FIRE STATION LOCATION ANALYSIS AND STRATEGIC PLANNING INITIATIVE

FY 2024-2025

Town of Shallotte Fire Department

Shallotte, North Carolina.

A Progressive Local Government Initiative Compiled & Presented by NC Fire Chief Consulting

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Approved Scope of Work and Project Disclaimer

NCFCC 2024-2025 Shallotte Fire Department Fire Station Location Analysis and Strategic Planning Initiative

1. **GIS Analysis of Shallotte Fire Stations Relative to Potential Needs and Any Re-Deployment Options.**

Current Conditions/Benchmarking Analysis

1. Current base map with the fire protection service area and Fire stations.
2. Current drive time map, based on NFPA 1710 for municipal areas and NFPA 1720 for unincorporated areas, identifying gaps and redundancies.
3. Effective firefighting force extent map by apparatus and number of staff.
4. Service demand heat map depicting the amount reached by drive time and classifying demand levels into risk rankings.
5. Residential population density map, classified into risk rankings.
6. Land use/Zoning risk classification analysis, classified into risk rankings.

Future Station Planning

1. Future deployment scenarios measured against scored combined matrix of population risk, demand risk and land use risk.
    1. Current fire stations score as a benchmark for the following scenarios:
        i. After consultation with draft findings, determine anchor and relocatable stations and determine optimal locations for relocatable stations and measure coverage score.
        ii. Additional station (s) as necessary to improve the coverage score.
        iii. Additional apparatus needed to improve the effective firefighting force (ERF).

GIS Deliverables:

*All work is data dependent and, at times, require concomitant analyses in order to perform.

*Electronic file images as .jpeg or .png format.

2. **Data Analysis of RMS**

Conduct an analysis of available data as possible from your records management system as data is available with full reporting capability using PowerPivot plus any recoverable data to achieve as much credible data as possible. Determine a baseline

level of performance for Shallotte Fire Department and compare that to the benchmark performance for emergency events at the 90th percentile (municipal) and 80th percentile (unincorporated). Note that the outcomes will be reflected in the data/information that NCFCC is provided.

3. Fire Station Needs Programming

NCFCC will provide a fire station programming fire facility and design spreadsheet and/or handbook to be completed by Shallotte Fire Department staff to determine the needed size and scale of fire stations. This includes:

- Apparatus and Support Areas
- Private Spaces
- Public Spaces
- Training Activities
- Other Activities

Subsequently, NCFCC will consult with an architectural specialist and provide general cost estimates for the new station facilities based upon current market conditions and provide cost estimates for future fiscal years based upon best practice. This information will provide critical capital improvement plan costing and planning information.

4. Critical Task Analysis:

NCFCC would collaborate with Shallotte to conduct the following hands-on fire scenarios in-person and on-site in Shallotte:

- *Residential Fire Scenario,*
- *Commercial Fire Scenario,*
- *Ladder Company Scenario (if applicable),*
- *EMS Scenario,*
- *Rescue Scenario – Simple Extrication (if applicable)*

We would design each exercise to measure the current operation and measure the effectiveness of increasing personnel on each exercise. Multiple measurements would be taken by two SMEs for credibility to provide current performance and future efficiencies.

An executive summary of the outcome of the critical task analysis will be provided, including applicable charts and graphs. This exercise will also provide significantly valuable training for the participating Shallotte Fire Department personnel. The hour estimate provided includes us partnering with Brunswick Community College to minimize costs to the Town of Shallotte for this component. We would need Shallotte's cooperation in working with the college.

5. Review Compilation of Data and Construct Observations and Recommendations Report for the Fire Chief.

Based upon the GIS analysis, data analysis, and community risk data, the NCFCC team will develop and prepare a recommendations report for use by Shallotte to assist in making informed decisions in assessing effective and efficient fire station locations in the short-term & long-term. This report will focus on an executive summary of key points and take-aways.

NCFCC will hold frequent virtual meetings with Shallotte Fire Department personnel throughout the process to keep key stakeholders informed of the progress. NCFCC will also be available to the Fire Chief post submission for additional follow up as necessary.

Project Disclaimer:

This project has been conducted upon the written request of the Town of Shallotte Fire Department. The sole intent of this project is to improve, advance and strengthen the fire protection service delivery system in Shallotte, Brunswick County, and the State of North Carolina. Persons involved in this report have contributed for the purposes of providing information, professional observations and recommendations to the town elected officials, management, and the fire service leadership. Recommendations included in this report are based upon professional experience and understanding of current fire and rescue service best practices. Examples and references in the document are for informational purposes only. Information contained within this document is not intended to be comprehensive, and recommendations are based on limited information available at this time. As with any project based on a snapshot in time, additional facts, local issues and/or changes in the facts could alter the conclusions and recommendations in this document. This document is solely to be utilized by local government and fire service officials for long-term planning purposes. It should not be utilized for any other purpose. No warranties or guarantees (express or implied) are provided. While this document will hopefully assist local officials in their deliberative and long-term planning process, it should be recognized that there are many local issues that may impact the ultimate decisions and what works for a particular jurisdiction. The ultimate decision-making lies with the appropriate local government and fire officials.

Project Executive Summary

As many North Carolina communities grow and demands for public services increase, changes and modifications are often needed in service delivery systems, including fire station facilities and infrastructure that are necessary to support essential, core public safety services. When dynamics change, the infrastructure and systems must enable and support essential functions. These "growing pains" are a natural progression of the maturity cycle of a local government unit and are not unique to Shallotte.

However, the Town of Shallotte Fire Department is aware of the changing environment and has proactively stepped forward to implement progressive measures to effectively manage that growth and transition, such as initiating an independent, third-party, strategic analysis of optimum locations for fire stations in the Shallotte community including analysis of response data. In addition, Shallotte is seeking to holistically improve through a concentration of evaluating critical task analysis. Shallotte selected North Carolina Fire Chief Consulting (NCFCC) to assist them in this critical endeavor. NCFCC focuses on strengthening the fire service in North Carolina and serves as the exclusive fire consulting provider for both the North Carolina League of Municipalities and the North Carolina Association of County Commissioners.

Overall, Purpose and General Methodology:

The core purpose of this initiative was to evaluate the **overall needs for fire stations within the Town of Shallotte and provide essential strategic planning elements.** The focus was to evaluate the demonstrated performance of the Shallotte Fire Department with the current resources and fire stations and project how that level of service/coverage would improve with the addition of subsequent fire stations, or potential relocation of fire stations. Shallotte has experienced growth and promises to continue to grow in the foreseeable future. A long-term plan for fire station facility needs will enable Shallotte town leadership to properly plan for future capital needs to ensure that people served by the Shallotte Fire Department receive timely emergency responses to fire and rescue calls for service.

To accomplish these important tasks, NCFCC evaluated the last six (6) full fiscal years of **emergency incident response records** of the Shallotte Fire Department utilizing PowerPivot technology to determine the levels of service that the fire department has been able to successfully and consistently provide their community. NCFCC developed a dynamic statistical analysis of incident data for the Shallotte Fire Department to determine the level of service that the

department can provide at the 90th percentile (based on population density and use of the national consensus standards), or simply what level of service can the department provide 90 percent of the time that someone dials 9-1-1 and needs emergency assistance.

NCFCC utilized state-of-the-art **geographical information computer systems** (GIS) that compile enormous amounts of geospatial data from Brunswick County and process that data to develop models and design systems to make these determinations. The computer system is designed around insurance services office rating systems and fire service industry standards and best practices. From all available data, a comprehensive vulnerability risk index (VRI score) for each area of the Shallotte community is established, which helps determine station needs and the most optimal distribution for fire station locations.

To best determine the effectiveness and efficiency of Shallotte's staffing levels, a **critical task analysis** (CTA) was conducted with all three shifts within the Shallotte Fire Department. Emergency scenarios are presented to different sized crews to determine the department's capabilities.

Input was collected from Shallotte personnel regarding **fire station facility needs** relative to size and space requirements. This information was reviewed by a fire station architect, who provided some guidance to overall building size needs and projected costs, which can be valuable when developing capital improvement plans for the Town of Shallotte.

All the above **data was comprehensively reviewed** by NCFCC's well-experienced team of long tenured and highly experienced fire chiefs who have worked extensively with fire protection service delivery systems, fire operations, fire station location and construction, fire fighter staffing and fire service management for many years. Certain specific recommendations have been noted within the report, and supplemental information is included in the appendix of this comprehensive report.

Overview:

Shallotte Fire Department is currently a fully career department that serves the Town of Shallotte and service district beyond the incorporated areas in Brunswick County. The Town of Shallotte is in the southeastern portion of the county and is a short distance from several other municipalities and combination fire departments. The department has three fire stations, but only Station 1, off Main Street in downtown is staffed. Station 1 is staffed with a minimum of 3 firefighters who staff the engine company unless the ladder truck is needed. The two additional stations currently house reserve apparatus for the department. The

current daily minimum staffing level for the department is 3 firefighters per shift. The assigned staffing for each shift is 5 firefighters. The Fire Chief and Deputy Fire Chief both work a traditional weekday schedule and respond to calls as needed. During nights and weekends, the chief officers respond from home. The department works with multiple municipal and private nonprofit fire departments that provide auto/mutual aid. The Town of Shallotte is in Brunswick County and serves as a commercial hub for residents and tourists visiting the nearby beaches.

Emergency Response Records Analysis:

The Shallotte Fire Department is a 3-station career fire department that staffs the headquarters fire station. The department provides services to the Town of Shallotte and to an unincorporated area of Brunswick County. In both FY 22-23 and FY 23-24, Shallotte Fire staffed Engine 3 with an average of approximately 3.6 persons and staffed Tower 15 with an average of approximately 2 firefighters on response incidents. The crews respond to an average of 2.72 emergency incidents per day.

Demand of services is heaviest during the day, between 8am and 8pm. Approximately 50% of the department's call volume is in response to medical emergencies. Actual fire emergencies comprise approximately 4% of the overall call volume. Approximately 16% of the call volume is related to fire alarm activations and 11% of the call volume is categorized as good intent responses. Some of the workload percentages were affected by the COVID pandemic, since the data reviews the past six years. Historically, August, September and October reflect the highest call volumes. Most responses were to locations that were classified as Suburban densities.

It is important to consider **overlapping calls** – when simultaneous emergency calls are occurring. Resources during these times are stretched. Generally, communities desire to keep the number of overlapping calls below 10%. In the most recent year, Shallotte demanded overlapping incidents 5.52% of the time. However, in previous years, the overlapping calls were a steady 8-9%. It is recommended that Shallotte keep watch on the percentage of calls that occur at the same time so that the fire department can work to mitigate those situations with additional strategies.

In the most recent completed fiscal year, mutual and automatic aid from other fire departments occurred on approximately 5 incidents. Shallotte provides aid assistance to neighboring fire departments including Supply, Ocean Isle Beach and Shallotte Point. During FY 23-24, Shallotte provided aid on approximately 50 incidents.

Ninety percent of all emergency responses take **10 minutes and 45 seconds**, or less, from the receipt in the 911 center until the first fire department unit arrives (total response time). This total response time is comprised of call processing time (3 minutes 59 seconds at the 90th percentile), turnout time (1 minute, 58 seconds at the 90th percentile), and travel time (6 minutes, 24 seconds at the 90th percentile). Based on eighteen **structure fires** within the six-year period, where all units traveled emergency traffic, and arrived within the department's first due response area, the first arriving unit required **10 minutes 6 seconds** to arrive at the 90th percentile. The unit arriving with the 6th firefighter required 50 minutes and 4 seconds, at the 90th percentile.

Call processing times for Brunswick County 9-1-1 to dispatch the Shallotte Fire Department are within 3 minutes, 49 seconds, or less, on 90% of incidents. The industry standard is to process emergency calls in 64 seconds on 95% of incidents or 106 seconds 99% of the time. However, the one-minute mark was met only 3.59% of the events. The assessment team recommends that priority attention be given to reduce the 9-1-1 call processing time to improve service delivery to the people of Shallotte. Within the appendix of this report, NCFCC is providing some 9-1-1 best practice guidance that may be helpful in holding discussions. Improving 9-1-1 call alerting may improve the overall service level in the most effective and efficient manner.

Turnout times were **01 minute 58 seconds,** or less, on 90% of the incidents. A goal of 1 minute 30 seconds was used as a benchmark and the current performance was compared to the benchmark. Overall, the goal of 1 minute 30 seconds turnout time was met on 79.59% of the events. The gap between the benchmark and the baseline is 28 seconds.

Travel times of the first arriving units from Shallotte Fire have demonstrated the ability to respond to 90% of emergency incidents within **06 minutes and 24 seconds** or less.

A goal of 06 minutes 30 seconds was used as a benchmark and the current performance was compared to the benchmark. Overall, **the goal of 06:30** travel time **was met on 90.68% of the events.** The gap between the benchmark and the baseline has been met and the department is now encouraged to establish a new goal for improvement but should also watch the current trend of increasing travel time in the last two years.

Response Times (turnout and travel times together) for Shallotte Fire demonstrated their ability to respond within **07 minutes and 42 seconds** with the first arriving unit, running lights and sirens, within the department's first due territory. A goal of 8 minutes was used as a benchmark and the current performance was compared to the benchmark. Overall, **the goal of 8 minutes** travel time **was met**

on 91.29% of the events. The gap between the benchmark and the baseline has been met at the 90th percentile.

Geographical Information Services (GIS) Analysis:

The assessment team conducted a comprehensive analysis utilizing state-of-the-art geographical information services (GIS) systems to map and analyze all available data, including demand for services, land use risk assessment, coverage distance, travel time coverage, an evaluation of current station locations and comparison of national fire service industry service delivery standards.

To responsibly locate fire stations, several dynamics can be considered such as incident demand, population, and structural risk. Covering incidents alone would not consider the structural risk associated with property within the town. The population alone ignores commercial property (no residents but higher risk), and both summon the fire department more than others. To find the optimal location or locations of fire stations to meet response time objectives, elemental aspects of future population, land use risk, and incident demand are combined after equalizing each aspect into five sets of weighted data from least to most. Traffic volume counts are also an essential element of consideration. A ¼ mile hexagonal grid was digitally constructed and overlaid atop the response area. The combined elemental scores were applied to the hexagonal areas to create a Vulnerability Risk Index (VRI) score for each area of the matrix.

Utilizing a six-minute municipal response time for a standard, several of the future planned developments will require the longest travel time to reach from current fire stations. **Future demand for services will principally follow the population.** As the population of the new developments increase, emergency incidents will increase as well, following where population density increases. Modeling for future fire stations utilized a **six-minute travel time for 90% of emergency incidents goal for service delivery.**

Development data was provided by the town, indicating 16 residential projects and 9 small commercial projects. The residential projects are projected to have about 4,300 new units. Multiplied by the census persons per household indicates that a potential population increase of over 9,000 persons is possible. The number of incidents per current population was applied to the additional population and the result indicates an estimated 1,000 additional calls for service from the Shallotte Fire Department.

The **current Shallotte VRI score** with only the Headquarters fire station is **71%**. This serves as a baseline for any potential changes. The VRI score for all three current fire stations "as is" score 89%. However, this is assuming that responses of fire apparatus are coming from each of the three fire stations, which they are not.

The VRI score goal for most communities is to reach a 90% or higher VRI score. **Hence, there is a VRI coverage gap for Shallotte of 19%.** This score indicates that additional staffed fire stations will achieve a stronger level of fire protection service consistent with best practice. A travel time of 6 minutes was applied in all the scenarios based upon direction from Shallotte. Also, the modeling which was conducted was inclusive of all the cells outlined within the report. This includes the Shallotte municipal limits and several adjacent areas where future expansion of Shallotte is planned or most likely.

This analysis identifies several options for Shallotte to consider:

Scenario A – Keeping Shallotte Headquarters Anchored and Seeking an Optimal Fire Station 2 Location that is Staffed:

In this scenario, the Shallotte Headquarters fire station is anchored – meaning that it is not considered to be relocated. The computer technology is asked to select an optimum location to locate a fire station 2 in Shallotte (which fire engines would respond from). Simply, the technology is choosing a location that will generate the highest VRI score possible.

A location just adjacent to the current/existing Shallotte fire station 2 was selected by the technology. The modeling would expect that the engine from Station 2 would be responding simultaneously with apparatus from the Headquarters station to the emergency incident (as necessary). The VRI score using this model goes from 71% to **84%**, an increase of 13%.

Scenario "B" – Keeping Shallotte Headquarters Anchored and Seeking an Optimal Fire Station 2 AND Fire Station 3 Locations that are Staffed:

In this scenario, the Shallotte Headquarters fire station is again anchored. The computer technology selected a Station 2 location further northwest of the current Station 2. In addition, the technology selected a Station 3 location that relocated the fire station to the southeast of the current Station 3 (Area of Village Road and Village Point Road Southwest). The VRI score in this model goes from 71% to **94%**, an increase of 23%.

Scenario "C" – NOT Anchoring the Current Shallotte Headquarters Fire Station and Seeking ONE Optimal, Single Fire Station Location for the Entire Identified Area:

The technology selected one, single optimal central location for a sole fire station. Note that the selected location (Area of Whiteville Road Northwest between NC130 and Main Street) does have some flood considerations in the area that would need to be vetted. This potential centralized method of operation would provide a VRI rating of **79%**, which is an increase of 8% over the current location of the Shallotte Headquarters.

Scenario "D" – NOT Anchoring the Current Shallotte Headquarters Fire Station and Seeking TWO Optimal Fire Station Locations for the Entire Identified Area:

Under this model, the optimal location for the Shallotte Headquarters moves to the northwest (Area of Ocean Highway and Smith Road) and the Station 2 location shifts to the southeast (Area of Copas Road and Village Point Road Southwest). This model provides a VRI rating of **90%**, which demonstrates an increase of 19% and negates seeking a third fire station to achieve a 90% rating.

A visual summary of these viable options is depicted below:

Scenario	Actions/Options	VRI Score Rating Earned	Improvement Percentage Over "Baseline"	New Facilities Needed
Baseline Current #1	Current Shallotte Headquarters Station Only.	71%	0	0
Current #1, 2, 3	All three current fire stations staffed.	89%	NA	NA
"A"	Keeping Shallotte Headquarters Anchored and Seeking an Optimal Fire Station 2 Location that is Staffed.	84%	+13%	0 *(But Renovations Are Needed at Station 2)*
"B"	Keeping Shallotte Headquarters Anchored and Seeking an Optimal Fire Station 2 AND Fire Station 3 Locations that are Staffed.	94%	+23%	2
"C"	NOT Anchoring the Current Shallotte Headquarters Fire Station and Seeking ONE Optimal, Single Fire Station Location for the Entire Identified Area.	79%	+8%	1
"D"	NOT Anchoring the Current Shallotte Headquarters Fire Station and Seeking TWO Optimal Fire Station Locations for the Entire Identified Area.	90%	+19%	2

If the projected large development with significant increases to population comes to fruition, the assessment team recommends that the town consider a fully functional fire station in the northwest area. This need could be accomplished by renovating the current fire station 2 and upfitting it for 24-hour operation (Scenario A at 84%). However, it could also be accomplished by Scenario B, where a fire station is placed in the northwest sector and fire station 3 is relocated to the southeast. The Scenario B model produces the highest VRI score rating of the available options (94%).

Critical Task Analysis:

The design of the Critical Task Analysis (CTA) is vital for any organization desiring to measure their current performance in typical emergency situations such as a residential building fire. The analysis designed for Shallotte Fire Department consisted of four specific scenarios to measure their current performance in delivering basic critical tasks. The scenarios were designed to ensure that the same performance metrics were measured consistently as to allow decision-makers the needed data to determine what Shallotte Fire Department's current performance is and what it could be with additional personnel. The critical tasks identified were reviewed by SFD executive staff to ensure that every task was applicable to Shallotte. The scenarios that were developed were designed to measure the following areas: 1) **Residential Building Fires, 2) Commercial Building Fires, 3) Witnessed Cardiac Arrests, 4) Technical Confined Space Rescue**.

During both the **residential and commercial fire scenarios** each shift responded as they currently do with 3 personnel on the engine and these firefighters completed both the needed engine company and ladder company fireground tasks. After all of Shallotte's three shifts had completed these tasks, additional staff were added to the scenarios and the department's ladder apparatus was included. The aerial deployed to the simulated roof of the training tower was also an added task in the commercial fire simulation. The technical rescue scenario had a typical alarm assignment of a single 3-person company for the initial evolution to establish the current capabilities of the department. To measure the impact on performance, an additional 3-person company was added to the evolution.

The **EMS scenario** began with the current response model of 2 personnel responding to an unknown EMS call and arriving to find a full arrest. Each shift was measured to determine an average for the department. The same crews were then measured with 1 additional person, and again with 2 additional crew members.

The **residential fire scenario** was designed to measure the typical tasks that firefighters must perform to ensure the event can be effectively mitigated while operating in a safe manner. The scenarios sought to measure the following tasks:

- 360 Initial Radio Report
- Simulated Forcible Entry
- Time from arrival until entry into fire building
- Water Supply- Hydrant flowing into the engine
- 1 ¾" hose line stretched for fire attack
- Multiple Ground Ladder Egress to 2nd Floor

- Primary Search of two floors
- Water on the Fire
- Victim Removal

Each shift performed baseline evolutions that measured their current performance of each task at their current staffing level. The tasks were assigned to the company that would normally be assigned the listed tasks. The Shallotte Fire Department's fireground operational guides were utilized in the design of the scenario. The current operational guides allow the first arriving company to determine if they will establish a water supply on their way to the fire or go directly to the fire building and initiate an attack. To best determine the safest scenario, it was determined that the companies will establish a water supply on the way to the fire building. The scenario measured water supply in that manner. SFD also expects that the first arriving company would establish ground ladder egress to at least two sides of the structure if it has more than one level.

The times from these evolutions were averaged to provide a **performance level at the current minimum staffed level for the analysis**. Each scenario was then repeated, and additional staffing was provided to include the response of the ladder apparatus. The additional evolutions were done with 2 firefighters staffing the ladder, 3 firefighters staffing the ladder, and 4 firefighters staffing the engine and 3 firefighters staffing the ladder. *It is important to note that the tasks commonly designated as "Ladder or Truck Company" disciplines were performed by the firefighters also performing the engine company tasks in the current staffing model of SFD.* When adding additional staff to the evolutions, tasks were required to be completed by the assigned discipline, as an example, the firefighters arriving on the engine could not initiate fire attack until the crew assigned to the ladder company completed forcible entry. It must be noted that federal OSHA requirements clearly state that <u>at least four firefighters must be on scene</u> before entry is made into a structure that is on fire. This is considered an IDLH, or immediately dangerous to life and health environment.

From this analysis, there were several **key demonstrated performance outcomes**. The results provided a significant amount of information on both the current capabilities of SFD and what their performance would be with additional staffing. Currently SFD completes the expected fireground tasks in just less than 8 minutes. From the arrival of an engine company on the scene until that crew enters the structure is 4:53, and on average it takes another 1:10 to apply water on the fire. These two measurements combine to show that on average it takes just over 6:04 from arrival to get water on the fire. This does not include the time required for the call to be received at the 911 Call Center, dispatched and the needed turnout and travel time. The rapid application of water is one of the most important factors in creating positive outcomes due to the rapid growth of a fire in a

residence. The addition of one firefighter per Engine Company showed increased effectiveness in all measurements. **The time required to get water on the fire decreased by over 25%. This decrease of nearly a minute and a half would significantly impact the fire growth and provide better potential outcomes**. The decrease in time it takes to apply water has been shown to have the greatest impact on the survivability of victims in studies performed by Underwriters Laboratories (UL).

The ladder company functions that are required for an efficient fireground operation such as forcible entry, secondary egress, and an aggressive primary search for potential victims highlight a need for an additional number of firefighters to perform these tasks. Currently, the Shallotte Fire Department can arrive and force entry into a structure and complete a primary search in just less than 8 minutes. Additionally, the firefighters establish ground ladder egress in 2 minutes. When additional firefighters were added to the evolutions and divided into distinct companies with specific tasks a significant improvement is seen in the time to complete a primary search and rescue a victim. **When operating with 3 firefighters assigned to ladder company tasks, the time to rescue a victim decreased by 2:39 or 36.7%. The time required to complete a search of the entire structure decreased by 5:09 or 70.5%.**

Comparable performance enhancements were seen in the other evolutions. The analysis team recommends that the Town of Shallotte seek to strengthen the number of firefighters on duty whenever conditions will allow to gain increased performance, improved firefighter safety and strengthened service delivery to the people of Shallotte. Seeking federal SAFER grants and other opportunities may assist the Town of Shallotte in that endeavor and the data collected in this critical task analysis will be helpful in writing those grant requests. Additional firefighter staffing will make the fire department more effective at mitigating emergencies within the response area, provide for the increased safety of the town's firefighters, and improve outcomes related to fire loss and both fire and medical casualties for the residents, business owners, and visitors in the Town of Shallotte.

Fire Station Needs Analysis:

NCFCC has analyzed current and possible future fire station space needs to assist the Shallotte Fire Chief with planning for the growth of the department. The Fire Chief and fire department staff completed worksheets provided by NCFCC to identify potential fire station space needs. Information for the headquarters station and substations was collected. NCFCC partnered with Stewart Cooper Newell Architects to make recommendations and identify project costs. The needed acreage for each fire station was also calculated based upon square footage of the building.

The following key information was collected and needs determined by fire department staff to include:

- The need for 4 bays at fire station 1.
- Space is needed for 25 people over 3 shifts at fire station 1.
- The need for a Captain's Office at both fire station 1 and at the substations.
- The need for a training room that can accommodate 30 people at fire station 1.
- The need for 3 bays at the substations.
- Space is needed for 15 people over 3 shifts at the substations.
- The need for a training room that can accommodate 10 people at each substation.

Current fire station construction prices in North Carolina are between $645 and $750 per square foot. Key recommendations for planning a new headquarters fire station 1 include:

- Identify a 3–4-acre parcel to build a new headquarters fire station 1.
- Estimated square footage to accommodate all needs will be around 14,919 (15,000 square feet).
- Budget estimation is between $9.63 and $11.24 Million with 2024 construction pricing.

Key recommendations for new substations include:

- Identify a 2–3-acre parcel to build each new substation.
- Estimated square footage to accommodate all needs will be around 9,785. (10,000 square feet).
- Budget between $6.11 and $7.33 Million with 2024 construction pricing.

Appendix Documents:

NCFCC has included a variety of reference material related to the project work for Shallotte. A baseline strategic plan document is provided to Shallotte using the CPSE model to help Shallotte build their strategic plan in a workable format. Components of the work of this analysis is pre-built into the baseline strategic plan, but it can be expanded and modified as conditions demand. The analysis team recommends that Shallotte Fire Department further develop the fire department's strategic plan document and utilize it as a living document to help guide the fire department into the future. Guidance to help with the 9-1-1 Center call dispatch times are included. A set of visual diagrams that exemplify the material throughout the report are also included, such as the number of firefighters to

safely work a typical residential fire. These materials are in support of the information within the analysis report but elaborate on key aspects and help provide potential methods to communicate needs and information.

Next Steps:

The next steps for this process will be for the Town of Shallotte to review the data and information contained within this report as well as the recommendations contained herein. A determination of the model that the town would desire to follow will need to be made regarding the headquarters fire station and potential additional substation(s). Capital improvement funding will be needed when conditions will allow to move forward with fire station planning and construction. Typically, the fire station construction process takes about two years, from initiation of the project to actual operation of the fire station serving the community. Recent experience in North Carolina has shown that post-COVID, that fire station construction timeline has extended by up to a year due to supply chain challenges and the labor market.

Given the potential growth in Shallotte and that this analysis depicts multiple components needed on the journey to improving the overall service delivery level (using the VRI scoring), Shallotte should conduct a periodic review of the analysis within this report and periodically refresh the key data with each component to ensure that current and relevant data is being used by decision makers with the most up-to-date information available at the time.

The data within this comprehensive report will allow the Shallotte Fire Department to advance their strategic plan for the organization, which will include creation of a capital improvement plan for apparatus to be developed and properly funded. The analysis team recommends that the Town of Shallotte periodically update the data and information within this analysis to keep the analysis current and responsive to changing conditions in and around Shallotte to ensure that Shallotte taxpayers are investing in the best overall long-term solutions.

The entire NCFCC team sincerely appreciates the opportunity to provide this vital information to the Town of Shallotte. We are proud to have assisted in efficiently supporting the Shallotte Fire Department in this critical endeavor. We humbly and sincerely thank everyone who supported this progressive initiative and express our honor to serve in this beneficial capacity of continuous improvement.

Section 1: Response Data Analysis

Response Data Key Findings

Demand for Services

- Demand has been impacted by two significate items in the six-year period; the pandemic of 2020 and a response change by the department in early spring of 2023. Both reduced demand for services compared to the demand of fiscal year 18/19.
- In FY18/19, demand was 2,050. In FY 23/24, demand was 995, a drop of 51.46%.
- Based on the demand of FY 23/24, the department averages 2.72 incidents daily.
- Almost 50% of the demand is related to a medical response.
- The highest demand is during the day, between 8am and 5pm.
- Fires, of all types, make up 3.99% of the demand.

Response Time Performance

- Ninety percent of emergency responses take 10 minutes and 45 seconds, or less, from the receipt in the 911 center until the first fire department unit arrives. (Total Response Time)
- Call Processing Time = 3 minutes 59 seconds at the 90th percentile.
- Turnout Time = 1 minute 58 seconds at the 90th percentile for the first arriving unit.
- Travel Time = 6 minutes and 24 seconds at the 90th percentile for the first arriving unit.

Effective Response Force

- Based on eighteen structure fires within the six-year period, where all units traveled emergency traffic, and arrived within the department's first due response area, the first arriving unit required 10 minutes 6 seconds to arrive at the 90th percentile. The unit arriving with the 6th firefighter required 50 minutes and 4 seconds, at the 90th percentile.

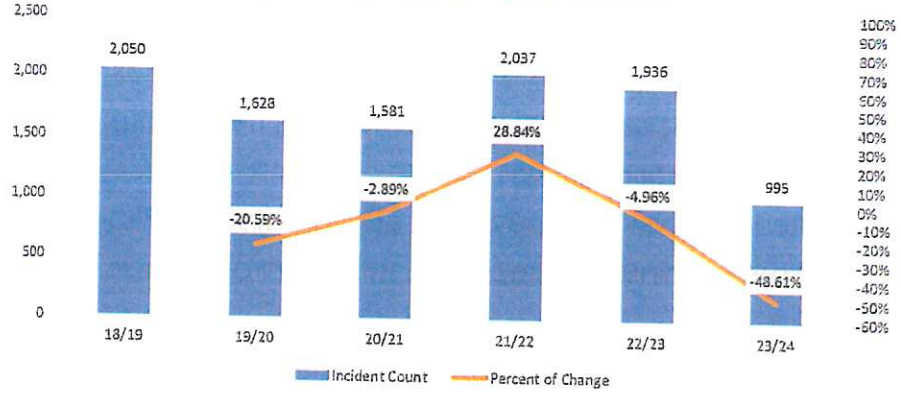
Demand for Services on the Department

Demand by Fiscal Year

During the 6-year period of evaluation, demand on the department has been up and down, some based on the environment like the pandemic of 2020, and some based on the department change to response protocols in February/March of 2023 where lower acuity medical events were no longer receiving a response from the department to assist the EMS service. Prior to this change, the department's response to medical incidents was 68% of their total demand in Fiscal Year (FY) 21/22. In FY23/24, their medical incidents were only 49% of their total response. Total demand of all incident types dropped 51% from FY21/22 to FY23/24. These two years represent a full year of the old response and the new response, since the change occurred in the middle of FY22/23.

Based on the 23/24 year, the department averages 2.72 incidents daily. Forty-nine percent (49%) medical, 15.88% for the false alarm and service call category, 11% good intent calls and 3.92% for fire incidents.

Figure 1: Demand by Fiscal Year



Demand by Month

The color chart below highlights both changes in responses for the pandemic in April 2020 and protocol changes in Feb 2023.

Figure 2: Demand by Month, by Fiscal Year

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Grand Total
18/19	144	182	235	170	192	158	154	169	162	178	148	158	2,050
19/20	169	160	189	174	160	154	146	121	126	50	70	109	1,628
20/21	89	100	85	128	133	128	120	133	152	167	164	182	1,581
21/22	187	217	159	154	134	159	156	160	167	193	183	168	2,037
22/23	186	203	173	213	168	219	226	174	96	94	92	92	1,936
23/24	75	92	85	104	99	69	64	86	87	72	81	81	995
Grand Total	850	954	926	943	886	887	866	843	790	754	738	790	10,227

Demand by Alarm Hour / Day of Week

For the full six-year period, demand by the hour of day/day of week is greater during daylight hours. This highest eight-hour period of demand is 9am to 5pm and the highest 12-hour period is 8am to 8pm. Thursday has more incidents than other days.

Figure 3: Demand by Alarm Hour

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
0	44	23	30	20	29	32	24	202
1	39	24	19	27	15	19	25	168
2	31	20	13	20	25	19	34	162
3	26	20	25	22	22	21	24	160
4	22	25	15	15	19	29	21	146
5	20	29	28	29	29	21	28	184
6	28	42	30	31	31	37	31	230
7	40	52	60	58	58	45	43	356
8	63	71	59	76	73	57	51	450
9	52	97	89	77	88	75	78	556
10	68	99	115	98	105	103	80	668
11	76	119	119	96	120	111	74	715
12	75	104	95	106	105	112	80	677
13	87	107	104	103	100	88	79	668
14	80	105	97	97	110	89	77	655
15	70	98	94	123	111	98	72	666
16	75	83	101	93	104	124	86	666
17	62	86	98	72	98	90	70	576
18	73	60	62	90	87	88	68	528
19	63	59	70	60	72	75	71	470
20	49	63	59	58	62	68	70	429
21	45	38	57	51	46	54	57	348
22	44	40	40	40	44	40	48	296
23	32	34	37	27	43	39	39	251
Total	1,264	1,498	1,516	1,489	1,596	1,534	1,330	10,227

Demand by NFIRS Category

The National Fire Incident Reporting System (NFIRS) groups responses into nine distinct categories. The medical category contains more incidents than any other over the six-year period. During the period, the percentages change based on the changes made by the department and the pandemic of 2020. See figure 5 for those changes.

Figure 4: Demand by NFIRS Category

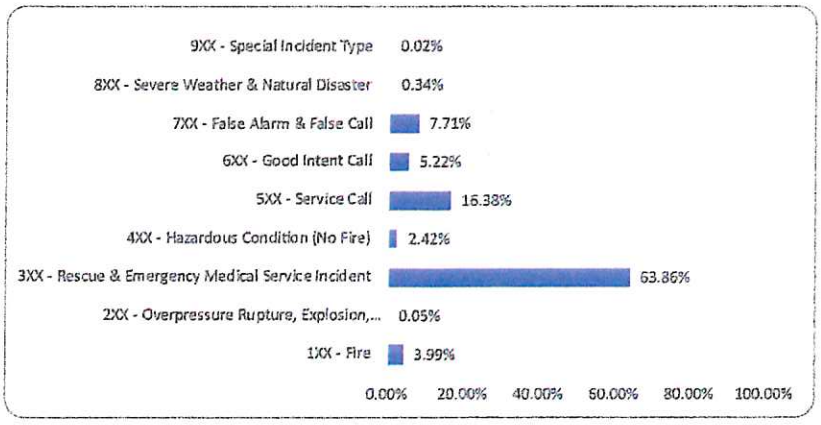
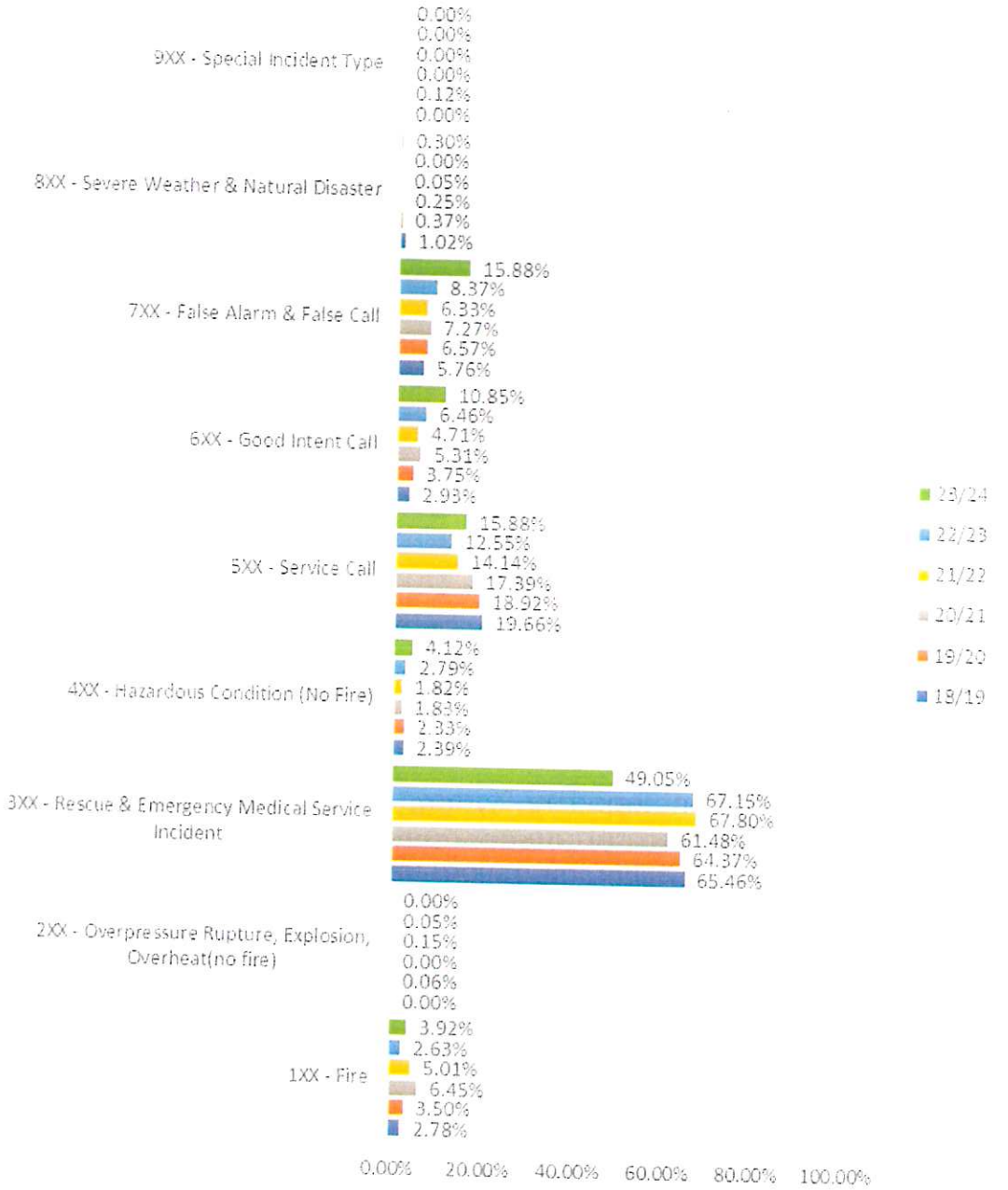


Figure 5: Demand by Category by Year



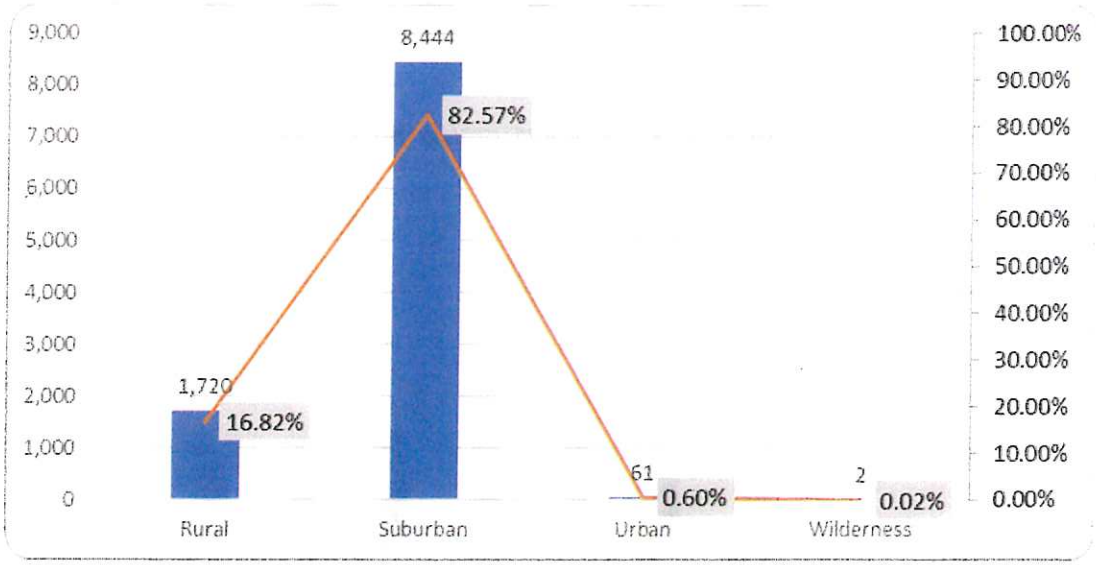
Assisting EMS with medical emergencies is the largest demand. Broken down by incident type, the top 55% of incidents of all are of medical assistance to EMS.

Figure 6: Demand by Incident Type (Top 15)

NFIRS Incident Type	Count	%
311 - Medical assist, assist EMS crew	3,616	35.36%
321 - EMS call, excluding vehicle accident with injury	2,082	20.36%
554 - Assist invalid	955	9.34%
322 - Motor vehicle accident with injuries	381	3.73%
552 - Police matter	315	3.08%
324 - Motor vehicle accident with no injuries.	300	2.93%
551 - Assist police or other governmental agency	267	2.61%
111 - Building fire	230	2.25%
743 - Smoke detector activation, no fire - unintentional	168	1.64%
745 - Alarm system activation, no fire - unintentional	160	1.56%
622 - No incident found on arrival at dispatch address	158	1.54%
733 - Smoke detector activation due to malfunction	153	1.50%
735 - Alarm system sounded due to malfunction	131	1.28%
621 - Wrong location	129	1.26%
611 - Dispatched & cancelled en route	92	0.90%

Demand by Population Density

Figure 7: Demand by Population Density



While uncertain how the RMS system classifies the individual categories of population density, the suburban is used more than any other. The fire department chooses this value during the fire report data entry phase. The Shallotte population density is just below 500 people per square mile.

Overlapping Incidents

This evaluation looks for an incident with a dispatch time before the clear time of the incident before it. Through the six-year period, a steady 8% to 9% of incidents overlapped the previous one except the 23/24 year where demand dropped due to response changes reducing responses to low acuity and mutual aid events. This change dropped overlapping incidents to 5.52%, which has increased reliability for the department. Zone 7 contains more events than any other zone, more than 2 times other zones. The peak hours are noon to 8pm with the peak hour at noon.

Figure 8: Overlapping Incidents

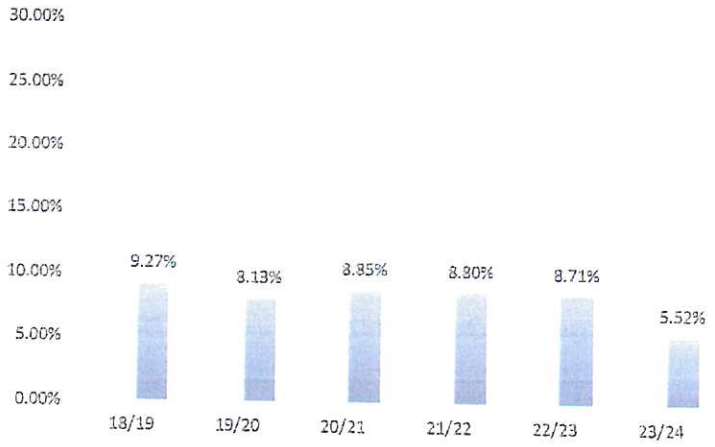
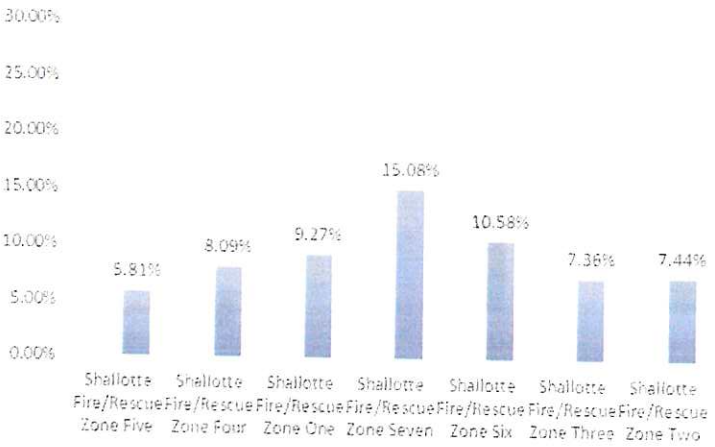


Figure 9: Overlapping Incidents by Zone



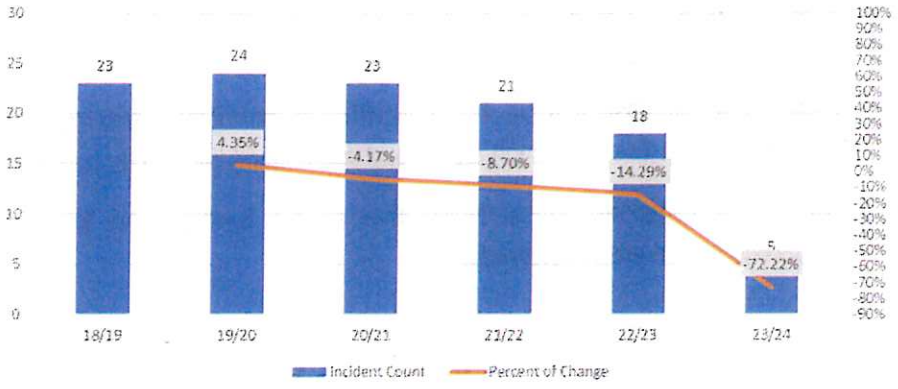
Aid Given and Received

Aid Received - The aid section of the fire report defines if mutual and/or auto aid was given, received or none. "None" is an indication the incident was mitigated without outside agency resources. The department's aid data suggests 97.06% of their incidents are mitigated without additional resources. Of the remaining 2.94%, most are fire related incidents, followed by hazardous conditions and weather-related events. The number of incidents receiving aid has continued to drop each year since the 19/20 fiscal year.

Figure 10: Aid Received

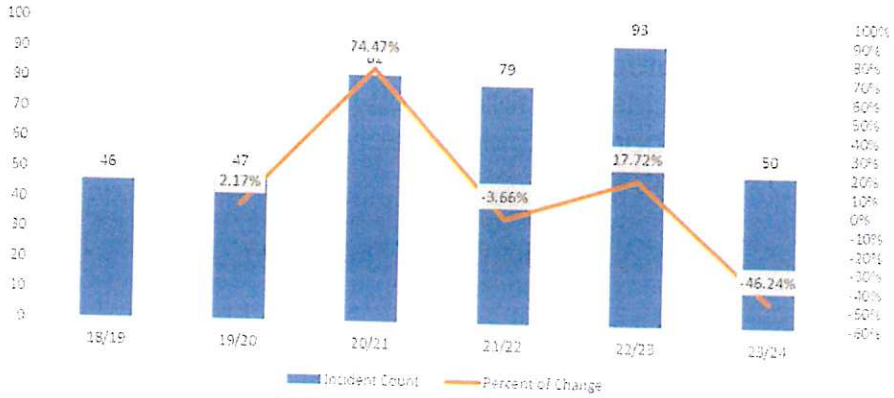
NFIRS Category/Description	None	Received
1XX - Fire	67.67%	32.33%
2XX - Overpressure Rupture, Explosion, Overheat(no fire)	100.00%	0.00%
3XX - Rescue & Emergency Medical Service Incident	99.64%	0.36%
4XX - Hazardous Condition (No Fire)	75.35%	24.65%
5XX - Service Call	100.00%	0.00%
6XX - Good Intent Call	84.96%	15.04%
7XX - False Alarm & False Call	98.68%	1.32%
8XX - Severe Weather & Natural Disaster	80.77%	19.23%
9XX - Special Incident Type	100.00%	0.00%
Grand Total	**97.06%**	**2.94%**

Figure 11: Aid Received - Count by Fiscal Year



Aid Given - Fires, specifically building fires, are the incident types driving the aid request from other agencies. The number of aid-given responses climbed each year until fiscal year 23/24 with a 46% reduction in responses. The fire districts of Supply, Ocean Isle Beach and Shallotte Point are the top 3 receiving those aid responses. 4pm is the peak hour for aid given with almost 25% more than any other hour of the day.

Figure 12: Aid Given Count by Fiscal Year



Response, based on time – The three time-segments.

Total Response Time is the duration of time, measured from the receipt of the 911 call in the Public Safety Answering Point (PSAP) until the first fire department unit arrives on the scene of the incident. Total response time should be measured for the first-arriving unit and the arrival of the full alarm, or the declared effective response force, if possible. This time element can be broken into the following segments.

Call Processing Time – the elapsed time from event receipt at the PSAP to the dispatching of the first unit.

Turnout Time – the elapsed time from notification of the fire department from the 911 center until a fire unit has forward moment (wheels turning).

Travel Time – the elapsed time from the unit's turnout to the arrival at the incident address (wheels stopped).

Response Time - the elapsed time from when a unit is dispatched until the first unit arrives. (Turnout + Travel)

Total Response Time – the time elapsed from receipt at the PSAP until arrival of the unit on scene. (Call Processing + Turnout + Travel)

The fire department will typically evaluate and focus on response time, since call processing time is normally the responsibility of the 911 center. Call processing is equally important because it plays a key role in the total response time and the outcome of those served and protected. Because of this, the department should

always analyze this information, if possible, and build relationships with the 911 center to develop a continuous improvement plan, using standards, best practices, or local approved goals as the benchmark.

Evaluation of response times should only evaluate those responses in the department's primary jurisdiction, excluding: those events where mutual/auto aid was given to other departments, non-emergency response, and justified outliers.

In this section, the evaluation of all time segments, including call processing, were limited to the first arriving unit that indicated their response mode to be "Lights and Siren." This limited the incidents to 3,123 for evaluation.

Improving call processing times are often one of the most cost-efficient ways to improve overall response times. A focus on reducing these call processing times will improve service delivery (not just for the fire department, but for all other emergency services as well).

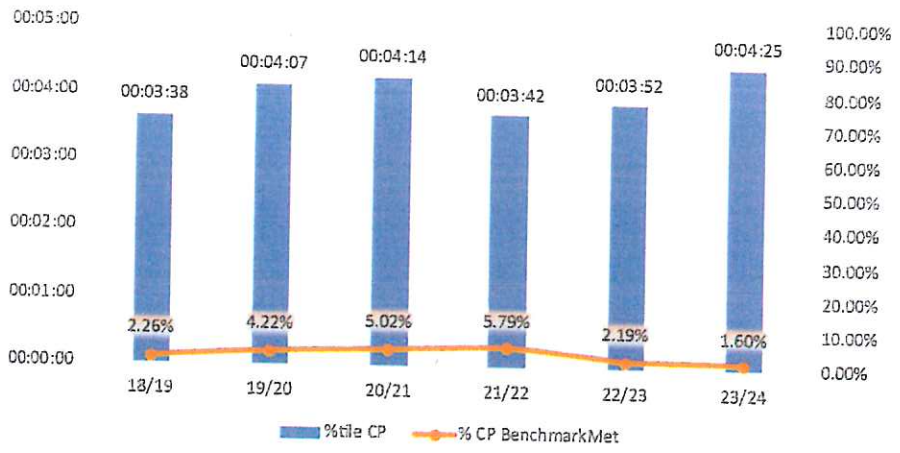
Call Processing Time – Segment One

The 911 center has demonstrated their ability to process incidents (3,123 due to filtering) and alert the fire department within **3 minutes and 59 seconds,** or less, **on 90%** (90th percentile) of the incidents. The trend is increasing times with the exception to the few months.

A goal of 1 minute was used as a benchmark and the current performance was compared to the benchmark. The percentage of incidents meeting that benchmark is shown in orange as a percentage of compliance. Overall, **the goal of 1 minute** call processing time **was met only 3.59% of the events**. The gap between the benchmark and the baseline is 2 minutes and 59 seconds.

The most current NFPA 1710 requirements surrounding "Alarm Processing" or call processing time state the call should be processed within 64 seconds 95% of the time or 106 seconds 99% of the time. This document uses 90th percentile and 1 minute as a reference point for percentage of compliance. Using either time or percentages, the department's call processing time is significantly longer than the standard and appears to be for all event types.

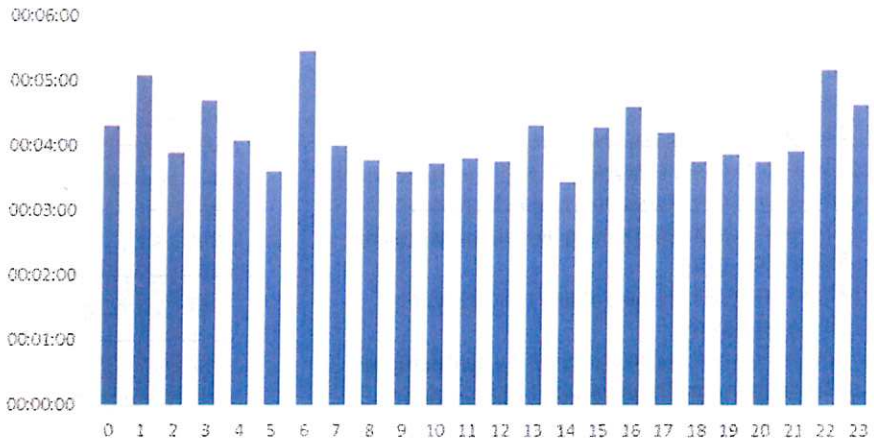
Figure 13: Call Processing by Fiscal Year



Call Processing by Alarm Hour

The time to process a call is higher during the nighttime hours when call demand is lower and lower during the day. This could be a sign of less staff during the nighttime hours.

Figure 14: Call Processing by Alarm Hour



Call Processing by NFIRS Category

Processing time over the eight categories listed here show no signs of great deviation. The hazardous condition and false alarm and false call categories seem to have the best processing times.

Figure 15: Call Processing by NFIRS Category

NFIRS Category/Description	Count	CP	Goal Met %
1XX - Fire	128	00:03:09	14.06%
2XX - Overpressure Rupture, Explosion, Overheat(no fire)	4	00:06:04	25.00%
3XX - Rescue & Emergency Medical Service Incident	2,024	00:04:07	1.68%
4XX - Hazardous Condition (No Fire)	74	00:03:02	8.11%
5XX - Service Call	206	00:05:09	3.40%
6XX - Good Intent Call	120	00:04:28	7.50%
7XX - False Alarm & False Call	562	00:03:05	6.58%
8XX - Severe Weather & Natural Disaster	5	00:04:23	0.00%
Grand Total	**3,123**	**00:03:59**	**3.59%**

Call Processing by Incident Type (Top 15)

Reviewing the top 15 incidents by incident type, the better processing time is related to alarm activations. Motor Vehicle Crashes and Medical incidents have the highest call processing times. The 911 agency utilizes the Priority Dispatch System, and the fire department has elected to respond to high acuity medical events. This means each 911 call must go through a series of questions to determine the severity level, which determines if the department will be dispatched. This takes time but yields to an appropriate response. This can also give reason as to the differences between fire alarms and medical responses.

Figure 16:Call Processing by NFIRS Incident Type (Top 15)

NFIRS Incident Type	Count	CP	Goal Met %
321 - EMS call, excluding vehicle accident with injury	966	00:03:45	2.07%
311 - Medical assist, assist EMS crew	623	00:04:05	1.28%
322 - Motor vehicle accident with injuries	257	00:05:05	1.56%
324 - Motor vehicle accident with no injuries.	125	00:05:16	1.60%
743 - Smoke detector activation, no fire - unintentional	121	00:03:27	4.96%
733 - Smoke detector activation due to malfunction	113	00:03:43	9.73%
745 - Alarm system activation, no fire - unintentional	107	00:02:55	3.74%
552 - Police matter	104	00:04:53	2.88%
735 - Alarm system sounded due to malfunction	91	00:02:35	14.29%
554 - Assist invalid	76	00:04:10	3.95%
622 - No incident found on arrival at dispatch address	57	00:05:32	1.75%
740 - Unintentional transmission of alarm, other	42	00:03:20	0.00%
714 - Central station, malicious false alarm	40	00:03:50	5.00%
651 - Smoke scare, odor of smoke	37	00:03:17	13.51%
142 - Brush or brush-and-grass mixture fire	32	00:03:46	12.50%

Turnout Time – Segment Two

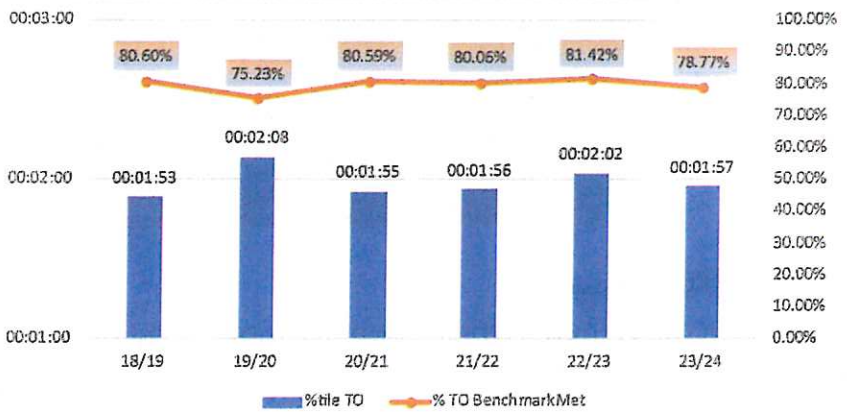
Defined as the segment of time from dispatch to apparatus moving forward, turnout time represents the time segment from where the fire department has the most control for response time improvement, with the least cost. That said, departments relying on fire staff and 911 staff to consistently timestamp the "enroute" timestamp at the same point in the response is the challenging part. Evaluating only the first arriving unit, traveling emergency traffic, the department has demonstrated a turnout time of **01 minute 58 seconds**, or less, on 90% of the incidents.

A goal of 1 minute 30 seconds was used as a benchmark and the current performance was compared to the benchmark. The percentage of incidents meeting that benchmark is shown in orange as a percentage of compliance. Overall, **the goal of 1 minute 30 seconds** turnout time **was met on 79.59% of the events**. The gap between the benchmark and the baseline is 28 seconds.

Turnout Time by Fiscal Year

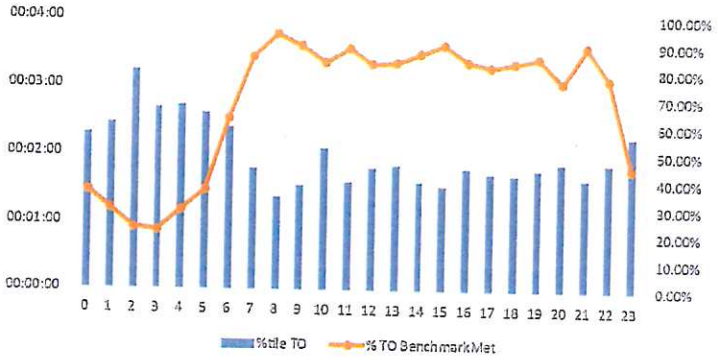
Turnout over the six-year period remained constant except for FY19/20 where a slight increase was seen, potentially related to the pandemic.

Figure 17: Turnout Time – First Arriving Unit



Turnout Time by Alarm Hour

Figure 18: Turnout Time by Alarm Hour



Hr/Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
0	00:02:14	00:02:13	00:02:18	00:03:06	00:02:19	00:03:42	00:03:29
1	00:02:43	00:02:53	00:02:27	00:02:06	00:02:24	00:02:12	00:02:29
2	00:02:50	00:01:47	00:04:09	00:04:29	00:02:04	00:01:35	00:02:33
3	00:02:20	00:03:32	00:02:08	00:02:46	00:02:40	00:02:36	00:03:08
4	00:02:26	00:02:26	00:02:44	00:01:30	00:02:47	00:02:10	00:03:19
5	00:02:32	00:02:39	00:02:14	00:03:03	00:03:51	00:02:34	00:02:51
6	00:02:12	00:02:14	00:02:08	00:01:28	00:03:21	00:02:24	00:02:23
7	00:02:06	00:02:25	00:01:31	00:01:38	00:01:11	00:01:48	00:01:23
8	00:01:30	00:01:35	00:01:26	00:01:27	00:01:20	00:01:18	00:01:12
9	00:02:03	00:01:32	00:01:38	00:01:25	00:01:02	00:01:56	00:01:21
10	00:02:06	00:02:29	00:01:52	00:01:59	00:03:46	00:02:05	00:01:59
11	00:01:24	00:01:26	00:01:35	00:01:17	00:01:58	00:01:54	00:01:23
12	00:02:25	00:02:24	00:01:19	00:01:44	00:01:55	00:02:04	00:02:04
13	00:01:23	00:01:45	00:02:14	00:01:28	00:01:53	00:01:32	00:02:32
14	00:01:36	00:02:15	00:01:30	00:01:31	00:01:58	00:01:42	00:01:18
15	00:01:16	00:01:30	00:01:17	00:01:33	00:01:53	00:01:41	00:01:24
16	00:01:31	00:01:12	00:01:28	00:01:36	00:02:50	00:01:32	00:01:39
17	00:01:34	00:01:32	00:01:40	00:02:44	00:02:13	00:01:37	00:01:14
18	00:01:48	00:01:38	00:02:32	00:01:22	00:01:43	00:01:19	00:01:52
19	00:01:46	00:01:43	00:01:39	00:02:27	00:01:24	00:02:12	00:01:58
20	00:03:10	00:01:21	00:01:51	00:01:55	00:01:55	00:01:43	00:01:18
21	00:01:28	00:01:21	00:02:15	00:01:15	00:01:26	00:01:24	00:01:39
22	00:01:39	00:01:43	00:01:38	00:01:27	00:02:44	00:01:29	00:02:20
23	00:01:49	00:02:39	00:02:31	00:01:30	00:02:05	00:02:01	00:02:37

Turnout Time by NFIRS Category

An interesting observation here is the turnout for medical events and fires with the same time despite most, if not all, fire events requiring the donning of fire gear before departure.

Figure 19: Turnout Time by NFIRS Category

NFIRS Category/Description	Count	TO	Goal Met %
1XX - Fire	128	00:01:54	78.13%
2XX - Overpressure Rupture, Explosion, Overheat(no fire)	4	00:01:12	100.00%
3XX - Rescue & Emergency Medical Service Incident	2,020	00:01:54	81.49%
4XX - Hazardous Condition (No Fire)	74	00:01:57	70.27%
5XX - Service Call	206	00:02:06	79.13%
6XX - Good Intent Call	120	00:02:06	76.67%
7XX - False Alarm & False Call	561	00:02:00	75.04%
8XX - Severe Weather & Natural Disaster	5	00:02:26	60.00%
Grand Total	**3,118**	**00:01:58**	**79.57%**

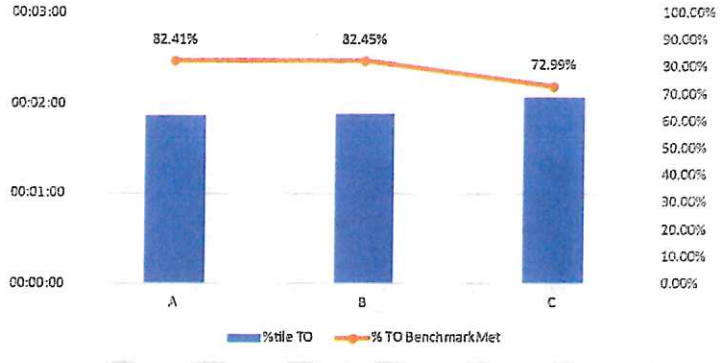
Turnout Time by Incident Type

Figure 20: Turnout Time by Incident Type (Top 15)

NFIRS Incident Type	Count	TO	Goal Met %
321 - EMS call, excluding vehicle accident with injury	966	00:01:42	85.92%
311 - Medical assist, assist EMS crew	620	00:02:02	77.74%
322 - Motor vehicle accident with injuries	256	00:01:54	78.13%
324 - Motor vehicle accident with no injuries.	125	00:02:08	72.80%
743 - Smoke detector activation, no fire - unintentional	121	00:01:52	80.99%
733 - Smoke detector activation due to malfunction	112	00:01:59	72.32%
745 - Alarm system activation, no fire - unintentional	107	00:01:43	82.24%
552 - Police matter	104	00:02:00	80.77%
735 - Alarm system sounded due to malfunction	91	00:02:14	64.84%
554 - Assist invalid	76	00:02:16	80.26%
622 - No incident found on arrival at dispatch address	57	00:01:53	85.96%
740 - Unintentional transmission of alarm, other	42	00:02:04	76.19%
714 - Central station, malicious false alarm	40	00:01:52	80.00%
651 - Smoke scare, odor of smoke	37	00:02:12	75.68%
142 - Brush or brush-and-grass mixture fire	32	00:01:31	87.50%

Turnout Time by Shift

Figure 21: Turnout Time by Shift



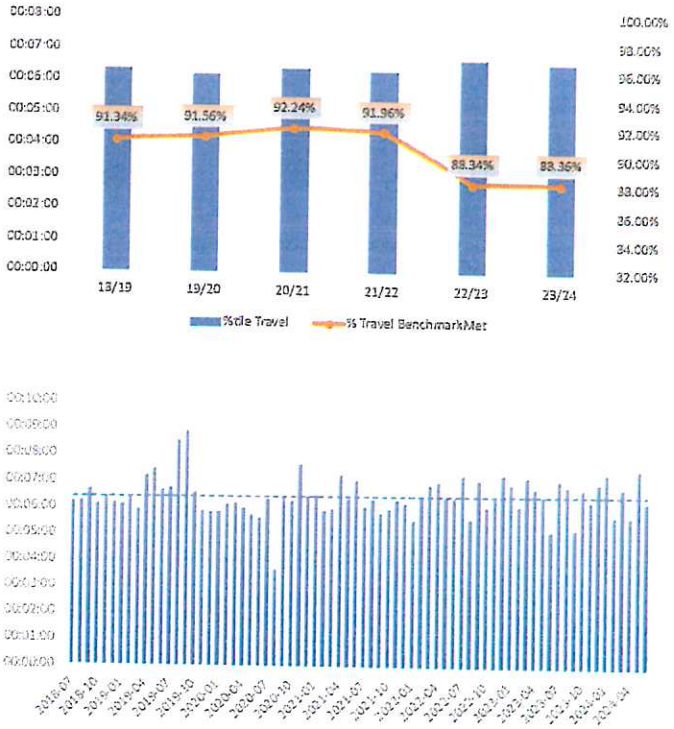
Travel Time – Segment Three

Defined as the segment of time from checking enroute (turnout) to the arrival at the dispatched address. Travel time can be affected by many factors such as distance, vehicle traffic, weather, street width and grade, traffic signals and stop signs, to name a few. Travel time performance is a good indicator of proper station placement and/or distribution and saturation of stations for those departments with more than one station. The Shallotte Fire Department has demonstrated the ability to respond to 90% of emergency incidents within **06 minutes and 24 seconds** or less.

A goal of 06 minutes 30 seconds was used as a benchmark and the current performance was compared to the benchmark. The percentage of incidents meeting that benchmark is shown in orange as a percentage of compliance. Overall, **the goal of 06:30** travel time **was met on 90.68% of the events.** The gap between the benchmark and the baseline has been met and the department is now encouraged to establish a new goal for improvement but should also watch the current trend of increasing travel time in the last two years.

Travel Time by Year Month

Figure 22: Travel Time by Fiscal Year



Travel Time by NFIRS Category

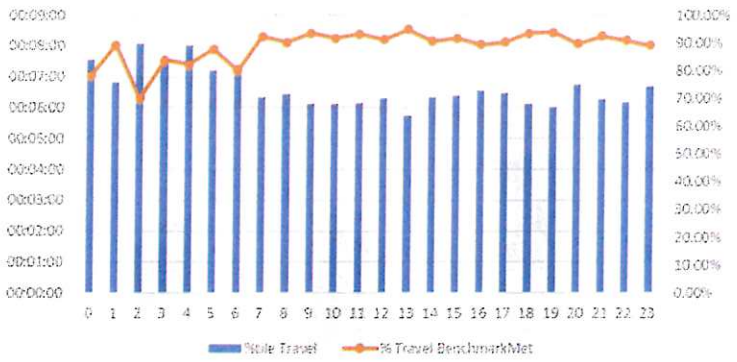
Travel time is consistent among all categories. Two of the eight are lower than others but also contain a smaller number of incidents which may contribute to these numbers.

Figure 23: Travel Time by NFIRS Category

NFIRS Category/Description	Count	Travel	Goal Met %
1XX - Fire	128	00:06:09	91.41%
2XX - Overpressure Rupture, Explosion, Overheat(no fire)	4	00:06:08	100.00%
3XX - Rescue & Emergency Medical Service Incident	2,024	00:06:28	90.32%
4XX - Hazardous Condition (No Fire)	74	00:05:28	93.24%
5XX - Service Call	206	00:06:28	90.29%
6XX - Good Intent Call	120	00:06:00	94.17%
7XX - False Alarm & False Call	562	00:06:22	90.75%
8XX - Severe Weather & Natural Disaster	5	00:05:41	100.00%
Grand Total	**3,123**	**00:06:24**	**90.68%**

Travel Time by Alarm Hour

Travel time by hour of day would normally not change unless traffic density during daytime hours caused elongation in travel. Here, travel times are longer during the night which could be an indication of slower drive times, or the most probable cause is the premature enroute timestamp, which in turn would elongate the travel time.



Travel Time by Incident Type

Differences between the '321' and '311' medical call have a markable gap and the difference between these two incident types have been defined by the department as; 321 is a high acuity call where the FD arrives first and administers care, and the 311 incident is a low or high acuity incident in which EMS requests Fire Department assistance.

The '554 – Assist Invalid' incident, has a higher-than-average travel time. This incident has been defined as an incident where lights and sirens were used, was

dispatched as a 321-type event where EMD indicated high acuity but was discovered to only be lifting assistance.

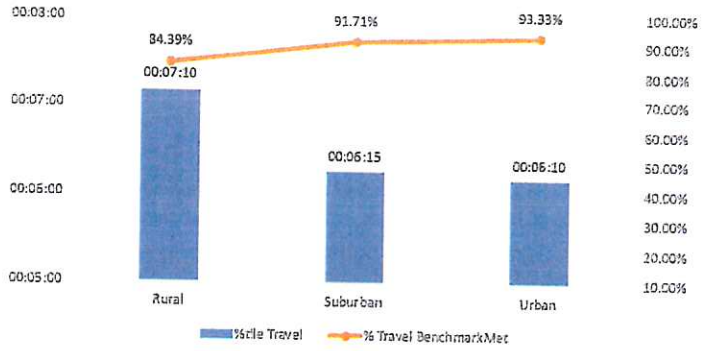
Figure 24: Travel Time by Incident Type (Top 15)

NFIRS Incident Type	Count	Travel	Goal Met %
321 - EMS call, excluding vehicle accident with injury	966	00:06:07	93.69%
311 - Medical assist, assist EMS crew	623	00:07:23	82.83%
322 - Motor vehicle accident with injuries	257	00:05:29	96.11%
324 - Motor vehicle accident with no injuries.	125	00:06:33	89.60%
743 - Smoke detector activation, no fire - unintentional	121	00:06:21	92.56%
733 - Smoke detector activation due to malfunction	113	00:06:23	90.27%
745 - Alarm system activation, no fire - unintentional	107	00:06:35	88.79%
552 - Police matter	104	00:05:11	96.15%
735 - Alarm system sounded due to malfunction	91	00:06:10	92.31%
554 - Assist invalid	76	00:07:22	84.21%
622 - No incident found on arrival at dispatch address	57	00:04:58	94.74%
740 - Unintentional transmission of alarm, other	42	00:05:57	95.24%
714 - Central station, malicious false alarm	40	00:07:02	85.00%
651 - Smoke scare, odor of smoke	37	00:05:31	97.30%
142 - Brush or brush-and-grass mixture fire	32	00:06:34	87.50%

Travel Time by Population Density

The rural population density has higher travel times than any other. This is due to the distance from the single fire station in the center of the Urban area.

Figure 25:Travel Time by Population Density



Response Time (Turnout and Travel)

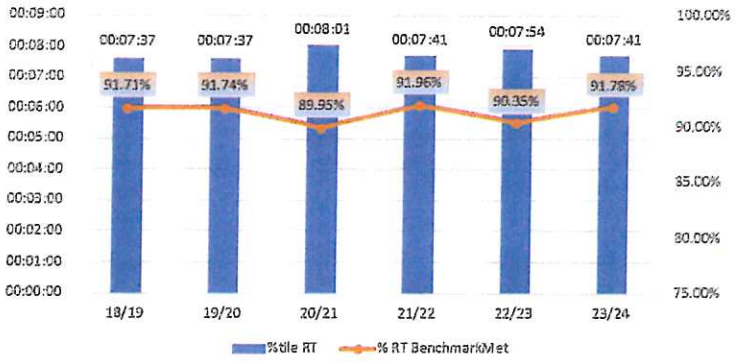
The measurable time segments which the department can manage and make improvements are turnout and travel. Added together and called "response time," the following presents response time, measured at the 90th percentile. The department has demonstrated their ability to respond within **07 minutes and 42 seconds** with the first arriving unit, running lights and sirens, within the department's first due territory.

A goal of 8 minutes was used as a benchmark and the current performance was compared to the benchmark. The percentage of incidents meeting that benchmark is shown in orange as a percentage of compliance. Overall, **the goal of 8 minutes** response time **was met on 91.29% of the events.** The gap between the benchmark and the baseline has been met at the 90th percentile. The six-year trend is a decreasing response time (improving) when evaluated monthly.

Response Time by Fiscal Year

A relatively steady response time performance during the period. Fiscal year 20/21 has an increased travel time, potentially related to the pandemic.

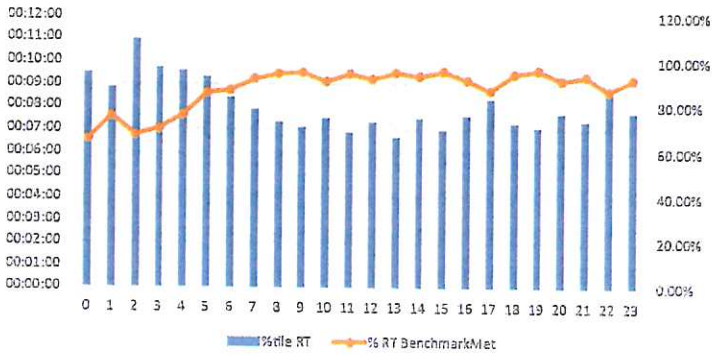
Figure 26: Response Time by Fiscal Year



Response Time by Alarm Hour

This graph illustrates the effects of longer turnout time during the nighttime hours. The differential between daytime and nighttime response times ranges from 06:40 in the 1pm hour to 10:56 in the 2am hour.

Figure 27: Response Time by Alarm Hour



Response Times by NFIRS Category

When evaluated in this manner, there are no large discrepancies between the categories. All eight categories are within the 7-minute range.

Figure 28: Response Time by NFIRS Category

NFIRS Category/Description	Count	RT	Goal Met %
1XX - Fire	128	00:07:34	92.97%
2XX - Overpressure Rupture, Explosion, Overheat(no fire)	4	00:07:20	100.00%
3XX - Rescue & Emergency Medical Service Incident	2,024	00:07:46	91.25%
4XX - Hazardous Condition (No Fire)	74	00:07:19	94.59%
5XX - Service Call	206	00:07:59	90.29%
6XX - Good Intent Call	120	00:07:16	93.33%
7XX - False Alarm & False Call	562	00:07:51	90.39%
8XX - Severe Weather & Natural Disaster	5	00:07:01	100.00%
Grand Total	**3,123**	**00:07:42**	**91.29%**

Response Time by Incident Type

Here, we can see the results of the longer turnout time and travel time on the 311-Medical Assist incident type where it posts the highest emergency response time of the top 15 types.

Figure 29: Response Time by Incident Type

NFIRS Incident Type	Count	RT	Goal Met %
321 - EMS call, excluding vehicle accident with injury	966	00:07:10	94.82%
311 - Medical assist, assist EMS crew	623	00:08:53	84.27%
322 - Motor vehicle accident with injuries	257	00:06:49	94.55%
324 - Motor vehicle accident with no injuries.	125	00:07:33	91.20%
743 - Smoke detector activation, no fire - unintentional	121	00:07:48	90.08%
733 - Smoke detector activation due to malfunction	113	00:08:03	88.50%
745 - Alarm system activation, no fire - unintentional	107	00:07:25	93.46%
552 - Police matter	104	00:06:22	95.19%
735 - Alarm system sounded due to malfunction	91	00:08:04	89.01%
554 - Assist invalid	76	00:08:48	86.84%
622 - No incident found on arrival at dispatch address	57	00:06:39	98.25%
740 - Unintentional transmission of alarm, other	42	00:07:53	90.48%
714 - Central station, malicious false alarm	40	00:07:59	92.50%
651 - Smoke scare, odor of smoke	37	00:06:44	94.59%
142 - Brush or brush-and-grass mixture fire	32	00:07:42	93.75%

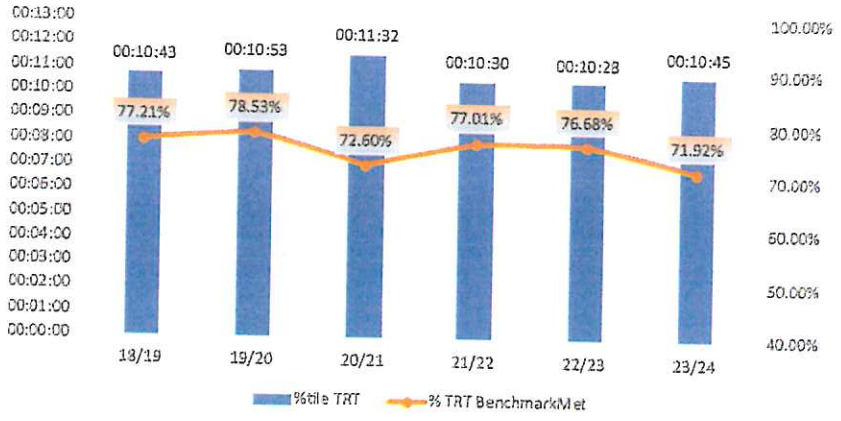
Total Response Time

This represents all three segments of time from the call received in the 911 center until the department arrives with their first unit. It is also a representation of the time the caller must wait before help arrives. Although not a direct reflection of the fire department's response capabilities, it should give the department a more realistic perspective on the amount of burn time a fire may have before their arrival. For medical events, it gives perspective on the possible cardiac downtime for cardiac arrest patients.

For the 6-year period of this evaluation, totaling **3,123 emergency response incidents** within the Shallotte Fire Department's first-due response area, the first arriving unit's Total Response Time at the 90th percentile is **10 minutes and 45 seconds.**

A goal of 7 minutes 30 seconds was used as a benchmark and the current performance was compared to the benchmark. The percentage of incidents meeting that benchmark is shown in orange as a percentage of compliance. Overall, **the goal of 9 minutes** travel time **was met on 75.92% of the events.** The gap between the benchmark and the baseline is 1 minute 45 seconds.

Figure 30: Total Response Time by Fiscal Year



NFIRS Category/Description	Count	Call Processing	Turnout	Travel	Response Time	Total Response Time
1XX - Fire	128	00:03:09	00:01:54	00:06:09	00:07:34	00:09:58
2XX - Overpressure Rupture, Explosion, Overheat(no fire)	4	00:06:04	00:01:12	00:06:08	00:07:20	00:08:59
3XX - Rescue & Emergency Medical Service Incident	2,024	00:04:07	00:01:55	00:06:28	00:07:46	00:10:50
4XX - Hazardous Condition (No Fire)	74	00:03:02	00:01:57	00:05:28	00:07:19	00:09:38
5XX - Service Call	206	00:05:09	00:02:06	00:06:28	00:07:59	00:11:53
6XX - Good Intent Call	120	00:04:28	00:02:06	00:06:00	00:07:16	00:10:13
7XX - False Alarm & False Call	562	00:03:05	00:02:01	00:06:22	00:07:51	00:10:03
8XX - Severe Weather & Natural Disaster	5	00:04:23	00:02:26	00:05:41	00:07:01	00:11:24
Grand Total	3,123	00:03:59	00:01:58	00:06:24	00:07:42	00:10:45

Benchmarks and Baselines

Most departments have response time goals which align with standards or best practices and monitor their performance against those goals. These are known as **benchmark goals**, and **baseline performance measures**. The unit of measure is percentile, normally 80th or 90th depending on the department type, and gives a good indication of what the department can accomplish in most incidents. The difference between the benchmark and baseline is the gap, and a gap analysis should be performed periodically to determine needs for improvement and/or highlight performance improvements that have been historically made.

Response Goals (Benchmark)

The Shallotte Fire Department has established benchmark goals at the 90th percentile as follows:

Call Processing	911 rec'd to dispatch	01:00
Turnout Time	Turnout 1st Arriving Unit	01:30
Travel Time	Travel Time 1st Arriving	06:30
Response Time	Turnout and Travel Time	08:00
Total Response Time	Call Processing, Turnout, Travel	09:00

Demonstrated Performance (Baseline)

Based on the incident data, the Shallotte Fire Department has demonstrated the ability to respond to **90 percent** of all events (all risk hazard) within **11 minutes and 19 seconds, or less**, from the receipt of the 911 call in the PSAP until the first fire department unit arrives. This is considered **Total Response Time** demonstrated, baseline performance.

		Benchmark	Baseline	Gap
Call Processing Time	911 Rec'd to Dispatch	01:00	**03:59**	02:59
Turnout Time	Turnout 1st Arriving Unit	01:30	**01:58**	00:28
Travel Time	Travel Time 1st Arriving	06:30	**06:24**	Goal Met
Response Time	Turnout and Travel Time	08:00	**07:42**	Goal Met
Total Response Time	Call Processing, Turnout, Travel	09:00	**10:45**	01:45

Unit Staffing

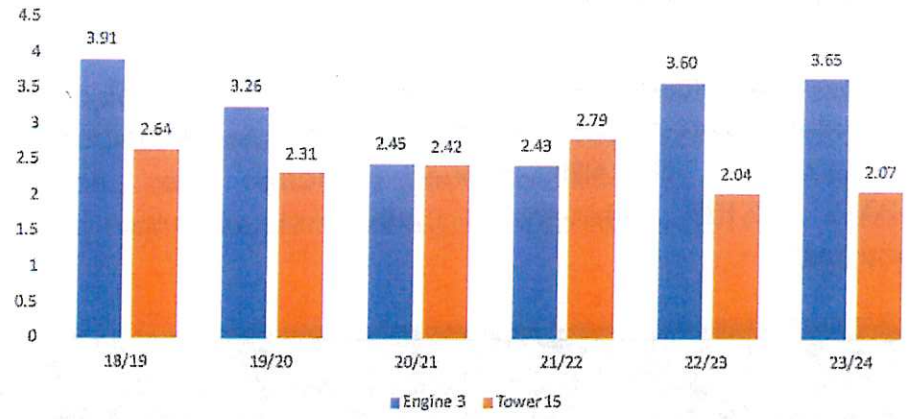
Within the NFIRS report, staff are associated with the unit and assumed to be those which traveled and arrived with the unit on the response. This gives the ability to determine when an effective response force arrived on the incident. This also allows the ability to see average staff count per unit over time.

During the six-year evaluation.

- Engine 3, with 8,830 incidents, averaged 3.7 staff.
- Tower 15, with 447 incidents, averaged 2.4 staff.

Over the six-year period, staffing remains constant with an exception to Engine 3 where average staff count dropped during fiscal years 20/21 and 21/22.

Figure 31: Avg Staff by Unit by Fiscal Year



Effective Response Force Analysis (ERF)

An Effective Response Force is determined by the fire department once they have analyzed their risk in the community and completed a critical task analysis of each risk type to determine what resources are needed in respect to apparatus and staff counts. The deployment and arrival of those resources should have time-based goals associated with each, and the objective of assembling the ERF in minimal time to mitigate the incident and assist in changing to a more positive outcome.

Limitations of this type of analysis are found when the department relies on mutual or automatic aid resources and those resources, both apparatus and staff, are not found in their data. The current fire reporting system, NFIRS, does not require the AHJ department to collect individual aid units, their respected timestamps, and staff count. This makes analyzing a true ERF difficult. The department can start collecting this information in their system to make this a possibility.

We can analyze the arrival of the AHJ's resources to give a look at their abilities to assemble their own apparatus and staff for specific incident types. The following represents 18 NFIRS-defined structure fires (Incident Types: 111,112,120,121,122,123), within the AHJ, where the units that arrived traveled emergency traffic.

Enter ERF # here->		6	Baseline@ 90th percentile	Benchmark	Gap
Call Processing Time (CP)	nth = 18	Pickup to Dispatch	0:03:34	0:01:00	0:02:34
Turnout Time (TO)		Turnout 1st Arriving Unit	0:02:05	0:01:30	0:00:35
Travel Time (Trv)		Travel Time 1st Arriving	0:05:47	0:06:30	Goal Met
	nth = 10	Travel Time ERF Unit	0:10:06	0:00:00	0:10:06
Total Response Time (TRT)		Total Response Time 1st Arriving Unit (CP,TO,Trv)	0:10:10	0:09:00	0:01:10
	nth = 10	Total Response Time ERF Unit (CP,TO,Trv)	0:50:04	0:00:00	0:50:04

Department Response Measures

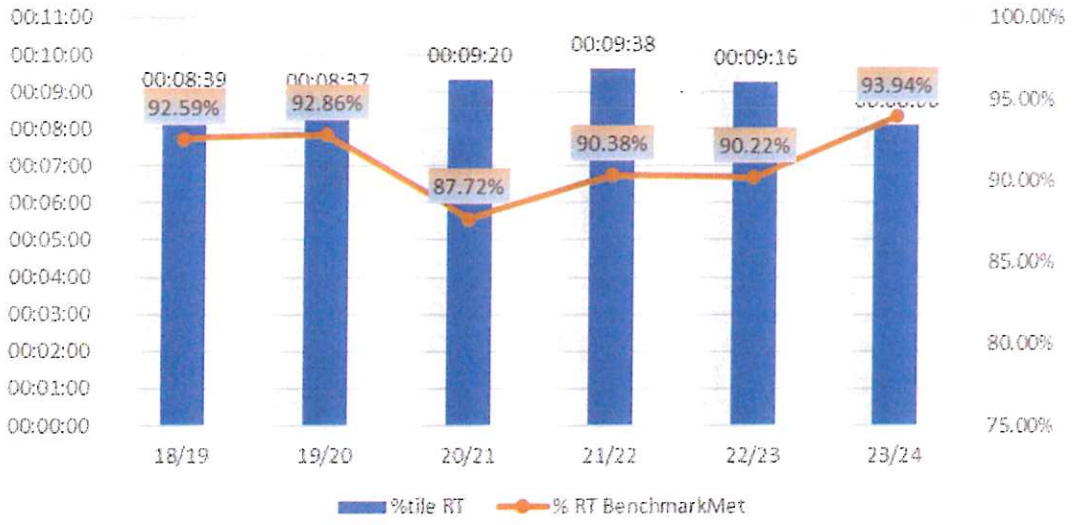
Response Measure #3

Benchmark: *Total response time (dispatch time to arrival at scene) for all medical responses inside the Town of Shallotte Fire/Rescue Department's primary response district shall be a vehicle equipped with medical supplies including an AED in 8 minutes or less 95% of the time.*

Using the data provided, an analysis of the department's response measure was conducted and has the following results.

Baseline: The Town of Shallotte Fire/Rescue has demonstrated a response time (dispatch to arrival at scene) of **8 minutes and 57 seconds** for **medical responses** (NFIRS 300 Series) of the first arriving unit traveling **emergency traffic**, inside the **primary response district**. The **goal of an 8-minute** response **was met on 91.25%** of incidents. The gap between the benchmark (08:00) and baseline (08:57) is 57 seconds. 2,024 incidents evaluated.

Figure 32: Department Response Measure #3



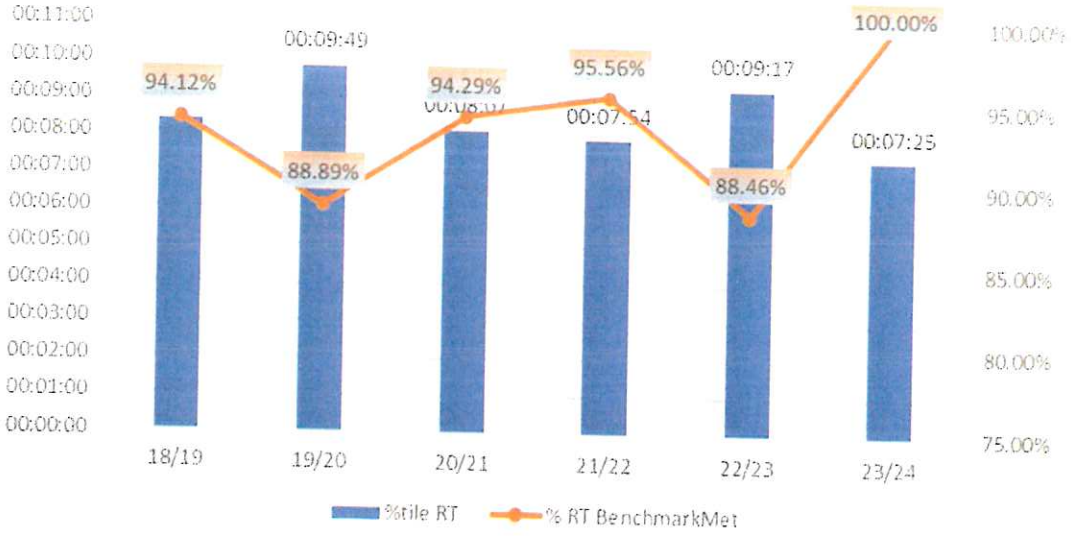
Response Measure # 8

Benchmark: *Total response time (dispatch time to arrival at scene) for all fire and hazardous condition responses (excluding 500, 600 and 900 call types) inside the Town of Shallotte Fire/Rescue Department's primary response district shall, at a minimum, be an apparatus appropriate for the call type in 7 minutes or less, 95% of the time.*

Using the data provided, an analysis of the department's response measure was conducted and has the following results.

Baseline: The Town of Shallotte Fire/Rescue has demonstrated a response time (dispatch to arrival at scene) of **8 minutes and 9 seconds** for **fire and hazardous responses** (NFIRS 100, 200 and 400 Series) of the first arriving unit traveling **emergency traffic**, inside the **primary response district**. The **goal of an 8 minutes** response **was met on 93.69%** of incidents. The gap between the benchmark (08:00) and baseline (08:09) is 1 minute 9 seconds. 206 incidents evaluated.

Figure 33: Department Response Measure #8



Recommendations

The following are recommendations related to data collection to allow more accurate analysis of demonstrated performance and demand.

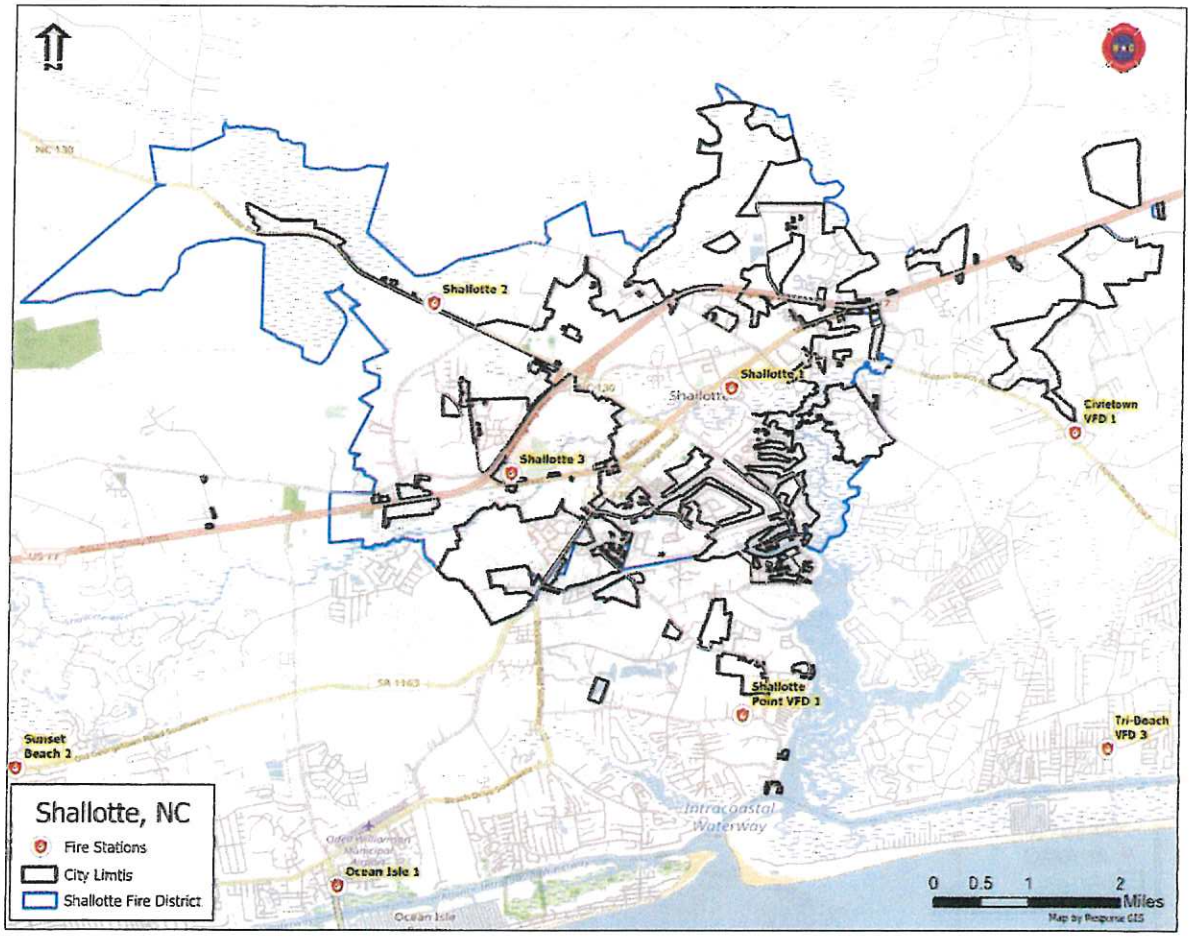
- Consider a meeting with your 911 center to determine the cause of the elongated call processing time.
- Consider defining call processing goals (benchmark) as they relate to time. These can be existing standards like NFPA 1910 or internal benchmarks. An evaluation should be conducted on a periodic basis and the period defined and agreed upon by both parties. The evaluation should compare the benchmark to the baseline (demonstrated performance) and when a gap exists, goals should be established with the intent to reduce call processing time and narrow the gap.
- For incidents where the department is attempting to analyze an effective response but requires mutual or auto aid companies, consider entering their unit report with accurate timestamps and a staff count of each into your RMS system.
- Reiterate the importance of the correct unit response mode to allow filtering of non-emergency responses in the response evaluation.
- Consider a documented outlier policy identifying the threshold of each time segment that should be filtered from a response time evaluation. Once established, each outlier should be investigated to determine the cause of the outlier and if processes or procedures can be improved to reduce or eliminate these outliers.

Section 2: Geographical Information System Analysis

Introduction

The Town of Shallotte is located on the North Carolina coast, just southwest of the City of Wilmington, North Carolina. The fire department operates from one staffed station and two other stations without dedicated duty staff across a 110 square mile area that includes areas outside the town limits as seen in the following figure. The fire department staffs an apparatus in Station 1.

FIGURE 34: Current Fire Service Area & Fire Station

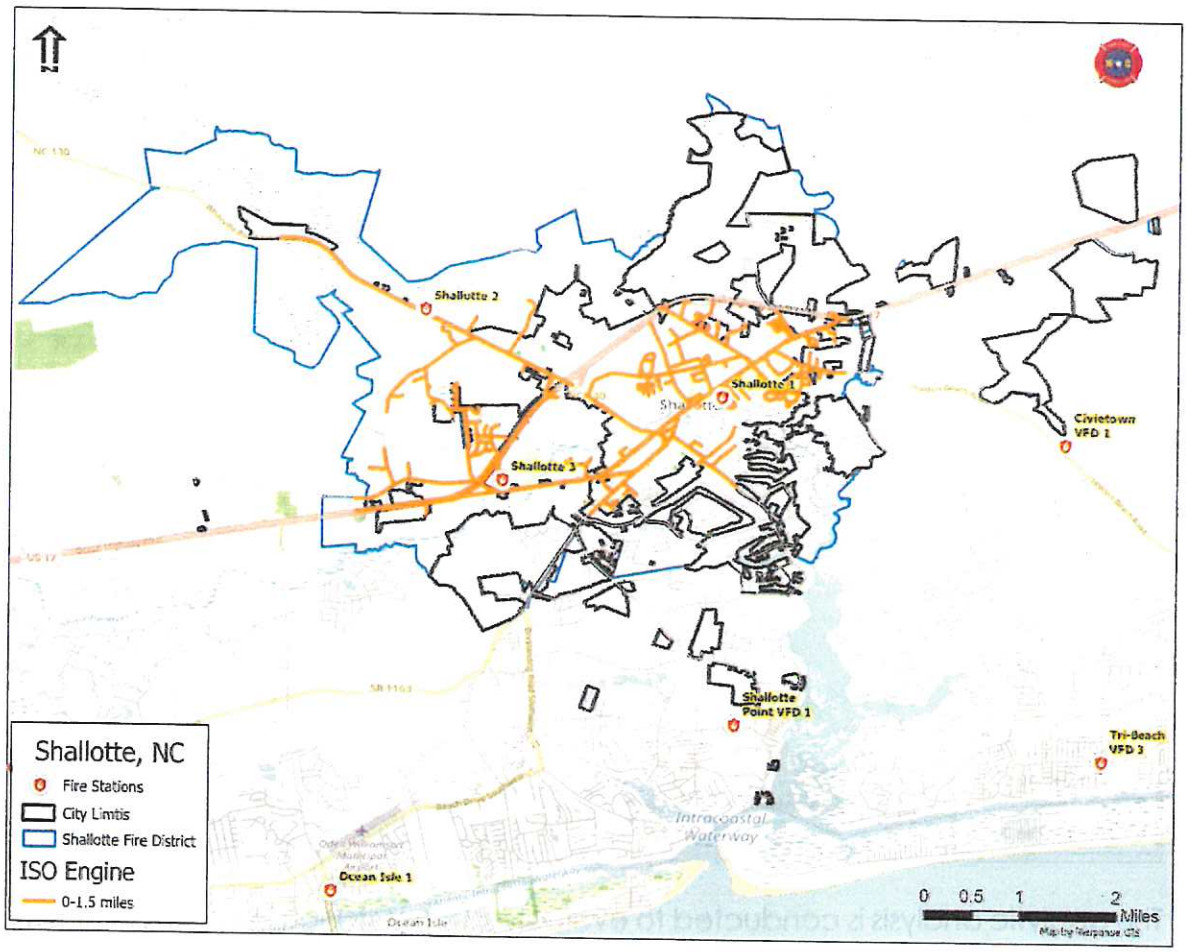


This analytic analysis is conducted to evaluate current station locations and select an optimal location(s) for relocatable stations. These scenarios will be evaluated against the current and former deployment coverage using a six-minute travel time model.

Distance Coverage

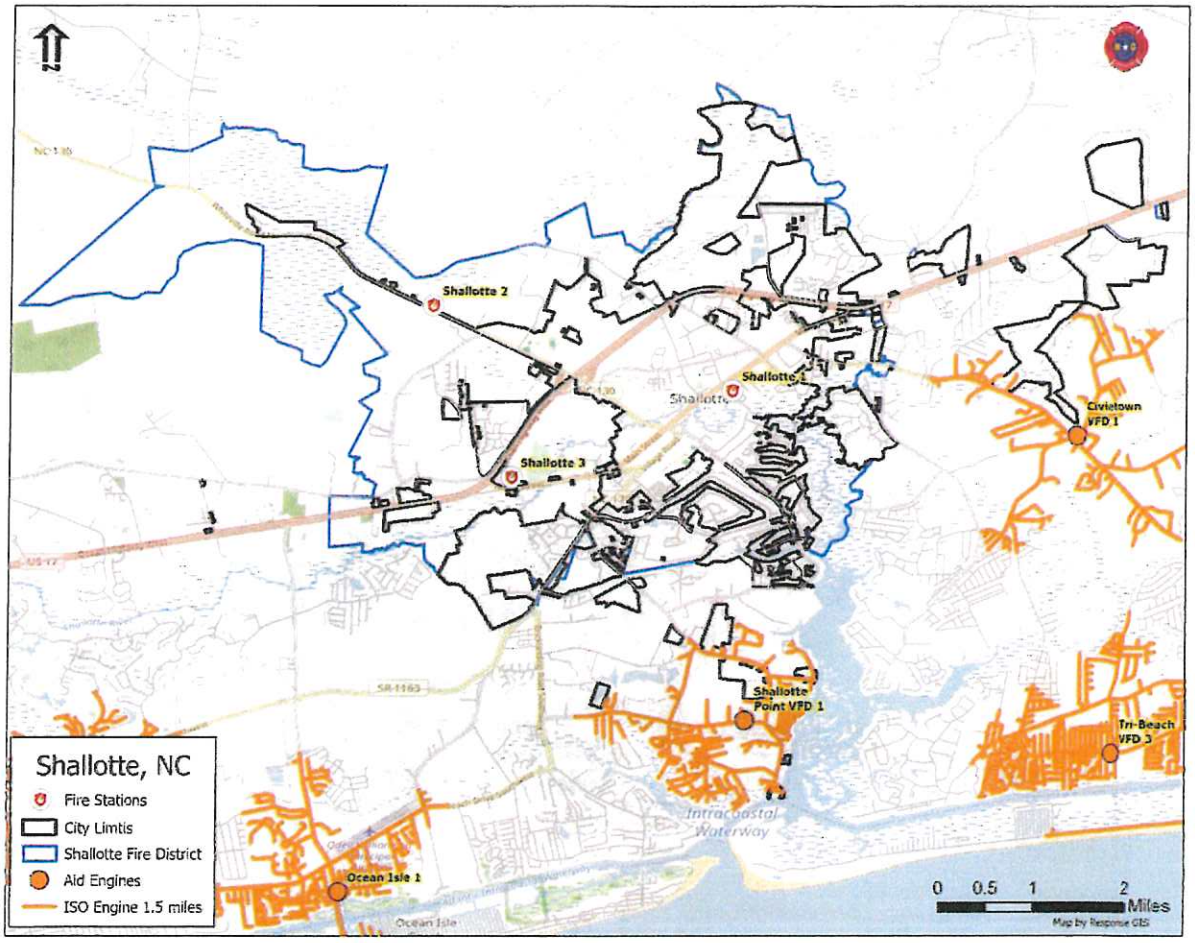
The Insurance Services Office (ISO) recommends that an engine company be within a 1.5-mile distance within a developed area (Hydrants indicate a developed area according to ISO) is needed for favorable insurance ratings for property owner premiums. It also specifies that a property could be considered for the highest insurance premium rates if it is greater than 5 miles from a fire station. The following map shows the Engine Company recommended distance.

FIGURE 35: ISO Engine & Limit Distance Coverage



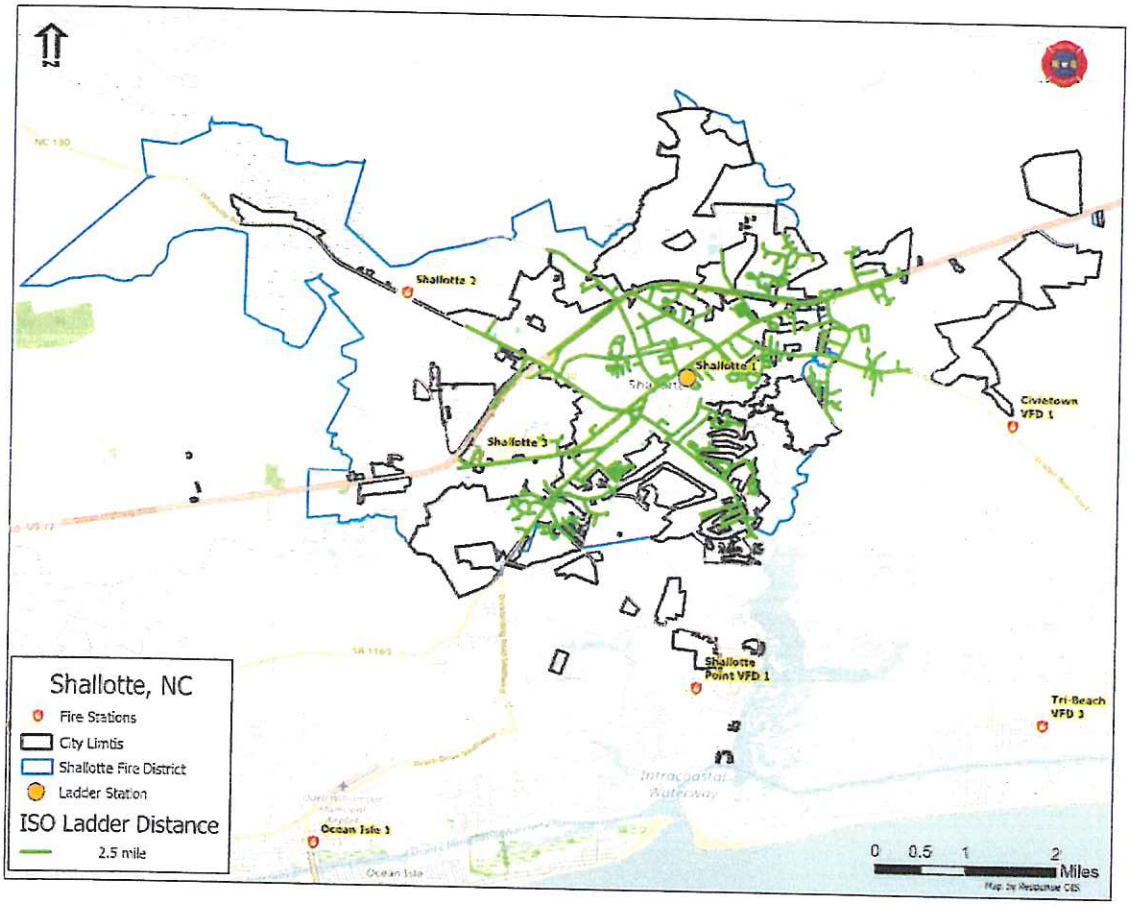
Credit can be given for automatic aid departments who are dispatched simultaneously with the Shallotte Fire Department (SFD). As can be seen in Figure 36, only minimal ISO credit could be received by the inclusion of Civietown VFD and Shallotte Point VFD.

FIGURE 36: ISO Engine Distance by Neighboring Fire Stations



For ladder/aerial trucks, the ISO recommends a 2.5-mile distance for favorable ratings. These types of apparatus are used for taller and larger buildings for their ability to provide access to victims in upper stories, elevate water to combat fires in upper stories and atop roofs, and to provide roof access for vertical ventilation in taller and large square footage structures.

FIGURE 37: ISO Truck Distance Coverage

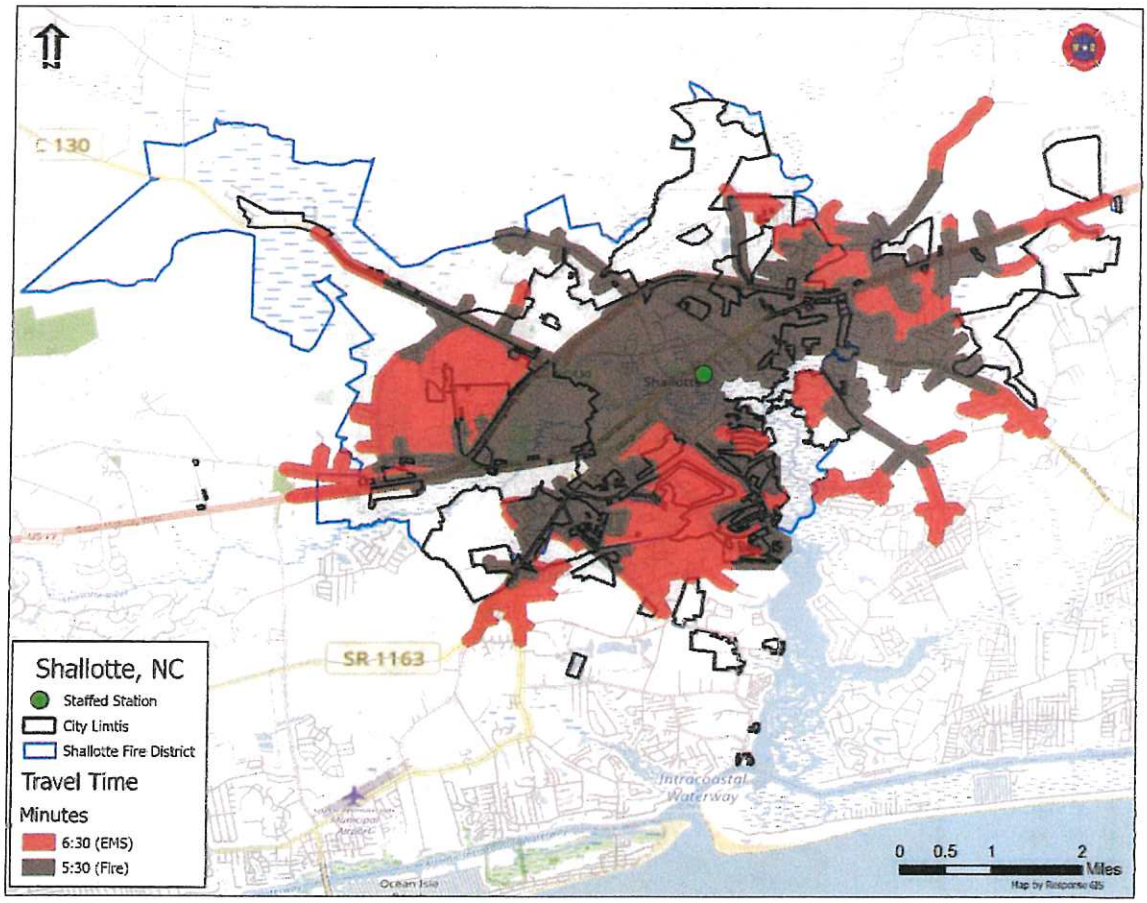


No neighboring department's ladder trucks are within the distance to improve SFD's rating in this analysis/metric.

Time Coverage

The most important element to the citizens is the time it takes to receive help in an emergency. The following map represents the extent of a modelled travel time using the street network, posted speed limits, and the restrictions in place, if any. While turns, intersection crossings such as traffic lights, and at-grade railroad crossings increase travel time and are factored in, uncontrollable events such as weather, detours, and traffic congestion are not factored in the computer modeling.

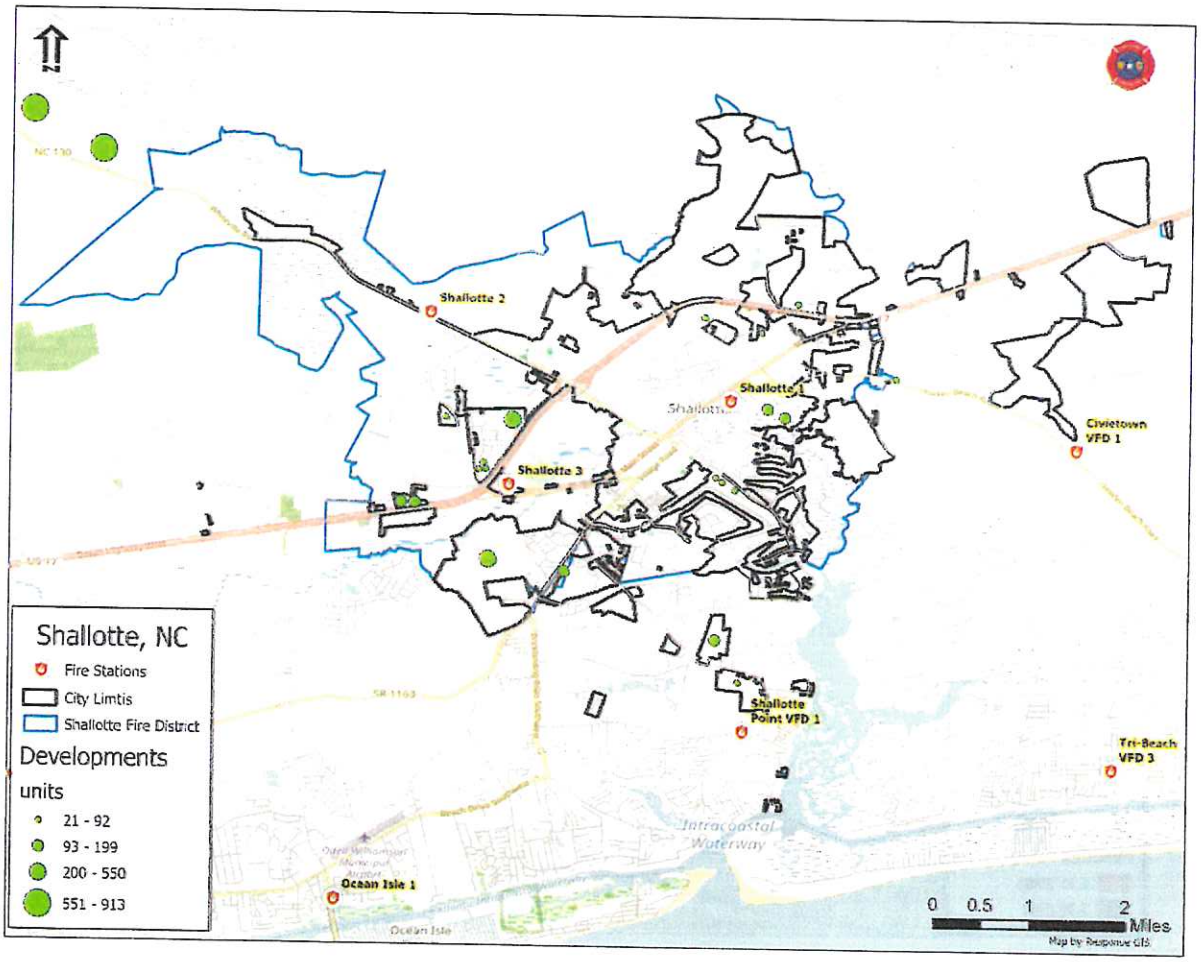
FIGURE 38: Travel Time Coverage



Much of the Town can be reached within the travel time, while most of the fire district is reachable within six minutes and 30 seconds of travel from the staffed fire station. Shallotte provided travel time parameters of 5 minutes, 30 seconds for fire emergency response and 6 minutes, 30 seconds for medical emergency response. Remaining projections use a 6-minute travel time for an average travel time predictability.

Development

Development data was provided by the town, indicating 16 residential projects and 9 small commercial projects. The residential projects are projected to have about 4,300 new units. Multiplied by the census persons per household indicates that a potential population increase of over 9,000 persons is possible with this projected development. The number of incidents per current population was applied to the additional population and the result indicates an estimated 1,000 additional calls for service for the fire department. The following map illustrates the units by symbol size in the fire district area.



The two largest developments (King Tract) just outside the northwest corner of the fire district are slated to have 1,825 units. It is reported that sewer and water services will be needed, increasing the possibility of annexation by the Town of Shallotte.

Project Name	Location	Project Type	# of Units
Garnet Place	Arnold St	Rez/Multi Family	72
The Tides - Smith Ave	HWY 130 (Smith Avenue)	Rezone & SUP	398
The Meadows	Wildwood Village	Subdivision	244
McLamb -Multi-Fam	98 Wildwood St	Cond. Rezone Muti-Fam	64
Sharron's Creek Crossing	HB Rd. (Hwy 130) & Red Bug Rd.	Subdivision	49
Highland Forest P5	Higlands Glen Dr./ Frontage Rd	Subdivision	92
Summer's Walk	Bricklanding Rd.	Annexation & SUP	145
Creekside Landing	1100 Village Point Road	Rezone& PUD	154
Tryon Village	Tryon Rd.	Subdivision	35
Coastal Walk Multi-Fam	Smith Avenue & Main Street	SUP/Multi Family	80
1295 Village Pt-RCD	1295 Village Point Rd	SUP	84
Copas Ridge	Copas Rd	Annex & PUD	72
Brunswick Pines	Hwy 179	Annex & PUD	550
Hawthorne Shallotte	4970 & 5030 Ocean Hwy (Hwy 17)	SUP/Multi Family	216
King Tract	Big Neck Rd NW/Hwy130		1825
			4296

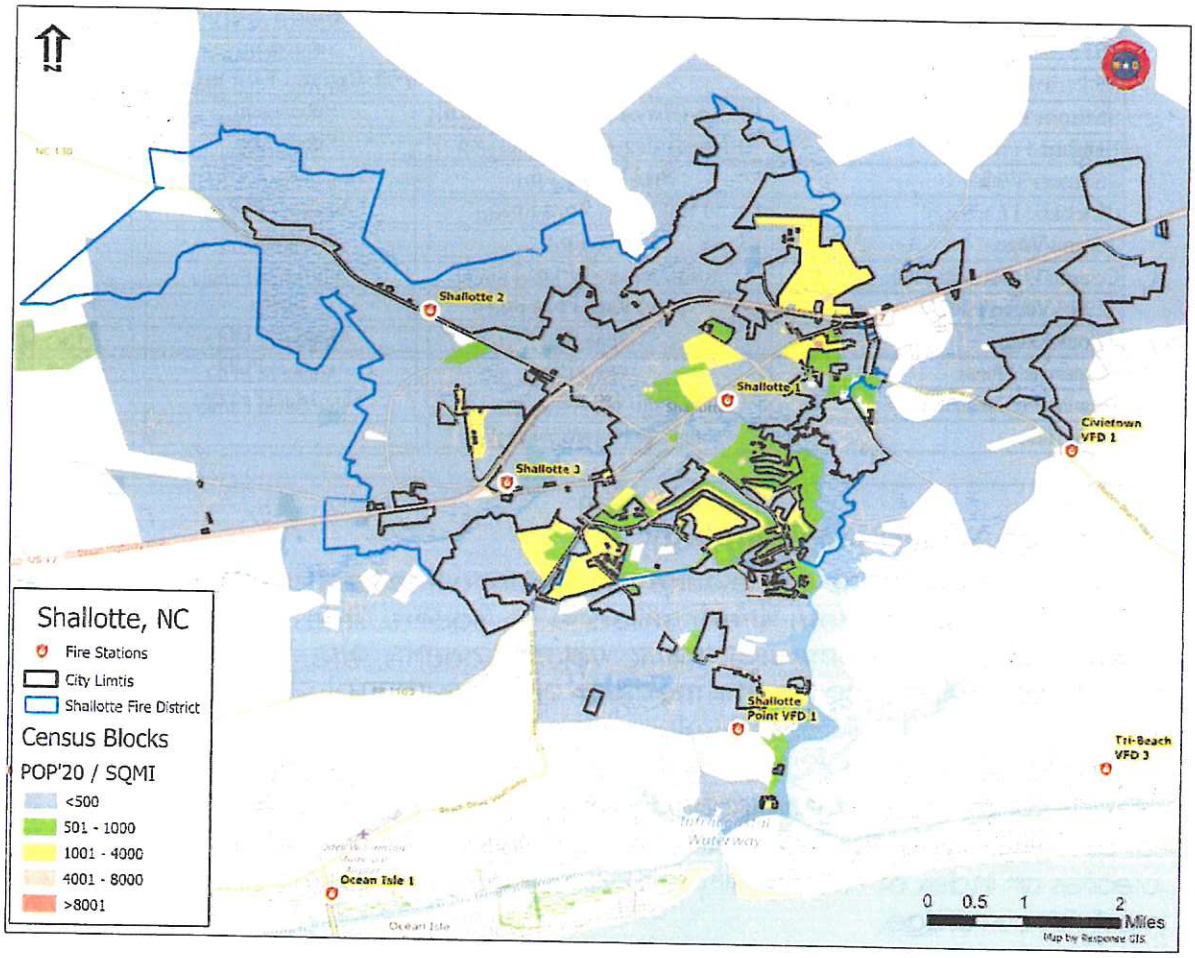
Coverage Analysis Methodology

To assess the coverage of the current locations of the fire stations, many measures can be tabulated from street mileage to square miles, population, events, address points, property use, traffic volume counts, etc. These multiple results would vary depending on the measure and the impact on the fire service. For instance, mileage assumes development. This is not true; streets simply provide a means to development. There are miles of open fields along a roadway which is why area coverage is also discouraged. What is needed is one methodology that levels the playing field of measures that impact the fire service the most and creates an index of vulnerability to evaluate coverage. The goal is to provide the most risk coverage.

Population

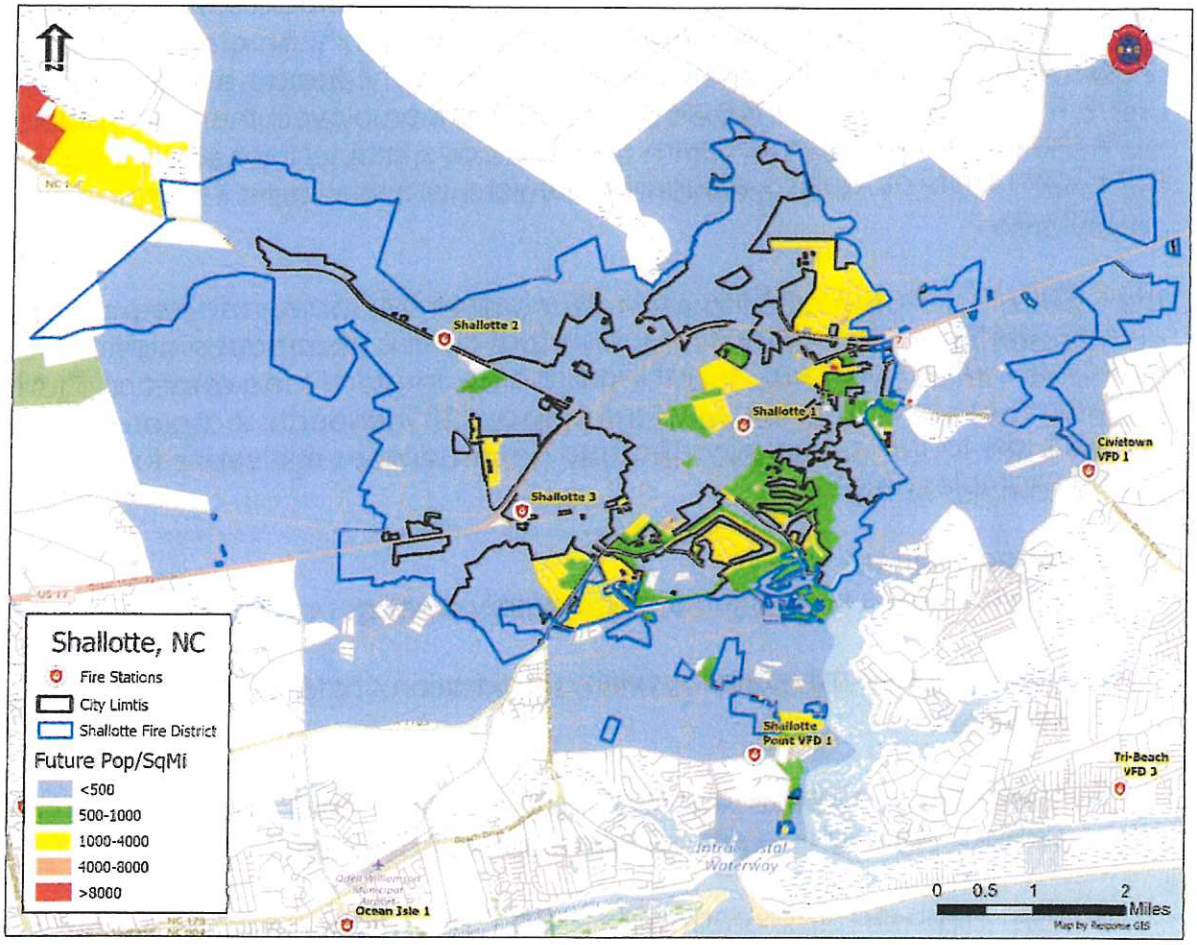
There are three elements that impact the fire service the most. First is population because areas of higher amounts correlate with more demand for services. Additionally, these are residential taxpayers funding the fire department services. The following map shows the census block areas with the 2020 population per square mile. 8,662residents are within the town limits.

FIGURE 39: Current Population Density



The higher concentrations of population are near the central core of the fire district. Future population density changes little based upon the development except for the King Tract area where significant change can be seen in the following figure.

FIGURE 40: Future Population Density



A drawback of examining population coverage alone is that it does not consider the risk that commercial and industrial properties (with no residential population) pose to a community.

Land Use Risk

Secondly, the use of land related to the structures and stockpiles vary in size and type. Some uses of land pose more risk to a community than others, such as a single-family home versus a chemical storage facility. Because of the myriad of uses, a macro analysis of risk based upon zoning is employed in the methodology. The study team was supplied with a zoning code attribute for each area within the Town limits as well as extending outward into the current unincorporated county area.

The types of uses pose differing risks to a community. Some may be a point of public assembly; others may be a facility that contains hazardous materials for its processes. Others are homes, that if lost to a fire is tragic to the owner and family. However, the loss of a structure that employs 300 residents is a greater overall impact loss to the community. The study team defines risk level as follows with some examples noted:

Risk Category Criteria

1. Lowest - Wide separation of single-family dwellings and farmland.

2. Low – Single-family dwellings with a separation of at least 100 feet between buildings.

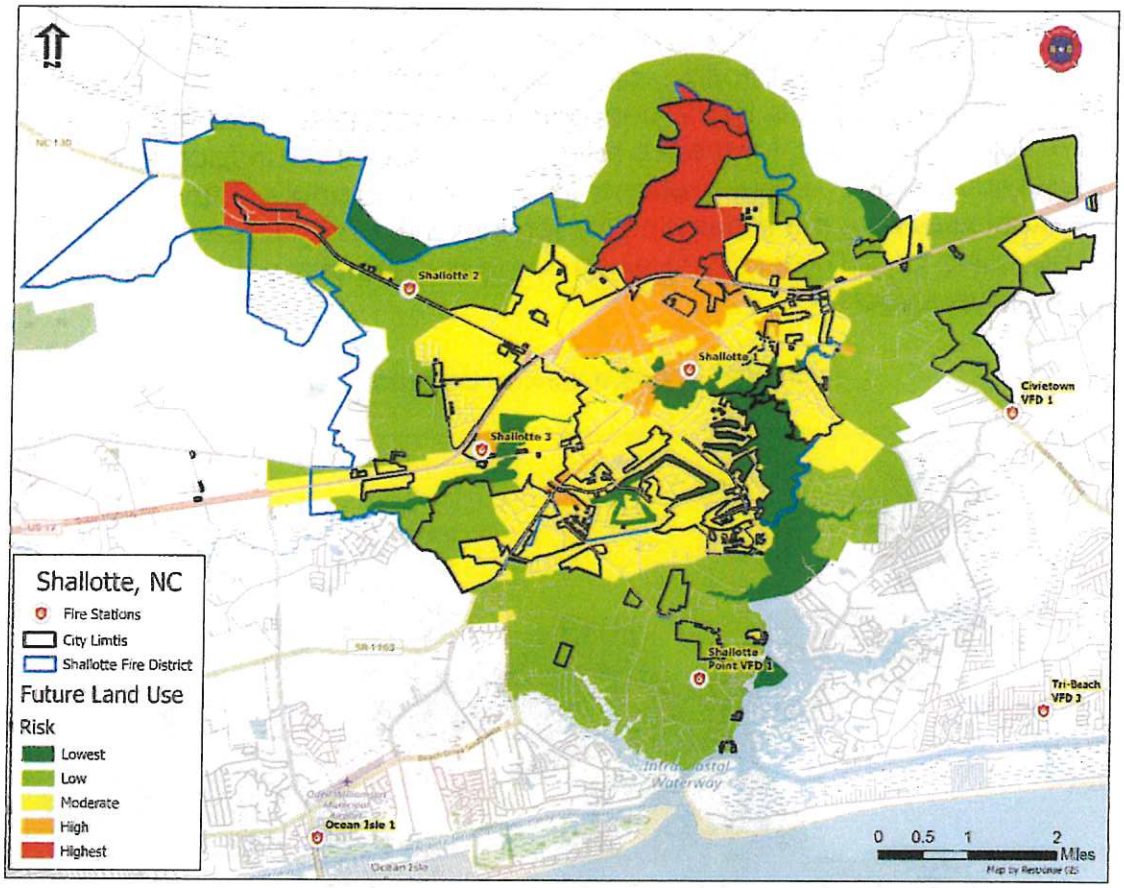
3. Moderate – Commercial and light industrial facilities, small shopping centers, and high-density, low-rise residential buildings.

4. High – High-rise hotels and residential buildings, large shopping centers, and industrial complexes.

5. Highest – Refineries, large industry, lumber yards, and propane storage facilities.

These risk levels were applied to the zoning data provided in the resulting map.

FIGURE 41: Land Use Risk Map

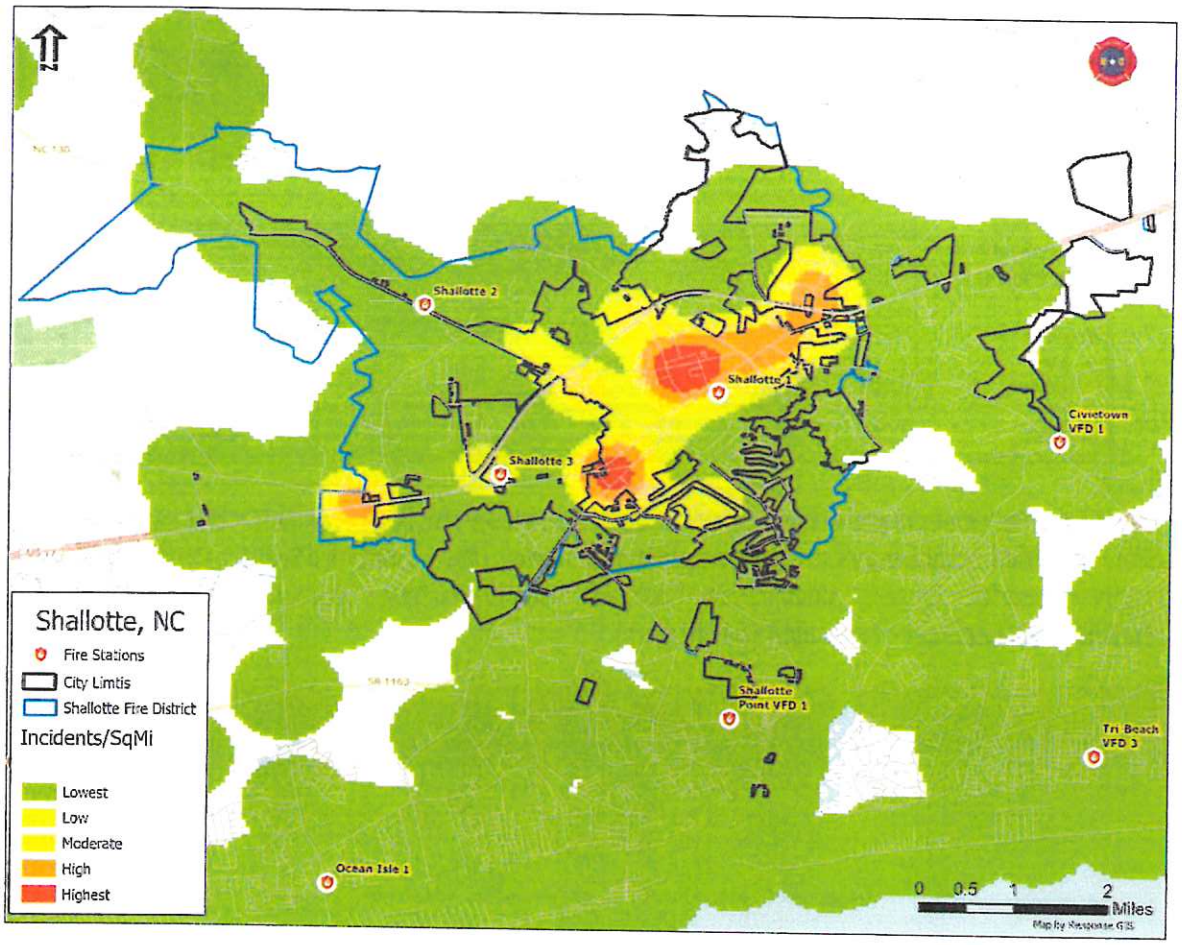


Most of the areas have low or moderate risk levels. Higher risk can be seen along the arterial roadways and along the rail lines. The area in South Point on the river is an electric power plant. The furthest south higher risk is a botanical garden facility zoned commercial (Fertilizers).

Demand for Services

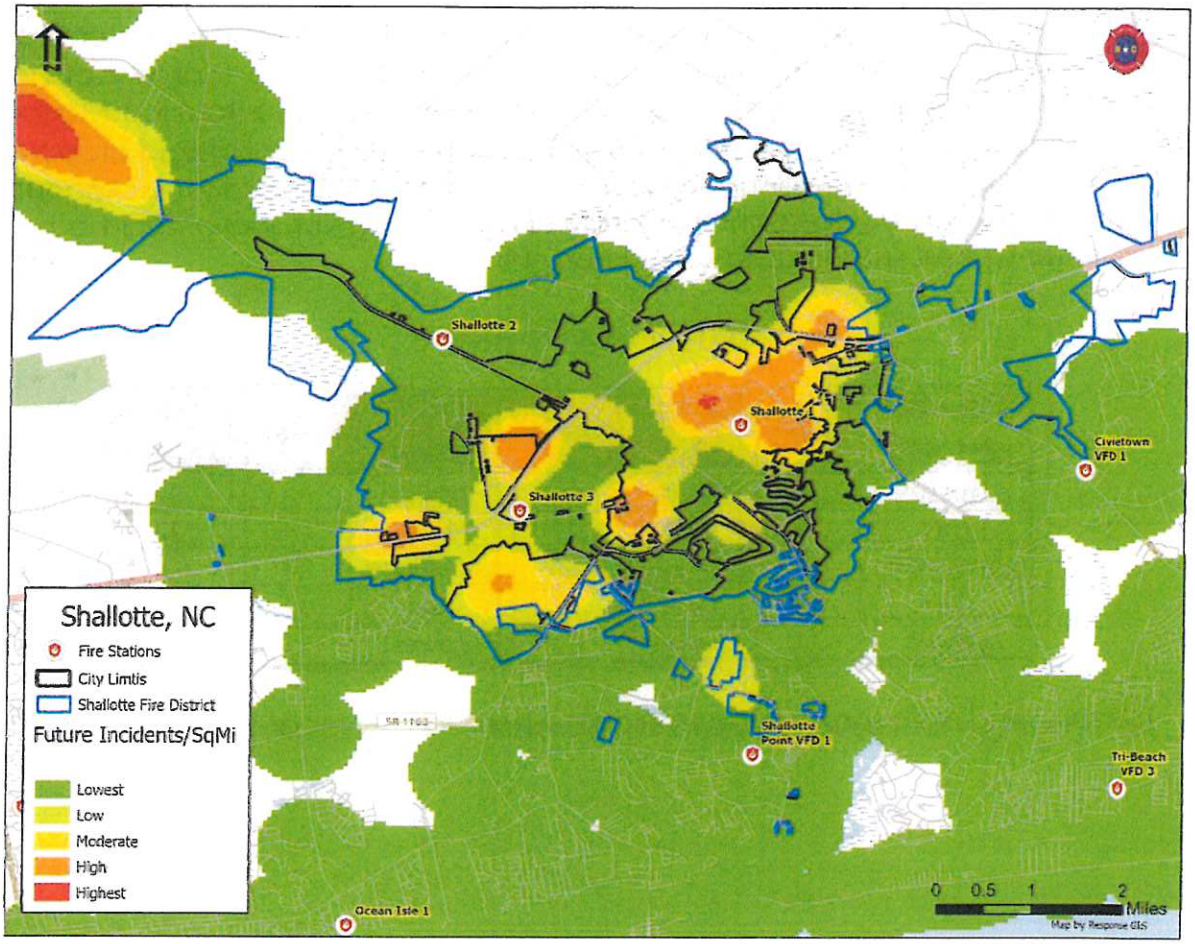
Thirdly, the demand for services, although they do correlate with higher population, can also be driven by non-residential commercial facilities like nursing homes, higher educational, and public facilities such as airports, and transportation terminals. Highly congested and unimproved intersections can also drive service demand for the fire service. Because of these factors, the demand for services is also a major element in coverage analysis. The following map demonstrates where the demand for services is the most intense based upon the geographic coordinates (X, Y) given in the fire department's raw incident data over multiple years.

FIGURE 42: Current Service Demand Density



Much of the demand is concentrated where higher population density is in the downtown area near fire station 1. The high demand is also noted east and west of station 3. Demand for services in the future changes modestly again except for the impact of the Kings Tract development.

FIGURE 43: Future Demand Density



Vulnerability Risk Index

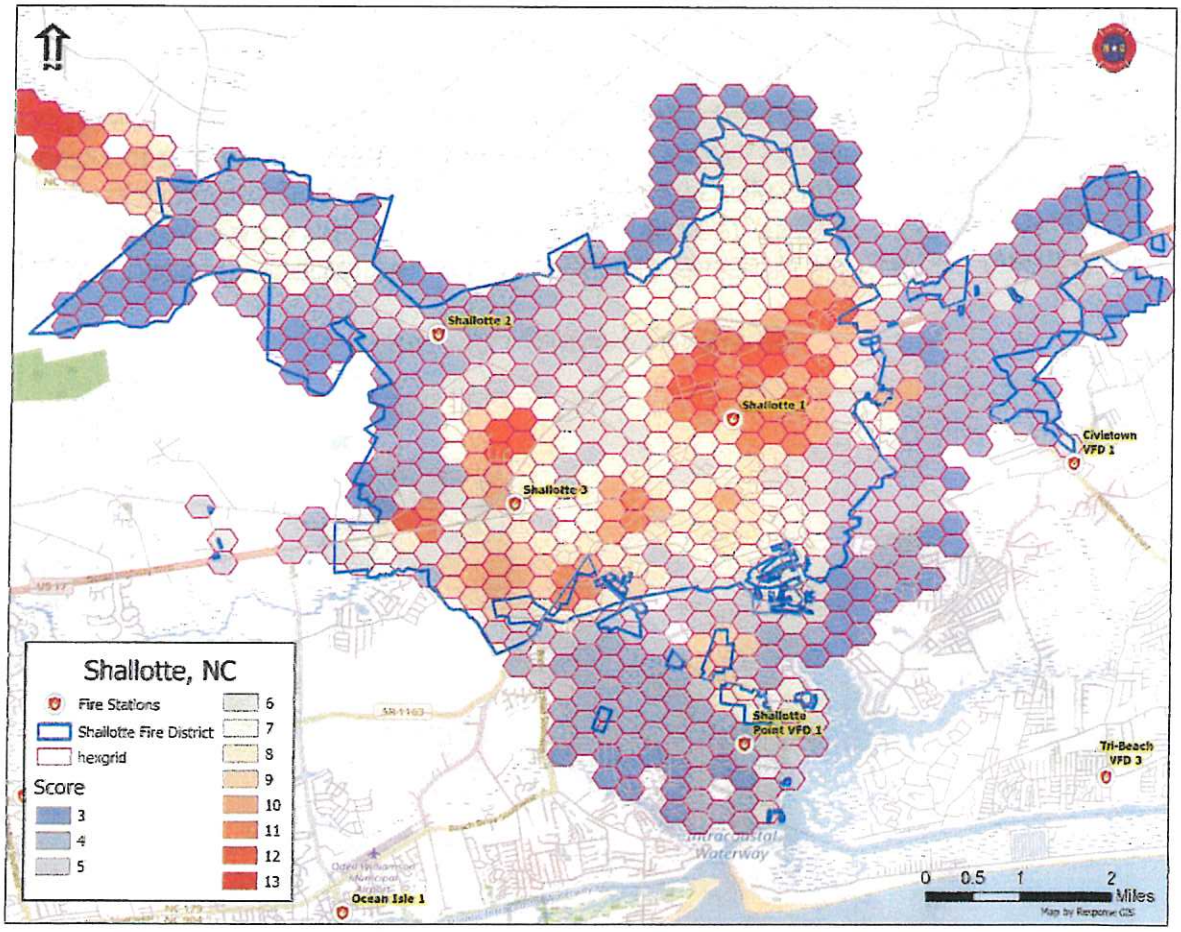
To measure the coverage adequacy by the fire station, travel time extents, the elemental aspects of population, land use risk, and demand for services are combined after equalizing each aspect into five sets of data from least to most (1-5). A 1/4-mile hexagonal grid was digitally constructed and overlaid atop the fire service area. The combined elemental scores were applied to the hexagonal areas to create a Vulnerability Risk Index (VRI). The lowest score would be a 3, while the highest score possible would be a 15.

FIGURE 44: VRI Scoring

Population per Sqmi	Score	Land Use Risk	Score	Incidents per Sqmi	Score	Total Score
Highest	5	Highest	5	Highest	5	15
High	4	High	4	High	4	12
Moderate	3	Moderate	3	Moderate	3	9
Low	2	Low	2	Low	2	6
Lowest	1	Lowest	1	Lowest	1	3

The following map shows geographically where the scores are higher or lower.

FIGURE 45: VRI Score Map



From the current SFD station 1 location, the coverage of the VRI score using the travel time model is 71%. This 71% serves as the benchmark to compare with any station relocations in this report. This 71% VRI score does not credit the current fire station 2 or fire station 3.

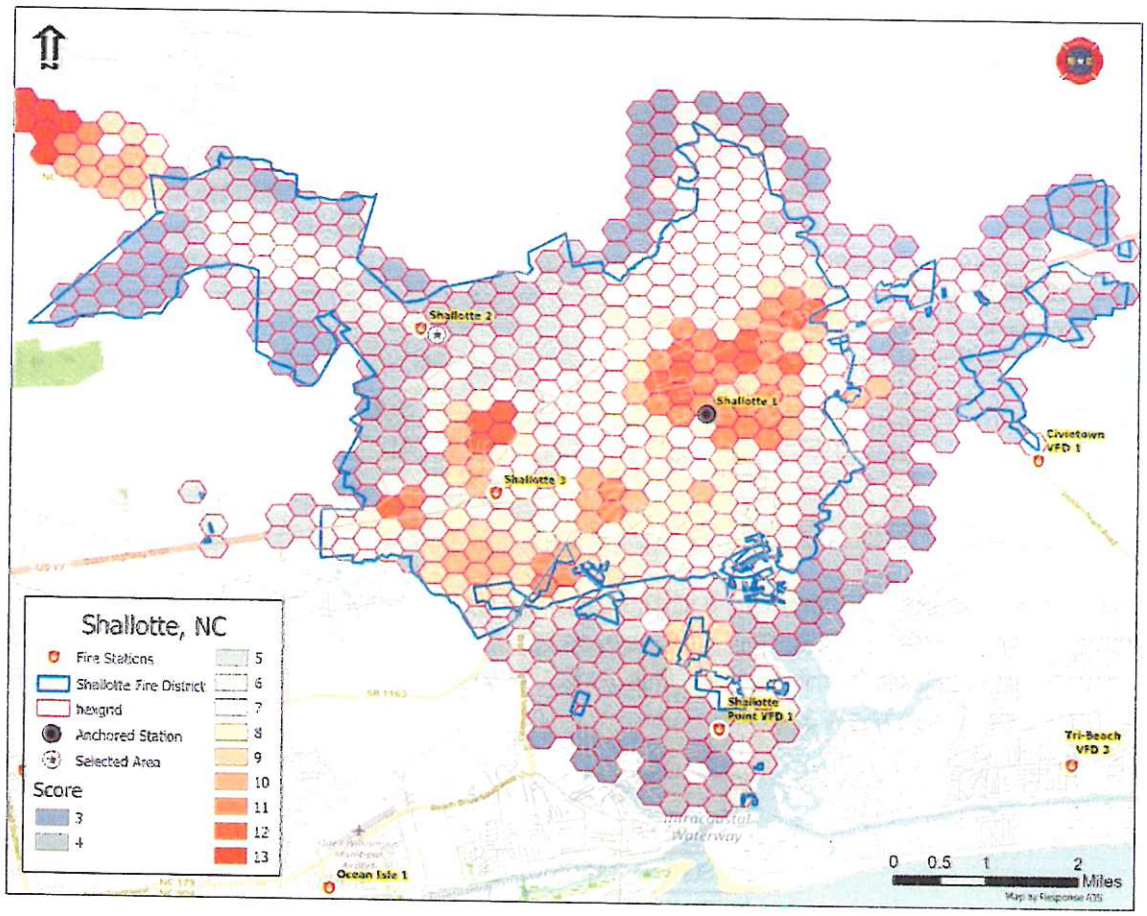
Travel Time	6 minutes
Staffed Station	71%
w/Station 2 staffed	84%
w/Station 3 staffed	79%
w/all stations staffed	89%

Note that Shallotte fire station 1 and Shallotte Point staffed increases the coverage from the benchmark to 80%.

Optimal Station Location-Scenario A

In the following scenario, Station 1 is not considered for relocation (anchored). The geographic intelligent technology attempts to optimize/improve the VRI score from the current conditions by locating the best location using the 6-minute travel time model to reach the hexagons for a second station. The following figure shows where the location of the second fire station should be located to optimize the total VRI score. The location is shown as a star in a circle. The location selected is near (almost adjacent) to the current fire station 2. This model provides a VRI score of 84%, which is an increase of 13% over just the Shallotte Station 1 facility.

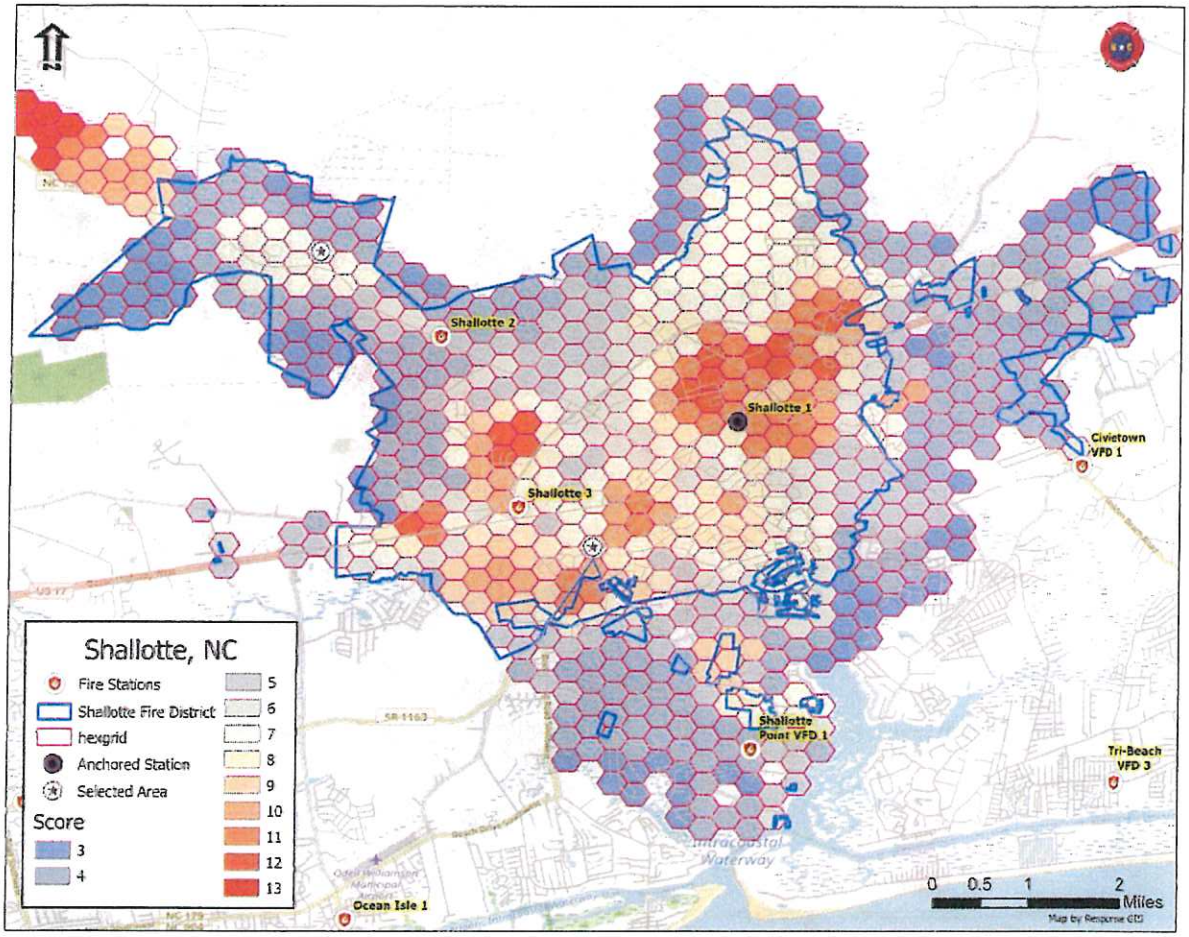
FIGURE 46: Scenario A Coverage



Optimal Station Location-Scenario B

This scenario repeats the previous scenario but searches for <u>two</u> optimal located stations beyond the current Shallotte fire station 1 facility. The following figure shows where the location should be to optimize coverage for the Town.

FIGURE 47: Scenario B Coverage

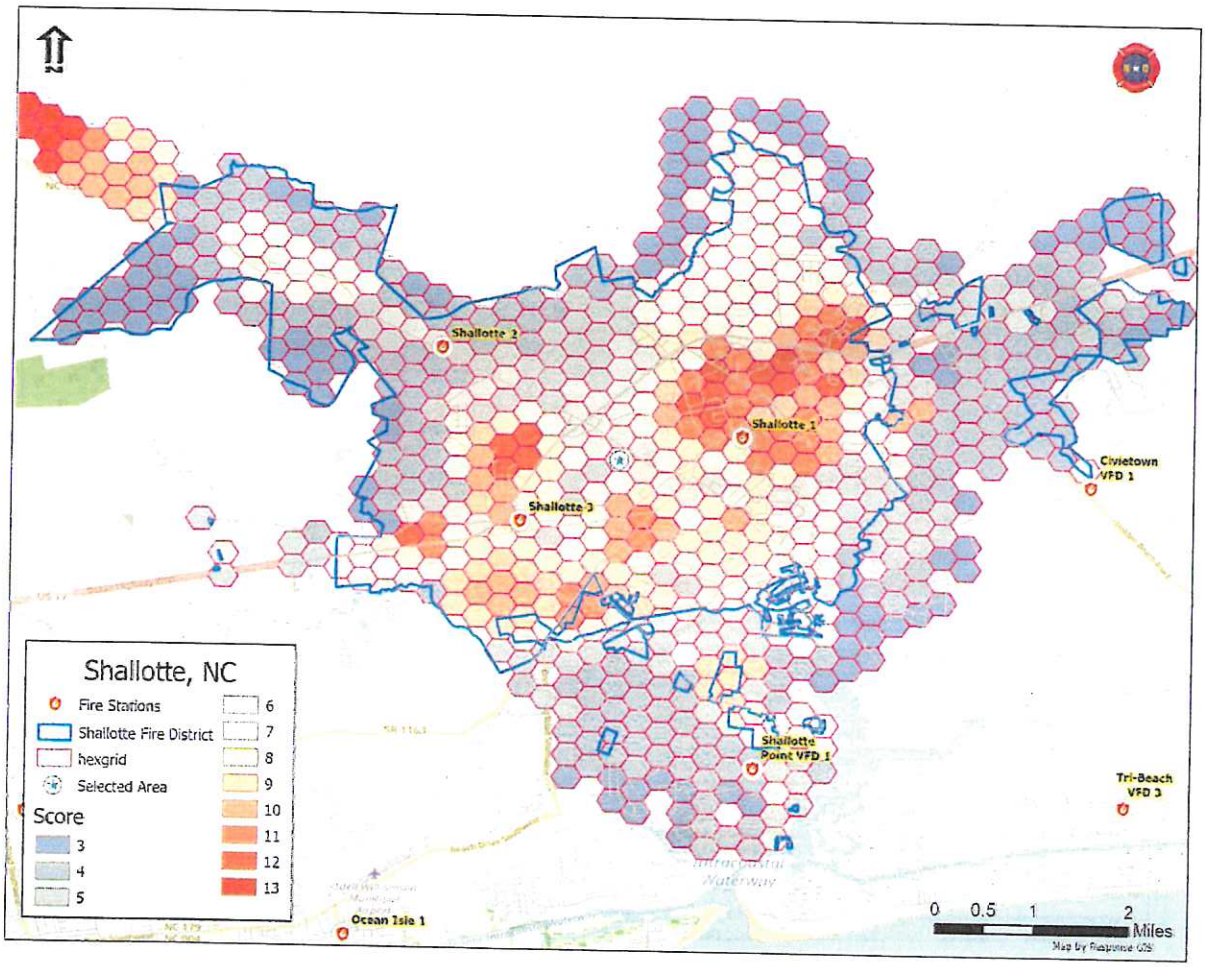


The optimal location of Station 2 moved to the northwest of the current location and Station 3 located to the southeast (Village Rd/Village Point Road SW). The VRI coverage score increased to 94%, which is a 23% improvement over fire station 1 alone.

Optimal Station Location-Scenario C

In the following scenario, Station 1 is considered for relocation (NOT anchored). The geographic intelligent technology attempts to optimize/improve the VRI score from the current conditions by locating the best location using the 6-minute travel time model to reach the hexagons for the staffed fire station 1. The following figure shows where the location of the fire station should be to optimize the total VRI score. The VRI score in this model is at 79%, which represents an 8% improvement.

FIGURE 48: Scenario C Coverage

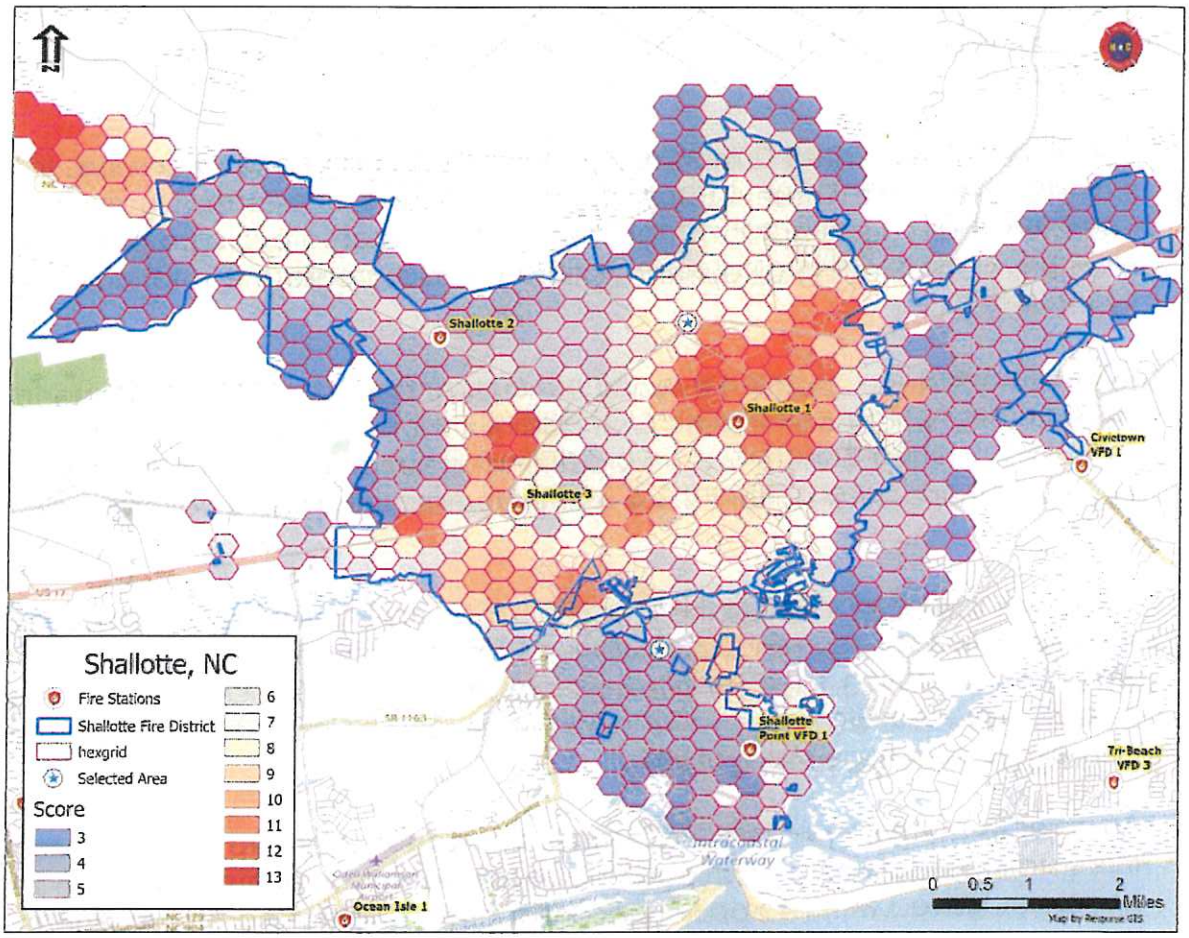


The optimal VRI scoring location for a single station is between the locations of the current fire stations 1 & 3 at Whiteville Rd NW between NC130 and Main St. Flood zones in this area must be considered so that the location on the opposite side of the street near the Lowe's hardware store is outside of the flood risk.

Optimal Station Location-Scenario D

This scenario repeats the previous scenario but searches for two optimal located stations. The following figure shows where the location should be to optimize coverage for the Town.

FIGURE 49: Scenario D Coverage



The optimal location of Station 1 moved to the northwest of the current location (Ocean Hwy & Smith Rd) and Station 2 located to the southeast (Copas Rd/Village Point Road SW). The coverage score was 90%. Because the VRI score reached the objective of 90%, a three-station scenario was not conducted.

GIS Executive Summary (GIS)

Analysis of current fire station locations indicates that the fire service area is well covered on an insurance distance standpoint and based upon a modeled travel time basis. However, it must be remembered that only one station is routinely staffed.

Development is expected to increase population and demand for services from the fire department. These factors along with the future land use risk were developed into a geographic matrix of weighted scores to evaluate the current station locations. Staffing all current stations could increase the total coverage score to 89%.

Scenarios were developed first by using the current staffed station 1 as a location to find other optimal location sites. One additional location was found to be very near to the current Station 2. Two additional optimal locations changed the locations of the current stations 2 & 3 and increased the score coverage by 23% to 94%.

Subsequent scenarios ignored the location of Station 1 to find optimal locations. A single station scenario relocated Station 1 to the southwest between the current Station 1 and Station 3, increasing the score from 71% to 79%. Optimal two station locations moved Station 1 to the northwest and Station 2 to the southeast providing a coverage score of 90%.

An objective of near or above 90% score coverage is achieved with the current three station locations or improved with two relocated to optimal sites. The same can be achieved with two optimal station locations. Staffing considerations must be evaluated when selecting the scenario to implement.

A visual summary of identified options is provided below:

Scenario	Actions/Options	VRI Score Rating Earned	Improvement Percentage Over "Baseline"	New Facilities Needed
Baseline Current #1	Current Shallotte Headquarters Station Only.	71%	0	0
Current #1, 2, 3	All three current fire stations staffed.	89%	NA	NA
"A"	Keeping Shallotte Headquarters Anchored and Seeking an Optimal Fire Station 2 Location that is Staffed.	84%	+13%	0 *(But Renovations Are Needed at Station 2)*
"B"	Keeping Shallotte Headquarters Anchored and Seeking an Optimal Fire Station 2 AND Fire Station 3 Locations that are Staffed.	94%	+23%	2
"C"	NOT Anchoring the Current Shallotte Headquarters Fire Station and Seeking ONE Optimal Fire Station Location for the Entire Identified Area.	79%	+8%	1
"D"	NOT Anchoring the Current Shallotte Headquarters Fire Station and Seeking TWO Optimal Fire Station Locations for the Entire Identified Area.	90%	+19%	2

Section 3: Critical Task Analysis (CTA)

CTA Design:

The design of the Critical Task Analysis (CTA) is vital for any organization desiring to measure their current performance in typical emergency situations such as a residential building fire. The analysis designed for Shallotte Fire Department consisted of four specific scenarios to measure their current performance in delivering basic critical tasks. The scenarios were designed to ensure that the same performance metrics were measured consistently as to allow decision-makers the needed data to determine what Shallotte Fire Department's current performance is and what it could be with additional personnel. The critical tasks identified were reviewed by SFD executive staff to ensure that every task was applicable to Shallotte. The scenarios that were developed were designed to measure the following areas: 1) Residential Building Fires, 2) Commercial Building Fires, 3) Witnessed Cardiac Arrests, 4) Technical Confined Space Rescue.

All scenarios were held at the Town of Shallotte Public Safety Training Facility in Shallotte, NC. The training facility consists of multiple training props including a two-story structure primarily used for search and firefighter survival drills. This structure was utilized for both the residential fire scenario and the engine company portion of the commercial fire scenario. The Shallotte Training Center also has a 4-story tower that was utilized to help simulate the ladder company tasks needed during a commercial occupancy fire. A confined space training prop that is located at the training facility was used to simulate rescuing a victim who was in a storm drain via a manhole access. The classroom at the training center was utilized for all the EMS scenarios. The scenarios were completed in two consecutive days in mid-October 2024. The members of Shallotte Fire Department participated in the scenarios both days, with personnel from all three shifts on site both days. In all scenarios the current state of staffing was measured to establish an understanding of how the department currently performs and then additional staff was added to provide how performance could be improved.

During both the residential and commercial fire scenarios each shift responded as they currently do with 3 personnel on the engine and these firefighters completed both the needed engine company and ladder company fireground tasks. After the department's three shifts each had completed these tasks, additional staff was added to the scenario and the department's ladder apparatus was included. The aerial deployed to the simulated roof of the training tower was an added task in the commercial fire simulation. The technical rescue scenario had a typical alarm assignment of a single 3-person company for the initial evolution to establish the current capabilities of the department. To measure the impact on performance an additional 3-person company was added to the evolution. The EMS scenario began with the current response model of 2 personnel responding to an unknown EMS call and arriving to find a full arrest.

Each shift was measured to determine an average for the department. The same crews were then measured with 1 additional person, and again with 2 additional crew members.

Residential Building Fire

The residential fire scenario was designed to measure the typical tasks that firefighters must perform to ensure the event can be effectively mitigated while operating in a safe manner. The scenarios sought to measure the following tasks:

- 360 Initial Radio Report
- Simulated Forcible Entry
- Time from arrival until entry into fire building
- Water Supply- Hydrant flowing into the engine
- 1 ¾" hose line stretched for fire attack
- Multiple Ground Ladder Egress to 2nd Floor
- Primary Search of two floors
- Water on the Fire
- Victim Removal

Each shift performed baseline evolutions that measured their current performance of each task at their current staffing level. The tasks were assigned to the company that would normally be assigned the listed tasks. The Shallotte Fire Department's fireground operational guides were utilized in the design of the scenario. The current operational guides allow the first arriving company to determine if they would establish a water supply on their way to the fire or go directly to the fire building and initiate an attack. To best determine the safest scenario, it was determined that the companies will establish water supply on the way to the fire building. The scenario measured water supply in that manner. SFD also expects that the first arriving company to establish ground ladder egress to at least two sides of a structure with more than one level.

The engine company tasks that were assigned: Connect large diameter hose (LDH) to hydrant, provide a 360 Initial Radio Report, hose line stretch, and simulated fire control in a room on the "Charlie side" on the second floor.

The ladder company tasks that were assigned: Forcible entry, ground ladder egress, primary search, and victim removal. A forcible entry door prop was utilized during each evolution and entry into the structure was not allowed until the firefighters completed breaching the door.

The times from these evolutions were averaged to provide a performance level at the current minimum staffing level for the analysis. Each scenario was then repeated, and additional staffing was provided to include the response of the

ladder apparatus. The additional evolutions were done with 2 firefighters staffing the ladder, 3 firefighters staffing the ladder, and 4 firefighters staffing the engine and 3 firefighters staffing the ladder. *It is important to note that the tasks commonly designated as "Ladder or Truck Company" disciplines were performed by the firefighters also performing the engine company tasks in the current staffing model of SFD.* When adding additional staff to the evolution tasks were required to be completed by the assigned discipline, as an example, the firefighters arriving on the engine could not initiate fire attack until the crew assigned to the ladder company completed forcible entry.

Residential Fire Results
Engine Company Tasks

	Additional	Current	Time Change	Percent
Average to Complete 360	0:55:00	0:37:00	0:18:00	32.7%
Average to Establish Water Supply at Hydrant	2:10:00	2:24:20	0:14:20	9.9%
Average to Establish Water Supply from Attack Eng	2:18:00	2:32:00	0:14:00	9.2%
Average to Establish Attack Line	2:53:20	4:11:00	1:17:40	30.9%
Average to Enter Building	3:40:20	4:53:20	1:13:00	24.9%
Average Water on the Fire	4:31:00	6:04:00	1:33:00	25.5%
Average from Entry to Water Application	0:50:40	1:10:40	0:20:00	28.3%
Average for Fire Under Control Communicated	4:47:20	6:13:40	1:26:20	23.1%
Average Scenario Total Time	5:28:40	7:58:40	2:30:00	31.3%

Back Up Line Established 4:10:00 4 Person Engine Evolution

Ladder Company Tasks

	Additional	Current	Time Change	Percent
Average to Force Entry	0:10:10	0:12:50	0:02:40	20.8%
Average to Establish Multiple Ground Ladders (2)	1:23:40	2:00:40	0:37:00	30.7%
Average to Locate and Remove Victim	4:33:40	7:12:40	2:39:00	36.7%
Average to Complete Primary Search	2:09:20	7:18:20	5:09:00	70.5%
Average Scenario Total Time	5:28:40	7:58:40	2:30:00	31.3%

Secondary Search Completed 5:30:00 3 Person Ladder Evolution

The results provided a significant amount of information on both the current capabilities of SFD and what their performance would be with additional staffing. Currently SFD completes the expected fireground tasks in just less than 8 minutes. From the arrival of an engine company on the scene until that crew enters the structure is 4:53, and on average it takes another 1:10 to apply water on the fire. These two measurements combine to show that on average it takes just over 6:04 from arrival to get water on the fire. This does not include the time required for the call to be received at the 911 Call Center, dispatched, firefighters to get on the truck and rolling (turn out time) and the needed turnout and travel time. The rapid application of water is one of the most important factors in creating positive

outcomes due to the rapid growth of a fire in a residence. The addition of one firefighter per Engine Company showed increased effectiveness in all measurements. The time required to get water on the fire decreased by over 25%. This decrease of nearly a minute and a half would significantly impact the fire growth and provide better potential outcomes. The decrease in time it takes to apply water has been shown to have the greatest impact on the survivability of victims in studies performed by UL.

The ladder company functions that are required for an efficient fireground operation such as forcible entry, secondary egress, and an aggressive primary search for potential victims highlight the need for an adequate number of firefighters to perform these tasks. Currently the Shallotte Fire Department can arrive and force entry into a structure and complete a primary search in just less than 8 minutes. Additionally, the firefighters complete establishing ground ladder egress in 2 minutes. When additional firefighters were added to the evolutions and divided into distinct companies with specific tasks a significant improvement is seen in the time to complete a primary search and rescue a victim. When operating with 3 firefighters assigned to ladder company tasks the time to rescue a victim decreased by 2:39 or 36.7%. The time required to complete a search of the entire structure decreased by 5:09 or 70.5%.

In all scenarios the initial company officer maintained all command and safety officer functions. It is important to note that in actual events the command function is often performed by the initial company officer until a chief officer can arrive and takes away from their capacity to perform other tasks.

Commercial Building Fire

The commercial building fire scenarios were designed to measure the required tasks that occur in a mercantile occupancy such as a "Dollar General" that are prevalent in the Shallotte area. The engine company tasks included deploying a 2 ½" hose line, locate, and extinguish a simulated fire approximately 50 feet inside the building. In building fires within commercial occupancies, it is important to deploy a larger diameter hose to ensure that there is adequate fire flow to extinguish the potential increased fire load generally found in this type of structure. The ladder company tasks that were required to be completed were forcing entry utilizing a commercial door prop, completes a primary search, place an extension ladder, or spotting and placing of the aerial device to provide a roof report, and spotting the aerial to the fourth-floor window on the "Delta Side" of the training tower. The current response model of SFD does not allow for the aerial apparatus to be deployed during the initial response to a reported fire. Often responding mutual aid departments provide the needed fireground tasks of providing a roof report of potential hazards above the firefighters in a commercial structure and utilizing the aerial device as a means of egress in occupancies beyond the reach of a 24' extension ladder. To provide an appropriate performance measure of these tasks the evolutions were modified to include utilizing both the simulated fire building and the training tower. An average of current staffing and increased staffing were performed in the same manner as the residential fire scenario.

Commercial Fire Results

	Additional	Current	Time Change	Percent	
Average to Complete 360	0:44:00	0:52:20	0:08:20	15.9%	
Average to Force Entry	0:10:00	0:05:20	0:04:40	46.7%	*Increased distance for task*
Average to Enter Building	2:02:20	2:41:20	0:39:00	24.2%	
Average to Establish Attack Line	2:29:20	1:57:00	0:32:20	21.7%	
Average to Complete Primary Search	6:05:40	4:44:00	1:21:40	22.3%	*Increased area to search*
Average Water on the Fire	2:42:40	3:43:00	1:00:20	27.1%	
Average from Entry to Water Application	0:40:20	1:01:40	0:21:20	34.6%	
Average to Establish 24' Extension Ladder		0:59:00	**0:59:00**	100.0%	
Average to Provide Roof Report via Aerial**	4:47:40		**4:47:40**	100.0%	
Average to Spot Aerial to 3rd Floor Window**	6:36:20		**6:36:20**	100.0%	
Average Scenario Total Time	7:26:40	4:57:00	2:29:40	33.5%	*Increased tasks to be completed*

Currently can not be accomplished

The department's current engine company average performance for the commercial scenario again highlights the impact that additional firefighters have on the fireground. The current average to enter the building and begin flowing water for fire extinguishment decreased by nearly 1:40 when additional firefighters were added to the evolutions. While the time to establish or charge the hose line increased with additional personnel it was due to part of the participating crews stretched the hose line part of the way into the structure dry and then charged the line. The additional staffing also impacted the decrease in the time from entry

to water application as the additional staffing made manipulating the hose line less difficult.

The ladder company tasks saw improvements in multiple ways during the performance measurement. When forcible entry was a ladder company assignment the time to force entry increased by nearly 5 seconds in spite of the travel distance to the prop increasing by about 30 yards from when the task was accomplished by the 3 firefighters on the engine. The most significant impact of the additional staff assigned to the ladder company was the ability to complete tasks that currently SFD cannot complete in the critical first 10 minutes of a fire in a commercial occupancy. The importance of a report from above a fire in a commercial structure cannot be minimized. In newer constructed structures there is an increased likelihood of lightweight construction components that can fail rapidly. In the coastal areas where multi-family residential units are often elevated it makes the ability to provide an elevated means of egress even more crucial as 24' extension ladders may not reach upper floors. Not being able to perform these tasks significantly impacts the safety of the members of SFD and any occupants that may be in a commercial structure, or elevated multi-family dwellings.

Technical Rope Rescue

In addition to being proficient in fire ground operations progressive fire departments must also be well trained and equipped to mitigate many other challenges such as technical rescue. Shallotte Fire Department is equipped to respond to multiple technical rescue challenges including vehicle extrication, high angle rope rescue, and below grade rope rescue. The scenario that was designed simulated the rescue of an individual in confined space below grade, such as a storm drain, or sewer lift station that would require rescuers to be lowered to the victim and the victim then raised back to the level of the rescue team. The scenario required the rescuers to access the victim through a manhole opening.

The benchmarks that were measured are:

- Establish Tripod/anchor points
- Establish Primary Rescue Line
- Establish Secondary Rescue line
- Patient Contact/Arrived at Patient
- Patient Packaged for Raise
- Patient Ready for Hand Off to EMS *(Back to level of rescue team)*
- Total Scenario Time

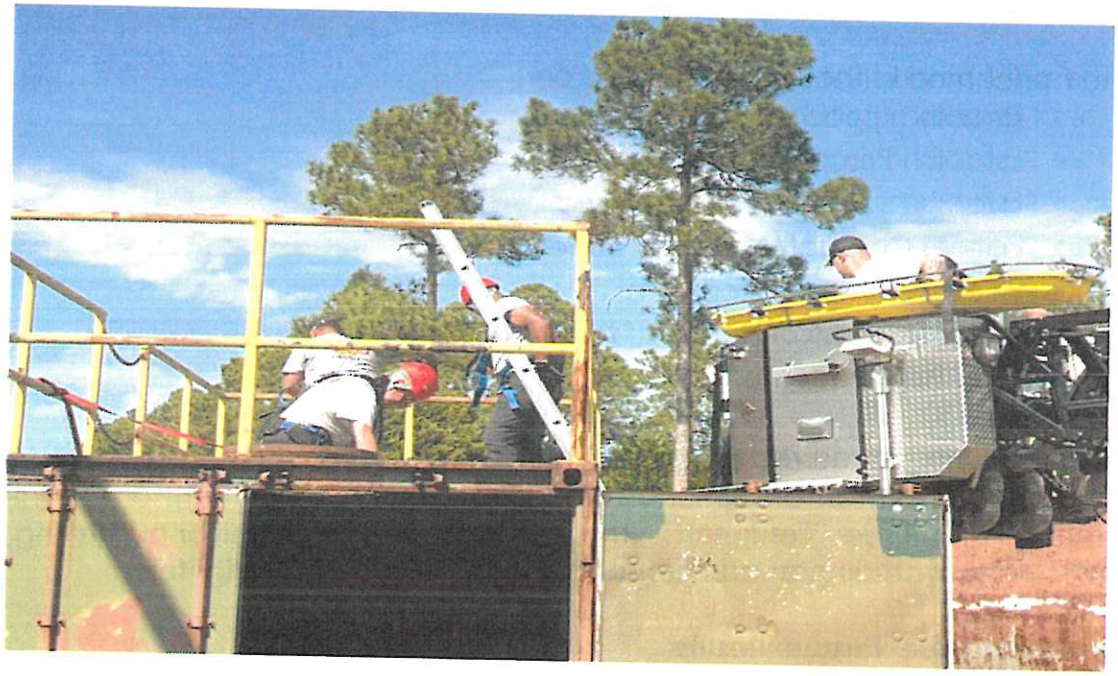
The scenarios measured the effectiveness of the current staffing levels of the department, with an evolution of the current alarm assignment of a company staffed with three firefighters. The performance of additional staffing was measured by adding an additional company with three firefighters.

Technical Rope Rescue Results

	6 Personnel	3 Personnel	Change	
			Time	*Percent*
Time to Establish Tripod/ Anchors	9:30:00	11:50:00	2:20:00	19.72%
Time to Establish Primary Rescue Line	3:27:00	7:11:00	3:44:00	51.97%
Time to Establish Secondary Rescue Line	10:15:00	29:25:00	19:10:00	65.16%
Arrived at Patient	11:54:00	39:00:00	27:06:00	69.49%
Time to Patient Packaged for Raise	2:08:00	2:04:00	0:04:00	3.12%
Time from arrival at Victim to Ready for Hand Off	15:53:00	43:17:00	27:24:00	63.30%
Scenario total time	17:08:00	44:38:00	27:30:00	61.61%

The results from the evolutions clearly demonstrate the increased effectiveness seen when an additional company was added to the scenario. The time to perform almost every measured task decreased significantly. The only task that did not see improvement was the time to package the patient, and due to a single rescuer performing the task in the confined space the times were nearly identical, only a 4 second difference. The most notable improvement can be seen in the time from arrival to patient ready for hand off to EMS decreased by

nearly 64%, or over 27 minutes faster. Additionally in the rope rescue scenarios the incident command system was not utilized as formally as it was during the fireground evolutions, this allowed for a void in divisional level supervision that likely impacted the overall performance of the rescue teams. The evolution highlighted the need to provide a command team in a high-risk low frequency event. The initial evolution with the single company also required all potentially needed equipment to be brought to the operational area, thus adding a significant time impact. When the evolution was performed utilizing two companies the division of work allowed for the rescuer and riggers to perform those tasks much more efficiently and effectively.



Cardiac Arrest

The addition of Emergency Medical response to the fire service over the past 40 plus years has significantly impacted communities across the United States leading to increased survivability for individuals who suffer a cardiac event. In Shallotte the current response model for these kinds of events sends the on-duty crew. If the call is dispatched as potential cardiac arrest all 3 members of the crew will respond. If the call is dispatched as an unknown medical event or a person unconscious only two crew members respond in a smaller quick response vehicle (QRV). This was the scenario for this measurement as the initial evolutions were with only two crew members. Additional evolutions were performed with 3 person and 4 person crews. The department operates what is commonly referred to as Pit Crew CPR. This allows for each crew member to deliver consistent effective chest compressions for two minutes and then rotate to another crew

member. The Brunswick County EMS system has CPR Compression devices available, and SFD is asked to assist with the devices on occasion.

The scenario designed to measure the current effectiveness of Shallotte's response to an unwitnessed cardiac arrest measured the following benchmarks.

- Confirm Patient is Pulseless/Non breathing
- Initiate CPR
- Apply an AED (defibrillator)
- Analyze rhythm and deliver shock
- Establish a Blind Insertion Airway Device (Igel)

Each shift simulated responses in their current staffing of 2 personnel responding to an unknown medical call. Additional evolutions were performed with 3 and 4 person crews for each shift. The evolution was allowed to continue until the AED analyzed the patient for the second time, about 4:00 from the beginning of the scenario. Averages were then determined from these responses. The scenarios were held in the classroom building at the Shallotte Public Safety Training Center and time measurement began when the responders entered the door of the classroom.

Full Arrest

	3 Personnel	2 Personnel	Change	
			Time	*Percent*
Average to Confirm Arrest	0:07:40	0:11:00	0:03:20	30.30%
Average to Initiate CPR	0:10:00	0:14:40	0:04:40	31.82%
Average to Apply AED	1:08:20	1:29:20	0:21:00	23.51%
Average to Analyze Rhythm	1:17:00	1:40:40	0:23:40	23.51%
Average to Establish Airway	1:15:40	2:39:40	1:24:00	52.61%

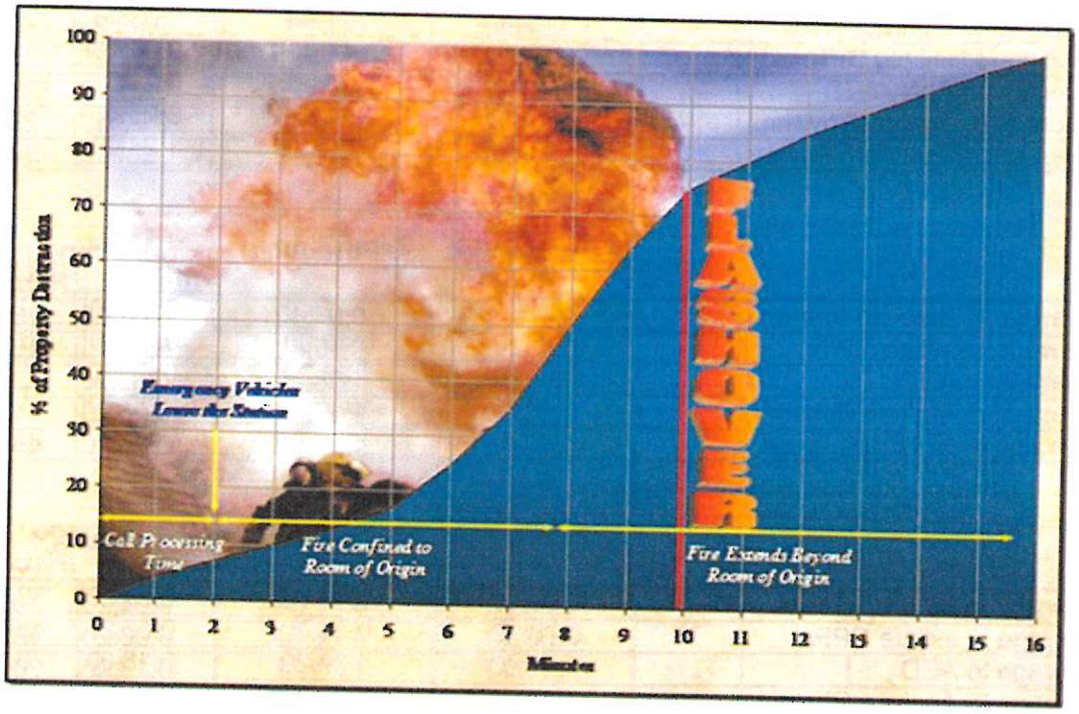
	4 Personnel	3 Personnel	Change	
			Time	*Percent*
Average to Size Up Scene	0:06:40	0:07:40	0:01:00	13.04%
Average to initiate CPR	0:08:20	0:10:00	0:01:40	16.67%
Average to AED	1:11:20	1:08:20	0:03:00	4.21%
Average to Analyze Rhythm	1:13:40	1:17:00	0:03:20	4.33%
Average to Establish Airway	0:40:40	1:15:40	0:35:00	46.26%

	4 Personnel	2 Personnel	Change	
			Time	*Percent*
Average to Size Up Scene	0:06:40	0:11:00	0:04:20	39.39%
Average to initiate CPR	0:08:20	0:14:40	0:06:20	43.18%
Average to AED	1:11:20	1:29:20	0:18:00	20.15%
Average to Analyze Rhythm	1:13:40	1:40:40	0:27:00	26.82%
Average to Establish Airway	0:40:40	2:39:40	1:59:00	74.53%

The performance measurements indicated significant improvement in scenarios that added personnel to the response. The most notable of the improvements was the increase in effectiveness of establishing an airway. The additional crew member allowed for that task to occur concurrently with the AED being applied, rather than afterwards. The time to apply the AED also decreased with additional staffing. The survivability of patients suffering a cardiac arrest greatly increases with early CPR and AED use. The additional staffing also allowed for greater focus on the tasks being performed improving the quality of CPR delivered that had fewer stops while applying an AED.

Conclusions

The performance measured by the scenarios demonstrates that additional personnel on the emergency scene would improve the effectiveness and safety of the Shallotte Fire Department. The current response model indicates that during a normal response after arrival to a residential fire it takes on average over 6 minutes for Shallotte Firefighters to complete the needed tasks of sizing up the fire, deploying a hose line, securing an effective water source, forcing entry, and entering the structure, and starting to apply water on the fire. This time coupled with the time required for notification of the fire and time to arrive at the fire greatly increased the likelihood that the fire will have progressed from the room of origin to a much greater advanced stage. See image below depicting the average fire progression.



This risk of making entry later in the fire's progression places firefighters at a significant risk. The number of firefighters needed number of firefighters for a total effect firefighting force (TERF) per NFPA 1710 for a low-risk structure fire is seventeen (17) and is not being met with the initial alarm of Shallotte firefighters. The required firefighters for a total effective firefighting force per NFPA 1720 (suburban density) is ten (10) and is not being met with the initial alarm. According to the data that we were able to evaluate the SFD cannot meet the required total effective firefighting force per NFPA rural, which is six (6) firefighters in 14 minutes. The SFD is dependent upon mutual aid to hope to achieve this needed number of firefighters. Depending upon the location the time required for the initial TERF could be delayed significantly. The needed 28 firefighters for a moderate risk building fire would require a significant response from the surrounding mutual aid departments and could also require greater travel times, again placing firefighters at a greater risk. In communities like Shallotte the need for adequate staffing and robust mutual aid agreements are paramount. During the evolutions only a limited number of the needed tasks were measured due to the level of staffing. Needed fireground functions of dedicated incident commander, staffed back up lines, ventilation of fire gases, or dedicated Rapid Intervention Teams (RIT) were not addressed. The need for dedicated firefighters for RIT early in an event is crucial for firefighter safety.

The Shallotte Fire Department has a significant risk to manage and is a busy fire department. Their staff is well trained and equipped, but as the scenario results showed, current staffing levels create delays in the performance of tasks that are critical to the effective management of incidents across all hazard types. These evolutions clearly demonstrated that increasing the number of initially responding firefighters, reducing call processing time, and staffing additional stations allows for firefighters to arrive sooner and complete the necessary tasks to be completed in a quicker manner, reducing the likelihood that the fire will progress to a more advanced stage or even to the point of flashover. The ability of a fire department to arrive and mitigate a fire event before it advances from the room of origin also increases positive outcomes for the community as it reduces the time a resident or business is displaced for repairs. In addition, some tasks were unable to be performed at all using the current staffing model. Additional staffing will make the fire department more effective at mitigating emergencies within the response area, provide for the increased safety of the town's firefighters, and improve outcomes related to fire loss and both fire and medical casualties for the residents, business owners, and visitors in the Town of Shallotte.

Supporting Documentation – Residential Fire Scenario:

Engine Company

Scenario 1

All Shifts- (Current State)
Each engine company will simulate the current response model of three (3) personnel per apparatus. Each apparatus will stage in the area near the entrance to the training grounds. Upon arrival each engine will locate and wrap their supply line onto hydrant entering training grounds. Engine Company will then proceed to the staging area on Alpha/Bravo side of the burn building, one personnel will remain at the hydrant to connect the supply line and open the hydrant when notified by the apparatus operator.

The following tasks are to be accomplished:

Engine Company Assignments

- Size Up/Initial Radio Report with 360 view of simulated fire building
- Water Supply Established- Hydrant flowing into first engine
- 1 ¾" Attack Line pulled and advanced to 2nd Floor burn room
- Water on Fire
- Fire Under Control

Scenario 2

(4 Personnel per Engine)
Measurement will determine the increase in responding number of personnel per company. Staffing will be four (4) per engine. Each apparatus will stage in the area near the entrance to training grounds. Upon arrival each engine will locate and wrap their supply line onto hydrant entering training grounds. Engine Company will then proceed to the staging area on Alpha/Bravo side of the burn building, one personnel will remain at the hydrant to connect the supply line and open the hydrant when notified by the apparatus operator. The following tasks are to be accomplished:

Engine Company Assignments

- Size Up/Initial Radio Report with 360 view of simulated fire building
- Water Supply Established- Hydrant flowing into first engine
- 1 ¾" Attack Line pulled and advanced to 2nd Floor burn room
- Water on Fire
- Fire Under Control

Truck Company

(2 or 3 Personnel)
Each Ladder company will simulate the current staffing model. Each apparatus will stage in the area near the tower and enter training grounds. Upon arrival the Ladder Company shall spot the apparatus near the staging area on Alpha/Bravo side of the burn building.

The following tasks are to be accomplished:

Ladder Company Assignments

- Forcible Entry/Simulated Forced Entry
- Ground Ladder egress to 2nd Floor Windows on Bravo & Delta Side x 2
- Primary Search of both floors
- Remove Victim(s)

Notes for Participants

- All participants must be in full PPE including SCBA. All participants must be utilizing SCBA when in areas considered IDLH.
- When not a participant be prepared to assist in resetting apparatus for the next exercise.
- Rehab area will be established, and personnel are required to go to rehab after emptying two SCBA cylinders in one exercise.

Supporting Documentation – Commercial Fire Scenario:

Engine Company

Scenario 1

All Shifts- (Current State)
Each engine company will simulate the current response model of three (3) personnel per apparatus. Each apparatus will stage in the area near the entrance of the training grounds. Engine Company will then proceed to the staging area on Alpha/Bravo side of the burn building. The following tasks are to be accomplished:

Engine Company Assignments

- Size Up/Initial Radio Report with 360 view of simulated fire building
- 2 ½" Hose Line Deployed and Charged
- Water on Fire

Scenario 2

(4 Personnel per Engine)
Measurement will determine the increase in responding number of personnel per company. Staffing will be four (4) per engine. Each apparatus will stage in the area near the entrance of the training grounds. Engine Company will then proceed to the staging area on Alpha/Bravo side of the burn building. The following tasks are to be accomplished:

Engine Company Assignments

- Size Up/Initial Radio Report with 360 view of simulated fire building
- 2 ½" Hose Line Deployed and Charged
- Water on Fire

Truck Company

(2 or 3 Personnel per Company)
Ladder Company will simulate the current staffing model. Each apparatus will stage near the entrance training grounds. Upon arrival the Ladder shall spot the apparatus near the staging area on Delta side of the training tower.
The following tasks are to be accomplished:

Ladder Company Assignments

- Provide Roof Report
- Aerial Device to 4th Floor Window on Delta Side
- Primary Search of four floors
- Victim Removal

Notes for Participants

- All participants must be in full PPE including SCBA. All participants must be utilizing SCBA when in areas considered IDLH.
- When not a participant be prepared to assist in resetting apparatus for the next exercise.
- Rehab area will be established, and personnel are required to go to rehab after emptying two SCBA cylinders in one exercise.

Supporting Documentation – Technical Rescue Scenario:

Current State

Scenario 1

Apparatus with current staffing model (3 minimum) will respond to a technical rope rescue event. Scene will be a simulated confined space where a victim is unconscious below grade through an opening. Due to the state of the structure access and egress cannot be made via the level the victim is on, and the victim will have to be extricated via a raise.
The following tasks are to be accomplished:

TR Specialist Tasks

- Establish anchor point/Tripod
- Establish rope system(s) for lower and raise including safety lines
- Patient Contact (rescuer arrival)
- Patient Injury Assessment (rescuer report to IC)
- Patient Packaged for extrication
- Patient extricated turned over to EMS

Scenario 2

An additional apparatus with 3 personnel will respond to a technical rope rescue event. Scene will be a simulated confined space where a worker is unconscious below grade through an opening. Due to the state of the structure access and egress cannot be made via the level the victim is on, and the victim will have to be extricated via a raise.
The following tasks are to be accomplished:

TR Specialist Tasks

- Establish anchor point/ Tripod
- Establish rope system(s) for lower and raise including safety lines
- Patient Contact (rescuer arrival)
- Patient Injury Assessment (rescuer report to IC)
- Patient Packaged for extrication
- Patient extricated turned over to EMS

Supporting Documentation – High Risk EMS Scenario:

Scenario 1

All Shifts- (Current State)
Each company will simulate the current staffing model. The following tasks are to be accomplished:

- Scene Size Up
- Initiate CPR
- Apply AED
- Analyzes Rhythm
- Establish Airway

Scenario 2

(1 or 2 Additional Personnel per company)
Each company will simulate the current response model of four (4) personnel per apparatus. The following tasks are to be accomplished:

- Scene Size Up
- Initiate CPR
- Apply AED
- Analyzes Rhythm
- Establish Airway

Notes for Participants

- All participants must be in full PPE for the scenario. When not a participant be prepared to assist in resetting apparatus for the next exercise.

All Completed Spreadsheets
Residential Fire
Shallotte Moderate Risk Fire
Commercial Fire
Shallotte High Risk Fire
Technical Rescue
Technical Rope Rescue
High Risk EMS
Full Arrest

Section 4: Fire Station Programming Needs Assessment

2024-2025 Town of Shallotte Fire Department Strategic Planning Analysis

NC Fire Chief Consulting (NCFCC) in assistance to the Town of Shallotte Fire/Rescue Department has analyzed current and possible future fire station space needs to assist the Fire Chief with planning for the growth of the department. The Fire Chief and fire department staff completed worksheets provided by NCFCC to identify potential fire station space needs. Information for the headquarters station and substations was collected. NCFCC partnered with Stewart Cooper Newell Architects to make recommendations and identify project costs. The needed acreage for each fire station was also calculated based upon square footage of the building.

The following key information was collected:

- Fire department staff has identified the need for 4 bays at fire station 1.
- Fire department staff has identified that space is needed for 25 people over 3 shifts at fire station 1.
- Fire department staff has identified the need for a Captain's Office at fire station 1 and at substations.
- Fire Department staff has identified the need for a training room that can accommodate 30 people at fire station 1.
- Fire department staff has identified the need for 3 bays at substations.
- Fire department staff has identified that space is needed for 15 people over 3 shifts at substations.
- Fire Department staff has identified the need for a training room that can accommodate 10 people at substations.
- Current fire station construction prices in North Carolina are between $645 and $750 per square foot.

Key recommendations for a new headquarters fire station 1 include:

- Identify a 3–4-acre parcel to build a new headquarters fire station 1.
- Estimated square footage to accommodate all needs will be around 14,919.
- Budget between $9.63 and $11.24 Million with 2024 construction pricing.

Key recommendations for new substations include:

- Identify a 2–3-acre parcel to build each new substation.
- Estimated square footage to accommodate all needs will be around 9,785.
- Budget between $6.11 and $7.33 Million with 2024 construction pricing.

Fire station construction costs in North Carolina have escalated in recent years. The chart below reflects cost changes in regional fire station bids between 2007 and 2024. The current and most recent cost of fire station construction in the region is between $645 and $750 per square foot. The typical fire station (non-headquarters) in North Carolina is approximately 10,000-14,000 square feet in size.

2007	**5%**	**+/- increase**	**2016**	**22%**	**+/- increase**
2008	**12%**	**+/- increase**	**2017**	**20%**	**+/- increase**
2009	**16%**	**+/- increase**	**2018**	**8%**	**+/- increase**
2010	**9%**	**+/- increase**	**2019**	**14%**	**+/- increase**
2011	**5%**	**+/- increase**	**2020**	**21%**	**+/- increase**
2012	**11%**	**+/- increase**	**2021**	**15%**	**+/- increase**
2013	**7%**	**+/- increase**	**2022**	**20%**	**+/- increase**
2014	**21%**	**+/- increase**	**2023**	**18%**	**+/- increase**
2015	**3%**	**+/- increase**	**2024**	**15%**	**+/- increase**

Mean Average = 13.4%

Below is an illustrative example of the cost estimation for fire station construction based upon a needs analysis. However, this will provide Shallotte with a good indication of how the planning for size, space and cost would roll out. First, each area of the station would be programmed. Second, allowances are given for "grossing" for the building and bay area to accommodate electrical rooms, hallways, service areas, HVAC rooms, maintenance areas, etc. Third, ranges of cost are given based on the current market. Fourth, an 80/20 adjustment is made with 80 percent representing "hard" costs of construction and 20 percent representing the "soft" costs such as furniture, furnishings, equipment, fees, architectural, etc. Cumulatively, this helps to project a total building cost for a fire station. In planning, it is important to factor in all projected costs.

**Source: Stewart, Cooper, Newell Architects*

Below are the worksheets for 1) a projected headquarters station for Shallotte, and 2) a projected substation for Shallotte:

Shallotte	125 Wall Street	Station #1	
Space	**Current Size**	**Needed Size**	**Notes**
Vehicle Bays	Two 30'x20'		Need 4 Bays. One for a 32 foot first out engine, one for a 40 foot first out ladder, one for a 12 foot first out QRV, and one for a 32 foot reserve engine
Turn Out Gear			Currently in Bays. Need space for 25 people over 3 shifts
Shop	8'x12'		
Decon Room			Needs updated per NFPA 1585
Decon Vestibule			
Tool Air Comp / SCBA Cascade Room			Currently in Bays. Need seperate room for SCBA and turnout gear from shop and work bench
Laundry Room	6'x12'		
EMS Storage			Currently in Laundry Room in laundry cabinets. Need seperate room.
Sprinkler Riser			
Haz-Mat Storage			Currently flammable Liquids Cabinet In Bay
Outside Equipment Storage			Currently in Bays
Mechanical / Storage Mezzanine			
Electrical Room			Currently in Bays & In Shop
Hose Drying			Currently on apron
Hose Drying Tower (Optional)			
Dayroom	21.5'x13.5'		
Kitchen	21.5'x10'		Currently too small for 7 people. Small prep room. Food storage and refrigerators are too small
Dining Room			Currently in Kitchen
Individual Sleep Rooms or Group Bunk Room	11.5'x13' (x2)		Currently two Group Bunk Rooms (Overcrowded)
Exercise Room	12'x10'		Currently limited Space for Dumbells, Bench and Elyptical. Need room for 7 people to exercise together.
Toilet/Shower/Locker Rooms or Individual Toilet/Shower Rooms w/ Locker Alcove	12'x9.5 (x2)		Currently only one person accessible. Need enough for 7 people during a shift
Residential Laundry			Currently combined with Turnout gear Laundry Room
Linen Closet			Currently in Laundry Room
Janitor Closet	5.5'x8'		Currently Combined with Pantry
Lobby	7.5'x5'		
Walk-in Triage/Vistor			Currently in Lobby
Public Restrooms			Currently in Staff "Living Quarters". Need a public restroom in lobby
Receptionist	12'x9'		Duty Office
Radio / Report Room	12'x9'		
IT Equip Closet			Currently in Shop
Dispatcher	12'x9'		Deputy Fire Chief's Office
Chief's Office	12'x9'		
Additional Offices			Need Captains Office that can be shared by 3 shifts
Training Room			Need one large enough for 30 people to attend classes
Community Room			
Toilet Rooms			
Vending Area			
Work/File Room	12'x8.5'		
Conference Room	12'x10.5'		
Library			In Duty Office
Training Opportunites In-House & On-Site			
Separate Facilty Users			
Outdoor Patio			Need area for 7 people to sit and eat
Parking	56'x85'		
Backup Generator	125kw		Diesel

Gross Square Feet	**14,919**
Project Budget	**$9.63M - 11.24M**
Acreage	**3-4**

Shallotte		Substations	Storage Building
Space	**Current Size**	**Needed Size**	**Notes**
Vehicle Bays	Two 30'x20'		Need 3 Bays. One for a 32 foot first out engine, one for a 12 foot first out QRV, and one for a 32 foot reserve engine
Turn Out Gear			Currently In Bays. Need space for 15 people over 3 shifts
Shop			
Decon Room			Needs updated per NFPA 1585
Decon Vestibule			
Tool Air Comp / SCBA Cascade Room			Need seperate room for SCBA and turnout gear from shop and work bench
Laundry Room			
EMS Storage			Need seperate room.
Sprinkler Riser			
Haz-Mat Storage			
Outside Equipment Storage			
Mechanical / Storage Mezzanine			
Electrical Room			
Hose Drying			
Hose Dryiing Tower			
Dayroom			
Kitchen			Need space for 5 people per shift
Dining Room			
Indivdiual Sleep Rooms or			Need space for 5 people per shift
Exercise Room			Need room for 5 peopel to exercise together.
Toilet/Shower/Locker Rooms			Need enough for 5 people during a shift
Residential Laundry			
Linen Closet			
Janitor Closet			
Lobby			
Walk-in Triage/Vistor			
Public Restrooms			Need a public restroom in lobby
Receptionist			Need a Duty Office
Radio / Report Room			
IT Equip Closet			
Dispatcher			
Chiefs Office			
Additional Offices			Need Captains Office that can be shared by 3 shifts
Training Room			
Community Room			
Toilet Rooms			
Vending Area			
Work/File Room			
Conference Room			Need room for 10 people to train or meet
Library			
Training Opportunites In-			
Separate Facility Users			
Outdoor Patio			Need area for 5 people to sit and eat
Parking	50'x30'		
Backup Generator			Diesel

Gross Square Feet	**9,785**
Project Budget	**$6.11M - $7.33M**
Acreage	**2-3**

Section 7: Appendix Documents

Appendix A – Summary of Project Assessment Team Recommendations:

The NCFCC assessment team constructed ten recommendations detailed within this report. Below is a collective summary of those recommendations:

1. Response Data Analysis: (5)

- The assessment team recommends that priority attention be given to reduce the 9-1-1 call processing time to improve service delivery to the people of Shallotte.

- Consider defining call processing goals (benchmark) as they relate to time. These can be existing standards like NFPA 1910 or internal benchmarks. An evaluation should be conducted on a periodic basis and the period defined and agreed upon by both parties. The evaluation should compare the benchmark to the baseline (demonstrated performance) and when a gap exists, goals should be established with the intent to reduce call processing time and narrow the gap.

- For incidents where the department is attempting to analyze an effective response but requires mutual or auto aid companies, consider entering their unit report with accurate timestamps and a staff count of each into your RMS system.

- Reiterate the importance of the correct unit response mode to allow filtering of non-emergency responses in the response evaluation.

- Consider a documented outlier policy identifying the threshold of each time segment that should be filtered from a response time evaluation, then invest the outliers to determine if there are improvements in processes or procedures that can minimize or eliminate these outliers.

2. Geographic Information System Analysis: (2)

- It is recommended that the Town of Shallotte determine the fire station distribution model that will best serve the town in the future with the information provided in this analysis along with leadership's understanding of the needs and capabilities of the town.

- If the projected large development with significant increases to population comes to fruition, the assessment team recommends that the town consider a fully functional fire station in the northwest area. This need could be accomplished by renovating the current fire station 2 and upfitting it for 24-hour operation (Scenario A at 84%). However, it could also be accomplished by Scenario B, where a fire station is placed in the northwest sector and fire

station 3 is relocated to the southeast. The Scenario B model produces the highest VRI score rating of the available options (94%).

3. **Critical Task Analysis: (1)**

- The analysis team recommends that the Town of Shallotte seek to strengthen the number of firefighters on duty whenever conditions will allow to gain increased performance, improved firefighter safety and strengthened service delivery to the people of Shallotte.

4. **Other: (2)**

- The analysis team recommends that Shallotte Fire Department further develop the fire department's strategic plan document and utilize it as a living document to help guide the fire department into the future.

- The analysis team recommends that the Town of Shallotte periodically update the data and information within this analysis to keep the analysis current and responsive to changing conditions in and around Shallotte to ensure that Shallotte taxpayers are investing in the best overall long-term solutions.

Appendix B – Framework for the Shallotte Fire Department Strategic Plan Consistent with the NCFCC Analysis:

Introduction

The Shallotte Fire Department provides fire suppression, emergency medical care, technical rescue, hazardous materials mitigation, fire and life safety education, and fire investigation to the residents, businesses, and visitors to the Town of Shallotte and the surrounding Shallotte Fire District.

As an organization that strives to maintain the highest level of professionalism and efficiency, the Town of Shallotte, and the Shallotte Fire Department chose North Carolina Fire Chief Consulting (NCFCC) to help develop a path into the future. The following strategic plan was written after team members from NCFCC completed a detailed analysis of Shallotte Fire Department's performance based upon historical call data, current emergency response performance based upon common critical tasks, and GIS analysis of the optimal locations for fire stations. It is intended to provide the Town of Shallotte Fire Department a beginning point for the enhancements and changes that will occur as both the Town of Shallotte and Brunswick County grows in the future.

The process of developing a strategic plan requires an organization to objectively look at how it currently functions and to critically examine paradigms, values, philosophies, and beliefs. This process is designed to challenge individuals to work in the best interest of the "team." Or stated differently, how can the Shallotte Fire Department provide for the ***best possible outcome*** when someone within the town or surrounding response area has an emergency?

The Town of Shallotte is in Brunswick County, North Carolina, it is one of the most rapidly growing areas of the state. The town has long recognized that as one of the municipalities within Brunswick County, it must proactively plan for the future. This is evident from The Town of Shallotte's Vision Statement in the NC Coastal Area Management Act (CAMA):

> *"The Town of Shallotte wishes to preserve environmentally sensitive areas and provide regulations that support sensitive development along the Town's waterfront and shorelines. The Town also wishes to enhance economic development in the area by sustaining existing business and encouraging new business through downtown revitalization and the promotion of eco-tourism and the proper planning of Interstate 74. Shallotte wants to continue its leadership position as the economic center of southeast Brunswick County. The Town desires to maintain a high quality of life for its residents by protecting existing residential areas, providing additional recreational opportunities in the form of facilities and greenways, and controlling traffic and urban sprawl."*

Of particular note within this statement is that the Town of Shallotte wishes to continue its leadership position within southeastern Brunswick County. The fire department's continued growth and operational efficiency is integral to the town's desire to be an economic hub for the region.

Critical Issues and Service Gaps

Upon compiling the information from the historical call data, critical task analysis, and GIS modeling a number of critical issues and service gaps were determined in discussions with the leadership of the Shallotte Fire Department. These critical issues and service gaps were distilled into areas of strategic initiatives.

Strategic Initiatives

The input of the executive team of the Shallotte Fire Department and from NCFCC team members was used to determine the following strategic initiatives as the foundation for the development of goals and objectives moving forward.

Shallotte Fire Department Strategic Initiatives	
Current Program Service Delivery	Infrastructure Needs
External Engagement	Firefighter Quality of Life

Goals and Objectives

To continuously achieve the mission of the Shallotte Fire Department, realistic goals and objectives with timelines for completion must be established to enhance strengths, address weaknesses, provide a clear path forward, and address the expectations of the community. These should become a focus of the department's efforts, as they will direct the organization to its desired future state. It should also help reduce and predict obstacles that will occur along the way. Leadership established work groups should meet and manage progress toward accomplishing these goals and objectives and adjust timelines as needs and the environment change. Regular reports of progress and changes should be shared with the department's stakeholders.

Goal 1:	Provide the highest quality of service in the most efficient manner of current departmental programs and enhance capabilities for the future needs of our community.

Objective 1A: Reviewall current services/programs provided to community to ensure alignment with community expectations.

Timeframe: 1 Year- ongoing

Critical Tasks: Review outcomes of current services to determine if comprehensive and modern.
Create list of needed adjustments of the services which will be provided to community.
Identify current funding gaps within established programs.
Incorporate Critical Task Analysis (CTA) findings in operational outcome discussions.

Objective 1B: Determine the future service needs of the community.

Timeframe: 12 Months- Annually there after

Critical Tasks: Review and analyze community and industry trends.
Review new and current legislation impacting service delivery.
Develop methodology for ongoing/annual stakeholder input into department programs and seek opportunities for collaboration.
Review potential utilization of SAFER grant opportunities for department.

Objective 1C: Perform an analysis of current program outcomes being measured to ensure accuracy, need, and appropriateness.

Timeframe: 1 Year

Critical Tasks: Identify what is currently being measured.
Analyze methods to improve understanding and access to performance measures and develop mechanisms to report outcomes to the community.
Determine other performance measures to be added to the inventory.

Objective 1D: Implement or modify services provided to meet the needs of the community.

Timeframe: 2 Years

Critical Tasks: Develop implementation plan.
Ensure an adequate funding stream has been identified.
Ensure implementation is created in accordance with all federal, state, and local regulations.
Educate personnel and community.

Ensure service delivery changes are aligned with the department mission.
Execute implementation plan.
Develop processes to engage members for suggestions to improve service delivery.

Objective 1E: Reassess service deliver model to ensure it meets needs of the community.

Timeframe: Ongoing

Critical Tasks: Perform continuous analysis to assess the impact of our interventions.
Share results of analysis with internal and external stakeholders.
Perform modifications to programs as needed.
Ensure that all decision-making regarding meeting future needs is considered holistically in the best interest of the town's growth, not solely on insurance rating.

Goal 2:	Develop a Capital Expenditure Plan that maintains current capabilities and provides for capabilities expansion in the future.
Objective 2A:	Ongoing analysis of current infrastructure to include fixed facilities, apparatus, equipment, personal protective equipment, and all supporting resources, to identify shortfalls and opportunities to increase efficiency and improve service delivery.
Timeframe:	Annually- ongoing
Critical Tasks:	Document all the current capabilities of the department. Once the current state is established, use that list as the baseline service level in which to maintain and then build upon.
Objective 2B:	Review the current level of support needed to maintain existing infrastructure and identify the levels needed to maintain and support proposed infrastructure changes or improvements. This should include addressing voids within both the existing and predicted Standard of Cover for the department.
Timeframe:	1 year- ongoing
Critical tasks:	Identify resource gaps between needed and current levels. Ensure that changes to infrastructure are shared with all relevant stakeholders within the Town of Shallotte and that an appropriate level of support is in place to facilitate these changes. Initiate stakeholder discussions related to the results of optimal station location GIS study.
Objective 2C:	Conduct a yearly review of current capital assets and ensure current plans address emerging needs of the community
Timeframe:	Annually ongoing
Critical Tasks:	Executive team review of department needs assessment during annual budget process. Ensure that each review is in keeping with the program's desired maintenance and growth in capability direction.
Objective 2D:	Identify additional funding streams that can address the capital expenditure needs of the department.
Timeframe:	Annually- ongoing
Critical Tasks:	Establish annual review of grant opportunities and determine organizational benefits for pursuing grants. Establish a management and tracking plan of all grants for efficiency and transparency

Objective 2E: Replace Fire Station 1 and substations to accommodate Standard of Cover improvements and space needs for the fire department.

Timeframe: 3-5 years

Critical Tasks: Identify and procure a 3–4-acre parcel for a new Fire Station 1. Identify and procure 2–3-acre parcels for each planned substation. Budget, plan, and contract for the construction of each planned facility.

Goal 3:	Increase the number of outreach and engagement opportunities to external stakeholders and continue to align efforts with the community's expectations.
Objective 3A:	Evaluate current initiatives and programs related to community risk reduction and community preparedness.
Timeframe:	6 months
Critical Tasks:	Identify current programs and methods used for community outreach. Analyze effectiveness of current programs.
Objective 3B:	Develop and improve emergency management processes and relationships that allow the Shallotte Fire Department to plan for, prevent, respond to, and recover from both manmade and natural disasters for a more resilient community.
Timeframe:	1 Year – ongoing
Critical Tasks:	Research industry best practices for programs not currently provided. Establish relationships with community partners to collaborate and leverage abilities.
Objective 3C:	Evaluate the flow of communication to the appropriate external stakeholders.
Timeframe:	Ongoing
Critical Tasks:	Identify community groups and organizations. Identify information that external stakeholders desire to receive. Evaluate response trends in affected areas. Identify opportunities for collaboration with other agencies.
Objective 3D:	Develop a communication delivery process for disseminating information to external customers to provide transparency and support.
Timeframe:	1 Year
Critical Tasks:	Develop a workgroup representing all mutual aid partners and Brunswick County government to create a standardized way to deliver information to external stakeholders. Develop communication timelines and frequencies based upon prioritization of external stakeholders. Create an external stakeholder focus group to test system processes and gather feedback on effectiveness.
Objective 3E:	Increase relationships with local and regional mutual aid partners and develop standardized operational practices as appropriate.
Timeframe:	1 Year
Critical Tasks:	Identify strategies to utilize shared technology. Evaluate current response practices for effectiveness.

Determine needs to address response deficiencies by both SFD and regional mutual aid.
Establish additional relationships regionally.

Goal 4:	Ensure all SFD members overall career satisfaction is being met and develop an ongoing recruitment strategy.
Objective 4A:	Review current strategies for recruitment to identify areas for improvement.
Timeframe:	1 Year
Critical Tasks:	Assess current recruiting venues for effectiveness. Examine current pay scale and compare to other fire departments within the region. Evaluate accessibility of initial application process and candidate applicant testing. Evaluate potential new recruiting avenues with local school system(s).
Objective 4B:	Develop and implement strategies and processes to remedy identified gaps in recruitment and retention of members.
Timeframe:	2 Years
Critical Tasks:	Seek input from stakeholders. Continue focusing on competitive compensation and benefits for members. Develop strategies to assist department members with high cost of living challenges in region, including affordable housing.
Objective 4C:	Develop an equitable and competitive promotional process for members of the department based on job qualifications, personal development, skills, and demonstrated performance. This includes providing clear feedback and opportunities for staff to develop skills required for advancement.
Timeframe:	**2** Years
Critical Tasks:	Assess promotional process for each rank within department. Evaluate competencies for each rank within department. Develop additional methods for personal and professional development of members.

Goal 5:	Develop, promote, and enhance the wellness of all SFD members in order to improve operational effectiveness and quality of life.
Objective 5A:	Analyze current health and wellness programs and available data to determine trends and effectiveness of current programs and potential gaps.
Timeframe:	12-18 Months
Critical Tasks:	Benchmark against best practices. Consolidate current data and provide accessibility for stakeholders. Convene Wellness Committee and other key stakeholders to analyze current status.
Objective 5B:	Establish a culture of personal and organizational accountability to health and wellness.
Timeframe:	2 Years-ongoing
Critical Tasks:	Evaluate and enforce current polices related to firefighter health and wellness. The development of training sessions related to nutrition, fitness, behavioral health, and firefighter wellness for all SFD members. Incorporate training and expectations into Officer Development Training.
Objective 5C:	Enhance and improve current programs to address deficiencies.
Timeframe:	2-3 Years
Critical Tasks:	Address gaps identified in Objective 5A. Identify necessary resources (funding, locations, and staff).
Objective 5D:	Initiate and develop new programs to address departmental needs.
Timeframe:	3 Years
Critical Tasks:	Address gaps identified in Objective 5A. Identify needed resources. Develop and deliver curriculum or educational needs to ensure an effective implementation. Collect and analyze data from program implementation and adjust to meet departmental goals.
Objective 5E:	Analyze effectiveness of program annually.
Timeframe:	2 Years
Critical Tasks:	Evaluate data relevant to programs and develop performance metrics Analyze feedback from internal stakeholders Update current programs and incorporate other avenues of wellness into plan.

Vision

The process of strategic planning would be incomplete if at the conclusion of the process there was not a shared vision. At the end of this process the Shallotte Fire Department and its members have been presented with a group of strategic initiatives and measurable objectives. The leadership and department members are now being asked to develop a vision statement that articulates where the Shallotte Fire Department will be when the plan is completed. This is not to override the Town of Shallotte's strategic plan or vision, but to confirm to its members that the goals established through this process are part of the future of the town and region.

(Potential prompts for writing a vision statement)

Shallotte Fire Department Vision 2028

What will we be if?

- We deliver services even better?
- We focus on our people?
- We focus on the community?
- We receive the resources to continue delivering services?
- How will we steward our resources?

Appendix C – 9-1-1 Best Practices for Expediting Emergency Dispatch of Fire and Rescue Calls:

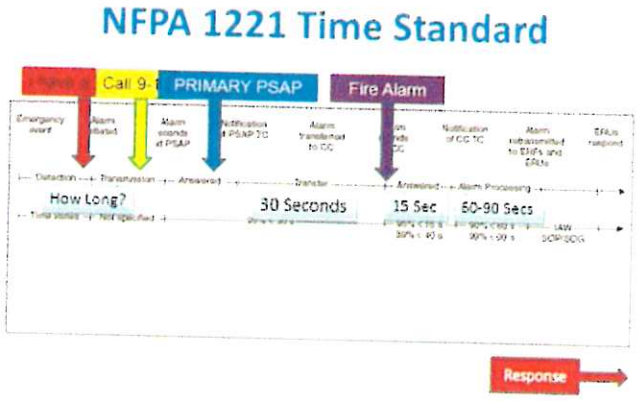
1. Assess the 9-1-1 Center Staffing Levels and Outcomes.

It is recommended that a deeper analysis be conducted with the Brunswick County 9-1-1 Center related to the time necessary to answer, receive and dispatch emergency calls to the Shallotte Fire Department.

Time is of critical importance in the fire and rescue services. The current call processing time for Brunswick County 9-1-1 Emergency Communications is concerning relative to the Shallotte Fire Department. Improving call processing times at the 9-1-1 Center will "raise the bar" for all public safety agencies by reducing the call processing times, thereby reducing the overall response time for public safety agencies.

The NFPA standard for receiving and dispatching fire calls (NFPA 1225) requires that 9-1-1 operators answer emergency calls within 10 seconds 90% of the time and process the emergency request within 60 seconds 90% of the time. Furthermore, NFPA 1710 sets a benchmark of 320 seconds (5 minutes and 20 seconds) for the TOTAL response time, which includes an 80 second turnout time and a 240 second travel time.

Hence, minimizing call processing time is critical to meeting the standard. In addition, the Insurance Services Organization (ISO) uses the NFPA 1225 (and NFPA 1221) standard when conducting analysis for insurance rating purposes. The 9-1-1 emergency communications component accounts for 10% of Shallotte's overall ISO rating.



Often, as populations grow and demands on fire and emergency services expand, support personnel (such as through 9-1-1 emergency communications centers) do not grow proportionally with the community's

needs. A further analysis would determine if this may be the case within Brunswick County. Strengthening the staffing and performance at 9-1-1 can improve all public safety service delivery models.

Illustrative information from another North Carolina community includes:

- *NFPA standard 1221, 7.4.1 requires that 90% of all emergency call processing (except for EMD calls, HAZMAT, Technical Rescue, and TTY/TDD calls) be complete within 64 seconds for Fire agencies. (Call completion means from time received to time dispatched). The* ***division dispatched these Fire calls at 82.7% for the month of October.*** *In addition, this same standard requires 95% of these calls be completed within 106 seconds.* ***The division dispatched these calls at 95.0% for the month of October.*** *The standard requires the other four types of calls be completed within 90 seconds 90% of the time.* ***The division dispatched these type calls at 99.4% for the month of October.***

- *NFPA standard 1221, 7.4.1 requires that 90% of all emergency call processing (except for EMD calls, HAZMAT, Technical Rescue, and TTY/TDD calls) be complete within 64 seconds for Fire agencies. (Call completion means from time received to time dispatched).* ***The division dispatched these Fire calls at 83.6% for the month of September.*** *In addition, this same standard requires 95% of these calls be completed within 106 seconds.* ***The division dispatched these calls at 95.0% for the month of September.*** *The standard requires the other four types of calls be completed within 90 seconds 90% of the time.* ***The division dispatched these type calls at 99.4% for the month of September.***

- *NFPA standard 1221, 7.4.1 requires that 90% of all emergency call processing (except for EMD calls, HAZMAT, Technical Rescue, and TTY/TDD calls) be complete within 64 seconds for Fire agencies. (Call completion means from time received to time dispatched).* ***The division dispatched these Fire calls at 79.1% for the month of August.*** *In addition, this same standard requires 95% of these calls be completed within 106 seconds.* ***The division dispatched these calls at 94.6% for the month of August.*** *The standard requires the other four types of calls be completed within 90 seconds 90% of the time.* ***The division dispatched these type calls at 99.4% for the month of August.***

Emergency Medical Dispatch Opportunities:

Many other North Carolina communities utilize certain key words when making the decision to send the fire department. Using these key words, the fire department is dispatched and then the response model is adjusted as the 9-1-1 telecommunicator receives more information. It is recommended that Brunswick County and Shallotte evaluate a change to use key words to help screen medical emergency calls before the calls are fully processed through EMD.

Furthermore, it is recommended that Shallotte Fire command staff review current protocols with the Brunswick County Medical Director to ensure that there is a demonstrated outcome that justifies the fire department response. Generally, throughout North Carolina, municipal firefighters responding as Emergency Medical Technicians are responding to "Delta" and "Echo" level medical emergencies to ensure that patients with the most acute medical emergencies are receiving the closest first responders possible and that there are enough personnel at the medical emergency to provide initial patient care and packaging for transport to a medical facility. In addition, fire department companies are sent when no EMS unit is available or there will be a lengthy delay of EMS units when they are not readily available. There are some cases of certain "Charlie" level calls being answered as well across the state. It is unusual for fire department first responders to provide an emergency response to "Alpha" or most "Bravo" level medical emergencies.

In North Carolina, EMS patient care and transport is the legislative responsibility of county government. Municipal government is a key element of the emergency medical response system by providing supplemental responses for the persons needing the most critical care. However, legislatively, response to medical emergencies falls upon the county.

Illustrative information from another North Carolina community includes:

- *By using the Fast Tracks in the IAED protocols, call takers utilize the Fast Track protocols to identify situations that require immediate dispatch, expediting the response process. Training is conducted in their IAED certification classes for EMD, EFD, and EPD to recognize and act on these high-priority cues.*

- *IAED EMD explains ECHO Determinant Practice as follows: 'The ECHO level allows early recognition based on extreme conditions of breathing and other dire circumstances as defined, such as a person on fire. Such coding is separated from DELTA to encourage local assignment of the absolute closes response of any trained crew (i.e., police with AEDs, fire ladder or snorkel crews, HAZMAT, or other specialty teams)."*

- *IAED EFD defines it as, "The ECHO level allows early recognition and response initiation based on specific ECHO situations. Such coding is separated from DELTA when earlier dispatch is possible."*

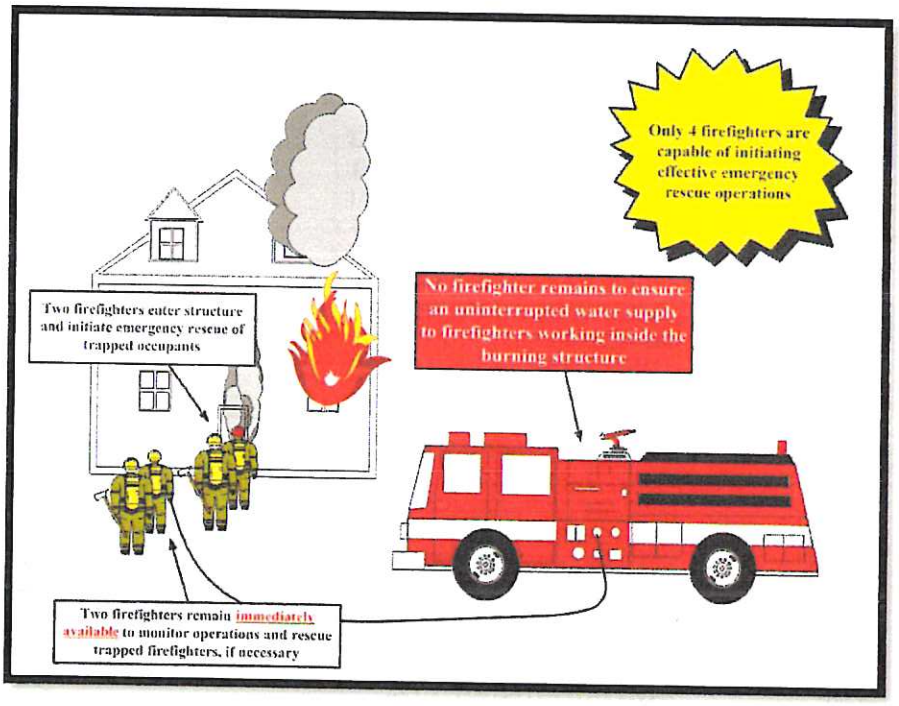
- *IAED EPD explains ECHO Situations as, "ECHO determinants allow early dispatch initiation for specific immediate dangers. When discovered in Case Entry, the following situations should be coded as ECHO directly from Case Entry" and lists specific situations.*

- *Fast forwarding occurs as outlined below:*

Nature Code	Full Description	Fast Forwarded
50FIRE	ACCIDENT WITH FIRE	True
AIREM	AIRCRAFT EMERGENCY	True
ALRT1L	AIR ALERT 1 LARGE AIRCRAFT	True
ALRT1S	AIR ALERT 1 SMALL AIRCRAFT	True
ALRT2L	AIR ALERT 2 LARGE AIRCRAFT	True
ALRT2S	AIR ALERT 2 SMALL AIRCRAFT	True
ALRT3L	AIR ALERT 3 LARGE AIRCRAFT	True
ALRT3S	AIR ALERT 3 SMALL AIRCRAFT	True
BDS	BIOHAZARD DETECTION SYS ALERT	True
BOAT	MARINE FIRE	True
BRUSH	BRUSH FIRE	True
COALRM	CARBON MONOXIDE ALARM	True
CODVIO	CODE VIOLATION	True
CONFIN	CONFINED SPACE / STRUCTURE	True
EHAZ	ELECTRICAL HAZARD	True
ELEV	ELEVATOR/ESCALATOR	True
EXPLO	EXPLOSION	True
EXTRI	EXTRICATION / ENTRAPPED	True
FIRAL	ALARMS	True
FIRAST	FIRE ASSISTANCE NEEDED	True
FIRINV	FIRE INVESTIGATION/FOLLOW UP	True
FUELSP	FUEL SPILL	True
GAS	GAS LEAK (NATURAL & LP)	True
HAR	HIGH ANGLE RESCUE	True
HAZ	HAZMAT - FIRE ONLY	True
LIGHT	LIGHTNING STRIKE (INVEST)	True
MED	FIRE ONLY - MEDICAL ASSISTANCE	True
MUTUAL	MUTUAL AID	True
ODOR	ODOR (STRANGE / UNKNOWN)	True
OSFIR	OUTSIDE FIRE	True
SMOKE	SMOKE INVESTIGATION	True
SNKVEH	SINKING VEH / FLOODWATER	True
STRINJ	STRUCTURE FIRE-INJURED	True
STRUC	STRUCTURE FIRE	True
TNKFIR	OUTSIDE TANK FIRE	True
TRAIL	TRAIL RESPONSE	True
TRAIN	TRAIN / RAIL INCIDENT	True
TRAINF	TRAIN AND RAIL FIRE	True
VFIRE	VEHICLE FIRE	True
WATER	WATER RESCUE	True
WCRAF	WATERCRAFT IN DISTRESS	True

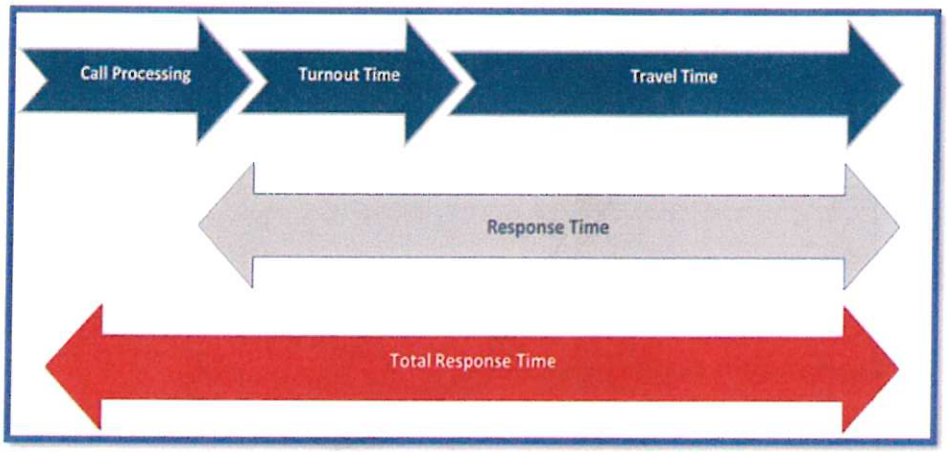
Appendix D – Two In – Two Out Firefighter Staffing Depiction

Regarding the number of firefighters, federal law mandates that before firefighters can make an interior attack on a structure fire, there must be a rescue crew established in case something goes wrong with the entry crew. The entry crew is going into an environment that is immediately dangerous to life and health (known as IDLH). Only when there is a known rescue are firefighters permitted by law to enter a structure fire without a rescue crew. This law is typically known as "Two In – Two Out" and applies to all fire service operations.

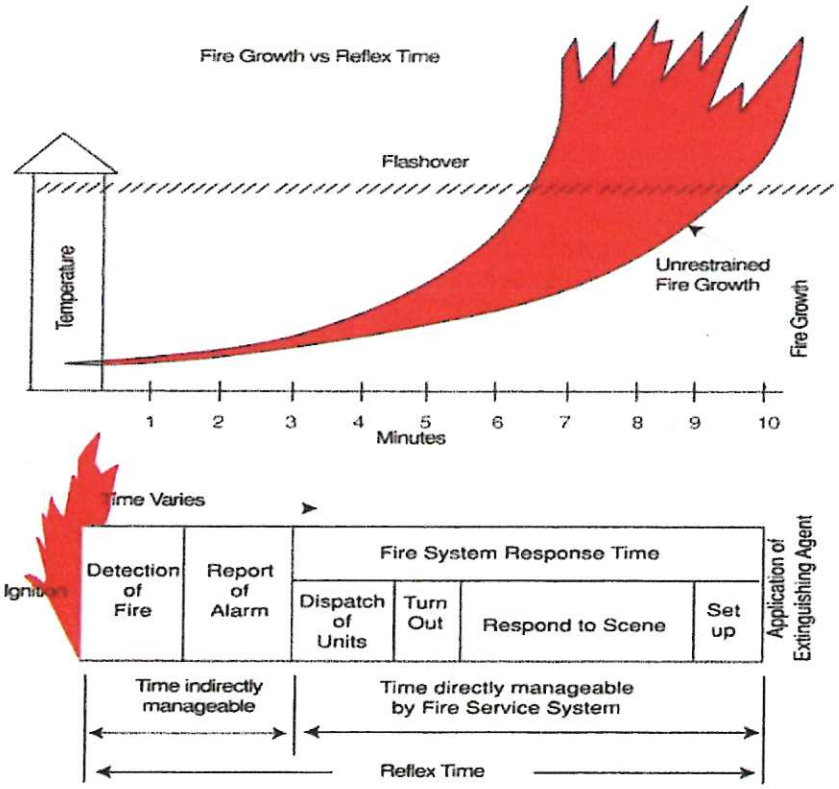


Appendix E – Select Fire Service Visual Data Points Applicable to Shallotte Fire Department:

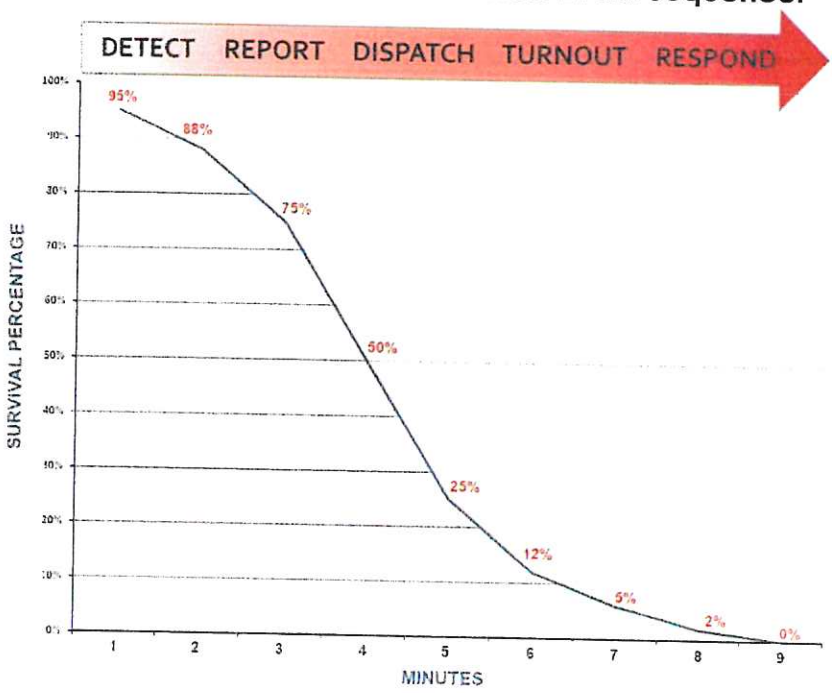
Total Response Time Continuum:



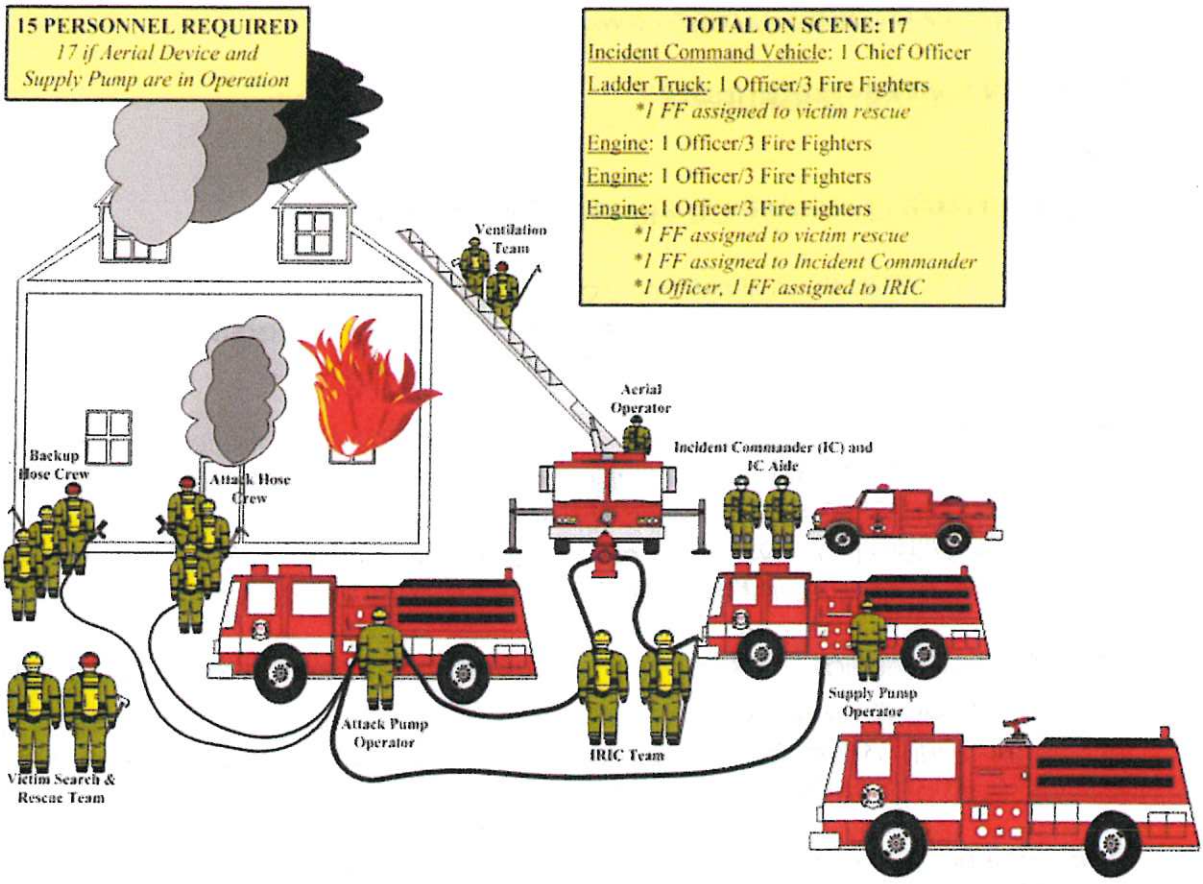
Fire Growth and Reflex Time:



Cardiac Arrest Event Sequence:



Visual of Firefighter Staffing Necessary at a Structure Fire Per the Consensus Standard for Areas with an Urban Population Density:



NFPA 1710 Initial Full Alarm Assignments:

2,000 SF Residential Structure Fire		Open-Air Shopping Center (13,000 SF to 196,000 SF)		1,200 SF Apartment (3-story garden apartment)	
Incident Commander	1	Incident Commander	2	Incident Commander	2
Water Supply Operator	1	Water Supply Operators	2	Water Supply Operators	2
2 Application Hose Lines	4	3 Application Hose Lines	6	3 Application Hose Lines	6
1 Support Member per line	2	1 Support Member per line	3	1 Support Member per line	3
Victim Search and Rescue Team	2	Victim Search and Rescue Team	4	Victim Search and Rescue Team	4
Ground Ladder Deployment	2	Ground Ladder Deployment	4	Ground Ladder Deployment	4
Aerial Device Operator	1	Aerial Device Operator	1	Aerial Device Operator	1
Rapid Intervention Crew	4	Rapid Intervention Crew	4	Rapid Intervention Crew	4
		EMS Care	2	EMS Care Crew	2
Total	**17**	**Total**	**28**	**Total**	**28**

Appendix F: Future Staffing Considerations:

An adequate number of firefighters to work structure fires is critical to the safety of the public and of the firefighters. Also, the largest portion of the ISO rating is staffing (15%). As the Town of Shallotte grows, the information below is provided as guidance for Shallotte to consider moving forward.

NFPA 1710 SUMMARY/HIGHLIGHTS

NFPA 1710
Fireground Staffing Levels for Career Fire Departments

NFPA 1710 provides the minimum requirements relating to the organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments.

For the 2016 edition of the standard, subsection 5.2.4 on fire department service deployment was revised to include three new occupancies, along with the appropriate response staffing levels for each. The minimum staffing level for each occupancy is listed below. *(For the full breakdown of staffing requirements by position, refer to the subsections specific to each occupancy in 5.2.4.)*

Single-Family Dwelling — minimum of 16 members (17 if aerial device is used)
The initial full alarm assignment to a structure fire in a typical 2000 ft^2 (186 m^2), two-story, single-family dwelling without a basement and with no exposures must provide for a minimum of 16 members (17 if an aerial device is used).

Open-Air Strip Mall — minimum of 27 members (28 if aerial device is used)
The initial full alarm assignment to a structure fire in a typical open-air strip shopping center ranging from 13,000 ft^2 to 196,000 ft^2 (1203 m2 to 18,209 m2) in size must provide for a minimum of 27 members (28 if an aerial device is used).

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

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

Other: Fire departments that respond to fires in occupancies that present hazards greater than those found in 5.2.4 shall deploy additional resources as described in 5.2.4.5 on the initial alarm.

NOTE: Even though fire ground staffing levels have changed, NFPA 1710 continues to require that engine companies be staffed with a minimum of 4 on-duty members, as stated in subsection 5.2.3. In addition, paragraph 5.2.2.2.1 requires that the fire department identify minimum company staffing levels as necessary to meet the deployment criteria required in 5.2.4 to ensure that enough members are assigned, on duty, and available to respond with each company safely and effectively.

Material used in this summary is taken from the 2016 edition of NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. This reprinted material is not the complete and official position of the NFPA or its Technical Committees on the referenced subject, which is represented solely by the standard in its entirety. That standard can be accessed online at www.nfpa.org.

Comparative Analysis for National Standards on Deployment and Staffing

NFPA 1710 – Staffing Standard for Primarily Career Fire Departments:

First due travel times – 4 minutes or less 90% of the time.
Full assignment assembly times – 8 minutes or less 90% of the time.
Staffing - each company with at least four firefighters.
Turn-out times = 80 seconds for fire calls, 60 seconds for medical calls.
Travel time = 4 minutes or less for fire calls or medical calls.
Effective response force

- 17 firefighters on a typical residential structure fire
- Arrival within 8 minutes or less

Appendix G – Project Staff:

Gregory H. Grayson, Fire Chief (ret), City of Greensboro, NC

Greg Grayson has more than 42 years of progressive experience in the North Carolina fire and rescue service. His experience includes beginning public service as a volunteer firefighter and ascending the career ranks to become the Fire Marshal/Fire Rescue Director for Wake County, North Carolina. In the following seventeen years, he served as the fire chief for three North Carolina urban cities – Burlington, Asheville, and Greensboro. In these executive leadership capacities, he was responsible for comprehensive fire and rescue operations, prevention programs, training and career development, emergency management functions and specialized regional response teams. In Burlington, he effectively led positive organizational change and implemented an innovative reserve firefighter program. In Asheville, he commanded significant re-engineering throughout the fire department and led Asheville to become an accredited agency. In Greensboro, he led the department to maintaining both accreditation and ISO "Class1" status and navigated the department through difficult fiscal years and challenging large-scale emergencies. In 2015, his long-term, dedicated public service to the people of North Carolina was recognized by the Governor through the prestigious "Order of the Long Leaf Pine", the state's highest honor that can be awarded to a citizen.

Upon retiring from local government service, Chief Grayson was appointed by the State Fire Marshal in 2015 to proactively serve as the state's first and only public fire service management consultant, providing high level technical assistance to county and municipal managers - enabling them to better strengthen their jurisdiction's fire protection service delivery systems. He also managed statewide fire service advancement initiatives and led the Office of State Fire Marshal's Technical Services program.

Beyond extensive experience, Chief Grayson holds a Master of Public Administration, bachelor, and associate in fire protection. He holds numerous professional credentials including Chief Fire Officer (CFO), MIFireE from the Institution of Fire Protection Engineers and multiple other fire service certifications, including being North Carolina's first Advanced Firefighter. He is one of very few, if not the only, Fire Chief in the United States to also hold the Senior Professional in Human Resources (SPHR) and SHRM-SCP credentials. He is active in the North Carolina Association of Fire Chiefs and the IAFC Metropolitan Fire Chiefs organizations and continues to serve as a volunteer firefighter in his home community.

David Bullins, Fire Chief (ret), Statesville, NC

David Bullins has served the NC fire service since 1982. His career started as a volunteer in the rural Piedmont area and ended as a career municipal fire chief in the foothills of the state. Chief Bullins served the Summerfield Fire Department as a volunteer and was the first paid firefighter on their roster. His career continued with the City of Greensboro Fire Department where he rose through the ranks serving as firefighter, captain, battalion chief, and planning & research officer. Part of his career with Greensboro Fire Department was that of Training Officer. Chief Bullins was appointed to the position of Fire Chief for the City of Statesville in 2007. After retiring in 2014 from the fire service, he continued his training and education goals by serving as the Fire and Emergency Management Department Chair for Guilford Technical Community College. He now serves as the Director of Public Safety for Mitchell Community College in Statesville, N.C. and teaches fire technology and emergency management throughout the state. Chief Bullins has a master's degree from Oklahoma State University in Fire & Emergency Management Administration, a bachelor's degree the University of Cincinnati in Fire & Safety Engineering Technology, and associate of applied science degree from Guilford Technical Community College. He also is a graduate of the National Fire Academy Executive Fire Officer Program and is designated as a Chief Fire Officer (CFOD) from the Center for Public Safety and Excellence.

Todd Tuttle, Assistant Chief (ret), Greensboro NC

Chief Tuttle is a 33-year fire service veteran who also served as a paramedic. For the last half of his career, he managed the intricate records management systems for the City of Greensboro Fire Department, which is an accredited, ISO Class 1 city. These duties included CAD, mobile data, AVL, Fire House, GIS technologies, Accreditation, performance management and many other related areas. Chief Tuttle is recognized throughout the state and nation as a technical expert on Firehouse records management systems as well as data analysis.

Barry Hendren, Assistant Chief (ret), City of Asheville, NC

Chief Hendren recently retired from Asheville Fire Department at the Assistant Chief level after more than 33 years of municipal fire protection experience. Chief Hendren was instrumental in developing and leading the department's training programs, accreditation efforts and served in a leadership capacity most of his career in Asheville. Chief Hendren was responsible for all shift operations, strategic planning, fire marshal's office and EMS program in his role.

Chief Hendren earned an associate degree in fire protection from Central Piedmont Community College and earned his Bachelor in Fire Protection Engineering Technology from UNC Charlotte. He has held the Chief Fire Officer Designation since 2008.

Wes Hutchins, Fire Chief (ret), Walkertown, NC

Chief Hutchins currently serves as the Executive Director of the North Carolina Association of Fire Chiefs. Previously, he served as the Dean of Emergency Services for Forsyth Technical Community College. He also served for near 44 years as Fire Chief for Walkertown Fire Department, where he now serves as a Town Council Member. He holds a master's in public administration degree from Grand Canyon University, a bachelor's from Gardner-Webb University and an Associate in Fire Protection from Guilford Technical Community College

Robert McNally, Beacon GIS Partner, Monroe, NC

A GIS Analyst/Planner with niche specialty and ground experience for Fire, Rescue, EMS, Public Safety, Emergency Management, and Homeland Security projects, Robert owns Beacon GIS, a first responder planning services firm. Robert brings 20 years of public safety experience as a responder, manager, and trainer. He has been awarded twice for his service to the community. He graduated magna cum laude with bachelor's degree in public administration, securing an honor scholarship while during his education. Robert also has a graduate degree in Urban and Regional Planning from the University of North Carolina at Charlotte. Robert McNally has spoken at several conferences about public safety and homeland security and Beacon GIS has been involved in over 180 projects for emergency services of various sizes across the United States & Canada.

Scott Burnette, Fire Chief (ret), City of Asheville, NC

Chief Burnette recently retired from Asheville Fire Department after more than 30 years of municipal fire protection experience, the last 14 as Fire Chief. Chief Burnette has also served as Fire Chief of the Mills River Fire Department in Henderson County. Chief Burnette led the Asheville Fire Department's initial accreditation effort as accreditation manager and continued to achieve accredited agency status for the department multiple times. He led the department through a tragic line-of-duty death in 2010. Chief Burnette implemented many innovative and progressive programs in his tenure in Asheville and led in the development and construction of Fire Station 13, increasing department staffing and opening a model regional fire training facility.

Chief Burnette has remained a certified and practicing North Carolina Paramedic and continues to serve with Henderson County EMS as a Paramedic responder. Chief Burnette has earned an associate degree in fire protection from Gaston College, was in the first graduating class of the University of North Carolina at Charlotte Fire Protection Engineering bachelor's degree program, graduating with honors, and received a master's degree in fire service leadership. He has held the Chief Fire Officer Designation since 2008.

North Carolina Fire Chief Consulting
www.NCFireChief.com
336-266-7998