Staffing & Deployment Analysis

for the

Middletown Division of Fire

Presented by

The Ohio Fire Chiefs' Association

Consulting Services

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PREMIER • PROFESSIONAL • PROACTIVE

Executive Summary

The Ohio Fire Chiefs' Association (OFCA) performed a staffing and deployment analysis for the Middletown Division of Fire. This analysis included a community risk survey, review of the division's current service demand, response performance, and staffing and support services.

Middletown is located in northeastern Butler County. The city is 25.6 square miles and has an estimated population of 48,823. Fifteen percent of the population is over 65 years of age and the median income is $36,215; 9.2% of the families and 12.6% of the individuals have incomes below the federal poverty level. The city is well known as the home to A-K Steel, a global steel manufacturing firm. Middletown is home to numerous affiliated companies such as Worthington Steel, Pilot Chemical, Quaker Chemical, Air Products and Thompson Steel.

The Middletown Fire Division (MFD) operates from four fire stations and has an authorized strength of 79 uniformed personnel. The division provides fire suppression response and paramedic level emergency medical service (EMS) which includes patient transport. Over the past 10 years, the division experienced an 18% increase in calls for service. In 2017, the division responded to 11,831 incidents; 83% were EMS related.

A community risk assessment was performed. The assessment consisted of evaluating "target hazard" properties on various elements of fire risk and the potential impact on the community. Five properties were identified as maximum risk properties and over 100 were identified as a significant risk.

The division currently has 24 personnel assigned to each shift; the minimum staffing level is 16. With 16 personnel on duty, the division staffs Stations 81, 82 and Station 85 as two-piece (engine and medic) combo-companies with three personnel assigned to each station. Station 83 has six personnel assigned staffing an engine, medic and other units.

The division's response performance was reviewed and analyzed for fire and EMS responses from 2017. The analysis revealed that a performance gap existed in each response district between the division's actual performance and baseline performance criteria established by national organizations such as the National Fire Protection Association and the Commission on Fire Accreditation International (Center for Public Safety Excellence). This included the response of the first-due company and the 2nd and 3rd due companies as part of an Effective Response Force.

A fire station location analysis was also conducted to analyze the impact the division's current and future fire station locations could have on response performance.

Some of the recommendations developed as part of the evaluation and analysis are briefly outlined in the following paragraphs:

Recommendation: ***The daily minimum staffing levels for the fire division should be increased to 19 personnel.*** Nineteen personnel would enable the division to staff three committed medic units, two engine companies, and two combo-companies plus the shift commander. This increase in minimum staffing would allow committed engine companies at Station 81 and Station 83. These were the two busiest stations, with Station 81 and Station 83 handling 34% and 31% of the call demand respectively, or 65% of the total workload. This would allow the division to essentially handle three to five EMS calls at the same time and still have at least two engine or quint companies available to respond to fires and other incidents such as an auto accident with entrapment, etc.

Optimally, the daily staffing levels should be 21 personnel. This would allow Station 82 to staff an engine company and a medic company. The analysis indicated that Station 82's district in the east end of the city is the growth area, with additional development in the planning stages.

Recommendation: ***The city should develop a facility improvement plan.*** A previously completed facility plan noted numerous deficiencies in the station facilities. These deficiencies were confirmed by the OFCA's cursory assessment. In addition, if was found that Stations 81 and Station 85, primarily due to the age of the facilities, did not facilitate rapid response of the personnel assigned to the station. The updated facility plan should include a series of improvements for the remaining facilities to make them more operationally efficient while meeting the modern needs of an essential facility, including proper air movement and make-up, infection control, and energy efficiencies.

Recommendation: ***As part of the facility plan identified, the city should replace and relocate Station 82.*** This was based on the analysis of the response performance, service demands and computer modeling. Computer modeling identified an optimal site on SR 122 near Towne Boulevard, between I-75 and Cincinnati-Dayton Road.

Recommendation: ***The fire division should consider adding another dedicated fire prevention position.*** This would bolster and expand the current prevention and education efforts. Two examples would be to work on preventing and reducing civilian death and injuries from residential fires and reducing fire alarm responses to commercial, assembly and industrial properties.

Recommendation: ***The city should explore the feasibility of adopting a False Alarm Ordinance.*** Recurrent responses to false alarms puts the public and fire division at risk unnecessarily and ties up resources that may not be available to respond to a true emergency. A well-crafted false alarm ordinance can reduce the number of recurrent false alarms while still allowing property owners the occasional accidental or unintended alarm activation. Many communities across Ohio have enacted false alarm ordinances with positive results.

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Introduction

The Ohio Fire Chiefs' Association (OFCA), a professional association and consulting firm, was selected by the city of Middletown to perform a staffing and deployment analysis for the Middletown Division of Fire. This analysis included a community risk survey, review of the division's current service demand, response performance, and staffing and support services. City officials also were interviewed to identify future concerns regarding the delivery of fire and emergency services, economic development and anticipated community growth.

Overview

Middletown has an area of 25.6 square miles and is located in northeastern Butler County and also has land area in Warren County. Madison Township borders the city to the north and west, Lemon Township borders to the south and southwest, and the city of Monroe borders to the south. The eastern border of the city is situated in Warren County and is bordered by Franklin and Turtle Creek Townships.

This urban community consists of a mixture of low- to high-density residential development, commercial occupancies, and light- and heavy-industrial properties and complexes. The city is well known as the home to A-K Steel, a major steel manufacturing complex. A-K Steel also has relocated and rebuilt a major new research facility. In addition to A-K Steel, Middletown is home to numerous affiliated companies such as Worthington Steel, Pilot Chemical, Quaker Chemical, Air Products and Thompson Steel. There are other large facilities such as Atrium Medical Center and Essity Paper. The city also is home to a regional campus of Miami University and Cincinnati State Technical and Community College. Main roadways in the area include Interstate 75, State Route 73 (Verity Parkway), State Route 122 (Roosevelt Boulevard), Yankee Road, Central Avenue and Breiel Boulevard.

Norfolk & Southern Railroad has a major rail line that runs through the city in a north-south direction and handles up to 10 trains per day. It services the A-K Steel facility and others, with a major delivery/switch yard at the A-K Steel complex. Most street crossings have an overpass nearby, so the switching and movement of rail cars does not pose a response concern for the department. CSX also has a heavily traveled rail line through the city and averages 10-12 trains a day. Hook Field, the city's municipal airport is located in the northwest section of the city. The Great Miami River runs along the north and northwestern boundaries of the city. The river is used for recreation and has one low-head dam across the river in the area of S. Main Street and 9th Street. A map of the city is displayed in Figure 1.

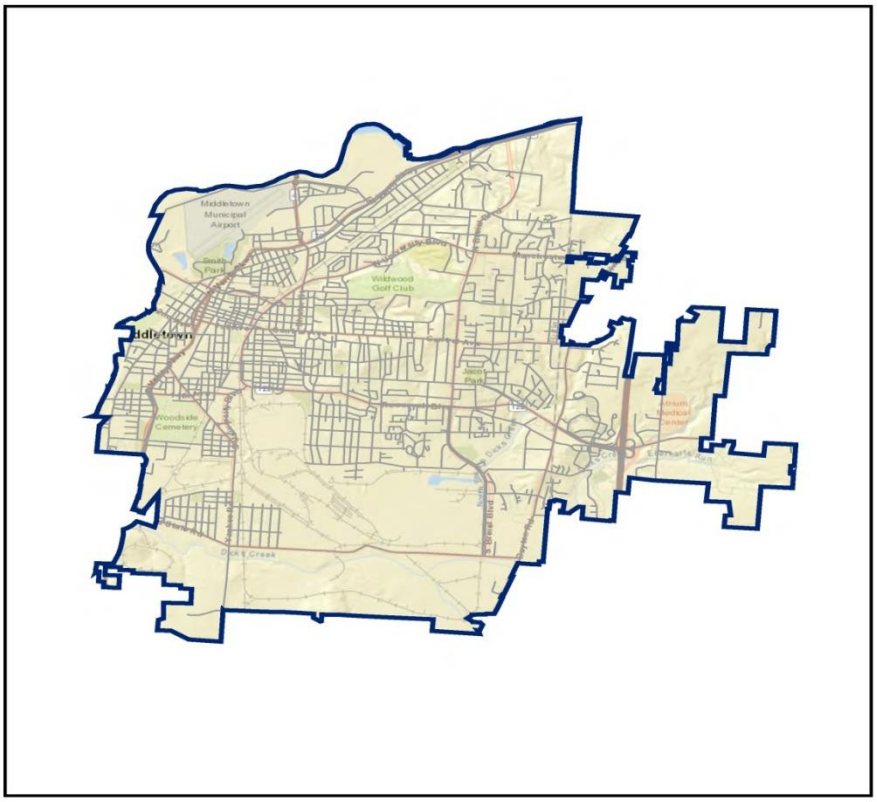

Figure 1

Governance

The city of Middletown is a council-manager form of government as outlined in the city's charter that is approved by the electorate subject to the provisions in the Ohio Constitution. There are five elected council members and the mayor. City council appoints a city manager, who is responsible for carrying out council direction and policy, and for the day-to-day operations of the city. There are 12 departments and several boards and commissions. There are three departments responsible for public safety and health; fire, police and health.

Demographics

The city has a population estimated at 48,823[1]. The population is 82% white, 12% African-American and other ethnicities makeup the other 6%. Fifteen percent of the population is over 65 years of age and the median income is $36,215; 9.2% of the families and 12.6% of the individuals have incomes below the federal poverty level. There are 23,296 housing units in the

[1] U.S. Census Estimate 2017

city and 87% are occupied. Fifty-four percent of the housing units are owner occupied and 46% are rental occupied. The city has a population density of 1,907 people per square mile.

Growth

Since the economic downturn in the mid and late 2000s, the city has experienced an increase in tax revenues as a result of steady economic growth. There was a downturn again in 2013 with resurgence in 2016. Housing is very integrated in the overall economic development projections of the city. The most significant is 600 acres primarily east of I-75 along SR 122. This is a combined residential and commercial area to include multi-family housing and assisted living facilities. Land area north of the Atrium Medical Center campus is planned for commercial and multi-family development. There is a residential plat south of SR 122 currently in the planning stages for 300 plus single-family residences. There also is a two-phase development of Ryan Homes planned with a total of 370 homes. The city is working with developers to identify areas for middle-income homes for families ready to move up from a starter home. In a recent Housing Study, the downtown area, due to its resurgence with entertainment venues and special events, was found to support 300 housing units for development and growth.

The city has benefitted from redevelopment and in-fill development. The downtown area has seen 36 new businesses in the last 30 months, including retail, entertainment and mixed-use residential development. The city is currently working on the implementation of a downtown revitalization district to continue to build on the success of the downtown development.

There is limited area left for industrial expansion. The city is currently exploring ideas with community leaders for development plans in this area. Overall, the economic forecast is good for the city. Continued population growth will impact the demand for fire division services. Expansion of assisted living facilities will have an immediate impact on demand. These facilities usually include a combination of over-55 units, assisted living facilities and skilled nursing facilities. These facilities normally average one EMS call, per unit, per year.

Mission and Vision

All organizations should have a mission statement. A carefully crafted mission statement describes an organization's purpose, function and services provided. This lays the foundation for the organization's direction and service goals. A mission statement often informs the vision statement, which describes where the organization aspires to be in the future. The Middletown Fire Division has a clearly developed mission and vision, along with defined core values that identify the organization's culture and belief system.

Mission

The mission of the Middletown Fire Division is to proudly serve with compassion, integrity and professionalism.

Vision

The vision of the Middletown Fire Division is to provide exceptional service, by a team of professionals, dedicated to the safety of the community and its citizens. While devoted to our mission and core values, we commit to continually bettering ourselves and holding one another accountable while maintaining a constant state of readiness. We will continually look to enhance our service delivery by being innovative and progressive, while ensuring fiscal sustainability and responsibility.

Core Values

Honesty

Integrity

Respect

Self-discipline

Professionalism

Speak truth to power

Technical competence

Fire & Emergency Services

The Middletown Fire Division (MFD) got its start in 1848 as a volunteer organization. In 1882, the division transitioned into a part-paid department with volunteer runners. In 1911, the division became fully paid. Over the next 50 years the city continued to grow and the division grew along with it. The city and division experienced significant growth after the conclusion of World War II, especially during the 1950s and early 1960s. In 1974, the division formally implemented emergency medical services (EMS).

The MFD has evolved into a modern, progressive organization and enjoys strong community support. The division is a full-time career organization with a current authorized strength of 79 uniformed personnel.

MFD provides fire suppression response and emergency medical service (EMS). The EMS is an advanced life support level (paramedic) and transport model. Approximately 63% of the EMS

transports are categorized as advanced life support calls. Patients are generally transported to Atrium Hospital in Middletown. The division utilizes EMS billing for transport service through a third-party service. The division also provides fire coverage to a two square mile area of Franklin Township, located east and north of the city limits in Warren County.

The division has experienced a steady increase in service demand. In 2008, the division responded to 10,019 calls for service. By 2017, this number had increased to 11,831 calls for service, an 18% increase. Note that a call for service is actually an incident count. If multiple companies respond to a fire, it counts as one incident or call for service. Middletown's calls for service over the past 10 years are displayed graphically in Figure 2.

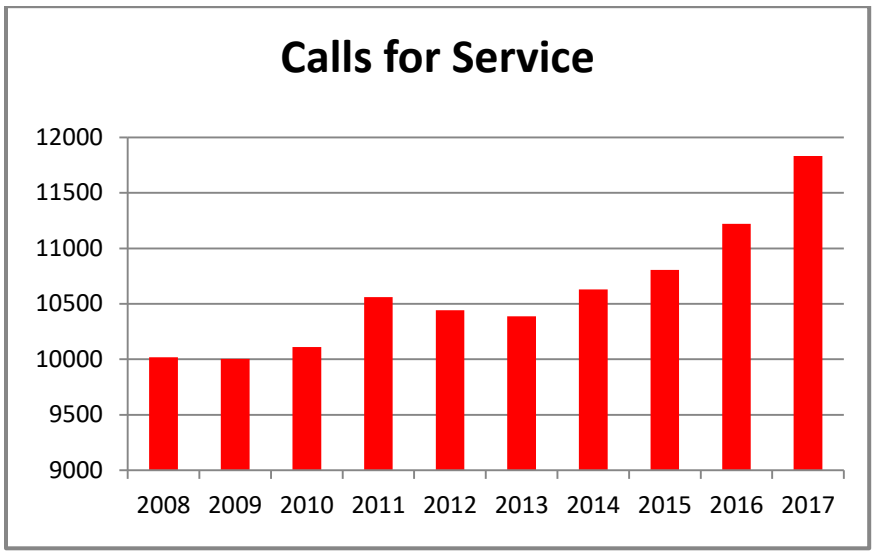

Figure 2

During this 10-year period, the number of fire responses remained steady, averaging 1,950 responses annually. In addition to building and auto fires, this number includes fire alarms, rescues, carbon monoxide calls, service calls, and other non-EMS responses. This steady number of fire responses is somewhat non-typical, as the number of fire responses nationally have decreased by 13% over the past 10 years. However, the division experienced a 22% increase in EMS calls for service, which continues to impact the operation of the division. Part of this increase was due to the opioid and heroin crisis that affected all parts of the country. At least 10% of the division's EMS responses in 2017 were due to drug or alcohol related overdoses that resulted in 77 deaths.

In the summer of 2016, the city created a Heroin Response Team (HRT) consisting of a police officer, paramedic, and alcohol and drug addiction counselor. The team visited overdose patients and their families shortly after an incident. The goal was to get users into treatment and their families to support groups. In 2017, another counselor was added due to partnerships with Atrium Hospital and the court system. This program has been successful; 58% of those contacted

by the HRT have been in treatment. Additionally, the number of overdose incidents has declined during the first half of 2018.

Figure 3 displays the comparison of fire and EMS responses experienced by the division over the past 10-year period.

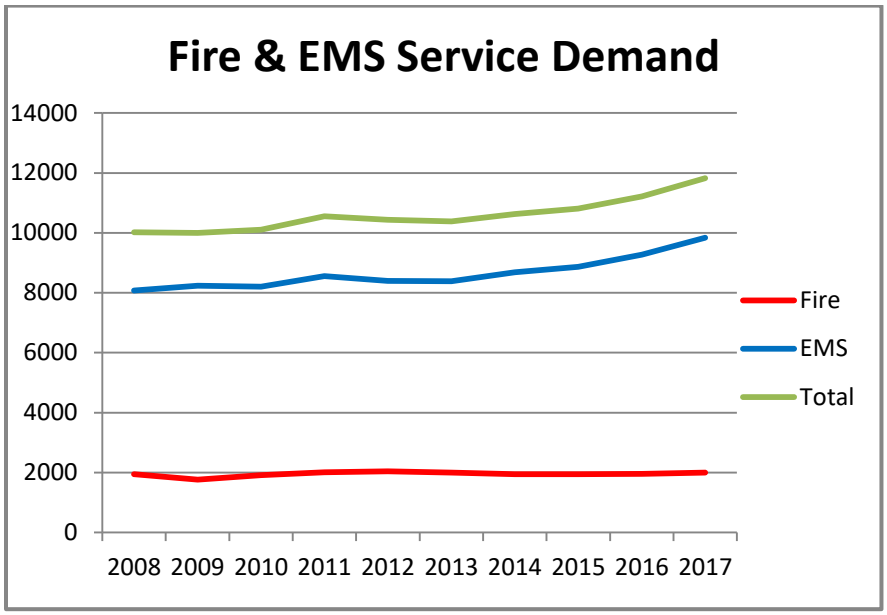

Figure 3

The assessment team found that the fire division has been affected by a significant number of false alarms. Over the past three years, 24% of the division's responses were classified as false alarms. This is not unique to Middletown. Nationally, the focus on improving civilian fire safety and protection of property has shifted increasingly toward suppression (sprinklers) and early detection systems. With the increasing number and complexity of these systems, activations are more frequent, which results in sometimes dramatic increases in the number of automatic alarms. This situation is problematic for the fire service in general. Suppression and alarm systems provide the most dependable level of protection, but frequent and recurrent alarm responses can negatively impact fire division operations. The increase in residential alarm systems also has contributed to the overall problem.

The use of mutual-aid departments to assist the division also continues to increase. In 2017, there were 180 mutual-aid responses into the city, 77% of those for EMS incidents. The division provided 58 mutual-aid responses to neighboring departments during the same time period.

The fire loss recorded for the city has remained relatively steady over the past five years. Fire loss is difficult to predict and one large-loss event can skewer any statistical analysis. However, the residential fire loss remains significant and is reflective of the number of working fires faced by the division. The total fire loss recorded in 2013 was $1.05 million and $1.47 million in 2017.

It should be noted that any fire loss experienced at an A-K Steel facility is not recorded. Due to its global economic prominence, any publically recorded fire loss can affect stock prices and customer orders, even if the incident has not affected production. A snapshot of the division's fire loss over the past five years is displayed in Figure 4.

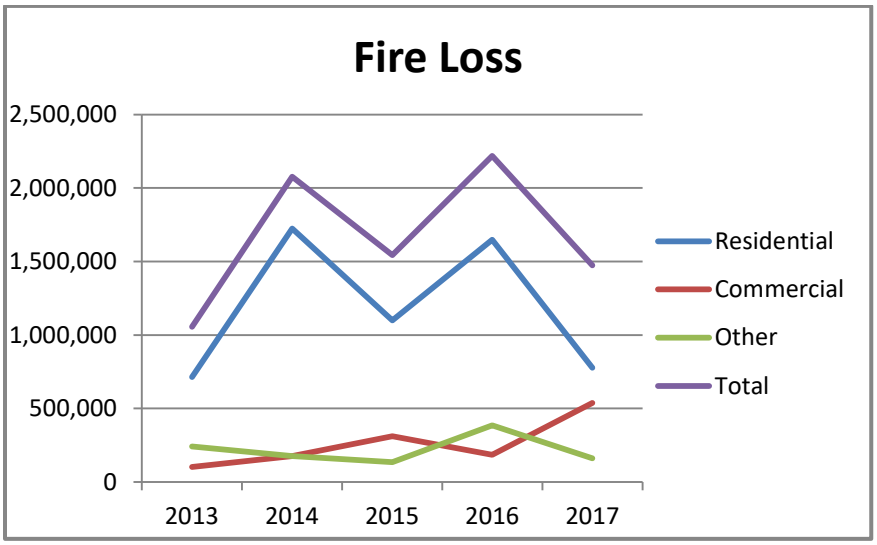

Figure 4

The division experienced six civilian fire fatalities over the past five years, all in residential building fires. During the same period, 29 civilians were injured as a result of exposure to fire by-products such as smoke or heat, or injuries received while attempting to escape from a fire. The division has averaged 27 firefighter injuries annually over the past five years. Back injuries associated with lifting and handling EMS patients is the most common cause of firefighter injury. The division has employed the newest power-lift style cots on ambulance units to help reduce back injuries.

The division has some technical rescue response capability and additional resources are available from the Butler County Technical Rescue Team. Technical rescue is a term used to describe special response situations including confined space rescue, high-angle rope rescue, trench rescue, fast-water rescue, and hazardous materials response. Technical rescue incidents are referred to as high-risk, low-frequency events which are dangerous to mitigate and involve a special set of skills, procedures, and equipment for each particular rescue situation. It is often very costly to implement and maintain proficiency in each particular emergency response capability. While a comprehensive, technical rescue assessment of the city was not performed, the division's response capability in each technical rescue response area was reviewed.

Fast-Water Rescue – these incidents involve the rescue of a victim(s) from fast moving water, such as the Great Miami River. Of special concern is the low-head dam on the Great Miami River near South Main Street and 9th Street south of the SR 122 bridge. Low-head dams can create dangerous currents, especially when river water levels are elevated or during flood stage.

MFD has some water rescue equipment and according to Chief Lolli is working toward achieving technician level capability by the end of 2018. The department is currently dependent on mutual-aid response and the Butler County Technical Rescue Team for the special resources needed for this type of incident.

Confined Space Rescue – includes incidents in which a victim(s) are trapped within an area that qualifies as a confined space. A confined space may be found in agricultural, industrial, and other settings as defined by the Occupational Safety and Health Administration (OSHA). In an industrial community such as Middletown, there will typically be thousands of confined spaces, including those involving city functions such as underground utility access and Waste Water Treatment Plant operations. The division has confined space equipment and some personnel are trained to the technician level. The division's goal is to have four confined space rescue trained personnel on each shift to initiate rescue operations. If an incident occurs, additional resources would be requested from the Butler County Technical Rescue Team.

Rope Rescue – includes incidents that are high-angle (elevated) or below grade and require the use of rope rescue systems to reach and rescue victims. A rope rescue incident could be part of a confined space incident due to the location of the victim. The two common types of rope rescues are litter evacuations (usually from below grade) and pick-off type rescues, most commonly used at cell towers, water towers or some similar structure. Chief Lolli indicated there are some personnel trained in this area and the division carries some of the necessary equipment, but the division's capability is limited. If an incident of this type occurs, the Butler County Technical Rescue Team would be requested for assistance.

Trench Rescue – these incidents also are referred to as trench "cave-in" incidents and involve an excavation trench or underground cave-in that traps a victim. The department has a trench rescue trailer with equipment. However, there are a limited number of personnel with this type of technical training. If an incident of this type occurs, the department would request assistance from the Butler County Technical Rescue Team.

Hazardous Materials – all Middletown personnel are trained in hazardous materials response at the operations level. Operations level means that personnel have the training and equipment to identify hazardous materials presence through various recognition factors such as placards and labels, container shapes and sizes, and hazardous material sites in the response area. They also have the ability and equipment to undertake defensive type of actions and low-risk offensive operations such as plugging, patching, diking, and the placement of booms and absorbent pads and other containment actions that help control or mitigate the incident. More advanced, offensive operations that require the use of level "A" (completely encapsulated protective equipment) or acid splash suits require a technician level response. Butler County has a county-wide Haz-Mat Team that responds to these types of incidents. MFD has several personnel trained to the technician level and participate as members of the team. In addition, Middletown

maintains, houses and responds one of the county's Haz Mat Response units, which carries the necessary equipment for a response. This unit is housed at Station 81.

Prevention & Loss Control

The division's fire prevention and inspection activities are coordinated by one of the Deputy Chiefs, whose primary responsibility is that of shift commander. Prior to 2014, the division had two fire marshals assigned full-time to prevention duties. Due to budget and personnel reductions, these positions were assigned to operations to maintain emergency response capability. While the division does set some priorities, daily prevention activity is basically complaint driven. The operations captain and operations lieutenant, both 40-hour per week positions, work on day-to-day activities such as foster home inspections, new construction and any problem areas. Priority is given to key "high-hazard" occupancies such as the hospital, schools, day care centers and nursing facilities. Utilizing company personnel, the division attempts to inspect commercial occupancies annually. However, with the level of emergency responses experienced by the division, this goal has been difficult to achieve and the division is behind in those inspections.

Due to the reduction in personnel, the division's fire safety education effort in the community also has been reduced. Programs such as fire extinguisher training to business and industry are provided on request and are conducted by company personnel. Fire safety education programs in the schools are also provided on a request basis. The division participates with the police division in Safety Town in June of each year. The division formerly had a residential smoke detector program; those requests are now forwarded to the local chapter of the American Red Cross.

The division conducts fire investigations of all fires that occur in the city. The division has an on-call group of nine personnel trained as investigators. This group is responsible for conducting all cause and origin investigations. Arson investigations involve a joint task force effort with the Middletown Police Division. The division averages 25-28 investigations annually beyond routine cause and origin determination.

Insurance Services Office

Insurance Services Office, Inc. (ISO) is the leading supplier of statistical, underwriting, and actuarial information for the property/casualty insurance industry. ISO conducts field evaluations in an effort to rate communities and their relative ability to provide fire protection and mitigate fire risk. This evaluation allows ISO to determine and publish the Public Protection Classification. The published classification is based on a scale of 1 through 10, with 1 being the highest rating and 10 indicating that the community's fire suppression program doesn't meet ISO's minimum criteria.

Middletown currently has a Public Protection Classification rating of 3, which was published in

2014. The cover letter accompanying the field evaluation report indicated that the published classification was retrogression from the previous classification. A lower score indicates a more favorable rating which translates into lower insurance premiums for the business owner and homeowner. A lower classification makes the community more attractive from an insurance risk perspective.

ISO's Public Protection Classification Program evaluates communities according to a uniform set of criteria defined in the *Fire Suppression Rating Schedule*. Using the rating schedule, ISO evaluates the fire suppression capabilities of each community in three major areas:

- Receiving and Handling Fire Alarms. This review accounts for 10% of the total classification. This section reviews the facilities provided for the general public to report fires and for the operator(s) on duty at the communication center to dispatch fire department companies to fires. Middletown received 5.45 points credit out of a total maximum credit of 10.00.

- Fire Department. This review accounts for 50% of the total classification and focuses upon engine and ladder-service companies, distribution of fire stations and fire companies, equipment carried on apparatus, pumping capacity, training, and available firefighters. Middletown received 35.51 points credit out of a total maximum of 50.00. This included 10.45 points credit out of a possible total 15 points for on-duty company personnel.

- Water Supply System. This review accounts for 40% of the total classification. This component examines the water supply a community uses for fire suppression including water main size, distribution and storage system. Also reviewed are hydrant size, type, and installation as well as the inspection frequency, maintenance, and condition of fire hydrants. Middletown received 31.62 points credit out of a total maximum of 40.00.

Funding

The fire division is funded primarily from the city's general fund. The city receives funds from a permanent 1.5% wage earner income tax. In addition, there is a permanent (.5%) public safety tax, which generates approximately $3 million annually. The public safety funds are split with the police division. Additionally, the division receives approximately $1.6 million annually in EMS billing revenue, which is directed to the city's general fund. The division's estimated operating budget for 2018 is $9.7 million. It is important to note that $900,000 of the operating budget comes from a SAFER grant, which funds 12 firefighter positions and is discussed in further detail on page 11. Capital replacement equipment is funded in a separate city-wide capital replacement budget. However, that capital replacement fund has been zero funded the past few years. Capital purchases currently are approved on an as-needed basis. Funds were appropriated

for the purchase of two engines with a scheduled delivery in 2019. A dedicated capital replacement fund for the fire division would help the division and city plan for future equipment needs in a cost-effective and proactive manner.

Staffing & Deployment

The fire division is a full-time career organization with an authorized strength of 79 uniformed career members. The current division roster includes the Fire Chief, Assistant Fire Chief, three Deputy Fire Chiefs (shift commanders), six captains, 11 lieutenants and 57 firefighters. The Fire Chief and Assistant Chief work a standard 40-hour work week. In addition to the Chief and Assistant Chief, staff positions include a fire operations captain and two lieutenants, and an EMS operations captain and lieutenant. These personnel fulfill a variety of assignments and responsibilities. There also is a civilian administrative assistant. The three Deputy Chiefs, four captains, seven lieutenants and 57 firefighters are assigned to operations, with 24 personnel assigned to each shift. The current minimum staffing level is 16.

A historical review is necessary to understand the current staffing model. In the 1980s, the division was at its peak in terms of personnel. There were 92 uniformed personnel with 22 personnel minimum staffing for each of the three shifts. In the 1990s, the city reduced the minimum staffing to 19 per shift. In 2006, as the economic downturn affected the nation, the staffing was further reduced to 16-17 per day. During this time period, personnel reduction was achieved through attrition.

In 2011, with a further loss of city revenue looming, the division applied for and received a SAFER grant, which enabled the division to maintain its number of personnel and increase the minimum staffing level to 19 each day. In 2014, with further reductions in revenues, the city defaulted on their financial obligations during the grant cycle, which resulted in forfeiture of funds and the subsequent loss of 15 firefighter positions; three through attrition and the layoff of 12 firefighters. This dropped the minimum staffing level to 13 per day. Through a variety of efforts including some increase in operating funds, successful acquisition of a SAFER grant and changes to the collective bargaining agreement, additional personnel have been added, allowing for the current minimum staffing of 16 personnel. An organizational chart depicting the current structure is found in Figure 5.

The Staffing for Adequate Fire and Emergency Response Grants (SAFER) was created to provide funding directly to fire departments to help them increase or maintain the number of trained, "front-line" firefighters available in their communities. The goal of the SAFER grant is to enhance the local fire department's ability to comply with staffing, response and operational standards established by the NFPA. The grant tis administered by FEMA.

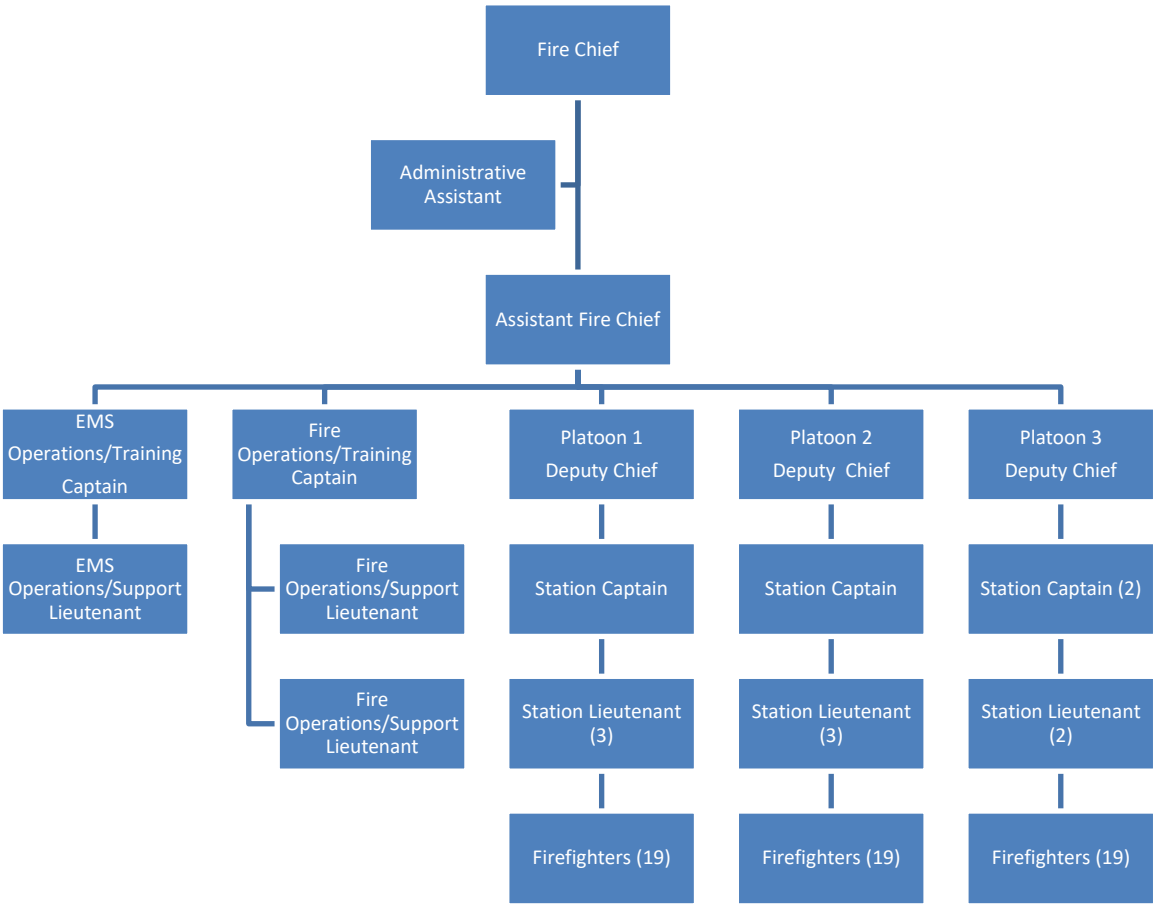

Figure 5

The division has four fire station facilities:

- Station 81 located at 307 N. Clinton Street
- Station 82 located at 3765 Dixie Highway
- Station 83 located at 2300 Roosevelt Boulevard, also houses administrative offices
- Station 85 located at 4310 Central Avenue.

The deployment of the resources to serve the community has been an on-going challenge for the division administration. After the loss of 15 positions and subsequent reduction of the minimum staffing level to 13 in 2014, the division was forced to revise the deployment model. Station 84 (located on Tytus Ave.) was closed and the division continued to deploy an engine and a medic unit (ambulance) at all four stations. Station 83, which is a larger facility, also housed additional apparatus including a tower ladder and back-up medic units. Three personnel (two firefighters and an officer) were assigned to each station. The engine and medic units at each station were considered combo units or cross-staffed. In other words, the personnel at these stations responded to calls on a first-emergency-first basis. For example, if an EMS call for that station

was received, the crew responded on the medic unit to the call, leaving the engine unstaffed and unable to respond to an emergency. If a fire call was received, the crew responded on the engine to the fire, leaving the medic unit unstaffed and unable to respond to a call until the engine company returned to the station.

With the increase of personnel and minimum staffing to 16 in 2017, the current deployment model continued as described above plus three personnel staff a dedicated engine company. This dedicated engine company staffing occurs at either Station 81 or Station 83, depending on the shift personnel makeup for that day. This practical approach limits the transferring of personnel, which could occur several times during the course of a shift. All of the deployment models include a Deputy Chief, who serves as the shift commander. The division has a detailed written operational policy that outlines staffing assignments when more than the minimum number of personnel is on duty. A staffing matrix based on current policy is displayed in Figure 6.

Staffing	Station 81	Station 82	Station 83	Station 85	Shift Commander
16	Engine and Medic 3 personnel	Engine and Medic 3 personnel	Engine - 3 personnel * Medic - 3 personnel	Engine and Medic 3 personnel	1 personnel
17	Engine -3 personnel Medic -2 personnel	Engine and Medic 3 personnel	Engine - 3 personnel Medic - 2 personnel	Engine and Medic 3 personnel	1 personnel
18**	Engine -3 personnel Medic -2 personnel	Engine and Medic 3 personnel	Engine - 3 personnel Medic - 2 personnel	Engine and Medic 3 personnel	1 personnel
19	Engine -3 personnel Medic -2 personnel	Engine and Medic 3 personnel	Engine - 3 personnel Medic - 2 personnel Medic - 2 personnel	Engine and Medic 3 personnel	1 personnel
20	Engine -3 personnel Medic -2 personnel	Engine and Medic 3 personnel	Engine - 3 personnel Medic - 2 personnel Engine and Medic - 3 personnel	Engine and Medic 3 personnel	1 personnel

*dedicated engine deployment determined by shift commander; Station 81 or Station 83
**additional firefighter assigned to a unit as determined by shift commander

Figure 6

Response Considerations

In fire suppression as well as EMS, there are a number of recognized safety and response standards and guidelines that must be considered when analyzing fire protection services. National Fire Protection Association (NFPA) 1500, *Standard on Fire Department Occupational Safety and Health*, is the safety standard for the fire service and deals with all aspects of fire department operational safety. Major components of the standard include personnel, apparatus, equipment, and incident management. The topics have general performance objectives, but the specific topic is generally more formally addressed in its own specific standard. Appendix B in NFPA 1500 contains a checklist that can be useful for departments to evaluate their overall safety and health program. While NFPA 1500 is non-binding, the Ohio Administrative Code specifically addresses many aspects of firefighting and firefighting equipment. Each of those will be discussed in their respective sections.

The Occupational Safety and Health Administration (OSHA) in recent years established a national standard for fire ground staffing. Although the directive is very detailed, it essentially states that before two properly trained and equipped firefighters can enter a structural fire there must be at least two or more properly trained and equipped firefighters ready to replace, rescue or assist the initial entry firefighters. This standard is often referred to as the "2-in, 2-out" rule. This rule also is listed in Ohio Administrative Code §4123:1-2, which applies to firefighting operations in Ohio.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, states that fire suppression companies should be staffed with four personnel, with one of them being a supervisor. This staffing standard is based on fireground evolution studies and task analyses for a response to 2,000 ft^2 two-story single-family dwelling fire, commonly found in communities across America. NFPA 1710 is non-binding, but the staffing recommendation is considered an ideal or optimal staffing goal for communities. However, few communities across Ohio are able to achieve this staffing goal due to financial limitations.

NFPA 1561, *Standard on Emergency Service Incident Management System* also has some relevance. It states that an effective span of control shall be determined by the ability of each supervisory position to monitor the activities of assigned subordinates. Span of control is a term to describe the number of workers that a supervisor can effectively manage. The range of span of control is considered to be three to seven, with an optimum of five. However, span of control is determined by the degree of complexity or danger of the task or activity. For example, a serious auto accident involving a difficult extrication procedure may require a span of control of three, while an officer may be able to effectively manage 10 water tenders (tankers) operating in a water shuttle at a rural fire.

Another critical factor in meeting service expectations is assuring that response crews are capable of performing the required tasks on arrival. The dispatching of a specific response with a minimum crew assignment is a concept that is widely supported by fire service literature and industry best practices. NFPA has published a book titled *The Fire Protection Handbook* for easy reference on fire service related matters. In the 20th edition of that text on page 12-12, the NFPA provides a recommendation for a minimum response to various structures. Figure 7 depicts those recommendations.

High-hazard occupancies Schools, hospitals, nursing homes, explosives plants, refineries, high-rise buildings, and other high life hazard or large fire potential occupancies.	At least 4 pumpers, 2 ladder trucks (or combination apparatus with equivalent capabilities), 2 chief officers, and other specialized apparatus as may be needed to cope with the combustible involved, not fewer than 24 fire fighters and 2 chief officers. One or more safety officers and a rapid intervention team(s) are also necessary.
Medium-hazard occupancies Apartments, offices, mercantile and industrial occupancies not normally requiring extensive rescue or firefighting forces.	At least 3 pumpers, 1 ladder truck (or combination apparatus with equivalent capabilities), 1 chief officer, and other specialized apparatus as may be needed or available; not fewer than 15 fire fighters and 1 chief officer, plus a safety officer and a rapid intervention team.
Low-hazard occupancies One-, two-, or three-family dwellings and scattered small businesses and industrial occupancies.	At least 2 pumpers, 1 ladder truck (or combination apparatus with equivalent capabilities), 1 chief officer, and other specialized apparatus as may be needed or available; not fewer than 14 fire fighters and 1 chief officer, plus a safety officer and a rapid intervention team.
Rural operations Scattered dwellings, small businesses, and farm buildings.	At least 1 pumper with a large water tank (500 gal or more), one mobile water supply apparatus (1,000 gal or larger), and such other specialized apparatus as may be necessary to perform effective initial firefighting operations; at least 12 fire fighters and 1 chief officer, plus a safety officer and a rapid intervention team.
Additional alarms	At least the equivalent of that required for rural operations for second alarms. This may involve the immediate use of mutual-aid companies until local forces can be supplemented with additional off-duty personnel.

Figure 7

ISO makes similar recommendations for fire response as outlined in the *Fire Protection Handbook*. Instead of using an occupancy hazard classification, ISO uses a gallon-per-minute needed fire flow criteria (minimum amount of water required for fire attack) for determining the minimum appropriate response of personnel and equipment to a call. Simply stated, the larger the fire flow – the larger the response requirement. However, the net result is very similar to NFPA recommendations.

Staffing and response to alarms is outlined in MFD Order and Notice 2016-06, which provides guidance on which station personnel are assigned based on the number of personnel on-duty at any given time. The emergency apparatus response assignment for the type of emergency response is consistent throughout the response area based on the type of structure, incident type, or location. The assignments have been developed by the division, some of which are outlined in the SOPs.

<u>Response assignments</u>

- Structure fire – 3 Engines, 1 Tower Ladder, 2 Medics, Shift Commander *
- Fire Alarm (residential) – 1 Engine *
- Fire Alarm (commercial) – 1 Engine *
- Fire Alarm (schools, nursing home, jail) – 1 Engine, Shift Commander
- Fire Alarm (hospital) – 1 Engine, Shift Commander
- Full Alarm Assignment – 3 Engines, Tower Ladder, Medic Unit**, Shift Commander
- Vehicle fire – 1 Engine
- Auto Accidents – 1 Medic, 1 Engine
  (closest ambulance and next closest Engine)
- EMS – Medic unit
  *any confirmed working fire is upgraded to a full alarm assignment
  **additional medic added on confirmed working fire

If additional resources are needed the Incident Commander may recall off-duty fire personnel or they can request a mutual aid response. These decisions are typically based on need, location, and time of day. A multiple-alarm system for Middletown has not been developed although the framework for a multiple-alarm plan is in place. A countywide mutual-aid agreement is in place which makes additional resources available when needed. The division has a strong working relationship with neighboring Monroe Fire Department, which provides fire and EMS responses to assist Middletown on a fairly regular basis. The division also is working with Monroe in developing an automatic response plan for coverage on Interstate 75 due to the placement of barriers and the elimination of crossover lanes.

MFD is dispatched by the Middletown Communications Center, which is operated by and under the direct supervision of the Middletown Police Division. The Communications Center utilizes a

computer-aided dispatch (CAD) software system. A CAD system provides displays and tools so that the dispatcher has an opportunity to handle calls for service as efficiently as possible. One of the features of the CAD system is that it can send a text message to the cellular phone of division personnel when a recall of personnel is required.

There are three dispatchers on duty with one being assigned to fire and EMS emergencies. The dispatchers are trained in Emergency Medical Dispatch (EMD), which is an enhanced service to the public. EMD is where a properly trained dispatcher can provide medical assistance instructions to a 9-1-1 caller who is requesting emergency help. Examples would be bleeding control, emergency breathing and CPR instructions. In addition to the EMD training, the Communication Center has the associated software that provides instructions for the specific type of medical emergency.

The division operates on an 800 MHz digital-trunked radio system and is part of the Butler County communications system. Coverage is good city-wide and allows good interoperability with surrounding communities and state agencies.

Apparatus & Equipment

The division's apparatus fleet consists of five engines, one tower ladder, seven medic units (EMS transport vehicles) and a hazardous materials response vehicle. An overall, general impression of the fleet is that it is well-maintained and is of appropriate size to meet the division's service needs. However, some of the units are aging and approaching their useful life expectancy. All front-line fire apparatus are equipped to NFPA and ISO standards. The following is an overview of the division’s current fleet.

Engine 81 is a 2003 American LaFrance pumper with a 1,500 GPM pump and carries 500 gallons of water. This vehicle is equipped with the necessary tools and equipment required by NFPA 1901 *Standard on Automotive Fire Apparatus*. The truck is in fair to poor condition.

Engine 82 is a 2009 Sutphen pumper with a 1,500 GPM pump and carries 1,000 gallons of water. This vehicle is equipped with the necessary hose and loose equipment as required by NFPA 1901. It also carries extrication equipment and airbags for special rescue situations and is in good condition.

Engine 83 is a 2006 Sutphen pumper with a 1,500 GPM pump and carries 650 gallons of water. This vehicle is equipped with the necessary hose and loose equipment as required by NFPA 1901. It also carries a combi-tool and other extrication equipment for special rescue situations. The vehicle is in good condition.

Engine 84 is a 1997 Luverne pumper with a 1,500 GPM pump and a 1,000 gallon water tank.

This vehicle is minimally equipped and did not have a full complement of ancillary firefighting equipment. This vehicle is in poor condition, currently is in reserve status and used when other front-line apparatus are out of service.

Engine 85 is a 2013 Sutphen pumper with a 1,500 GPM pump and carries 1,000 gallons of water. This vehicle is equipped with the necessary tools and equipment as required by NFPA 1901. This truck is in good condition.

Tower 86 is a 2002 Sutphen 110 ft. aerial tower platform with a 1,500 GPM pump and a 300 gallon water tank. This vehicle is equipped with the necessary tools and equipment as required by NFPA 1901. In addition, it carries a combi-tool and other extrication equipment for special rescue situations as well as additional technical rescue equipment for rope rescue. This truck is in good condition.

Medic 81 is a 2016 Medix medium-duty Type III modular ambulance. This unit is configured and equipped to deliver ALS care and transport service, including a LIFEPAK 15 heart monitor/defibrillator. It is in good condition.

Medic 82 is a 2009 Braun medium-duty Type III modular ambulance on a Chevrolet chassis. It is a reserve medic unit and is in poor condition.

Medic 83 is a 2016 Medix medium-duty Type III modular ambulance. This unit is configured and equipped to deliver ALS care and transport service, including a LIFEPAK 15 heart monitor/defibrillator. It is in good condition.

Medic 84 is a 2011 Horton medium-duty Type III modular ambulance on an International chassis. It is a reserve medic unit and is in fair condition.

Medic 85 is a 2017 Medix medium-duty Type III modular ambulance. This unit is configured and equipped to deliver ALS care and transport service, including a LIFEPAK 15 heart monitor/defibrillator. It is in good condition.

Medic 86 is a 2012 Chevrolet medium-duty Type III modular ambulance. This unit is configured and equipped to deliver ALS care and transport service, including a LIFEPAK 15 heart monitor/defibrillator. It is in fair condition.

Medic 87 is a 2012 International medium-duty Type III modular ambulance. This unit is configured and equipped to deliver ALS care and transport service, including a LIFEPAK 15 heart monitor/defibrillator. It is in fair condition.

HM 81 is a 1993 Utilmaster Haz-Mat vehicle equipped with an assortment of hazardous material tools, monitoring equipment, protection suits, and materials used in the containment and

mitigation of hazardous situations. The unit is considered in fair condition.

B 80 is a 2017 Ford Explorer used by the shift commander and is considered in good condition.

The division has four pickups, one van and two autos assigned as staff vehicles. The division also is in the process of purchasing a boat and motor for water rescue purposes.

Two Sutphen 1,250 GPM pumpers are currently under contract and scheduled to arrive in the spring of 2019. These new units will become Engine 81 and Engine 83. Quint 81, the 2000 Sutphen mini-tower and Engine 84, the 1997 Luverne pumper will be removed from the division's fleet. The current Engine 81, the 2003 American LaFrance pumper and Engine 83, a 2006 Sutphen pumper will become reserve units.

Fire Station Facilities

Note: An evaluation of the fire station facilities was completed in 2010 by Michael Schuster & Associates (MSA), an architectural firm located in Cincinnati, OH. The *Fire Department*: *Facility Analysis and Master Plan* was developed for the city as a result of that evaluation and analysis.

This report is based on MSA's report, the meeting held with division staff June 13, 2018 and a cursory site review of the facilities. This commentary should serve as a generalized overview based on those discussions and observations.

Fire Station 81 - 307 N. Clinton Street

Station 81 was built in approximately 1954. It has 6,400 square feet on the first floor which includes three back-in apparatus bays and 1,300 square feet on the upper level. The facility does not contain any fire suppression or central alarm alerting system. By code requirements, this structure is an Essential Facility, which is required to remain operational in the event of extreme environmental loading from wind, flood, snow and earthquake. It is assumed the construction of the existing building and all modifications to date met the building codes in effect at the time of completion. The analysis summary is based on current codes in effect at the time the MSA review was conducted.

The building does not meet codes pertaining to construction; exterior walls are required to be rated since they are so close to the property line and the interior stairs are not enclosed with rated

construction or contain fire doors. MSA noted the structure met the current building codes for area and height limitations based upon its use group classification and construction methods.

Apparatus Bay Area

However, it did not meet codes pertaining to fire suppression or egress requirements in the dormitory area. The structure does not comply with current American with Disabilities Act (ADA) accessibility requirements. It does not meet the structural requirements for an essential building classification and does not appear to meet current Ohio Building Code (OBC) requirements for make-up air. Since the MSA study the mechanical system for the facility has been updated.

Current space within the facility is limiting efficient access flow, both in the living areas and bay sections of the structure. Numerous items were stored on the bay floor as well as Personal Protective Equipment (PPE). The living spaces are fully utilized with multiple functions occurring in some spaces. Five apparatus are stationed at this facility:

Locker Area and Work Station

- Engine 81
- Medic 81
- Haz Mat 81
- Decon 81
- Medic 84

Fire Station 82 – 3765 Dixie Highway

Station 82 was built in the 1960s by Franklin Township and was renovated by Middletown in 1997 when they acquired the facility. It has 2,800 square feet of space with two back-in bays. The building does not contain a suppression or central alarm alerting system. By code requirements, this building is considered an Essential Facility. It is assumed the construction of the existing building and its renovation met the building codes in effect at the time construction occurred.

MSA noted the structure met the current building codes for area and height limitations based upon its use group classification and construction methods. However, it did not meet codes

pertaining to fire suppression or egress requirements in the dormitory area. The structure does not comply with current ADA accessibility requirements. It does not meet the structural requirements currently established for an essential building classification and does not appear to meet current OBC requirements for make-up air.

Apparatus Bay Area

The bay area is wholly utilized with such materials or items as their workout equipment, desk and computer, washer & dryer, cleaning equipment, and wall shelving containing PPE equipment. Aisle space between the medic and engine restricts the smooth movement of personnel and their ability to rapidly access and don their PPE. The administrative/living area of the station is fully used with the dayroom, officer-report desk and kitchen and open area.

Kitchen and Officer Work Area

The dormitory space is utilized as both a sleeping area and a secondary dayroom with a wall-mounted television as well as a desk/file cabinet space. Space within this area is limited and restricts the smooth movement of personnel for alarm purposes as well as routine entry/exiting by personnel at different times at night. Two apparatus are stationed at this facility:

- Engine 82
- Medic 82

Fire Station 83 - 2300 Roosevelt Boulevard

Station 83 is a one-story building constructed in 1978 and has an area of approximately 12,700 square feet. It serves as the headquarters and administration facility for the fire division. It has four drive-thru bays and routinely houses seven department vehicles. It is considered an Essential Facility.

MSA indicated the facility meets current building codes for area and height limitations based on the building's Use Group classification and construction. The building does not meet current building codes for fire suppression which requires all portions of the facility to be equipped with a suppression system, nor does not it meet

the current building standards for egress. Overall, the building does not meet the ADA standards.

The building's mechanical systems do not appear to meet current OBC requirements for make-up air with the corridors used for the return air to the mechanical room. The building does not meet the current structural code requirements for an Essential Facility. The bay area uses wall and floor spaces for storage while the administrative section of the building was fully utilized for office and storage space. The facility has a dedicated training room. It was noted during the inspection the mechanical room was being used as an overflow storage area where current code standards are explicit in prohibiting any storage in mechanical rooms. Since this is the headquarters, numerous apparatus and vehicles are stationed at this facility:

Apparatus Bay with Wall & Floor Storage

Typical Office Area

- Engine 83
- Tower 86
- Medic 83
- Medic 86
- Battalion 80
- Medic 87
- Engine 86
- Engine 84
- Six staff and utility vehicles

Fire Station 84 – 2600 Tytus Avenue

This station has been closed since 2014. It was constructed in the mid-1950s. No major improvements have been made to this facility over the past 60 years.

Fire Station 85 – 4310 Central Avenue

Station 85 is a one-story 2,500 square foot building that was constructed in 1966. It has a single, double deep-bay. Use of the double deep-bay design requires the units to face either the front or rear door of the single bay and exit through their respective bay door for egress. MSA noted in their report the building met current building codes for area and height limitations based upon its use group and construction. The

opening between the apparatus bay and living area is not rated as would be required by current code standards. The building does not meet current building codes for fire suppression or egress. In general, the facility does not meet ADA requirements. The building does not meet current structural requirements for an Essential Facility. The mechanical systems do not appear to meet current OBC requirements for make-up air.

Dorm, Dayroom, Work Station & Workout Area

The bay area is used for storage of cleaning materials, fluids, and PPE worn by staff. The station has a washer and dryer that are housed in the mechanical room. Two apparatus are stationed at the facility:

- Engine 85
- Medic 85

Fire Station Summary

Overall, the department has outgrown the facilities. Storage space throughout the structures is at a premium. As a result, equipment and supplies are not stored properly. A designated storage area with adequate space would permit the department to uniformly store supplies and other fire and EMS items in one location, permitting quick and easy access to the items and allow for efficient review of inventory. In some cases, the limited space and size of the apparatus bays may restrict the type and size of fire apparatus the department can use. This would put the department and city at a strategic disadvantage.

The storage of firefighter PPE is less than ideal. This gear should be stored away from diesel exhaust (even when exhaust systems are installed) and away from chemicals and solvents. Adequate ventilation should be provided to avoid garment deterioration or contamination from potentially carcinogenetic fumes, vapors or chemicals. Exposure to ultraviolet light and direct sunlight should also be avoided. Studies have shown this exposure also leads to material degradation and shortens the life span of the garment. PPE should be stored in a separate ready-room under positive pressure conditions. Numerous tools and equipment, such as fire hose, are subjected to the same exposures described for PPE.

Public entrances to the stations should be clearly identifiable from the street and entrances should open directly into a secure lobby for security purposes. It was noted the facility doors are all secured and the department is in the process of placing a coding lock system for exterior doors at all stations.

It was recognized the majority of the facilities do not have separate male/female restrooms. Department referenced station assignments would need to be made to female firefighters based on the access of restrooms and or locks. The stations are not fully compliant with ADA and OBC requirements.

> The American with Disabilities Act of 1990 (ADA) prohibits discrimination and ensures equal opportunity for persons with disabilities in employment, state and local government services, public accommodations, and transportation. It is referenced and requirements specified in the Ohio Building Code. [28 CFR Part 35&36]

According to the current OBC, fire stations are considered Essential Facilities and are given the highest priority with regard to design criteria and limits on damages sustained in the event of a natural disaster. All new structures that fall into the Essential Facility category are required to outperform and maintain operations after the worst case seismic or wind event. If modifications are to be made in the future, a structural engineer would need to evaluate the existing structure to determine the feasibility and cost implications of upgrading the structures to meet the Essential Facility requirements.

The department has installed Magna Grip Exhaust Removal Systems in all stations. This system enables a flexed hose to be connected to the exhaust discharge on an apparatus and direct fumes to the exterior of the facility when a motor is stared thus preventing the accumulation of engine by products within the bays.

Risk Assessment

For a community to appropriately provide for and understand the need for emergency services, a coordinated assessment must be performed. The Community Risk Assessment (CRA) tool was used to assess the property risk within the city of Middletown. The tool is a hybrid of the former risk hazard and evaluation system developed by the United State Fire Administration.

The Community Risk Assessment Guide developed by Vision 20/20, National Strategies for Fire Loss Prevention, was used to assist in identifying critical or "target" facilities within the city. The following facilities were identified: hospitals, out-patient surgery centers, assisted living centers, nursing homes, community shelters, schools, airport, government offices including post office, armory, courts, city building and emergency operations center, dispatch center, Tier 2 hazmat sites, high-rise buildings, industry and manufacturing with more than 50 employees, large churches, apartment buildings with more than 12 units and hotels.

The master target hazard file supplied by the fire division was used to survey and document the risk imposed by each property. Each property was assessed for the risk posed for each of the following elements:

- Life hazard
- Community impact
- Hazard index
- Water supply
- Building usage
- Building construction
- Number of stories
- Square footage

Each of the areas described received a rating score from 1 to 3 with 1 equating to low risk or impact and 3 representing high risk or high impact. The simplicity of this system allowed for an evaluation of 153 properties. Each address was provided with a final CRA rating from 9 for the lowest risk to 24 for the highest (based on the eight rated categories). Upon completion of the field work, the data was processed into a spreadsheet which yielded a final score. The scores were reviewed and the following levels of identified risk were classified.

Risk	CRA Score
Maximum	21-24
Significant	16-20
Moderate	10-15
Low	0-9

The CRA scores were assessed by response district to help identify locations of risk so that the ultimate location and placement of resources could be considered. Each property assessed as part of the risk analysis that was identified as a significant risk or maximum risk property was plotted on a city map, which allowed for visualization of where the “at risk” properties are located within the city. There were over 100 significant risk properties and five maximum risk properties identified in the city. The maximum risk properties are located with a red dot and the significant risk properties are shown with a green dot in Figure 8.

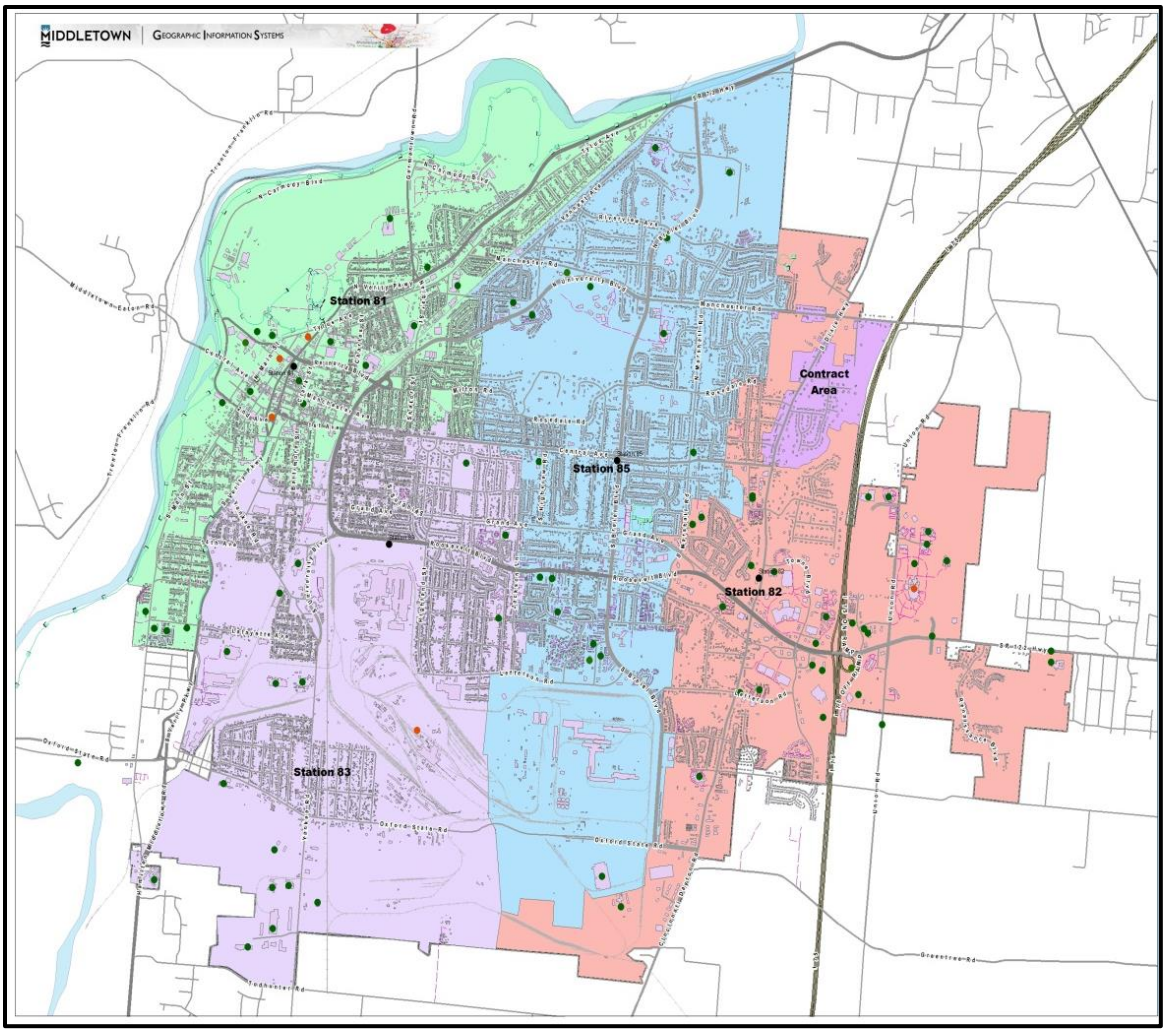

Figure 8

The maximum risk properties present a special risk for the division. AK Steel is a large industrial steel manufacturer with a global market located at 1801 Crawford Street. This industrial complex has over 30 buildings situated on a parcel of 3± square miles. Employees and contractors number 2,000-3,000 daily. The complex includes a large rail yard and rail lines to transport raw and finished product. Daily there is significant truck traffic in and out of the complex. The facility has large quantities of sulfuric acid, coke gas, and anhydrous ammonia which are used in the manufacturing process. In addition, the facility moves 70 million cubic feet of natural gas into the facility via pipeline. The main entrance is located adjacent to Fire Station 83.

The Atrium Medical Center is a 328-bed hospital that is five stories in height. The facility is a full-service hospital with a 24-hour emergency department and other ancillary services. The occupants (patients and visitors) are a transient type of population and may have limited or impaired mobility. The building is fully sprinklered and is located east of Interstate 75 at I Medical Center Drive.

Although not rated as a maximum risk property, Kettering Health Network opened a free-standing emergency room with professional offices in August of 2018. It is fully suppressed and is located just off of I-75.

Ross Hunt Towers is located at 112 S. Clinton Street. It is a 7-story apartment building with 225 apartments. The Town House is located at 600 N. Verity Parkway. It is a 9-story apartment building with 82 apartments. Neither building has a sprinkler system, but do have standpipe connections on each floor. This presents logistical challenges for the rescue and safety of occupants during an emergency incident due to their size.

City Hall is located downtown at One Donham Plaza. It is a 5-story building that has limited accessibility. All of the city offices are located here and the city jail is located in the basement of the building. The building is not sprinklered but has a standpipe system.

The downtown area in general poses a special risk. Numerous unprotected properties including the majority of the city's mid-rise and high-rise structures are located in this area. Most of the construction in the downtown area is "ordinary", which is classified in the fire and building industry as Type III. This construction style entails a brick exterior with wood structural elements on the interior including floor joists and roof assemblies. During the era in which most of the downtown was built, this type of construction was very common for larger buildings.

Because of the age of these structures, numerous remodels and alterations have taken place over many decades. This provides an opportunity of an environment in which an incipient fire may go undetected for some time and has a chance to gain headway in concealed spaces and voids. Due to the size of the buildings and the potential for several layers of roof and/or several layers of ceiling to be present, interior firefighting capability can be greatly compromised. Thus, the opportunity for a large-scale fire exists in most of the downtown buildings. In addition, those buildings that contain occupied apartments on upper floors create a potentially grave situation for emergency responders. All of this combined with the buildings being constructed adjacent to one another causes this area of the community to carry an extremely high level of risk from fire.

Non-fire risk assessment process

This section normally contains an analysis of the various non-fire related risks considered within the city. This would include non-fire risks such as flood, tornado, earthquake, drought, etc. Due to the limited scope of the project, this area was not included in the risk assessment analysis.

The Science of Fire and the Need for Rapid Response to Affect Positive Change

Because there is such a wide variation in the fire dynamics of each particular fire, it is imperative to find a common reference point, something that is common to all fires regardless of the risk-

level of the structure, the material involved or length of time the fire has burned. Such a reference point exists. Regardless of the speed of growth or length of burn time, all fires go through the same stages of growth. One stage in particular emerges as a very significant one because it marks a critical change in conditions; it is called flashover.

The flashover stage of a fire marks a major turning point in fire conditions that increases the challenge to a fire department's resources. How and why this is so is explained in the following descriptions of each stage of fire growth in a structural fire.

Incipient stage

The smoldering stage is the first stage of any fire. When heat is applied to a combustible material, the heat *oxidizes* the material's surface into combustible gases. The oxidation process is exothermic, meaning that the oxidation process itself produces heat. The heat from the oxidation raises the temperature of other materials, which increases the rate of oxidation and begins a chemical chain reaction of heat-release and burning.

A fire progresses from the smoldering phase immediately or slowly depending upon the fuel, nearby combustibles, and the surrounding air. For example, a wad of newspapers will smolder only a few seconds before progressing to the next stage, but a couch with a burning cigarette may continue smoldering for an hour or more.

Growth stage

When the temperature gets high enough visible flames can be seen. This stage is called the growth stage or open burning. The visible burning at this stage is still limited to the immediate area of origin. The combustion process continues to release more heat which heats nearby objects to their ignition temperature and they begin burning.

Flashover/fully developed stage

Not all of the combustible gases are consumed in the growth stage. They rise and form a superheated gas layer on the ceiling that can quickly reach 1,500°F. As the volume of this gas layer increases, it begins to bank down to the floor, heating all combustibles regardless of their proximity to the burning object. The gas layer is mostly carbon monoxide so the absence of oxygen prevents the heated objects from bursting into flame.

Oxygen gets introduced into the space in two ways. There is often enough available oxygen near floor level to start the open burning process when the gas layer reaches that level. Or, the high heat breaks a window and the incoming oxygen allows the burning to begin. It should be noted that the room becomes untenable long before flashover. Even though open flaming may not be present until everything reaches 500°F and oxygen is introduced, the room becomes untenable for human survival at 212°F.

When flashover occurs, everything in the room breaks into open flame at once. This instantaneous eruption into flame generates a tremendous amount of heat, smoke, and pressure with enough force to push beyond the room of origin through doors and windows. The combustion process then speeds up because it has an even greater amount of heat to move to unburned objects.

Flashover is a critical stage of fire growth for two reasons. First, no living thing in the room of origin will survive, so the chance of saving lives drops dramatically. Second, flashover creates a quantum jump in the rate of combustion and a significantly greater amount of water is needed to reduce the burning material below its ignition temperature. A fire that has reached flashover means that it is too late to save anyone in the room of origin, and a significant increase in staffing is required to handle the larger hose streams necessary to extinguish the fire. A post-flashover fire burns hotter and moves faster, compounding the search and rescue problems in the remainder of the structure at the same time that more firefighters are needed for fire attack. See the chart in Figure 9.

Pre-Flashover	Post-Flashover
Fire limited to room or area of origin	Fire spreads beyond room or origin
Search and rescue efforts easier	Compounds search and rescue efforts
Requires small attack lines	Requires more or larger attack lines
Requires few resources and can be handled by initial effective response force	Requires additional resources (companies)

Figure 9

It has long been known that the real killer in a structural fire is smoke, not the flame or heat. Smoke contains many toxic gases released as by-products of the combustion process. Carbon monoxide is one of these gases and the most prevalent. Test fires in residential structures have demonstrated the production of carbon monoxide in measurable amounts after 3½ minutes from the ignition of the fire.

The primary objective of fire operations is to provide enough firefighters and equipment strategically located so that an effective response force can respond to and reach fire scenes to mitigate the problem before flashover occurs. The “time-temperature curve” standard is based on data from NFPA and ISO, which have established that a typical point source of ignition in a residential house will “flashover” at some time between five and 30 minutes after ignition, turning a typical “room and contents” fire into a structural fire of some magnitude. This is illustrated in Figure 10.

Time-Temperature Curve

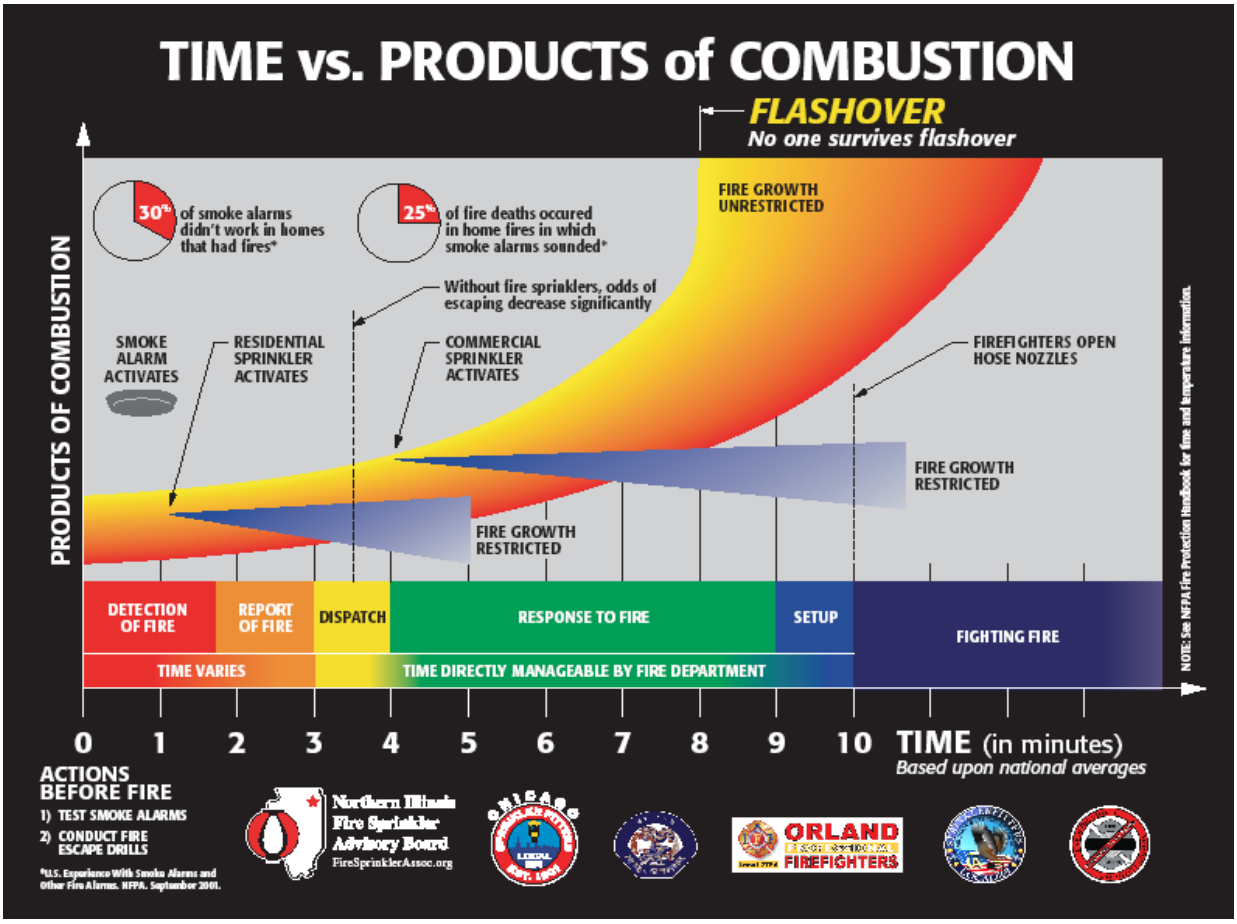

Figure 10

EMS Performance Goal

Time requirements for EMS calls are comparable to fire incidents. The purpose of a quick response, especially in the most critical situation (cardiac arrest), is that the brain, devoid of oxygen and circulation begins to die within four to six minutes. Brain damage is normally irreversible after 10 minutes. Interventions include early cardiopulmonary resuscitation (CPR) and electrical defibrillation. This is displayed graphically in Figure 11.

Figure 11

Structural Firefighting Operations

Understanding the structural fire dynamic is the key in any discussion of fireground evolutions or actions. Variables of fire growth dynamics and property and life risk combine to determine the fireground task that must be accomplished to mitigate loss. These tasks are interrelated, but can be separated into two basic types: fire flow and life safety. Fire flow tasks are those related to getting water on the fire. Life safety tasks are those related to finding trapped victims and safely removing them from the building.

Fire flow tasks can be accomplished with handheld hoses or master streams (i.e., nozzles usually attached to the engine or ladder). Master streams take relatively fewer firefighters to operate because they are most often fixed to the apparatus or an appliance anchored to the ground.

The decision to use hand lines or master streams depends upon the stage of the fire and the threat to life safety. If the fire is in a pre-flashover stage, firefighters can make an offensive fire attack into the building by using smaller, more mobile hand-held hose lines to attack the fire and shield trapped victims until they can be removed from the building. If the fire is in its post-flashover stage and has extended beyond the capacity or mobility of hand-held hoses, or if structural damage is a threat to firefighters' safety, the structure is declared lost and master streams are deployed to extinguish the fire and keep it from advancing to surrounding exposures. Initial arriving firefighters may use a transitional "defensive to offensive" strategy to limit or remove an

immediate danger to life or health (IDLH) threat while awaiting the arrival of additional resources.

Life safety tasks are based upon the number of occupants, their location, their status (e.g. awake vs. sleeping), and their ability to take self-preserving action. For example, ambulatory adults need less assistance than non-ambulatory adults require; the elderly and small children always require more assistance.

The key to a fire department's success at a fire is adequate staffing and coordinated team work, regardless of whether the fireground tasks are all fire flow related or a combination of fire flow and life safety.

Before on-scene procedures can be established, the initial Incident Commander (IC) must select an appropriate initial strategy; offensive or defensive. An offensive strategy is an aggressive interior fire attack and is used whenever possible. The top priority is rescue of trapped victims. The department's goals are to eliminate any/all fire-related deaths or injuries and contain fires to their room of origin. The first objective is to put a hose line between the victims and the fire and to rescue those victims by removing them from proximity to the hazard. The second objective is to contain the fire to the room or origin.

A defensive strategy is one that does not allow interior fire attack except as needed to rescue trapped firefighters. When opting for a defensive attack all victims are considered to have already expired because there are no tenable spaces. No attempts are made to retrieve bodies because fire and structural conditions do not warrant the risk to firefighters.

Critical Task Capabilities

In order to effect positive change, agency personnel must be properly assigned, resources must be properly placed and equipped, and each individual must be assigned a critical task to complete. Consequently, those individuals must arrive within a time frame which allows them a chance to use their skills to stop the loss or convert a potentially fatal medical condition. The following section will establish critical task assignments for fire and EMS responses and duties.

Structural Firefighting Critical Tasking

Single-family and two-family dwelling fires are the most frequent type of fire incident facing fire departments. National data provided by the NFPA identifies these fires as the most common. These types of buildings are where the majority of fire fatalities occur. Seventy-seven percent of the approximately 3,300 lives lost annually in fires occur in a residential setting which includes one- and two-family dwellings and apartment units[2]. During the reporting period of 2013-2017,

[2] NFPA- Fire Loss in U.S.2017

44% of Middletown's fire responses were to one- and two-family dwellings and apartments. Since the single-family and two-family dwelling fire is the most prevalent, critical tasks are outlined for this type of response. These tasks must be conducted in a timely manner by firefighters in order to control the fire prior to flashover or to extinguish the fire in an effective manner. The fire department is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt and proficient manner.

Attack line: a minimum of two firefighters who advance a 1¾" hose line that produces a fire stream of 150-200 GPM or a 2½" hose line that produces up to 250 GPM. Each engine carries a set of attack lines that are either pre-connected to the apparatus, folded in the hose bed, or in a special pack for carrying into high-rise buildings. The selection of which attack line to use depends on the type of structure, the distance to the seat of the fire, and the size of the fire. The pre-connected lines are the fastest to use but are generally limited to fires within 200-250 feet of the engine. When attack lines are needed beyond this limit, the line must be physically extended to a longer length or the hose bed lines are used. A 2½" attack line may be used when the fire is already beyond the flashover stage and threatens an unburned portion of a structure.

Search and Rescue: a minimum of two firefighters assigned to search for living victims and remove them from danger while the attack crew moves between the victims and the fire to stop the fire from advancing. A two-person crew is normally sufficient for most moderate risk structures, but more crews are required in multi-story buildings or structures with people who are not capable of self-preservation (i.e. nursing homes and hospitals).

Ventilation Crew: a minimum of two firefighters may be required to open a horizontal or vertical ventilation channel when the attack crew is ready to enter the building. Vertical ventilation or ventilation of a multi-story building can require more than two firefighters. Ventilation removes super-heated gases and obscuring smoke, preventing flashover and allowing attack crews to see and work closer to the seat of the fire. It also gives the fire an exit route so that the attack crew can "guide" the fire out the opening they choose and keep it away from endangered people or unburned property.

Ventilation must be closely timed with the fire attack. If it is performed too soon, the fire will get additional oxygen and grow. If performed too late, the attack crew cannot push the fire in the direction they want. Instead, the gases and smoke will be forced back toward the firefighters and their entry point, which endangers them, any victims they are protecting, and unburned property. The latest technical information is from Underwriter's Laboratories and other technical sources. That information recommends and outlines the actions necessary to control "flow-paths" within a structure during firefighting operations, especially at it relates to ventilation.

Backup line: a minimum of two firefighters will advance a 1¾" line that is taken in behind the attack crew to cover the attack crew in case the fire overwhelms them or a problem develops with the attack line. This backup team could also be assigned to temporarily assist the search and

rescue team if needed. If 2½" lines are used, it doubles the staffing requirement.

Rapid Intervention Team: a minimum of two firefighters equipped with self-contained breathing apparatus (SCBA) and select tools and are available near the entry point to enter the structure, perform search and rescue, or backup a suppression crew if something goes wrong. The rapid intervention team is an outcome of the "two-in and two-out" rule. This particular requirement is an OSHA rule that requires two firefighters to be suited up and ready to rescue firefighters who are assigned to interior firefighting operations and are in an Immediate Danger to Life and Health (IDLH) environment should one of those firefighters become disabled. IDLH is a National Institute for Occupational Safety and Health (NIOSH) term used to describe an environment or atmosphere that because of contaminants, heat, or oxygen deficiency could cause death or serious injury to a worker if they are exposed to those conditions for even a short period of time without the proper level of protective equipment.

Exposure line: a minimum of 1¾" attack line may be taken above the fire in multi-story buildings to prevent fire extension, or used externally to protect nearby structures from igniting from the radiant heat. In situations where the heat release is great such as a flammable or combustible liquid, a 2½" line or deluge gun could be used. If 2½" lines are used, it doubles the staffing requirement.

Pump operator: one firefighter must be assigned to operate the fire apparatus under the correct pressure to the attack, backup, and exposure lines, monitor the pressure changes caused by changing flows on each line, and ensure that water hammer doesn't endanger any of the hose line crews. This firefighter also completes the hose connections to the correct discharges and completes the water supply connection to the correct intake. The pump operator can sometimes make the hydrant hookup alone if the engine is near a hydrant, but the hydrant spacing for moderate risk fires normally precludes this.

Water supply: either the first-due or second-due engine must establish a reliable water supply by connecting a larger diameter (4" or 5") "supply line" to a fire hydrant. Once the connection is made the fire hydrant is then turned on allowing water to flow from the water distribution system into the intake side of the pump on the engine. Timing is a critical factor in establishing a continuous water supply for the fire. The agency's front line engines carry 500 to 1,000 gallons of water. Five hundred gallons provides about 2½ to 3 minutes of water for the attack crew if one 1¾" hose line is flowing.

Patient/Victim Care and Firefighter Rehabilitation: two firefighter/EMTs are assigned to treat any victims of the fire who may be exposed to smoke or fire or who may become injured escaping the fire environment. This assignment also is responsible for treatment of firefighters who suffer injuries during fire attack. Once this task is completed the assignment shifts to monitoring the conditions of firefighters during rehabilitation periods which includes monitoring of vital signs, body cooling and fluid replacement.

Safety Officer: one firefighter or officer is assigned to continuously monitor the scene for situations that could injure or kill firefighters. The Safety Officer monitors and evaluates changing fire conditions. The structural integrity of the building including roof, floor, and wall assemblies, are some of the areas evaluated. The Safety Officer works in concert with the Incident Commander to maintain a safety plan during the incident.

Incident Command: one officer is assigned to remain outside the structure to coordinate the attack, maintain a constant evaluation of the scene and make changes as necessary, arrange for more resources, and monitor conditions that might jeopardize crew safety.

The structural firefighting critical tasking is outlined in Figure 12.

Task	Personnel
Attack Hose line	2
Backup Hose line	2
Water supply support	2
Search & rescue	2
Ventilation/Utility control	2
RIT Team	2
Victim care/Rehabilitation	2
Pump operator	1
Safety Officer-aid to IC	1
Command	1
TOTAL	17

Figure 12

The number of personnel identified in the critical tasking is a practical and common-sense approach to structural firefighting. In managing many of the typical residential fires, departments are able to assign multiple tasks to some of the responding personnel. For example, after establishing a water supply, which is typically connecting a large diameter hose line from a hydrant to the on-scene pumper, personnel completing that task (2-3 personnel on the second engine) can be given another task, such as utility control, search & rescue, or assistance with tasks such as ventilation. Additional personnel also are needed to rotate and rest crews during active fireground operations, especially in extreme weather conditions. When working with the minimum staffing of 16, the division's response is short of the number of personnel needed for an organized and effective response force. If a structure fire incident occurs when one or more medic units are committed on calls, the division responds to the incident with the available companies and will be in a position to accomplish needed fire ground tasks in a priority order based on the number of personnel available. This makes it difficult to accomplish multiple tasks simultaneously, which is a key to an effective fire suppression effort. Responding short-handed makes successful rescue operations for any victims trapped very dangerous with minimal chance of success. It also increases the injury risk to personnel.

Emergency Medical Critical Tasking

Critical tasking analysis of EMS response is dependent on the type of call encountered. The standard response for the majority of EMS calls is one medic unit. One medic unit describes an ambulance that is equipped to provide advanced life support services and staffed with a minimum of two personnel with at least one of them being a paramedic. The tasking involved with emergency medical responses includes diagnosis and treatment of the patient, patient information collection, and patient transport to a medical facility. However, it should be noted that many ALS level calls require three or more personnel to manage the patient properly. Examples include cardiac arrest, gun shot or knife wound victims, falls greater than 10', severe trauma and some overdose patients.

The standard response for a motor vehicle accident with injury and entrapment is a medic unit and an engine or quint company. The purpose of the engine or quint company is to provide trained personnel and specialized rescue tools such as the "Jaws of Life" or high-pressure air bags, cribbing, etc., which is used to disentangle and remove entrapped victims. The minimum number of personnel MFD will typically place on an auto accident with injury is five. If the shift command officer is available and responds to the incident, the division would have sufficient personnel in most situations. The minimum critical tasking for motor vehicle accidents is described in Figure 13.

Task	Personnel
Incident Command/Safety	1
Patient Treatment	2
Extrication	2
Hazard suppression	2
Total	**7**

Figure 13

Service Level Objectives

Service level objectives are based on several basic principles. Once the level of service is determined by policy, the resources must be distributed in such a way that maximizes the efficiency of each unit. The distribution of resources includes both equipment and personnel. In the fire service the distribution of resources has been very traditional. Fire response units are normally placed in fixed locations (fire stations). Once "fixed" locations are established they are very difficult to move or relocate when the community expands and develops.

Because most of the resources are delivered from fixed locations, the concentration of resources is equally important to maintain a community standard of coverage. An agency must deploy resources in a manner which provides depth and redundancy normally referred to as

concentration. This additional depth and concentration of resources allows a community to manage busy periods of service, areas of increased activity, and the ability to provide additional resources to maximum risk properties.

Distribution

Distribution of resources defines the specific geographical location for each resource. Because resources could change locations at any point in time, a standard criterion must be used. That criterion is what is referred to as "first due" or the closest resource under normal response conditions.

Distribution strives for an equitable level of outcome; to the greatest degree possible everyone in the community is within the same distance from a fire station. Many years ago in built-up urban areas, government leaders felt that distribution of resources should be based on risk. For example, an area of low risk could have fire company travel times far greater than those of a high-risk, high-consequence area. But in modern times, aggressive EMS response times based on successful intervention in cardiac and trauma cases drive distribution to be the same community wide, which negates distribution based solely on risk. In other words, the agency must attempt to cover all of the "dirt" with the same surface delivery goal.

As described previously, Middletown delivers fire and emergency services from four facilities. Fire Station 81 is located in the northwestern area of the city at 307 N. Clinton Street. Station 82 is located in the eastern area of the city near Interstate 75, located at 3765 Dixie Highway. Station 85 is located in the north central area of the city at 4310 Central Avenue. Station 83 is located at 2300 Roosevelt Avenue at the entrance to the A-K Steel complex. It is considered west of the city's central point and near the downtown or central business district.

Statistical information for the first-due response area for each station is outlined in Figure 14. Included is the percentage of calls that occur within each station's defined response area, which is referred to as call demand. Note: When staffing levels permit, additional companies are staffed and a Station 86 response area is placed into service. That defined area normally lies within Station 81 and Station 83's response area. The calls located within Station 86's response area are listed within the corresponding areas of Station 81 and Station 83 in the chart below. Mutual aid responses and calls to the contracted area account for 2% of the division's responses.

Station	Area	Road Miles	Demand
81	21%	28%	34%
82	23%	14%	14%
83	27%	25%	31%
85	29%	33%	19%

Figure 14

Concentration

Concentration is the spacing of multiple resources arranged close enough together so that an initial "Effective Response Force" can be assembled on scene within acceptable time frames. An initial Effective Response Force is that which will most likely stop the escalation of the emergency, be it fire or increased illness or injury in the case of a medical emergency. The Effective Response Force is a result of the critical task analysis previously conducted for fire and EMS emergencies. While distribution was about the first unit arrival, concentration is about having enough of the right equipment and staff arriving in a timeframe that allows them to be effective servicing the situation. This essentially entails the arrival of the second- and third-due companies.

Response Performance

Response goals are a local decision and are based on a variety of factors. Some of those factors include demographics and size of the response area, risk, demand volume, and public expectation. In reviewing the division's current policies and procedures, there has been no formal policy adopted that identifies response performance goals or targets for the community. Since there is no local response performance goal established, the assessment team reviewed other nationally developed criteria. A number of efforts have been made to develop a consensus standard for response time, unit staffing and deployment of resources. While there is no one consensus standard, there are several that provide guidance. The published response criteria are based on national fire behavior research and data collected on past EMS response in relationship to patient outcomes. This was previously discussed on pages 27-29.

ISO provides some guidelines, but those are singularly focused on travel distance. There are two national publications that address response performance. One publication is National Fire Protection Association (NFPA) Standard 1710. NFPA 1710 is the *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.* The standard outlines criteria that address functions and objectives of fire department emergency service delivery, response capabilities, and resources.

Based on NFPA 1710 criteria, the MFD should meet the following response time objective: for 90% of all fire incidents, the first-due unit shall arrive within 7 minutes, 06 seconds total response time. This response objective includes 106 seconds (1:46) for call processing, 80 seconds (1:20) for turnout, and 240 (four minutes) for travel time. This response objective begins when the 9-1-1 call is received at the Communications Center.

The second published criterion is found in the *Standards of Cover*, published by the Commission on Fire Accreditation International (CFAI), which is part of the Center for Public Safety

Excellence. CFAI criterion refers to the NFPA 1710 standard for urban communities, which would apply to Middletown. It is important to note however, that communities should establish their own response objectives that meet the expectations of its citizens within the context of available resources.

Total Response Time Measurement

The concept of a response time continuum (sometimes referred to as cascade of events) has evolved from the standards set by NFPA and CFAI. Each component of the total fire response time continuum was reviewed.

Call Processing Time

Call processing time is a component of the communication system. As noted previously, the MFD is served by the Middletown Communications Center, which is operated by the Middletown Police Division. The Communications Center serves as a public safety primary answering point (PSAP). A 9-1-1 call originating in Middletown goes to the Middletown Communications Center PSAP and then processed according to the type of emergency. The dispatcher verifies the location, immediate caller information and nature of the emergency. The location of the call and the emergency response information appears on a screen in front of the dispatcher providing the necessary information to notify and dispatch the appropriate emergency response equipment and personnel. This database and software is commonly referred to as a computer-aided dispatch or CAD system.

Determining an acceptable amount of time to process an emergency call can be difficult because communication center systems vary from jurisdiction to jurisdiction. NFPA 1221 *Standard on Emergency Services Communications Systems* establishes various benchmarks for call handling depending on the system, type of call and level of caller assistance provided. For example, Middletown dispatchers are trained in Emergency Medical Dispatch (EMD), which is an enhanced service to the public. EMD is where a properly trained dispatcher can provide medical assistance instructions to a 9-1-1 caller who is requesting emergency help. Examples would be bleeding control, emergency breathing and CPR instructions. With this enhanced level of service, EMS call processing and dispatching shall be completed within 120 seconds (2:00) 99% of the time. For fire calls, emergency call processing and dispatching shall be completed within 106 seconds (1:46) for at least 95% of the alarms. This call processing criteria is adopted by CFAI and included in the criteria listed in NFPA 1710.

Turnout Time

Turnout time is measured from the time personnel are “toned out” or notified for an emergency response to the time the first unit marks en route to the call. Turnout time is a measurement used for personnel who are typically “in-station”. The turnout time benchmark is 60 seconds for EMS calls and 80 seconds (1:20) for fire responses.

Travel time

Travel time is the time it takes for dispatched response units to arrive on scene at the emergency. Travel time is generally considered to encompass the distance and time traveled from the fire station housing the apparatus until it arrives on scene at the location of the emergency. However, several factors can affect travel time. Winter weather conditions as well as localized flooding can affect travel time during certain times of the year. Traffic patterns on heavily traveled roadways, especially during peak travel hours can affect the emergency response. Another problem that can increase travel time and ultimately responder response time is receiving multiple calls for services. When simultaneous emergencies occur and adequate resources are not available to respond, a condition occurs that is referred to as a "stacking effect." A component to the stacking effect is that at times units may need to respond from adjoining districts in an effort to provide the quickest and most reliable response to the incident. For example, if the Station 85 medic unit was committed to an emergency and a request for another ambulance or a fire occurs in Station 85's response district, then the medic unit from Station 82, 83, or 81 may become the primary response unit, depending on which unit was closest to the call location. In some situations, such as all medic units committed, the closest unit may actually be a mutual-aid company. Clearly, this would lengthen the travel time of the response unit because of the unavailability of the first response units in the district. The travel time benchmark is 240 seconds (4:00 minutes).

Total Response Time

Total reflex or response time is that time which totally encompasses the response event, from the time the call for service is initially received through the time dispatched units arrive on location. The division receives response time data from the Communications Center. This information is then copied and entered manually into the MFD database when incident reports or patient care reports are completed. If the call handling time previously identified is taken into consideration, the total response time for fire emergencies should be 7 minutes, 06 seconds for 90% of the incidents.

EMS Response Time

Time requirements for EMS calls are comparable to fire incidents and are based on research conducted on pre-hospital delivery of medical care and patient outcome and survivability. The purpose of a quick response, especially in the most critical situation (cardiac arrest) is that the brain, devoid of oxygen and circulation, begins to die within four to six minutes. Interventions include early CPR and electrical defibrillation.

For medical emergencies a prompt response is needed to relieve suffering and save lives, but few calls for service are true life or death emergencies. Again, a reasonable service goal is to be on scene soon enough to: 1) assess patients and prioritize to prevent death and disability; 2) intervene successfully in life-threatening emergencies; 3) stabilize patients to prevent additional

suffering. The travel time benchmark is 4 minutes and the total response time is 7 minutes, 0 seconds for 90% of the incidents.

Data Analysis

For response planning purposes, the fire division has divided the city into four response districts or response zones. Those response zones are the established response districts for Station 81, Station 82, Station 83 and Station 85. As described previously in the Staffing section, when staffing levels for the day reach 19, the division staffs an additional company operating from Station 83. When this happens, portions of the response areas of Station 81 and Station 83 are designated Response Area Station 86, which pre-identifies the first-due response area for the additional company. The four-station response districts are displayed in Figure 15.

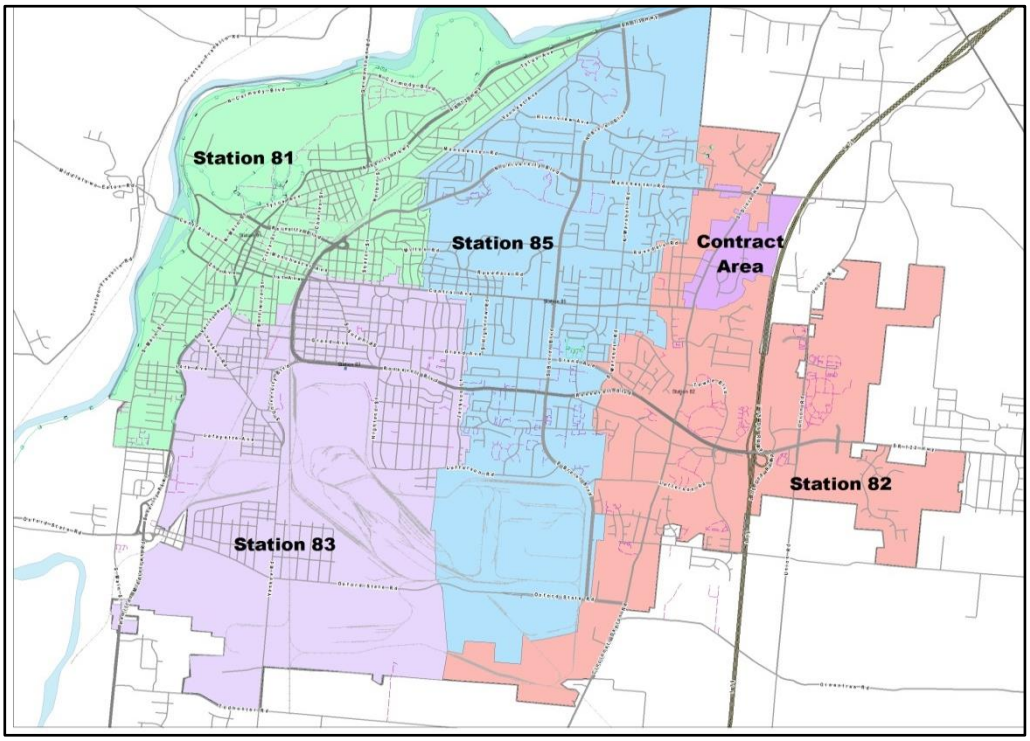

Figure 15

Response data for the three-year period of 2015-2017 was analyzed for overall performance. More specific information was obtained by analyzing 2017 response data for each response area and station.

It is common for many organizations to use average response times in determining response performance. However, the use of averages and median measurements does not provide a true indication of performance. One or two "outliers" may adversely affect the response analysis,

leading management and citizens to an inaccurate and at times, unfair service expectation. It is understood that no agency can meet a stated performance 100% of the time. Many factors can influence an agency's response including multiple calls, apparatus deployment, training assignments, traffic patterns, weather, human performance and travel distance. Therefore, NFPA and CFAI have recognized the use of percentiles as the most accurate method to analyze and evaluate response performance. Figure 16 and 17 displays graphically the division's overall response performance for fire and EMS responses within the city. The percentage column identifies the frequency the division meets the target-time benchmark. The 90th percentile column identifies the division's actual segment or response time for 90% of the responses. Meeting the target-time benchmark for at least 70% of the responses is often considered the baseline or threshold measurement.

Fire Response

Element	Target	Percentage	90th Percentile
Call processing time	1:46	93%	2:01 (95 percentile)
Turnout time	1:20	23%	3:13
Travel time	4:00	50%	7:54
Total response time	7:06	50%	11:10
2nd & 3rd due companies	8:00	73%	12:24

Figure 16

EMS Response

Element	Target	Percentage	90th Percentile
Call processing time	2:00	60%	2:43 (99 percentile)
Turnout time	1:00	64%	2:56
Travel time	4:00	58%	6:26
Total response time	7:00	60%	9:41

Figure 17

The data in the above charts indicates several areas of concern. First is the turnout time for fire responses. The division is only meeting this benchmark 23% of the time. While the target benchmark is quite restrictive at 1:20 (80 seconds), performance in this part of the response continuum needs to be further analyzed by the division. A number of factors can affect this area. If the crews are involved in training, inspections or other duty assignment, the turnout of the crews will be delayed. The layout and condition of the existing fire stations can also affect the crews' ability to quickly prepare for an emergency response. This was pointed out on pages 20 and 21 where the assessment team's inspection of the fire stations noted restrictive space issues that limit efficient flow of personnel to apparatus bays, etc.

Also of note was the division's performance of total response time of 50% for fire responses and 60% for EMS responses. This can be attributed to several factors and will be more closely examined with individual response district analysis that follows.

The table in Figure 18 displays the response performance for total response time and the second- and third-due companies for fire incidents in each response district. Keep in mind the later arriving companies at a fire incident constitute the Effective Response Force (EFR) outlined in the report in relation to concentration of resources.

Element	District	Target	Percentage
Travel Time	Station 81	4:00	55%
Response Time	Station 81	7:06	57%
2nd & 3rd due units	Station 81	8:00	70%
Travel Time	Station 82	4:00	46%
Response Time	Station 82	7:06	46%
2nd & 3rd due units	Station 82	8:00	25%
Travel Time	Station 83	4:00	48%
Response Time	Station 83	7:06	47%
2nd & 3rd due units	Station 83	8:00	73%
Travel Time	Station 85	4:00	45%
Response Time	Station 85	7:06	41%
2nd & 3rd due units	Station 85	8:00	69%

Figure 18

As can be seen in the table above, a performance gap exists regarding fire response in each response district. There are several factors that can potentially influence response time. Some of those factors include apparatus deployment and fire station location, stacked calls, and unit availability. Referring back to Figure 14, the coverage area for each station is fairly uniform, but may not take into consideration the geographic layout of the city and surface streets. For example, some areas within the response area have limited surface street development, which adds to the travel time and ultimately the overall response time. However, the availability of first-due units and fire station location are normally the drivers of this performance area. This will be further examined with GIS mapping of current fire station locations. Station location and unit availability also are affecting the response performance of the 2nd and 3rd due companies on a fire incident, as part of the Effective Response Force. As can be seen in Figure 18, there is a performance gap in the 8:00 minute benchmark. Station 82's area has a very low performance of only 25% in this area. The other response districts' Effective Response Force response times vary from 69% to 73%.

Figure 19 displays the response performance for total response time for EMS incidents. The Handled by Others column depicts the percentage of calls located within the response district that were handled by other units because the first-due medic unit was committed to another call.

Element	District	Target	Percentage	Handled by Others
Response Time	Station 81	7:00	60%	34%
Response Time	Station 82	7:00	57%	26%
Response Time	Station 83	7:00	71%	34%
Response Time	Station 85	7:00	55%	31%

Figure 19

The data indicates there is a performance gap in the EMS responses as well. There are several factors that can potentially influence response time. Some of those factors include apparatus deployment and fire station location, stacked calls, and unit availability. The unit availability and distance to the hospital are two significant factors affecting EMS response time. As noted in Figure 19, over 30% of the calls in Station 81, 83 and 85's response district were handled by another unit. This is due to the high volume of calls. Of the division's over 11,000 calls for service, there were 7,748 incidences where the calls occurred concurrently. Of that number, there were 1,617 where three calls were occurring at the same time. This creates a situation where the calls begin "stack" and units from much farther distances respond to the emergency, sometimes relying on mutual aid units.

Another factor that affects the overall response performance is the distance from the hospital to some areas of the city. This impacts primarily Station 81 and Station 83, which handle a higher percentage of calls. Station 81 is 6 road miles and Station 83 is 4.3 road miles from the hospital.

It also appears that the staffing levels are affecting the overall response performance. When the division is at minimum staffing levels, several stations are staffing combo-companies. Using Station 81 as an example, when the staffing levels are at the minimum of 16, the three-person crew assigned to the station cross-staff an engine and a medic unit. If the medic is dispatched to a call, the station is empty until the three-person crew returns. In this situation, the engine is essentially empty. If another EMS or fire call occurs in Station 81's response district, units from another station are dispatched to respond. Depending on the exact location of the incident, units from Station 83 or Station 85 would be dispatched. However, if they are committed to a call as well, then the unit could come from Station 82, which would be the farthest distance.

However, if 17 personnel are on duty, Station 81 would have a five-person crew assigned. When an EMS call is received, the medic unit would respond with two personnel and three personnel would remain available with the engine to respond. Then if a fire call is received, the engine could respond in quick manner within response time criteria. Also, if the second call in the response area is an EMS call, the engine can respond quickly and render advanced level EMS care until a medic from another station can arrive to further treat and transport the patient. The engine company then returns to service and is available for another call.

To verify the response data analysis, Unit-Hour Utilization was used to measure the amount of

time units were committed to emergency calls. Unit-Hour Utilization (UH:U) is a method by which to measure efficiency and how much time was spent delivering emergency service. It is commonly used by larger private ambulance providers, but has been adapted to apply the basic measurements to public response agencies. As an additional analytical tool, UH:U is a calculation that estimates the amount of time a unit is occupied or committed on emergency calls as a percentage of the total amount of hours a unit is staffed and available for a response. In other words, UH:U measures the percentage of on-duty time consumed by emergency responses. A high UH:U means lower availability for calls. Poor availability negatively impacts response times and the number of resources available for larger incidents.

UH:U measures the percent of a unit's time in service that is spent running calls. However, there is other productive time not accounted for, such as training, maintenance, public education activities and other preparedness-related functions. When units are not engaged, it doesn't mean they are not working.

The UH:U percentage for each unit is shown in Figure 20 .

Unit	UH:U
Medic 81	27%
Quint/Eng. 81	9%
Medic 83	27%
Engine 83	8%
Station 82	18%
Eng. 82	3%
Med. 82	15%
Station 85	25%
Eng. 85	4%
Med. 85	23%
Battalion 80	5%

Figure 20

Ideally, a percentage less than 10% is considered efficient as the workload for a unit is considered "steady", but is still typically available when the next call is received. Percentage use greater than 10% begins to impact the organization.

Station 82 and Station 85 both are staffed as a dual or combo-company. Station 82 has a UH:U percentage of 18% and Station 85 is 25%. Both Medic 81 and Medic 83 have a 27% UH: U. While the division has capacity; the capacity is not available at the correct time. This results in a drawdown of resources. This affects first due availability and sufficient resources for an Effective Response Force.

It is also important to understand when emergency calls occur during a 24-hour period. The division is consistently the busiest during the time period between 8:00 am and midnight with peak activity between 11:00 am and 11:00 pm. The slowest time is between 1:00 am and 7:00

am. The chart in Figure 21 reflects the distribution of the division's emergency calls for service over a 24-hour period.

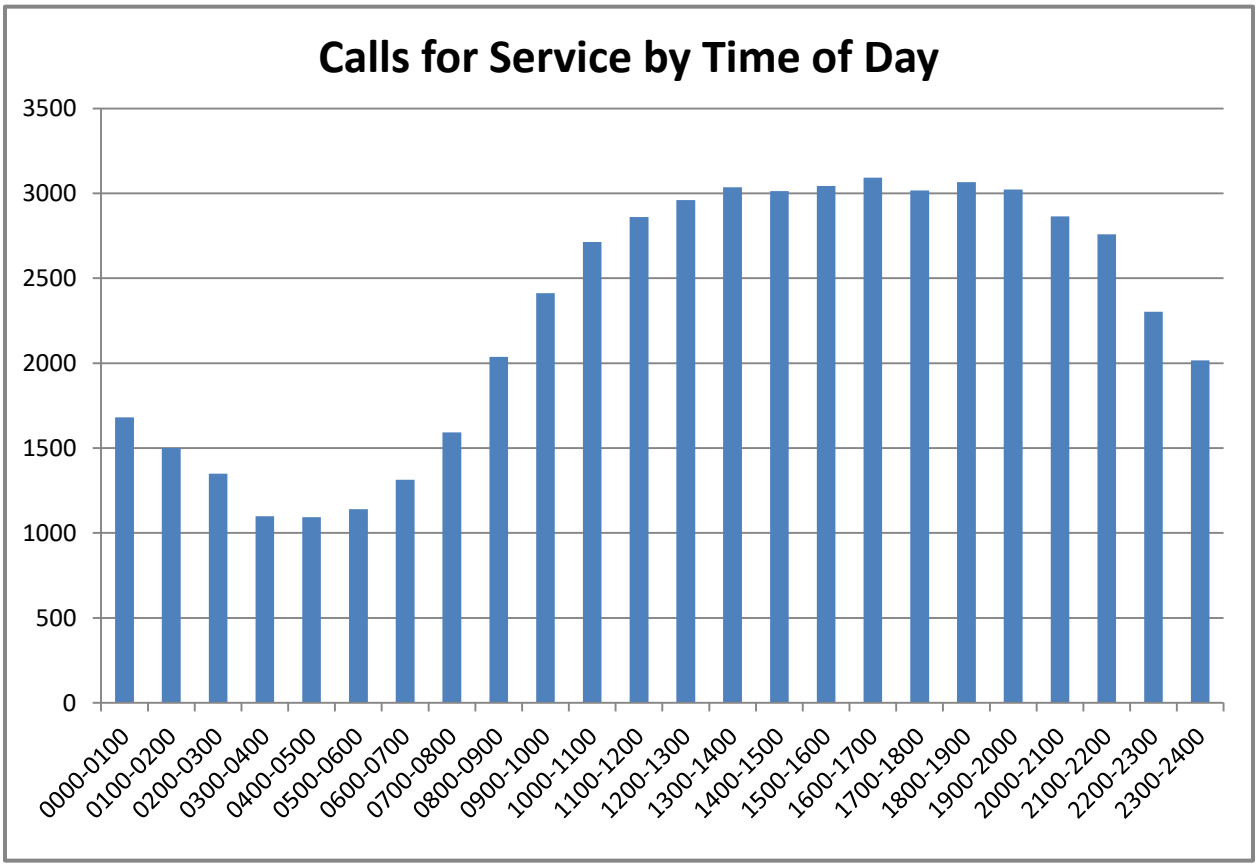

Figure 21

As part of the study, the city wanted to identify high-volume call locations. This would provide information to identify potential EMS system abuse and help determine the need for any strategies to address the problem. A review of the 2017 run data identified 252 locations that experienced 6 to 20 calls for service or more. There were 20 locations which experienced 21 to 50 calls, eight locations which experienced 51 to 100 calls, and five locations which experienced over 100 calls for service. These five locations were assisted living or retirement facilities. A map of the high-volume call locations is displayed in Figure 22. Locations that experienced 6 to 20 calls are identified with a red dot; locations with 21 to 50 calls with a blue dot; locations with 51 to 100 calls a green dot; and locations with over 100 calls for service with a yellow dot. Stations are designated with a black dot. All of the locations that experienced over 100 calls for service were nursing homes, assisted living facilities or retirement communities.

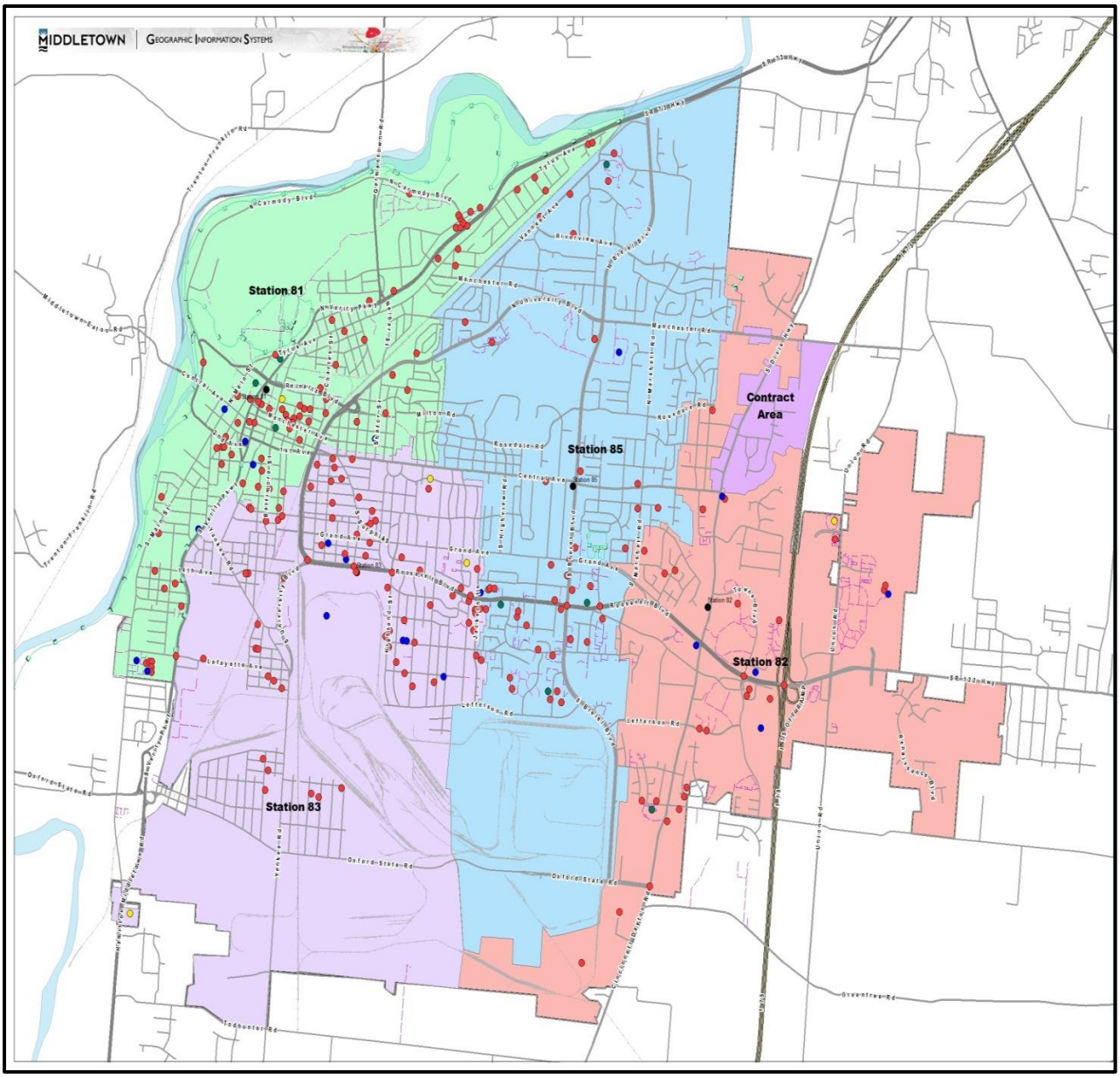
MIDDLETOWN
GEOGRAPHIC INFORMATION SYSTEMS
Station 81
Station 85
Contract Area
Station 82
Station 83

Figure 22

Fire Station Location

While this study is not a formal station location analysis, it is important to review the impact station location has on the division's overall response performance. After evaluating the division's performance, the next step is to analyze and select a location(s) to maximize the resources for the agency. Determining the location to build a fire station involves several factors. Some of those factors include: travel times, roadway accessibility, first-due area impact, neighborhood type, and land availability. This specific analysis will only examine travel times and first-due company impact.

The most accurate mapping system available utilizes GIS technology. With this information and ArcGIS9 Fire Analysis Tool Software®, planning maps were developed to visually explain the emergency travel times within the city. This includes the current fire station locations as well as exploratory locations in an effort to analyze potential sites. The ArcGIS software produces easy to read maps which are included in this report.

The map in figure 23 outlines the 4-, 5-, and 6-minute travel times from the existing four fire stations. In examining the response areas, it can be seen that a large portion of the city area is within a 4-minute travel time. However, it can be seen that the southwestern parts of the city has areas that have 5- and 6-minute travel times. The northern areas also are in the 5- and 6-minute travel time areas. There are areas in the northeast and eastern section of the city that has travel times exceeding 5- and 6- minute travel times, but these are not fully developed. The large area across the southern area of the city outside a 6-minute travel time is the southern portion of the large AK Steel complex, which has a limited roadway system.

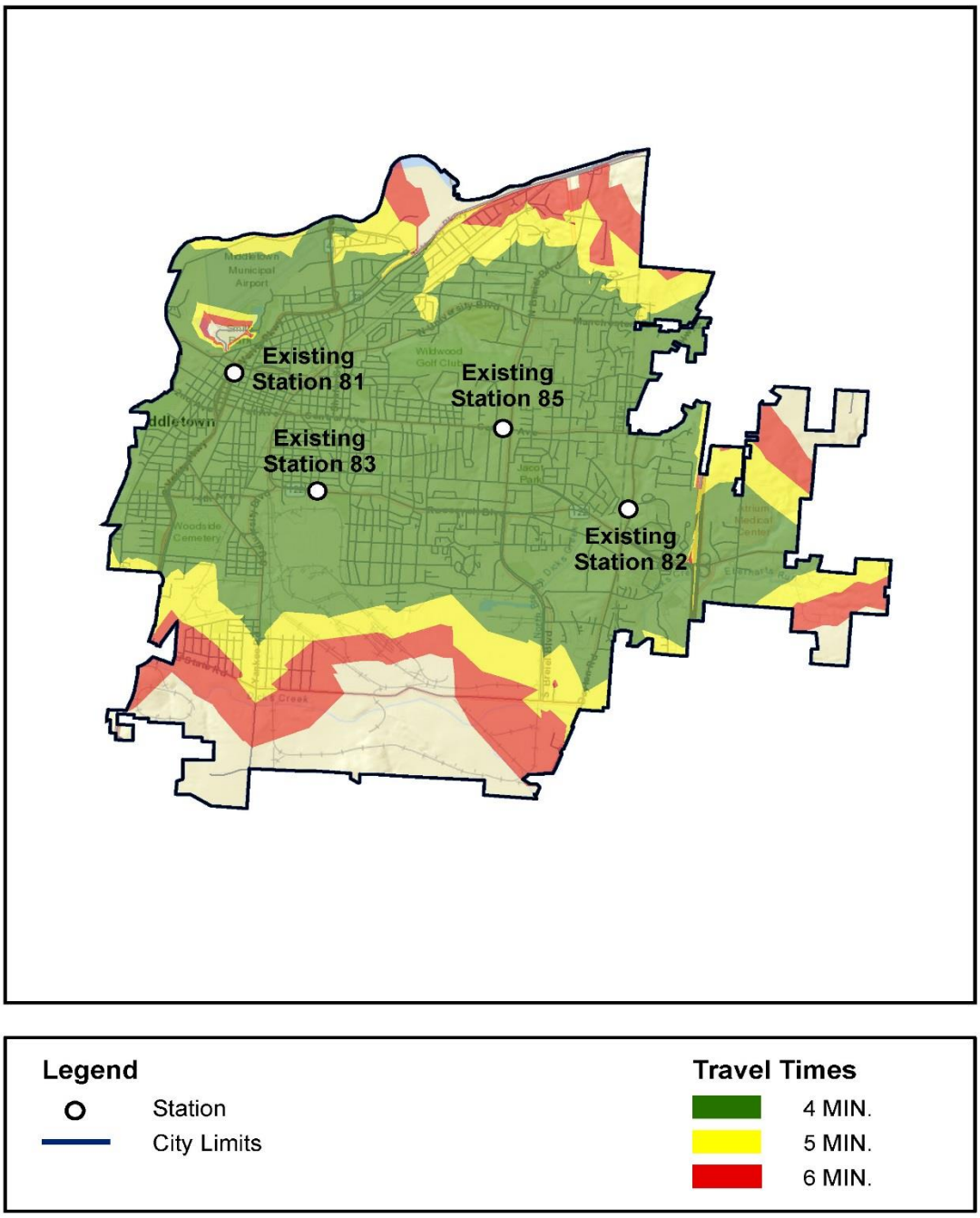

Figure 23

The following maps show the 4-, 5-, and 6-minute travel time maps for each existing station. The maps show the response district outlined with a red border. This detail shows the first-due coverage for each district as well as travel time into other districts as a second or third-due arriving company, which is part of the Effective Response Force, which is critical to the overall fire response to an incident. Figure 24 shows the travel times from Station 81. The downtown

area is in this first-due district. Most of Station 81's first-due area is within a 4-minute travel time and all of the first-due area is within 6-minutes. Station 81 covers almost all of District 83 within 6 minutes. It also covers a good portion of District 85 within 6 minutes.

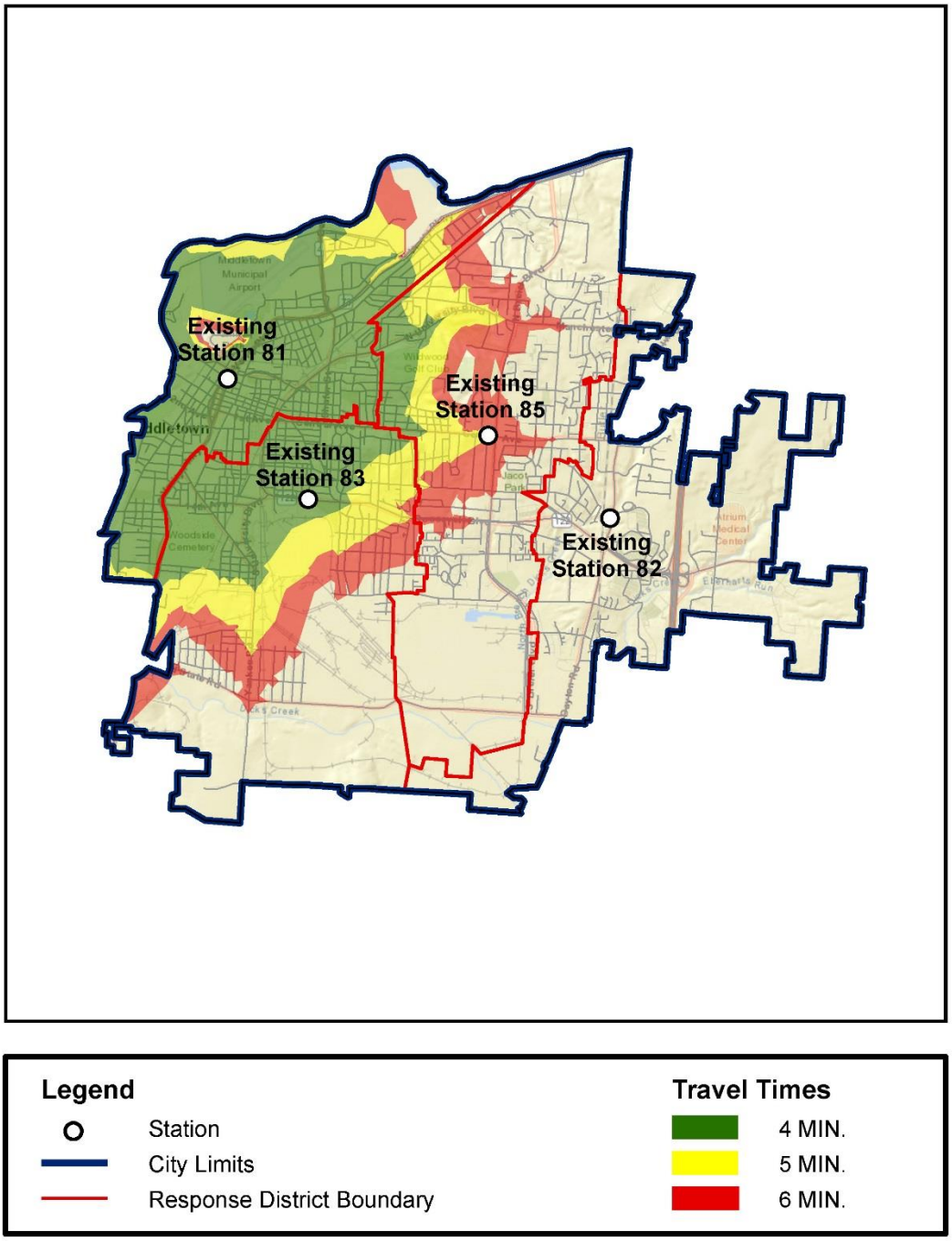

Figure 24

The map in Figure 25 shows the travel times from Station 83. Approximately 60% of Station 83's first-due area is within a 4-minute travel time. Areas in the southwestern area of the city are within a 6-minute travel time. Areas near the city's southern and southwestern border in the vicinity of Yankee Road and Oxford State Road are beyond 6-minutes. Several significant risk properties are located in this area including Pilot Chemical, Quaker, and Suncoke Energy. Approximately 60% of District 81 is covered within 6 minutes and the downtown area is covered within 4 minutes. Station 83 also covers approximately 50% of District 85 within 6 minutes and covers some of District 82 within 6 minutes.

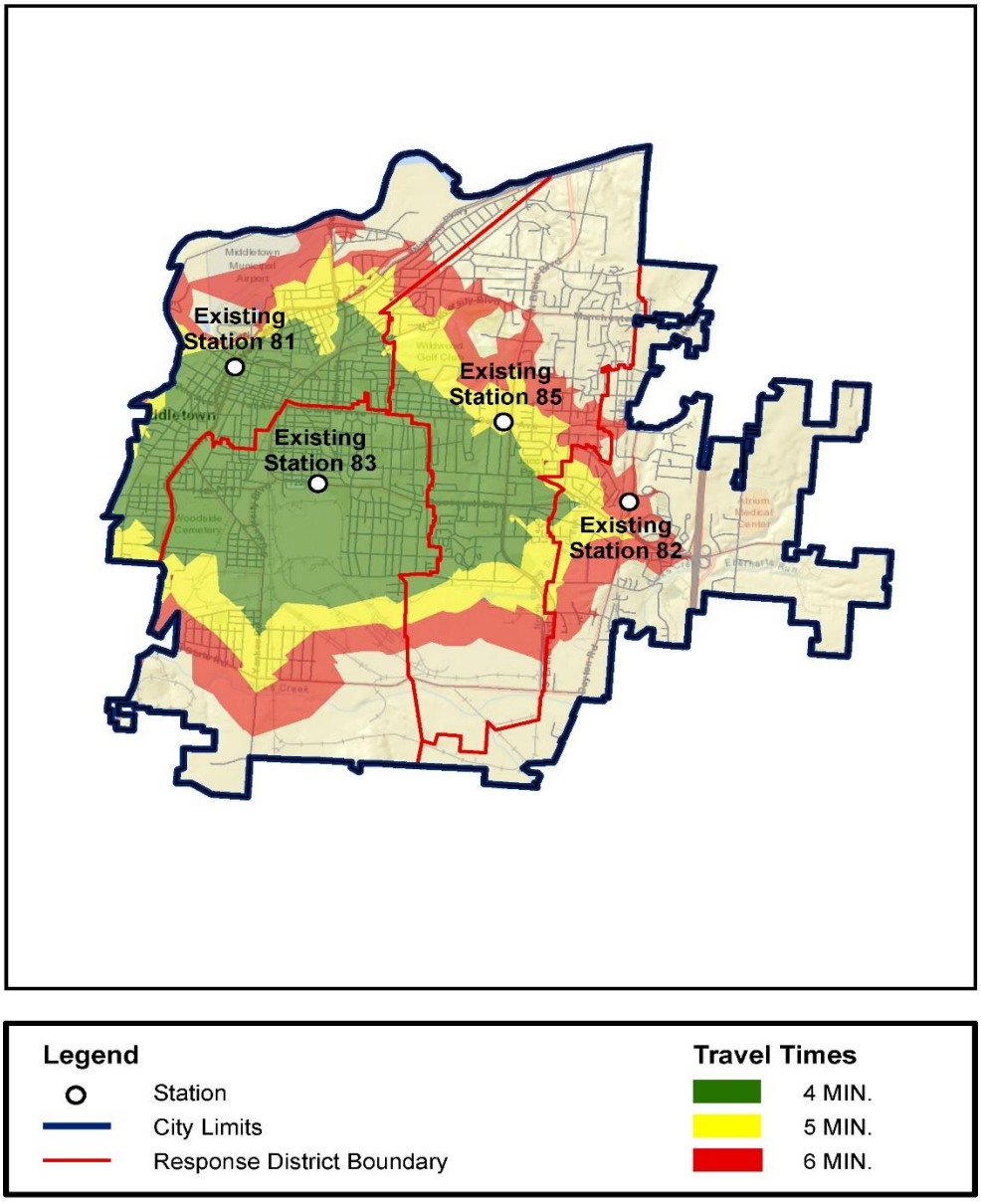

Figure 25

The map in Figure 26 shows the travel times from Station 85. Most of the response area is within a 4-minute travel time. Some of the southern area in the response district is beyond a 6-minute travel time. Approximately 80% of District 81 is covered within 6 minutes including the downtown area. Approximately 50% of District 83 is within a 6 minute travel time, including the AK Steel complex. It also covers approximately 50% of District 82 within 6 minutes.

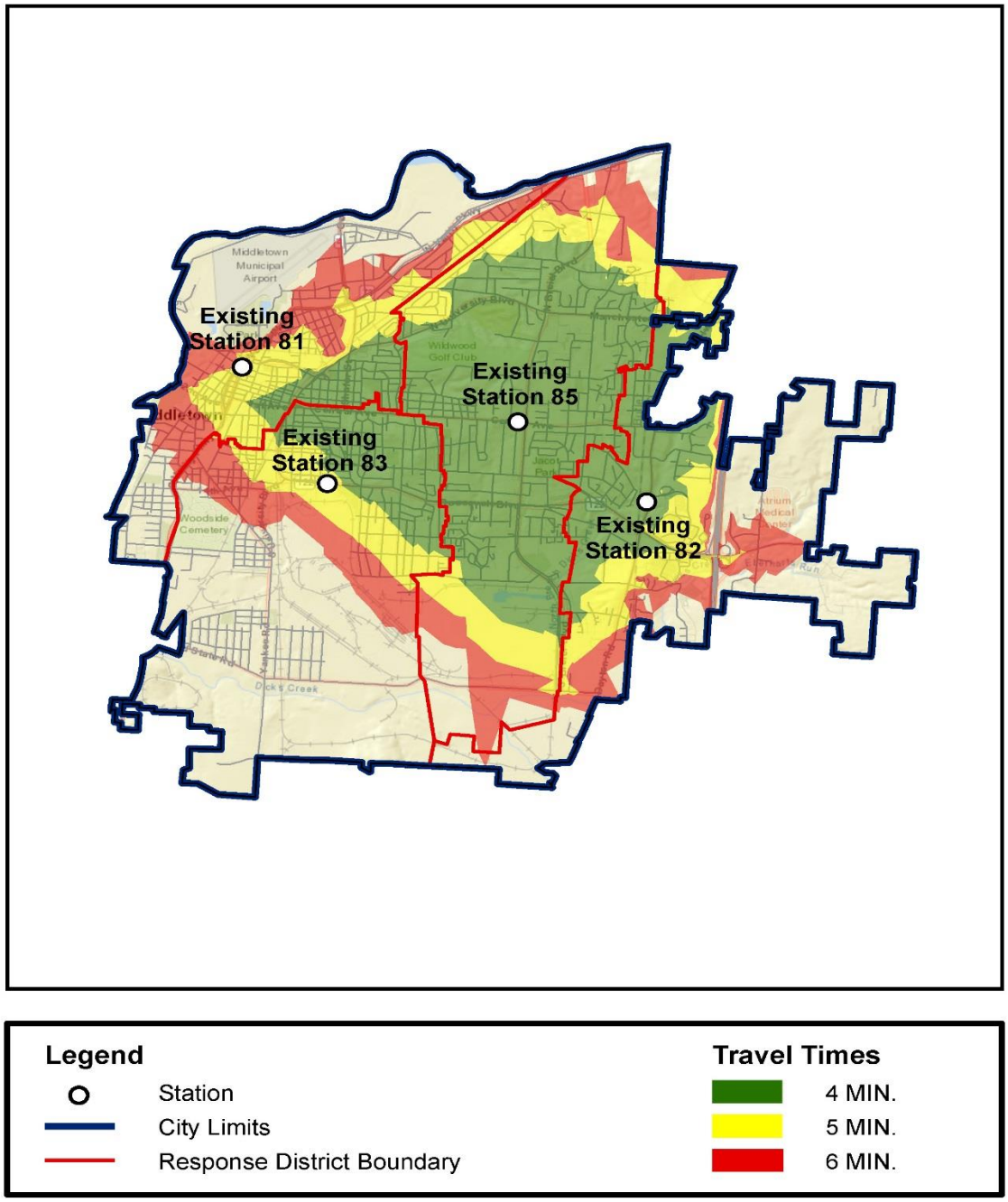

Figure 26

The map in Figure 27 shows the travel times from Station 82. Most of the response area is within a 4-minute travel time, including the Atrium Medical Center campus. Some of the southern area in the response district is beyond a 6-minute travel time. Approximately 60% of District 85 is covered within 6 minutes. Approximately 30% of District 83 is within a 6-minute travel time, including the AK Steel complex.

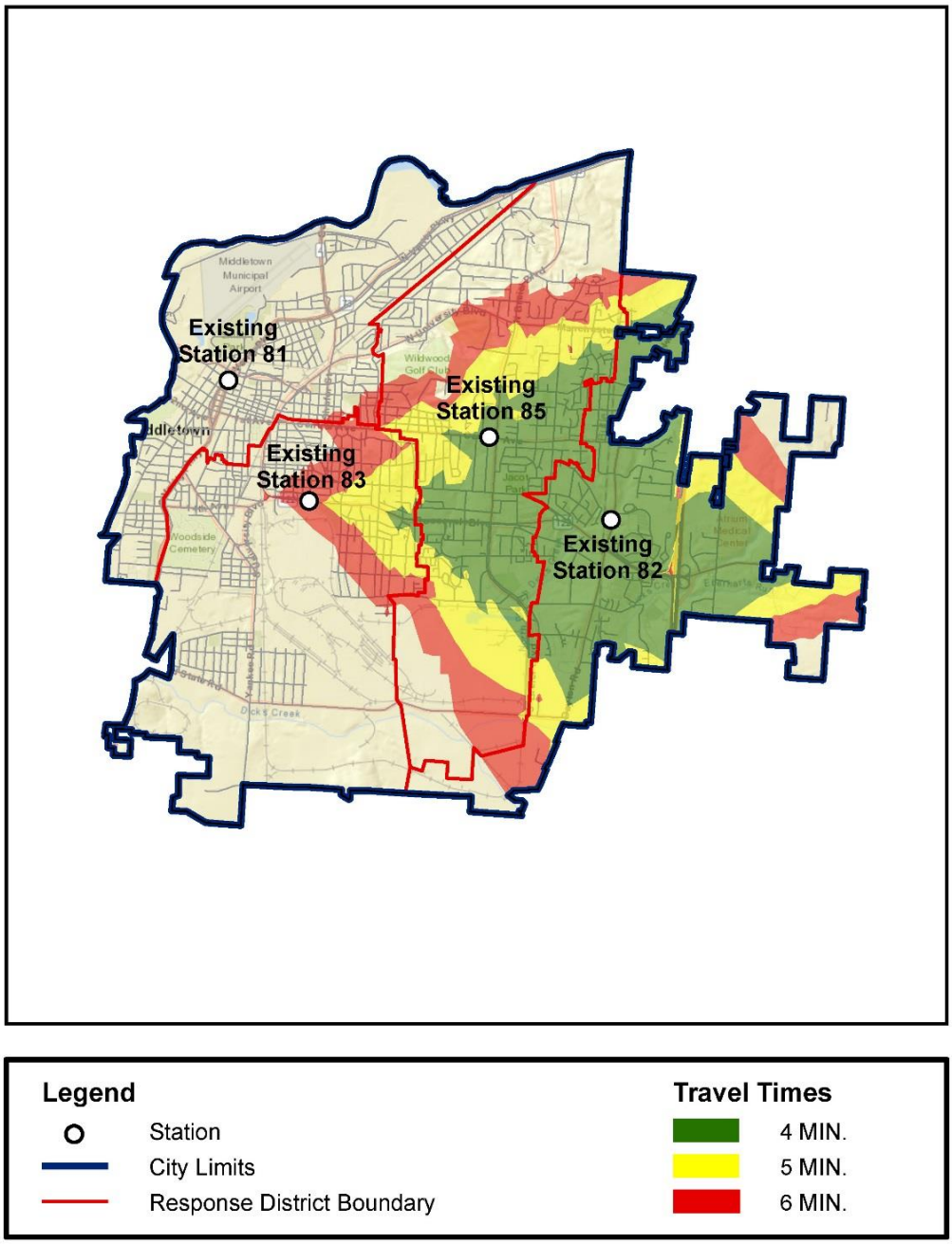

Figure 27

Overall, the travel time maps indicate good first-due coverage. The area in the southwestern portion of the city is beyond 6-minute travel times. AK Steel's large complex is situated in a manner that forces Station 83 units to go around it rather than a direct line to that area of the city. Station 85 covers some of the area along Oxford State Road because crews have a direct travel line on South Breiel Boulevard to Oxford State Road area. Portions of the far eastern area of the city, which is primed for future development, is beyond 5- and 6-minute travel times.

Of concern is the concentration of the resources. The second and third due companies in the downtown area, western area and central area is good. However, the southwestern area previously discussed, the northern and northeastern area of the city, along with the eastern portion of the city, have travel times for the second and third due companies in excess of 6 minutes. This stresses the initial arriving company, which may be faced with a rescue situation or fire conditions that have extended beyond the room or floor of origin. This situation is further exacerbated when the first-due company is out of service handling an EMS call and the first-arriving company from another district could be 6 -10 minutes away. This same situation affects EMS incidents and patient outcomes in a similar fashion.

Strategies

The assessment team learned during initial planning meetings that the city desired options to consider in a stepped approach to improving service delivery. Therefore, several options and recommendations have been developed for consideration. The recommendations are based on the risk identified in the community, service demands and response performance gaps identified in this analysis. Middletown has a coordinated economic development effort, which has resulted in steady growth and a renaissance of the downtown area. This is expected to continue,and the fire division needs to be in a position to meet those future and current service demands.

Staffing needs

The fire division is currently dealing with a significant call volume and is understaffed when working at minimum staffing level of 16. The analysis of the response performance clearly identifies a consistent performance gap in delivering service. This is not reflective of the effort of the dedicated personnel of the division. It is however, reflective of the impact of significant service demands and insufficient resources to meet those demands. Because of the work load, fire companies or medic units are naturally committed to calls for service as they are received. With fewer resources, the next closest unit will handle the call. In some cases, the farthest unit away may have to handle the call, some even being handled by mutual aid departments, such as the Monroe Fire Department. All of these scenarios result in longer response times and can have a negative impact on the outcome of the call, depending on the situation and type of call.

The first and most important approach to improving the service delivery is an increase in

staffing.

Recommendation #1: ***The daily minimum staffing level for the fire division should be 19 personnel.*** Using the current staffing matrix in use by the fire division administration, 19 personnel would enable the division to staff three committed medic units, two engine companies, and two combo-companies plus the shift commander. This would allow the division to essentially handle three to five EMS calls at the same time and still have at least two engine or quint companies available to respond to fires and other incidents such as an auto accident with entrapment, etc. If only three medic units are committed, the division would have up to three engines and a ladder company with a total of 12 personnel plus the shift commander to respond to a fire incident. This is still less than the 17 identified in the Critical Tasking Section for a residential fire attack, but provides enough personnel to conduct simultaneous tasks and undertake a rescue operation if needed. If all units were available, it would provide sufficient personnel for an initial response to medium-risk properties recommended by the NFPA (see page 16) although there will still be some deficiencies for responses to maximum risk properties such as AK Steel, Atrium Medical Center and the downtown area.

This increase in minimum staffing would allow committed engine companies at Station 81 and Station 83. These are the two busiest stations, with Station 81 and Station 83 handling 34% and 31% of the call demand respectively, or 65% of the total workload. Station 81 and Station 83 are also the two closest stations to the downtown area and three maximum risk properties. The downtown area has numerous mid-rise and high-rise buildings that create their own special risk, as described in the Risk Analysis on pages 26 and 27.

Optimally, the daily staffing levels should be 21 personnel. This would allow Station 82 to staff an engine company and a medic company. The analysis indicates that Station 82's district in the east end of the city is the growth area, with additional development in the planning stages. Growth predictions (reviewed on page 3) identified development plans for 600 acres primarily east of I-75 along SR 122. This combined residential and commercial area will include multiple-family housing and assisted living facilities. There also is a residential plat in this area currently in the planning stages for 300 plus single-family residences.

This continued growth will impact the division's demand for services. Of concern is the response time for the other stations to arrive into Station 82's first-due district. While Station 82 currently only handles 14% of the demand, this will change in the future. Additionally, one-third of significant risk properties and one maximum risk property (Atrium Medical Center) are located within the area. This increase in staffing would have a positive impact on the division's response performance and better prepare the division to meet future service demands.

Recommendation #2: ***The city should develop a facility improvement plan.*** The previous facility plan conducted by MSA indicates deficiencies in the station facilities. These deficiencies were confirmed by the OFCA in our cursory assessment. In addition, Station 81 and Station 85,

primarily due to the age of the facilities, do not facilitate rapid response of the personnel assigned to the station, which also can negatively impact the division's response performance.

The updated facility plan should include a series of improvements for the remaining facilities to make them more operationally efficient while meeting the modern needs of an essential facility, including proper air movement and make-up, infection control and energy efficiencies. Replacement of the facilities may be a more cost-effective option, but that decision would need to be examined collaboratively by the fire division and city administration to determine the division's current and future needs. This facility plan can be developed internally with the information from previous studies and current building conditions, maintenance records, etc. If a decision is made to replace any additional stations, the response performance of the division should be reevaluated to determine the best locations for the stations.

If the city were to construct four new stations now, the map in Figure 28 shows the best locations to achieve optimal first-due coverage. This configuration places Station 82 closer to Interstate 75 and in a position to serve additional land area should the city continue to extend further east as well as the planned infill of the current available land area. This configuration does not resolve the problem of the Effective Response Force response times being longer than target goals, but additional personnel to keep engine companies staffed would keep companies available except in the most extreme response scenarios.

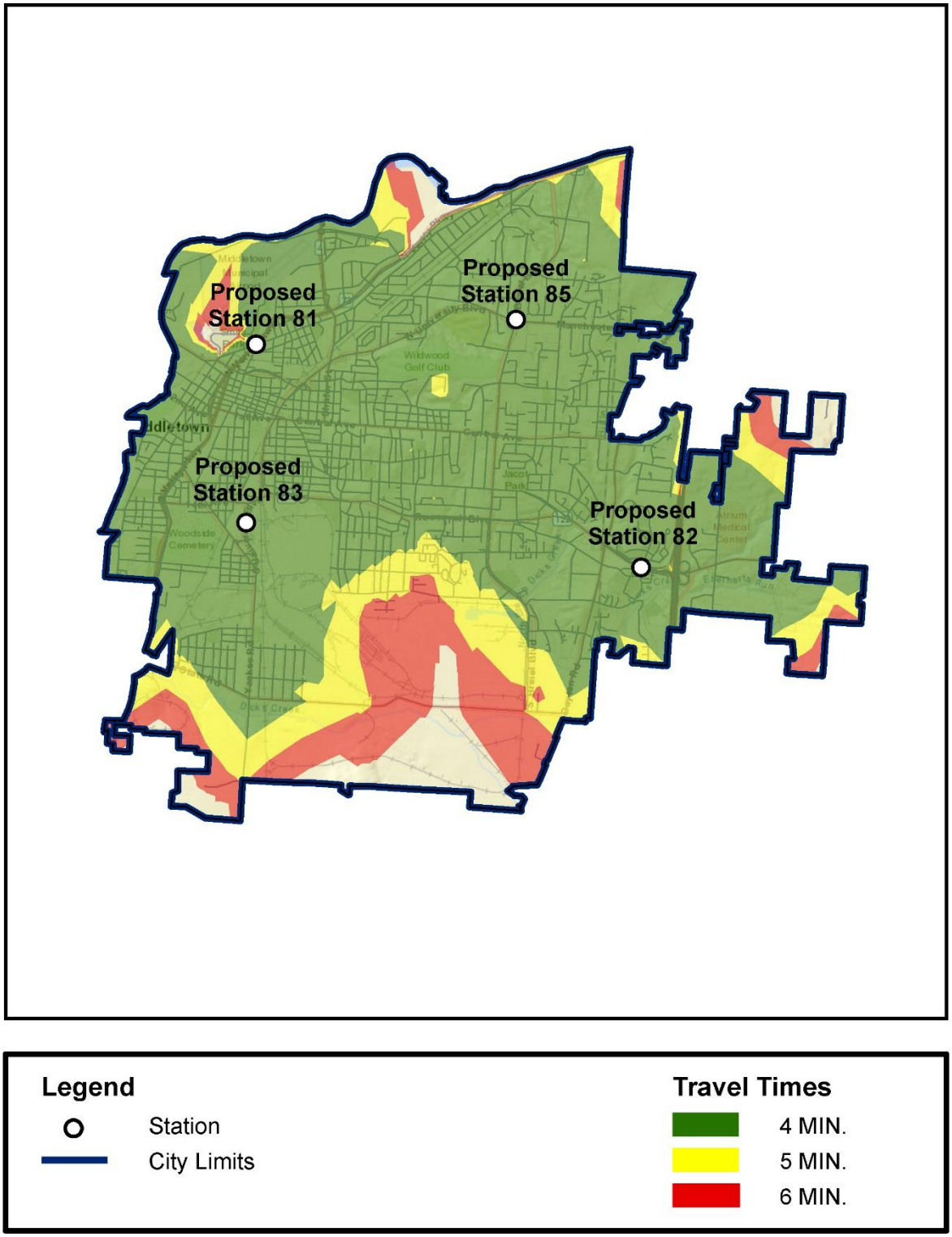
Proposed
Station 81
Proposed
Station 85
Proposed
Station 83
Proposed
Station 82
Legend
Station
City Limits
Travel Times
4 MIN.
5 MIN.
6 MIN.

Figure 28

Recommendation #3: ***As part of the facility plan, the city should replace and relocate Station 82.*** This is based on the analyses of the response performance, service demands and computer modeling. The map in Figure 29 shows a new relocated Station 82 while keeping the other stations at their current locations.

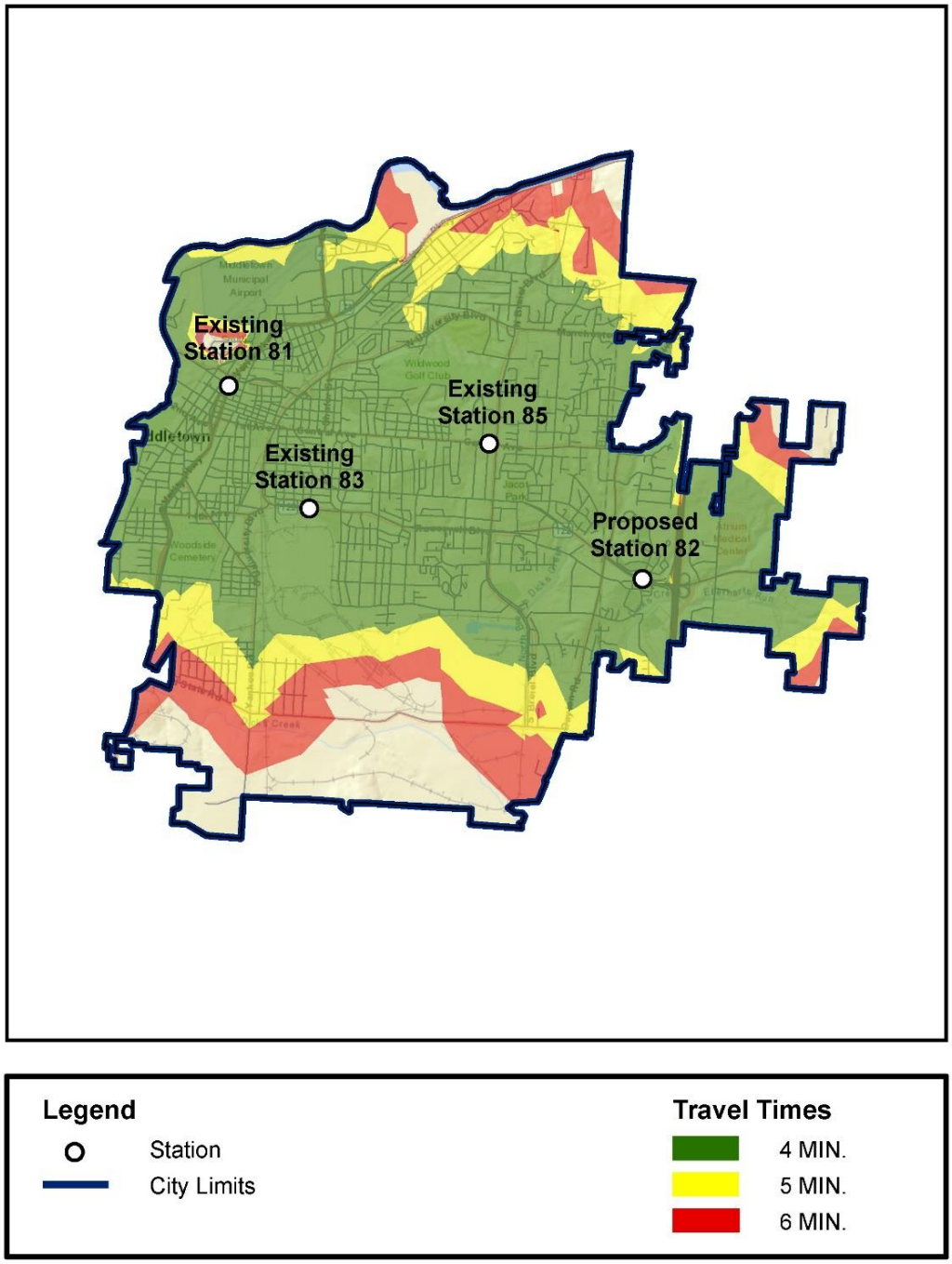

Figure 29

While the first recommendation dealt with staffing improvements to meet the current service demands, the division must also look at ways to reduce call volume and unnecessary calls. The city and the division have experienced significant success with the Heroin Response Task Force. This is an excellent example of a multi-faceted approach to deal with a specific problem in the community. This same approach should be expanded to identify and take appropriate steps to reduce recurrent and unnecessary calls for service. Several examples and suggestions as part of a community risk-reduction program are provided.

Recommendation #4: ***The fire division should explore implementing a community paramedicine program.*** As part of the service demand analysis, high-volume call locations were identified (see page 47). There were 229 locations that had between six and 20 calls for service in the calendar year 2017. Twenty locations had between 21 and 50 calls for service. While some of these can be attributed to the continuing drug crisis, the large number of these locations warrants further investigation.

For example, community paramedicine is an innovative and evolving model of community-based healthcare designed to provide more effective and efficient services at a lower cost. Community paramedicine (sometimes referred to as mobile integrated healthcare) allows paramedics to function outside their traditional emergency response and transport roles to help facilitate more appropriate use of emergency care resources while enhancing access to primary care for medically underserved populations.

Community paramedics are licensed paramedics who have received specialized training in addition to general paramedicine training and work within a designated community paramedicine program under local medical control as part of a community-based team of health and social services providers. Paramedics are uniquely positioned for expanded roles as they work in home and community-based settings; are trusted and accepted by the public; are trained to make health status assessments; recognize and manage life-threatening conditions outside of the hospital; and operate under medical control as part of an organized, systems approach to care.

This program helps patients living at home who have difficulty managing chronic conditions and help match and facilitate appropriate social agencies with needs of the patient. The goals of the program are to provide more effective, efficient and timely healthcare, avoid or reduce unnecessary EMS response and transport to the hospital, reduce hospital readmissions, reduce emergency room visits and lower healthcare costs. This type of program should be examined by the division to determine its potential effect on the community and the service demands on the division. A partnership with a local hospital or health agency may be a possibility with this type of program.

Recommendation #5: ***The fire division should consider adding another dedicated fire prevention position.*** The division has made recent progress in this area with the addition of an operations captain and lieutenant who primarily handle fire prevention duties and fire

inspections. These positions were an effort to restore the division's fire prevention focus from the loss of two fire marshal positions during the economic downturn in 2014.

Having full-time assignments in prevention would provide several advantages for the division and the community. A concentrated and multi-faceted prevention program can be developed and implemented. Fire companies currently perform company level inspections on commercial and public assembly occupancies. However, Middletown's industrial occupancies and complexes, as well as the significant and maximum risk properties, require a higher level of expertise in the inspection process, which can be achieved with the full-time assignment and additional training. Adding an additional position also would allow the division to identify, develop and provide message-specific fire prevention programs to the community. These message-specific programs typically are based on leading fire causes in the community as well as field observations of fire division personnel and social service agencies. The division experienced six civilian fire fatalities and 29 injuries during the past five years, all in residential type settings. The fire loss experienced in the community is also significant. The goal of a fire safe community is a worthwhile goal; it improves the quality of life of the community, helps promote growth and reduces the service demands on the fire division.

Fire prevention efforts should also be directed at reducing the number of fire alarm responses to commercial, assembly and industrial properties. In 2017, 24% of the division's responses were classified as a false alarm or a false call. This is not uncommon, but there are steps that can be taken to help reduce this type of call.

Recent changes in the Ohio Fire Code give local inspectors greater latitude in determining local alarm needs. For example, manual pull stations can be removed from schools and other business occupancies, if the building is suppressed (fully sprinklered) and alarmed (heat or smoke detectors). This change was implemented in part due to the false alarm problem and to help manage the risk in schools from the alarm system being used by an active shooter.

In hotel occupancies, if suppressed, only one smoke detector is required in a room and it only has to alarm at the front desk. Experience has shown that alarm installation by private contractors, usually well-intentioned, is at times more than is needed and often results in unnecessary emergency responses due to activation. System maintenance and age of equipment also may affect the alarm systems. All of these type of actions can be managed by a coordinated fire prevention effort and help reduce the number of false alarms. Each time a response occurs, the situation must be checked, which commits at least two companies and keeps them from responding to other calls. This affects the number of companies and personnel available for an actual fire incident, and potentially lengthens the response time to a fire or EMS call if it must be handled by units from stations farther away from the incident location.

Recommendation #6: ***The city should explore the feasibility of adopting a False Alarm Ordinance.*** Recurrent responses to false alarms puts the public and fire division at risk unnecessarily and ties up resources that may not be available to respond to a true emergency.

Nationally, the focus on America's fire problem has turned increasingly towards fire sprinklers as well as early detection and notification systems. Codes have significantly increased the requirements and trade-offs available for installing such systems and their complexity has increased as well.

With the increasing numbers and complexity of the systems, activations are more frequent. As a result, fire departments across the country have seen increases in the number of automatic alarms they handle, including those in the residential setting. A well-crafted false alarm ordinance can reduce the number of recurrent false alarms while still allowing property owners breathing space in terms of the occasional accidental or unintended alarm activation.

Many communities across Ohio have enacted false alarm ordinances with positive results. Most efforts have included similar problems experienced by the police division.

Recommendation #7: *The fire division should develop a written standard of cover for service.* While standards exist, it is the commitment and resources of the community that must come to bear against the threat of community risks. Community risk is more than just fire risk; it encompasses technical rescue, EMS, and disaster response. This report examined the community fire risk with a macro view. The standard of cover allows the agency to analyze community risk with a micro view. The assessment team was impressed with the engagement, acumen and professionalism of the fire division staff. They clearly have the capability to complete such an undertaking if given sufficient time to complete the assignment.

Recommendation #8: *Develop organizational performance goals*. Working together, the city administration, city council and fire division should develop organizational performance goals. An example of an organizational performance goal would be: *the first-due fire division unit will arrive at a fire incident within 6 minutes, 50 seconds total response time for 80% of all incidents.* This performance goal then provides the foundation, along with other factors, from which to determine the appropriate level of resources to meet the goal(s). This also provides a method from which to analyze response and other related data and report to the citizens on the agency's performance in a clear and understandable manner. This also is an excellent opportunity to involve and engage members of the community.

Appendix A

Response and Performance Data

For records management purposes and determining response run cards, MFD has divided the city into four response districts or response zones. The response districts are correlated to each of the four fire stations and identified as District 81, District 82, District 83 and District 85. There also is a small response district for the contract area with Franklin Township.

District 81 - This response area is the northwestern part of the city. The western boundary of the response area is the Great Miami River and Madison Township. To the south, this area borders the city of Monroe and Lemon Township. To the north, this area borders the city of Franklin. This response area includes the historic downtown, municipal airport, city building, courts, and all of the high-rise buildings. The majority of maximum risk properties within the city are located within this response area. This district has 73.79 road miles within 5.41 square miles and has 4,256 single-family and 977 multi-family residences.

District 82 - This response area is located in the eastern portion of the city and borders Franklin Township and Turtlecreek Townships. Interstate-75 runs through the eastern part of the response area north to south. This response area includes the contracted service area for Franklin Township and those portions of Warren County that were annexed into the city of Middletown. Two hospitals, several nursing homes, and the AK Steel Research facility are located within this response area. This area includes the majority of the city's undeveloped commercial property and a large residential neighborhood that is under construction. This response district has 37.56 road miles within 6.11 square miles and has 2,148 single-family and 729 multi-family residences.

District 83 - This response area contains the fire department headquarters just outside the main entrance to AK Steel. AK Steel is a maximum risk property with over 30 buildings within a 3± square mile area. This response area borders the city of Monroe and Lemon Township to the south. This district contains 64.81 road miles within a 7.26 square mile area and has 4,888 single-family and 817 multi-family residences.

District 85 - This response district borders the Great Miami River and the city of Franklin to the north and the city of Monroe to the south. The response district contains Middletown High School, which was recently reconstructed and a regional campus of Miami University. There are 86.58 road miles within 7.77 square miles. There are 4,928 single-family and 1,142 multi-family residences within this district.

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