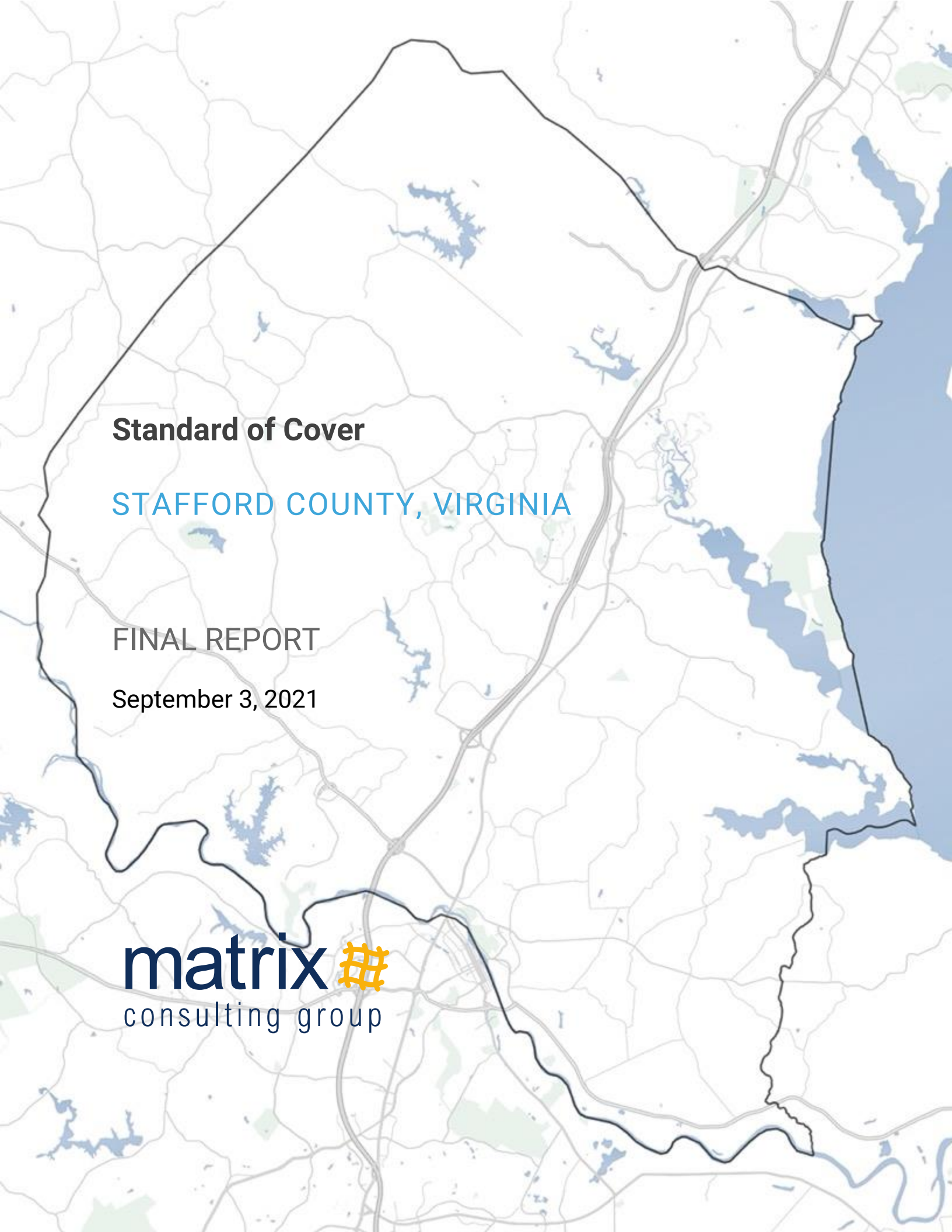


Standard of Cover

STAFFORD COUNTY, VIRGINIA

FINAL REPORT

September 3, 2021

matrix consulting group

Table of Contents

INTRODUCTION AND EXECUTIVE SUMMARY

The Matrix Consulting Group was retained by Stafford County to facilitate the development of a Standard of Cover for the Fire and Rescue Department. This document includes the project teams' research and analysis of the Fire and Rescue Department and community that includes risk assessment, staffing, response capabilities, and deployment analysis.

Scope of Work

The scope of this study included the assessment of the Stafford County Fire and Rescue Department (SCFR) operations, response capabilities, staffing, and other resources necessary for the delivery of services to the County. A review of services and the delivery of those services should be performed periodically to ensure needs are being met. This project focused on the fire and EMS protection system response to calls and included:

- Response capabilities
- Response time analysis
- Resource locations
- Available resources
- Staffing and manpower.

The approaches used in this study were comprehensive as described below.

Approaches Utilized in the Study

To understand and evaluate service level issues facing the Stafford County, the project team undertook an assessment of the Fire and Rescue Department. The principal approaches utilized by the project team in this study included, but were not limited to, the following:

- Internal Interviews – members of the project team individually interviewed numerous executives, management, and supervisory staff of Stafford County, and Fire and Rescue Department leadership.
- Data Collection – the project team collected a wide variety of external and internal data documenting the structure, operations and organization, including:
    - Department staffing and scheduling.
    - Documentation reflecting operations management.

  - Numerous output data points reflecting services provided.
  - Various other performance information and indicators.

- This data was summarized in a 'descriptive profile' of the Fire and Rescue Department, which was reviewed and modified by SCFR staff to ensure we had a factual foundation for the study. This approach ensured that the project team had an appropriate understanding of the Department.

Data was collected over the past several months and presented in interim deliverables. Throughout this process, the project team reviewed facts, findings, and conclusions through these interim deliverables with the Fire and Rescue Department.

Executive Summary

Stafford County is a suburban county to the Washington DC metro area and has many workers from the DC area and from the Marine Corp Base Quantico living in the County. The population has grown by approximately 15% over the past ten years and it is anticipated that this this pattern will continue with new residential and commercial construction continuing in various areas of the county.

With the increase in population the demand for services will also increase. Based on the population projections, the calls for service for the fire and rescue department are expected to increase from an average of 10,000 calls per year to over 21,000 calls by 2040. Many new residents in Stafford County are moving from other municipalities in the region and from other areas within the United States. The challenge for Stafford County is the delivery of services as many of these residents come to the county with certain level of expectation for services. This is especially true of individuals moving from a metro sized municipality to a suburban/rural type area.

The Fire and Rescue Department resources are reaching capacity in terms of call volume, utilization of services, and infrastructure. As demonstrated in this report, the medical units are beyond capacity and it is taking a toll on the emergency response system as a whole. Residential and commercial growth increasing, especially in the suburban areas, and the emergency services are struggling to keep pace. This growth will require the department and community leaders to address the needs of the fire and rescue department constantly and consistently. Monitoring the data points such as response time, unit hour utilization, and the demand for services during this growth period will enable leadership to keep pace with the demand for services in a timely manner.

Summary of Strategic Initiatives

A summary of recommendations established in this report follows. The report itself should be reviewed to understand the factual basis behind each recommendation, as well as the analysis leading to each goal and the related objectives.

General Provisions:

- Stafford County should adopt an organizational statement for the emergency services system that outlines response time expectations, staffing, response capabilities, and to provide guidance for any future expansion of the Fire and Rescue Department.
- The Fire and Rescue Department must identify response demand zones to provide for planning and response performance objectives.

Call Processing:

- The Stafford County Sheriff's Office Emergency Communications Center should establish call processing benchmarks as outlined in NFPA 1221 Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems including calls answered and call processing performance objectives.
- The Stafford County Sheriff's Office Emergency Communications Center should provide monthly statistical reports to the various departments and agencies outlining their performance as compared to the established benchmark performance objectives.

Turnout Time:

- Formally establish a baseline performance objective for turnout times of 1 minute 18 seconds for emergency medical calls 90% of the time.
- Formally establish a benchmark performance objective for turnout times of 1 minute for emergency medical calls 90% of the time.
- Formally establish a baseline performance objective for turnout times of 1 minute and 44 seconds to fire related calls 90% of the time.
- Formally establish a benchmark performance objective for turnout times of 1 minute and 20 seconds to fire related calls 90% of the time.
- Work with the Stafford County Sheriff's Office Emergency Communications Center to ensure procedure and processes are adequate for capturing the time stamps.
- Install timers in the stations at the apparatus doors to indicate the elapsed time from dispatch.
- Post turnout time performance monthly by station and by shift at each station to allow crews to see their performance.

- Create a reporting mechanism for excessive turnout times to allow for evaluation on the cause in turnout time delays.

Resource Distribution:

- The Fire and Rescue Department should add an ambulance/medic unit to the current allocation of resources in the North Suburban Demand Zone.
    - Continue to monitor the call volume, response time, and unit hour utilization for the needs of an additional ambulance/medic unit in the future.
- The Fire and Rescue Department should add a new fire station in the area of Mine Road and Austin Ridge Drive and staff this station with an engine company and an ambulance/medic unit.
- The Fire and Rescue Department should add an ambulance/medic unit to the resources in the South Suburban Demand Zone.
    - Continue to monitor the call volume, response time, and unit hour utilization for the needs of an additional ambulance/medic unit in the future.
- The Fire and Rescue Department should work with Stafford County leadership and planning agencies on the development of the Centreport Parkway and Jefferson Davis Highway area.
- Due to the condition and poor location, the Fire and Rescue Department should replace the Brooke Fire Station and move the station to the area of 2092 Courthouse Road.
- Due to the poor condition and location of the Rockhill Fire Station, the Fire and Rescue Department should combine the Rockhill Fire Station and the Rockhill Rescue Station into a single facility in the area of Popular Road and Mountain View Road.

Resource Concentration:

- The Fire and Rescue Department should increase the minimum staffing of the career fire suppression units from three personnel to four personnel.

Facility Assessment Summary

Facility	Current Condition	Recommendation
Station # 1 – Falmouth	Good	Continue current use, renovate as required, increase way finding signage on site.
Station #2 – Stafford	Good	Repair exterior issues immediately and repave the parking area in the next five years. Maintain the building for current use.
Station #3 – Widewater	Good	Address standing water issue at rear of building. Maintain the building for current use.
Station #4 – Mountain View	Good	Continue current use and maintain the facility as needed.
Station #5 - Brooke	Poor	This station should be decommissioned. Alternative location should be determined as needed.
Station #6 - Hartwood	Excellent	Continue current use and maintain the facility as needed.
Station #7 – White Oak	Fair	Continue maintenance on building. Would require extensive renovation in the event that career personnel are located in building.
Station #8 – Rockhill	Extremely Poor	Decommission the station and relocate immediately. May consider moving to Rescue Station #8 as an interim step until a more centralized station is constructed.
Fire Station #9 – Aquia Harbour	Poor	Replace existing facility. Would likely require new site for adequate size station.
Station #10 – Potomac Hills	Good	Continue current use and maintain the facility as needed.
Station #12 – Berea	Good	Continue current use and maintain the facility as needed.
Station #14 - Garrisonville	Excellent	Develop a preventive maintenance plan for this facility to help preserve the longevity of the facility. Maintain the facility and continue current use.
Rescue Station #4 – Mountain View	Fair	Discontinue current use and return asset to community.
Rescue Station #7 – White Oak	Fair	Expand staff area for career personnel or relocate personnel to different station.
Rescue Station #8 - Rockhill	Fair	Discontinue current use and return asset to community. May serve as interim location for Fire Station #8 while a new site is purchased and station constructed.
Training and Logistic Center	Fair	Renovate the training and office areas if this site is a long term county asset. Consider moving away from urban core to allow for redevelopment on site.

ORGANIZATION AND OVERVIEW

This chapter provides an overview of the general characteristics of Stafford County.

Background and Overview

A part of the Northern Virginia region, Stafford County is approximately 40 miles south of Washington DC, along the Rappahannock and Potomac Rivers. The county was established in 1664 and today is considered one of the fastest growing counties in the nation.

Stafford County is approximately 280 square miles with the Marine Corp Base Quantico occupying approximately 51 of those square miles. Based on the 2018 estimated population of 149,960 residents, the population density is 655 people per square mile. The Potomac River forms the eastern border and I-95 transects the county from north to south. There is a significant population center along I-95 in the Garrisonville, parts of Griffis-Widewater, and parts of Aquia areas resulting in higher population densities in these areas. The proximity of Washington DC also increases the commuter traffic in the County.

Stafford County is governed by a County Administrator form of government with seven County Supervisors elected by the seven magisterial districts. A County Administrator manages the daily operations of the county.

Demographic Profile

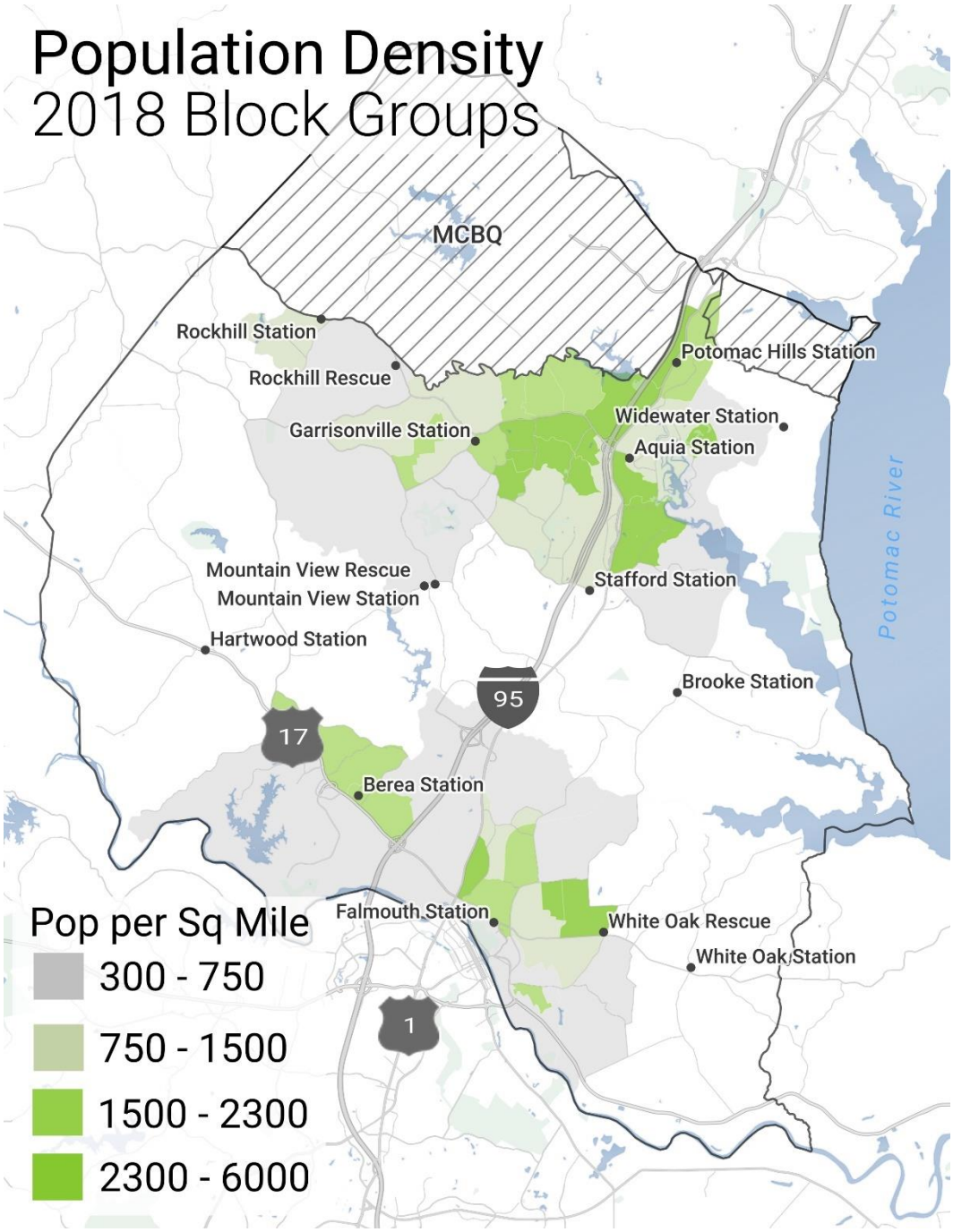
The following table illustrates the demographic profile of Stafford County and changes that have occurred since the 2010 Census.

Stafford County Demographics

United States Census Data	2010	2015	2018
Estimated Stafford County Population	129,745	142,003	149,960
Median Age	34.2	35.9	35.8
Children Under Age 5	6.7%	6.0%	6.6%
Children Ages 5 to 19 years	24.6%	23.3%	22.3%
Persons Age 20 to 59 years	57.6%	57.1%	56.0%
Persons Age 60 and Over	11.0%	13.5%	15.1%
Families in Poverty	3.4%	2.2%	3.1%
Civilian Labor Force Unemployed	6.9%	4.2%	4.0%
Median Household Income	$40,720	$43,887	$48,418
Employment Sectors:			
Education, Health Care, Soc. Svc.	19.9%	20.7%	21.0%
Retail Trade	9.7%	11.2%	10.0%
Professional, Scientific, Mgmt.	13.8%	15.2%	15.7%
Finance, Insurance, Real Estate	4.7%	5.1%	4.4%
Entertainment, Recreation, Food	7.3%	6.6%	7.6%
Construction	6.2%	8.1%	8.7%
Manufacturing	3.1%	3.9%	1.9%
Transportation, Warehousing, Util.	3.5%	2.7%	2.9%
Public Administration	22.7%	20.7%	19.1%
Other Services	5.8%	3.2%	4.7%
Wholesale	1.1%	1.0%	1.6%
Information	1.7%	1.4%	1.9%
Agriculture, Forestry, Fishing	0.5%	0.4%	0.4%

Since 2010, the population of Stafford County has increased approximately 15% adding an estimated 20,215 residents. The median age has remained consistent at approximately 35 years old with small fluctuations in the various age groups.

The following map provides a view of population density by block groups.



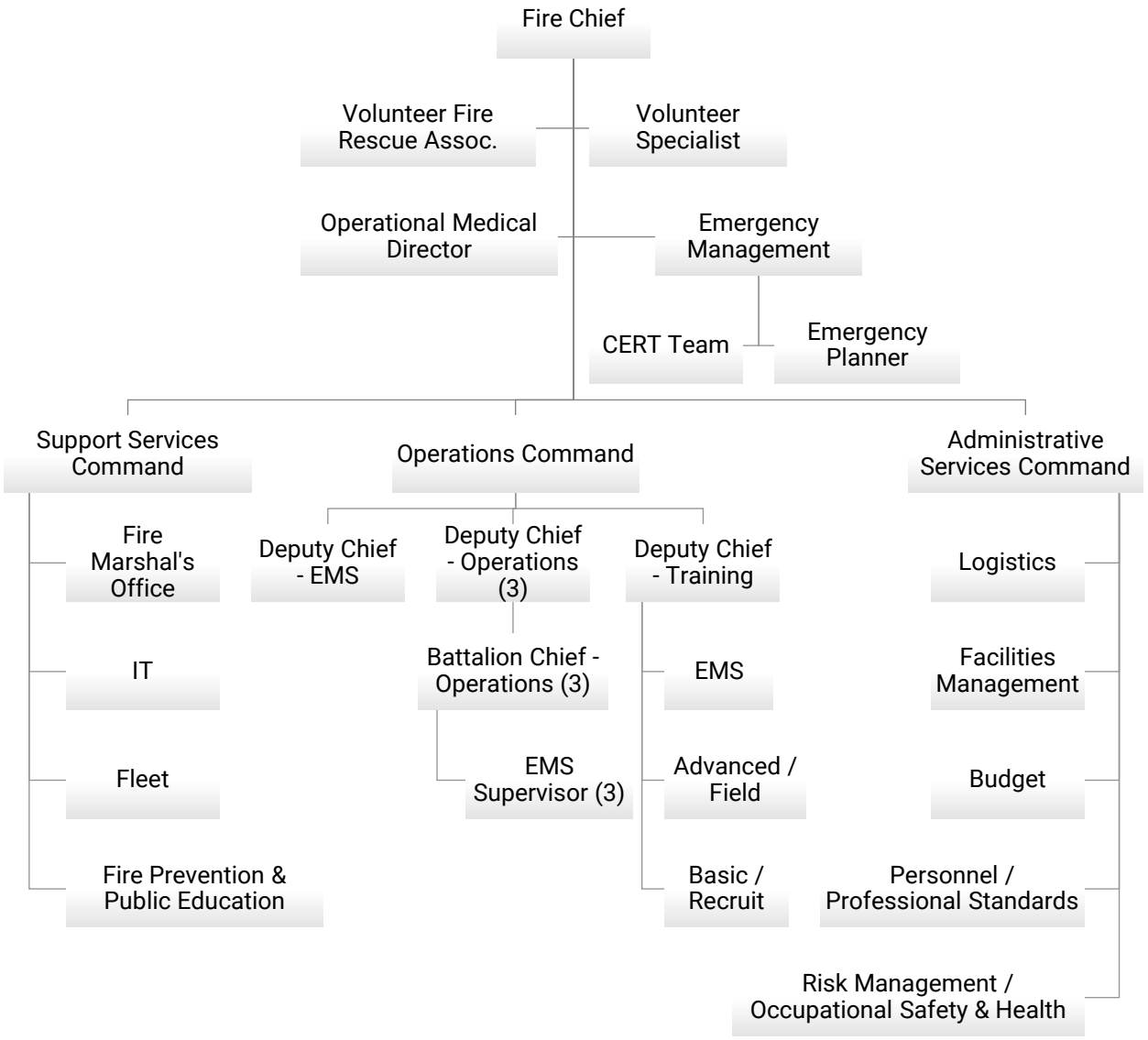
Fire Services

This chapter provides an overview of the fire protection system including the resources available to Stafford County and a historical review of the workload for the Fire and Rescue Department.

Organization

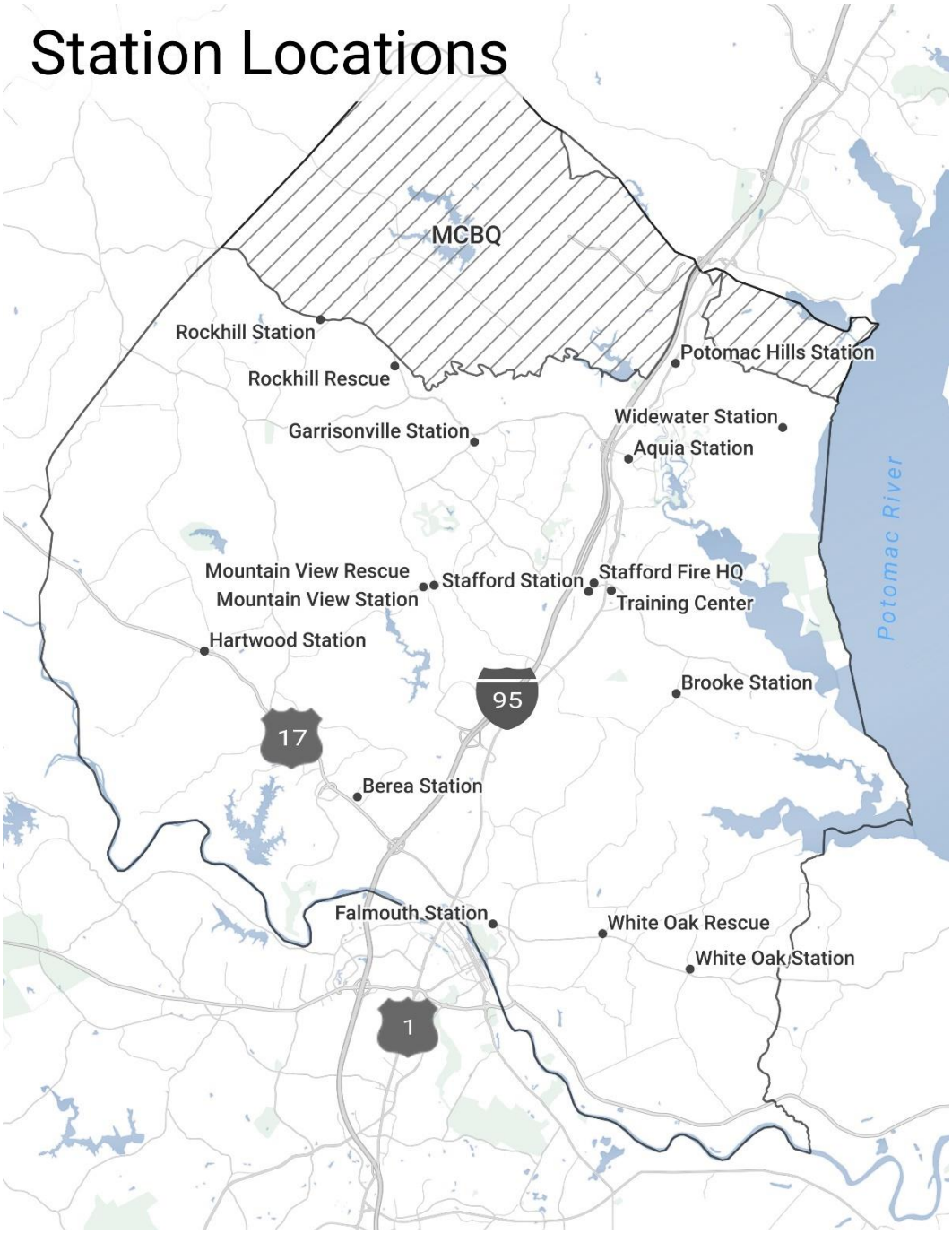
In the early years, the fire protection system in Stafford County consisted of numerous volunteer organizations providing services to the populated neighborhood areas. In September 2005, the Stafford County Fire and Rescue Department (SCFR) was established to create a single department within the County structure. The SCFR is a combination volunteer-career organization that operates from 15 fire stations with 350 career and volunteer personnel. The SCFR also functions as the lead agency for emergency management and handles fire prevention activities in the County. The organizational chart that follows illustrates the current Fire and Rescue Department organization.

Stafford County Fire and Rescue Department Organization



Physical Resources

Service to Stafford County is provided from fifteen (15) fire and EMS stations. The following map illustrates the locations of the fire stations.



The career staff for the County work a modified shift with 24 hours on, 24 hours off, 24 hours on, 24 hours off, 24 hours on, then 96 hours off. The daily minimum staffing is 40 personnel.

The tables below outline the apparatus and minimum staffing for each of the fifteen (15) stations.

Fire Company 1 - Falmouth

250 Butler Road

Description of Use	Combination volunteer and career staffed station providing service to the southern areas of the County along the US 1 corridor.
Apparatus Space	Four drive-through bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Ambulance/ Medic 1	2017	Ford F-550	Ambulance	County	2
Engine 1	2019	Spartan	Type 1 Engine	County	3
Rescue 1	2014	Pierce Arrow XT	Rescue	County	Cross Staffed w/E1
Car 1	2011	Dodge Charger	Command	County	
Chief 1	2011	Dodge Charger	Command	County	
Engine 1 Bravo	2008	Pierce Dash	Type 1 Engine	County	
MSU-1	2008	Ford F-350	Marine Support	County	
Trailer	2011	Cargo Trailer	Utility	County	
Utility 1	2001	Ford F-350	Utility	Volunteer	
Zodiac 1	1989	Zodiac Boat	Water Rescue	Volunteer	

Fire Company 2 - Stafford

305 Jason Mooney Drive

Description of Use	Located in Stafford providing service in the central sections of the County and parts of the I-95 corridor with career and volunteer staffing.
Apparatus Space	Three drive-through bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Ambulance/ Medic 2	2017	Ford F-550	Ambulance	County	2
EMS 2		Ford F-250	Command	County	1
AC-2	2005	Chevrolet Suburban	Command	Volunteer	
Brush 2	1989	Ford F-350	Type 6 Engine	Volunteer	
Chief 2	2009	Chevrolet Suburban	Command	County	
Engine 2 - Bravo	1996	Pierce Lance	Type 1 Engine	Volunteer	
Engine 2	2020	Spartan	Type 1 Engine	County	
Truck 2	2019	Pierce Ladder	Aerial Ladder	County	
Truck 2 (old)	1999	Pierce Lance	Aerial Ladder	Volunteer	
Utility 2	2002	Ford F-350	Utility	Volunteer	

Fire Company 3 - Widewater

749 Widewater Road

Description of Use	Provides service to the far northeast area of the County.
Apparatus Space	Four bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Ambulance/ Medic 3	2019	Ford F-550	Ambulance	County	2
Engine 3	2014	Rosenbauer	Type 1 Engine	County	
Boat-3	1999	Proline Boat-240	Water Rescue	Volunteer	
Brush 3	2004	Ford F-350	Type 6 Engine	County	
Chief 3	1999	Chevrolet Tahoe	Command	Volunteer	
Hovercraft 3	2002	Hovercraft	Water Rescue	Volunteer	
Tanker 3	2001	E-One	Water Tender	County	

Fire Company 4 - Mountain View

924 Kellogg Mill Road

Description of Use	Located in the central section of the County providing service to the area west of Stafford.
Apparatus Space	Five Bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Engine 4	2015	Rosenbauer	Type 1 Engine	County	3
Tower 4	2018	Rosenbauer	Aerial Tower	County	Cross Staff w/E4
Boat-4	1986	John Boat	Water Rescue	Volunteer	
Brush 4	1997	Ford F-350	Type 6 Engine	Volunteer	
Chief 4	2003	Ford F-150	Command	Volunteer	
Support Unit	1994	E-One	Support	County	
Jeep 4	1977	Jeep	Utility	Volunteer	
Utility 4	2003	Ford F-350	Utility	Volunteer	

Fire Company 5 - Brooke

222 Andrew Chapel Road

Description of Use	Provides service to the southern areas of the County east of Stafford.
Apparatus Space	Six Bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Ambulance/ Medic 5	2019	Ford F-550	Ambulance	County	2
Ambulance/ Medic 5 Bravo	2015	Ford F-450	Ambulance	County	
Boat 5	1996	Privateer Boat	Water Rescue	County	
Brush 5	1998	Ford F-350	Type 6 Engine	Volunteer	
Chief 5	1998	Ford Expedition	Command	Volunteer	
Engine 5	2006	Pierce Lance	Type 1 Engine	County	
MSU-5	2006	Ford F-350	Marine Support	Volunteer	
Tanker 5	2000	Pierce Lance	Water Tender	Volunteer	

Fire Company 6 - Hartwood

67 Hartwood Church Road

Description of Use	Located in the far southwestern section of the County provides service west of Berea and along the Warrenton Road corridor.
Apparatus Space	Four Bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Engine 6	2018	Rosenbauer	Type 1 Engine	County	3
Ambulance/ Medic 6	2016	Ford F-450	Ambulance	County	
Brush 6	2006	Ford F-350	Type 6 Engine	Volunteer	
Chief 6	2008	Ford Explorer	Command	Volunteer	
Engine 6B	2004	Pierce Lance	Type 1 Engine	County	
Tanker 6	2007	Kenworth T-300	Water Tender	County	
Utility 6	2017	Ford F-250	Utility	County	

Fire Company 7 - White Oak

12 Newton Road

Description of Use	Provides service along the White Oak Road corridor and the far southeast sections of the County.
Apparatus Space	Three Bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Assistant Chief 7	2004	Ford Expedition	Command	Volunteer	
Boat 7	1991	Seamark Boat	Water Rescue	Volunteer	
Brush 7	1997	Dodge RAM	Type 6 Engine	Volunteer	
Chief 7	2007	Ford Explorer	Command	Volunteer	
Engine 7	2018	Rosenbauer	Type 1 Engine	County	
MSU 7	2002	Ford F-350	Marine Support	Volunteer	
Rescue Engine 7	1994	Pierce Lance	Rescue	Volunteer	
Tanker 7	2007	Kenworth T-300	Water Tender	County	

Fire Company 8 - Rockhill

2133 Garrisonville Road

Description of Use	Located in the far northwest section of the County providing service to the area west of Garrison.
Apparatus Space	Five Bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Engine 8	2015	Rosenbauer	Type 1 Engine	County	3
Brush 8	1992	Ford F-350	Type 6 Engine	Volunteer	
Tanker 8	2007	Kenworth T-300	Water Tender	County	

Fire Company 9 - Aquia

1001 Washington Drive

Description of Use	Situated just outside the Aquia Harbour area providing service to the Aquia Harbour neighborhood and the northeast sections of the County.
Apparatus Space	Two bays, one drive through

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Engine 9	2015	Rosenbauer	Type 1 Engine	County	3
Ambulance/ Medic 9	2020	Ford F-550	Ambulance	County	
Ambulance/ Medic 9 Bravo	2015	Ford F-450	Ambulance	County	
Response 9	2001	Ford Expedition	Utility	Volunteer	

Fire Company 10 - Potomac Hills

3528 Jefferson Davis Highway

Description of Use	Provides service to the far northeastern areas of the County and support to the Garrsionville area.
Apparatus Space	Seven Bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Ambulance/ Medic 10	2017	Ford F-550	Ambulance	County	2
FMOSU	1999	International Excellence	Fire Marshal Support	County	
Engine 10	1998	Pierce Lance	Type 1 Engine	Volunteer	

Fire Company 12 - Berea

20 Sebring Drive

Description of Use Apparatus Space	Provides service to the Berea area along Warrenton Road and southern areas of the County. Three drive through bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Ambulance/ Medic 12	2017	Ford F-550	Ambulance	County	2
Battalion 1	2011	Ford F-350	Command	County	1
Engine 12	2015	Rosenbauer	Type 1 Engine	County	3
Truck 12	2015	Rosenbauer Aerial	Aerial Ladder	County	Cross Staff w/E12
Medical Ambulance Bus 12	1997	International 3000	Utility	County	
MCSU Support Unit	2010	Navistar 4400	Utility	County	
MSU-12	2008	Ford F-250	Marine Support	County	

Fire Company 14 - Garrisonville

53 Shelton Shop Road

Description of Use Apparatus Space	Located west of the Garrisonville area, this is a new facility to provide service to Garrsionville and the western areas surrounding Garrisonville. Three drive through bays

Assigned Apparatus

Unit ID	Year	Description	Type	Ownership	Minimum Staffing
Ambulance/ Medic 14	2017	Ford F-550	Ambulance	County	2
Engine 14	2021	Spartan	Type 1 Engine	County	3
Rescue 14	1995	Pierce Lance	Rescue	Volunteer	Cross Staff w/E14
Battalion 2	2006	Ford Expedition	Command	County	
Utility 14	2006	Ford Expedition	Utility	County	

Rescue Company 4 - Mountain View

1268 Mountain View Road

Description of Use	Located southwest of Stafford provide service and support to Fire Company 4 in the central area of the County.					
Apparatus Space	Two bays					
Assigned Apparatus	Unit ID	Year	Description	Type	Ownership	Minimum Staffing
	Ambulance/ Medic 4	2015	Ford F-450	Ambulance	County	
	Ambulance/ Medic 4 Bravo	2002	Ford E-450	Ambulance	County	
	Rehab 4	2007	Chevrolet C-5500	Rehab	Volunteer	
	Response 4	2006	Chevrolet Suburban	Utility	Volunteer	
	Trailer for Gator	2006	Carry-On Tailer	Utility	Volunteer	

Rescue Company 7 - White Oak

535 White Oak Road

Description of Use	Located in the far southeastern section of the County providing service and support to Fire Company 1 and 7.					
Apparatus Space	Three Bays					
Assigned Apparatus	Unit ID	Year	Description	Type	Ownership	Minimum Staffing
	Ambulance/ Medic 7	2017	Ford F-550	Ambulance	County	2
	Ambulance/ Medic 7 Bravo	2016	Ford F-450	Ambulance	County	
	Ambulance/ Medic 7 Charlie	2004	Ford E-450	Ambulance	County	
	Response 7	2008	Ford Expedition	Utility	County	

Rescue Company 8 - Rockhill

1565 Garrisonville Road

Description of Use	Provides service and support to the northern area of the County west of Garrsionville.					
Apparatus Space	Four Bays					
Assigned Apparatus	Unit ID	Year	Description	Type	Ownership	Minimum Staffing
	Ambulance/ Medic 8	2016	Ford F-450	Ambulance	County	
	Ambulance/ Medic 8 Bravo	2016	Ford F-450	Ambulance	County	

Historical Workload

The Fire and Rescue Department responds to emergency and non-emergency calls for service. The following tables illustrate the activities of the Department grouped by the type of call or detail.

Calls for Service by Type

	2017	2018	2019	Total	Pct.
Auto Accidents	1,404	1,463	1,404	4,271	9.9%
Medical Calls	9,028	9,445	9,595	28,068	65.0%
Total Medical and Auto Accidents	10,432	10,908	10,999	32,339	74.9%
Alarm – Activation	1,406	1,763	1,713	4,882	11.3%
Other Type Fire	18	18	24	60	0.1%
Smoke Scare	57	59	40	156	0.4%
Structure Fire	154	159	152	465	1.1%
Vegetation/Brush/Debris Fires	251	292	269	812	1.9%
Vehicle Fire	88	108	80	276	0.6%
All Fire Calls	1,974	2,399	2,278	6,651	15.4%
Rescue Calls - Extrication	194	188	167	549	1.3%
Rescue Calls - Other	10	22	13	45	0.1%
Rescue Calls - Technical	24	26	27	77	0.2%
Rescue Calls - Water	28	45	19	92	0.2%
All Rescue Calls	256	281	226	763	1.8%
Aircraft Emergency	1	0	1	2	0.0%
Hazardous Condition	432	545	542	1,519	3.5%
Hazardous Materials	12	3	4	19	0.0%
Railroad Incidents	2	1	0	3	0.0%
Service Calls	501	589	635	1,725	4.0%
Unclassified	33	36	108	177	0.4%
Other Type of Calls	981	1,174	1,290	3,445	8.0%
Total Calls for Service	**13,643**	**14,762**	**14,793**	**43,198**	

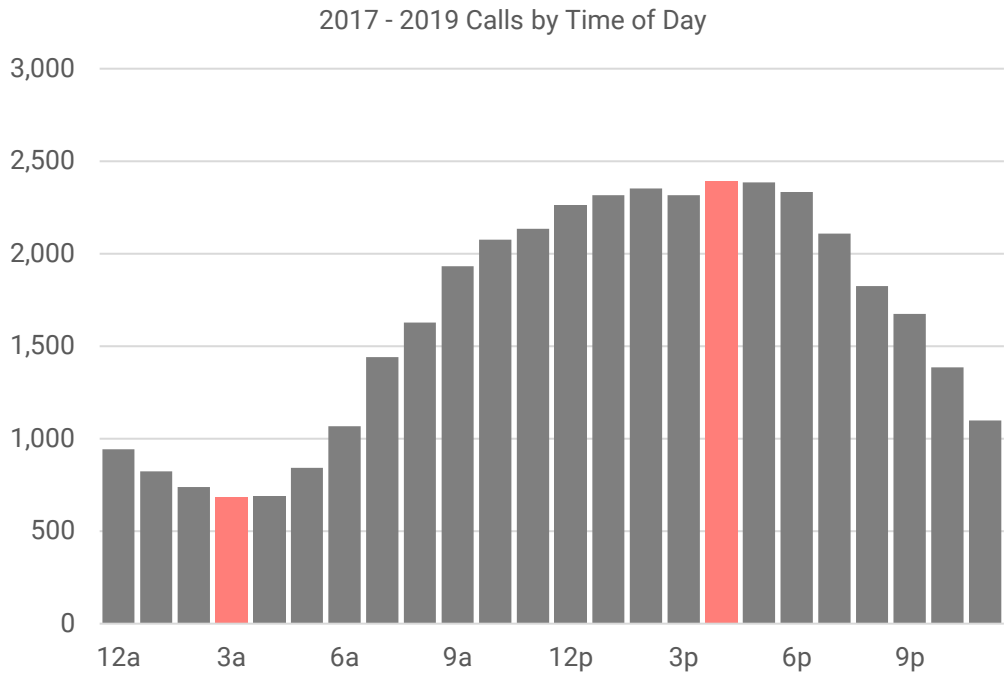
The following table displays the total number of calls for service handled by the Fire and Rescue Department by each hour and day of the week for the past three years. Both emergency and non-emergency calls were included to provide an overall view of the call demand on the fire protection system.

2017 – 2019 Calls for Service by Hour and Weekday

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
12 am	163	110	116	133	115	140	165	942
1 am	168	102	102	98	108	116	129	823
2 am	125	112	112	80	104	97	109	739
3 am	90	97	95	82	92	114	116	686
4 am	101	108	94	73	87	110	117	690
5 am	124	131	104	110	135	119	120	843
6 am	129	176	164	153	157	163	126	1,068
7 am	160	211	216	229	222	237	166	1,441
8 am	164	246	247	238	268	257	207	1,627
9 am	244	301	296	292	267	300	232	1,932
10 am	288	320	302	275	284	310	297	2,076
11 am	267	302	301	347	287	331	299	2,134
12 pm	297	350	295	308	357	351	304	2,262
1 pm	304	334	328	344	348	335	323	2,316
2 pm	327	318	310	318	361	390	329	2,353
3 pm	267	327	323	343	357	404	295	2,316
4 pm	331	370	333	316	378	360	306	2,394
5 pm	314	346	336	378	343	393	275	2,385
6 pm	337	314	339	361	336	334	312	2,333
7 pm	302	319	282	302	292	341	270	2,108
8 pm	282	249	252	252	260	229	301	1,825
9 pm	224	232	211	242	225	279	262	1,675
10 pm	196	177	189	174	180	223	246	1,385
11 pm	122	169	135	153	164	156	200	1,099
Total	5,326	5,721	5,482	5,601	5,727	6,089	5,506	39,452

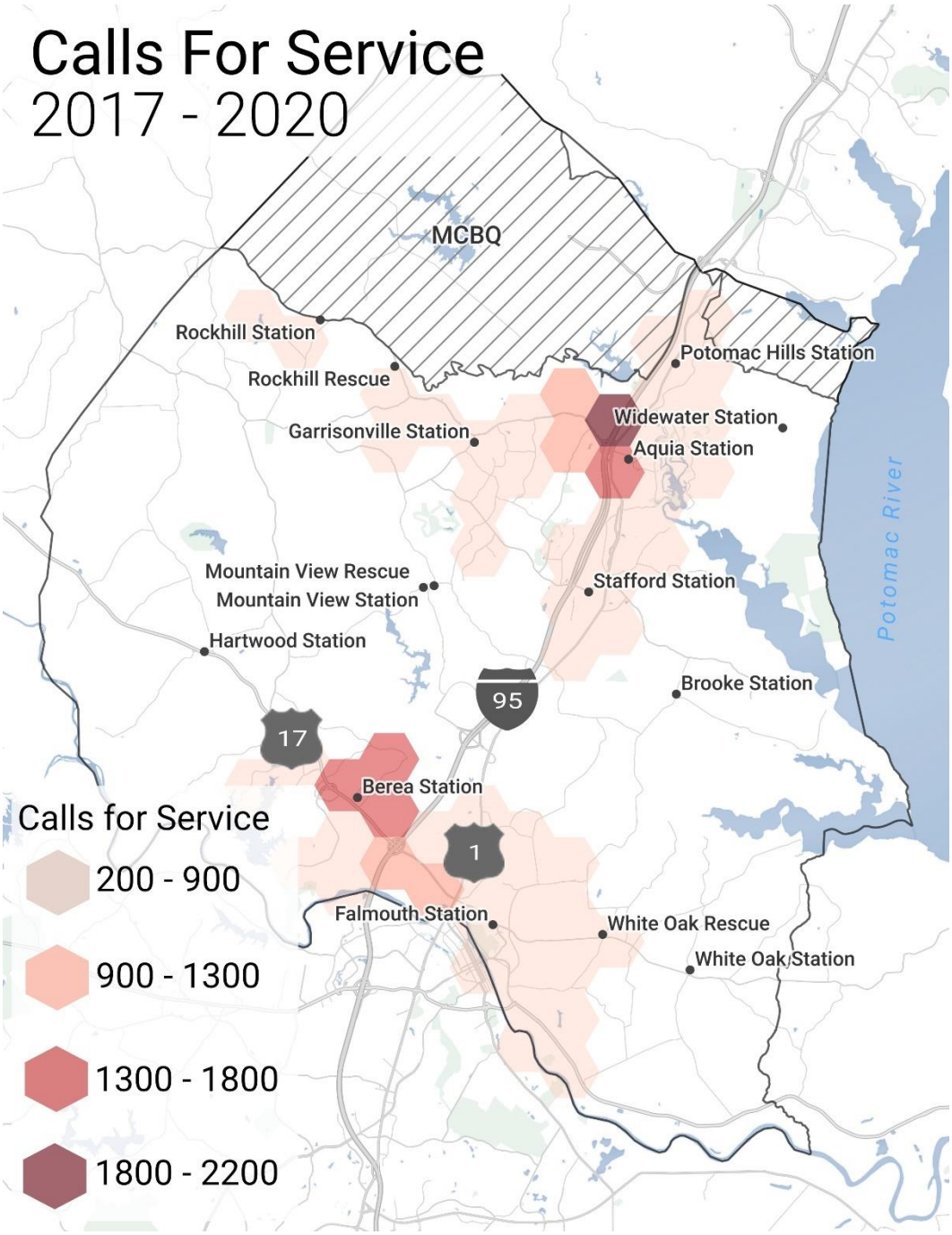
The call volume is heaviest during the middle part of the day from late morning to the early evening and generally though the normal workweek of Monday through Friday. The calls for service varied by time of day and day of the week. The busiest time of the day is 4 pm with the slowest hour being 3 am.

The following chart further illustrates the calls for service by hour of the day.



As illustrated above, calls increase sharply at the 9 am hour peaking at 4 pm and remaining steady throughout the day. The calls begin to decline at the 8 pm hour and sharply decline at the 10 pm hour with 3 am being the slowest hour of the day.

The following map illustrates the call demand using GIS technology to outline where the majority of the calls are occurring. As illustrated, the highest volume of calls is in the Berea area in the southern section of the County and in Aquia and Garrisonville areas in the northern sections of the County.



Financial Resources

Stafford County operates on a fiscal year ending on June 30. Budget preparation is the responsibility of the County Administrator with assistance from the Chief Financial Officer and various department heads throughout the County. The County Board of Supervisors is responsible the final approval of the annual budget.

Revenue

The County receives revenues from a variety of sources including taxes, licenses and permits, and charges for services. The real estate property tax accounts for approximately 80% of the taxes received.

The table below is a summary of the revenues that are attributable to the Fire and Rescue Department.

Stafford County Fire and Rescue Revenues

Line Item	2018 Actual	2019 Actual	2020 Budget
Fire and Rescue Charges	$454,345	$412,247	$417,555
Ambulance Charges	$2,620,298	$2,369,240	$2,000,000
Total Revenues	**$3,074,643**	**$2,781,487**	**$2,417,555**

The largest contributor to the revenues attributable to the Fire and Rescue Department is the Ambulance Cost Recovery Charges.

Expenditures

The following table is a summary of the operating expenditures for the Fire and Rescue Department.

Stafford County Fire and Rescue Expenditures

Line Item	2018 Actual	2019 Actual	2020 Budget (Adjusted)
Wages and Salaries	$8,828,351	$9,583,675	$12,135,810
Salaries - Overtime	$963,598	$1,006,339	$764,569
Salaries - Specialized Overtime	$1,220,468	$1,522,730	$1,002,780
Benefits	$3,971,582	$3,995,779	$4,651,311
Total Personnel Expenditures	**$14,983,999**	**$16,108,523**	**$18,554,470**
Operating Expenditures			
Operations	$2,230,060	$2,353,660	$4,310,786
Support Services	$1,301,524	$1,377,003	$1,001,242
Fire Marshal	$55,400	$56,528	$73,832
Training	$279,121	$187,880	$260,330
Stafford Rescue Company 1	$7,049	$550	
Mountain View Rescue Company 4	$28,969	$31,887	$40,714
White Oak Rescue Company 7	$17,286	$37,353	$40,574
Rock Hill Rescue Company 8	$16,899	$28,479	$47,991
Aquia Harbor Rescue Company 9	$23,423	$45,964	$61,223
Falmouth Fire Company 1	$82,929	$61,714	$81,632
Stafford Fire Company 2	$73,788	$46,892	$42,275
Widewater F&R Company 3	$21,536	$34,619	$43,280
Mountain View Fire Company 4	$15,828	$28,349	$41,186
Brooke F&R Company 5	$21,316	$31,875	$45,723
Hartwood F&R Company 6	$31,122	$26,407	$38,759
White Oak Fire Company 7	$23,128	$33,841	$45,984
Rock Hill F&R Company 8	$39,836	$27,145	$46,245
Potomac Hills F&R Company 10	$1,714	$0	
Total Operating Expenditures	**$4,270,928**	**$4,410,146**	**$6,221,776**
Capital Expenditures			
White Oak Rescue Company 7	$6,070	$0	$6,435
Rock Hill Rescue Company 8	$9,993	$0	
Support Services	$24,473	$48,140	$20,000
Falmouth Fire Company 1	$35,000	$28,517	$41,483
Operations	$79,943	$78,593	$294,932
Total Capital Expenditures	**$155,479**	**$155,250**	**$362,850**
Total Expenditures	**$19,410,406**	**$20,673,919**	**$25,139,096**

As illustrated, personnel services for the Fire and Rescue Department are the largest operating expenditure for the Stafford County Fire and Rescue Department, accounting for approximately 74.9% of operating expenditures in FY 2020.

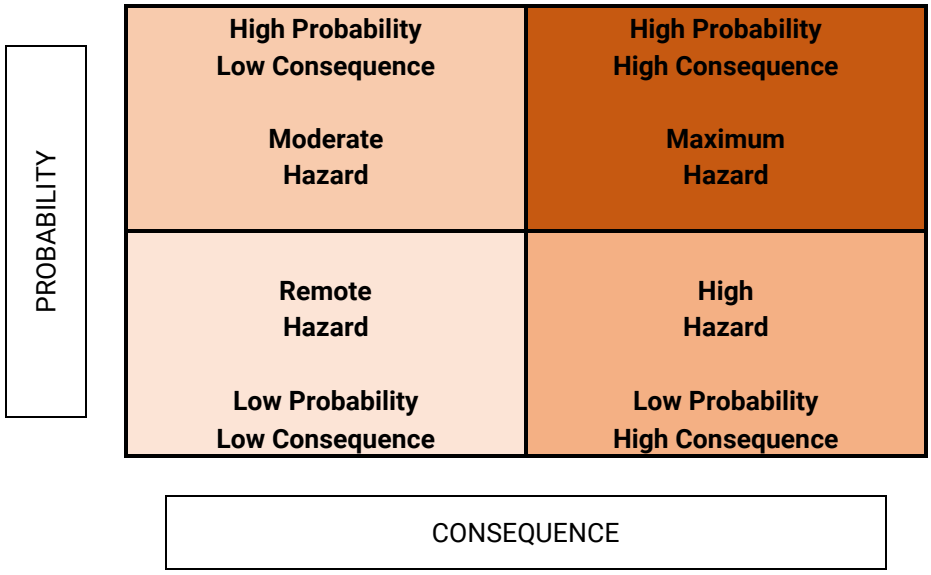
Community Risk Assessment

Risk is defined as the possibility of loss or injury or other unwelcome adverse circumstance or event. As a community we try to reduce the effects of the unwanted events through mitigation efforts prior to an emergency and using services such as police departments, public works and fire departments.

Risk Factors and Categories

Determining the fire and non-fire risks in a community provides the foundation to develop resource deployment strategies to reduce the effects of the unwanted events or circumstances. There are three primary components used in the risk assessment.

- Identification – what are the hazards faced by the community.
- Probability – the likelihood that an unwanted event will occur within a given period of time. Events that occur daily is highly probable while those that occur annually are less likely.
- Consequence – the measure of disparate outcome that can be defined by loss of life, loss of property and loss of historic values.
- Occupancy Risk – an assessment of the built upon area and the types of structures in the area, their occupancies, and any special risks that may be present.



The previous graph illustrates the correlation between the probability of occurrence and consequences of that occurrence. The result of this graph then allows for the identification of the hazard class. The four hazard classes are defined as follows:

Maximum Risk

An area classified as maximum risk should be of substantial size and contain properties presenting a high risk of life loss, loss of economic value to the community, or large loss damage to property if destroyed. Such areas would ordinarily be the highest fire flow areas and have a high probability of events. The structures within them may lack built in fire protection features and may contain occupants not capable of self-preservation. Maximum risk areas include the following:

- Major shopping and business centers, large department stores, shopping malls, multi-story hotels, and office properties.
- Concentrations of high risk industrial and commercial properties including hazardous materials facilities.
- Concentrations of theaters, cinemas, clubs, dance halls, bars and other areas with potential for large life loss.
- Occupancies with occupants that may require assistance such as non-ambulatory or restrained persons (i.e., nursing homes and hospitals).
- Any occupancy over 10,000 square feet without built-in fire protection.
- Emergency medical, rescue, special operations incidents requiring multiple alarms.

Maximum risks frequently impact a fire agency's needs for multiple alarm capability and an adequate assessment of its ability to concentrate resources. Failure to identify these risks often results in the inability to effectively control these incidents. In the sections that follow, many of these risks are identified as places of assembly, hazardous materials storage, and high fire-flow buildings.

In addition to the buildings and structures included in the maximum risk areas, special events pose a large risk in terms of the number of attendees and the large areas involved in some of those events. Threats in these situations include terrorism, mass casualty incidents, and severe weather events are all part of this risk.

High Risk

A high-risk area is defined as one that contains properties or hazards presenting a substantial risk of life loss, a severe financial impact on the community, or unusual

potential damage to property if there is a fire and has a low probability of events. Examples of such areas include the following:

- Strip shopping centers and business centers not exceeding two stories.
- Concentrated areas of revenue generating properties or high job loss to the community if business is lost.
- Infrastructure facilities such as schools, city, county, state, and federal facilities.
- Properties deemed to be of historical value to the community.
- Any building with life safety and fire load beyond the reach of pre-connected hose lines (200 feet).
- Concentrated areas of single- or two-story multi-family dwellings.
- Any occupancy over 10,000 square feet with built-in fire protection not classified as a maximum risk.
- Emergency medical, rescue, special operations incidents requiring a first alarm.

Moderate/Typical Risk

An area is classified as a moderate fire risk when it contains built up areas of average size and the risk of life loss or damage to property if there is a fire in a single occupancy is usually limited to the occupants. In certain areas such as small apartment complexes, the risk of death or injury may be relatively high. Concentrations of property may vary, but generally will be of limited extent. Probability of fire events are high along with frequent, routine non-fire risks resulting in a service demand other than fire. Examples of moderate risk areas include the following:

- Developments of generally detached single family housing.
- Apartments with pre-connected hose line access (200 feet).
- Industrial or commercial buildings under 5,000 square feet without built in fire protection.
- General business offices under 5,000 square feet.
- Emergency medical, rescue, special operations incidents requiring three units or less.

These risks are often the greatest factor in the distribution of fire stations to ensure fair and equitable access to initial attack capability. As with the maximum risk above, there are a number of moderate risk buildings and structures identified in the following sections.

Remote Isolated Rural Risks

Areas may be classified as remote rural risks if they are isolated from any centers of population and contain few buildings. There is a low probability of events and low consequences. Examples include the following:

- Rural land with minimal occupied structures.
- Recreational areas.

Natural Hazard Assessment

Stafford County is a part of the George Washington Region that includes four counties and the City of Fredericksburg. A regional hazard mitigation plan was developed and last updated in 2017. This plan is a good source of natural hazard identification, probability, and vulnerability of the various hazards. With the regionalization of the plan and hazard identification, it also provides a mechanism to identify hazards that may indirectly impact Stafford County.

During the most recent update of the plan, the number of events over the preceding five years and data from the Commonwealth of Virginia Mitigation Plan was used to determine the relative risk to the region and the various partners in the region. The table that follows outlines the hazard priorities to the partner areas based on this assessment.

	Hazard Priority				
Event	**Stafford County**	**Caroline County**	**Fredericksburg**	**King George County**	**Spotsylvania County**
Dam Failure	Low	Low	N/A	Low	Low
Drought / Extreme Heat	Medium - High	Medium	Medium - High	Medium - High	Medium
Wildfires	Medium - High	Medium - High	Medium - High	Medium	Medium
Earthquakes	Low	Low	Medium	Low - Medium	Low - Medium
Sinkholes and Landslides	Low - Medium	Low	Low - Medium	Low	Low
Flooding	High	Low	High	Medium - High	High
Non-Rotational Wind (Hurricanes / Thunderstorms)	High	Medium - High	High	High	High
Rotational Wind (Tornadoes)	High	Medium - High	High	High	Medium - High
Winter Storms / Nor'easters	High	Medium - High	High	High	High

As noted previously, the potential of indirect impacts to Stafford County are shown in the previous table. The indirect impact may be the ability of neighboring resources not being able to provide assistance. In the instance of flooding, both Stafford County and Fredericksburg are in the high priority category meaning the likelihood of assistance from Fredericksburg is low.

Flooding

According to the George Washington Regional Commission Hazard Mitigation Plan, Stafford County averages about two flood events a year. The plan also notes problem areas in the County as follows.

Repeated road closures due to flooding and debris at:

- River Road;
- Harrell Road at the CSX Crossing;
- Aquia Drive, requiring emergency access from Decatur Road;
- Kellogg Mill Road at Abel Lake;
- Brooke Road;
- Various streets and roads in the following neighborhoods:
    - Vista Woods,
    - Grafton Village,
    - Argyle Hills.

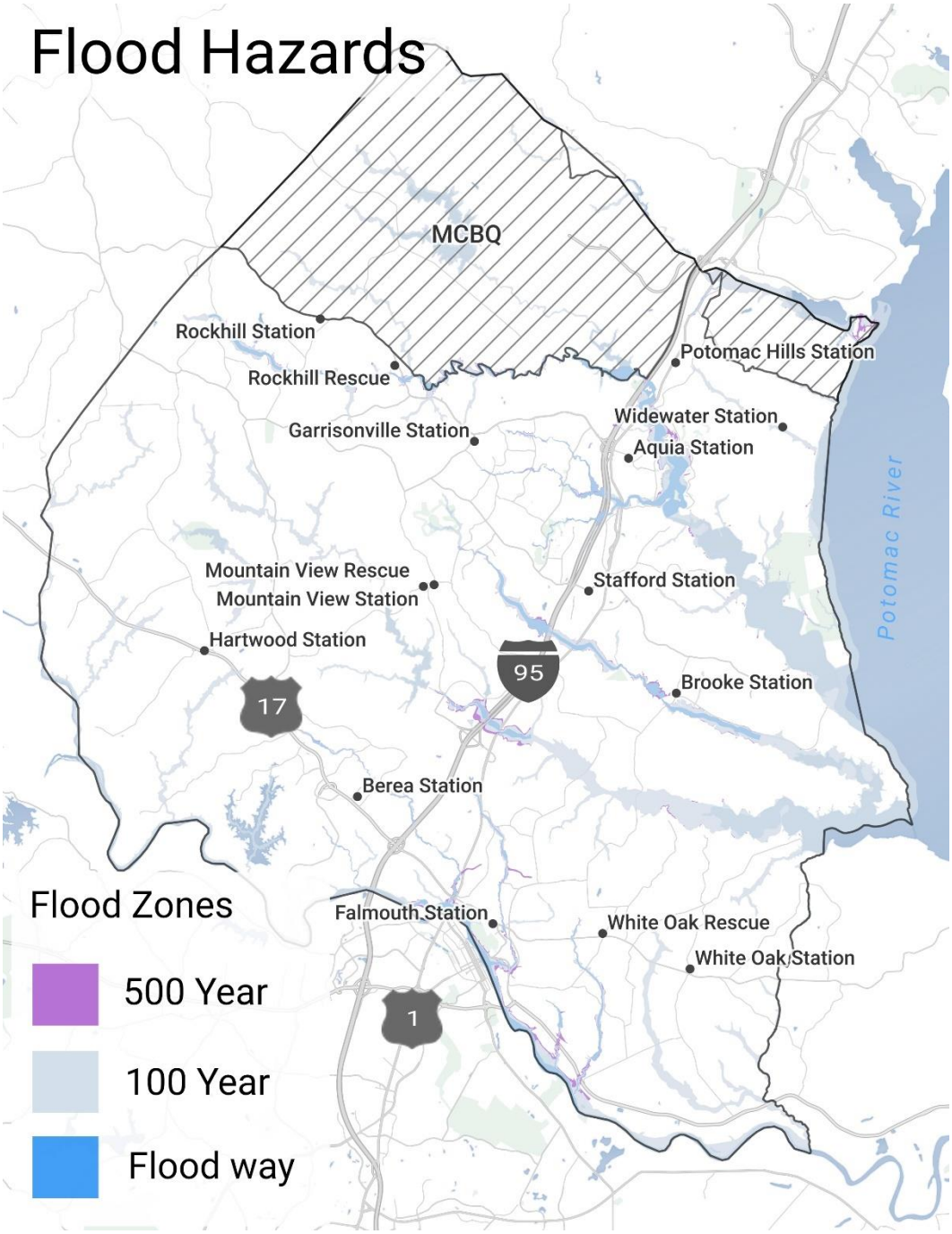
Riverine flooding in several neighborhoods including:

- The Falmouth area, which is often impacted; and
- The Aquia Harbour area with over 1,000 homes affected.

Tidal flooding in the marina areas

- Hope Springs Marina;
- Holiday Harbor Marina;
- Aquia Bay Marina.

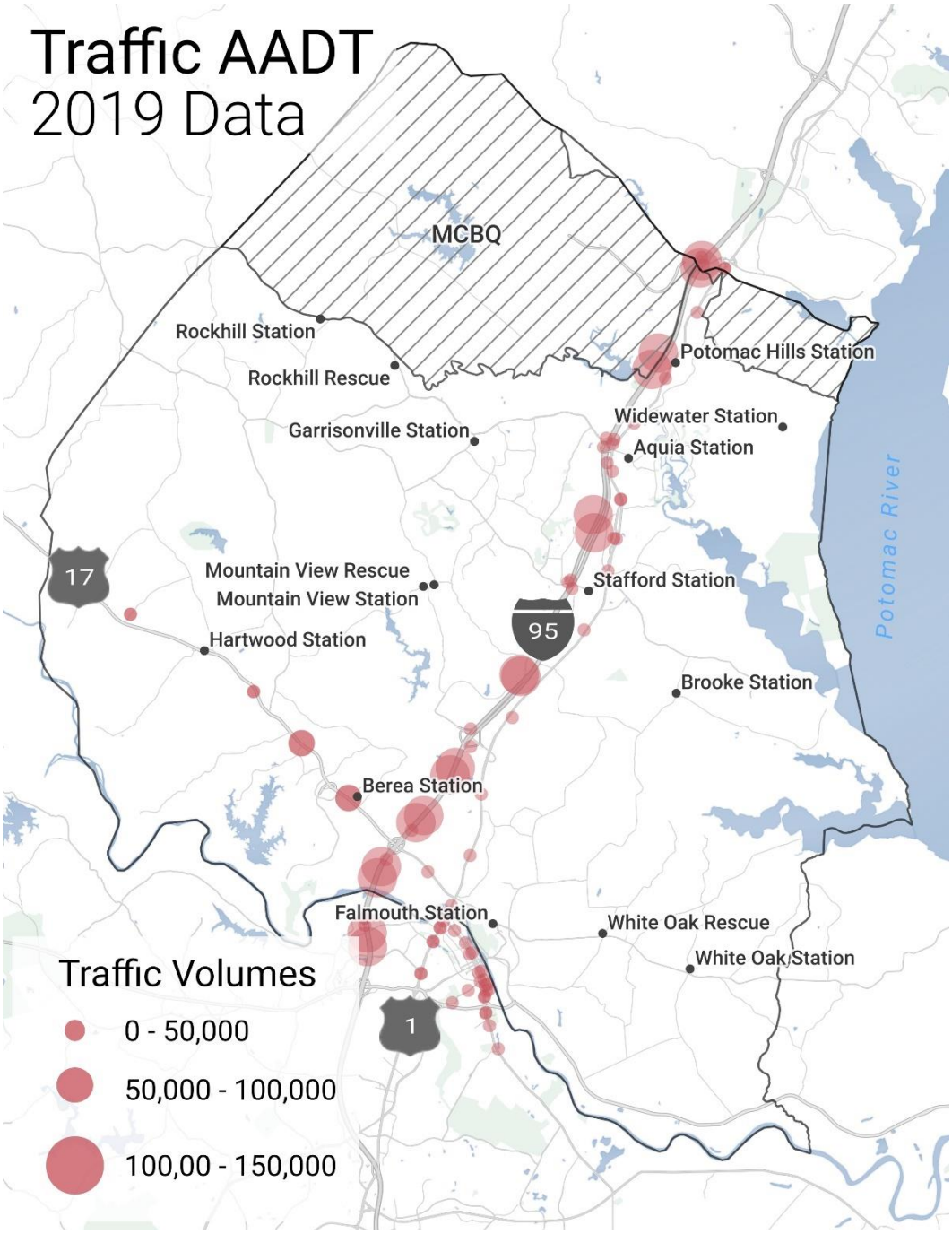
The following map illustrates the floodways and floodplains in Stafford County as identified by the 2020 FEMA Floodplain Program.


Flood Hazards
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Stafford Station
Hartwood Station
95
17
Brooke Station
Berea Station
Falmouth Station
White Oak Rescue
White Oak Station
1
Flood Zones
500 Year
100 Year
Flood way

Transportation Hazards

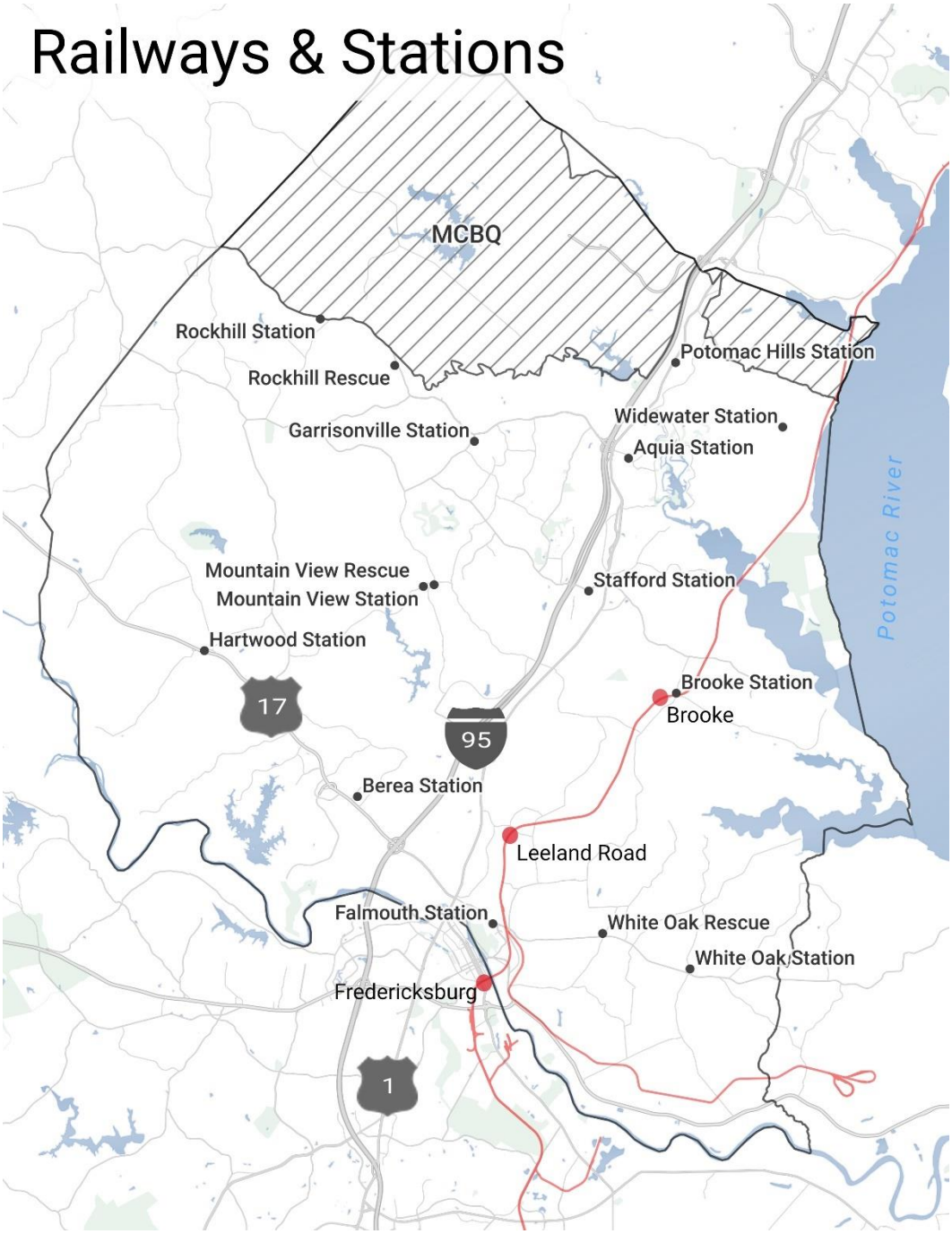
Roadway Network

Within Stafford County there are two primary highways that transect the county from a north-south trajectory. Interstate 95 is a major highway that follows the east coast from Miami, Florida to the United States/Canadian Border in Maine. It passes through Stafford County providing access to Washington DC to the north and Richmond VA to the south. Parallel to I-95 is US-1 also providing a north-south corridor through the county. Along the southern half of Stafford County is US-17 that creates an east-west corridor. The data is provided as point data meaning the traffic counts are taken at specific points along the route. The following map illustrates an average daily traffic count as provided by the Commonwealth of Virginia.


Traffic AADT
2019 Data
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
17
Mountain View Rescue
Mountain View Station
Hartwood Station
Stafford Station
95
Brooke Station
Berea Station
Falmouth Station
White Oak Rescue
White Oak Station
1
Traffic Volumes
0 - 50,000
50,000 - 100,000
100,00 - 150,000

Railways

The Virginia Railway Express (VRE) provides commuter rail passenger service to the Washington DC area originating in Spotsylvania with two stops in Stafford County. The Brooke Station has 727 parking spaces and the Leeland Road station has 1,029 spaces. Both locations indicate the capacity is typically in the 75% to 80% range. A recent expansion agreement between VRE and CSX (owner of the rail line) will allow increased passenger service from 8 round trips daily to 13 round trips daily along with weekend routes in the next ten years. Additionally, CSX continues to use this rail line for freight movement and is considered a main north/south rail line for their operations with numerous trains throughout the day. Amtrak also uses this rail line for their east coast operations and has a separate agreement with CSX for the use of the rail line.

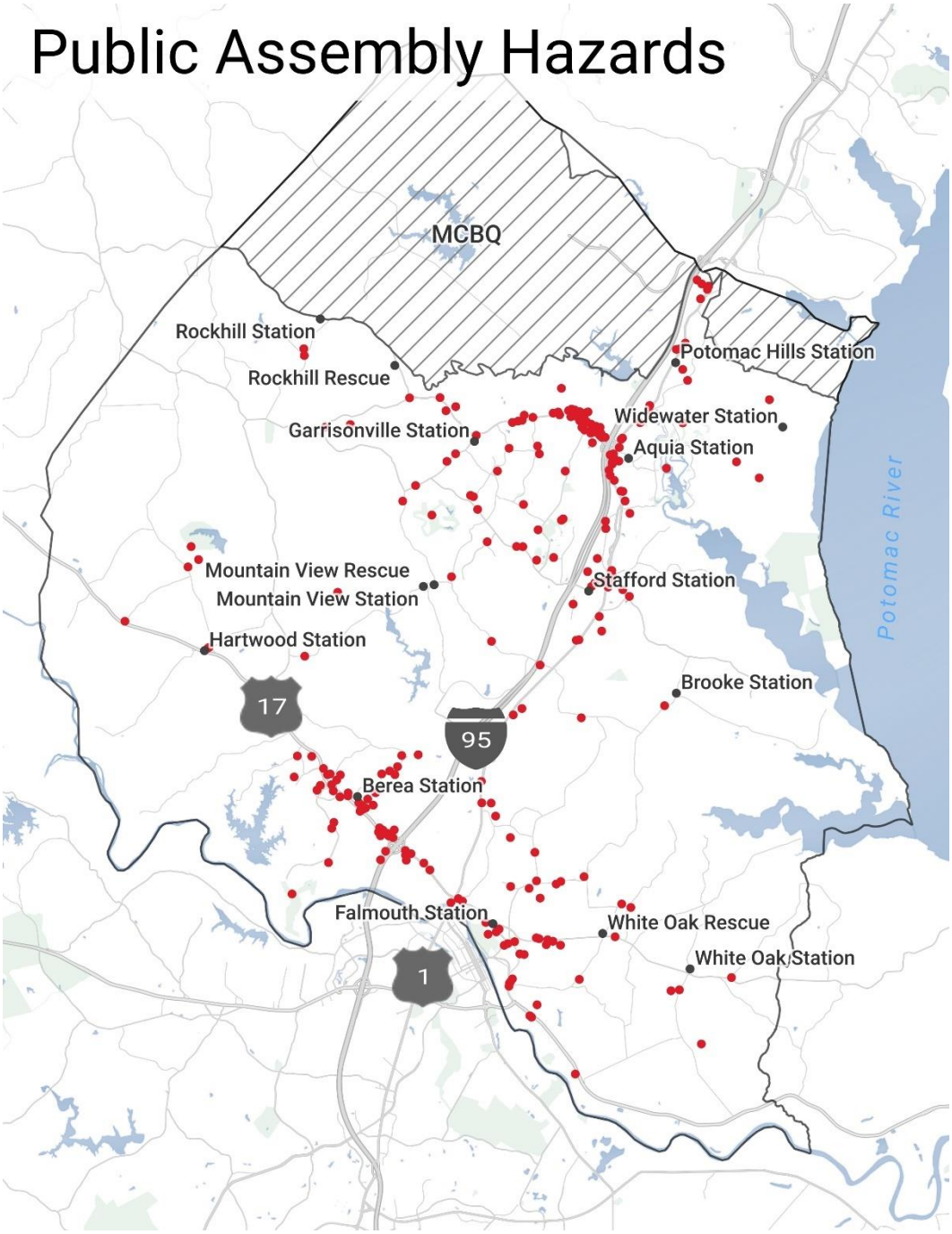

Railways & Stations
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Hartwood Station
Stafford Station
17
95
Brooke Station
Brooke
Berea Station
Leeland Road
Falmouth Station
White Oak Rescue
White Oak Station
Fredericksburg
1

Physical Hazards

Physical hazards are facilities in the built upon area that may present a unique challenge for the Fire and Rescue Department. These facilities are also referred to as target hazards. The Federal Emergency Management Agency (FEMA) defines target hazards as those facilities either in the public or private sector that provide essential products and services to the public, are otherwise necessary to preserve the welfare and quality of life in the community, or fulfill important public safety, emergency response, and/or disaster recovery functions.

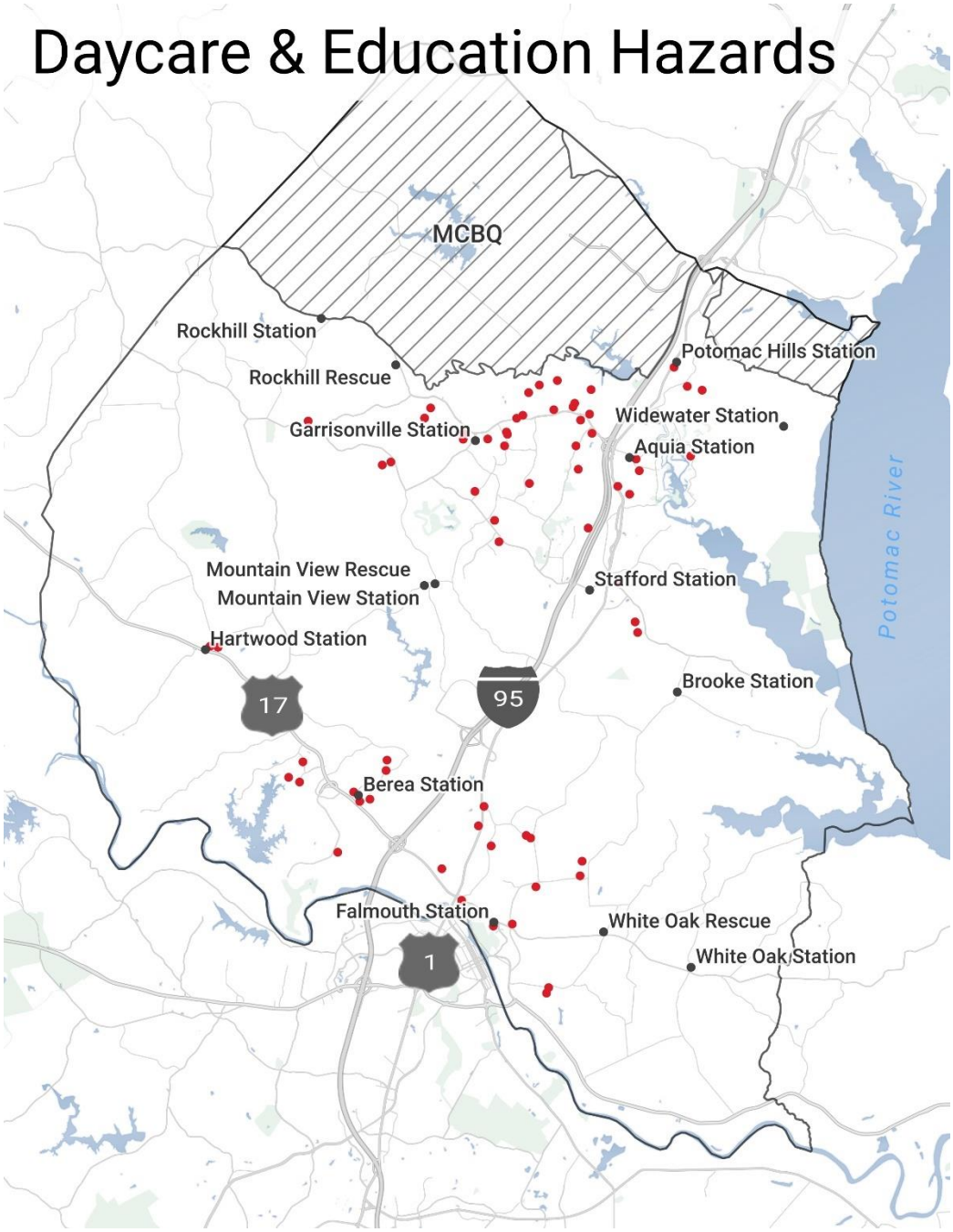
Public Assembly

Public assembly facilities provide a risk of mass casualty incidents, as well as fires and potential terrorist incidents. The map that follows provides an illustrative view of the locations of these types of facilities in Stafford County. Note the higher concentration of these types of facilities in the north central part of the County and along the US 17/Warrenton Road corridor.


Public Assembly Hazards
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Stafford Station
Hartwood Station
Brooke Station
17
95
Berea Station
Falmouth Station
White Oak Rescue
White Oak Station
1

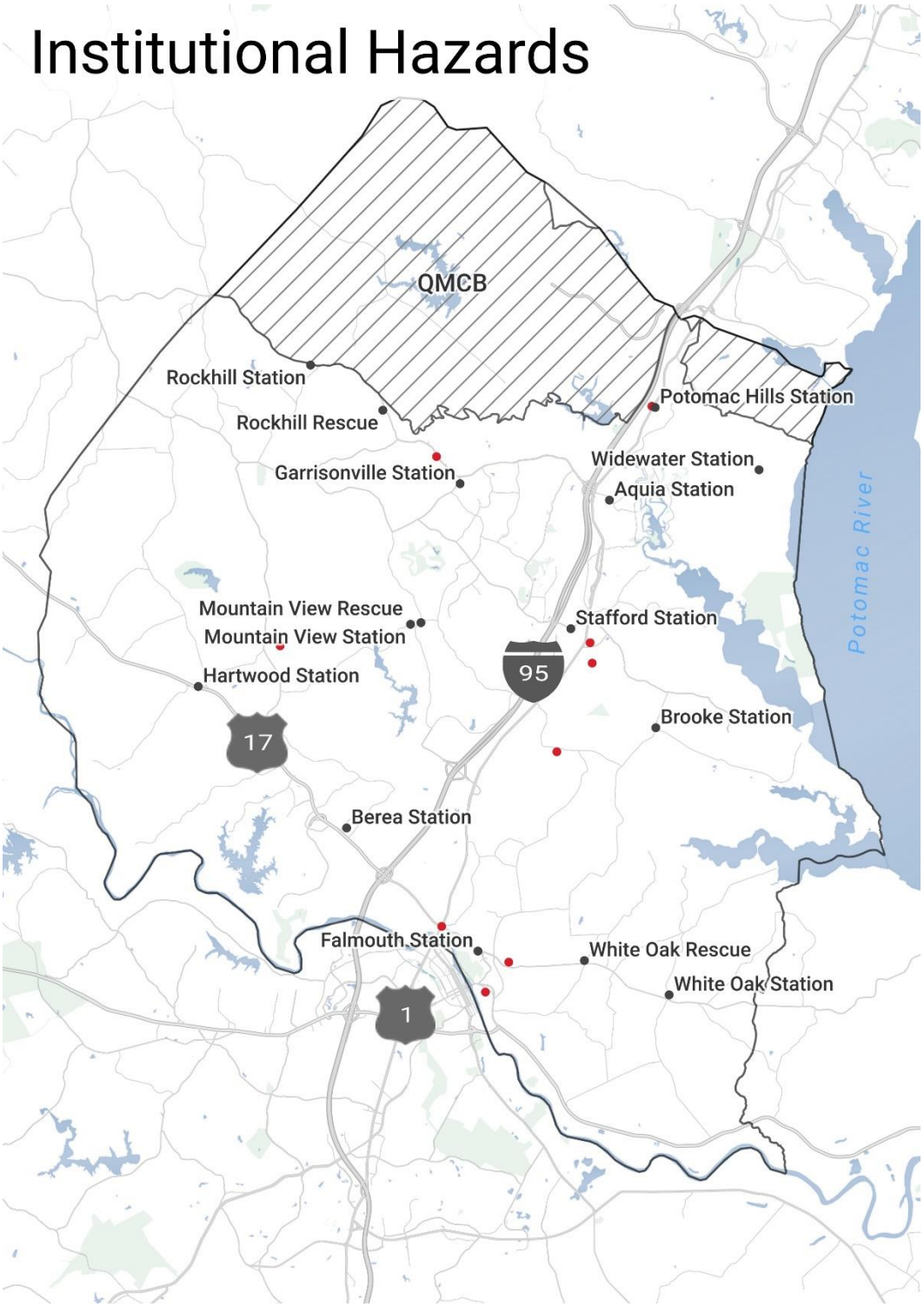
Education and Day Care Facilities

As with Public Assembly facilities, schools also provide a risk of mass casualty incidents and potential terrorist incidents. These facilities typically have large meeting areas for sports and assembly halls. Day care facilities are generally smaller than schools but house children that are much younger in age including infants. These facilities present a life risk due to the younger age of the occupants and the need to assist with evacuation and rescue. The following map provides an illustrative view of the locations of these types of facilities in Stafford County.


Daycare & Education Hazards
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Hartwood Station
Stafford Station
Brooke Station
17
95
Berea Station
Falmouth Station
White Oak Rescue
White Oak Station
1

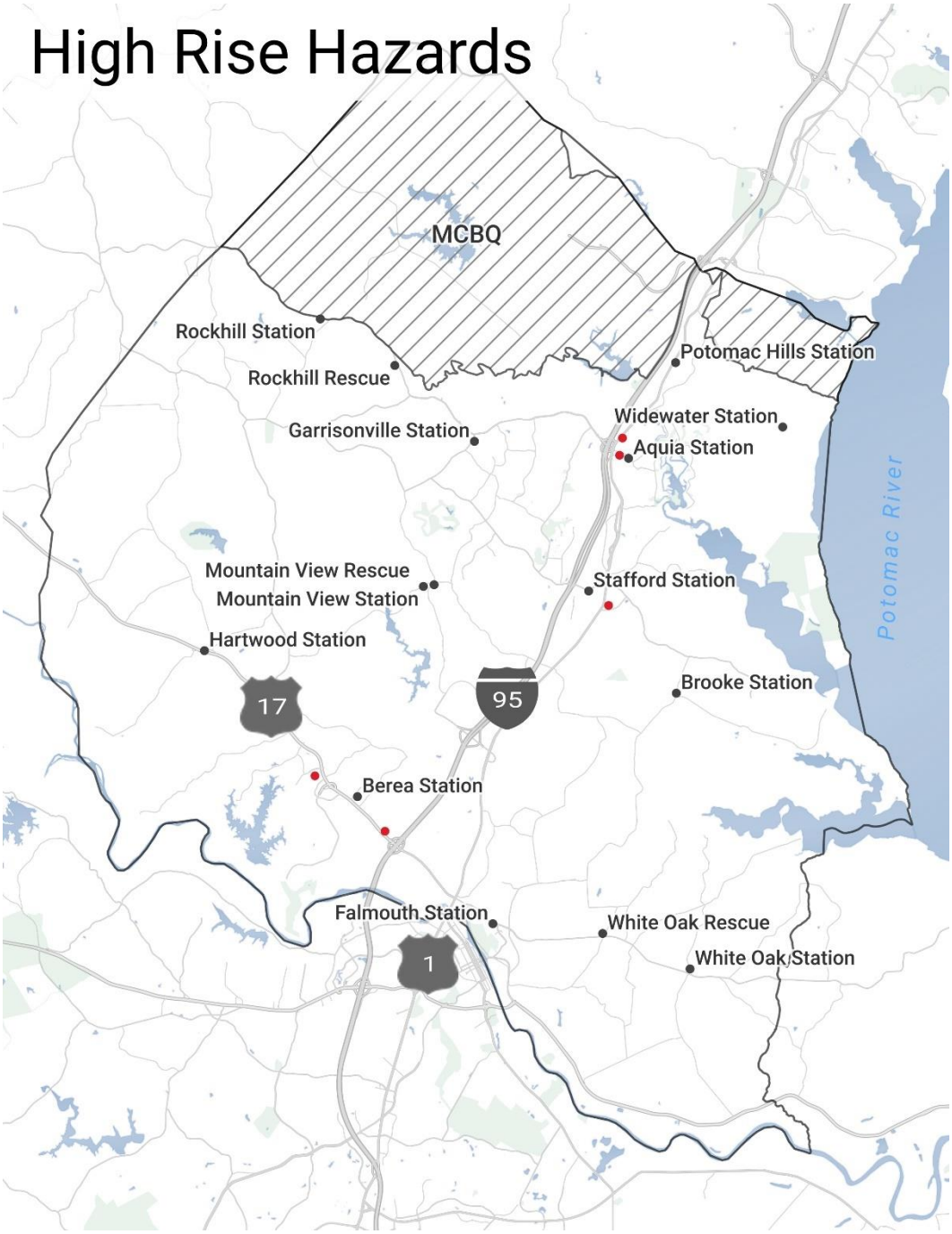
Institutional Facilities

Institutional facilities include hospitals, nursing homes, assisted living facilities and extended care facilities. While most of these facilities have built-in fire protection systems such as fire sprinklers, the residents of these facilities may not be mobile or will at the very least need other assistance in the event of an emergency. The following map provides an illustrative view of the locations of these types of facilities in Stafford County.


Institutional Hazards
QMCB
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Hartwood Station
Stafford Station
95
17
Brooke Station
Berea Station
Falmouth Station
White Oak Rescue
White Oak Station
1

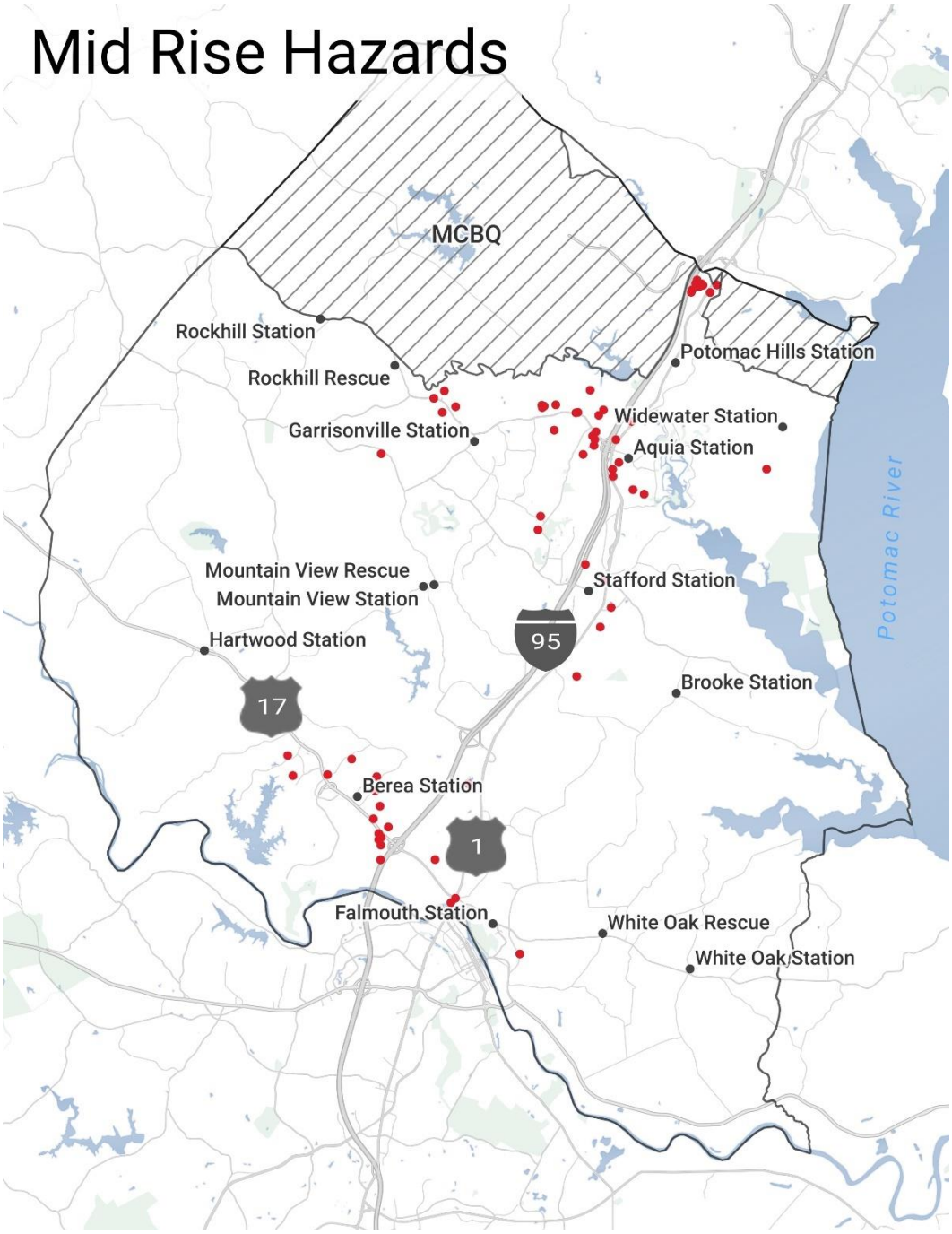
High Rise Facilities

In Stafford County a high rise structure is considered any structure greater than 5 stories in height. Emergency events in the upper floors of the building require additional personnel, equipment, and time to access and mitigate the incident. Depending on the type of occupancy there may be evacuation issues in getting people out of the building. The following map provides an illustrative view of the locations of these types of facilities in Stafford County.


High Rise Hazards
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Hartwood Station
Stafford Station
Brooke Station
17
95
Berea Station
Falmouth Station
White Oak Rescue
White Oak Station
1

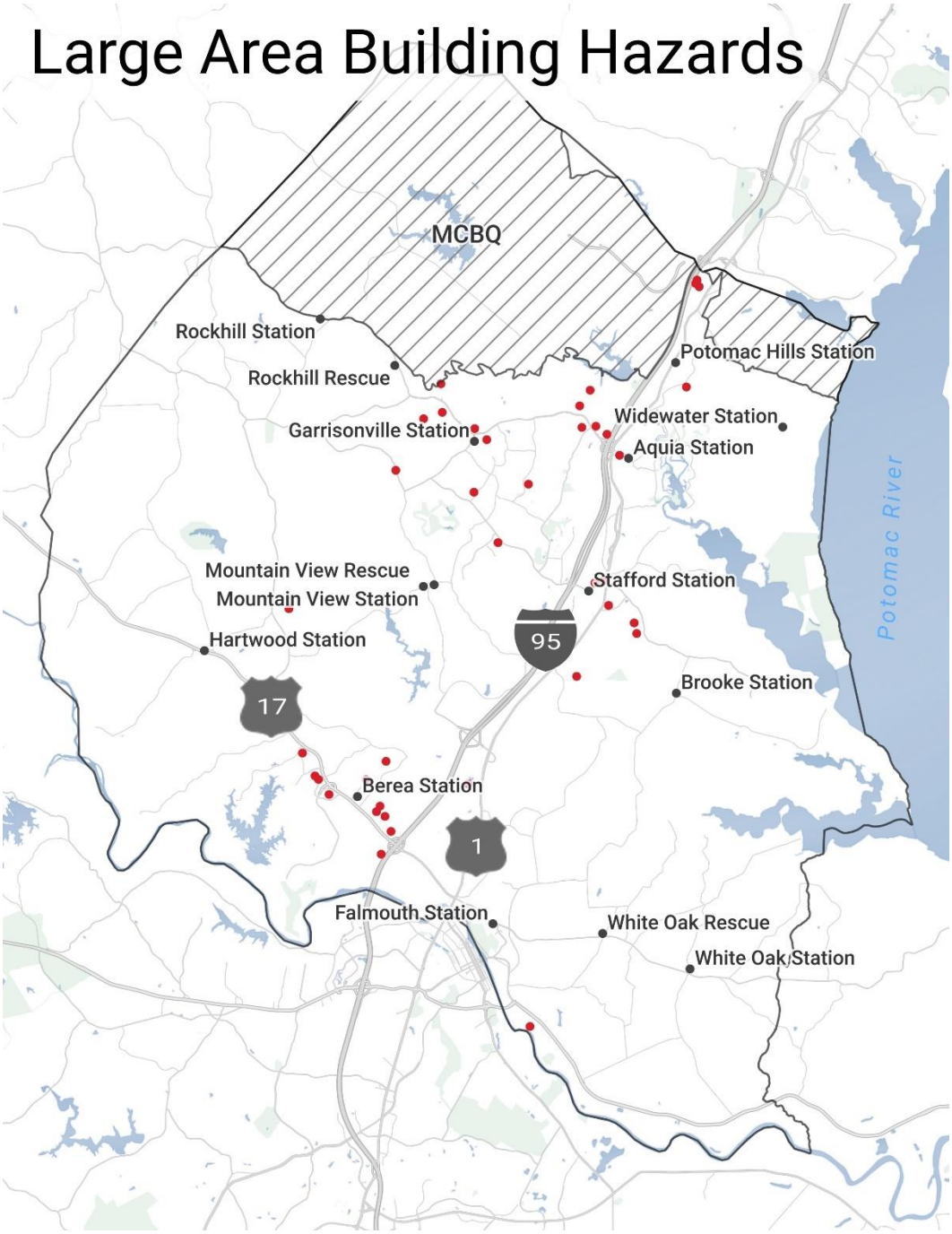
Mid Rise Facilities

Much like the high rise structures these buildings present a different challenge to the fire department. Generally, three to four stories in height, used predominately as residential apartments, and are built in complexes with numerous buildings in the complex. Access is an issue for the fire department as they generally have a longer set back and are just high enough to create issues for ground ladder access. The following map provides an illustrative view of the locations of these types of facilities in Stafford County.


Mid Rise Hazards
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Stafford Station
Hartwood Station
95
17
Brooke Station
Berea Station
1
Falmouth Station
White Oak Rescue
White Oak Station

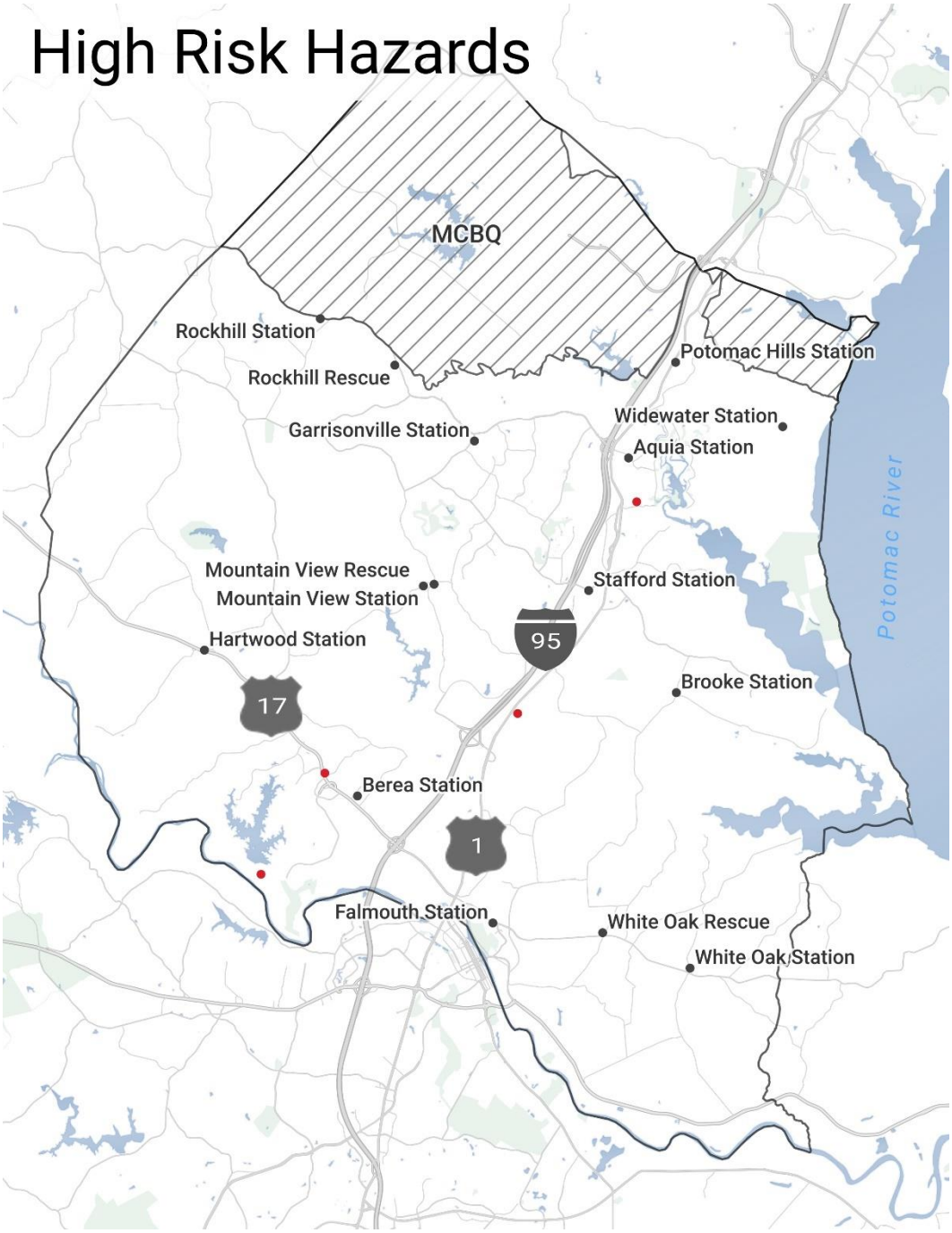
Large Area Buildings

Large structures are those structures that are 100,000 square feet and larger and can present a distinct challenge to the Fire and Rescue Department. Some of these structures have sprinkler systems, some require high water flows due to their size and contents, and others do not have any fixed fire suppression systems. These occupancies will require additional resources and may require different operational tactics. The following map provides an illustrative view of the locations of these types of facilities in Stafford County.


Large Area Building Hazards
MCBQ
Rockhill Station
Rockhill Rescue
Garrisonville Station
Potomac Hills Station
Widewater Station
Aquia Station
Potomac River
Mountain View Rescue
Mountain View Station
Hartwood Station
Stafford Station
95
Brooke Station
17
Berea Station
1
Falmouth Station
White Oak Rescue
White Oak Station

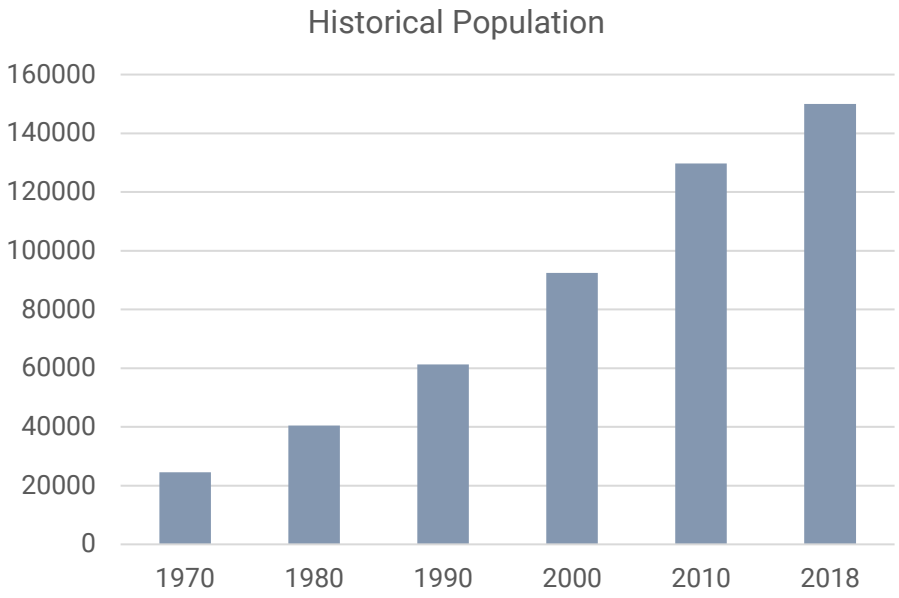
High Hazard Facilities

These types of facilities present a different challenge to the Fire and Rescue Department. With these facilities, extinguishing a fire may not be the best solution and there is also the spill hazard that is present. These types of incidents may require more personnel for suppression, containment or may require specialized equipment. The map that follows provides an illustrative view of the locations of these types of facilities in Stafford County.



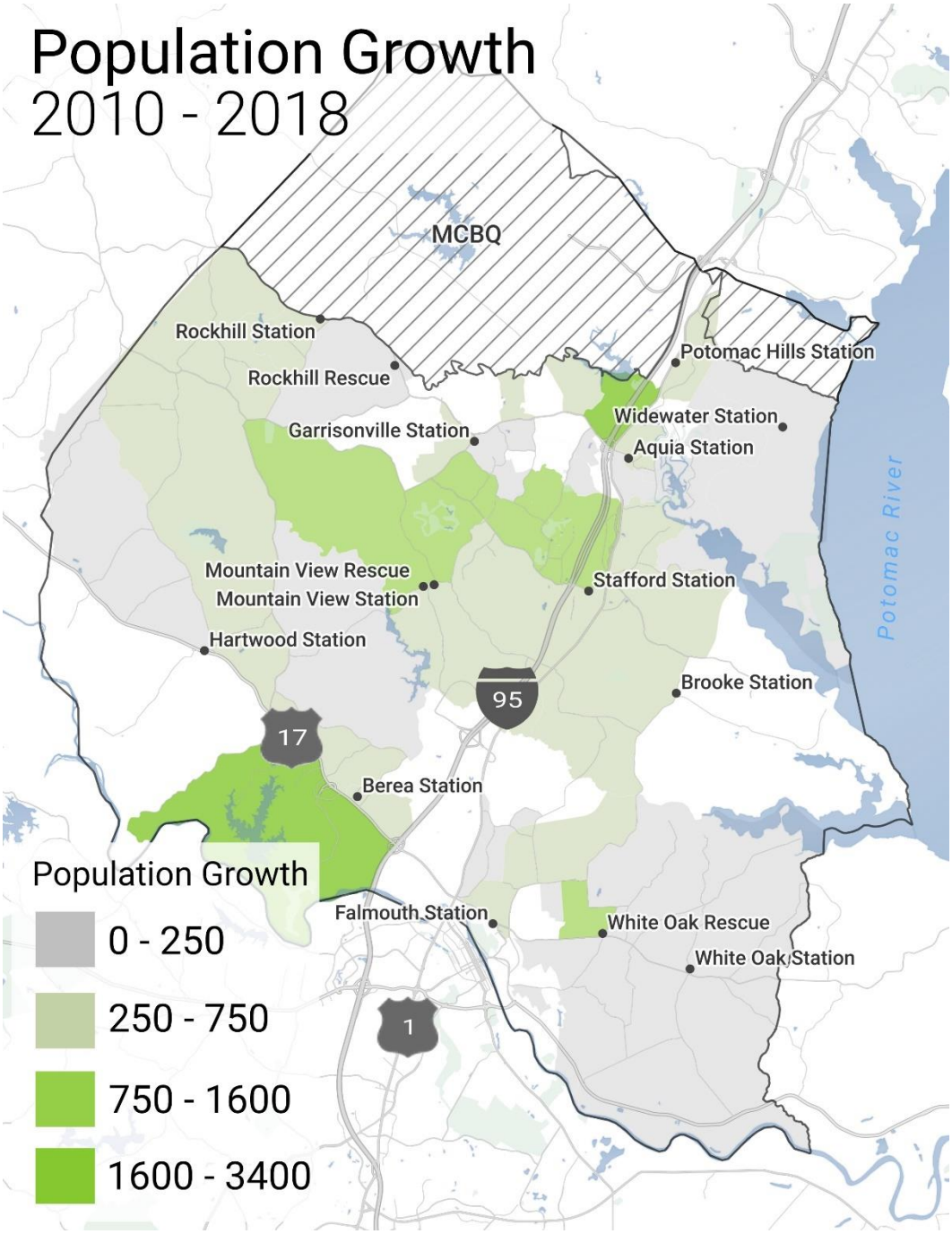
Community Growth and Development

In April 2016, Stafford County revised their Comprehensive Plan to assist in guiding the development of the County. Within this document there is a considerable amount of information and projections for various segments of the community. One segment includes population and dwelling units that is particularly useful for the Fire and Rescue Department. Additionally, the U.S. Census Bureau also provides data related to the population and dwelling units in the County. The following figure illustrates the population from a historical perspective based on the data from the Census Bureau.



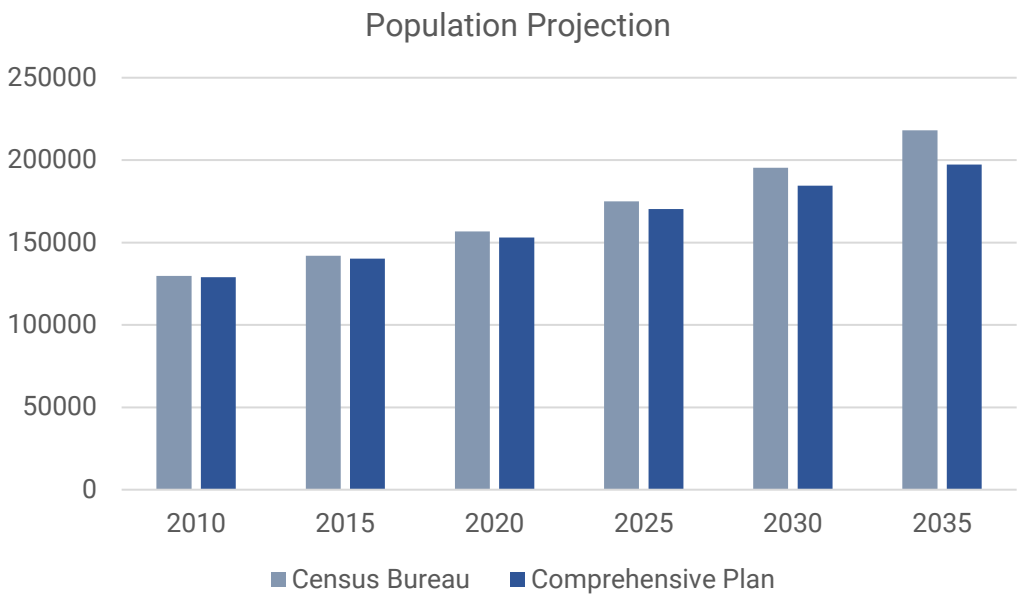
Stafford County has been growing at a relatively steady pace since 1970 with an average annual growth rate of approximately 10.8% or an average of approximately 2,600 people per year.

The data collected was integrated into a GIS (geographic information systems) format in order to spatially analyze historical, current, and future growth trends. For a historical view, the following map utilizes the US Census Bureau data to illustrate the population growth during the past eight years.



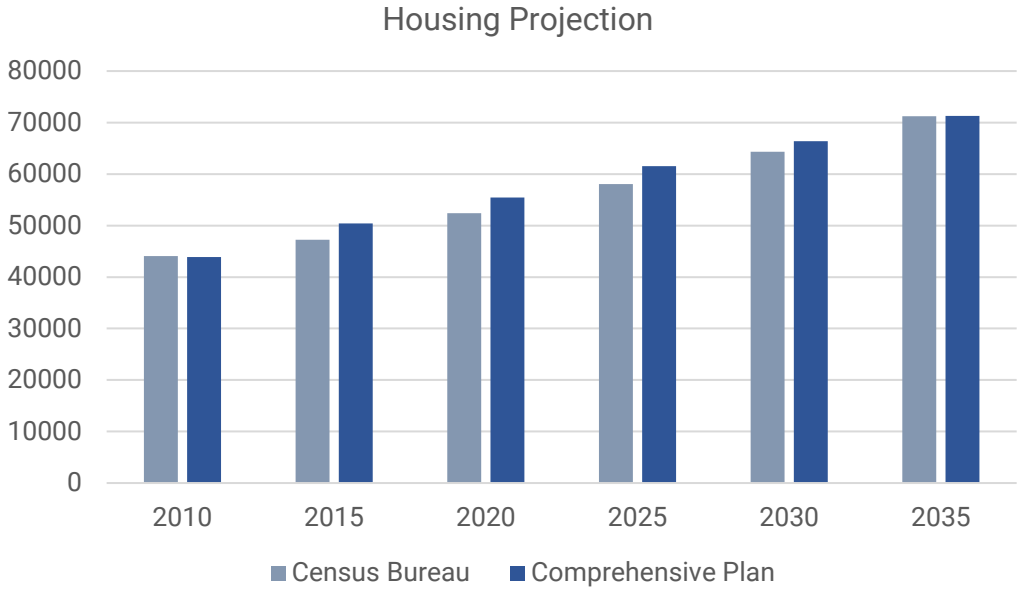
The Berea area has the highest growth rate over the past eight years in a concentrated area south of the Warrenton Road corridor. In the Garrisonville area, the growth has also been significant, but over a wider area and moving towards the Roseville area and to the south of Mountain View Road.

Using the data from the Census Bureau and the Stafford County Comprehensive Plan, the following figure illustrates the projection population growth through 2035.



The Census Bureau data is based on an annual population growth of approximately 2.2% which represents the annual growth for the past eight years. The Comprehensive Plan is based on the anticipated number of dwelling units over the course of the next twenty years. As illustrated, the Census Bureau data is slightly more aggressive in terms of population growth, with a population projected to be approximately 218,024 by 2035. The Comprehensive Plan projects the 2035 population for the County to 197,315.

For the dwelling units, the comparison is much more aligned between the two data points. The figure that follows illustrates the projected units through 2035.

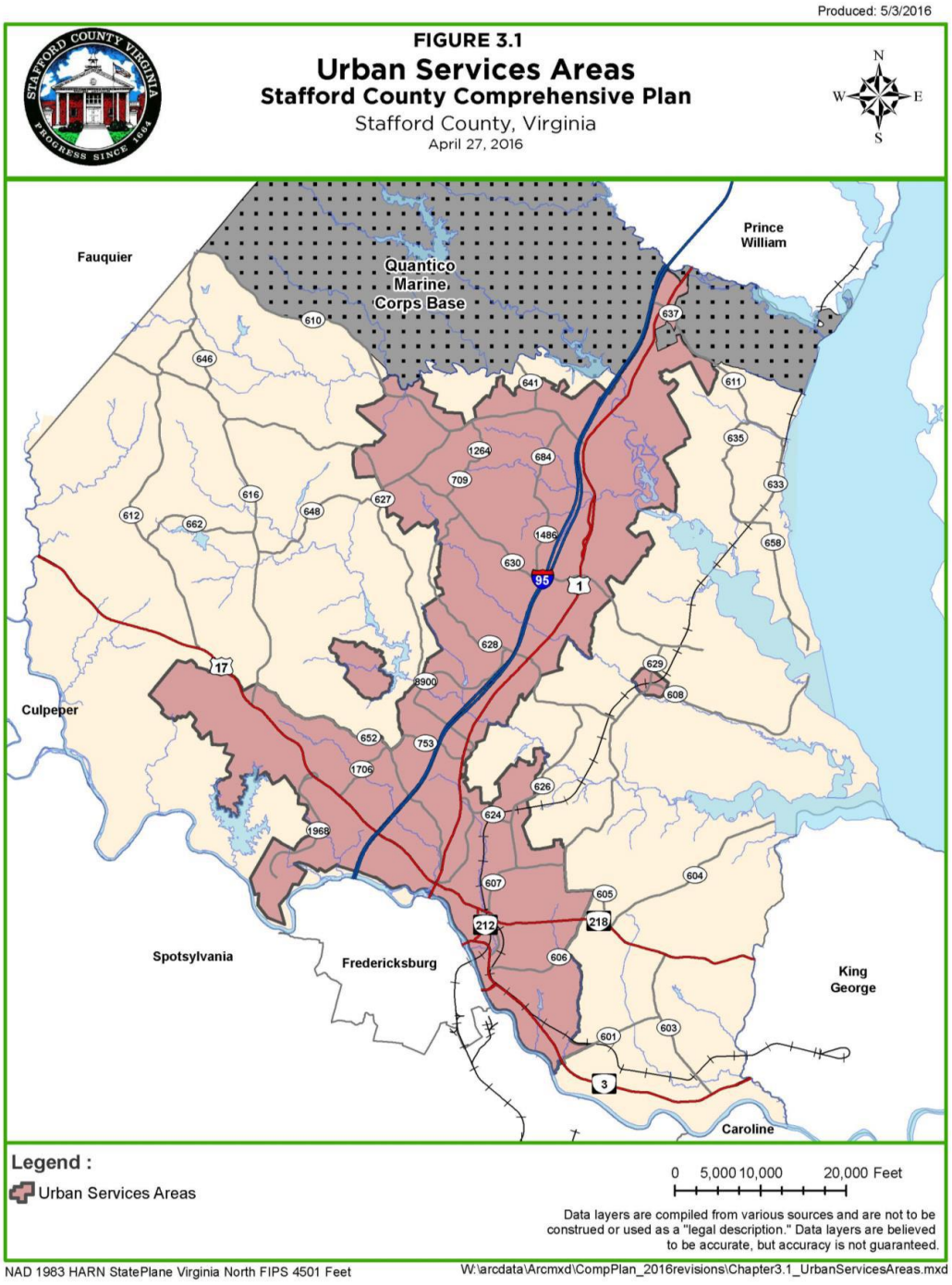


Based on the previous eight years' data, the Census Bureau dwelling unit projection increases at an annual rate of 2.1%. For the Comprehensive Plan, the increase is based on the number of projected new housing units for each of the planning years. As illustrated by 2035, the Census Bureau projection is 71,215 while the Comprehensive Plan projects 71,264 units.

It is important to note the increases shown for the Census Bureau is based on the historical growth over the past eight years. The Comprehensive Plan is based on the anticipated growth in terms of new housing units. Both methods are projecting a growth pattern of approximately 2% per year for the coming years.

Commercial Growth

In the 2016 Comprehensive Plan, an Urban Services Area was identified, primarily following the I-95 corridor through Stafford County. The area is suitable for both residential and commercial growth into the future. One such development is on Austin Ridge Drive that is scheduled to have approximately 390,000 square feet of industrial buildings. The following map from the 2016 Comprehensive Plan highlights the Urban Services Area.

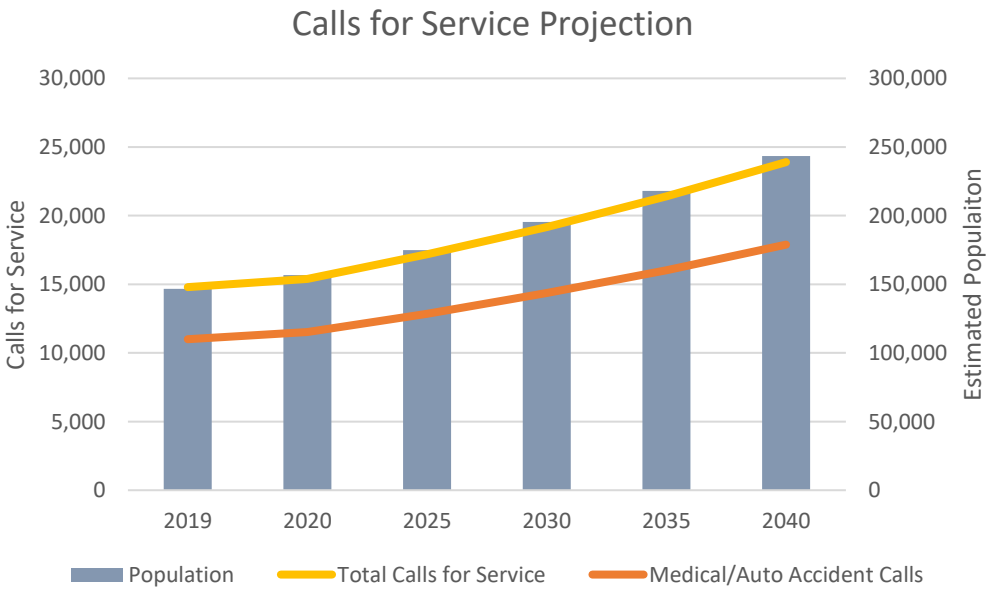


Additional commercial and residential development is expected in this area. According to the Comprehensive Plan, at least 80% of the future cumulative residential growth should be located in this area.

Emergency Services

Jurisdictional growth represents a potential increase in calls for service, increased risk in terms of new buildings, and increases in traffic flow. The increase in housing units can also indicate a need for additional retail facilities such as grocery stores, pharmacies, restaurants, and other service related items. As well, the type of housing such as mid-rise style buildings will have an impact on the emergency services with increased fire loads but also emergency medical services.

Using the average number of calls for service from 2017 – 2019, 14,399, and the average population from 2017 – 2019, 146,649, the average call per resident is approximately 0.1 calls. This allows for a projection of calls for service based on population growth as illustrated in the figure that follows.

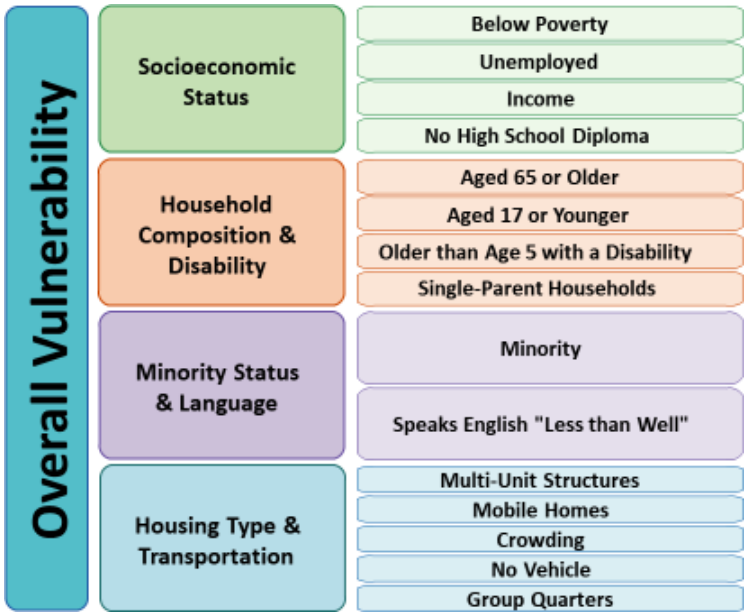


Based on the Census Bureau population projection, the calls for service will likely increase from the 2019 total calls for service of 14,793 to 19,176 calls for service by 2030 and to 23,898 calls for service by 2040. A second item is shown in the chart to indicate the calls for medical and auto accidents during the same time period. These calls currently represent approximately 75% of the total call volume and will continue to increase with the increasing population. Building inventory, an aging population, and the rate of growth will influence the number, type, and complexity of the calls for service into the future.

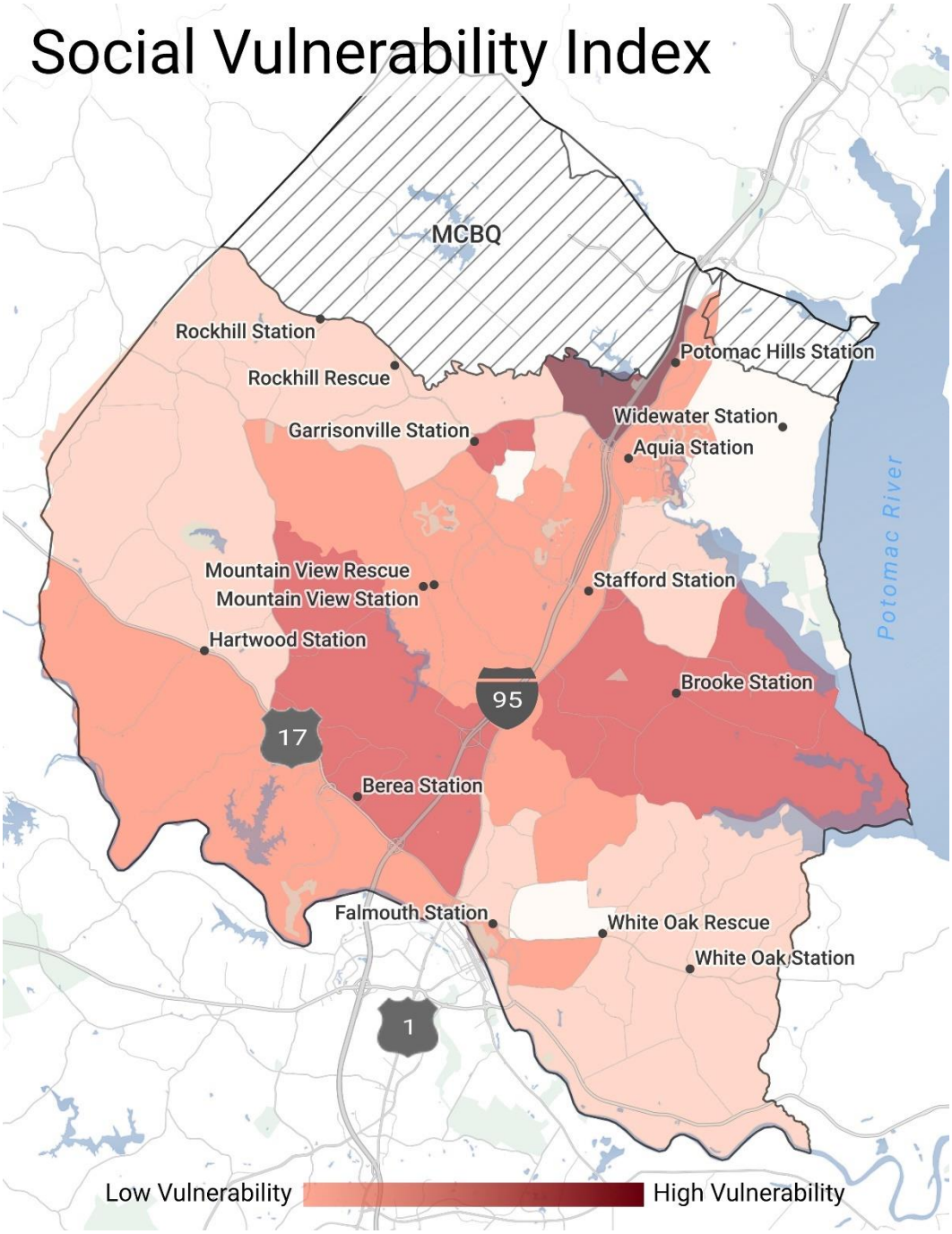
Additional Risk Factors

The Center for Disease Control (CDC) created the Social Vulnerability Index (SVI) to assist public health and emergency response organizations to identify and map the areas of a

community that will most likely need support before, during, and after a hazardous event. The SVI is determined by examining a variety of factors such socio-economics, housing composition, and residents with disabilities. The following chart from the CDC illustrates the data from the US Census Bureau used in calculating the SVI for the areas.



As noted, there are numerous factors used in the overall vulnerability to provide a well-rounded view of the vulnerability index. The map that follows illustrates the SVI score by census tract for Stafford County.



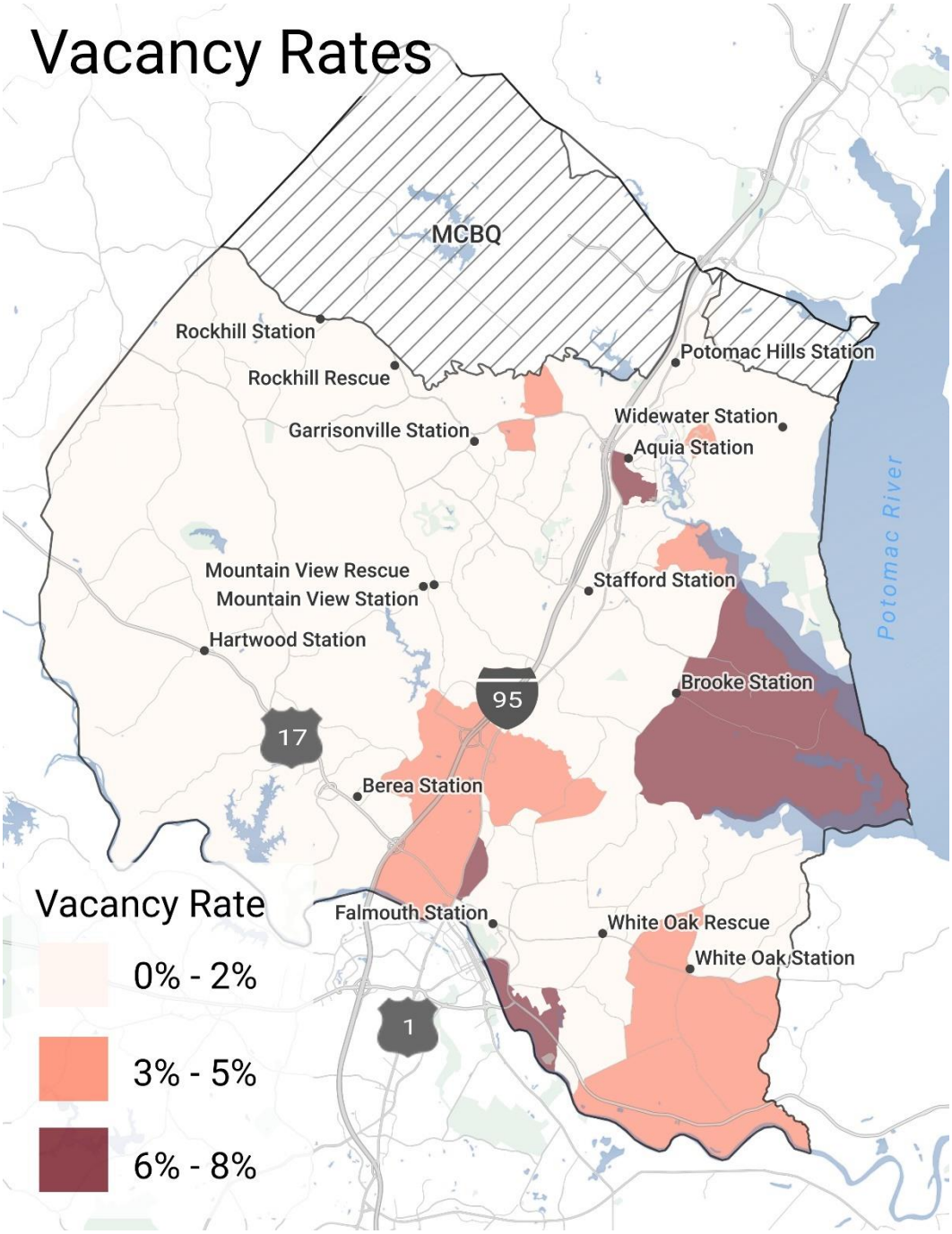
The highest SVI scores are in the north central area, just west of the I-95 corridor. Two additional areas near the Brooke Fire Station and to the north and west of the Berea Fire Station are slightly higher in the range of scores.

Vacancy Rates

In 2018 there were 50,458 housing units in Stafford County according to the U.S. Census Bureau estimates. Of these housing units, 73.2% were single-family residences, with 24.2% being multi-family and 2.2% being mobile homes. Approximately 21% of these

units were constructed prior to 1970 and another 16.5% constructed between 1980 and 1989. The risk of fires is greater in older buildings with outdated building codes which may have building construction, type of materials, or wiring that increases the risk and spread of fire.

Based on the estimates from the U.S. Census Bureau, Stafford County had an overall vacancy rate of 4% in 2018 as compared to 10.3% for the Commonwealth of Virginia. The National Fire Protection Association (NFPA) reports from 2011 – 2015 fire departments responded to an average of 30,200 structure fires per year in vacant properties. According to the report, fires in vacant buildings are more likely to have been intentionally set and to spread beyond the building than fires in other structures. The following map illustrates the vacant buildings, by census tract, based on estimates from the U.S. Census Bureau for 2018.



There are many reasons for vacant housing units and will vary from year to year. It is important to note where the vacancies are occurring and to document the areas of higher rates for response planning purposes.

Emergency Service System Dynamics

In making decisions about the emergency services system, it is important to understand the science behind the location of resources, the deployment strategies of those resources, and other factors necessary to form an effective emergency services system. For many years, the Insurance Services Office (ISO) had set the standard for deployment through their Public Protection Classification system. This system was designed to provide insurers a basis for setting insurance rates and to limit their exposure to large losses and catastrophic events. While these efforts provided a good starting point, there is much more for the leadership to know while making decisions about the emergency services in Stafford County.

Nationally, a great deal of effort and research has been put into developing performance objectives for the delivery of fire and emergency medical services. This effort is critical for local government decision making about deployment and location of emergency resources. Objectives for Fire/Rescue and EMS providers have been derived from research conducted in two critical areas:

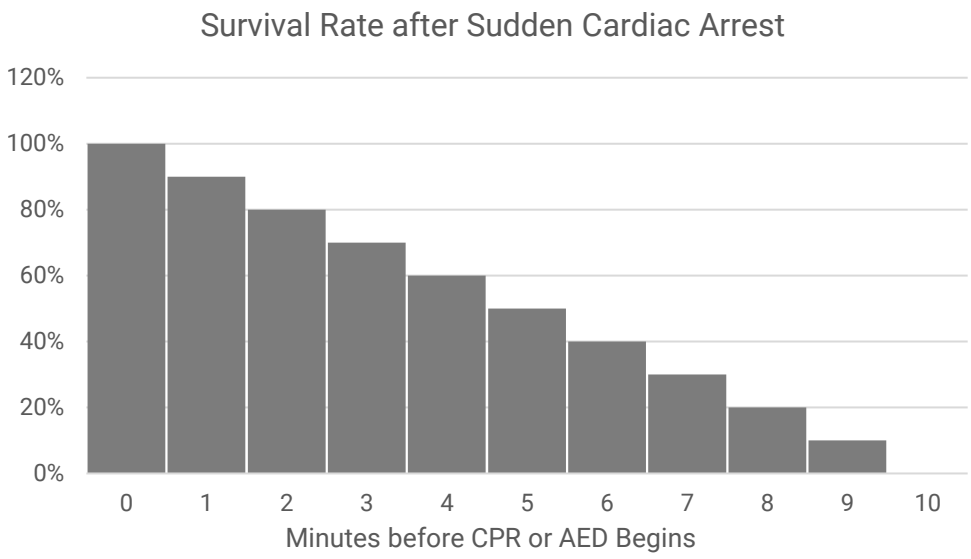
- What is the impact of the passage of time on survivability for victims of cardiac arrest?
- What is the key point in a fire's "life" for gaining control of the blaze while minimizing the impact on the structure of origin and on those structures around it?

Emergency Medical Services

Emergency medical services are a significant part of the emergency services system. Not only are these types of calls rising but are also wide-ranging in terms of the type and complexity of the calls that services are receiving. As a part of the overall healthcare system, the design of emergency medical response services systems must incorporate appropriate care in a time-sensitive manner.

From a scientific position, the American Heart Association states that brain and permanent death starts to occur 4 to 6 minutes following cardiac arrest. Trauma events are also at the forefront of time-sensitive response. In 2015, a national awareness program was launched called "Stop the Bleed".

For perspective, the following graph illustrates the survivability of cardiac patients related to the time onset:



The graph illustrates the chances of survival of sudden cardiac arrest diminish approximately 10% for each minute that passes before the initiation of CPR and/or defibrillation. These dynamics are the result of extensive studies of the survivability of patients suffering from cardiac arrest.

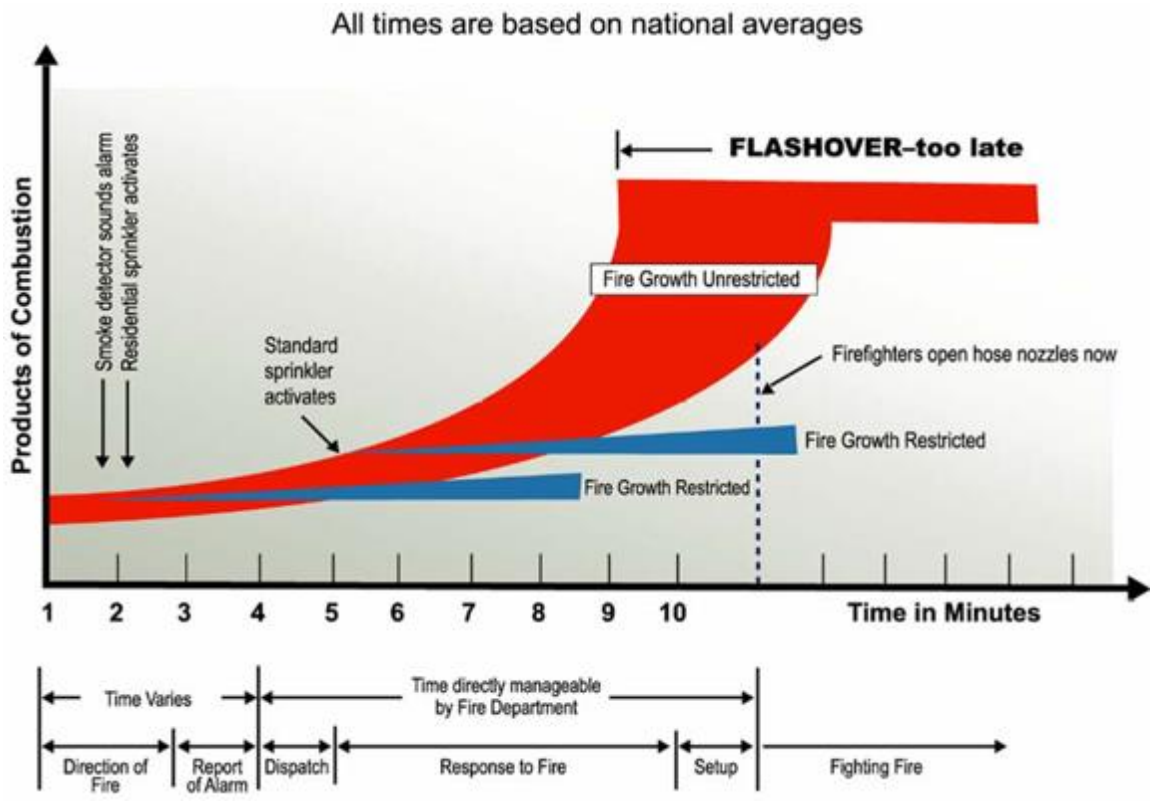
While the demand for services in EMS is wide-ranging, the survival rates for full arrests are often utilized as benchmarks for response time standards as they are more readily evaluated because of the ease in defining patient outcomes (a patient either survives or does not). This research results in the recommended objective of provision of basic life support within 4-minutes of notification, and the provision of advanced life support within 8 minutes of notification.

Considering the response time continuum, the response time goal for emergency services is to provide BLS within 6 minutes of the onset of the incident (including detection, dispatch and travel time) and ALS within 10 minutes. This is often used as the foundation for a two-tier system where fire resources function as first responders with additional (ALS) assistance provided by responding ambulance units and personnel.

Fire Suppression Services

Much like emergency medical services, the goal of fire suppression systems is to save lives and minimize property damage. Every structure fire goes through the same process of development. The growth of that fire is dependent on many factors including fuel loads, the types of materials, and the area involved. There is one point, “flashover”, that is identifiable and serves as a benchmark for the response of resources.

The chart that follows, illustrates the traditional "flashover" curve for interior structure fires. The point in time represented by the occurrence of "flashover" is critical because it defines when all the contents of a room become involved in the fire. Once this occurs, the space becomes untenable for firefighters and un-survivable for any occupants. With the rapid expansion of the fire, there is additional risk to other areas of the structure and potentially to any structures or wildland areas surrounding the original location of the fire.



Note that this illustration depicts a fire from the moment of inception – not from the moment that a fire is detected or reported. This demonstrates the importance of early detection and fast reporting as well as rapid dispatch of responding units. This also shows the critical need for a rapid (and sufficiently staffed) initial response – by quickly initiating the attack on a fire, "flashover" can be averted.

It should be noted that not every fire will reach flashover – and that not every fire will "wait" for the 8-minute mark to reach flashover. In fact, research conducted in 2010 by the Underwriter Laboratories determined the increased use of synthetic materials in the home has created faster flashover times to less than 4 minutes in some of their tests. Modern home furnishings made of foam, plastics, or other petroleum-based products have increased the available fuel load for a fire. Additionally, construction techniques and

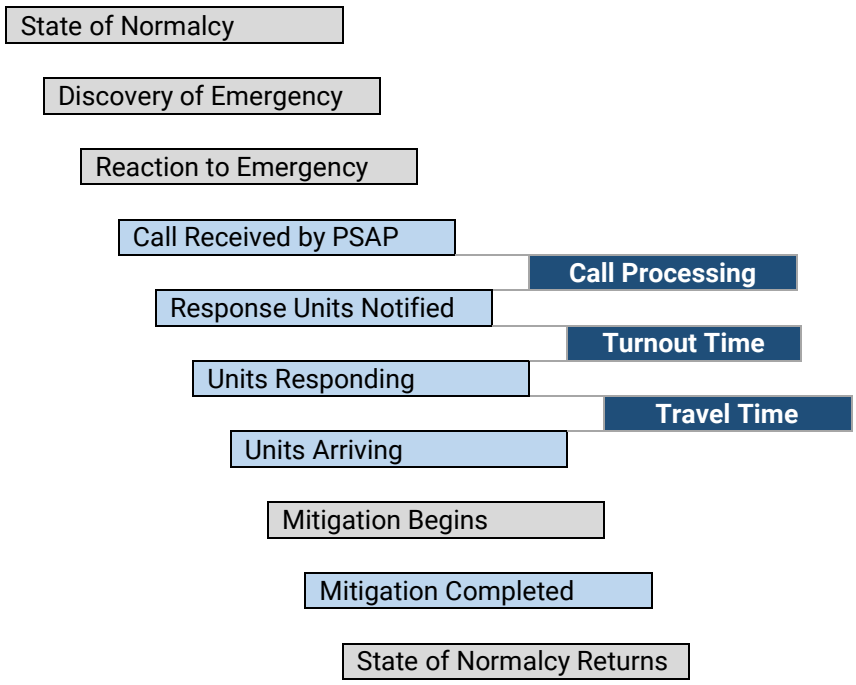
components have increased the efficiency of our homes but has added a new dimension to fire growth.

National Response Time Criteria

The expression of response time has changed. In years past, the measurement was expressed as an average of time. This essentially represents how the system or department is performing 50% of the time and is not a true reflection of how a department is performing. With the research that has been performed in developing performance standards and practices, the use of fractal time has become the best practice in the measurement and presentation of response time components. Fractal response time measures how often (as a percent of calls) a department can perform within each response time component. The National Fire Protection Association (NFPA) and the Center for Public Safety Excellence (CPSE) use the 90th percentile as the standard to meet for benchmark and baseline criteria. Benchmark measurements are described as the industry best practice. Baseline measurements are described as the actual performance of the organization.

Response time to an emergency or call for assistance has been broken down into measurable and non-measurable segments. The response time continuum begins when the state of normalcy changes to a recognizable emergency. The following chart outlines the cascade of events that occurs once an emergency starts or is recognized. Those highlighted points represent hard data or that which is quantitative versus soft data or that which is subjective and unknown.

Response Time Continuum



The highlighted points in the chart above represent three segments that can be used for evaluation; call processing, turnout time, and travel time. Each of these components represent a different point in the response time continuum and through their measurement and evaluation areas for improvement can be identified. Below are the definitions for the three components:

- Call Processing is the defined as beginning when the call taker answers the call and ends with the dispatching of appropriate emergency services units.
- Turnout Time is defined as beginning when the emergency services unit receives the call and is on the apparatus responding (wheels rolling) to the call.
- Travel Time is defined as beginning when the apparatus and personnel begin the response (wheels rolling) and ends once on location of the emergency (wheels stopped).

There are four nationally recognized models used to measure performance of the fire protection system and each have their own set of performance measurements based on different aspects of the community served.

- 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 last published in 2020.

- NFPA 1720 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments last published in 2020.
- Center for Public Safety Excellence (CPSE) Fire and Emergency Service Self-Assessment Manual last published in 2015 and Community Risk Assessment and Standard of Cover last published in 2016.
- Insurance Services Office (ISO) updated their Fire Suppression Rating Schedule in 2012 to allow the systematic performance evaluation of responses for their distribution and concentration ratings.

To further define response time components there are benchmark performance objectives and current performance.

- Benchmark performance objectives are those values or standards that represent superior performance or best practice. These are also defined as goals to which an organization strives to meet.
- Baseline performance are those values or standards that represent actual performance based on past data and history. In terms of response time, the baseline performance is generally based on three to five years of data.

Effective Response Force

There are several tasks, which must occur simultaneously to adequately combat different types of fires. The absence of adequate personnel to perform these tasks requires each task to be prioritized and completed in chronological order. These fire ground tasks include command, scene safety, search and rescue, water supply, fire attack, pump operations, ventilation, back up, and rapid intervention.

An initial full alarm assignment should be able to provide personnel to accomplish the following tasks:

- Establish incident command outside of the hazard area. This will allow coordination and direction of the incoming emergency response personnel and apparatus. A minimum of one person should be dedicated to this task.
- Establish an uninterrupted water supply of at least 400 gallons per minute for 30 minutes. Once established the supply line can be maintained by the pump operator to ensure uninterrupted water supply. A minimum of one person is assigned to this task that can then assume support role.
- Establish an effective water flow rate of 300 gallons per minute. This will be supplied to a minimum of two hand lines each operating at a minimum flow of 100 gallons per minute. Each hand line must have two individuals assigned with one serving as the attack line and the other as a back-up line.

- Provision of one support person to handle the hydrant hookup, utility control, forcible entry, and assist in deploying fire hose lines.
- Establish a search and rescue team. Each team will consist of a minimum of two.
- Establish a ventilation team. Each team will consist of a minimum of two personnel.
- Establish an initial rapid intervention team (RIT). Each RIT team shall consist of a minimum of two properly trained and equipped personnel.

Critical tasking will vary depending on the size and nature of the incident. The Center for Public Safety Excellence (CPSE) provides a suggestive list of tasks that need to be completed at a fire situation based on the risk. A similar list is provided within the NFPA 1710 document. The CPSE analysis, from the 8th edition, is summarized in the table below showing the minimum required personnel to mitigate the initial emergency response requirements by occupancy risk:

Critical Tasks for the Effective and Efficient Control of Structural Fires

Critical Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Attack Line	4	4	4	2
Search and Rescue	4	2	2	0
Ventilation	4	2	2	0
Backup Line	2	2	2	2
Rapid Intervention	2	2	2	0
Pump Operator	1	1	1	1
Water Supply	1*	1*	1*	1*
Support (Utilities)	1*	1*	1*	1*
Command	1	1	1	1
Safety Officer	1	1	1	1
Salvage/Overhaul	2	0	0**	0
Command Aid	1	1	0	0
Operations Chief	1	1	0	0
Logistics	1	0	0	0
Planning	1	0	0	0
Staging Officer	1	1	0	0
Rehabilitation	1	1	0	0
Division Supervisors	2	1	0	0
High-rise Evacuation	10	0	0	0
Stairwell Support	10	0	0	0
Total Personnel	**50 – 51**	**21 – 22**	**16 – 17**	**8 – 9**

*Tasks can be performed by the same individual. **Task can be performed by the attack crew

Adding to the critical tasks and staffing issues is the OSHA requirement of two in – two out in 1910.134(g)(4). These regulations state that if entry into an Immediately Dangerous to Life and Health (IDLH) atmosphere is necessary, two firefighters must enter together and remain in contact with each other. In addition, there must be two firefighters located outside the IDLH atmosphere for potential rescue if needed. This is a mandatory requirement.

Daily minimum staffing of the Stafford County Fire and Rescue Department is 40 career personnel, of which 16 are assigned to emergency medical units, leaving 21 assigned to fire suppression units and 3 assigned to command positions. Volunteer firefighters provide additional staffing when available. Based on the critical task guidelines above, a high-risk occupancy, including small businesses or a single-story multi-family dwelling, would require almost all of the on-duty fire suppression personnel. For a maximum risk, such as the new commercial buildings being constructed in various areas of the County, would completely deplete the on-duty personnel and require a call-back of off-duty personnel and the use of mutual aid from other fire departments in the area, or both.

The concept of an effective response force carries through for other response types by the Fire and Rescue Department. The tables below outline the critical tasks for an effective response force for those response types.

Critical Tasks for Hazardous Materials

Critical Task	High Risk	Low Risk
Command/Safety	2	1
Liaison	1	1
Decontamination	4	4
Research Support	2	1
Team Leader, Entry Team, Backup Team	6	6
Total Personnel	**15**	**13**

Critical Tasks for Initial Wildland Urban Interface Fires

Critical Task	No Hydrants	With Hydrants
Command/Safety	1	1
Pump Operations	1	1
Attack Line	2	2
Structure Protection	3	2
Water Supply	1	0
Tender Operator	2	0
Exposure Lines	2	0
Total Personnel	**12**	**6**

Critical Tasks for Technical Rescue Operations

Critical Task	Swift Water	High/Low Angle	Confined Space
Command/Safety	1	1	2
Rescue Team	3	2	2
Backup Team	2	2	2
Patient Care	2	2	2
Rope Tender	2	0	0
Upstream Spotter	2	0	0
Downstream Safety	2	0	0
Rigger	0	1	1
Attendant	0	1	1
Ground Support	0	4	4
Edge Person	0	1	0
Shoring	0	0	0
Total Personnel	**14**	**14**	**14**

The previous tables illustrate the needs for a sampling of hazardous materials, wildland urban interface, and technical rescue incidents and there are numerous other response types. Each of the technical rescue incidents will require similar numbers of personnel or more depending on the complexity of the incident. Further, many of the positions require personnel to be certified in those positions or that particular discipline.

As with the emergency services system, an effective response force is needed for the effective and efficient delivery of emergency medical services. A task analysis for emergency medical calls analyzes three different types of calls or patient conditions. These three types of calls usually require the most effort on the part of the response team. Other calls or patient types can generally be handled with two or three personnel. Many times, especially in trauma calls, there are multiple patients. The table below outlines the tasks for handling these critical patients and the number of responders it may require for a successful outcome. It is important to note that some tasks are accomplished by the same personnel, so the total is not simple addition of the positions noted.

Critical Tasks for Effective Patient Care

Critical Task	Cardiac Arrest	Stroke	Multi-System Trauma
Patient Assessment	2 per patient	2 per patient	2 per patient
Airway Management/Intubation	2 per patient	2 per patient	2 per patient
Cardiac Defibrillation	1	N/A	N/A
CPR	1	N/A	N/A
EKG Monitoring	1	1	1
IV/Pharmacology	1	1	1
Splint/Bandage/Immobilization	N/A	N/A	1
Patient Lifting/Packaging	2 – 4	2 – 4	2 – 4
Medical Information Collection	1	1	1
Total per Patient	**6 - 8**	**5 - 7**	**6 - 8**

Evaluation of the Stafford County Emergency Services System

This chapter compares and evaluates the current deployment and performance of the Fire and Rescue Department as it relates to the benchmark performance objectives outlined and described in the previous chapter.

Response Time

Computer Aided Dispatch (CAD) data for 2017, 2018, and 2019 was examined and evaluated. The data is not without issues such as coding problems, transcription errors, and equipment failures. The project team used the following mechanism to address these issues.

Only qualified data is used to calculate response time and any related components. To be considered the data must meet the following criteria:

- The incident must have been unique.
- The incident must have involved at least one Fire and Rescue Department unit being dispatched to the call.
- Calls that are missing data are not used in the computations for call processing, turnout time, travel time, or call duration.
- Any call with usually long times or times sorted incorrectly (arrived before dispatch time) were removed.
- Non-emergency responses are removed; only emergency responses are included.

After filtering the data using the methodology outlined above, the remaining incidents represent the response time for calls for service handled by the Fire and Rescue Department. It should be noted the 2020 data was not used in this analysis as the responses, in terms of call volume and the type of response, were altered due to the COVID 19 pandemic and does not represent a typical response for the Fire and Rescue Department.

Call Processing

Performance Standards

The emergency communications center for Stafford County is a division within the Stafford County Sheriff's Office. This division is the public safety answering point (PSAP) for all 911 calls in Stafford County and handles the dispatching of law enforcement, fire department, emergency medical services, and rescue calls. NFPA 1221 Standard for the

Installation, Maintenance and Use of Emergency Services Communications Systems establishes the call processing benchmarks as outlined in the chart below.

NFPA 1221 Time Requirements

Component	Target	Performance
Calls Answered	Within 15 seconds	90%
	Within 20 seconds	95%
Call Processing	Within 60 seconds	90%
Call Processing for: * Language Translation * TTY/TDD Device Services * Hazardous Materials * Technical Rescue * Text Message * Calls Received during a Disaster * Unable to Determine Location	These types of calls are exempt from the call processing time illustrated above.	

Both CPSE and ISO use the 60 second call processing time benchmark performance objective as outlined in NFPA 1221 for their requirements. NFPA 1720 does not address call processing in any statements and does not reference NFPA 1221.

System Performance

The table below summarizes the performance of the Stafford County Emergency Communications Center.

Stafford County Sheriff's Department

All Emergency Calls - 90th Percentile Times		2017 - 2019	2017	2018	2019	Benchmark
Call Processing	Pick-up to Dispatch	2:13	1:41	1:42	2:45	1:00

Over the course of three years the communications center has processed the emergency calls in 2 minutes and 13 seconds for 90% of the emergency calls handled for the Fire and Rescue Department. For 2019 there was a significant increase in the call processing time over the previous two years.

Turnout Time

Performance Standards

Turnout time is a measurable time segment that begins when the emergency service unit receives the call and is on the apparatus responding (wheels rolling) to the call. The following tables provides a comparison between the four models for benchmark performance objectives.

Turnout Time – Benchmark Performance Objectives

Call Type	NFPA 1710	NFPA 1720	ISO	CPSE
Emergency Medical Calls	60 seconds or less 90% of the time	60 seconds or less 90% of the time	No Requirement	60 seconds or less 90% of the time
Fire or Special Operations Calls	80 seconds or less 90% of the time	90 seconds or less 90% of the time	No Requirement	80 seconds or less 90% of the time

System Performance

The table below illustrates the performance for the Stafford County Fire and Rescue Department, staffed stations only.

Stafford County Fire and Rescue Department – Staffed Apparatus

All Emergency Calls - 90th Percentile Times			2017 - 2019	2017	2018	2019	CPSE Benchmark Objectives
Turnout Time	1st Unit	Medical Calls	1:59	1:54	1:57	2:07	1:00
		Fire Calls	1:45	1:42	1:40	1:50	1:20

All times shown is the 90th percentile time for each of the three years. The benchmark performance objective time shown to the far right represents the recommended turnout time performance objective for staffed stations. For the three-year period, the emergency medical calls are over the recommended objective time by 59 seconds and the fire related calls are over the recommended time by 25 seconds. The following table illustrates the turnout time for each staffed company in the County.

Stafford County Fire and Rescue Department Staffed Units Turnout Time

All Emergency Calls - 90th Percentile Times			2017 - 2019	2017	2018	2019	Benchmark Objectives
Company 1 - Falmouth	Ambulance /Medic 1	Medical Calls	2:30	-	-	2:30	1:00
		Fire Calls	2:27	-	-	2:27	1:20
	Engine 1	Medical Calls	2:09	2:02	2:15	2:04	1:00
		Fire Calls	1:57	1:56	1:59	1:56	1:20
	Rescue 1	Medical Calls	2:12	0:37	1:57	2:27	1:00
		Fire Calls	1:51	1:02	1:28	2:06	1:20
Company 2 - Stafford	EMS 2	Medical Calls	0:27	0:04	0:07	0:42	1:00
		Fire Calls	-	-	-	-	1:20
	Ambulance/ Medic 2	Medical Calls	2:15	2:06	2:20	2:24	1:00
		Fire Calls	2:12	2:06	2:19	2:05	1:20
Company 3 - Widewater	Engine 3	Medical Calls	1:44	1:22	1:38	1:16	1:00
		Fire Calls	2:32	2:29	2:27	2:44	1:20
Company 4 - Mountain View	Engine 4	Medical Calls	1:45	1:43	1:46	1:50	1:00
		Fire Calls	1:48	1:48	1:45	1:54	1:20
Company 5 - Brooke	Ambulance /Medic 5	Medical Calls	1:37	2:06	1:31	0:48	1:00
		Fire Calls	1:52	2:23	1:41	0:47	1:20
Company 6 - Hartwood	Engine 6	Medical Calls	2:36	2:40	2:42	2:28	1:00
		Fire Calls	2:11	2:28	2:19	1:58	1:20
Company 8 - Rockhill	Engine 8	Medical Calls	1:44	1:46	1:27	-	1:00
		Fire Calls	1:37	1:38	1:22	-	1:20
	Ambulance/ Medic 14	Medical Calls	2:05	1:50	2:15	2:10	1:00
		Fire Calls	2:11	1:58	2:19	2:10	1:20
Company 9 - Aquia	Engine 9	Medical Calls	1:56	1:55	1:57	1:57	1:00
		Fire Calls	1:47	1:40	1:46	1:57	1:20
Company 10 - Potomac Hills	Ambulance/ Medic 10	Medical Calls	2:05	2:09	1:57	2:10	1:00
		Fire Calls	2:07	2:12	2:08	1:56	1:20
Company 12 - Berea	Battalion 1	Medical Calls	-	-	-	-	1:00
		Fire Calls	2:37	2:34	2:39	1:25	1:20
	Engine 12	Medical Calls	2:00	2:01	1:57	2:10	1:00
		Fire Calls	1:54	1:58	1:49	1:49	1:20
	Ambulance/ Medic 12	Medical Calls	2:23	1:48	1:57	2:27	1:00
		Fire Calls	2:14	1:37	2:08	2:17	1:20
	Truck 12	Medical Calls	-	-	-	-	1:00
		Fire Calls	1:34	1:51	-	1:16	1:20
Company 14 - Garrisonville	Engine 14	Medical Calls	1:54	1:36	1:54	2:01	1:00
		Fire Calls	1:47	1:47	1:47	1:46	1:20
Rescue Company 7 - White Oak	Ambulance/ Medic 7	Medical Calls	2:11	2:15	2:11	2:07	1:00
		Fire Calls	2:07	2:09	2:09	1:53	1:20

In some instances, there was not enough data to determine the 90th percentile turnout time.

Distribution of Resources

Distribution is the measure of getting initial resources to an emergency to begin mitigation efforts. This is measured in a variety of ways including percentage of square miles, percentage of road miles and travel time. The Insurance Services Office (ISO) has used road miles for many years advocating one and a half miles for an engine company and two and a half miles for a ladder company. With the advent of GIS technology and improved computer aided dispatch (CAD) systems, the use of actual travel time is another more accurate measure for the distribution of resources.

Performance Standards

Travel time is a measurable time segment that begins when the apparatus and personnel begin the response (wheels rolling) and ends once on location of the emergency (wheels stopped). It is the most appropriate measurement available for the distribution of resources that has a proven record of success. The table that follows is used for the travel time dynamics of the emergency services system.

First Arriving Unit - Benchmark Performance Objectives

Demand Zone	Demographics	NFPA 1710	NFPA 1720	ISO	CPSE
Urban	Greater than 1,000 per sq. mile	4 minutes or less 90% of the time.	No Requirement	1.5 road miles in the built-upon area	4 minutes or less 90% of the time
Suburban	500 - 1,000 per sq. mile	4 minutes or less 90% of the time.	No Requirement	1.5 road miles in the built-upon area	5 minutes or less 90% of the time
Rural Area	Less than 500 per sq. mile	4 minutes or less 90% of the time.	No Requirement	1.5 road miles in the built-upon area	10 minutes or less 90% of the time
Remote Area	Travel Distance greater than / equal to 8 miles	4 minutes or less 90% of the time.	No Requirement	1.5 road miles in the built-upon area	No Requirement

There are several notable items contained in the previous table. First, NFPA 1720 does not address the first arriving unit as it only addresses the arrival of the full response which does not lend itself for any resource distribution performance. NFPA 1710 does not address the various demographics or population densities. CPSE addresses the travel time for the various demographics with differing travel times and ISO only addresses the built upon area defined as those areas with fire hydrants available.

There are three areas within Stafford County with varying population densities based on the U.S. Census data. In the north central section of the County there is a more populous area that closely adheres to the I-95 corridor. This area includes Garrisonville, Aquia, Potomac Hills, and Stafford. In the south central section of the County is a second population cluster that is near the intersection of I-95, US-1, and US-17 that includes Falmouth and Berea. The third area is the remaining sections of Stafford County that meet the definitions of a rural area. The east rural section of the County are those areas the east of the I-95 corridor in the rural demographic. Likewise, the west rural section of the County are those areas west of the I-95 corridor in the rural demographic.

Effective analysis of travel time and the adequacy of coverage is best completed by creating demand zones within the County. The following table will be used to identify the travel time demand zones.

Fire Company Demographics

North Suburban Demand Zone	South Suburban Demand Zone
Fire Company 2 – Stafford	Fire Company 1 – Falmouth
Fire Company 4 – Mountain View	Fire Company 12 – Berea
Fire Company 9 – Aquia	
Fire Company 10 – Potomac Hills	
Fire Company 14 – Garrisonville	

East Rural Demand Zone	West Rural Demand Zone
Fire Company 3 – Widewater	Fire Company 6 – Hartwood
Fire Company 5 – Brooke	Fire Company 8 – Rockhill
Fire Company 7 – White Oak	Rescue Company 8 - Rockhill
Rescue Company 7 – White Oak	

System Performance

The table that follows illustrates the travel time for the suburban and rural demographic as compared to the recommended benchmark performance objectives.

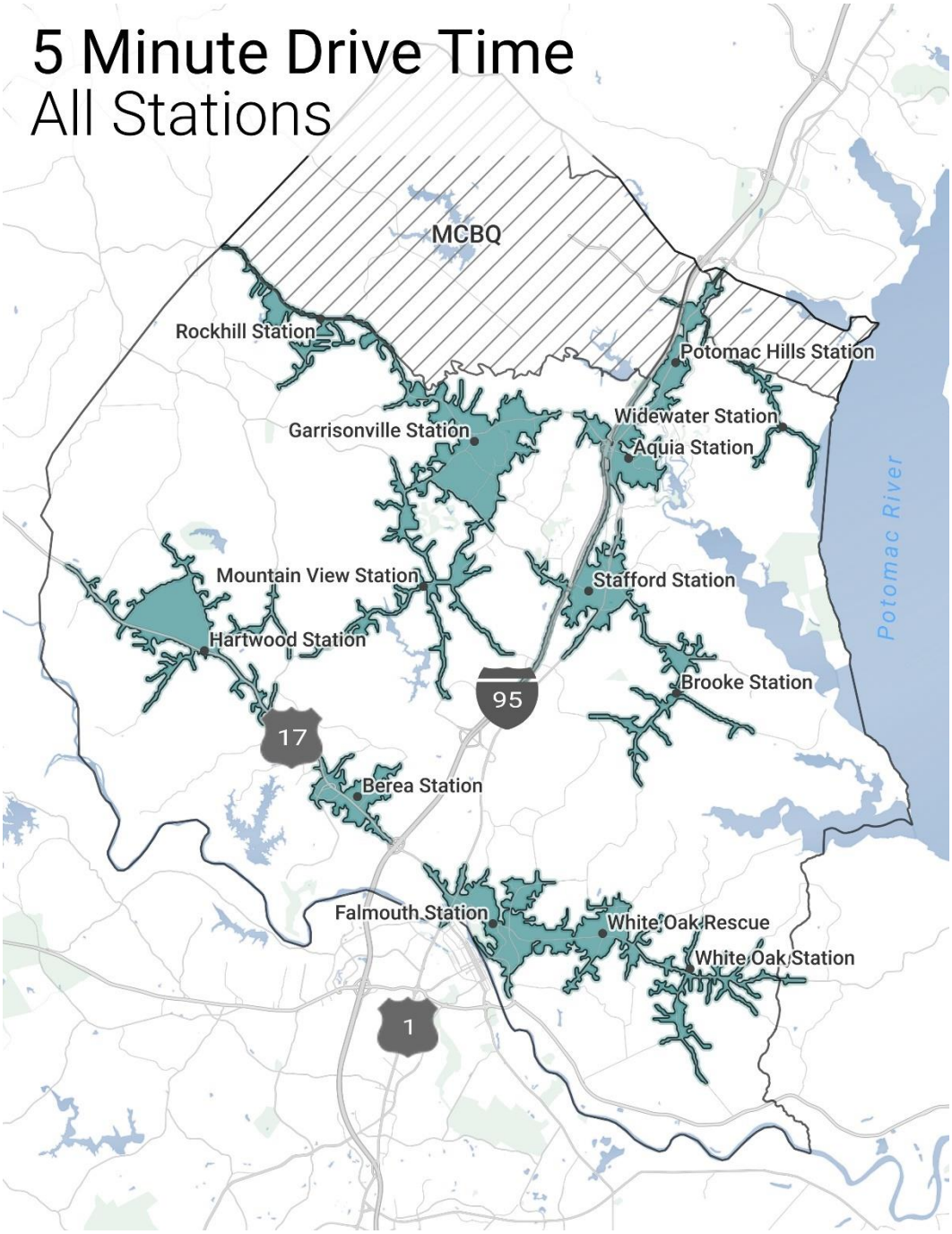
Stafford County Fire and Rescue Department Travel Time Performance

All Emergency Calls - 90th Percentile Travel Times		2017 - 2019	2017	2018	2019	Benchmark Objectives
	Suburban	9:06	9:07	8:48	9:26	5:00
	Rural	11:56	11:59	11:44	12:04	10:00
1st Unit Distribution	North Suburban	9:14	8:59	8:47	9:55	5:00
	South Suburban	8:56	9:18	8:49	8:46	5:00
	East Rural	11:14	11:53	11:15	11:51	10:00
	West Rural	12:05	12:08	11:58	12:09	10:00

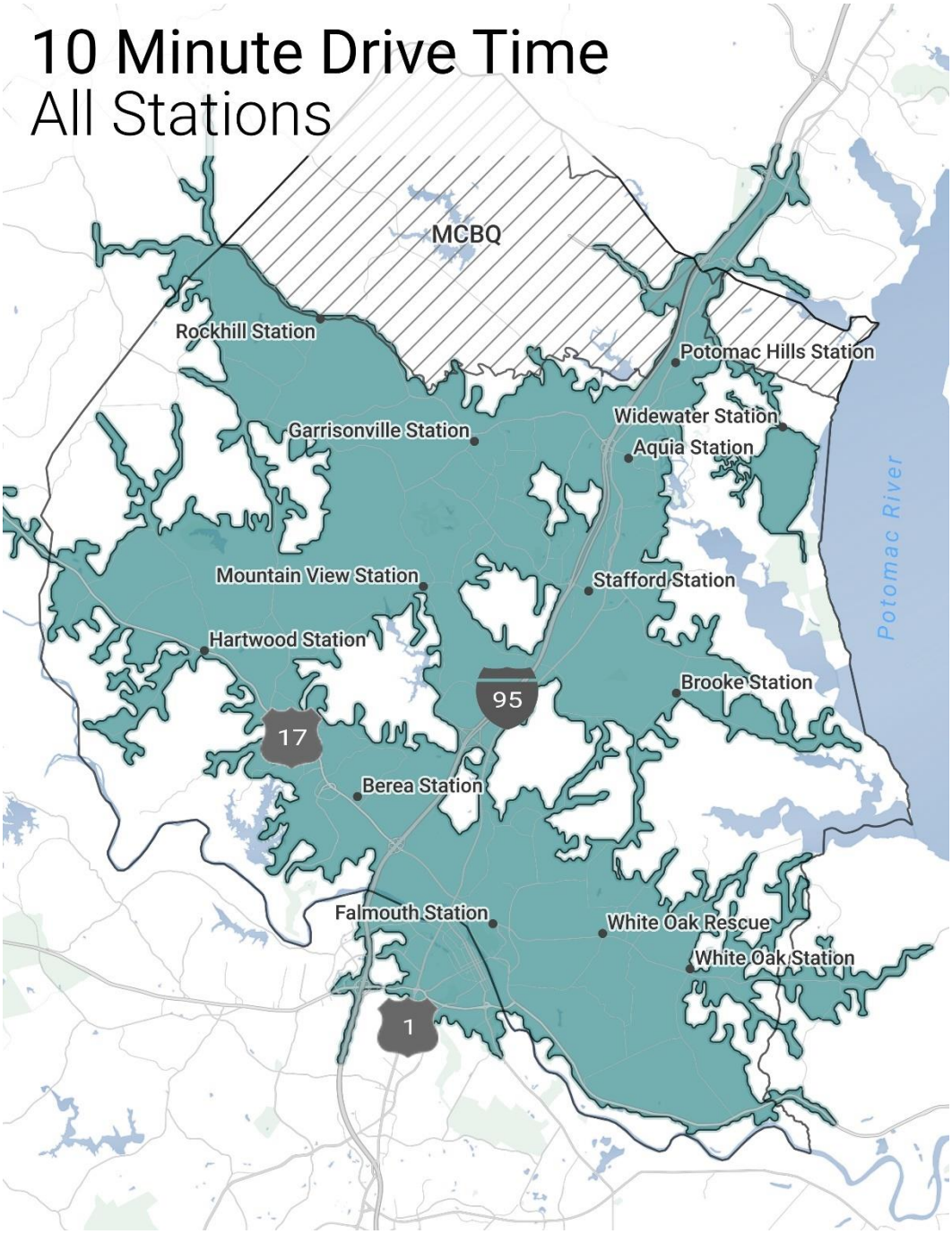
For 2017 – 2019, the suburban zone performance is 9 minutes 6 seconds, which is 4 minutes and 6 seconds over the benchmark performance objective. For the rural demand zone, the travel time is 11 minutes and 56 seconds for the 2017 – 2019 time period which is 1 minute and 56 seconds over the benchmark performance objective.

Also shown is the breakdown between the demand zones. In the north suburban demand zone, the travel time is 4 minutes and 14 seconds over the benchmark performance objective. Using the three-year period to establish a baseline travel time of 9 minutes and 6 seconds in the suburban area, the south suburban zone is under the baseline travel time by 10 seconds.

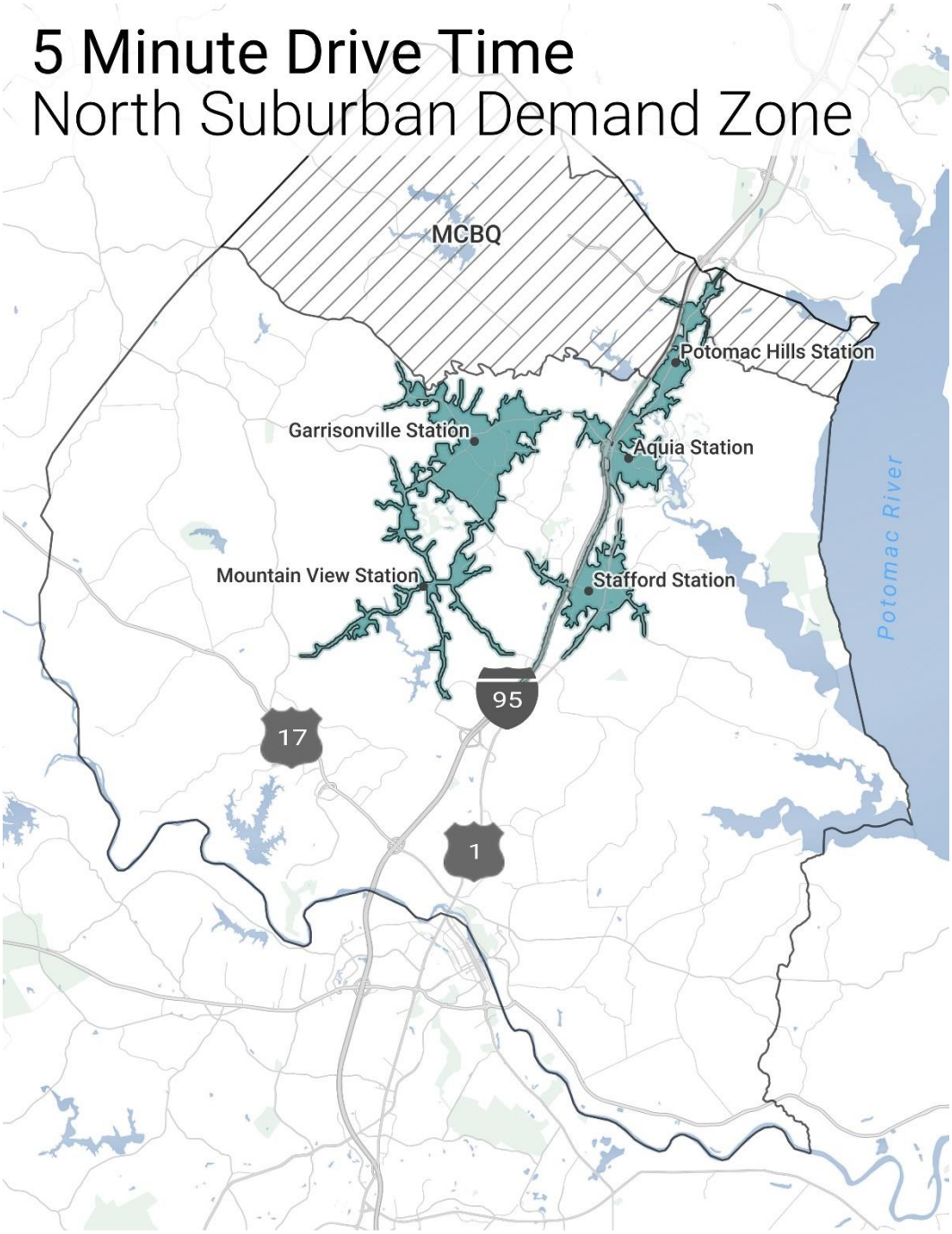
For a visual perspective, the following maps illustrate travel times from all stations in Stafford County for both the 5 minute and 10 minute benchmark performance objectives.



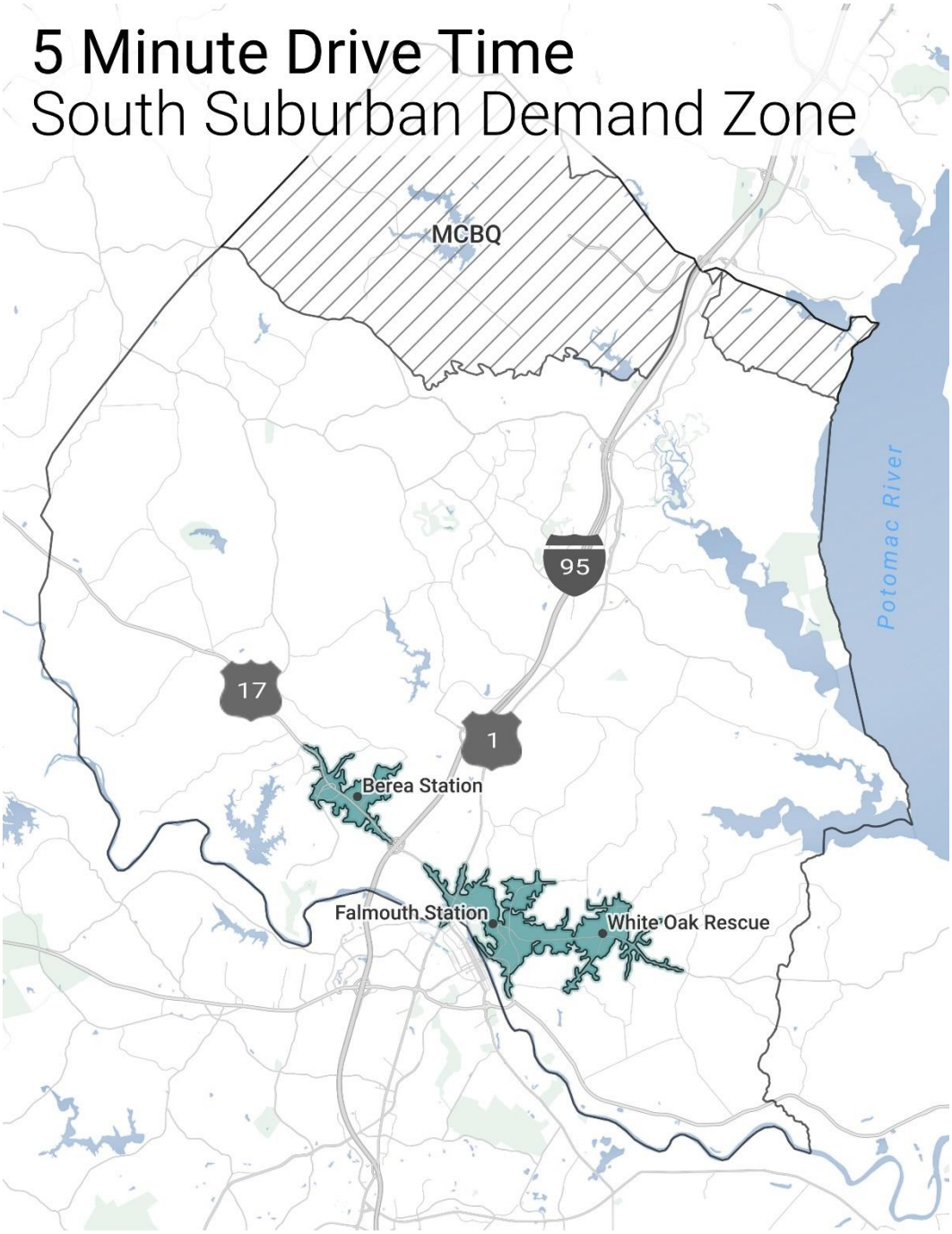
All stations are shown with a 5 minute travel time to illustrate the overlap from the stations in each of the demand zones to other areas.



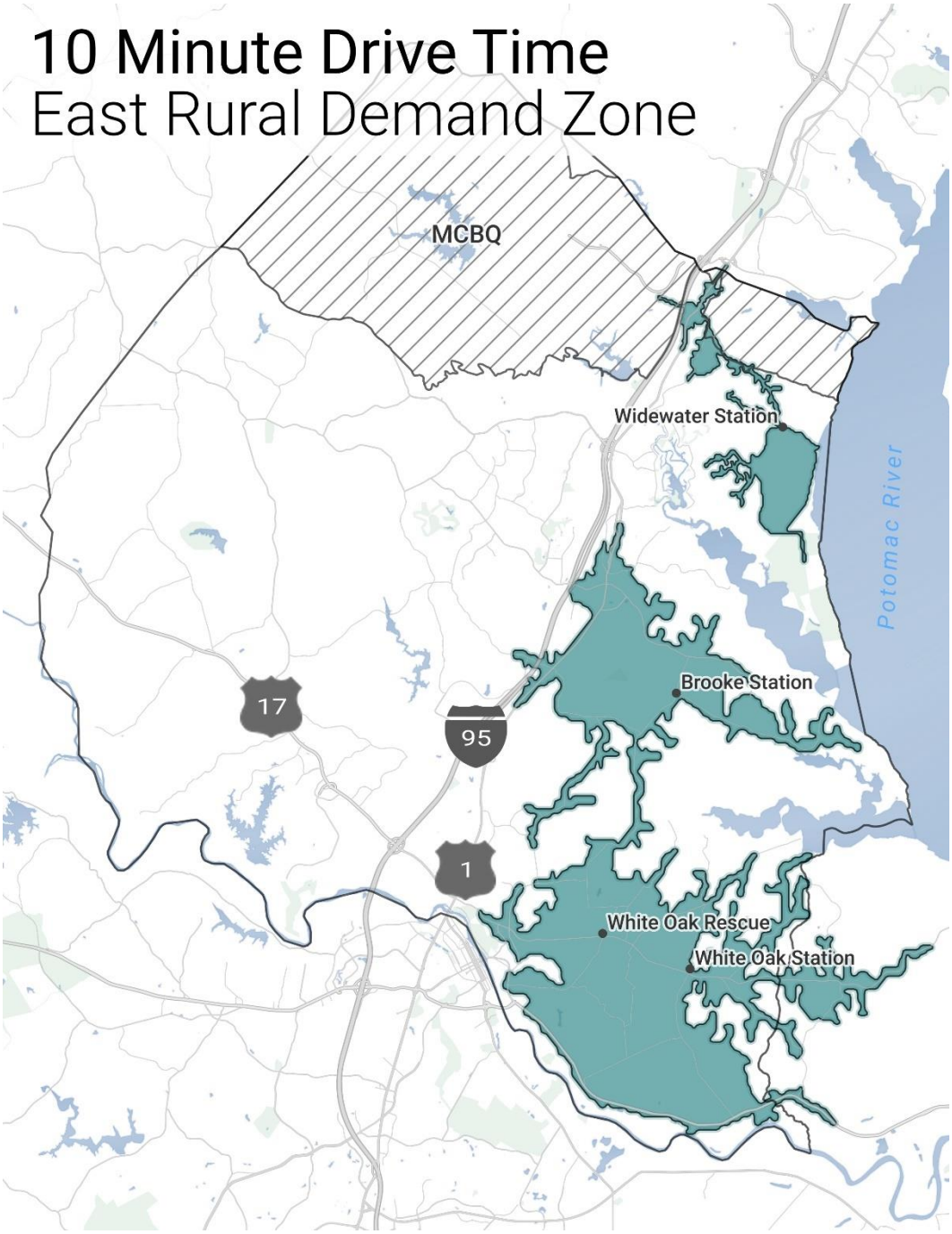
This map illustrates a 10 minute travel time from all stations illustrating the overlap between stations in the suburban and rural areas. The following maps provide detailed a visual perspective of the response districts for the benchmark performance objective for suburban and rural responses.



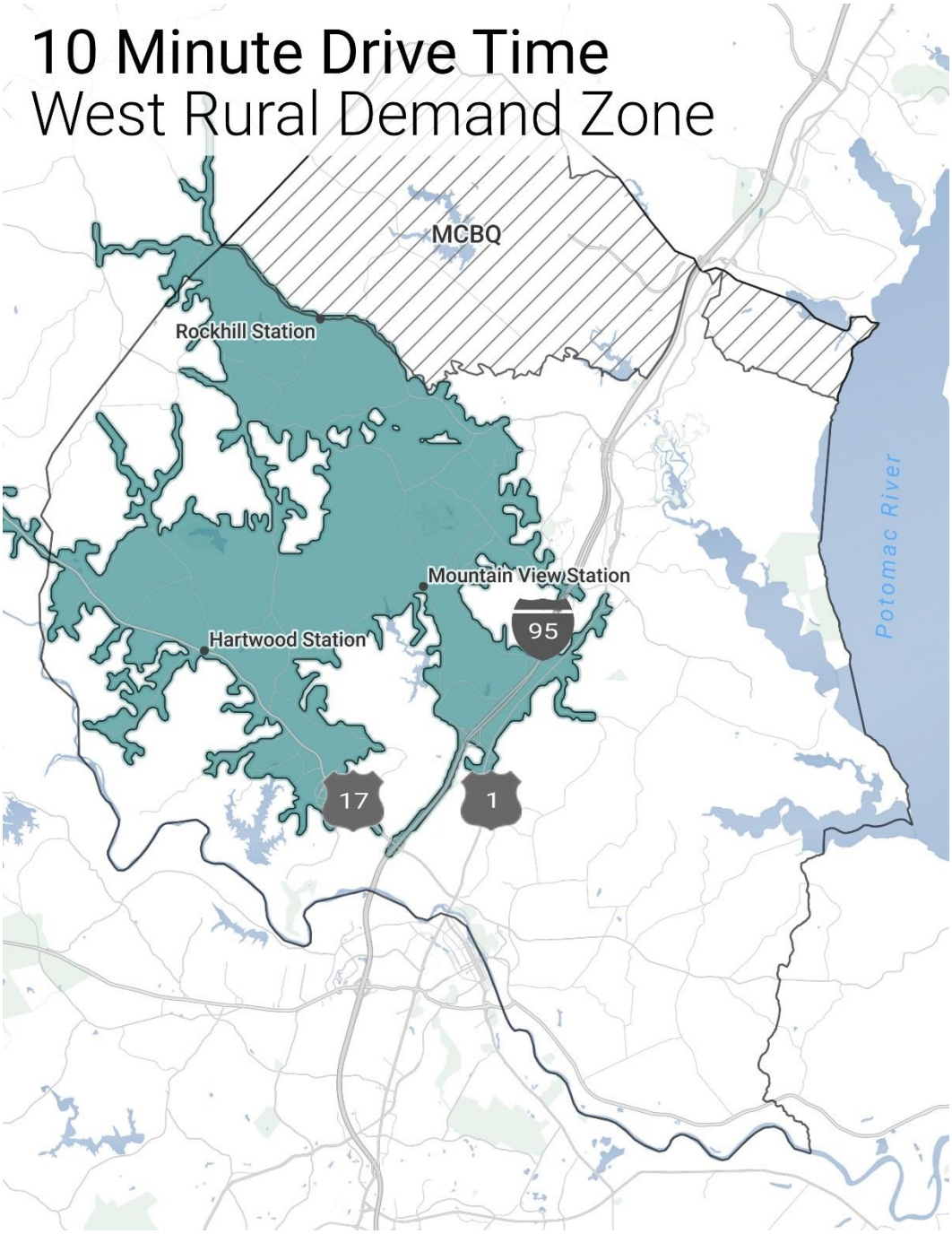
Located in the central section of the County, this demand zone is experiencing an increase in residential and commercial construction.



This map represents the suburban demand zone in the southern section of the County. The White Oak Rescue Station was included as it is a staffed station and does have an impact on the response capabilities for both the suburban area and the rural area.



The eastern rural response district includes a number of waterways and is along the coastline of the Potomac River. Due to those waterways the roadway network in this area is somewhat disconnected.



In the western rural response district, the roadway network is somewhat more connected than the eastern area allowing for a better movement of resources. The area in the northern section is the Quantico Marine Base and out of the response area for this district. The Mountain View Station is also included in this response district as it is in a position to serve both the north suburban district and the west rural district.

Concentration of Resources

Concentration of resources is generally described as the ability of the fire protection system to get the appropriate number of personnel and resources to the scene of an emergency within a prescribed time to effectively mitigate the incident. There are two parts to this component – the first is providing an effective response force and the second is the amount of time to get those resources in place.

Performance Standards

As noted, there are two segments to concentration of resources, the first segment uses travel time, and the second segment involves the number of personnel. Again, these two segments represent the most appropriate measurement available for the concentration of resources and these measurements has a proven record of success nationally.

The concentration segment has two travel time components that must be considered. The first is the travel time for the second arriving apparatus and the second is the balance, travel time and personnel, of the first alarm assignment. The following table summarizes the differing viewpoints for the travel time of the second arriving unit.

Second Arriving Unit - Benchmark Performance Objectives

Demand Zone	Demographics	NFPA 1710	NFPA 1720	ISO	CPSE
Urban	Greater than 1,000 per sq. mile	6 minutes or less 90% of the time	No Requirement	No time or mileage requirement	8 minutes or less 90% of the time
Suburban	500 - 1,000 per sq. mile	6 minutes or less 90% of the time	No Requirement	No time or mileage requirement	8 minutes or less 90% of the time
Rural Area	Less than 500 per sq. mile	6 minutes or less 90% of the time	No Requirement	No time or mileage requirement	14 minutes or less 90% of the time
Remote Area	Travel Distance greater than / equal to 8 miles	6 minutes or less 90% of the time	No Requirement	No time or mileage requirement	No Requirement

As can be noted in the previous table, CPSE and NFPA 1710 have requirements for the second arriving apparatus, the other models are silent. The next table illustrates the travel time for the first alarm assignment.

First Alarm Assignment - Benchmark Performance Objectives

Demand Zone	Demographics	NFPA 1710	NFPA 1720	ISO	CPSE
Urban	Greater than 1,000 per sq. mile	8 minutes or less 90% of the time	9 minutes or less 90% of the time	No time or mileage requirement	8 minutes or less 90% of the time
Suburban	500 - 1,000 per sq. mile	8 minutes or less 90% of the time	10 minutes or less 80% of the time	No time or mileage requirement	10 minutes or less 90% of the time
Rural Area	Less than 500 per sq. mile	8 minutes or less 90% of the time	14 minutes or less 80% of the time	No time or mileage requirement	14 minutes or less 90% of the time
Remote Area	Travel Distance greater than / equal to 8 miles	8 minutes or less 90% of the time	Dependent on the travel distance	No time or mileage requirement	No Requirement

In the previous table, NFPA 1720 addresses the first alarm assignment by demographic and the stated time is measured from the time of dispatch to arrival at the scene. Additionally, NFPA 1720 has a performance objective for suburban and rural of 80% and not 90% of the time. Which differs from ISO, CPSE, and NFPA 1710.

As mentioned above, the second part of the concentration of resources arrival time concerns the number of personnel arriving with the first alarm assignment. The next table summarizes NFPA, ISO, and CPSE standards for the number of personnel arriving for a first alarm assignment for a single-family dwelling.

First Alarm Assignment - Recommended Personnel

Demand Zone	Demographics	NFPA 1710	NFPA 1720	ISO	CPSE
Urban	Greater than 1,000 per sq. mile	16 personnel	15 personnel	No specific requirement	16 personnel
Suburban	500 - 1,000 per sq. mile	16 personnel	10 personnel	No specific requirement	16 personnel
Rural	Less than 500 per sq. mile	16 personnel	6 personnel	No specific requirement	16 personnel
Remote	Travel Distance greater than / equal to 8 miles	16 personnel	4 personnel	No specific requirement	16 personnel

As illustrated, ISO does not specify the number of personnel that is expected or anticipated to arrive, and instead provides points for the personnel - meaning the more on-duty personnel the more points are added to the overall evaluation. In comparison, NFPA 1720 addresses the number of personnel based on the demographics with less personnel in rural areas than urban or suburban. NFPA 1710 and CPSE base their personnel requirements on creating an effective response force using critical tasking.

Performance

Computer Aided Dispatch (CAD) data was used for the evaluation of resource concentration. To be considered for inclusion the following conditions were required to be met:

- Building fires with a dollar loss of $1,000 or more.
- All the units dispatched must have a recorded arrival time. An assumption was made that if the unit did not arrive on scene that it was cancelled while enroute.

The data used were from 2017, 2018, and 2019. To be considered as meeting the resource concentration criteria both the travel time and the minimum number of personnel had to arrive on the scene. For purposes of staffing, the career and volunteer apparatus were staffed with three personnel. It is possible for more personnel to be on the volunteer apparatus; however, for planning purposes and to be consistent the staffing policy was used. Chief officers were staffed with one personnel and emergency medical services units were staffed with two personnel. Incoming mutual aid from Quantico and Fredericksburg were also staffed with three personnel.

Second Arriving Apparatus

This part of the concentration model is slightly different in that it only examines the travel time of a second suppression apparatus. This evaluation does not include a personnel component; however, in Stafford County the arrival of the second suppression unit would typically provide six personnel at the scene.

Benchmark performance objectives established for the second arriving suppression unit are provided by NFPA 1710 and CPSE. NFPA 1710 only addresses the urban setting and has a travel time performance benchmark of 6 minutes for the second arriving suppression unit. CPSE previously established an 8 minute travel time objective for the second arriving suppression unit in the suburban setting. For the rural demographic, CPSE previously established 14 minutes as the travel time objective for the second arriving suppression unit. NFPA 1720 does not have a performance objective for the second arriving suppression unit. The following table illustrates the performance for the second arriving apparatus.

Stafford County Fire and Rescue Department – Second Arriving Apparatus

Structure Fire Calls - 90th Percentile Times		2017 - 2019	Benchmark	Number of Calls	Percent Met
2nd Suppression Unit Travel Time	Suburban	11:35	8:00	105	57.1%
	Rural	14:09	14:00	18	88.9%
	North Suburban	10:41	8:00	63	66.7%
	South Suburban	11:53	8:00	42	42.9%
	East Rural	16:06	14:00	10	80.0%
	West Rural	12:34	14:00	8	100.0%

Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

With a smaller dataset, the travel times shown in the previous table are limited to a three-year period. There are two viewpoints provided in the previous table. In the suburban area the second arriving suppression unit was at the scene in 11 minutes and 35 seconds for 90% of the calls examined. The second viewpoint illustrates that for the 105 calls evaluated, 57.1% of the calls met the 8-minute travel time performance objective. Likewise for the rural component the second suppression unit was at the scene in 14 minutes and 9 seconds for 90% of the calls examined with 88.9% of the calls meeting the 14-minute performance objective. Note the west rural district met the 14 minute travel time performance objective 100% of the time, however, there are only 8 calls over a three-year period.

First Alarm Assignment

The following table summarizes the travel time of the first unit and the remaining first alarm assignment for the suburban demographic.

Stafford County Fire and Rescue Department

Structure Fires - 90th Percentile Times			2017 - 2019	Benchmark	Number of calls	Percent Met
Travel Time*	1st Unit Distribution	Suburban	5:44	5:00	113	82.3%
	ERF Concentration	Suburban	19:01	10:00	73	17.8%
	1st Unit Distribution	North Suburban	5:48	5:00	66	78.8%
	ERF Concentration	North Suburban	19:19	10:00	44	18.2%
	1st Unit Distribution	South Suburban	5:21	5:00	47	87.2%
	ERF Concentration	South Suburban	17:53	10:00	29	17.2%

Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

With a smaller dataset, the travel times shown in the previous table are limited to a three-year period. There are two viewpoints provided in the previous table. For the suburban demographic, the first arriving unit was at the scene in 5 minutes and 17 seconds for 90% of the calls examined. The second viewpoint illustrates that for the 113 calls evaluated, 85.8% of the calls met the 5-minute travel time performance objective. The effective response force required a minimum of 16 personnel to arrive at the scene. For the suburban demographic, an effective response force arrived at the scene in 14 minutes and 34 seconds for 90% of the calls examined with 47.3% of the calls meeting the 10-minute travel time benchmark performance objective. Also shown are the travel times for each of the two suburban districts using the same methodology. The following table summarizes the travel time of the first unit and the remaining first alarm assignment for the rural demographic.

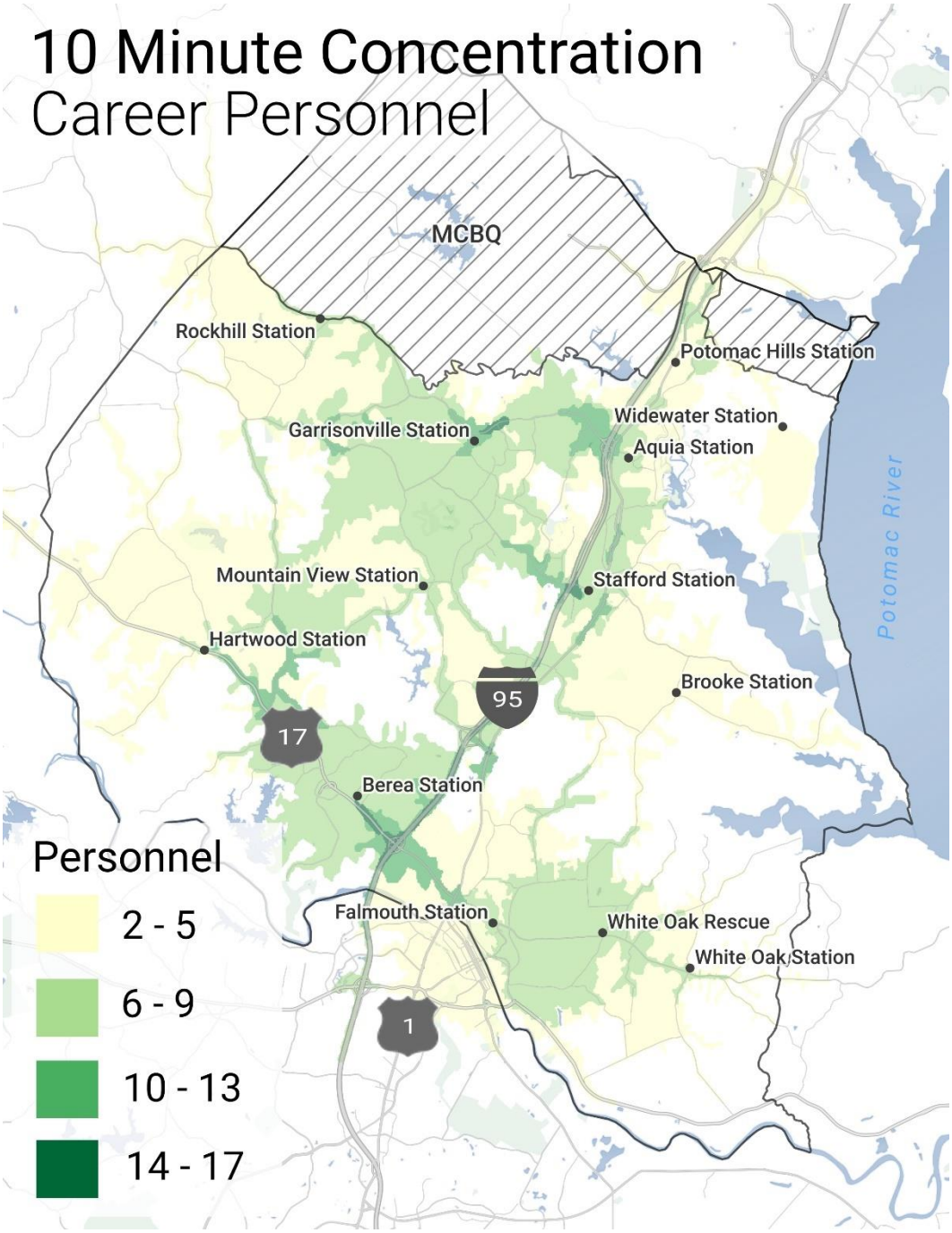
Stafford County Fire and Rescue Department

Structure Fires - 90th Percentile Times			2017 - 2019	Benchmark	Number of calls	Percent Met
Travel Time*	1st Unit Distribution	Rural	10:26	10:00	19	84.2%
	ERF Concentration	Rural	19:55	14:00	14	42.9%
	1st Unit Distribution	East Rural	9:45	10:00	10	90.0%
	ERF Concentration	East Rural	22:13	14:00	6	66.7%
	1st Unit Distribution	West Rural	10:26	10:00	9	77.8%
	ERF Concentration	West Rural	17:54	14:00	8	25.0%

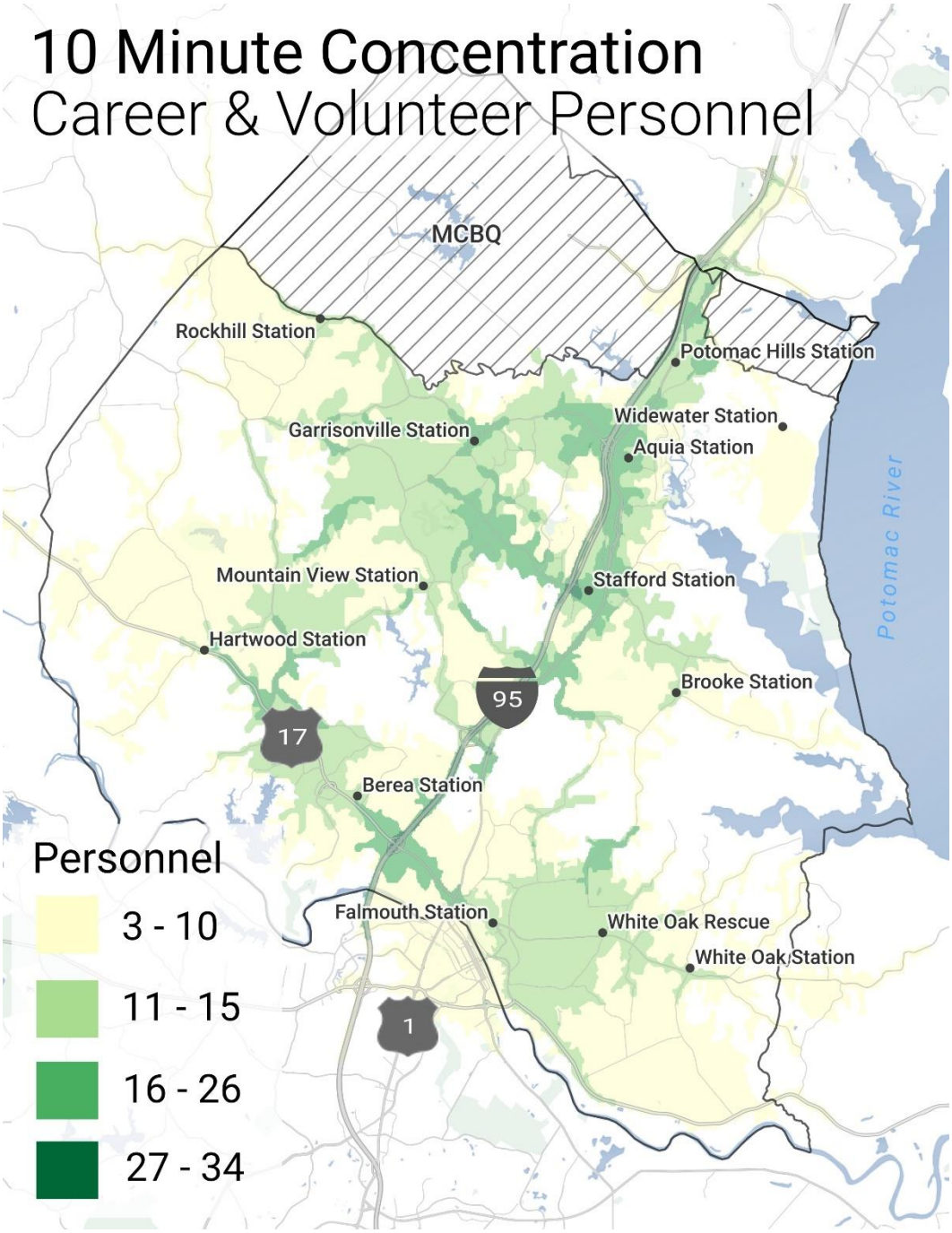
Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

With a smaller dataset, the travel times shown in the previous table are limited to a three-year period. There are two viewpoints provided in the previous table. For the rural demographic, the first arriving unit was at the scene in 10 minutes and 26 seconds for 90% of the calls examined. The second viewpoint illustrates that for the 19 calls evaluated, 84.2% of the calls met the 10-minute travel time performance objective. The effective response force required a minimum of 16 personnel to arrive at the scene. For the rural demographic, an effective response force arrived at the scene in 19 minutes and 55 seconds for 90% of the calls examined with 42.9% of the calls meeting the 14-minute travel time performance objective. Also shown are the travel times for each of the two rural districts using the same methodology.

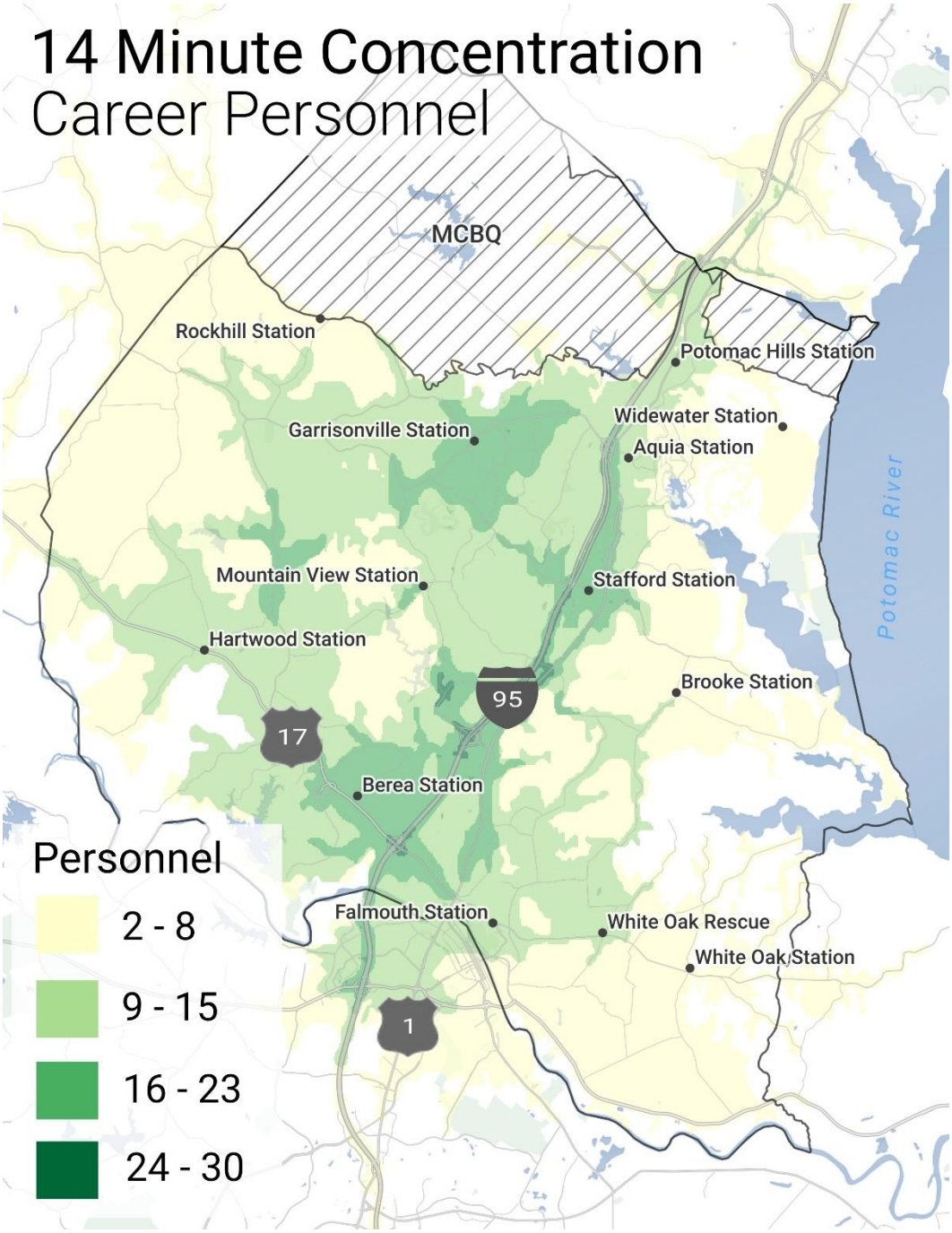
The following maps provide a visual perspective of the concentration of resources for the County. These maps illustrate the benchmark travel time for the arrival of an effective response force for a structure fire in both the suburban and rural demographics. All stations are shown with on map illustrating only career personnel with the second map illustrated both career and volunteer staffing.



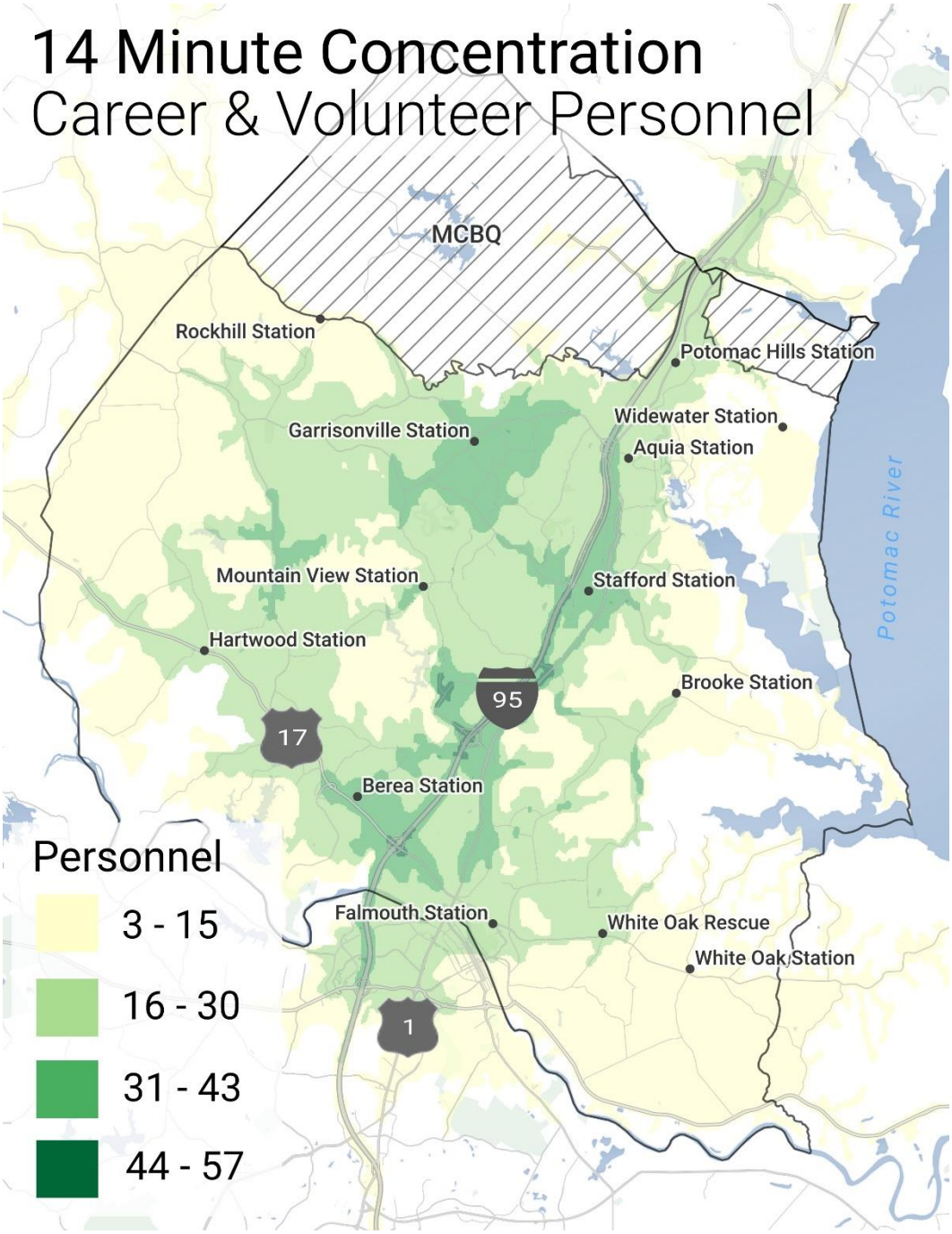
The previous map illustrates the suburban benchmark travel time for an effective response force. Note there are only a few places that can reach the effective response of 14 to 17 personnel and those areas are mostly near the I-95 corridor. The following map illustrates the same area but includes the response of volunteer apparatus. For purposes of evaluation, each fire station had one additional fire suppression unit to respond with a minimum of three volunteer personnel.



With the additional personnel from the volunteer apparatus, an effective response force can be achieved in a slightly broader area in the north and south areas of the north suburban district. The same is true along the US 17 corridor in the area of the I-95 corridor. The rural demographic is illustrated in the next map utilizing the same career personnel configuration.



With career staffed stations only, the effective response force of at least 16 personnel is primarily along the perimeter of the suburban districts.



Adding the volunteer response (one suppression unit and three personnel to each station) improves the arrival of an effective response to the rural areas. However, the roadway network also continues to play a part in the response which is not unexpected as rural roadway networks are not typically gridded like what is found in suburban and urban areas.

System Reliability

The concept of distribution and concentration of resources can be influenced by other contributing factors including unit hour utilization and concurrent calls for service.

Unit Hour Utilization

Unit hour utilization is another factor in determining whether there is an appropriate fire suppression response. Unit hour utilization is calculated by taking the total hours the unit is committed to an incident divided by the total hours in a year. Expressed as a percentage, it identifies the amount of time the unit is committed but more importantly the amount of time the unit is available. Within the framework of the 80th and 90th percentile performance standards the amount of available time can have an impact in meeting that standard. If utilization rates are too high the units are often unavailable for immediate response.

The following table illustrates the unit hour utilization for the past three years for the career staffed units.

Unit Hour Utilization

Unit	2017			2018			2019		
	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration
Ambulance/Medic 12	77:25:10	0.9%	47:24	571:55:24	6.5%	49:53	2068:34:58	23.6%	44:42
Ambulance/Medic 10	1681:13:29	19.2%	40:57	1660:18:40	19.0%	38:29	1641:55:24	18.7%	39:43
Ambulance/Medic 2	1496:43:03	17.1%	38:35	1640:09:21	18.7%	41:31	1520:31:31	17.4%	37:19
Ambulance/Medic 7	1282:16:41	14.6%	44:25	1234:21:21	14.1%	47:16	1518:31:10	17.3%	47:44
Ambulance/Medic 1	1950:56:04	22.3%	43:20	1917:11:41	21.9%	47:20	1514:04:19	17.3%	37:17
Ambulance/Medic 5	125:38:36	1.4%	27:55	349:07:12	4.0%	29:40	999:13:27	11.4%	35:17
Engine 9	979:19:28	11.2%	18:34	1001:32:20	11.4%	19:15	950:44:14	10.9%	20:47
Ambulance/Medic 14	806:15:28	9.2%	36:57	909:59:22	10.4%	44:39	948:59:48	10.8%	43:02
Engine 1/Rescue 1	232:17:42	2.7%	15:05	436:58:49	5.0%	16:10	788:10:46	9.0%	19:38
Engine 12/Truck 12	1092:20:56	12.5%	17:54	1202:03:01	13.7%	19:14	786:51:32	9.0%	19:45
Engine 14/Rescue 14	775:08:30	8.8%	18:48	857:28:27	9.8%	20:20	729:05:31	8.3%	21:39
Engine 6	201:52:16	2.3%	26:03	183:07:58	2.1%	23:32	582:15:04	6.6%	25:52
Ambulance/Medic 3	281:09:57	3.2%	25:55	357:23:35	4.1%	30:05	340:21:50	3.9%	37:08
Engine 4/Tower 4	469:12:17	5.4%	17:18	483:07:57	5.5%	18:19	224:07:28	2.6%	20:30
Engine 8	41:50:03	0.5%	18:36	12:45:55	0.1%	21:53	0:59:04	0.0%	29:32

The busiest units are the emergency medical units with Ambulance/Medic 12 being the busiest in terms of committed time. In 2019 Ambulance/Medic 12 was committed approximately 24% of the time and Ambulance/Medic 10 was committed approximately 19% of the time. As a general rule, the unit hour utilization is not an issue until it begins to reach 20% to 25% and if it begins to interfere with the travel time of the unit. There are several units in the emergency services system that are at or approaching the unit hour utilizations rates that will begin to interfere with the response time continuum.

Concurrent Calls

It is common for a fire protection system to have multiple requests for service occurring simultaneously. The larger the system the more frequently this will occur. With the appropriate resources this can be handled efficiently. The following table summarizes the number of concurrent calls for the emergency services system for the past three years.

Concurrent Calls for Service

Calls	2017	2018	2019	Total	Percent
1	1,615	1,586	1,441	4,642	11.2%
2	2,779	1,665	2,499	6,943	16.8%
3	2,786	2,877	2,793	8,456	20.4%
4	2,222	2,390	2,464	7,076	17.1%
5	1,683	1,794	1,958	5,435	13.1%
6	999	1,208	1,386	3,593	8.7%
7	581	763	811	2,155	5.2%
8	372	484	521	1,377	3.3%
9+	388	699	640	1,727	4.2%
Total	**13,425**	**13,466**	**14,513**	**41,404**	**100%**

Of the 13,425 calls for service in 2017, there were 2,779 instances that two calls were occurring simultaneously. Likewise, there were 2,786 instances that three calls were occurring simultaneously. Over the past three years approximately 21% of the calls occurred with at least three simultaneous calls. In fact, approximately 67% of the calls occurred with multiple calls occurring in Stafford County. It should be noted that it is possible for two or three calls to occur at the same time in different areas of the County such as one in the Potomac area and one in the Berea areas that may not have an effect on the emergency services system. Another factor that is not captured are the back-to-back calls. For example, Engine 9 could respond to a call in the northern section of their district and clear that call only to receive a second call in the southern section of their district. This would not show up as a concurrent call, but it would extend the travel time for the second call. It should also be noted that a single call for service may require a significant number of resources that could impact the delivery of services.

Total Response

Previous sections in this chapter reviewed and evaluated the different response time components individually. Call processing and turnout time are two components that are controllable either by the dispatch center or the fire department. Travel time is less controllable as this utilizes a stationary location, a fire station, as the starting point and

the existing roadway network to arrive at the call for service. For this reason, this component is a primary source that is used for the distribution and concentration of resources.

Stafford County Fire and Rescue Department

All Emergency Calls - 90th Percentile Times			2017 – 2019	2017	2018	2019	Benchmark
Call Processing	Pick-up to Dispatch		2:12	1:40	1:41	2:44	1:00
Turnout Time	1st Unit	All Calls	1:45	1:39	1:42	1:51	1:20
Travel Time	1st Unit Distribution	Suburban	8:16	8:07	8:00	8:37	5:00
Total Response		Suburban	11:56	11:30	11:24	12:48	7:20
		North Suburban	11:50	11:05	11:07	13:01	7:20
		South Suburban	12:03	11:57	11:43	12:28	7:20

The total response time illustrated in the previous table is measured from the time the call is initiated to the initial arrival of resources. For the past three years the total response time for the first arriving resource is 11 minutes and 56 seconds for 90% of the calls for service. Total response for each of the suburban districts are also illustrated as a comparison to the overall suburban experience. Also note the turnout time is not separated between fire and emergency medical calls, this table represents the view from the resident. However, the total response time does illustrate the impact that call processing and turnout time has on the overall response time continuum. The table that follows provides the same information for the rural areas of the County.

Stafford County Fire and Rescue Department

All Emergency Calls - 90th Percentile Times			2017 – 2019	2017	2018	2019	Benchmark
Call Processing	Pick-up to Dispatch		2:17	1:45	1:45	2:48	1:00
Turnout Time	1st Unit	All Calls	1:43	1:34	1:39	1:53	1:20
Travel Time	1st Unit Distribution	Rural	11:15	11:09	11:04	11:23	10:00
Total Response		Rural	15:11	14:59	14:54	15:44	12:20
		East Rural	14:18	13:52	14:00	15:02	12:20
		West Rural	15:55	15:55	15:27	16:17	12:20

This table represents the total response time for the rural areas of the County. For the past three years the total response time for the first arriving resource is 15 minutes and

11 seconds for 90% of the calls for service. Total response for each of the rural districts are also illustrated as a comparison to the overall rural experience.

Strategic Improvement Opportunities

During this study, several opportunities for improvement were identified. Some of those are related to the growth of the community, while others are gaps in service levels. This chapter provides recommendations intended to provide improvements to the emergency services system within Stafford County.

Community Standards

As noted previously there are four nationally recognized models to use to design and improve a fire protection system in our communities. Each model is based on different aspects of a community from population density, the type of fire department, and the road miles in the area.

The applicability for the NFPA models is based on the definitions of the fire department servicing the community.

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 was last published in 2020.

> *Defines a career fire department as one that utilizes full-time or full-time equivalent (FTE) station-based personnel immediately available to comprise at least 50 percent of an initial full alarm assignment.*

NFPA 1720 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments was last published in 2020.

- Defines a combination fire department as one having emergency service personnel comprising less than 85 percent majority of either volunteer or career membership.
- Defines a volunteer fire department as one having volunteer emergency service personnel comprising 85 percent or greater of its department membership.
- Defines four demographic components based on population density as urban, suburban, rural, and remote.

ISO continues to use their standard 1.5-mile and 2.5-mile criteria for engine company and ladder company placement. Although they now accept a systematic performance evaluation that demonstrates the department can meet the time constraints outlined in NFPA 1710.

Appendix A contained in the NFPA 1710 document provides additional information and background as it pertains to service delivery objectives for the jurisdiction as follows:

> "There can be incidents or areas where the response criteria are affected by circumstances such as response personnel who are not on duty, unstaffed fire station facilities, natural barriers, traffic congestion, insufficient water supply, and density of population or property. The reduced level of service should be documented in the written organizational statement by the percentage of incidents and geographical areas for which the total response time criteria are achieved.
>
> Additional service delivery performance objectives should be established by the AHJ for occupancies other than those identified within the standard for benchmark single-family dwellings. Factors to be considered include specific response areas (i.e., suburban, rural, and wilderness) and occupancy hazards."

This passage acknowledges the authority having jurisdiction (AHJ), in this case Stafford County, is responsible for determining the level of service to be provided by its fire and rescue department. Considerations for the level of service include, but not limited to, the manner in which the Fire and Rescue Department responds, travel time, staffing, emergency calls versus non-emergency calls, roadways, financial resources, and those calls involving different occupancies. The levels of service provided to the County should be written and documented so the residents of the County know and understand the expectations of the emergency services system.

Previously the Center for Public Safety Excellence had defined benchmark and baseline response times for each of the three components. These baseline performance objectives were derived from the benchmark response times to a lesser 70% of the benchmark. They have since determined they are not a standard making organization and decided to leave the establishment of response time standards to others. However, their body of work is significant and has been used by numerous communities across the country to assist with determining what baseline services should be for a community.

The definitions for the criteria of each service area are defined in the following table. CPSE also gives a community a range of acceptable performance standards from "Baseline", minimally accepted performance or to "Benchmark", fully compliant with best practices. CPSE had previously set the following performance standards for urban, suburban and rural areas:

Service Area / Population Density Response Travel Time Standards

	1st Unit	2nd Unit	1st Alarm Balance	Performance
Urban: Population density of over 1,000 per square mile				
Benchmark	4 minutes	8 minutes	8 minutes	90%
Baseline	5 minutes/12 seconds	10 minutes 24 seconds	10 minutes/24 seconds	90%
Suburban: Population density between 500 and 1,000 per square mile				
Benchmark	5 minutes	8 minutes	10 minutes	90%
Baseline	6 minutes/30 seconds	10 minutes/24 seconds	13 minutes	90%
Rural: Population density of less than 500 per square mile				
Benchmark	10 minutes	14 minutes	14 minutes	90%
Baseline	13 minutes	18 minutes/12 seconds	18 minutes/12 seconds	90%

While Stafford County fits the NFPA 1720 definition, the standard does not provide appropriate performance objectives to evaluate and analyze the emergency services system. These CPSE guidelines offer the most appropriate and comprehensive performance objectives in terms of travel time components for the distribution and concentration of resources. For purposes of this analysis and evaluation, the CPSE travel time guidelines will be used.

Response Demand Zones

Stafford County is a diverse area covering approximately 280 square miles of land with a population of approximately 149,960 residents. The County has two population centers along the I-95 corridor that includes the Garrisonville, Widewater, and parts of the Aquia areas. The second population center is in the southern section of the County in the Berea and Falmouth area. The other areas are more rural in nature with a population density much less than areas along the I-95 corridor. Each of these areas have their own issues in terms of roadways and traffic congestion. Higher traffic counts and congestion along the I-95 corridor and fewer, narrower, and curvier roads in the rural areas of the County. Water supply is another issue between the two areas as there is no water system in the rural areas which means the Fire and Rescue Department must use a water shuttle system and static water sources to provide a fire flow.

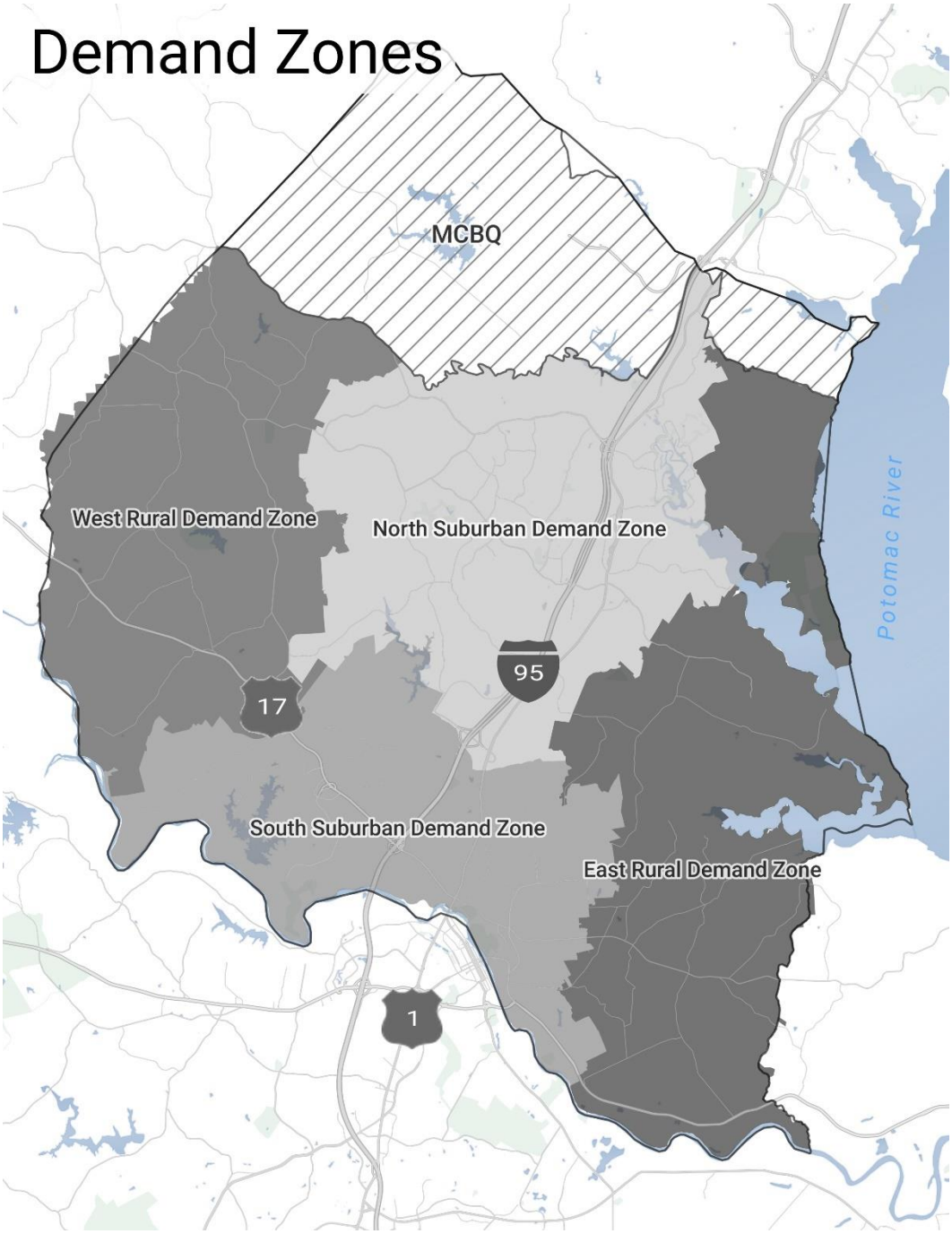
As noted previously, there are three areas within the County with varying population densities based on the U.S. Census data. For purposes of identifying response demand zones, planning the response, and to further the development of performance objectives, the County should identify four response demand zones using the existing fire station response districts as noted in the following table.

Fire Company Demographics

North Suburban Demand Zone	South Suburban Demand Zone
Fire Company 2 – Stafford	Fire Company 1 – Falmouth
Fire Company 4 – Mountain View	Fire Company 12 – Berea
Fire Company 9 – Aquia	
Fire Company 10 – Potomac Hills	
Fire Company 14 – Garrisonville	

East Rural Demand Zone	West Rural Demand Zone
Fire Company 3 – Widewater	Fire Company 6 – Hartwood
Fire Company 5 – Brooke	Fire Company 8 – Rockhill
Fire Company 7 – White Oak	Rescue Company 8 - Rockhill
Rescue Company 7 – White Oak	

The following map provides a visual perspective of the response demand zones.



As the authority having jurisdiction, Stafford County, should provide an organizational statement establishing the levels of service the emergency services system will provide. The CPSE provides a template for developing such a statement. It should be stressed that a one-size fits all approach does not address the issues within the various areas. A County adopted organizational statement can address those issues such as the travel time in the rural areas versus the suburban areas. The response to a call for service will

also be different as water tankers will be needed in the rural areas that are not needed in the urban areas. In crafting the organizational statement any of the sections from the NFPA standards, CPSE guidelines, or the ISO documentation can be utilized as a basis for determining the levels of service and performance objectives of the Fire and Rescue Department.

The organizational statement should also provide direction and guidance for any future expansion of the Fire and Rescue Department and the County. Growth in Stafford County is expected to continue as previously documented. Having the organizational statement, which provides for guidance and direction, will allow Stafford County to plan for the needs of the emergency services system. As well this organizational statement will provide a pathway for the Fire and Rescue Department to transition from a suburban/rural area to an urban/suburban area.

Recommendations:

Stafford County should adopt an organizational statement for the emergency services system that outlines response time expectations, staffing, response capabilities, and to provide guidance for any future expansion of the Fire and Rescue Department.

The Fire and Rescue Department must identify response demand zones to provide for planning and response performance objectives.

Call Processing

The call processing component is not in the direct control of the Fire and Rescue Department however, the Department should continue to work with the Stafford County Sheriff's Office Emergency Communications Center to improve their call processing performance. The call processing time is measured from the time the call is answered by the dispatcher until the field units are dispatched. Times illustrated in the following table is the call processing performance for a three year period and were obtained via the computer aided dispatch system.

Stafford County Communications

All Emergency Calls – Call Processing	2017 – 2019	Benchmark
90th Percentile	2:13	1:00
80th Percentile	1:31	
70th Percentile	1:08	

National best practice as outlined in NFPA 1221 Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems uses a 90th

percentile performance objective. The previous table illustrates call processing performance at various performance objective achievements. For example, the call processing time at the 90th percentile achievement was 2 minutes and 13 seconds. During the same time period, call processing time at the 80th percentile achievement was 1 minute and 31 seconds. Using this data, reducing the call processing from 2 minutes and 13 seconds to 1 minute and 31 seconds represents a 10% improvement in performance.

Many communications centers use systematic programs to assist in identifying the reason for the call and to match the resources to be sent to the call for service. Emergency Medical Dispatch is such a system that uses locally approved guidelines to not only dispatch the correct resources but also provide pre-arrival instructions to the caller. Additional systems are in place for other types of calls such as fire response and law enforcement. However, these systems should not increase the call processing time but rather speed up the process. The intent is to send the initial resource as quickly as possible while gathering additional information. The response can be upgraded or downgraded depending on the additional information and while the resources are responding pre arrival instructions can be provided. The systems are not designed to delay the response of emergency forces.

Recommendations

The Stafford County Sheriff's Office Emergency Communications Center should establish call processing benchmarks as outlined in NFPA 1221 Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems including calls answered and call processing performance objectives.

The Stafford County Sheriff's Office Emergency Communications Center should provide monthly statistical reports to the various departments and agencies outlining their performance as compared to the established benchmark performance objectives.

Turnout Time

There are several factors that will influence the turnout time for apparatus including the station layout. Such considerations include stairs, detour to restroom, policy for signaling enroute, opening the bay doors, policy for gathering response information, and the personal protective gear that must be donned. In any case, formally establishing turnout time performance objectives provides direction to the employees and establishes the expectations of their performance. As well, the public understands and knows what to expect from their fire services.

The following table illustrates the turnout time for the past three years, derived by combining the last three-years of turnout time data using the same filtering mechanisms as previously noted. It is shown as a fractal time ranging from 90% to 70% for emergency medical calls and fire-related calls.

Stafford County Fire and Rescue Department Turnout Time

	90%	80%	70%	Avg.
Turnout Time – EMS	1:59	1:38	1:24	1:02
Turnout Time – Fire	1:45	1:23	1:09	0:49

For the past three-years combined the turnout time for medical calls was 1 minute and 59 seconds for 90% of the time and for 80% of the time the turnout time was 1 minute and 38 seconds.

This table illustrates the achievable incremental improvement to the turnout time segment of the response time continuum. For example, improving the 90% fractal time from 1 minute and 59 seconds to 1 minutes and 38 seconds represents a 10% improvement. As well, reducing the 90% fractal time to 1 minute and 24 seconds would represent a 20% improvement. Incremental improvements are measurable and provide a baseline to measure those improvements.

Recording the time a unit begins its response is a function of the dispatch center and the dispatcher handling the call. The process used in Stafford County is for the unit to notify the dispatcher of the response and the dispatcher then records or time stamps the enroute time. It is possible for the dispatcher to be handling several issues simultaneously resulting in a delay in the recording of the enroute time. It is also possible for the unit to be delayed in notifying the dispatcher of the response due to other radio traffic or other issues that may be occurring simultaneously. The times and variances illustrated above is the first step to identify any issues or problems with how response times and unit performance is currently captured and reported. The next step is to establish guidelines for accurately capturing the turnout time performance and identify those times when the turnout time is beyond established thresholds. This will allow for the evaluation of the problem, identify if it is a data issue, an operational issue, or other technical problem and the process further refined to improve the reliability of the data.

Improvement to the turnout time component can take several forms. Some departments have installed timers in the station at the apparatus bay doors that indicate the amount of time that has elapsed since the dispatch was received. This allows the crews to instantly see their turnout time performance and according to some departments has helped to improve their turnout time. Many departments have also encouraged and

required the on-duty crews to place their gear at or on the apparatus instead of leaving it in the locker or other location within the station.

Other remedies include the posting of turnout time by station and by shift. This allows the company officer to see the results and work to improve the turnout time of his or her units. Some departments have instituted a process to hold the company officer accountable for excessively long turnout times by creating a written report as to why the turnout time was excessive. This could be established using the current baseline turnout time as a trigger point to generate a time variance report.

Another option is to establish a standard operating procedure as to when a unit is to place themselves enroute. For example, one shift will place themselves enroute from the living quarters while another shift will place themselves enroute once they are on the truck. Still yet, another shift may wait until they have cleared the bay doors, all of which will vary the reported turnout time and possibly skew the data related to actual performance. Establishing a procedure will improve the accuracy of the data.

The use of the mobile data terminal (MDT) to place a unit enroute electronically records the enroute time, eliminating the need for the dispatcher to place a unit enroute. Busier communications centers can delay the recording of an enroute time for a unit as there may be multiple units calling or other calls that may take priority. Using the MDT is not without its issues either. It does not allow the other units in the system to hear that a unit is in fact responding. For example, there are multiple units responding to a fire call and the officer in charge needs to know what units are responding and with MDT's the only way to see responses is to look at the computer screen, which is not a safe options while driving. Reliability issues with the MDT system can also pose another hurdle. Questions of has the MDT connected to the system properly and has the MDT recorded the enroute or on scene keystroke. There are some departments that will mark the units enroute on the MDT and then announce themselves over the radio, so all personnel know what unit is responding. It does create a dual action, but it also enables the capture of the true enroute time.

Recommendations:

Formally establish a baseline performance objective for turnout times of 1 minute 18 seconds for emergency medical calls 90% of the time.

Formally establish a benchmark performance objective for turnout times of 1 minute for emergency medical calls 90% of the time.

Formally establish a baseline performance objective for turnout times of 1 minute and 44 seconds to fire related calls 90% of the time.

Formally establish a benchmark performance objective for turnout times of 1 minute and 20 seconds to fire related calls 90% of the time.

Work with the Stafford County Sheriff's Office Emergency Communications Center to ensure procedure and processes are adequate for capturing the time stamps.

Install timers in the stations at the apparatus doors to indicate the elapsed time from dispatch.

Post turnout time performance monthly by station and by shift at each station to allow crews to see their performance.

Create a reporting mechanism for excessive turnout times to allow for evaluation on the cause in turnout time delays.

Distribution of Resources

Distribution is the measure of getting initial resources to an emergency to begin mitigation efforts. This is measured in a variety of ways including percentage of square miles, percentage of road miles and travel time. The Insurance Services Office (ISO) has used road miles for many years advocating one and a half miles for an engine company and two and a half miles for a ladder company. With the advent of GIS technology and improved computer aided dispatch (CAD) systems, the use of actual travel time is another more accurate measure for the distribution of resources.

Travel time is a measurable time segment that begins when the apparatus and personnel begin the response (wheels rolling) and ends once on location of the emergency (wheels stopped). Using the four response zone areas previously defined, the next four sub-sections provide a closer evaluation of Stafford County in terms of distribution of resources.

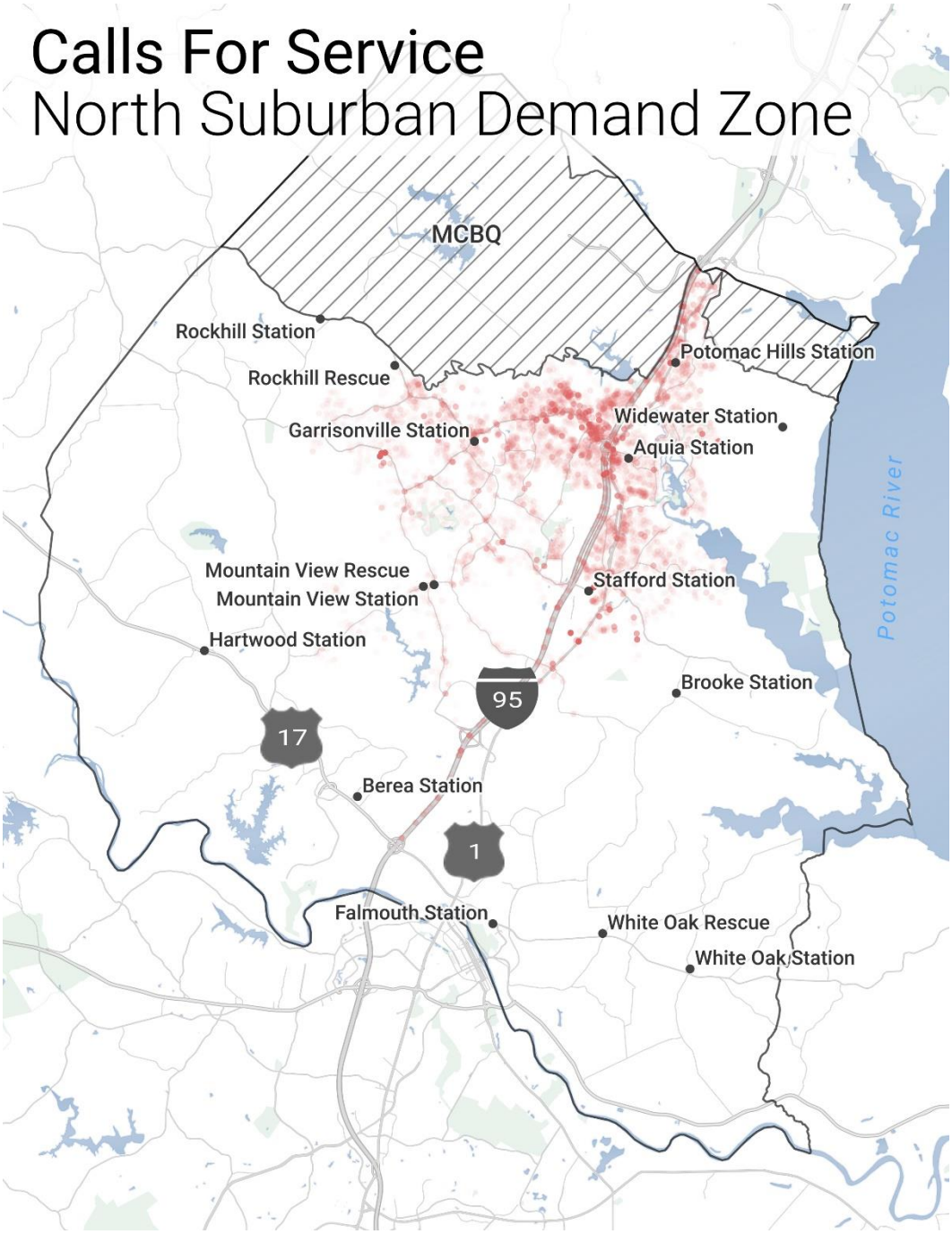
North Suburban Demand Zone

This population center includes the Garrisonville, Aquia, Stafford, and Potomac Hills area of the County. It is predominately along the I-95 corridor and continues to grow in residential and commercial development. Overall, the area is a suburban population density with small sections that are more urban in nature. The table that follows illustrates the fire stations, units, and career staffing that typically provide services to this area.

North Suburban Demand Zone

Fire Companies	Staffed Units	Minimum Staffing
Fire Company 2 – Stafford	Ambulance/Medic 2	2
	EMS 2	1
Fire Company 4 – Mountain View	Engine 4/Tower 4	3
Fire Company 9 – Aquia	Engine 9	3
Fire Company 10 – Potomac Hills	Ambulance/Medic 10	2
Fire Company 14 – Garrisonville	Engine 14/Rescue 14	3

Fire Company 4 is in a location that can and does serve both the North Suburban Demand Zone and the West Rural Demand Zone. For purposes of this evaluation, it is included here as the development is moving towards this area. The following map illustrates the location of the calls for the past three years in this demand zone.



The majority of the calls for the past three years is in the northern section of the demand zone. The heavier calls also extend along the eastern side of the I-95 corridor.

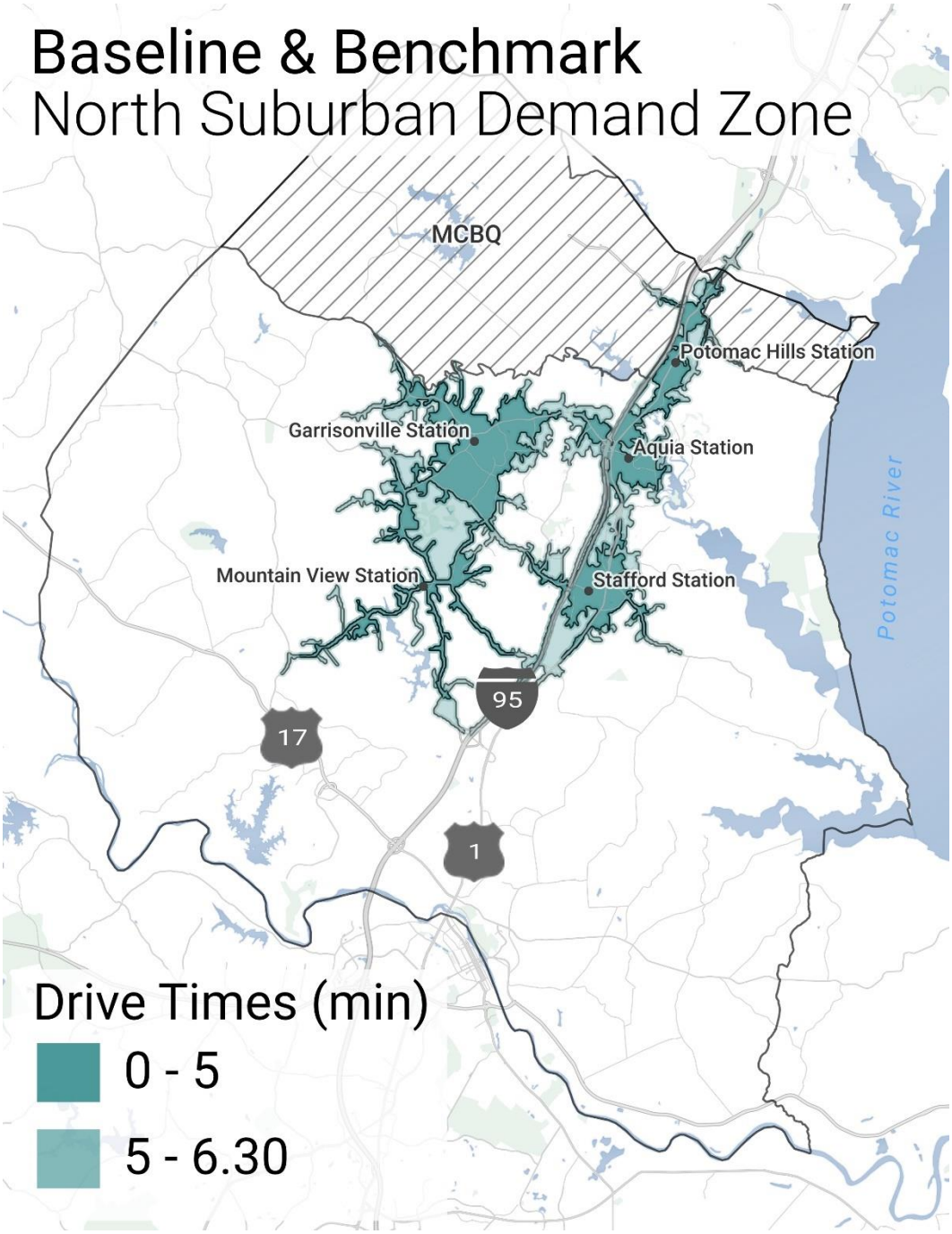
The following table illustrates the travel time performance for this demand zone.

North Suburban Demand Zone Travel Time Performance

All Emergency Calls - 90th Percentile Travel Times		2017 – 2019	2017	2018	2019	Benchmark Objectives	Baseline Objectives
1st Unit Distribution	Suburban	9:06	9:07	8:48	9:26	5:00	6:30
	North Suburban	9:14	8:59	8:47	9:55	5:00	6:30

Compared to the overall suburban travel time, the north suburban demand zone is slightly longer.

The following map provides a spatial view of the travel time, both benchmark and baseline, using the Stafford County fire station locations as the starting point. The drive time isochrones are generated using a digital road network with existing speed limits, traffic laws, and a general pattern of traffic flow factored into the equation.



As shown, there areas in the middle sections of the demand zone that are outside the baseline travel time of 6 minutes and 30 seconds. Two areas to the south are undeveloped and have limited roadway access. The area in the in the northern section has some residential and commercial development and continues to grow.

Calls for service are concentrated in the northern section of the demand zone and along the eastern side of I-95 corridor as noted previously. As well, the calls for service are

generally located within the travel time polygons in this demand zone. It should also be noted that 74% of the call volume in this demand zone are medical emergencies and auto accidents.

A review of resource availability for this demand zone indicates several response units are at or near over utilization. The following table illustrates the unit hour utilization for the units assigned to the central suburban demand zone.

North Suburban Demand Zone Unit Hour Utilization – Staffed Units

Unit	2017			2018			2019		
	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration
Ambulance/Medic 10	1681:13:29	19.2%	40:57	1660:18:40	19.0%	38:29	1641:55:24	18.7%	39:43
Ambulance/Medic 2	1496:43:03	17.1%	38:35	1640:09:21	18.7%	41:31	1520:31:31	17.4%	37:19
Engine 9	979:19:28	11.2%	18:34	1001:32:20	11.4%	19:15	950:44:14	10.9%	20:47
Engine 14/Rescue 14	775:08:30	8.8%	18:48	857:28:27	9.8%	20:20	729:05:31	8.3%	21:39
Engine 4/Tower 4	469:12:17	5.4%	17:18	483:07:57	5.5%	18:19	224:07:28	2.6%	20:30

As illustrated Ambulance/Medic 10 and Ambulance/Medic 2 are near the 20% utilization rate. As these units become more utilized, resources from other areas will need to respond to calls for service.

With 74% of the calls for service being medical emergencies and auto accidents, the following table illustrates the number of responses medical units made into the central suburban demand zone in 2019. The units in bold are those units assigned to this demand zone.

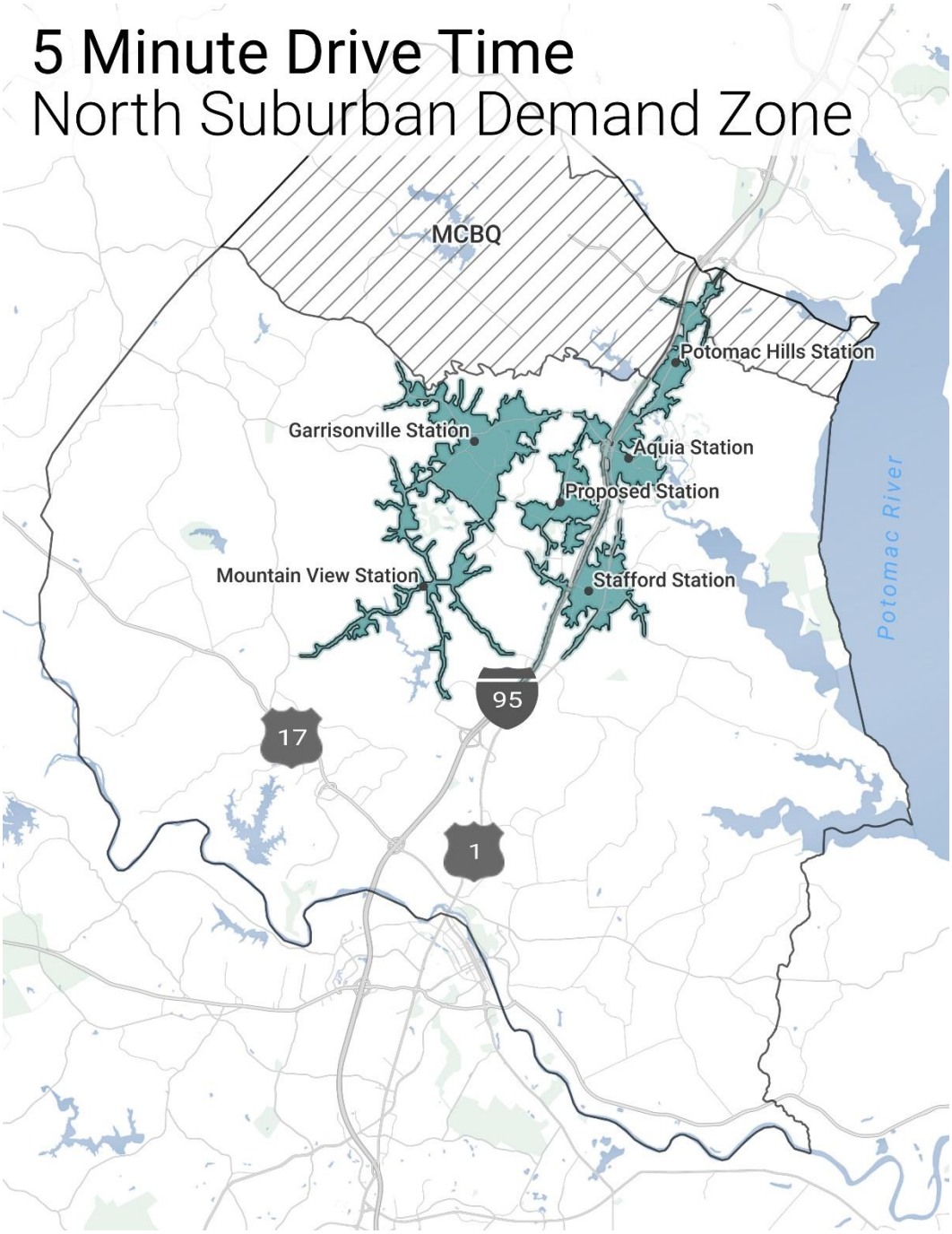
North Suburban Demand Zone Medical Responses – 2019

Unit	Travel Time	Responses	Pct of Responses
Ambulance/Medic 10	0:10:15	2,267	18.5%
Ambulance/Medic 2	0:10:47	2,036	16.6%
Ambulance /Medic 5	0:11:28	996	8.1%
Ambulance/Medic 14	0:11:49	846	6.9%
Ambulance/Medic 3	0:12:07	406	3.3%
Ambulance/Medic 12	0:12:18	180	1.5%
Ambulance/Medic 1	0:10:48	63	0.5%
Ambulance/Medic 7	0:10:29	55	0.4%
Total Responses		**6,849**	

There are some calls for service that require additional resources and are also included in this table. Longer travel times for Ambulance/Medic 10 and 2 is indicative of higher utilization and not necessarily responding from their respective stations. Ambulance /Medic 5 is stationed at the Brooke Station and has responded to approximately 8% of the calls in the north suburban demand zone. Likewise, Ambulance/Medic 14 responded to approximately 7% of the calls from the Rockhill Station.

There are two issues in this demand zone. The first, as illustrated, is an over utilization of resources creating the inability to meet the 90th percentile performance objective. Adding an additional ambulance/medic unit would assist in relieving the high utilization rates and improve the response time as the units would be more available to respond from within the demand zone. This addition would need to be monitored as there would be a potential for another ambulance/medic unit in the future depending on the call volume, response time, and utilization rates.

The second issue in this demand zone is the gap in travel time in the center section of the demand zone. This area continues to grow with residential and commercial development along the Mine Road corridor and Courthouse Road. Placing a new fire station in this area will improve the initial response travel time as illustrated in the following map.



The new station is located at the intersection of Mine Road and Austin Ridge Drive. The area to the west of this intersection is currently being developed. Once the roadway network is in place, the travel time can be better illustrated.

There is another issue in this area that needs to be noted. The developments are more like islands with little to no connectivity. This type of development inhibits access by emergency services and could create delays in the response. There are many reasons for

these types of roadway networks including limiting thoroughfares and the related traffic concerns and the desire to create exclusive neighborhoods.

To illustrate this point, consider this situation. True Road was built with a dead end, not a "T" turnaround or a cul-de-sac, indicating the street was planned to be a through street. Spring Lake Drive was built and not connected to True Road. Using a standard internet based driving application, travel time to 33 True Road (house at the dead end of the road) from Fire Station 14 is 6 minutes (approximately 2.5 miles). Travel time to 75 Spring Lake Drive, the house whose yard abuts the dead end of True Road, from Fire Station 14 is 3 minutes (approximately 1.3 miles).

The continued development in this area may result in the need for additional fire stations and resources. This is especially true with future development in the area south of Courthouse Road and north of Ramoth Church Road.

Recommendations:

The Fire and Rescue Department should add an ambulance/medic unit to the current allocation of resources in the North Suburban Demand Zone.

Continue to monitor the call volume, response time, and unit hour utilization for the needs of an additional ambulance/medic unit in the future.

The Fire and Rescue Department should add a new fire station in the area of Mine Road and Austin Ridge Drive and staff this station with an engine company and an ambulance/medic unit.

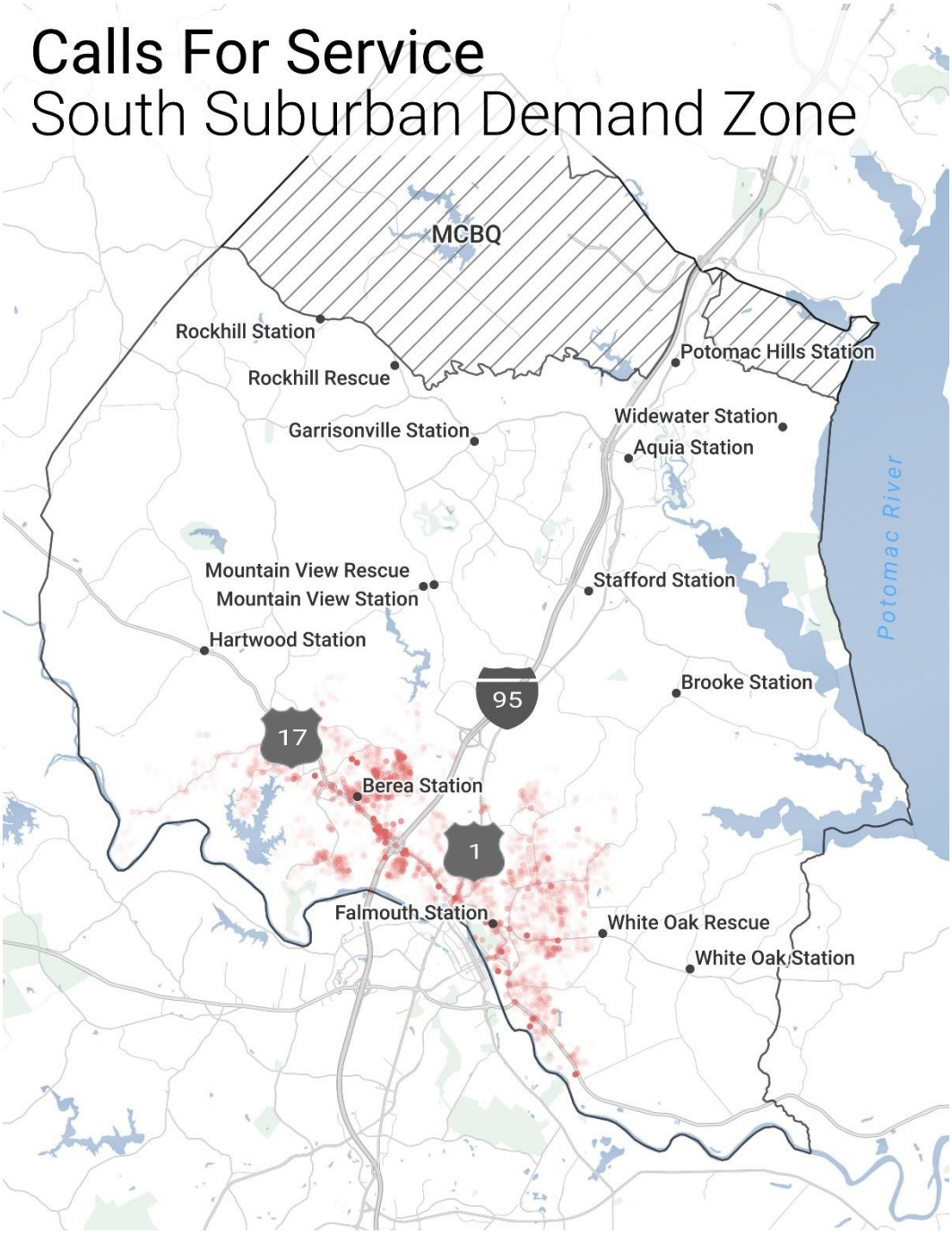
South Suburban Demand Zone

This population center includes the Berea and Falmouth area of the County. It is along the southern border of the County and along the I-95 corridor. Much like the central suburban response district, the area is a suburban population density with small sections that are more urban in nature. The table that follows illustrates the fire stations, units, and career staffing that typically provide services to this area.

South Suburban Demand Zone

Fire Companies	Staffed Units	Minimum Staffing
Fire Company 1 – Falmouth	Ambulance/Medic 1	2
	Engine 1/Rescue 1	3
Fire Company 12 – Berea	Ambulance/Medic 12	2
	Engine 12/Truck 12	3
Rescue Company 7 – White Oak	Ambulance/Medic 7	2

Rescue Company 7 is in a location that can and does serve both the South Suburban Demand Zone and the East Rural Demand Zone and has a career staffed ambulance/medic unit. The following map illustrates the location of the calls for the past three years in this demand zone.



The majority of the calls for the past three years is just north of the Berea Fire Station and along Warrenton Road. There are also heavier pockets of calls in the Bel Air area.

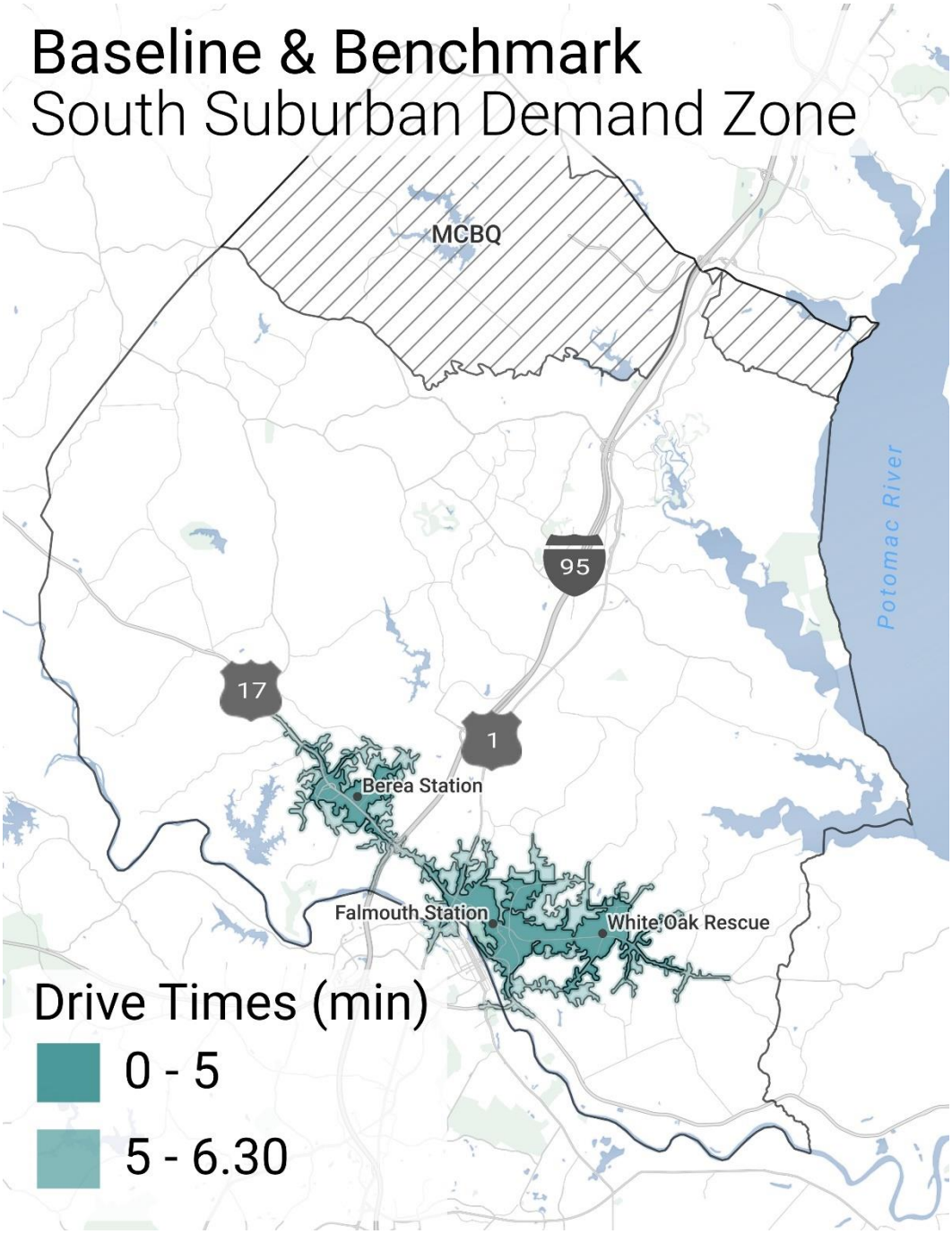
The following table illustrates the travel time performance for this demand zone.

South Suburban Demand Zone Travel Time Performance

All Emergency Calls - 90th Percentile Travel Times		2017 – 2019	2017	2018	2019	Benchmark Objectives	Baseline Objectives
1st Unit Distribution	Suburban	9:06	9:07	8:48	9:26	5:00	6:30
	South Suburban	8:56	9:18	8:49	8:46	5:00	6:30

Compared to the overall suburban travel time, the south suburban demand zone is slightly under.

The following map provides a spatial view of the travel time, both benchmark and baseline, using the Stafford County fire station locations as the starting point. The drive time isochrones are generated using a digital road network with existing speed limits, traffic laws, and a general pattern of traffic flow factored into the equation.



There are a number of areas in this demand zone that are undeveloped or lack roadway access. For example, the area along the I-95 corridor north from Warrenton Road to the Centreport Parkway is largely undeveloped. Likewise, areas to the east of the Berea Fire Station have limited roadway access and is undeveloped. These areas will continue to grow and develop and will need to be monitored for response time and the need for additional resources.

Calls for service are concentrated along Warrenton Road and to the north of the Berea Fire Station as noted previously. As well, the calls for service are generally located within the travel time polygons in this demand zone. It should also be noted that 76% of the call volume in this demand zone are medical emergencies and auto accidents.

A review of resource availability for this demand zone indicates several response units are at or near over utilization. The following table illustrates the unit hour utilization for the units assigned to the south suburban demand zone.

South Suburban Demand Zone Unit Hour Utilization

Unit	2017			2018			2019		
	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration
Ambulance/Medic 12	109:12:09	1.2%	0:43:41	625:11:41	7.1%	0:47:51	2075:27:16	23.7%	0:44:39
Ambulance/Medic 1	1962:47:07	22.4%	0:43:20	1934:00:47	22.1%	0:47:19	1677:41:04	19.2%	0:37:55
Ambulance/Medic 7	1320:03:21	15.1%	0:44:02	1287:49:40	14.7%	0:46:50	1538:09:38	17.6%	0:47:49
Engine 12/Truck 12	1101:15:02	12.6%	0:17:56	1215:35:47	13.9%	0:19:17	797:30:48	9.1%	0:19:42
Engine 1/Rescue 1	232:17:42	2.7%	0:15:05	436:58:49	5.0%	0:16:10	788:10:46	9.0%	0:19:38

As illustrated Ambulance/Medic 12 is over the 20% utilization rate and Ambulance/Medic 1 is near the 20% utilization rate with Ambulance/Medic 7 just approaching the 20% utilization rate. As these units become more utilized, resources from other areas will need to respond to calls for service.

With 76% of the calls for service being medical emergencies and auto accidents, the following table illustrates the number of responses medical units made into the south central suburban demand zone in 2019. The units in bold are those units assigned to this demand zone.

South Suburban Demand Zone Responses

Unit	Travel Time	Responses	Pct of Responses
Ambulance/Medic 12	**0:09:15**	**1,960**	**37.5%**
Ambulance/Medic 1	**0:10:02**	**1,532**	**29.3%**
Ambulance/Medic 7	**0:10:01**	**1,257**	**24.0%**
Ambulance/Medic 6	0:10:32	260	5.0%
Ambulance/Medic 10	0:10:22	74	1.4%
Ambulance/Medic 14	0:05:50	65	1.2%
Ambulance/Medic 2	0:15:06	56	1.1%
Ambulance/Medic 5	0:12:36	28	0.5%
Total Responses		**5,232**	

There are some calls for service that require additional resources and are also included in this table. Longer travel times for Ambulance/Medic 12 and Ambulance/Medic 1 is indicative of higher utilization and not necessarily responding from their respective stations. Ambulance/Medic 7 is stationed at the White Oak Rescue Station and has responded to approximately 24% of the calls in the south central suburban demand zone. This increase in travel time is expected as the station is further east of the Falmouth Fire Station.

Over utilization of emergency medical units is the primary issue in this demand zone as all three units are highly utilized. This high utilization creates the inability of meeting the 90th percentile performance objective similar to the central suburban demand zone. Adding an additional ambulance/medic unit would assist in relieving the high utilization rates and improve the response time, as the units would be more available to respond from within the demand zone. This addition would need to be monitored as there would be a potential for another ambulance/medic unit in the future depending on the call volume, response time, and utilization rates.

This demand zone has numerous areas for development with much of the potential to the north of the Berea Fire Station. In fact, the Centreport Parkway feeds into the airport area and has an interchange with I-95 and the Jefferson Davis Highway. Placing a fire station in this area would likely improve response time and reinforce responses to both suburban demand zones. However, without much development in progress or a vision of what the roadway network would be placing a fire station in this area now would not be feasible. This would be an excellent opportunity for the Fire Rescue Department and the

planning agencies to work together on a plan for the development and the placement of resources to provide emergency services to the area using the population density as a trigger to add resources.

Recommendations:

The Fire and Rescue Department should add an ambulance/medic unit to the resources in the South Suburban Demand Zone.

Continue to monitor the call volume, response time, and unit hour utilization for the needs of an additional ambulance/medic unit in the future.

The Fire and Rescue Department should work with Stafford County leadership and planning agencies on the development of the Centreport Parkway and Jefferson Davis Highway area.

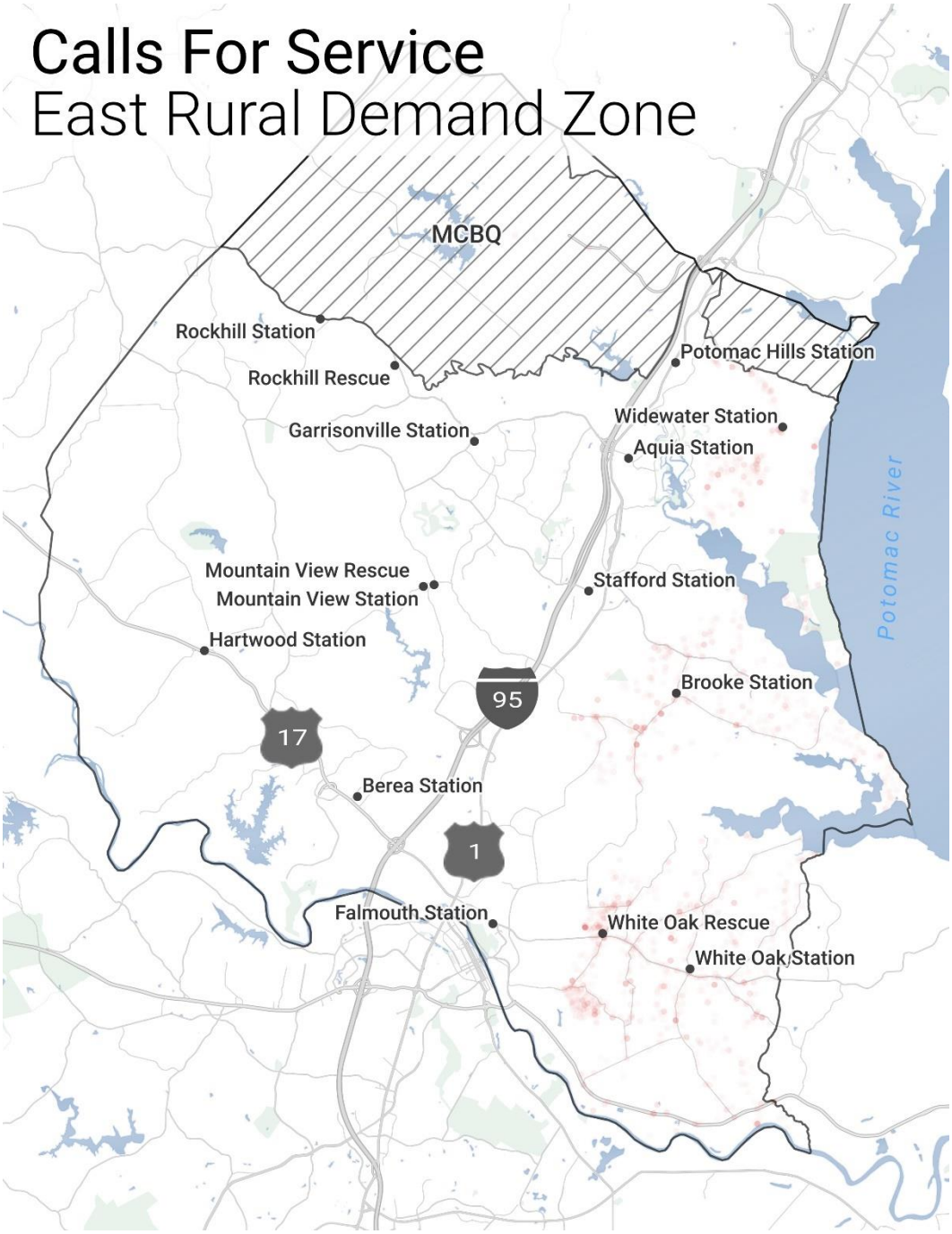
East Rural Demand Zone

This is a rural area located east of the I-95 corridor and along the Potomac River that includes the Widewater, Brooke, and White Oak areas. There are small areas of heavier population densities along the western areas of the demand zone. Along the eastern areas there are numerous smaller waterways that feed into the Potomac River. The table that follows illustrates the fire stations, units, and career staffing that typically provide services to this area.

East Rural Demand Zone

Fire Companies	Staffed Units	Minimum Staffing
Fire Company 3 – Widewater	Ambulance/Medic 3	2
Fire Company 5 – Berea	Ambulance/Medic 5	2
Rescue Company 7 – White Oak	Ambulance/Medic 7	2

Rescue Company 7 is in a location that can and does serve both the South Suburban Demand Zone and the East Rural Demand Zone and has a career staffed ambulance/medic unit. The following map illustrates the location of the calls for the past three years in this demand zone.



Calls for service are clustered in the areas near the fire stations with the heaviest in the White Oak area.

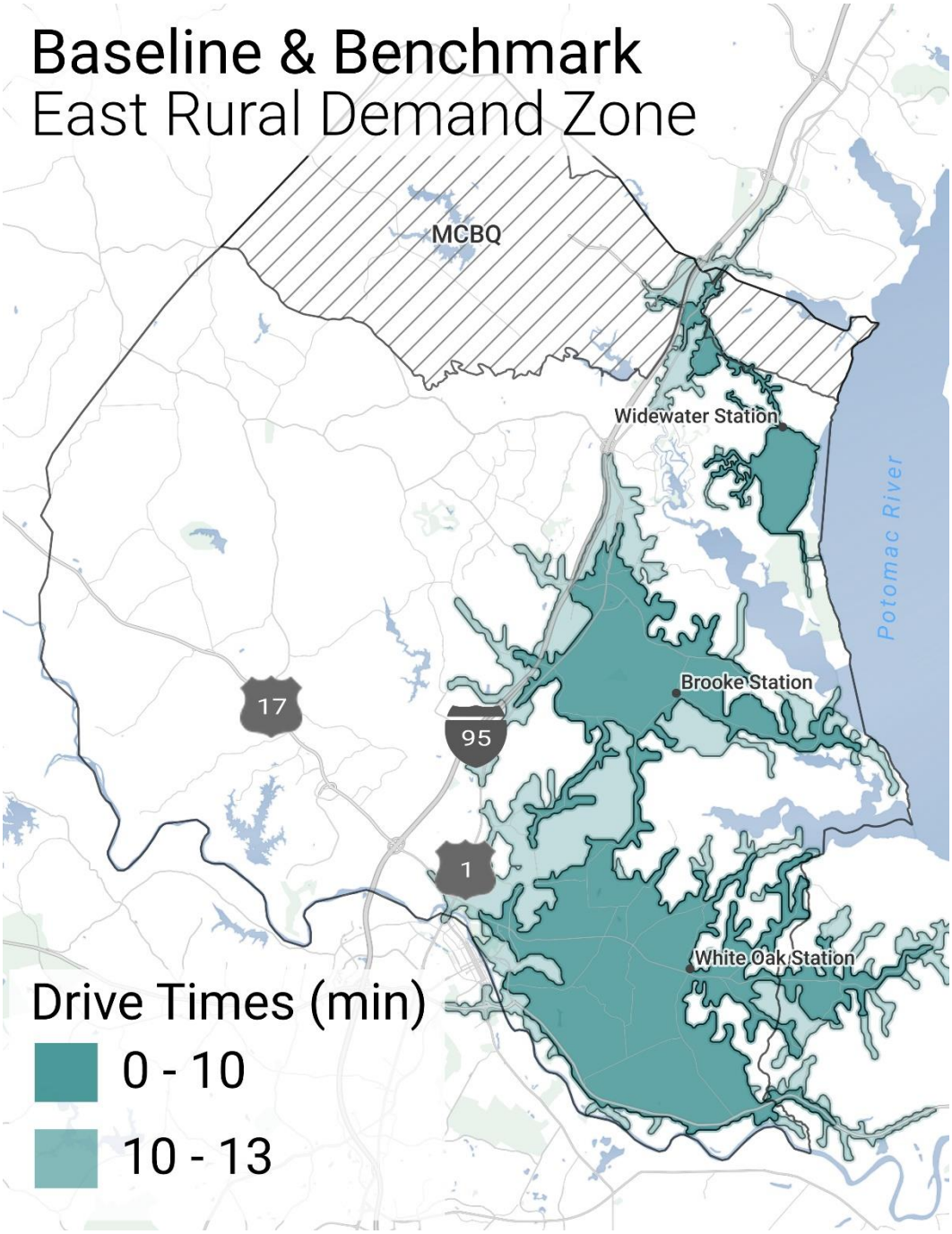
The following table illustrates the travel time performance for this response district.

East Rural Demand Zone Travel Time Performance

All Emergency Calls - 90th Percentile Travel Times		2017 – 2019	2017	2018	2019	Benchmark Objectives	Baseline Objectives
1st Unit Distribution	Rural	11:56	11:59	11:44	12:04	10:00	13:00
	East Rural	11:14	11:53	11:15	11:51	10:00	13:00

Compared to the overall rural travel time, the east rural demand zone is slightly under.

The following map provides a spatial view of the travel time, both benchmark and baseline, using the Stafford County fire station locations as the starting point. The drive time isochrones are generated using a digital road network with existing speed limits, traffic laws, and a general pattern of traffic flow factored into the equation.



As expected in a rural area the roadway network is not gridded and with widespread roadways. In this demand zone the waterways around the Potomac River create natural obstacles for access to various areas.

A review of resource availability for this demand zone indicates several response units are at or near over utilization. The following table illustrates the unit hour utilization for the units assigned to the central suburban demand zone.

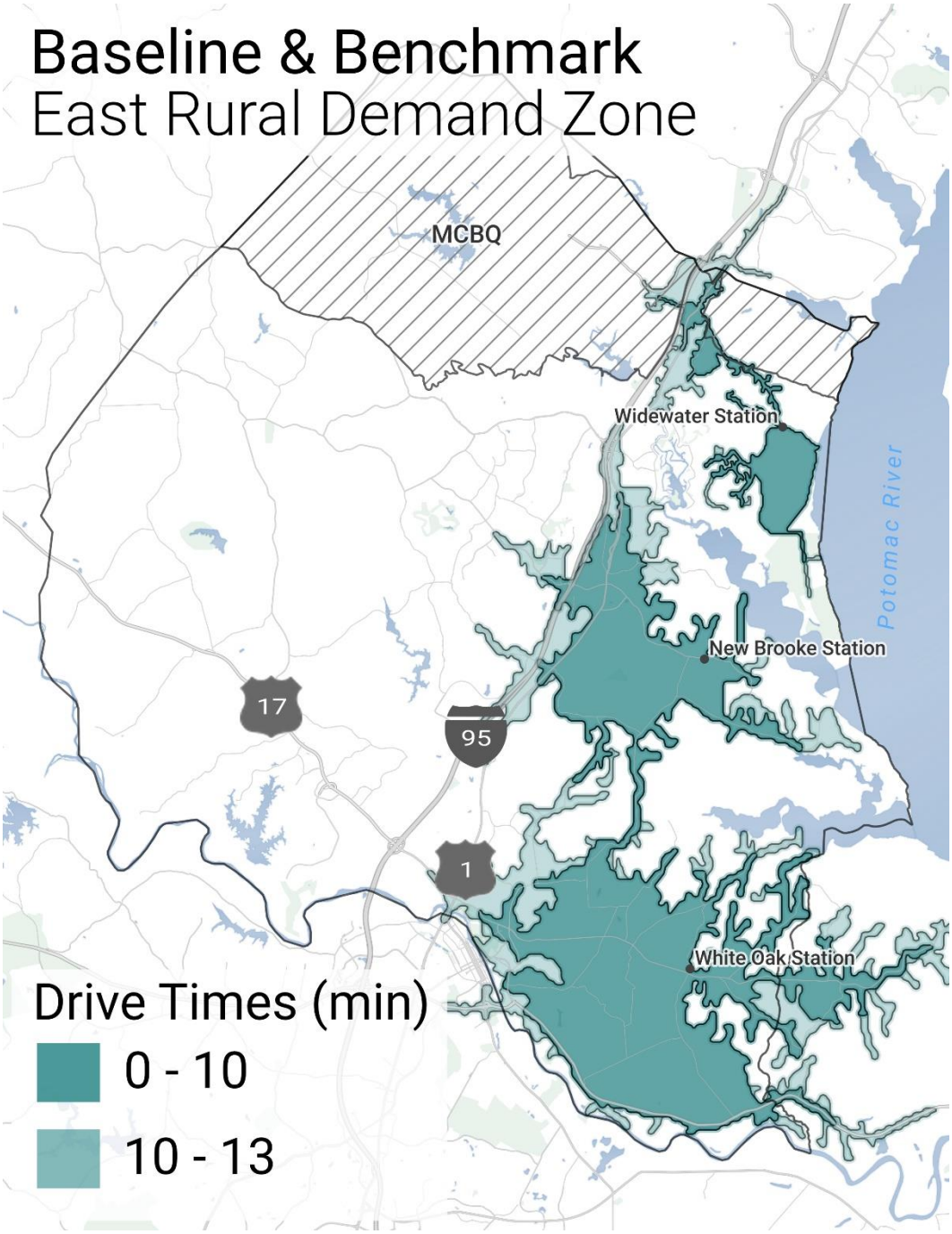
East Rural Demand Zone Unit Hour Utilization

Unit	2017			2018			2019		
	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration	Duration	Pct. Of Time	Average Call Duration
Ambulance/Medic 7	1320:03:21	15.1%	0:44:02	1287:49:40	14.7%	0:46:50	1538:09:38	17.6%	0:47:49
Ambulance/Medic 5	125:38:36	1.4%	0:27:55	349:07:12	4.0%	0:29:40	999:13:27	11.4%	0:35:17
Ambulance/Medic 3	281:09:57	3.2%	0:25:55	357:23:35	4.1%	0:30:05	340:21:50	3.9%	0:37:08

As noted in the previous two demand zones, Ambulance/Medic 7 and Ambulance/Medic 5 respond to calls for service outside their normal response areas. Once those two demand zones increase their resources, these two units will in effect reduce their respective utilization rates.

For the east rural demand zone, the most critical infrastructure issue is the condition of Fire Station 5 (Brooke). As noted in the facility assessment chapter, this building should be decommissioned and razed due to it being located over a stream and adjacent to a heavily utilized rail corridor. There are several building code and quality of life issues noted with the facility. This site does not meet current standards for the placement of critical public safety infrastructure.

Moving this station to the area of 2092 Courthouse Road provides access on a roadway that has better clearances and access east and west via a railroad overpass. The following map illustrates the travel time in the east rural demand zone with the Brooke Station moved to a new location.



The area along the I-95 corridor that is outside the baseline travel time. This area is largely undeveloped and has the Stafford County Landfill in the area.

Recommendation:

Due to the condition and poor location, the Fire and Rescue Department should replace the Brooke Fire Station and move the station to the area of 2092 Courthouse Road.

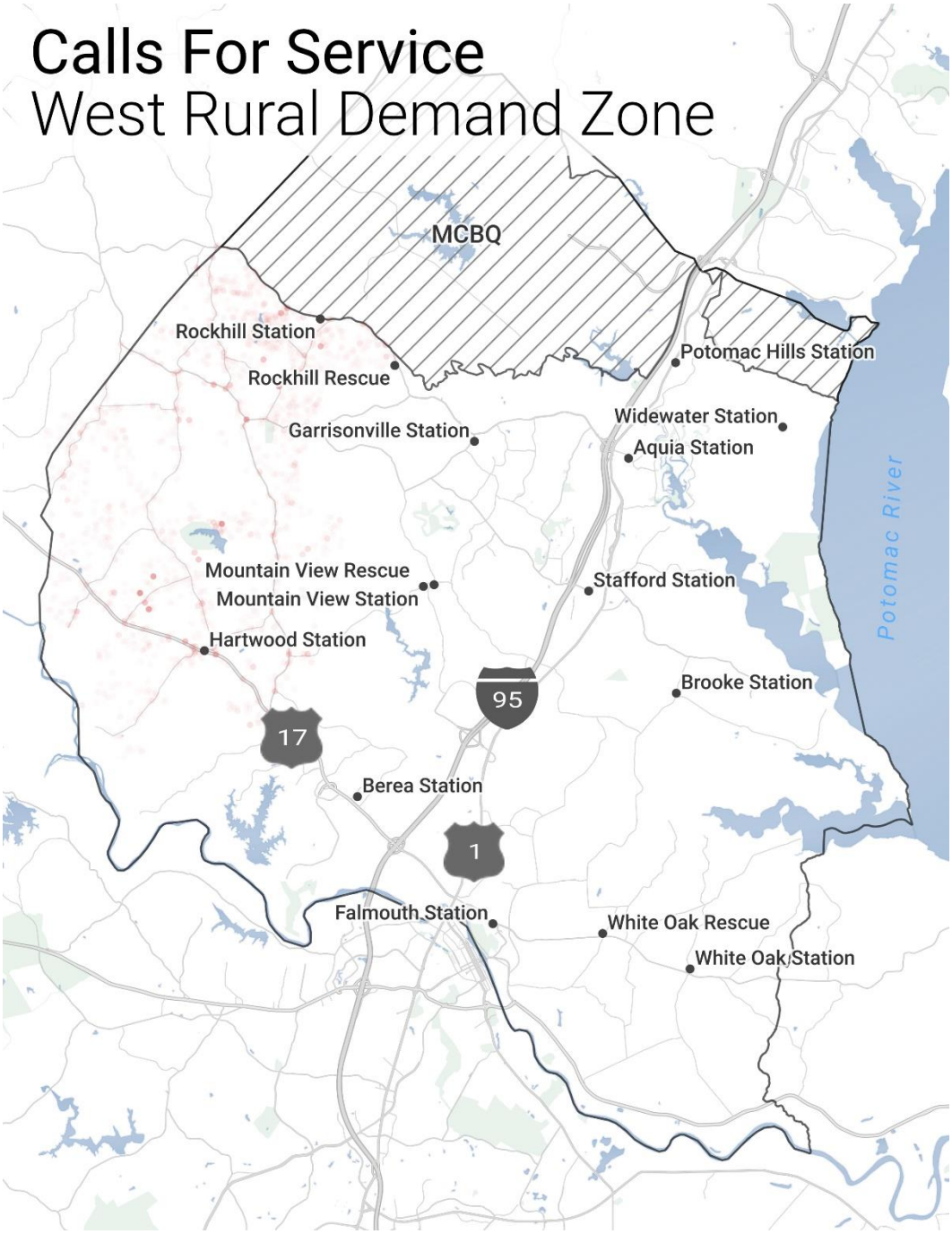
West Rural Demand Zone

This is a rural area located west of the I-95 corridor and along the west Stafford County Line with Fauquier County that includes the Rockhill and Hartwood areas. There are small areas of heavier population densities along the eastern areas of the demand zone near the Garrisonville area. The table that follows illustrates the fire stations, units, and career staffing that typically provide services to this area.

East Rural Demand Zone

Fire Companies	Staffed Units	Minimum Staffing
Fire Company 8 – Rockhill	Engine 8	3
	Ambulance/Medic 14	2
Rescue Company 6 – Hartwood	Engine 6	3

Fire Company 4 is in a location that can and does serve both the central suburban demand zone and the west rural demand zone. For purposes of this evaluation, it was included in the north suburban demand zone as the development is moving towards this area. The following map illustrates the location of the calls for the past three years in this demand zone.



Calls for service are clustered in the areas near the fire stations with the heavier call volume in the northwest section of the demand zone.

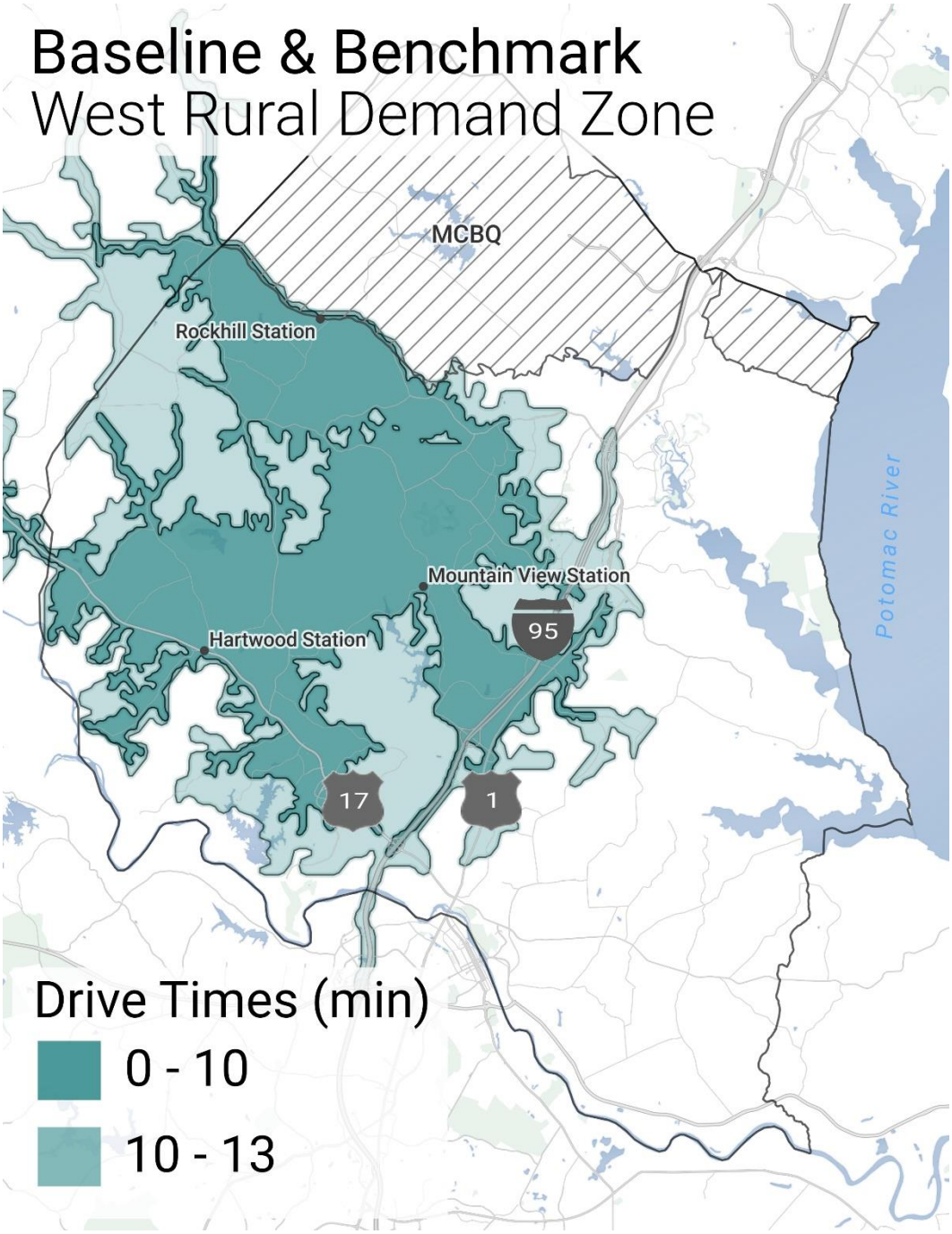
The following table illustrates the travel time performance for this response district.

West Rural Demand Zone Travel Time Performance

All Emergency Calls - 90th Percentile Travel Times		2017 – 2019	2017	2018	2019	Benchmark Objectives	Baseline Objectives
1st Unit Distribution	Rural	11:56	11:59	11:44	12:04	10:00	13:00
	West Rural	12:05	12:08	11:58	12:09	10:00	13:00

Compared to the overall rural travel time, the west rural demand zone is slightly over.

The following map provides a spatial view of the travel time, both benchmark and baseline, using the Stafford County fire station locations as the starting point. The drive time isochrones are generated using a digital road network with existing speed limits, traffic laws, and a general pattern of traffic flow factored into the equation.



As expected in a rural area the roadway network is not gridded and with widespread roadways. There are a couple of roadways that provide an east/west pathway and one in the southern area that works well for a north/south roadway.

A review of resource availability for this demand zone indicates several response units are at or near over utilization. The following table illustrates the unit hour utilization for the units assigned to the central suburban demand zone.

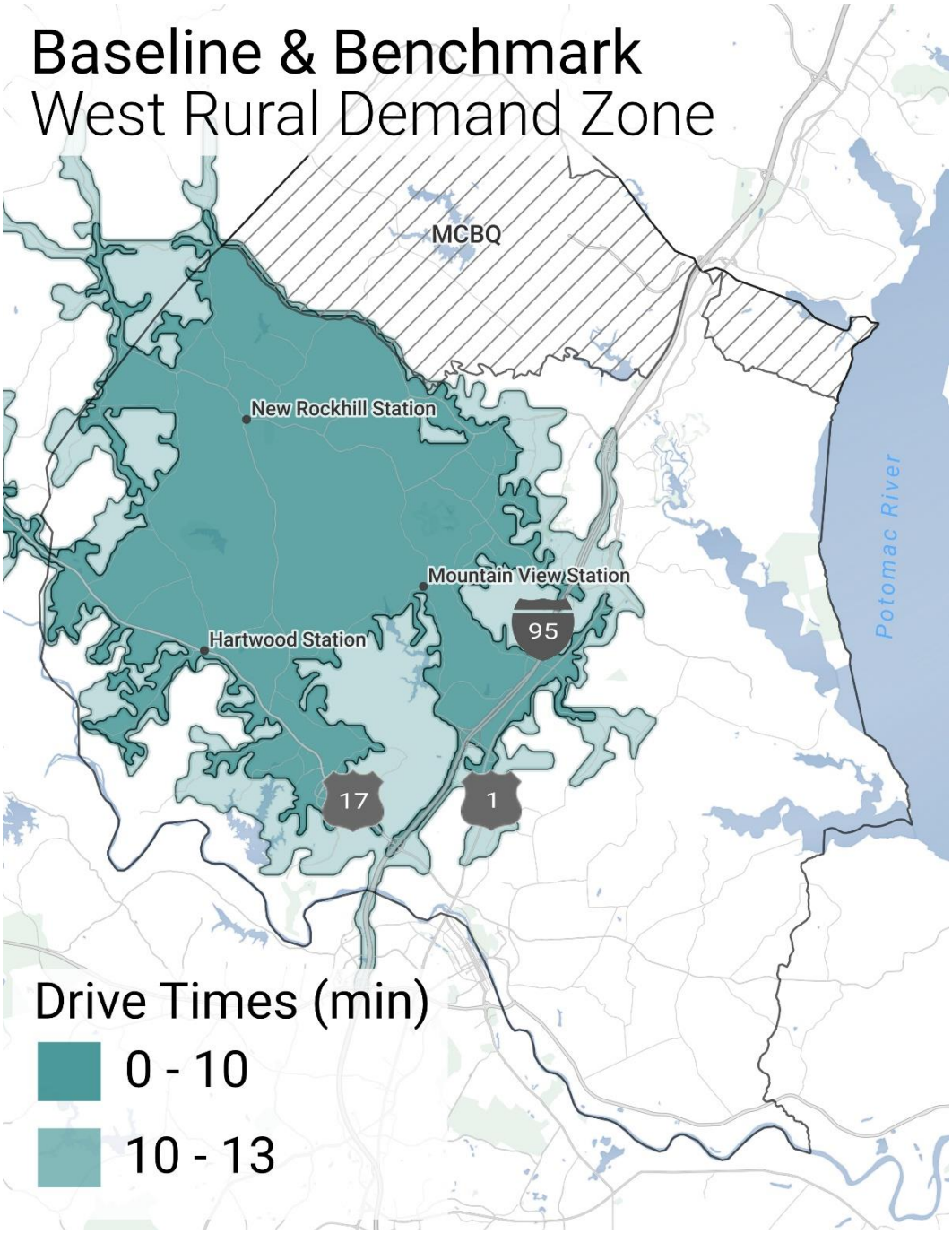
West Rural Demand Zone Unit Hour Utilization

Unit	2017			2018			2019		
	Duration	Pct. of Time	Average Call Duration	Duration	Pct. of Time	Average Call Duration	Duration	Pct. of Time	Average Call Duration
Ambulance/Medic 14	806:15:28	9.2%	0:36:57	909:59:22	10.4%	0:44:39	1007:40:16	11.5%	0:43:30
Ambulance/Medic 6	1391:54:10	15.9%	0:44:53	1414:01:08	16.1%	0:44:28	256:29:58	2.9%	0:44:37
Engine 6	106:49:54	1.2%	0:25:57	146:12:06	1.7%	0:21:46	452:45:52	5.2%	0:23:22
Engine 8	41:50:03	0.5%	0:18:36	12:45:55	0.1%	0:21:53	0:59:04	0.0%	0:29:32

As noted in the central suburban demand zone, Ambulance/Medic 14 responds to calls for service outside the normal response area. Once that demand zone increases its resources, this unit will in effect reduce its utilization rates.

As in the east rural demand zone, the most critical infrastructure issue in the west rural demand zone the condition of Fire Station 8 (Rockhill). As noted in the facility assessment chapter, this fire station has multiple challenges associated with it. The first being that there are several areas that have failing floor/subfloor structures, including multiple holes in the subfloor. Second, there are mold issues in several locations in the building that have been or will be addressed soon. The configuration of this building is poor with restrooms separated from the staff quarters and located on opposite sides of the apparatus bay. Fire operations at this location should be moved to a more appropriate location in the service district. This issue is exasperated due to the extremely poor condition of the facility and the inability to expand onsite. To maintain this facility, significant costs would be required to bring this facility up to modern facility design standards. This facility should be decommissioned.

Moving this station to the area of Poplar Road at Mountain View Road places the station in the middle of the area. The current location is on the extreme north side of the demand zone and the border with the Marine Corp Base Quantico. This location is also on a primary east/west roadway in the rural area allowing for easier access to some parts of the demand zone. The following map illustrates the travel time in the west rural demand zone with the Rockhill Station moved to a new location.



Three stations in the west rural demand zone including a new Rockhill location provides benchmark travel time coverage for virtually the entire west rural demand zone.

Recommendation:

Due to the poor condition and location of the Rockhill Fire Station, the Fire and Rescue Department should combine the Rockhill Fire Station and the Rockhill Rescue Station into a single facility in the area of Popular Road and Mountain View Road.

Concentration of Resources

Concentration is generally described as the ability of the fire department to get the appropriate number of personnel and resources to the scene of an emergency to effectively mitigate the incident.

As noted previously this concept has three components that include the first arriving response unit, the second arriving fire suppression unit, and the first alarm assignment. Using the CPSE baseline travel times as the performance objectives for the county, the following tables illustrate the current performance for the two demographics.

Stafford County Fire and Rescue Department

Structure Fires - 90th Percentile Travel Times			2017 - 2019	Baseline	Number of calls	Percent Met
Travel Time*	1st Unit Distribution	Suburban	5:44	6:30	113	94.7%
	2nd Arriving Apparatus	Suburban	11:35	10:24	105	81.9%
	ERF Concentration	Suburban	19:01	13:00	73	60.3%
	1st Unit Distribution	North Suburban	5:48	6:30	66	95.5%
	2nd Arriving Apparatus	North Suburban	10:41	10:24	63	87.3%
	ERF Concentration	North Suburban	19:19	13:00	44	56.8%
	1st Unit Distribution	South Suburban	5:21	6:30	47	93.6%
	2nd Arriving Apparatus	South Suburban	11:53	10:24	42	73.8%
	ERF Concentration	South Suburban	17:53	13:00	29	65.5%

*Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

With a smaller dataset, the travel times shown in the previous table are limited to a three-year period. There are two viewpoints provided in the previous table. For the suburban demographic, the first arriving unit was at the scene in 5 minutes and 44 seconds for 90% of the calls examined. The second viewpoint illustrates that for the 113 calls evaluated, 94.7% of the calls met the 6 minute and 30 second travel time baseline performance objective. The effective response force required a minimum of 16 personnel to arrive at the scene. For the suburban demographic, an effective response force arrived at the scene in 19 minutes and 1 second for 90% of the calls examined with 60.3% of the calls meeting the 13-minute travel time baseline performance objective. Also shown are the travel times for each of the two suburban districts using the same methodology. The

following table summarizes the travel time of the first unit and the remaining first alarm assignment for the rural demographic.

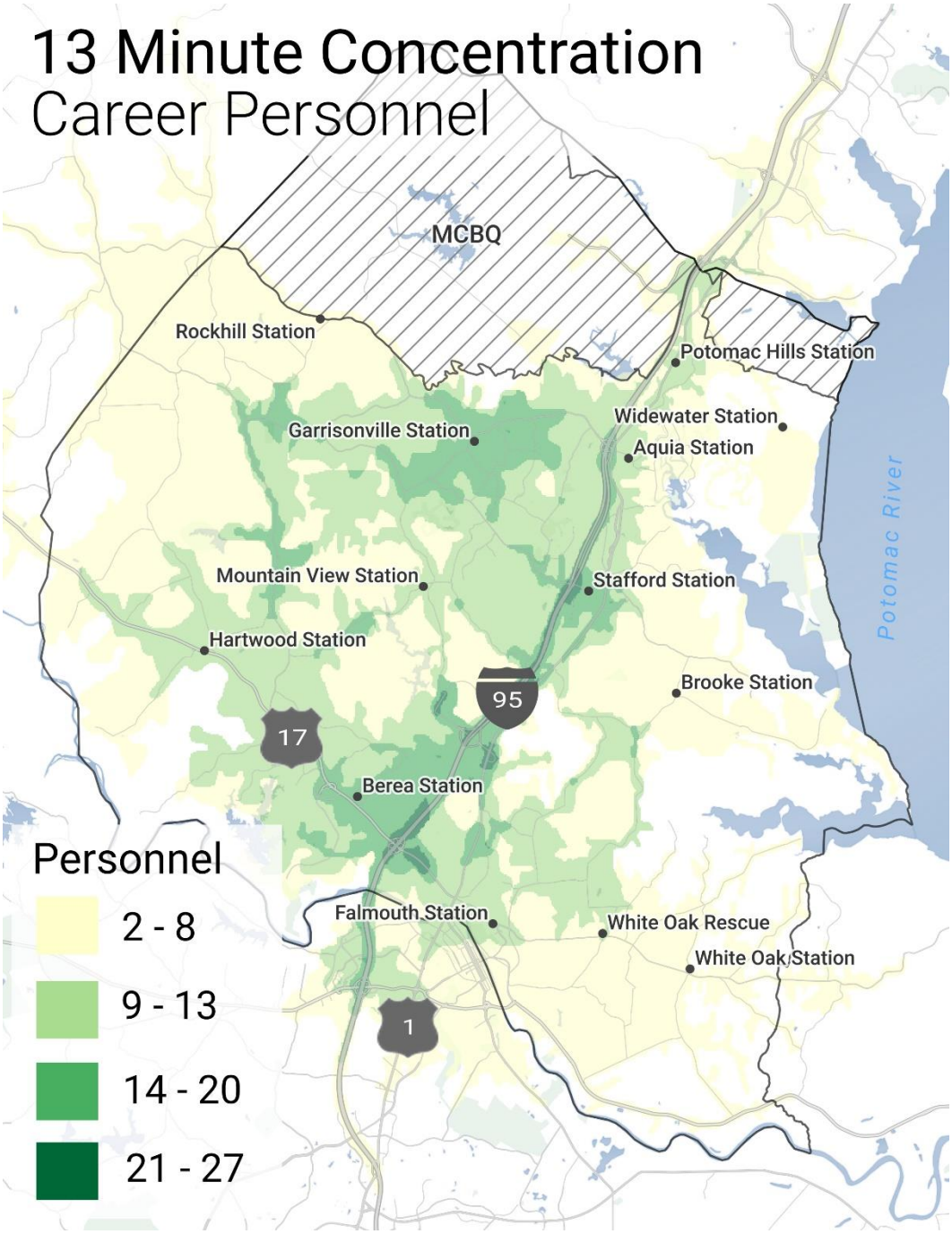
Stafford County Fire and Rescue Department

Structure Fires - 90th Percentile Times			2017 - 2019	Baseline	Number of calls	Percent Met
Travel Time*	1st Unit Distribution	Rural	10:26	13:00	19	100.0%
	2nd Arriving Apparatus	Rural	14:09	18:30	18	100.0%
	ERF Concentration	Rural	19:55	18:30	14	85.7%
	1st Unit Distribution	East Rural	9:45	13:00	10	100.0%
	2nd Arriving Apparatus	East Rural	16:06	18:30	10	100.0%
	ERF Concentration	East Rural	22:13	18:30	6	66.7%
	1st Unit Distribution	West Rural	10:26	13:00	9	100.0%
	2nd Arriving Apparatus	West Rural	12:34	18:30	8	100.0%
	ERF Concentration	West Rural	17:54	18:30	8	100.0%

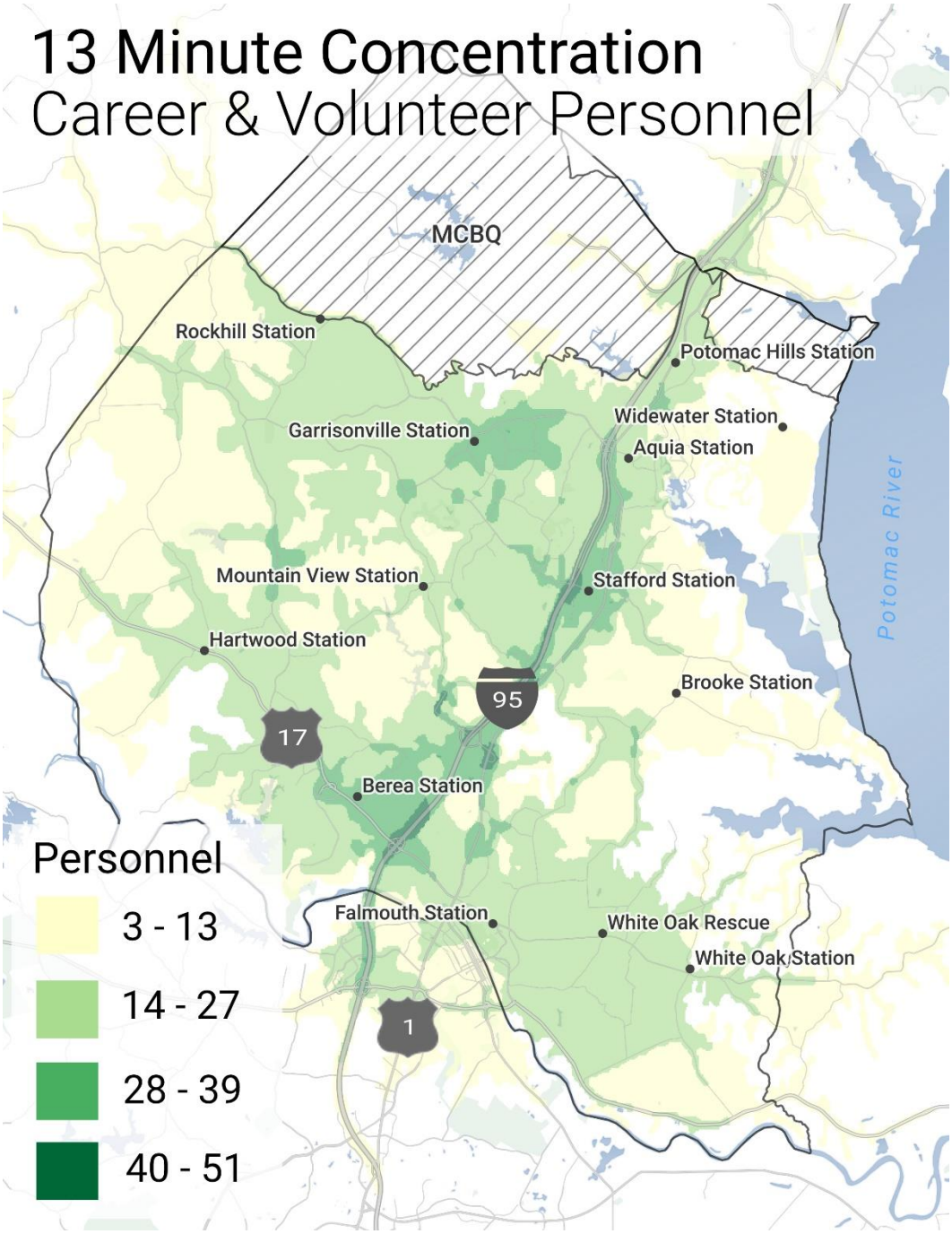
Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

With a smaller dataset, the travel times shown in the previous table are limited to a three-year period. There are two viewpoints provided in the previous table. For the rural demographic, the first arriving unit was at the scene in 10 minutes and 26 seconds for 90% of the calls examined. The second viewpoint illustrates that for the 19 calls evaluated, 100% of the calls met the 13-minute travel time baseline performance objective. The effective response force required a minimum of 16 personnel to arrive at the scene. For the rural demographic, an effective response force arrived at the scene in 19 minutes and 55 seconds for 90% of the calls examined with 85.7% of the calls meeting the 18 minute 30 second travel time baseline performance objective. Also shown are the travel times for each of the two rural districts using the same methodology.

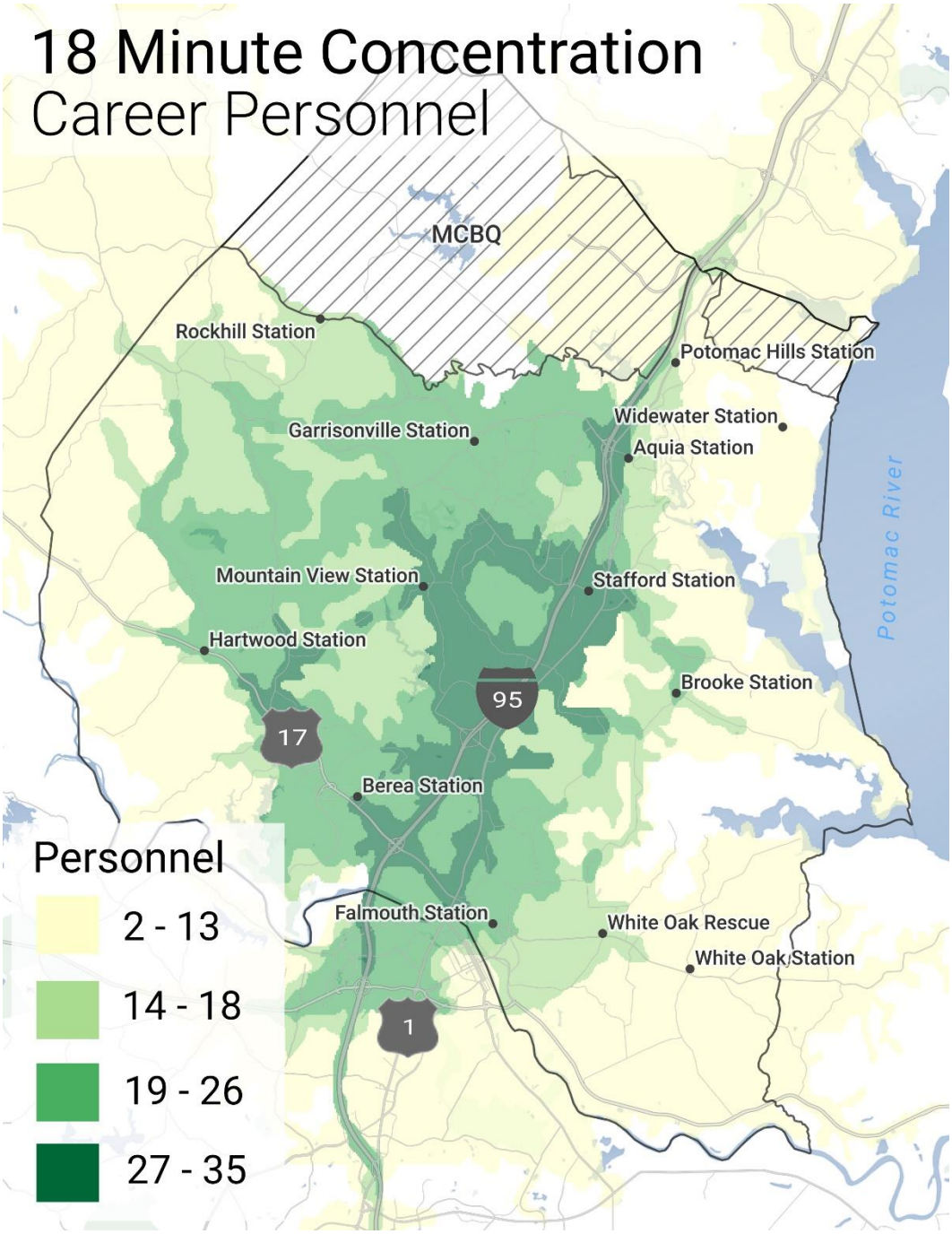
The following maps provide a visual perspective of the concentration of resources on the County. These maps illustrate the benchmark travel time for the arrival of an effective response force for a structure fire in both the suburban and rural demographics. All stations are shown with on map illustrating only career personnel with the second map illustrated both career and volunteer staffing. For purposes of evaluation, each volunteer station had one fire suppression unit to respond with a minimum of three personnel.



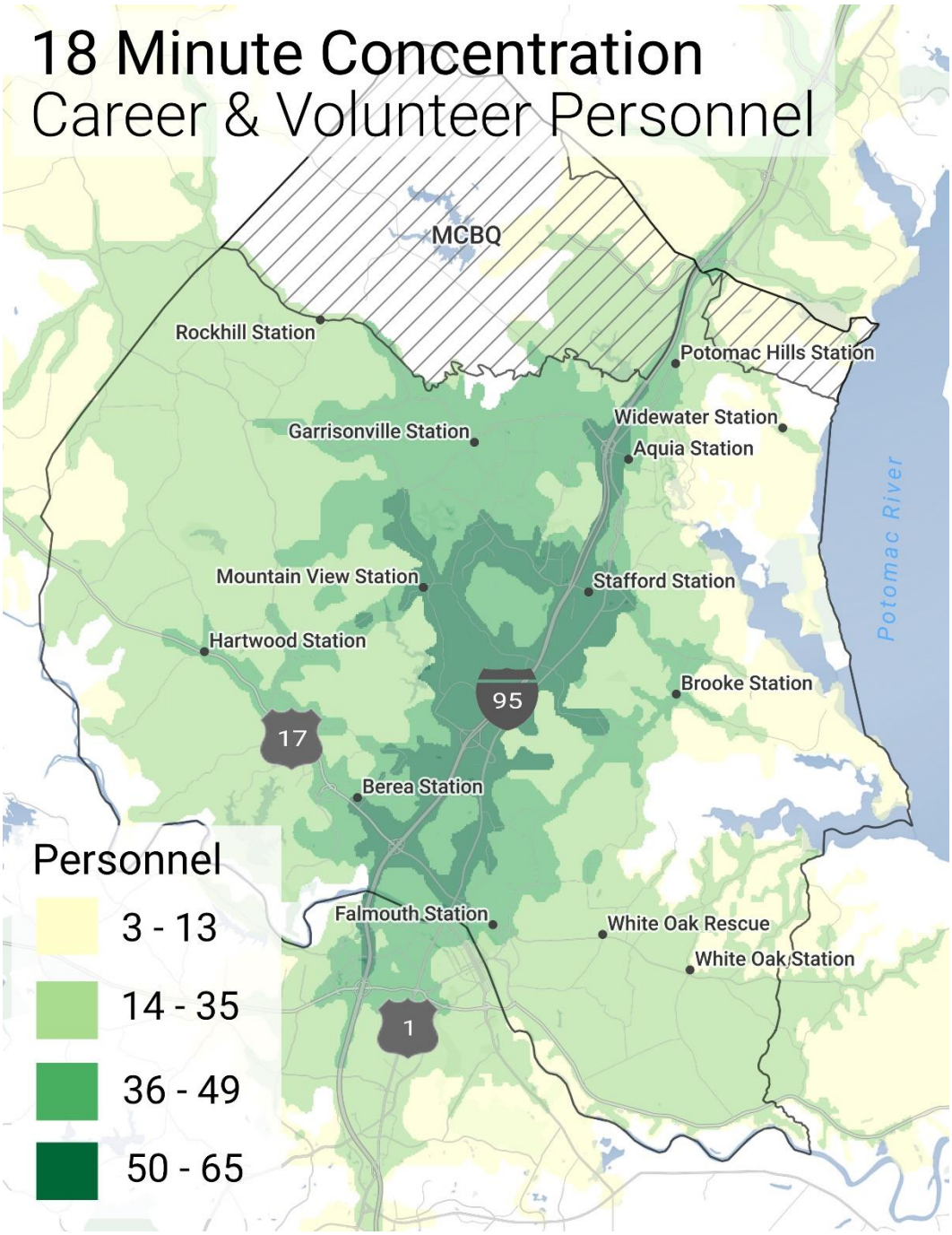
This map illustrates the suburban baseline travel time for an effective response force. Based on the staffing patterns and baseline travel time objective, areas along the I-95 corridor and close to the fire stations can reach the effective response force 16 personnel. The following map illustrates the same area but includes the response of volunteer apparatus.



With the additional personnel from the volunteer apparatus, an effective response force can be achieved in a slightly broader area in the north and south areas of the central suburban district. The same is true along the US 17 corridor in the area of the I-95 corridor. The rural demographic is illustrated in the next map utilizing the same personnel configuration.



With career staffed stations only, the effective response force of at least 16 personnel in the west rural area can meet the baseline effective response force and travel time objectives. In the east rural areas, the further away from the suburban areas the effective response force is considerably lower.



Adding the volunteer response improves the arrival of an effective response to the rural areas. However, the roadway network and waterway obstructions also continue to play a part in the east rural area.

In the previous tables and maps only Stafford County resources were evaluated. This was done to effectively analyze the emergency services system as it relates to the concentration of resources. The following tables incorporate mutual aid partners in the response to structure fires.

Stafford County Fire and Rescue Department

Structure Fires - 90th Percentile Times			2017 - 2019	Baseline	Number of calls	Percent Met
Travel Time*	1st Unit Distribution	Suburban	5:17	6:30	113	96.5%
	2nd Arriving Apparatus	Suburban	10:29	10:24	110	89.1%
	ERF Concentration	Suburban	14:34	13:00	91	85.7%
	1st Unit Distribution	North Suburban	5:17	6:30	66	97.0%
	2nd Arriving Apparatus	North Suburban	10:35	10:24	66	86.4%
	ERF Concentration	North Suburban	15:07	13:00	54	81.5%
	1st Unit Distribution	South Suburban	5:12	6:30	47	95.7%
	2nd Arriving Apparatus	South Suburban	8:53	10:24	44	93.2%
	ERF Concentration	South Suburban	12:34	13:00	37	91.9%

Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

As illustrated, there is a significant improvement to the arrival of an effective response force from 60.3% of the time with Stafford County resources only to 85.7% of the time when mutual aid partners are included. This indicates a heavy reliance on mutual aid partners to provide services to Stafford County.

Stafford County Fire and Rescue Department

Structure Fires - 90th Percentile Travel Times			2017 - 2019	Baseline	Number of calls	Percent Met
Travel Time*	1st Unit Distribution	Rural	10:29	13:00	18	100.0%
	2nd Arriving Apparatus	Rural	13:06	18:30	18	100.0%
	ERF Concentration	Rural	18:40	18:30	16	87.5%
	1st Unit Distribution	East Rural	9:53	13:00	9	100.0%
	2nd Arriving Apparatus	East Rural	13:18	18:30	10	100.0%
	ERF Concentration	East Rural	19:05	18:30	8	75.0%
	1st Unit Distribution	West Rural	10:26	13:00	9	100.0%
	2nd Arriving Apparatus	West Rural	12:34	18:30	8	100.0%
	ERF Concentration	West Rural	17:54	18:30	8	100.0%

Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

As illustrated, there is an improvement in the arrival of an effective response force in the rural areas although not as significant as the suburban areas. Overall, the arrival of an effective response force rose from 85.7% with Stafford County resources to 87.5% with mutual aid partners.

One of the impacts on the effective response force is the unit hour utilization. Medical units are part of the response to a structure fire and a part of the effective response force. Five of the medical units have utilization rates between 17% and 24% meaning these units are only available for a response approximately 80% of the time. Adding medical units into the emergency response system will aid in the reduction of unit hour utilization and make these units more available for a response.

The staffing plan for Stafford County is to staff fire suppression units with 3 personnel. A review of the response data from the past three years was used to examine the effects of adding a fourth person to the fire suppression units. The following table illustrates the same response data for 2017 – 2019 but with the fire suppression units staffed with 4 personnel.

Stafford County Fire and Rescue Department – 4 Personnel on Suppression Units

Structure Fires - 90th Percentile Travel Times		2017 - 2019	Baseline	Number of calls	Percent Met
ERF Concentration	Suburban	16:13	13:00	85	68.2%
ERF Concentration	North Suburban	16:35	13:00	51	64.7%
ERF Concentration	South Suburban	14:48	13:00	34	73.5%
Structure Fires - 90th Percentile Travel Times		**2017 - 2019**	**Baseline**	**Number of calls**	**Percent Met**
ERF Concentration	Rural	17:32	18:30	15	93.3%
ERF Concentration	East Rural	19:13	18:30	7	85.7%
ERF Concentration	West Rural	16:09	18:30	8	100.0%

Statistically these travel times use a small data set and therefore should be viewed with a certain amount of skepticism.

Adding an additional person to the suppression units improves the arrival of an effective response force. For example, in the suburban areas the arrival improved from 60.3% of the time to 68.2% of the time. The south central suburban demand zone improved from 65.5% of the time to 73.5% of the time. Likewise, the rural demand zones improved from 85.7% to 93.3% of the time. While this would not eliminate the need for mutual aid partners, it would begin to reduce the reliance on those partners to provide service to the County.

Resource Allocation

In the distribution section there are recommendations to increase the number of medical units and to build a new fire station in the central suburban demand zone. An additional fire station in the south central demand zone will be needed once the development to the north of that zone begins to take shape. The addition of the medical units will aid in the effective response force as they are part of the structure fire response. However, these units will likely increase with the medical call volume as well.

With the anticipation of a new fire station in both suburban demand zones, it would benefit the current response system to put the personnel in place now instead of waiting until the fire stations are completed. Once the stations are completed the personnel would already be in place, trained and experienced, to staff the station and become operational.

Recommendation:

The Fire and Rescue Department should increase the minimum staffing of the career fire suppression units from three personnel to four personnel.

Facilities Assessment

The project team conducted a walk-through evaluation of each Fire and Rescue Department location with the exception of Headquarters. Headquarters was excluded from this assessment, as it is only approximately 10 years old and is designed for adequate expansion of administrative and staff areas.

The project team toured each location with Fire and Rescue Department personnel and was provided information as to the historical use, conditions, and general shortcomings of each facility. The ultimate goal of the evaluation was to establish a baseline inventory of current facility and site conditions to aid in determining potential future use, expandability, deficiencies, and obsolescence for each location.

Facility Inventory and Condition Assessment

For the facility evaluations, the project team conducted a "walk through" assessment of the facility's exterior, interior, and technical systems in April 2021. Overall building systems such as structural, mechanical, and electrical were assessed to the extent that they could be readily observed. All evaluations were supplemented by information provided by the user regarding the current conditions and any recent or planned improvements. The evaluations are not based on a detailed analysis, but rather as a broad index of each facility's relative physical condition and viability. Conditions were rated on a scale of Excellent, Good, Fair, or Poor, as defined below.

- **Excellent** – conditions are newly renovated or constructed, basic standards are meet or exceeded.
- **Good** - conditions meet basic standards and potential exists for expansion or redevelopment at low expense.
- **Fair** - conditions may be reasonable for improvement or redevelopment at substantial expense.
- **Poor** - conditions do not meet basic standards and have little potential for improvement without significant effort and resources.

The following Stafford County Fire and Rescue Department facilities were evaluated by the project team:

Facility Listing	
Fire Station #1 – Falmouth	Fire Station #9 – Aquia Harbour
Fire Station #2 – Stafford	Fire Station #10 – Potomac Hills
Fire Station #3 – Widewater	Fire Station #12 – Berea
Fire Station #4 – Mountain View	Fire Station #14 - Garrisonville
Fire Station #5 – Brooke	Rescue Station #4 – Mountain View
Fire Station #6 – Hartwood	Rescue Station #7 – White Oak
Fire Station #7 – White Oak	Rescue Station #8 – Rockhill
Fire Station #8 – Rockhill	Training and Logistics Center

A summary of each facility/site evaluation plus general comments and recommendations are presented in the following evaluation sheets.

Fire Station #1 – Falmouth

250 Butler Road, Fredericksburg, VA

Description of Use	Combination volunteer and career staffed station providing service to the southern areas of the County along the US 1 corridor. Approximately half of the building is a community center/church and was not evaluated as part of this assessment.	
Year Constructed	1968	
Building Size	BGSF: 20,860 (entire building)	#Floors: 2
Site Conditions	Parking Spaces:	21 for FD, 60 for Community Center
	ADA parking spaces:	2 (Community Center)
	Parking Lot:	Fair
	Signage:	Fair
	Access/ADA Issues:	None identified
	Expansion Capability:	Fair (adjacent detention pond and developed property)
	Security:	Fair
Building Exterior	Exterior Wall:	Good (Brick)
	Roof:	Good
	Apparatus Accessibility	Excellent (Double Stacked Bay)
Building Interior	Structure:	Good
	Access/ADA Issues:	Poor
	Code Compliance Issues:	ADA accessibility to staff area.
	Layout:	Poor
	Renovation Suitability:	Good
	Staff Sleeping Quarters Availability by Gender:	10 unisex rooms with 2 person capacity
	Storage Capacity:	Poor
Technical Systems	Plumbing:	Fair
	Mechanical (HVAC):	Fair
	Electrical:	Fair
	Lighting:	Fair
General Comments	This station includes four drive-thru apparatus bays that is located on a main corridor. The general condition of the fire station is good and is suitable for renovation and continued use. Signage is poor and it is difficult to differentiate between Fire Rescue Department access and the community center.	
Recommendations	Maintain the existing facility and renovate as needed for current and future fire service uses. Install way finding signage to better differentiate the FD from the community building portion. Parking area should be outlined better to separate the two uses.	

Fire Station #2

305 Jason Mooney Drive, Stafford, VA

Description of Use	Located in Stafford providing service in the central sections of the County and parts of the I-95 corridor with career and volunteer staffing.			
Year Constructed	2008			
Building Size	BGSF: 15,883		#Floors: 1	
Site Conditions	Parking Spaces:	33		
	ADA parking spaces:	2		
	Parking Lot:	Poor		
	Signage:	Excellent		
	Access/ADA Issues:	None identified		
	Expansion Capability:	Excellent		
	Security:	Good		
Building Exterior	Exterior Wall:	Poor		
	Roof:	Good		
	Apparatus Accessibility	Excellent (drive thru)		
Building Interior	Structure:	Good		
	Access/ADA Issues:	None identified		
	Code Compliance Issues:	None identified		
	Layout:	Good		
	Renovation Suitability:	Excellent		
	Staff Sleeping Quarters Availability by Gender:	Male:	Female:	Unisex: 8
	Storage Capacity:	Good		
Technical Systems	Plumbing:	Good		
	Mechanical (HVAC):	Good		
	Electrical:	Good		
	Lighting:	Excellent		
General Comments	The interior of this building is in good to excellent shape. The layout aligns with prevailing practice for fire station design. The building exterior and site are in poor condition. There are significant issues with the internal gutters not working properly and rotting the fascia board. This is especially notable in front of the building lobby. The parking lot is in poor shape, including the pavement condition and wheel stops not being properly mounted in front of the building.			
Recommendations	This building requires immediate attention to the internal gutter issues. Consideration should be given to parking lot renovations in the next few years. Maintain current use of this facility and create a preventive maintenance plan to maintain the longevity of this newer asset.			

Fire Station #3 – Widewater

749 Widewater Road, Stafford, VA

Description of Use	Provides service to the far north east area of the County with career and volunteer staff.			
Year Constructed	1980			
Building Size	BGSF: 8,708		#Floors: 1	
Site Conditions	Parking Spaces:	25		
	ADA parking spaces:	1		
	Parking Lot:	Excellent		
	Signage:	Good		
	Access/ADA Issues:	None identified		
	Expansion Capability:	Limited		
	Security:	Good		
Building Exterior	Exterior Wall:	Good		
	Roof:	Good		
	Apparatus Accessibility	Fair (back in)		
Building Interior	Structure:	Excellent		
	Access/ADA Issues:	None identified		
	Code Compliance Issues:	None identified		
	Layout:	Fair		
	Renovation Suitability:	Excellent		
	Staff Sleeping Quarters Availability by Gender:	Male: 1	Female: 1	Unisex:
	Storage Capacity:	Limited		
Technical Systems	Plumbing:	Good		
	Mechanical (HVAC):	Excellent		
	Electrical:	Excellent		
	Lighting:	Excellent		
General Comments	This facility was recently renovated on the interior. Also, site work was completed on the backside of the apparatus bays to address drainage issues that led to dirt/debris build up along exterior wall. The primary issue has been resolved by installation of storm drainage channel. However, there was standing water noted along rear of building and it had not rained for several days prior to the site visit. The overall condition of the facility is good or excellent. Some challenges exist with limited restroom availability for staff that is not in the rentable area. The site has limited expansion capability, but there are sufficient apparatus bays for current and future use.			
Recommendations	Maintain the building and site for current and future use. Expand recent drainage improvement to prevent water ponding on the rear of building, which may create environmental challenges during warmer months.			

Fire Station #4 – Mountain View

924 Kellogg Mill Road, Fredericksburg, VA

Description of Use	Located in the central section of the County providing service to the area west of Stafford. Includes both career and volunteer staff.	
Year Constructed	1980	
Building Size	BGSF: 6,415	#Floors: 1
Site Conditions	Parking Spaces:	8
	ADA parking spaces:	0
	Parking Lot:	Good
	Signage:	Poor
	Access/ADA Issues:	None identified
	Expansion Capability:	Limited
	Security:	Good
Building Exterior	Exterior Wall:	Good (metal and brick veneer)
	Roof:	Good
	Apparatus Accessibility	Good (back in only)
Building Interior	Structure:	Excellent, recent renovation
	Access/ADA Issues:	Access to basement area/storage
	Code Compliance Issues:	None identified
	Layout:	Extremely Poor
	Renovation Suitability:	Poor
	Staff Sleeping Quarters Availability by Gender:	Male: 1 Female: 1
	Storage Capacity:	Limited in building
Technical Systems	Plumbing:	Good
	Mechanical (HVAC):	Excellent
	Electrical:	Excellent
	Lighting:	Excellent
General Comments	Building was recently renovated. The layout of the building is extremely poor as staff quarters are not directly accessible from kitchen and living areas and must pass through the apparatus bays or exterior. Staff lockers are located in a hallway which limits accessibility and functionality. Metal building provides additional storage on site.	
Recommendations	The building should continue to be maintained for current use. Opportunities are limited to improve layout and efficiencies due to the size of the lot and the steep terrain at the rear of the building.	

Fire Station #5 – Brooke

222 Andrew Chapel Road, Stafford, VA

Description of Use	Provides service to the southern areas of the County east of Stafford. Includes both career and volunteer personnel.	
Year Constructed	1970	
Building Size	BGSF: 5900	#Floors: 1
Site Conditions	Parking Spaces:	16
	ADA parking spaces:	0
	Parking Lot:	Good
	Signage:	Fair
	Access/ADA Issues:	None identified
	Expansion Capability:	Very Poor
	Security:	Poor
Building Exterior	Exterior Wall:	Good
	Roof:	Excellent
	Apparatus Accessibility	Poor (back in only)
Building Interior	Structure:	Fair
	Access/ADA Issues:	Restrooms, showers, staff quarters
	Code Compliance Issues:	Exposed electrical wires in laundry closet, electric wiring not in conduit in sleeping quarters.
	Layout:	Poor
	Renovation Suitability:	Poor
	Staff Sleeping Quarters Availability by Gender:	Male: 1 Female: 1 Unisex: 1
	Storage Capacity:	Limited
Technical Systems	Plumbing:	Poor
	Mechanical (HVAC):	Poor
	Electrical:	Poor
	Lighting:	Poor
General Comments	The site is on top of a stream/creek that is routed under the building via culvert. Location is also adjacent to the railroad. The adjacent bridge that goes under the railroad is only 11.5 feet in height, which limits larger apparatus from being deployed at this location in the future. The staff quarters are in poor condition and need significant upgrades. Building is in general poor condition, with several recent renovations not meeting current building code (e.g. laundry room).	
Recommendations	This building should be decommissioned and razed due to it being located over a stream and adjacent to a heavy rail corridor. There are several building code and quality of life issues noted with the facility. This site does not meet current standards for the placement of critical public safety infrastructure.	

Fire Station #6 – Hartwood

67 Hartwood Church Road, Hartwood, VA

Description of Use	Located in the far southwestern section of the County provides service west of Berea and along the Warrenton Road corridor. Includes both career and volunteer staff.	
Year Constructed	1967 / 2006	
Building Size	BGSF: 7,895	#Floors: 2
Site Conditions	Parking Spaces:	13
	ADA parking spaces:	2
	Parking Lot:	Good
	Signage:	Fair
	Access/ADA Issues:	None identified
	Expansion Capability:	Limited
	Security:	Good
Building Exterior	Exterior Wall:	Excellent
	Roof:	Good
	Apparatus Accessibility	Fair (back in, with limited turnaround onsite)
Building Interior	Structure:	Excellent
	Access/ADA Issues:	Staff quarters located on second floor.
	Code Compliance Issues:	None identified
	Layout:	Fair (flow and adjacency issues)
	Renovation Suitability:	Excellent
	Staff Sleeping Quarters Availability by Gender:	Male: 1 Female: 1 Unisex:
	Storage Capacity:	Limited
Technical Systems	Plumbing:	Good
	Mechanical (HVAC):	Good
	Electrical:	Good
	Lighting:	Excellent
General Comments	Building was recently expanded and remodeled. The biggest challenges are associated with separated apparatus bays and shared staff quarters. Also, the apparatus bays are split on two sides of the building. With the career bays being smaller than the primary volunteer bays. The site is located adjacent to US 17 and provides immediate access to this main thoroughfare.	
Recommendations	This station should continue to be maintained as a fire station. The facility is in excellent condition due to recent renovations.	

Fire Station #7 – White Oak

12 Newton Road, Fredericksburg, VA

Description of Use	Provides service along the White Oak Road corridor and the far south east sections of the County. Includes only volunteer personnel.	
Year Constructed	1970	
Building Size	BGSF: 7,569	#Floors: 2
Site Conditions	Parking Spaces:	25+
	ADA parking spaces:	0
	Parking Lot:	Fair
	Signage:	Excellent (Building), No signage on White Oak Rd.
	Access/ADA Issues:	None identified
	Expansion Capability:	Excellent
	Security:	Good
Building Exterior	Exterior Wall:	Excellent
	Roof:	Fair
	Apparatus Accessibility	Poor (back in only)
Building Interior	Structure:	Good
	Access/ADA Issues:	Steps to basement/storage
	Code Compliance Issues:	None identified
	Layout:	Poor
	Renovation Suitability:	Fair
	Staff Sleeping Quarters Availability by Gender:	Not applicable for volunteer station.
	Storage Capacity:	Limited
Technical Systems	Plumbing:	Fair
	Mechanical (HVAC):	Good
	Electrical:	Fair
	Lighting:	Excellent
General Comments	This is a volunteer station only that has back in apparatus bays only. Building is slightly disjointed between bays and staff areas. Approximately half of the building is a community center. There is limited security between the community and fire portions of the facility. Community center was recently updated. On site is a corrugated metal building for storage, current houses a reserve apparatus. The storage building is heated but is not insulated.	
Recommendations	The facility may continue its current use with renovations as needed for the fire operations side. In the event that career staff are located at this location, then extensive renovation will need to occur for staff quarters, showers, kitchen, etc. The community center may be converted to career support space. The current site is adequately sized for expanded use if needed. Opportunity exists to place FD signage along White Oak Road to identify the location of the Fire Rescue Department, critical if career staff operate at this location.	

Fire Station #8 – Rockhill

2133 Garrisonville Road, Ruby, VA

Description of Use	Located in the far north west section of the County providing service to the area west of Garrison. Staffed by career personnel only.	
Year Constructed	1960	
Building Size	BGSF: 7,024	#Floors: 2
Site Conditions	Parking Spaces:	8
	ADA parking spaces:	0
	Parking Lot:	Poor
	Signage:	Fair
	Access/ADA Issues:	None identified
	Expansion Capability:	Extremely Poor
	Security:	Poor
Building Exterior	Exterior Wall:	Good
	Roof:	Good
	Apparatus Accessibility	Poor (back in)
Building Interior	Structure:	Extremely Poor
	Access/ADA Issues:	Access to 2nd floor and internal movement from bays to staff areas.
	Code Compliance Issues:	Subfloor damage that includes holes and possible mold issues.
	Layout:	Extremely poor
	Renovation Suitability:	Extremely poor
	Staff Sleeping Quarters Availability by Gender:	Repurposed offices for unisex staff quarters.
	Storage Capacity:	Limited
Technical Systems	Plumbing:	Poor
	Mechanical (HVAC):	Poor, ventilation issues
	Electrical:	Poor
	Lighting:	Poor
General Comments	This fire station has multiple challenges associated with it. The first being that there are several areas that have failing floor/subfloor structures, including multiple holes in the subfloor. Second, there are mold issues in several locations in the building that have been or will be addressed soon. The configuration of this building is poor with restrooms separated from the staff quarters and located on opposite sides of the apparatus bay. There is a corrugated metal building onsite that has a training structure built inside. The building has roof leaks and water flows through the roll up door onto the concrete floor in the building. The building is land locked with limited ability to expand. The area between the road and building is the septic field and cannot be built upon. Across Garrisonville Road is Marine Corp Base Quantico, which has their own fire protection operation. The current location is not ideal for the current service area of the station.	

Recommendations	Fire operations at this location should be moved to a more appropriate location in the service district. This issue is exasperated due to the extremely poor condition of the facility and the inability to expand onsite. To maintain this facility, significant costs would be required to bring this facility up to modern facility design standards. This facility should be decommissioned.

Fire Station #9 – Aquia Harbour

1001 Washington Drive, Stafford, VA

Description of Use	Situated just outside the Aquia Harbour area providing service to the Aquia Harbour neighborhood and the north east sections of the County. Staffed by career and volunteer personnel.	
Year Constructed	1991	
Building Size	BGSF: 4,340	#Floors: 2
Site Conditions	Parking Spaces:	12
	ADA parking spaces:	0
	Parking Lot:	Fair
	Signage:	Good
	Access/ADA Issues:	None identified
	Expansion Capability:	Poor
	Security:	Good
Building Exterior	Exterior Wall:	Fair
	Roof:	Poor
	Apparatus Accessibility	Poor (back in)
Building Interior	Structure:	Poor
	Access/ADA Issues:	Staff areas on second floor, access via stairs.
	Code Compliance Issues:	None identified
	Layout:	Extremely Poor
	Renovation Suitability:	Extremely Poor
	Staff Sleeping Quarters Availability by Gender:	Male: 1 Female: 1 Unisex:
	Storage Capacity:	Poor
Technical Systems	Plumbing:	Fair
	Mechanical (HVAC):	Good
	Electrical:	Good
	Lighting:	Poor
General Comments	This facility is in overall poor condition and is extremely small. There are shared staff quarters and a small kitchen and living areas. The apparatus bay doubles as storage and work out area. The floors on the second level sag and dip in multiple areas indicating potential substructure issues that should be further explored.	
Recommendations	This facility should be replaced with a modern fire station facility that includes modern amenities and adequate space and quarters for staff. This facility is inadequately sized for current operational use. Due to the site size and restrictions, this station may need to be moved to a larger parcel to accommodate a new facility.	

Fire Station #10 – Potomac Hills

3528 Jefferson Davis Highway, Stafford, VA

Description of Use	Provides service to the far northeastern areas of the County and support to the Garrisonville area. Career personnel only.	
Year Constructed	1980	
Building Size	BGSF: 10,980	#Floors: 2
Site Conditions	Parking Spaces:	4
	ADA parking spaces:	0
	Parking Lot:	Fair
	Signage:	Good
	Access/ADA Issues:	None identified
	Expansion Capability:	Poor
	Security:	Good
Building Exterior	Exterior Wall:	Good
	Roof:	Good
	Apparatus Accessibility	Poor (back in only)
Building Interior	Structure:	Downstairs – Excellent, Upstairs - Good
	Access/ADA Issues:	Internal access to second floor
	Code Compliance Issues:	None identified
	Layout:	Fair
	Renovation Suitability:	Good
	Staff Sleeping Quarters Availability by Gender:	Male: Female: Unisex: 3
	Storage Capacity:	Excellent
Technical Systems	Plumbing:	Good
	Mechanical (HVAC):	Good
	Electrical:	Good
	Lighting:	Excellent
General Comments	The primary staff areas were recently renovated. The second floor of this building provides ample space for multiple uses. Currently, training is held on a routine basis at this location. The second floor is accessible at ground level from the driveway that goes around the building. A portion of the parking lot is shared with adjacent property owner. The amount of paved parking for the building is too small for the full capacity of the building. May pose parking and site accessibility issues during high volume trainings or events on site. Two bays are utilized for departmental storage and two bays are used for the Candidate Physical Ability Testing. These functions should be relocated to allow full use of the fire station.	
Recommendations	Continue with current use and maintain the building as needed. May consider renovation of the second floor to better align with current sustainability practices and infrastructure needs for training.	

Fire Station #12 – Berea

20 Sebring Drive, Fredericksburg, VA

Description of Use	Provides service to the Berea area along Warrenton Road and southern areas of the County. Career personnel only.			
Year Constructed	2007			
Building Size	BGSF: 15,060		#Floors: 1	
Site Conditions	Parking Spaces:	57		
	ADA parking spaces:	3		
	Parking Lot:	Good		
	Signage:	Good		
	Access/ADA Issues:	None identified		
	Expansion Capability:	Good		
	Security:	Good		
Building Exterior	Exterior Wall:	Excellent		
	Roof:	Good		
	Apparatus Accessibility	Excellent (Drive thru)		
Building Interior	Structure:	Good		
	Access/ADA Issues:	None identified		
	Code Compliance Issues:	None identified		
	Layout:	Excellent		
	Renovation Suitability:	Excellent		
	Staff Sleeping Quarters Availability by Gender:	Male:	Female:	Unisex: 8
	Storage Capacity:	Good		
Technical Systems	Plumbing:	Good		
	Mechanical (HVAC):	Fair		
	Electrical:	Excellent		
	Lighting:	Excellent		
General Comments	This is a newer station that was adequately designed to current and future expansion and with unisex staff quarters. The layout of this facility is efficient and effective.			
Recommendations	This facility should continue to be maintained for current use.			

Fire Station #14 – Garrisonville

53 Shelton Shop Road, Stafford, VA

Description of Use	Located west of the Aquia/Garrisonville area, this is a new facility to provide service to Garrisonville and the western areas surrounding Garrisonville. Staffed by career personnel.			
Year Constructed	2019			
Building Size	BGSF: Unknown		#Floors: 2	
Site Conditions	Parking Spaces:	18 staff, 15 public		
	ADA parking spaces:	2		
	Parking Lot:	Excellent		
	Signage:	Excellent		
	Access/ADA Issues:	None identified		
	Expansion Capability:	Limited		
	Security:	Excellent		
Building Exterior	Exterior Wall:	Excellent		
	Roof:	Excellent		
	Apparatus Accessibility	Excellent		
Building Interior	Structure:	Excellent		
	Access/ADA Issues:	None identified		
	Code Compliance Issues:	None identified		
	Layout:	Good		
	Renovation Suitability:	Good		
	Staff Sleeping Quarters Availability by Gender:	Male: 1	Female: 1	Unisex: 1
	Storage Capacity:	Excellent		
Technical Systems	Plumbing:	Excellent		
	Mechanical (HVAC):	Excellent		
	Electrical:	Excellent		
	Lighting:	Excellent		
General Comments	This is the County's newest station and was commissioned in 2019. The overall design of the facility is good. Operational issues noted was related to shared staff quarters and challenges with medic/fire teams sharing the same staff quarters and impacting sleep patterns of staff. This site also has a training tower for fire personnel. Facility also serves as a backup emergency communications center.			
Recommendations	Develop a preventive maintenance plan for this facility to help preserve the longevity of the facility. Maintain the facility and continue current use.			

Rescue Station #4 – Mountain View

1268 Mountain View Road, Falmouth, VA

Description of Use	Located southwest of Stafford provide service and support to Fire Company 4 in the central area of the County. Staffed by volunteers only.			
Year Constructed	1982			
Building Size	BGSF: 9,706		#Floors: 2	
Site Conditions	Parking Spaces:	19		
	ADA parking spaces:	2		
	Parking Lot:	Excellent		
	Signage:	Excellent		
	Access/ADA Issues:	Not ADA compliant from upper to lower parking areas but was compliant when originally built.		
	Expansion Capability:	Poor		
	Security:	Good		
Building Exterior	Exterior Wall:	Good		
	Roof:	Excellent		
	Apparatus Accessibility	Poor (back in)		
Building Interior	Structure:	Poor		
	Access/ADA Issues:	Second floor access		
	Code Compliance Issues:	None identified		
	Layout:	Poor		
	Renovation Suitability:	Poor		
	Staff Sleeping Quarters Availability by Gender:	Male: 1	Female: 1	Unisex:
	Storage Capacity:	Limited		
Technical Systems	Plumbing:	Poor		
	Mechanical (HVAC):	Good		
	Electrical:	Good		
	Lighting:	Poor		
General Comments	This is fairly large building with two sets of apparatus bays. Apparatus bays are small for current apparatus size but works well for ambulances which are deployed (volunteer) from this location. The building has a rentable community room. The building has mostly an original interior and could use updating. It appears that the building has not been used frequently over the last few years.			
Recommendations	This building should be decommissioned as a rescue station due to limited use and functionality. The Mountain View Fire Station is within ½ mile of this location and provides full time EMS coverage for this area.			

Rescue Station #7 – White Oak

535 White Oak Road, Fredericksburg, VA

Description of Use	Located in the far southeastern section of the County providing service and support to Fire Company 1 and 7. Staffed by career and volunteers. The building also includes a community center that is rental for the public.	
Year Constructed	1985	
Building Size	BGSF: 7,360	#Floors: 1
Site Conditions	Parking Spaces:	28
	ADA parking spaces:	2
	Parking Lot:	Fair
	Signage:	Fair
	Access/ADA Issues:	None identified
	Expansion Capability:	Excellent
	Security:	Good
Building Exterior	Exterior Wall:	Good (Corrugated Metal)
	Roof:	Good
	Apparatus Accessibility	Fair (back in only)
Building Interior	Structure:	Good
	Access/ADA Issues:	None identified
	Code Compliance Issues:	None identified
	Layout:	Poor
	Renovation Suitability:	Good
	Staff Sleeping Quarters Availability by Gender:	Male: Female: Unisex: 1
	Storage Capacity:	Fair
Technical Systems	Plumbing:	Fair
	Mechanical (HVAC):	Fair
	Electrical:	Fair
	Lighting:	Good / Excellent (Community Center)
General Comments	This location serves as a volunteer station and a career ambulance station. The career area is very small (e.g. kitchen, lounge, and quarters) and could use expansion. The apparatus bays are very small and only can fit ambulances and light duty vehicles. The site has ample room for future expansion.	
Recommendations	The career area should be expanded to align better with space allocation of other FD facilities. This would require extensive renovation of the current building and utilize a portion of the community center or recapture space in one of the apparatus bays.	

Rescue Station #8 – Rockhill

1565 Garrisonville Road, Ruby, VA

Description of Use	Provides service and support to the northern area of the County west of Garrisonville. Staffed by volunteers only.			
Year Constructed	1989			
Building Size	BGSF: 5,720		#Floors: 1	
Site Conditions	Parking Spaces:	20		
	ADA parking spaces:	0		
	Parking Lot:	Good		
	Signage:	Good		
	Access/ADA Issues:	Lack of ADA parking.		
	Expansion Capability:	Good		
	Security:	Good		
Building Exterior	Exterior Wall:	Good		
	Roof:	Excellent		
	Apparatus Accessibility	2 drive through bays for ambulances and 2 back in bays.		
Building Interior	Structure:	Fair		
	Access/ADA Issues:	None identified		
	Code Compliance Issues:	None identified		
	Layout:	Fair		
	Renovation Suitability:	Good		
	Staff Sleeping Quarters Availability by Gender:	Male: 1	Female: 1	Unisex: 0
	Storage Capacity:	Limited		
Technical Systems	Plumbing:	Good		
	Mechanical (HVAC):	Fair		
	Electrical:	Good		
	Lighting:	Poor		
General Comments	This is a volunteer rescue station only. The overall building is in good condition, but it lacks general amenities for a modern fire or rescue station. Staff quarters are limited and do not meet new design standards and should be updated. There is rentable community space in the apparatus bays, however it does not appear to be used frequently.			
Recommendations	This location may serve as a temporary short term fix (five years) to relocate Fire Station #8 operations to this location in lieu of current volunteer services, which appear to be limited. Otherwise, consideration should be given to relinquishing this location for alternative use.			

Trainings and Logistics Center

1326 Courthouse Road, Stafford, VA

Description of Use	Serves as the training center for Stafford County Fire and Rescue Department and the fleet maintenance shop. The site also includes storage area for other Stafford County operations in an adjacent fenced area that includes open style sheds.	
Year Constructed	1998	
Building Size	BGSF:	#Floors: 1
Site Conditions	Parking Spaces:	35
	ADA parking spaces:	2
	Parking Lot:	Poor
	Signage:	Poor
	Access/ADA Issues:	None identified
	Expansion Capability:	Fair
	Security:	Good
Building Exterior	Exterior Wall:	Fair
	Roof:	Fair
Building Interior	Structure:	Fleet (Good), Training (Poor)
	Access/ADA Issues:	None identified
	Code Compliance Issues:	None identified
	Layout:	Poor
	Renovation Suitability:	Poor
	Storage Capacity:	Fair
Technical Systems	Plumbing:	Excellent
	Mechanical (HVAC):	Good
	Electrical:	Good
	Lighting:	Excellent
General Comments	This is a former boat retail and repair center that has been converted to a training center and also serves as the fleet maintenance shop for Fire. Challenges exist with the training classroom space as walls do not extend to the ceiling and therefore sound moves easily throughout the space. Two classrooms are in the area, but only one can be used at a time. There is additional training space outside the facility in the parking lot. There are three bays dedicated to fleet maintenance and the maintenance area is fenced off to provide security while vehicles are waiting for repair. The fleet area and adjacent shower area was recently renovated. This site is used in conjunction with other County departments adjacent, including open storage bays in a separate fenced lot.	
Recommendations	If this facility is to be used primarily as a training facility, significant renovations should be completed to delineate two classroom spaces. Office space areas for training staff should be renovated to provide for more individual office space. The site should include enhanced signage to specify space and user groups. The parking lot should be renovated and paved in the near future.	

	This site is not a sustainable long term training and fleet solution as it may be prime redevelopment space in the near future and consideration should be given to move County operations away from the urban core area.

Summary

Stafford County has a total of 15 fire and rescue facilities that were purpose built for their current use. The only facility not purpose built for the current use is the Training and Logistics Center. While some facilities are older than others, the majority of the stations are maintained, with the exception of Station #8 – Rockhill.

Many of the elements that are included in the newly design stations are absent from many of the older stations, such as drive through apparatus bays and individual staff quarters. The lack of current amenities may pose operational challenges for the department in the future. Also, many of the sites are not eligible for expansion due to the size of the site or adjacent uses. Overall, many of the facilities could use larger apparatus bays and individual staff quarters.

The following is a summary of the Fire and Rescue Department facility inventory, including the general condition and recommended use.

Facility	Current Condition	Recommendation
Station # 1 – Falmouth	Good	Continue current use, renovate as required, increase way finding signage on site.
Station #2 – Stafford	Good	Repair exterior issues immediately and repave the parking area in the next five years. Maintain the building for current use.
Station #3 – Widewater	Good	Address standing water issue at rear of building. Maintain the building for current use.
Station #4 – Mountain View	Good	Continue current use and maintain the facility as needed.
Station #5 - Brooke	Poor	This station should be decommissioned. Alternative location should be determined as needed.
Station #6 - Hartwood	Excellent	Continue current use and maintain the facility as needed.
Station #7 – White Oak	Fair	Continue maintenance on building. Would require extensive renovation in the event that career personnel are located in building.
Station #8 – Rockhill	Extremely Poor	Decommission the station and relocate immediately. May consider moving to Rescue Station #8 as an interim step until a more centralized station is constructed.
Fire Station #9 – Aquia Harbour	Poor	Replace existing facility. Would likely require new site for adequate size station.
Station #10 – Potomac Hills	Good	Continue current use and maintain the facility as needed.
Station #12 – Berea	Good	Continue current use and maintain the facility as needed.
Station #14 - Garrisonville	Excellent	Develop a preventive maintenance plan for this facility to help preserve the longevity of the facility. Maintain the facility and continue current use.
Rescue Station #4 – Mountain View	Fair	Discontinue current use and return asset to community.
Rescue Station #7 – White Oak	Fair	Expand staff area for career personnel or relocate personnel to different station.
Rescue Station #8 - Rockhill	Fair	Discontinue current use and return asset to community. May serve as interim location for Fire Station #8 while a new site is purchased and station constructed.
Training and Logistic Center	Fair	Renovate the training and office areas if this site is a long term county asset. Consider moving away from urban core to allow for redevelopment on site.