THE UNIVERSITY of TENNESSEE

MUNICIPAL TECHNICAL ADVISORY SERVICE

CLINTON, TENNESSEE

Fire Station Location Study

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Municipal Technical Advisory Service

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Introduction and Scope of Work

MTAS conducted this study at the request of Clinton Fire Chief Archie Brummitt. MTAS Fire Consultant Dennis Wolf met with Chief Brummitt and Mr. William Riggs to discuss the scope of the study and complete a site visit of the community.

The purpose of this study is to evaluate the city's distribution of fire stations, determine if the locations are adequate, determine if a fire station or stations should be relocated, and determine the optimal location for an additional fire station. The scope of this study included review of distribution requirements in the ISO Fire Suppression Rating Schedule, NFPA requirements, and fire service best practices regarding deployment of resources. Best practices are acceptable performance standards in the fire service that are recognized and used to improve operations and safety. The recommendations provided in this report include consideration of local criteria including the size of the community, land usage, existing and potential use of resources, public perception of services, and geographical features of the community.

The level of fire services provided in any community is a local policy decision made by the elected governing body through the annual budget. The decision is unique to every community and includes factors such as desired response times, growth, increased life risk (schools, daycares, hotels, assisted care facilities, etc.), increased commercial and industrial risk, the desire to maintain or improve services, and the desire to maintain or improve the ISO rating. A fire department is an investment in the community. The Insurance Services Office (ISO) states that, "A community's investment in fire mitigation is a proven and reliable predictor of future fire losses." Clinton has made a significant investment in community fire mitigation through the fire department as reflected in the favorable Class 4 ISO Rating.

A written request from the city authorized MTAS to conduct an official study.

Background

The City of Clinton is the second largest city in, and county seat of, Anderson County, in East Tennessee, approximately eighteen miles northwest of Knoxville and ten miles northeast of Oak Ridge. Clinton has a population of 9,841, an area of 10.77 square miles, and is part of the Knoxville Metropolitan Statistical Area. A Council-Manager form of government governs the city. The seven-member council, which includes the mayor, sets policy and evaluates the management of the city. The city manager oversees all operational activities.

Fire protection and staffing is a local policy issue, and a community must balance local resources against acceptable risk. The City of Clinton provides fire services to its residents through a municipal fire department authorized under Article IV, Section 5 of the city charter and organized under Section 7-301 in the code of ordinances. The fire chief is a city department head and reports to the city manager. The Clinton Fire

Department is a career fire department recognized by the State of Tennessee under TCA 68-102-108 and funded by the city.

As part of the master settlement agreement signed in 2006, Clinton agreed "to build a fire station in the vicinity of I-75 and State Hwy. 61 for the use and benefit of the surrounding businesses and residents." Clinton borrowed money to build said fire station, and the city wants to build the fire station in a location to provide the best service as part of the overall plan of fire service for the community. The proposed location is two miles from an existing fire station, and Clinton wants to know if they should relocate existing stations, build a new station in the area proposed, or look for the most optimal location(s) based on providing the best service to the community.

The Importance of the ISO Rating

This information will assist city leaders in their understanding of the complexities of providing fire protection, assist in the prioritization of community needs, and assist in the decision-making process.

The Insurance Services Office, Inc., also known as ISO, is a for-profit corporation that works for insurance companies to evaluate the capability of a community to suppress fires. ISO rates a community on a scale of 1 through 10. An ISO rating of 1 is the best (only 0.13% of the fire departments in the county have a Class 1 rating). An ISO rating of 10 is equivalent to not having any fire protection. Clinton has a Class 4 rating. ISO rates a community based upon three major categories: communication (10% of the rating), fire department (50% of the rating), and water supply (40% of the rating).

Clinton's Class 4 rating is very good. Just over eight percent of all fire departments in Tennessee have a Class 4 ISO rating, and just forty-three fire departments out of over 732 have a better ISO rating (see Figures 1 and 2). The Class 4 rating means the city is doing the right things to provide good service, and because of this Clinton residents pay very competitive rates for property insurance.

Staffing

The fire department has eighteen career shift personnel, with six assigned to three rotating shifts that work 24-hour tours of duty. Minimum staffing per shift is five firefighters to allow for time off. The fire department has twenty-five active volunteer firefighters. The department staffs Stations 1 and 2 continuously 24/7, and staffs the headquarters station sporadically with staff officers and volunteers. There has been some discussion on using public safety officers (PSO) to augment on-duty staffing.

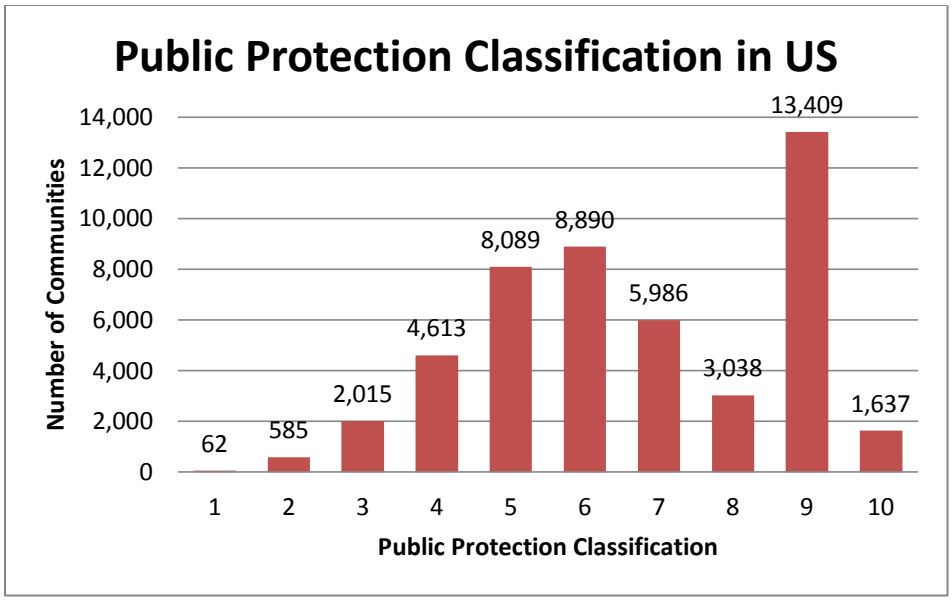

Figure 1 – Public Protection Classification (ISO Rating) in the US

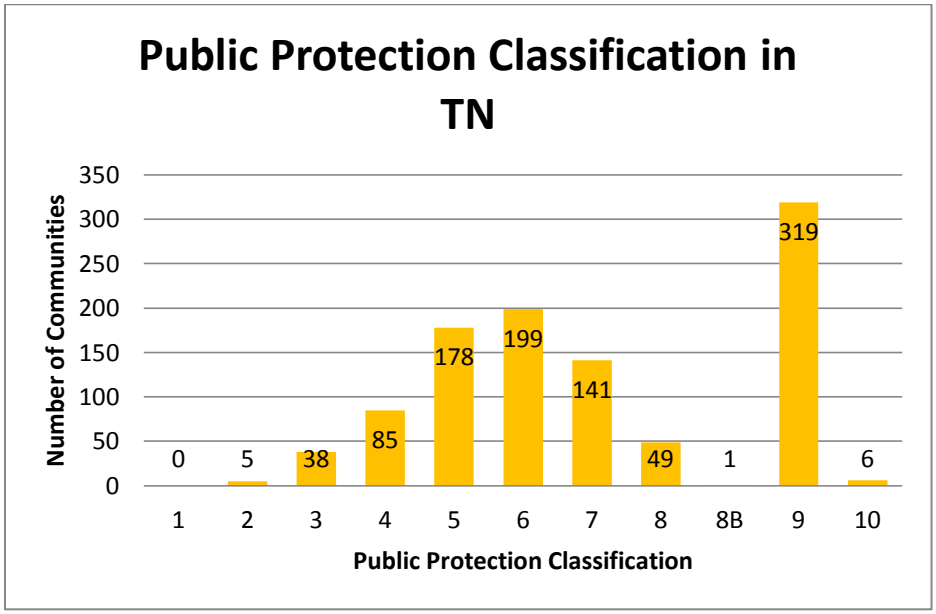

Figure 2 – Public Protection Classification (ISO Rating) in Tennessee

Facilities

Fire stations represent a major capital investment in the community. Clinton has three fire stations as identified in Table 1 and located as shown on the map in Figure 3. The building code classifies a fire station as a storage facility, but people live in them, which makes them unique structures. Fire stations are in use 24/7, contain the mixed-use functions of storage of motorized apparatus, storage of hazardous chemicals, and use as a business office, contain cooking operations, and overnight accommodations for on-

duty crews. Since 2007, the state expects new and existing fire stations to be gender friendly to accommodate men and women working in the same station. Fire stations are part of the community's critical infrastructure and station security should be part of the community's homeland security plan. Fire stations should be capable of continuous operation during disasters. As a rule of thumb, fire stations have a useful designed life of approximately fifty years.

Station	Address
Fire Headquarters	125 West Broad Street
Station 1	100 Longmire Road
Station 2	264 Hiway Drive

Table 1 – Addresses of Clinton Fire Stations

Fire Headquarters is located in city hall and is in the center of the most developed part of Clinton. Station 1 is located north of the downtown area near Veterans Bridge. Station 3 is located in South Clinton in a mainly residential area.

Providing Optimal Locations for Fire Stations

To determine optimal locations, one must first know how many fire stations Clinton needs based on the size of the city, the basic fire flow for the community, and desired level of fire response associated with the Class 4 ISO rating. The map in Figure 4 shows the current city limits, designated by the light blue line and area shaded in white, and the 1.5-mile response areas of the three fire stations. Clinton has conducted a "finger" annexation that has extend the city limits along Tennessee Highway 61 to the north, creating areas separate from the main portion of the city.

The first item to review is the Insurance Services Office (ISO) Fire Suppression Rating Schedule. Section 560 of the schedule covers distribution of companies and states: "The built-upon area of the city should have a first-due engine company within 1½-miles and a ladder-service company within 2½-miles." Clinton's three fire stations are located as shown on the map in Figures 3 and 4. The colored lines indicate the 1.5-mile response area for each fire station. Figure 4 shows the station locations overlaid with the city limits. Areas in white outside of the colored lines are more than 1.5-miles from a fire station.

There is significant overlap (approximately 25%) of the 1.5 miles response zones of Fire Headquarters and Station 1. The overlap helps keep response time low by reducing travel time, but the overlap means that some of the coverage area of each station is not available to provide coverage to other areas of the city. There are times when overlap is desirable, such as when call volume is high, when topography is a factor, or when the method of operation indicates the need for having fire stations close together. Clinton's minimum on-duty staffing level is five firefighters. These five personnel staff Engine 1 and Rescue 2 at Station 1, and Engine 2 at Station 2. The city does not staff the headquarters station continuously.

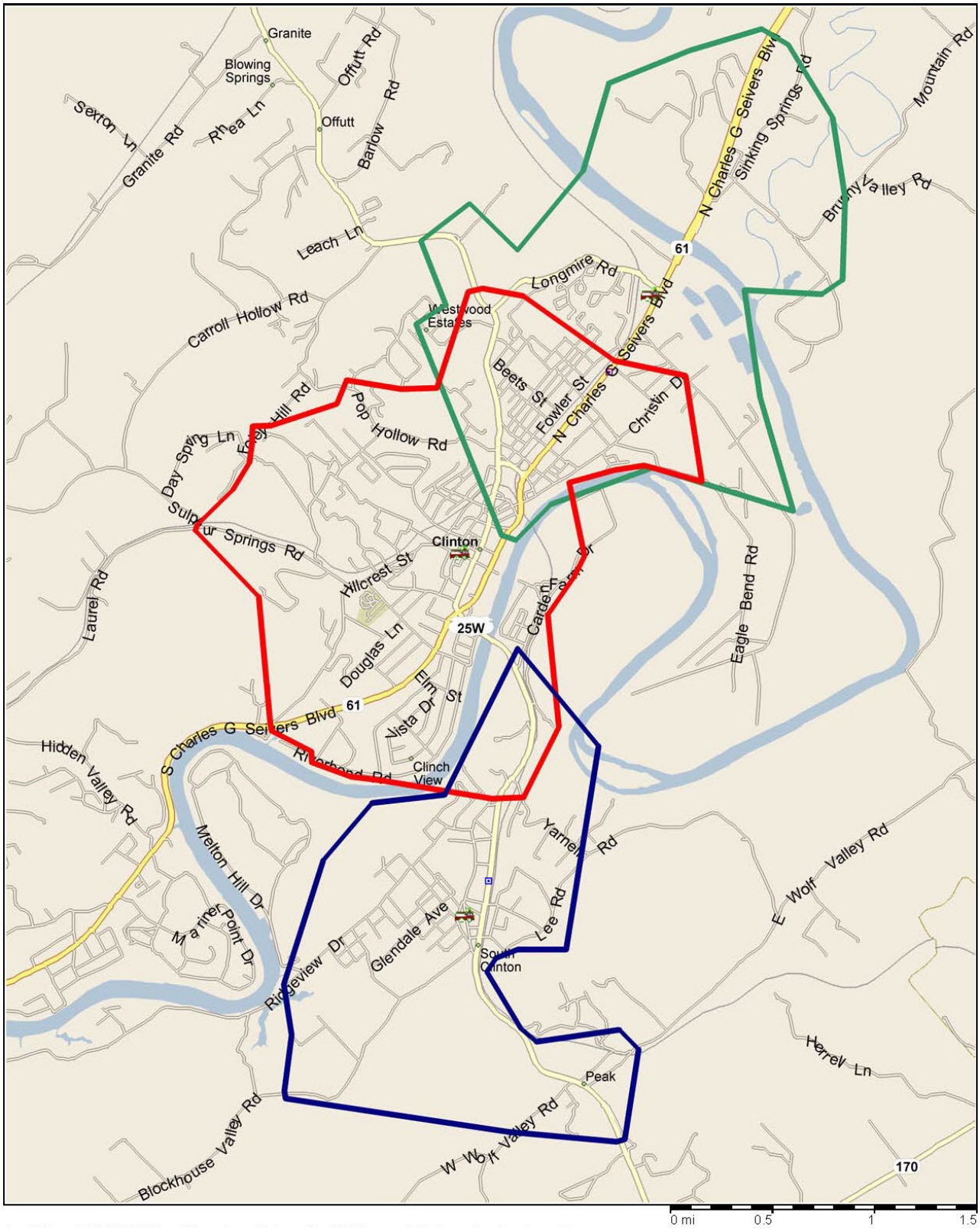

Figure 3 – Clinton Fire Stations and 1.5 Mile Service Areas

The fact that the headquarters station is not staffed continuously means that even though the stations overlap, the engine at headquarters has a delayed response, or may not respond at all. This method of operation cancels out the negative factor of overlapping response districts. Ideally, the city should staff the headquarters station continuously to improve fire protection.

Using an "as the crow flies" radius of 1.5 miles to draw a circle does not adequately represent the geographical area that a single fire station can cover. Studies have shown that a polygon better represents the ISO required response area, and that the average size of the polygon is 4.5 square miles. Two caveats: the polygon model assumes the even distribution of resources throughout the area, which is generally not the case, and the formula does not allow for geographical barriers, such as rivers and railroads, but the formula is useful as a reference. Based upon the 10.77 square miles within the city limits, a travel distance of 1.5 miles, and assuming all engine companies are evenly distributed throughout the ten square mile service area (which they are not) Clinton needs 2.4 fire stations right now for adequate coverage.

One can use the polygon model to determine the number of needed ladder trucks or service companies based upon ISO's maximum travel distance of 2.5 miles for a ladder or service company. The average size of a polygon for a ladder or service company is 12.3 square miles. Based upon a ten square mile service area, a travel distance of 2.5 miles, and assuming all ladder or service companies are evenly distributed throughout the service area (which they are not) Clinton needs 0.88 ladder companies right now.

The second resource is the National Fire Protection Association (NFPA). NFPA addresses the number of fire stations needed in an indirect way based on minimum response times. NFPA Standard 1710 Section 5.2.4.1.1 allows a 240 second (4 minute) travel time for the first arriving engine company. Using an empirical model called the piece-wise linear travel time function, based upon studies done by the Rand Institute estimating the average response speed of fire apparatus at 35 mph, one can determine that the distance a fire engine can travel in 4 minutes is approximately 1.97 miles. A polygon based on a 1.97 mile travel distance covers on average 7.3 square miles. Based upon a 10.77 square mile service area, a travel-time-calculated travel distance of 1.97 miles, and providing assuming all stations are evenly distributed throughout the service area (which they are not) Clinton needs 1.48 fire stations right now.

In reality, the area of the city is not evenly distributed, the river, the railroad, and topography are significant factors affecting response routes, and strip annexation has extended the corporate limits far beyond what the three fire stations can cover adequately.

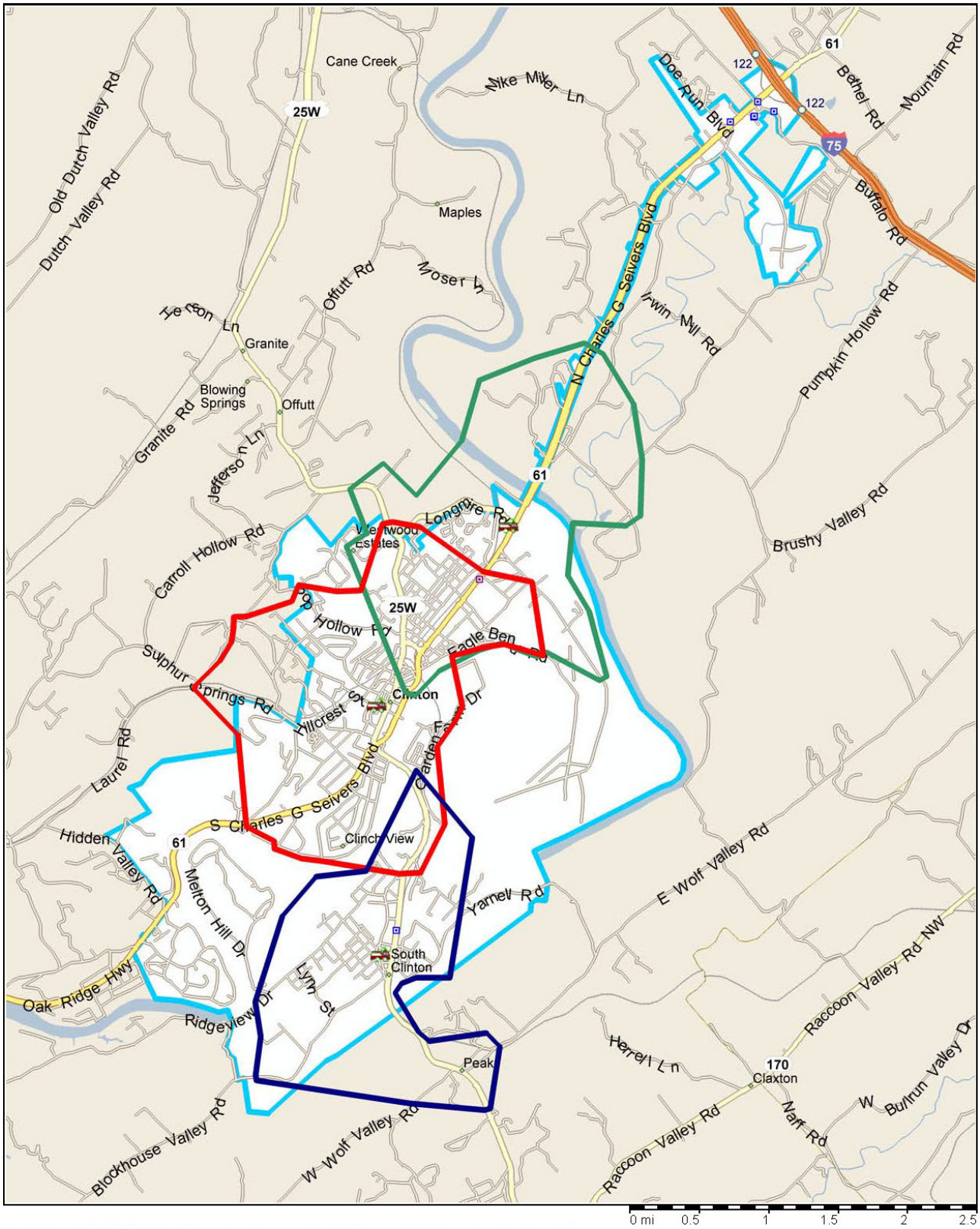

Figure 4 – City Limits and 1.5-Mile Service Areas of Fire Stations

The previous two examples are based upon time and distance to be covered. A third resource is the ISO Fire Suppression Rating Schedule's determination of needed engine companies based upon the community's basic (needed) fire flow. Section 510 of the schedule requires one engine company for a basic fire flow of 500 to 1,000 gpm, two engine companies for a basic fire flow of 1,250 to 2,500 gpm, and three engine companies for a basic fire flow of 3,000 to 3,500 gpm. Basic fire flow is calculated by determining the needed fire flow for all non-sprinklered properties in the community, and then the fifth highest is considered the basic fire flow for the community. For Clinton, that is 3,500 gallons-per-minute. For full ISO credit, the city needs to have enough fire engines on the scene to provide a total pump capacity of at least 3,500 gpm. A strong commercial and residential sprinkler ordinance can limit significantly community risk, as ISO does not consider properties protected by automatic sprinkler systems when determining the basic fire flow, and sprinklered properties reduce the fire risk in the community. Clinton has adopted model codes that require fire sprinklers in commercial occupancies, and Clinton should consider adopting a residential sprinkler ordinance for one and two-family homes to reduce fire risk to the community.

Finally, city leaders must consider the phenomenon known as flashover. As a fire grows in size, it gives off temperatures that heat other objects near the fire. At some point in the time-temperature curve, all of the objects in the fire room reach their ignition temperature and ignite. The entire room bursts into flames, and the temperature rises to a point where no person can survive, including firefighters. This is flashover. The NFPA Fire Protection Handbook states: "During flashover, however, the temperature rises very sharply to such a level that survival of persons still in the room at that stage becomes unlikely. Thus the time interval between the start of the fire and the occurrence of flashover is a major factor in the time that is available for safe evacuation of the fire area." The development of fire conditions to reach the point of flashover is a function of temperature rise over time. Therefore, a sufficient number of fire stations strategically located to provide quick response times could reduce the incidence of flashover, thus saving lives and property. As shown in the graph in Figure 5, flashover can occur within 9 to 11 minutes of the start of a fire. Locating fire stations to provide a total response time of six to seven minutes is advantageous, as firefighters need time after arrival to setup, lay fire hose, and gain access to the seat of the fire before they can actually begin to search for trapped occupants or extinguish the fire. This is where having enough fire stations strategically located and apparatus staffed with a sufficient number of firefighters proves to be advantageous.

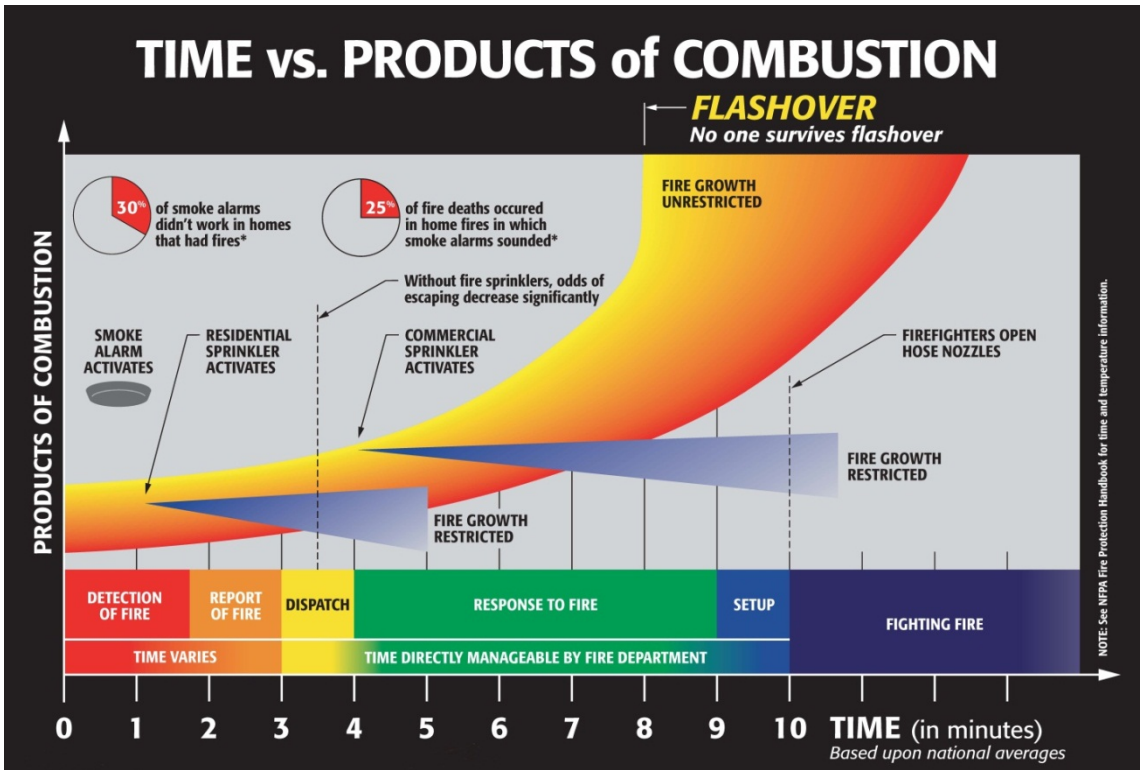

Figure 5 – Time versus Products of Combustion

Discussion of Fire Station Locations and Need for an Additional Station

Clinton's three fire stations are not optimally located. Though the size of the city in square miles may indicate a need for fewer stations, the topography, railroad, and newly annexed areas indicated the need to relocate one fire station and add a fourth fire station.

If possible, the city should relocate the headquarters fire station to an area near South Charles G. Seivers Boulevard and Hicks Circle, though available land may be a problem. A fire station located in this area would be close enough to serve downtown and would extend the 1.5-mile response coverage to the Forest Trails, Wealdwood, and Mariner Point areas. Relocating the station would decrease the overlap, which would increase the percent of area within 1.5-miles of a fire station and improve the ISO score for distribution. An engine company located here would have a good response route using the Highway 61 bridge over the Clinch River to backup Station 2, and Highway 61 provides a fast route north to backup Station 1.

Station 1 is in a good location. The station is close enough to serve the downtown area and is the first due station for the Eagle Bend area industrial park. The proximity to Highway 61 gives the station quick access to a fast route to the north and south to backup Fire Headquarters and Station 2.

Station 2 is in a good location to cover the developed area in southeast Clinton. There is no significant benefit to relocating this station as moving the station further north would reduce the coverage in the developed area to the south. Because of the river and topography, this area needs a fire station.

Because of the layout of the city, Fire Headquarters is not in the best location. MTAS recommends staffing Fire Headquarters now to improve response times and service levels. Relocating Fire Headquarters in the future will improve response times in the southern portion of the city and improve the distribution score under the ISO grading schedule. This is important for the city to understand because of the desire to maintain the ISO Class 4 rating. The map in Figure 6 shows a possible location for Fire Headquarters and the associated 1.5-mile ISO defined response area outlined in bright green. The red outline marks the current 1.5-mile service area of Fire Headquarters, and the dark green outline marks the service area of Fire Station 1. MTAS acknowledges that the city must find available land, but this map gives an indication of the change in response areas.

Location of the Additional Station

There are two proposed locations for an additional fire station. For the purpose of discussion, the locations are labeled A and B on the map in Figure 7. Location A is on Highway 61 near Bland Road. Location B is on Highway 61 near Alpine Drive. The map in Figure 7 shows the two locations with their associated 1.5-mile ISO response areas. The yellow line indicates the response area for location A, and the blue line illustrates the response area for location B. Though both locations are suitable, location B is preferred. The response area of location B includes more already annexed area and includes the I-75 interchange. Location B includes more of the industrial park, and has minimal overlap with the response area of Station 2. Of the two locations, location B provides the best coverage as future annexations occur and the city annexes its urban growth boundary.

The site the city chooses should be a minimum of two acres and located near, but not necessarily on, a major road. A minimum two-bay drive through station with bays deep enough to accommodate two pumpers in-line would serve the community for many years to come. The city could use this as an opportunity to address other space needs for the fire department, such as for office space, classrooms, and storage space, and include these uses in the station's design.

Special Considerations for Fire Station Design and Construction

Fire stations represent a major capital investment in the community and are unique buildings. The building code classifies a fire station as a storage facility, but people live in them, which makes them unique structures. Fire stations are in use 24/7, contain the mixed-use functions of storage of motorized apparatus, storage of hazardous chemicals, and use as a business office, contain cooking operations, and overnight

accommodations for on-duty crews. Since 2007, the state expects new and existing fire stations to be gender friendly to accommodate men and women working in the same station. Fire stations are part of the community's critical infrastructure and station security should be part of the community's homeland security plan. Fire stations should be capable of continuous operation during disasters. As a rule of thumb, fire stations have a useful designed life of approximately fifty years.

Modern fire apparatus is larger and heavier than apparatus designed twenty years ago. Innovations including high side compartments, mechanical/hydraulic ladder racks, topside storage compartments, elevated waterways, aerial ladders, platforms, and on-board foam systems have resulted in larger, wider, and taller apparatus. The use of polyethylene water tanks has increased the amount of water that a fire truck can carry, which in turn increases the weight, which means bay floors must be capable of supporting heavier fire trucks. The maximum height of a fire truck is 13' 6", but not all fire trucks are that tall. Depending upon the amount of storage space desired and the amount of water carried, most fire pumpers are at least twenty-four feet long, with lengths of thirty-two feet being common. Aerial ladder trucks and platforms are longer. Aerial ladder trucks have lengths starting around thirty-nine feet, and platforms have lengths starting around forty-seven feet. Drive-through stations offer the best accommodations for fire apparatus.

A fire station is an essential facility for the community and should be self-sufficient for major emergencies (power outages, ice storms, etc.) and immediately occupiable following an earthquake of a magnitude possible for the community, which is an M5.5 for Anderson County. Anderson County is at risk for tornadoes, and all new stations should have a safe room for firefighters to use during tornado warnings.

The city should consider using energy efficient design, energy efficient heating and cooling systems, and energy efficient appliances in the station, which will reduce operating costs for years to come. A fire station is a complex building, and Clinton should use professional architects, engineers, and contractors who are familiar with the special requirements and needs for fire stations for this project.

How Many Ladder or Service Companies Does Clinton Need?

A community needs a ladder company when it has at least five buildings that are at least three stories, or more than thirty-five feet in height, or five or more buildings with a needed fire flow greater than 3,500 gpm, or a combination of five buildings meeting these criteria. Clinton has enough buildings to require a ladder truck under ISO requirements. ISO states that if the community does not need a ladder company, a service company is then required. A service company carries the same tools and equipment as a ladder company, but does not have the aerial ladder. Based on ISO's requirements for distribution, Clinton needs one ladder company. A ladder company has an ISO response district of 2.5-miles as measured over roads, so the ladder truck should be centrally located for optimal coverage.

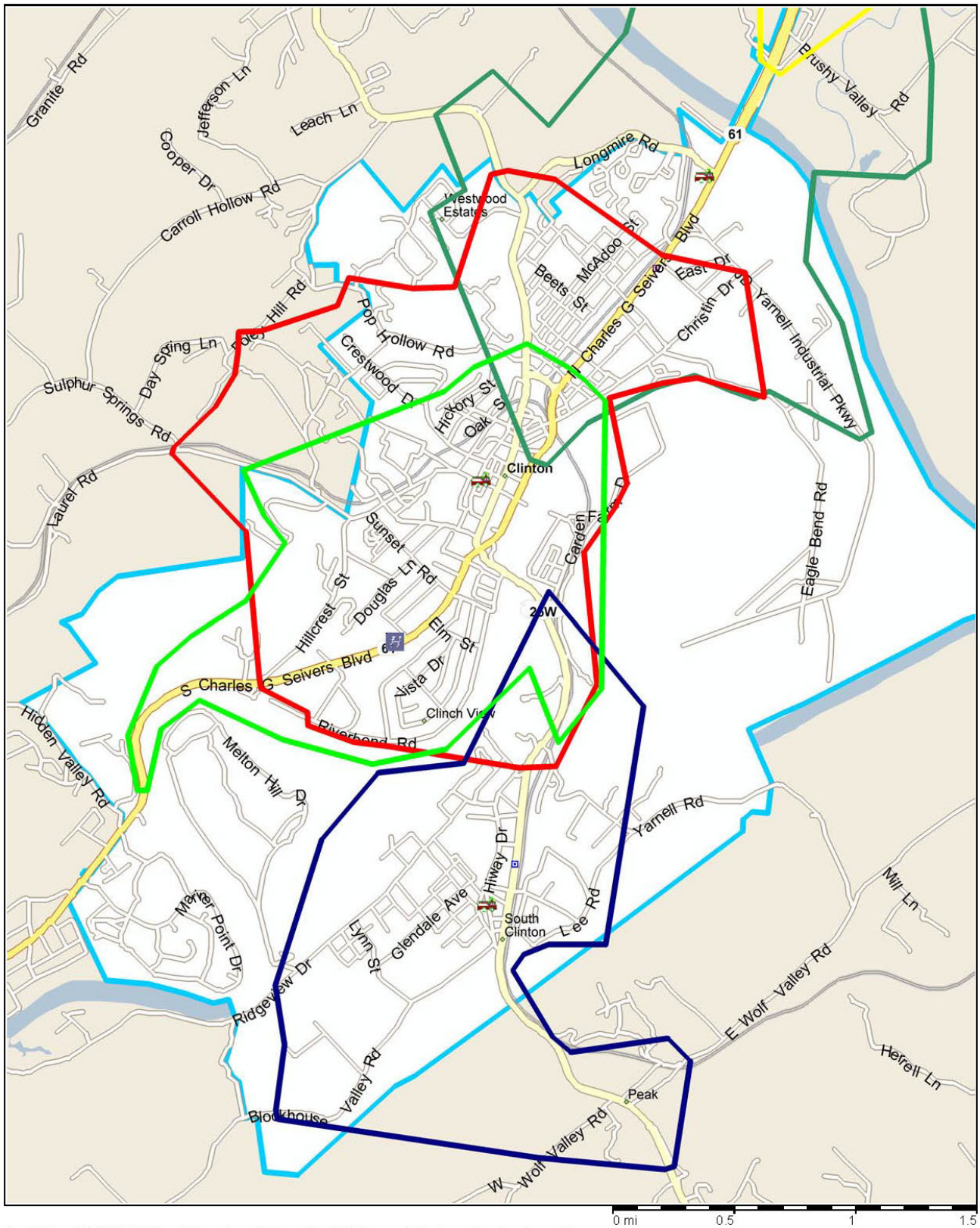

Figure 6 – Possible Relocation Site for Fire Headquarters

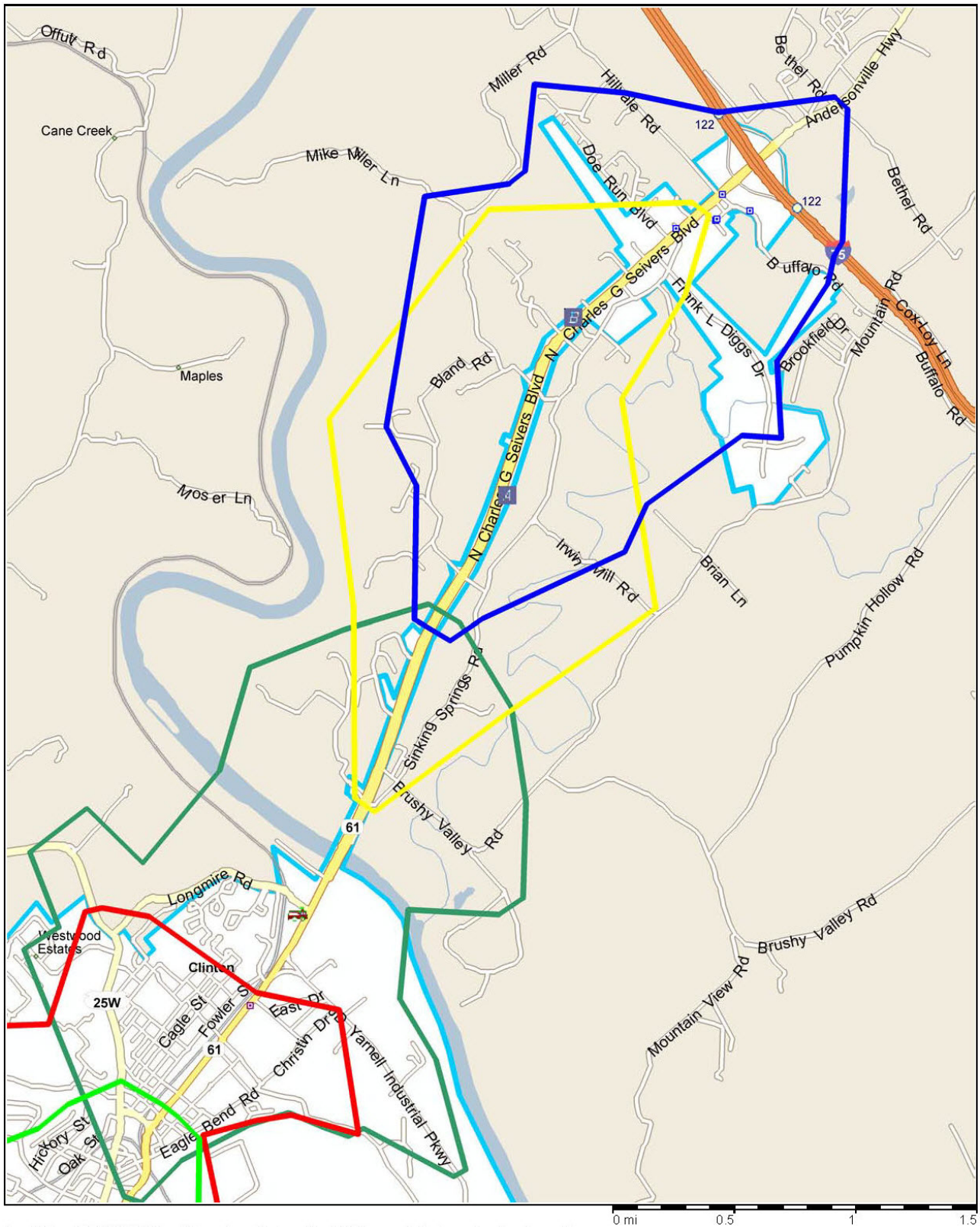

Figure 7 – Proposed Locations for Additional Fire Station

Staffing Considerations

Firefighting is a dangerous and labor-intensive operation, and the discussion on the number of firefighters needed to fight a fire continues, but there are guidelines one can use to make an informed decision on the number of firefighters needed to fight a structure fire. Back in 1966, NFPA Standard 197, A Training Standard on Initial Fire Attack, stated, "*The desirable number of men normally required to respond with the apparatus to give this level of performance with properly manned hose streams and equipment would be approximately fifteen plus the chief.*" NFPA Standard 1710 replaced NFPA Standard 197 in 1979, but the idea of a minimum of fifteen firefighters plus an incident commander as a valid minimum number of personnel for the initial alarm has withstood the test of time. Since then, various agencies have conducted many studies over the years regarding the number of firefighters needed to extinguish a fire, and there is consensus among NFPA, ISO, and the International City Management Association (ICMA) that a low-risk structure fire requires between sixteen to nineteen firefighters for effective operations. A single-family dwelling is an example of a low-risk structure fire. For example, ISO gives full staffing credit for a response of nineteen personnel. NFPA recommends a minimum of sixteen firefighters as shown in Table 2 and typically deployed as illustrated in Figure 8.

Initial full-alarm structure fire assignment per NFPA 1710, § 5.2.4.2.2		
Sub-section	Function	Minimum Number
(1)	Incident command	1
(2)	Water supply & attack pumper operators	2
(3)	Two hand lines with 2 firefighters each	4
(4)	Hand line support, 1 for each hand line	2
(5)	Search and rescue	2
(6)	Ventilation	2
(7)	Aerial device operator (only if aerial used)	1
(8)	Rapid Intervention Team (RIT)	2
	Total	**16**

Table 2 – NFPA Recommended Minimum Response for House Fire

The response level described above is for a residential structure fire of a house of about 2,000 square feet with no basement or exposures. NFPA 1710 Section 5.2.4.2.3 says that higher risk occupancies (schools, hospitals, apartments, commercial properties, etc.) require more resources, which means more apparatus and personnel. Local leaders must decide on a level of fire protection for their community, balancing the cost of providing the service against the lives and property at risk. To make this decision, it is important for the leaders to understand minimum response recommendations. This report acknowledges that Clinton currently does not have the financial resources to hire enough paid personnel to provide that level of response to a structure fire. The use of volunteers, automatic aid and mutual aid can provide a sufficient number of trained

firefighters but these methods take more time to assemble an effective firefighting team of sixteen personnel.

The fire department has about twenty-five active Volunteers. Volunteer response provides additional staff for on-scene operations and costs less than paid personnel. However, volunteer response is usually dependent upon the time of day and day of the week as most volunteers have full-time jobs. A fire department may use volunteers to augment station staffing when volunteers "ride out" at the fire station alongside paid personnel. There are benefits to this practice. If the fire department has a volunteer shift staffing policy, and documents the ride out time, ISO will count the volunteer as being "on-duty," which means the fire department gets the same staffing credit for the ride out time as it does for having a paid firefighter in the station. Volunteers who ride out arrive at the same time as the paid personnel, and are able to go to work immediately, whereas volunteer response from home is delayed.

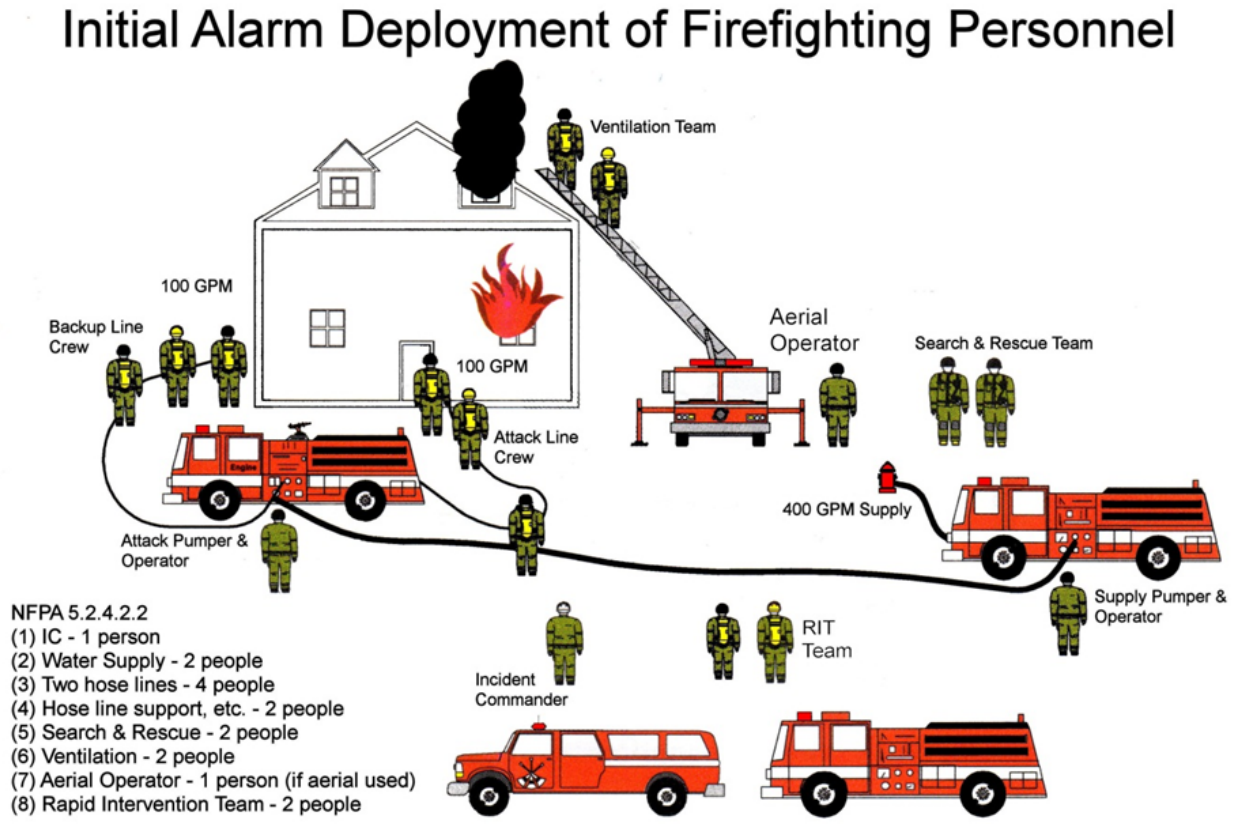

Figure 8 – Initial Alarm Deployment of Firefighting Personnel

Summary

The residents and businesses of Clinton are well served by the Clinton Fire Department as evidenced by the Class 4 ISO rating. The city desires to maintain the Class 4 rating, and distribution (the number and location of fire stations throughout the service area) is part of the rating, as is staffing. Immediate challenges include adding a fourth station as required by the master settlement agreement, and increasing on-duty staffing.

Staffing Recommendations

With respect to on-duty staffing, the community needs three fire engines and a truck company. ISO gives full credit for staffing at six firefighters per apparatus, so for full ISO staffing credit, Clinton needs twenty-four firefighters on-duty every day. ISO credits volunteers as on-call firefighters using a 3:1 ratio, where three on-call firefighters (volunteers) responding to a fire equal one on-duty firefighter.

The city has considered using public safety officers to augment on-duty staffing, but MTAS does not recommend this option. While it is common to refer to police and fire in the same breath, the jobs are very different and require different skill sets. Police officers and firefighters must meet minimum training standards annually, and both disciplines have levels of certification. Firefighters should have 240 hours of training annually, and be certified through the level of Fire Fighter II through the state. If the firefighter has first responder certification or an EMT or paramedic license, additional training hours are required for recertification. Police officers have annual training requirements, too, and must maintain proficiency in the use of firearms, and it is difficult to schedule enough time for the training required for both disciplines without reducing the number of hours devoted to work or patrol. Some cities using public safety officers have reported that the PSOs are not readily available to respond to fires because of police activities and that a working fire depletes the number of officers on patrol and reduces police presence. Cities have reported that police officers who respond and perform firefighting duties must be taken out of service to clean up and change into a fresh uniform before returning to patrol duties, which contributes to reduced patrol time.

MTAS recognizes that Clinton has limited financial resources because of the economy, but if Clinton wants to increase the number of firefighters on-duty, MTAS recommends that the city hire additional firefighters and staff Fire Headquarters 24/7. While research has shown that four-person crews are the most effective in fire suppression operations, many cities staff fire apparatus with three-person crews, and for Clinton MTAS recommends a minimum staffing level of three firefighters per engine or truck augmented by strong volunteer response.

Managing a volunteer program requires a lot of time and effort, and the fire department should appoint someone to serve as a volunteer coordinator to oversee the volunteer program and promote recruitment and retention of volunteers. MTAS has several resources available through Knowledge Base on the MTAS website to provide ideas on

recruitment and retention, as well as a sample volunteer shift staffing policy. The MTAS website is at http://www.mtas.tennessee.edu.

Fire Station Recommendations

The recommended option is for the city to leave Stations 1 and 2 where they are, as these current locations provide good coverage. The river and topography require that the area served by Station 2 have a fire station, and there is no benefit to moving Station 2 to another location in that area. The city should staff the Headquarters station as soon as possible, and begin a capital improvement project to find suitable land to relocate the Headquarters station in the future. The city should proceed with acquiring proposed location B as a site for the additional fire station.

Planning Recommendations

All of these items requiring planning and funding. The best way to examine and prioritize these needs is through a comprehensive strategic plan. The fire department should develop a strategic plan with short and long-range goals and objectives tied to the level of risk present in the community and the level of fire protection desired. The plan will serve as a roadmap for the city in planning and budgeting for maintaining and improving service levels.

Recommendations

1. When financially practical and possible, staff Fire Headquarters 24/7. Adopt a minimum staffing policy of three firefighters per engine and truck.
2. Adopt a minimum response policy based on NFPA 1710 to provide a minimum of sixteen firefighters on the scene of a low-hazard structure fire, and to provide more firefighters on the initial response as the risk increases.
3. Adopt a response time standard for the initial arriving company that includes all components of response time. Clinton is a perpetual organization that will outlast current leaders, and this study looks towards eventual build out, which is many years in the future. Once adopted, the response time standard will serve as a planning guide for future leaders. This study recommends a response time standard of 6:35 (six minutes, 35 seconds) for 90% of all responses, which is based upon recommendations found in NFPA Standard 1710, Standard for the Organization and Deployment of Fire Suppression Operations. The 6:35 breaks down as follows: ring time – 15 seconds, call processing time – 60 seconds, firefighter turnout time – 80 seconds, travel time – 240 seconds. Using this standard, planners would look for fire station locations to maintain a 4 minute travel time to as much of the area to be protected as possible. Track and report response time monthly. Use the table in Appendix A, showing estimated response times and travel distance times, as a resource.
4. Adopt a response time standard for the full first alarm assignment that includes all components of response time. This study recommends a first alarm response time standard of 10:35 (ten minutes, 35 seconds) for 90% of all responses, which is based upon recommendations found in NFPA Standard 1710, Standard for the Organization and Deployment of Fire Suppression Operations. The 10:35 breaks down as follows: ring time – 15 seconds, call processing time – 60 seconds, firefighter turnout time – 80 seconds, travel time – 480 seconds. Monitoring this benchmark will help community leaders determine if the fire department is meeting the desired service level for the community. Track and report the full first alarm response time monthly.
5. Using a shift staffing policy that meets ISO requirements, have volunteers ride out regularly at the fire stations to increase on-duty staffing levels.
6. Build a fourth fire station on Highway 61 near Alpine Drive. Complete a space needs study for the fire department before designing the fire station. Use architects and contractors who are familiar with the unique uses and needs of fire stations.
7. Plan for and construct a fire station to serve the southwestern portion of the community. Before designing the station, perform an assessment of the space needs (offices, storage, training, backup emergency operations center, etc.) for the fire department and incorporate these needs in the new station.
8. Develop a strategic plan for fire services. The plan should state the desired service level for the community, identify goals and objectives to achieve the desired level of service, identify desired performance measures to monitor progress, include a time line, and identify key individuals responsible for specific goals and objectives.

Appendix A – Estimated Travel Times and Total Response Time in Minutes

Distance To Travel in Miles	Estimated Travel Time	Ring Time	Call Processing Time	Fire Dept. Turnout Time	Total Response Time
0.25	1.08	0.25	1.00	1.33	3.66
0.38	1.30	0.25	1.00	1.33	3.88
0.50	1.50	0.25	1.00	1.33	4.08
0.75	1.93	0.25	1.00	1.33	4.51
1.00	2.35	0.25	1.00	1.33	4.93
1.25	2.78	0.25	1.00	1.33	5.36
1.50	3.20	0.25	1.00	1.33	5.78
1.75	3.63	0.25	1.00	1.33	6.21
2.00	4.05	0.25	1.00	1.33	6.63
2.25	4.48	0.25	1.00	1.33	7.06
2.50	4.90	0.25	1.00	1.33	7.48
2.75	5.33	0.25	1.00	1.33	7.91
3.00	5.75	0.25	1.00	1.33	8.33
3.25	6.18	0.25	1.00	1.33	8.76
3.50	6.60	0.25	1.00	1.33	9.18
3.75	7.03	0.25	1.00	1.33	9.61
4.00	7.45	0.25	1.00	1.33	10.03
4.25	7.88	0.25	1.00	1.33	10.46
4.50	8.30	0.25	1.00	1.33	10.88
4.75	8.73	0.25	1.00	1.33	11.31
5.00	9.15	0.25	1.00	1.33	11.73
5.25	9.58	0.25	1.00	1.33	12.16
5.50	10.00	0.25	1.00	1.33	12.58
5.75	10.43	0.25	1.00	1.33	13.01
6.00	10.85	0.25	1.00	1.33	13.43
6.25	11.28	0.25	1.00	1.33	13.86
6.50	11.70	0.25	1.00	1.33	14.28
6.75	12.13	0.25	1.00	1.33	14.71
7.00	12.55	0.25	1.00	1.33	15.13

Notes:

- Travel time was calculated using the Rand formula of T = 1.7(D) to estimate travel time, where T is time and D is the distance to be covered expressed in miles.
- The 15-second ring time, 60-second call processing time, and 80-second turnout time are based on recommendations found in NFPA Standard 1710.
- Minutes are expressed as decimal minutes: to compute seconds, multiply the decimal number by 60. For example, 3.66 decimal minutes equals 3:40 (three minutes, forty seconds).

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