CITY OF BURLINGTON
2025 FIRE STATION LOCATION ANALYSIS

NCFCC Commitment to NC Local Governments

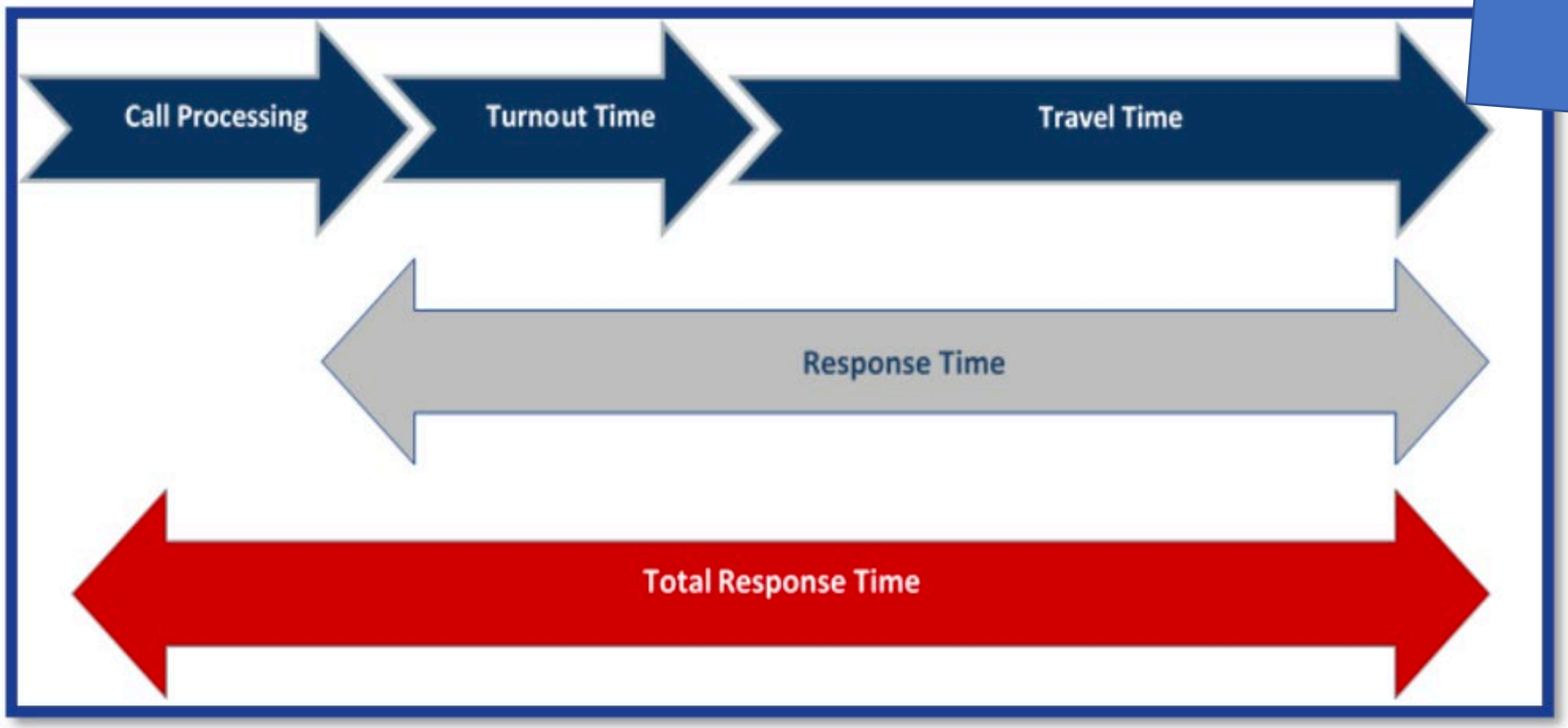
NCFCC's Purpose:

- This **independent**, third party, analysis is to guide city staff and fire service leaders towards building the **strongest, most sustainable** fire and rescue service delivery system possible that is in the best interest of **protecting and serving** the people of Burlington, North Carolina.

Burlington Fire Station Location Analysis Components From NCFCC:

1. Geographic Information System (GIS) Analysis.
2. Statistical Data Analysis of Historical Call Volume.
3. Team Review and Written Report.

Fire Station Locations Primarily Impact Travel Time in Your Service Delivery System:



Reducing FD Travel Time is the Principal Focus of this Analysis

STATISTICAL ANALYSIS - RESPONSE TIME PERFORMANCE – ALL CALLS

The following statement would be the most credible measure to explain to the public the actual demonstrated level of service from the time that an emergency 9-1-1 call is placed until the first Burlington Fire Department unit arrives – **6 minutes, 54 seconds, or less, 90% of the time**.

In comparison to the national consensus standard and department goal, the Burlington Fire Department is meeting the total response time goal of 6 minutes, 20 seconds, or less, 84.69% of the time, rather than 90%.

STATISTICAL ANALYSIS - RESPONSE TIME PERFORMANCE FOR STRUCTURE FIRES

- Based on a 2023-2024 evaluation period, the Burlington Fire Department has demonstrated the ability to respond to **90 percent of all structure fires within 3 minutes and 46 seconds**, or less, from the receipt of the event in the 911 center until the first fire department unit arrived.
- The full complement arrival is **13 minutes, 30 seconds 90% of the time.**

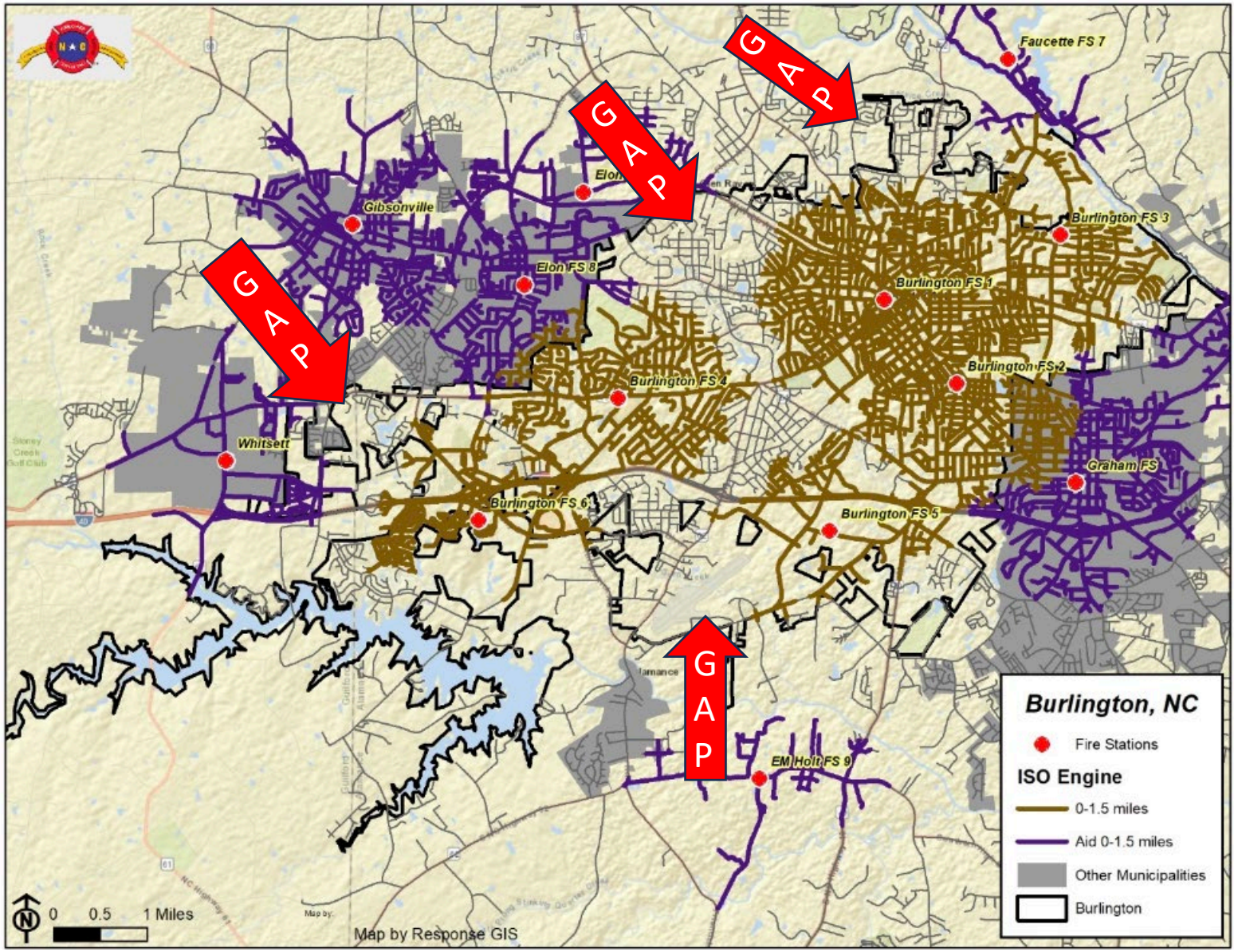
Enter ERF # here->		16	Baseline@ 90th percentile	Benchmark	Gap
Call Processing Time (CP)	nth = 57	Pickup to Dispatch	**0:01:53**	0:01:00	0:00:53
Turnout Time (TO)		Turnout 1st Arriving Unit	**0:01:06**	0:01:20	Goal Met
Travel Time (Trv)		Travel Time 1st Arriving	**0:03:03**	0:04:00	Goal Met
	nth = 47	Travel Time ERF Unit	**0:11:06**	0:08:20	0:02:46
Total Response Time (TRT)		Total Response Time 1st Arriving Unit (CP,TO,Trv)	**0:03:46**	0:06:20	Goal Met
	nth = 47	Total Response Time ERF Unit (CP,TO,Trv)	**0:13:30**	0:10:20	0:03:10

BURLINGTON INCIDENT WORKLOAD ANALYSIS

Heaviest Call Load = 9am-8pm

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
0	296	246	209	219	232	227	253	1,682
1	260	205	179	188	176	194	235	1,437
2	213	176	211	159	168	179	224	1,330
3	191	170	174	177	183	174	221	1,290
4	183	154	162	151	180	164	154	1,148
5	199	213	157	156	160	209	193	1,287
6	238	252	237	260	242	273	231	1,733
7	277	394	336	348	338	308	280	2,281
8	316	515	461	431	452	469	345	2,989
9	422	530	543	521	535	518	427	3,496
10	439	625	609	559	540	533	504	3,809
11	463	613	578	596	624	610	532	4,016
12	473	641	590	595	574	600	521	3,994
13	508	552	578	627	575	562	509	3,911
14	508	599	582	591	592	584	468	3,924
15	476	563	561	554	571	531	516	3,772
16	473	549	568	534	605	572	511	3,812
17	475	503	501	556	527	583	537	3,682
18	474	488	512	545	511	536	500	3,566
19	460	491	438	498	491	486	465	3,329
20	445	433	428	486	442	453	463	3,150
21	360	353	345	394	392	378	412	2,634
22	313	330	330	324	307	371	395	2,370
23	247	292	282	260	284	306	336	2,007
Total	8,709	9,887	9,571	9,729	9,701	9,820	9,232	66,649

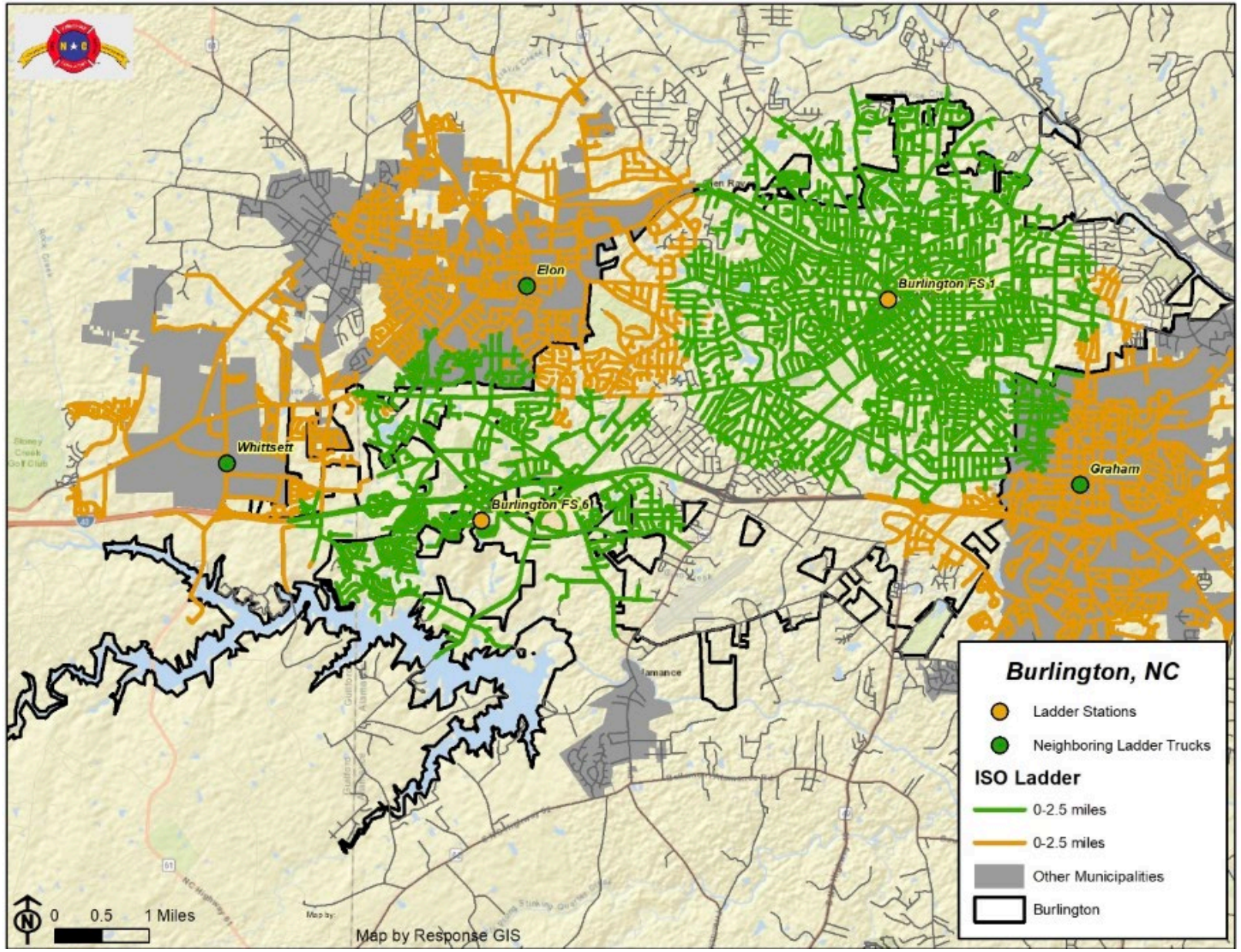
GEOGRAPHIC INFORMATION SYSTEM ANALYSIS



Overall Burlington ENGINE Coverage:

Dark brown lines represents the engine company coverage within Burlington. Purple lines represent neighboring jurisdictions.

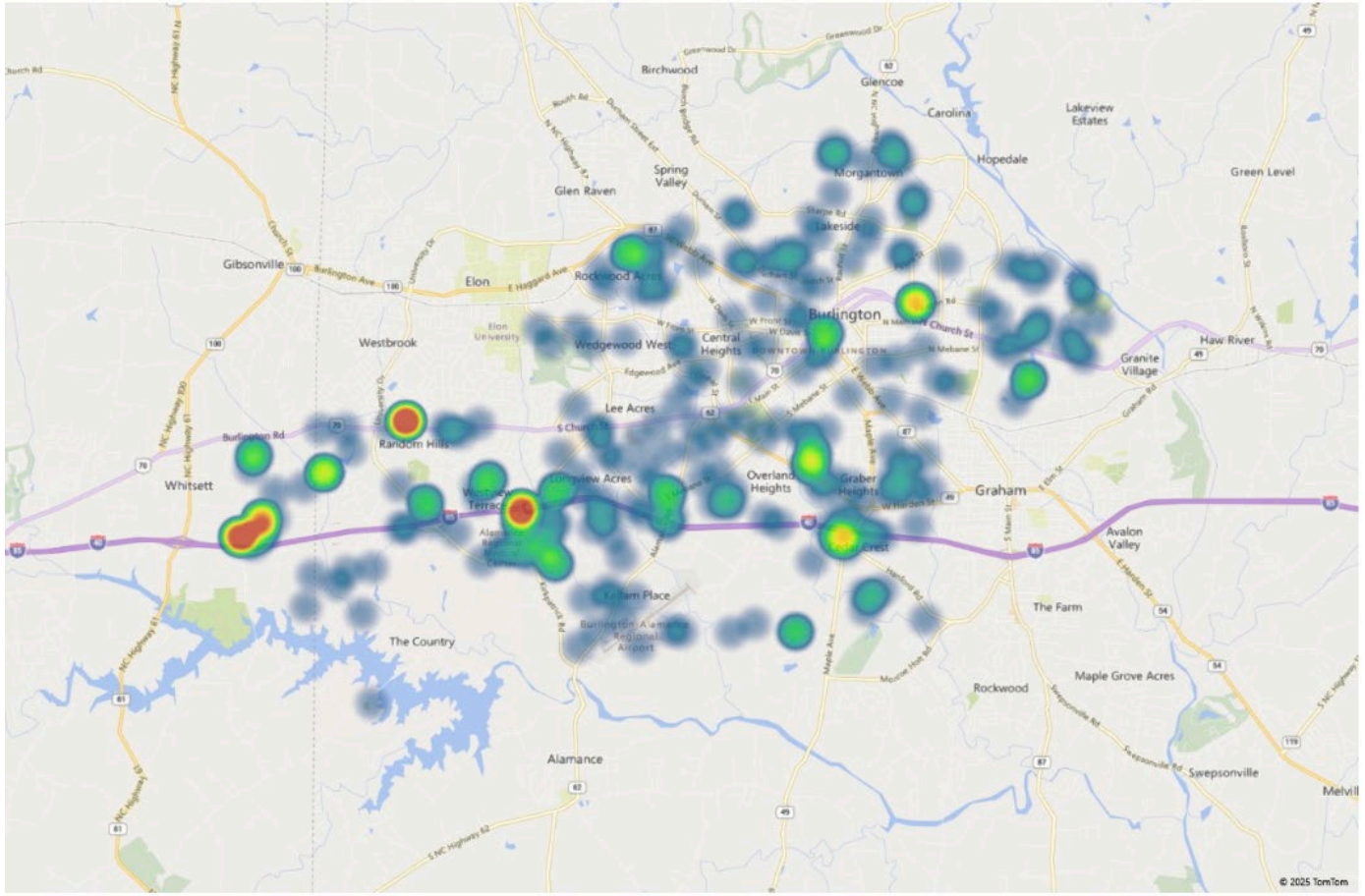
4 general gap areas are shown in red.



Overall Burlington LADDER Coverage:

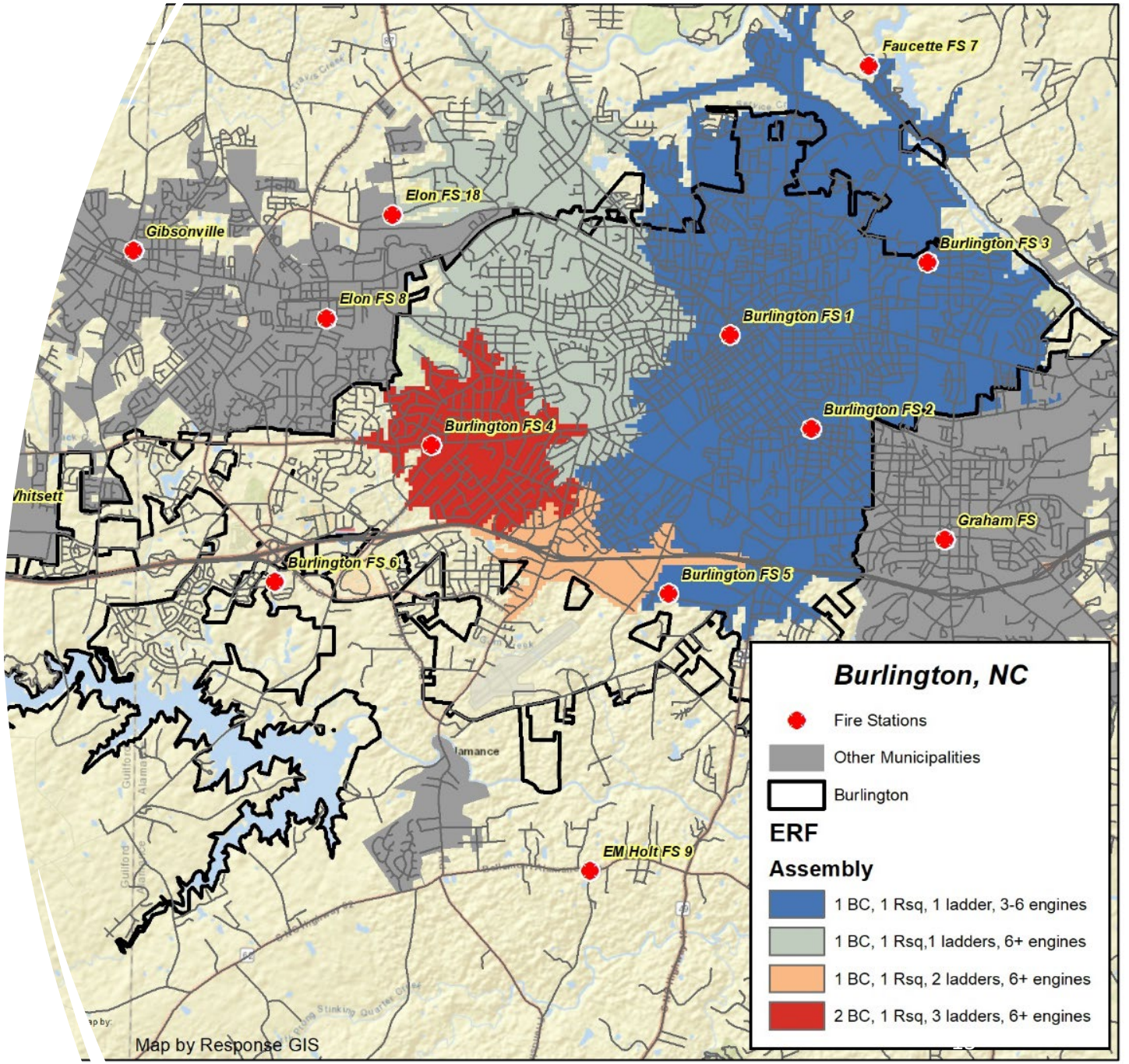
Green lines represents the ladder company coverage within Burlington (Stations 1 & 6). Orange lines represent neighboring jurisdictions.

Current Response Times Greater than 7 Minutes:

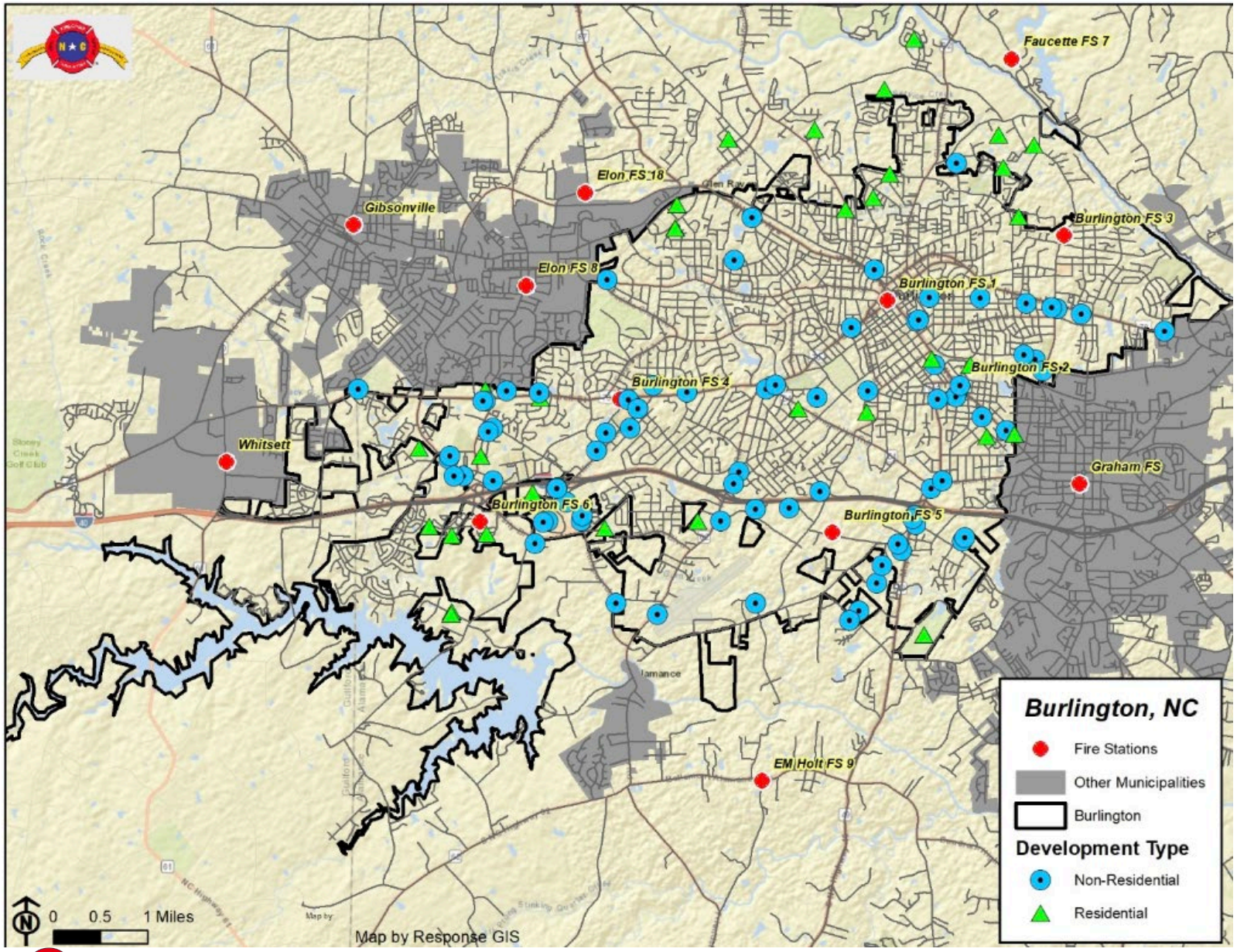


Concentration of Response Resources:

- Based upon the current average staffing, deployment and first alarm assignment (3 engines, 1 truck, 1 squad, and 2 chiefs), this map indicates that the Burlington Fire Department cannot achieve an effective response force (ERF) to most of the Station 6's primary area in 10 minutes, 20 seconds, or less 90 percent of the time.



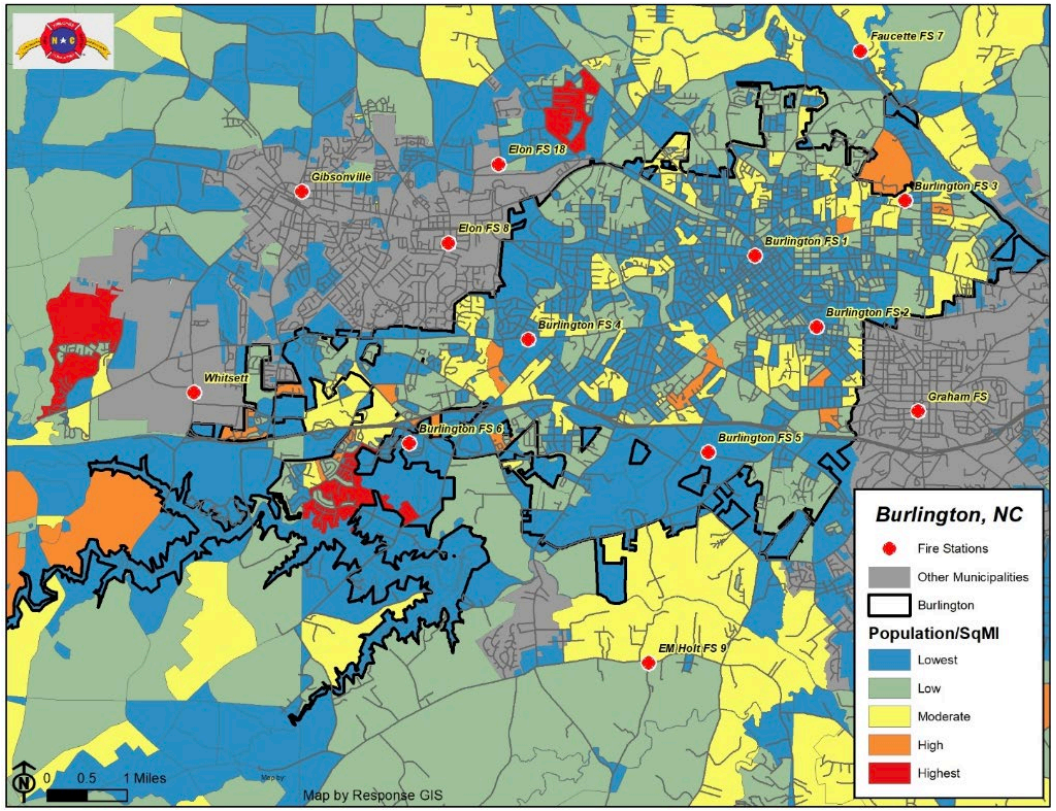
Development Effects on the City of Burlington



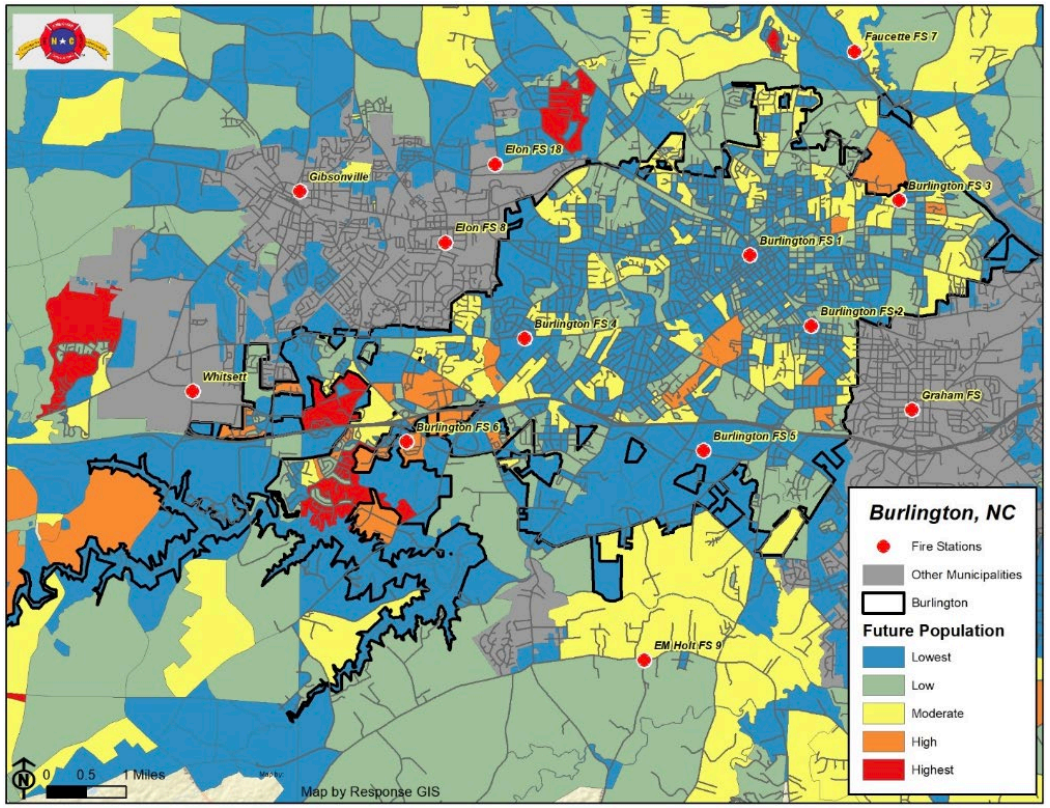
Blue dots represent 34 residential projects and 79 commercial projects.

This new development will represent about 9,000 additional persons in the city and @ 2,000 additional fire department responses annually.

Burlington Current and Future Population Densities:

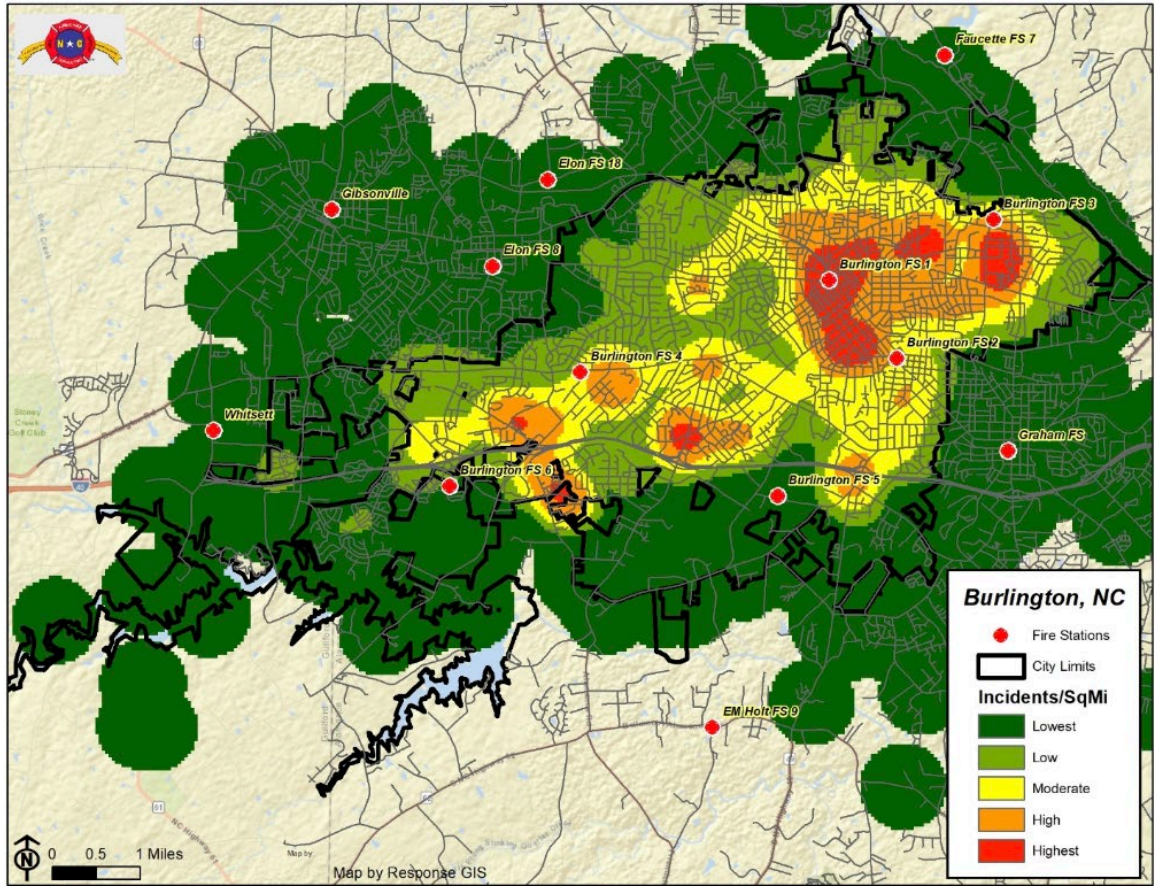


Current Population Density

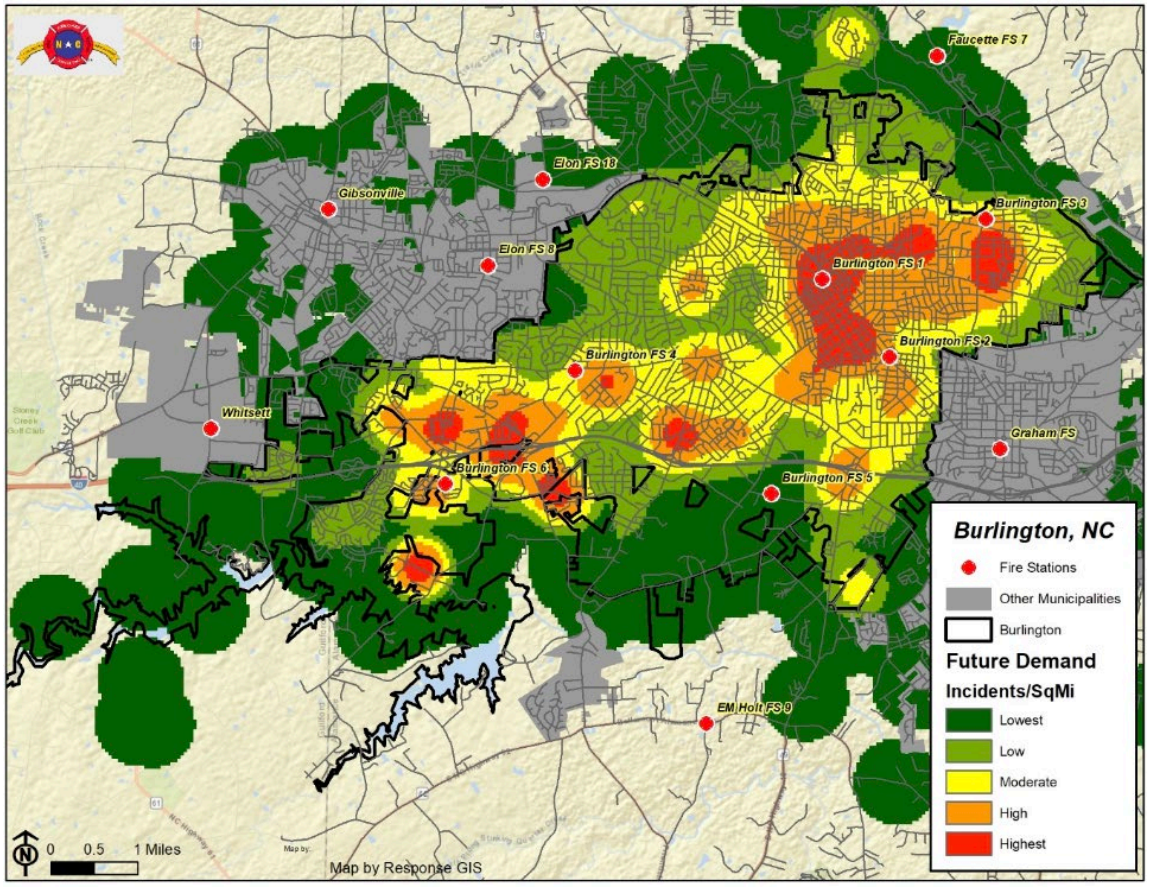


Future Population Density Projection

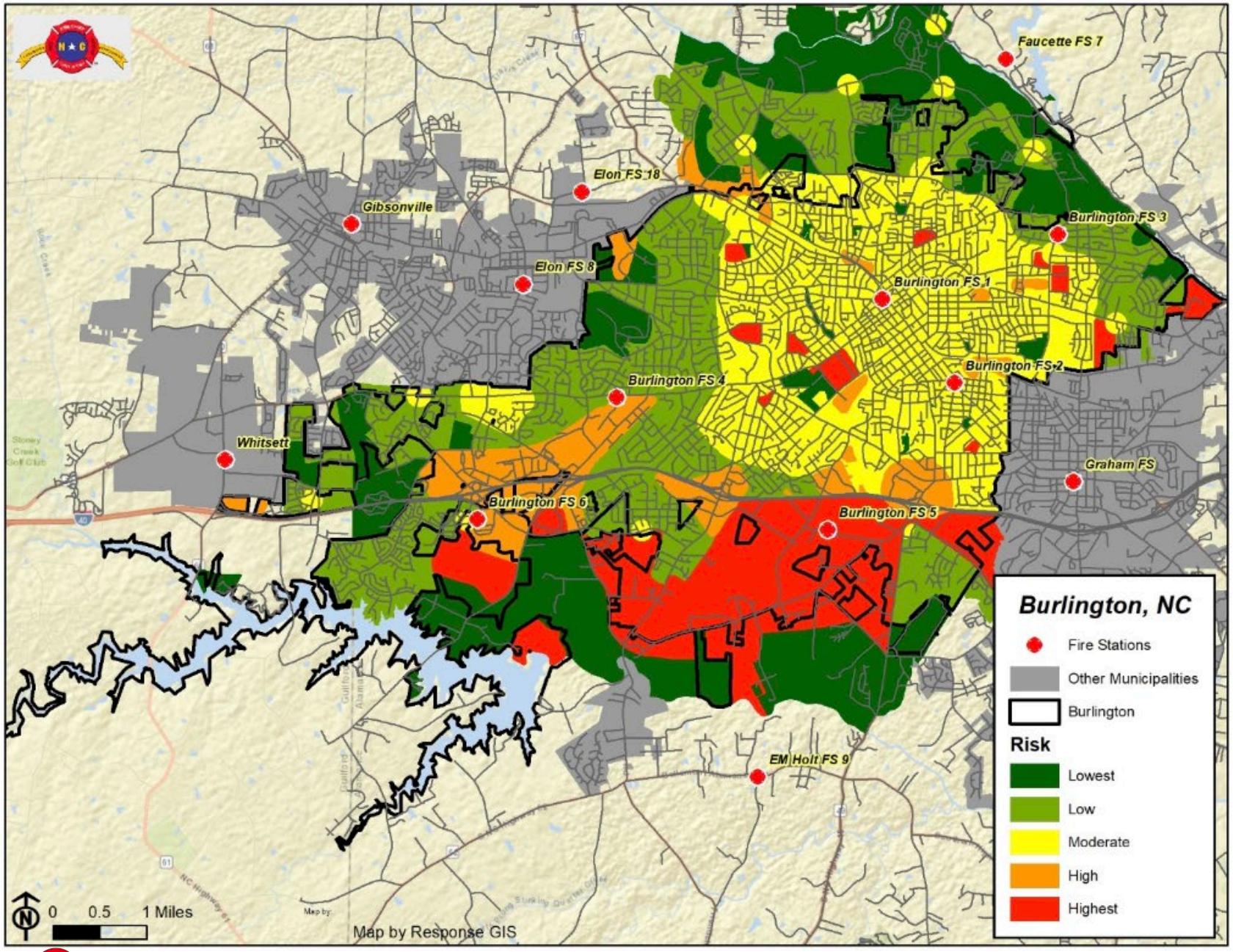
Burlington Current and Future Fire Service Demand:



Current Service Demand Density



Future Service Demand Density Projection

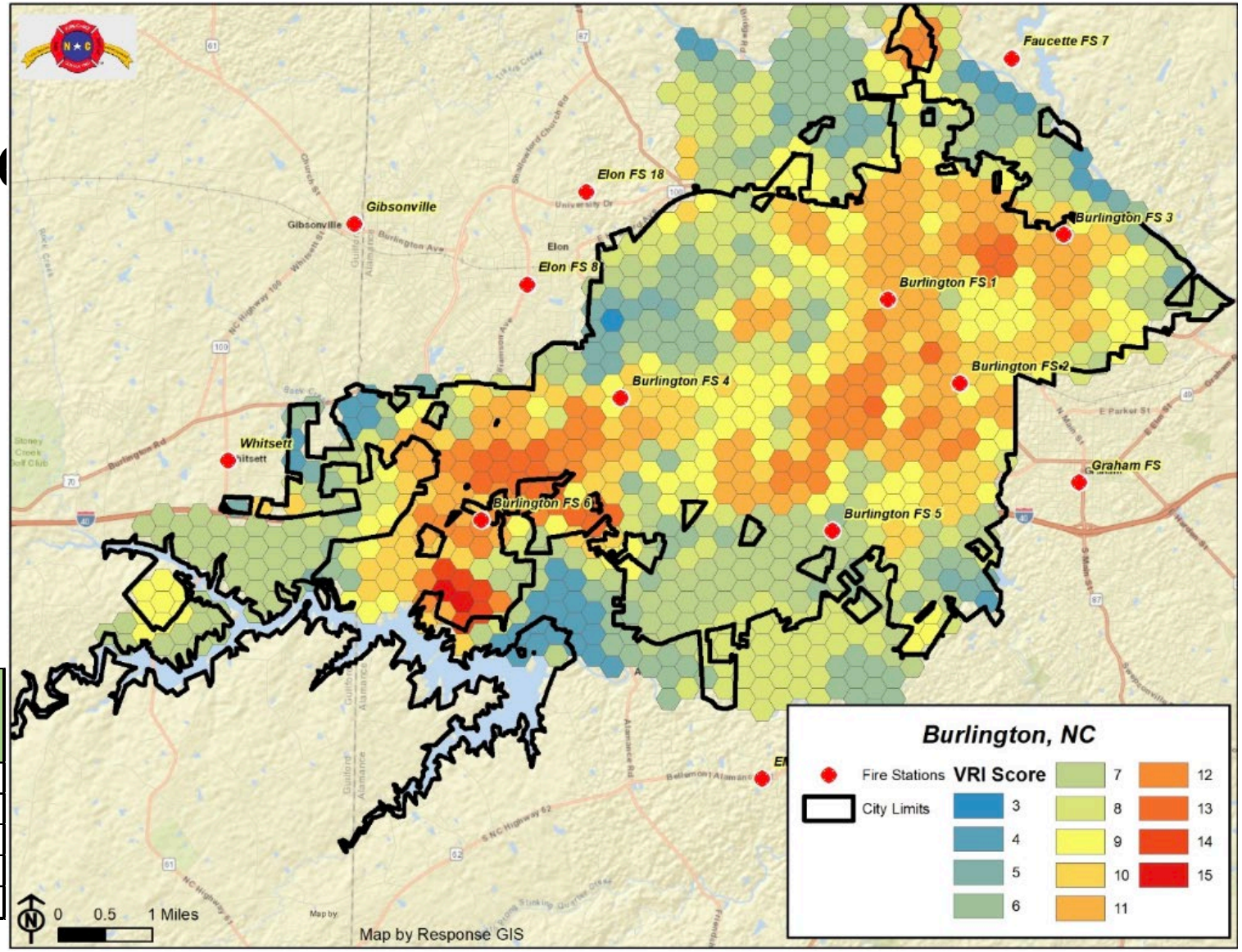


Land Use Risk in Burlington:

- *Red and Orange colors represent the highest risks.*

Vulnerability Risk Inde
Utilizing a Hexagonal
Grid

Population per Sqmi	Score	Land Use Risk	Score	Service Demand per Sqmi	Score	Total Score
Highest	5	Highest	5	Very Heavy	5	15
High	4	High	4	Heavy	4	12
Moderate	3	Moderate	3	Moderate	3	9
Low	2	Low	2	Light	2	6
Lowest	1	Lowest	1	Very Light	1	3



Fire Station Vulnerability Risk Index Score Rating

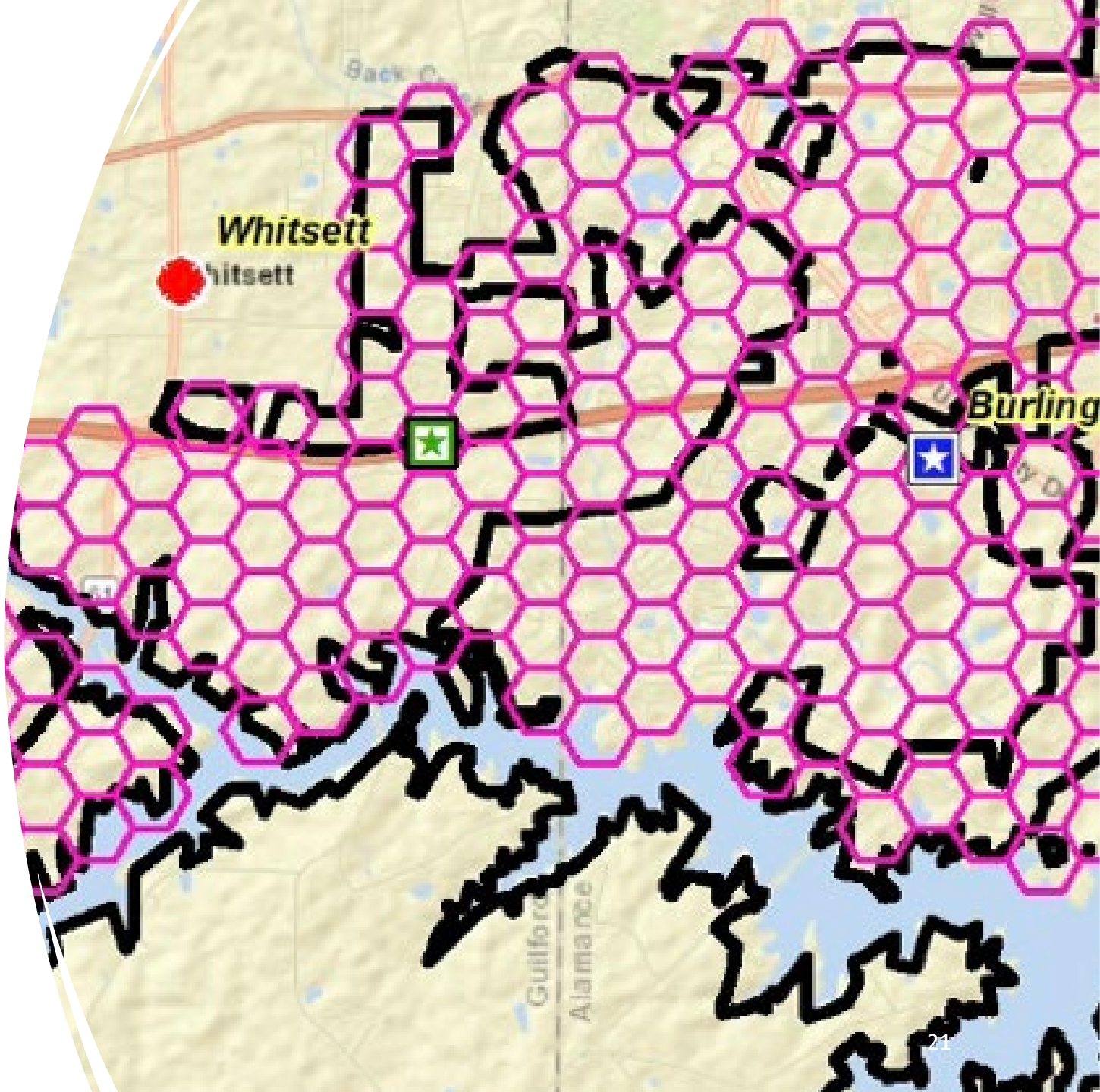
- Can be equated to **level of service** delivery capability.
- The computer modeling system divides Burlington into hexagonal shapes based upon travel times.
- The vulnerability risk index (VRI) was constructed using the five varying levels of **population, emergency call demand, and land use/hazard risk** and applied to each hexagonal cell with a risk score that reflects the ranks of the metrics described in that area.
- The **higher the VRI, the higher the level of service** capability.

Key Analysis Observations and Recommendations:

1. Plan and secure funding for new stations, equipment, and firefighter staffing.
2. Plan for a new fire station west of Station 6, ideally near Springwood Park.
3. Consider a dual-purpose fire station to better serve the airport with potential federal funding.
4. Improve coverage between Fire Stations 1 and 4, an identified gap in service.
5. Acquire land for a future northern fire station to accommodate future growth.
6. Explore fire service expansion into unincorporated areas with cost-sharing agreements.

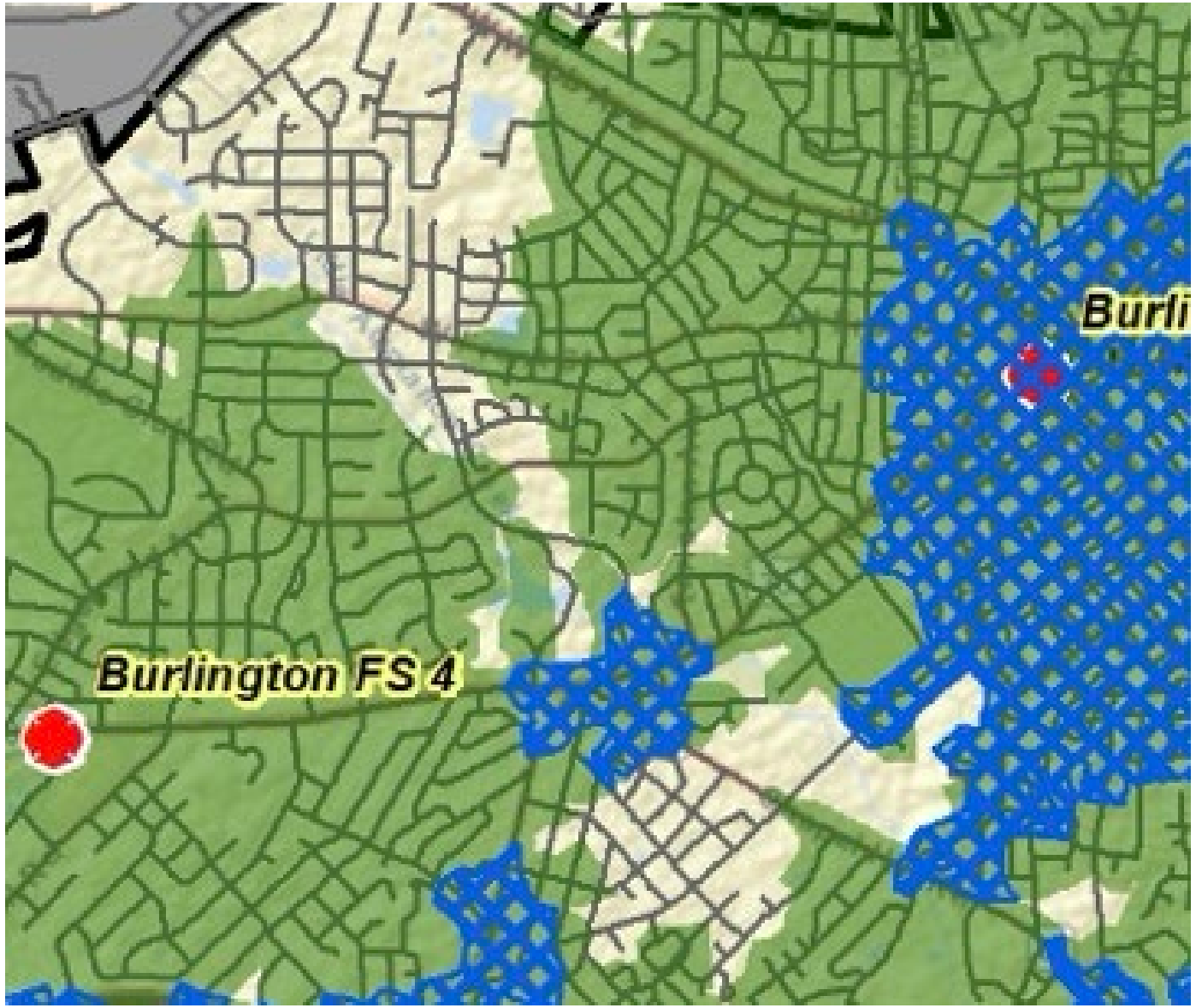
Focus Area #1: Westernmost Part of Burlington

- The computer modeled optimum area compared with current city owned property at **Burlington's Springwood Park** earned within one percent the same credit with the VRI score.

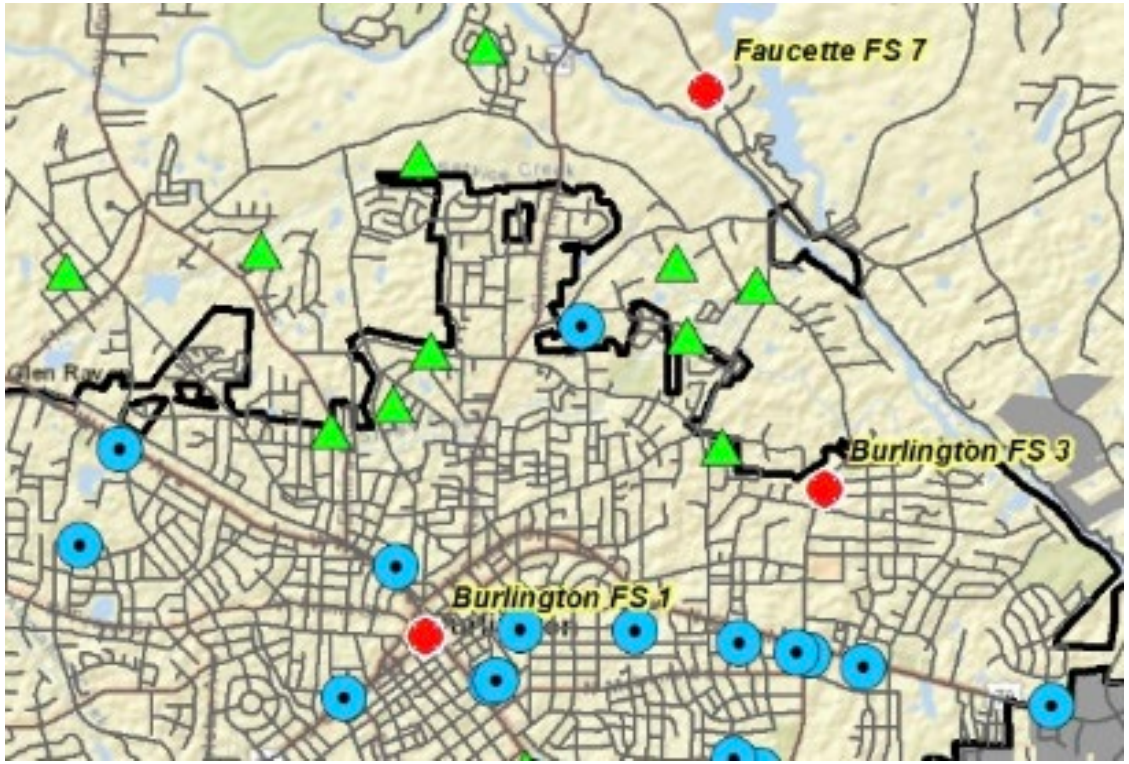


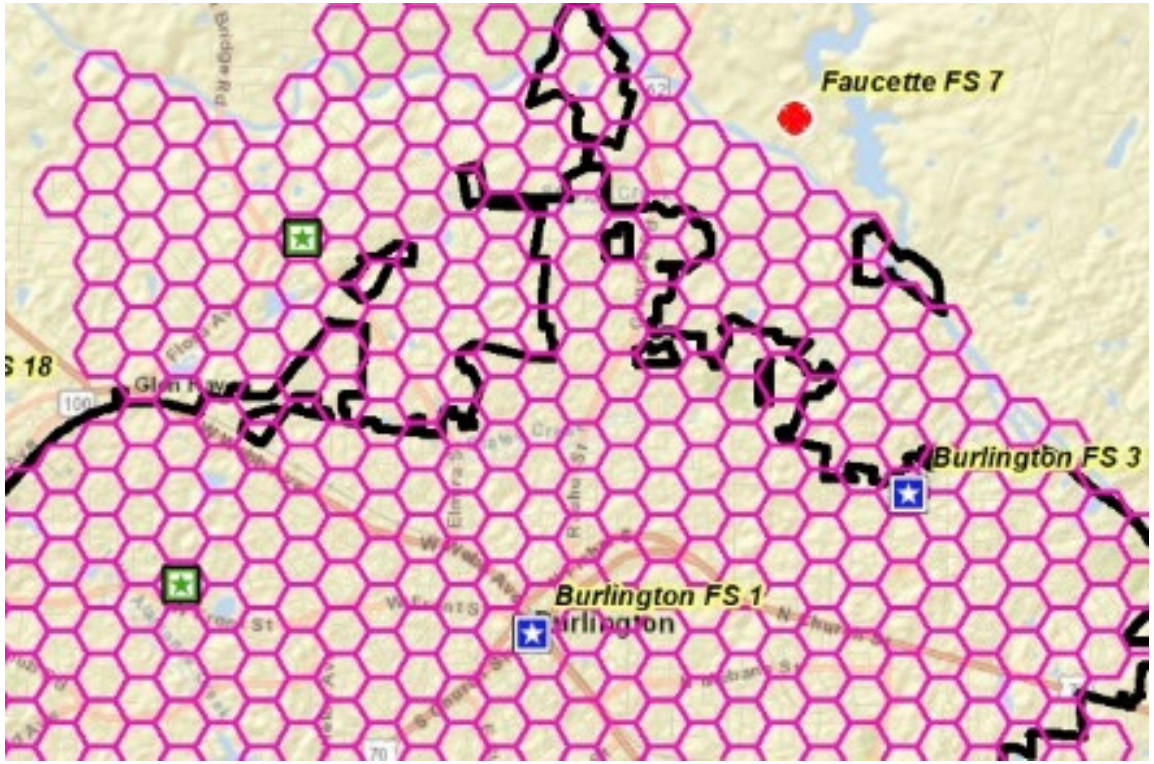
Focus Area # 2: Central Burlington Area

- **Gaps** remain between Burlington Fire Station 1 Downtown and Fire Station 4 at Holly Hill Mall.
- A slight **relocation of Fire Station 4** could strengthen coverage in this area of the city.



Focus Area #3
Northeast Area





Focus Area #4: Airport/Alamance Road

- Opportunity to place a **dual-purpose fire station in the area of Alamance Road and Grand Oaks Boulevard** that would be able to service both the City of Burlington and the Burlington-Alamance Regional Airport.
- This facility could be eligible for federal funding for both the facility and specialized airport firefighting equipment. A fire station that could serve both the community and the airport would best support economic development for the region.
- The City of Monroe, NC provides an excellent best practice model with a dual-purpose fire station.

Questions?

THANK YOU!

North Carolina Fire Chief Consulting

336-266-7998 ♦ www.NCFireChief.com

FIRE STATION LOCATION ANALYSIS

February

2025

Burlington Fire Department

Burlington, North Carolina

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

TABLE OF CONTENT

Table of Figures

Scope of Work and Project Disclaimer:

NCFCC 2025 Burlington Fire Department Fire Station Location Analysis

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

a. Current Conditions/Benchmarking Analysis

- Update the base map with the fire protection service area, city area, and fire stations.
- Update drive time map using updated roads database, based on NFPA 1710 and identifying gaps and redundancies.
- Update Service demand heat map depicting the amount reached by drive time and classifying demand levels into risk rankings. This will use recent incident data from the past immediate 3-5 years.
- Update Residential population density map, classified into risk rankings.
- Update changes to Land use/Zoning risk classification analysis, classified into risk rankings.

b. Future Station Planning

- Future deployment scenarios are measured against an updated scored combined matrix of population risk, demand risk and land use risk.
    - Current fire stations score as a benchmark for the following scenarios:
        - Keeping the current Headquarters fire station, Station 3 and 6 "anchored" for future consideration.
        - Evaluate feasibility of relocation of Fire Station 5 to an identified Burlington Airport location, with comparison and contrast on the impact on the vulnerability risk index rating for both locations.
        - Evaluate locations in western Burlington deemed feasible by the GIS model for a future fire station 7 optimum location.
        - Evaluate a more optimum location for Fire Station 4, given alternatives with Station 5 and utilizing Station 6.

GIS Deliverables:

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

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

2. Data Analysis of RMS

- Conduct an analysis of available data from Fireworks Software for 3 to 5 years with full reporting capability using a supplied data model from NC Fire Chiefs Consulting. Determine a baseline level of performance for Burlington Fire Department and compare that to the benchmark performance for emergency events at the 90th percentile. Note that the outcomes will be reflected in the data/information that NCFCC is provided.

3. 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 Burlington 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 Burlington 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 Burlington Fire Department. The sole intent of this project is to improve, advance and strengthen the fire protection service delivery system in the City of Burlington of both Alamance and Guilford Counties, 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 fire district 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 grow, 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 the City of Burlington. Recent growth coupled with projected growth in the coming years is significant for Burlington.

However, the Burlington 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 Burlington community as well as analysis of response data. Burlington 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 NC League of Municipalities and the NC Association of County Commissioners.

Overall, Purpose and General Methodology:

The core purpose of this initiative was to evaluate the **overall needs for future fire stations within the City of Burlington.** The focus was to evaluate the demonstrated performance of the Burlington Fire Department with the current resources and fire stations and project how that level of service would improve with the addition of subsequent fire stations. The City of Burlington Fire Department projects growth at a steady rate in the foreseeable future. A long-term plan for fire station facility needs will enable City of Burlington leadership to properly plan for future capital needs to ensure that people served by the Burlington Fire Department receive timely emergency responses to fire and rescue calls for service.

To accomplish these important tasks, NCFCC evaluated the last **seven years of emergency incident response records** of the Burlington Fire Department utilizing PowerPivot technology to determine the levels of service that the fire department has been able to successfully provide their community. NCFCC developed a

dynamic statistical analysis of incident data for the Burlington Fire Department to determine the level of service that the department can provide at the 90th percentile (based on population density), 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.

Furthermore, NCFCC utilized state-of-the-art **geographical information computer systems** (GIS) that compile enormous amounts of geospatial data from Alamance and Guilford Counties 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 geographic area of the Burlington community is established, which helps determine station needs and the most optimal (effective and efficient) distribution for fire station locations.

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.

Emergency Response Records Analysis:

In the seven years of incident data that NCFCC reviewed, a focus was placed on the emergency responses for data analysis. Over this review period, there were 66,798 incidents, creating 102,886 responses, of which 85, 914 had incident arrival times. The data in the system was closely reviewed and determined to be "clean" data to work with. 8,202 of the total unit responses were eliminated from some segments of the response time analysis because they had an arrival time but no enroute time. In addition, there were 431 records eliminated when measured time components exceeded the pre-determined parameters (outliers).

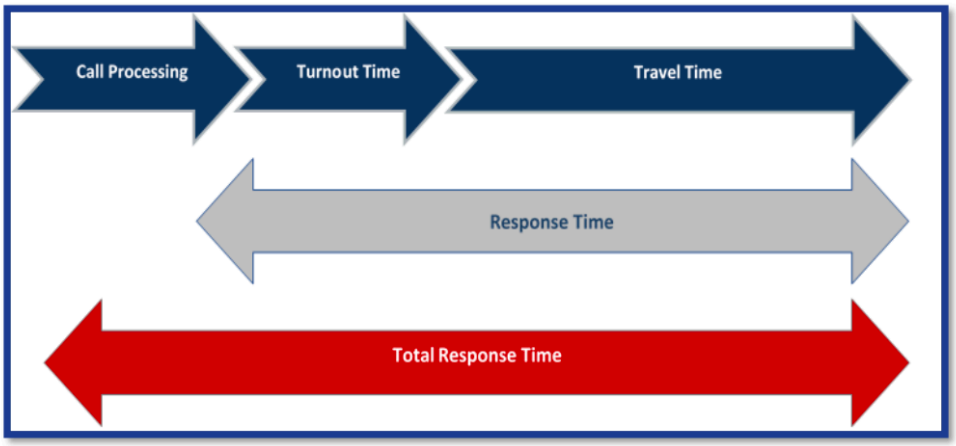
The Burlington Fire Department has self-established benchmarks to evaluate their demonstrated performance and they self-report this data within the community. This self-reporting uses the following benchmarks:

- Percentile Measure = 90th percentile
- Call Processing Time – 01:00
- Turnout Time – 01:20
- Travel Time – 04:00
- Response Time – 05:20
- Total Response Time – 06:20
- Effective Response Force Travel Time – 08:20
- Effective Response Force Total Response Time – 10:20

It should be noted that the Burlington Fire Department self-reporting schedule is consistent with the **national industry standard** for fire and emergency responses to urban areas (areas with 1,000 people per square mile, or greater) as outlined in NFPA consensus and industry standard, known as "*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.*"

Within this national industry consensus standard, response times are recognized in fractile format at 90% of all responses and not averages because the fractile percentages much more accurately reflect the actual level of service that is provided to the residents that are served and protected by the fire department.

Components of "response time" is often mis-understood. To "Ms. Smith" who is calling 9-1-1 to report an emergency, the response time to her is from the time she dials 9-1-1 until the fire department arrives at her location. However, the graphic below illustrates that there are several variables that must be considered for what occurs when someone calls 9-1-1.



Performance Overview includes the following points:

- Demand of Services:
  - Daily incident average = 26
  - Since 2021, demand has increased approx. 2-5% annually.
  - The month of October has the highest demand.
  - The11 am hour is the busiest hour.
  - Monday is the busiest day.
  - The Rescue/Medical incident type is 75% of the overall demand on the department.
  - The department mitigates incidents without aid on 98.44% of their incidents.
  - Aid given to other departments is less than 1% of their demand.
  - Multiple events at the same time occur approximately 30% of the day.
- Response Time Performance:
  - Call Processing Time = 01:43 or less, on 90% of incidents.
  - Turnout Time (first arriving unit) = 01:12 or less, on 90% of incidents.
  - Travel Time (first arriving unit) = 04:40 or less, on 90% of incidents.
  - Response Time = 05:28 or less, on 90% of incidents.
  - Total Response Time = 06:54 or less, on 90% of incidents.

- **Unit Staffing**
  - Engines = 3
  - Trucks/Quints = 3
  - Squad/Rescue = 2
  - Cars / Batt Chief = 1

- **Effective Response Force**
  - The Burlington Fire Department has demonstrated their ability to place their **first unit on scene to a building fire within 3 minutes and 46 minutes,** or less, on 90% of events and arrive their effective response force of **16 firefighters within 13 minutes and 30 seconds.** (It should be noted that the applicable NFPA 1710 standard identifies that for an effective response force for low-risk structures is 17 firefighters and for high-risk structures is 43 firefighters.)

Call Processing time (answering the 9-1-1 call and dispatching Burlington Fire) is reflected at 1 minute, 43 seconds, or less, on 90% of the qualifying incidents that

were able to be analyzed. The goal of 1 minute for call processing was met 56.63% of the total events. The call processing time is improving, and the 1-minute goal was met on almost 63% of incidents since 2020.

Turnout time (or the time it takes from receiving the emergency call until wheels on the fire apparatus are turning forward) for the first arriving Burlington Fire Department unit is 1 minutes, 12 seconds, or less, on the reviewable emergency responses. The turnout time goal of 1 minute, 20 seconds, or less, was met on 93.75% of incidents.

Travel time (or the time it takes the fire apparatus to respond by roadways) for the first responding Burlington Fire Department unit on the reviewable emergency responses was 4 minutes, 40 seconds, or less, on 90% of those events. The department's goal, based upon national industry standards, is 4 minutes. That 4-minute travel time goal was met on 81.24% of the reviewed emergency response incidents (56,896).

When evaluating the **total response time** (the combination of call processing, turnout, and travel time) for all risks for the first unit arriving from the Burlington Fire Department, the data reflects that the above three segments took 6 minutes, 54 seconds, or less, on 90% of the incidents. The following statement would be the most credible measure to explain to the public the actual demonstrated level of service from the time that an emergency 9-1-1 call is placed until the first Burlington Fire Department unit arrives – **6 minutes, 54 seconds, or less, 90% of the time**. In comparison to the national consensus standard and department goal, the Burlington Fire Department is meeting the total response time goal of 6 minutes, 20 seconds, or less, 84.69% of the time, rather than 90%.

Using only data from 2023 forward, Burlington's **effective response force** (ERF) (which means assembling enough firefighters to safely and effectively manage a typical residential house fire) is responding 16 firefighters within **13 minutes and 30 seconds** for structure fire responses.

The Burlington Fire Department averages well over 10,000 incident responses annually. The busiest 8 hours for the fire department are between 10am and 6pm. **Overlap of incidents** is an important consideration. Approximately 35% of incidents overlapped with a previous incident. This means that multiple emergency calls are occurring simultaneously. Burlington should continuously

keep a focus on overlapping calls to ensure service delivery is consistent with the potential of growth in the Burlington community in the coming years.

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.

The Burlington Fire Department provides services currently from six (6) fire stations to cover the near **32 square mile incorporated area**. The current population within the Burlington municipal limits is well over 60,000 people with an average density of 1,894 people per square mile.

Development data was provided by the city, indicating 34 residential projects and 79 commercial projects. The residential projects are projected to have about 3,900 new units. Multiplied by the census persons per household indicates that a potential population increase of over 9,000 persons is possible. Incident rate per existing commercial property was applied to new commercial development. The number of incidents per current population was applied to the additional development and the result indicates an estimated 2,000 additional annual calls for service from the fire department. In addition to the identified development, the fire department and city planning office provided additional details for potential development within and bordering the city limits. This was taken into consideration when creating a fire service planning extent discussed later.

To properly locate fire stations, several dynamics must be considered such as incident demand, population, and structural risk. Covering incidents alone would not consider the structural risk associated with property within the fire district. The population alone ignores commercial property (no residents but higher risk), and both summon the fire department at differing levels. 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. A ¼ mile hexagonal grid was digitally constructed and overlaid atop the entire

Burlington Fire 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.

A baseline VRI score is developed to effectively determine the potential improvements that adding or relocating fire stations may yield. The current baseline VRI score within the current municipal limits for the City of Burlington is **77.5%.** In addition, the total response area was also assigned a VRI score, which is determined by the current municipal limits plus areas that are anticipated to be annexed in the coming years. This VRI rating was determined to be **63.5%.** As a best practice, many municipalities seek to obtain a **90%**, or higher, VRI score. Hence, Burlington's current gap is 12.5%, or more, with the current municipal limits and 26.5% with the municipal limits PLUS the designated planning expansion area.

Optimal Locations to Reach an Improved VRI Score District Wide:

Scenario A1 – Retaining All Current Fire Stations and Adding Fire Stations to Achieve a 90% or Higher VRI Score inclusive of the Planning Potential Expansion Area:

By keeping all six (6) of the current Burlington fire stations in place, the city would need to **add five (5)** additional fire stations to reach a VRI score of 90% or higher. The computer modeled these five (5) additional fire stations 1) North of the current Burlington municipal limits, 2) West of current fire station 6, 3) East of current fire station 6, 4) South of current fire station 5 and 5) Between current fire station 1 and current fire station 4. This plan would achieve a total VRI score of 91%.

However, it is recognized that adding five (5) additional fire stations is not practically feasible in the foreseeable future.

The greatest gain in this model **(8.1%)** comes from the addition of a fire station north of the current municipal boundaries due to the potential planning expansion area.

Scenario A2 – Retaining All Current Fire Stations and Adding Fire Stations to Achieve a 90% or Higher VRI Score Within Municipal Limits:

By keeping all six (6) of the current Burlington fire stations in place, the city would need to **add three (3)** additional fire stations to reach a VRI score of 90% or higher. The computer modeled these three (3) additional fire stations 1) Between current fire station 5 and current fire station 6, 2) West of current fire station 6, 3) Between current fire station 1 and current fire station 4. This plan would achieve a total VRI score of 90%.

The greatest gain in this model **(4.5%)** comes from the addition of a fire station between current fire station 5 and fire station 6.

Scenario B1 – Anchoring Fire Stations 1,3, and 6 as permanent, thereby allowing Fire Stations 2, 4 and 5 to be relocated within the municipal limits, placing these three available fire stations at more optimum locations.

Modeling of this scenario increased the VRI score by **8%**, taking the VRI score from the baseline of 77.5% to 85%. However, the gains for relocating fire station 4 and fire station 5 were extremely minimal and could not justify expenditure of substantial capital investment. The true gain in this model only comes from re-locating current fire station 2 into an area west of current fire station 6.

Scenario B2 – Same scenario as B1, but including adding the potential planning expansion area for consideration in addition to the current Burlington municipal boundaries:

Again, this scenario did not produce a pathway to achieve a VRI score of 90% or higher with less than five (5) new fire stations. Again, it is recognized that adding five (5) additional fire stations is not practically feasible in the foreseeable future.

The greatest gain in this model **(11.1%)** comes from placing a fire station north of the current municipal boundaries due to the potential planning expansion area.

Relocate Station 5 Scenario:

In addition to the scenarios above, the Burlington Fire Department requested that the assessment team evaluate relocating the current fire station 5 from Industry Drive to the area of Alamance Road and Grand Oaks Boulevard. This move does not increase the VRI score. It decreases the VRI score from 77.5% to 76.2% for the current municipal area and decreases the VRI score from 63.5% to 62.8% for the municipal area plus the potential planning expansion area. Hence, a 1.3% decrease and a .7% decrease respectfully.

Although the relocation does not increase the VRI score, the adverse impact is very minimal. If this relocation could enhance fire protection coverage, improve the department operationally and enhance economic development, the delta between keeping the current fire station 5 and relocating fire station 5 is minimal. For example, if relocating fire station 5 would allow direct airport access and better support the Burlington-Alamance Regional Airport, the VRI cost of making that move is minimal.

Monroe, NC provides a best practice model of supporting their airport operation (which is very similar in many ways to the Burlington airport) by placing a fire station adjacent to airport property with structural fire service responding from the front of the fire station and airport fire protection (ARFF) responding from the rear of the fire station directly onto airport property. The City of Monroe has received substantial federal funding to support the fire station construction and ARFF equipment that is located within the efficient dual purpose fire station.

Options with the Westernmost Fire Station Placement Scenario:

The modeling conducted for this analysis as part of Scenario A2 demonstrated a need for an additional fire station west of current fire station 6. The area of interest identified in this analysis was between the current Whitsett fire station and the current Burlington fire station 6 location, but just south of the interstate.

Modeling was used to potentially place the fire station identified for this area north of the Interstate on property currently owned by the City of Burlington near Springwood Park. The delta for the VRI score between placing the fire station on the city owned land north of the interstate versus the potential site south of the interstate was only .9% (less than one percent). Therefore, the difference is so minimal that it would be recommended to consider the current city owned land at Springwood Park to minimize costs for this enhancement.

A visual representation of the options identified by this analysis is found below in the chart that outlines impacts in each of the scenarios presented.

Scenario	Description	#Stations	VRI Score % Coverage	VRI Score % Coverage		
Benchmark	Current Station Locations	6	63.5%	77.5%		
A1	Keep Current Stations, Add Others		**Planning Area Coverage**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
	Add 1 Station	7	72%	8.1%	8.1%	North of City
	Add 2 Stations	8	78%	14.8%	6.8%	West of Station 6
	Add 3 Stations	9	84%	20.2%	5.4%	East of Station 6
	Add 4 Stations	10	88%	24.3%	4.0%	South of Station 5
	Add 5 Stations	11	91%	27.2%	3.0%	Between Stations 1 & 4
A2	Keep Current Stations, Add Others	**#Stations**	**City Limits Only**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
	Add 1 Station	7	82%	4.5%	4.5%	Between Stations 5 & 6
	Add 2 Stations	8	86%	8.7%	4.2%	West of Station 6
	Add 3 Stations	9	90%	13.0%	4.3%	Between Stations 1 & 4
	Anchor 1,3,6/Relocate 2,4,5	**#Stations**	**City Limits Only**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
B1		6	85%	8%		Stns 4 & 5 near. Stn 2 moves to west of Stn 6
B2	Then add stations to perimeter	**#Stations**	**Planning Area Coverage**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
	Add 1 Station	7	75%	11.1%	11.1%	North of City
	Add 2 Stations	8	80%	16.5%	5.4%	East of Station 6
	Add 3 Stations	9	84%	20.5%	4.0%	South of Station 5
	Add 4 Stations	10	88%	24.3%	3.8%	Between Stations 2 & 5
	Add 5 Stations	11	90%	26.5%	2.1%	Between Stations 1 & 4
Alt Stn 5 location	Alamance Rd/Grand Oaks	6	62.8%	76.2%		

Observations and Recommendations:

1. **Capital improvement plan funding** is needed for land acquisition, fire station facility planning, construction, and fire apparatus for future fire stations. Operations fiscal planning will also be needed for the necessary firefighters to operate Burlington's future fire stations.

2. The need to address a **fire station location west of Fire Station 6** is present with the current municipal limits and is enhanced with the planning potential expansion area. The fire station modeling suggests that an area at or near **Springwood Park** would be well-suited for a future fire station site.

3. There is a viable opportunity to place a **dual-purpose fire station in the area of Alamance Road and Grand Oaks Boulevard** that would be able to service both the City of Burlington and the Burlington-Alamance Regional Airport. This facility could be eligible for federal funding for both the facility and specialized airport firefighting equipment. A fire station that could serve both the community and the airport would support economic development for the region. It is possible to relocate Fire Station 5 to this area with a minimal loss of VRI score. However, an additional fire station would obviously provide a higher level of service.

4. The geographic **area between Burlington Fire Station 4 and Downtown/Fire Station 1** does not have the fire station coverage consistent with most of the Burlington municipal limits in this developed area and does not have automatic aid from neighboring fire departments that can ensure an immediate response into this geographic area. The area in question has surfaced in multiple studies and analysis as an area of need in past years. It is recommended that planning to enhance fire and rescue services to this area occur when conditions will allow.

5. It is recommended that the City of Burlington secure property for a **future fire station in the northern part of the city** to prepare for future growth. As growth occurs north of the current municipal boundary, it is recommended that the City of Burlington plan for a fire station facility in that area.

6. **As an additional future fire service funding consideration**, it is recommended that the City of Burlington further evaluate the potential of

providing fire and rescue services to certain select unincorporated areas of Alamance and Guilford County where 1) a Burlington fire station is the closest fire station, 2) where there is already a municipal water supply, and 3) where the area is within the City of Burlington extraterritorial jurisdiction (ETJ).

As fire and rescue services operational and capital costs increase, it is further recommended that the City of Burlington, Alamance County and Guilford County evaluate any potential unincorporated areas that the Burlington Fire Department could provide the closest fire station response to. Providing services in the unincorporated area (such as the Burlington ETJ) could be through a newly created fire protection service district (or districts), which would generate additional funding for the City of Burlington to help support increasing costs for fire services. A **cost share analysis between the City of Burlington and Alamance County as well as Guilford County** using multiple variables would be necessary to ensure that the cost structure between the city and the unincorporated area served is balanced. Typically, five or more factors are used in that calculation, such as population, call volume/workload, property valuation, total square miles, total road miles, square footage, and others. This type of analysis ensures that the city and the unincorporated area are paying for a properly proportional amount of the necessary costs of providing fire and rescue services and that one or the other are not out of sync and supplementing the other's duties and obligations to provide core public safety services. The cost share formula is dynamic and should be evaluated annually, adjusting rates accordingly against the costs to provide essential services.

7. When planning the **addition of future engine companies**, it is recommended that Burlington consider the addition of 15 firefighters for each new engine or ladder company to maintain a minimum four (4) person firefighting crew.

Next Steps:

The next steps for this process will be for the Burlington Fire Department to review the data and information contained within this report as well as the observations and recommendations contained herein. **Capital improvement funding** will be needed when conditions will allow to move forward with fire station construction by the City of Burlington. These capital funds will be needed for property acquisition and apparatus acquisition, as well as planning and design for the next fire station facility. Also, operations funding needs to be secured when conditions will allow for additional firefighter staffing and apparatus acquisition within the capital improvement plan. Proper planning will minimize the impact on the City of Burlington's budget and the property tax rate for the citizens and businesses in the city.

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, the fire station construction timeline has been extended by up to a year due to supply chain challenges and the labor market. The same core issues have increased fire apparatus delivery times to two or three years from the date of order.

With projected growth in the Burlington community, this analysis recommends multiple components to improve the overall service delivery level (using the VRI scoring). It is recommended that the City of Burlington periodically review data provided within this report and refresh key data with each component to ensure that current and relevant data is being used by decision makers.

Of the models that were evaluated in this analysis and the data available to the NCFCC team at this time, the assessment team recommends that the City of Burlington focus on three areas within the foreseeable future – 1) the Springwood Park area, 2) the Alamance Road/Grand Oaks area, and 3) the area between fire station 1 and fire station 4.

The entire NCFCC team sincerely appreciates the opportunity to provide this vital information to the City of Burlington Fire Department. 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

RMS Data Analysis Introduction

Purpose & Approach

This report is intended to provide a summary of the demand of service(s) on the fire department and a response time performance evaluation for emergency responses. The report uses the department's Fire Records Management System's data (FRMS) as the source from the past 7 years to show trends in both demand and performance. These trends help the department plan for future needs, show where improvements are needed and show where past changes have made improvements as they relate to response times.

Data Source

The department's current FRMS is Fireworks EPR, a National Fire Incident Management System (NFIRS) compliant records system with records from January 2018, forward; the previous FRMS was Firehouse RMS. Data from Firehouse RMS was imported to Fireworks to allow for a single source of data collection. The 7-years of data in the Fireworks EPR system yields 66,798 incidents with 102,886-unit responses. 85,914 of these unit responses had arrival times.

Noted Errors & Omissions

The data was found to be very clean. Timestamps for unit responses were found with hour, minute, and second formation. There were 9.33% (6,449) incidents found with no timestamp representing the time at which the incident was received into the 911 center, known as PSAP Time. Nine (9) records had dispatch times greater than the enroute time, these will be eliminated from the turnout evaluations. There were 7.96% (8,193) unit responses with an arrival time but no enroute time, these will be excluded from the travel time evaluations.

Outlier filters were applied to incident and unit records exceeding the following.

Call Processing Time > 6 minutes. – .22% (150) incident records met these criteria.
Turnout Time > 5 minutes. – .13% (131) unit records met these criteria.
Travel Time > 15 minutes. – .27% (279) unit records met these criteria.

In addition, unit records with a zero-turnout time or travel time were not evaluated in their individual section analysis.

Response Time Measures

The Burlington Fire Department is a career fire department and has adopted the National Fire Protection Association's (NFPA) 1710 standard, giving guidance to response time and assembly of staff to complete tasks on an incident. The department has set their own benchmarks with respect to response time, to which they measure, in the following manner.

Percentile Measure = 90th percentile
Call Processing Time – 01:0
Turnout Time – 01:20
Travel Time – 04:00
Response Time – 05:20
Total Response Time – 06:20
Effective Response Force Travel Time – 08:20
Effective Response Force Total Response Time – 10:20

Key Findings

Demand of Services

- Daily incident average = 26
- Since 2021, demand has increased approx. 2-5% annually.
- The month of October has the highest demand.
- The11 am hour is the busiest hour.
- Monday is the busiest day.
- The Rescue/Medical incident type is 75% of the overall demand on the department.
- The department mitigates incidents without aid on 98.44% of their incidents.
- Aid given to other departments is less than 1% of their demand.
- Multiple events at the same time occur approximately 30% of the day.

Response Time Performance

- Call Processing Time = 01:43 or less, on 90% of incidents.
- Turnout Time (first arriving unit) = 01:12 or less, on 90% of incidents.
- Travel Time (first arriving unit) = 04:40 or less, on 90% of incidents.
- Response Time = 05:28 or less, on 90% of incidents.
- Total Response Time = 06:54 or less, on 90% of incidents.

Unit Staffing

- Engines = 3
- Trucks/Quints = 3
- Squad/Rescue = 2
- Cars / Batt Chief = 1

Effective Response Force

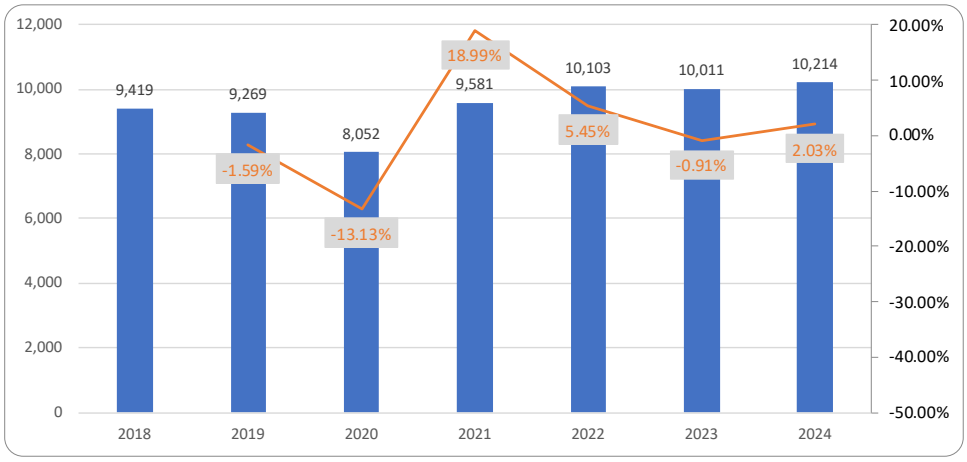
The Burlington Fire Department has demonstrated their ability to place their **first unit on scene to a building fire within 3 minutes and 46 minutes** or less on 90% of events and arrive their effective response force of **16 firefighters within 13 minutes and 30 seconds.**

Demand for Services on the Department

Demand by Fiscal Year

Over the 7-year period, the department averaged 26 incidents daily or 9,521 incidents annually. The year 2020 had the most significant decrease in demand, most likely due to the COVID pandemic which mirrors what many departments in NC witnessed during the period. In 2021, demand starts to climb beyond pre-COVID counts and continues to increase 1% to 5 % annually since 2021.

Figure 1: Demand by Fiscal Year



Demand by Month

The month of October stands out as the highest demand month of any other. February, with almost 16% less demand than October, is the month with the least demand.

Figure 2: Demand by Month, by Fiscal Year

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand Total
2018	893	740	791	754	791	718	785	800	769	887	729	762	9,419
2019	802	706	748	780	813	701	814	820	767	794	758	766	9,269
2020	775	712	682	512	631	546	657	670	670	730	751	716	8,052
2021	678	597	740	818	857	775	814	876	931	808	824	863	9,581
2022	892	705	752	799	872	809	893	848	844	869	929	891	10,103
2023	862	765	793	788	875	759	899	861	824	857	841	887	10,011
2024	853	738	860	870	876	831	850	837	873	902	855	869	10,214
Grand Total	5,755	4,963	5,366	5,321	5,715	5,139	5,712	5,712	5,678	5,847	5,687	5,754	66,649

Demand by Alarm Hour / Day of Week

Mondays have more incidents than any other day, the 11-am hour more than any other hour. The 8-hour period with the highest demand is between 10am and 6pm, the 12-hour period is 9am to 9pm. Any staff considerations could use these periods for consideration to maximize benefit.

Figure 3: Demand by Alarm Hour

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
0	296	246	209	219	232	227	253	1,682
1	260	205	179	188	176	194	235	1,437
2	213	176	211	159	168	179	224	1,330
3	191	170	174	177	183	174	221	1,290
4	183	154	162	151	180	164	154	1,148
5	199	213	157	156	160	209	193	1,287
6	238	252	237	260	242	273	231	1,733
7	277	394	336	348	338	308	280	2,281
8	316	515	461	431	452	469	345	2,989
9	422	530	543	521	535	518	427	3,496
10	439	625	609	559	540	533	504	3,809
11	463	613	578	596	624	610	532	4,016
12	473	641	590	595	574	600	521	3,994
13	508	552	578	627	575	562	509	3,911
14	508	599	582	591	592	584	468	3,924
15	476	563	561	554	571	531	516	3,772
16	473	549	568	534	605	572	511	3,812
17	475	503	501	556	527	583	537	3,682
18	474	488	512	545	511	536	500	3,566
19	460	491	438	498	491	486	465	3,329
20	445	433	428	486	442	453	463	3,150
21	360	353	345	394	392	378	412	2,634
22	313	330	330	324	307	371	395	2,370
23	247	292	282	260	284	306	336	2,007
Total	8,709	9,887	9,571	9,729	9,701	9,820	9,232	66,649

Demand by NFIRS Category

Medical and Rescue event types have the highest demand with 75.48% of all incidents in this category. The good intent category is the second highest demand at 8.95%. This category includes incidents where a unit never arrived, which may have been a medical incident type as dispatched.

Figure 4: Demand by NFIRS Category

NFIRS - Category / Description	Count	%
1-Fire	1,465	2.20%
2-Overpressure Rupture, Explosion, Overheat(no fire)	91	0.14%
3-Rescue & Emergency Medical Service Incident	50,308	75.48%
4-Hazardous Condition (No Fire)	1,855	2.78%
5-Service Call	2,105	3.16%
6-Good Intent Call	5,966	8.95%
7-False Alarm & False Call	4,765	7.15%
8-Severe Weather & Natural Disaster	54	0.08%
9-Special Incident Type	16	0.02%
-Unknown	24	0.04%
Grand Total	**66,649**	**100.00%**

Each NFIRS category also has individual incident types. The top 20 below, sorted by count, show the medical incident as the leading individual incident type. The dispatched and canceled enroute is the second highest type of incident, which is categorized as the good intent category as seen above. The top 20 make up the top 93.22% of the total demand.

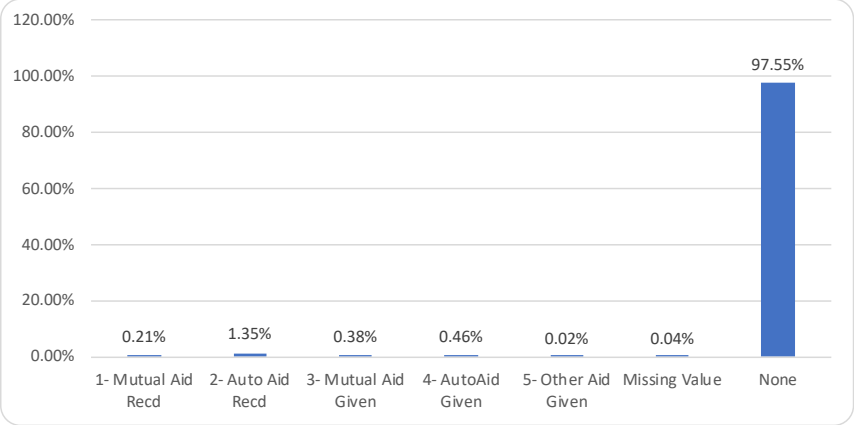
Figure 5: Demand by Incident Type (Top 20)

NFIRS - Incident Type / Description	Count	%
321-EMS call, excluding vehicle accident with injury	40,441	65.08%
611-Dispatched & canceled en route	3,272	5.27%
311-Medical assist, assist EMS crew	3,025	4.87%
622-No incident found on arrival at dispatch address	2,137	3.44%
300-Rescue, EMS incident, other	2,038	3.28%
324-Motor vehicle accident with no injuries.	1,884	3.03%
322-Motor vehicle accident with injuries	1,801	2.90%
745-Alarm system activation, no fire - unintentional	1,647	2.65%
320-Emergency medical service incident, other	870	1.40%
743-Smoke detector activation, no fire - unintentional	792	1.27%
700-False alarm or false call, other	595	0.96%
412-Gas leak (natural gas or LPG)	570	0.92%
550-Public service assistance, other	495	0.80%
553-Public service	474	0.76%
444-Power line down	397	0.64%
561-Unauthorized burning	392	0.63%
440-Electrical wiring/equipment problem, other	347	0.56%
111-Building fire	343	0.55%
740-Unintentional transmission of alarm, other	334	0.54%
735-Alarm system sounded due to malfunction	282	0.45%

Demand by Aid – Given or Received

Aid given (all types) represents 0.86% of the demand for the department. Almost 98% of the total incidents are mitigated with their own resources and only 2.42% required aid from neighboring departments.

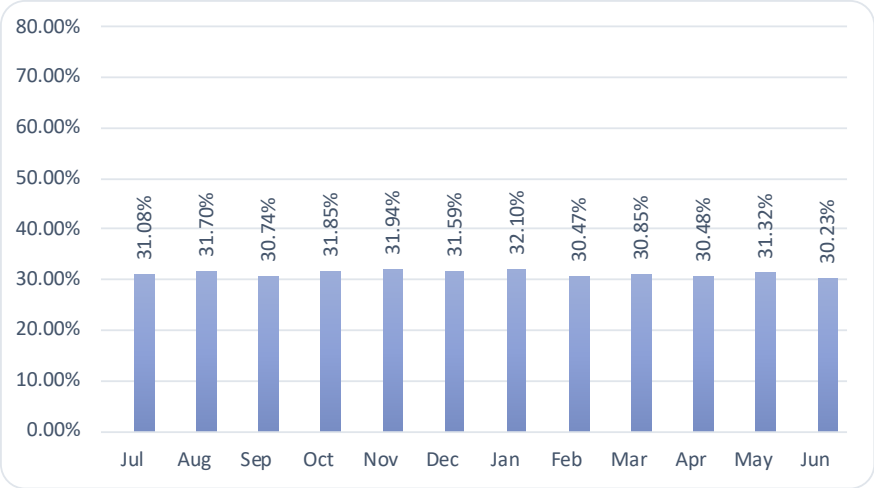
Figure 6: Aid Given or Received



Multiple Events

Defined as an incident that occurs before a previous incident has cleared, the multiple incidents can deplete resources quickly, possibly making response benchmarks unobtainable. The chart below shows a steady occurrence of simultaneous incidents. Between the hours of 10am to 6pm, approximately 35% of the hours have multiple incidents at the same time. Thursdays have more than any other day and January more than any other month.

Figure 7: Multiple Events


80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
31.08%
31.70%
30.74%
31.85%
31.94%
31.59%
32.10%
30.47%
30.85%
30.48%
31.32%
30.23%
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun

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 movement (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, the outcome of those served and protected and it may be improved. 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.

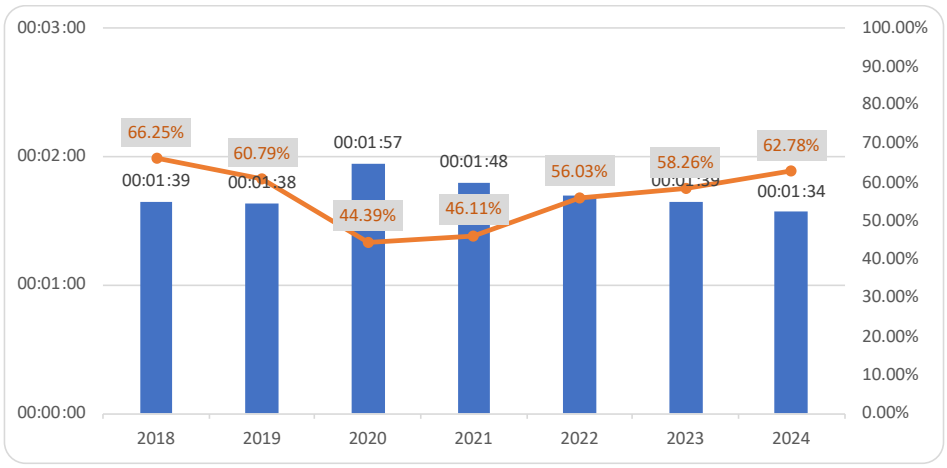
Call Processing Time – Segment One

The 911 center has demonstrated their ability to process incidents (1,584) and alert the fire department within **01 minutes and 43 seconds,** or less, **on 90%** (90th percentile) of the incidents.

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 for 56.63% of the events**. The gap between the benchmark and the baseline is 43 seconds.

Since 2020, there has been an annual improvement in call processing time. The most current year's call processing time at the 90th percentile was 1 minute 34 seconds, and the 1-minute goal was met on 62.78% of incidents.

Figure 8: Call Processing by Year



Call Processing by NFIRS Category

By separating incidents into the nine NFIRS categories, it shows the medical incident type have a better call processing time than the fire categories. This may suggest a different process in the 911 center for medical events compared to fire related. Depending on the Computer Aided Dispatch (CAD) system, the medical events for the fire department may have been spawned from the EMS incident and created a separate incident with different time stamps. The agency should confirm the earliest timestamp on the fire department's medical event represents the actual time the call for service was received in the 911 center and not the time the call may have been spawned to the fire department.

Figure 9: Call Processing by NFIRS Category

NFIRS Category/Description	Count	CP	Goal Met
1-Fire	1,289	00:02:25	16.91%
2-Overpressure Rupture, Explosion, Overheat(no fire)	78	00:02:37	15.38%
3-Rescue & Emergency Medical Service Incident	45,210	00:01:25	64.72%
4-Hazardous Condition (No Fire)	1,647	00:02:46	14.27%
5-Service Call	1,785	00:03:13	42.52%
6-Good Intent Call	2,550	00:02:18	42.27%
7-False Alarm & False Call	4,237	00:02:13	14.56%
8-Severe Weather & Natural Disaster	37	00:03:35	27.03%
9-Special Incident Type	13	00:02:13	0.00%
Grand Total	**56,846**	**00:01:43**	**56.63%**

Call Processing by Incident Type (Top 15)

A more detailed view of the top 15 individual incident types shows the EMS call as the top incident type. Here, we can see fire related incidents with higher call processing time also.

Figure 10:Call Processing by NFIRS Incident Type (Top 15)

NFIRS Incident Type	Count	CP	Goal Met
321-EMS call, excluding vehicle accident with injury	36,316	00:01:21	68.21%
311-Medical assist, assist EMS crew	2,799	00:01:37	57.41%
622-No incident found on arrival at dispatch address	1,864	00:02:08	47.75%
300-Rescue, EMS incident, other	1,798	00:01:38	54.56%
324-Motor vehicle accident with no injuries.	1,710	00:01:54	40.00%
322-Motor vehicle accident with injuries	1,600	00:01:43	43.25%
745-Alarm system activation, no fire - unintentional	1,483	00:02:07	13.35%
320-Emergency medical service incident, other	770	00:01:30	60.65%
743-Smoke detector activation, no fire - unintentional	689	00:02:12	15.09%
700-False alarm or false call, other	529	00:02:16	20.79%
412-Gas leak (natural gas or LPG)	489	00:02:38	7.36%
550-Public service assistance, other	424	00:03:33	46.70%
553-Public service	417	00:03:25	55.16%
444-Power line down	362	00:02:54	18.78%
561-Unauthorized burning	346	00:02:38	24.28%

Turnout Time – Segment Two

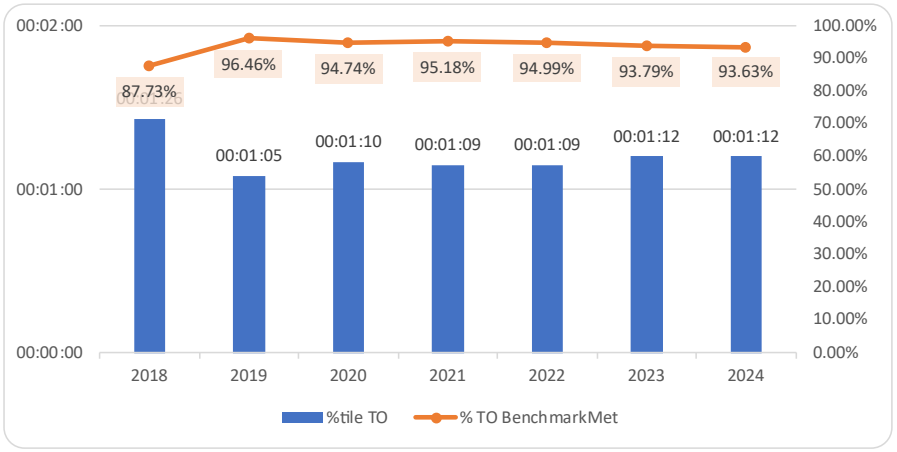
Defined as the segment of time from dispatch to the apparatus moving forward, turnout time represents the time segment from where the fire department has the most control for response time improvement, with the least cost. Evaluating only the first arriving unit, traveling "Lights & Sirens" or "Unknown/NA", the department has demonstrated a turnout time of **01 minutes 12 seconds,** or less, on 90% of the incidents.

A goal of 1 minute 20 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 20 seconds** turnout time **was met on 93.75% of the events**. The goal has been met therefore no gap exists. This evaluation was for 56,919 first arriving units. The months of December 2022 to May of 2023 contained no PSAP received time or enroute times, therefore turnout times could not be calculated. Despite the loss of those months, there is still enough data for the remainder of the year to determine a baseline of performance.

Overall, turnout times have remained constant with a significant improvement change in 2019.

Turnout Time by Year

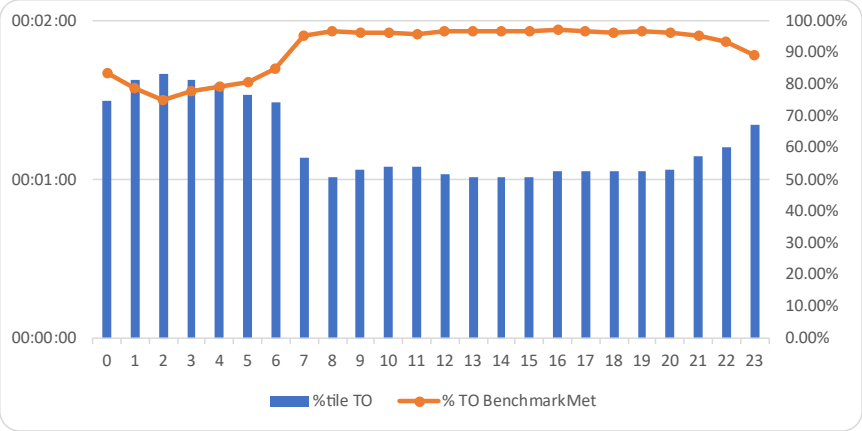
Figure 11: Turnout Time by Year



Turnout Time by Alarm Hour

Nighttime responses generally yield higher turnout times due to firefighters sleeping during the night.

Figure 12: Turnout Time by Alarm Hour



Turnout Time by NFIRS Category

Turnout time appears to be consistent across 7 of the 9 categories. The Overpressure Rupture category and the False Alarm category have higher turnout times and fall under the 90% of compliance for the 01:20 goal.

Figure 13: Turnout Time by NFIRS Category

NFIRS Category/Description	Count	TO	Goal Met %
1-Fire	1,290	00:01:18	91.86%
2-Overpressure Rupture, Explosion, Overheat(no fire)	78	00:01:21	88.46%
3-Rescue & Emergency Medical Service Incident	45,203	00:01:09	94.62%
4-Hazardous Condition (No Fire)	1,668	00:01:18	91.49%
5-Service Call	1,821	00:01:12	93.63%
6-Good Intent Call	2,559	00:01:14	93.51%
7-False Alarm & False Call	4,237	00:01:26	86.26%
8-Severe Weather & Natural Disaster	50	00:01:15	92.00%
9-Special Incident Type	13	00:01:19	92.31%
Grand Total	**56,919**	**00:01:12**	**93.75%**

Turnout Time by Incident Type

Turnout time between the fire and medical incident type are expected to be different due to the gear donning required prior to departure. This can be seen in the fire related incidents below. Here, the top 15 are shown, which make up 90% of the total incidents.

Figure 14: Turnout Time by Incident Type (Top 15)

NFIRS Incident Type	Count	TO	Goal Met %
321-EMS call, excluding vehicle accident with injury	36,317	00:01:06	95.21%
311-Medical assist, assist EMS crew	2,797	00:01:20	90.35%
622-No incident found on arrival at dispatch address	1,872	00:01:13	93.64%
300-Rescue, EMS incident, other	1,795	00:01:11	93.65%
324-Motor vehicle accident with no injuries.	1,709	00:01:18	91.46%
322-Motor vehicle accident with injuries	1,598	00:01:15	93.05%
745-Alarm system activation, no fire - unintentional	1,484	00:01:25	86.12%
320-Emergency medical service incident, other	769	00:01:05	95.06%
743-Smoke detector activation, no fire - unintentional	686	00:01:23	88.34%
700-False alarm or false call, other	529	00:01:28	84.69%
412-Gas leak (natural gas or LPG)	490	00:01:19	90.61%
550-Public service assistance, other	432	00:01:14	92.36%
553-Public service	431	00:01:05	94.43%
444-Power line down	377	00:01:13	94.43%
561-Unauthorized burning	348	00:01:01	97.99%

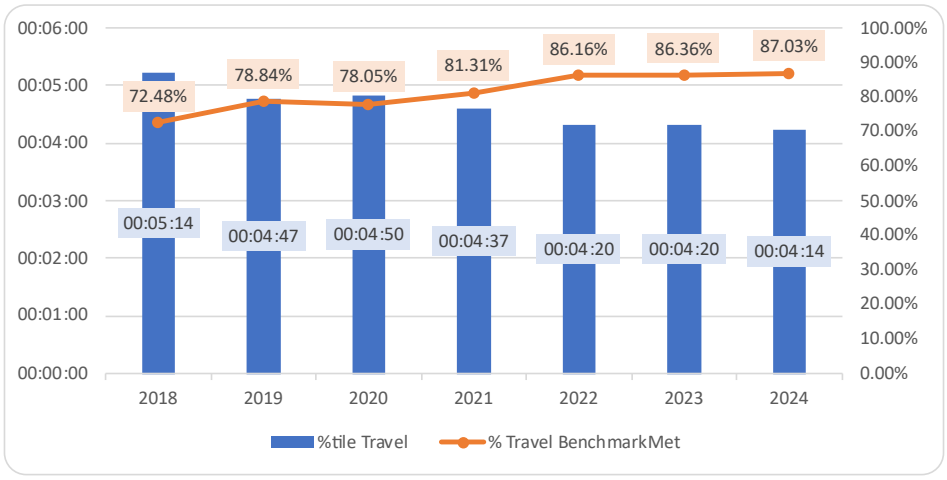
Travel Time – Segment Three

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, and 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 Burlington Fire Department has demonstrated the ability to respond to 90% of emergency incidents within **4 minutes and 40 seconds** or less. This indicates a gap of 40 seconds.

A goal of 4 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 4 minutes travel time** was **met on 81.24% of the events.** A total of 56,896 incidents were evaluated.

Travel Time by Year

Figure 15: Travel Time by Year



Travel Time by NFIRS Category

Travel for the first arriving unit responding emergency traffic is consistent across all NFIRS categories where many records exist. Severe weather incidents would expect a longer response due to road conditions.

Figure 16: Travel Time by NFIRS Category

NFIRS Category/Description	Count	Travel	Goal Met %
1-Fire	1,290	00:04:38	83.10%
2-Overpressure Rupture, Explosion, Overheat(no fire)	78	00:04:33	79.49%
3-Rescue & Emergency Medical Service Incident	45,182	00:04:36	81.90%
4-Hazardous Condition (No Fire)	1,668	00:04:48	81.06%
5-Service Call	1,819	00:05:42	71.47%
6-Good Intent Call	2,558	00:04:45	80.88%
7-False Alarm & False Call	4,238	00:04:56	78.55%
8-Severe Weather & Natural Disaster	50	00:07:08	54.00%
9-Special Incident Type	13	00:07:46	53.85%
Grand Total	**56,896**	**00:04:40**	**81.24%**

Travel Time by Incident Type

Most incident types hover the 4 to 5-minute mark also. The Public Service incident types are greater than others. It is possible these were non-emergency incidents, and the user is not completing the fire report as a "no Lights &Siren" unit response.

Figure 17: Travel Time by Incident Type (Top 15)

NFIRS Incident Type	Count	Travel	Goal Met %
321-EMS call, excluding vehicle accident with injury	36,287	00:04:29	83.20%
311-Medical assist, assist EMS crew	2,801	00:05:21	70.22%
622-No incident found on arrival at dispatch address	1,871	00:04:37	81.99%
300-Rescue, EMS incident, other	1,800	00:05:20	73.28%
324-Motor vehicle accident with no injuries.	1,708	00:04:56	80.50%
322-Motor vehicle accident with injuries	1,599	00:04:20	86.49%
745-Alarm system activation, no fire - unintentional	1,484	00:04:42	83.63%
320-Emergency medical service incident, other	769	00:05:03	76.07%
743-Smoke detector activation, no fire - unintentional	688	00:04:59	76.45%
700-False alarm or false call, other	529	00:04:52	77.13%
412-Gas leak (natural gas or LPG)	490	00:04:09	88.16%
550-Public service assistance, other	433	00:05:57	71.36%
553-Public service	430	00:05:51	67.67%
444-Power line down	376	00:05:20	73.67%
561-Unauthorized burning	348	00:05:12	76.15%
Grand Total	**51,613**	**00:04:38**	**81.57%**

Response Time (Turnout and Travel)

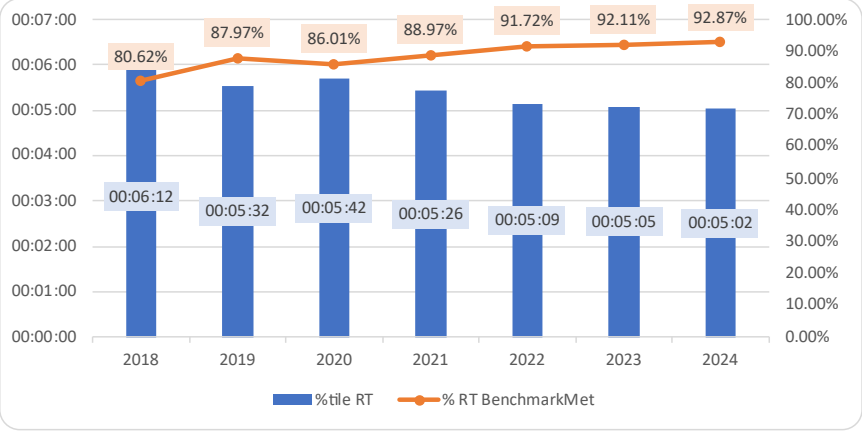
The measurable time segments which the department can manage and make improvements are turnout and travel. Added together and called "response time", the following presents response time, measured at the 90th Percentile. The department has demonstrated their ability to respond within **5 minutes and 28 seconds** with the first arriving unit, running lights and sirens, within the department's first due territory.

A goal of 5 minutes 20 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 5 minutes 20 seconds** response time **was met on 88.82% of the events.** For this evaluation, 63,096 incidents were evaluated.

Response Time by Year

Over the 7-year period, response times are improving annually with the percentage of compliance improving also. This is due to the improvement made in travel times.

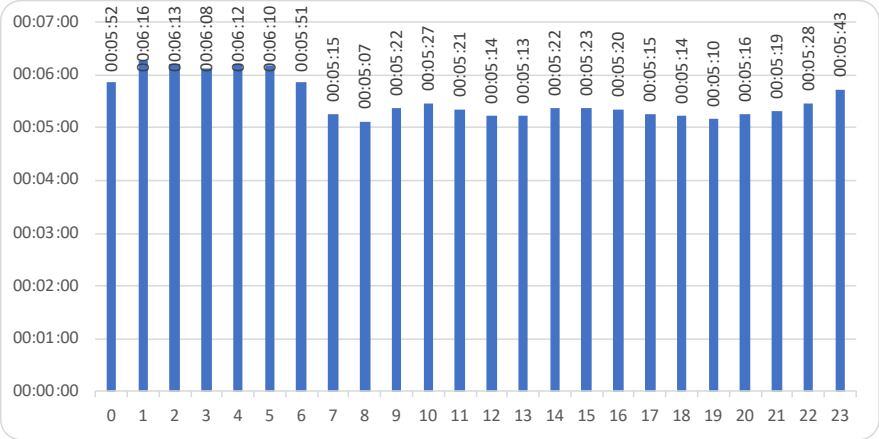
Figure 18: Response Time by Year



Response Time by Alarm Hour

Changes in response times are often related to the turnout time and the graph below illustrates how the increase in turnout time can change the overall response time by hour of the day.

Figure 19: Response Time by Alarm Hour



Response Times by NFIRS Category

Minus the Severe Weather and Special Incident Types, response times are consistent in the 5 to 6 minutes range.

Figure 20: Response Time by NFIRS Category

NFIRS Category/Description	Count	RT	Goal Met %
1-Fire	1,406	00:05:31	88.62%
2-Overpressure Rupture, Explosion, Overheat(no fire)	89	00:05:46	84.27%
3-Rescue & Emergency Medical Service Incident	50,096	00:05:22	89.78%
4-Hazardous Condition (No Fire)	1,834	00:05:42	86.91%
5-Service Call	2,027	00:06:31	80.46%
6-Good Intent Call	2,885	00:05:30	88.46%
7-False Alarm & False Call	4,692	00:05:56	83.59%
8-Severe Weather & Natural Disaster	52	00:07:08	65.38%
9-Special Incident Type	15	00:08:19	73.33%
Grand Total	**63,096**	**00:05:28**	**88.82%**

Response Time by Incident Type

The medical incident, where the department has the highest demand, has just over a 5-minute' response time. The Building Fire incident type shows 4:32 at the 90th Percentile (not seen below)

Figure 21: Response Time by Incident Type

NFIRS Incident Type	Count	RT	Goal Met %
321-EMS call, excluding vehicle accident with injury	40,328	00:05:14	91.10%
311-Medical assist, assist EMS crew	3,010	00:06:13	79.37%
622-No incident found on arrival at dispatch address	2,099	00:05:24	89.47%
300-Rescue, EMS incident, other	2,024	00:06:07	82.76%
324-Motor vehicle accident with no injuries.	1,841	00:05:51	85.77%
322-Motor vehicle accident with injuries	1,788	00:05:10	91.16%
745-Alarm system activation, no fire - unintentional	1,617	00:05:44	86.39%
320-Emergency medical service incident, other	858	00:05:41	86.13%
743-Smoke detector activation, no fire - unintentional	791	00:05:58	83.31%
700-False alarm or false call, other	570	00:05:54	82.98%
412-Gas leak (natural gas or LPG)	562	00:04:59	93.24%
550-Public service assistance, other	490	00:06:44	78.78%
553-Public service	470	00:06:37	78.09%
444-Power line down	395	00:06:01	81.27%
561-Unauthorized burning	391	00:05:56	84.65%
Grand Total	**57,234**	**00:05:25**	**89.26%**

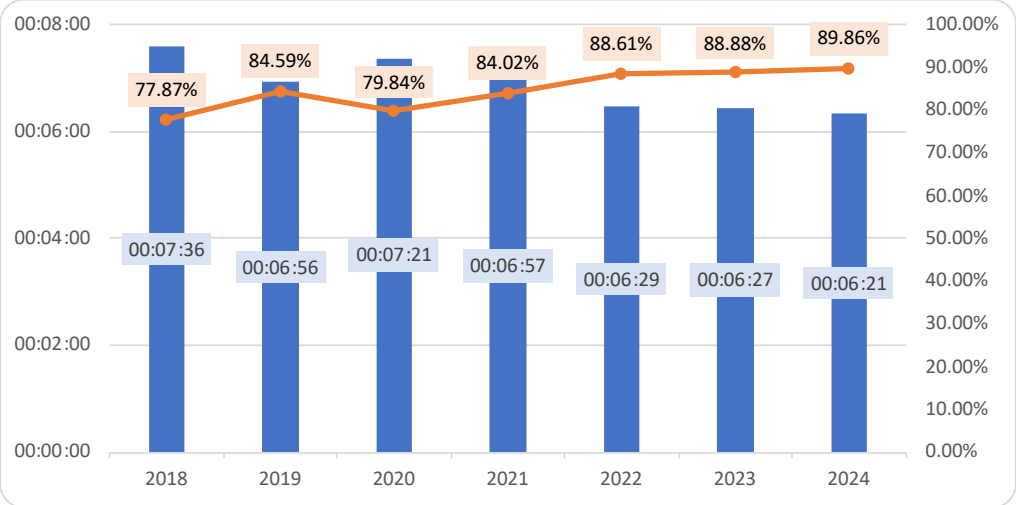
Total Response Time

This represents all three segments of time from the call received in the 911 center until the department arrives their first unit. It is also a representation of the true 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 for fire may have before their arrival. For medial events, it gives perspective on the possible cardiac downtime for cardiac arrest patients, or the amount of time that a patient may go without oxygen.

For the 7-year period, within the Burlington Fire Department's first-due response area, the first arriving unit's Total Response Time at the 90th Percentile is **6 minutes and 54 seconds**.

A goal of 6 minutes 20 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 6 minutes 20 seconds total response time was met on 84.69% of the events.** This reveals a gap of 34 seconds.

Figure 22: Total Response Time – by Year



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 referred to as the gap. A gap analysis should be performed periodically to determine needs to improve and highlight performance improvements that have been made.

Response Goals (Benchmark)

The Burlington Fire Department has established benchmark goals for each time segment in respect to time, measured at the 90th percentile. The following represents those established by the department.

Call Processing	911 rec'd to dispatch	01:00
Turnout Time	Turnout 1st Arriving Unit	01:20
Travel Time	Travel Time 1st Arriving	04:00
Response Time	Turnout and Travel Time	05:20
Total Response Time	Call Processing, Turnout, Travel	06:20

Demonstrated Performance (Baseline)

Based on the incident data, the Burlington Fire Department has demonstrated the ability to respond to **90 percent** of all events (all risk hazards) within **6 minutes and 54 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. This is based on the 56,935 incidents for the first arriving unit for an emergency incident within the department's first due territory.

2025 City of Burlington Fire Station Location Analysis

Benchmark - Response Time Goals					
Percentile	**Call Processing**	**Turnout**	**Travel**	**Response Time**	**Total Response Time**
90%	0:01:00	0:01:20	0:04:00	0:05:20	0:06:20

Baseline - Demonstrated Performance					
	Call Processing	**Turnout**	**Travel**	**Response Time**	**Total Response Time**
	00:01:43	00:01:12	00:04:40	00:05:28	00:06:54

Compliance - % Baseline meets Benchmark					
	Call Processing	**Turnout**	**Travel**	**Response Time**	**Total Response Time**
	56.63%	93.75%	81.24%	88.82%	84.69%

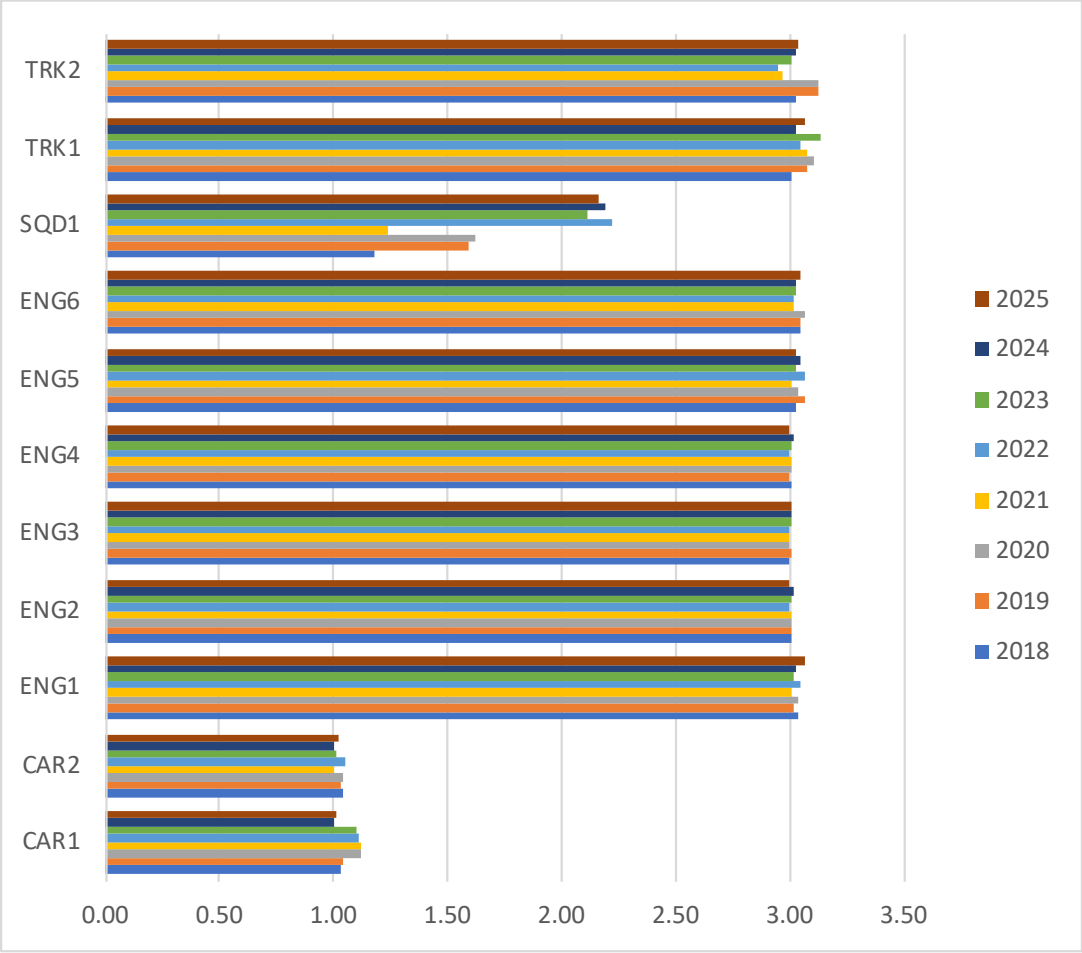
Gap Analysis - Baseline minus Benchmark					
	Call Processing	**Turnout**	**Travel**	**Response Time**	**Total Response Time**
	00:00:43	Goal Met	00:00:40	00:00:08	00:00:34

Unit Staffing

Evaluating only the units that have a higher incident count, the following represents those units, and the average staff count assigned to the unit on incidents, per year. Unit staffing seems to remain consistent over the 7-year period. Squad 1 has improved its staffing averages over the last three years.

Based on these averages, it appears the agency attempting minimum staffing at the following counts:
Engines = 3
Trucks/Quints = 3
Squad/Rescue = 2
Cars / Batt Chief = 1

Figure 23: Avg Staff by Unit by Year



Effective Response Force

NFPA 1710 recommends 17 firefighters on scene to mitigate the initial tasks needed on a moderate (risk) structure fire. In the 7-years of data, there were 318 NFIRS defined Structure (building) Fires within the department's first due area. Of those incidents, 204 of these had an initial deployment of 2-Cars, 3-Engines, 1-Rescue and 1-Truck. This is most events; therefore, it is assumed to be the base response plan for structure fires. This complement of apparatus yields 16 personnel based on the average staffing found on the previous page.

*The Burlington Fire Department has demonstrated their ability to place their **first unit on scene to a building fire within 4 minutes and 26 minutes,** or less, on 90% of events and arrive their effective response force of **16 firefighters within 18 minutes and 46 seconds.***

The above statement includes all unit response modes. The assessment team utilized all response modes as the number of incidents that would have been filtered out by just evaluating "emergency" responses significantly reduced the incidents that the team could evaluate.

Figure 24: Structure Fires /w 16 FF Chart

Enter ERF # here->		16	Baseline@ 90th percentile	Benchmark	Gap
Call Processing Time (CP)	nth = 204	Pickup to Dispatch	0:02:08	0:01:00	0:01:08
Turnout Time (TO)		Turnout 1st Arriving Unit	0:01:15	0:01:20	Goal Met
Travel Time (Trv)		Travel Time 1st Arriving	0:03:29	0:04:00	Goal Met
	nth = 145	Travel Time ERF Unit	0:13:43	0:08:20	0:05:23
Total Response Time (TRT)		Total Response Time 1st Arriving Unit (CP,TO,Trv)	0:04:26	0:06:20	Goal Met
	nth = 145	Total Response Time ERF Unit (CP,TO,Trv)	0:18:46	0:10:20	0:08:26

The data from 2023 and beyond appears to be more accurate in respect to the unit response mode. When re-evaluating just incidents with a unit response of "Emergency", incidents are limited to the years of 2023-2024. This yields a more accurate evaluation but limited to 57 incidents. With this data, a standard of coverage statement could be written like this:

*The Burlington Fire Department has demonstrated their ability to place **their first unit on scene to a building fire within 3 minutes and 46 minutes,** or less, on 90% of events and arrive their effective response force of **16 firefighters within 13 minutes and 30 seconds.***

Enter ERF # here->		16	Baseline@ 90th percentile	Benchmark	Gap
Call Processing Time (CP)	**nth = 57**	Pickup to Dispatch	**0:01:53**	0:01:00	0:00:53
Turnout Time (TO)		Turnout 1st Arriving Unit	**0:01:06**	0:01:20	Goal Met
Travel Time (Trv)		Travel Time 1st Arriving	**0:03:03**	0:04:00	Goal Met
	nth = 47	Travel Time ERF Unit	**0:11:06**	0:08:20	0:02:46
Total Response Time (TRT)		Total Response Time 1st Arriving Unit (CP,TO,Trv)	**0:03:46**	0:06:20	Goal Met
	nth = 47	Total Response Time ERF Unit (CP,TO,Trv)	**0:13:30**	0:10:20	0:03:10

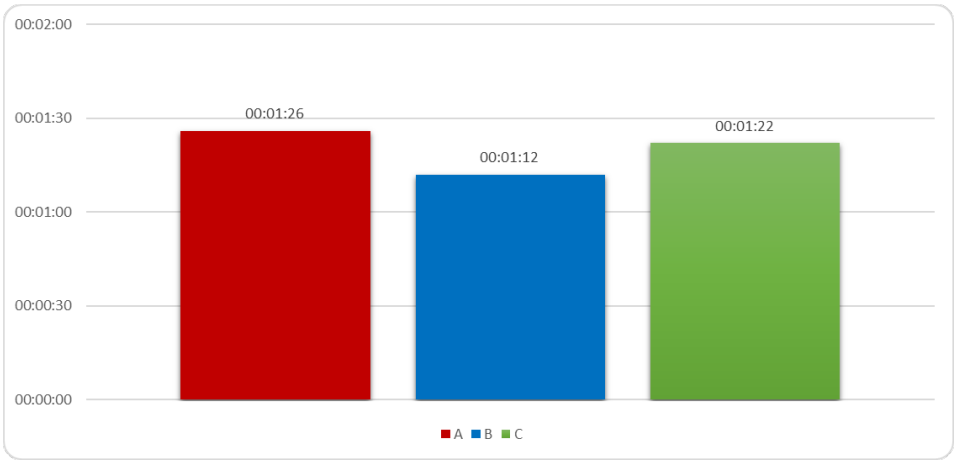
Turnout Time – A Deeper Dive

The previous section for turnout time focused on the first arriving unit only. In this section, a focus on all units' turnout, where a turnout exists, will be evaluated and shown in different ways. The units evaluated here are Engines 1-6, Truck 1 and 2, Squad 1 and Cars 1 and 2. All unit response modes were included.

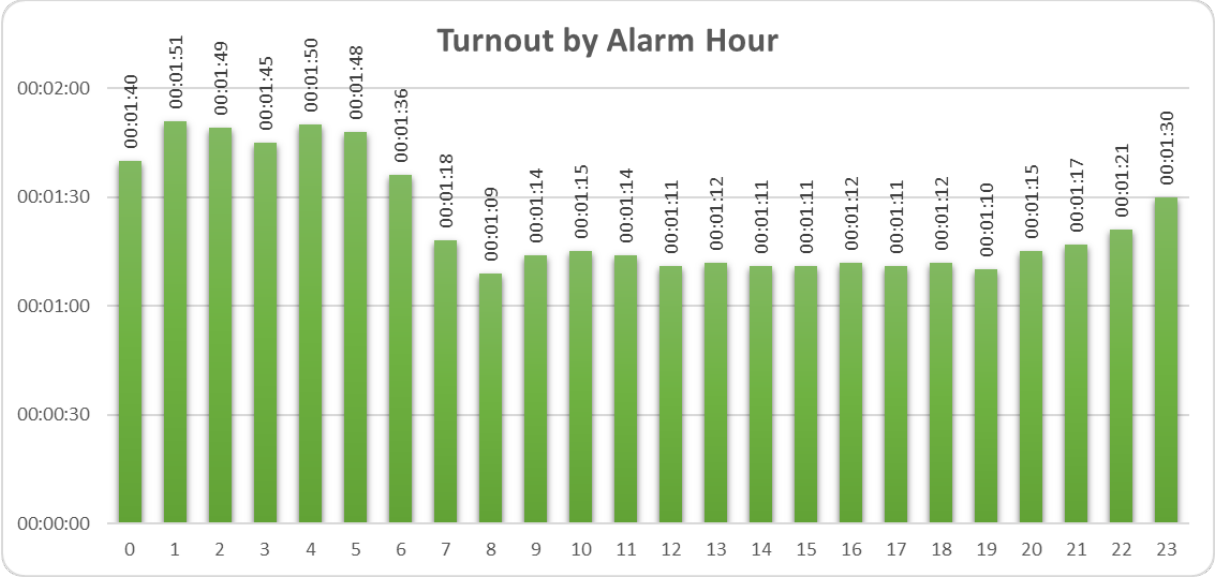
Overall, a turnout time of 1 minute 20 seconds is found at the 90th percentile when evaluating all units, all modes, and all arrival sequencies. When broken out by Unit and Shift, the following can be seen.

- Engine 5 B-shift has the best turnout times.
- B Shift has the best turnout times.
- Engines turn out faster than trucks and cars.

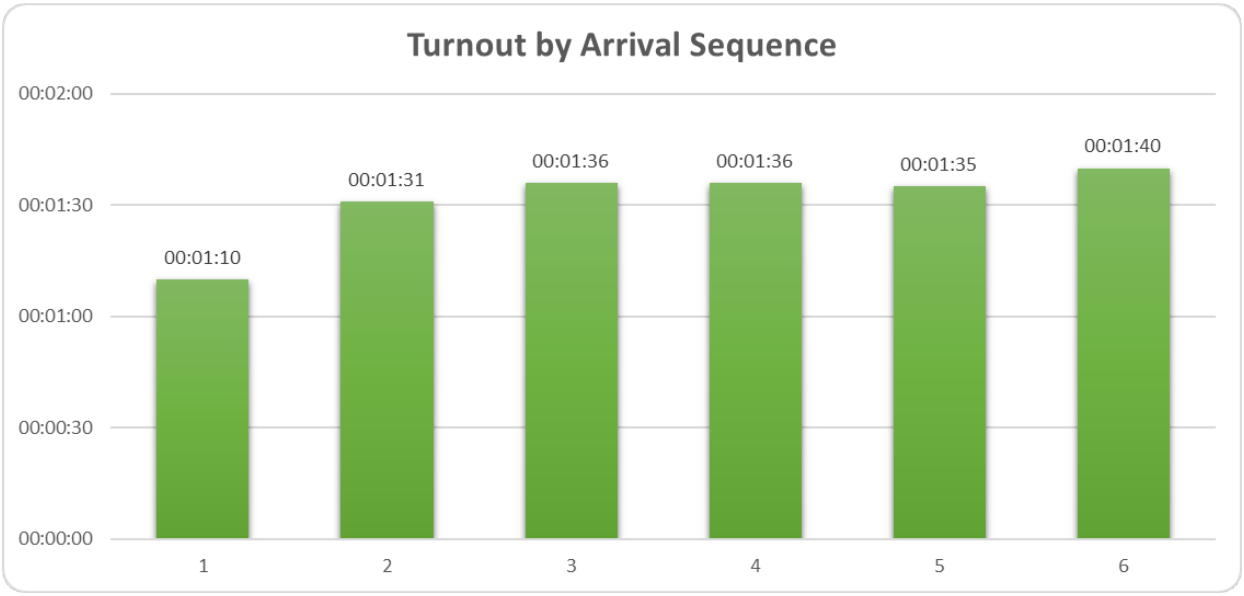
Unit	A	B	C	
CAR1	00:01:38	00:01:20	00:01:30	00:01:29
CAR2	00:01:38	00:01:29	00:02:00	00:01:43
ENG1	00:01:13	00:01:05	00:01:11	00:01:10
ENG2	00:01:06	00:01:06	00:01:11	00:01:08
ENG3	00:01:23	00:01:06	00:01:09	00:01:14
ENG4	00:01:35	00:01:09	00:01:14	00:01:20
ENG5	00:01:15	00:01:03	00:01:11	00:01:10
ENG6	00:01:29	00:01:12	00:01:20	00:01:21
SQD1	00:01:27	00:01:22	00:01:28	00:01:26
TRK1	00:01:37	00:01:19	00:01:35	00:01:31
TRK2	00:01:51	00:01:29	00:01:52	00:01:44
	00:01:26	**00:01:12**	**00:01:22**	**00:01:20**



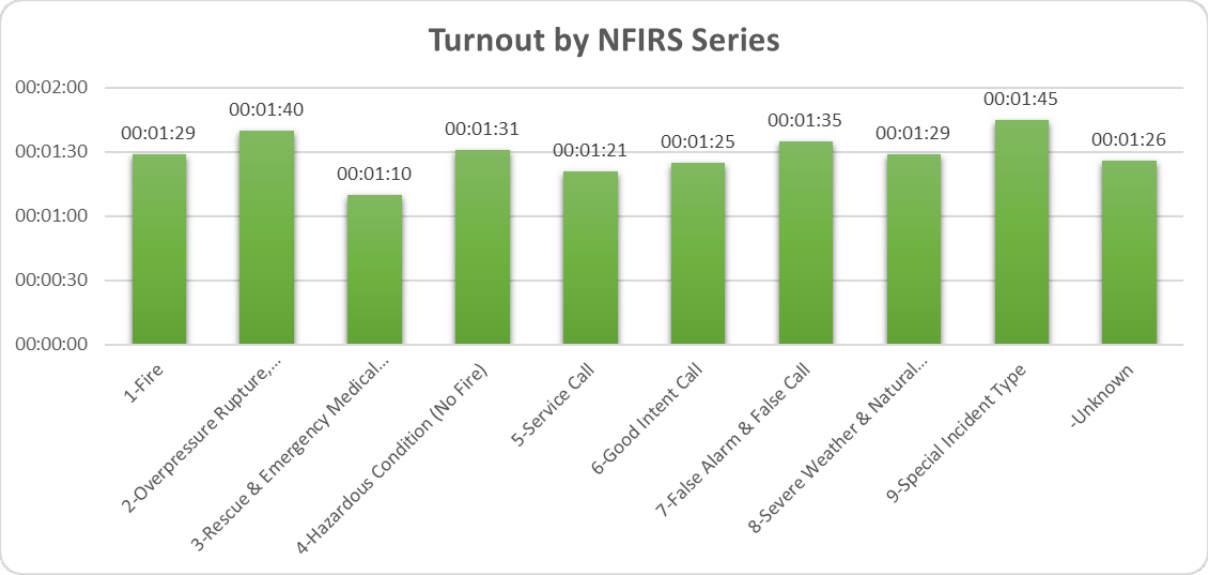
Nighttime turnout increases by approx. 30 seconds.



By looking at arrival sequence, it appears the units that know they will arrive first have better turnout.

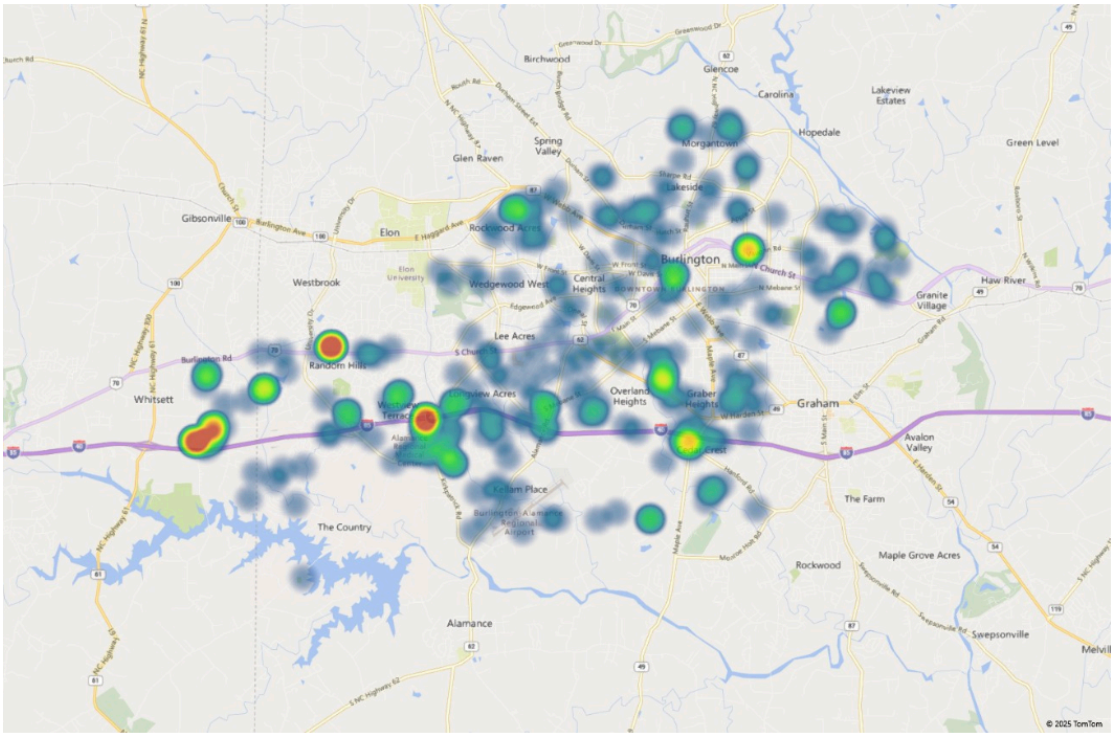


Fire events requiring fire gear do take longer to turn out than medical events.



Response Times Greater than 7 Minutes:

Also, the data did not contain a fire demand zone so the assessment team could not look at the select areas within the RMS analysis for station locations. However, the RMS data was used to construct a simple heat map of incidents with response times greater than 7 minutes, which is shown below.

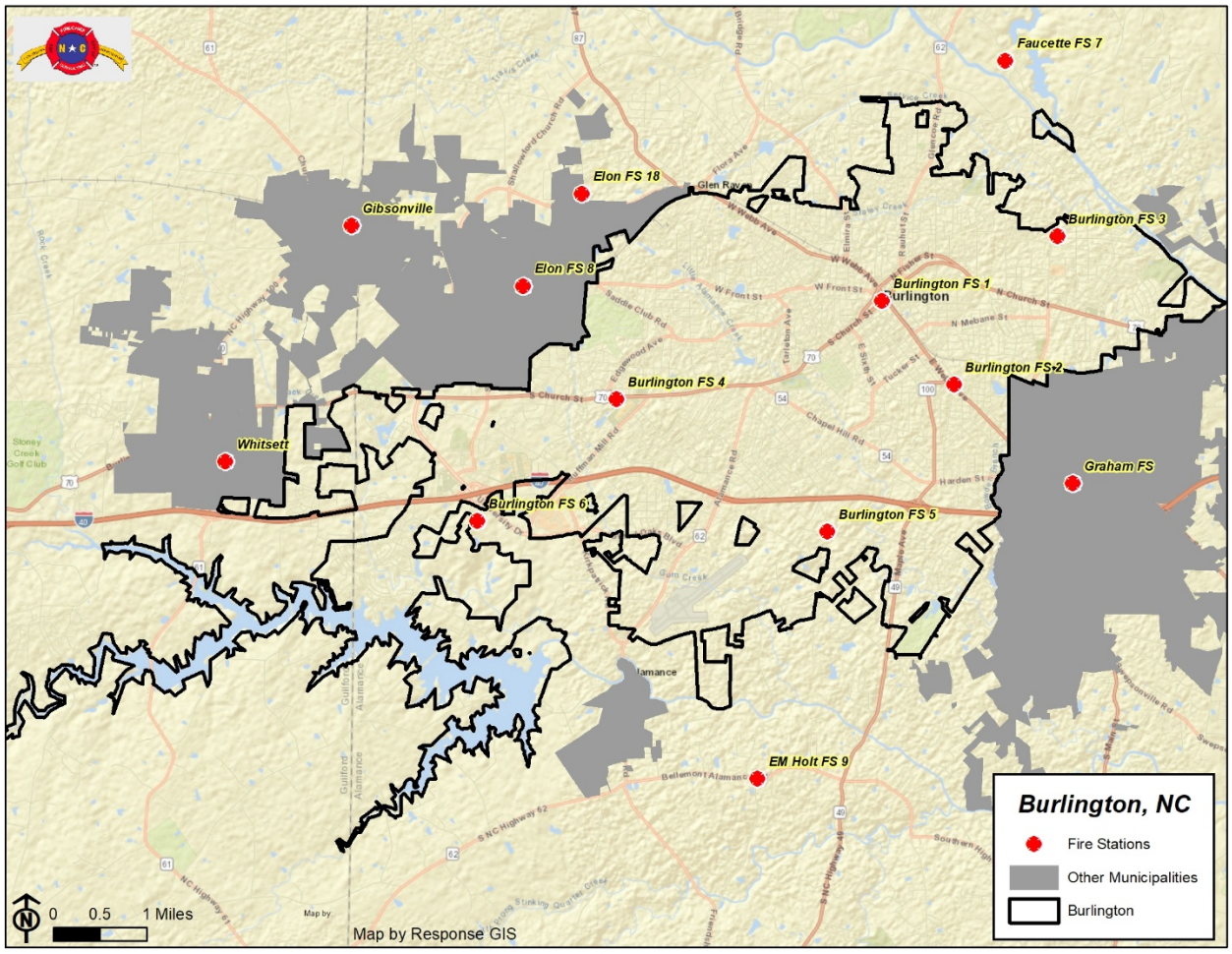


SECTION 2: GEOGRAPHICAL INFORMATION SYSTEMS (GIS) ANALYSIS

Introduction

The City of Burlington is located within the Carolina piedmont, east of Greensboro and west of Durham, North Carolina along the I-85/40 corridor. The Burlington Fire Department (BFD) currently operates from six (6) stations across a 31.8 square mile area as seen in the following figure.

FIGURE 25: Current City Limits & Fire Stations

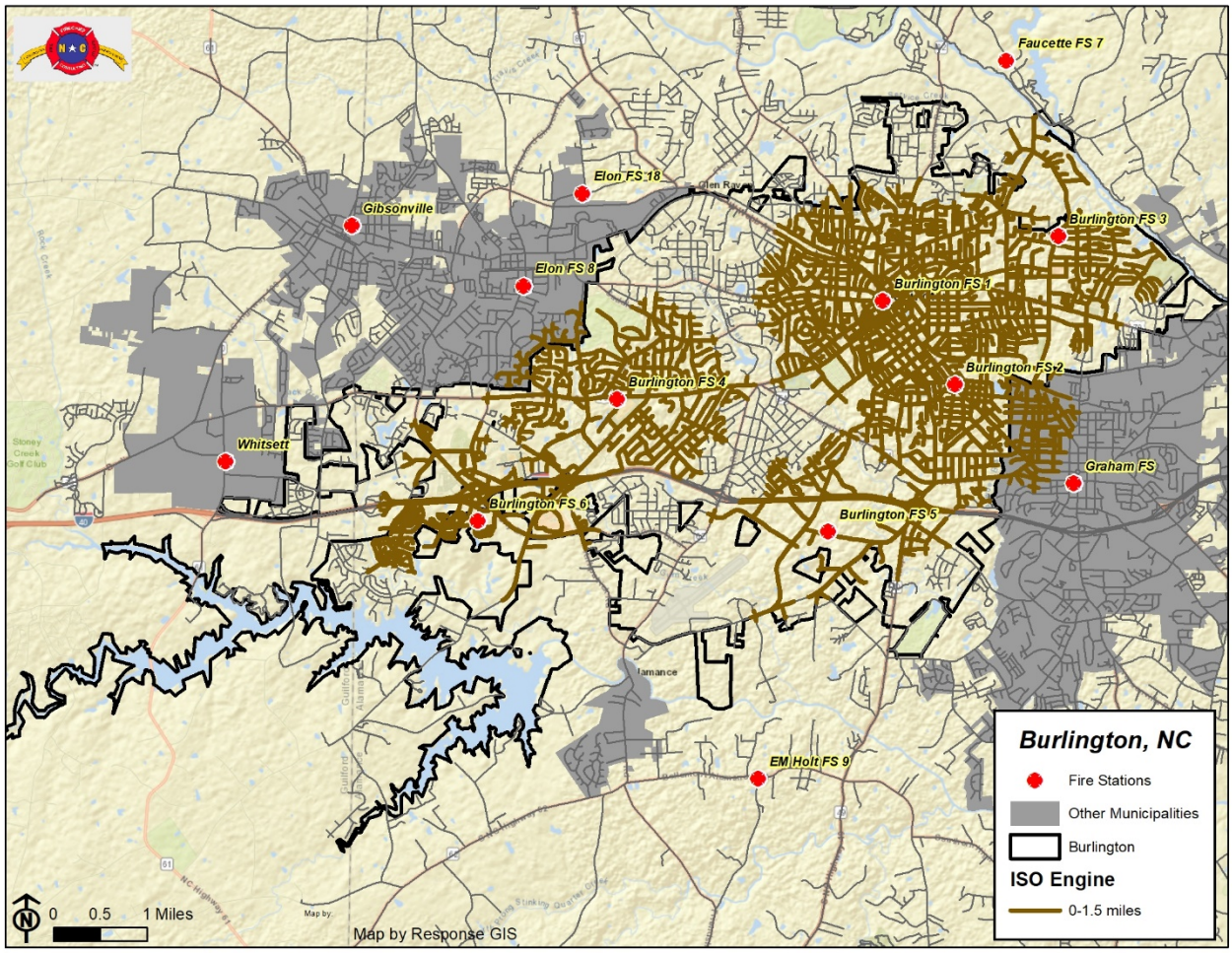


This analytic study is conducted to evaluate current station locations and select an optimal location(s) for relocatable stations and potentially additional stations based upon development.

Distance Coverage

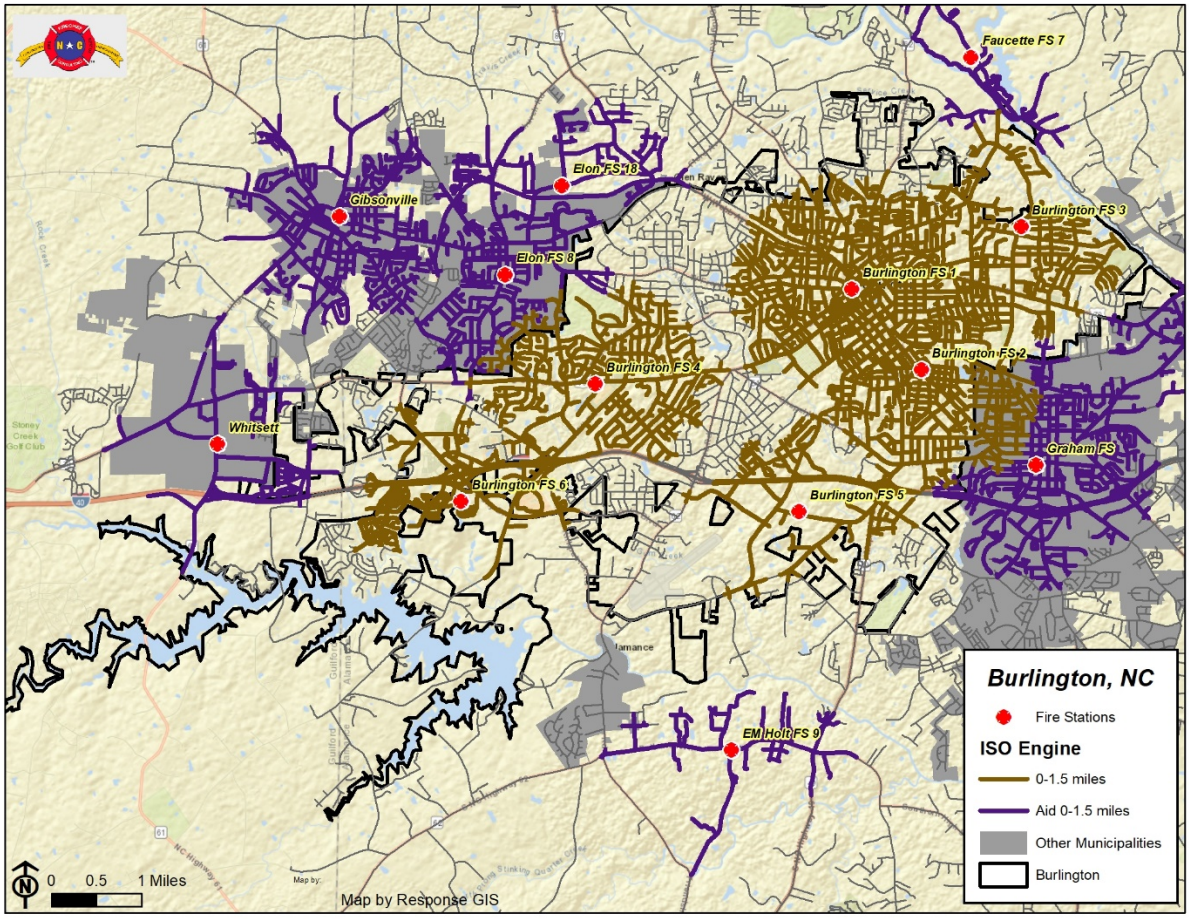
The Insurance Services Office (ISO) recommends that an engine company be within a 1.5-mile distance within a developed area (Hydrants indicate a developed area according to ISO) is needed for favorable insurance ratings for property owner premiums. It also specifies that a property could be considered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

FIGURE 26: ISO Engine & Limit Distance Coverage



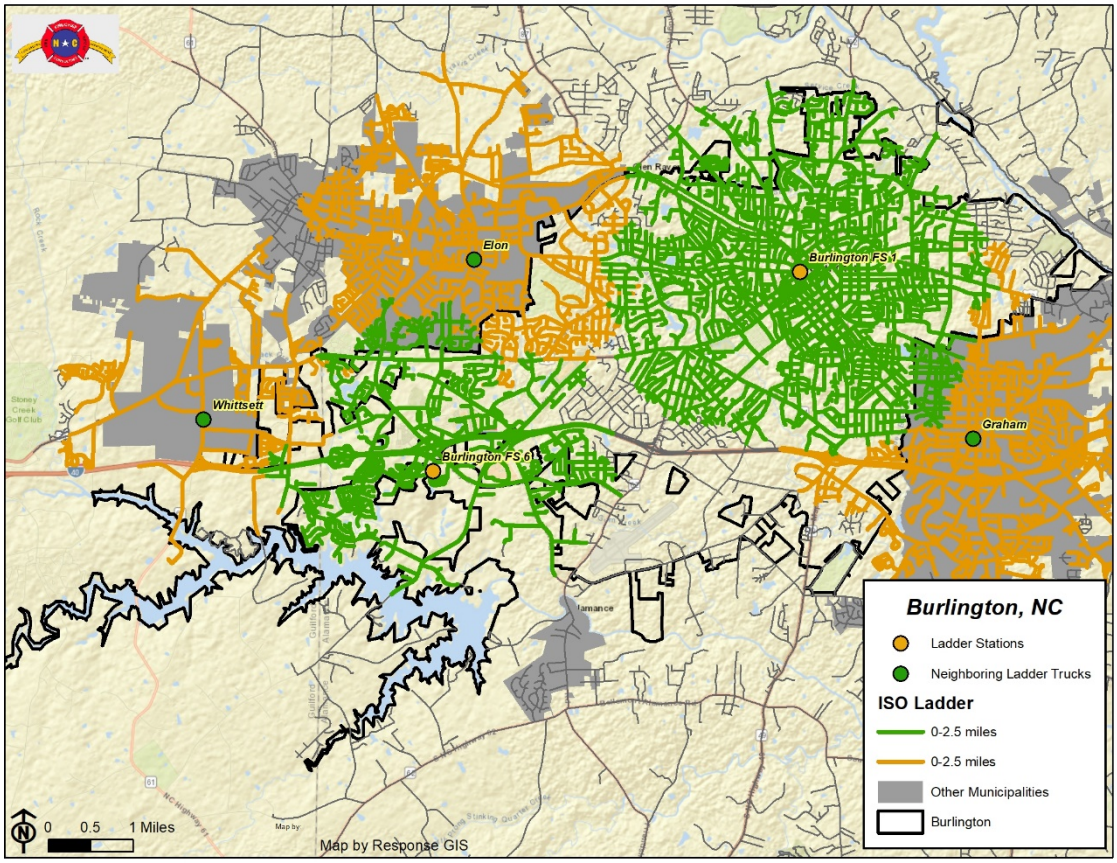
While credit can be given for automatic aid departments who assist BFD and are automatically dispatched simultaneously. With the exception perhaps of Whitsett, the credit gained with automatic aid stations is not anticipated to improve the department's rating overall for this metric.

FIGURE 27: 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 to elevate water to fires in upper stories and atop roofs, provide access for search and rescue to upper stories, and provide access for ventilation that ground ladders cannot reach.

FIGURE 28: ISO Truck Distance Coverage

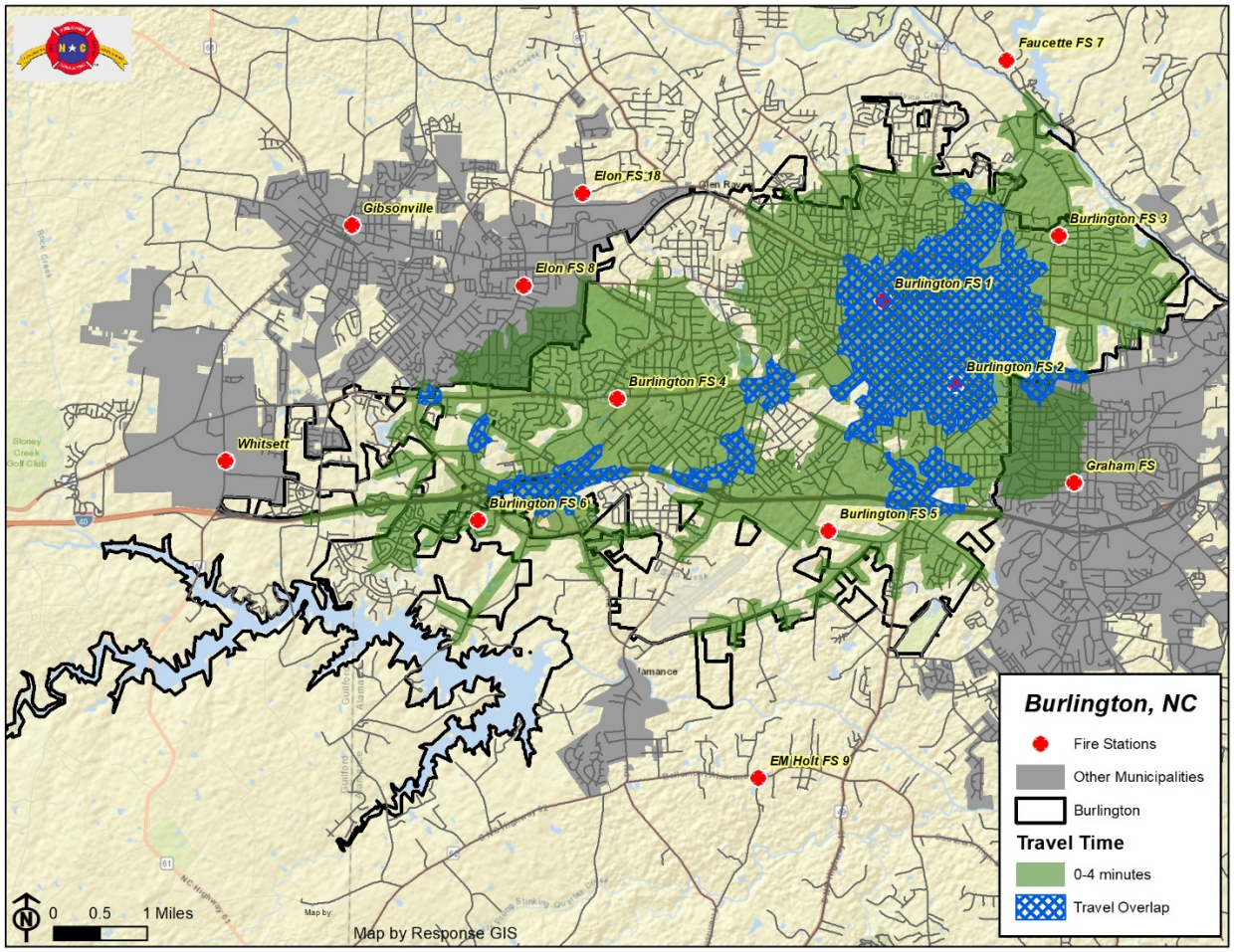


Unlike the engine's 1.5-mile metric, the neighboring fire department's ladder trucks can provide additional coverage that may improve BFD's rating in this metric if they are automatically dispatched to aid the BFD.

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 are known to effect response times and are factored in. Uncontrollable events such as weather, detours, and traffic congestion are not factored in. The NFPA 1710 standard travel time is applied in this graphic.

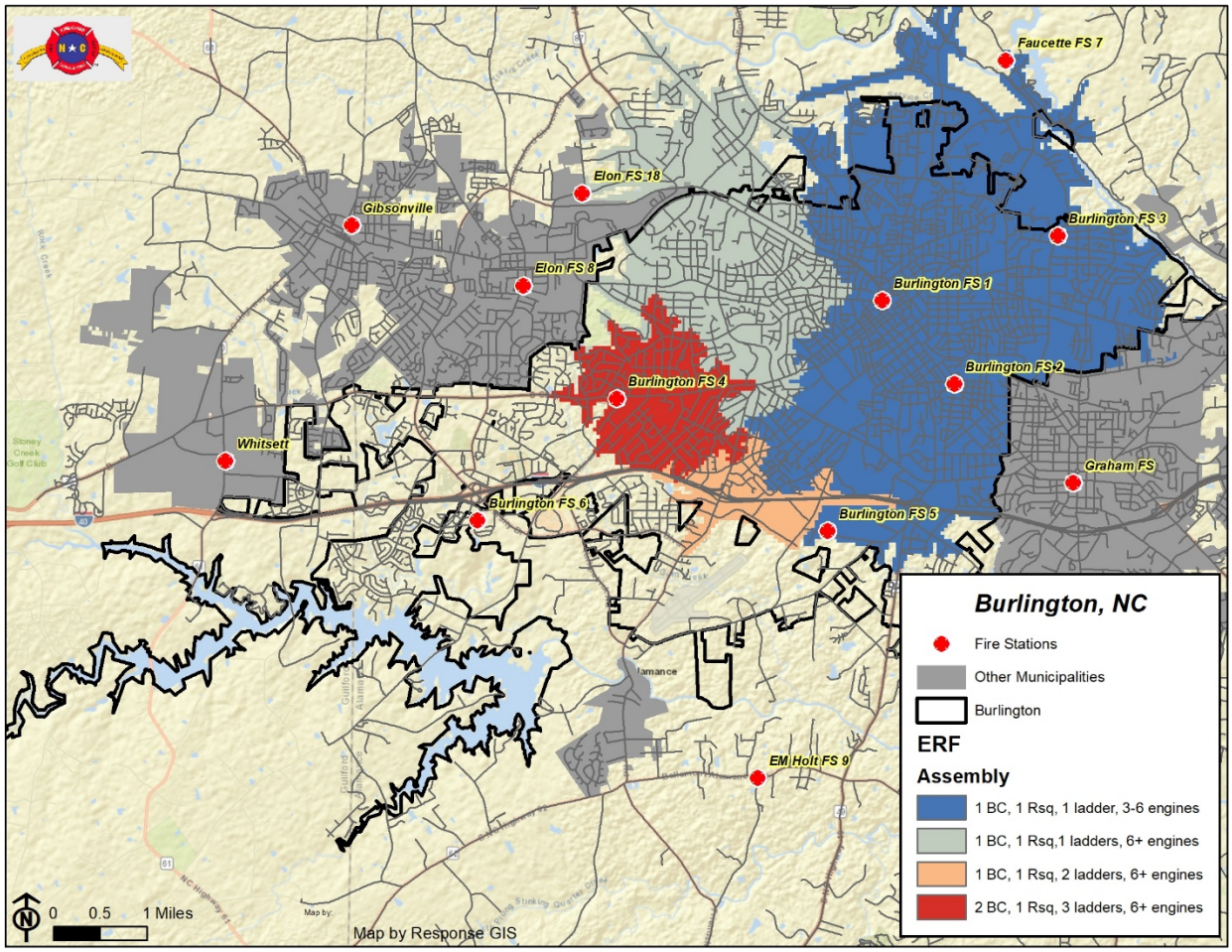
FIGURE 29: Travel Time Coverage



There are gaps in coverage at the edges of the city and the northeast side of the city. Station 1 and Station 2 have overlapping coverage but in instances of structure fires, multiple apparatus and staffing are needed. It can also be helpful when multiple calls occur in the area. When a structure fire occurs, the fire department has determined it needs 16 firefighters for the first alarm. Considering the travel time model, the current staffing levels and locations of fire apparatus,

the fire department has established a dispatch protocol of 2 Battalion Chiefs (Stations 1 and 6), 1 ladder truck, 1 rescue unit, and 3 engines/pumpers. Using an eight-minute travel time, the following figure shows where varying levels of apparatus (including neighboring automatic aid units) can reach.

FIGURE 30: First Alarm Concentration of Apparatus

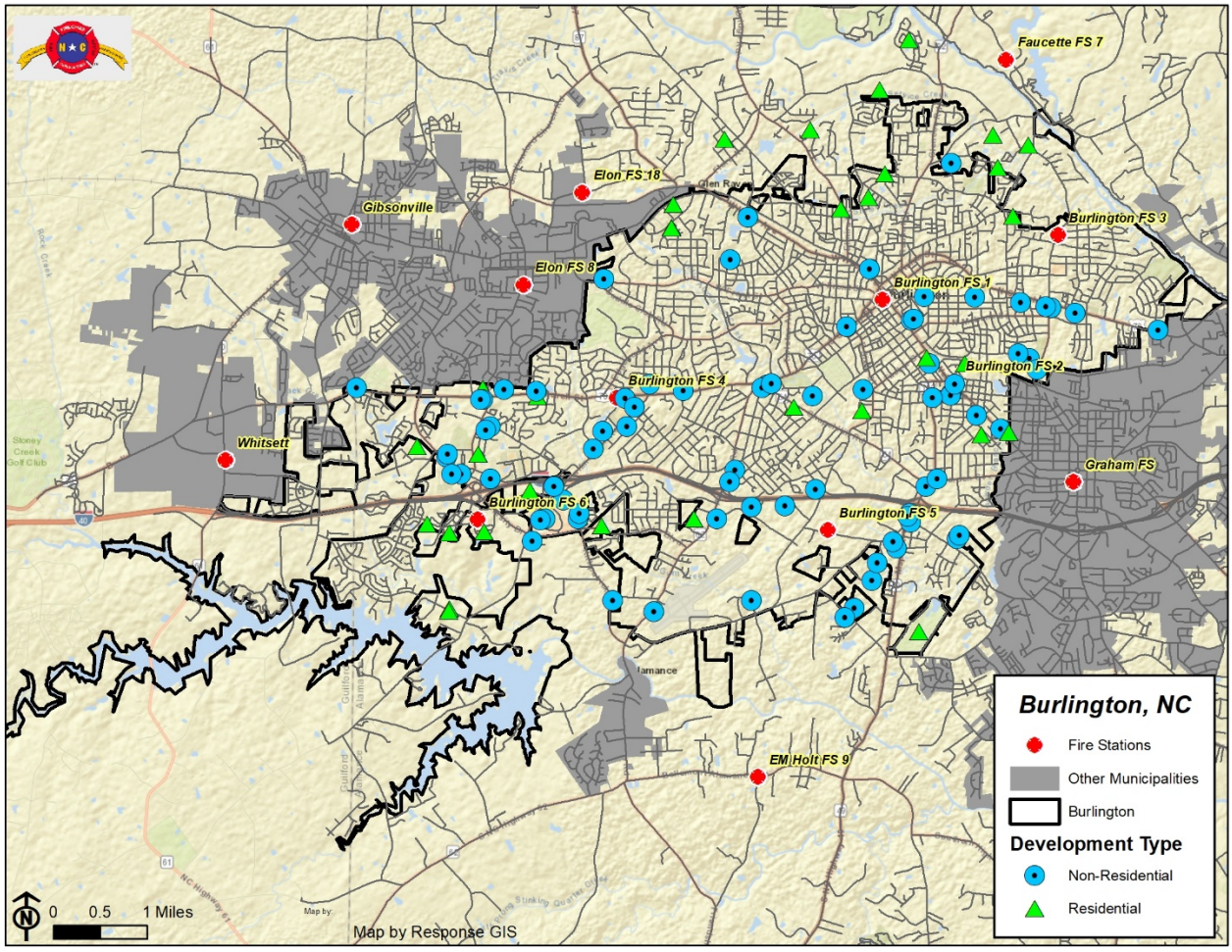


Based upon the current average staffing, deployment and first alarm assignment (3 engines, 1 truck, 1 squad, and 2 chiefs), this map indicates that the Burlington Fire Department cannot achieve and effective response force (ERF) to most of the Station 6's primary area in 10 minutes, 20 seconds, or less 90 percent of the time.

Development

Development data was provided by the city, indicating 34 residential projects and 79 commercial projects. The residential projects are projected to have about 3,900 new units. Multiplied by the census persons per household indicates that a potential population increase of over 9,000 persons is possible. Incident rate per existing commercial property was applied to new commercial development. The number of incidents per current population was applied to the additional development and the result indicates an estimated 2,000 additional annual calls for service from the fire department. The following map illustrates the residential and commercial projects in the area.

FIGURE 31: Development Projects



In addition to the development, the fire department and city planning office provided additional details for potential development within and bordering the city limits. This was taken into consideration when creating a fire service planning extent discussed later.

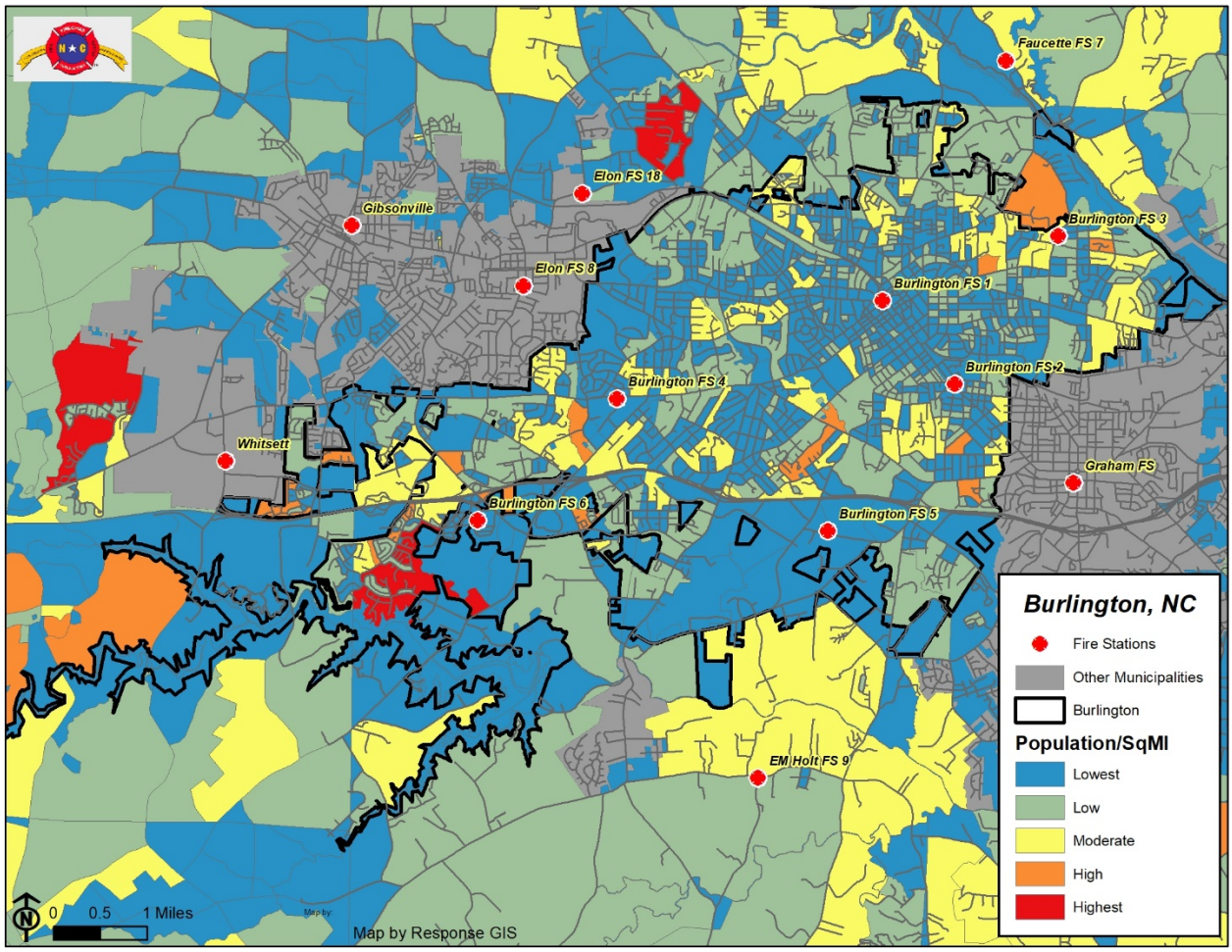
Coverage Analysis Methodology

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 coverage to all the elements impacting the fire service.

Population

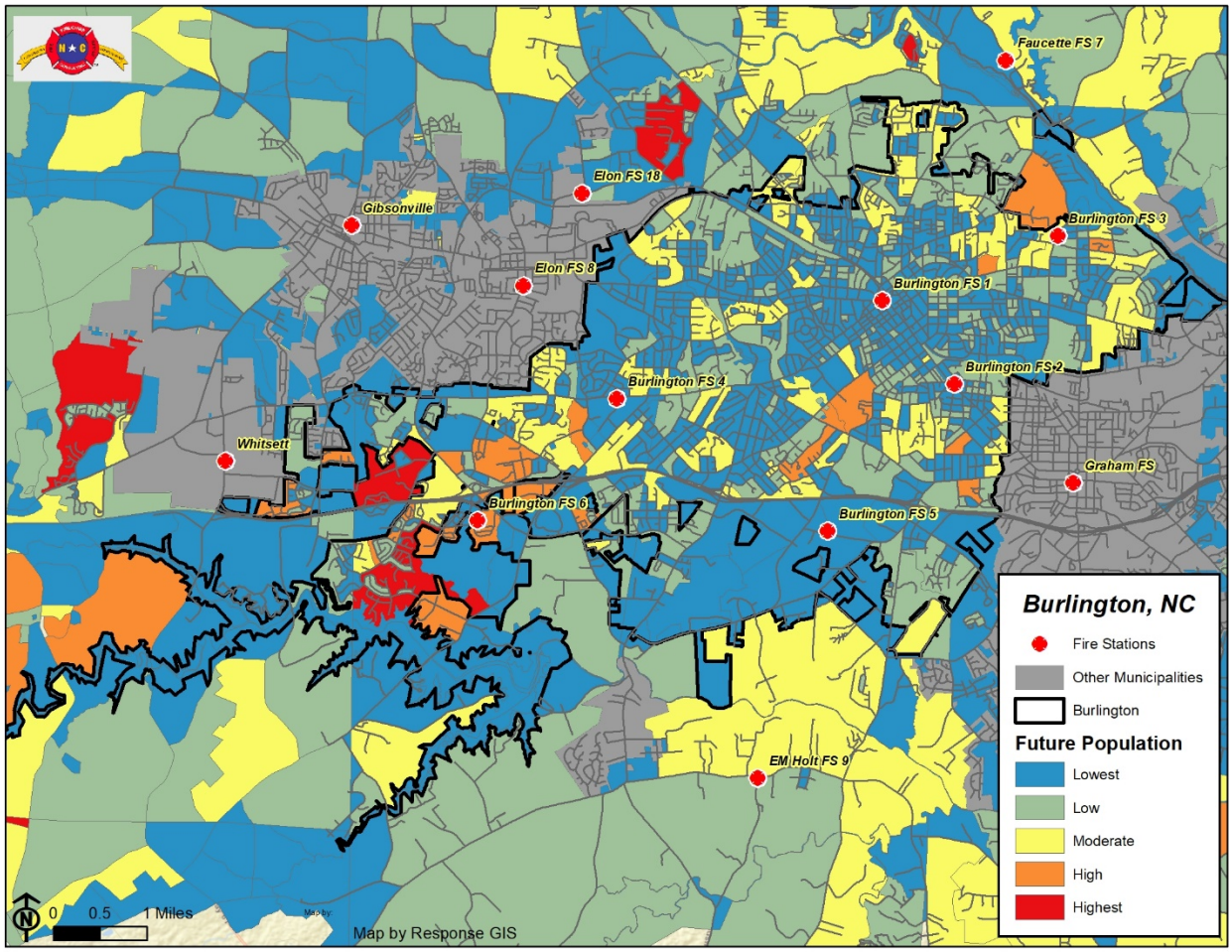
There are three elements that impact the fire service the most. First is population because there is a direct correlation between greater population and a greater demand for services. Additionally, these are residential taxpayers who are funding the fire departments services. The following map shows the census block areas with the 2020 population per square mile. An estimated 60,032 residents are within the city limits.

FIGURE 32: Current Population Density



The higher concentrations of population are outside the central commerce area of the city. Future population density changes based upon development can be seen in the following figure.

FIGURE 33: 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 analysis team was supplied with a zoning code attribute for each area within the city limits as well as extending outward into the current unincorporated county area.

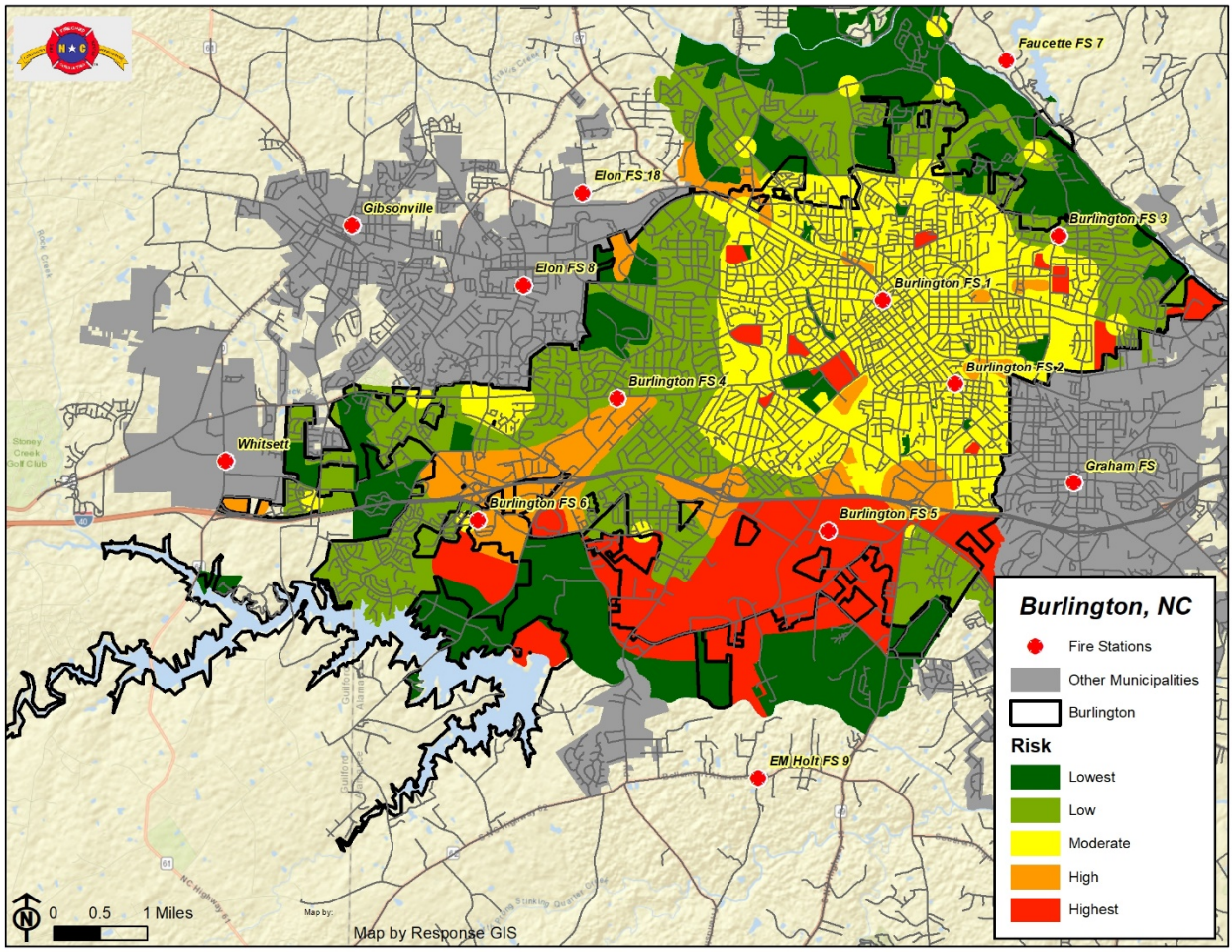
The types of uses pose differing risks to a community. Some may be a point of public assembly; others may be a facility that contains hazardous materials for its processes. Others are homes, that if lost to a fire is tragic to the owner and family. However, the loss of a structure that employs 300 residents is a greater overall impact to the entire community. The analysis 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 future land use data provided in the resulting map.

FIGURE 34:Future Land Use Risk Map

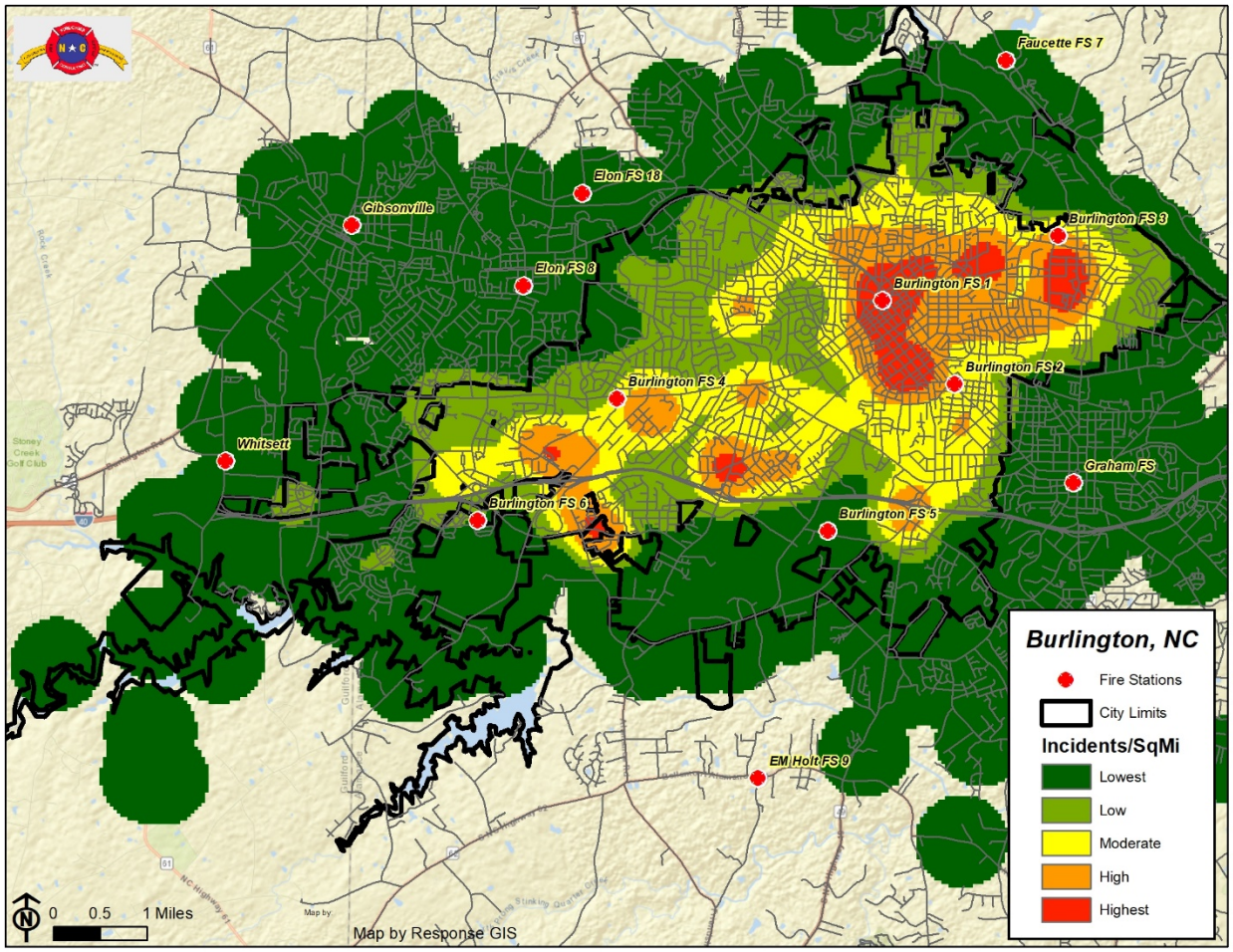


The city contains mostly higher risk levels and that some areas in the adjoining unincorporated area are included in the data.

Demand for Services

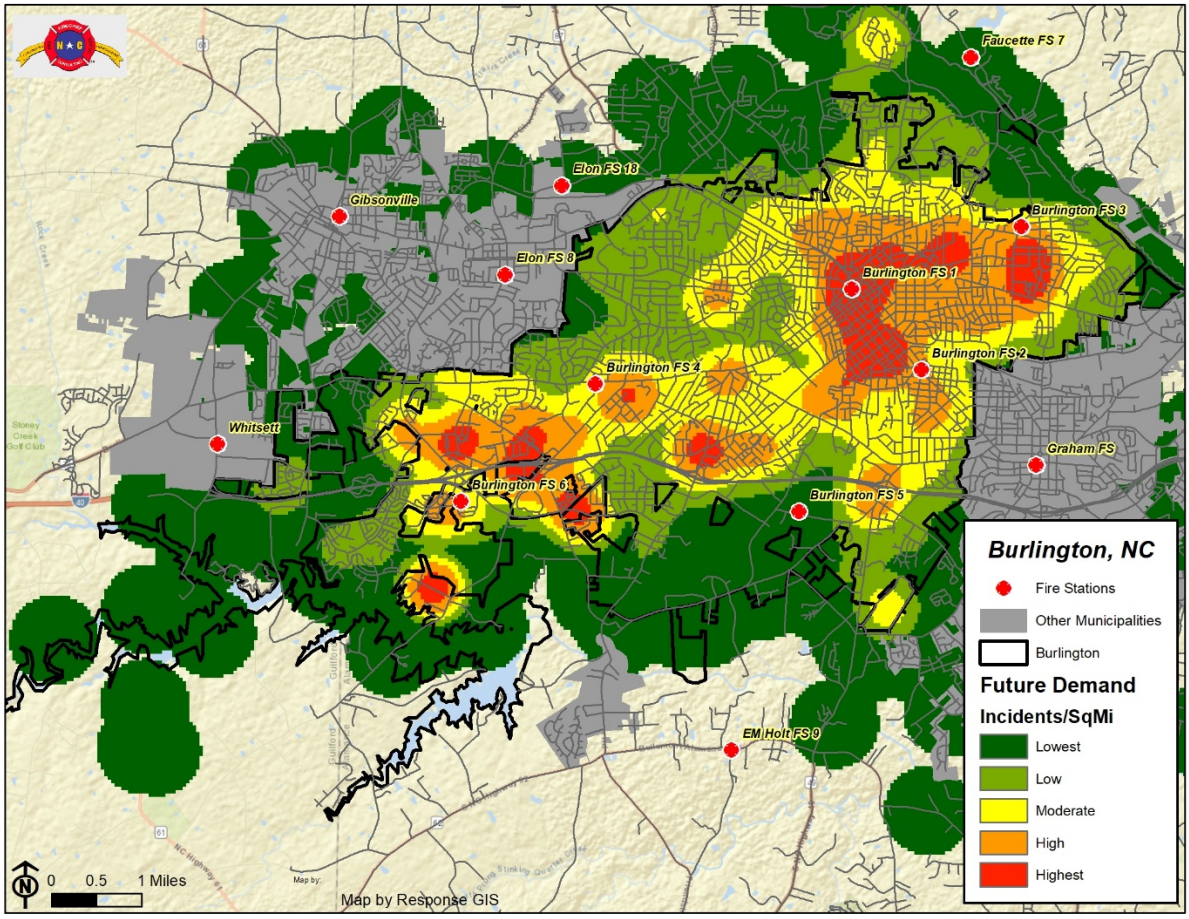
Thirdly, we review the demand for services. Although demand for services does correlate with higher population, demand can also be driven by non-residential commercial facilities like nursing homes, higher educational, and public facilities such as airports, and transportation terminals. Highly congested 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.

FIGURE 35: Current Service Demand Density



Much of the demand is concentrated where higher population activity is in the downtown area near fire station 1. The high demand is also noted east and south of station 3. There are nodal hot spots noted south of Station 4 and east of Station 6. Demand for services in the future changes modestly near Station 6.

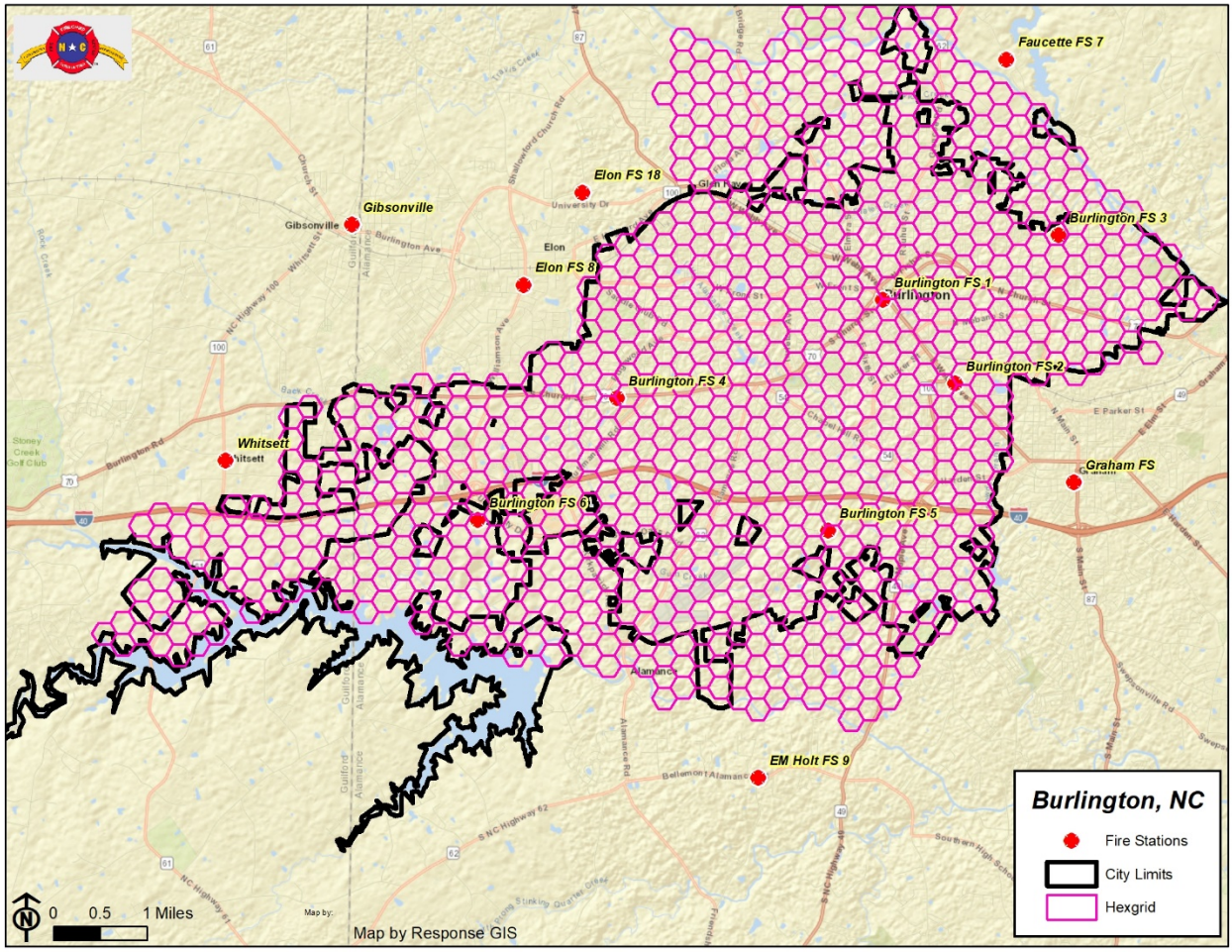
FIGURE 36: Future Demand Density



Vulnerability Risk Index

To measure the coverage adequacy by the fire station, travel time extents, the elemental aspects of future population, future land use risk, other areas of expected development provided by city staff, and future 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.

FIGURE 37: Hexagonal Grid of fire service planning area.



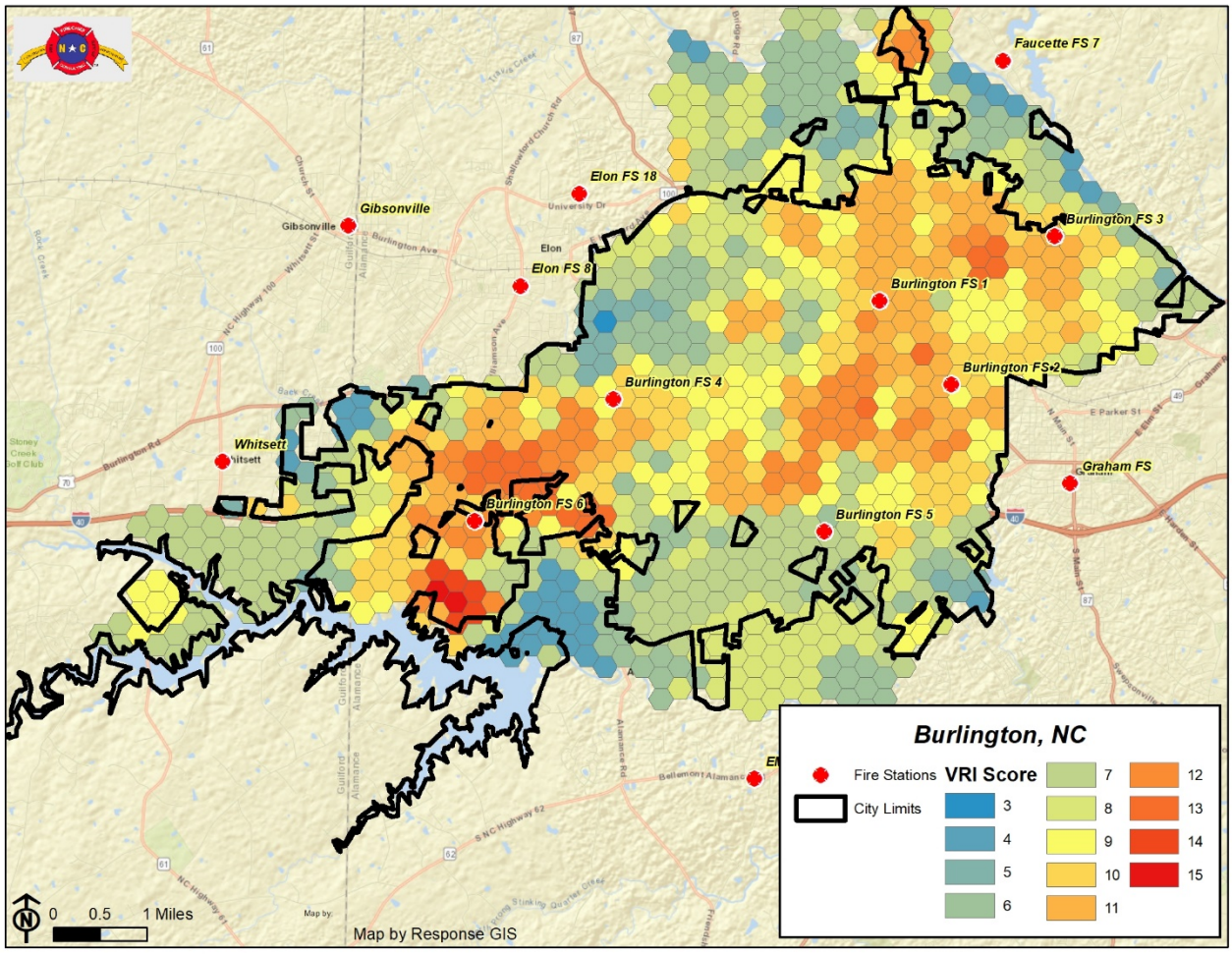
The combined elemental scores were applied to the hexagonal areas to create a Vulnerability Risk Index (VRI). The lowest score would be a 3, while the highest score possible would be a 15.

FIGURE 38: 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 39: VRI Score Map



From the current BFD station locations, the coverage of the VRI score using the travel time model is 63.5%. Considering the VRI cells within the current city limits only, the score is 77.5% of the total. These serve as benchmarks to compare with any station relocations or additions in this report.

It is important to note that the geographic technology used seeks to optimize the total score coverage in varying scenarios. Fire Station additions have a reducing coverage impact the more stations that are considered. The locations shown are areas of interest as exact location properties may not be available or suitable for fire stations.

Requested Scenario-Relocate Station 5

The fire department provided an area to consider relocating Station 5 to better serve its area and the growing airport operations. The location was Alamance Road & Grand Oaks. There was a loss of only 1% from the benchmark scores with this location change.

Optimal Station Location-Scenario A

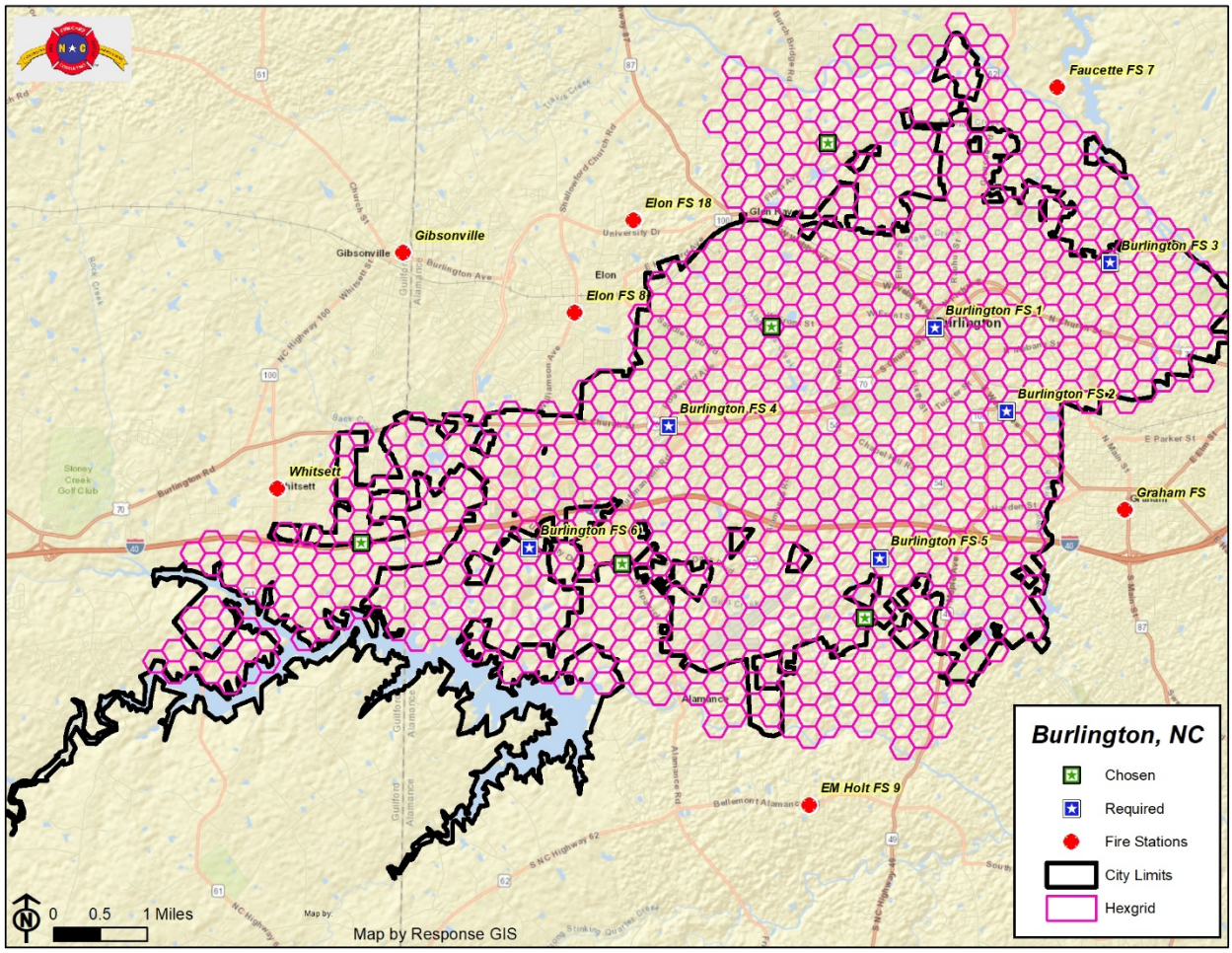
Considering the fiscal impact and logistics involved in relocating current fire stations, several scenarios were analyzed.

Scenario A1

The current station locations were retained, and additional stations were located within the fire service planning area to improve the score to near 90%. The following table details the additional stations in order of impact. While five additional fire stations are needed to reach 90%, the positive coverage impact falls with each fire station addition.

Scenario	Description	#Stations	VRI Score % Coverage	VRI Score % Coverage		
	Keep Current Stations, Add Others		Planning Area Coverage	%Change from benchmark	%Change from Previous	Area of Station
A1	Add 1 Station	7	72%	8.1%	8.1%	North of City
	Add 2 Stations	8	78%	14.8%	6.8%	West of Station 6
	Add 3 Stations	9	84%	20.2%	5.4%	East of Station 6
	Add 4 Stations	10	88%	24.3%	4.0%	South of Station 5
	Add 5 Stations	11	91%	27.2%	3.0%	Between Stations 1 & 4

FIGURE 40: Scenario A1 Station Locations

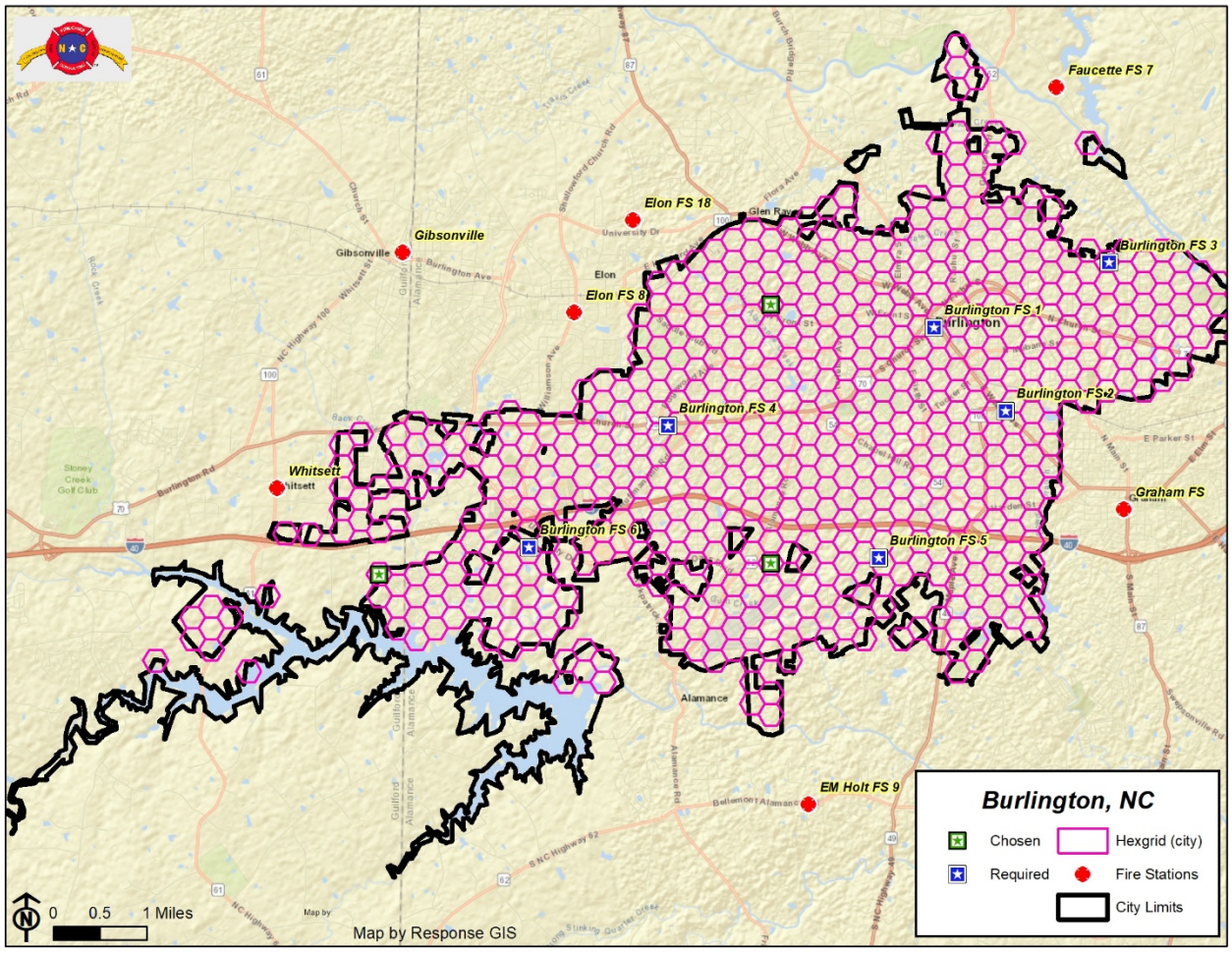


Scenario A2

In the following scenario, the VRI score cells are limited to the current city limits area in deference to the unknown aspect of responding outside the city in the future. The following table shows details of the number of additional fire stations, their impact, and the area of interest for where the additional fire stations should be to optimize the total VRI score.

Scenario	Description	#Stations	VRI Score % Coverage	VRI Score % Coverage		
A2	Keep Current Stations, Add Others	**#Stations**	**City Limits Only**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
	Add 1 Station	7	82%	4.5%	4.5%	Between Stations 5 & 6
	Add 2 Stations	8	86%	8.7%	4.2%	West of Station 6
	Add 3 Stations	9	90%	13.0%	4.3%	Between Stations 1 & 4

FIGURE 41: Scenario A2 Station Locations



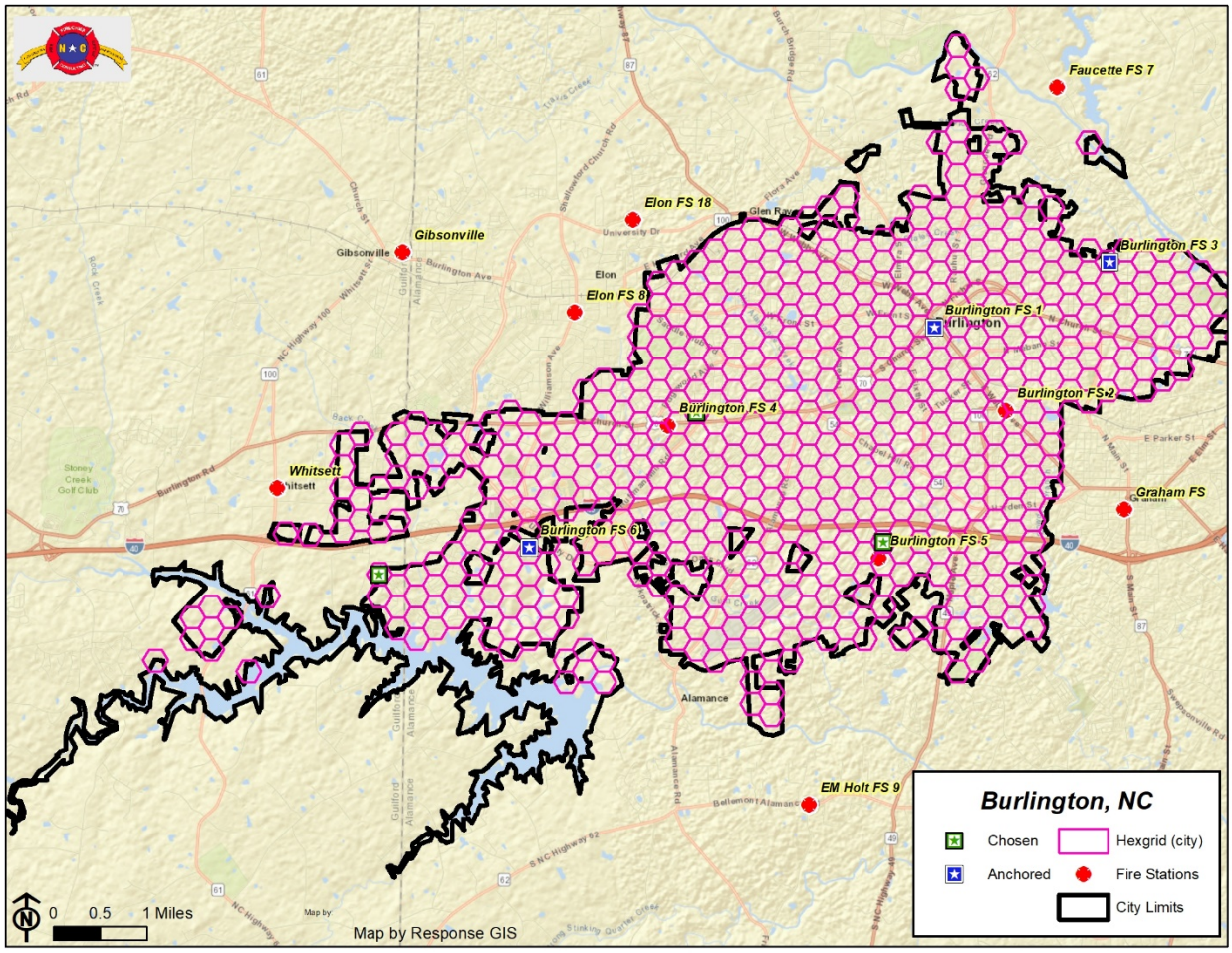
Optimal Station Location-Scenario B

These scenarios relocate certain current fire stations identified by the fire department within the city limits and then builds upon this into the remainder of the fire planning area.

Scenario B1

The fire department has identified Stations 2, 4, & 5 as relocatable while the remaining fire stations are locked in place (anchored) within the city limits. By doing so, the VRI score increased by 8% to 85%.

FIGURE 42: Scenario B1 Station Locations



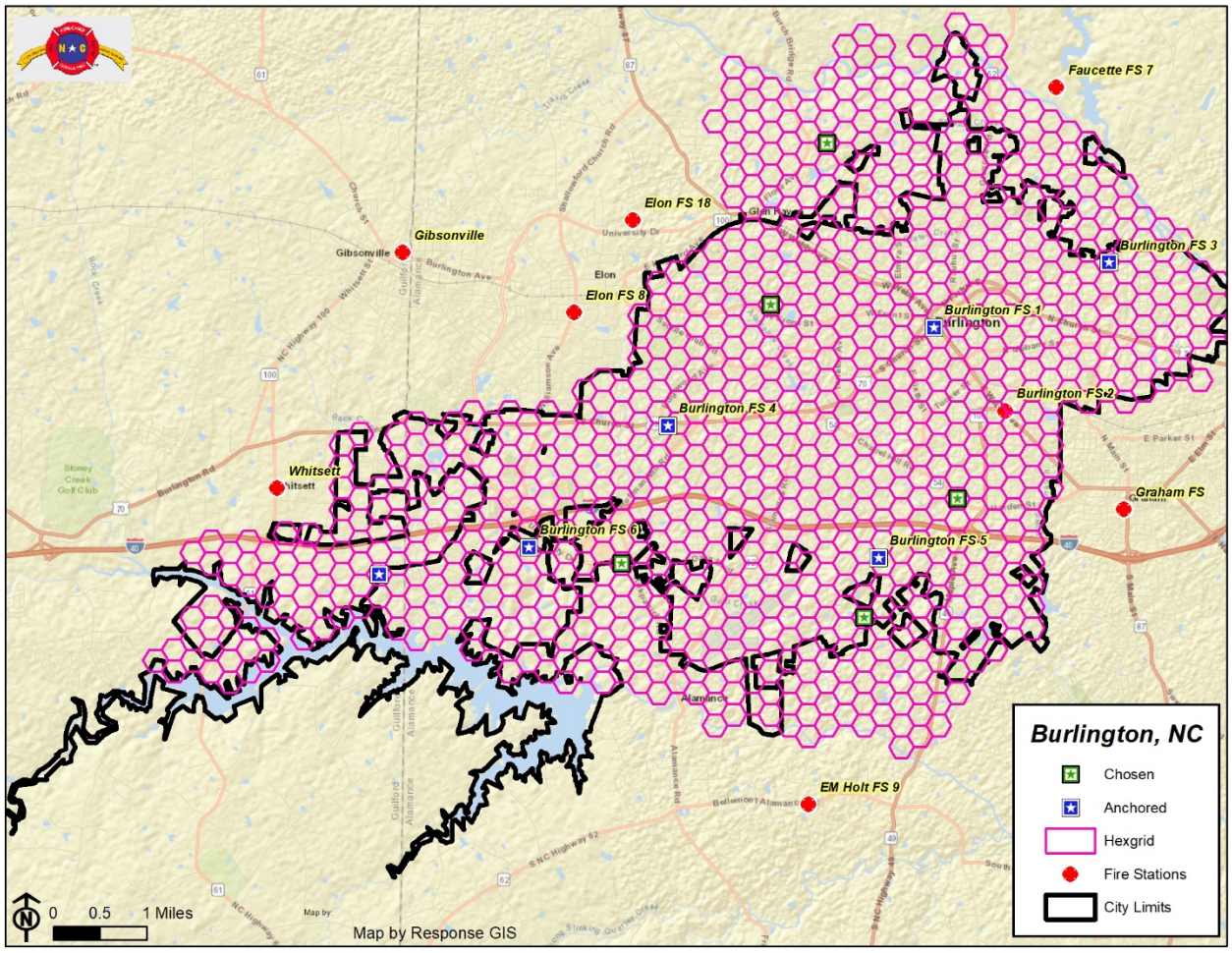
The optimal location of Station 2 moved to the west of Station 6. Stations 4 & 5 optimal locations were within the immediate area of interest of the current locations, making the case for any potential relocation of these two fire stations weak at best.

Scenario B2

Given the result of the previous scenario, only the station west of Station 6 was retained and additional fire stations were added to optimize the total VRI score considering the extent of the fire planning area. The following table shows details of the number of additional stations, their impact, and the area of interest for where the additional fire stations should be to optimize the total VRI score.

Scenario	Description	#Stations	VRI Score % Coverage	VRI Score % Coverage		
	Then add stations to perimeter	#Stations	Planning Area Coverage	%Change from benchmark	%Change from Previous	Area of Station
B2	Add 1 Station	7	75%	11.1%	11.1%	North of City
	Add 2 Stations	8	80%	16.5%	5.4%	East of Station 6
	Add 3 Stations	9	84%	20.5%	4.0%	South of Station 5
	Add 4 Stations	10	88%	24.3%	3.8%	Between Stations 2 & 5
	Add 5 Stations	11	90%	26.5%	2.1%	Between Stations 1 & 4

FIGURE 43: Scenario B2 Station Locations



The optimal VRI scoring coverage of at or near 90% is desirable, but it goes without saying that a cost /benefit decision must be debated by city officials and the fire department administration. An added difficulty is whether the city limits will remain static, or the fire planning area will be eventually realized. The following table summarizes the analysis of the scenarios discussed herein.

2025 City of Burlington Fire Station Location Analysis

Scenario	Description	#Stations	VRI Score % Coverage	VRI Score % Coverage		
Benchmark	Current Station Locations	6	63.5%	77.5%		
A1	Keep Current Stations, Add Others		**Planning Area Coverage**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
	Add 1 Station	7	72%	8.1%	8.1%	North of City
	Add 2 Stations	8	78%	14.8%	6.8%	West of Station 6
	Add 3 Stations	9	84%	20.2%	5.4%	East of Station 6
	Add 4 Stations	10	88%	24.3%	4.0%	South of Station 5
	Add 5 Stations	11	91%	27.2%	3.0%	Between Stations 1 & 4
A2	Keep Current Stations, Add Others	**#Stations**	**City Limits Only**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
	Add 1 Station	7	82%	4.5%	4.5%	Between Stations 5 & 6
	Add 2 Stations	8	86%	8.7%	4.2%	West of Station 6
	Add 3 Stations	9	90%	13.0%	4.3%	Between Stations 1 & 4
	Anchor 1,3,6/Relocate 2,4,5	**#Stations**	**City Limits Only**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
B1		6	85%	8%		Stns 4 & 5 near. Stn 2 moves to west of Stn 6
B2	Then add stations to perimeter	**#Stations**	**Planning Area Coverage**	**%Change from benchmark**	**%Change from Previous**	**Area of Station**
	Add 1 Station	7	75%	11.1%	11.1%	North of City
	Add 2 Stations	8	80%	16.5%	5.4%	East of Station 6
	Add 3 Stations	9	84%	20.5%	4.0%	South of Station 5
	Add 4 Stations	10	88%	24.3%	3.8%	Between Stations 2 & 5
	Add 5 Stations	11	90%	26.5%	2.1%	Between Stations 1 & 4
Alt Stn 5 location	Alamance Rd/Grand Oaks	6	62.8%	76.2%		

Executive Summary (GIS)

Analysis of current fire station locations have some coverage gaps between certain stations and at the edges of the city. In addition, the city may, at some point, expand and will require the fire department to respond to what are now, unincorporated areas of the county(ies).

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. The current coverage total score was 77.5% in the city and 63.5% in the greater fire planning area described in the report.

Scenarios were developed using current stations or relocated stations in the city and planning areas to locate additional stations as needed to optimize coverage.

SECTION 3: APPENDIX DOCUMENTS

Appendix A – Abbreviated Report Executive Summary:

Project Executive Summary

- As Burlington, NC, grows, so does the demand for essential public safety services, including fire station infrastructure. To ensure effective emergency response, the Burlington Fire Department (BFD) commissioned North Carolina Fire Chief Consulting (NCFCC) for an independent analysis of fire station locations and response data.

Purpose & Methodology

- The study assessed current and future fire station needs, evaluating seven years of emergency response data. Using PowerPivot technology and GIS mapping, NCFCC analyzed response performance at the 90th percentile, aligning with NFPA 1710 standards. A vulnerability risk index (VRI) was created to determine optimal fire station placement.

Key Records Management System (RMS) Findings

- **Service Demand**: BFD responds to 26 incidents daily, with demand increasing 2-5% annually. Medical/rescue calls comprise 75% of responses.
- **Response Performance**: BFD meets industry standards in turnout and call processing times but falls slightly short of its total response time goal (6:54 vs. 6:20 at the 90th percentile).
- **Staffing & Deployment**: BFD operates 6 engines, 2 trucks, squads/rescue unit, and 2 battalion chief units. Data reflects that BFD operates with an average staffing of 28 firefighters per shift.
- **Effective Response Force (ERF)**: In 2023, 16 firefighters arrived within 13:30 for 90% of structure fire calls.
- **Incident Overlap**: 35% of calls occur simultaneously, requiring continuous resource evaluation. This reduces the reliability that the closest units will respond to a structure fire, therefore impacting the Burlington Fire Department's ability to get an ERF on scene in 10 minutes and 20 seconds or less. This may be one of the reasons the department is currently not meeting its benchmark.

GIS Analysis and Fire Station Planning

The assessment team used GIS analysis to evaluate Burlington's fire service needs, including demand, risk, travel time, and national standards. The Burlington Fire Department currently operates six stations across 32 square miles, serving a population of over 60,000.

City development data projects 3,900 new residential units and 79 commercial projects, potentially adding 9,000 residents and increasing annual fire service calls by 2,000. Future planning includes population growth, land use risk, and incident demand. A Vulnerability Risk Index (VRI) was developed to assess fire station coverage, with Burlington scoring 77.5% within city limits and 63.5% when considering planned expansion. A 90% VRI is ideal.

Fire Station Expansion Scenarios

1. **Scenario A1:** Retain all six stations and add five new ones to reach 91% VRI, though this is not financially feasible. The greatest improvement (8.1%) comes from a new station north of the city.

2. **Scenario A2:** Add three new stations within municipal limits, achieving 90% VRI. The biggest gain (4.5%) comes from a station between Fire Stations 5 and 6.

3. **Scenario B1:** Relocate Fire Station 2 west of Station 6 while keeping Stations 1, 3, and 6 permanent. This increases the VRI to 85% but relocating Stations 4 and 5 provides little benefit.

4. **Scenario B2:** Expanding the analysis to future growth areas requires five new stations, which is not feasible. A new northern station provides the most improvement (11.1%).

5. **Relocating Fire Station 5:** Moving Station 5 to Alamance Road/Grand Oaks Blvd. decreases VRI slightly but could improve airport coverage and economic development. Monroe, NC, provides a successful model for this dual-purpose approach.

6. **Western Expansion:** A new station west of Fire Station 6 is needed. Placing it at city-owned land near Springwood Park is cost-effective, with only a 0.9% difference in VRI compared to other locations.

Recommendations

- Secure funding for new stations, equipment, and firefighter staffing.
- Plan for a new fire station west of Station 6, ideally near Springwood Park.
- Consider relocating Fire Station 5 to better serve the airport with potential federal funding.
- Improve coverage between Fire Stations 1 and 4, an identified gap in service.
- Acquire land for a future northern fire station to accommodate growth.
- Explore fire service expansion into unincorporated areas with cost-sharing agreements.

Next Steps

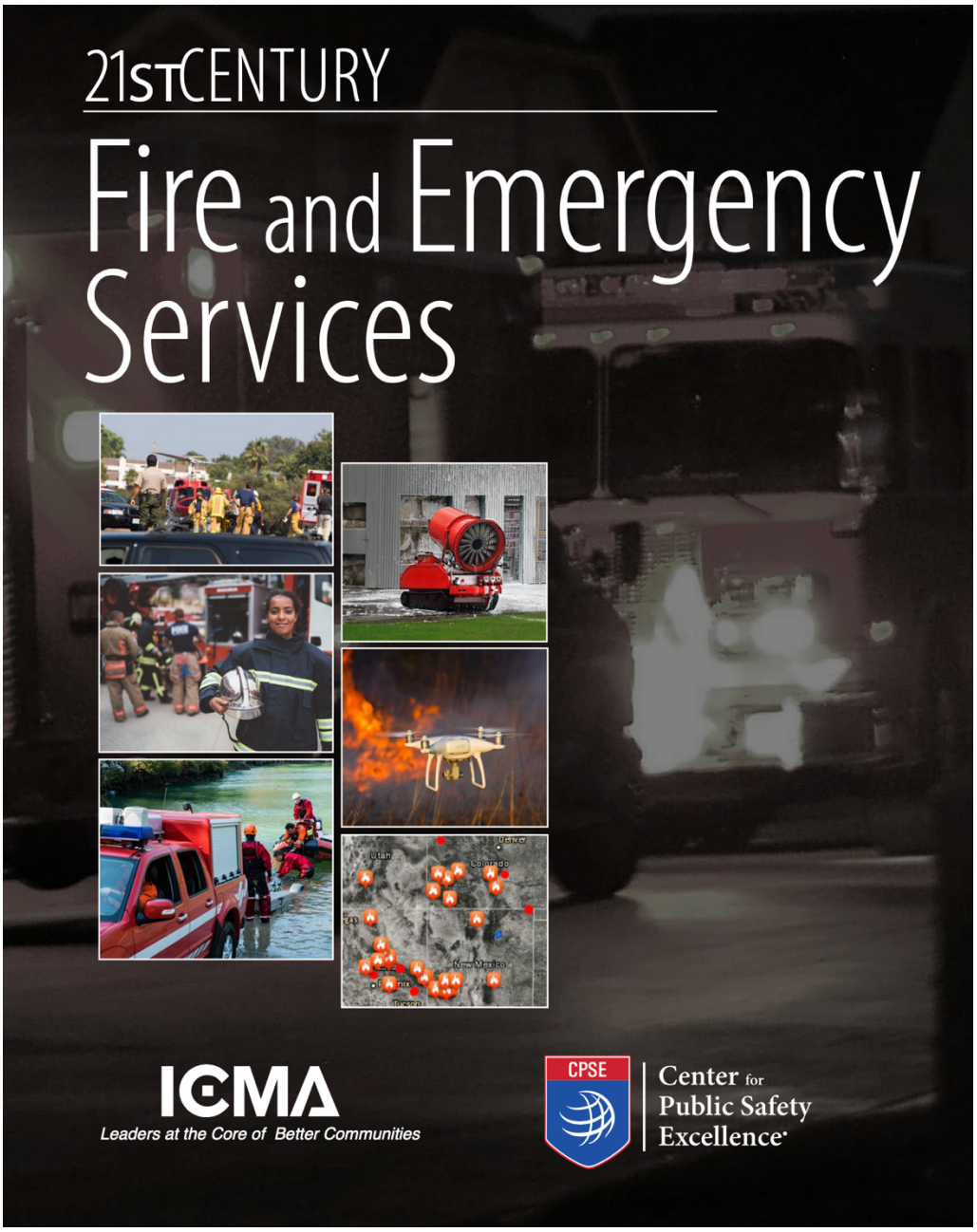
The Burlington Fire Department should periodically review and update this analysis. Given growth and construction timelines, planning should begin for stations in Springwood Park, Alamance Road/Grand Oaks, and between Fire Stations 1 and 4.

The assessment team appreciates the opportunity to support Burlington in enhancing its fire service.

Note that the above summary is generated by Artificial Intelligence (AI) for simplified review.

Appendix B – 21st Century Fire and Emergency Services:

Below are excerpts from the 21st Century Fire and Emergency Services that are relative to this review for the Burlington Fire Department.



CRITICAL ISSUE E:
PARTNERSHIPS

A partnership is often thought to be a form of business, where two or more people come together to share ownership, responsibility, and profits from a given business venture. In every community across our nation, a partnership exists between the fire and emergency services and the general public that is built upon a shared commitment to the health and safety of its residents. The fire and emergency services are in an enviable position in communities, as they are well positioned to be the hub of service provision for many supporting services already found within their community, and that align with organization's core mission. The importance of this has been clearly proven during homeland security threats, through the interagency cooperation, intelligence sharing, and joint response to those events by law enforcement and the fire and emergency services. There are significant opportunities to create partnerships with allied health care, mental and behavioral health providers, and various social service agencies to leverage the talents of each agency with a focus on improving service to the community. Too often agencies respond multiple times to the same individual who calls 911 as their only known access for assistance, when the need is truly not an emergency, but could be met by another service provider in the community. Over the next 30 years, the fire and emergency services will need to partner with related service providers to create a local response network that can provide a host of services under the umbrella of a multifaceted organization, if it hopes to meet the needs of the community served.

Initiative 1: **Acknowledge the need to work with a wide range of partners to serve the community and develop local strategies to create new approaches to providing services more effectively.**

Strategies:

1. Inventory and leverage the allied services (law enforcement, health, social services, non-governmental organizations) in the community to provide more effective and efficient services.
2. Partner with insurers and health providers to innovate existing response strategies, improve patient outcomes, and reduce system costs.

Initiative 2: Promote a symbiotic relationship with other internal departments and outside agencies that are routinely allied responders to an incident.

Strategies:

1. Routinely meet, train, develop standardized operational response plans, and share real-time intelligence of what is happening in communities with allied responders to increase response capability and coordination during a homeland security event.
2. Develop goals and outcomes with a wide array of agency stakeholders, both internally and externally, to meet the objective of providing for a safe and healthy community.
3. Promote regular communication between all stakeholders on strategic issues, while continuing to handle operational issues through the established chain of command.
4. Develop opportunities for stakeholders to appreciate the roles and responsibilities of all other stakeholders toward better alignment of service delivery.

Initiative 3: Continue to expand community emergency response capabilities.

Strategies:

1. Promote individual and neighborhood self-sufficiency though existing programs (e.g. community emergency response teams, the radio amateur civil emergency service, volunteers in patrol, and senior Medicare patrol volunteers) to create greater resiliency in the community.
2. Focus on creating personal accountability in preparation for community-wide emergencies.
3. Identify and support community functions that are critical for recovering from and adapting to community-wide disasters.

CRITICAL ISSUE F:
SUSTAINABILITY

Sustainability is often defined as meeting the needs of the present without compromising the ability of future generations to meet their needs. The concept of sustainability has three pillars: economic, environmental, and social. If we look through the lens of local government today, there are reasons to be concerned that local government may not be sustainable in the future. Many agencies across the United States are struggling with the cost to provide services at the levels needed to meet a growing population, an aging population, and a population with changing service demands. Those cost pressures are exacerbated by unfunded pension costs along with and the cost to maintain and replace aging infrastructure and response vehicles. Shifting responsibilities from federal and state governments to the local level have forced many local governments to provide new services. These factors have placed tremendous strain on local government to balance ever growing service demands with funding available within their jurisdiction. This will be an on-going issue and will necessitate doing business differently in the future, not only in the fire and emergency services but throughout all services provided by local government as well.

The volunteer fire service has struggled in the last decade in many parts of the United States to recruit and retain enough volunteers to provide adequate services. With the mission of providing services to more than 70 percent of U.S. jurisdictions, volunteer recruitment and retention is becoming a national problem.

Today business, government, and society are learning from the science of change that they must recreate themselves even when they would like to believe the old way of business will go on forever. As Peter Drucker put it, "the best way to predict the future is to create it." The future of the fire and emergency services will rest upon those who are in it. If the fire and emergency services hope to sustain itself in the future, it must be willing to redesign itself and address the issues that are having a negative impact on the service today. Failure to address these issues will lead to what author Max Bazerman calls "predictable surprises." Predictable surprises are those events or outcomes that catch us by surprise, yet both were predictable and preventable. If this occurs, the fire and emergency services will be placed at risk to continue to be the community's safety net. Ultimately, local government will be faced with making difficult choices about how to provide the services needed and the level of services to be provided. That is why the issue of sustainability is so important and must be addressed now, rather than being left to the next generation of leaders to resolve.

Initiative 1: Address aging fire and emergency services vehicles and building structures.

Strategies:

1. Establish a comprehensive building renewal and replacement plan and provide the needed funding to address the short- and long-term community needs.
2. Urge the architectural profession and equipment manufacturing industry to anticipate and plan for the future designs needed by the fire and emergency services to address changes in response and deployment methods, building constructions, building densities, road infrastructure, and SMART cities and SMART building design.

Initiative 2: Reconsider and revamp current deployment methods.

Strategies:

1. Ensure response protocols and opportunities for consolidation are explored to ensure effectiveness of service delivery is balanced with cost efficiency.
2. Adopt staffing models based on statistically known call demand factors, such as time of day, special events, and seasonal changes while maintaining an adequate baseline deployment required to meet the health and safety needs of the community and employees.
3. Evaluate consolidation of seldom used specialty and single-purpose pieces of equipment to maintain effective cost management and capacity of those services for the threat environment that exists within the jurisdiction.
4. Develop a better understanding of community needs and their changing demands for services so as to modify the service delivery model(s) to meet them.

Initiative 3: Develop sustainable pension model.

Strategy:

1. Promote collaboration between labor groups, local government, and state government to ensure existing pension financial commitments are met while ensuring adequate service levels within the communities being served.

Initiative 4: Adopt and implement a community risk reduction strategy

Strategies:

1. Embrace a comprehensive strategy to minimize incidents and, if an incident does occur, to minimize the impact on the people, the community, and the emergency responder.
2. Adopt the concepts outlined in "Vision 20/20 – National Strategies for Fire Loss Prevention," and incorporate these recommendations into the daily agency operation to minimize the impacts to the community and emergency responders.
3. Develop strategies locally and nationally that reduce risk through proper vegetation management, designing new fixed fire protection systems that can be used in wildland urban interface, and zoning changes that prohibit building in the wildland urban interface.
4. Embrace the use of fire sprinkler technology in all buildings through the rapid adoption of codes and ordinances at the federal, state, and local government levels to dramatically reduce the incidence of deadly and costly fires. .
5. Urge the sprinkler industry to develop a more cost-effective means to retrofit existing buildings with sprinklers or other fire suppressant technology.
6. Develop standards and a tiered code methodology that would support a phased in retrofit plan for existing buildings.

Initiative 5: Improve resource allocation by focusing on the outcomes trying to be achieved.

Strategy:

1. Evaluate resource allocation using department response data.
2. Alter deployment methods to assure better outcomes and desired services levels for communities including EMS, community paramedicine, or increased prevention efforts.

Initiative 6: Examine fixed costs associated with current delivery models and associated contracts.

Strategy:

1. Negotiate labor contracts with the flexibility to promote innovation in service delivery and servicing models, while still providing a fair and equitable wage, benefit, and pension package for the workforce that is economically sustainable.

Initiative 7: Explore public/private partnership opportunities.

Strategies:

1. Solicit success stories and best practices of effective public/private partnerships related to capital investments and operating costs.
2. Create, maintain, and regularly update a national repository of best practices available to all agencies at no cost.

Initiative 8: Research strategies to assist communities in sustaining their volunteer fire and emergency services or, if needed, how to transition to a new model.

Strategy:

1. Champion the establishment of a federal commission to develop a national plan of action to ensure volunteer fire and emergency services agencies remain viable in the future.

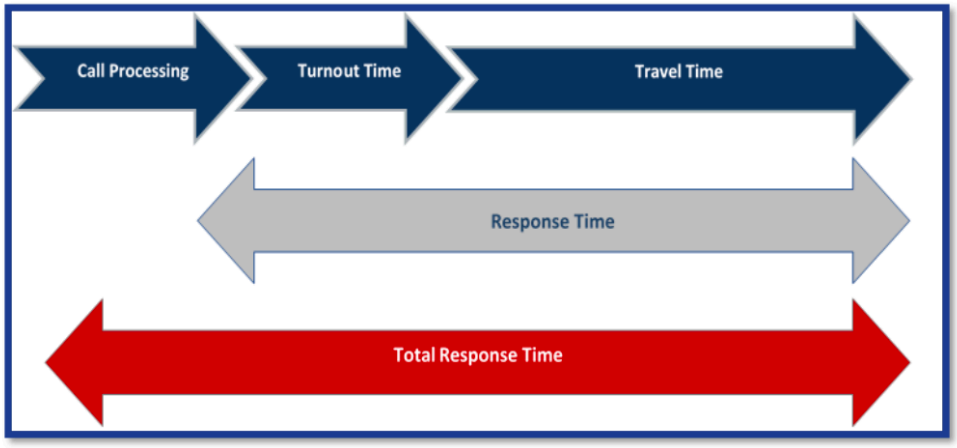
Initiative 9: Dramatically revamp the fire and emergency services education and training model to provide the needed skill sets, knowledge, and abilities required for the anticipated changes in the future and to remain current with the application of emerging technologies.

Strategy:

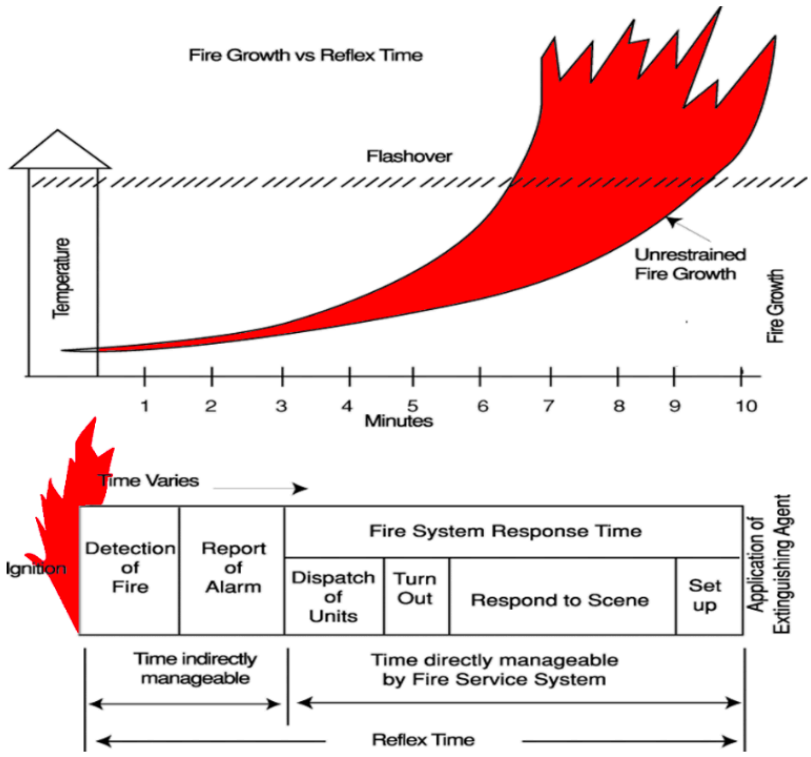
1. Urge academic institutions to develop the means to speed up their course development model and to be able to quickly adapt and develop new courses that will be required to sustain the needed workforce skill sets.
2. Encourage academia to use of state-of-the-art technology to meet the educational learning styles of future generations.

Appendix C – Select Fire Service Visual Data Points Applicable to the Burlington Fire Station Location Analysis:

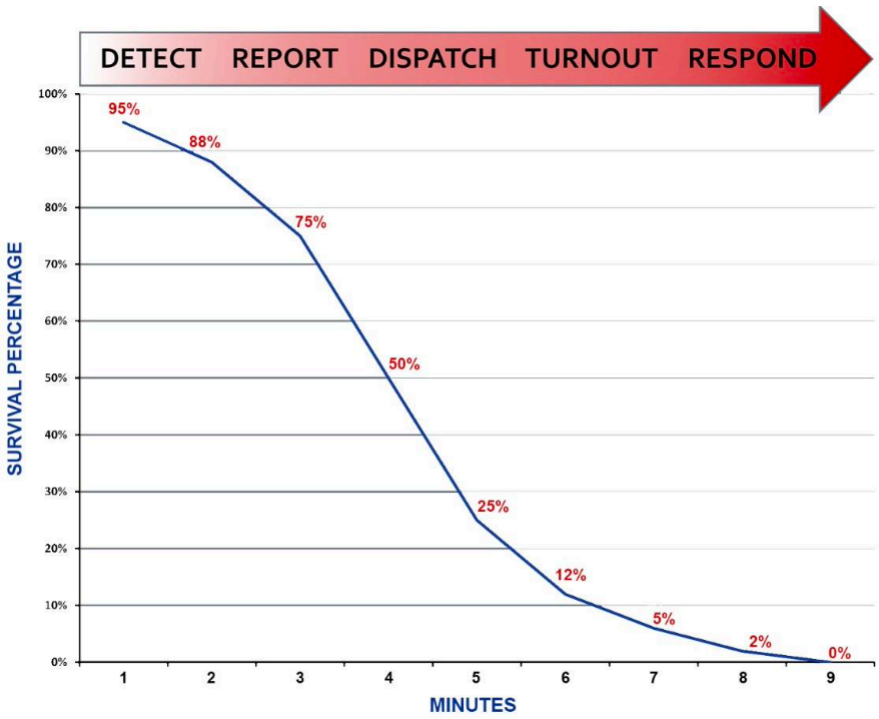
Total Response Time Continuum:



Fire Growth and Reflex Time:



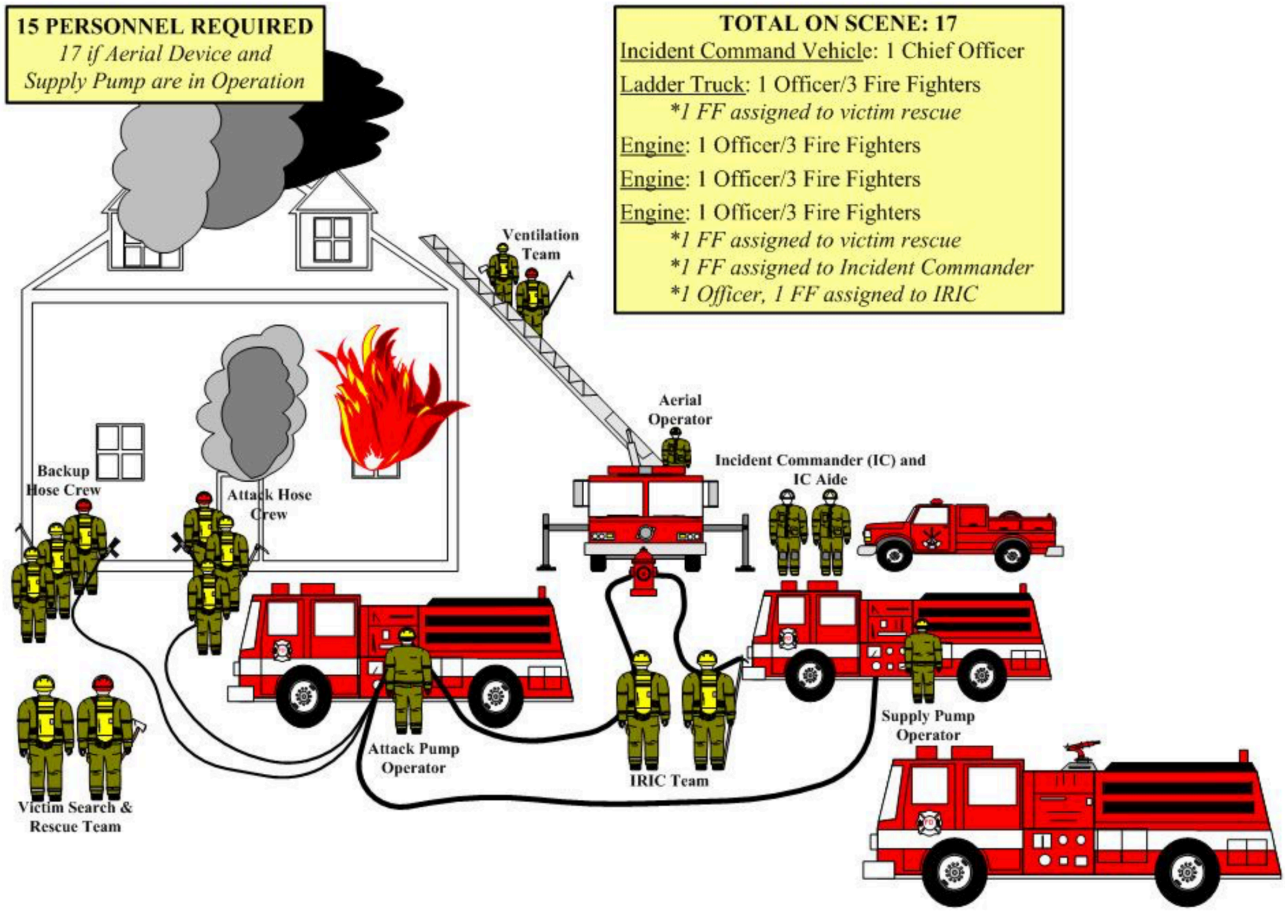
Cardiac Arrest Event Sequence:



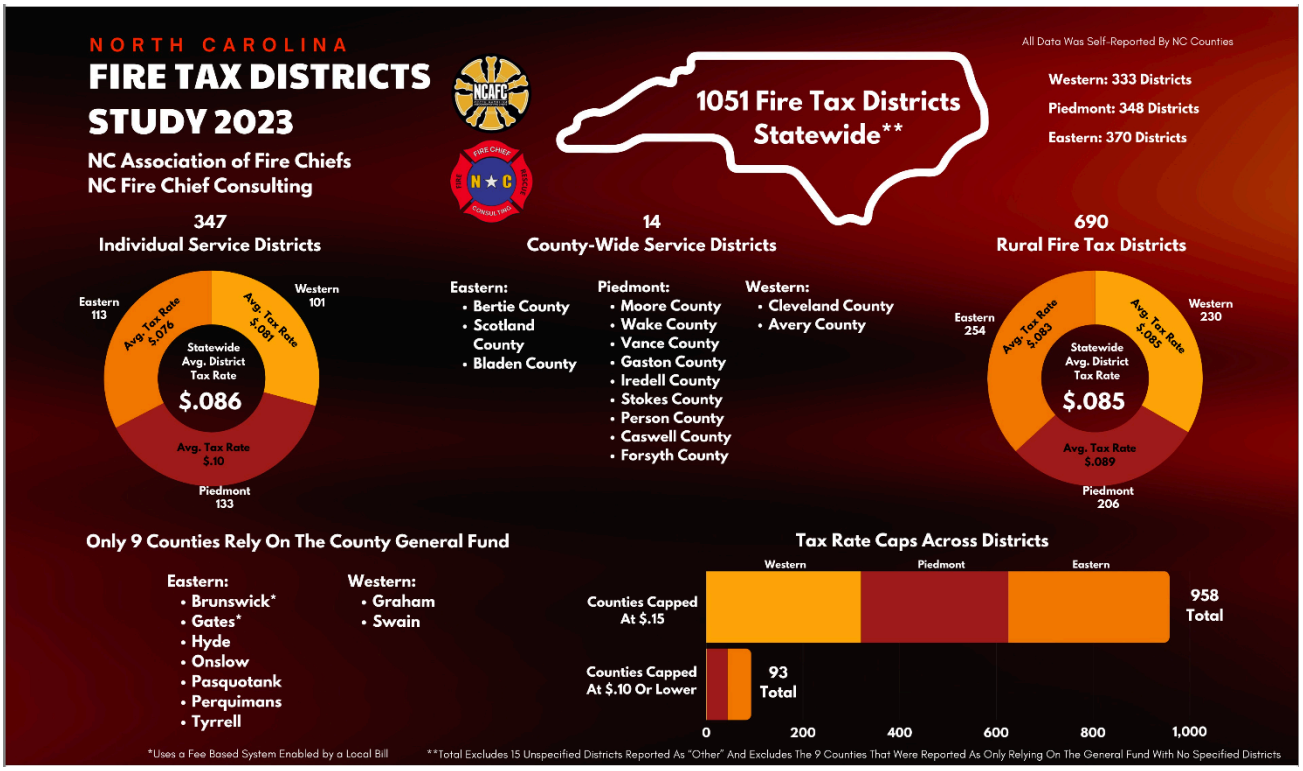
NFPA 1710 (Urban Areas) Initial Full Alarm Assignments:

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**

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



FY 23-24 Fire Service District and Rural Fire District Tax Rate Information for North Carolina.



Appendix D – North Carolina Illustrative Fire Station Size and Programming Information:

New Facility/Personnel Needs:

NCFCC partners with Stewart-Cooper-Newell Architects to make recommendations and identify project costs for fire station facilities. They also assist in determining the necessary acreage for a substation calculated based upon square footage of the building.

Although the needs of Burlington Fire may differ somewhat from the models offered, the details below will provide illustrative examples for projections until Burlington is ready to move forward with an identified fire station site.

Some illustrative examples are provided for Burlington for consideration moving forward. In the first model, we provide recent data from **Butner, NC:**

- Fire department staff identified the need for 3 drive through bays.
- Fire department staff identified that space is needed for 12 people over 3 shifts.
- Fire department staff identified the need for 2 offices.
- Fire Department staff identified the need for a training room.
- Current fire station construction prices in North Carolina are between $645 and $750 per square foot.

From that model, key recommendations for a new substation include:

- Identify a 3–4-acre parcel to build a new substation.
- Estimated square footage to accommodate all needs will be around 15,400.
- Budget between $9.62 and $11.55 Million with 2024 construction pricing.

Initial programming needs for an additional Butner future fire station is outlined on the next two pages below.

Butner		
Space	**Current Size**	**Needed Size**
Vehicle Bays		3 Drive through bays
Turn Out Gear		Room for 12
Shop		open in bay 8x8
Decon Room		n/a
Decon Vestibule		n/a
Tool Air Comp / SCBA Cascade Room		Open in bay 8x8
Laundry Room		10x15 room for extractor and drying rack
EMS Storage		n/a
Sprinkler Riser		n/a
Haz-Mat Storage		10x10
Outside Equipment Storage		15x15
Mechanical / Storage Mezzanine		20x20
Electrical Room		5x5
Hose Drying		open in bay 8x8
Hose Dryiing Tower (Optional)		
Dayroom		40x40 (Room for 6)
Kitchen		Standars kitchen with refrigerators
Dining Room		20x25 Table for 8
Indivdiual Sleep Rooms or Group Bunk Room		12 individual rooms

Exercise Room		30x30
Toilet/Shower/Locker Rooms or Individual Toilet/Shower Rooms w/ Locker Alcove		1 Toilet/Shower/Locker Room per 3 rooms (4)
Residential Laundry		6x8
Linen Closet		4x4
Janitor Closet		8x8
Lobby		20x20
Walk-in Triage/Vistor		
Public Restrooms		1 ADA compliant
Receptionist		n/a
Radio / Report Room		20x20
IT Equip Closet		10x10
Dispatcher		n/a
Chiefs Office		15x20
Additional Offices	5 people currently sharing one office	2 offices 15x10
Training Room		30x40
Community Room		n/a
Toilet Rooms		n/a
Vending Area		In lobby
Work/File Room		15x20
Conference Room		n/a
Library		n/a
Training Opportunites In-House & On-Site		
Separate Facility Users		n/a
Outdoor Patio		yes
Parking		Room for 10
Backup Generator		yes/exterior

The second recent example for Burlington's consideration comes from **Pittsboro, NC**, which is also a private, non-profit corporation fire department.

New Facility/Personnel Needs:

NCFCC conducted a needs analysis in partnership with a local fire station specialist architect to estimate fire station construction minus land acquisition based upon prevailing prices in mid-2023. Fire station construction has increased dramatically in recent years, post COVID at approximately 20% per year. The estimated needs size for one of the four stations identified in this analysis to provide approximately 12,227 of functional space will require approximately **16,158 square feet of construction**. The cost of this construction in the traditional mode would be **approximately $11-$13 million**. Utilizing the design/build approach could potentially reduce the total cost of the project to $10-$12 million. These significant costs would need to be programmed into the city's capital improvement plan if the desire is to proceed forward with the next fire station for Pittsboro.

Initial programming needs for any one of the four new future fire stations is outlined on the page below.

2025 City of Burlington Fire Station Location Analysis

PITTSBORO	9/24/23				
Space	**Current Size**	**Needed Size**	**Notes**	Estimated Size	**Notes**
Vehicle Bays	3 bays	3 bays	Engine, squad, ladder. If rescue or brush truck is placed there depending on location, then a 4th bay would be needed.	1,600	
				1,600	
Turn Out Gear		35		420	
Shop			We would like to have a tool/shop room to repair small equipment	120	
Decon Room			Decon room with stainless steel sink and Emergeny Shower / Eyewash area	400	
Decon Vestibule				120	
Tool Air Comp / SCBA Cascade Room			Air Compressor will be needed and should be housed in a separate room to reduce noise. Tool Room/Shop should not house the air compressor	168	Cascade and breathing air compressor plus room for tool compressor
EMS Storage			Station should include an EMS closet to store medical supplies	36	A/C Reqd.
Sprinkler Riser			Sprinkler riser can be placed in the apparatus bay	0	
Haz-Mat Storage			Storage for fuel for small equipment. Storage room for lawn equipment	120	
Outside Equipment Storage			N/A	0	
Mechanical / Storage Mezzanine			N/A	400	Mechanical Equipment, water heater(s), etc.
Electrical Room				120	Main Switch Gear, ATS, etc.
Hose Drying			Hose dryer	120	20' Wide bays allow for hose drying racks, showing additional sqft for optional tower
Hose Dryiing Tower (Optional)			Incorporate with training tower	0	8x8 fore hose drying only, or include stair case and landing(s) for training. Revise to 2 or 3 story and 240 - 400 sf per level
Dayroom			10 People. Day room to include Recliners, Wall Mounted TV and AV Equipment, along with a display cabinet. Separate from kitchen and dining area.	500	
Kitchen			Stove, Dish Washer, Commercial Refrigerator, (3) walk in pantry closets, Microwave. Kitchen table for 10p	700	Includes Dining, 3 refrigerators, one for each shift.
Dining Room			Open area with kitchen		Included in above
Individual bedrooms.			Individual bedrooms with 3 beds, one for each shift. 3 closets in each bedroom instead of lockers		
				1,500	
Exercise Room			Room designed for 10-12 workout machines	800	
Toilet/Shower/Locker Rooms or Individual Toilet/Shower Rooms w/ Locker Alcove			3 Bathrooms with separated pods for shower and toilet	1,440	
			Linen storage in bathrooms	0	
Residential Laundry			N/A		
Linen Closet			No		
Janitor Closet			Janitor Walk-In Closet near Laundry Room	64	
Lobby			Small lobby	140	
Walk-in Triage/Visitor			No	0	
Public Restrooms			Yes. One male and one female	128	
Receptionist			Yes. Secretary office	140	
Radio / Report Room			Yes, 2 work stations and network printer, radio/communications equipment	120	
IT Equip Closet			Comms equipment	64	
Dispatcher			No	0	
Chiefs Office			Station Supervisor Office w/ Desk, File Cabinets, Small Conference Table, Bookcase, Closet	280	
Additional Offices	6			360	
Training Room			Large Training Room to seat up to 20 people	700	
Community Room			Combined with Training Room		
~~Toilet Rooms~~			~~One male one female at training room~~	0	
Vending Area			No		
Work/File Room			No		
Conference Room			No		
Library			No		
Training Opportunites In-House & On-Site			No		
Separate Facility Users			No		
Outdoor Patio			Yes, Covered. Outside of public view	67	200 sf Undercover (indicating 1/3 size in sf tally for costing)
Parking			40 Daily Spaces		
Backup Generator			Full Building, Natural Gas		
Net Square Feet				12,227	
Grossing -Bays	10%			320	
Grossing - Building	40%			3,611	
				16,158	
			Projected Costs		
			Low @ 550	$8,886,790	
			High @ 650	$10,502,570	
			Total Project 80/20	11,108,488	
				13,128,213	

Appendix F - Fire Station Construction Estimate Information:

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 is 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 Annual Increase = 13.4%

Below is an illustrative example of the cost estimation for fire station construction based upon a needs analysis (which was not part of the scope of work for Burlington). However, this will provide Burlington 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*

Two types of construction are typically considered – traditional and design/build. As noted above construction costs for traditional construction is approximately $650-$750 per square foot across North Carolina for fire stations. The design build model may reduce that cost into the $450-$600 per square foot cost range. The graphic below is an illustrative example of a recent design/build approach in nearby Wake County.

OWNER: Town of Fuquay-Varina

DELIVERY METHOD: Design-build

PROJECT DESCRIPTION: The new 12,000 sqft facility will include separate space for both Fire and EMS comprised of drive-thru apparatus bays, administrative space, living accommodations, cubicle space, locker rooms and an antique truck and history room.

FINAL COMPLETION DATE: September 2023 *(Estimated completion)*

GENERAL COST INFORMATION: Costs for a new fire station can vary depending on many factors. In today's market, construction costs for a fire station similar to Fuquay-Varina Fire Station No.17 are ranging from $400 - $600/sf, which includes all the plans, permits and construction costs. The site work is the biggest variable and can have a significant impact on the cost of the station.

CONTACT REFERENCE:
Jim Jones, *Deputy Fire Chief*
(919) 753-1003
jjones@fuquay-varina.org

New Facility Needs Illustrative Example - Pittsboro:

In FY 23-24, NCFCC conducted a needs analysis for Pittsboro in partnership with a local fire station specialist architect to estimate fire station construction minus land acquisition based upon prevailing prices in mid-2023. Fire station construction has increased dramatically in recent years, post COVID at approximately 20% per year. The estimated needs size for one of the four stations identified in this analysis to provide approximately 12,227 of functional space will require approximately **16,158 square feet of construction**. Cost of this construction in the traditional mode would be **approximately $11-$13 million**. Utilizing the design/build approach could potentially reduce the total cost of the project to $10-$12 million.

Initial programming needs for any one of Pittsboro's new future fire stations is outlined on the page below.

FIGURE 43: Future Pittsboro Fire Station Initial Estimated Programming Needs

PITTSBORO	9/24/23					
Space	**Current Size**	**Needed Size**	**Notes**	Estimated Size		**Notes**
Vehicle Bays	3 bays	3 bays		1,600		
				1,600		
			Engine, squad, ladder. If rescue or brush truck is placed there depending on location, then a 4th bay would be needed.			
Turn Out Gear		35		420		
Shop			We would like to have a tool/shop room to repair small equipment	120		
Decon Room			Decon room with stainless steel sink and Emergeny Shower / Eyewash area	400		
Decon Vestibule				120		
Tool Air Comp / SCBA Cascade Room			Air Compressor will be needed and should be housed in a separate room to reduce noise. Tool Room/Shop should not house the air compressor	168		Cascade and breathing air compressor plus room for tool compressor
EMS Storage			Station should include an EMS closet to store medical supplies	36		A/C Reqd.
Sprinkler Riser			Sprinkler riser can be placed in the apparatus bay	0		
Haz-Mat Storage			Storage for fuel for small equipment. Storage room for lawn equipment	120		
Outside Equipment Storage			N/A	0		
Mechanical / Storage Mezzanine			N/A	400		Mechanical Equipment, water heater(s), etc.
Electrical Room				120		Main Switch Gear, ATS, etc.
Hose Drying			Hose dryer	120		20' Wide bays allow for hose drying racks, showing additional sqft for optional tower
Hose Dryiing Tower (Optional)			Incorporate with training tower	0		8x8 fore hose drying only, or include stair case and landing(s) for training. Revise to 2 or 3 story and 240 - 400 sf per level
Dayroom			10 People. Day room to include Recliners, Wall Mounted TV and AV Equipment, along with a display cabinet. Separate from kitchen and dining area.	500		
Kitchen			Stove, Dish Washer, Commercial Refrigerator, (3) walk in pantry closets, Microwave. Kitchen table for 10p	700		Includes Dining, 3 refrigerators, one for each shift.
Dining Room			Open area with kitchen			Included in above
Individual bedrooms.			Individual bedrooms with 3 beds, one for each shift. 3 closets in each bedroom instead of lockers			
				1,500		
Exercise Room			Room designed for 10-12 workout machines	800		
Toilet/Shower/Locker Rooms or Individual Toilet/Shower Rooms w/ Locker Alcove			3 Bathrooms with separated pods for shower and toilet	1,440		
			Linen storage in bathrooms	0		
Residential Laundry			N/A			
Linen Closet			No			
Janitor Closet			Janitor Walk-In Closet near Laundry Room	64		
Lobby			Small lobby	140		
Walk-in Triage/Visitor			No	0		
Public Restrooms			Yes. One male and one female	128		
Receptionist			Yes. Secretary office	140		
Radio / Report Room			Yes, 2 work stations and network printer, radio/communications equipment	120		
IT Equip Closet			Comms equipment	64		
Dispatcher			No	0		
Chiefs Office			Station Supervisor Office w/ Desk, File Cabinets, Small Conference Table, Bookcase, Closet	280		
Additional Offices	6			360		
Training Room			Large Training Room to seat up to 20 people	700		
Community Room			Combined with Training Room			
~~Toilet Rooms~~			~~One male one female at training room~~	0		
Vending Area			No			
Work/File Room			No			
Conference Room			No			
Library			No			
Training Opportunites In-House & On-Site			No			
Separate Facility Users			No			
Outdoor Patio			Yes, Covered. Outside of public view	67		200 sf Undercover (indicating 1/3 size in sf tally for costing)
Parking			40 Daily Spaces			
Backup Generator			Full Building, Natural Gas			
Net Square Feet				12,227		
Grossing -Bays	10%			320		
Grossing - Building	40%			3,611		
				16,158		
			Projected Costs			
			Low @ 550	$8,886,790		
			High @ 650	$10,502,570		
			Total Project 80/20	11,108,488		
				13,128,213		

Appendix G - 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%).

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.

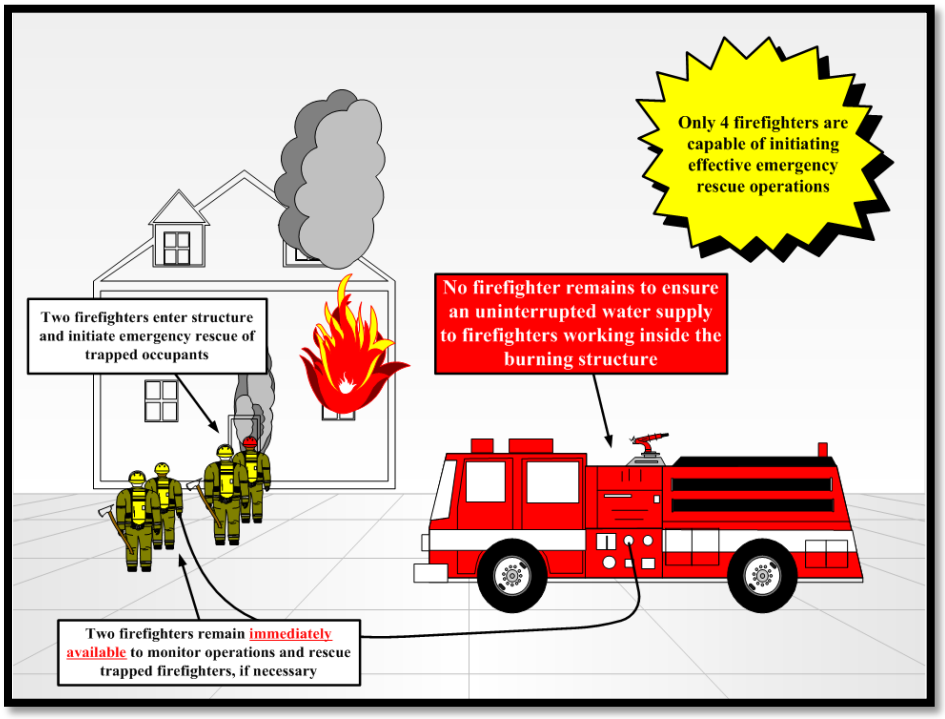
Travel time = 4 minutes or less for fire calls or medical calls.

Effective response force

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

Appendix H – 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 I – 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.

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.

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