Improving Emergency Response for the Southwest Quadrant of the City of Green: A Recommendation Report

Prepared for: City of Green City Council

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Submitted: September 8, 2020

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Date: September 8, 2020
To: City of Green City Council
From: Fire Chief Jeff Funai
Subject: Recommendation Report for Improving Response Times to the Southwest Region

Attached is the report for our study, "Improving Emergency Response Times for the Southwest Quadrant of the City of Green: A Recommendation Report." We completed the tasks requested by council on April 9th, 2019: investigate different options in improving response times, determining which has the greatest impact on improving response times, estimating the costs and providing a timeline on implementing a solution to the problem. It is our hope that this report provides the elected officials and the community they serve a better understanding of emergency response, community risk assessment and protection strategies

A special note of thanks to Wayne Wiethe and the Planning Department for allowing so much access to the time and talents of Ms. Chrissy Lingenfelter, the city's GIS Administrator. She spent countless hours developing ideas and plotting information to help us clearly visually display the situation. She was a key to presenting a comprehensive and fact-based evaluation of station location and her skills were applied to almost every aspect of the evaluation and study of improving the emergency response.

An additional thank you to Mr. Steven Schmidt, the Finance Director for the City of Green as he was the primary source of financial information and analysis included in the study. We are grateful for his time and effort in pulling the information and projections together to support the decision-making process

Finally, a note of thanks to the men and women of the City of Green Fire Division. I am humbled to be among your ranks. I marvel daily at the work you do and how you do it. The business of saving lives is never easy, but you do it so well. Thank you to our study Team for the hours and effort assembling facts and information, reviewing progress and chasing down lose ends

On behalf of the entire Team that participated in this study, I would like to thank the City Council and the Mayor for the opportunity and inviting us to participate in this phase of the feasibility study. We look forward to working with you on any follow-up activities. If you have any questions or comments, please contact Fire Chief Jeff Funai, at JFunai@cityofgreen.org or at 330-896-6610.

Chief Funai

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INTRODUCTION

NOTE

Throughout this report there are multiple maps to provide visual aid in discussing while this topic. These maps were created by GIS Administrator Chrissy Lingenfelter. The data and limitations are discussed in detail throughout this report. The time period studied was September of 2017 through the end of December 2019.

In April of 2019, Green City Council passed Ordinance 2019-08 that authorized the Finance Director to transfer three million dollars ($3,000,000.00) to the Capital Projects Reserve Fund (Fund 401) from the unappropriated balance of the Pipeline Settlement Fund (Fund 245) to study, design, and implement a plan to improve safety services and emergency response times in the Southwest region of the City of Green. In the whereas clauses of this legislation, the Council noted that improving the emergency response in this area of the City would be a benefit to citizens throughout the City and that safety services are an appropriate expense to which to apply Pipeline Settlement Funds.

This report documents the study, findings, and recommendations of the Fire Division on how best to improve emergency services response to this Southwest region of the City. It roughly follows a quantitative research methodology. The inherent difficulty in such a report is the perception of need and the tolerance for risk of the reader. This report is not intended to advocate for a given position, it is a factual representation of how to provide a more robust emergency service and an improved response. It will be the task of the City Council and City Administration to interpret these facts, weigh them against the other needs of the City and balance the collective tolerance for risk to determine the appropriate course of action.

HISTORY OF GREEN FIRE

Our Mission

The City of Green Fire Division is committed to being a premiere leader in public safety service. We are dedicated to protecting life and property while enhancing the safety of our community.

The City of Green Fire Division is committed to serving our community in the most efficient and effective manner possible. Our goal is to meet the needs and expectations of our citizens. Simply put, our mission is to save lives. To meet this mission, we must continually examine our operations and position ourselves strategically in a forward-looking and values driven manner. This means a constant re-evaluation of our resource deployment model to ensure we are being both efficient and effective with the limited resources we have been given.

The City of Green is just under the 36 square mile size (33.53 sq. miles) of a typical Ohio township. Our history as a township includes the formation of the Fire Department in 1939, with a township owned fire truck. This fire truck was stored in the privately owned garage of the first Fire Chief, Marion Baab.

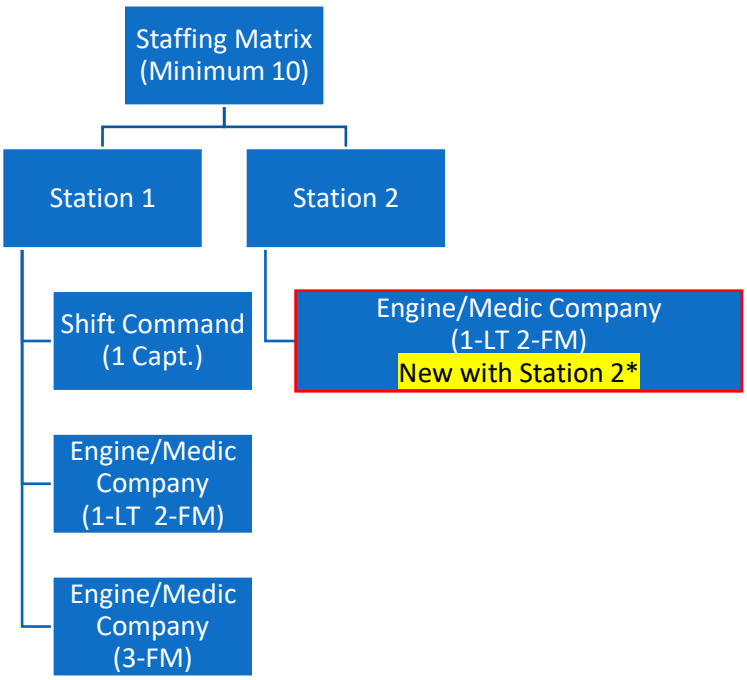
The first Township fire station was constructed at the corner of Greensburg and Massillon Roads. That station was modified and added on to several times through the years until the current Fire Station #1 was built in 1977 at the intersection of Steese and Massillon Roads. This location is just slightly to the east of the center of Green, and ideally suited for a one station configuration as it was roughly equidistant to all corners of the township. At the time of its construction, the department was staffed by all volunteer members, and paramedic level emergency care was provided by local ambulance companies.

In 1983, the township passed a levy to support staffing for paramedic level service. At this point, there was at least one full-time fire/medic on duty every day with another full-time fire/EMT

basic and at times supported by a part-time firefighter. Sometime in the late 80's or early 90's, the number of on-duty fire/medics increased. In 1995, minimum staffing increased to four full-time fire/medics per shift and in 1997, became six. This level of staffing allowed two full crews to function out of Station #1. This was the first time the department could respond more than one apparatus at a time without calling in additional resources from home. In other words, the department could; handle simultaneous EMS alarms, respond both an ambulance and a fire truck to a vehicle accident, or respond a fire engine and a ladder to a structure fire with on duty personnel.

Having available staff on-duty to respond to what is most likely to happen is critical because waiting for mutual aid units or off duty members to return to the Station to respond adds to the total response time when help is needed most. This philosophy became a core part of the Fire Division and remains a guiding principle today. It is our desire to have enough resources on duty to handle what is most likely to happen. Not everything that could happen, just what typically happens based on historic data. The key to being able to sustain this philosophical commitment has been the change in how the department is funded. In 2002, the 5-year Fire and EMS property tax levy was allowed to expire due to the income tax increase from 1 to 2 percent. This provided the stability to the City's finances necessary to make the commitment to building Fire Station #2 and take on the additional costs associated with increased Fire Division staffing

Over the years, the decision to increase staffing has always been closely tied to call volume. The most reliable predictor of the future is the past, so current and historical call volume have always been the predictor of what is most likely to happen. Increasing call volume has driven the need for more staffing to handle the alarms. With the operation tied to just the one station location, response time was not a variable that could be managed. Station #2 changed that.



(Figure 1)

Figure 1 provides an organizational chart depicting our staffing model for our previous two station response model. In 2001, construction began on Fire Station #2. It opened in early 2002 and shift staffing was increased to a minimum of ten full-time fire/medics. This level of staffing set up the response to include two three-person companies at Station #1 and one three-person company at Station #2 and with a dedicated Shift Commander. The Shift Commander oversees all stations and coordinates the efforts of the three companies. They are in command on alarms, make resource requests, develop the strategies and tactics, and are responsible for the safety of all personnel on scene. At the time, the decision to maintain two companies at Station #1 was contested. There was sentiment among the City leaders to simply spread out the fire/medics already on-duty between the two stations and there were some who wanted to open Station #2 as a limited response "EMS only" station. Ultimately, the desire to provide a fire response and the flexibility and redundancy gained in covering the operation with two companies out of Station #1 carried the day. Two companies at Station #1 yields a more reliable and effective response by having a

company in-service and available to respond to any area in the city as back-up or back fill to the primary company in that area. In addition, we have more opportunity to have staffing available to respond the specialty apparatus such as the water tanker, ladder truck or rescue truck.

This ability to respond to a larger number of alarms with a more effective response is consistent with the vision and core values of the Fire Division. We understand the costs that come with training, equipment and staffing, but we have made it our mission to give the citizens of Green the full effect of every dollar spent in the Fire Division. While our service is only requested by about 15% of the population each year, our response capability is an insurance policy for 100% of the population and should be geared toward providing coverage for all.

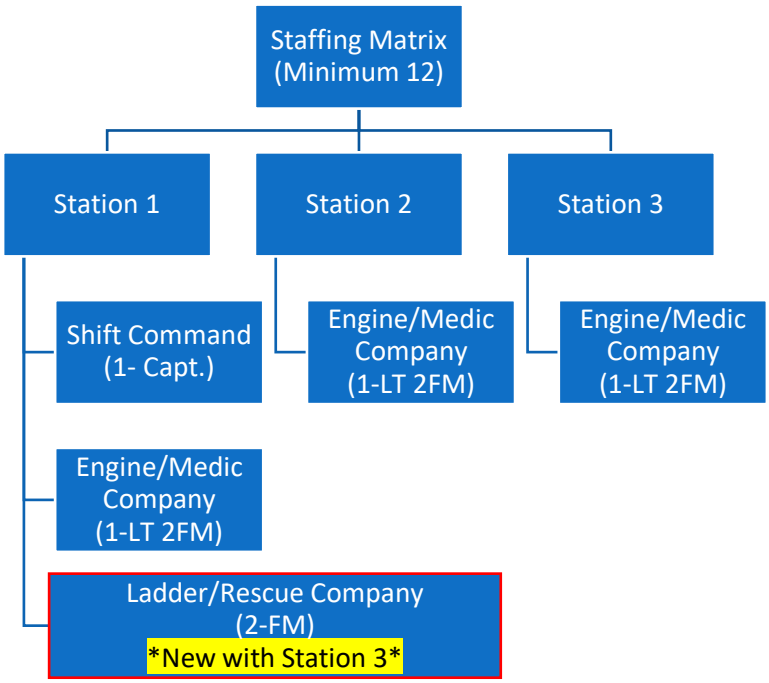
OUR VISION

The members of the City of Green Fire Division:

- Strive to be role models in the community and leaders in our profession.
- Will be accountable to those we serve, each other and any emergency service organizations with whom we interact.
- Are committed to providing the best public service through innovative training, education and equipment.
- Will take the fire department into the future through productive teamwork, open and honest communication and participative decision-making throughout the organization.
- Are committed to our values, mission, and dedicated to our fire service profession.

Our organization is driven to provide a cost effective and efficient fire department while honoring our values, accomplishing our mission and achieving our goals.

CURRENT DEPLOYMENT



(Figure 2)

Figure 2 provides an organizational chart depicting our current staffing model. The construction of Fire Station #3 is bringing with it an increase in overall staffing. The Division is going to staff a ladder/rescue company at Station #1. This will put an engine/medic company, comprised of one lieutenant and two fire/medics, at each of the three stations; with a single ladder/rescue company, comprised of two fire/medics, along with the Shift Commander at Station #1. This ladder/rescue will be in place to provide support to any of the other companies. The ladder truck provides the responding units a full complement of ground ladders ranging from a 10 ft attic ladder to a 35 ft extension ladder. This is in addition to the ladder mounted to the apparatus. These provide the companies the ability to access areas on a structure the engine is not able to reach. The rescue provides the capability to perform heavy rescue operations at car accidents and other machinery accident incidents. In addition, the rescue apparatus carries the equipment needed to

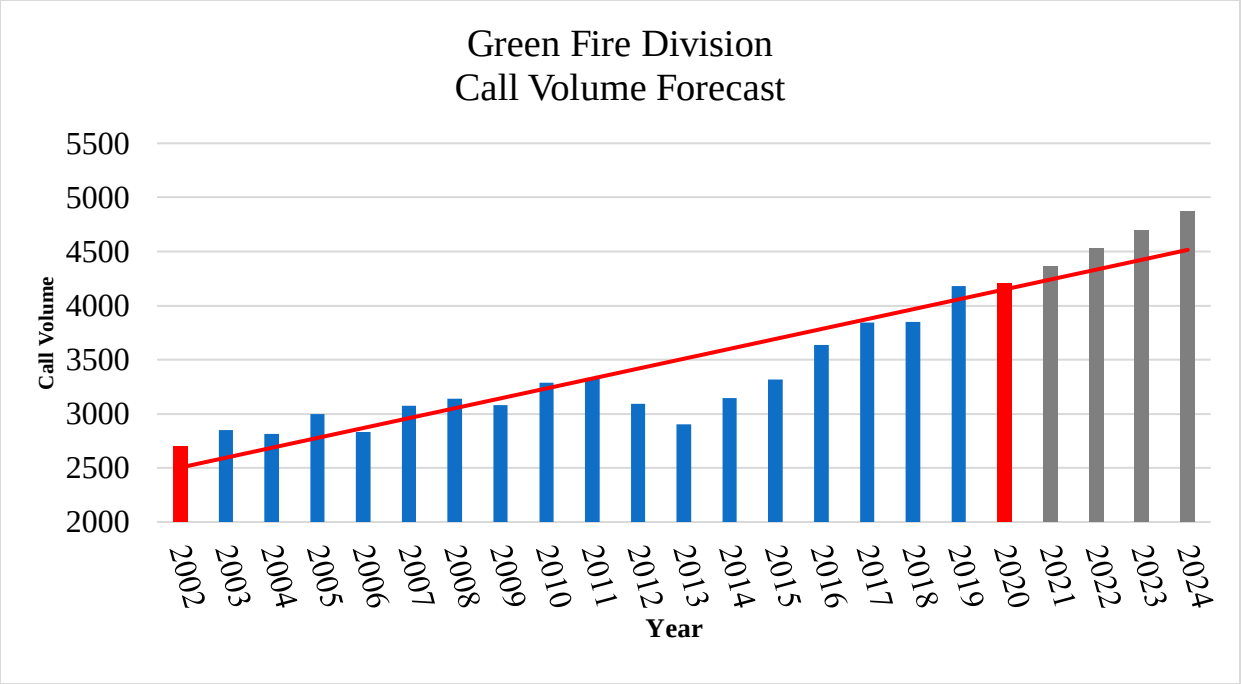
initiate a response to specialty incidents such as: hazardous material, rope rescue, trench rescue, structural collapse and confined space.

Housing this support company at Station #1 is critical to successful outcomes as it keeps this company centrally located in the city, yielding the best coverage for the specialty apparatus. Total minimum shift staffing will be increased to twelve in 2021. This number is important not just for staffing the number of medics necessary to meet EMS demand, but also for mounting an effective firefighting response. As we consider how best to deploy staffing and resources, the strategies we select need to impact outcomes, not just address a single variable like time.

The Mission and Vision of the Fire Division dictate that our staffing and deployment strategy should be optimized to accomplish the greatest good for the greatest number of people. The solution to improving the response to the Southwest region should account for maintaining or improving emergency outcomes for all. Throughout this study, the committee made a point to ensure that the selected strategy would not also concurrently cause a negative impact or decrease in service to other areas of the City.

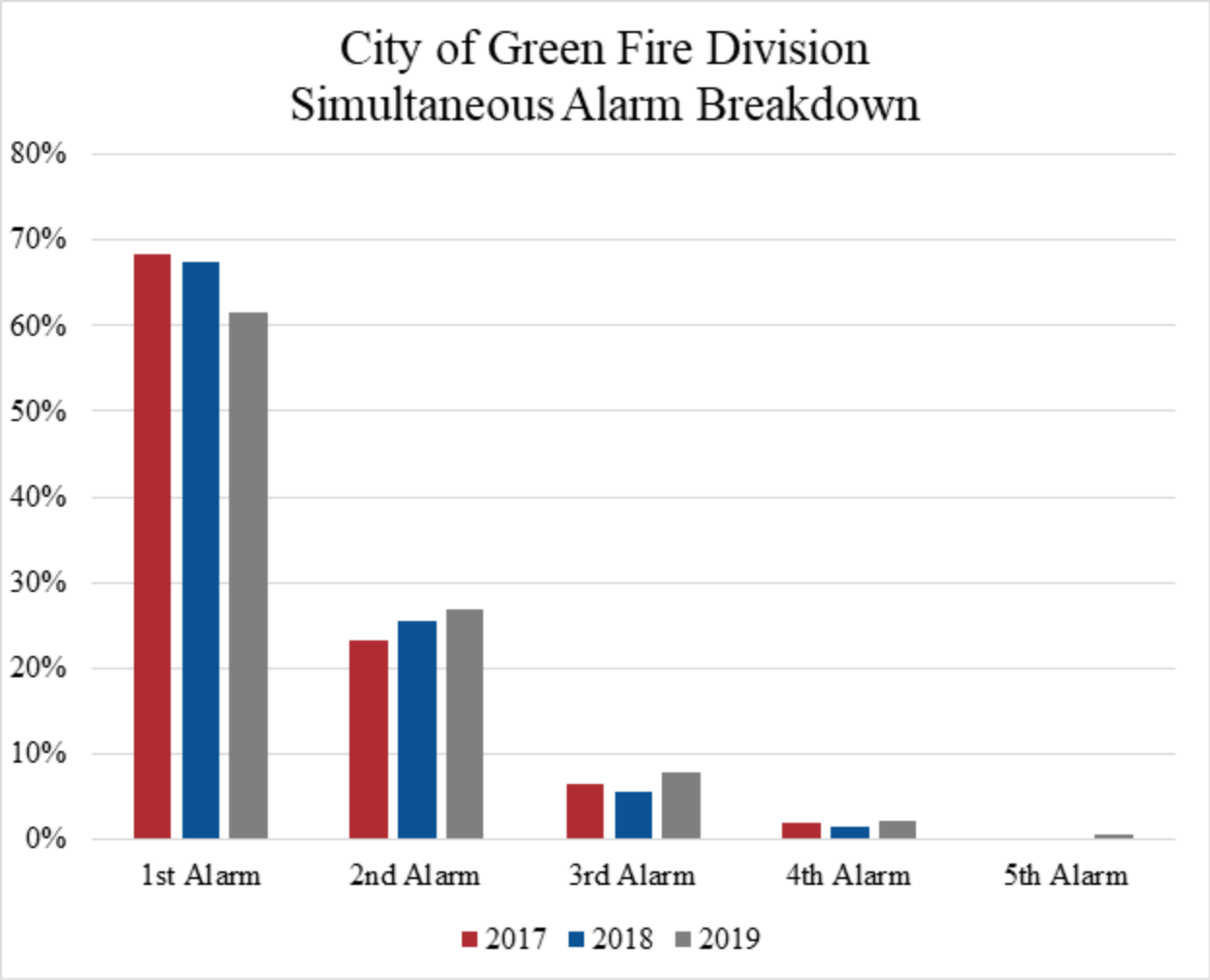
DEMAND FOR SERVICE

To study the issue of improving emergency response to the southwest region of Green, one must first understand the current situation. This report began with a narrative on the history of the Fire Division in Green and a description of the current staffing and station configuration. This information provides the reader with the context of the department's history and culture. To go forward and study how to improve the emergency response, it is necessary to consider the following: call volume, frequency and location. These following sections will provide you a better understanding of all three of these components.



(Figure 3)

Figure 3 shows the call volume history and forecast for the Fire Division. The bars shaded grey is a forecast that was performed using the average historical percentage change of a 3.469% increase (this includes 2020). The bars shaded red indicate when Station 2 and Station 3 were constructed. There was a 54.8% increase in volume from 2002 to 2019. It is important to note when you view this graph that in 2011-2013, both Summa Health System and Cleveland Clinic Akron General started construction and began seeing patients in their free-standing emergency rooms and health care facilities. This could account for the drop in call volume in 2012 and 2013.

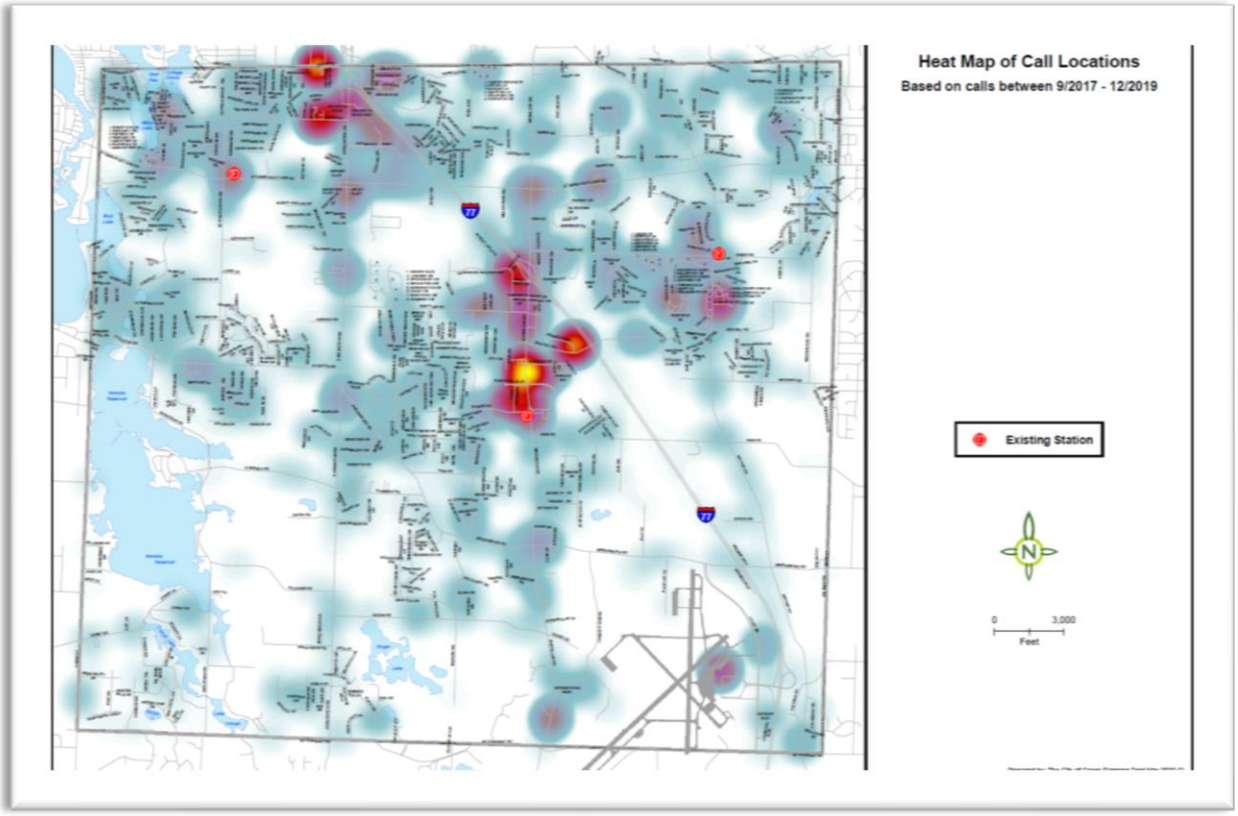


(Figure 4)

Figure 4 shows the percentage of simultaneous alarms the division responded to from September 2017 to December 2019. Simultaneous alarms are incidents that overlap, a second incident begins before the first one is finished. First alarm means there is only one incident underway. Second alarm means there are two incidents occurring at the same time, etc.

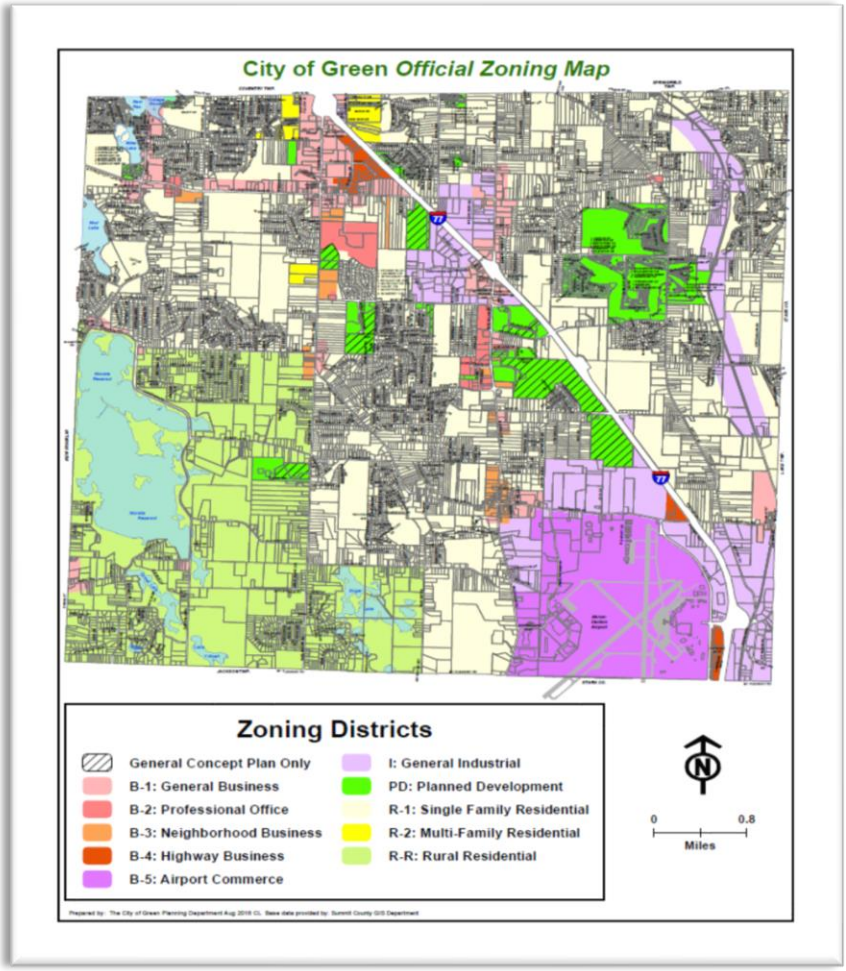
It is important to note that this does not take into consideration the number of companies required to respond to a given alarm. On average a total number of 3.5 personnel are used on a single alarm, this does not include mutual aid personnel. Take, for example, a motor vehicle accident (MVA) on Interstate 77. Current standard operating procedures (SOPs) require the Fire Division respond the following: Shift Commander (1 officer), ladder/rescue (2 fire/medics) and

medic unit (3 fire/medics). Notice that one alarm accounted for half of the minimum staffing (12 fire/medics). If there are additional patients that require medical care or transport, additional medic units are needed to respond. A routine medical alarm requires a response of a medic unit (3 fire/medics). Additional personnel may be needed to respond to that same alarm if it is more critical (overdose, cardiac arrest, trauma, etc.). A residential structure fire response (which will be discussed in greater detail later in this report) requires the following response: Shift Commander (1 officer), ladder (3 fire/medics), engine (3 fire/medics), tanker (3 fire/medics) and medic (1-2 fire/medics). This leaves the City without any additional companies available to respond to alarms that may happen during the initial incident. Mutual aid is now required to respond to those additional alarms. It is important to note the trend down in first alarms and the trend up in second and third alarms. The Fire Division requested mutual aid a total of 101 times in 2019.



(Figure 5)

Figure 5 shows accumulated call location data from September 2017 to December 2019 in a heat map. The map indicates higher concentration of call areas with yellow/reds and the lower areas of concentration of calls with blues/white. The results show a consistent pattern of call activity concentrated in the northern half of the City and along the Massillon Road corridor. The heat map is shared to show why satellite fire station location considerations have, until now, been focused in the northern areas of the City. Having a consistent response time throughout the entire City is important but the demand for our services has been and is projected to continue to be more concentrated in the north and along major corridors.



(Figure 6)

Figure 6 depicts the zoning classifications of the City. With the zoning designation of the Southwest being rural residential, this will limit the population density and associated supporting neighborhood business and attractions that help contribute to higher call volume in other areas of the City. City of Green feature maps be found on the City of Green's website including:

- business and industrial parks,
- retail and office plazas
- recent traffic counts

These maps all support the conclusion that Fire and EMS call volume will continue for the foreseeable future to be more highly concentrated in the north and along the more heavily traveled transportation corridors.

ASSESSMENT OF RISK

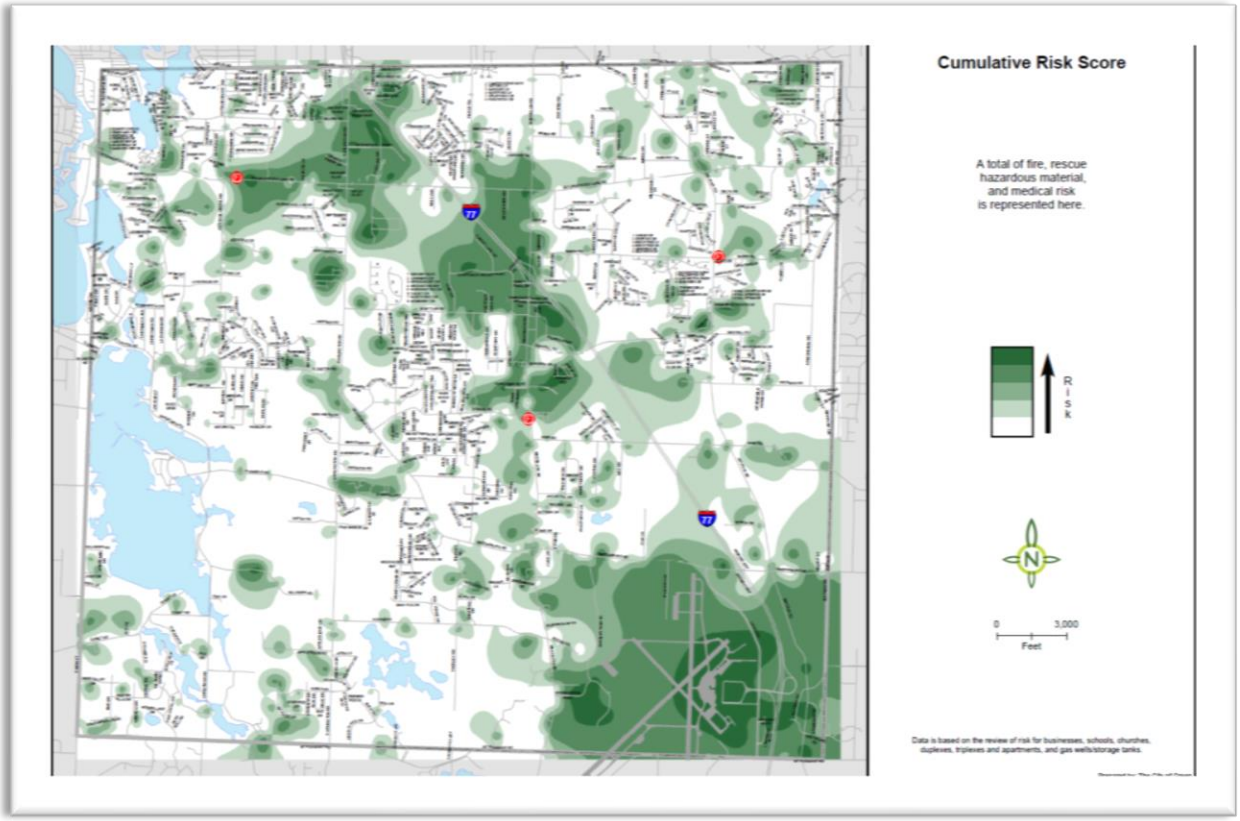
Beyond looking at the probability of emergency calls by considering where the call volume has been in the past, one must also consider the possibility of calls in the future. As such, a decision on how to improve emergency response should include an analysis of the potential risks of a given region. The Commission on Fire (Department) Accreditation International (CFAI) is the body that governs the process and requirements for fire department professional credentialing and accreditation. The cornerstone of the accreditation process is the development of the department's Standard of Cover. This is an official statement of the response capability of the department. When completing a Standard of Cover, it is important the authority having jurisdiction create a metric that can simply and effectively communicate the risk assessment process.

The following is an example of a simplified approach to measuring risk. This model was used to perform a risk assessment of the City. Lt. Keith Geiger (Lieutenant Division of Green Fire Prevention Bureau) compiled a list of assessed businesses, some of which are home-based businesses, and assigned them an appropriate risk score based on the data in Figure 7. The data then was sent to Chrissy Lingenfelter (GIS Administrator) in the Planning Department for her to create heat maps. Ms. Lingenfelter added duplexes, triplexes, apartments, gas wells and storage tanks to the data set. The final data set for the following maps totaled 10,887 data points.

Fire Risks	**Medical Risks**
Low – Areas with a predominate risk of mobile property, outbuildings and uninhabitable buildings. **Moderate** – Areas with a predominate risk of single-use occupancy structures with fire flow requirements up to 3,000 GPM **High** – Areas with a predominate risk of multi-occupancy structures with fire flow requirements with fire flow above 3,000 GPM but less than 4,000 GPM and less than seven stories in height **Special** – High-rise, target hazards and/or specific building construction/use requiring additional resources or a needed fire flow of 4,000 GPM or greater	**Low** – Areas with a history of mostly Basic Life Support level incidents requiring basic first-aid skills. Areas of limited population engaged in high risk activities. **Moderate** – Areas with a history of Paramedic Level service incidents requiring the full scope and depth of the Emergency Medical System. Traditional neighborhoods and commercial and business districts. **High** – Areas with a history of multiple Paramedic Level incidents occurring concurrently, or single incidents with the need for multiple paramedic units. Large senior communities, complexes. Areas without good access to medical care **Special** – Disasters, mass casualty incidents
Rescue Risks	**Hazmat Risks**
Low – Areas with a history or potential for rescue situations requiring only the tools and knowledge set carried on first due apparatus. Examples include persons needing assistance up or down an elevation difference where simple solutions such as rope or ladder will complete the rescue. **Moderate** – areas with a history or potential of rescue situations the use of rescue tools typically carried on standard fire apparatus. Examples include traffic accidents with persons trapped, or persons immobilized and victims needing to be moved up or down an elevation. **High** – Areas with a history or potential of rescue calls requiring specialized apparatus, equipment, and training. Examples include technical rescues of persons trapped by equipment, buildings, or earth, which will require extended and complex rescue solutions **Special** – Disaster responses to earthquakes, floods, landslides, hurricanes, or tornados	**Low** – Areas with a history of storage/use of materials requiring only basic tools and minimal hazard material knowledge carried on first-due apparatus. This risk would include incidents related to chemicals used in home or small businesses. **Moderate** – Areas with a history of incidents or the storage/use of materials requiring specialized tools and knowledge to deal with hazardous materials, which are normally liquids or solids without acute hazards. This risk would include incidents related to chemicals used in light industry and larger amounts of hazardous materials in transport or storage. **High** – Areas with a history of incidents or the storage/use of acutely hazardous materials requiring encapsulation of the worker and multiple specialized teams with a level of decontamination, which is in itself potentially hazardous. **Special** – Weapons of Mass Destruction or terrorist acts.

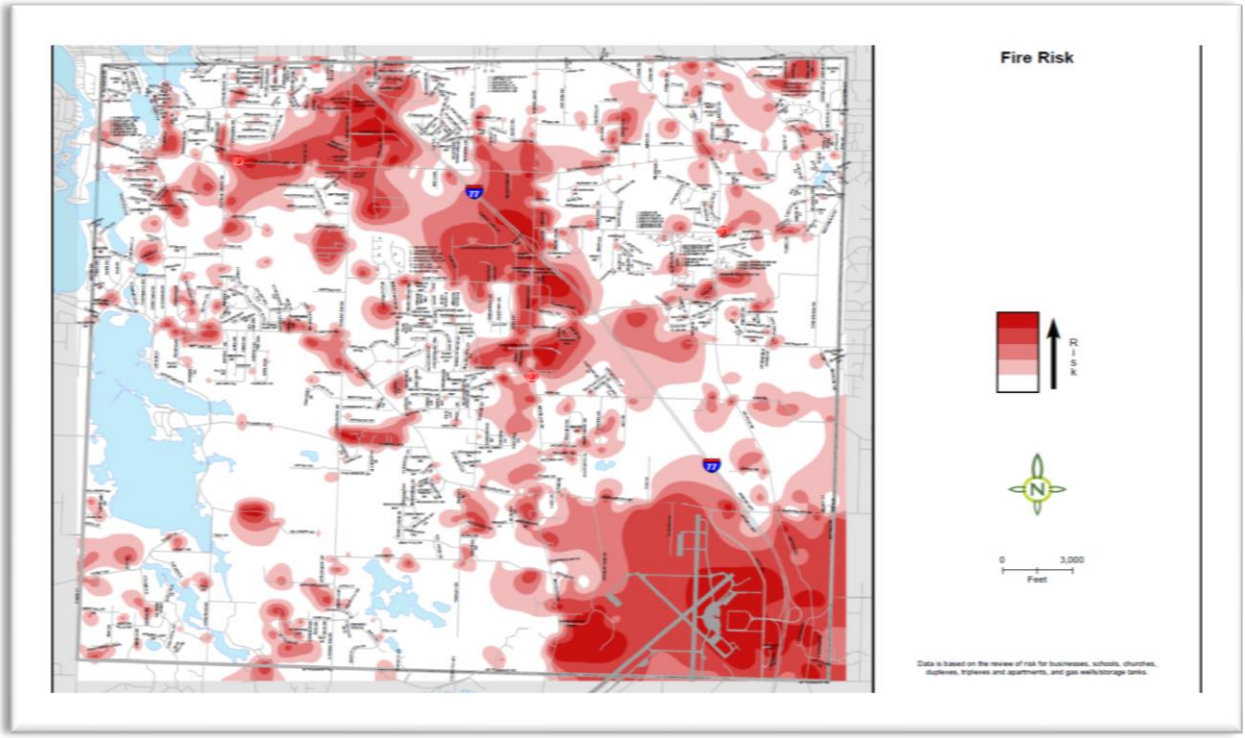
(Figure 7) (Standard of Cover 5th Edition pg. 42)

To understand the geographic distribution of these risks in the City of Green and develop a sense of the probability and possibility of an emergency response, these risks were geolocated on a map of the City. An individual map of each of the four areas of risk is included in the Map Supplemental for closer review.



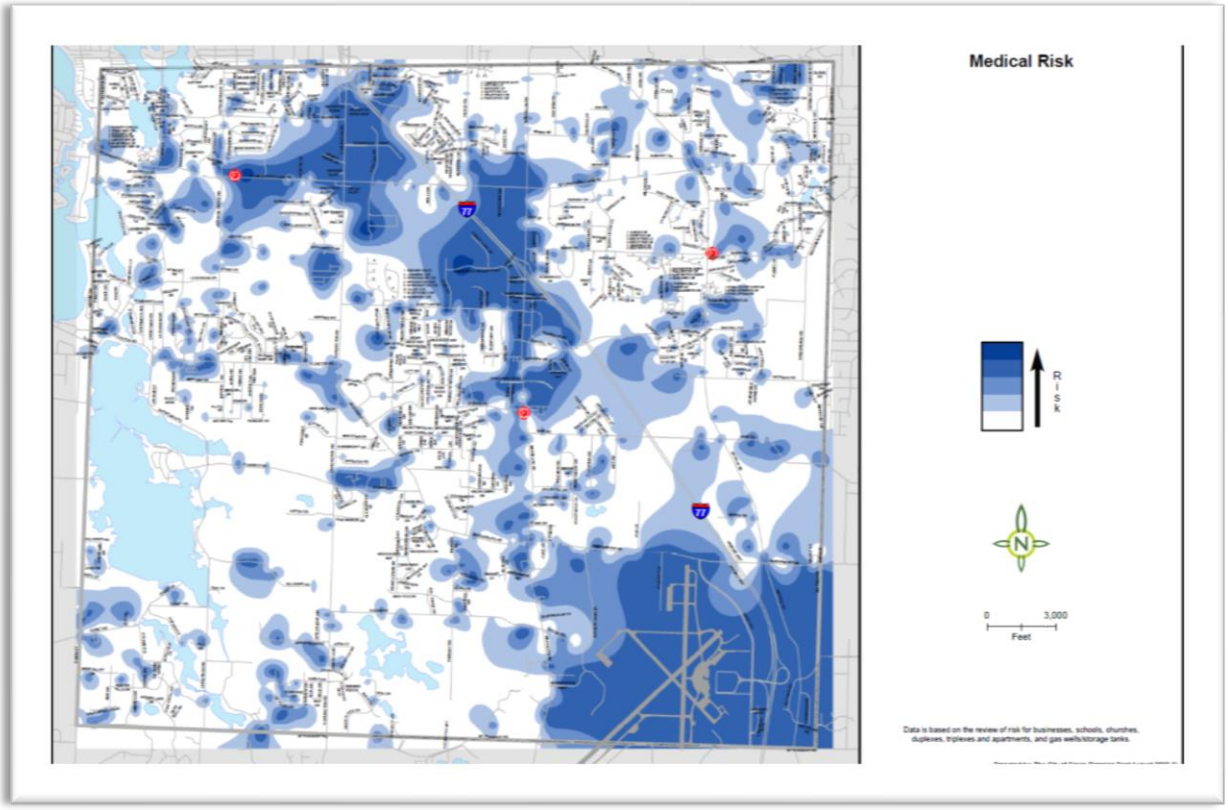
(Figure 8)

Figure 8 displays a cumulative risk heat map. Higher levels of risk are identified all throughout the City. The solution to improving the response to the Southwest region should account for maintaining or improving emergency outcomes for all. The selected strategy must be careful to not negatively impact other areas of the City. This map shows that while we have learned that historically, the demand of service has been more highly concentrated in the North, there is a more even distribution of risk throughout the City than expected.



(Figure 9)

Figure 9 displays a fire risk heat map. The distribution of higher fire risks in the Southwest speaks to the need to ensure that any effort to improve emergency response to the Southwest include the ability to rapidly respond to the risk of fire. The strategy of a limited response "EMS only" station was one of the potential strategies identified and considered in this report. The information displayed in the fire risk map, along with other factors (discussed throughout this report) all lead to the conclusion that an "EMS only" station would not effectively improve all emergency responses in the Southwest.



(Figure 10)

Figure 10 provides an EMS risk heat map. The map shows a more even distribution of higher than normal EMS risks throughout the southwest. There is a retreat facility, a campground, a group home for residents with disabilities, a trailer park and other higher risk EMS target hazards. These risks and the travel time from our current three station response model further supports the need to improve emergency response to the Southwest region.

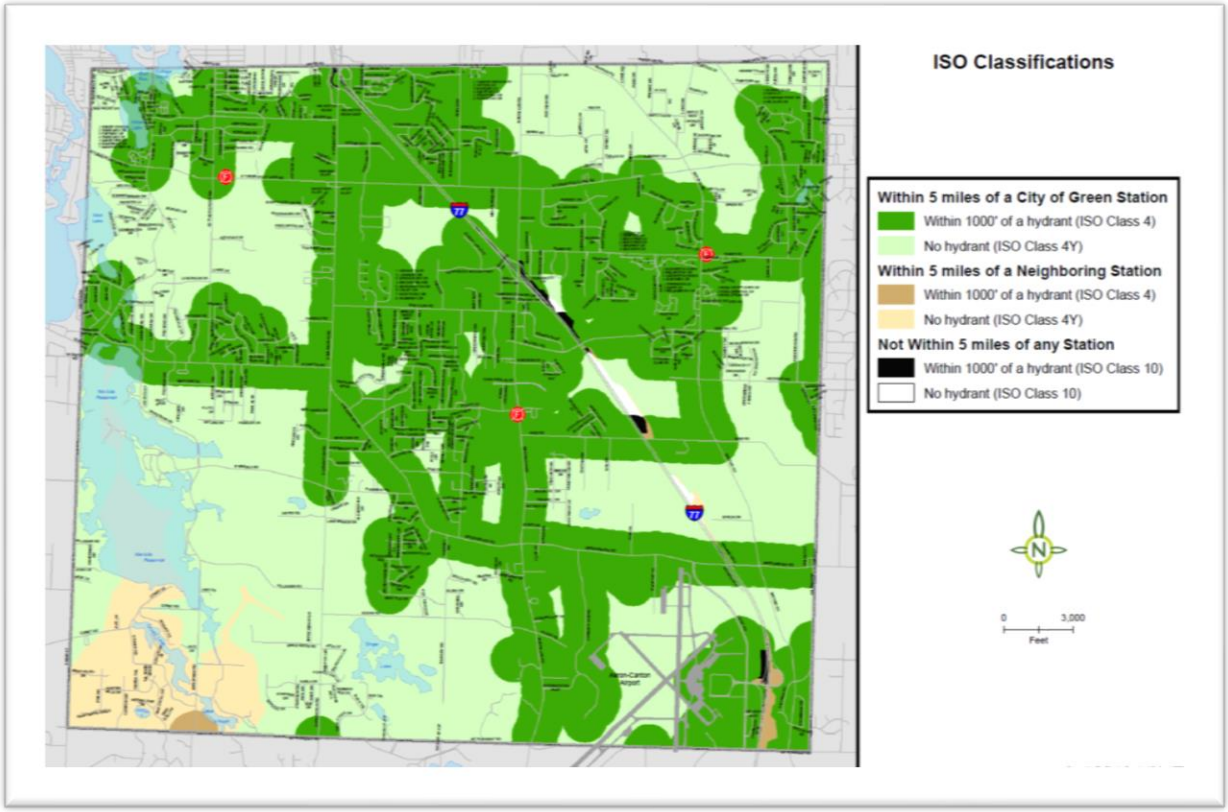
CRITICAL TASK ANALYSIS AND NECESSARY RESOURCES

There are three major components to emergency response: time, staffing and equipment. It is imperative that each of these components be understood to help determine the best solution to improve emergency response to the Southwest region of the City. Two industry standards that provide benchmark objectives for career fire departments to meet are NFPA 1710 *Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to Public Career Fire Departments (2020 edition)* and the Insurance Services Office's (ISO) Public Protection Classification system (PPC ^{tm}) . Both organizations are recognized as benchmark standards for the fire service industry. (NFPA, 2020) NFPA 1710 provides limited requirements for EMS related functions while ISO provides no EMS requirement standards.

NFPA 1710 is 39-page standard with the most recent version approved as an American National Standard on May 18, 2019. The purpose of NFPA 1710 is "to specify the minimum criteria addressing the effectiveness and efficiency of the career public fire suppression operations, emergency medical service, and special operations delivery in protecting the citizens of the jurisdiction and the occupational safety and health of fire department employees" (NFPA 1710, 2020).

ISO collects and evaluates information from communities in the United States on their structure fire suppression capabilities. The data is analyzed using their *Fire Suppression Rating Schedule (FSRS)* and then a Public Protection Classification (PPC ^{tm}) grade is assigned to the community. The PPC ^{tm} is numbered 1 through 10 with split classifications if needed. Class 1 represents an exemplary fire suppression program, and Class 10 indicates that the area's fire

suppression program does not meet ISO's minimum criteria. This score is used by some insurance companies when determining insurance costs for both residential and commercial occupancies.



(Figure 11)

Figure 11 shows the most recent ISO classification zones. The City was last evaluated in August 2016 and received a PPC ^{tm} of **04/4Y**. Having a split classification, the first number (04) applies to properties within five road miles of the responding fire station and 1,000 feet of a creditable water supply. The second number (4Y) applies to properties within five road miles of a fire station but more than 1,000 feet away from a creditable water supply. Class 4Y is a special classification that recognizes a superior level of fire protection in otherwise Class 9 areas. It is designed to represent a fire protection delivery system that is superior except for a lack of a water supply system capable of the minimum FSRS fire flow criteria of 250 gallons per minute (gpm) for 2 hours.

The following sections of this report will provide you a better understanding of each component of an emergency response (staffing, apparatus, and time) and their relevance to improving emergency response to the southwest region of the City.

STAFFING

Staffing is the foundation to an effective emergency response. NFPA 1710 requires fire company staffing "be based on minimum levels necessary for safe, effective, and efficient emergency operations" (NFPA 1710, 2020). It also requires firefighters be organized into companies, with appropriate apparatus and equipment assigned to each company (NFPA 1710, 2020). Each company is required to have a company officer (Lieutenant). As previously mentioned, the Fire Division's current minimum staffing level is twelve on duty fire/medics. Of these fire/medics a minimum of two are sworn officers, either Captain or Lieutenant. This staffing model is based on a three-station response model. With a minimum staffing level of twelve, we can staff three companies (engine/medic), one support company (ladder/rescue) and a shift commander.

ISO takes fire department staffing into consideration while calculating PPC ^{tm} (Credit for Company Personnel). This score is determined by "reviewing the average number of existing firefighters and company officers available to respond to reported first alarm structure fires in the city". The Fire Division received **3.47 points** out of a possible 15 points. This evaluation was completed when the Division's minimum staffing was nine. Though the increase in staffing to twelve with the construction of Station #3 will help, this still will not be enough to raise our score to 15.

NFPA 1710 requires engines and ladder companies to be staffed with a minimum of four (4) on duty firefighters (NFPA 1710, 2020) for low hazards. That number increases depending on

hazard level and geographical restrictions. This is not a reality for the City of Green. There are few municipalities that can meet this requirement of NFPA 1710. Most departments our size in our region staff their apparatus with three, one being a company level officer (Reference Supplemental Documents - Fire Department Comparison). Due to budgetary constraints our ladder/rescue company does not have a company officer currently. It is our hope to one day increase the staffing of this company and staff a company officer.

The issue of comparability is always difficult and usually subjective. Whenever discussions are held regarding the size, capability or cost of the Fire Division, the conversation invariably turns to comparisons with other departments. There is great value in such comparisons but there is also the possibility for misinterpretation. History has shown that for every department that is mentioned to support a lower cost or less staffing, another can be found that is higher cost and more heavily staffed. The key is that the Fire Division is a service provider, and the customers should dictate the level of risk they can tolerate and the level of service they are willing to support. With that framework for discussion, please consider the comparison statistics utilized throughout this report.

Career Firefighters per 1,000 People for all Career Departments
Work Week and Population Protected 2016-2018

Population Protected	40-45 Hour	46-51 Hour	52-60 Hour
1,000,000 or more	*	1.53	0.9
500,000 to 999,999	2.3	1.83	1.17
250,000 to 499,999	1.89	1.94	1.18
100,000 to 249,999	2.07	1.47	1.28
50,000 to 99,999	2.02	1.58	1.39
25,000 to 49,999	2.01	1.62	1.62

*Insufficient data.

The rates listed above are based on data reported to the NFPA and do not reflect recommended rates or some defined fire protection standard.

The rates of a particular size of community may vary widely because departments face great variation in their specific circumstances and policies, including structural conditions, type of service provided to the community, geographic dispersion of the community, and other factors

Career rates are shown only for communities over 25,000, where departments are comprised mostly of career firefighters.

Source: NFPA Fire Service Survey, 2016-2018

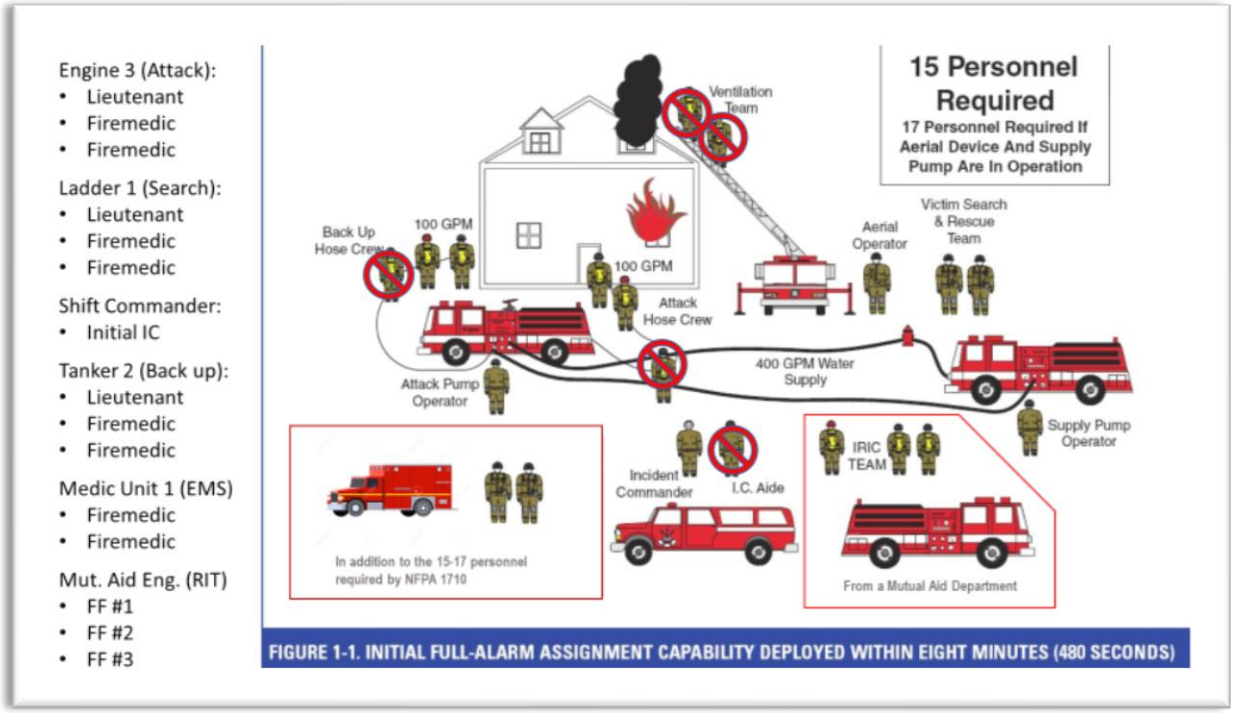
(Figure 12)

Figure 12 shows that for a community our size with our fire/medics' work week, the average is 1.62 firefighters per 1,000 population. With a population of just under 26,000 (according to the 2010 census) on average our department would be staffed with 42 firefighters. The City of Green Fire Division is currently staffed with 44 firefighters on response shift. To provide better service than average to our residents and businesses and to facilitate our above average training

and EMS service, the City of Green Fire Division has additional personnel on day shift to perform fire and life safety inspections, public education and public relations events, fire and EMS training and education, and community paramedicine.

When considering the number of firefighters necessary to mount an effective firefighting response, one must consider responding with enough to ensure the critical tasks can be accomplished simultaneously. Three fire fighters can respond to a residential structure fire and spray water, but they are not able to effectively perform more than one task. Other essential tasks such as rescuing a trapped occupant, keeping the fire from spreading to an adjacent structure, establishing a water supply, and limiting the damage and destruction to the unaffected property may not be able to be initially accomplished. A single crew of three must pick which one of these tactics to pursue and then sequentially move on to the next. This delay allows damage to continue and makes the next sequential task that much more difficult.

Figure 13, the following illustration, shows the current staffing of the City of Green Fire Division as depicted in the required NFPA 1710 fire response. The positions that are not able to be filled currently without receiving mutual aid are crossed out.



(Figure 13)

NFPA 1710 requires a minimum initial response of fifteen (15) firefighters to a low hazard incident, twenty-eight (28) to a medium hazard incident and forty-three (43) to a high hazard incident (NFPA 1710, 2020). Examples of medium hazard occupancies are things like apartments, offices, mercantile and industrial occupancies not normally requiring an extensive rescue or fire-fighting force. High hazard occupancy examples are things like schools, hospitals, nursing homes and other critical infrastructure that has large potential fire lose (NFPA 1710, 2020). These staffing standards call for a minimum initial response of 43 firefighters to the following example locations: Any of Green local schools, Pebble Creek or any of the extended care facilities / nursing homes, Kid's Country and all the day care centers, most of our churches, the Cleveland Clinic Akron General Wellness Center, the Summa free standing Emergency Room, the YMCA, the Airport and our larger business facilities like FedEx, Diebold, and the businesses in the foreign trade zone. A medium hazard response would be a fire response to Briarwood or any of our apartment

complexes, the Giuseppe's pizza plaza or any of our other strip plazas, Camp Y-Noah, Target, Lowes, or any one of our car dealerships would require 28 firefighters.

Considering just the Southwest region occupancies that would require a medium or high hazard response (28 or 43 firefighters within the first 8 minutes of travel time) would include the following:

- Loyola Retreat House,
- Hillwood Chapel
- Camp Y-Noah
- The Hartong Farm
- Numerous gas wells and pipelines

Many people discount these staffing requirements as unrealistic and created for the larger urban departments. They claim the NFPA standards are not actually required or enforceable in a department like the City of Green Fire Division. The standards are based on collective experience fighting fires. The location or size of the jurisdiction is irrelevant. The standards reflect what is necessary to most safely and effectively search for and remove victims and locate, confine and extinguish fire in any given occupancy.

While the standards are not law unless adopted into the Ohio Revised Code (ORC), they can be used to establish liability. Further, the Fire Division is responsible for enforcing the requirements of the Ohio Fire Code. The Ohio Fire Code is based on the NFPA standards. It is, therefore, imperative that the Fire Division continually strive to live up to the standards we enforce on others as they represent the safest, most effective, legally defensible and internally consistent thing to do.

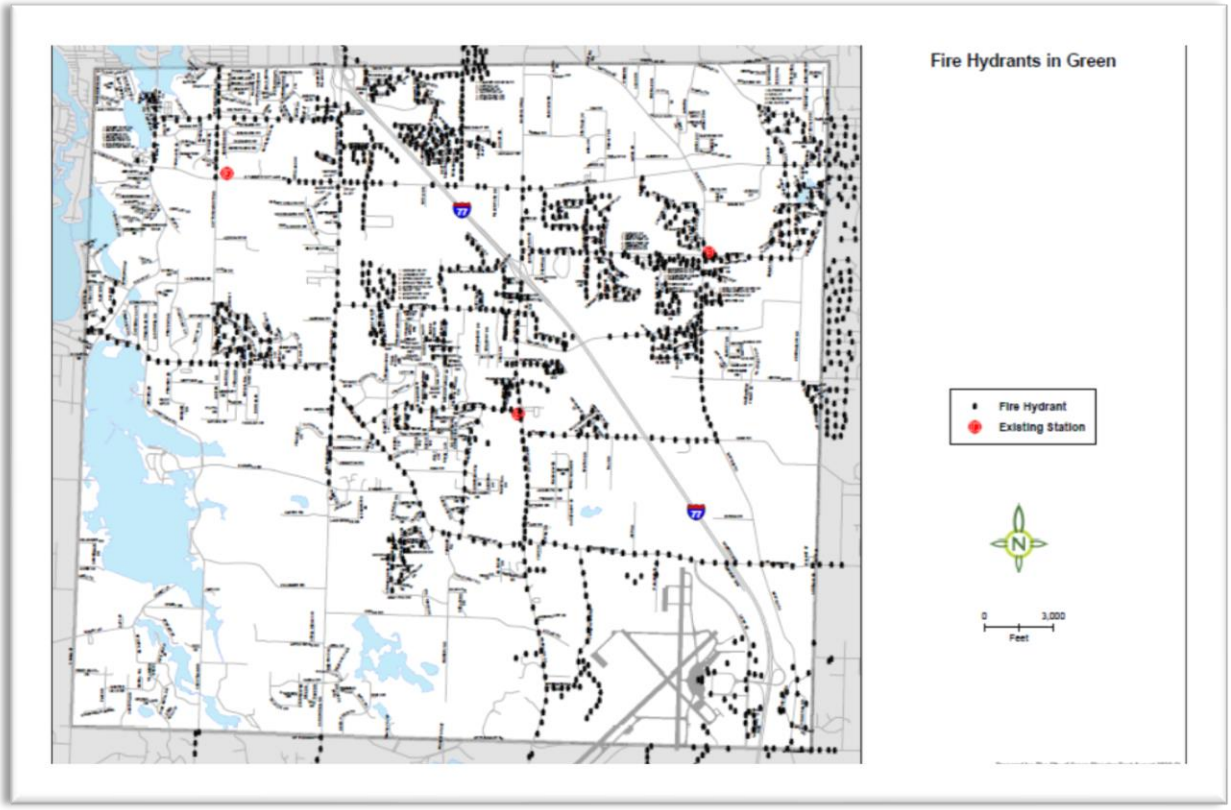
Another argument against staffing would be to utilize staffing from mutual aid departments. A department providing mutual aid generally sends one engine or tanker with a crew of 3 firefighters. With our current staffing we must call for mutual aid from ten neighboring departments to assemble 43 firefighters. In addition, consider the amount of call processing time involved when calling ten departments and consider the response time that will be involved in getting a response from that far away. Calling ten departments deep involves seeking a response from Hartville, Norton, Copley, Akron, Canton, or Doylestown depending on which end of the city the call is in. Beyond just these beginning numbers, it is important to realize these are the initial response requirements. Some incidents may require additional staffing above the initial response. Again, it is critical to assemble an effective firefighting force (the number of firefighters recommended by the NFPA) to have enough resources on hand to conduct simultaneous operations and have the greatest impact on outcomes.

In addition to responding the required fire suppression apparatus it is important to consider the need for EMS on fire incidents. With the mission of the Fire Division focused on saving lives, the decision has been made to dedicate personnel to responding the medic unit as part of the initial response to a potential structure fire to ensure we have the resources available on scene to care for any injured victims or responders. The Fire Division personnel are trained in both EMS and firefighting. The same on-shift personnel provide both EMS and fire responses in the City. This is also true of the surrounding communities that may assist us. The same staffing pool and resources that respond to the fires in southern Summit County must also be used to address EMS concerns.

What this means is that for every victim or injured fire fighter on scene, the Incident Commander must call another department to assist with mutual aid. This means either the ambulances are coming from farther away or the closer departments are bringing ambulances and

the fire engines are coming from farther away. In either case, longer travel time means more potential for the outcome to turn negative.

Water is another critical resource in fighting a fire. ISO takes water supply into consideration while calculating PPC ^{tm} (Water Supply). The Fire Division received **35.10 points** out of a possible 40 points. It is important to remember this evaluation was completed in August 2016. Any water lines or hydrants added after this would not be considered in this evaluation.



(Figure 14)

Figure 14 shows the distribution of fire hydrants in the City. The City of Green has many areas that do not have fire hydrants. This makes the ability to move water a critical component in achieving a positive outcome. Moving water in a rural area, like the Southwest region of the City of Green, requires tanker trucks to carry the water to the scene, off-load it for firefighting purposes, then drive to a water source to refill and loop back around. The general rule of thumb in the industry (although it is dependent on the quality of the tankers and the distance to the water source) is that an additional tanker is needed for every 100 gallons per minute (gpm) of water that is necessary to flow to extinguish the fire. NFPA 1710 requires tankers whose primary function is the transport of water be staffed with two firefighters (NFPA 1710, 2020). These tankers draw down resources of nearby departments, but, do not count towards the needed on-scene personnel. Therefore, requiring even more mutual aid departments to be dispatched.

Our current 1¾” attack line pulled by a company to fight a kitchen or bedroom fire flows 160 gpm. If the first arriving company arrives quickly enough, this first line will most likely be able to extinguish a one or two room (typical 10’ x 12’ rooms) fire (with a typical fuel load) with the water carried on the first in fire engine (1,000 gallons). The Occupational Safety and Health Administration (OSHA) requires firefighters not enter a burning structure, except for a rescue, until there are two firefighters standing by outside the hazardous atmosphere. This may impact how much of the residence becomes involved in fire while the initial arriving crew of three waits for additional firefighters to arrive. If the fire grows to the point of flashover (rapid-explosive fire growth) or if three to four rooms are on fire, the hose selected will be larger, a 2½” attack line, that flows 300 gpm. This line is heavier and less maneuverable requiring two companies, a total of six firefighters, to effectively deploy and maneuver. The higher gpm provided by the 2½” is needed to extinguish the higher number of BTUs being produced by the fire. The water supply demand needed for one 2½” requires at least three tankers to be a part of the total response force.

Once a fire grows to the point of involving an entire floor, multiple floors or the entire structure, the BTUs being produced can quickly outpace the ability of the fire department to suppress them with water. The large master streams flowing from the tip of a ladder truck or from the deck gun of a fire engine can flow 500 – 1,000 gpm or higher. Flowing 1,000 gpm requires ten mutual aid tankers in an area with no fire hydrants. This doesn’t take into consideration the use of multiple hose lines on that same scene, just the ladder in operation. Consider that in reference to the calculated fire flow chart for some of the City of Green occupancies in Figure 15, on the next page.

Fire Flow Calculation for Buildings in the City of Green

Structure	District	Floors	Length(ft)	Width(ft)		GPM @ 25% Involved	GPM @ 50% Involved	GPM @ 75% Involved	GPM @ 100% Involved
Super 8, Corporate Woods Pkwy	1	3	170	55	Single Floor Involvement	779	1558	2338	3117
Cambria, Thorn Dr	1	4	275	80		1833	3667	5500	7333
Hilton, Landmark Blvd	1	4	275	70		1604	3208	4813	6417
Residence Inn, Arlington Ridge	2	4	280	65		1517	3033	4550	6067
Holiday Inn, Arlington Ridge	2	3	265	75		1656	3313	4969	6625
Hampton Inn, Arlington Ridge	2	3	280	70		1633	3267	4900	6533
Fairfield Inn, Interstate Pkwy	2	3	255	70		1488	2975	4463	5950
WoodSpring, Fortuna	2	4	230	55		1054	2108	3163	4217
4200 Town Park	1	4	240	75		1500	3000	4500	6000
Greensburgh Manor, Burgess Dr	1	3	300	65		1625	3250	4875	6500
Boulevard at Green (Largest Complex), Burgess	1	3	265	70		1546	3092	4638	6183
4020 Brier Creek	2	3	480	80		3200	6400	9600	12800
Pioneer Physicians, Massillon	1	4	130	125		1354	2708	4063	5417
1559 Corporate Woods Pkwy	1	4	100	85		708	1417	2125	2833
FedEx, Boettler	1	3	535	145		6465	12929	19394	25858
Glen Eagles Apartments	3	3	730	70		4258	8517	12775	17033
1622 E. Turkeyfoot Lake	3	3	150	75		938	1875	2813	3750
Hartong Farm, Killinger	4	2	145	90		1088	2175	3263	4350
Hillwood Chapel, S. Arlington	4	2	200	65		1083	2167	3250	4333
Camp Y Noah (Equestrian), Christman	4	1	200	75		1250	2500	3750	5000
Camp Y Noah(Mess Hall), Mount Pleasant	4	1	115	65		623	1246	1869	2492
Loyola Retreat, Killinger	4	1	450	40		1500	3000	4500	6000

Structure		GPM @ 25% Involved	GPM @ 50% Involved	GPM @ 75% Involved	GPM @ 100% Involved		GPM @ 25% Involved	GPM @ 50% Involved	GPM @ 75% Involved	GPM @ 100% Involved
Super 8, Corporate Woods Pkwy	1st 100% Second Floor Involvement	3896	4675	5454	6233	1st & 2nd 100% Third Floor Involvement	7013	7792	8571	9350
Cambria, Thorn Dr		9167	11000	12833	14667		16500	18333	20167	22000
Hilton, Landmark Blvd		8021	9625	11229	12833		14438	16042	17646	19250
Residence Inn, Arlington Ridge		7583	9100	10617	12133		13650	15167	16683	18200
Holiday Inn, Arlington Ridge		8281	9938	11594	13250		14906	16563	18219	19875
Hampton Inn, Arlington Ridge		8167	9800	11433	13067		14700	16333	17967	19600
Fairfield Inn, Interstate Pkwy		7438	8925	10413	11900		13388	14875	16363	17850
WoodSpring, Fortuna		5271	6325	7379	8433		9488	10542	11596	12650
4200 Town Park		7500	9000	10500	12000		13500	15000	16500	18000
Greensburgh Manor, Burgess Dr		8125	9750	11375	13000		14625	16250	17875	19500
Boulevard at Green (Largest Complex), Burgess		7729	9275	10821	12367		13913	15458	17004	18550
4020 Brier Creek		16000	19200	22400	25600		28800	32000	35200	38400
Pioneer Physicians, Massillon		6771	8125	9479	10833		12188	13542	14896	16250
1559 Corporate Woods Pkwy		3542	4250	4958	5667		6375	7083	7792	8500
FedEx, Boettler		32323	38788	45252	51717		58181	64646	71110	77575
Glen Eagles Apartments		21292	25550	29808	34067		38325	42583	46842	51100
1622 E. Turkeyfoot Lake		4688	5625	6563	7500		8438	9375	10313	11250
Hartong Farm, Killinger		5438	6525	7613	8700					
Hillwood Chapel, S. Arlington		5417	6500	7583	8667					
Camp Y Noah (Equestrian), Christman										
Camp Y Noah(Mess Hall), Mount Pleasant										
Loyola Retreat, Killinger										

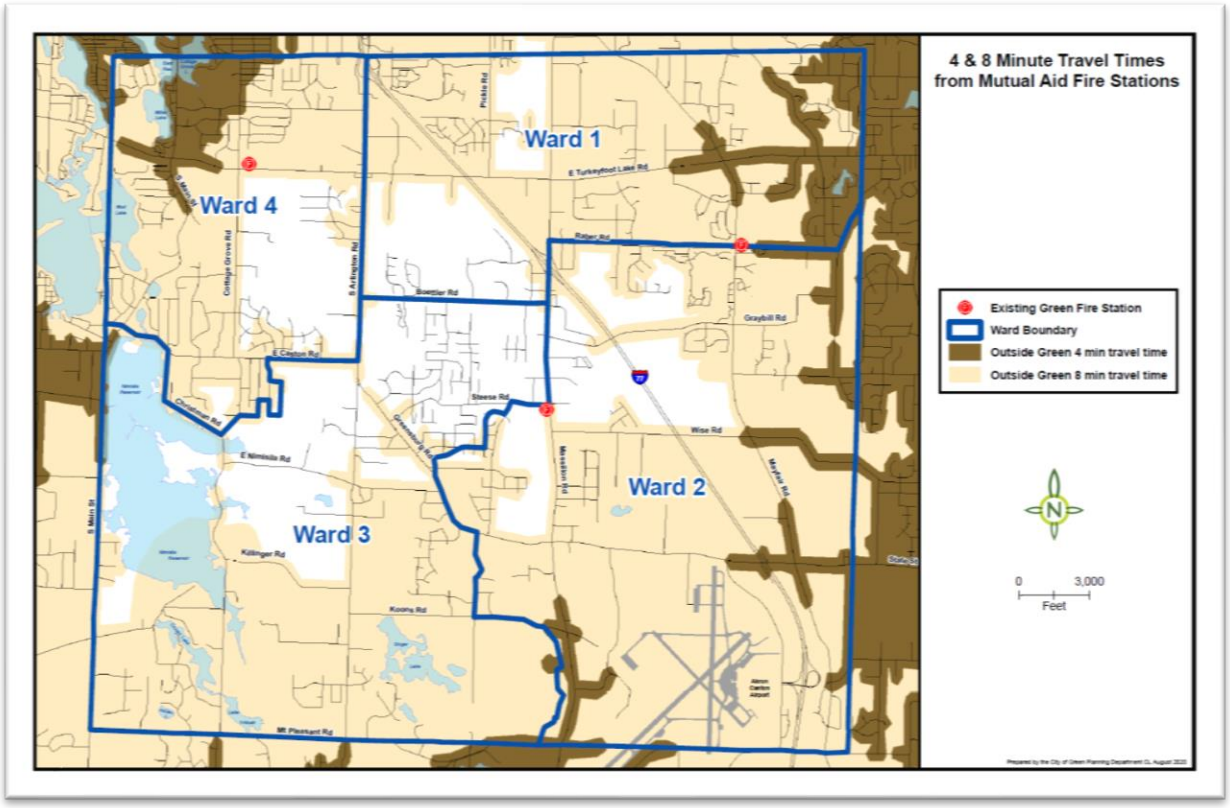
(Figure 15)

The data used for Figure 15 was calculated using the National Fire Academy (NFA) formula [(Length x Width) / 3]. In the 1980s, NFA developed a simple method of calculating fire flow at the scene of a fire. This method was intended to be used by fire fighters at an incident as a tool to aid in determining the amount of water necessary to fight the fire, the apparatus used to deliver the water, and the number of companies required for the incident. This formula was developed by the NFA through a study of many working fires and a survey of fire officers throughout the country.

The fire flow formula is given as: Fire Flow = $(L*W)$ /3 (gpm) where L is the length of the involved floor in feet and W is the width of the involved floor in feet. This formula can be expanded to include multiple floors by adding the fire flows for each floor. The NFA suggests that the formula is only reliable if four or fewer floors are involved. This formula can also account for a partially involved floor by multiplying by the percentage involvement of that floor.

This information on hydrants and fire flows is included in the discussion to develop the full picture of fighting fires in an area of the city with no water supply source and the total staffing required to sustain an effective and efficient fire attack. All three components of emergency response (staffing, apparatus, and time) dictate the logistics and operation of water movement and tactics of an effective and efficient fire attack. The odds of a successful outcome are greatly enhanced as the time to establish a fire attack is decreased (water on the fire) and as the time it takes to assemble the resources necessary to sustain an initial attack (response from our other stations and our mutual aid departments) is decreased.

To achieve the recommended total minimum staffing for a standard residential house fire (low hazard) the City of Green at a minimum (provided there are no concurrent alarms underway) must request a mutual aid engine to respond to serve as the rapid intervention team (depicted as the IRIC – initial rapid intervention crew in Figure 13). This is the team of firefighters who remain outside the hazardous atmosphere and are immediately able to initiate a rescue effort should any of the firefighters in the hazardous atmosphere have an emergency. Examples would be a trapped, lost, or missing firefighter(s). The rapid intervention team is necessary for the health and safety of the firefighters and to meet the requirements of the Occupational Safety and Health Administration's (OSHA), Code of Federal Regulations, the Ohio Administrative Code 4123:1-21-07 *Fire Department Occupational Safety and Health* and City of Green Fire Policy 303 *Rapid Intervention Two-In Two-Out*. This rule requires that at minimum, a crew of two fire fighters are outside the hazardous atmosphere, immediately able to respond to an emergency.



(Figure 16)

Figure 16 shows the capability of mutual aid to respond to the City within the NFPA required time. The areas shaded in white are not reachable by a mutual aid department within the standard travel time of eight minutes even with a simultaneous notification. The City of Green is unique in our total square mileage compared to some of the other municipalities in our region. This presents a problem with relying on mutual aid to supplement staffing. Using mutual aid companies to respond is not ideal because of the delay in the mutual aid company's arrival. Recall NFPA 1710 calls for the initial company to arrive on scene within four-minutes of travel time and the full complement of first alarm resources to arrive on scene within eight-minutes of travel time. Many areas in the City cannot be reached by a mutual aid response within an eight-minute travel time. In addition, requesting mutual aid for the number of alarms we have in this region would jeopardize our relationships with our neighboring departments. We would not be able to provide the same

level of mutual aid that we would be requesting. This becomes supplemental aid and not mutual aid.

This staffing need must be considered not only for fire, but all services provided by the Fire Division. In addition to fire suppression, the Fire Division provides emergency response in the following areas: emergency medical services (EMS), technical rescue, hazardous material and weapons of mass destruction, surface water rescue, dive rescue and tactical EMS for the Summit County Sheriff's SWAT Team. These areas account for the majority of what the Division responds to. With the increase in services comes the increase in demand. Therefore, adequate staffing is essential to providing an effective emergency response.

These numbers are shared to illustrate that the solution is not as simple as just shifting fire/medics we already have. It is imperative we retain our ladder/rescue support company at Station #1. The increasing simultaneous demand for service requires a support unit be centrally located to provide effective assistance when needed. Spreading out the fire/medics we already have to a different station would have a negative impact on the other areas of Green, as those emergency response resources would be further from the areas where they would be called upon more often. This strategy would improve the emergency response for a few at the expense of many. The strategies involving spreading out our current staff to cover an additional station and relying on mutual aid to cover our jurisdiction were rejected as strategies to improve emergency response to the Southwest as they violate the core principle of improving outcomes while reducing response times.

APPARATUS

It is essential to respond the appropriate piece of apparatus with adequate staffing in a time efficient manner to have a positive outcome to the emergency. Having a medic unit arrive alone

on the scene of a fire, in a geographically restricted area, though this may happen on occasion, should not be the norm. The same could be said of an engine arriving on scene of a cardiac event when time is of the essence and there is a delay in waiting for a medic unit capable of transporting them to the definitive care (hospital).

As previously mentioned, NFPA 1710 requires firefighters be equipped with appropriate apparatus and equipment necessary for safe, effective, and efficient emergency operations. If we were to change our response model, additional apparatus would be needed to not negatively impact our response capabilities at our other fire stations. Our current response model dictates all the stations require the capability to initiate a rescue of a victim that may be trapped in a hazardous atmosphere and provide emergency medical care and transport of a sick or injured patient. This means each station requires a suppression apparatus (fire engine) and a medic unit. In addition, Stations #1 and #2 need the capability to respond to emergencies on Nimisila Reservoir. Station #1 and #2 both have a boat in addition to the engine and medic unit. This model allows all the additional specialty apparatus (ladder, tanker and rescue) to be housed at Station #1. ISO takes engine companies into consideration while calculating PPC ^{tm} (Item 513 - Credit for Engine Companies). “This item reviews the number of engine companies, their pump capacity, hose testing, pump testing and equipment carried on in service pumpers”. The Fire Division received **3.93 points** out of a possible 6 points.

At the time of this report the Division is in the process of purchasing a new ladder/aerial apparatus. This apparatus provides not only the ability to flow water from an elevated waterway it also provides access to buildings to perform rescue of trapped occupants, and/or ventilation of super-heated gases from the structure. This apparatus is essential on commercial structures and multifamily dwellings. In addition, it provides a compliment of ground ladders that are used on

single family residential occupancies. It is important to understand the need for this versatile piece of apparatus to be on the scene of a fire. In our current response model, this apparatus is housed at Station #1 because of its ability to respond to a large portion of the City in an eight-minute travel time. ISO takes ladder companies into consideration while calculating PPC ^{tm} (Item 549 – Credit for Ladder Service). The Division received **3.04 points** out of a possible 4 points.

It is important that the Division be cost efficient when determining the number of apparatus needed for a given response model. Currently we do not have a reserve suppression apparatus. We have been able to shift our staffing around when a piece of apparatus is out of service and still meet our emergency response needs of having the capability to initiate a rescue of a victim that may be trapped in a hazardous atmosphere and provide emergency medical care and transport of a sick or injured patient. ISO takes reserve apparatus into consideration while calculating the PPC ^{tm} (Item 523 – Credit for Reserve Pumpers). The Division received **0.07 points** out of a possible 0.50 points. One main reason we have not been able to maintain a reserve apparatus is because we attempt to make every effort to keep an apparatus in a primary response role for as long as possible. This can be seen by the age of our primary rescue apparatus that is 27 years old. This leaves very little, if any service life left in these larger vehicles when they are replaced. Many departments replace the larger fire apparatus at 20 years of service and then maintain the apparatus for another 5-10 years in a reserve status.

There is another reason we have not been able to maintain a reserve apparatus and that is space. As previously stated, current Station #1 was constructed in 1977 and the apparatus bays have not been added on to since its construction. With the growth of the department's capabilities and the growth in the size of the apparatus this leaves us no room to store a spare piece of suppression apparatus indoors. Until the construction of Station #3 we had to store our spare medic

unit outside in the elements along with our trench rescue trailer. We still store all our prevention and day staff vehicles outside.

There is a delicate balance when determining the appropriate amount of apparatus. With our three-station current response model we can adequately provide the needed number of apparatus to meet the capability of initiating a rescue of a victim that may be trapped in a hazardous atmosphere and providing emergency medical care and transport of a sick or injured patient. If we were to change our response model, we would have to invest in additional apparatus and consider space for a reserve suppression apparatus.

TIME

Time is critical to this study. Multiple residents of the Southwest region of the City have voiced concerns on extended response times from the fire department to emergency incidents in their region. It is this concern that lead Green City Council to order this study in March of 2019. The faster the Fire Division can arrive on scene, the faster we are able accomplish our mission of saving lives and protecting property.

Green Fire Policy 306:
Response Time Standards

Dispatch Processing Time
1 Minute or less (90%)

Turnout Time
1 Minute or less (90%)

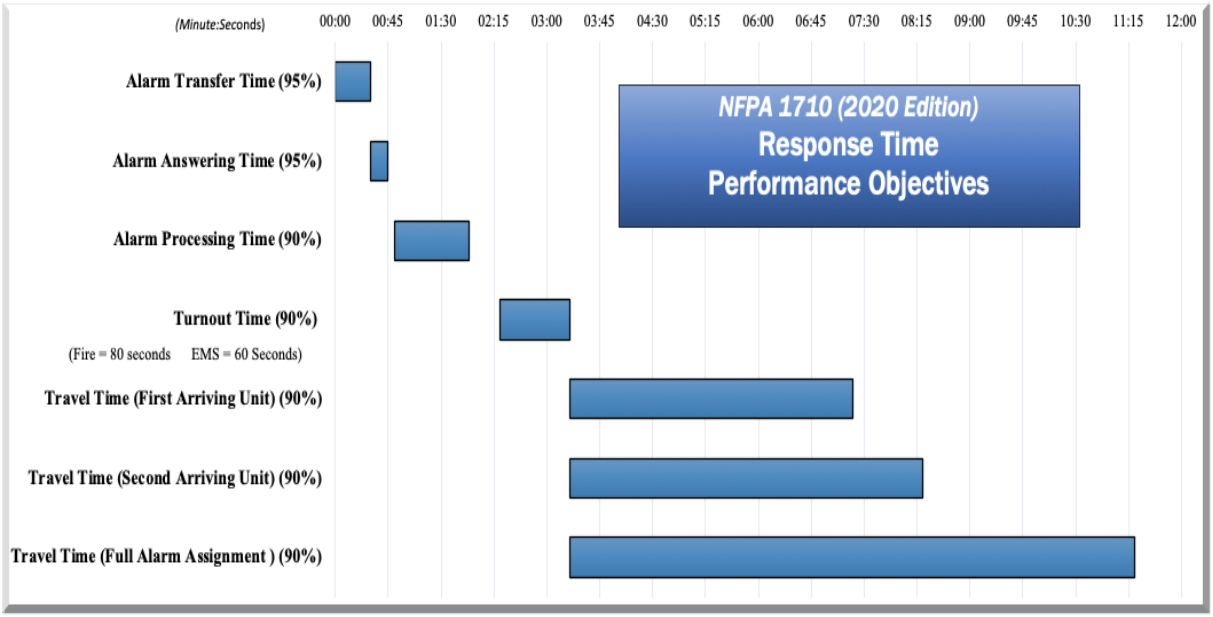
Travel Time (Initial Engine Company)
4 Minutes or less (90%)

Travel Time (Full Response)
8 Minutes or less (90%)

Travel Time (First Responder)
4 minutes or less (90%)

Travel Time (Advanced Life Support)
8 Minutes or less (90%)

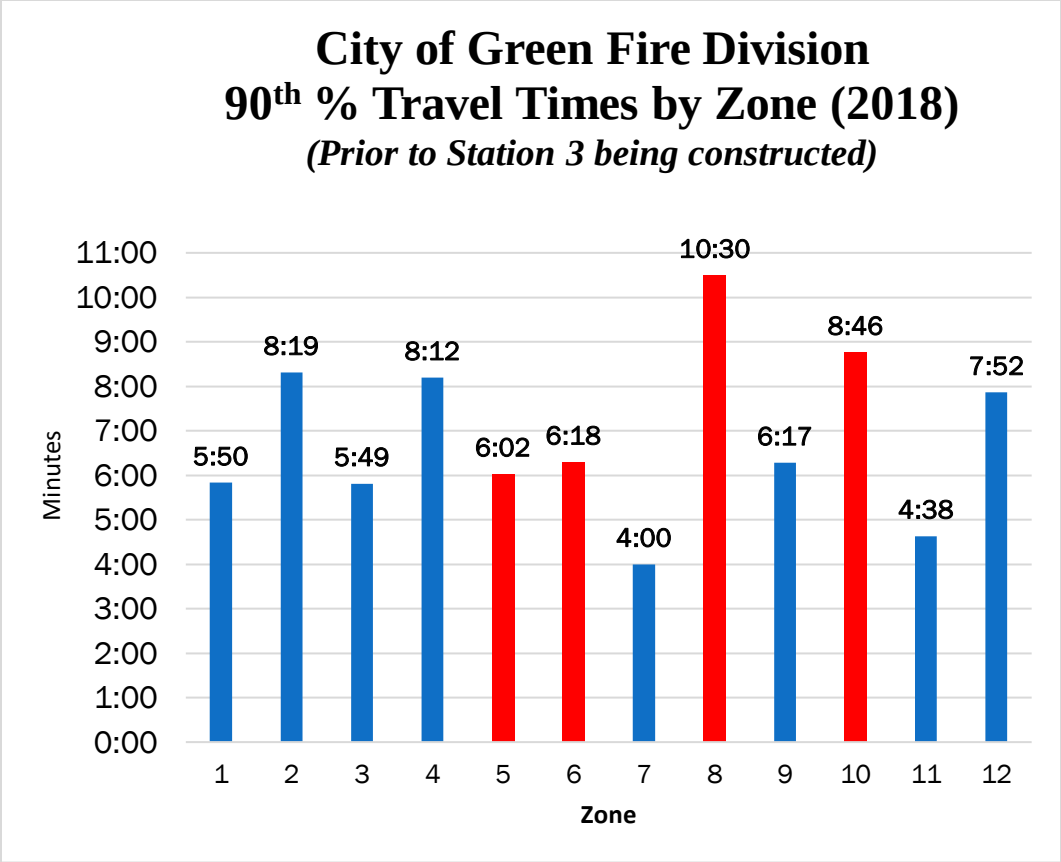
The Division's current response time standards are framed around NFPA 1710. NFPA 1710 defines total response time as "The time interval from the receipt of the alarm at the primary public safety answering point (PSAP) to when the first emergency response unit is initiating action or intervening to control the incident" (NFPA 1710, 2020).



(Figure 17)

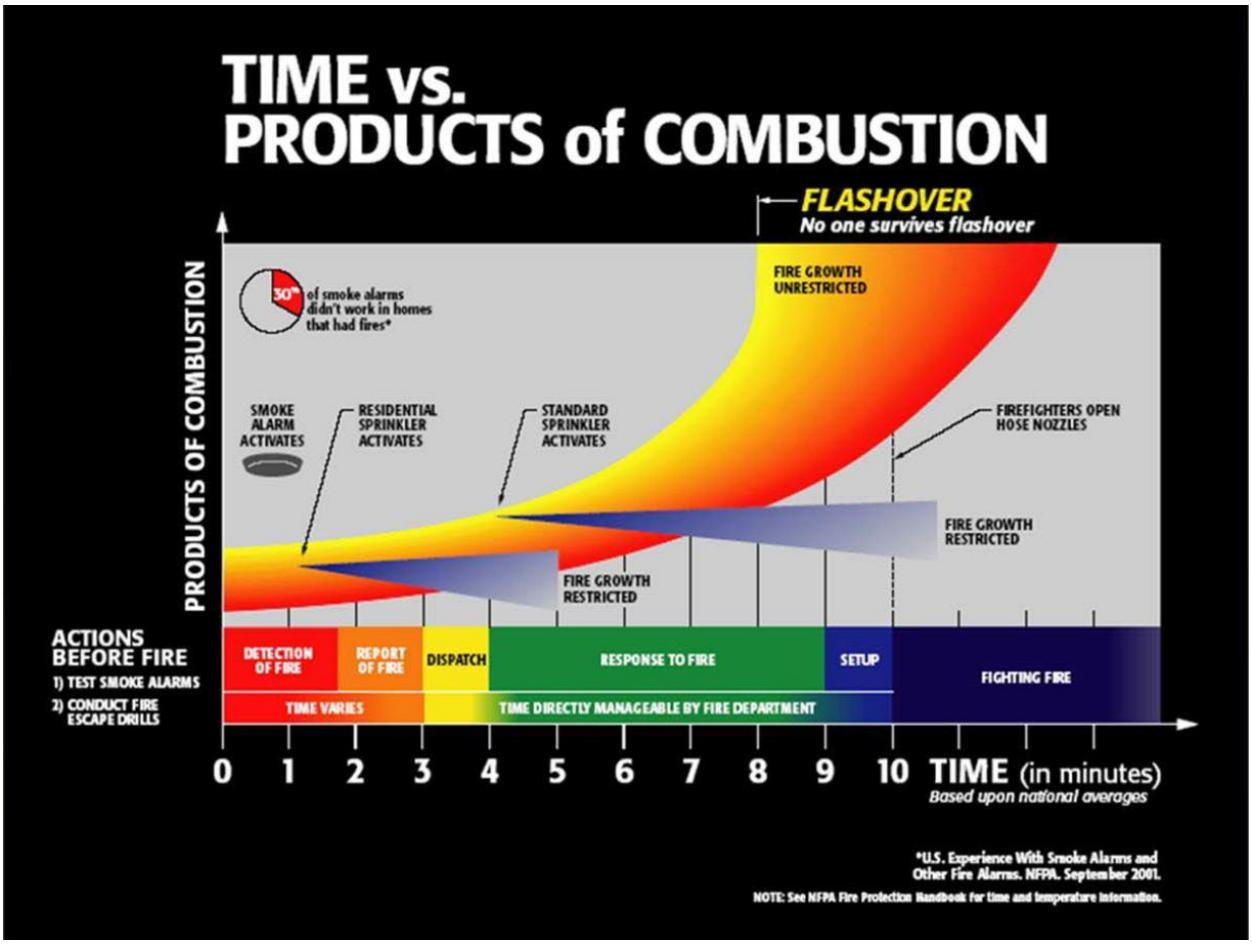
Figure 17 shows NFPA 1710's response time performance standards that fire departments are required to meet. NFPA does not provide a standard objective time for a total response time. Instead it provides standard objectives for each component of the total response time, excluding the initiating action/intervention time. This time is dependent on too many variables, but NFPA 1710 does require departments track this time.

The total response time is broken into three different phases. Phase one is comprised of alarm handling, which includes alarm transfer time, alarm answering time and alarm processing time (NFPA 1710, 2020). Phase two is comprised of the turnout time and travel time (NFPA 1710, 2020). Phase three is comprised of the initiating action/intervention time (NFPA 1710, 2020). ISO takes alarm processing into consideration while calculating PPC ^{tm} (Item 42 Telecommunicators (CTC)). The Division received **20 points** out of a possible 20 points. Travel time accounts for the majority of phase two and makes up most of the total response time.



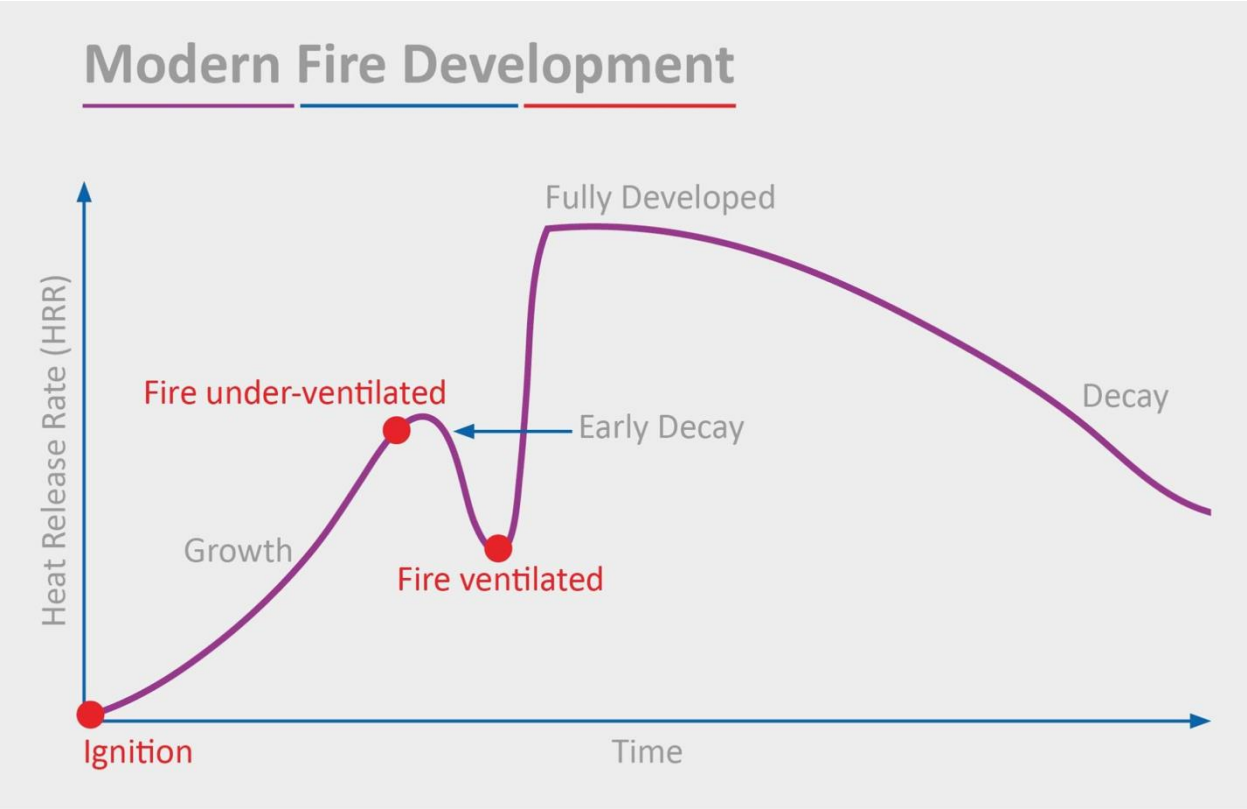
(Figure 18)

Figure 18 indicates the typical travel times of the City, highlighted in red are the zones that make up the Southwest region of the City. These times are taken from 2018. (Reference Supplemental Documents – MABAS Zone Map 2013 Edition). This time frame was used due to the Division's reporting software updating and not being able to accurately track this data any longer. This map shows the zones the Fire Division has divided the city into for the purposes of calling the next closest most appropriate mutual aid resource that can reach that area of the City in the shortest amount of time. The red border line running roughly north to south through the map indicates the division between the area of the City that Station 1 responds to versus the Station 2 response area. This graph does not take Station 3 into consideration, as it did not exist in 2018. For a point of reference, Station #3 response Zones are Zones 3, 4, 9 and part of 12.



(Figure 19)

Figure 19 presents another way to show the importance of time. The growth of a fire follows a predictable curve over time. The British thermal units (BTUs) produced will grow along a time / temperature curve. The best fire department in the world will only be able to effectively apply a certain amount of water. If the fire is producing more BTUs than the water the department is applying can absorb, the fire will continue to grow. Therefore, any steps that can be taken to decrease the time necessary to effectively apply water will increase the chances of stopping the growth of the fire before it's BTUs outpace the firefighting gallons per minute (GPMs). These steps could include more fire fighters, more apparatus delivering more water and faster response times.



(Figure 20)

Figure 20 shows a modern fire development growth chart. Consider that the fire department could assemble an effective firefighter response force with the appropriate apparatus and apply a given amount of water in a time efficient manner the fire will be extinguished. If those given amounts fall below the heat release rate of the fire, the fire will continue to grow and the fire department will not be able to extinguish the fire until the heat release rate drops as the fire runs out of fuel in the decay phase. This shows how critical it is to assemble enough fire fighters to effectively apply water in the quickest amount of time possible, to catch the heat release rate before it outproduces the firefighters' ability to stop it.

Percentage of US Fire Departments With:

Population Protected	No Stations	1 Station	2 Stations	3-4 Stations	5 or More Stations	Total
50,000 to 99,999	0	3	4	15	78	100
25,000 to 49,999	0	14	25	28	34	100
10,000 to 24,999	0	45	30	14	11	100
5,000 to 9,999	0	69	21	6	4	100
2,500 to 4,999	0	77	17	4	2	100
Under 2,500	0	86	11	2	1	100

Sums may not equal totals due to rounding errors.

Source: NFPA Fire Service Survey, 2016-2018.

(Figure 21)

Figure 21 shows that the across the nation, for jurisdictions in our same population range 28% also have three (3) or four (4) fire stations. While 39% have fewer stations and 34% have more. This again speaks to the difficulty in applying national statistics to our local situation. For each category of decision, number of fire fighters, number of stations, length of response time, cost per alarm, etc., statistics can show departments that do better and departments that do worse. The key will be to match the cost and level of resources required to provide the level of service that meets or exceeds the expectations and demands of the customers.

One must also consider the advancements in EMS and emergency medicine when discussing the components of emergency response. The fire division can now administer lifesaving medications like Epinephrine in allergic reactions, Narcan in overdoses, Dextrose in diabetic

emergencies along with a vast array of other medications. In addition to directly treating the patients the Division is now able to assess patients for signs of heart attack, stroke and trauma with advanced training and equipment. If it is determined the patient meets a certain criteria EMS can activate advanced teams of highly trained nurses and physicians to meet and be prepared to treat the patient when they arrive at the emergency room. Definitive care (hospital/surgery) is the end goal for many patient's EMS encounters. The sooner EMS can arrive on scene to administer a lifesaving medication or assess the patient for life threating conditions, the sooner the hospital can be notified and the better the outcome is for the patient. We can't reduce the time from the patient's residence to the hospital, but we can reduce the time it takes us to get to the patient. The sooner we get to the patient, the sooner we can get them to definitive care.

The best way to directly impact travel time is the location and number of fire stations throughout the municipality. Many municipalities our size, even some smaller, have a four or five station response model (Reference Supplemental Documents Fire Department Comparison). Take Jackson Township for example. They are 36.5 square miles and have five fire stations throughout the township. One could reasonably expect if the Division were to transition to a four-station response model we would be able to improve not only emergency response to the southwest but to the entire City.

GIS STUDY

PROCEDURE

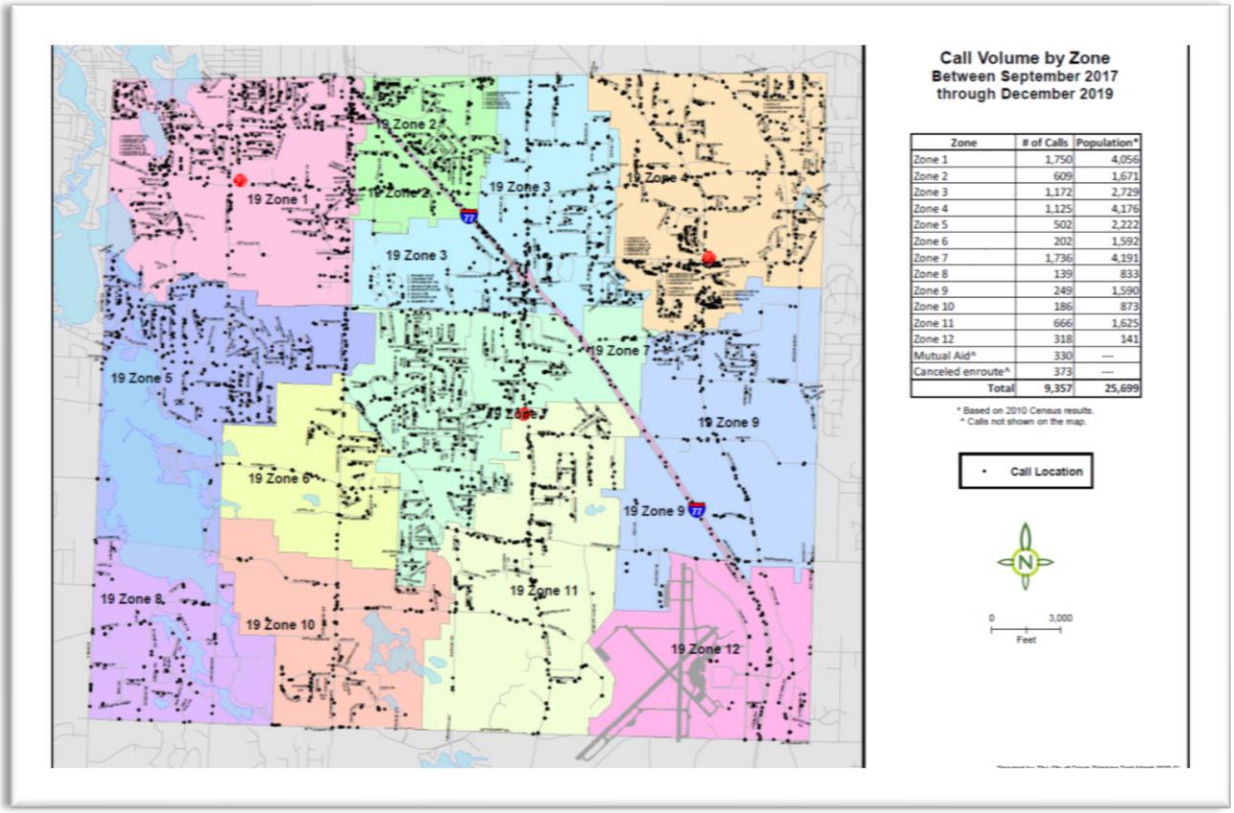
A geographic information system (GIS) study was performed to determine if a different three station model or four station model would best improve emergency response to the Southwest region of the City without negatively impacting other regions of the City. GIS is the technology used to analyze geographic data to look for patterns. GIS data and analysis can help decision makers make informed decisions. To make statistical comparisons, a point on the map had to be selected and referenced for station locations. This is not to imply that the City owns land or intends to acquire land. It is simply a reasonable general area and the actual location could be further away and will be determined in the future based on several factors including what land is available at the time.

Data was extracted from ESO, the mobile reporting software the Fire Division currently uses, from September 1, 2017 to December 31, 2019. This timeframe was used due to the division switching reporting software from Firehouse to ESO in September of 2017. Data prior to September 2017 is held in a different format and database. A total of 8,654 data points was used in this study. The data points that were coded as mutual aid or cancelled enroute were not factored into the GIS study. 373 data points were coded as canceled enroute and a total of 330 data points were coded as mutual aid. The data was sent to **Chrissy Lingenfelter (GIS Administrator)** in the Planning Department for her to create four- minute travel time maps based on NFPA 1710.

Ms. Lingenfelter added the 2010 Census data along with the commercial and residential address data. According to the 2010 Census the population for the City of Green was 25,699. To obtain the population counts used throughout, the census blocks were selected for the count if the centroid of the block overlapped the location area. This method provides population estimates but not exact counts. At the time this study was completed the City has a total of 13,483 commercial

and residential addresses. Counts shown on the maps created reflect both commercial and residential addresses. The travel time analysis does not take into consideration emergency lights and siren response or traffic light preemption (this allows emergency vehicles to "capture" the traffic light changing it to green in the direction of travel they are traveling and red to all other traffic patterns). The following analysis assumes a travel speed of the posted speed limit. No other restrictions or factors were used. The data and maps were then compared to the current response model to determine which would best improve emergency response to the Southwest region of the City without negatively impacting other regions of the City

RESULTS



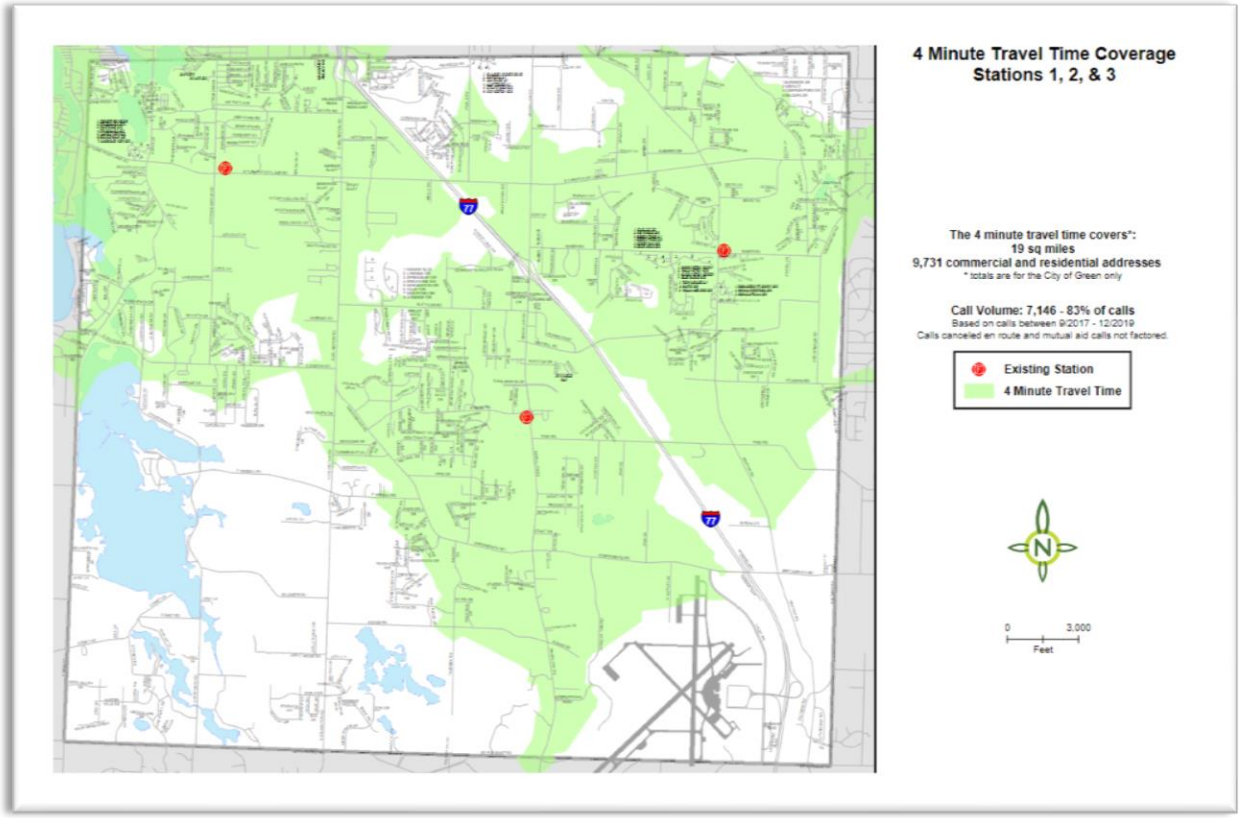
Zone	# of Calls	Population*
Zone 1	1,750	4,056
Zone 2	609	1,671
Zone 3	1,172	2,729
Zone 4	1,125	4,176
Zone 5	502	2,222
Zone 6	202	1,592
Zone 7	1,736	4,191
Zone 8	139	833
Zone 9	249	1,590
Zone 10	186	873
Zone 11	666	1,625
Zone 12	318	141
Mutual Aid^	330	---
Canceled enroute^	373	---
Total	9,357	25,699

* Based on 2010 Census results.
^ Calls not shown on the map.

(Figure 22)

Figure 22 shows the data points plotted on the map. Each of these points represent the address of an emergency alarm that was responded to from September 2017 to December 2019. Some points may represent multiple alarms at the same address location. The table in the legend of the map indicates the total call volume and population in each zone for the time period studied.

THREE STATION MODEL – *CURRENT RESPONSE MODEL*



(Figure 23)

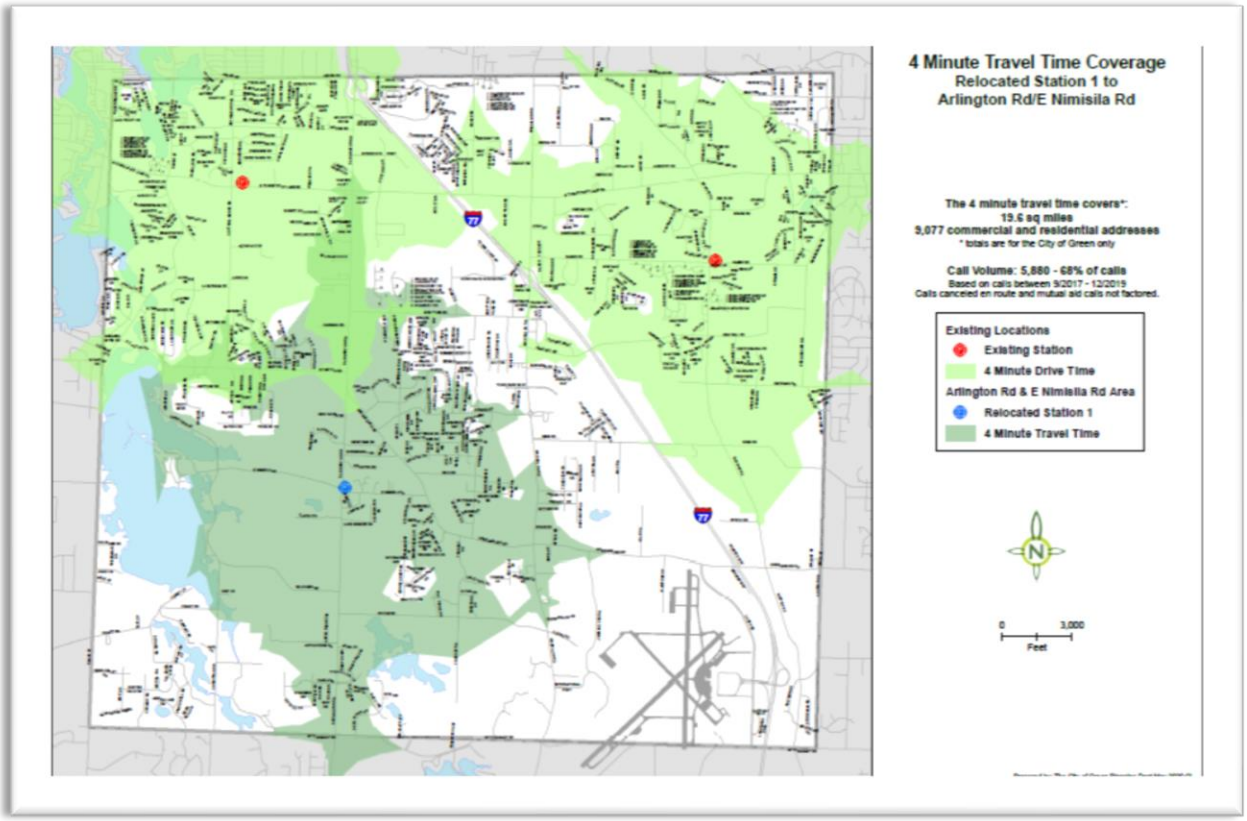
Inside 4 – Minute Travel Time Results *Previous Two Station Model Compared to Current Three Station Model*				
Location	Square Miles	Number of Addresses	Population (2010 Census)	Call Volume
Previous Two Station Model	13.9 (41%)	7,075 (52%)	12,025 (48%)	5,863 (63%)
Current Three Station Model	19.0 (57%)	9,731 (72%)	17,710 (70%)	7,146 (83%)
Percent Change	**41.8% Increase in Coverage**	**37.5% Increase in Coverage**	**47.2% Increase in Coverage**	**21.9% Increase in Coverage**

(Figure 24)

Figures 23 and 24 show the impact of transitioning from a two-station model to a three-station model. This provides a benchmark against which to compare the other response models. As you will see in the pages that follow as the data for the various improvement options is considered, the data indicates that the improvements to number of calls covered and percent of population covered by the various response improvement options does not yield as dramatic an increase as the addition of the third station. This can be attributed to the population density, the business corridor and the more heavily traveled roadways of the northeast area of Green.

The addition of a third station increased the percent of the total population of the City of Green that live within 4 minutes of travel time of a station by 47% over the two stations alone to a total of 70% of the total population of Green. More importantly, the total call volume from the sample set of data showed that with three stations the Fire Division could have reached 21.9% more of the actual calls responded to by the department within 4 minutes of travel time. The total number of calls reachable in 4 minutes of travel time was 83%.

THREE STATION MODEL – *RELOCATING STATION 1 TO ARLINGTON AND NIMISILA*



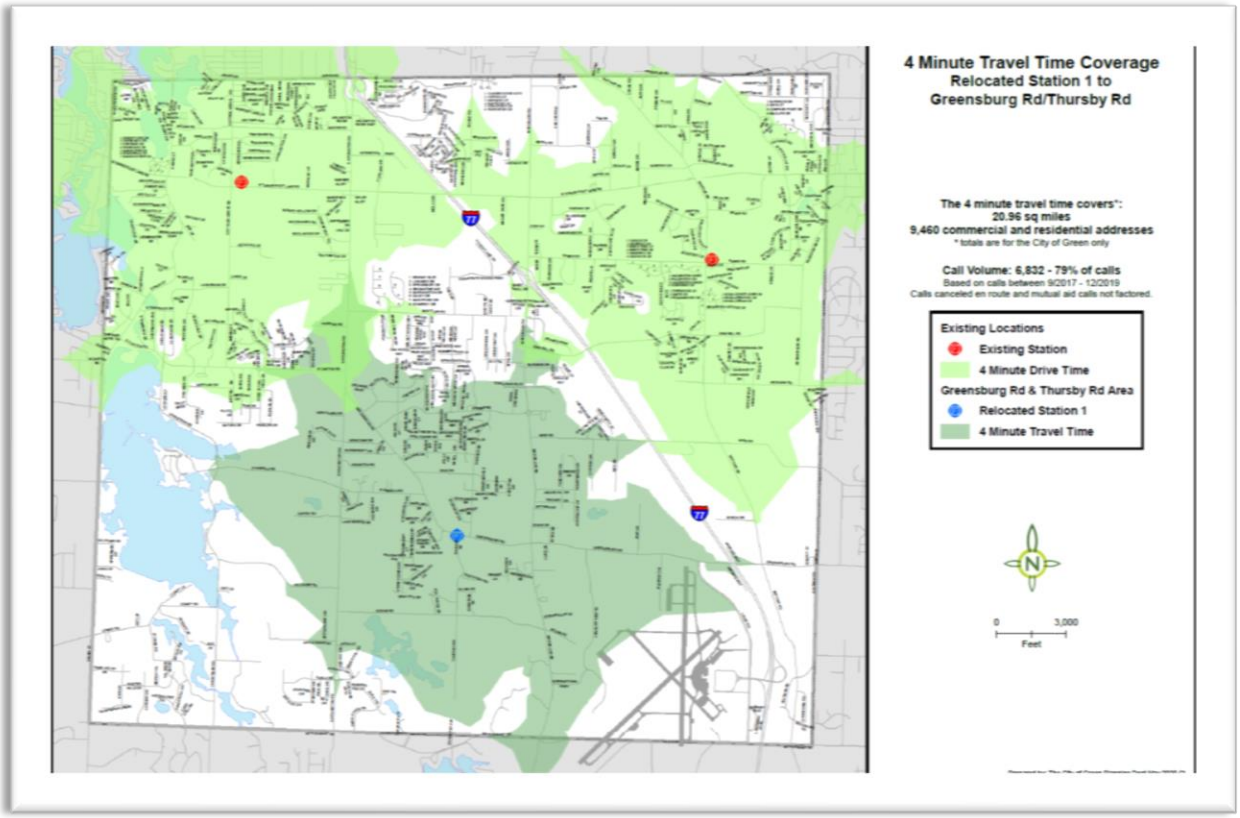
(Figure 25)

Inside 4 – Minute Travel Time Results *Proposed Three Station Model – Station 1 at Arlington and Nimisila*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Current Three Station Model	19.0 (57%)	9,731 (72%)	17,710 (70%)	7,146 (83%)
Proposed Three Station Model *(Arlington and Nimisila)*	19.63 (59%)	9,077 (67%)	17,154 (68%)	5,880 (68%)
Percent Change	**3.3% Increase in Coverage**	**6.9% Decrease in Coverage**	**3.1% Decrease in Coverage**	**17.7% Decrease in Coverage**

(Figure 26)

Figures 25 and 26 provide the data and map of a proposed three station model. One of the strategies considered to improve the emergency response to the southwest of Green was the potential relocation of Station 1 to a location more to the south and west to decrease the response time to the area. Two specific locations were studied that employed this relocation strategy. The first was to move Station 1 from its current location at the intersection of Steese Road and Massillon Road to roughly the intersection of Arlington and Nimisila. This location improves the response time to parts of the southwest, but there is still a significant area in the extreme south and west that would not fall in the four-minute travel time footprint. Beyond that, this station configuration opens a gap in the four-minute travel time coverage in the main corridor of the City where the heat map shows our call volume is the highest. Empirically, the data indicates this station configuration leads to a 3.1% decrease in the population covered and a 17.7% decrease in the number of calls covered in the four-minute response footprint versus the current Massillon Road location for Station 1. For these reasons, this option was rejected.

THREE STATION MODEL – *STATION 1 AT GREENSBURG AND THURSBY*



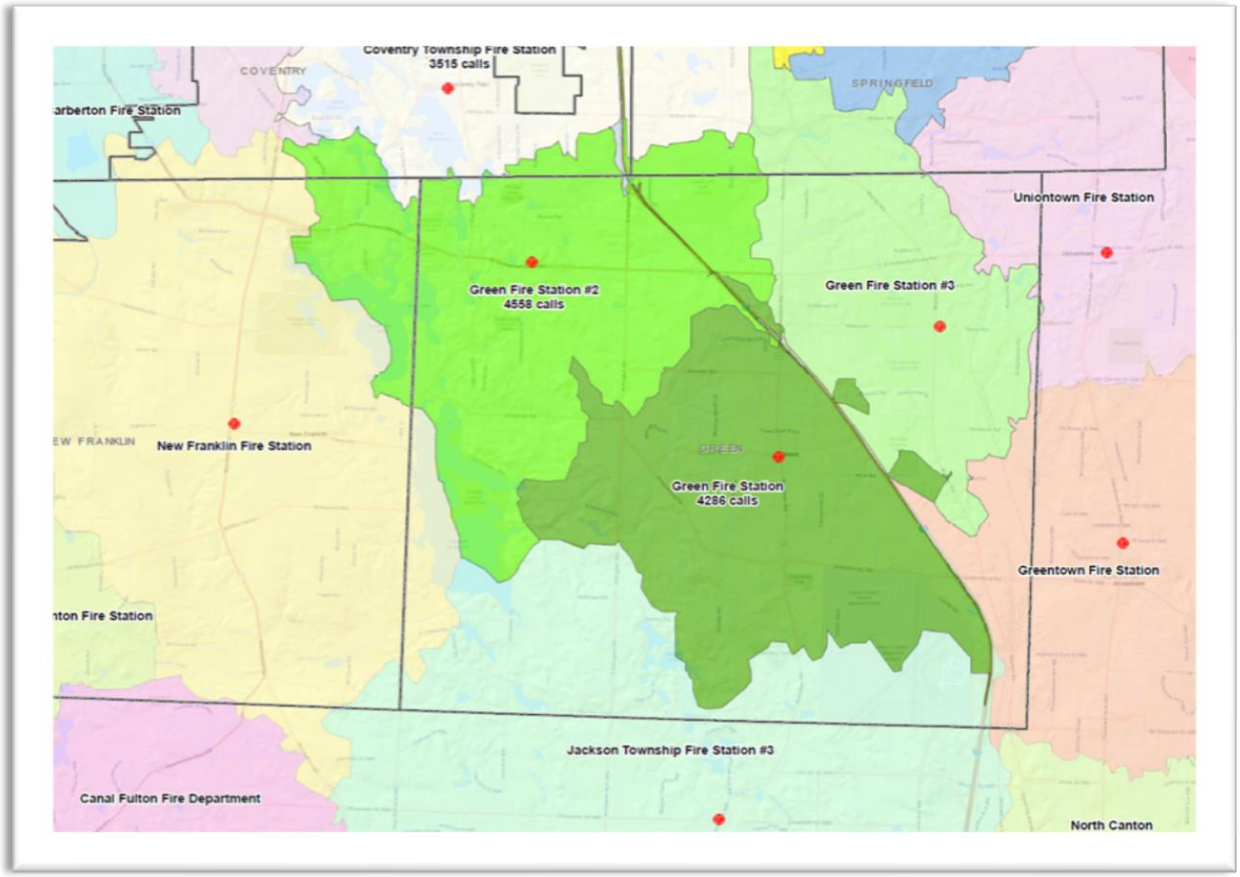
(Figure 27)

Inside 4 – Minute Travel Time Results *Proposed Three Station Model – Station 1 at Greensburg and Thursby*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Current Three Station Model	19.0 (57%)	9,731 (72%)	17,710 (70%)	7,146 (83%)
Proposed Three Station Model *(Greensburg and Thursby)*	20.96 (63%)	9,460 (70%)	17,180 (68%)	6,832 (79%)
Percent Change	**10.3% Increase in Coverage**	**2.9% Decrease in Coverage**	**3% Decrease in Coverage**	**4.4% Decrease in Coverage**

(Figure 28)

Figures 27 and 28 shows a second proposed option for a three-station model while This proposed station location is a bit more to the east and north than the Arlington and Nimisila location and it was thought that it might give an improved response to the southwest while at the same time preserving the capability to reach the main Massillon Road corridor and its associated call volume within the four-minute window. While this option was found to improve the coverage of the corridor, it opened the gap to the southwest even more and made it roughly equivalent to the travel time of our mutual aid departments to the Southwest region. If this were to be the model selected, the City would be better off to keep Station 1 at its current location to preserve a quick response to the core of the city and contract with our neighboring departments to first respond to the Southwest. Beyond providing only a slight improvement to the Southwest this configuration leads to a 3% decrease in population covered and a 4.4% decrease in call volume covered in the four-minute footprint when the stations are configured this way. For these reasons, this option was rejected.

THREE STATION MODEL – *AUTOMATIC AID FROM NEIGHBORING DEPARTMENTS*



(Figure 29)

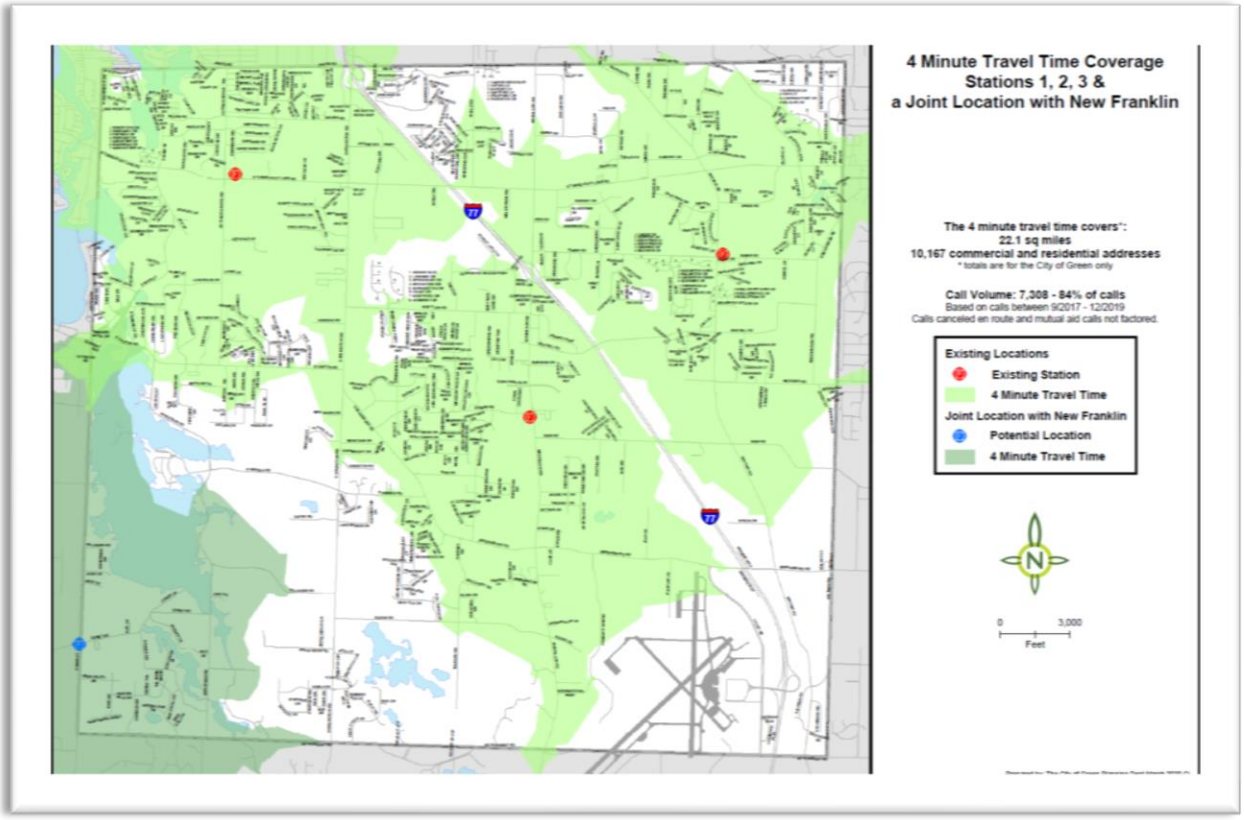
Figure 29 shows the Division maintaining the current three station model and requesting automatic response to every alarm in the Southwest from a neighboring department. This map shows those areas of the Southwest that could be reached more quickly by either Jackson Township out of their third station or New Franklin out of their main station. While these stations can reach this area of Green more quickly than a response from either Station #1 or Station #2, neither of the neighboring departments can reach this area in less than 4 minutes.

Most of the responses from either of these departments would be in the eight to ten-minute range, only marginally better than our current response model. Also, it is important to note that the travel time advantage shown on the map cannot account for the dispatch delay that occurs when

the City of Green calls another jurisdiction for assistance. The one to two-minute advantage in travel time from the mutual aid station is taken up by the increased call processing time as the critical information is transferred to the responding department. The advantage in response time does not match the map.

Another issue with joint responses is that they work best when each department can help the other. An example would be Uniontown in the Northeast. With each department having resources in place that can potentially help the other, it becomes mutual. The issue in the Southwest would likely require a contractual fee. Since resources from Green cannot reach any of these areas of New Franklin or Jackson in a sub-eight-minute time frame, the help becomes one way, not mutual but supplemental. Therefore, this strategy would likely require a fee if it was to be the long-term solution. Another with mutual aid resources is those resources are not dedicated to Green and may be committed to alarms in their own jurisdiction. They will not be standing by waiting for calls in the City of Green. For these reasons, this option was not considered to be optimal, was not included in the GIS study and was rejected. With the determination that the three station models appear to decrease the total level of coverage and open up gaps in coverage in the area of highest call volume, the Team moved on to study configurations that include the construction of a fourth fire station.

FOUR STATION MODEL – *JOINT STATION WITH NEW FRANKLIN*



(Figure 30)

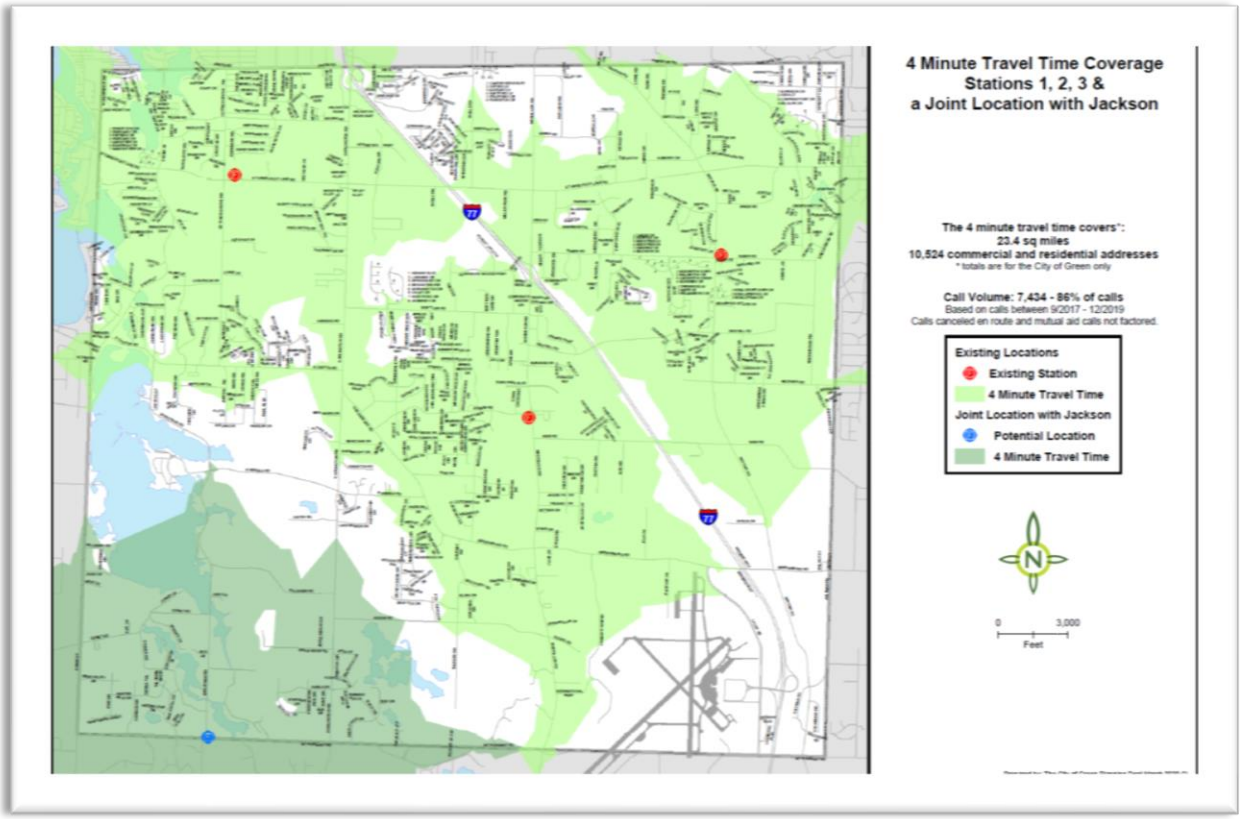
Inside 4 – Minute Travel Time Results *Proposed Four Station Model – Joint Station with New Franklin*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Current Three Station Model	19.0 (57%)	9,731 (72%)	17,710 (70%)	7,146 (83%)
Proposed Four Station Model *(Joint with New Franklin)*	22.1 (66%)	10,167 (70%)	18,622 (74%)	7,308 (84%)
Percent Change	**16.3% Increase in Coverage**	**4.3% Increase in Coverage**	**4.9% Increase in Coverage**	**2.3% Increase in Coverage**

(Figure 31)

Figures 30 and 31 show the results for the first strategy considered in a four-station model using a joint station with a neighboring department or a joint station with a cooperating agency. The first neighboring jurisdiction we approached about a joint station was the City of New Franklin to our west. The proposed joint station location was the area of East Comet and South Main Street. This location would provide a four-minute footprint to the extreme southwest of Green, but still left a gap in coverage in the intermediate southwest.

There are several other issues in choosing a joint location for instance it is reasonable to assume that some of the time when they are needed, they would be unavailable due to being on an alarm in the other jurisdiction. There are issues with different EMS protocols, drug licenses and medical directors. Additionally, there would be issues with different contracts, rules and regulation (both Division and City), and chains of command for discipline. At time of this study, New Franklin is not interested in a joint fire station. With the current location of their Station 1 (5605 Manchester Rd. Akron OH 44319) they do not have a response issue to the region in question. For these reasons, this option was rejected.

FOUR STATION MODEL – *JOINT STATION WITH JACKSON TOWNSHIP*



(Figure 32)

Inside 4 – Minute Travel Time Results *Proposed Four Station Model – Joint Station with Jackson Twp.*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Current Three Station Model	19.0 (57%)	9,731 (72%)	17,710 (70%)	7,146 (83%)
Proposed Four Station Model *(Joint with Jackson Twp.)*	23.4 (70%)	10,524 (78%)	19,364 (77%)	7,434 (86%)
Percent Change	**23.2% Increase in Coverage**	**8.1% Increase in Coverage**	**9.3% Increase in Coverage**	**4.03% Increase in Coverage**

(Figure 33)

Figure 32 and 33 display the results of a four-station model with a joint station configuration between Green and Jackson Township. The location was near the intersection of Christman and Mt. Pleaseant. It produces slightly better coverage improvements than the New Franklin model. However, the issues with sharing availability with another jurisdiction, a gap in four-minute coverage between this station and Stations #1 and #2, and the limited eight-minute response footprint remain. This station would be so far to the south, that its ability to respond back up to the rest of Green would be negatively affected.

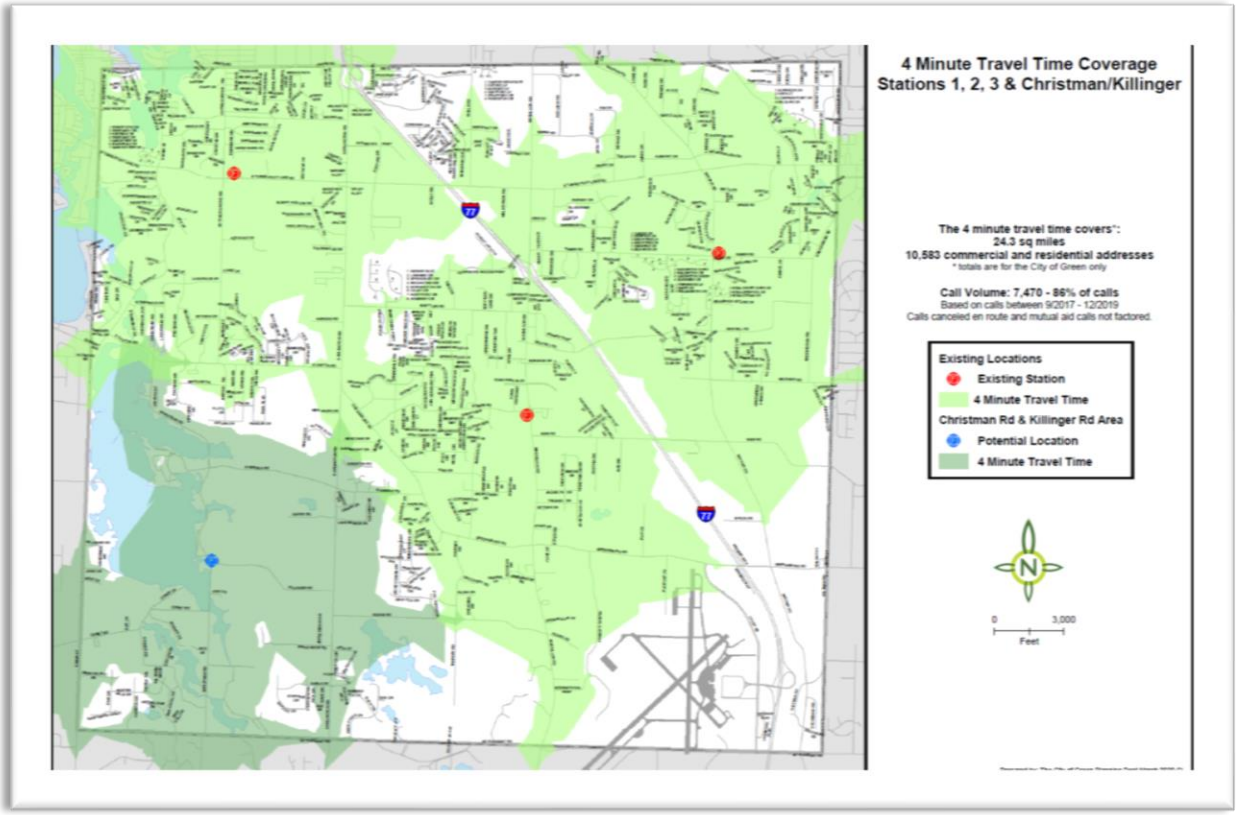
In considering how call volume is distributed in Green, it is likely that this station would be asked to respond to other areas of Green at least as often if not more often than within its own response area. This makes a station this far to the south with such a limited eight-minute response area, a less than ideal solution. In addition, the same concerns described with a joint station with New Franklin must be considered.

During the process of this study Green Fire administration met with Jackson Township Fire administration and discussed the option of a joint fire station. At the time of this study Jackson Fire was not interested in a joint fire station. With the current location of their Station 3 (6965 Strausser St. NW North Canton, OH 44720) and other stations they do not have a response issue to the region in question. They voiced concerns with their response capabilities to their northeast region, our southeast region, near the airport. They remain a viable option for a joint station should the City of Green ever choose to address concerns in the southeast. But, for the purposes of this study, this option was rejected.

FOUR STATION MODEL – *JOINT STATION WITH SUMMIT METROPARKS*

In attempting to cover all bases on agencies with whom the City could potentially partner to construct and staff a joint fire station, Fire Administration officials also met with Metro Parks Administration to discuss their needs and any possibility of a joint facility. The Metro Parks would be interested in a small space to house a boat for use at Nimisila. With their Firestone office so close, they have no need for an additional facility. Their officers are accustomed to working out of their vehicles. They appreciated us reaching out, but there is no interest on their part in partnering on a joint facility. With that being the case, the possibility was eliminated as a potential strategy and there was no separate location included in the GIS study. This strategy was rejected.

FOUR STATION MODEL – *CHRISTMAN AND KILLINGER*



(Figure 34)

Inside 4 – Minute Travel Time Results *Proposed Four Station Model – Station 4 at Christman and Killinger*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Current Three Station Model	19.0 (57%)	9,731 (72%)	17,710 (70%)	7,146 (83%)
Proposed Four Station Model (*Christman and Killinger*)	24.4 (73%)	10,583 (78%)	19,337 (77%)	7,470 (86%)
Percent Change	**28.4% Increase in Coverage**	**8.7% Increase in Coverage**	**9.1% Increase in Coverage**	**4.5% Increase in Coverage**

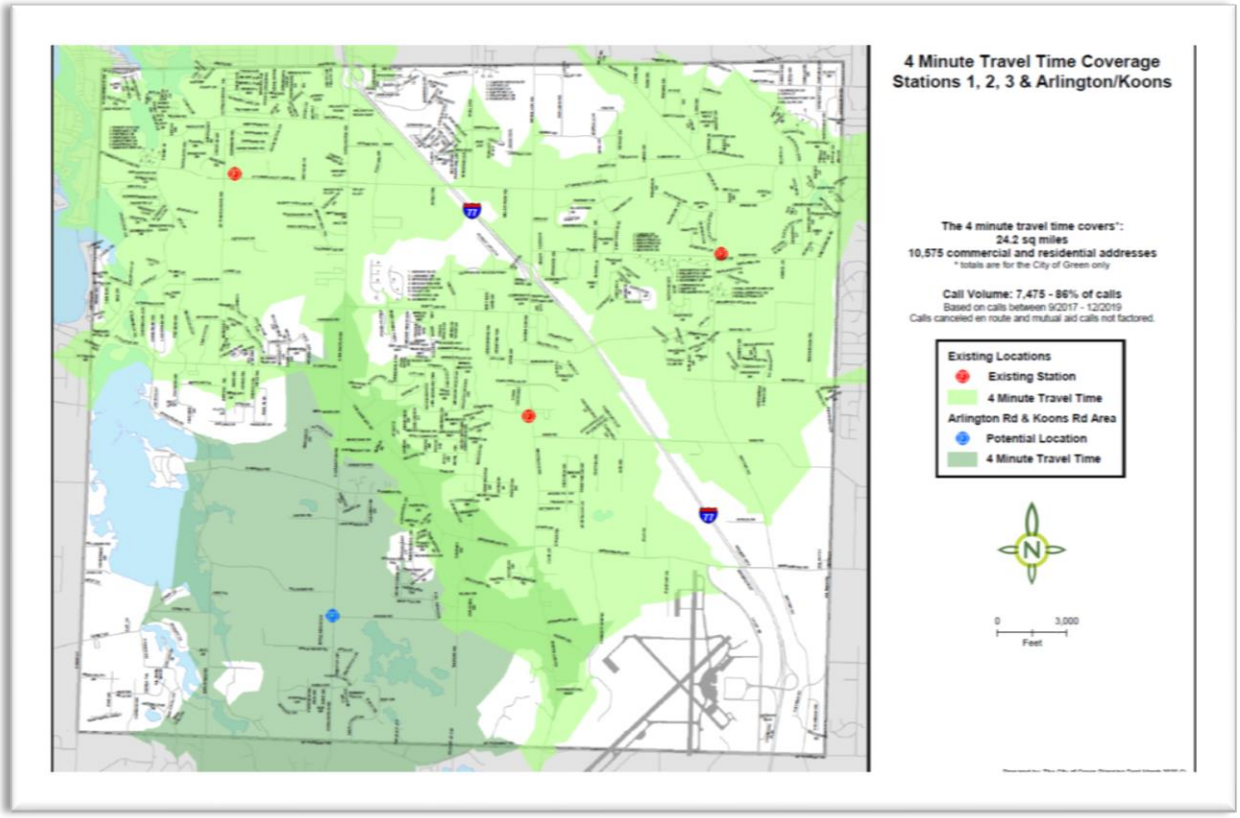
(Figure 35)

Figures 34 and 35 display a proposed four-station model with all four stations being owned and operated by the City. The location of Christman and Killinger for the addition of a fourth fire station substantially fills in the white space, the area outside of a four-minute response time, in the southwest. It fills in the southwest quadrant of the city with only minimal spillage of the four-minute footprint across our borders into Jackson and New Franklin. There is still a small island of homes outside the four-minute footprint in the extreme southwest, but they would have a dramatically improved response over the current response from Station #2.

The issue of land availability is being addressed with the Ohio Department of Natural Resources (ODNR) and the National Parks Service (NPS). The NPS is currently evaluating a proposal from the Fire Division and endorsed by ODNR that, if the City ever decided to proceed with a fourth fire station in the southwest, would allow the construction of that station on park land. The conversation is ongoing and non-binding on either party's behalf, but the parcel being considered is the area just to the north of Killinger on Christman. This location is likely on the very western edge of what may be considered an optimal location for an additional station in the Southwest. The same concerns raised with joint stations regarding travel distance back into the rest of the City apply to this location to a lesser extent as well.

Otherwise, an additional station here would take the overall population covered in a four-minute travel time footprint to 77% and the call volume from the sample set covered in the four-minute footprint to 86%. This location is an attractive option.

FOUR STATION MODEL – *ARLINGTON AND KOONS*



(Figure 36)

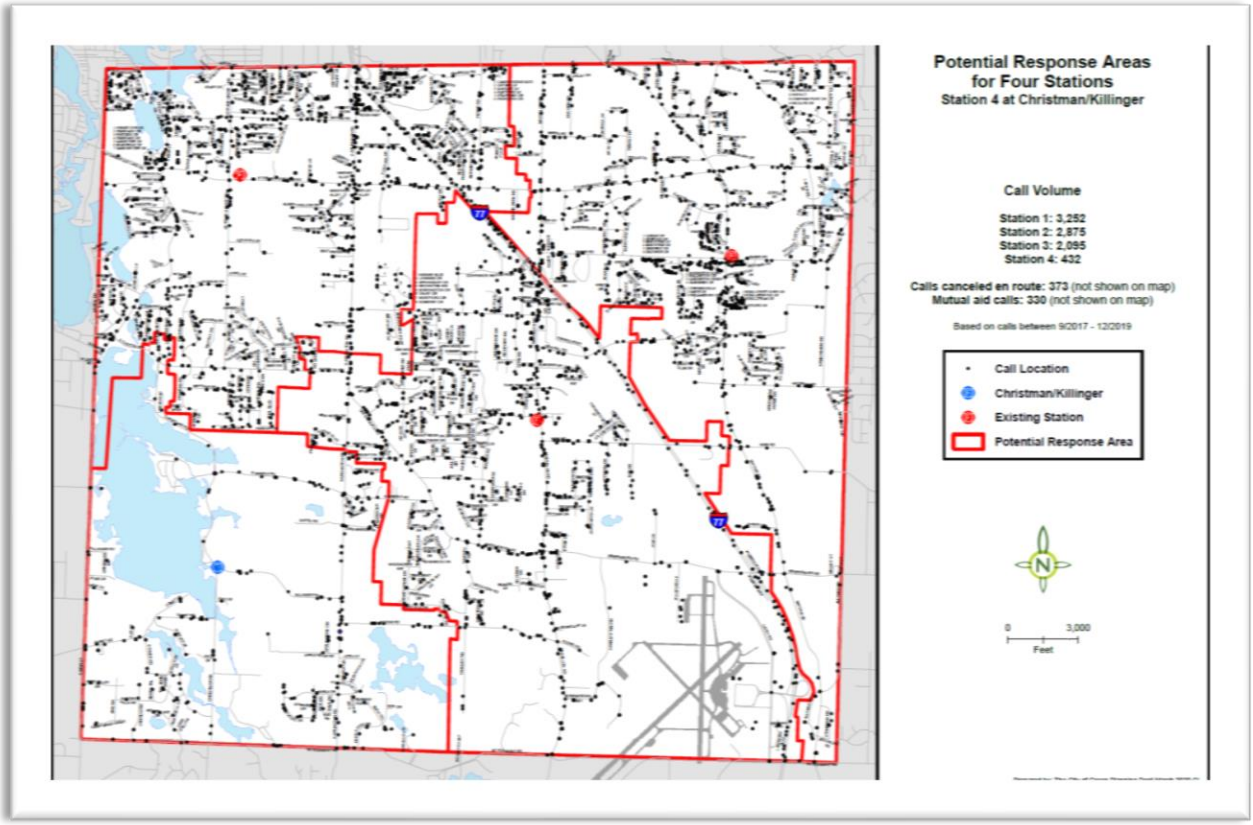
Inside 4 – Minute Travel Time Results *Proposed Four Station Model – Station 4 at Arlington and Koons*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Current Three Station Model	19.0 (57%)	9,731 (72%)	17,710 (70%)	7,146 (83%)
Proposed Four Station Model (*Arlington and Koons*)	24.2 (72%)	10,575 (78%)	19,357 (77%)	7,475 (86%)
Percent Change	**27.4% Increase in Coverage**	**8.1% Increase in Coverage**	**9.3% Increase in Coverage**	**4.6% Increase in Coverage**

(Figure 37)

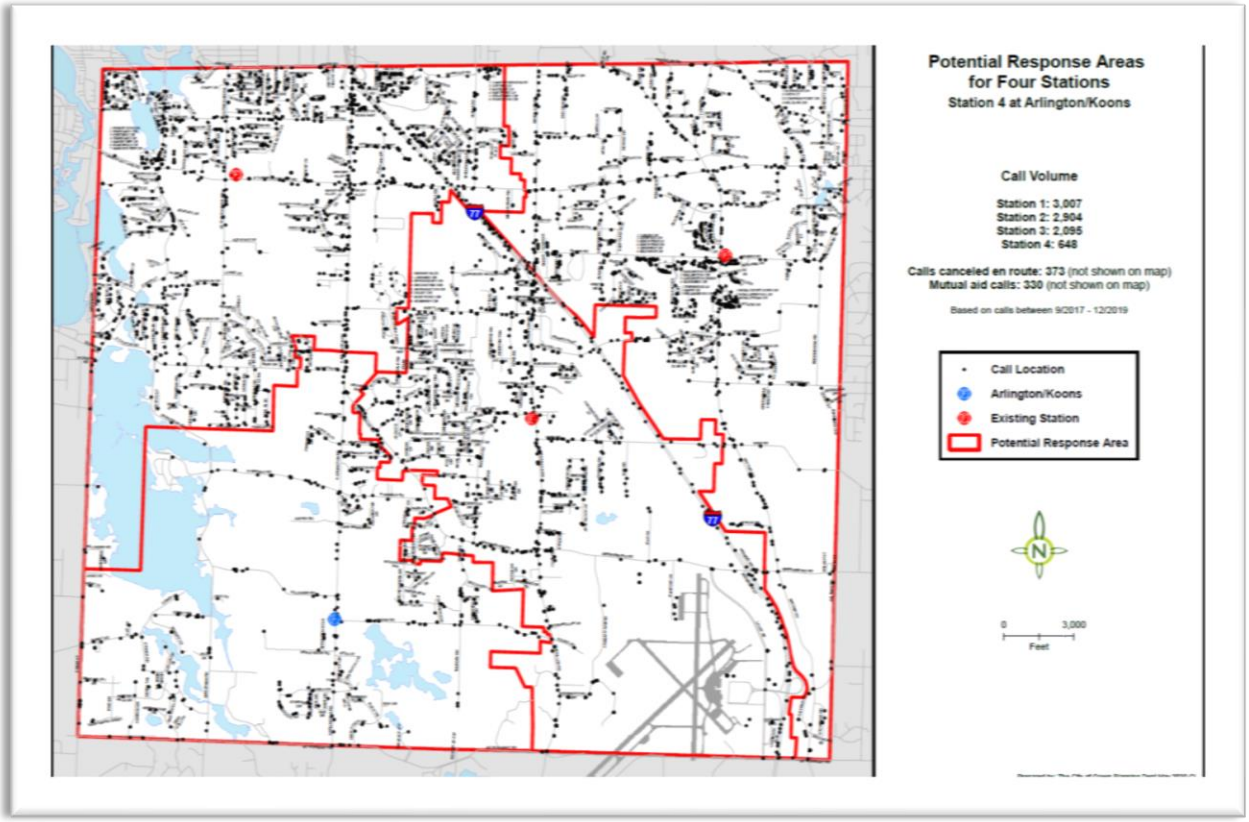
Figures 36 and 37 are a second proposed four-station model with all four stations being owned and operated by the City. This proposed station location, Koons and Arlington is slightly more to the east than the Christman and Killinger location. This location was proposed as a potential better location due to demand for service in the Northern portions of the City. While there is some overlap in the four-minute response coverage between this station and Station #1, it was an attempt to move it to a more central location while still preserving as much of the southwest coverage as possible. This strategy is an attempt to make sure the City's limited resources are leveraged to do the most good for the most people. This location is also an attractive option to consider.

COMPARISON OF CHRISTMAN AND KILLINGER TO KOONS AND ARLINGTON

Being that both the Christman and Killinger and Koons and Arlington locations are attractive options it was determined to do more in depth analysis to see which would provide the best overall improvement to our emergency response capabilities. The following section will provide the results of this comparison.

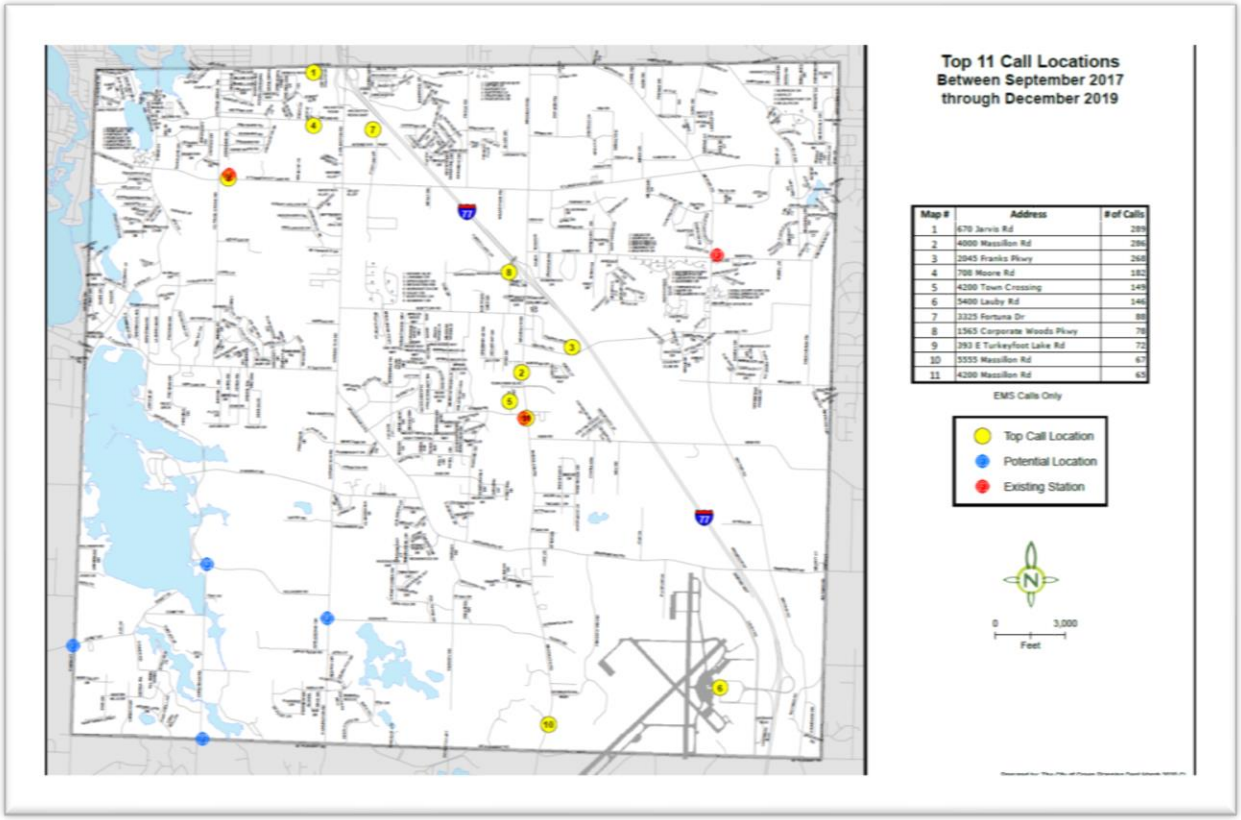


(Figure 38)



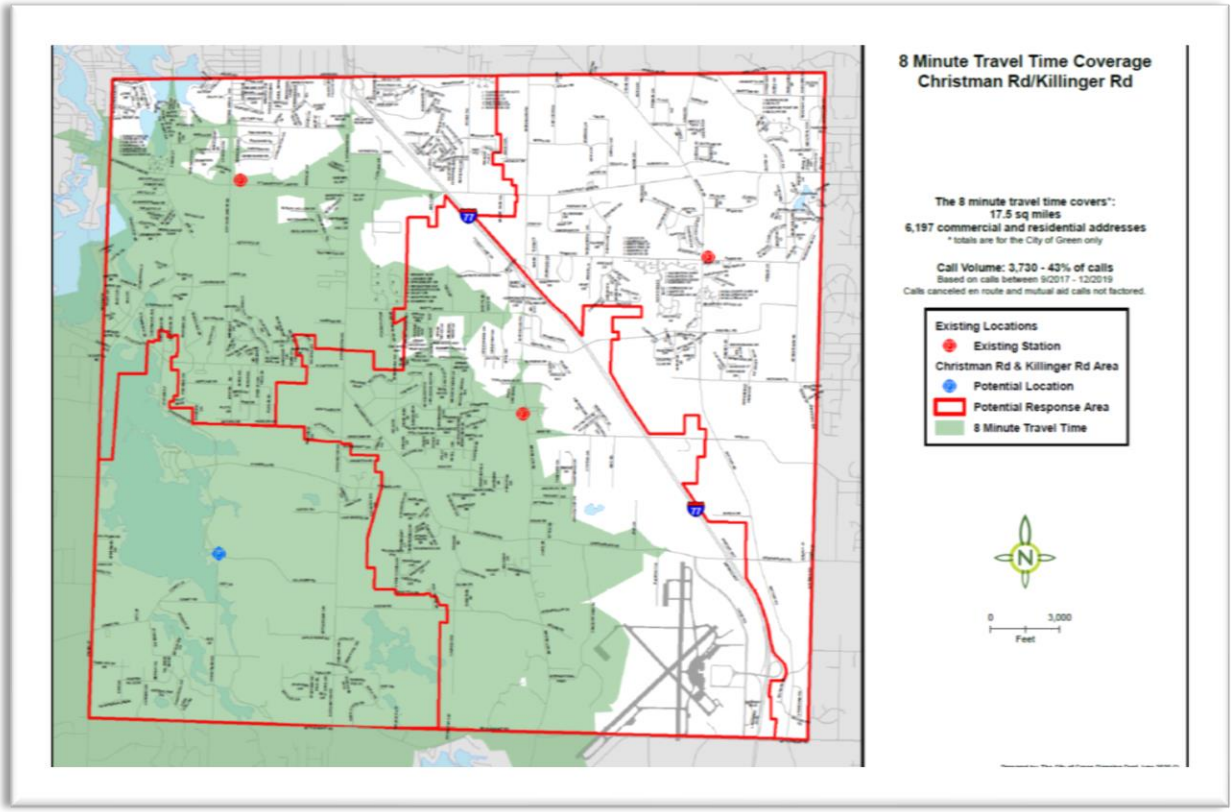
(Figure 39)

Figures 38 and 39 show the results of the GIS study on the potential response area for each proposed Station location. The red lines on the maps indicate the boarders between each stations' response area and the legend on the maps includes a list of the call count in each response area. The lower number of calls in the Station #4 response area associated with the Christman and Killinger location in comparison with the total number of calls in the City are an indication of the likelihood that Station #4 will be frequently asked to respond to areas outside of their primary response district. The actual number of times they will be asked to respond outside their district is too hard to predict because it is based on factors too difficult to quantify accurately.



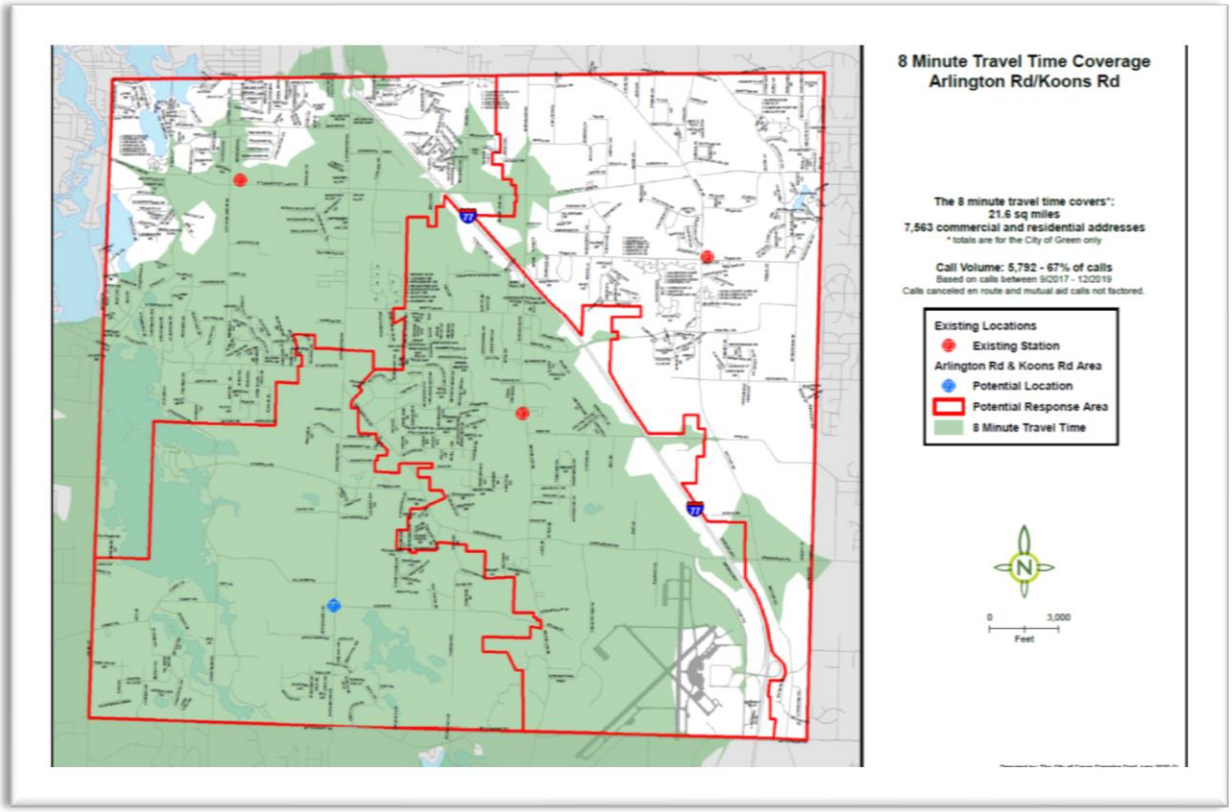
(Figure 40)

Figure 40 is a listing and mapping of the 11 locations in the study period that had the most calls for emergency service. Not surprisingly, these high frequency call locations are in the areas found to be the busiest areas in the City, to the north and along the transportation corridors. The frequency of calls from these locations, make these likely locations for which a response from Station #4 may be requested due to the first in unit from that response district already being tied up on an alarm. This is not a scientific piece of information for the study but is worthwhile point to consider when making the determination on where to build the fourth station. It would be reasonable, if the goal is to accomplish the greatest good for the greatest amount of people, to build Station #4 in an area where it could reach these top 11 locations within an eight-minute response time.



(Figure 41)

Figure 41 depicts the eight-minute travel time of Christman and Killinger. This location does not offer the same level of coverage and redundancy that the Arlington and Koons location has to offer. This is important when you consider the top 11 call locations mentioned and when you consider the heat map of total call volume activity. The eight-minute travel time footprint of the Christman and Killinger location does not adequately cover these areas of concern.



(Figure 42)

Figure 42 depicts the eight-minute travel time of the Arlington and Koons location and is significant because it covers almost all of Station #1 and Station #2 response areas. This level of redundancy is important when considering how to maximize the effect of this additional station. Compare this coverage with the Christman and Killinger coverage in the Figure 41.

Inside 4 – Minute Travel Time Results *Proposed Station Four Located at Christman and Killinger compared to Arlington and Koons*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Proposed Four Station Model (*Christman and Killinger*)	24.4 (73%)	10,583 (78%)	19,337 (77%)	7,470 (86%)
Proposed Four Station Model (*Arlington and Koons*)	24.2 (72%)	10,575 (78%)	19,357 (77%)	7,475 (86%)
Percent Change	**0.8% Decrease in Coverage**	**0.08% Decrease in Coverage**	**0.1% Increase in Coverage**	**0.07% Increase in Coverage**

(Figure 43)

Inside 8 – Minute Travel Time Results *Proposed Station Four Located at Christman and Killinger compared to Arlington and Koons*				
Location	**Square Miles**	**Number of Addresses**	**Population (2010 Census)**	**Call Volume**
Proposed Four Station Model (*Christman and Killinger*)	17.47 (52%)	6,197 (46%)	11,226 (45%)	3,730 (43%)
Proposed Four Station Model (*Arlington and Koons*)	21.6 (64%)	7,563 (56%)	12,787 (51%)	5,792 (67%)
Percent Change	**23.6% Increase in Coverage**	**22.0% Increase in Coverage**	**13.9% Increase in Coverage**	**55.3% Increase in Coverage**

(Figure 44)

Figure 42 and 43 provides a comparison of the 4-minute and 8-mintue travel times of both locations. The real differentiation between the two locations is the 8-minute travel time. The Arlington and Koons location yield a 13.9% increase in population covered and a 55.3% increase in call volume covered in the eight-minute travel time footprint versus the Christman and Koons proposed station location. Provided there is no change in call volume and call location patterns,

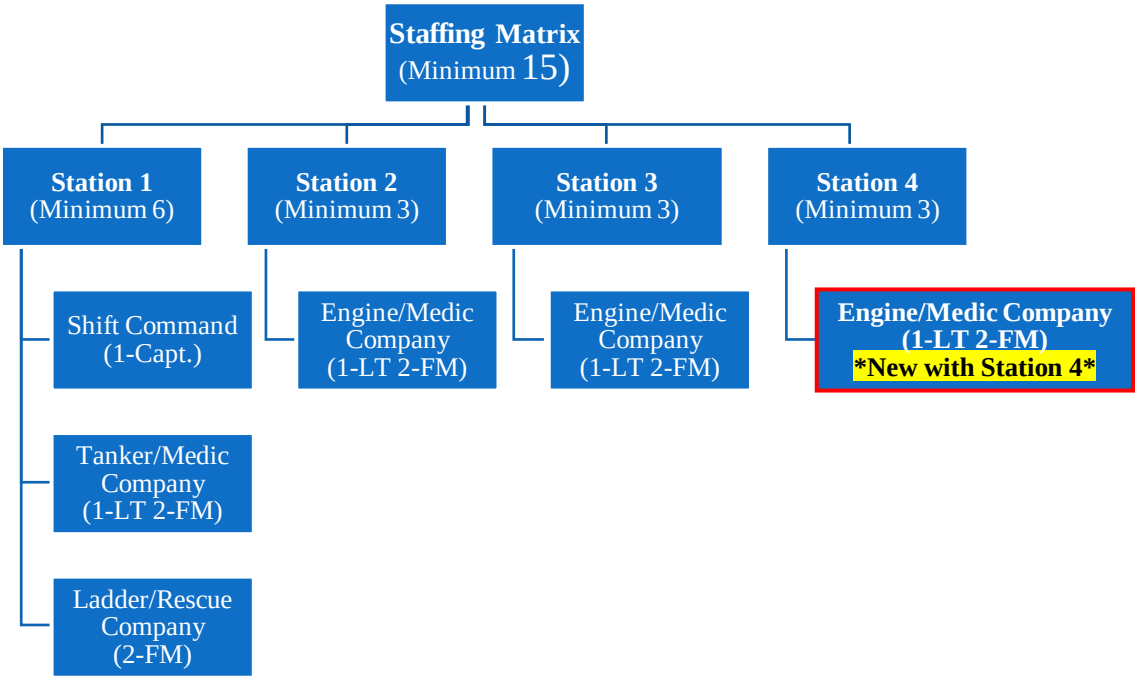
this eight-minute travel time footprint makes it a clear choice as a preferred general location for a future Station #4.

RECOMMENDATION

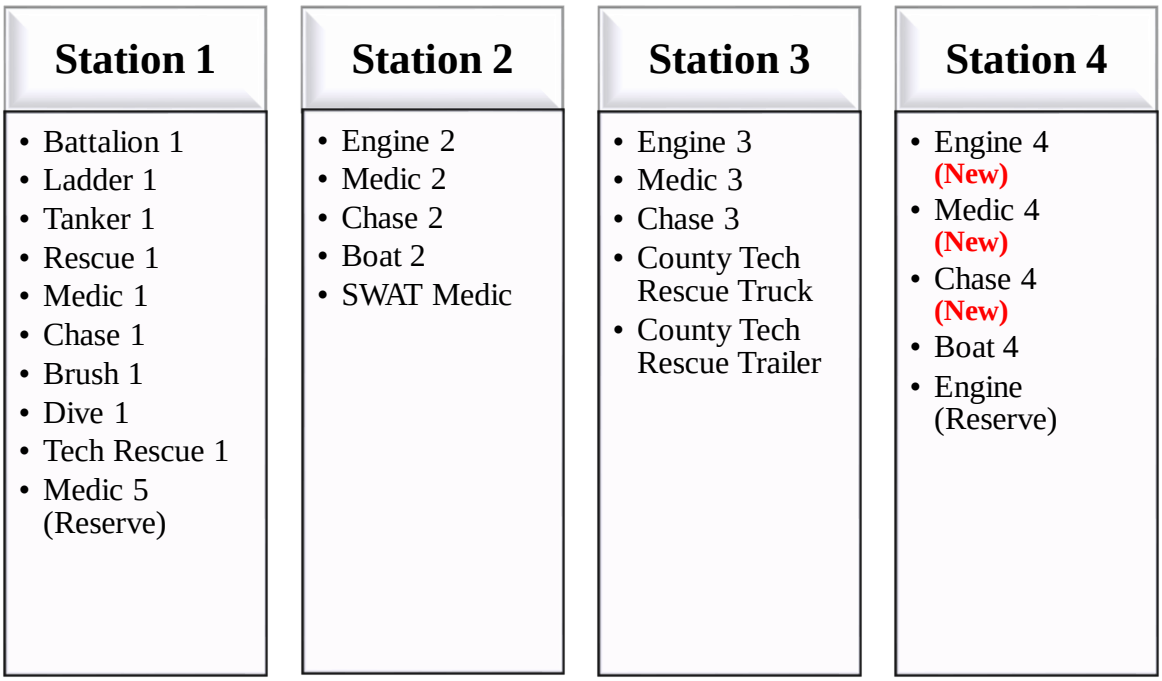
Taking into consideration the different components to emergency response and the results of the GIS study, it is our recommendation that the City of Green transition to a four-station response model and construct a fourth fire station in the area of Arlington and Koons Rd. The construction of a fourth fire station staffed with an engine/medic company will provide the improved emergency response capabilities in the Southwest and provide the needed redundancy within the City as a whole.

RECOMMENDED STAFFING AND APPARATUS

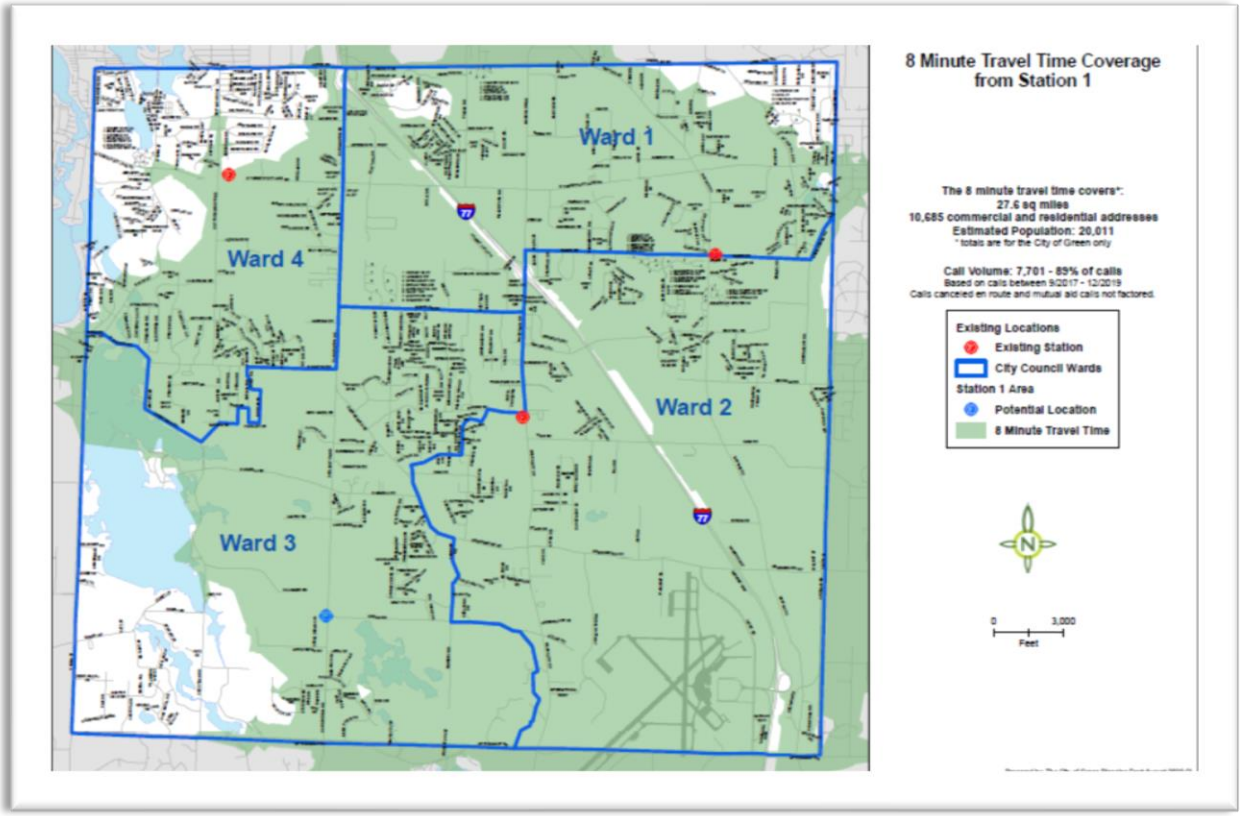
The recommended staffing level and apparatus for the proposed four station operation is detailed in next two figures (Figures 45 and 46). This level of staffing matches the staffing at the other satellite stations and helps ensure the ability of the Fire Division to assemble an effective firefighting force. This is necessary to facilitate simultaneous firefighting activities. This staffing level also allows for a ladder/rescue support company to respond out from Station #1. This company would provide the staffing necessary for serious medical alarms, motor vehicle accidents or multiple simultaneous alarms. This model also provides a better opportunity to have staffing available to respond the specialty apparatus (tanker, ladder, rescue truck, dive trailer, TROT trailer) from a central location at the time of this study.



(Figure 45)



(Figure 46)



(Figure 47)

Figure 47 shows eight-minute travel map from Station #1. Having the ladder/rescue company at Station #1 allows it to reach 27.6 square miles, 10,685 total addresses, 77.9 % of the population and 88% of the volume that was used for this report in an 8-mintue travel time. Having most of our specialty equipment at one station allows the City to save on the cost, as it is not needed to duplicate certain specialty apparatus throughout the City. This may change in the future depending on the demand for service or the need for additional specialty apparatus.

As an interim step toward a full response Station #4 and to make an immediate impact on redundancy and reliability for the Southwest, we further recommend hiring the additional staff necessary to bring a fourth medic unit online at Station #1 as quickly as possible. Upon completion of Fire Station #4, this medic unit crew would be repositioned and bolstered with a company officer to staff an engine/medic company similar to our other satellite stations.

TIMELINE

(Figure 48)

Figure 48 provides the suggested timeline for the design, construction, staffing and implementation of four-station response model. The timeline is drawn out over five years to allow for some flexibility and adjustment to the actual run volume and costs as opposed to the predicted values. The coronavirus pandemic is certainly a strong wild card in making confident financial predictions. With a projected second wave of the virus in the fall and winter of 2020, the timeline may need to be adjusted to accommodate a decrease in income tax collections if it occurs.

The thought of the committee is that Station #4 is not a question of if, but of when. The timeline presented allows for some flexibility as the 2020 planning has no associated cost and the part of the 2021 step calling for the acquisition of property is essentially a low risk proposition.

The acquisition of the property is an investment. If the station never goes forward, the land can be sold at a future date with very little risk of taking a loss.

The recommendation to increase staffing in 2021 to accommodate a fourth medic unit would stand whether the project to build Station #4 proceeded or not. Proceeding through this study helped further refine a long-held belief that call volume drives the need to increase staffing. While that is essentially true, the study revealed the more accurate standard that call volume drives the number of companies needed to handle the volume of calls. An additional company of fire/medics can allow the department to operate another engine/medic unit and have a major impact on emergency response capabilities.

In rough numbers, the review of our history of increasing call volume over the years and the increasing frequency of simultaneous emergency alarms (Figures 3 and 4), has led to the identification of the need to add an additional company for every additional 1,000 alarms. One thousand additional alarms represent almost an additional 2.7 calls a day. If an additional company is not added, the increasing number of calls leads to more cases of units from Green not being available to respond. This means 911 calls will be answered more frequently by mutual aid units that are traveling from farther away. As previously mentioned, the Fire Division has been operating with three engine/medic companies since Station #2 opened in 2002.

When we operated a two-station response model we were able to utilize one of the engine/medic companies to respond the specialty apparatus such as the ladder, rescue or tanker from Station #1. With the increase in demand for EMS it was becoming difficult to respond the specialty apparatus when needed due to the medic unit being on an alarm. When we transitioned to a three-station response model we determined there was a need to staff a dedicated support

company that would not be required to provide transport services, thus leaving resources available to respond the needed specialty apparatus.

Though we need 12 additional fire/medics to operate a Station #4 engine/medic company, the transitional approach of staffing a second medic unit at Station #1 allows us to decrease this request in 2024 to 6. We are still able to meet our requirement of all stations having the capability to initiate a rescue of a victim that may be trapped in a hazardous atmosphere and provide emergency medical care and transport of a sick and injured patient. Having a second available medic unit at Station #1 will add the redundancy necessary to ensure a more rapid response to the Southwest during simultaneous alarm events and ensure the next available medic unit response to the entire lower two thirds of the City is not coming from the more distant Station #2 or Station #3 when the first medic unit company out of Station #1 is already on an alarm.

In further considering the flexibility of the timeline suggested, even in 2022, if the architect was hired and a plan drawn, the project could still go on hold if something unforeseen happens that challenges the City finances. The plan could be held until it is determined that construction could move forward. It is not until the fourth year of the timeline, 2023 that the project would reach a point of no return.

This flexibility gives confidence that discussions about a fourth station in 2020 are not overcommitting the City to a project it cannot sustain. The recommendations call for immediate actions with immediate impact. Yet, the ability to slow the project down in subsequent years provides flexibility to match evolving conditions while the capital money already allocated gives reassurance that there is a commitment on the part of the City to improve the emergency response of the Fire Division in the Southwest.

BUDGET PROJECTIONS

As with any project dealing with the allocation of tax dollars, a thorough analysis of the cost of the project must be weighed against the potential benefits of the proposed action. The recommended option, a four-station response model, is associated with both capital and operating expenditures

The proposed fire station would be a smaller, satellite fire station designed to house a fire engine, medic unit and chase vehicle. The station will be staffed by a lieutenant and two fire/medics each 24-hour shift. The proposed station would have a footprint that would include four bays. The fourth bay could be used to house a boat and a reserve piece of apparatus. Housing the reserve apparatus indoors is critical to extending its service life. A reserve apparatus is an older apparatus that have transitioned off the frontline and are kept in reserve to fill-in for front line units when the front-line apparatus is down for repairs or preventative maintenance. The living quarters would be designed to have an office space, meeting / training space, kitchen, day room, work out area, laundry room, decontamination area, and associated mechanical spaces. A typical satellite fire station design for the operation described would be in the 8,000 - 9,000 square foot range. See Figure 49 on the following page for details.

Square Footage Requirements for Proposed Station 4			
Program Item	**Room Name**		**Square Feet**
	Apparatus Bay		
1		2 pull through bays – four doors	3,200
2		Turnout gear storage	200
3		PPE 2	100
4		Workshop	60
5		Decontamination area	200
6		Restroom	180
		Subtotal	**3,940**
	Administration		
7		Lieutenant's Office	100
8		Conference Room / Classroom / FM Workstation	200
9		Public Restroom	80
		Subtotal	**380**
	Living Quarters		
10		Day Room	250
11		Kitchen / Dining	300
12		Exercise Room	400
13		Dorms (4 @ 120 sq. ft.)	480
14		Bathrooms (2 @ 90 sq. ft/)	180
		Laundry	60
		Subtotal	**1,670**
	Miscellaneous		
15		Vestibule	60
16		Housekeeping Storage	12
17		Janitor's Closet	48
18		Mechanical / Electrical	250
19		IT	60
20		Generator	180
		Subtotal	**610**
	Area Subtotals		**6,600**
	Walls and Circulation		
		Apparatus bay walls at 10%	320
		Living quarters walls at 18%	480
		Living quarters hallways at 20%	535
		Subtotal	**1,335**
		Total Footprint	**7,935**

(Figure 49)

City of Green Fire Division Fire Station 4 Cost Schedule			
Year		**Capital Cost**	**Operating Cost**
2020	Complete the study	$0	$0
2021	Confirm the location and acquire the land	$200,000	
	Hire 6 new firemedics		$636,540
	New Medic Unit (redundancy at Station #1) Will move to Station #4	$270,000	
	Promote 3 new Lieutenants		$30,000
	2021 Capital Costs	**$470,000**	
	2021 New Operating Costs		**$666,540**
2022	RFQ for Architect – creation of plans	$375,000	
	RFQ for Construction Manager – contract with same		$0
	2022 Capital Costs	**$375,000**	
	2022 New Operating Cost		**$0**
2023	Construction of Station #4	$2,900,000	
	Construction Manager contract	$375,000	
	New Fire Engine	$500,000	
	New Chase Vehicle for Station #4	$56,000	
	2023 Capital Costs	**$3, 831,000**	
	2023 New Operating Cost		**$0**
2024	Hire 6 new Fire/Medics		$695,562
	Contracted services, utilities and supplies		$142,000
	2024 Capital Costs	**$0**	
	2024 New Operating Cost		**$837,562**
	Total Station #4 Capital Costs	**$4,676,000**	
	Total Station #4 New Operating Costs		**$1,504,102**

(Figure 50)

Figure 50 shows the estimated cost schedule for Station #4 including both capital and operating expenses. Construction costs of Station #3, in 2020, came in at roughly $320 per square foot. To build the proposed Station #4 in 2020 would cost $2.56 million dollars. Adjusting construction costs at 4% per year until proposed construction in 2023 / 2024 would yield a construction capital cost of $2,879,652.

The other capital costs for Station 4 would be the purchase of land for the station, contracts with an architect and construction manager, and purchase of additional apparatus (fire engine, medic unit and chase vehicle).

In terms of operational costs, the first-year operational costs for a new station include the costs of personnel and the costs of contracted services, supplies and utilities as outlined in black in Figure 50. In 2020, the loaded cost of a fulltime fire/medic round up is $103,000 per year. Loaded cost means the full cost of wages and benefits for a fulltime fire/medic. Adjusting that amount by 3% per year yields a 2021 amount of $106,090 and a 2024 amount of $115,927. That per fire/medic amount must be multiplied by the total number of fire/medics needed to support a 24/7 operation. The recommended staffing for adding a fourth medic unit in 2021 is 6 additional fire/medics. The recommended staffing to then open Fire Station #4 is an additional 6 fire/medics in 2024. Green Fire has an established history of holding operational costs to 10% of total annual costs with personnel costs making up the other 90%. That ratio was used to determine the amount to build into the budget for operational costs for Station #4.

Funding sources to cover these capital and operating expenses include Nexus funding, ambulance billing and the General Fund. The Fire Division is funded primarily by an annual transfer of funds from the General Fund. With City of Green Ordinance 2019-08A, City Council designated $3,000,000 toward the improvement of emergency response to the Southwest region of

the City. This $3 million would be applied to capital costs. The cost of the fire engine, ambulance and chase vehicle may be able to be taken from the unencumbered ambulance billing fund balance.

At issue is the cost of other Fire Division Capital expenses between now and the opening of Station #4. The Fire Division is currently, for the third year in a row, seeking an Assistance to Firefighters Grant for funds to replace the 27-year-old rescue truck. If the grant is not awarded and ambulance billing funds are needed to purchase the rescue truck in 2021 or 2022, there will not be time to build up the ambulance billing fund to support the purchase of a new fire engine in 2023.

The ambulance billing fund is used to pay for capital purchases and some EMS operating expenses like EMS supplies and EMS contracted services. While dependent on the actual capital purchases made each year, on an annual basis, the average net increase in revenues over expenses assigned to the ambulance billing fund is about $350,000. That indicates there needs to be at least 2 years of collections after the medic unit is acquired to accumulate the funds necessary to cover the cost of a new fire engine for Station #4. See Figure 51 for a ledger showing an example of one way the approximate predicted flow of funds into and out of the ambulance billing fund could be handled. This example shows that the ambulance billing fund alone cannot keep up with the replacement of apparatus according to the schedule proposed without modification if the 2019 Assistance to Firefighters Grant for the rescue truck is not received.

Example 218 Ambulance Revenue (all approximations)				
Description	Beginning Balance	Revenue	Expenses	Ending Balance
July 31, 2020	1,400,00			
Second half of 2020		350,000	175,000	1,575,000
Ladder Truck			900,000	675,000
Maintenance Vehicle			65,000	610,000
2021 Ambulance Fund		700,000	350,000	960,000
Rescue Truck (If no AFG)			900,000	60,000
2022 Ambulance Fund		700,000	350,000	410,000
Medic Unit 2022			280,000	130,000
Command Vehicle 2022			59,000	71,000
2023 Ambulance Fund		750,000	400,000	421,000
Engine for St. #4			500,000	-79,000

(Figure 51)

Figure 51 shows that one key to establishing the timeline for building Station #4 will be decisions on managing the replacement of vehicles and apparatus in the fleet. The ambulance billing fund is a great source of additional revenue that can be used to capture flexibility in managing replacement of vehicles to ensure the department can maintain its response capability and expand that capability when appropriate. If the department is successful in obtaining grant money for the replacement of the rescue truck, the ambulance billing fund can support all replacement of vehicles and expansion to a fourth station along the timeline proposed.

General Fund Transfers to Fire Fund and Expenses					
Year		Transfer Amount		*Total Annual Expenses*	*Percent Increase in Expenses*
1999		1,600,000			
2000		475,000			
2001		1,150,000			
2002		1,660,000			
2003		1,256,000			
2004		1,982,000			
2005		5,000,000		4,948,316	
2006		5,250,000		5,151,178	3.9%
2007		5,250,000		5,113,345	-0.7%
2008		5,000,000		5,374,940	4.9%
2009		5,000,000		5,712,599	5.9%
2010		5,350,000		5,396,273	-5.9%
2011		5,000,000		5,196,425	-3.8%
2012		5,000,000		5,218,908	0.4%
2013		5,000,000		5,453,008	4.3%
2014		5,000,000		5,085,380	-7.2%
2015		5,000,000		5,821,551	12.6%
2016		5,500,000		6,234,639	6.6%
2017		6,500,000		6,729,298	7.4%
2018		6,500,000		7,446,449	9.6%
2019		7,500,000		7,027,175	-6.0%
Total Since 2005		81,850,000		85,909,484	Avg. 2.3%

(Figure 52)

Figure 52 shows the history of the annual transfer from the General Fund to Paramedic / Fire Fund. The big change in transfers from the General Fund to the Fire / Paramedic Fund in 2005 is due to the department being partially funded by a property tax levy up until 2005. The levy was not renewed when the change from a 1% to a 2% income tax was approved.

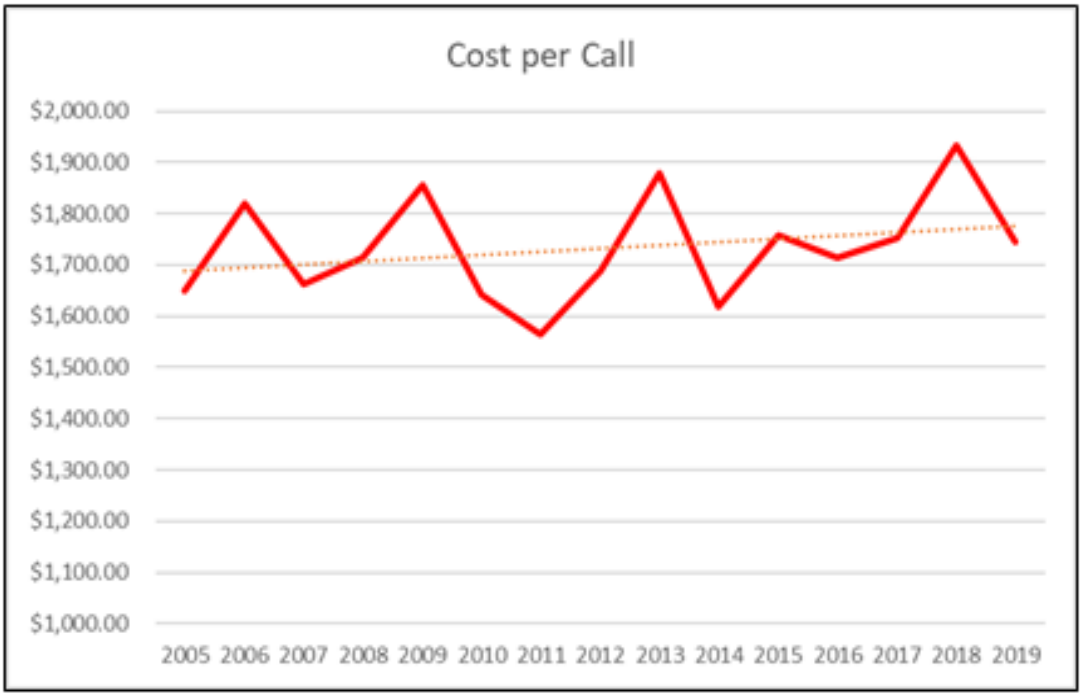
With the expiration of the property tax levy, the department is now primarily funded by a General Fund transfer and ambulance billing revenue. Figure 50 shows several years in which the transfer from the General Fund to the Fire/Paramedic Fund was not increased at the same pace as expenses increased. This difference was absorbed by the ambulance billing revenue. The history of total department expenses is the next column to the right and is included to establish the appropriate historical trends on average annual increase in expenses so that a more accurate prediction of the future expenses of the Fire Division can be made. To fund Fire Station #4, the annual transfer from the General Fund to the Fire/Paramedic Fund would need to continue to be increased to cover the projected annual total operational cost of Station #4.

Cost of Safety Services as a Percent of Total Budget*						
	FS #1	FS #2		FS #3	4th Medic	FS #4
	2001	2003	2019	Budget 2020	2021 est.	2024 est.
Total City Operating Expenses	21,057,359	21,078,927	25,679,486	29,944,875	30,244,324	32,704,670
Fire/Paramedic Expenditures	2,998,506	4,110,764	7,287,813	8,754,098	9,621,982	11,138,848
Sheriff Contract	653,742	885,942	2,874,350	2,962,725	3,021,979	3,199,743
Total Safety Services	3,652,248	4,996,706	10,162,163	11,716,823	12,642,961	14,321,218
Fire/Paramedic % of Total	14%	20%	28%	29%	32%	34%
Sheriff % of Total	3%	4%	11%	10%	10%	10%
Safety Services % of Total Expenditures	17%	24%	40%	39%	42%	44%

* Assumed an overall 1% increase in City budget operating costs per year, a 2.3% increase in fire costs per year plus $666,540 salaries and benefits in 2021 and a 2.3% increase in fire costs per year plus $837,562 in new operating costs, fire/paramedic salaries and benefits in 2024. Further assumes a 2% per year increase in the cost of the Sheriff's contract.

(Figure 53)

Figure 53 shows the cost of safety services as a percentage of the total budget. This is given to provide context for the impact of the proposed Station #4 on the City's budget. The percentage the City spends on Fire and EMS coverage has grown from 14% of the total budget in 2001 to 28% in 2019, 29% with the opening of Station 3 and a projected 32% with the staffing of an additional medic unit in 2021 and 34% in 2024 with the opening of Station #4. Equally important to the evaluation of the feasibility of moving forward is the impact to the City budget when considering the total cost of public safety. Combining the public safety costs of the Sheriff's Office for Law Enforcement Services and the Fire Division accounts for 40% of the total City budget in 2019 with 2 stations and an estimated 44% in 2024 with 4 stations.



(Figure 54)

Figure 54 provides another important comparison statistic, the total cost per call. A look at the history of the cost per call in the City of Green shows great fluctuations as call volume changes and costs vary from year to year with high dollar equipment purchases, but the increase in average cost per call has been relatively modest over time with the average cost per call increasing by around $100 over the last 15 years. This is important because it indicates a strong tendency and culture of fiscal discipline on the part of the City in containing costs and maximizing efficiency. For comparison with other reasonably similar jurisdictions, consider the data in Figure 55.

Financial Comparison – Safety Services as a Percent of Total Budget - 2019							
City/Township	**City/Township Budget**	**Fire Budget**	**Police Budget**	**Fire % of Budget**	**Police % of Budget**	**Public Safety % of Total Budget**	**Cost per Call**
Green, OH	**$25,679,486**	**$7,287,813**	**$2,876,415**	**28.4%**	**11.2%**	**39.6%**	$1,743
Stow, OH	$35,394,453	$9,186,816	$6,206,506	26.0%	17.5%	43.5%	$1,960
Kent/Franklin, OH	$33,872,937	$6,300,543	$8,315,529	18.6%	24.5%	43.1%	$1,350
Jackson Township, OH	$38,890,660	$13,736,969	$10,030,425	35.3%	25.8%	61.1%	$1,918
Plain Township, OH	$26,412,987	$9,865,850	$3,357,287	37.4%	12.7%	50.1%	$1,813
Barberton, OH	$18,064,465	$6,013,459	$5,845,243	33.3%	32.4%	65.6%	$1,245
New Franklin / Clinton, OH	$14,163,206	$2,393,526	$2,436,110	16.9%	17.2%	34.1%	$1,194
Cuyahoga Falls, OH	$36,292,967	$10,373,776	$10,802,065	28.6%	29.8%	58.3%	$1,166
Massillon,OH	$22,610,279	$6,740,008	$5,523,962	29.8%	24.4%	54.2%	$1,042
Wooster, OH	$27,749,307	$5,840,283	$7,742,066	21.0%	27.9%	48.9%	$1,250
North Canton, OH	$22,913,361	$2,948,517	$3,640,950	12.9%	15.9%	28.8%	$922
Hudson, OH (Split Fire/EMS)	$78,670,625	Fire $1,801,090 EMS $2,011,568	$5,265,150	4.8%	6.7%	11.5%	$1,773
Twinsburg, OH	$29,911,320	$4,908,900	$4,938,894	16.4%	16.5%	32.9%	$1,646
Strongsville, OH	$39,386,500	$8,857,900	$12,148,700	22.5%	30.8%	53.3%	$1,568
Solon, OH	$45,788,638	$9,466,920	$10,277,287	20.7%	22.4%	43.1%	$2,847
Mentor, OH	$79,754,054	$15,595,999	$17,791,171	19.6%	22.3%	41.9%	$1,783
Huber Heights, OH	$75,278,175	$8,063,550	$8,400,420	10.7%	11.2%	21.9%	$1,092
Sidney, OH	$20,571,142	$5,473,394	$6,726,716	26.6%	32.7%	59.3%	$1,287
Trotwood, OH	$22,642,095	$4,057,128	$4,101,350	17.9%	18.1%	36.0%	$598
Elizabethtown, KY	$33,337,715	$2,088,350	$7,359,842	6.3%	22.1%	28.3%	$1,305
Hobart, Indiana	$28,458,668	$4,622,149	$6,031,350	16.2%	21.2%	37.4%	$888
Average	**$36,195,639**	**$7,264,406**	**$7,134,163**	**21.5%**	**21.0%**	**42.5%**	**$1,372**

(Figure 55)

Figure 55 is a comparison chart that shows increasing the percentage of the total City budget dedicated to safety services is not out of line, if it is increased to 42% in 2021 to bring a fourth medic unit into operation or 44% to support a four-station model. Both of these cost levels are in fact reasonably comparable to the average of these comparable departments, 42.5%.

City Council will have to evaluate if 44% of the total operating budget of the City being applied to safety services is an appropriate total in comparison to the other needs of the City. This approach also presumes that Law Enforcement services in the City will continue to be provided by the Summit County Sheriff's Office for the foreseeable future as a move to stand up a City of Green Police Department could reasonably be expected to cost more than contracting with the Sheriff.

CLOSING STATEMENT

This report fulfilled the requirements set forth by Ordinance 2019-08 and documented the study, findings, and recommendations of the Fire Division on how best to improve emergency services response to this southwest region of the City. The recommendation provided will not only improve emergency response to the Southwest region of City but the City as a whole. This was done by addressing all three critical components of emergency response: staffing, apparatus and time. The inherent difficulty in such a report is the perception of need and the tolerance for risk of the reader. This report is not intended to advocate for a given position, it is a factual representation of how to provide a more robust emergency service and an improved response. It will be the task of the City Council and City Administration to interpret these facts, weigh them against the other needs of the City and balance the collective tolerance for risk to determine the appropriate course of action.

REFERENCE MATERIAL

- NFPA 1710 *Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to Public Career Fire Departments (2020 edition*

- ISO Public Protection Classification (PPC^{tm}) Summary Report *Green, Ohio August 2016*

- The National Fire Protection Research Foundation Evaluation of Fire Flow Methodologies January 2014 Fire Protection Research Foundation

- United States Census Website