



**Final Report
Fire Facility Plan
With Fleet Study
Zebulon (NC) Fire Department**

February 15, 2018

**Presented by:
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Brooks Innovative Solutions**

*Brooks Innovative Solutions is a NC based small business organized as a Sole Proprietorship and
Dedicated to helping clients find and implement the most innovative solution available.*

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Forward

Brooks Innovative Solutions has been contracted by the Town of Zebulon Fire Department to conduct a fire facilities study. This study began with three main components. During site work for the existing facility assessment it was obvious that the fleet represents a significant investment for the Town and presents a number of concerns and issues, including reliability and space requirements. An additional element was added to conduct a fleet study as part of the overall project. The four components of the study are existing and historical service demand and growth along with future projections, an existing facility assessment, a fire station location study analyzing the current station location and land secured for a future sub-station, and a fleet study. The study results in analysis and recommendations for improvement.

This firm is a North Carolina based small business wholly focused on helping meet the needs of organizations like the Town of Zebulon Fire Department. Brooks Innovative Solutions facilitates strategic planning and community stakeholder input, analyzing existing and modeling new fire station service areas, and conducting executive and management assessment and training focusing on Social Style and Versatility. Brooks Innovative Solutions is actively engaged with national and international professional fire organizations, is certified for training by The TRACOM Group, and holds Academy Membership with the National Speakers Association.

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Acknowledgements

The following persons played major roles in data and information collection and documentation, and provided their valuable perspective during the conduct of this study. We thank each of them individually for their assistance and credit them for any success resulting from it. The study was conducted under the tenure of Fire Chief Chris Perry and we thank him for his leadership and for the cooperation of his staff and other members of the local fire protection and county government community.

Special acknowledgement is due for Chief Perry who served as the project coordinator. His work in ensuring the accuracy of data provided to us and ensuring our understanding and interpretation of that data was critical. He was a partner in the management of the project and was always available when needed.

The follow individuals were principal team members of the Town of Zebulon data and project team:

Chris Perry	Fire Chief, Project Coordinator, Project Management, Data/Document Collection
Wayne Dupree	Division Chief, Project Team, Station and Fleet Assessment
Mark Hetrick	Planning Director
Julie Spriggs, GISP, CZO	Senior Planner

The following individuals were principal contributors of data, information and perspective from other local agencies with whom the Town of Zebulon Fire Department partners with or is dependent upon for mission success:

Nick Campasano, CFO	Director, Wake County Fire Services
Darrell Alford	Deputy Director/Chief of Operations, Wake County Fire Services
Jonathan Olson	Deputy Director, Wake County EMS
Tony Bailey	Fire Rating Inspector, Office of State Fire Marshal
Vernon Ward	Fire Rating Inspector, Office of State Fire Marshal
Dale J. Roenigk	Lecturer/Director, NC Benchmarking Project, NC Institute of Government

Brooks Innovative Solutions Team

Paul D. Brooks	Business Principal, Project Manager, Principal Researcher and Analyst
Robert McNally	Beacon GIS Founder & Principal; GIS/Research Analyst, Fire Station Service Area Analyst



Executive Summary

The Town of Zebulon has experienced swings in growth and development over the last decade that have created both challenges and opportunities for the community and fire department. Following a period of quiet and calm after the booms of the tobacco and textile era in the last century, the town was experiencing growth again...even planning the town's first fire sub-station having purchased land where development was thought to soon follow. Then it happened... the economic downturn of 2008 and after. Development slowed to nearly a stop and the fire department's calls for service actually fell off by more than 7% in the first year of the recession. It was eight years before the demand for services return to the 2017 levels.

The region is rebounding however and growth for the town is projected to escalate significantly over the next decade and more. One regional economic study has projected that Zebulon's population could triple by 2030. The growth and service demands in this study support the possibility. Projections based on historical experience predicts growth but at a steady and slow rate. But the town is uniquely situated with the capacity to accommodate capital region expansion with open land, excellent transportation networks and a community that is ready. It has already started for the fire department which has experienced greater than 5% average annual growth in service demand each of the last three years. There are several large residential developments underway that have the opportunity to add over 7,000 persons to the base in the next ten years. Town population has grown by 10% since 2010 and the annual population growth rate for the last three years has average nearly 3%. The fire district has a population just slightly larger than the town making the total population being served by the Zebulon Fire department just under 10,000.

The demographics of the community reflect an emerging youthful populace. Only 13.5% of the town population is older than age 65 while 50% are less than 35 years of age. The community is becoming more educated as the economy shifts further away from agriculture and more towards services and technical professionals working at the large manufacturing facilities in the community. Median household income trails Wake County as a whole but is still outpacing that of the State of North Carolina.

This study evaluated and makes recommendations for three areas: Fire Station locations, an assessment of the existing fire facility, and a study of the fleet of fire apparatus. The fleet study was added as an amendment to the original project as it became more evident that there are fleet needs and the impact of the size of the fleet on the station and personnel.

This report finds the success of the department has masked the issues of an aged facility once near the central business district but now on the edges as the town has grown and developed in an opposite direction. Although the department has been able to earn a very good insurance rating for both the town (Class 3) and the rural district (Class 4) the town and rural district have not added resources to the



deployment model and now this one station fire department must protect 10,000 people in an area covering 29 Square miles; four square miles in town and twenty five in the rural district.

The town urban district and the rural district are intertwined and inextricable. The department has served both so well for so long that the jurisdiction is simply seen as the entire community. The county contributes to the costs of the services through the counties cost sharing program. Slightly more than 40% of the overall department budget is funded by county fire tax funding and the county has provided a pumper, a tanker and a brush truck to the department's fleet.

The study finds that the current and projected service demand and growth rates, based on historical experience of the last decade, do not support the construction and operation of a second fire station. The deployment model developed for the Town of Zebulon for fire protection resources in the course of this study does provide a very effective tool to begin considering future sites as growth and development continue beyond the five and ten year projection periods of this study, or if the environment significantly changes in response to elements not now readily obvious and identifiable. It would be to the financial advantage of the Town to begin looking at future land purchases during the next five-ten years.

Concerning the existing facility, it is overburdened and insufficient to meet personnel requirements for office space/privacy, adequate living quarters and privacy, equipment and supply storage, and fleet space. The outside area does not provide adequate space for training nor apparatus routine inspection and maintenance. There may be issues of non-compliance with regulations or industry standards.

The current station should be replaced. The next issue then is where a replacement station should be located. The current location (lot) is not large enough to accommodate a station that would meet the needs of the Town without adding a second or more stories, even if that were possible. The current site is not located to best serve the majority of the town's population density or service demand. This site does not help the department meet standards of cover for deployment in the urban and rural service areas meeting or approaching national or state standards and guidelines. Actual development and service demand growth has not occurred as originally predicted; therefore the property purchased on Green Pace Road is not located such that it is a viable location for relocation or expansion of fire services.

The size and nature of the fleet is much larger than that expected for a station and town of this size. However, it is a very large total town and rural response area served by this single station. The number of engines and the aerial device are more in line with a district of this size (29 Sq. Mi.) that might typically be served by more stations.



The Rural Response Rating System (RRRS) has determined, according to the ISO Fire Suppression Rating Schedule used nationally for insurance rating purposes, that the department should have three engines and one aerial device. The rural district also requires a tanker be available for deployment. The RRRS evaluates fire suppression deployment in a community but does not rate or make recommendations for other hazards and risks such as EMS, Rescue or Hazardous Materials.

In addition to the needed engines, aerial and tanker, the department also deploys a rescue unit, a brush truck that also serves as the primary EMS response unit, and the typical command and staff vehicles.

The size of the needed fleet, although meeting requirements and recommendations noted above, cannot be staffed or readily deployed with the current staffing complement. This study does not include a staffing element therefore there are no staffing recommendations, but it is obvious to note that the department cannot deploy the fleet it currently maintains based upon hazard and risk found in the district.

The study recommends the town relocate/replace the current station to a site that better meets the deployment needs and service level objectives for the town and district. The new station design should better address HIPPA and OSHA regulations, crew living quarters, office space to ensure personnel privacy, adequate storage space, and fleet/apparatus bay space.

The new site should provide adequate exterior paved areas for apparatus maneuverability eliminating backing of apparatus into the station and providing drive through capability. The design should also consider paved space for drill yard training evolutions if site size allows.

The new fire station service area matrix developed as part of this study strongly recommends selecting a site for relocation that is in near proximity to the intersection of I-495/US Hwy 64 and Arendell Ave. This area provides the most efficient location serving the greatest population density and demand for service while providing access to new development. The study also recommends that the town begin a fleet replacement capital budget program with emphasis on the following:

Replace Ladder 95, the 102' Aerial Platform, immediately.

Move Engine 92 to the first out unit position. Replace Engine 91 as soon as budget programming will allow.

The study recommends the department evaluate opportunities to downsize the fleet. When replacing the 102' aerial platform, replace with a quint, outfitted with a 75' or 85' straight stick aerial ladder that is also configured to provide rescue capacity. It is common in the industry to build rescue engines and rescue ladders to improve efficiency and expand unit capability. The reduction from a 102' platform to a 75'-85' stick better reflects the hazards found in the district, reduces considerably the overall vehicle and individual axle weight (GVW), reduces the over length of the apparatus, and better accommodates



the increased runs resulting from the rescue mission. This unit would very likely qualify for county participation under the cost sharing program

This summary has provided an overview of the major observations and recommendations of the study. The details to support these are found in the following report. The last chapter of the report has all recommendations made in the study.



Chapter I – Introduction

Scope of Work

Consultant provided services as described below:

The firm conducted through stakeholder input, data analysis, analytic projections, document and study reviews and geospatial analysis using GIS tools that leverage existing GIS data and mapping as well as the development of a specific fire station service and planning area model to achieve the following Fire Facility Plan Project Objectives:

Project Objectives

1. The firm and the Customer Project Manager produced a project work plan and timeline to provide process guidelines, milestones, tasks and estimated delivery dates.
2. Produce a comprehensive Fire Facility Plan and facilitate the final adoption process through the Town Council.
 - a. Town Council facilitation events will include:
 - i. Initial Council meeting briefing as part of the on-site orientation phase;
 - ii. Town Council Annual Retreat to present final recommendations; and,
 - iii. Regular Meeting of Town Council to answer related questions, and facilitate final adoption.
3. Facilitate an internal stakeholder input process which will include:
 - a. Orientation session with ZFD staff and local team;
 - b. Tour existing station soliciting input from station personnel;
 - c. Tour proposed Future Station Site; and,
 - d. Meet/Interview key internal Town of Zebulon and other stakeholders.
4. Conduct comprehensive analysis for evaluating and testing the department’s community risk and standards of cover studies and objectives including current and future deployment.
 - a. All references to analysis and evaluation of stations, apparatus and staffing mentioned here or elsewhere in this Service Agreement shall include references to and comparison with Insurance Services Office (ISO), North Carolina Department of Insurance (NCDOI) Response Rating System, Commission on Fire Accreditation International, National Fire Protection Association (NFPA) guidelines, state and regional market city comparisons and other industry best practices.
5. Conduct an analysis of the existing facility for the purpose of identifying deficiencies and developing recommendations for improvement.
6. Prepare projections of future service demand and growth factors along with recommendations for future resource deployment.



-
7. During the course of observations and data collection related to the existing fire facility it became obvious that fleet requirements and issues are contributing to the concerns and limitations of the facility and replacement needs for apparatus. Both parties to the original agreement prepared and executed an Amending Agreement to add the following objective to the scope of work:
 - a. Conduct a comprehensive analysis of the existing fire and rescue fleet inventory for the purpose of recommending appropriate fleet components and capital budget plans based upon existing and projected hazard and risk, service demand, comparative analysis with standards, industry guidelines, insurance rating, and comparative market communities, and in accordance with statement 4.a above.

In addition to these stated objectives and scope of work, the firm shall leave with the ZFD an electronic copy of the Fire Station Service and Planning Area Model for the Customer's future use.

Study Process

A tremendous amount of work was done by the ZFD Team in providing relevant documents, reports and raw data or specific reports as requested by the study team. Fire Chief Chris Perry and Senior Planner Julie Spriggs contributed the majority of the vast library of data and documents made available to the consultant. Document reviews have contributed to the body of knowledge for this report. The local team has been very responsive in following up to requests for information based upon the document reviews, or making modifications to reports to add value or improve understanding.

Data collection and analysis utilizing already existing resources and creating new views of existing reports or data files helped answer standard questions and also contributed to the identification of new questions and findings. The availability of some data, the format of available data, or the process for retrieving data has been challenging at times during the study for the local team and the study team. This was especially true in attempting to collect data or present data related to critical response time elements. For these reasons there are limited references or analysis of alarm handling times for incidents and units.

Two opportunities were provided for members of the ZFD team to provide stakeholder input into the assessment of the existing facility and the current condition of units of the emergency response fleet. A project orientation meeting was held that helped tremendously in understanding local practices, data sources, and the local teams understanding of the scope of the project and the study team's needs. A Stakeholder input session was conducted immediately following the orientation with on duty staff and off-duty or volunteer members to offer direct stakeholder input and raise stakeholder's awareness of the project scope. To expand upon the breath of input, specifically related to the existing facility, a survey tool was used to get input from any member who wished to participate. The invitation was sent



to thirty-eight members, both volunteer and full-time, and received twenty full responses for a 53% participation rate. Each of the twenty responses had a 100% completion rate. This is a high participation rate and provided much needed insight into the existing facility by those who use it most.

An orientation briefing was provided for the Town Board of Commissioners and the Town Manager, Joe Moore.

A second face-to-face opportunity for department stakeholder feedback was provided when conducting on-site field work for assessment of emergency response apparatus. Station shift personnel were interviewed about each major piece of apparatus and provided their responses which were recorded in individual apparatus assessment forms. A unit database was created using this information supplemented by more detailed information provided by the Chief from department records of maintenance costs, etc.

Performance data was provided for review by the local coordinator upon initial review and assessment of service demand and future demand for service projections. Numerous conversations were conducted electronically or by phone concerning the data available for analysis. Incident data has been recorded in a format that has met local reporting needs but which will not be in the format necessary for a full external comparison, especially for fire service accreditation. The specific data that was not available was complete alarm handling data. This data was only available for calendar year 2016, and in the opinion of the consultant, that data was not a complete representation of the total alarm handling activity.

A briefing was conducted with the Chief and Division Chief once the first fire station service area matrix was created. The matrix serves as the model and framework for evaluating existing and future fire station service areas. This briefing and the feedback received was very helpful to the overall project.

Interviews were conducted with a number of personnel, some internal and some external to the Town of Zebulon. The ZFD Project Coordinator was available and also reached out to other ZFD staff when necessary for additional information or interpretations.

The Director and Deputy Director of Wake County Fire Services provided support and communications electronically, by phone and in person on a number of issues including the ZFD and Wake County service agreements, the cost sharing program for funding the rural insurance district services, the Town and rural district insurance ratings, fleet and facilities concerns, and performance and demographic data collected by the Wake County Fire Services office. Director Campasano and Deputy Director/Chief of Operations Darrell Alford were very supportive and open in their assistance for the benefit of the Town and rural district and the study team.



The Town of Zebulon Planning Director, Mark Hetrick, and Senior Planner Julie Spriggs were interviewed and provided valuable information concerning growth and development, both historically and for current projects underway. The planning staff and other town staff provided critical documents and data. Ms. Spriggs was especially helpful in posting a tremendous amount of data, reports, and GIS mapping and material produced by or influencing the Town. The Planning Department provided invaluable information related to current zoning and land use, and insights into future development, focusing on specific projects.

In addition to providing data from departmental assets, the ZFD project coordinator provided tours of the existing fire station and of the Town and rural fire districts. The Division Chief was very helpful in providing access to fleet assets and providing data and information as requested. The principal researcher for the study team made several visits to the jurisdiction to gather data or visit sites.

The study team utilized performance, service demand, and other GIS infrastructure and demographic data to analyze the current existing conditions and station service areas. Robert McNally, Founder and Principal for BeaconGIS served on the study team providing geospatial analysis and evaluation. A Service Area Matrix was created for the ZFD jurisdiction that identifies recommended service areas for existing and future stations as well as contiguous areas served by neighboring resources. The size and orientation of the service areas in the matrix are directly related to response capability and desired outcomes. The matrix provides a model to collect and assess various data elements that evaluate factors contributing to growth, service demand and service capacity or performance. The model also helps to quantify threshold values for deployment, capital decisions and provides a communicable view of the community's decisions regarding acceptable and unacceptable risk.

Regression Analysis

Workload and service demand current and future trends were identified primarily through trend analysis of historical experience using regression analysis tools. Most regression analysis was conducted using linear regression. When a standard reliability formula that was applied to every measure of the regression analysis was moderate, a second method, exponential regression was used. Both methods were presented with the resulting trend line reliability calculation result. In a few cases trends were also evaluated with a standard rolling two year average method. To ensure credibility of the results, forecasting tools were also used to validate or challenge the regression analysis. Two methods of forecasting, Growth Trend and Linear Trend, were used and averaged to arrive at specific service demand targets for each of the next seven years for the jurisdiction. Regression and Forecasting analysis are common statistical tools for predictive analysis and can be replicated by the agency or any other external stakeholder utilizing the same variable and non-variable data set(s).



Report Organization

The report is organized in chapters to present the findings of the study while satisfying the scope of work and the major objectives of assessing the current facility, determining potential new or future station locations for the jurisdiction, and evaluating the fleet and make appropriate capital recommendations. There are five chapters:

Chapter I – Introduction

Chapter II – Development Scan

Chapter III – Service Demand

Chapter IV – Fire Facility Assessment

Chapter V – Fleet Study

Chapter VI – Recommendation Summary

Chapter II – Development Scan

Community Description

The Town of Zebulon is a dynamic community located in Wake County and the capital metropolitan area in central North Carolina. As reported in the Town’s Code of Ordinance’s Diagnostic Report, Executive Summary (2013), “... the town is facing an increasing amount of development pressure. Zebulon is a mere 24 miles from downtown Raleigh and is one of the last areas in Wake County with the capacity to accommodate major growth and development. Zebulon’s population is projected to more than triple over the next 15 years, from about 4,500 people today (2016) to about 15,000 people in 2030. The town has already begun to see evidence of this growth pressure. As Zebulon has emerged from the recession of 2008, it has experienced an increase in its

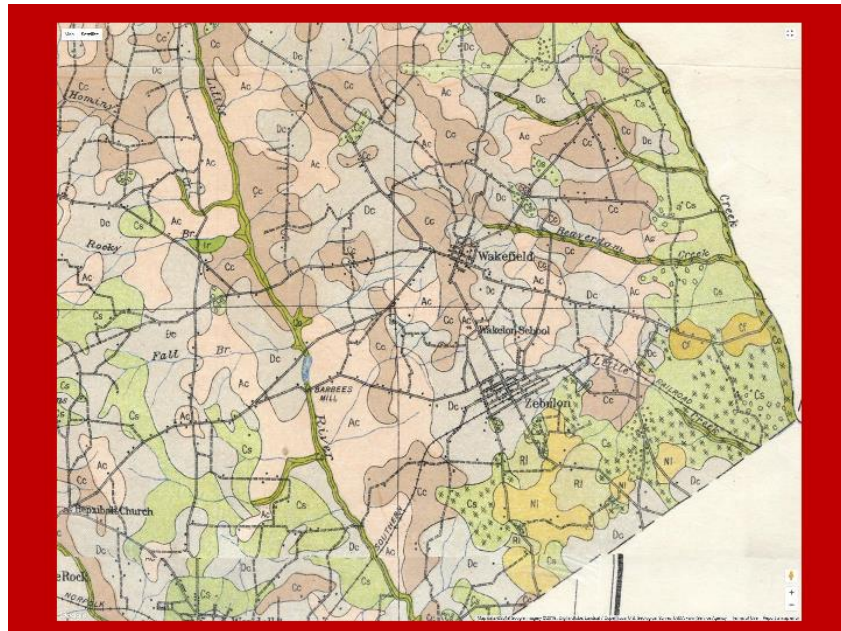


Figure 1 – 1914 Soil Map of Wake County and Zebulon. Source: Washington, DC: US Bureau of Soils and North Carolina Department of Agriculture, 1914. NC State Archives, Google Earth.

development activity, from about 13 housing permits in 2011 and 2012 to more than 50 in 2013.” In fact, the NC Capital Area Metropolitan Planning Organization (NC CAMPO), in its *Northeast Area Study-State of the Region* summary report released in 2014 states that Wake County is the 9th fastest growing county in the nation. According to CityData.com, the issuance of building permits has continued to climb with 89 issued in 2014 with an average cost of \$134,800. The 4 mile stretch of US 64 between Raleigh and Rocky Mount has been designated as I-495 since December 12, 2013.

Originating as a small community impacted by the construction of the Raleigh Pamlico Railroad around 1905, the town was incorporated on February 16, 1907. The town experienced rapid growth in its early years and purchased its first fire truck in 1923. Just prior to this, according to a brief departmental history provided by Legeros.com, the fire department, comprised of fifteen volunteers, operated hand pulled hose reels from three fire stations located around town. The once rural community has taken on a very suburban flavor. The rapid growth of the last century, fueled by the railroad and a robust tobacco market, hit a speed bump during and after the Great Depression. The tobacco market closed during the

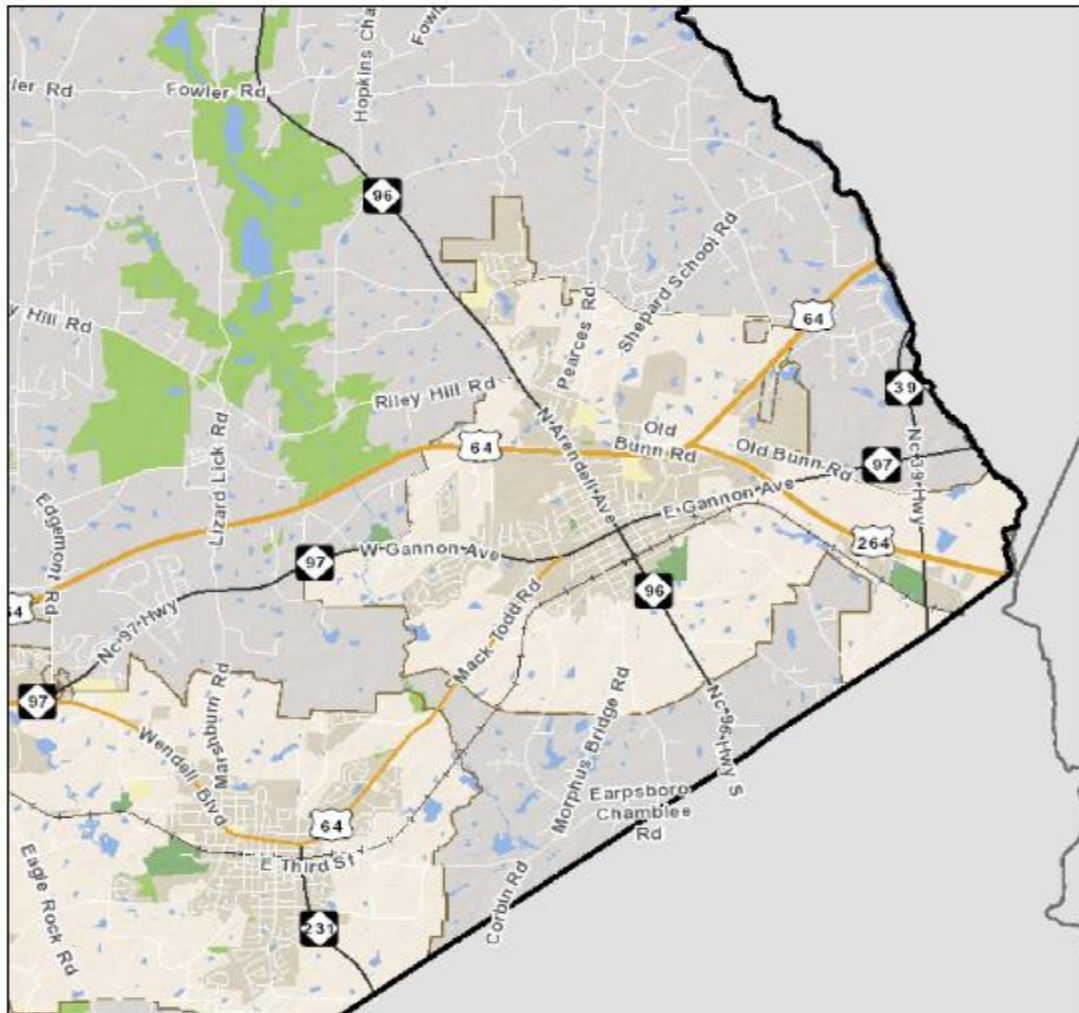


Depression and the railroad has since closed. There is some rail traffic picking back up on the line. The early 21st Century saw an economic resurgence and associated growth that was again stymied with the 2008 Recession. As reported in the preceding paragraphs, growth has again returned and Zebulon is poised to accommodate significant population and housing growth over the next decades.

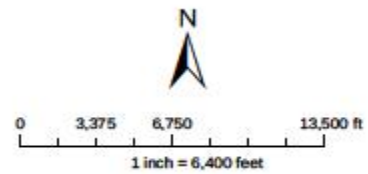
The town is geographically buffered by rural areas but in close proximity to other small municipalities experiencing their own growth resurgence. Zebulon is in a prime position to be able to accommodate growth resulting from Wake County's position as home to the Research Triangle Park, State Capital Region, Raleigh-Durham International Airport and major transportation networks and roadways that have aided economic activity throughout the county. The town area is approximately four square miles while the Wakelon Fire Insurance District covers approximately 25 square miles. The town has developed principally in a linear fashion along the interstate and state highway corridors. The town is approximately five miles in length north to south along the NC 96 corridor. It is approximately four miles wide generally following the I-495-US 64 and NC 97 corridors. Most opportunity for development lies to the east/northeast and to a more limited degree to the southwest; the watershed areas and the future reservoir area limits any significant growth to the north/northwest.

Transportation infrastructure, including major roadways and a rail line, continue to present significant barriers for development and deployment. A major regional roadway bisects the community. NC Highway 96 runs the length of the Town from north to south. This road intersects NC Highway 97, which runs nearly parallel to I-495/US 64. Interstate I-495 runs essentially the length of the town on an east/west axis. This interstate creates a major barrier for emergency services with the very limited cross over points. There are only two bridges in the town area and only one of those has ramp access to the interstate. There is a significant interchange at the junction of I-495/US 64 and US 264 but this is primarily a junction rather than an access point to any of the roadways from local streets and roads. The available ramps are sweeping merge lanes for the major highways.

The rail line generally borders the town to the south. The town was developed by the railway in the early 1900's. The original rail company has long since gone out of business and the last major operator, Norfolk Southern, now leases the line to Coastal Carolina Railway. This rail company primarily provides business freight services along its routes and provides connectivity to major carriers at hub sites. Although serving customers all along its route from Raleigh to the coast, ITT Hi-Cone was their local customer whom they served in Zebulon.



Town of Zebulon



Disclaimer
 Maps makes every effort to produce and publish the most current and accurate information possible. However, the maps are produced for information purposes, and are NOT surveys. No warranties, expressed or implied, are provided for the data therein, its use, or its interpretation.

Figure 2 - Town of Zebulon and Other Jurisdictions: Source – Wake.gov/IMAPS

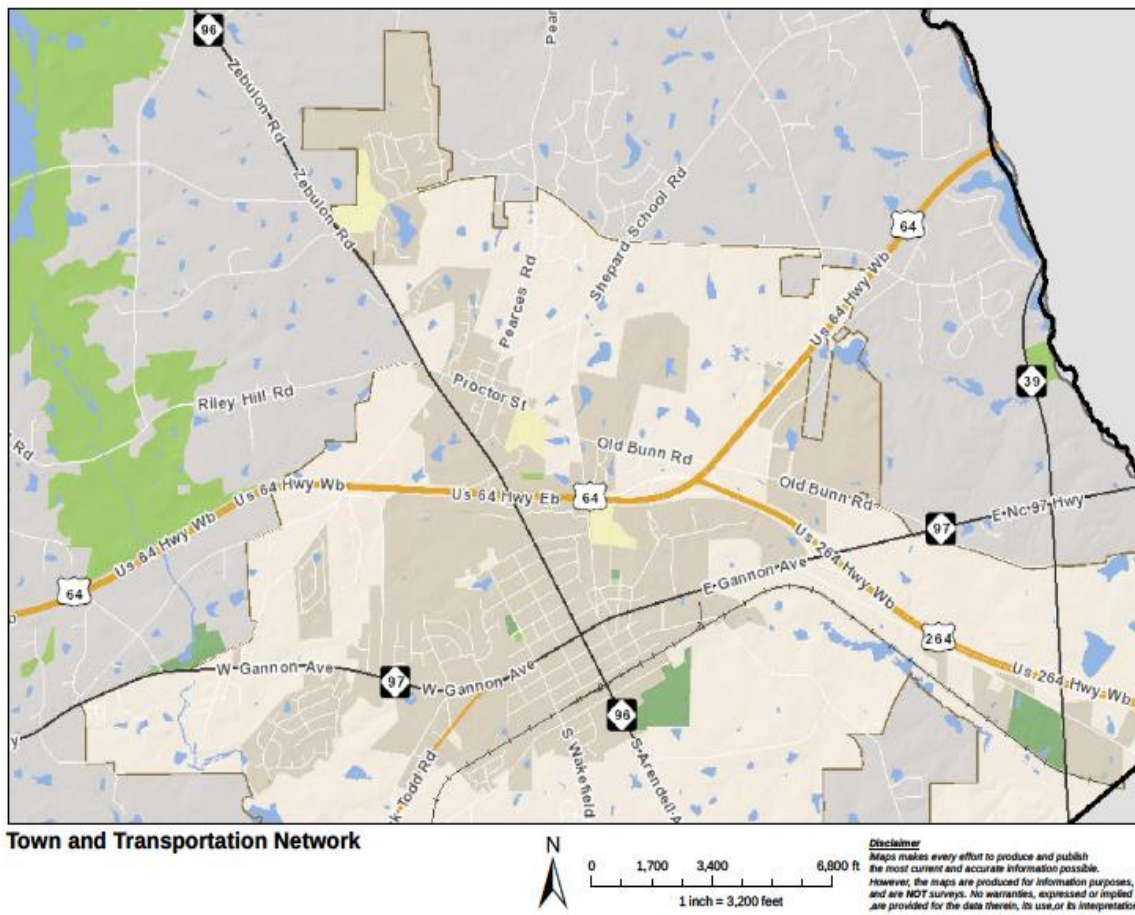


Figure 3 - Town of Zebulon Boundary and Major Transportation Network: Source – Wake.gov/IMAPS

Population and Demographics

Population growth in the Town of Zebulon has been slow and steady. The population in the year 2010 was 4,433 persons. In 2017 the population is estimated at 4,865, an increase of nearly 10%. It should be noted that there are several different estimates of population, depending upon who issued the estimate. Regardless, all entities are in agreement that the population for the town has increased at a steady rate and continues to closely follow the population growth rate of the county and far exceeds the growth rate of the state. In this study, except when citing the county’s comparison between the town and the rural district or in the cost sharing formulas, we have used population estimates provided by the US Census Bureau; American Fact Finder.

POPULATION GROWTH SINCE 2010		
YEAR	TOM.POP.EST.	% Chg.
2010	4,433	
2011	4,445	0.27%
2012	4,489	0.99%
2013	4,535	1.02%
2014	4,590	1.21%
2015	4,690	2.18%
2016	4,813	2.62%
2017	4,865	3.73%
AVERAGE		1.72%

Historical Table 1 - Population Growth since 2010:
Source – US Census: American Fact Finder

For the eight year period since 2010, the year of the last formal census, the overall town population has grown by 432 persons, a 10% increase, with an average annual rate of increase of 1.72%. According to the American Community Survey – 2016, Zebulon has a young and racially diverse population. Only



13.5% of the population is older than 65 years of age while 50% of the population is under 35 years of age. Median household income trails Wake County by 38% and exceeds the state median household income by 6%. The population is becoming more educated with more than 19% of those 18 or older having earned a bachelor’s degree or higher and 81% of the total population having graduated high school or higher.

According to the community’s Wikipedia profile, GlaxoSmithKline is the largest employer in Zebulon.

Reports vary but it is fairly certain that the company employees approximately 1,500 persons at its manufacturing facility on the Zebulon campus. Other large employers in the town include US Food Services, Inc., Nomacor LLC, Nomaco, Inc. and Devil Dog.

Zoning and Future Land Use

The current Comprehensive Plan is undergoing a revision. Land use however is not likely to change. The parcel zoning and land use plans of the town and the Southeast Wake (County) Area Land Use Plan are generally in concert for most of the developable land within the town's extra-jurisdictional area and those county areas immediately adjacent. The Town has planned the principal land use in the areas currently experiencing the most activity, and the areas providing the most promise for development as Medium Density Residential. Specific zoning classifications are R-13 and R-20 both of which are low to moderate density.

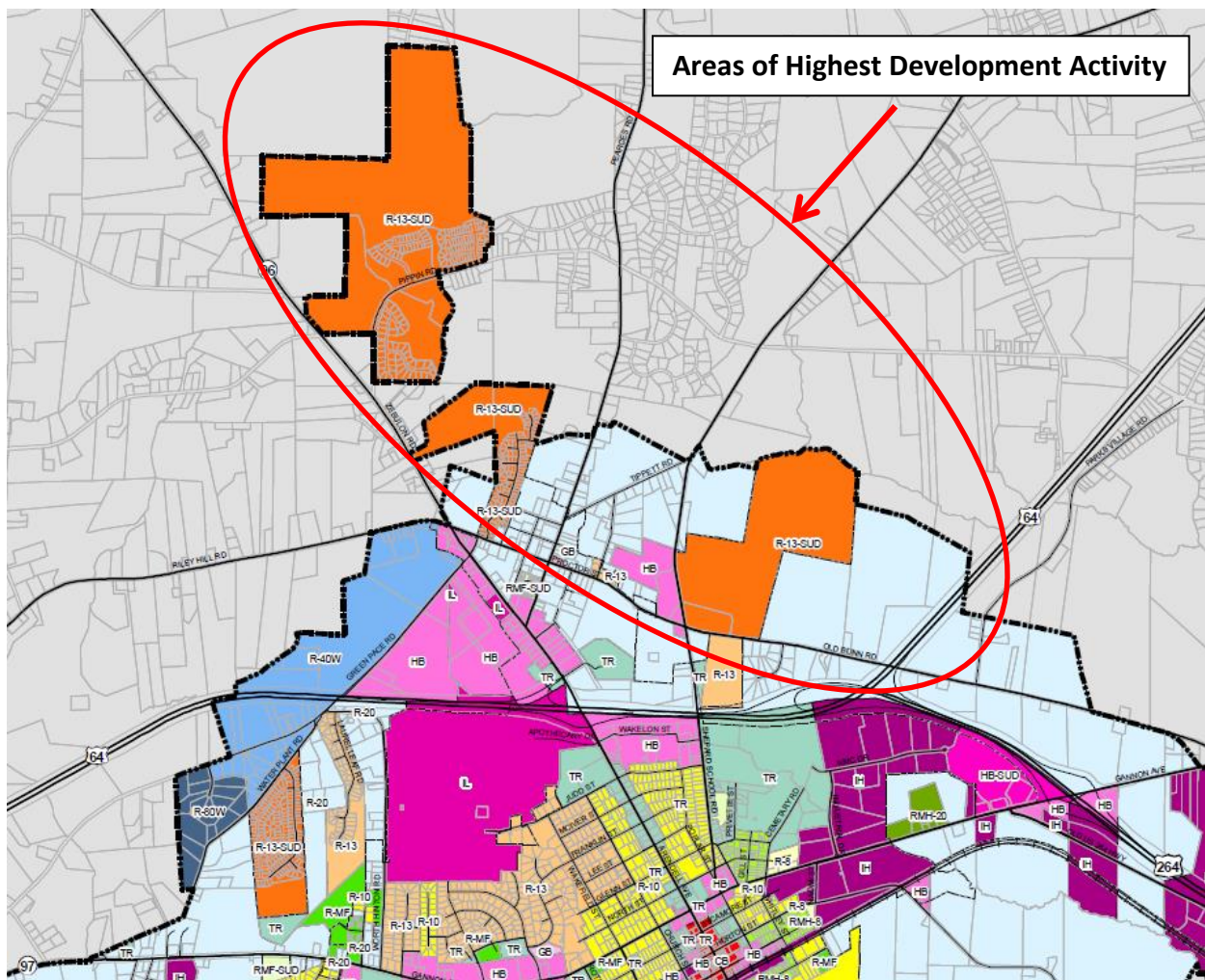


Figure 4 - Town of Zebulon Zoning - Northeast Areas

Any significant business or industrial development is planned for the areas along the Hwy 264 corridor. The principal land use and zoning categories are light to medium industrial, some mixed-use, and highway business.

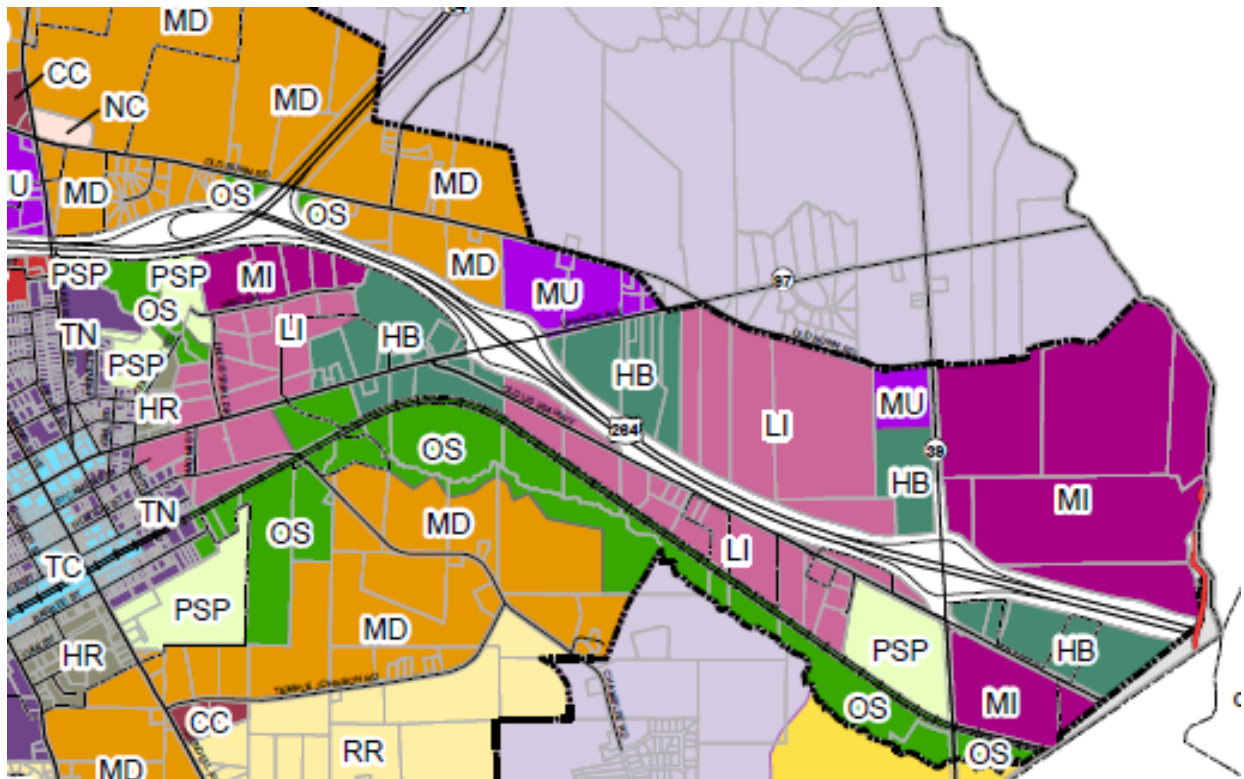


Figure 5 - Zebulon Land Use - Eastern Extension

For land located outside of the town's extra-jurisdictional areas, the county has established land use through its Unified Development Ordinance and area plans. Two area plans impact Zebulon. Land area located contiguous to the town in the southeast corner of the County is currently designated light to medium residential, 2-3 dwelling units per acre. (See Figure 8)

The land areas located generally along NC 96 and north of I-495/US 64 are restricted for development for watershed and the future Little River Reservoir. This essentially blocks development in this direction. (See Figure 9)

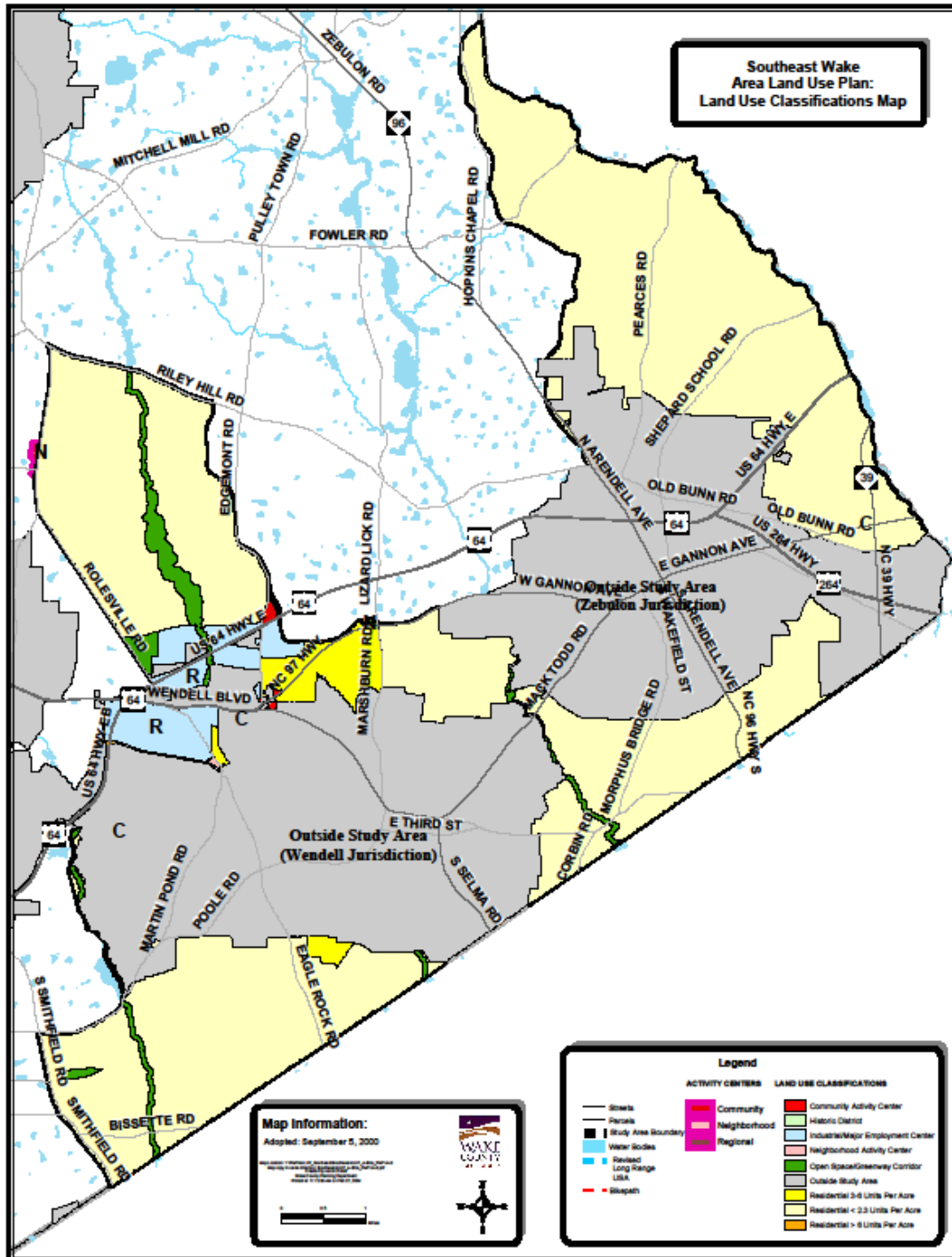


Figure 6 - Southeast Wake Area Land Use Plan

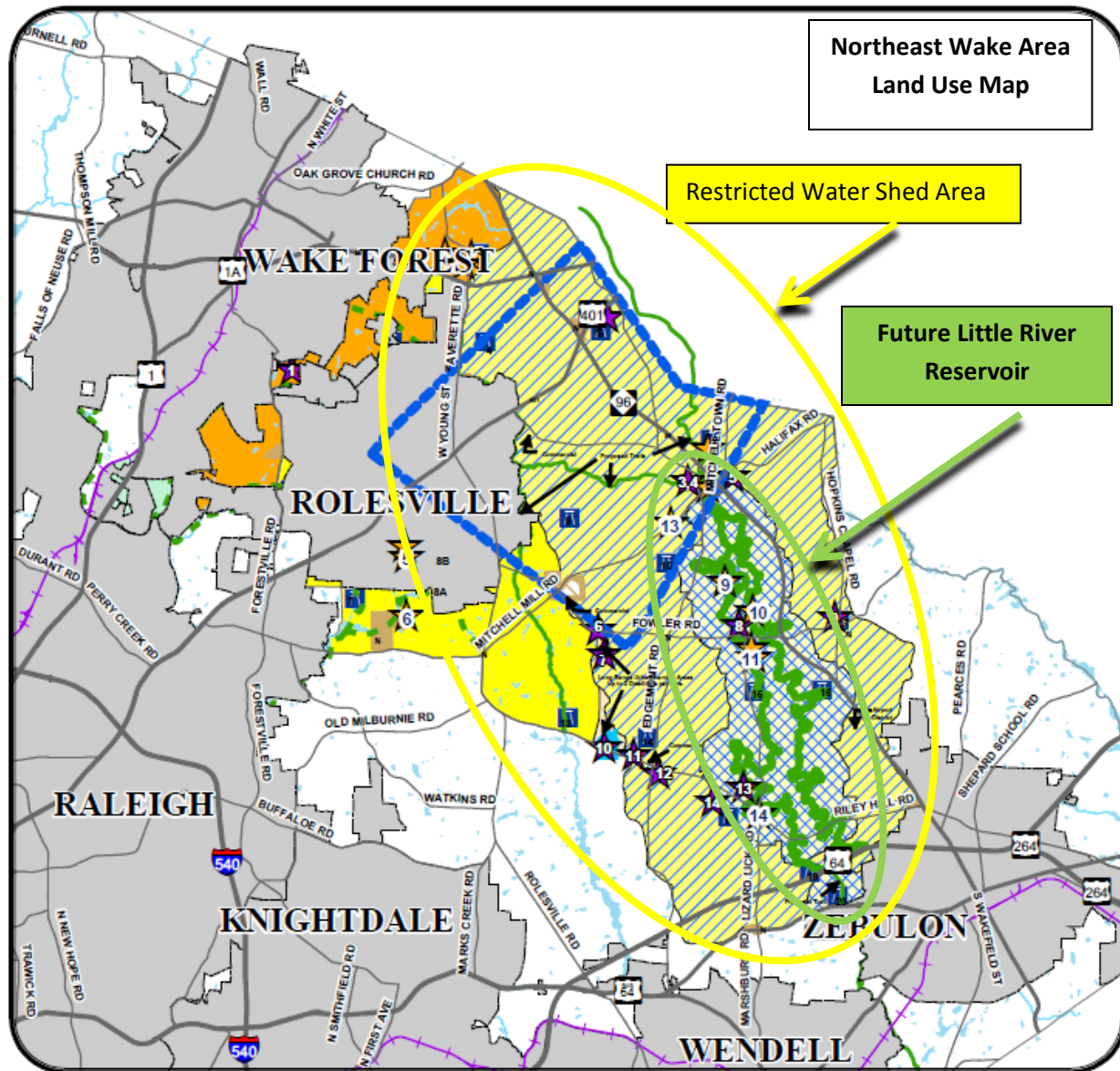


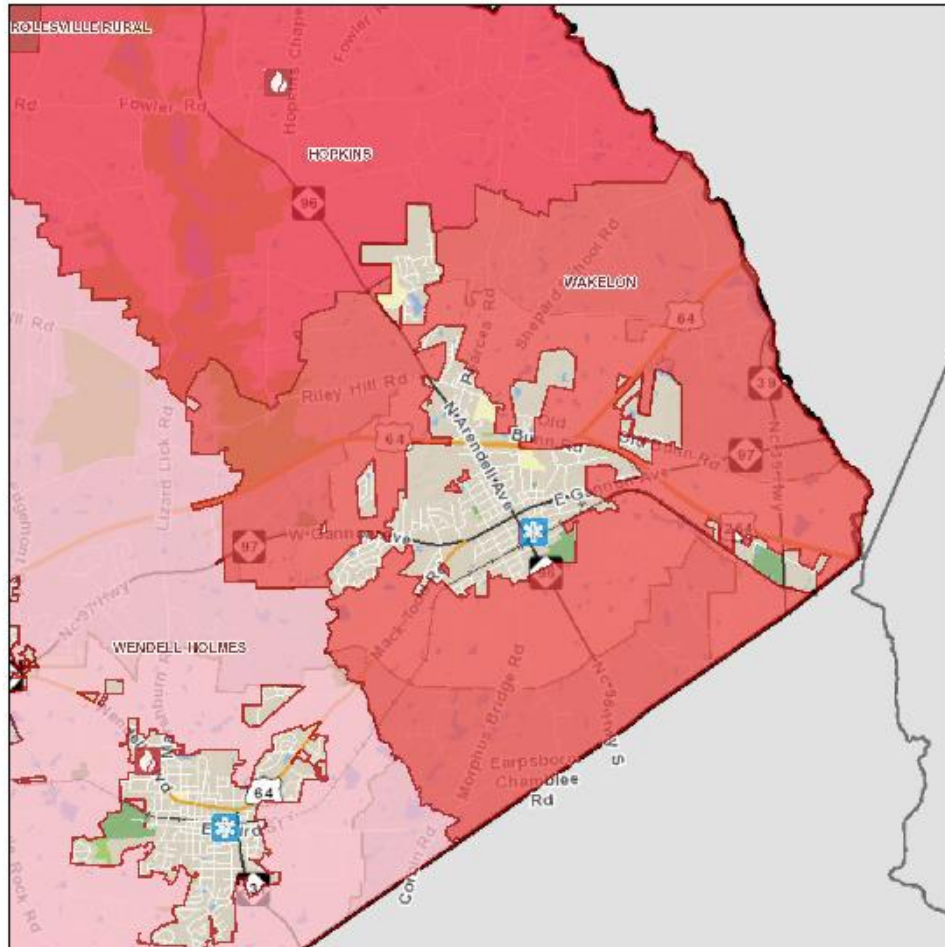
Figure 7 - Northeast Wake Area land Use Plan

Rural District

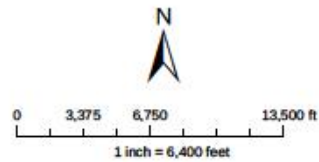
Areas of the rural district not in the town’s extra-jurisdictional area are covered by the Wake County Land Use Plans which designate future land use as low to moderate residential.

The rural district will continue to shrink reflecting Zebulon’s annexation of developing properties. The actual effect on the rural district will be small considering its size compared to that of the town and its extra-jurisdictional area. It is expected that the county will continue to contract with the town for the

rural district. The town is providing acceptable service to the County considering the relatively low risk and low service demand.



Wakelon Fire District



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Figure 8 - Wakelon Fire District



The town is included in the Wake County Fire Services Cost Sharing Program and a substantial portion of the town's fire department budget is unwritten for services provided to the Wakelon district. The county also has provided an engine, a tanker and a brush truck to the fleet of apparatus.

The source for comparative data for the rural district and town overview comes from the Office of the Director, Wake County Fire Services with 2017 valuation estimates and 2016 population estimates.

The rural fire district covers a total area of 25 square miles, nearly 85% of the total area served by the ZFD. The area of the rural district has been shrinking slightly; primarily from the annexation of areas by the Town of Zebulon. The valuation of the rural district is \$497,625,765 while the town's valuation is \$705,206,281. According to Zebulon incident reports, calls for service in the rural district represent 27% of the total ZFD calls for service in 2017 (including responses to other districts or municipalities.) The rural district represents 50.1% of the total population protected by ZFD and 41.37% of the total valuation. The rural district represents a significant responsibility for the ZFD. There are 1,961 dwelling units in the district, primarily single family homes, housing a population of 4,997 people.

The rural district will not significantly change in the next five to ten years. The annexation of areas, primarily residential developments, will likely continue to shrink the rural district somewhat, but with changes to annexation laws, the rate of area change from rural to town will likely continue at a rate similar to the last five years. Most of the changes will occur in the eastern and northeastern areas of the district.

Wake County Fire Services indicates no desire to change their relationship and considers ZFD their preferred provider for the rural district. The County has adopted a cost sharing program to fund nine municipalities in the county that also provide services to a rural district. The proportion of cost sharing is based upon an annual evaluation of five critical elements and the ratio between the element's value within the Town of Zebulon and the value of that element within the Zebulon Rural area. After weighting all elements, the calculation results in a percentage for cost sharing and that percentage is applied to 100% of the ZFD operational budget as submitted to Wake County. The same percentage for cost sharing will also be considered for capital expenses, including stations, apparatus and equipment on a case by case basis and when the capital expenditure benefits the rural district.

The cost sharing percentage for 2018 and 2019 are 42.36% and 42.59% respectively, based on three year averages. There is slight growth due primarily to an increase in rural district service demand. Service demand in the rural district increased at a higher rate than in the town. This resulted in a higher ratio. Ratios for population, valuation, area served and heated square footage essentially remained unchanged.

COUNTY COST SHARE PERCENTAGE		2016 Actual		2017 Actual	
FACTOR	WEIGHT	VALUE	RESULT	VALUE	RESULT
SERVICE DEMAND	35.0%	28.01%	9.8%	32.27%	11.29%
POPULATION	30.0%	49.28%	14.78%	49.24%	14.77%
VALUATION	20.0%	41.37%	8.27%	41.37%	8.27%
AREA	7.5%	84.38%	6.33%	84.19%	6.31%
HEATED SQUARE FOOTAGE	7.5%	31.70%	2.38%	31.93%	2.39%
	100.0%		41.57%		43.04%

Table 2 - County Cost Sharing

Future Growth

Future growth for the Town of Zebulon will be the result of continued buildout of current large residential developments, new residential development tracts, and other business related economic development. Most of the growth in the next ten years will most likely be the overflow from the Raleigh Metropolitan area. There will be opportunities to incorporate new developments seeking utilities and other town services. Using regression analysis, we can project population growth to provide a quick view of one growth factor that may contribute to increased service demand in the near future.

Population Projection

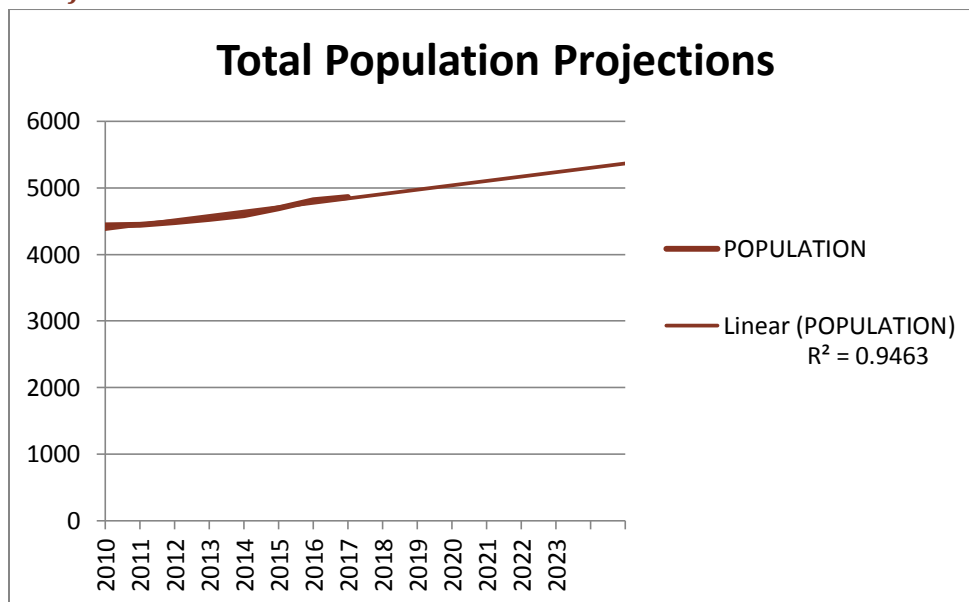


Figure 9 - Total Population Trend Line Projection



Total population will continue to keep pace with the surrounding area. It can be estimated that total population for the town will increase by another 400 people for an 8% increase by 2023, growing at an annual average rate between 1-2%.

TOWN POPULATION			
	Growth Trend	Linear Trend	Average of Trends
YEAR			
Forecasting	Linear	Growth	
2010	4433	4433	
2011	4445	4445	
2012	4489	4489	
2013	4535	4535	
2014	4590	4590	
2015	4690	4690	
2016	4813	4813	
2017	4865	4865	4865
2018	4903	4909	4906
2019	4969	4979	4974
2020	5035	5050	5042
2021	5101	5122	5111
2022	5166	5195	5181
2023	5232	5270	5251

Figure 10 - Forecasting Future Population Counts

Emerging Locations

There are projects in the planning and/or construction stage that can significantly alter the projections made in the previous section, which were made based upon historical experience. These projects can or will result in opening previously undeveloped or under-developed areas to new and specific development that will impact the capability of the ZFD to meet service demands.

This is not a development planning study. There are studies or plans already addressing each of these areas and more. The following information includes highlights of the findings or implications of these studies and plans, and provides a heads up to changes on the visible horizon. The following information is provided thanks to information developed by the Town of Zebulon Planning Department.

There are at least seven new subdivisions under construction, built out, or nearing build out that can dramatically change the population forecasts for the town. The largest of these subdivisions are also the two that are farthest from fire and life safety protection in the newly developing area of the town. Weaver Pond located to the farthest point north near Zebulon Rd. /NC 96. Barrington is to the far east along Old Bunn Road. All but one of these subdivisions is located in the newest area of growth that is generally bounded by NC 96 to the west, Proctor Street and Old Bunn Road to the south, straddling I-495/US 64 and nearing NC39 to the east.

Additional Population Growth Centers		
Subdivisions		
ID #	Name	# Lots
1	Weaver Pond	779
2	Taryn Meadows	203
3	Taryn Creek	60
4	Shepard's Park	124
5	Shepherds Point	45
6	Autumn Lakes	550
7	Barrington	837
8	Braemar	164
Total Additional Dwellings		2762
Potential Population Increase (2.66/Unit)		7347

Figure 11 - Additional Population Centers

When these subdivisions reach build out, likely in the five to ten year timeframe, and applying the average single family dwelling occupancy rate of 2.66 persons per dwelling, the total new associated population could be over 7,000 persons just in these new subdivisions. Adding these projections to the projects made earlier, which were based upon actual historical experience, **the total population for the Town of Zebulon in the next 10-15 years could be in excess of 12,000-13,000.**

Economic Development Centers		
Commercial/Industrial		
ID #	Name	Valuation
A	BB&T	\$34,162,770
B	GSK	\$280,984,582
C	NOMACO/NOMACORC	\$41,211,734
D	US FOODS	\$28,175,813
Total Valuation		\$384,534,899

Figure 12 - Economic Development Centers

The largest employers like GSK, Nomaco/Nomacorc and US Foods, along with new projects like the BB&T facility near N. Arendell Avenue and Green Pace Road, contribute substantially to the economic health of the community. They are also drivers of growth. These facilities will likely continue to add construction and processes at their current locations. They are also targets for companies doing business with them who wish to locate nearby.

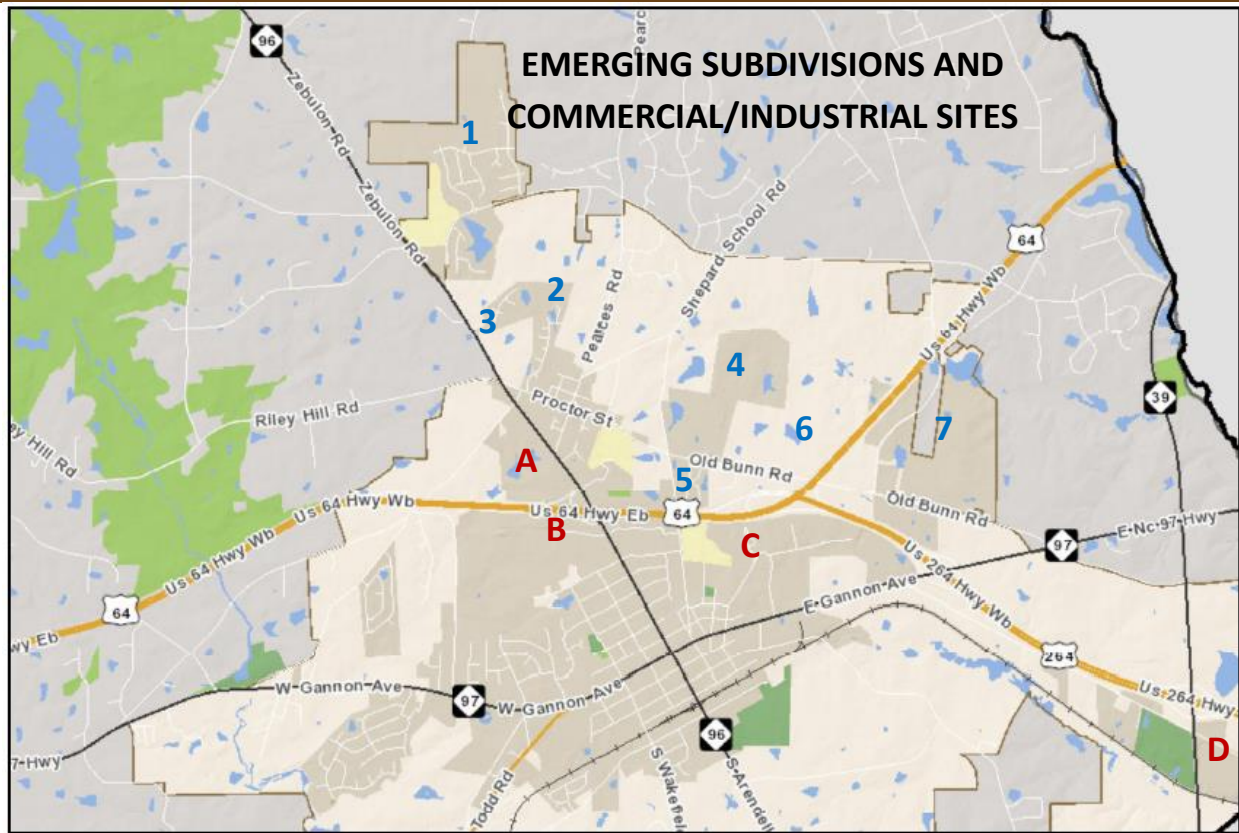


Figure 13 - Emerging Locations Map; Source - Zebulon Planning Department



Chapter III – Fire Station Location Study

The scope of work for the fire facility study included evaluation of the need for an additional fire station in the Town of Zebulon, and recommend locations for future stations. The Town acquired a property a number of years ago and an opinion and recommendation concerning that site was requested. Consideration for the entire ZFD jurisdiction, including the rural district was included in the analysis and station location modeling.

To comply with the desire to conduct comparative analysis where possible, the industry standards for National Fire Protection Association (NFPA) 1710 and NFPA 1720 were utilized, as well as the guidelines from the Center for Public Safety Excellence (CPSE), Commission on Fire Accreditation International (CFAI). NFPA 1710 and 1720 are both deployment industry standards. *The Fire & Emergency Services Self Assessment Manual* from CFAI provides guidance for industry best practices in establishing and measuring Standards of Cover performance. The ZFD utilizes NFPA 1710 and the CFAI guidance for deployment and performance measurement in the department. This station location study includes future projections and forecasts of service demand, and a fire station service area matrix and model that are not part of the SOC.

For the purposes of this study, incident level rather than unit level data was used in most cases. Incident data was analyzed at the largest category level. More detail of incident typing within major categories is available in FireHouse, the department’s incident reporting system, and from the CAD system. Ten years of data, from 2007/2008-2016/2017, was used in most analysis of service demand to provide greater accuracy in identifying trends and forecasts. Trend projections and forecasts were made for five and ten year periods, whenever possible, as specified in the scope of work.

Demands for Service

ZFD responded to 1,680 calls for service in 2016/2017 and a total of 15,256 calls for service in the period 2007/2008-2016/2017. During this period the overall service demand increased by 5.13% and the annual rate of change was .58%. During the ten year period, there were only three years when calls decreased, and in those years only by an average of -3.91%. The single largest year gain was in 2015/2016 with a 7.30% gain. The largest decline was in 2008/2009 at -7.13%. There was a clearly notable pattern shift at the five year mark in 2013/2014 with a rate of growth of 3.28%. The most recent three years have seen average growth at 5.46%. The most recent five year period experienced growth at a higher rate than the previous five year period. The total increase in incidents was 14.21% with an average annual growth rate of 2.36%. The most recent three to five year period is very likely more predictive of the future.

Rescue EMS calls continue to represent the largest service demand over the period at 72.08% of total incidents. Next were Good Intent Calls at 10.83% followed by Fires at 5.15%. Annual growth rate for



Rescue EMS Calls are less than 1% and Fire Calls actually decreased over the ten year period at a rate of .51%.

Other call types have experienced greater growth rates but the actual call volumes are much lower. Rescue EMS calls actually decreased slightly over the whole period and the average annual rate of increase was only .01% but represent 72.08% of the total responses. Hazmat calls have grown by 88.10% overall with an annual growth rate of 9.92% but represent only 584 total calls over the ten year period, or 3.83%.

The rates of change has increased somewhat for the most recent five year period but overall demand has remained rather flat at an overall percentage increase of 5.13%. The annual growth rate for this five year period was 2.36%, higher than the overall ten year period. This is likely due to the slow recovery of the community following the 2008 Recession and that the five year period includes a significant bump in responses during the Hurricane Matthew period and other severe weather events.

Table 3 - Total Service Demand Changes, 2007/2008-2016/2017; Source - ZFD Incident Reporting

YEAR	CALLS PER YEAR	ANNUAL% CHANGE
2016-2017	1680	5.79%
2015-2016	1588	7.30%
2014-2015	1480	3.28%
2013-2014	1433	-2.58%
2012-2013	1471	-2.00%
2011-2012	1501	0.00%
2010-2011	1501	0.74%
2009-2010	1490	0.40%
2008-2009	1484	-7.13%
2007-2008	1598	
2007- 2017 OVERVIEW		
MINIMUM	1433	-7.13%
MEDIAN	1495.5	0.40%
MAXIMUM	1680	7.30%
TOTAL CHANGE	82	5.13%
AVG ANNUAL % ^		0.58%
2012 - 2017 OVERVIEW		
MINIMUM	1433	-2.58%
MEDIAN	1480	3.28%
MAXIMUM	1680	7.30%
TOTAL CHANGE	209	14.21%
AVG ANNUAL % ^		2.36%

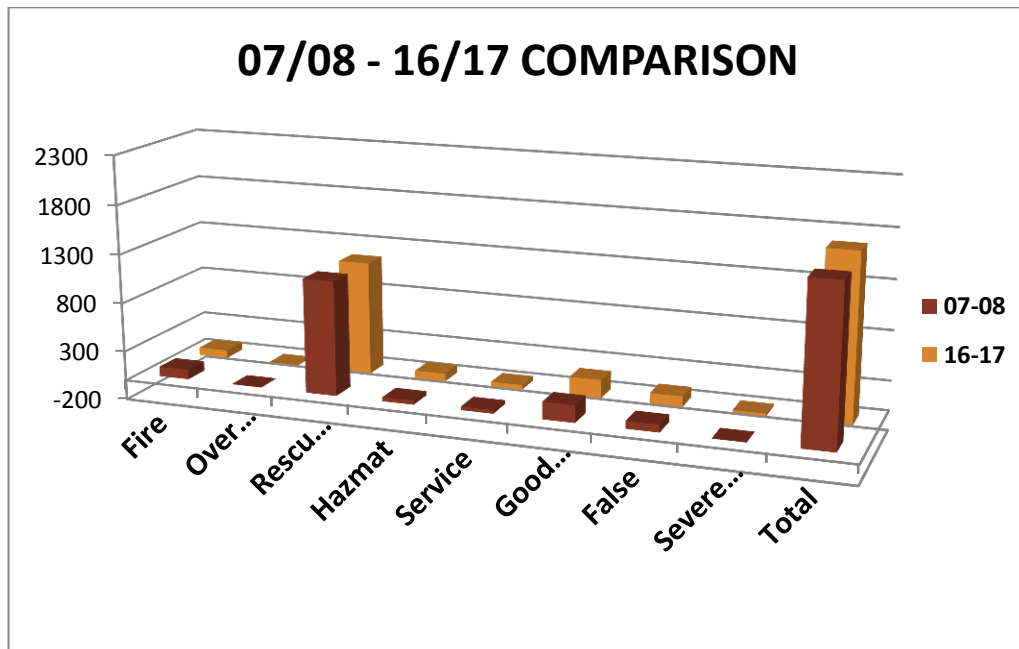


Figure 14 - 2007/08 - 2016/17 Comparisons

While the volume of calls for service has increased slightly over the study period, the distribution of calls by incident type has not changed by more than a few percentage points in any category.

Charts are provided on the following page to illustrate the distribution of incidents by type for both 2007/08 compared to 2016/17.

2007/08 DEMAND FOR SERVICE

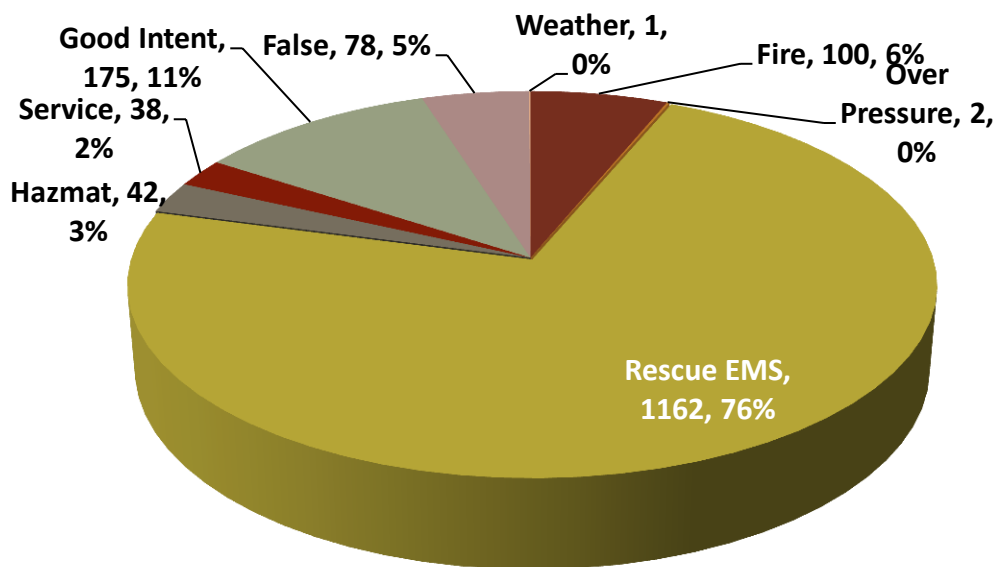


Figure 16 - 2007/08 Demands for Service Comparisons

2016/17 DEMAND FOR SERVICE

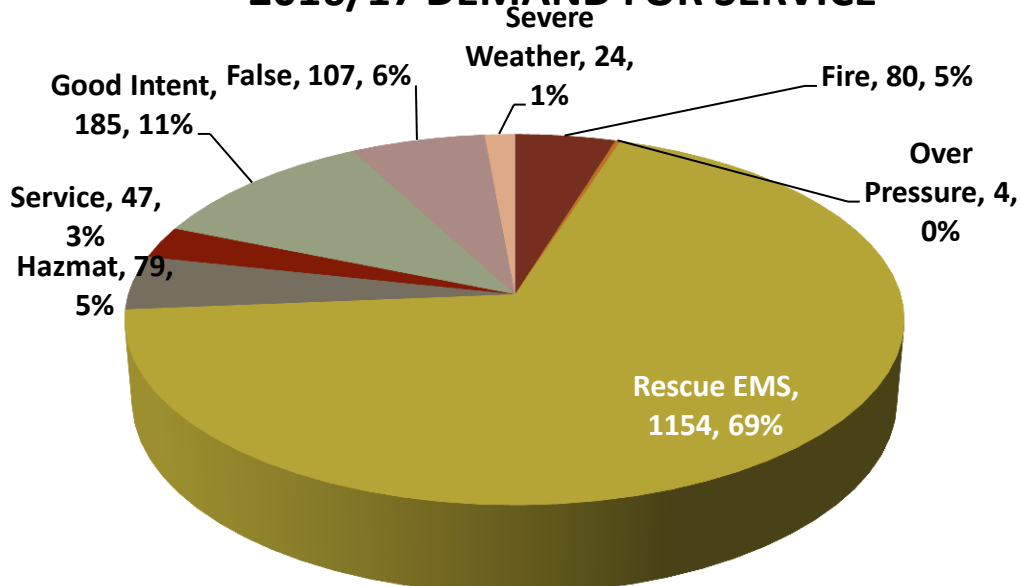


Figure 15 - 2016/17 Demands for Service Comparison

ZFD is a key partner in a regional response system for fire and emergency services delivery. Zebulon is dependent upon neighboring agencies for aid, primarily for filling out an effective or full first alarm. Zebulon also provides aid based upon service agreements with neighboring jurisdictions and as part of the county fire protection system.

The service demand is distributed across three areas; the jurisdiction as a whole, the town and the Wakelon Fire (Insurance) District (labeled by the town as the rural district). The jurisdiction, for this analysis, is the town and the fire district combined. Service demand for the ten year study period indicates that 96% of ZFD total service demand is within the jurisdiction while only 4% is outside the jurisdiction. In 2016/2017 95% of all calls were inside the jurisdiction while only 5% were outside.

Of the total calls for service responded to by ZFD, 68% are within the town boundary while 31% are outside of the town.

Rural fire district response accounted for 28.06% of the incidents within the jurisdiction and 27% of the total calls for service.

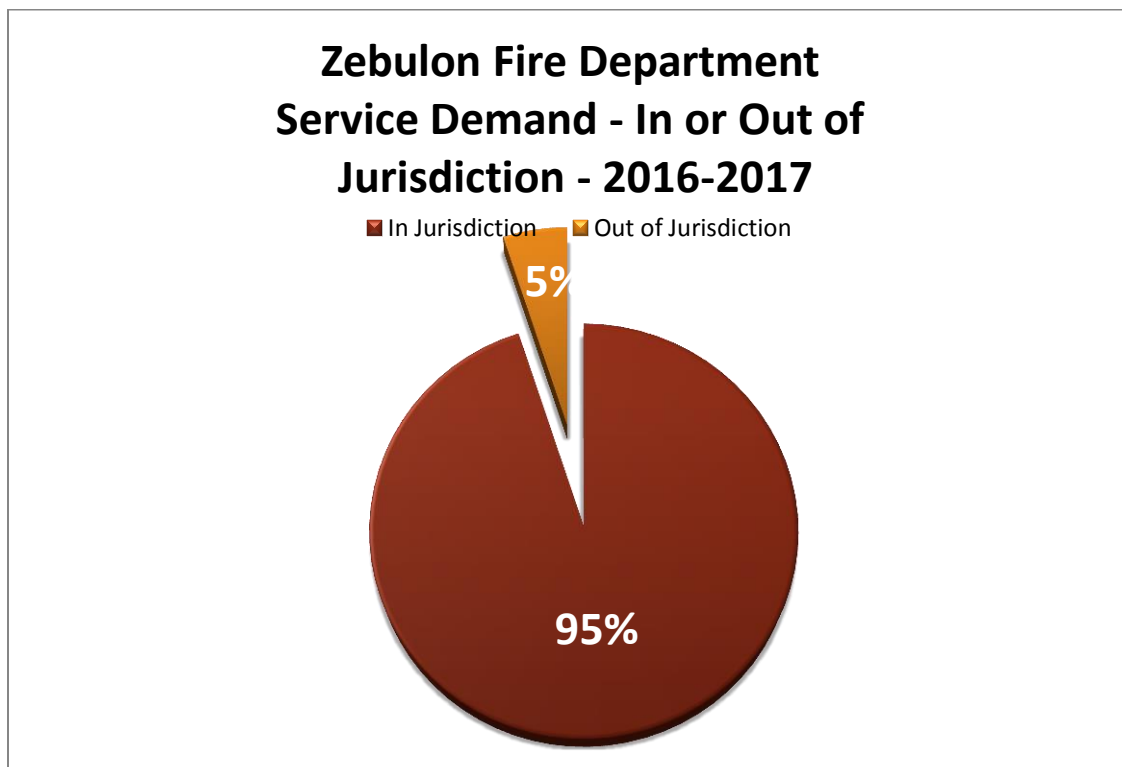


Figure 17 - Service Demand In or Out of Jurisdiction; Source - ZFD Incident Data

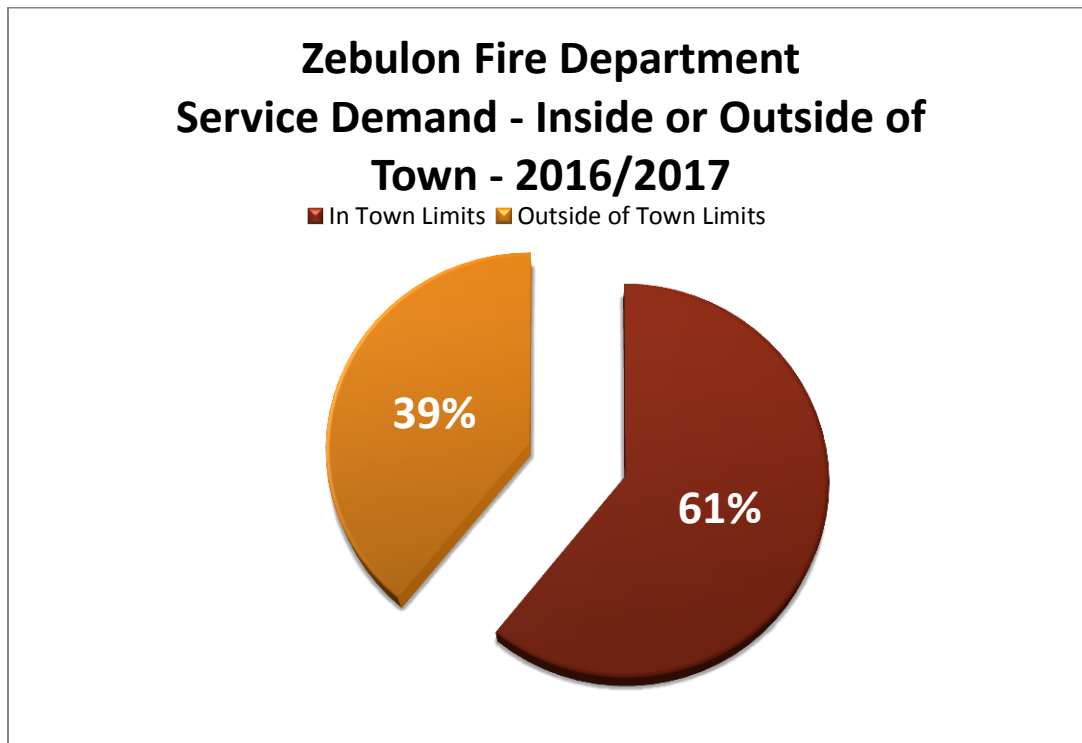


Figure 18 - Service Demand In or Out of Town; Source - ZFD Incident Data

Service demand from outside the district, and reasonably expected according to mutual aid and service agreements with neighboring departments and the county fire protection system, resulted in only 84 responses in 2016/2017.

Service Demand Projections

Due to the large volume of data and graphics, only the ten year regression analysis and service demand projects will be presented in the body of the report. The complete five year regression study and service demand projects are presented in Appendix A.

All Incident Types

Of all the major incident types Fire Calls and Good Intent Calls demonstrate a declining trend based upon historical experience.

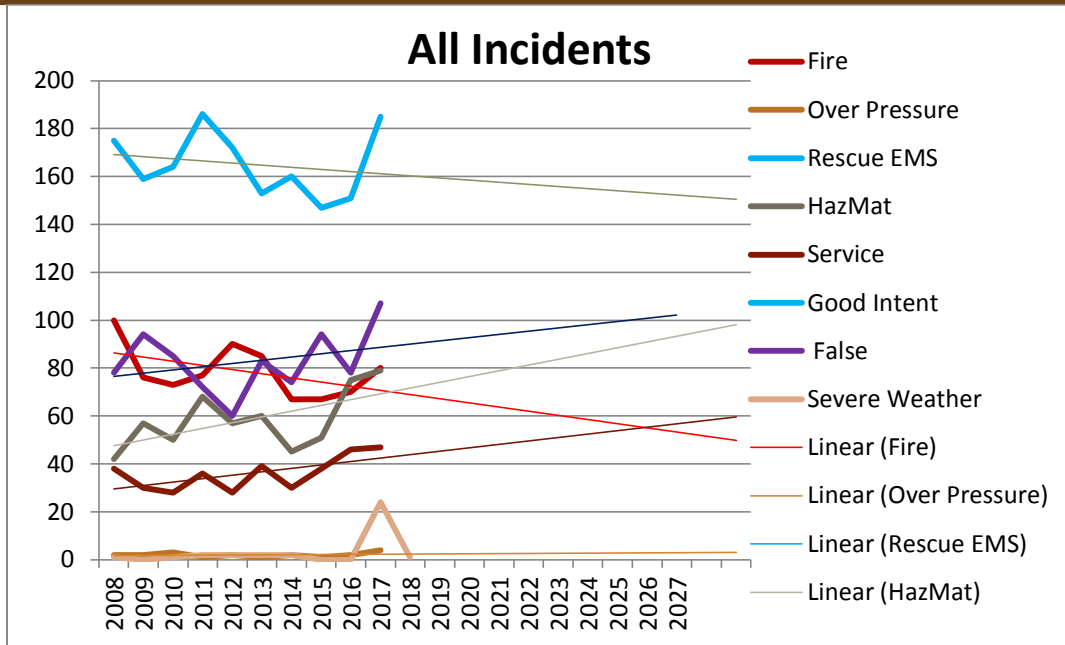


Figure 19 - Growth Patterns for All Incidents

Total responses will remain relatively flat with models demonstrating a range of -9 calls to approximately 73 calls.

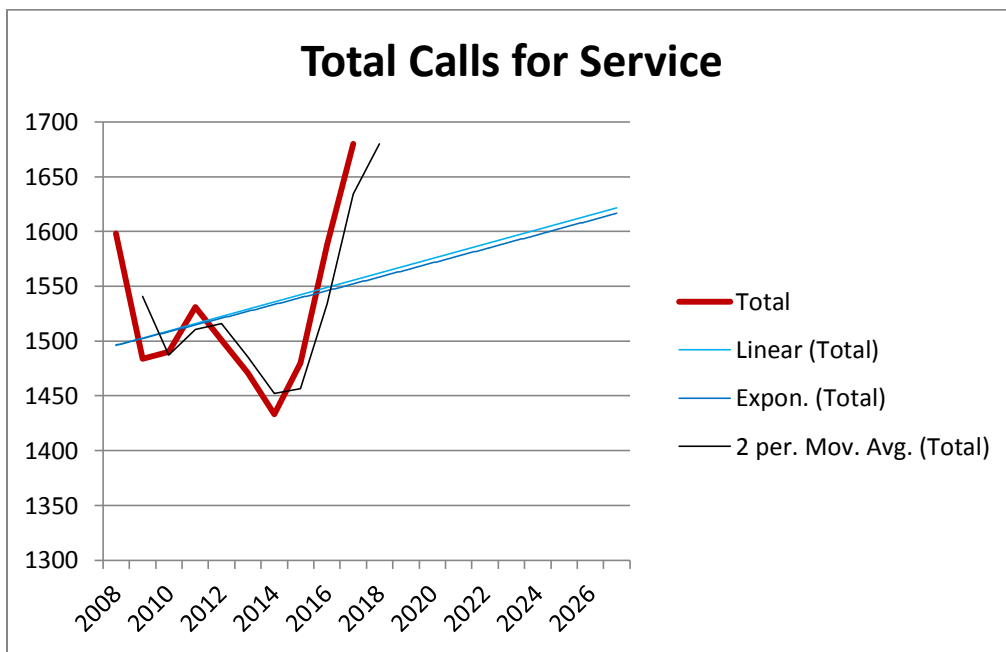


Figure 20 - Growth for Total Calls for Service



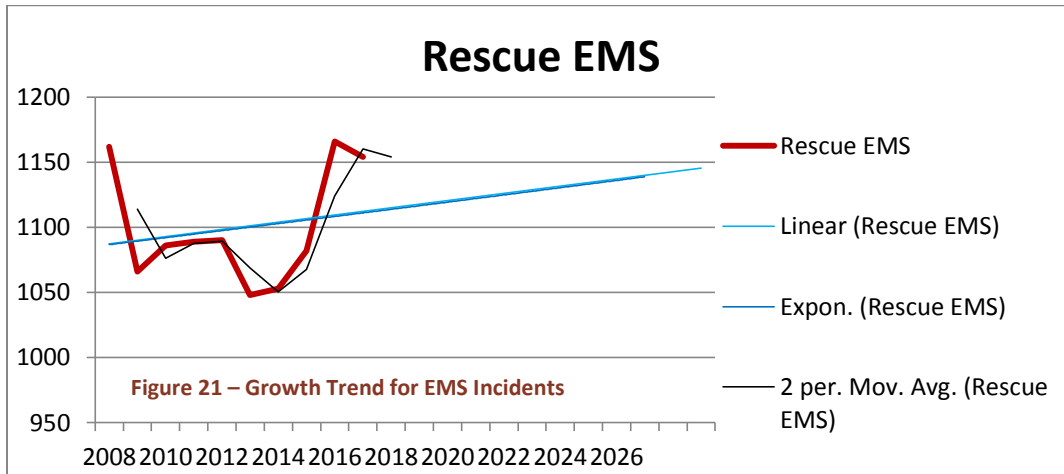
Forecasting tools indicate a low growth rate, if any, with a possible average annual growth rate of -.05% per year with a minimum of -6.35% in 2018 to a maximum of .70% in 2027.

ALL CALLS FOR SERVICE			
	Growth Trend	Linear Trend	Average of Trends
YEAR			
2008	1598	1598	
2009	1390	1390	
2010	1490	1490	
2011	1531	1531	
2012	1501	1501	
2013	1471	1471	
2014	1433	1433	
2015	1480	1480	
2016	1588	1588	
2017	1680	1680	
2018	1572	1575	1573
2019	1583	1585	1584
2020	1594	1596	1595
2021	1605	1606	1606
2022	1616	1617	1616
2023	1627	1628	1627
2024	1638	1638	1638
2025	1649	1649	1649
2026	1661	1659	1660
2027	1672	1670	1671

Table 4 - Forecast for Total Calls for Service

Rescue EMS

EMS incidents account for the largest percentage of all call types and this will remain true over the next ten years. Growth, however, is nearly flat with a forecast of a loss of 14 calls or 1.99%.



RESCUE EMS			
	Growth Trend	Linear Trend	Average of Trends
YEAR			
2008	1162	1162	
2009	1066	1066	
2010	1086	1086	
2011	1089	1089	
2012	1090	1090	
2013	1048	1048	
2014	1053	1053	
2015	1082	1082	
2016	1166	1166	
2017	1154	1154	
2018	1114	1115	1114
2019	1117	1118	1117
2020	1119	1120	1120
2021	1122	1123	1123
2022	1125	1126	1125
2023	1128	1129	1128
2024	1130	1132	1131
2025	1133	1134	1134
2026	1136	1137	1137
2027	1139	1140	1139

Table 5 - Forecast for EMS Calls for Service

Fires

Fire incidents account for the third largest percentage of all call types. Fires have the highest risk of major loss. The gross number of fire calls has been declining for the last decade and this experience can be expected to continue at least for the next five to ten years. Total responses will likely decrease by approximately fourteen calls to fifty-five calls.

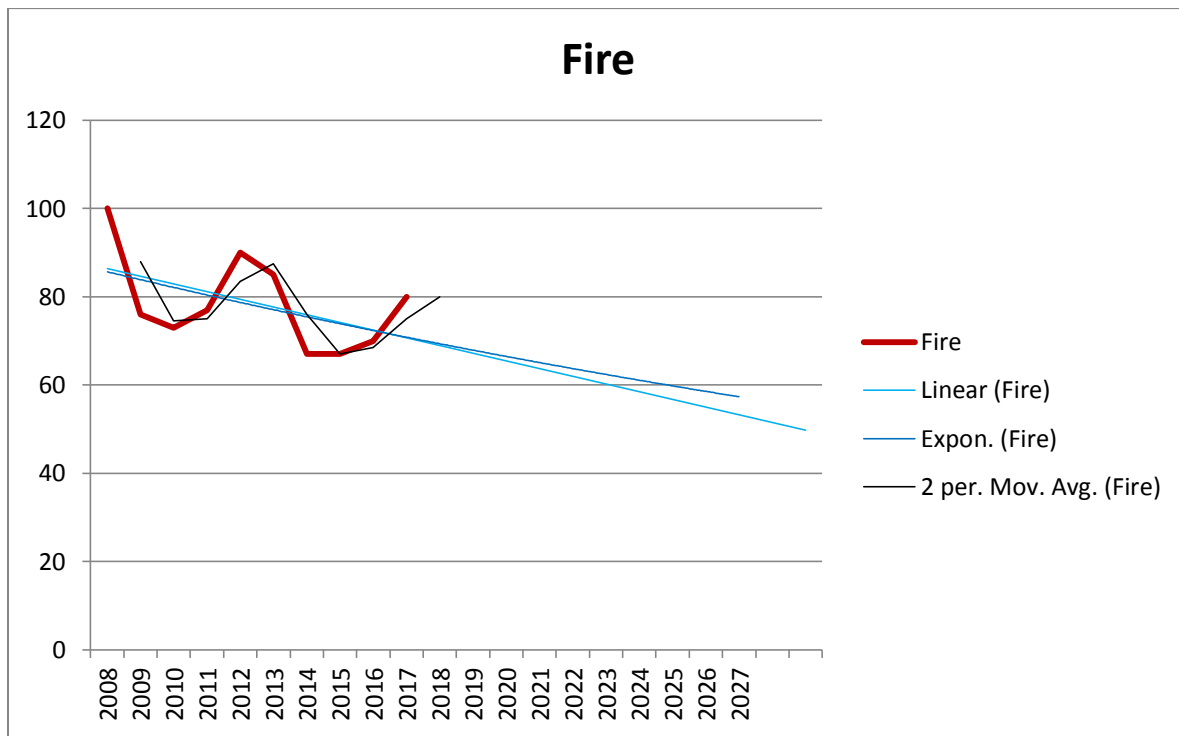


Figure 22 - Growth Trend for Fire Incidents

FIRES			
	Growth Trend	Linear Trend	Average of Trends
YEAR			
2008	100	100	
2009	76	76	
2010	73	73	
2011	77	77	
2012	90	90	
2013	85	85	
2014	67	67	
2015	67	67	
2016	70	70	
2017	80	80	
2018	69	69	69
2019	68	67	68
2020	66	65	66
2021	65	64	64
2022	64	62	63
2023	62	60	61
2024	61	58	60
2025	60	57	58
2026	59	55	57
2027	57	53	55

Table 6 - Forecast for Fire Demand for Service

Forecasting tools indicate an annual decline of 2.2% per year. Regression analysis indicates a slightly sharper decline.

Service Calls

Service call incidents account for 2.36% of total responses and has grown at the rate of 4.97% annually. Trending tools indicate a drop off in 2018 and then a return to a growing trend of 3-6% annually. The average annual increase is predicted at 3.47%.

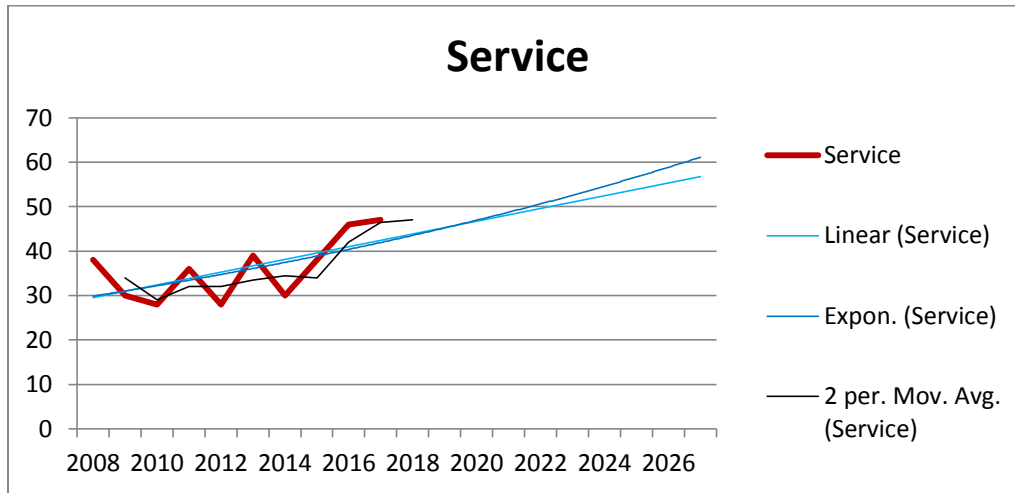


Figure 23 - Growth Trends for Service Calls

SERVICE			
	Growth Trend	Linear Trend	Average of Trends
YEAR			
2008	38	38	
2009	30	30	
2010	28	28	
2011	36	36	
2012	28	28	
2013	39	39	
2014	30	30	
2015	38	38	
2016	46	46	
2017	47	47	
2018	44	44	44
2019	45	45	45
2020	47	47	47
2021	49	48	48
2022	51	50	50
2023	53	51	52
2024	55	52	54
2025	57	54	55
2026	59	55	57
2027	61	57	59

Table 7 - Forecast for Service Calls

HazMat

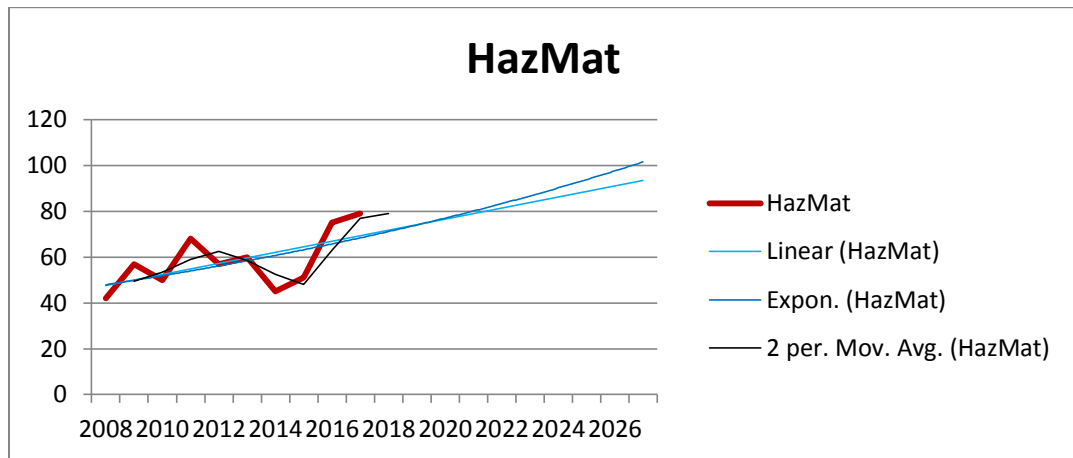


Figure 24 - Growth Trend for Hazmat Calls

HAZMAT			
YEAR	Growth Trend	Linear Trend	Average of Trends
2008	42	42	
2009	57	57	
2010	50	50	
2011	68	68	
2012	57	57	
2013	60	60	
2014	45	45	
2015	51	51	
2016	75	75	
2017	79	79	
2018	71	72	71
2019	74	74	74
2020	77	76	77
2021	80	79	80
2022	83	81	82
2023	87	84	85
2024	90	86	88
2025	94	89	91
2026	98	91	94
2027	102	93	97

Hazardous materials responses have been the fastest growing incident type over the last ten years. This is likely due to rapidly increasing traffic on the interstates and the increase in industrial activity. Total responses will likely increase by approximately 25 calls to 97 for a 35% increase over the next ten years. Trending is moderately reliable for hazmat responses.

Figure 25 - Forecasting for HazMat Calls



Total Response Time Analysis

Normally, fire station location studies are more focused on travel time and distances required to produce desired travel times. In this case, however, there are some issues facing the agency that travel time cannot overcome alone. We have previously discussed the impacts of the transportation network on travel time. The physical barrier of the major roadways and the railroad are presenting an increasing impediment to response. Traffic is increasing and will continue to increase as more people come to work and live in Zebulon. One NC Capital Area Metropolitan Planning Organization (NC CAMPO) study reported 17,000 vehicles per day enter the intersection of NC 96 and NC 97. The limited access between the north and south areas of town actually create separation between fire resources and the area experiencing the greatest growth and development.

Time is a critical factor in determining outcomes in fire, medical and rescue events. This study included several views of segments of total response time. (The results of the total response time studies have identified opportunities for improvement in times and the recording and analyzing time.) In some locations we can achieve the same desired improvement in outcomes by improving alarm handling as we could by deploying additional resources.

Communications standards are established for fire and emergency services in *NFPA 1221, Standard on the Installation, Maintenance and use of Emergency Services Communications Systems*. These are the standards that are used to evaluate communications programs by the Commission on Fire Accreditation International (CFAI) for accreditation and by the NC Response Rating Program and ISO for scoring the communications component for a community's insurance rating.

Turnout Time and Travel Time standards are established for the fire and emergency services industry in *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 is the reference standard for performance assessment and program evaluation by the CFAI for accreditation. It is also a reference standard and a method of demonstrating compliance for distribution by the NC Response Rating program and ISO for insurance ratings.

Alarm Handling

According to the NFPA 1221 standard, for fire incidents, 90% of all calls shall be processed within 90 seconds and 95% within 106 seconds. This time period is called alarm handling. This segment of time is measured from the time the caller's emergency call is picked up by phone in the 9-1-1 System and until the response unit is notified. Notification is usually accomplished by some alerting tone or voice notification over a radio. The data used to analyze this element of time originates within the Computer Aided Dispatch system (software program). For this study, the agency was not able to extract the data points necessary to confidently and effectively analyze this element. They did get one calendar year (2016) of CAD data that included a time stamp called Created Time. When evaluated along with



Notification Time, you should be able to demonstrate Alarm Handling Time. When these two data points were analyzed however, the resulting time span is illogical for the activities involved with Alarm Handling. The results are presented here for information purposes. The agency should work with the emergency communications center staff to determine how to easily extract the data necessary to fully evaluate Alarm Handling over any specified period of time.

Table 8 - Total Response Time for All Calls, 2016

	Alarm Handling	Turnout	Travel	Tot Resp Time
ALL CALLS AVERAGE	0:00:15	0:01:05	0:03:48	0:05:08
90th Percent	0:00:27	0:02:02	0:05:52	0:07:38
Minimum	0:00:02	0:00:03	0:00:01	0:00:20
Maximum	0:03:08	0:25:14	0:46:02	0:58:15
Number of Incidents	1371			

Table 9 - Total Response Time for Structure Fires, 2016

	Alarm Handling	Turnout	Travel	Tot Resp Time
STRUCTURE FIRE AVERAGE	0:00:24	0:01:00	0:03:20	0:04:45
90th Percent	0:00:52	0:01:55	0:05:23	0:07:06
Minimum	0:00:02	0:00:03	0:00:01	0:00:20
Maximum	0:01:12	0:02:11	0:07:03	0:09:18
Number of Incidents	35			

Table 10 - Total Response Time for Rescue EMS Calls, 2016

	Alarm Handling	Turnout	Travel	Tot Resp Time
RESCUE EMS AVERAGE	0:00:15	0:01:02	0:03:43	0:05:01
90th Percent	0:00:26	0:01:59	0:05:38	0:07:24
Minimum	0:00:03	0:00:03	0:00:01	0:00:20
Maximum	0:02:06	0:25:14	0:46:02	0:58:15
Number of Incidents	1101			



Based upon anecdotal experience with other agencies served by the same communications center, and experience with other agencies measuring for this performance standard, it is highly unlikely, but cannot be proven with this data set, that the Alarm Handling times reported here are not realistic, at least with any significant confidence. Additional data sets were not available from which this measure could have been tested.

According to the standard, for medical incidents 90% of all calls shall be processed within 90 seconds and 99% shall be processed within 120 seconds.

In reality there is likely a performance gap in Alarm Handling when compared to the national and industry standards. However, this data set does not reflect any gap.

Turnout Time

Turnout Time is that segment of time from Notification and until the unit begins to move in route to the emergency. During this time segment, personnel are ensuring the location and route for travel, donning proper personal protective gear, and securing themselves safety for travel on the apparatus by fastening themselves in with their seatbelt. For this study, we were only able to get turnout time isolated in the 2016 CAD dataset. In the data provided for each of the ten year historical periods, the time stamps were such that turnout time and travel time were consolidated into one time segment.

According to the NFPA 1710 standard, for fire incidents, turnout time shall be 80 seconds at the 90th percentile mark. For medical incidents, turnout time is 60 seconds or less at the 90th percentile mark.

According to Table 9 turnout time for fire events is 115 seconds at the 90th percentile. According to Table #10 turnout time for medical events is 119 seconds at the 90th percentile.

There is a performance gap for fire event turnout of 35 seconds at the 90th percentile. There is a performance gap for medical turnout of 59 seconds at the 90th percentile.

Travel Time

Travel Time is the time segment measured from once the apparatus begins to move in route to the incident location and until the apparatus comes to a stop at the reported location. It is easiest to remember "From Wheels Start until Wheels Stop!" For this study, we were able to get turnout time isolated in the 2016 CAD dataset as reflected in Tables 8, 9 and 10. We were able to sort and manually process unit level data provided for each of the ten year historical periods and isolated each time segment for Structure Fire events where a larger effective response force is needed. The time stamps for incident level data for the ten historical time periods were such that turnout time and travel time were consolidated into one time segment.



According to the NFPA 1710 standard, for fire incidents the first due unit shall arrive within 240 seconds travel time or less to 90% of all calls. The standard also states an initial full first alarm shall arrive within 480 seconds travel time or less at the 90th percentile.

According to Table 9, travel time for first due units to fire events is 324 seconds at the 90th percentile.

There is a travel time performance gap of 84 seconds for first due unit.

According to the NFPA 1710 standard, for medical incidents the first due unit, capable of initiating basic life support, shall arrive within 480 seconds travel time or less to 90% of all calls.

As shown in Table 10, travel time for first due units to medical events are 338 seconds at the 90th percentile.

The performance exceeded the standard by 142 seconds for the initial effective response force to medical events.

Alarm processing/handling is the simpler of the gaps to attack. The solution is setting a performance standard, expecting that your standard be met, and tracking that performance monthly.

Considering one or more additional stations can help close the travel time gap for the urban district and some areas of the rural district.

Current Stations and Service Areas

ZFD currently covers the urban and rural district from one station. Station #1 is located in the older urban historic district within the town limits and provides first due coverage to the town and most of the rural district. This station is not located centrally in the jurisdiction and the newer and more densely developed areas. There are significant gaps in coverage that indicate a need to plan for redeployment or new resources.



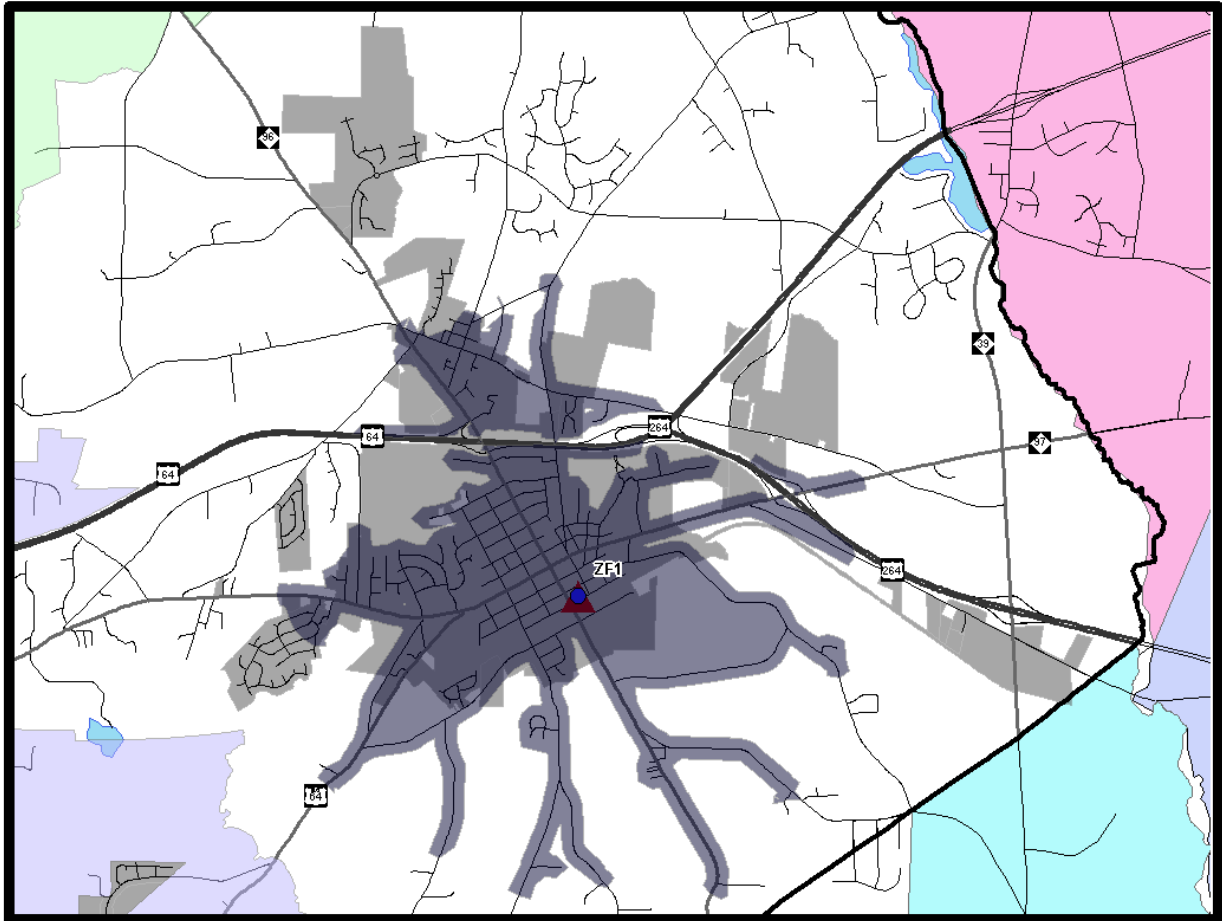


Figure 26 - Existing 1.5 Mile Coverage Map

Fire Station Service Area Model & Matrix

The study team has created a Fire Station Service Area model for the ZFD as a tool to identify appropriate fire station locations based upon a desired service level outcome. In this case it is based upon desired travel times. The service area travel time criteria are based upon the desired performance outcomes for two critical incidents that are routine events for the Town of Zebulon and its rural fire district.

Basis for Deployment

The desired outcomes for the service area model are fires confined to room or area of origin and basic life support with defibrillation within six to eight minutes of onset of cardiac arrest.

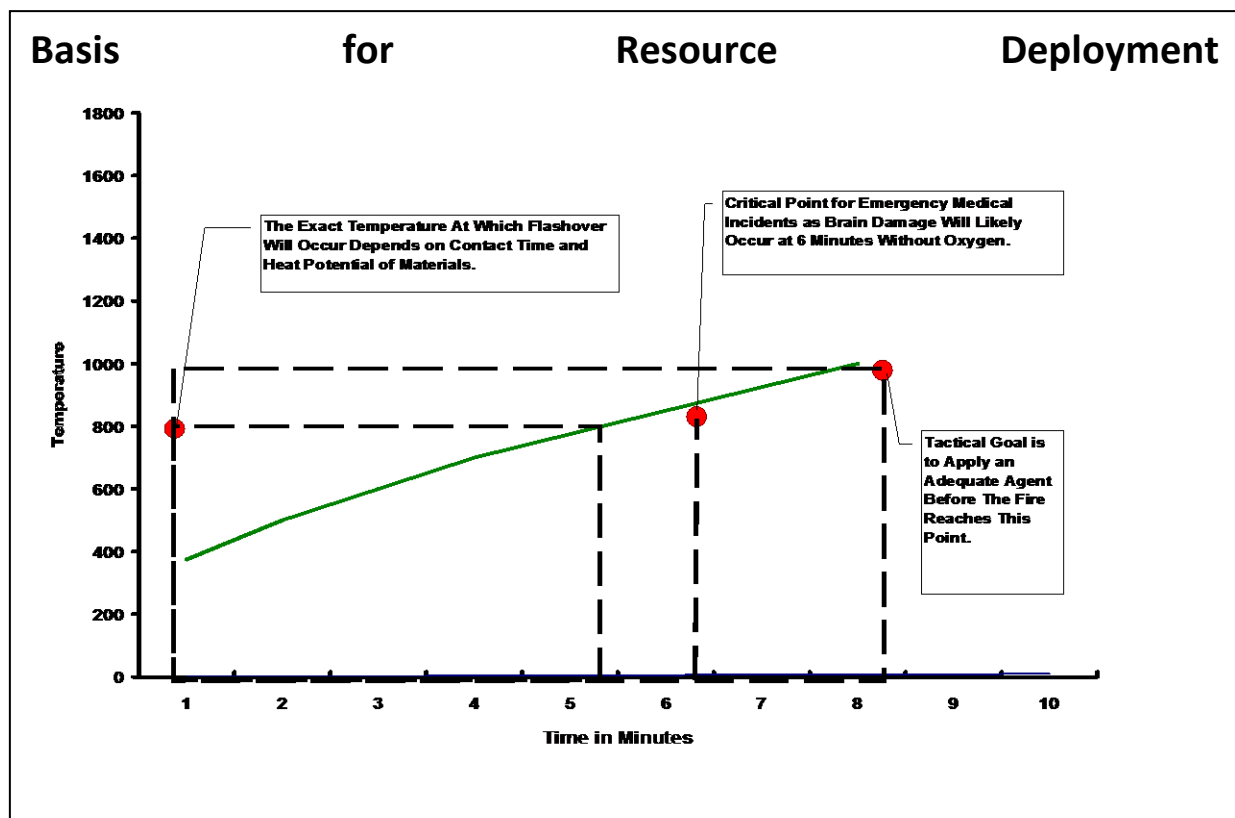
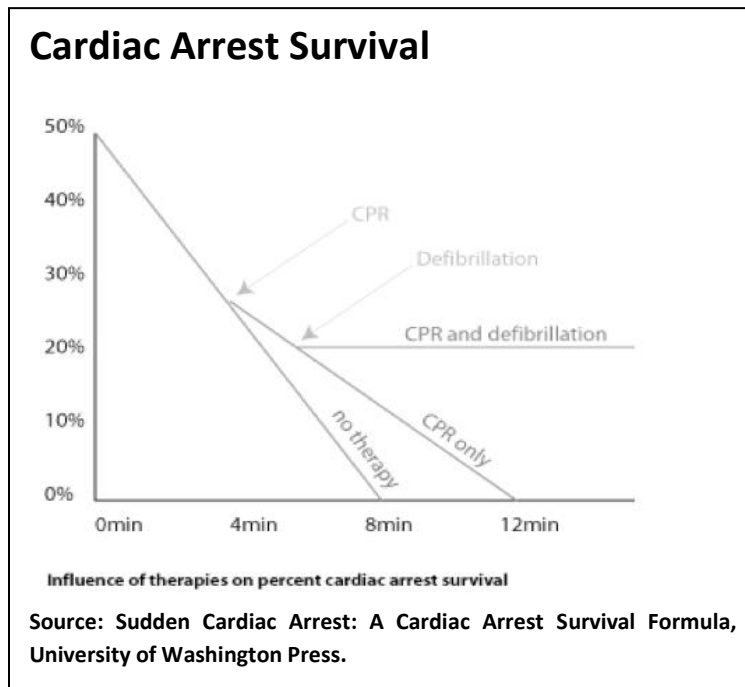


Figure 27 - Basis for Resource Deployment

An example of how to display the assumptions upon which a fire station location study and plan can be based and the findings justified is provided in the Basis for Resource Deployment chart. This graphic represents the relationships of time to fire propagation, generally expected property loss, and cardiac survival. Although there may be some who will challenge the absolute accuracy of this tool, many of the current standards and service organizations which routinely deal with these common hazards and risk use the same general benchmarks. This model assumes that the primary hazards to plan for in

determining the deployment of resources is the cardiac EMS event and the residential structure fire event.

Medical Rescue Response with Cardiac Event



The American Heart Association still teaches that brain cells begin to die between four and six minutes when suffering from a lack of oxygen. Much research now points to a combination of timely CPR and Defibrillation for survival of cardiac arrest to hospital discharge. A paper published by the University of Washington Press, and based upon work done at the University of Washington School of Medicine, documents in an article titled, *Sudden Cardiac Arrest: A Cardiac Arrest Survival Formula*, suggests that CPR begun within four minutes of cardiac arrest and defibrillation begun within six minutes should result in a sustainable survival rate of 20% to hospital discharge.

Figure 28 - Cardiac Arrest Survival Model

Structure Fire Event

The time/temperature curve for fires, better stated today as the fire propagation curve, is undergoing considerable scrutiny and may be changing somewhat due to very valuable and recent research on differences between modern and traditional residential fire interior configuration, construction, furnishings and air flow paths. A generalization would state that there has not been significant data that changes the survivability and economic loss projections for fires confined to room of origin and fires that extend beyond room of origin. There is evidence that in modern structures, the time/temperature curve looks very different and that flashover can occur much earlier in the event. The biggest changes so far based on recent research are not substantially changing the recommended times for response or even the critical tasking and staffing requirements, but rather in the order of critical tasks and the tactical decisions made during the initial attack on the fire. Generally, we can still apply the guidance from figures like the Fire Propagation Curve identified by Gerard and Jacobsen. Figures very similar appear in many other guidance documents, such as NFPA 1710.

Fire Propagation Curve

Clearly, an early aggressive and offensive initial interior attack on a working structural fire results in greatly reduced loss of life and property damage. Consequently, given that the progression of a structural fire to the point of “flashover” (the very rapid spreading of the fire due to super heating of room contents and other combustibles) generally occurs in less than 10 minutes, two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of its origin as possible.

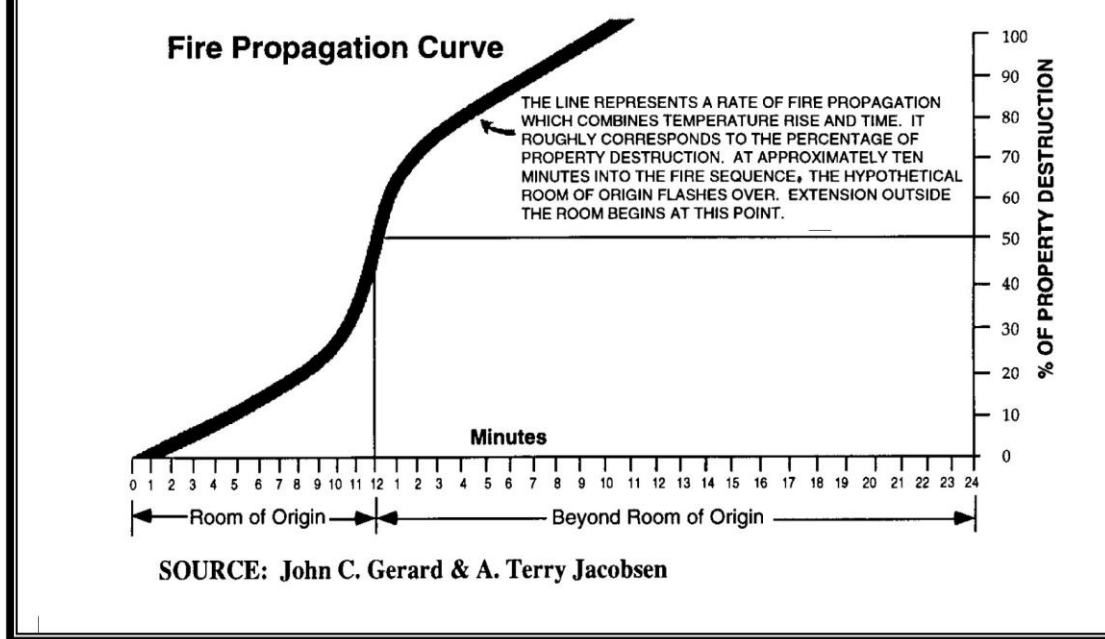


Figure 29 - Fire Propagation Curve

Time is a critical and measurable element in emergency response and can be directly related to incident outcomes. Although the current research and information on time to flashover is undergoing significant updating, it is clear that there is a point in time before which we must assemble and deploy an appropriate and effective response force in order to impact the outcomes for lower loss of life and injury as well as reduced property losses. The NFPA Fire Analysis and Research Division reports differences in outcomes in NFPA Standard 1710, Annex A: Explanatory Material. There is a documented

**Consequences of Flame Spread
per 1000 Fires**

1.91 – Civilian death rate for fires confined to room of origin

22.73 – Civilian death rate when fire extends beyond room of origin to floor of origin

Source: NFPA Fire Analysis and Research Division as reported in NFPA 1710 Annex A.

increase of more than 1,000% in civilian deaths when fires extend beyond room of origin to floor of origin. Civilian injuries increase by 153% and property loss per structure fire increase by 149%. Survivability of the victim(s) has been associated with time for both EMS and fire incidents. Even the safety of our responders and reasonable expectations for responder capability has been related to time in recent research.

Travel Time and Explanation of Matrix

The matrix used in the fire station location model then reflects the desired travel times. The matrix reflects a four minute travel time. Total Response time then for first arriving units to the scene of a structure fire or a cardiac event should be within six to eight minutes to achieve the desired outcomes. This matrix can be laid down over the

Figure 30 - Consequences of Flame Spread per 1,000 Fires

community and existing resources to better evaluate and plan deployment.

Station Service Area Matrix

The matrix uses diamond shaped representations of station service areas. The shape and size represent an ideal station service area that meets travel time standards. The grids in this matrix are three miles distant from point to point and cover an area of 4.5 square miles. The result, if a fire station is located at or near the centroid of a service area is travel time performance of four minutes at the 80-90th percentile. This model provides a standard tool for collecting and analyzing data according to critical growth, service demand and service capability factors for resource deployment planning.

Each category has a set of factors. These factors are weighted since they are all considerations in making deployment decisions but are not generally equal in terms of impact. Decisions about weighting are local

Service Area Evaluation Factors

Growth Factors	
Developable Land	5.00%
Population	15.00%
Developed Land	20.00%
<i>Sub-Total</i>	<i>40.00%</i>
Service Demand Factors	
Call Volume	5.00%
Commercial Sq Footage	5.00%
Risk Score	15.00%
Property Valuation	15.00%
<i>Sub-Total</i>	<i>40.00%</i>
Performance / Capability	
Distance to Fire Station	5.00%
Over 4 minute Calls	10.00%
% Covered in 4 Minutes	5.00%
<i>Sub-Total</i>	<i>20.00%</i>
Grand Total	100.00%

Table 11 - Service Area Evaluation Factors

decisions and should be made deliberately and based upon analysis and data, not to drive a specific outcome.

Growth factors are directly related to increasing or decreasing service demand. You can use other growth factors but population and development related factors are easily understood by community decision makers. In Zebulon, population and development growth are the biggest known factors affecting the community.

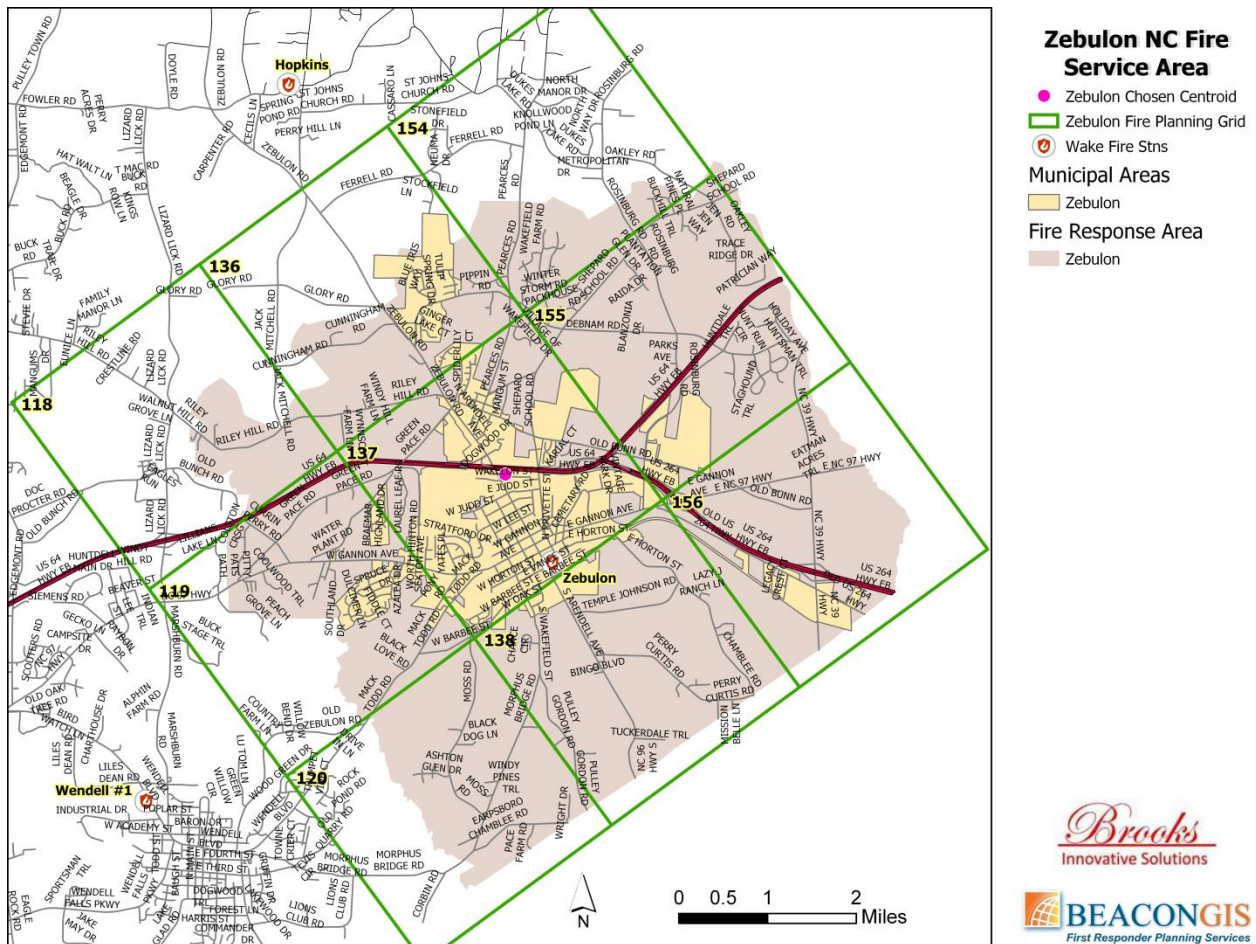


Figure 31 - Zebulon Station Matrix 2017

Service demand factors are the results of growth factors. Growth factors are predictive of service demand, while actual service demand factors relate directly to the communities changing need and requirements for service delivery. As growth and service demand factors increase, the need for new resources, or additional resources, inside the station service area increase.

Performance and capability factors reflect the department’s ability to respond to increasing or decreasing demand based upon growth or other changes. As growth and service demand increase, their ability to meet the demand becomes more challenging. When all of the categories are scored and combined, the service area score is determined; the higher the service area score, the greater the need for resources.

Service Area Scoring

When the service area grid is laid down on the Town of Zebulon and the Wakelon Fire District it helps to identify service level improvements that can be realized with a relocation of the existing fire station. The proposed site is in the area of the intersection of NC 96 and I-495/US 64.

The orientation depicted in Figure #31 results in better coverage of historical incident activity, moves resources closer to locations of higher population density, and improves travel time by maximizing the four minute travel time coverage capability. The following figures illustrate these points.

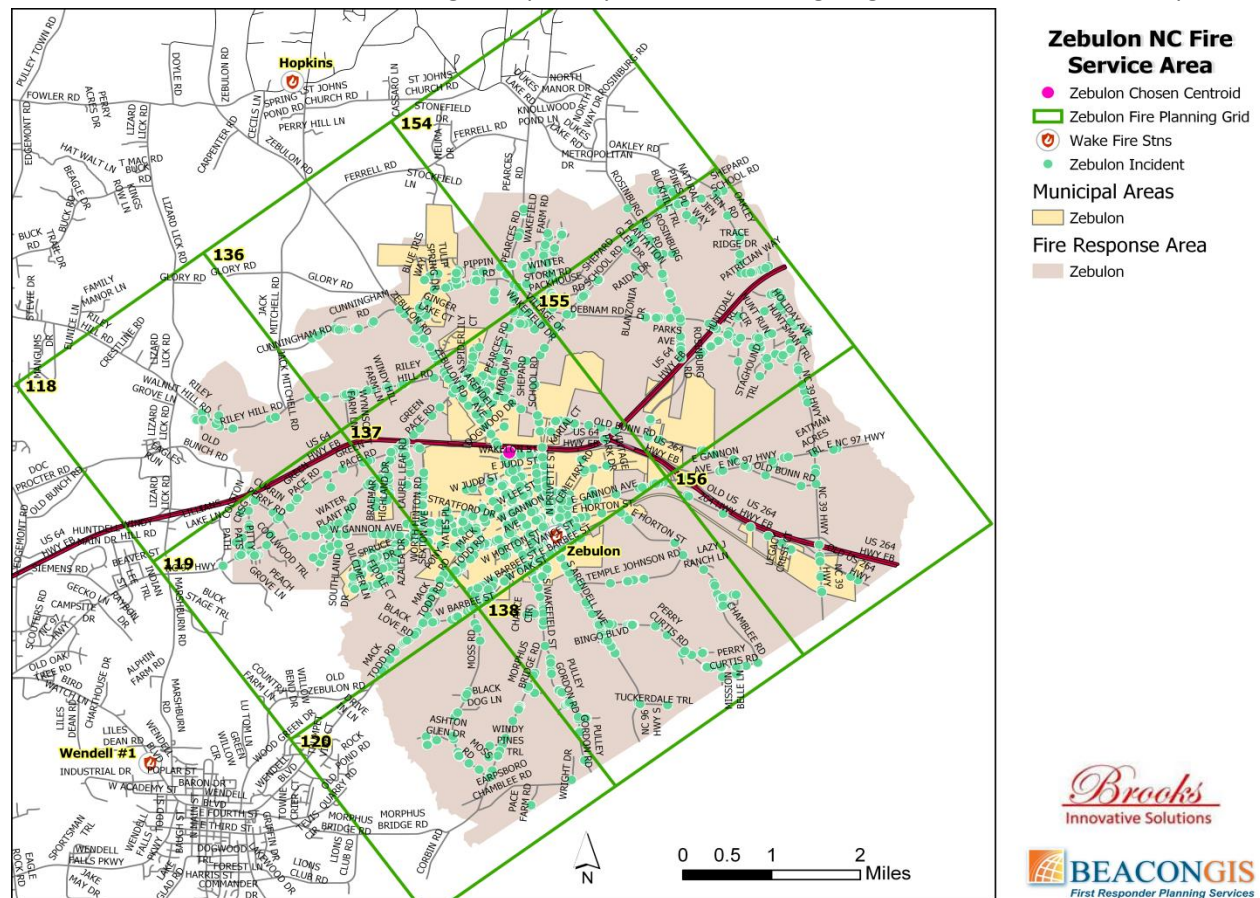


Figure 32 - Zebulon Demand Density

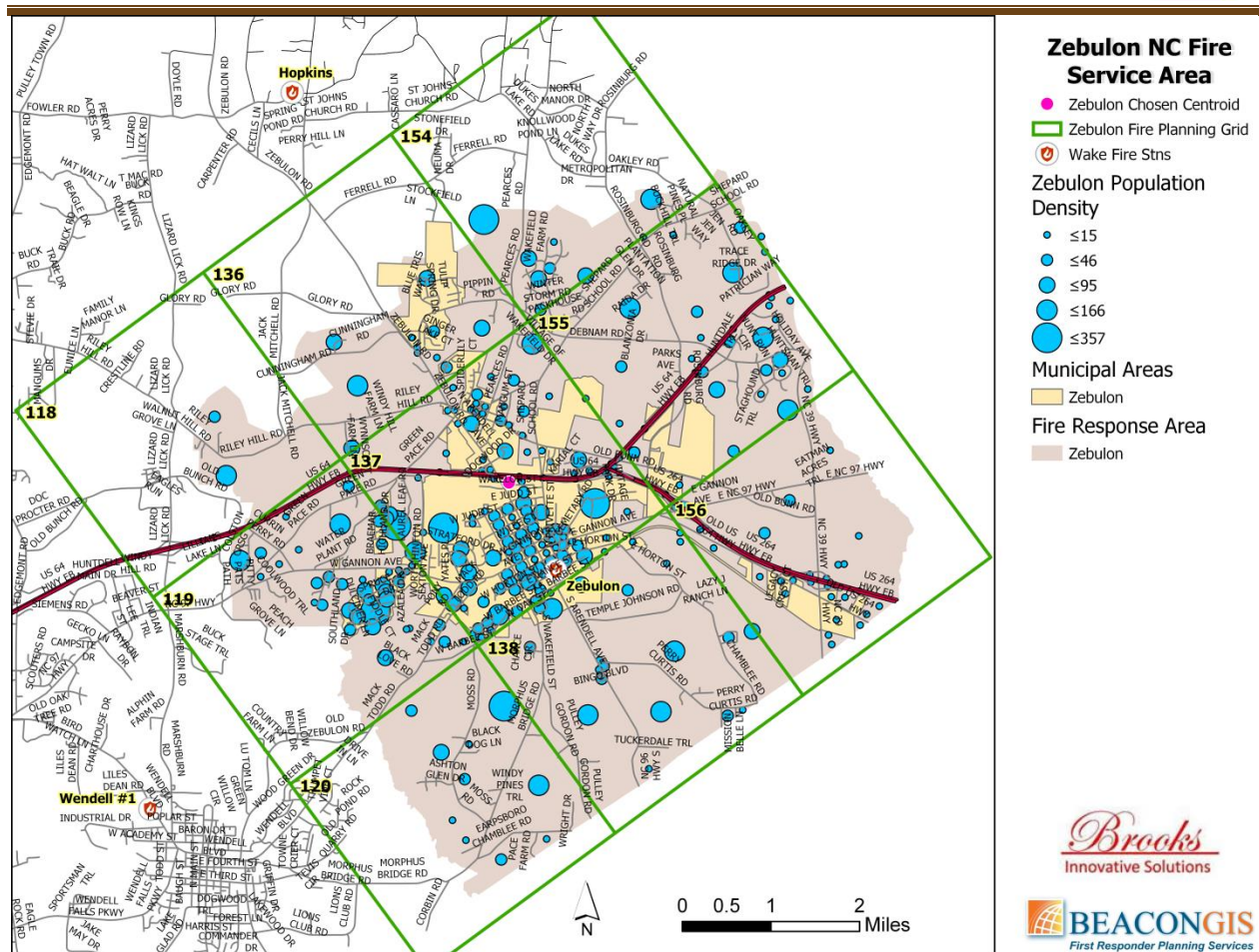


Figure 33 - Zebulon Population Density

As seen in Figure #32, Zebulon Demand Density, the central grid in the matrix captures the greatest number of historical events while still providing excellent travel time performance, just as the model is designed to achieve. Of the nearly 13,500 events that are plotted here, 7,541, or 56.1%, are within this grid.

Relocation of the existing station captures the highest population density in the fire district as well. The central grid in Figure 33, Zebulon Population Density, and representing the proposed Station #1 service area, covers a population of 3,759 persons or 42.2% of the total population of the jurisdiction.

Figure #34 on the next page, Zebulon Four Minute Travel, illustrates the best possible coverage for the overall jurisdiction, while operating from a single location. The Station #1 Central Grid, #137 on the map, results in four minutes or less drive time for 7,380 incidents, or 97.9% of all historical incidents plotted in this grid. Recall that this also captured more than 56% of the total historical incidents plotted on the entire map.

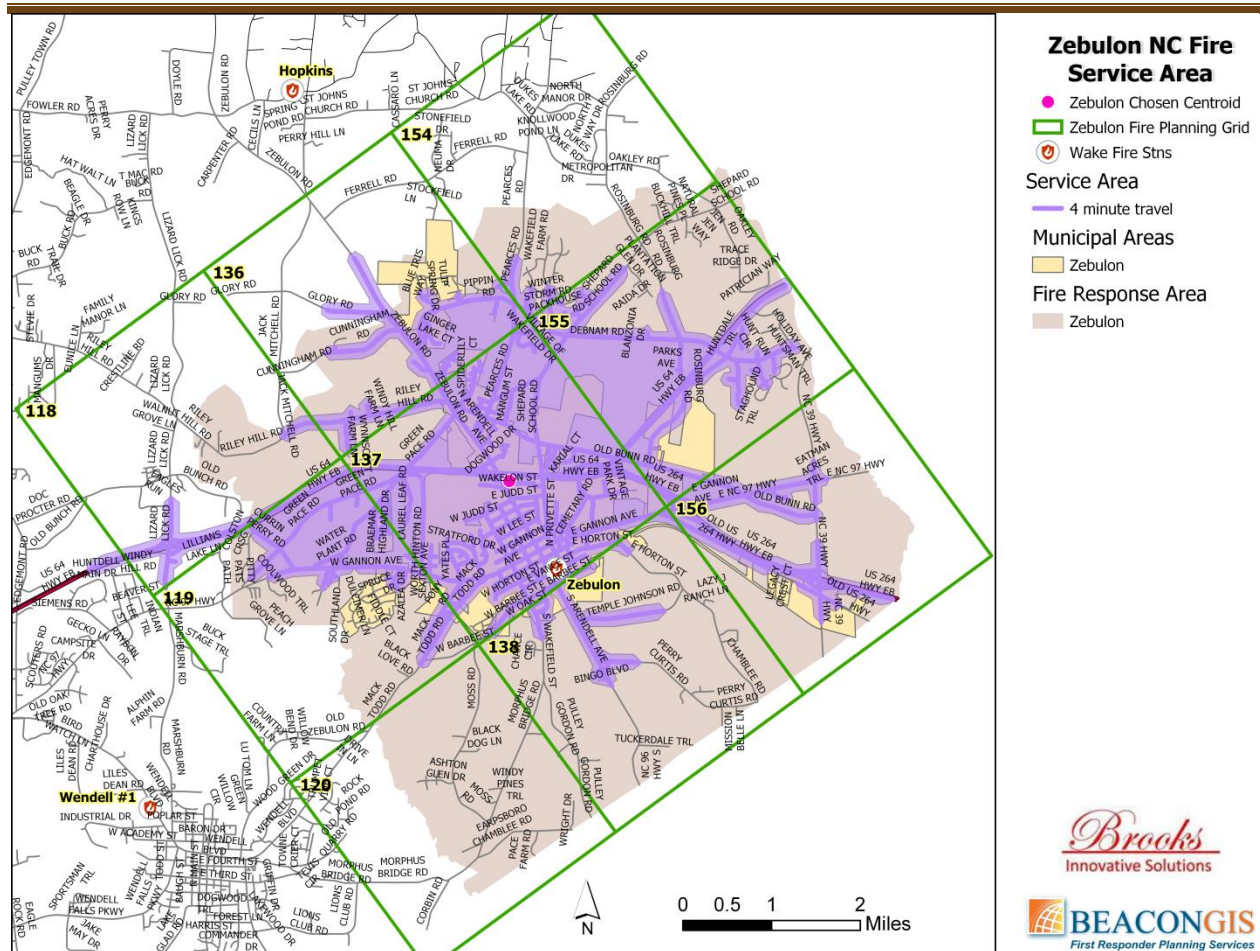


Figure 34 - Zebulon Four Minute Travel Time

The town and district enjoy a low ISO rating for insurance premiums and desires to maintain this rating in the future. This site provides excellent coverage for distribution of engine companies as measured by the NC Rural Response Rating System and ISO comparing engine company locations to areas within 1.5 miles. Figure #35, on the following page, provides a view of 1.5 mile coverage from the proposed new station location.

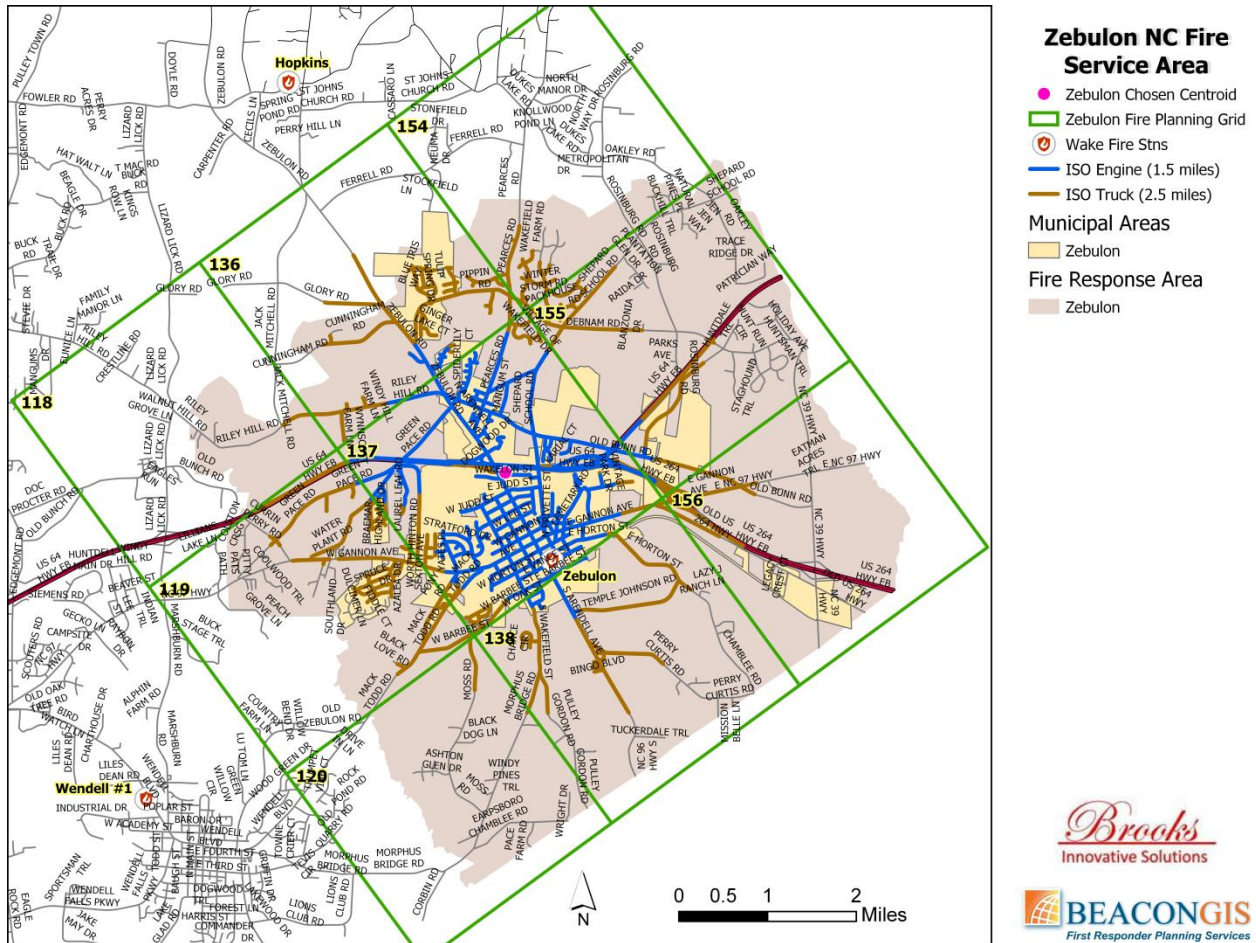


Figure 35 - Zebulon 1.5 Mile ISO Coverage.

The Station #1 Central Grid achieves very good measures for other growth, demand and capability factors. In addition to those already illustrated, this central grid has the highest count of commercial square footage at 1,219,291. 1,766 real estate parcels lie in this grid, the highest concentration by far representing nearly 39% of the total number in the entire jurisdiction. The percentage of developed parcels is the highest by far of any other grid at 83.1%. The model has measured growth and demand and determined this grid to be the focal point for nearly every major indicator for deploying resources.



We can see with this grid matrix that a station located in close proximity to the central grid centroid will take maximum advantage of the roadway networks overcoming to some degree the obstacles the network presents to the current deployment model.

We can also see the value of this model for looking into the future for other station locations. The model, if updated periodically, provides a dynamic tool for tracking expanding growth and demand factors in other station service areas. Decision makers can then begin to plan well in advance and will be able to determine best resource distribution locations well ahead of actual high density development.

Station Location Recommendations

These recommendations are in priority order and are in concert with recommendations that will follow in the chapter on existing station assessment.

1. Develop plans for the relocation of the existing fire station to area proposed in Station Service Area #137, previously identified as Station #1, Central Grid. This would result in improving performance and closing gaps in the current deployment of resources for standards of cover achievement. This location also moves current resources closer to the areas of new growth and development.
2. Begin negotiations with Wake County Fire Services for participation in the relocation through the Cost Sharing Program. This would likely be the first station relocation project which the county might help fund. The cost sharing percentage could be as high as 33%-43%.
3. Begin negotiations with Wake County EMS. This organization has a very strong interest in co-locating in a station that provides them the options in response which this one does. The degree of financial participation may be based on a number of factors, but could be as high as 20%-33%.
4. Utilizing the forward view format encouraged by this model, develop a long term plan for additional fire stations (15-20 years out) as the jurisdiction continues to develop. The area which the model seems to forecast next is Grid #155. This is consistent with evolving subdivision development as well as the commercial/industrial development which is taking place in the area identified with the Mud Cats Stadium.
5. The Green Pace Road property is not a very effective or efficient location for a fire station. It will not be of value to co-locating partners. The recommendation is to find another use for this site other than emergency response deployment.
6. Begin a process to routinely capture and analyze Alarm Handling time, Turnout time and Travel Time for the first due unit to incidents as well as the full effective response force.



Chapter IV – Fire Facility Assessment

The Zebulon station was originally built in 1974. It was remodeled in the 1980's to add additional bay space and a larger training room. The building was again expanded in the 1990's to add office and equipment space and increase bay size. During the 2000's sleeping quarters were added along with other interior renovations. The building occupies almost the entire lot with a front apron just long enough to pull apparatus out without blocking the street. There is very little space at the rear although the bays were designed as drive-through bays. There's specialty apparatus that faces to the rear and runs out of rear doors on responses. Every spot in the apparatus bay is occupied by a piece of apparatus or equipment storage. To pull into the bays, apparatus on both the front and rear must back in creating a hazard for personnel and equipment.

Several methods were employed to conduct the facility assessment. The principal investigator for the study toured the facility and conducted meetings and orientation sessions there. As part of the employee stakeholder input session, members in attendance were asked about the facility and any challenges it presented. The Chief, as Local project coordinator, and the principal investigator both agreed that members wished for greater access and input into the fire facility study process. A survey was designed and administered electronically. All full, part-time and volunteer members were invited to participate. Over 50% of the invitees did complete their surveys providing valuable information.

Considering the valuable information that was collected, this assessment focused on the information from the survey, a previous facility evaluation by a third party, some brief mentions in a county study conducted in 2004, and an assessment and commission presentation conducted by the Fire Chief in the last budget year.

Tri-Data Study

In 2003 Tri-Data Consultants were hired by Wake County (Wake County Fire Commission) to conduct a Fire and EMS Capital Facility and Equipment Study. The decision to hire Tri-Data and commission a station and equipment study resulted from findings of an assessment of station locations and facilities for the Fire Commission by Heery International. This Tri-Data study did not mention the condition of the Zebulon Fire Station but it was evaluated as a part of the overall county system-wide response for fire and EMS. The station at that time was reported to be in the upper quartile for total response time performance. It was included in the study recommendations that excess fleet assets be redistributed, moving one or more pieces from Zebulon Station and redistributing the pieces to other more active facilities. This was an efficiency recommendation but one that would have also relieved a space problem in the Zebulon station as well. There is no evidence that this recommendation was acted upon.



Heery Report

In approximately 2002, Heery International conducted a Wake County Fire Stations/EMS Facility assessment for the Wake County Fire Commission. Known as the Heery Report, a copy of the assessment and report evaluating the Zebulon Fire Station was reviewed. This assessment conducted a compliance assessment of the Zebulon station against the Wake county prototype facility model for a headquarters station. The comparison found numerous deficiencies with the Zebulon facility. The principal issue that underscored all others was that the facility was undersized and did not include or provide critical infrastructure for staffing or the public. The station area in square feet is less than 50% the size of a prototype model. Semi-public and private spaces for crews, especially for 24 hour shift personnel and volunteers are undersized, poorly located, or non-existent. The facility lacks adequate dorm, locker, shower and toilet facilities. The space for administrative and management functions is deficient. The station office space is consistently used as a multifunctional space out of necessity. There is not adequate exterior space for parking, let alone training or drill activities.

The Heery Report conclusion was that the station should be relocated to another site that is large enough to accommodate a modern fire headquarters. It was determined that the current lot is not large enough to allow all of the deficiencies to be addressed

Facility Study Observations

The apparatus bay is barely large enough for the current fleet assets. When all apparatus are in the bay it is difficult if not impossible to walk between some pieces of apparatus. Office space is deficient. The station office is a multi-purpose facility out of necessity rather than design. It was observed during a station visit that two members were conducting breathing apparatus fit testing; another was attempting to enter station records, while the plans reviewer was attempting to conduct a plans review; all in a room that 11'X14', 154 square feet in area.

The dormitory, shower and bathroom facilities are very small. The company officers room is not much larger than a closet, and none of the rooms provide much privacy. The training room cannot be used as effectively as possible since it also must serve for storage and break area, and is open to foot traffic of any visitor to the facility.

There is not proper turnout gear cleaning equipment or space available.

It was observed that turnout gear is stored on the apparatus bay. Some components of the diesel exhaust system are not operating properly or not used routinely exposing gear to toxins and contaminants.

Storage space for equipment and supplies is inadequate. Storage space was recently repurposed to provide a work space for the new fire marshal.

Zebulon Fire Station Facility Floor Plan



Figure 36 - Zebulon Fire Station Floor Plan

Member Survey

The web-based survey was designed to capture member's perceptions of the current facility and provide an opportunity for members to contribute their input and express their concerns.

Members were asked what activities on which they spent the most time and the least time. This will help to identify specific areas of the facility that should experience more or less traffic.

Members reported that most of their time was spent in training or maintenance activities.

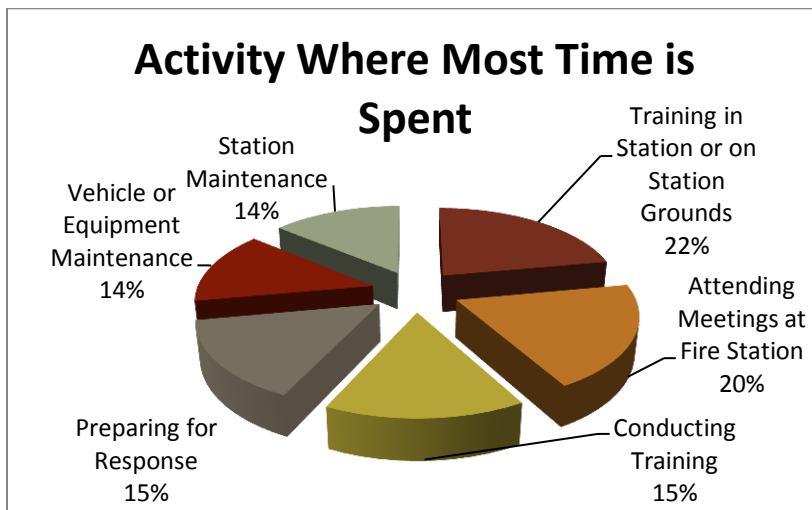


Figure 37 - High Activities

They also reported that they spent the least amount of time in office related activities.

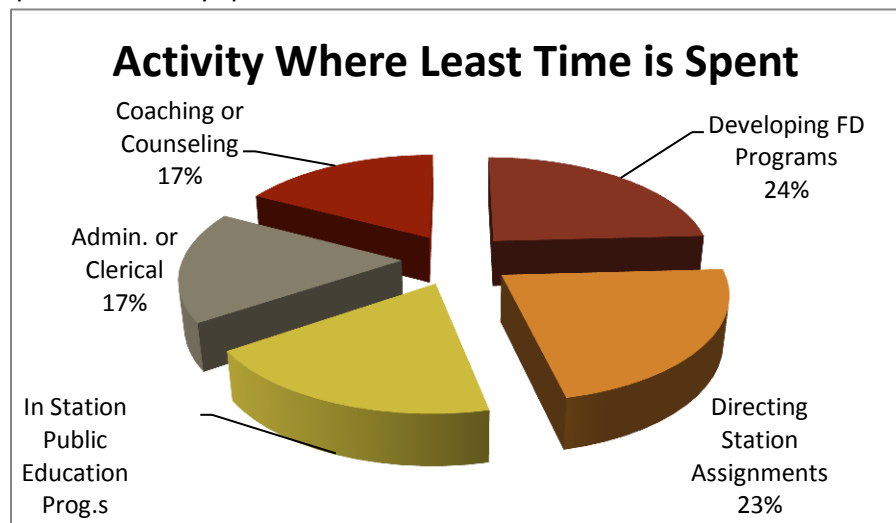


Figure 38 - Low Activities

Survey participants were asked to rate eighteen different functional areas within the station. Only one received an overall rating of Good, the SCBA Filling station area.

Three areas were rated poor, the lowest rating available. These were the apparatus bay, the food preparation and day room area, and the fire inspection and plans review area.

The remaining areas, essentially the rest of the facility, were rated no higher than fair by 75% of the respondents.

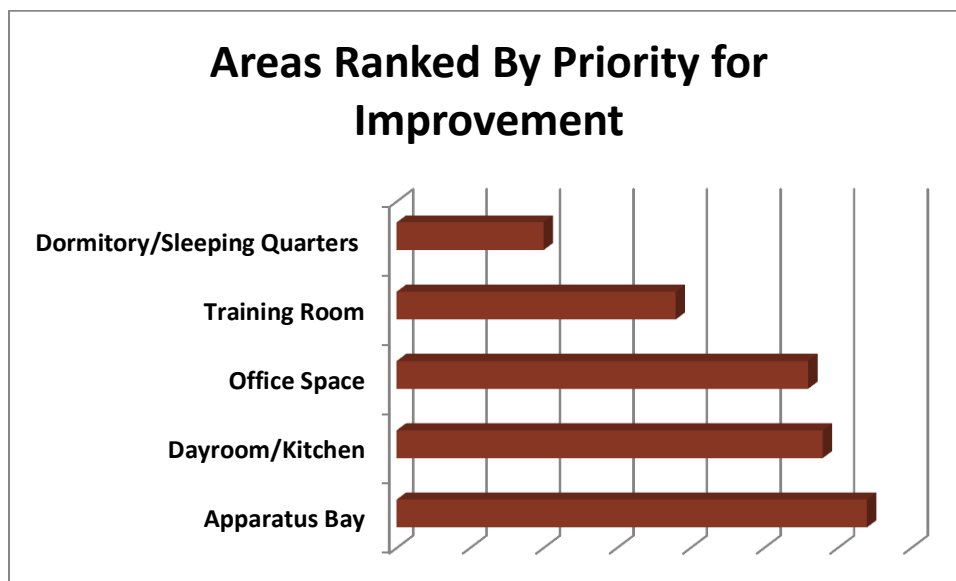


Figure 39 - Highest Priority Areas for Attention

When asked to provide their top priorities all respondents generally agreed that these five areas need immediate attention. 60% of the respondents perceive some areas and/or functions in the station or on the grounds might not be in compliance with regulations, guidelines or best practices. Concerns dealt with privacy and gender issues, accident risk due to crowding, and accessibility for public, especially the handicapped.

Facility Recommendations

1. This study's findings are in agreement with the Heery Report and the Fire Chief's assessment. The facility badly needs to be replaced. The deficiencies are too many to renovate or repair. The site is not large enough to accommodate the features of a properly sized prototype headquarters station.



2. Relocation should be to the most efficient location as identified in the Fire Station Service Area Model presented in Chapter III.
3. The replacement/relocated station should be sized from approximately 13,500 square feet to 18,000 square feet and include the features of the Wake County Prototype Headquarters station and include three drive-through bays to accommodate the departments fleet.
4. The new site should be sized appropriately to accommodate the headquarters station with adequate all weather surface area to provide some drill yard capability. This could be in the range of 2.5-3.5 acres.
5. Based upon other fire station projects in North Carolina and Wake County, it is recommended that an estimated budget might be approximately \$350,000 for planning and design, and \$3.5 million to \$4.5 Million for land acquisition and construction.
6. It is further recommended that a station of this type, properly located to provide the most efficient coverage as recommended in the station matrix model, should meet the needs of the Town and district for the next fifteen years before a second sub-station is needed.

Chapter V – Fire Fleet Study

Description of Fleet

The town of Zebulon Fire Department operates a fleet that meets the needs of the town and rural district. The fleet includes standard first line firefighting apparatus, specialty equipment for rescue, wildland fire fighting and water moving. The fleet inventory includes three pumpers, one aerial/quint, one heavy rescue, one light rescue/brush truck, one tanker, two command/support vehicles and one utility truck.



Figure 40 - First Out Apparatus During Daily Inspection

The fleet is aging with several pieces of apparatus well beyond the age at which equipment might be moved to reserve status or retired. The aerial apparatus is 31 years old. One pumper is 21 years old while two others are 11 and 9 years old. The average age of the fleet is 14 years.

The department utilizes independent vendors and contractors to perform mechanical maintenance and repairs. They also utilize vendors for annual and other testing of apparatus and equipment including ground ladders, etc. The Average Annual cost to the department for maintenance and repairs is \$34,100. The annual average cost for individual pieces of equipment range from \$1,241 to \$7,528. The average annual cost for maintenance and repair across all large fire apparatus is \$4,583.

The ZFD does not have any apparatus classified as reserve, but can move units of the fleet around to cover one unit for another.



The ZFD has internal policies and also generally follows the guidelines of industry standards and county wide policies for vehicle acquisition, deployment maintenance and repair.

Standards

NFPA 1911

The dominant industry standards for fire apparatus are NFPA 1901 and NFPA 1911. These standards are observed industry wide and internationally as proven science and research based. *NFPA Standard 1911: Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Emergency Vehicles* provides very detailed information as well as sample guidelines, procedures and forms for every aspect of fire fleet management. Highlights from NFPA 1911 provide some guidance for evaluating the current status and planning for ZFD's fleet. Annex D, Guideline for First-In and Reserve Fire Apparatus makes the following specific points:

- Apparatus should be renovated/upgraded, moved to reserve status or retired after fifteen years.
- "...fire departments should seriously consider the value (or risk) to firefighters of keeping apparatus in first-line service (after the fifteen year point.)
- Although providing extensive guidelines for the refurbishment or upgrade of apparatus, the standard challenges fire chiefs and other administrators to consider the practicality and long term cost benefit of renovating twenty plus year old apparatus.
- Any apparatus over twenty-five years old should be retired from emergency service regardless of first-line or reserve status.
- The standard does provide information that can be used to develop your own vehicle score card assessment process.

Average Annual Maintenance & Repair Costs	
Unit	Costs
Ladder 95	\$7,528
Pumper 92	\$7,011
Pumper 91	\$6,911
Pumper 94	\$3,629
Rescue 99	\$3,424
Tanker 98	\$2,337
Rescue 9	\$1,241
Total Costs	\$32,081
Maximum Unit Cost	\$7,528
Minimum Unit Cost	\$1,241
Average Unit Cost	\$4,583

Table 12 - Fleet Annual Maintenance and Repair Costs

Wake County Apparatus Policy and Procedures

Although there are many resources available to departments for aiding in fleet assessment and renovation/retirement decisions, one of the best found during this project are the policies and procedures for fleet management of the Wake County Fire Commission Apparatus Committee. The adopted policy and procedures provide the structure for fleet management of county own emergency fire apparatus. The affected apparatus are those owned and operated directly by the county, apparatus



and equipment provided to or purchased with tax assets for the rural fire tax insurance districts, and the county funded apparatus held by municipalities participating in the county cost sharing program.

The policy and procedures provide the following general guidelines:

- A vehicle replacement workbook should be developed for each piece of equipment.
- Generally, Engines, Pumper/Tankers, Tankers, Rescues, and Ladder/Aerials should be replaced when twenty years old or older.
- Brush trucks that are fifteen years old should be replaced.
- Apparatus replacement decisions will be aided by the results of the vehicle replacement workbook assessment, essentially a vehicle score card.
 - The principal factors, in addition to vehicle type, are apparatus age, road mileage and/or hours of operation, and annual expenses of the apparatus.

The policy and procedures provide prescriptive guidance in how to score the factors to ensure consistency and benefit. The factors and prescriptive rating points were used in this study as the principal core to develop vehicle score cards for the heavy vehicles in the ZFD fleet.

There are provisions in the policy and guidelines for considering the consolidation of two apparatus into one. This will be important to the town when considering retirements and replacements within the fleet.

Challenges

There are a number of challenges when considering fleet size and structure for the ZFD. The majority of the district is generally suburban with the majority of fire risks found in residential properties. The town benefits significantly from the cost sharing program as a result of its coverage of the Wakelon fire insurance District, but the lack of a positive water supply requires the town to have a water moving capability. The impact of the Interstate, State and high volume North Carolina highways, and the associated hazards and risks, along with the industrial and manufacturing component of the local economy require a rescue capability. All of these risks require a fleet of diverse capability.

Vehicle Age		
Unit	Year of Manf.	Age
Ladder 95	1987	31
Pumper 91	1997	21
Pumper 94	2007	11
Rescue 99	2007	11
Pumper 92	2009	9
Rescue 9	2009	9
Tanker 98	2010	8
Maximum Age		31
Minimum Age		8
Average Age		14

Table 13 - ZFD Fleet Age



Figure 41 - Engine 94

The size of the fleet certainly contributes to the cramped spaces on the apparatus bay of the existing station, and will be a design consideration for a replacement facility. It is our opinion that the department should evaluate every opportunity to reduce the number and size of apparatus in the fleet to reduce or better manage the impacts.

The age and escalating annual maintenance costs for apparatus and the increasing uncertainty of reliability, especially for Pumper 91 and Ladder 95 will be creating pressure on the town’s budget and the cost sharing program as replacement options are considered.

ISO Rating Impact

The town enjoys a very good Rural Response Rating System (ISO) classification upon which insurance premiums for the town and rural district are determined. The current rating is Class 3 in town and Class 4 in the rural district.

The size and makeup of the fleet were rated during the evaluation and scoring. A 3,000 gallon per minute required fire flow was determined under the rating schedule and is based upon the town and district makeup and size. Three engines/pumpers are needed to receive credit for meeting the required fire flow. There are also twelve buildings located throughout the jurisdiction establishing the need for an aerial ladder apparatus. The tanker is also needed for those areas not within 1,000 feet of a fire hydrant. Therefore, at least five large apparatus are needed to continue to maintain the favorable ISO rating. This fleet size requires large apparatus space and other associated space for supplies and equipment for such a large fleet.

Fleet Values		
Unit	Acquisition costs	Replacement Value
Ladder 95	\$399,205	\$1,200,000
Pumper 91	\$250,556	\$400,000
Pumper 92	\$300,000	\$400,000
Pumper 94	\$302,110	\$400,000
Tanker 98	\$240,182	\$300,000
Rescue 9	\$208,514	\$325,000
Rescue 99	\$80,762	\$100,000
C1	\$36,818	\$50,000
C2	\$23,661	\$45,000
UT9	\$24,469	\$40,000
Total	\$1,866,277	\$3,260,000

Table 14 - ZFD Fleet Values



The conundrum is that the department does not have the staff or volunteers to deploy the apparatus in the fleet that is available for response. There is enough staff to deploy one unit fully manned or two units if staff is split. Splitting staff between apparatus is not a desirable situation since it splits crews and reduces effective unit staffing. For active/working and major events, the department is dependent upon volunteers to respond to the station and then deploy additional apparatus. This is a time consuming process and sometimes, available apparatus remains in the station for lack of staffing.

Fleet Investment

Large fire apparatus is very expensive to purchase and maintain but has a relatively long service life of ten to twenty years. The original acquisition costs for the existing fleet was nearly \$1.9M. The replacement cost of the fleet, as estimated by the town's insurance carrier, is \$3.26M. This replacement value may actually be a little low.

Vehicle Score Card

A system of vehicle score cards, whether by that name or by some other, provides a standard method of auditing the fleet to help determine replacement needs and track maintenance and other costs. It also provides a system of annual assessment that helps support more informed decision making.

There are many systems available and used in fleet management applications for determining when, and at what costs, to replace or renovate assets. After evaluating several, the Wake County factors for developing their Vehicle Replacement Workbook, was selected to be the core of a study evaluation of fleet assets. In addition to the factors of age, mileage, M&R costs, and vehicle type, a factor for component assessment was added. This factor is actually made up of at least eleven sub-factors. Some examples are mechanical factors, body and paint condition and the condition of compartments. On duty staff assisted during the assessment process and this step was used to further gather input from shift personnel and other members. The Vehicle Score Card assessment documentation will be left with the agency as part of the promised data library, and which they can maintain if they choose.

The process of creating score cards for each piece of heavy apparatus helps to rate and rank units for action, like retirement or replacement. Even the opportunities for consolidation of units can be helped with information from this process. The high level results of the vehicle score card process are presented in Figure 42, Vehicle Score Card Results

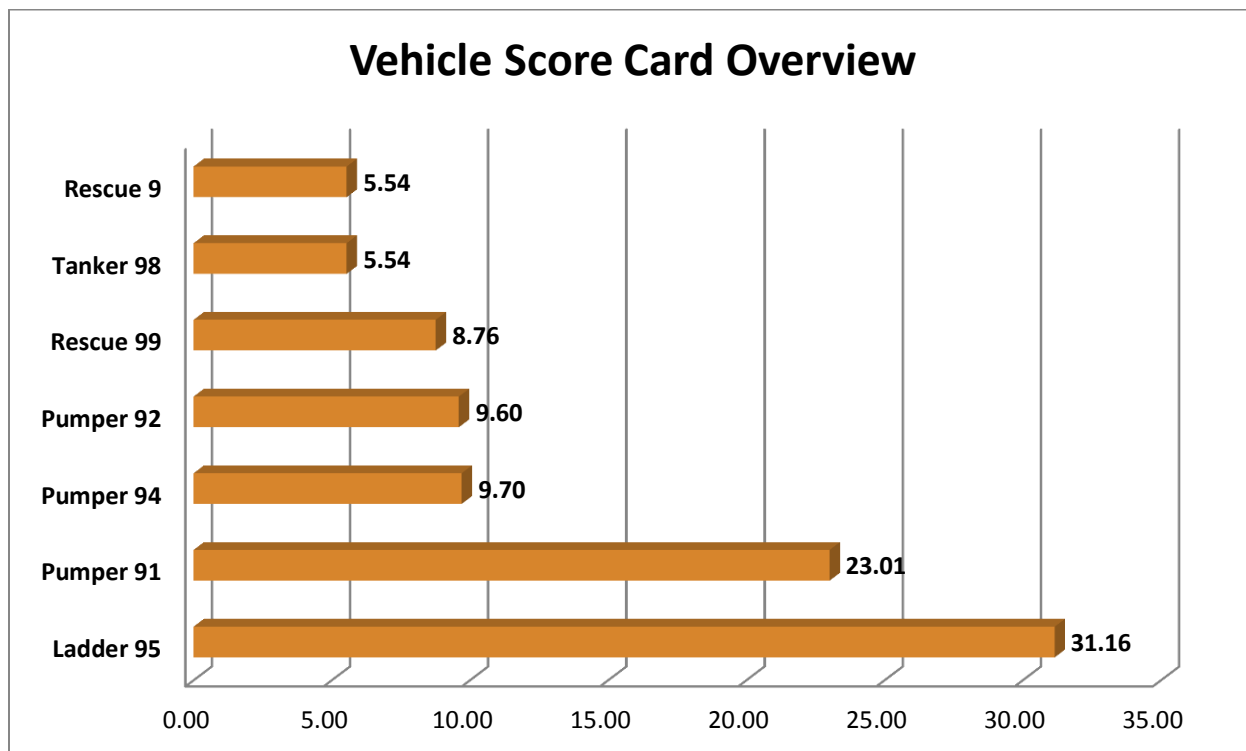


Figure 42 - Vehicle Score Card Results

Recommendations

1. There is an immediate need to replace L95. This piece of equipment is sixteen years older than the current industry standard recommends for the maximum age of a first line piece of fire equipment and is eleven years older than the recommended replacement age in the Wake County Fire Commission Apparatus Committee, Policy and Procedures. This aerial device is larger than the district would require therefore, it is further recommended to investigate replacing the 102 foot aerial with a 75' or 85' aerial on a shorter and much lighter chassis.
2. It is recommended to replace Pumper 91 in the year following Ladder 95.
3. A fleet capital plan should be developed to begin programming replacements for Pumps 94 and 92. According to the industry standard, P94 should be taken out of first line service in 2022 and according to the county policy it should be retired in 2027. According to the same guidelines, Pumper 92 should move from first line service in 2024 and retired in 2029.
4. To help reduce the size of the fleet, when considering replacement of Ladder 95 or Pumper 91, thought should be given to configuring the replacement apparatus as a rescue aerial or pumper.



This would result in a more efficient unit with a higher call load, reduce cost and maintenance, and relieve some floor space requirement.

5. It is recommended that the department maintain the Vehicle Score Card System used in this study, or some similar process to help manage a fleet replacement and capital program.



Chapter VI – Recommendation Summary

Station Location Study Recommendations

These recommendations are in priority order and are in concert with preceding recommendations in the chapter on existing station assessment.

1. Develop plans for the relocation of the existing fire station to area proposed in Station Service Area #137, previously identified as Station #1, Central Grid. This would result in improving performance and closing gaps in the current deployment of resources for standards of cover achievement. This location also moves current resources closer to the areas of new growth and development.
2. Begin negotiations with Wake County Fire Services for participation in the relocation through the Cost Sharing Program. This would likely be the first station relocation project which the county might help fund. The cost sharing percentage could be as high as 33%-43%.
3. Begin negotiations with Wake County EMS. This organization has a very strong interest in co-locating in a station that provides them the options in response which this one does. The degree of financial participation may be based on a number of factors, but could be as high as 20%-33%.
4. Utilizing the forward view format encouraged by this model, develop a long term plan for additional fire stations (15-20 years out) as the jurisdiction continues to develop. The area which the model seems to forecast next is Grid #155. This is consistent with evolving subdivision development as well as the commercial/industrial development which is taking place in the area identified with the Mud Cats Stadium.
5. The Green Pace Road property is not a very effective or efficient location for a fire station. It will not be of value to co-locating partners. The recommendation is to find another use for this site other than emergency response deployment.
6. Begin a process to routinely capture and analyze Alarm Handling time, Turnout Time and Travel Time for the first due unit to incidents as well as the full effective response force.

Existing Facility Recommendations

1. This study's findings are in agreement with the Heery Report and the Fire Chief's assessment. The facility badly needs to be replaced. The deficiencies are too many to renovate or repair. The site is not large enough to accommodate the features of a properly sized prototype headquarters station.



2. Relocation should be to the most efficient location as identified in the Fire Station Service Area Model presented in Chapter III.
3. The replacement/relocated station should be sized from approximately 13,500 square feet to 18,000 square feet and include the features of the Wake County Prototype Headquarters Station and include three drive-through bays to accommodate the departments fleet.
4. The new site should be sized appropriately to accommodate the headquarters station with adequate all weather surface area to provide some drill yard capability. This could be in the range of 2.5-3.5 acres.
5. Based upon other fire station projects in North Carolina and Wake County, it is recommended that an estimated budget might be approximately \$350,000 for planning and design, and \$3.5 million to \$4.5 million for land acquisition and construction.
6. It is further recommended that a station of this type, properly located to provide the most efficient coverage as recommended in the station matrix model, should meet the needs of the Town and district for the next fifteen years before a second sub-station is needed.

Fleet Study Recommendations

1. There is an immediate need to replace L95. This piece of equipment is sixteen years older than the current industry standard recommends for the maximum age of a first line piece of fire equipment and is eleven years older than the recommended replacement age in the Wake County Fire Commission Apparatus Committee, Policy and Procedures. This aerial device is larger than the district would require therefore it is further recommended to investigate replacing the 102 foot aerial with a 75' or 85' aerial on a shorter and much lighter chassis.
2. It is recommended to replace Pumper 91 in the year following Ladder 95.
3. A fleet capital plan should be developed to begin programming replacements for Pumpers 94 and 92. According to the industry standard, P94 should be taken out of first line service in 2022 and according to the county policy it should be retired in 2027. According to the same guidelines, Pumper 92 should move from first line service in 2024 and retired in 2029.
4. To help reduce the size of the fleet, when considering replacement of L95 or P91, thought should be given to configuring the replacement apparatus as a rescue aerial or pumper. This would result in a more efficient unit with a higher call load, reduce cost and maintenance, and relieve some floor space requirement.
5. It is recommended that the department maintain the vehicle score card system used in this study, or some similar process to help manage a fleet replacement and capital program.



Appendix A: Five Year Regression Analysis with Service Demand Projections for 2023

