all fire suppression units to a minimum of three personnel. This includes 12 new FTEs, and the upgrading of 12 FF positions to Lieutenant to ensure an officer on each apparatus. This increases minimum staffing on engines/ladders to 21 per shift (+ 3 from the current).
- Over the longer term, the city should consider increasing minimum staffing on all single house engines to a minimum of four personnel and the two ladder trucks to a minimum of 4 personnel. This includes 16 new FF FTEs. This increases minimum staffing on engines/ladders to 25 per shift (+ 4 from the near-mid-term recommendation and + 7 from the current engine/ladder staffing).

Financial Impact of Fire Staffing Recommendations

The phased implementation of CPSM's recommended staffing changes should be evaluated not only from an operational and service-delivery perspective, but also in terms of their long-term financial impact on the City. CPSM has recommended additional staffing to support the deployment of two ladder companies and the five engine companies, including the promotion of officers necessary to provide appropriate company-level supervision. While these recommendations will increase personnel expenditures, they represent a significant investment in the City's emergency response capabilities and should be considered within the broader context of service deployment, organizational sustainability, overtime, and the City's ability to maintain reliable minimum staffing.

Over the near-mid-terms, CPSM has recommended the City consider increasing minimum number of staffing on all fire suppression units to a minimum of three personnel. Currently Engines 1, 5, 6, and 9 are staffed with three personnel (Engines 6 and 9 can drop to two minimum if staffing is unavailable) and Engine 3 and Ladders 1 and 2 are staffed with two. Neither Engine 3 or Ladders 1 and 2 have company level officers.

The minimum staffing upgrades with the financial impact are outlined next. The cost shown includes 2026 minimum salaries for firefighter per the current collective bargaining agreement, plus \$47,234 for fringe benefits (total cost \$107,907.14), and the cost of promoting a firefighter to Lieutenant. For promotion to Lieutenant, a firefighter at the E step is eligible.

Position	Cost Impact
■ Upgrade 4 FF positions to Lieutenant: Ladder 1.	Single promotional cost: \$5,203.10 Four promotions to Lieutenant total cost: \$20,812.40
✓ Backfill promotions with 4 FF Trainee positions.	Total Compensation: \$107,907.14 x 4 = \$431,628.56
■ Upgrade 4 FF positions to Lieutenant: Ladder 2.	Single promotional cost: \$5,203.10 Four promotions to Lieutenant total cost: \$20,812.40
✓ Backfill promotions with 4 FF Trainee positions.	Total Compensation: \$107,907.14 x 4 = \$431,628.56
■ Upgrade 4 FF positions to Lieutenant: Engine 3.	Single promotional cost: \$5,203.10 Four promotions to Lieutenant total cost: \$20,812.40
✓ Backfill promotions with 4 FF Trainee positions.	Total Compensation: \$107,907.14 x 4 = \$431,628.56
Total Cost for this recommendation: \$1,357,322.88 phased in over the near to mid budget terms.	

Over the longer term, the city should consider increasing minimum staffing on all single house engines to a minimum of four personnel and the two ladder trucks to a minimum of 4 personnel. This includes 16 new FF FTEs. The minimum staffing upgrades with the financial impact are outlined next. The cost shown includes 2026 minimum salaries for firefighter per the current collective bargaining agreement, plus \$47,234 for fringe benefits.

Position	Cost Impact
Additional FF per shift on Engine 5: 4 Total	Total Compensation: \$107,907.14 x 4 = \$431,628.56
Additional FF per shift on Engine 9: 4 Total	Total Compensation: \$107,907.14 x 4 = \$431,628.56
Additional FF per shift on Ladder 1: 4 Total	Total Compensation: \$107,907.14 x 4 = \$431,628.56
Additional FF per shift on Ladder 2: 4 Total	Total Compensation: \$107,907.14 x 4 = \$431,628.56
Total Cost for this recommendation:	\$1,726,514.24 phased in over the longer budget terms. Engine 5 and Engine 9 as single house companies are the priority.

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Alternate Shift Schedules

Included in the scope of work for this analysis are alternate shift schedules. The Bethlehem Fire Department currently operates with four operational platoons and a rotating schedule consisting of nine-hour day shifts and 15-hour night shifts. This schedule, in accordance with the current collective bargaining agreement produces an average work week of approximately 42 hours. The current collective bargaining agreement also establishes a 16-day Fair Labor Standards Act (FLSA) 207(k) work period of 16 days. Under the same FLSA 207(k) work period, the minimum overtime standard is 121 hours (establishes the mark when premium pay is due the employee).

The Department currently has 96 operational personnel divided among four platoons, resulting in approximately 24 personnel assigned to each platoon. Daily minimum staffing is 18, while maximum staffing is 24. The six additional staff above the 18 minimum are utilized to fill vacancies created by scheduled and unscheduled leave and separation from the department.

This structure provides Bethlehem with the significant benefit of a relatively low average workweek and four separate staffing groups. However, it also means that the Department's available personnel are divided among four platoons. A three-platoon system would consolidate the workforce into three larger operational groups and increase the number of personnel assigned to each platoon.

While there are different versions of a four-platoon fire department schedule, a four-platoon fire department schedule generally produces an average work week of 42 hours. The basic math is straightforward:

- A 24/7 fire department requires 168 hours of coverage each week. If that coverage is divided among four equal platoons:

✓ $168 \div 4 = 42$ hours per platoon per week

This is why the traditional four-platoon model is often associated with a 42-hour average workweek.

Conversely,

- The same 24/7 fire department requires 168 hours of coverage each week. If that coverage is divided among three equal platoons:

✓ $168 \div 3 = 56$ hours per platoon per week

This is why the traditional three-platoon model is often associated with a 56-hour average workweek.

Examples of alternative four platoon schedules are included next. Regardless of the schedule, it will take the same current 96 FTEs that are assigned to the four platoon nine-hour day shifts and 15-hour night shifts, which accounts for the 24 maximum and 19 minimum model currently in use.

Schedule	Average Work Week	Four Platoons
■ 24 on/72 off	42 Hours	Yes
■ 24 on/48 off -24 on/96 off	42 Hours	Yes
■ 24 on/24 off -24 on/120 off	42 hours	Yes

Three-Platoon System

An additional alternative for consideration is a three-platoon schedule. As outlined previously, if the current 96 operational personnel were retained and redistributed among three platoons, each platoon would expand from the current maximum of 24 under a four platoon system to a maximum of 32 personnel. A comparison is outlined next.

	Current Four-Platoon	Three-Platoon
■ Operational personnel	96	96
■ Number of platoons	4	3
■ Personnel per platoon	24	32
■ Average workweek	42 hours	56 hours
■ Max Staffing	24	32
■ Difference in platoon complement		+8 personnel

The additional eight personnel per platoon is the most significant operational benefit of the three-platoon model. These personnel can be used to staff additional seats on apparatus as CPSM has recommended previously and also cover vacancies resulting from scheduled and unscheduled leave and separation from the department vacancies on shift.

As a review, CPSM recommended over the mid-term to increase shift minimum staffing by three (19-22). This additional staffing is focused on officers for each of the two ladders (2/per shift) and an officer on Engine 3 (currently no officer assigned-1/per shift). In actuality, this would require three promotions to Lieutenant on each shift (9 total on a three-platoon system) and three new firefighters per shift (9 total on a three-platoon system).

Overall, a three-platoon system would incorporate an additional eight staffing and fulfill mid-term staffing increase recommendations as follows:

- Minimum Company Level Staffing: 22
 - ✓ 1 Assistant Chief (1 Total)
 - ✓ Ladder 1: 1 Officer - 2 FFs (3 total)
 - ✓ Ladder 2: 1 Officer - 2 FFs (3 total)
 - ✓ Engine 1: 1 Officer - 2 FFs (3 total)
 - ✓ Engine 3: 1 Officer - 3 FFs (3 total)
 - ✓ Engine 5: 1 Officer - 2 FFs (3 total)
 - ✓ Engine 6: 1 Officer - 2 FFs (3 total)
 - ✓ Engine 9: 1 Officer - 2 FFs (3 total)

Daily Staffing – Current Maximum 25

Max Staff-32 (+8)

Min Staff-22 (+3) Includes the Assistant Chief

10 float positions to cover vacancies. (+5)

CPSM also made long-term staffing recommendations. These include consideration of increasing the minimum staffing on all single house engines and ladder companies to a minimum of four personnel. CPSM further recommended the single house engine companies (Engine 5 and

Engine 9) receive initial consideration. A three-platoon system would incorporate an additional eight staffing and fulfill mid-term staffing increase recommendations as follows:

■ Minimum Staffing: 26

- ✓ 1 Assistant Chief (1 Total)
- ✓ Ladder 1: 1 Officer - 3 FFs (4 total)
- ✓ Ladder 2: 1 Officer - 3 FFs (4 total)
- ✓ Engine 1: 1 Officer - 2 FFs (3 total)
- ✓ Engine 3: 1 Officer - 3 FFs (3 total)
- ✓ Engine 5: 1 Officer - 3 FFs (4 total)
- ✓ Engine 6: 1 Officer - 2 FFs (3 total)
- ✓ Engine 9: 1 Officer - 2 FFs (4 total)

Daily Staffing

Max Staff-32 (+5)

Min Staff-26 (+4) Includes the Assistant Chief

7 float positions to cover vacancies. (+1)

Examples of three platoon systems to consider as outlined next. There are more. All consist of a 24-hour work period followed by time off and have the same rotating cycle.

Schedule	Average Work Week	Three Platoons
■ 24 on/48 off Continuous Rotation. Works well with 14-day and 28-day FLSA work periods.	56 Hours	Yes
■ 24 on/24 off - 24 on/24 off -24 on/96 off Creates 3, 9-day cycles. Works well with the 27-day FLSA work period.	56 Hours	Yes
■ Starting on Saturday: 24 on/24 off – 24 on/72 off – 24 on/24 off – 24 on/48 off – 24 on/120 off – 24 on/24 off – 24 on24/off. Creates a 21-day cycle. Works well with a 21-day FLSA work period.	56 hours	Yes

Considerations: Moving from a Four Platoon System to a Three Platoon System

The most important financial and labor consideration is that moving from a 42-hour workweek to a 56-hour workweek represents an increase of approximately 14 scheduled hours per employee per week. This is an important distinction as the City would not be hiring 33 percent more people. Instead, the existing 96 employees would be scheduled for approximately 33 percent more hours.

Additionally, how the FLSA minimum standard overtime is agreed upon (the FLSA work period) will have an effect on what hours premium pay is applied. The current minimum overtime standard of 121 hours (16-day FLSA work period). Fire departments around the country utilize different FLSA work periods dependent on collective bargaining agreements or payroll guidelines.

An additional consideration is the impact on hourly rate. If annual salary remains unchanged while the scheduled work week increases from 42-hours to 56-hours, the mathematical straight-time hourly equivalent would decline, as overall hours per year will increase.

For example, if a firefighter's annual base salary were \$100,000:

- Current equivalent hourly rate: $\$100,000 \div 2,184 = \$45.79/\text{hour}$
(2,184 is a common annualized scheduled hours for a 42-hour workweek)
- 56-hour equivalent: $\$100,000 \div 2,912 = \$34.34/\text{hour}$
(2,912 is a common annualized scheduled hours for a 56-hour workweek on a 14 or 28-day FLSA work period))

There is a 25 percent reduction in the hourly equivalent because $(2,184 \div 2,912 = 75 \text{ percent})$.

CPSM realizes the FLSA regular-rate calculation per employee can be affected by the City's compensation structure, included/excluded compensation, and applicable collective bargaining provisions. Therefore, this calculation should be treated as an illustration of the potential impact that may be raised if a shift to a three-platoon system were to be considered.

Leave Use and Staffing Impacts

Leave utilization is an important consideration when evaluating the actual day-to-day staffing available within a career fire department. The number of authorized positions assigned to a platoon does not necessarily represent the number of personnel available to staff emergency response companies on any given day. Firefighters earn and use vacation, sick, personal, birthday, and other forms of leave throughout the year. As a result, a department may have a staffing complement that appears adequate on paper while routinely experiencing reductions in available personnel because of both scheduled and unscheduled absences.

This distinction is particularly important in Bethlehem. Although each platoon is assigned 24 firefighters, this does not mean that all 24 firefighters are available to work every shift. Daily staffing is routinely affected by planned leave, such as vacation and personal leave, as well as unplanned leave, particularly sick leave. Understanding these leave entitlements and their actual utilization is therefore an important component of evaluating the department's effective staffing capacity and determining whether authorized staffing levels are sufficient to consistently maintain the desired daily deployment.

As discussed, Bethlehem has an additional staffing resource in the form of five float positions per platoon. Float positions provide valuable flexibility and are intended, in part, to help absorb normal leave and other staffing requirements without immediately requiring overtime or reducing the number of staffed companies. However, float positions should not be viewed as a guarantee that leave will have no impact on daily staffing. Float personnel are employees who are themselves entitled to vacation, sick, personal, and other forms of leave. When a float firefighter is absent, that position is no longer available to provide relief for another employee's absence. Consequently, the availability of float personnel can fluctuate from day to day, and multiple simultaneous absences can quickly reduce the department's ability to use floaters as intended.

The interaction between leave and float staffing is particularly important when evaluating minimum staffing. For example, if several firefighters assigned to companies are on scheduled vacation while one or more float personnel are also unavailable because of sick or scheduled

leave, the department's effective staffing reserve may be significantly reduced. The result may be the need to use overtime, reassign personnel, hold positions vacant, adjust company staffing, or otherwise modify the daily deployment plan. In this respect, the five float positions provide a staffing buffer, but they do not eliminate the effects of leave on operational staffing.

Bethlehem's leave structure provides firefighters with significant annual leave opportunities. Each firefighter receives three personal days, one birthday leave day, and 21 sick days per year, with sick leave accrued quarterly and eligible for carryover up to 170 days. Vacation leave is awarded based on years of service, ranging from a prorated amount for employees with less than one year of service to 25 days for employees with 20 or more years of service. Based on the current workforce, 33 employees receive 16 vacation days, 33 receive 20 days, and 23 receive 25 days annually. These entitlements represent a substantial number of potential personnel absences over the course of a year and must be considered when determining the Department's effective staffing requirements.

The department's sick leave provisions also create the potential for significant variation in staffing availability. While sick leave is an earned benefit and an important component of employee compensation, its utilization is inherently unpredictable. Scheduled vacation and personal leave can generally be incorporated into staffing plans in advance, whereas unscheduled sick leave can occur with little or no notice. The operational impact is therefore not simply the total number of leave days used annually, but when those absences occur, how many employees are absent simultaneously, and whether sufficient relief personnel are available to cover them.

Not counted are vacancy hours (hours created on a shift when a separation occurs and there is not an immediate firefighter hired to replace the separated position).

CPSM analyzed leave usage for a three-year period (2023, 2024, 2025). The City's Human Resources Department provided the data, which is outlined next in hours.

<i>Calendar Year</i>	<i>Sick Leave Usage</i>	<i>Personal/Vacation Leave Usage</i>	<i>Workers' Comp. Leave Usage</i>
2023	10,219.20	17,037.75	3,076.80
2024	10,911.20	17,896.50	2,679.60
2025	9,296.00	19,042.25	2,158.80

In summary, over the three-year period, the Bethlehem Fire Department averaged approximately 30,773 hours of sick, personal/vacation, and workers' compensation leave annually. With four platoons, this equates to approximately 7,693 hours of leave per platoon per year.

On average, each platoon accounted for approximately:

- 2,536 hours of sick leave
- 4,498 hours of personal/vacation leave
- 660 hours of workers' compensation leave
- 7,693 total hours of leave annually

The data also shows a notable shift in the composition of leave. Personal/vacation leave increased each year, reaching more than 19,000 hours department-wide in 2025, while workers'

compensation leave declined substantially. Sick leave also declined in 2025 after reaching its three-year high in 2024.

From a staffing perspective, the approximately 7,700 hours of leave per platoon each year is significant. It demonstrates that the 24 firefighters assigned to each platoon cannot be viewed as 24 consistently available personnel. Leave occurs throughout the year and can affect both company staffing and the availability of the five float positions. In practical terms, the department must maintain sufficient staffing above its minimum operational requirements to absorb these predictable and unpredictable absences without routinely relying on overtime or reducing daily deployment. *It is important to note that this calculation is an average allocation of department-wide leave across the four platoons, not a measure of the actual leave used by each individual platoon. Actual leave utilization may vary considerably among platoons and from year to year.*

The five float positions per shift are scheduled for 2,184 hours/year per position (on average). This totals 10,920 hours, which in theory will cover the scheduled and unscheduled leave. Ultimately, the presence of five float positions provides Bethlehem with an important staffing resource, but the existence of floaters should not be interpreted as meaning that all 24 positions assigned to each platoon will routinely be available for deployment. Float positions are themselves subject to leave and other absences, and their effectiveness as a relief resource depends on their actual availability when other personnel are absent.

§§§

End of Section

SECTION 5. EMERGENCY MEDICAL SERVICES

EMS Division Overview



Emergency Medical Services (EMS) is a core component of the City of Bethlehem's public safety delivery system. Alongside fire suppression, law enforcement, and emergency management, EMS operations form a critical element of the community's safety infrastructure. EMS responses represent the majority of emergency service workload in most modern fire and rescue organizations, and Bethlehem is no exception. The delivery of timely, effective, and clinically sound prehospital medical care remains a central responsibility of the City's emergency services system.

The City of Bethlehem delivers Emergency Medical Services through the Bethlehem Bureau of EMS (BEMS), which operates within the organizational structure of the Bethlehem Fire Department. While EMS personnel are administratively aligned under the Fire Department command structure and EMS units are co-located within select fire stations, the EMS division functions operationally as a largely independent service component. This hybrid structure presents both opportunities and challenges. Co-location of resources offers the potential for enhanced interoperability, shared training, and coordinated response strategies; however, when operational integration is limited, the benefits of co-location may not be fully realized, resulting in parallel service delivery models rather than a fully integrated fire-EMS system.

Bethlehem Emergency Medical Services (BEMS) serves as the primary EMS provider for the City of Bethlehem and provides both Basic Life Support (BLS) and Advanced Life Support (ALS) services to the community. The primary service area encompasses 19 square miles, divided into six EMS districts, with ambulance resources strategically deployed throughout the city to support effective response coverage. BEMS operates eight frontline ambulances, which provide emergency medical response, patient stabilization, and transport to regional healthcare facilities.

EMS incidents constitute the majority of total emergency responses within the City of Bethlehem. In 2025, Bethlehem EMS responded to 12,260 total calls for service, of which approximately 94 percent were EMS-related incidents, reinforcing the role of EMS as the dominant driver of operational workload. Mutual aid responses accounted for approximately five percent of responses, while fire-assist calls accounted for approximately one percent of the total incident volume.

Over the past decade, EMS demand in Bethlehem has demonstrated a measurable upward trend. Annual call volume ranged from 8,608 calls in 2019 to 12,260 calls in 2025, representing a significant increase in service demand over a relatively short period. This growth reflects broader national and regional trends in EMS utilization, including increased reliance on emergency medical services as a primary point of access to healthcare for many residents.

The operational workload associated with this demand is further illustrated through the number of total unit responses, commonly referred to as "runs." In 2025, BEMS units completed 14,479 total runs, representing the true workload placed upon system resources. These responses

resulted in approximately 8,768.7 total deployed hours, reflecting the time units remained committed to active incidents. This level of activity highlights the importance of maintaining sufficient staffing levels and system resiliency to ensure consistent availability of emergency medical resources.

The EMS system in Bethlehem emphasizes rapid response, patient stabilization, and safe transport to appropriate receiving facilities. EMS crews respond to a wide range of medical emergencies, including cardiac events, respiratory distress, traumatic injuries, behavioral health emergencies, overdoses, and other acute medical conditions. In 2025, EMS incidents averaged 31.4 EMS calls per day, demonstrating the consistent demand placed upon the system. Illness-related calls represented the largest portion of EMS incidents, accounting for approximately 40 percent of all EMS calls, followed by fall and injury incidents and cardiac-related emergencies.

Transport capability is a central function of the Bethlehem EMS system. In 2025, the system completed 9,736 patient transports, resulting in an overall transport conversion rate of approximately 84.8 percent, which is consistent with national EMS system norms. This high transport rate reinforces the importance of ambulance availability and highlights the operational dependency on maintaining adequate unit staffing and deployment strategies.

In addition to primary response responsibilities, Bethlehem EMS participates in mutual aid operations with surrounding jurisdictions. External EMS agencies provided assistance to Bethlehem on 820 incidents in 2025, illustrating the importance of regional cooperation but also highlighting periods where local resources were unavailable due to concurrent incident demand. Mutual aid reliance is an important indicator of system resiliency and should be closely evaluated when assessing staffing and deployment strategies.

Emergency Medical Services delivery within Bethlehem reflects many of the characteristics commonly observed in modern urban EMS systems, including increasing call volumes, higher service expectations, and expanding clinical responsibilities. EMS personnel routinely manage both high-acuity, time-sensitive emergencies and lower-acuity medical complaints, requiring a balanced system capable of managing simultaneous incidents without compromising response reliability.

CPSM assesses that Emergency Medical Services represents the primary workload driver for the City of Bethlehem's emergency response system, with sustained increases in call volume, transport activity, and deployed unit hours placing measurable pressure on existing staffing and deployment models. Continued growth in demand will require careful evaluation of system capacity, resource availability, and operational integration to maintain service reliability and response effectiveness.

Service Area

The Bethlehem Bureau of EMS operates from four strategically distributed facilities throughout the city. These facilities provide geographic distribution across the city and support the deployment of ambulance resources into each of Bethlehem's primary response districts. The current station configuration provides reasonable geographic coverage of both the North and South Side service areas while allowing EMS units to access major transportation corridors and population centers. The primary service area is the City of Bethlehem.

A non-engineering assessment of station locations indicates that the existing facilities generally support current deployment requirements; however, several stations are older structures originally designed for historical fire service operations rather than modern EMS delivery models. As a result, some facilities may experience limitations related to apparatus bay dimensions, crew

living accommodations, storage capacity, technology infrastructure, energy efficiency, and future expansion capability.

The co-location of EMS units within fire stations provides opportunities for improved interoperability, shared resources, and coordinated emergency response. However, facility layouts and station design should continue evolving to support modern EMS operational requirements, including enhanced infection-control practices, secure medication storage, decontamination areas, technology integration, and workforce wellness considerations.

Ambulance locations in the service area are illustrated next.

Figure 22: BEMS Ambulance Locations



The response configuration includes:

- Medic 1 – 419 East Fourth Street (Joint Fire/EMS Facility)
In service 24/7/365.
- Medic 2 – 540 Stefko Boulevard
In service 12 hours per day from 8:00 AM to 8:00 PM – 7 days a week.
- Medic 6 – 521 West Broad Street (Joint Fire/EMS Facility)
In service 12 hours per day from 11:00 AM to 11:00 PM – Tuesday, Wednesday, Thursday however it often is not in service on Tuesdays due to an inability to staff it.
- Medic 7 – 201 Dewberry Avenue
In service 24/7/365.

CPSM recommends that the City of Bethlehem and BEMS consider:

- Including EMS stations or space in any facilities long-range renovation planning that is focused on apparatus accommodations, crew facilities, technology infrastructure, and operational efficiency.
 - ✓ Any facility upgrades should include opportunities to enhance decontamination areas, infection-control measures, and secure medical supply storage.

Financial Impact dependent on space selected and needed upgrades to accommodate EMS crews and fleet as wells as materials and labor cost at the time of the renovation.

- Monitor future development, population growth, and EMS demand trends to determine whether additional EMS deployment locations may be warranted.
 - ✓ Utilize GIS-based travel time modeling and system status analysis to periodically validate station locations and deployment effectiveness.

EMS Mutual Aid

Review of mutual aid response activity demonstrates that surrounding EMS agencies play a consistent and operationally significant role in supporting the Bethlehem EMS system during periods of peak demand and resource commitment. Over the ten-year study period, mutual aid responses into the City of Bethlehem ranged from 533 calls in 2018 to a peak of 1,128 calls in 2022, with more recent years stabilizing between 820 and 1,004 annual responses.

Table 41: Aid Receiving Calls by Agency and Year

Year	Agency				Total Calls
	Bethlehem Twp EMS	Dewey EMS	Hanover Twp EMS	Other	
2016	524	121	1	5	649
2017	515	234	6	3	754
2018	368	158	6	5	533
2019	368	174	112	32	681
2020	306	165	102	16	584
2021	442	253	159	34	874
2022	564	286	255	44	1,128
2023	507	206	267	34	1,004
2024	400	194	224	19	830
2025	459	164	185	22	820

Bethlehem Township EMS consistently provided the largest share of mutual aid responses across the study period, followed by Dewey EMS and Hanover Township EMS. The presence of recurring mutual aid utilization indicates that external resources are frequently required to maintain response coverage during periods of overlapping incidents or when frontline Bethlehem EMS units are already committed to active calls.

While mutual aid support represents a valuable regional strength and demonstrates strong interagency cooperation, sustained reliance on outside agencies also serves as an indicator of system workload pressure and reduced internal resiliency. The overall trend reflects the growing

demand placed upon Bethlehem EMS resources and reinforces the importance of evaluating staffing levels, deployment practices, and system capacity to ensure reliable service delivery as call volume continues to increase.

Bethlehem EMS also provided mutual aid to surrounding jurisdictions.

Table 42: Aid Given Calls and Year

Year	Total Aid Given Calls	Highest Mutual Aid Zone Receiving Aid from BEMS
2016	286	Ma-S: 199
2017	362	Ma-S: 278
2018	304	Ma-S: 207
2019	353	Hellertown: 93
2020	413	Bethlehem Twp.: 110
2021	677	Bethlehem Twp.: 134
2022	639	Hellertown: 110
2023	690	Hellertown: 188
2024	557	Hellertown: 124
2025	602	Hellertown: 152

Ma-S are mutual aid calls provided by BEMS to areas south of the city not otherwise captured by the municipality name.

EMS Demand Analysis and Resiliency

Demand includes the types of calls to which EMS units respond, the frequency of those calls, and the geographic distribution of incidents throughout the service area. Demand drives workload and directly influences station location, staffing levels, and deployment strategies. Areas with higher population density and increased service demand require greater resource availability. Sustained or increasing demand affects the resiliency of EMS systems and may translate into longer response times when available units are committed to other incidents.

EMS demand presents additional operational considerations, including the availability of staffed ambulances and crews, the frequency of simultaneous incidents, and the reliance on mutual aid resources when local units are unavailable. In systems such as Bethlehem, where a limited number of frontline units are staffed at any given time, maintaining adequate resource availability during peak demand periods is essential to preserving response reliability.

Throughout this discussion, a call is an emergency service request or incident. A run is a dispatch of a unit (i.e., a unit responding to a call). Thus, a call may include multiple runs (units).

Runs are the true workload of an-EMS department.

The following table outlines call distribution by category for EMS-related responses in Bethlehem during 2025. Of the 12,260 total calls responded to by BEMS during the study period:

- 94 percent were EMS calls (11,477 total).
- 1.5 percent were fire-assist calls (181 total).
- 4.9 percent were mutual aid responses to surrounding jurisdictions (602 total).

Table 43: EMS Calls by Type and Percentage Responded To 2025

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	1,198	3.3	9.8
Cardiac and stroke	1,260	3.5	10.3
Fall and injury	1,853	5.1	15.1
Illness and other	4,899	13.4	40.0
MVA	104	0.3	0.8
Overdose and psychiatric	1,083	3.0	8.8
Seizure and unconsciousness	1,080	3.0	8.8
EMS Subtotal	11,477	31.4	93.6
Fire assist	181	0.5	1.5
Mutual aid	602	1.6	4.9
Total	12,260	33.6	100.0

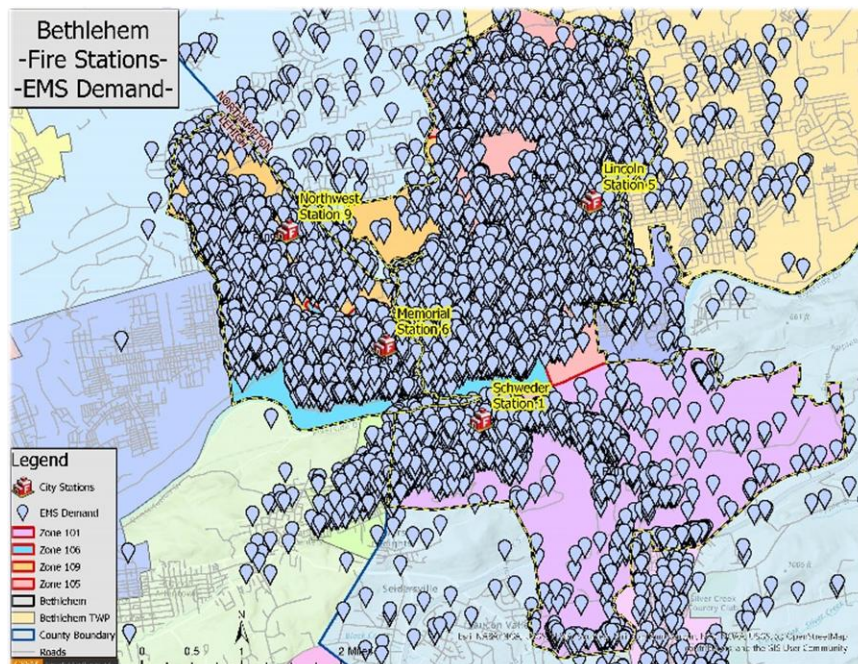
Higher acuity calls highlighted in red accounted for 29% of all calls in 2025.

Lower acuity illness and other calls highlighted in orange accounted for 40% of all calls in 2025.

These figures demonstrate that EMS-related incidents constitute the overwhelming majority of service demand within Bethlehem, consistent with national trends in municipal EMS systems where medical emergencies represent the dominant workload component. The high percentage of EMS-related incidents reinforces the need for a deployment model focused on maintaining ambulance availability and managing overlapping incidents across the service area.

The figure below illustrates EMS demand spatially.

Figure 23: EMS Demand



EMS demand is concentrated in the core central areas of the city as well northside, westside, and southwest. The southeast area of the city has moderate demand in built upon residential areas.

EMS demand also includes EMS mutual aid responses outside of the primary response area of the city.

Run Type	Total Runs	Runs per Day
Breathing difficulty	1,367	3.7
Cardiac and stroke	1,502	4.1
Fall and injury	2,223	6.1
Illness and other	5,616	15.4
MVA	158	0.4
Overdose and psychiatric	1,309	3.6
Seizure and unconsciousness	1,385	3.8
EMS Subtotal	13,560	37.2
Fire assist	233	0.6
Mutual aid	686	1.9
Total	14,479	39.7

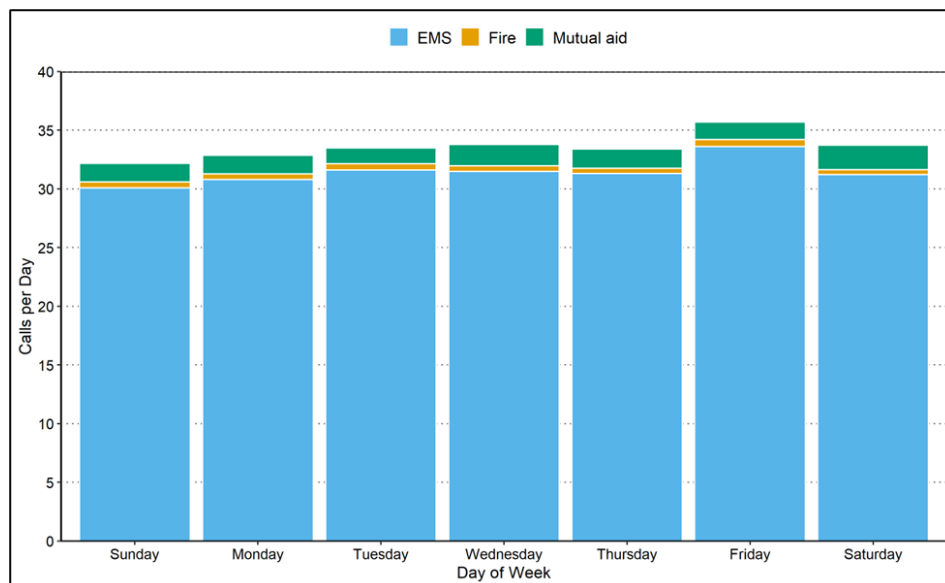
In addition to call volume, total unit activity further illustrates system workload demands. During 2025, BEMS responded to 14,479 total runs, reflecting the dispatch of multiple units to certain incidents and highlighting the cumulative workload placed on available EMS resources.

This level of activity underscores the importance of maintaining adequate frontline unit staffing to support system resiliency and minimize delays in response to subsequent incidents.

It is important to evaluate EMS response activity temporally over time, including calls by month, calls by hour of the day, and calls by day of the week. Understanding temporal demand patterns assists in identifying peak workload periods, aligning staffing levels, and improving overall system resiliency.

The following figures illustrate temporal demand patterns for Bethlehem Emergency Medical Services (BEMS). First, responses were analyzed by day of the week. Demand remains relatively consistent across most days, with minor variation. The highest demand occurs on Friday, averaging approximately 35.7 calls per day, while the lowest demand occurs on Sunday, averaging approximately 32.2 calls per day. These variations are modest and indicate that EMS demand remains stable throughout the weekly operational cycle.

Figure 24: Calls by Day of the Week (2025)



The peak demand day is Friday. Other than Sunday (lowest demand day), demand is consistent the remaining five days.

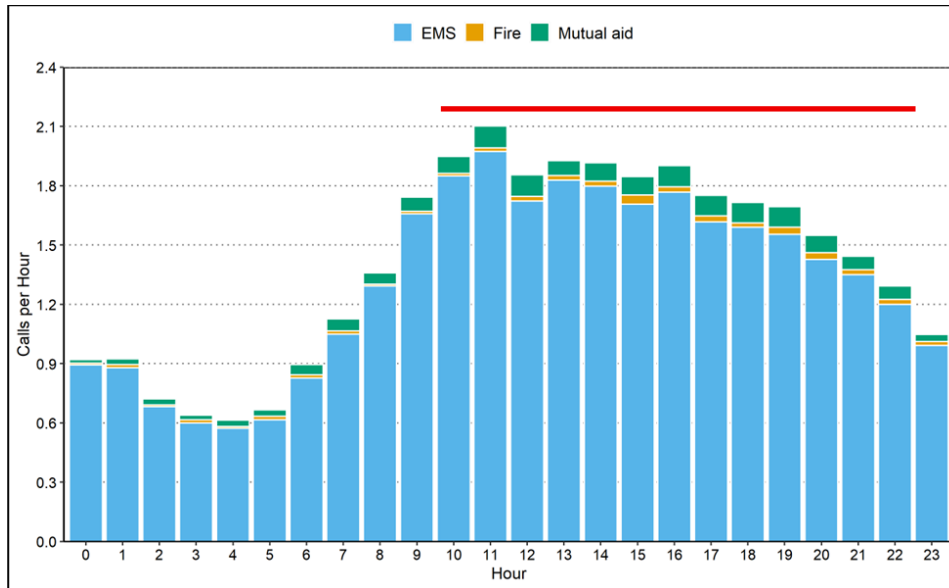
Currently BEMS has a peak demand unit in service on Tuesday, Wednesday, Thursday.

Thursday, Friday, Saturday align better with a peak demand unit.

Next we examine calls by hour of the day. As the analysis demonstrates, call demand is lowest during overnight hours and increases steadily during daytime operations. The lowest demand occurs between 2:00 a.m. and 6:00 a.m., averaging approximately 0.66 calls per hour. Demand

increases significantly, beginning in the late morning and continues through the afternoon and early evening hours. The highest demand occurs between 10:00 a.m. and 5:00 p.m., averaging approximately 1.93 calls per hour, with the overall peak occurring between 11:00 a.m. and noon at approximately 2.10 calls per hour.

Figure 25: Calls by Hour of Day (2025)



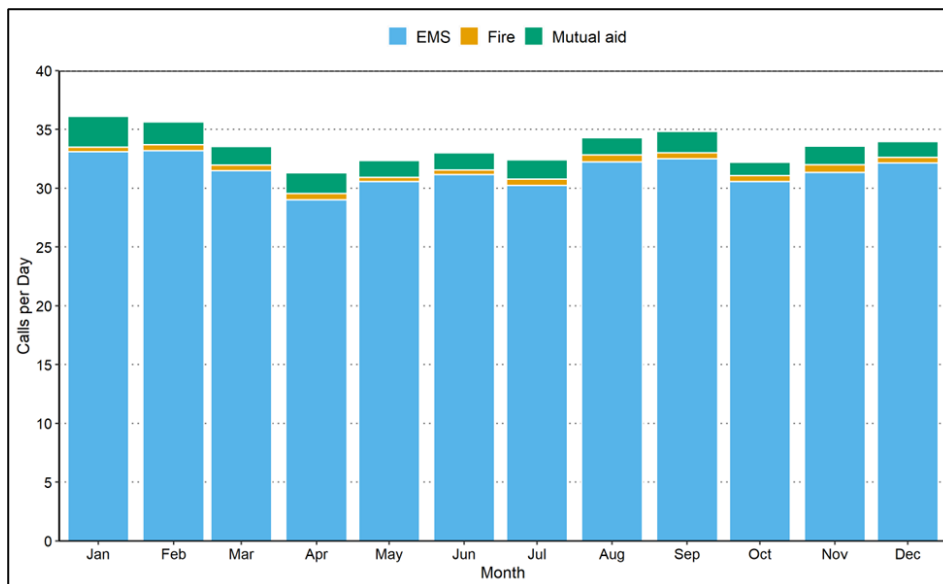
Peak demand hours occur between 9:00 am and 9:00 pm.

Peak time units staffing considerations should consider this timeframe.

The current peak time unit staffs from 11:00 am-11:00 pm., aligns with the data within two hours.

Next, EMS demand was analyzed by month of the year (calls per day). Demand levels remain relatively consistent throughout the year, with modest seasonal variation. Overall call demand peaked in January, averaging approximately 36.1 calls per day, while the lowest demand occurred in April, averaging approximately 31.3 calls per day. EMS call volume followed similar trends, with slightly higher activity during winter months and reduced activity during early spring months.

Figure 26: Calls by Month 2025



These temporal demand patterns demonstrate that Bethlehem EMS experiences predictable daily and seasonal workload cycles. The concentration of demand during daytime hours reinforces the importance of maintaining sufficient frontline ambulance availability during peak operational periods, particularly within a deployment model utilizing a limited number of continuously staffed units.

Overlapping Calls

The frequency of overlapping calls is a critical indicator of EMS system workload and resiliency. Overlapping incidents occur when one or more units are already committed to an active call when an additional call for service is received. As the number of simultaneous calls increases, available resources become limited, potentially increasing response times and reliance on mutual aid resources.

As shown in the table below, 36.9 percent (4,526 calls) occurred without any overlapping, meaning that in just over one third of incidents, a unit was available to respond without competing demand. However, the remaining 63.1 percent of calls occurred while at least one other call was already in progress, indicating that simultaneous incident demand is common within the Bethlehem EMS system.

Table 44: Frequency of Overlapping calls (2025)

Scenario	Number of Calls	Percent of Calls	Total Hours
No overlapped call	4,526	36.9	3,026.9
Overlapped with one call	4,694	38.3	1,631.1
Overlapped with two calls	2,553	20.8	583.4
Overlapped with three calls	456	3.7	72.4
Overlapped with four calls	26	0.2	2.8
Overlapped with five calls	3	0.0	0.4
Overlapped with six calls	1	0.0	0.2
Overlapped with seven calls	1	0.0	0.0

36.9% of all calls did not have an overlapping call.

38.3% of all calls had one overlapping calls.

24.7% of all calls were overlapped with two of more calls.

The most frequent overlapping occurred when calls overlapped with one additional call, representing 38.3 percent of all incidents. Calls overlapping with two simultaneous incidents accounted for 20.8 percent, while 3.7 percent of calls overlapped with three concurrent incidents. Although less frequent, higher-order overlapping events (four or more simultaneous calls) were observed and represent periods of significant system stress and reduced resource availability.

From a workload perspective, overlapping incidents accounted for a substantial portion of deployed unit hours. Of the total deployed time represented in this analysis, more than half of system workload hours occurred during periods of overlapping calls, reinforcing that simultaneous demand and not simply total call volume is a primary driver of operational stress within the Bethlehem EMS system.

The next table looks at the frequency of calls in an hour.

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Table 45: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	2,299	26.2
1	2,854	32.6
2	2,057	23.5
3	1,052	12.0
4	378	4.3
5	103	1.2
6+	17	0.2
Total	8,760	100.0

This resiliency measure is the frequency distribution of calls, or how many calls occur in an hour.

The table to the left tells us that citywide, 26 percent of the time there are no calls in an hour; 56 percent of the time there are one or two calls in an hour; and 18 percent of the time there are three to six plus concurrent or overlapping calls in an hour.

EMS Transport Unit Demand

Analyzing EMS transport data and EMS transport unit resiliency is essential to ensure that emergency medical services can maintain timely and effective patient care despite growing challenges and call demand in the system. Increasing hospital offload wait times, extended transport durations, and limited ambulance availability all contribute to potential service delays and reduced system capacity.

Evaluating transport resiliency helps identify bottlenecks, assess resource adequacy, and develop strategies to sustain response performance during peak demand or system stress. By closely monitoring these factors, agencies can strengthen operational reliability, optimize unit utilization, and enhance patient outcomes through more resilient EMS delivery.

The next table looks at ambulance transport conversion rate (rate of calls that resulted in a transport). Overall, the call to transport ratio is 82.1 percent (27 transports/day).

Table 46: EMS Call to Transport Conversion Rate

Call Type	Number of Calls			Conversion Rate
	Non-Transport	Transport	Total	
Breathing difficulty	78	1,120	1,198	93.5
Cardiac and stroke	109	1,151	1,260	91.3
Fall and injury	291	1,562	1,853	84.3
Illness and other	940	3,959	4,899	80.8
MVA	65	39	104	37.5
Overdose and psychiatric	82	1,001	1,083	92.4
Seizure and unconsciousness	176	904	1,080	83.7
EMS Subtotal	1,741	9,736	11,477	84.8
Fire & Other	457	326	783	41.6
Total	2,198	10,062	12,260	82.1

**27
transports
per day**



Table 47: Time Component Analysis for Transport Runs by Run Type (Minutes)

Run Type	Average Time Spent per Run				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	15.4	10.1	13.7	46.6	1,123
Cardiac and stroke	15.0	10.4	13.2	46.2	1,164
Fall and injury	13.2	10.4	11.6	44.0	1,585
Illness and other	13.1	10.2	11.4	43.5	3,986
MVA	9.9	10.0	13.1	40.1	44
Overdose and psychiatric	11.1	9.2	11.4	40.3	1,005
Seizure and unconsciousness	16.3	10.5	13.8	47.7	910
EMS Subtotal	13.7	10.2	12.1	44.3	9,817
Fire & Other	14.3	11.7	12.6	49.3	327
Total	13.7	10.2	12.2	44.5	10,144

Overall, transport times are efficient as outlined here:

- Transport unit on-scene time for EMS calls is on average 13.7 minutes and for fire and other call types is 14.3 minutes (**very efficient**).
- Travel time to hospital is on average 10.2 minutes (**very efficient**).
- Hospital turnover time is on average 12.2 minutes. **This is very efficient** and significantly increases ambulance resiliency.
- Total deployed transport unit time is on average 44.5 minutes.

Additionally, CPSM analyzed ambulance times where a transport did not occur. On average a BEMS ambulance was on scene 27 minutes when EMS calls did not require a transport.

Overall, BEMS EMS transport times are efficient resulting in only moderate resiliency issues.

The next table outlines primary BEMS receiving hospitals.

Table 48: Primary BEMS Receiving Hospitals

Destination	Average Time Spent per Run				Number of Runs	Percent of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed		
Lehigh Valley Hospital -Muhlenberg	14.5	9.7	11.8	44.8	3,448	34.0
St. Luke's Hospital – Anderson	14.2	14.0	15.6	53.1	431	4.2
St. Luke's Hospital – Bethlehem	13.2	10.3	12.1	43.7	6,090	60.0
Other	13.9	10.0	12.9	44.6	175	1.7
Total	13.7	10.2	12.2	44.5	10,144	100.0

Primary receiving hospitals for BEMS include St. Luke's Hospital – Bethlehem (6,090), Lehigh Valley Hospital – Muhlenberg (3,448), and St. Luke's Hospital – Anderson (431). Other regional hospitals accounted for a smaller number of transports (175).

Historically in Bethlehem, EMS incidents represent a majority of service demand across fire and EMS. From 2016 to 2015, EMS call volume has increased 9 percent. In tears 2028, 2019, and 2020, calls trended down from 2017. Between 2020 and 2025, calls have increased each year with a slight decrease in 2023.

The transport conversion ration has remained consistent over the ten-year period. The ten-year average transport conversion ratio is 83.96 or 84 percent. This high ratio creates transport unit resiliency challenges, particularly during off-peak hours when there are two transport vehicles available for calls.

Table 49: EMS Call Volume and Transport by Year

Year	EMS Call			
	Non-Transport	Transport	Total	Conversion Rate
2016	1,558	8,947	10,505	85.2
2017	1,585	9,257	10,842	85.4
2018	1,282	7,150	8,432	84.8
2019	1,308	6,848	8,156	84.0
2020	1,675	7,480	9,155	81.7
2021	1,819	8,452	10,271	82.3
2022	1,834	8,856	10,690	82.8
2023	1,733	8,863	10,596	83.6
2024	1,686	9,522	11,208	85.0
2025	1,741	9,736	11,477	84.8

Ambulance Unit Hour Utilization

When analyzing workload and resiliency of EMS transport units, Unit Hour Utilization (UHU) is often used to measure transport utilization or productivity. The most widely used methodology to calculate EMS UHU is the total number of hours ambulances are staffed (in-service) divided by total number of transports. Regarding this measure, the higher the UHU the more productive the ambulance is, meaning the system is making more transports with fewer ambulances. Private EMS systems utilize this measure frequently when calculating expenditure vs overall costs. This higher utilization of course has a potential impact on the crews doing the work.

In a fire-based EMS transport system, ambulance staff are typically cross trained (fire and EMS), and ambulances are dispatched to fire incidents to stand-by in the event someone from the public or on-scene firefighter needs treatment and/or transport to a hospital. Crew members are also included in the calculation for the Effective Response Force and often engage in assigned critical tasks.

UHU also describes the amount of time a unit is not available to respond when committed already to another incident. The larger the UHU the greater the utilization and the less the unit is available for responses. Additionally, the higher the utilization the higher the frequency of crew fatigue, which in EMS can lead to patient care errors. Lastly, the higher the UHU equals reduced time crews have to complete other daily tasks; some required such as training, physical conditioning, report writing, and associated administrative tasks.

There is no generally accepted UHU, as EMS systems can be EMS only, fire based, emergency only, non-emergency transport, or both emergency and non-emergency transport. Systems nationally also staff differently in terms of total shift segments (8, 12, and 24 hours are the most common). That said, many Academy of International Mobile Healthcare Integration (AIMHI) member organizations use 0.228 – 0.476 as an acceptable range.²⁹ Some urban based EMS systems use .25 -.35 as a UHU range, while others utilize an upper range of .45. Many EMS only systems however staff with shifts of less than 24 hours. The fire service views UHU above .25 -.30 as creating resiliency issues, which lead to increased response times.³⁰

CPSM utilized two methods to calculate system UHU for this analysis. First, we calculated UHU based on the number of transports divided by total unit hours (all transport units) and next we divided total individual unit minutes deployed in a day divided by minutes in a day. The results are outlined below.

Total Transport/Total Unit Hours

Total BEMS transports/total unit hours (in a year) yield an overall system UHU of .42.

Using this methodology, BEMS operates outside of the generally accepted urban EMS utilization range (.25–.30) but below the upper range of .45 and operates in the upper range of the AIMHI recommended operating range (0.228-0.476). ***This indicates that frontline ambulance resources are actively utilized and operating at levels typically associated with system strain during peak times and persistent use of mutual aid as reviewed earlier.***

Table 50: UHU: Total Transports/Total Unit Hours (2025)

Number of Frontline Ambulances: 4 Total Unit Hours: 23,772 (24x2x365 =17,520) (12x1x365=4,380) (12x3x52=1,872) Number of Transports: 9,736	Number of Transports (10,062)/Total Unit Hours (23,772) $UHU = \frac{10,062}{23,772} = .42$
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Total Deployed Minutes Day/Total Minutes in a Day

Total BEMS transports/total unit hours (in a year) yield an overall system UHU of .95.

Using this methodology, BEMS operates outside of the generally accepted urban EMS utilization range (.25–.30) and well above the upper range of .45 and operates beyond the upper range of the AIMHI recommended operating range (0.228-0.476). ***This indicates that frontline ambulance resources are actively utilized and operating at the upper levels of time on task associated with system strain around the clock, which drives the use of mutual aid as reviewed previously.***

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29. Where should you start when it comes to benchmarking, EMS 1, December 30, 2020.

30. Fire Service Fatigue: A Problem You Can't Ignore, Fitch & Associates.

Table 51: UHU: Total Deployed Minutes Day/Total Minutes in a Day by Zone (2025)

Unit	Unit Type	Minutes per Run	Hours	Percent	Minutes per Day	Runs	Runs per Day
10EU1	Ambulance	36.4	910.6	10.4	149.7	1,503	4.1
10EU2	Ambulance	36.6	1,199.9	13.7	197.3	1,968	5.4
10EU3	Ambulance	39.2	1,273.8	14.5	209.4	1,949	5.3
10EU4	Ambulance	38.0	686.7	7.8	112.9	1,084	3.0
10EU5	Ambulance	37.4	1,195.6	13.6	196.5	1,919	5.3
10EU6	Ambulance	40.4	1,145.4	13.1	188.3	1,701	4.7
10EU7	Ambulance	37.5	1,164.4	13.3	191.4	1,863	5.1
10EU8	Ambulance	39.0	716.2	8.2	117.7	1,102	3.0
Ambulance Total		38.0	8,292.7	94.6	1,363.2	13,089	35.9

Total deployed minutes (1,363)/total minutes in a day (1,440) = UHU of .95.

CPSM assesses that overall, Bethlehem Emergency Medical Services (BEMS) experiences moderate to high system resiliency pressures, driven primarily by simultaneous incident demand, transport workload, and the limited number of concurrently staffed frontline ambulances. During the year 2025 analysis, BEMS responded to 12,260 calls and 14,479 total unit runs, averaging approximately 34 calls per day and nearly 40 runs per day. These values reflect a consistently active EMS system operating within a defined urban service area.

Analysis of multi-year call activity demonstrates a steady increase in EMS demand, with total calls rising from lower historical levels to recent peak volumes. EMS incidents represent the overwhelming majority of total service demand, accounting for approximately 94 percent of all calls, reinforcing the EMS-centric nature of the Bethlehem response system.

In terms of peak operational demand, Bethlehem EMS experiences its highest call volumes during daytime hours, particularly between 10:00 a.m. and 5:00 p.m., with peak hourly activity occurring between 11:00 a.m. and noon, averaging approximately 2.0 calls per hour. The lowest demand occurs during early morning hours, typically between 4:00 a.m. and 5:00 a.m., averaging fewer than one call per hour. Overall peak time is between 9:00 am and 9:00 pm.

This predictable daytime demand concentration places consistent pressure on available frontline ambulance resources and increases the likelihood of simultaneous incidents during peak operational periods.

Overall, ambulance unit utilization levels are on the higher end of similar systems indicating moderate operational demand levels without sustained overload conditions.

The overall frequency of concurrent calls represents one of the most significant resiliency indicators within the Bethlehem EMS system. Analysis demonstrates that only 36.9 percent of calls occurred without overlap, while 63.1 percent of calls occurred concurrently with one or more additional incidents.

These findings indicate that simultaneous incident demand is the operational norm rather than the exception within Bethlehem. When multiple ambulances are committed to overlapping calls, the system's ability to respond rapidly to new incidents becomes constrained, increasing reliance on extended travel distances or mutual aid resources.

Overall, BEMS transport operations demonstrate efficient time management and operational performance. The average on-scene time is approximately 13.7 minutes, and the average travel time to the hospital is approximately 10.2 minutes, with an average total deployed transport duration of 44.5 minutes. Non-transport calls average approximately 20.6 minutes, allowing for relatively rapid unit return to service following lower-acuity incidents.

These efficient operational time intervals support system resiliency by reducing prolonged unit commitment times. However, the cumulative impact of high transport frequency—combined with frequent overlapping incidents—remains a primary driver of reduced ambulance.

The ability of the Bethlehem EMS system to absorb multiple simultaneous incidents and restore response readiness can be challenged during periods of peak demand, particularly when multiple transport units are committed to extended-duration calls. With a maximum of three frontline ambulances in service (2-24 hours/day and 1 12 hours/day) and an additional peak load ambulance three days/week for 12-hours, the margin for available backup resources becomes limited during concurrent incident activity. This is a primary driver for EMS mutual aid.

When units are committed outside their primary coverage areas or when mutual aid resources are required, response times may increase due to extended travel distances and reduced geographic coverage. These conditions reflect typical resiliency challenges observed in systems operating with limited frontline staffing capacity relative to call demand.

In summary, the current level of activity within the Bethlehem EMS system reflects a consistently engaged and busy service environment. Sustaining an average of more than 30 calls per day, combined with frequent overlapping incidents, requires effective coordination, reliable staffing, and efficient unit deployment strategies to maintain consistent service delivery.

CPSM recommends that Bethlehem EMS continue to monitor ambulance unit workload, overlapping call frequency, and Unit Hour Utilization trends to support long-term system resiliency planning. Attention should be given to periods where:

- System Utilization approaches or exceeds 0.45.
- Overlapping call frequency increases during peak demand hours.
- Response performance trends demonstrate sustained increases in travel or response times.
- Periodically evaluate geographic deployment patterns to ensure that ambulance placement aligns with evolving service demand and population distribution patterns.

Response Times – Station and Resource Distribution Analysis

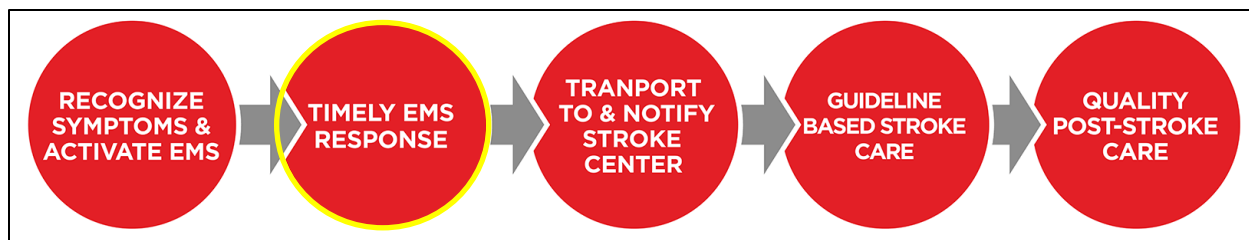
The focus of EMS response times should be directed to the evidence-based research relationship between clinical outcomes and response times. Much of the current research suggests response times have little impact on clinical outcomes of low acuity calls.

Higher-acuity medical incidents such as strokes, respiratory compromise, cardiovascular emergencies including STEMI, select obstetrical complications, and other conditions affecting the cardiovascular, neurological, or respiratory systems require rapid response times, timely basic and advanced life support interventions, efficient patient packaging, and rapid transport to definitive care. **Response times are critical in these high acuity emergencies. Seconds count.**

Other EMS incidents are similarly life-threatening, with patient outcomes directly influenced by how quickly responders arrive. These include full drownings, severe allergic reactions, electrocutions, and major trauma from gunshots, stabbings, and significant motor vehicle collisions.

The next figure illustrates the out-of-hospital chain of survival for stroke emergencies, which is a sequence of actions proven to reduce stroke mortality. Timely EMS response is a critical component of this process.

Figure 27: Cerebrovascular Emergency (Stroke) Chain of Survival



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

The next figure illustrates the out of hospital chain of survival, which is a series of actions that, when put in motion, reduce the mortality of sudden cardiac arrest. Adequate EMS response times coupled with community and public access defibrillator programs can positively impact the survival rate of sudden cardiac arrest victims. Again, timely basic and advanced EMS response is a key component of the overall patient care system.

Figure 28: Sudden Cardiac Arrest Out of Hospital Chain of Survival

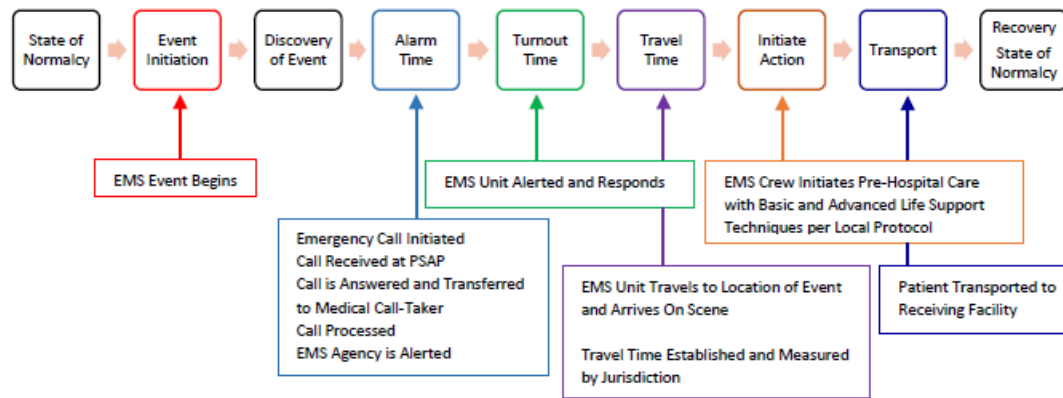


Adult OHCA Chain of Survival

From: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

Although a smaller percentage of 911 patients require time-sensitive, advanced life support interventions, timely response is critical for those who do, as delays can directly affect morbidity and mortality. For the majority of callers who may not have an emergent clinical need there is still an expectation of rapid service. For many patients and their families, response time is the most visible and meaningful measure of EMS performance. Regardless of the service delivery model, response times represent both a clinical obligation and a customer service responsibility and therefore should not be overlooked.

Figure 29: Incident Cascade of Events: EMS Response



For EMS systems, overall response time begins well before an ambulance is dispatched. A critical component is detection and notification time, which is the interval between the onset of a medical emergency and the activation of the 911 system. Delays in recognizing life-threatening conditions such as cardiac arrest, stroke, or severe trauma can significantly reduce the effectiveness of emergency medical care and negatively affect patient outcomes. While EMS agencies cannot influence when an emergency is recognized, they can optimize every subsequent phase of the response.

An effective EMS deployment system is designed to place ambulances and first-response resources where they can reach patients in the shortest possible time while accounting for incident demand, population distribution, roadway networks, traffic congestion, and geographic barriers. Resource placement should balance operational efficiency with community coverage to ensure that the closest appropriate unit is available to respond quickly. Strategic deployment, combined with appropriate staffing and sufficient resource availability, improves system reliability, reduces response times, and enhances the ability to deliver timely, high-quality prehospital care.

BEMS Response Times

The first response time table examines response times by call type. In this analysis, we include all EMS calls within the City of Bethlehem to which at least one unit responded. Calls with a total response time of more than 60 minutes are excluded. In addition, we focus on units that have complete time stamps, that is, units with all components recorded, so that we can calculate each segment of response time. Based on the methodology above, there were a total of 12,260 calls responded to by BEMS in 2025 that were analyzed.

Priority	Total Calls	Calls for Response Time Analysis
1	10,519	9,181
2	122	66
3	1,619	1,418
Total	12,260	10,665

The priority field in the CAD data suggests the level of severity for calls, of which “Priority 1” labels the most serious calls, whereas “Priority 3” labels the least serious calls.

Table 52: Average and 90th Percentile Response Times, by Call Type (Minutes)

Call Type	Average Response Time				90 th Percentile Response Time				Call Count
	Dispatch	Turnout	Travel	Total	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.9	1.5	6.1	9.5	2.7	2.6	9.6	13.2	1,158
Cardiac and stroke	2.1	1.6	6.0	9.7	2.7	2.6	9.6	13.8	1,223
Fall and injury	3.1	1.7	7.5	12.3	4.8	2.8	12.9	19.3	1,753
Illness and other	3.2	1.6	7.4	12.2	4.2	2.7	12.4	18.7	4,448
MVA	5.0	1.4	4.3	10.7	8.7	2.3	8.1	20.0	95
OD	6.3	1.6	7.3	15.2	19.2	2.7	12.0	28.7	983
Seizure and UNC	1.9	1.4	5.1	8.4	2.7	2.4	8.9	12.6	1,005
Total	3.1	1.6	6.9	11.5	4.1	2.6	11.6	18.0	10,665

Detailed review of the response timetables indicates the following performance characteristics across the Bethlehem EMS system:

- The 90th percentile dispatch time (alarm handling) was 4.1 minutes (**246 seconds**).

Industry standards such as NFPA 1225 (formerly NFPA 1221) recommend call processing times of ≤ 60 seconds for high-priority EMS calls, with dispatch completed within 90 seconds for most incidents. Based on the available data, the Northampton County dispatch process exceeds these benchmark thresholds.

However, it should be recognized that dispatch processing performance is typically influenced by regional communications center operations and protocol structures, which may include medical interrogation requirements, pre-arrival instructions, and system-wide dispatch coordination practices. CPSM sees elongated call processing times in 911 centers that utilize Emergency Medical Dispatch principles and software.

- The 90th percentile turnout time was 2.6 minutes (**156 seconds**).

BEMS's turnout performance is consistent with its internally established operational expectations. Department leadership identified an internal objective of responding within approximately three minutes from dispatch notification. Based on the available data, the 90th percentile turnout time of 2.6 minutes indicates the department is generally meeting this expectation. Industry benchmark turnout times for EMS responses generally target ≤ 60 seconds, particularly for emergency medical incidents. The 90th percentile travel time for EMS responses was 11.6 minutes (**696 seconds**).

Travel time represents the largest component of overall response time within the Bethlehem EMS system. Industry best-practice guidance such as the Commission on Accreditation of Ambulance Services (CAAS) requires the agency to establish response times. NFPA 1710 has a standard which is-240 seconds travel time for the arrival of the initial BLS unit with an automatic external defibrillator and 480 seconds travel time for the arrival of an advanced life support unit.

The travel time values observed in Bethlehem reflect the combined influence of geographic coverage requirements, station location distribution, traffic conditions, and the availability of frontline ambulance units during concurrent incidents. Additionally, some calls for service such as low acuity calls are managed without lights and siren, which will affect overall travel time analysis. High acuity calls such as breathing difficulty, cardiac and stroke, and seizure and unconscious aggregately average 9.4 minutes. ***This indicates effective prioritization and response alignment for time-critical emergencies.***

When considered alongside the documented 63 percent overlapping call rate, the response time data suggests that system performance is influenced less by dispatch or turnout efficiency and more by resource availability and geographic unit distribution. With only two frontline ambulances staffed 24/7, 1 staffed 12 hours/day/7 days a week, and 1 staffed three days/week for 12 hours, periods of simultaneous incident demand reduce available coverage and regularly increase travel distances to new incidents.

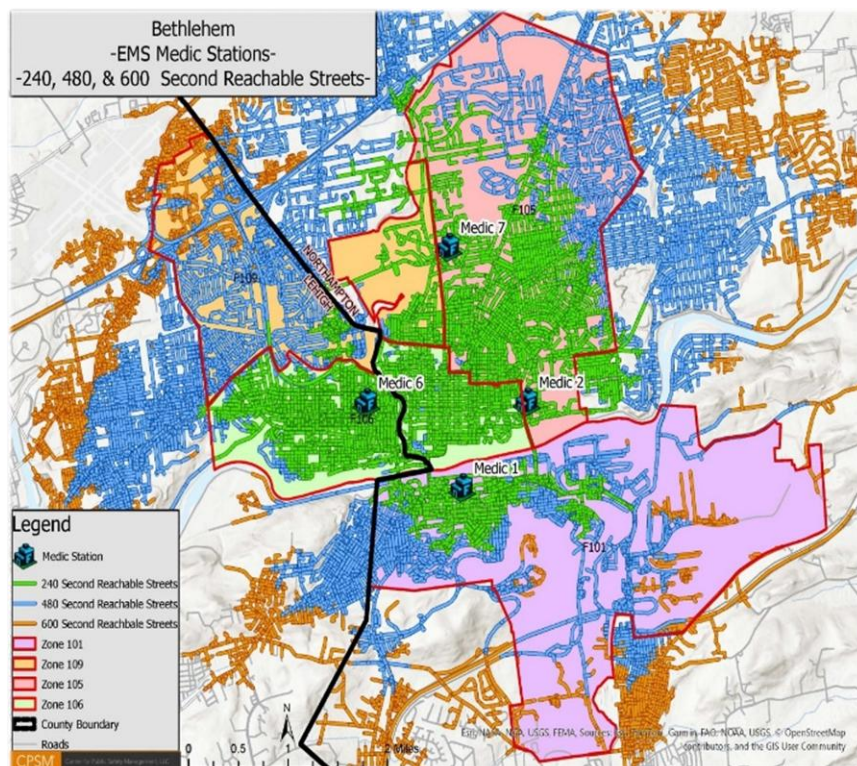
This condition represents a typical resiliency challenge observed in busy EMS systems operating with limited reserve capacity.

GIS-based travel-time modeling was conducted utilizing the current EMS station locations. Analysis of 240-second, 480-second, and 600-second reachable street networks demonstrate that the existing station configuration provides strong geographic coverage throughout Bethlehem. The majority of densely populated and historically higher-demand areas fall within a 240- to 480-second travel-time envelope, while nearly all developed portions of the city are reachable within approximately 600 seconds under modeled travel conditions.

The analysis further demonstrates substantial overlap between station service areas, particularly among Medic 2, Medic 6, and Medic 7, creating operational redundancy and enhancing system resiliency when units are committed to other incidents. Evaluation of the two 24-hour stations, Medic 1 and Medic 7, also indicates that these facilities provide a strong baseline coverage footprint capable of reaching significant portions of the city within established travel-time thresholds.

Figure 30: BEMS Travel Time Bleeds-All Stations

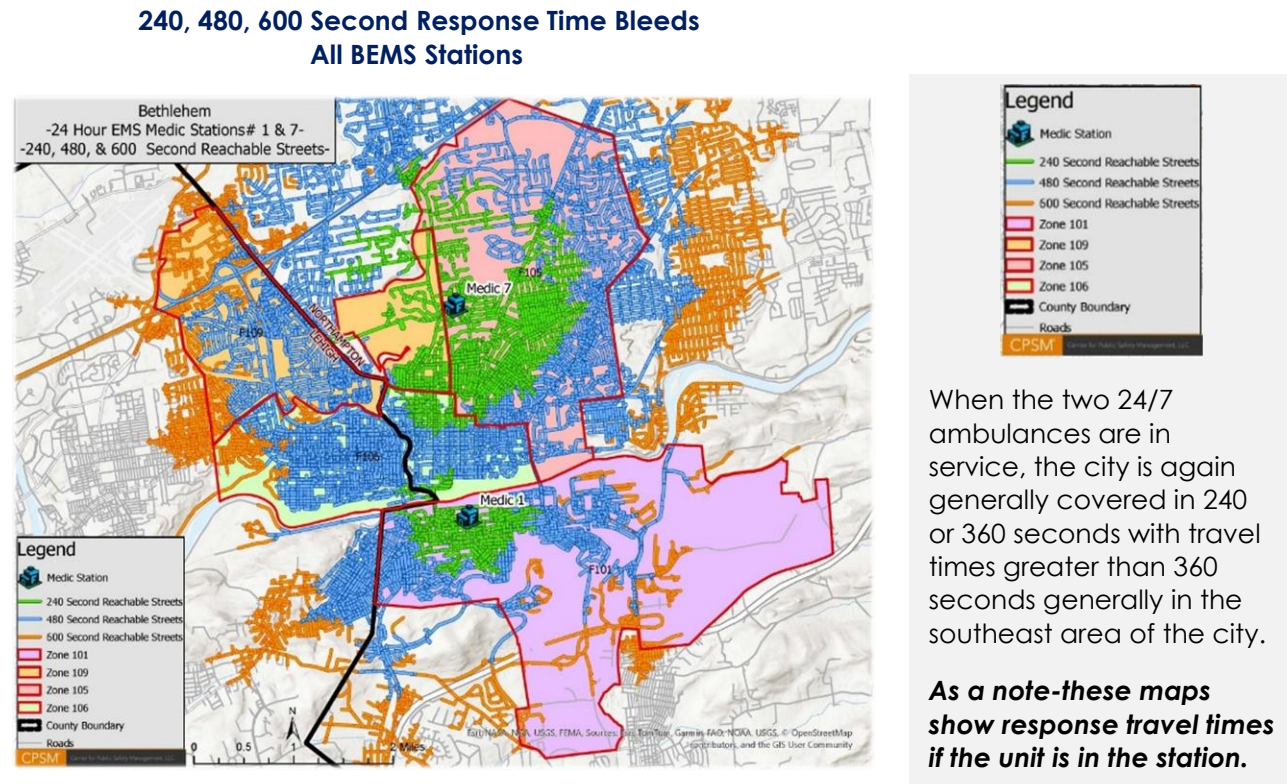
240, 480, 600 Second Response Time Bleeds All BEMS Stations



When all four ambulances are in service, the city is generally covered in 240 or 360 seconds with only small instances of travel times greater than 360 seconds.

As a note-these maps show response travel times if the unit is in the station.

Figure 31: BEMS Travel Time Bleeds-All Stations



While travel-time modeling does not account for unit availability, traffic congestion, weather conditions, simultaneous incident demand, or hospital turnaround delays, the results support the conclusion that the current station network remains appropriately positioned to support existing deployment strategies and service demand.

CPSM assesses that the current station network provides reasonable geographic coverage and supports existing deployment strategies. No immediate closures or relocations are recommended based on available operational data. CPSM assesses further that Bethlehem EMS is meeting its internally established turnout standard; however, opportunities may exist to further reduce turnout times for high-priority emergency responses that align with ≤ 60 seconds. Reductions in turnout time, particularly for cardiac arrest, stroke, severe respiratory distress, major trauma, and other time-sensitive medical emergencies, can contribute to improved overall system performance and enhanced patient outcomes.

Response Priority and Lights-and-Siren Utilization

Many EMS agencies have adopted response policies that differentiate between high-acuity, time-critical emergencies and lower-acuity medical calls. Best practices supported by emergency medical dispatch systems recognize that not every EMS incident requires a response with lights and sirens (L&S). Calls that are determined through structured emergency medical dispatch protocols to involve non-life-threatening conditions such as minor illnesses, chronic medical complaints, routine lift assists, or low-priority injuries can often be safely managed with a non-emergency response. This approach reduces the risk of emergency vehicle collisions, enhances the safety of responders and the public, lowers vehicle operating costs, and minimizes unnecessary wear on apparatus while preserving emergency response capability for higher-

priority incidents. BEMS aligns with this travel time response practice as indicated above where certain lower acuity calls such as fall and injury and illness and other have longer travel times than the higher acuity calls.

Research has consistently shown that the time savings achieved by responding with lights and sirens are often modest in urban environments, frequently amounting to only one to three minutes, while substantially increasing the risk of crashes and injuries to EMS personnel and the public. Consequently, many progressive EMS systems use evidence-based dispatch protocols, such as priority dispatch systems, to match the response mode to the patient's reported condition. These systems reserve emergency responses for patients with suspected cardiac arrest, stroke, severe trauma, respiratory distress, or other immediately life-threatening conditions, while dispatching non-emergency responses to low-acuity calls. This risk-based deployment strategy improves overall system efficiency, enhances responder and public safety, and ensures that advanced life support resources remain available for patients with the greatest clinical need without compromising the quality of care provided to lower-acuity patients.

CPSM assesses that the Bethlehem EMS system demonstrates appropriate prioritization of higher-acuity incidents; however, opportunities exist to further enhance the priority-based and dispatch priorities. The analysis also indicates that system performance is influenced by several operational factors, including a limited number of staffed frontline ambulances, geographic coverage requirements, transport workload, and a significant rate of overlapping incidents. Approximately 63 percent of incidents occur concurrently with at least one other active event, reducing resource availability and increasing travel distances for subsequent responses. These conditions are commonly observed in municipal EMS systems operating with a limited number of frontline units and contribute to extended travel intervals during peak demand periods.

Based on the available data, CPSM concludes that response performance challenges are primarily related to resource availability, concurrent demand, and geographic coverage requirements rather than any single operational component. Future performance improvement efforts should focus on maintaining adequate frontline unit availability, monitoring deployment effectiveness, and evaluating response performance by incident acuity and response priority.

CPSM recommends the BEMS:

- Work with Northampton County 911 to establish response performance measures based on ProQA determinant levels and dispatch priority categories. Until this can be accomplished, continue utilizing Emergency Medical Dispatch protocols to align response modes with patient acuity and clinical necessity.
- Continue monitoring turnout performance and evaluate opportunities to reduce turnout times for high-priority EMS incidents toward a ≤ 60 -second benchmark through enhanced station readiness procedures, performance monitoring, crew accountability measures, and periodic review of response initiation practices.
- Periodically evaluate the relationship between dispatch priority, response mode, and patient acuity through the Quality Assurance/Quality Improvement process.
- Evaluate dispatch processing, turnout, and travel time components collectively as part of a comprehensive system performance review.
- Monitor overlapping incident frequency, unit-hour utilization, and ambulance availability to identify future deployment or staffing adjustments necessary to maintain service reliability.

Medical Direction

Medical direction serves as the clinical foundation of any Emergency Medical Services (EMS) system and is essential to ensuring that patient care is delivered safely, consistently, and in accordance with accepted medical standards. The City of Bethlehem Bureau of EMS operates under the medical direction of Dr. Bryan Wilson, MD, FAEMS, FAAEM, who serves as the Medical Director for the Bureau of EMS. Dr. Wilson has served in this capacity since 2018 and provides comprehensive oversight of clinical operations, protocol implementation, and quality improvement initiatives.

Dr. Wilson is affiliated with St. Luke's University Health Network, where he serves as an emergency medicine and EMS physician and holds the role of EMS Fellowship Director. In addition to his responsibilities within the City of Bethlehem, Dr. Wilson serves as the President of the Eastern Pennsylvania EMS Council and is a member of the Pennsylvania Emergency Health Services Council Medical Advisory Committee. His involvement in both local and regional EMS leadership supports alignment between municipal EMS operations and regional clinical standards.

The Medical Director provides oversight of clinical care protocols utilized by Bethlehem EMS personnel. These protocols guide patient assessment, treatment, medication administration, and transport decisions, ensuring that field providers operate within clearly defined medical standards. Regional protocol alignment ensures that EMS personnel are equipped to deliver both Basic Life Support (BLS) and Advanced Life Support (ALS) care across a wide spectrum of patient presentations.

Medical direction involvement extends beyond protocol oversight and includes participation in the Quality Assurance/Quality Improvement (QA/QI) process. Patient care reports are reviewed for clinical accuracy, protocol compliance, and adherence to established standards of care. High-risk, low-frequency incidents such as cardiac arrest, major trauma, airway compromise, and other critical patient presentations receive focused reviews to identify opportunities for clinical improvement and reinforce best practices.

The Medical Director also supports EMS education and clinical training efforts. Annual training sessions are conducted to reinforce protocol compliance, update clinical practices, and address identified performance gaps. These educational interactions strengthen provider competency and reinforce a culture of clinical accountability. However, opportunities exist to expand the frequency and structure of Medical Director engagement to further enhance provider readiness and operational confidence.

Modern EMS systems increasingly recognize the importance of regular, structured interaction between field personnel and medical direction. Frequent engagement supports consistent interpretation of clinical protocols, improves communication between operational and medical leadership, and strengthens the overall clinical governance of the EMS system. Enhanced engagement also supports the development of training programs focused on emerging clinical priorities and evolving community health needs.

CPSM assesses that the City of Bethlehem benefits from experienced and engaged medical direction leadership that provides consistent clinical oversight and protocol governance. Continued collaboration between EMS leadership and medical direction supports strong clinical performance and alignment with regional standards.

CPSM assesses further that opportunities exist to enhance the frequency and structure of Medical Director interaction through the development of quarterly high-acuity, low-frequency training programs. These structured training sessions should focus on critical patient care events

such as cardiac arrest, airway emergencies, pediatric resuscitation, major trauma, and complex medical emergencies. Regular scenario-based training will improve provider confidence, enhance clinical decision-making, and strengthen system readiness for time-sensitive events.

EMS Guidelines and Medical Protocols

The delivery of Emergency Medical Services within the City of Bethlehem is governed by standardized clinical and operational protocols designed to ensure consistent, safe, and effective patient care. Bethlehem Bureau of EMS personnel operates under the Pennsylvania Statewide Basic Life Support (BLS) and Advanced Life Support (ALS) Protocols, which establish the scope of practice, treatment pathways, medication administration guidelines, and operational procedures for EMS providers throughout the Commonwealth of Pennsylvania.

The Pennsylvania statewide protocol system provides a uniform framework that ensures consistency in patient care delivery across jurisdictions. These protocols are developed through evidence-based medical practices and are regularly reviewed and updated at the state level to reflect advances in prehospital medicine. By operating under standardized statewide protocols, Bethlehem EMS personnel can deliver care that aligns with current medical standards while maintaining interoperability with surrounding EMS agencies and regional healthcare systems.

The use of statewide protocols also supports regional interoperability with neighboring EMS agencies and hospitals. This alignment is particularly important in systems that rely on mutual aid support or participate in coordinated regional emergency response activities. Standardized clinical expectations improve communication between responding agencies and receiving facilities, supporting continuity of care from the field to the hospital environment.

Operational guidelines within the Bethlehem EMS system support both Basic Life Support (BLS) and Advanced Life Support (ALS) response capabilities. The system utilizes a mixed ALS/BLS transport model, allowing units to respond based on patient acuity and operational demand. This model enhances system flexibility and supports efficient resource utilization, particularly during periods of peak call activity or concurrent incident demand.

The standardized protocol structure supports clinical decision-making across a broad spectrum of patient presentations, including medical emergencies, trauma incidents, behavioral health crises, cardiac events, respiratory distress, and overdose-related responses. ALS-level interventions available to Bethlehem EMS personnel include advanced airway management, cardiac monitoring, medication administration, intravenous access, and advanced life support procedures consistent with statewide scope-of-practice standards.

In addition to clinical protocols, Bethlehem EMS maintains internal operational policies governing response procedures, unit readiness, equipment management, infection control practices, patient transport procedures, and documentation standards. These policies provide operational continuity and support accountability across all levels of service delivery. Standardized documentation practices, including the use of electronic patient care reporting (ePCR) systems, ensure accurate recordkeeping and facilitate participation in quality improvement and performance monitoring processes.

From an operational perspective, the use of Pennsylvania statewide protocols provides a stable clinical foundation for Bethlehem EMS operations. However, the effectiveness of protocol-driven care is dependent on consistent training, competency validation, and ongoing performance evaluation. EMS systems that integrate protocol education into routine training and quality

assurance processes are better positioned to maintain clinical readiness and reduce variability in patient care delivery.

CPSM assesses that the use of Pennsylvania Statewide EMS Protocols provides a consistent and standardized clinical framework for patient care delivery within the City of Bethlehem. The reliance on statewide protocols supports interoperability, reduces clinical variability, and aligns Bethlehem EMS operations with established regional and state medical standards.

CPSM assesses further that continued emphasis on protocol-based education, scenario-driven training, and competency validation will further strengthen clinical consistency and enhance provider readiness across both ALS and BLS service levels.

Pharmaceutical and Controlled Substance Inventory Control

The management of pharmaceuticals and controlled substances within the Bethlehem Bureau of EMS is governed through established policies designed to ensure accountability, regulatory compliance, and patient safety. The handling of controlled substances represents one of the highest-risk operational components within an EMS system and requires consistent oversight, secure storage practices, and clearly defined chain-of-custody procedures.

Bethlehem EMS maintains a structured controlled substance management system that includes both centralized and decentralized safeguards. Controlled substances are stored within secure, locked medication safes on frontline ambulance units, ensuring that medications remain readily accessible to authorized personnel during emergency response while maintaining appropriate security controls. Unit-level medication storage is supported by secure access protocols designed to limit handling to authorized EMS personnel.

In addition to unit-based storage, Bethlehem EMS maintains centralized medication storage locations, which serve as the primary points for medication receipt, inventory control, and resupply operations. Centralized storage enhances accountability and supports standardized inventory management practices across the organization. Medications are received, logged, and distributed through documented procedures that support chain-of-custody requirements and minimize opportunities for diversion or unauthorized access.

The Bureau of EMS utilizes automated medication tracking systems to document controlled substance inventory movement, usage, and replenishment activities. Automated tracking systems provide an electronic audit trail that supports regulatory compliance and enhances internal accountability. These systems assist supervisory personnel in monitoring medication usage trends, identifying discrepancies, and ensuring that inventory records remain accurate and up to date.

Daily accountability practices are incorporated into routine operational activities. Daily controlled substance counts are conducted at the unit level, with personnel verifying medication inventory against documented records. This process supports early identification of discrepancies and reinforces personnel accountability. Supervisory oversight of daily inventory practices strengthens compliance and reduces operational risk associated with controlled substance management.

Controlled substance policies within Bethlehem EMS are designed to align with applicable federal and state regulatory requirements, including standards established by the United States Drug Enforcement Administration (DEA) and Pennsylvania Department of Health EMS regulations. Documentation procedures ensure that all medication administration events are

recorded accurately within the electronic patient care reporting (ePCR) system, supporting both clinical documentation and regulatory compliance.

The presence of layered safeguards including secure storage, centralized inventory management, automated tracking systems, and daily accountability checks demonstrates a structured approach to medication control. These measures reduce the likelihood of medication diversion and support safe and responsible pharmaceutical management within the EMS system.

CPSM assesses that Bethlehem EMS maintains multiple layers of controlled substance security, including locked unit safes, centralized medication storage, automated inventory tracking, and daily accountability procedures. These combined safeguards provide a strong foundation for regulatory compliance and responsible medication management.

CPSM assesses further that continued periodic review of controlled substance policies in alignment with evolving DEA regulatory expectations will further strengthen system accountability. Emphasis should be placed on maintaining electronic audit capability, reinforcing supervisory review processes, and validating daily inventory reconciliation procedures to ensure ongoing compliance with federal and state regulatory requirements.

Training and Education

The delivery of high-quality Emergency Medical Services (EMS) is dependent upon the ongoing education, clinical competency, and professional development of field personnel. Continuing education programs ensure that Emergency Medical Technicians (EMTs) and paramedics maintain regulatory compliance, remain current with evolving medical practices, and are prepared to manage both routine and high-acuity patient care scenarios.

Bethlehem EMS supports continuing education through a combination of in-house training programs and online educational platforms. This blended approach provides flexibility for personnel while allowing leadership to maintain oversight of required educational content and competency validation. In-house training sessions provide opportunities for hands-on skill reinforcement, scenario-based instruction, and direct interaction with supervisory personnel and medical direction. Online training platforms support knowledge retention through structured coursework, protocol review, and competency-based learning modules.

Initial EMS certification provides the foundational knowledge required to enter the profession; however, continuing education ensures that clinical capability is sustained and enhanced throughout a provider's career. EMS personnel within Bethlehem must maintain certification requirements consistent with Pennsylvania Department of Health regulations. Continuing education requirements include both didactic and practical components designed to reinforce clinical decision-making, protocol compliance, and patient care standards.

Hands-on training remains an essential component of effective EMS education. Scenario-based learning, equipment familiarization, and practical skills evaluations support the development of clinical confidence and operational readiness. Training opportunities typically include airway management, cardiac care, trauma response, medication administration, and patient assessment procedures. These training activities support readiness for both common patient encounters and time-sensitive emergencies.

As EMS systems grow in complexity, the importance of targeted education programs increases. Modern EMS systems benefit from structured training programs that incorporate lessons learned from quality assurance reviews, emerging clinical trends, and operational performance data.

Training that is aligned with system performance indicators improves provider competency and enhances overall system reliability.

Opportunities exist within the Bethlehem EMS training framework to further expand structured education programs that focus on high-acuity, low-frequency events, including cardiac arrest management, pediatric emergencies, advanced airway interventions, and complex trauma care. These critical events occur infrequently but require rapid and precise clinical intervention. Regular scenario-based training focused on these events strengthens provider readiness and reduces performance variability during critical incidents.

The continued development of structured training programs also supports organizational resiliency. As workforce demands increase and staffing models evolve, maintaining a consistent and coordinated education program becomes essential to ensuring operational continuity and clinical effectiveness. The addition of dedicated clinical leadership to oversee training initiatives would support improved coordination between quality assurance activities and continuing education efforts.

CPSM assesses that the BEMS maintains a blended continuing education model utilizing both in-house and online training platforms, providing flexibility while supporting compliance with certification requirements. Opportunities exist to expand structured, scenario-based training programs focused on high-acuity, low-frequency medical emergencies. Increasing the frequency of hands-on training sessions will strengthen clinical competency and enhance operational readiness.

CPSM assesses further that the development of a full-time Clinical Coordinator position would significantly enhance training coordination, improve integration between QA/QI findings and continuing education programs, and support long-term clinical readiness across the organization.

Quality Assurance/Quality Improvement

A comprehensive Quality Assurance and Quality Improvement (QA/QI) program is essential to ensuring the consistent delivery of safe, effective, and evidence-based patient care within an EMS system. QA/QI programs provide structured reviews of clinical performance, identify opportunities for improvement, reinforce protocol compliance, and support continuous professional development among EMS personnel.

Bethlehem EMS maintains a structured QA/QI program that incorporates routine review of patient care reports and focused evaluation of high-risk clinical events. All patient care reports (PCRs) are reviewed as part of the quality assurance process, ensuring that clinical documentation, protocol compliance, and treatment decisions are evaluated for accuracy and adherence to established standards of care. This systematic review process supports clinical accountability and enhances the overall reliability of patient care delivery.

In addition to routine call review, 100 percent of cardiac arrest cases and other high-acuity incidents are evaluated through focused clinical review processes. These critical event reviews provide opportunities to assess provider performance, evaluate adherence to clinical protocols, and identify areas where additional education or operational refinement may be beneficial. High-risk, low-frequency events such as airway emergencies, major trauma incidents, and resuscitation efforts receive particular attention due to their potential impact on patient outcomes.

The QA/QI process includes oversight from designated supervisory personnel and engagement with medical direction. Identified performance concerns are addressed through structured review and provider feedback, ensuring that individual personnel receive timely guidance regarding clinical performance expectations. Feedback mechanisms reinforce professional accountability and support continuous clinical improvement across the organization.

While the current QA/QI structure demonstrates a commitment to clinical oversight and patient safety, opportunities exist to further strengthen the integration between quality review activities and training initiatives. Modern EMS systems increasingly link QA/QI findings directly to continuing education programs to ensure that identified performance trends result in measurable improvements in provider competency.

The absence of a dedicated full-time clinical coordination position limits the organization's ability to fully leverage quality data as a driver for ongoing education and system-wide performance improvement. As EMS systems grow in complexity and demand, dedicated clinical leadership roles become increasingly necessary to manage performance metrics, coordinate training initiatives, and support consistent clinical oversight.

Integration of QA/QI findings into structured training programs represents a critical next step in advancing system maturity. Linking clinical review data to targeted education initiatives enhances provider competency, improves patient outcomes, and supports organizational readiness for complex medical emergencies.

CPSM assesses that the Bethlehem Bureau of EMS maintains a structured QA/QI program that includes comprehensive review of patient care reports, focused evaluation of high-risk incidents, and consistent feedback to providers. These practices demonstrate a strong commitment to clinical accountability and patient safety. Opportunities exist to strengthen the integration between QA/QI findings and training initiatives. Establishing a direct connection between clinical performance review and continuing education programming will enhance provider readiness and support measurable improvements in patient care delivery.

EMS Fleet Evaluation

Bethlehem EMS maintains a fleet consisting of frontline ambulances, reserve ambulances, and supervisory vehicles that support emergency response operations throughout the City. Fleet reliability is a critical component of service delivery given that the system staffs a maximum of four ambulances at any given time, relying on reserve units to maintain operational continuity during maintenance cycles, repairs, and periods of increased demand.

A review of the current fleet inventory indicates that ambulance model years range from 2014 through 2023, with several frontline and reserve units exceeding ten years of service. The department has historically followed a planned replacement schedule of approximately one ambulance per year; however, extended national ambulance production timelines have required the city to adjust its procurement strategy.

Recognizing these delays, Bethlehem ordered two replacement ambulances in 2023, which are anticipated to be delivered during Fall 2026. The department also ordered two additional ambulances during the current procurement cycle to maintain replacement momentum and prevent fleet aging from accelerating due to manufacturing backlogs.

Table 53: Current EMS Ambulance Fleet

Vehicle	VIN	Make	Model	Year
1081	1FDWE3FNXMDC18702	Ford	E-350	2021
1082	1FDWE3FS8HDC37504	Ford	E-350	2017
1083	1GB6GUCL1G1194162	Chevy	GM4500	2016
1084	1FDWE3FSXGDC20010	Ford	E-350	2016
1085	1FDWE3FN8MDC18732	Ford	E-350	2021
1086	1GB3GRC7XP1106311	Chevy	GM3500	2023
1087	1FDWE3FS4KDC33232	Ford	E-350	2019
1088	1GB6G5CL9E1182845	Chevy	GM4500	2014

The current replacement philosophy demonstrates proactive fleet management and reflects industry's best practices. Nationally, ambulance replacement cycles generally range from 7 to 10 years for frontline units, depending on annual mileage, maintenance costs, and operational demands. Several units within the Bethlehem fleet are approaching or exceeding this threshold and should be prioritized for replacement as new apparatus are received.

Vehicle inspections and fleet maintenance activities appear to be conducted through a structured preventative maintenance program designed to maintain operational readiness and compliance with applicable Pennsylvania Department of Health requirements. The use of reserve ambulances provides operational flexibility and reduces frontline downtime during scheduled maintenance and repairs.

Equipment carried on frontline ambulances was observed to be generally consistent with current Advanced Life Support transport standards. Apparatus configuration and equipment placement were found to support efficient patient care delivery and provider access during emergency operations. Standardization of vehicle layouts across the fleet assists personnel transitioning between units and reduces cognitive workload during high-acuity incidents.

CPSM assesses that Bethlehem EMS maintains an appropriate fleet management strategy supported by reserve apparatus, preventative maintenance practices, and a structured replacement program. The recent decision to accelerate ambulance procurement due to manufacturing delays demonstrates sound long-term planning and should assist in preventing excessive fleet aging.

CPSM assesses further that continued emphasis should be placed on maintaining a rolling fleet replacement schedule that targets ambulance replacement within a 7–10-year service life. Future fleet planning should include annual lifecycle analysis, maintenance cost tracking, and replacement forecasting to ensure long-term fleet sustainability and operational readiness.

CPSM recommends that the City of Bethlehem and BEMS:

- Continue the current planned ambulance replacement schedule and maintain orders sufficiently in advance to account for industry production delays.
- Evaluate future opportunities for alternative-fuel, hybrid, or reduced-idle technologies as apparatus are replaced.

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EMS Critical Tasking

EMS responses, whether in an EMS only agency or a fire department-based response system generally do not define critical task benchmarks as rigidly as the fire suppression discipline. The concept of critical tasking however remains central to effective service delivery. EMS incidents require specific actions to be performed either sequentially or simultaneously to achieve optimal patient outcomes. On-scene care begins with scene size-up and safety assessment, followed by a focused and systematic patient evaluation. From there, providers initiate appropriate basic and advanced clinical interventions in accordance with established medical protocols. The timely coordination of these tasks directly impacts patient stabilization, transport decisions, and overall clinical success.

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 transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including the provision of an ALS assessment or at least one ALS intervention.
- **Advanced Life Support, Level 2 (ALS2)**, which is the transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including:
 - ✓ 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:
 - *Manual defibrillation/cardioversion.* □ *Chest decompression.*
 - *Endotracheal intubation.* □ *Surgical airway.*
 - *Central venous line.* □ *Intraosseous line.*
 - *Cardiac pacing.*

The next set of tables reviews the current critical tasking for the BEMS continuum of care based on the current CMS ground transport definition of ambulance services. Responder numbers are based on BEMS minimum staffing on fire apparatus of two/three (Engines), two (Ladders) and two (Ambulance).

Table 54: Low Acuity Response: BLS Critical Tasking

Critical Task	# Responders
Primary Patient Care	1
Secondary Patient Care	1-2
Effective Response Force	2-3

Resource Deployment

1 Ambulance

1 BPD Officer

Table 55: ALS1 Critical Tasking

Critical Task	# Responders
EMS Supervisor	1
Primary Patient Care	1
Secondary Patient Care	1-2
Effective Response Force	3-4

Resource Deployment

1 Ambulance
1 EMS Supervisor
1 BPD Officer

Table 56: ALS2 Critical Tasking

Critical Task	# Responders
EMS Supervisor	1
Primary Patient Care	1
Secondary Patient Care	1-2
Effective Response Force	4-5

Resource Deployment

1 Ambulance
1 EMS Supervisor
1 BFD Engine
(if outlined in CBA)
1 BPD Officer

Table 57: Pulseless/Non-Breathing Critical Tasking

Critical Task	# Responders
EMS Supervisor	1
Primary Patient Care	1-2
Secondary Patient Care	1-2
Tertiary Patient Care Provider	1
Vehicle Operations	1
Effective Response Force	7

Resource Deployment

1 Ambulance
1 EMS Supervisor
1 BFD Engine
1 BPD Officer

CPSM assesses low acuity EMS calls are generally and should be managed by an Ambulance unit only in response unless the call is upgraded by the 911 Center or ambulance unit after arrival on scene.

CPSM assesses further BEMS can assemble an appropriate Effective Response Force (ERF) on the initial EMS alarm as outlined herein.

Mobile Integrated Health/Community Paramedicine

CPSM previously identified several demographic and socioeconomic indicators within the City of Bethlehem that suggest the presence of vulnerable population groups that may influence EMS demand. These indicators include the following:

- **Older Population Risk:** Approximately 14–16 percent of Bethlehem residents are age 65 and older, representing a population segment associated with higher rates of chronic illness, falls, and cardiac-related emergencies. This demographic profile aligns with BEMS call-type data, where falls/injury (15 percent), cardiac and stroke incidents (10 percent), and seizure/unconsciousness events (approximately 9 percent) collectively represent a significant portion of EMS demand. As the senior population continues to grow, the prevalence of age-related emergencies is expected to increase, placing additional demand on EMS response resources and healthcare infrastructure.
- **Socioeconomic Risk Indicators:** Bethlehem includes areas with moderate levels of poverty and housing burden, which are commonly associated with increased reliance on emergency medical services. Residents living below the poverty level often experience barriers to

preventive healthcare, transportation access, and medication compliance, contributing to increased emergency utilization and repeat EMS encounters.

- **Healthcare Access and Utilization Patterns:** A measurable percentage of Bethlehem residents lack consistent access to healthcare coverage or primary care services. Populations experiencing gaps in healthcare access frequently rely on EMS and hospital emergency departments as entry points into the healthcare system. This pattern contributes to higher call frequency, increased transport rates, and recurring non-emergent EMS utilization.
- **Community Vulnerability Indicators:** Social Vulnerability Index (SVI) data for Northampton and Lehigh Counties indicate moderate levels of community vulnerability, with localized concentrations of higher-risk populations. Elevated SVI scores are commonly associated with increased health disparities, limited access to services, and greater dependence on emergency medical systems.

Given these demographic, economic, and healthcare-related factors, the potential implementation of a Community Paramedicine / Mobile Integrated Healthcare (MIH) program represents a strategic opportunity for Bethlehem Emergency Medical Services (BEMS) to address underlying community health risks. A Community Paramedicine program would enable specially trained paramedics to conduct scheduled home visits, wellness checks, chronic disease monitoring, medication reconciliation, and post-discharge follow-ups for high-risk or high-utilizer patients.

Rather than functioning solely as a reactive emergency response system, BEMS could expand into a preventive, population-health-focused model designed to reduce avoidable EMS utilization and unnecessary emergency department transports. Such programs are particularly effective when targeted toward:

- Frequent EMS users.
- Recently discharged hospital patients.
- Elderly residents living independently.
- Individuals with chronic disease management challenges.
- Residents experiencing barriers to transportation or healthcare access.

A Community Paramedicine / Mobile Integrated Health program would also serve as a navigation bridge for vulnerable populations by connecting residents to:

- Primary care providers.
- Behavioral health services.
- Public health resources.
- Social service programs.
- Nutritional and housing assistance resources.

Paramedics operating within an MIH framework can identify risks such as:

- Fall hazards.
- Food insecurity.
- Medication non-compliance.
- Transportation limitations.
- Lack of primary care follow-up.

These interventions redirect non-emergent needs away from hospital emergency departments and toward appropriate community-based care, improving patient outcomes and reducing unnecessary system utilization.

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For the Bethlehem EMS system, the potential benefits of a Community Paramedicine / Mobile Integrated Health program include:

- Improved patient outcomes.
- Reduced repeat EMS utilization.
- Decreased emergency department overcrowding.
- Enhanced system resiliency.
- Improved coordination between EMS and healthcare providers.
- Strengthened integration between public safety and public health systems.

In communities experiencing sustained EMS demand, frequent overlapping incidents, and identifiable vulnerable populations, Community Paramedicine represents an effective tool for managing system demand and improving long-term service sustainability.

CPSM assesses that Bethlehem EMS should evaluate the feasibility of implementing a targeted Community Paramedicine / Mobile Integrated Healthcare pilot program, focusing initially on high-frequency EMS users and vulnerable populations. The program should be developed in collaboration with regional healthcare partners and public health agencies to ensure alignment with local community needs and system capacity.

CPSM recommends that BEMS:

- Conduct analysis of frequent EMS users to identify repeat utilization patterns.
- Develop partnerships with local hospitals and public health agencies.
- Initiate a pilot MIH program focused on post-discharge follow-ups and fall-risk prevention.
- Evaluate program performance metrics, including reduction in repeat EMS utilization and transport volume.
- Expand services incrementally based on demonstrated outcomes and system benefit.

Financial impact dependent on any expansion past EMS crew follow-ups under the suggested pilot program. Expansion may include the addition of one Paramedic as the MIH Coordinator. Potential financial impact (1 Paramedic): \$68,263.56 + \$32,534 fringe = \$100,798.00

Overall, BEMS represents a strong and professionally managed EMS system that provides reliable, clinically competent emergency medical care to the community. The Bureau operates within a mixed ALS/BLS transport model utilizing dual-paramedic staffing, which enhances clinical capability, improves patient care outcomes, and supports advanced treatment capacity during high-acuity emergencies. The commitment of personnel, leadership engagement, and the presence of structured clinical oversight demonstrate a mature and capable EMS organization positioned to meet the current needs of the community.

During the site visit and system review process, it was noteworthy that the Bethlehem Police Department demonstrates a highly collaborative operational relationship with Bethlehem EMS. Police personnel respond to more than 90 percent of EMS incidents and are trained and equipped at the first responder level, including the use of first aid kits, automated external defibrillators (AEDs), oxygen delivery systems, and naloxone (Narcan). This level of interagency support enhances early care intervention and contributes to overall system effectiveness.

In contrast, response participation by the Bethlehem Fire Department is limited by collective bargaining agreement (CBA) provisions restricting fire unit response to five defined high-acuity EMS call types. As a result, the Bethlehem EMS system relies heavily on EMS-only response resources and police first responder support to manage the majority of medical incidents.

As discussed, the current frontline deployment model includes:

- Two 24-hour ambulances.
- One 12-hour ambulance operating 0800–2200 daily.
- One surge ambulance typically staffed 1000–2300 approximately three days per week.

While this configuration has allowed BEMS to maintain operational coverage, the data clearly demonstrates moderate to high resiliency challenges, particularly during peak demand hours and overlapping incidents. Continued growth in EMS demand without corresponding increases in staffing capacity will likely result in increased response times, greater reliance on mutual aid, and reduced operational flexibility.

Additionally, during the site visit, CPSM identified an opportunity to strengthen supervisory resiliency within the Bethlehem Bureau of EMS. Under the current Pittman staffing schedule, the Bureau generally staffs a single EMS Supervisor responsible for field operations, clinical support, incident command, quality assurance follow-up, and specialty program oversight.

While this model functions effectively during routine operations, resiliency is reduced during periods of vacation, illness, training, military leave, or other planned and unplanned absences. During these periods, supervisory coverage may be unavailable, reducing operational oversight and limiting access to specialized resources assigned to the supervisor vehicle.

One example identified during this assessment is the Bureau's Whole Blood Program. Currently, whole blood is carried on the supervisor vehicle. As a result, when no supervisor is available, this advanced clinical capability is not immediately deployable, potentially limiting access to life-saving transfusion therapy during critical hemorrhagic emergencies.

Rather than recommending the immediate addition of another full-time supervisory position, CPSM recommends that Bethlehem EMS consider developing a **Senior Paramedic** Career Development Program. Under this model, experienced paramedics meeting established qualifications could be trained to serve as Acting EMS Supervisors ("ride-up" supervisors) during periods when a supervisor is unavailable or when operational conditions warrant additional field leadership.

While discussing the current staffing model, it should be noted here that BEMS utilizes a Pittman schedule that supports the Bureau's primary deployment configuration. While the schedule has successfully supported routine operations, it creates predictable staffing challenges for the fourth (surge) ambulance (the Tuesday, Wednesday, Thursday peak time unit). Under the current model, the surge unit is frequently staffed only two days per week because Tuesday coverage requires approximately 40 hours of overtime or part-time staffing. As a result, the Bureau is often unable to consistently field the additional ambulance during periods when it would provide the greatest operational benefit.

Because the surge ambulance is intended to absorb peak demand and improve system resiliency during overlapping incidents, inconsistent staffing reduces the Bureau's ability to manage simultaneous calls, decreases deployment flexibility, and increases reliance on mutual aid during periods of high system demand.

Lastly, and as discussed, over the past several decades, the mission of the American fire service has evolved from one centered primarily on fire suppression to one in which Emergency Medical Services (EMS) represents the predominant service delivered to the community. Today, EMS accounts for 70 to 90 percent of emergency responses in many fire departments and has become the most frequent point of interaction between the department and the public. In

addition to the significant incident workload, modern EMS systems require executive oversight of clinical quality improvement, medical direction, state and federal regulatory compliance, continuing education, credentialing, community health initiatives, data analytics, reimbursement, accreditation, and system performance. The complexity and operational impact of these responsibilities have elevated EMS into one of the department's most critical strategic functions.

Given the scope, workload, and organizational importance of EMS, the BEMS bureau head should be elevated to the rank of Deputy Chief. This change appropriately recognizes EMS as an equal pillar of the department's public safety mission alongside fire suppression, community risk reduction, training, and emergency management. A Deputy Chief-level position provides the executive authority necessary to develop long-term strategic initiatives, advocate for resources during the budget process, establish organizational priorities, oversee clinical governance, coordinate with healthcare systems and regional EMS partners, and ensure compliance with an increasingly complex regulatory environment. It also strengthens accountability for patient care outcomes, clinical excellence, quality assurance, and continuous system improvement.

This organizational structure also aligns the department's executive leadership with its actual service demand. When the majority of emergency incidents involve EMS, executive representation at the highest leadership level ensures that staffing, apparatus deployment, technology investments, capital planning, and organizational priorities accurately reflect the services most frequently provided to the community. Elevating the EMS Bureau Chief to Deputy Chief demonstrates the department's commitment to delivering high-quality emergency medical care while ensuring that EMS receives the same level of strategic attention afforded to other core divisions.

CPSM recommends:

- The City of Bethlehem and BEMS consider expanding ambulance staffing to improve resiliency to include:
 - ✓ Upgrading the existing 0800–2200 daily peak time ambulance to 24-hour staffing.
Financial Impact: Requires 4 Paramedics - $\$100,798 \times 4 + \$32,534 \text{ fringe} \times 4 = \$403,192$.
 - ✓ Expand the three day/week 1100–2300 surge/peak time ambulance to seven day/week staffing during an appropriate 12-hour peak workload time period.
Financial Impact: Requires 2 Paramedics - $\$100,798 \times 2 + \$32,534 \text{ fringe} \times 2 = \$201,596$.
- To strengthen clinical training, quality improvement integration, and ongoing professional development, the city and Bethlehem EMS should consider establishing a full-time Clinical Coordinator position.

Primary responsibilities should include:

- | | |
|--|---|
| ✓ Coordinating QA/QI review processes. | ✓ Supporting protocol compliance monitoring. |
| ✓ Developing targeted continuing education programs. | ✓ Assisting Medical Director engagement activities. |
| ✓ Managing high-acuity, low-frequency training. | |

This role will significantly strengthen the connection between quality review findings and field-level training performance.

Financial impact (1-Paramedic): $\$68,263.56 + \$32,534 \text{ fringe} = \$100,798.00$.

- BEMS should expand direct Medical Director participation in structured training sessions, transitioning from primarily annual competency-based training to quarterly high-acuity scenario-based training programs.

Recommended training focus areas:

- ✓ Cardiac arrest management.
- ✓ Pediatric emergencies.
- ✓ Airway management.
- ✓ Major trauma care.
- ✓ High-risk clinical decision-making.

Increased physician involvement strengthens clinical alignment and enhances provider confidence.

- BEMS should continue strengthening interagency collaboration. The strong partnership between BEMS and BPD should be maintained and further supported through:
 - ✓ Joint training initiatives.
 - ✓ Shared command structure alignment.
 - ✓ Continued first responder capability development.
- The City should consider adjusting the title of the Director of Emergency Medical Services to a Deputy Chief in the BFD organizational chart. As EMS represents the department's highest service demand and has become an equal pillar of the organization's public safety mission, executive-level leadership is necessary to provide strategic direction, clinical oversight, and organizational accountability.

A Deputy Chief of EMS should be responsible for the department's EMS system, including clinical quality improvement, medical direction coordination, regulatory compliance, workforce development, community health initiatives, data analytics, budget development, and strategic planning. This organizational change aligns the department's leadership structure with its operational realities, ensures EMS is represented in executive decision-making, strengthens coordination with healthcare and regional partners, and positions the department to effectively address the increasing complexity of emergency medical services while maintaining the highest standards of patient care and operational performance.

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End of Section

SECTION 6. EMERGENCY MANAGEMENT

City of Bethlehem Emergency Management Overview

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, proactively mitigate those risks, and respond to and recover from emergency situations. Through planning, preparedness, coordination of response, and management of resources, emergency management plays a critical role in reducing the impacts of disasters.³¹

Emergency management for the City of Bethlehem is coordinated through municipal leadership in collaboration with Northampton and Lehigh Counties' emergency management agencies. These offices work together to support planning, preparedness, mitigation efforts, and emergency response activities across the region. Staffing and funding are supported through a combination of local resources and state and federal grant programs, including pass-through funding from federal agencies.³²

The Mayor, as the chief elected official of the City, serves as the lead authority during an emergency and has the power to declare a local state of emergency when necessary. In accordance with Pennsylvania law, the Mayor may take actions deemed necessary to protect public safety, mitigate disaster impacts, and preserve critical records and evidence for future review or investigation.³³

The emergency management community consists of numerous organizations at the local, county, state, federal, military, nonprofit, and private-sector levels. Agencies that regularly coordinate with local emergency management include the Federal Emergency Management Agency (FEMA), Pennsylvania Emergency Management Agency (PEMA), local fire and EMS departments, public works agencies, emergency communications centers (911 dispatch), public health agencies, law enforcement, the Pennsylvania National Guard, nonprofit organizations, and the American Red Cross.

In recent years, the City of Bethlehem has participated in several federal disaster declarations affecting the Commonwealth of Pennsylvania, including those related to the COVID-19 pandemic, severe storms, flooding, and other natural hazards. These declarations have enabled access to federal assistance programs supporting response, recovery, and hazard mitigation efforts.

Emergency Management Staffing

The City of Bethlehem's current emergency management structure relies on a distributed model in which responsibilities are conducted as ancillary duties by the Fire Chief, designated representatives, and personnel across multiple departments. While this approach has allowed the city to meet basic statutory obligations, it creates clear limitations in sustainability, continuity, and program development. As outlined in the City Emergency Operations Plan 2026, essential functions such as Emergency Operations Center activation, interagency coordination, preparedness planning, and maintenance of Emergency Support Function roles are performed alongside the already demanding operational workloads of public safety leaders. This model

31. *Comprehensive preparedness guide (CPG) 101, Version 3.0.*

32. Pennsylvania Emergency Management Agency. (2022). *Emergency management in Pennsylvania.*

33. Pennsylvania Emergency Management Services Code, 35 Pa.C.S. § 7501 et seq.

inherently constrains the city's ability to conduct consistent long-range planning, proactively address emerging hazards, or maintain the level of readiness expected in an all-hazards environment.

At the same time, Bethlehem faces a diverse and evolving risk landscape that increases the demand for comprehensive emergency management oversight. As documented in the City Emergency Operations Plan 2026, the city must coordinate across local, county, and state systems while managing risks driven by aging infrastructure, densely populated neighborhoods, major institutional occupancies, and significant special events. These conditions require sustained attention to planning, mitigation, grant administration, and regulatory compliance—activities difficult to maintain when emergency management is not a dedicated, full-time function. The growing complexity of these responsibilities underscores the need for a more resilient and professionalized structure, naturally leading to the recommendation that Bethlehem establish a full-time Emergency Manager to ensure that these critical duties receive continuous, specialized focus.

Emergency Operations Center Analysis

Per the City of Bethlehem's Emergency Operations Plan (EOP), the Mayor's Conference Room serves as the initial location for emergency coordination and policy-level decision-making during the early stages of an incident. This space functions as the primary location for executive leadership and the policy group to convene, assess situational conditions, and establish strategic direction.³⁴

At the same time, the City's primary Emergency Operations Center (EOC), located within the Police Headquarters, must remain fully operational and ready for immediate activation. Although the space may be used for routine purposes, it should be maintained in a state of readiness that allows for rapid transition to full EOC operations without delay when an incident escalates.

During emergencies requiring multi-agency coordination, the Police Headquarters EOC serves as the central hub for operational command and control in alignment with the EOP and Emergency Support Function (ESF) structure. This facility must support ESF personnel with adequate workspace, reliable communications systems (including telephones, radios, and networked computers), uninterrupted utilities with backup power, and sufficient accessibility and parking for staff.

It is critical that there be a clear delineation between the roles and responsibilities of the policy group and operational staff. The policy group, operating from the Mayor's Conference Room, is responsible for high-level decision-making, resource prioritization, and public policy considerations. The EOC, operating from Police Headquarters, is responsible for tactical coordination, resource deployment, interagency communication, and execution of response activities. Maintaining this separation ensures efficient incident management, reduces duplication of effort, and aligns with best practices under the National Incident Management System (NIMS).

Additional considerations for the EOC include designated planning and briefing areas, accommodation for extended or 24-hour operations (including rest areas), and separate break spaces to support personnel during prolonged incidents.

34. City of Bethlehem Emergency Operations Plan, 2025.

Staffing, equipment, materials, and infrastructure should be scalable to meet the needs of the incident, ensuring that the EOC can effectively support both routine emergencies and large-scale events.

FEMA's Emergency Operations Center Quick Reference Guide provides further best practices for EOC design, staffing, and operations and should be used as a resource for continued improvement of the City's capabilities.

Emergency Operations Plan Analysis

CPSM reviewed the City's existing Emergency Operations Plan (EOP) and Hazard Mitigation Plan (HMP) and found the content to be valid and consistent with applicable standards. The EOP is structured using the Emergency Support Function (ESF) framework and aligns with Commonwealth of Pennsylvania guidelines and applicable statutes. All core components of emergency management are addressed within the plan, and the EOP meets or exceeds the five mission areas of emergency management: prevention, protection, mitigation, response, and recovery.

Pursuant to the Pennsylvania Emergency Management Services Code (35 Pa.C.S. § 7501 et seq.), municipalities are required to maintain a current and compliant emergency operations plan to remain eligible for state and federal assistance. These plans must be reviewed and updated regularly and submitted to the Pennsylvania Emergency Management Agency (PEMA) for approval. The EOP must address all applicable emergency management functions and align with FEMA's Comprehensive Preparedness Guide (CPG) 101, Version 3.0. Bethlehem's plan meets these requirements.³⁵

Additionally, a comparison of Bethlehem's EOP to FEMA's CPG 101, Version 3.0 indicates that the plan is fully compliant. The guidance in CPG 101 v3 incorporates practitioner feedback, lessons learned, and best practices from real-world incidents and exercises to strengthen planning processes. It emphasizes the integration of all five mission areas and highlights the importance of including private-sector and nonprofit partners in planning and preparedness efforts. Bethlehem's plan reflects these principles and incorporates current doctrine, policies, and legal requirements.

Emergency Management Training and Education

While the City of Bethlehem conducts hazard- and threat-based planning, the city is not fully compliant with National Incident Management System (NIMS) training requirements for personnel assigned to emergency response roles and/or Emergency Operations Center (EOC) functions. The primary NIMS components include Fundamentals and Concepts, Resource Management, Command and Coordination, and Communications and Information Management. The NIMS training courses outlined below are designed to educate response personnel in incident management principles and ensure effective application within their jurisdiction.

NIMS provides a consistent nationwide framework that enables all levels of government, nongovernmental organizations, and the private sector to work together to prevent, protect against, mitigate, respond to, and recover from incidents. It establishes a shared vocabulary, standardized systems, and coordinated processes necessary to deliver capabilities outlined in

35. Federal Emergency Management Agency. (2023). *Comprehensive preparedness guide (CPG) 101, Version 3.0*.

the National Preparedness System. In addition to improving coordination during emergencies, eligibility for certain federal preparedness grants, and in some cases state-administered pass-through funding is contingent upon NIMS compliance.³⁶

CPSM assesses the City of Bethlehem is currently not fully NIMS training compliant.

To achieve compliance, and be fully compliant, key personnel in Bethlehem need to complete various NIMS classes based upon their position and responsibilities under the EOP. These courses include:

- NIMS ICS-100: Introduction to the Incident Command System
 - ✓ Required for all City employees with response and/or EOC assignments, as well as volunteer OEM personnel.
 - ✓ Available as an independent study course through FEMA's Emergency Management Institute (EMI).
- NIMS ICS-200: ICS for Single Resources and Initial Action Incidents
 - ✓ Required for all City employees with response and/or EOC assignments, as well as volunteer OEM personnel.
 - ✓ Available as an independent study course through FEMA EMI.
- NIMS ICS-300: Intermediate Incident Command System for Expanding Incidents
 - ✓ Required for personnel in decision-making roles, those participating in unified command, or those who may staff a local or county EOC.
 - ✓ Conducted as a multi-day, in-person course offered throughout Pennsylvania.
- NIMS ICS-400: Advanced Incident Command System for Complex Incidents
 - ✓ Required for senior personnel in command and general staff roles, unified command participants, and EOC leadership staff.
 - ✓ Conducted as a multi-day, in-person course offered throughout Pennsylvania.
- NIMS ICS-700: National Incident Management System, An Introduction
 - ✓ Required for all City employees with response and/or EOC assignments, as well as volunteer OEM personnel.
 - ✓ Available as an independent study course through FEMA EMI.
- NIMS ICS-800: National Response Framework, An Introduction
 - ✓ Required for all City employees with response and/or EOC assignments, as well as volunteer OEM personnel.
 - ✓ Available as an independent study course through FEMA EMI.

CPSM assesses that completion of these training courses will enhance the City's ability to coordinate effectively during emergencies and ensure continued eligibility for federal and state funding opportunities.

36. U.S. Department of Homeland Security. (2017). *National incident management system* (3rd ed).

COOP Planning

Another critical document that the City of Bethlehem's Emergency Management program should maintain is a Continuity of Operations Plan (COOP). A COOP is essential for local governments that manage financial systems, human resources, public facilities, and vital community services. It serves as a roadmap to ensure the city can prepare for, respond to, and recover from events that disrupt operations, facilities, services, or lines of succession.

COOP planning includes the following key elements:

- **Essential Functions** – The critical activities that must continue during and after a disruption of normal operations.
- **Orders of Succession** – Pre-established lines of authority to ensure leadership continuity if key officials are unavailable.
- **Delegations of Authority** – Identification, by position, of personnel authorized to make policy and operational decisions at all levels when normal leadership channels are disrupted. These delegations remain in effect until standard operations are restored.
- **Continuity of Facilities** – Identification of alternate locations or methods (e.g., telework, mobile operations) to maintain essential functions if primary facilities are unavailable.
- **Continuity of Communications** – Systems and protocols that ensure reliable communication among departments and partner agencies under all conditions.
- **Vital Records Management** – Procedures to identify, protect, and ensure access to critical records, data systems, and documents necessary to support essential functions.
- **Human Capital** – Identification and management of personnel needed to conduct essential functions during a continuity event, including emergency and support staff.
- **Devolution of Control and Direction** – The capability to transfer authority and responsibility for essential functions to alternate personnel and facilities when primary staff or locations are incapacitated.
- **Reconstitution** – The process of restoring normal operations at the primary facility or a new permanent location following a disruption.

CPSM assesses that the City of Bethlehem does not maintain a formal Continuity of Operations Plan (COOP) as described herein. However, the city has developed plans and procedures such as severe weather response protocols that provide a strong foundation for managing and coordinating emergency events. These existing resources should be leveraged and expanded to develop a comprehensive, citywide COOP that ensures continuity of essential government functions under all conditions.

CPSM recommends:

- The City consider establishing a full-time Emergency Management Analyst/Planner position. This is necessary given the increasing complexity of emergency management responsibilities, including continuous planning and preparedness, interagency coordination, grant and project management, and the development and maintenance of required emergency management plans. The current structure, which distributes these responsibilities among existing personnel, limits the City's ability to sustain a comprehensive and proactive program. Given the potential for natural, technological, and human-caused incidents, including those that may result in federal disaster declarations, the City should dedicate sufficient resources to this function. **Financial impact: (1-Analyst): \$81,746 + \$32,534 fringe = \$114,289.00**

- The City work to achieve and maintain full compliance with the National Incident Management System (NIMS). This includes developing a formal implementation plan and ensuring that all City personnel with emergency response and/or Emergency Operations Center (EOC) responsibilities receive appropriate NIMS training commensurate with their roles.
- The City consider maintaining a clearly defined and operationally ready Emergency Operations Center (EOC) capability. In accordance with the Emergency Operations Plan (EOP), the Mayor's Conference Room should serve as the initial location for policy-level coordination and executive decision-making. Concurrently, the primary EOC located within Police Headquarters should remain in a constant state of readiness for immediate activation with minimal setup.

CPSM further recommends the EOC should be capable of supporting multi-agency, 24-hour operations and must include adequate space, communications systems, technology, and infrastructure to support Emergency Support Functions (ESFs). It is essential that there be a clear delineation between the policy group (operating from the Mayor's Conference Room) and operational coordination (conducted within the EOC) to ensure efficient incident management in alignment with NIMS principles.

The City should ensure the EOC can be relocated if the primary site becomes compromised and that it is equipped in accordance with best practices outlined in FEMA guidance.

- CPSM recognizes that the city has existing emergency response protocols (e.g., severe weather procedures) that provide a strong operational foundation. **CPSM recommends** these should be leveraged to develop a formal, all-hazards Continuity of Operations Plan (COOP). The COOP should ensure that essential City functions, personnel, systems, and operations can be maintained or rapidly restored during and after a disruption.

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End of Section

Understanding the appropriate staffing and deployment of the Bethlehem Fire Department and EMS Bureau requires consideration of the City and its emergency service environment as a whole. Bethlehem is not simply a mid-sized city with a corresponding level of fire and EMS demand. It is a compact, densely developed, and historically urban community that contains a diverse and evolving combination of residential neighborhoods, commercial corridors, institutional occupancies, historic structures, high-rise buildings, major educational and healthcare facilities, and large industrial, manufacturing, and distribution properties. The City's location along the Lehigh River and its development across portions of Northampton and Lehigh Counties further contributes to a complex service environment in which municipal boundaries do not necessarily correspond to the way emergency incidents occur or how resources must be deployed.

The risk environment is particularly important when considering the appropriate level of fire department staffing. Bethlehem's older neighborhoods include closely spaced and, in many locations, attached residential structures where age, construction, building condition, occupancy density, and limited fire protection features can increase the potential consequences of a fire. At the same time, redevelopment of the former Bethlehem Steel property and other areas is introducing larger-footprint industrial, warehouse, distribution, and commercial occupancies. The City also contains hospitals, nursing and residential care facilities, universities, schools, high-rise buildings, assembly occupancies, and other target hazards capable of generating incidents that require substantially more personnel and specialized resources than a typical residential fire.

These risks must be considered alongside the Department's actual workload. BFD does not experience an exceptionally high number of structure fires relative to the size of the community, and its fire suppression operation generally demonstrates good routine geographic coverage and relatively limited concurrent fire incidents. However, this does not eliminate the need for adequate staffing depth. The Department's current minimum staffing configuration does not allow it to independently assemble recommended Effective Response Forces for a number of incident types, even when all on-duty personnel are available. The distinction is important: Bethlehem's principal fire suppression staffing challenge is not simply the volume of routine calls; it is the Department's ability to rapidly assemble sufficient personnel when a low-frequency but high-consequence incident occurs, particularly while other companies are committed elsewhere.

The EMS environment presents a different but equally important dimension of resiliency. Bethlehem EMS carries a substantially greater routine workload than the fire suppression system, with EMS incidents representing the overwhelming majority of emergency service demand. High transport rates and frequent concurrent incidents place recurring pressure on the limited number of frontline ambulances available to the community. Consequently, the EMS system's resiliency is influenced less by major individual incidents and more by the frequency with which multiple incidents occur simultaneously and ambulances remain committed to patient care and transportation. Bethlehem's sustained reliance on surrounding EMS agencies during periods of peak demand demonstrates the importance of regional resources to maintaining service availability.

This creates an important nuance for evaluating the overall emergency response system: fire and EMS have different workload and resiliency challenges, but they compete within the same emergency service environment. A fire department company committed to a major incident is unavailable for another emergency, just as multiple ambulances committed to simultaneous

medical calls reduce the system's ability to absorb additional demand. Staffing, deployment, station coverage, mutual aid, automatic aid, and resource availability must therefore be evaluated as interconnected components of one emergency response system rather than as isolated issues.

Regional cooperation is particularly significant for Bethlehem because the City cannot reasonably be expected to maintain sufficient personnel and specialized resources to independently manage every potential high-consequence incident while also maintaining adequate coverage for routine emergencies. Neighboring career, combination, and volunteer agencies provide an important regional resource, but their ability to respond is not uniform. Staffing availability, geography, labor agreements, response expectations, and the distinction between mutual aid and automatic aid all affect how reliably outside resources can contribute to Bethlehem's initial response. This makes the development of formal, dependable automatic-aid arrangements especially important for incidents where the Department's initial response cannot independently achieve an appropriate ERF.

Finally, Bethlehem's risk profile reinforces the importance of prevention and risk reduction as components of the staffing discussion. The City's older building stock, target hazards, redevelopment, and portions of the residential rental inventory require effective inspections, code enforcement, pre-incident planning, and maintenance of fire protection systems. Reducing preventable fires and improving firefighters' pre-incident knowledge of complex buildings can increase the effectiveness of existing personnel and reduce the operational consequences of major incidents.

Accordingly, the evaluation of Bethlehem's fire and EMS staffing should not be reduced to a comparison of calls per firefighter or population-to-staffing ratios. Bethlehem requires a deployment and staffing strategy that reflects the City's unique combination of urban density, aging construction, target hazards, redevelopment, EMS demand, concurrent incidents, limited local staffing depth, and regional resource availability.

The Bethlehem Fire Department (BFD) operates in a relatively compact but operationally complex urban environment. The City encompasses 19.46 square miles, including 19.12 square miles of land and 0.34 square miles of water, with approximately 15.07 square miles in Northampton County and 4.39 square miles in Lehigh County. Within this relatively small geographic footprint are 79,644 residents (2025 U.S. Census estimates), a dense and diverse mix of residential, commercial, institutional, industrial, and recreational occupancies, and a significant inventory of older buildings. Bethlehem's location within the Lehigh Valley also places it within a highly interconnected regional emergency service environment that includes Allentown, Easton, and numerous surrounding municipalities.

The City's population density of approximately 4,165 residents per square mile, combined with its largely built-out character, creates a fundamentally different fire and EMS service environment than that found in a rapidly developing suburban community. Bethlehem has limited opportunities for outward expansion. Future development is more likely to occur through infill, redevelopment, adaptive reuse, and continued development of former industrial properties, particularly portions of the former Bethlehem Steel site. Consequently, the Department must plan for increasing service demands within an established urban environment rather than relying on geographic expansion of the community.

Community Risk and Fire Department Staffing

Bethlehem's risk profile is best characterized as moderate to elevated, with significant variation among geographic areas and occupancy types. The City's older residential neighborhoods

contain closely spaced and, in some locations, attached or interconnected buildings. Many structures date from the late nineteenth and early twentieth centuries and may have combustible construction, aging building systems, limited fire protection features, and configurations that can make access, search, ventilation, and fire suppression more challenging.

The South Side and other older urban neighborhoods present particular operational considerations. Higher population densities, multifamily occupancies, student housing, mixed-use buildings, narrow streets, and older construction can combine to create conditions where a relatively small fire can rapidly become a multiple-occupancy or multiple-exposure event. The proximity of buildings can also increase the potential for fire extension beyond the building of origin.

At the same time, Bethlehem has developed a significant inventory of newer and redeveloped properties. The former Bethlehem Steel area contains increasingly large industrial, manufacturing, warehouse, distribution, and commercial facilities. These occupancies can have large floor areas, high-piled storage, specialized processes, hazardous materials, and substantial fire-flow requirements. The City also contains hospitals and healthcare facilities, colleges and universities, high-rise buildings, assembly occupancies, schools, and other target hazards capable of generating incidents that exceed the capabilities of a single fire company.

The resulting risk environment is therefore not defined simply by the number of fires occurring each year. It is defined by the potential consequences of individual incidents and the resources required to manage them safely.

This distinction is important when evaluating BFD staffing. The Department has 106 authorized personnel, with 96 assigned to fire and EMS operations across four operational shifts. Normal staffing assigns two or three personnel to each fire suppression unit, with a minimum daily staffing level of 19 personnel. An Assistant Chief provides citywide operational command, while company officers provide station-level supervision.

From a daily service-delivery perspective, this staffing model provides a relatively stable operating platform. However, the staffing level is less robust when evaluated against the City's risk profile and the personnel required to assemble an Effective Response Force (ERF) for significant structure fires.

CPSM's analysis indicates that BFD cannot independently assemble the recommended ERF for even a single-family dwelling fire on the initial alarm under the current response configuration. The staffing limitation becomes more pronounced for apartment, commercial, industrial, and high-rise incidents. Even if every on-duty BFD member and apparatus is available, the Department cannot independently achieve the personnel levels generally associated with larger and more complex fireground operations.

This does not mean that BFD cannot initiate effective fire suppression operations. The initial companies can begin critical tasks such as incident command, fire attack, water supply, search, ventilation, and other priority functions. Rather, it means that the Department's ability to simultaneously perform all required fireground functions is constrained by the number of personnel available on the initial alarm.

Consequently, staffing and deployment must be evaluated not only against routine workload but also against the City's low-frequency/high-consequence incidents. A department may experience relatively modest numbers of actual structure fires while still requiring sufficient staffing and regional support to manage the occasional large fire, hazardous materials incident, technical rescue, high-rise fire, or multiple-alarm event.

Workload Does Not Fully Describe the Staffing Requirement

Bethlehem's workload data present an interesting contrast. In 2025, BFD responded to 4,603 incidents, averaging approximately 12.3 incidents per day. Only 160 of these were actual fires, including 93 structure fires. EMS/MVC-related incidents accounted for 1,686 incidents, while other fire-service incidents, including false alarms and other calls, represented a substantial portion of the remaining workload.

Over the longer ten-year period, total incident volume has not consistently increased. In fact, overall calls peaked in 2017 and remained approximately 13 percent below that peak in 2025. Structure fires also remain below the 2016 peak. Consequently, an argument based solely on total incident volume would not necessarily support substantial increases in fire suppression staffing.

However, the Department's total run workload tells a different story. Apparatus runs reached their highest level in 2025, at approximately 9,320, representing a 20 percent increase from 2016. This distinction between incidents and runs is important. A single incident can generate multiple apparatus responses, and those additional responses consume personnel time and reduce availability for subsequent incidents.

False alarms are an important component of this workload. False alarms increased from 1,012 calls in 2020 to 1,334 in 2025, a 32 percent increase. Although these incidents generally do not involve an actual fire, they require apparatus and personnel to respond, investigate, and verify conditions. Repeated false alarms therefore contribute to unit utilization without necessarily representing a corresponding increase in community fire risk.

The workload analysis suggests that BFD does not experience severe system-wide workload saturation across its fire suppression operation. Station-level overlap and response availability remain generally favorable, and concurrent fire incidents are relatively infrequent. This is an important finding because it indicates that the principal staffing issue is not simply excessive routine call volume.

Instead, the more significant issue is the department's ability to provide an adequate depth of resources when a serious incident occurs while other companies are committed. In other words, BFD's challenge is more closely associated with consequence, staffing depth, and resiliency than with raw call volume alone.

A Breakdown of Structural Fire Incidents: 2019-2025

The classification and analysis of structural fire incidents is an important component of evaluating a fire department's operational workload, community risk, staffing and deployment requirements, and overall service delivery performance. The National Fire Incident Reporting System (NFIRS), developed and administered by the United States Fire Administration (USFA), has historically provided a standardized methodology for documenting and categorizing fire incidents and other emergency responses. NFIRS enables fire departments to collect information regarding the nature of an incident, the property involved, the extent of fire spread, civilian and firefighter casualties, property losses, and the resources committed to emergency operations.

A reported structure fire may involve a minor cooking fire contained to a pot or pan, a fire confined to a chimney or appliance, a fire originating in a single room, or a significant working fire involving multiple rooms, floors, or buildings. Although each incident may be associated with

a structure, the operational demands and risks presented to responding firefighters can vary substantially.

NFIRS Structural Fire Incident Classification

NFIRS uses a three-digit incident type classification system to identify the nature of an emergency incident. Structural fires are generally associated with the 110 series of fire incident codes, while fires confined to specific equipment, appliances, or other objects within structures are reported separately under the 120 series.

The following classifications are particularly relevant when evaluating structural fire incidents.

NFIRS Code	Incident classification	Description
111	Building fire	A fire involving a building, excluding fires classified as confined fires.
112	Fire in structure other than a building	A fire involving a nonbuilding structure, such as certain bridges or other constructed facilities.
113	Cooking fire, confined to container	A cooking fire that remains confined to the vessel or container of origin.
114	Chimney or flue fire, confined to chimney or flue	A fire confined to the chimney or flue system.
115	Incinerator overload or malfunction, fire confined	A fire confined to an incinerator.
116	Fuel burner or boiler malfunction, fire confined	A fire confined to a fuel burner or boiler.
117	Commercial compactor fire, confined to rubbish	A fire confined to rubbish within a commercial compactor.
118	Trash or rubbish fire, contained	A fire confined to a trash or rubbish container in or on a structure.

The distinction between NFIRS Incident Type 111 (Building Fire) and the confined-fire classifications is particularly important.

A building fire classified under Incident Type 111 generally represents a fire that is not eligible for classification as one of the specifically defined confined fires. However, this does not automatically indicate that the incident involved a significant working fire, extensive structural involvement, or sustained interior suppression operations.

Conversely, fires classified under Incident Types 113 through 118 generally involve fires contained within their designated objects or systems. Although these incidents may require an emergency response, investigation, ventilation, or other fire department actions, they typically present different operational demands than a developing or fully involved building fire.

Using BFD NFIRS data, CPSM was able to break down structure fire incidents from 2019 to 2025 as indicated here.

Type		Year						
		2019	2020	2021	2022	2023	2024	2025
Building fire* <i>Building Fires</i>	Dwelling	15	39	30	27	20	20	17
	Commercial	4	5	2	1	1	3	4
	Other	12	9	18	10	10	13	14
	Subtotal	31	53	50	38	31	36	35
Other structure fire <i>Fires or conditions in a building but confined to an appliance, container or other component.</i>	Dwelling**	15	20	25	14	22	20	24
	Commercial	2	3	3	4	2	5	7
	Other	13	19	11	24	21	20	27
	Subtotal	30	42	39	42	45	45	58
Total		61	95	89	80	76	81	93

Note: *NFIRS incident type is 111; **NFIRS incident type varies from 100 to 118 but is not 111.

The green shaded categories represent actual building fires. The red shaded categories represent fires in buildings but contained to an appliance, container, or component within the building.

The NFIRS structural fire incident classifications provide an important foundation for understanding the frequency and characteristics of fires occurring within a community. The distinction between confined fires, nonconfined building fires, and the extent of fire spread is particularly important. A percentage of reported structural fire incidents may involve relatively limited fire conditions, while a much smaller number may require extensive suppression operations and the commitment of multiple companies.

Of particular importance, a relatively low number of working structure fires does not eliminate the need to maintain sufficient suppression capabilities. Fire departments must be prepared to respond to high-consequence, low-frequency incidents, including fires that require immediate rescue operations, simultaneous critical task completion, and the timely assembly of an Effective Response Force.

Ultimately, structural fire incident data should be used to inform risk-based staffing and deployment decisions, not as the sole determinant of fire suppression resource requirements. Integrating incident classifications with fire spread, incident outcomes, response performance, community risk, and ERF capabilities provides a more comprehensive and defensible basis for assessing fire department operational effectiveness.

The EMS Dimension

The EMS environment adds another layer to the staffing and resiliency discussion. Bethlehem EMS experienced substantially greater workload pressure than the fire suppression system. In 2025,

BEMS responded to 12,260 calls and generated 14,479 unit runs. Approximately 94 percent of those calls were EMS incidents, and the transport rate was approximately 82 percent.

More importantly, 63.1 percent of EMS calls occurred concurrently with at least one other incident. This demonstrates that simultaneous demand—not simply annual call volume—is a principal driver of EMS system stress.

BEMS operates with a limited number of frontline ambulances. During periods when multiple ambulances are committed to patient care and transportation, the system increasingly depends on mutual aid resources to maintain geographic coverage. The ten-year data demonstrate this reliance, with mutual aid responses into Bethlehem ranging from approximately 533 annually to more than 1,100 in the peak year.

This creates an important distinction between the fire and EMS systems. BFD's fire suppression operation demonstrates relatively good routine resiliency but limited depth for major incidents, while BEMS experiences greater day-to-day resource pressure caused by overlapping calls and transport commitments.

The two systems are nevertheless interconnected. Fire personnel, EMS personnel, command staff, apparatus, and mutual aid resources operate within the same regional emergency response environment. A significant EMS workload can remove personnel or resources from availability, just as a major fire can affect the availability of EMS resources.

Mutual Aid as a Staffing Multiplier

Traditional mutual aid provides assistance when requested. Automatic aid goes a step further by establishing predetermined response arrangements in which neighboring resources are dispatched simultaneously with local resources based on incident type, location, and risk. For a department such as Bethlehem, automatic aid can function as a staffing multiplier, allowing the Department to assemble a larger and more capable response force without maintaining all of those personnel locally. Mutual and automatic aid are therefore particularly important to Bethlehem.

This is especially important for high-risk occupancies. A fire in a single-family dwelling may require a relatively modest initial response, but a fire involving an apartment building, high-rise, warehouse, industrial facility, or large commercial occupancy can rapidly exceed the personnel available on duty in Bethlehem.

The existing regional environment, however, presents challenges. While Allentown provides a nearby career-staffed fire department capable of providing dependable assistance, many surrounding jurisdictions rely substantially on volunteer personnel. Volunteer availability can vary by time of day, day of week, weather, employment obligations, and other factors. Consequently, not all neighboring resources can be considered equally dependable for meeting an ERF at any given time.

The current collective bargaining provisions also affect the practical use of mutual aid by requiring the recall of Bethlehem personnel when outside assistance is requested under certain circumstances. This can diminish some of the operational advantages of relying on outside resources.

As recommended, CPSM views the development of formal, written automatic-aid agreements as particularly important. These agreements should identify the types of incidents that trigger additional resources, the specific companies or units assigned, response expectations,

command relationships, staging procedures, and provisions for station coverage when local companies are committed.

Fire Prevention and Risk Reduction

Bethlehem's fire prevention program is also an important component of this equation. The City has approximately 2,318 buildings and 6,150 occupancies requiring fire prevention inspections, not including certain residential rental properties. Yet the number of inspections declined from 2,374 in 2022 to 1,132 in 2025.

The decline should be viewed in the context of staffing and organizational capacity within the Fire Marshal's Office. The Inspections Captain position was vacant for a significant period, and turnover among Lieutenant/Inspectors required substantial training time.

This represents more than an administrative issue. Fire prevention is a staffing strategy as well as a regulatory function. Effective inspections, code enforcement, plan review, pre-incident planning, and fire protection system oversight reduce the probability that a building will experience a serious fire and improve the Department's ability to operate when one occurs.

This is particularly important for Bethlehem's target hazards. Pre-fire planning should focus resources on occupancies where the consequences of a fire could rapidly exceed the capabilities of the initial response. Hospitals, nursing homes, high-rise buildings, schools, universities, large assembly occupancies, warehouses, industrial facilities, high-piled storage buildings, and older multifamily occupancies should receive particular attention.

The City's approximately 138 residential rental properties identified as not being subject to routine fire prevention inspections also warrant consideration. Where these properties lack features such as monitored automatic fire detection, sprinklers, protected stairs, or secondary means of egress, the combination of occupant density, building configuration, and limited fire protection features can increase both life-safety risk and the personnel required to mitigate an incident.

An External Perspective

Bethlehem's situation is not unique. Many established Northeast cities face the same tension between an aging and increasingly complex built environment and relatively constrained municipal staffing. As a review, Bethlehem's U.S. Census estimated population is 79,644 inside 19.12 square miles. **The population/square mile is 4,165.**

Allentown, Pennsylvania provides the closest regional comparison, although a higher population. Like Bethlehem, Allentown is an older, densely developed Lehigh Valley city with substantial legacy housing stock, commercial corridors, industrial properties, institutional occupancies, and a combination of older and newer development. Its proximity makes it particularly valuable as a potential automatic-aid partner because resources can cross the municipal boundary without the long travel distances associated with more distant mutual-aid agencies. Comparatively, Allentown has a land mass of 17.55 square miles, and a U.S. Census estimated 2025 population of 126,044 (**7,182 people/square mile**). The Allentown Fire Department staffs and deploys from six stations.

Lancaster (City), Pennsylvania presents another useful comparison. Lancaster operates within a compact, older urban environment containing historic buildings, dense residential areas, commercial occupancies, institutional facilities, and redevelopment occurring within an established community. Like Bethlehem, its fire protection requirements are influenced by the characteristics of its existing building stock rather than simply by population growth.

Comparatively, Lancaster has a land mass of 7.23 square miles, and a U.S. Census estimated 2025 population of 58,366 (**8,073 people/square mile**). The Lancaster Fire Department staffs and deploys from three stations.

Easton, Pennsylvania provides another regional example of an older, compact urban community. Its historic core, closely spaced buildings, mixed-use occupancies, and surrounding suburban development create a risk environment in which the consequences of a significant structure fire can exceed the resources available from a small initial response. Comparatively, Easton has a land mass of 4.026 square miles, and a U.S. Census estimated 2025 population of 30,402 (**7,551 people/square mile**). The Easton Fire Department staffs and deploys from three stations.

Looking beyond Pennsylvania, Troy, New York, and New Haven, Connecticut, provide additional examples of Northeast cities where older urban building stock, historic structures, mixed residential and commercial occupancies, institutional properties, and constrained municipal boundaries create fireground challenges that cannot be evaluated solely through annual fire counts.

Comparatively, Troy has a land mass of 10.36 square miles, and a U.S. Census estimated 2025 population of 50,912 (**4,914 people/square mile**). The Troy Fire Department staffs and deploys from six stations.

Comparatively, New Haven has a land mass of 18.69 square miles, and a U.S. Census estimated 2025 population of 138,774 (**7,425 people/square mile**). The New Haven Fire Department staffs and deploys from 11 stations.

A comparison of peer cities illustrates the importance of population density and the built environment when evaluating fire protection needs in Bethlehem. Lancaster has approximately 8,073 people per square mile, Easton 7,551, New Haven 7,425, Allentown 7,182, and Troy 4,914. These population densities provide useful context because higher population density is often accompanied by greater building density, more multifamily and multi-story residential structures, and a greater concentration of people within individual buildings.

For fire and EMS departments, however, population density is more than a demographic measure. It can be an indicator of vertical density and the complexity of the built environment. A population concentrated in multi-story apartment buildings, attached housing, mixed-use structures, or other larger occupancies creates different operational challenges than the same population distributed across predominantly low-density, single-family development. Firefighters may need to move significant numbers of occupants vertically through stairwells, operate on multiple floors, stretch hose lines over greater distances, and deploy ladders or other specialized equipment. High-rise and multi-story residential incidents can also require substantially more personnel than a typical single-family residential fire.

The peer communities demonstrate that higher-density urban environments generally require a deployment system capable of rapidly assembling an effective initial response. Lancaster operates from three fire stations despite its high population density; Easton also operates from three stations. Allentown, with more than 126,000 residents and approximately 7,182 people per square mile, operates from six stations, while New Haven, with approximately 138,800 residents and 7,425 people per square mile, operates from 11 stations. Troy, by comparison, has a lower population density of approximately 4,914 people per square mile and operates from six stations. The differences reinforce that population density alone does not determine staffing or station requirements, but it is an important indicator of the potential concentration of risk and the consequences of delayed or insufficient response.

This distinction is particularly important for Bethlehem. The City's fire protection requirements should be evaluated not simply by comparing annual incident volume or the number of structure fires, but by examining where people live and work, how many occupants are concentrated within individual buildings, the prevalence of multi-story and multifamily residential structures, and the resources required to manage a significant incident in those buildings. A relatively low frequency of structure fires does not necessarily translate into a low level of fire protection risk. In a dense urban environment, a single fire in a large apartment building, high-rise, mixed-use structure, institutional occupancy, or other complex building can rapidly generate a personnel requirement that exceeds the capabilities of the initial arriving companies.

Consequently, Bethlehem's deployment strategy must account for both the frequency of incidents and the consequences of significant incidents. The greater the vertical and population density, the greater the importance of rapid response, sufficient initial staffing, multiple-unit deployment, and the ability to maintain coverage elsewhere in the community while a major incident is underway. This is particularly relevant when assessing whether the Fire Department has adequate staffing and station distribution to provide an effective initial response while also maintaining regional fire and EMS resiliency.

Overall Nuanced Assessment

Bethlehem presents a moderate-to-elevated community risk environment within a relatively compact urban footprint. The City does not experience an extraordinary number of structure fires, and BFD generally demonstrates good routine response coverage and relatively limited fire suppression concurrency. These are positive indicators.

At the same time, the BFD operates with limited staffing depth relative to the potential complexity of the City's fire problem. The combination of older attached residential construction, dense neighborhoods, high-rise buildings, universities, healthcare facilities, assembly occupancies, and expanding industrial and warehouse development creates a risk profile in which major incidents can quickly exceed the personnel available on the initial alarm.

The data therefore support a nuanced conclusion: Bethlehem's primary fire suppression staffing issue is not an inability to handle its routine workload; it is the limited depth of staffing available when the Department encounters a high-consequence incident, multiple simultaneous incidents, or a major fire while other companies are committed. This is evident in the structure fire data analysis.

For this reason, Bethlehem's future fire service strategy should consider three complementary components: **1-** maintaining adequate on-duty staffing to initiate critical fireground tasks, **2-** strengthening regional automatic aid and formal mutual-aid agreements to provide additional personnel when needed, and **3-** expanding prevention and pre-incident planning efforts to reduce the probability and consequences of major incidents.

The regional fire service environment should be viewed as an extension of Bethlehem's own deployment system. A well-designed automatic-aid network can provide the personnel depth that a municipality of Bethlehem's size may not be able to economically maintain independently, while allowing the City to preserve local staffing for routine emergencies and initial fireground operations. Formal agreements with dependable career and combination agencies, particularly neighboring departments with predictable staffing, should be considered alongside broader regional arrangements for specialized resources.

Ultimately, Bethlehem's fire protection strategy should be based on risk, consequence, staffing depth, and regional resiliency, not simply annual incident totals. The City's relatively stable

population and modest overall fire workload should not obscure the operational demands created by its older urban building stock, target hazards, redevelopment, EMS workload, and limited ability to independently assemble recommended ERFs. A balanced approach that combines appropriate local staffing, strong prevention, targeted pre-incident planning, automatic aid, mutual aid, and regional cooperation provides the greatest opportunity to maintain reliable emergency service delivery while recognizing the fiscal and operational realities of a mid-sized Northeast city.

Alternatives and Considerations

- For Bethlehem, automatic aid should not be interpreted as a substitute for appropriate minimum staffing. Rather, it should be viewed as a mechanism for providing the additional depth needed for major incidents.

A reasonable alternative to an immediate large-scale staffing increase would be a three-part strategy:

- ✓ Maintain or modestly strengthen minimum BFD staffing to ensure the Department can initiate critical fireground tasks independently.
- ✓ Establish formal automatic-aid agreements, particularly with reliable career-staffed neighboring departments, to provide additional personnel on the initial alarm for multifamily, commercial, industrial, high-rise, and other target hazards.
- ✓ Focus additional staffing resources on EMS and peak-demand periods, where the data demonstrate the greatest concurrency and resource depletion.

This approach recognizes the reality that Bethlehem **cannot** economically staff every conceivable ERF solely with its own personnel, while also avoiding excessive dependence on mutual aid for routine emergency response. It creates a layered system in which BFD provides the initial response, automatic aid supplies additional depth, and regional mutual aid provides reinforcement for extended or extraordinary incidents.

■ Risk-Based Automatic Aid Deployment

Rather than waiting for BFD personnel to determine that additional resources are needed, establish automatic aid by incident type.

For example, an alarm at a specific risk as outlined below could automatically generate additional companies from neighboring departments:

- ✓ High-rise building
- ✓ Hospital
- ✓ Nursing facility
- ✓ Large warehouse
- ✓ Industrial facility
- ✓ Large multifamily building
- ✓ Major assembly occupancy

This would allow Bethlehem to overcome its ERF limitation without requiring the City to maintain all of the necessary personnel internally.

Assessment: This would provide one of the greatest improvements in initial incident capability with relatively little change to BFD's local station configuration.

■ Establish different initial response assignments based on risk and occupancy type.

For example:

- ✓ Low-risk residential fire: 3–4 BFD companies.
- ✓ Moderate-risk apartment/commercial fire: 4–5 BFD companies plus automatic aid .
- ✓ High-risk/target hazard: predetermined BFD response plus automatic aid from neighboring departments.
- ✓ High-rise/industrial fire: predetermined assignment with automatic aid and multiple alarms.

This approach recognizes that a single-family dwelling and a large warehouse should not necessarily receive the same deployment.

Assessment: This is probably one of the most appropriate alternatives for Bethlehem as it aligns deployment with the City's diverse risk profile.

■ Targeted Fire Prevention and Risk Reduction

- ✓ Increase inspections and pre-incident planning for the City's highest-risk occupancies.
- ✓ Prioritize high-rise buildings, hospitals, nursing facilities, universities, large assembly occupancies, warehouses, industrial facilities, and older multifamily buildings.
- ✓ Improving prevention and pre-incident intelligence can reduce both incident probability and the resources required to manage an incident.

■ False Alarm Reduction

- ✓ Strengthen enforcement of the City's Emergency Alarm System ordinance and require corrective action for repeat offenders.
- ✓ Targeted Fire Marshal efforts to reduce the 1,334 false alarm responses recorded in 2025 would return apparatus and personnel to service and improve system availability.

Overall, aligning the BFD's fire and EMS deployment system with its actual risk profile, and targeting fire prevention and community risk reduction while recognizing that the Department's relatively low routine fire workload, lessens the burden of maintaining shift staffing locally to independently achieve the maximum ERF for every conceivable incident.

The important point is that deployment alternatives are not necessarily staffing alternatives. A department can potentially improve coverage, ERF capability, and resiliency by changing where, when, and how existing personnel and apparatus are deployed, even if the number of authorized positions remains unchanged or modestly improved over the near, mid, and longer budgeting terms to initiate the most critical of critical tasks on low, moderate, and higher risk occupancies as CPSM has recommended.

End of Report

