Traffic Impact Study

Broad & Washington Redevelopment

City of Falls Church, VA

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TABLE OF CONTENTS

List of Figures 2
List of Tables 2
List of Appendices 3
Introduction And Summary 3
Purpose and Study Objective 3
Executive Summary 4
Site Location and Study Area 4
Description of Proposed Development 4
Principal Findings, Conclusions and Recommendations 4
Background Information: Proposed Development (Site and Nearby) 5
Description of On-Site Development 5
Planned Transportation Improvements 6
Scope of Study 6
Roadway Network 8
Bicycle/Pedestrian Facilities 9
Transit 11
Existing Conditions (2019) 13
Historical Crash Data 13
Existing Traffic Volumes 24
Existing Conditions Capacity Analysis 24
Future Conditions Without Development (2024) 30
Future without Development Traffic Volumes 30
Future without Development Capacity Analysis 30
Trip Generation 35
VDOT Mixed-Use Trip Generation Model 36
Site Traffic Distribution and Assignment 37
Site Access 37
Distribution and Assignment 37
Future Conditions With Development (2024) 40
Future with Development Traffic Volumes 40
Future with Development Capacity Analysis 40
Peak Hour Signal Warrant Analysis 45

Conclusions 46

LIST OF FIGURES

Figure 1: Site Location 7
Figure 2: Proposed Development Plan 8
Figure 3: Existing (2019) Roadway Network 10
Figure 4: Existing Transit Service 12
Figure 5: Crash Aerial Map 14
Figure 6: Full Year Crash History 24
Figure 5: Existing (2019) Traffic Volumes 26
Figure 6: Existing (2019) Level of Service 29
Figure 7: Future without Development (2024) Traffic Volumes 31
Figure 8: Future without Development (2024) Level of Service 34
Figure 9: Directions of Approach 38
Figure 10: Site Generated Trips 39
Figure 11: Future with Development (2024) Traffic Volumes 41
Figure 12: Future with Development and Proposed Mitigations (2024) Levels of Service 44
Figure 13: Warrant 3, Peak Hour Signal Warrant Analysis Results 45

LIST OF TABLES

Table 1: Weekday Bus Route Information 11
Table 1: Historical Crash Data Summary (September 2014 through August 2019) 13
Table 3: Crash Data Breakdown (Broad Street & Washington Street) 15
Table 3: Crash Data Breakdown (Broad Street & Applebee's Entrance/Proposed Site Entrance) 16
Table 4: Crash Data Breakdown (Columbia Street & Lawton Street) 17
Table 5: Crash Data Breakdown (Washington Street & Columbia Street) 18
Table 6: Crash Data Breakdown (Washington Street & Great Falls Street) 19
Table 7: Crash Data Breakdown (Washington Street & Park Avenue) 20
Table 8: Crash Data Breakdown (Washington Street & Park Place) 21
Table 9: Crash Data Breakdown (Washington Street & Existing Driveway) 22
Table 11: Crash Data Summary (Intersection of Broad Street & Washington Street - Sept. 2009 to Aug. 2014) 23
Table 2: Existing (2019) Intersection Capacity Analysis 27
Table 3: Future without Development (2024) Intersection Capacity Analysis 32
Table 4: Site Trip Generation 35
Table 5: Mixed-Use Trip Generation Model Results 36
Table 6: Future with Development (2024) Intersection Capacity Analysis 42

Table 7: Volumes used for Peak Hour Warrant Analysis 45

LIST OF APPENDICES

Appendix A: Scoping Document

Appendix B: Historic VDOT Crash Data

Appendix C: Existing (2019) Traffic Volumes & Count Sheets

Appendix D: Level of Service Definitions

Appendix E: Intersection Capacity Analysis - Existing Conditions (2019)

Appendix F: 301 W Broad Street Site Trips

Appendix G: Intersection Capacity Analysis - Future without Development Condition (2024)

Appendix H: Traffic Volumes for Each Use and Pass-by Trips

Appendix I: Intersection Capacity Analysis - Future with Development Condition (2024)

INTRODUCTION AND SUMMARY

Purpose and Study Objective

This report presents the findings of a traffic impact analysis for the proposed redevelopment of the property located on the northeast corner of the Broad Street and Washington Street intersection in the City of Falls Church. The site is bound by Park Place on the north, E. Broad Street (Route 7) on the south, Lawton Street on the east, and N. Washington Street on the west. The development, which is planned to consist of up to 56,600 square feet of grocery store, 13,400 square feet of retail/restaurant uses, a 100-seat live theater, and 350 apartments is anticipated to be complete in 2024

The following tasks were completed as part of this study:

- A scoping meeting was held on June 22, 2015 with City of Falls Church staff, which included discussions about the parameters of the study and relevant background information. A scoping letter stating the parameters and assumptions used in the analysis herein is included in Appendix A. Updates to the study have been incorporated to address staff comments of September 28, 2015. This study includes the new development plan and is part of the application previously submitted on December 9, 2015.
- Field reconnaissance in the vicinity of the site was performed to collect information related to existing traffic controls, roadway geometry, and traffic flow characteristics.
- Saturday peak period traffic counts were conducted on Saturday, January 31, 2015. Weekday AM and PM peak period traffic counts were conducted at the study intersections on Tuesday, February 3, 2015. As the general roadway network in the vicinity of the site has not experienced traffic growth in recent years, 2015 counts were used as base volumes for 2019.
- Future without development traffic conditions were projected based on existing traffic and trip generated by approved but incomplete development in the vicinity.
- Proposed site traffic volumes were generated based on the methodology outlined in the Institute of Transportation Engineers' (ITE) Trip Generation, 10th Edition publication.

- Future with development traffic conditions were projected based on existing regional and site traffic patterns and the proposed development plan.
- Intersection capacity analyses were performed for the existing conditions (2019) and future conditions with development (2024) during the weekday and Saturday peak hours at the intersections located within the study area.

Sources of data for this study include the City of Falls Church, VDOT, Insight Property Group, MV+A Architects and the office files and field reconnaissance efforts by Gorove/Slade Associates, Inc.

Executive Summary

Site Location and Study Area

The subject development is located in the City of Falls Church, on the north side of E. Broad Street between N. Washington Street and Lawton Street. It is in the vicinity to four major commuter corridors: I-66, Route 7, Route 29, and Route 50. The site is currently occupied by an Applebee's restaurant, a physical therapy clinic, a combined office/retail building and a City public parking lot. The study area consists of nine intersections, both local and regional in nature, two of which are the driveways for the existing uses. The proposed development will continue to be served by these two site driveways.

Description of Proposed Development

The 3.22-acre Broad & Washington development site is currently zoned Central Business (B-2). The project is a special exception application to construct a multi-use building featuring up to 13,400 square feet of retail/restaurant space, 56,600 square feet of grocery store, a 100-seat live theater, and 350 apartments. A multi-level garage will be constructed with access off of E. Broad Street to the south and Park Place to the north. The site will be served by retail parking spaces at the Broad Street level and above-ground levels, and below-grade residential parking. The development is anticipated to be complete in 2024.

Principal Findings, Conclusions and Recommendations

The analysis presented in this report supports the following major conclusions:

Existing Conditions (2019)

Weekday traffic counts were conducted at the study intersections during the AM and PM peak periods on Tuesday, February 3, 2015 and Saturday peak period traffic counts were conducted on January 31, 2015. The existing volumes were balanced across proximate intersections to reflect a consistent baseline for the volume projections within this report.

Intersection capacity analyses were performed for the existing conditions at the study area intersections during the weekday morning and afternoon peak hours, as well as the Saturday peak hour. *Synchro, version 10.0* was used to analyze the study intersections with results based on the Highway Capacity Manual (HCM 2000) methodology. For the purpose of this analysis, it is desirable to achieve a LOS D or better for each approach of an intersection. All of the study intersections' approaches currently operate at acceptable levels of service and most queue lengths can be accommodated during the weekday morning, afternoon, and Saturday peak hours, with the following exceptions:

- Broad Street and Washington Street (queues)
- N. Washington Street and Park Avenue (queues)

Future Conditions without Development (2024)

Traffic volumes were projected for the year 2024 without the proposed Broad & Washington redevelopment. While historical VDOT traffic counts for the road sections analyzed show a general reduction of traffic volumes over the past several years, per the request of City staff, a growth rate of 0.15% compounded annually over a four- year period, totaling 0.6% growth of the existing volumes, was applied to all existing turning movement volumes at the study intersections. Furthermore, the traffic associated with the 301 W. Broad Street project was added to the existing traffic volumes to obtain the future conditions without development.

Most of the study intersections' approaches will continue to operate at acceptable levels of service with manageable queues during the weekday morning, afternoon, and Saturday peak hours, with the following exceptions:

- Broad Street and Washington Street (LOS and queues)

Future Conditions with Development (2024)

The proposed mixed-use redevelopment will generate approximately 69 new external trips during the weekday morning peak hour, 339 new external trips during the weekday afternoon peak hour, 418 new external trips during the Saturday peak hour, and 3,464 new external weekday daily trips, accounting for existing or potential trips associated with the existing buildings. Access to the proposed development will be provided via a full-movement driveway on E. Broad Street and one full-access point along Park Place. Future conditions with the development were derived from the future without development scenario and the site generated trips.

With the proposed development, the intersection of N Washington Street and Park Place is proposed to operate as full-movement signalized intersection incorporated within the Park Avenue signal.

As under the existing and future without development conditions, most of the study intersections' approaches will continue to operate at acceptable levels of service with manageable queues during the weekday morning, afternoon, and Saturday peak hours, with the following exceptions:

- Broad Street and Washington Street (LOS and queues)
- E. Broad Street and Site Driveway (LOS and queues)

Signalization of the Site Entrance on E. Broad Street was investigated as part of the mitigation. With the addition of a traffic signal at the intersection of E. Broad Street and site driveway, the side street movements operate at acceptable levels of service. Alternatively, additional site trips could be accommodated through with signalized intersections while maintaining acceptable levels of service and would reduce delays at the Broad Street driveway by up to half. With the signalization and clustering of the intersection of Park Ave and Park Place with N Washington Street, the intersections continue to perform acceptably with manageable queues during all study peak hours.

In summary, traffic operations within the study area will be similar with or without the proposed Broad & Washington redevelopment.

BACKGROUND INFORMATION: PROPOSED DEVELOPMENT (SITE AND NEARBY)

Description of On-Site Development

This study is being performed to examine the potential traffic impact of the proposed Broad & Washington redevelopment on the area's future roadway network. The project site is bounded by E. Broad Street to the south and Park Place to the north, N. Washington Street to the west and Lawton Street to the east. A site location map is shown in Figure 1. Portions of

the site's development plan showing access points and a typical upper level are shown in Figure 2. The subject parcel is currently zoned Central Business (B-2). The development is anticipated to be complete in 2024.

The project is a special exception application to construct up to approximately 13,400 square feet of retail/restaurant space, 56,600 square feet grocery store, a 100-seat live theater, and 350 apartments. Access to the proposed development will be provided by one full-entrance into a multi-level garage with full-access off of E. Broad Street and another full-access entrance leading into the multi-level garage located along Park Place. The garage will be constructed to provide parking for the retail and residential uses.

Planned Transportation Improvements

Neither the City of Falls Church's Comprehensive Plan, Five-Year Capital Improvements Program, or VDOT's Six-Year Improvement Program (SYIP) propose any major long-term transportation improvements within the study area. Of note, and as discussed in a subsequent section of the report, the City of Falls Church's Comprehensive Plan calls for an increase of transit frequency along major corridors in the city to provide 15-minute all day service from the 20-minute service currently.

Scope of Study

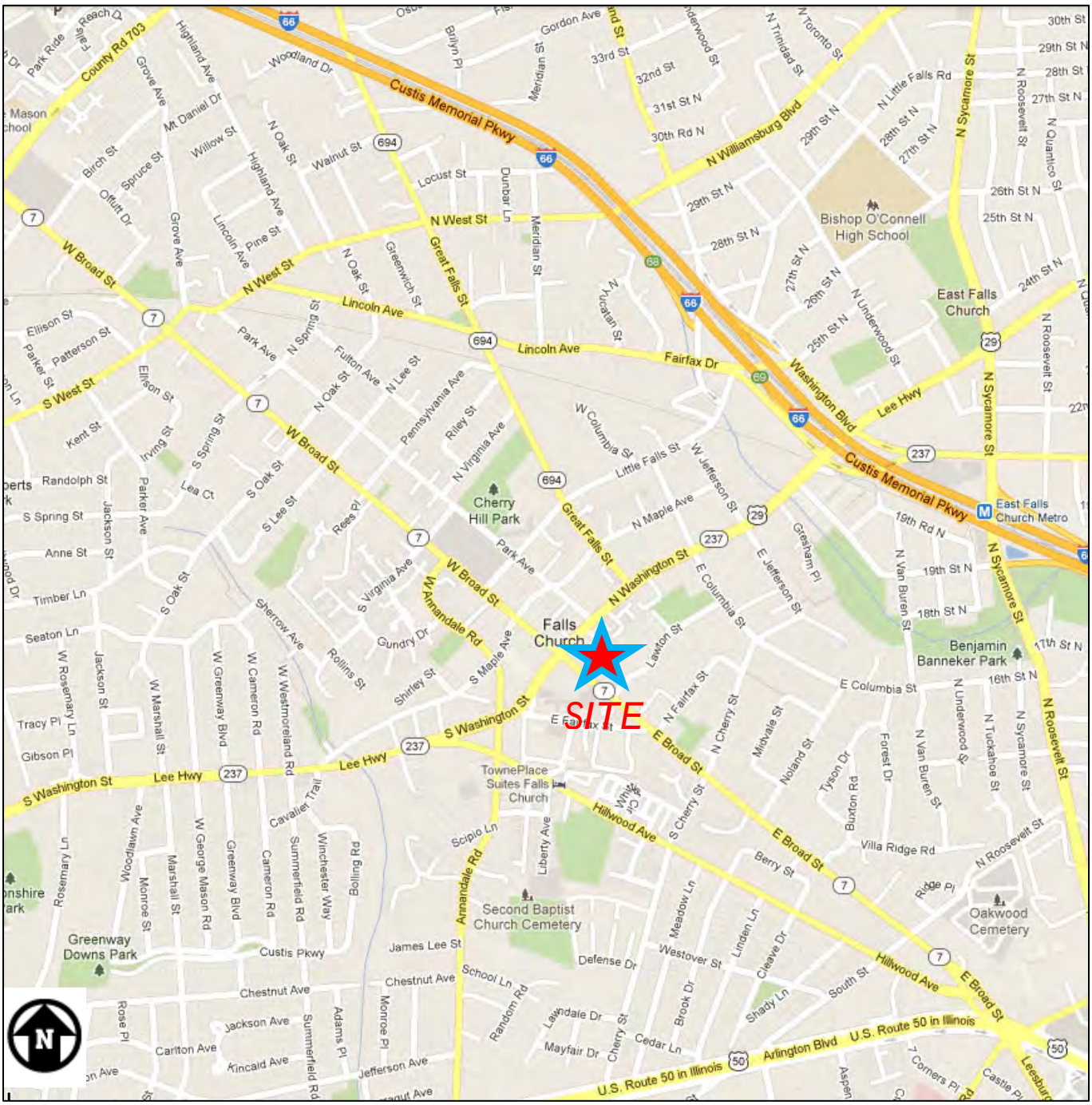
The study area consists of nine intersections, two of which will allow traffic to enter and exit the site. The study area was determined based on the scoping meeting held with City of Falls Church staff on June 22, 2015. A copy of the agreed-upon scoping document is included in Appendix A. The following intersections were identified for inclusion in this study:

1. Broad Street and Washington Street;
2. E. Broad Street and Applebee's entrance/proposed site entrance;
3. E. Broad Street and Lawton Street;
4. Lawton Street and E. Columbia Street;
5. N. Washington Street and Columbia Street;
6. N. Washington Street and Great Falls Street;
7. N. Washington Street and Park Avenue;
8. N. Washington Street and Park Place;
9. N. Washington Street and existing driveway

This report presents the findings of analyses performed for the following conditions:

- **Existing Conditions (2019):** Considers existing traffic volumes and existing roadway configurations.
- **Future Conditions without Development (2024):** Considers future traffic conditions for the year 2024 with the background development traffic, but without the proposed development.
- **Future Conditions with Development (2024):** Considers future traffic conditions for the year 2024 (build-out year) with the background development traffic and the proposed Broad & Washington development.

The results of the analysis and the traffic impacts associated with the proposed development plan are presented in the Conclusion section of this report.


SITE
Custis Memorial Pkwy
N Williamsburg Blvd
N West St
W Broad St
Lincoln Ave
Fairfax Dr
Great Falls St
Washington Blvd
Lee Hwy
N Washington St
S Washington St
E Broad St
Hillwood Ave
Arlington Blvd
U.S. Route 50 in Illinois
Bishop O'Connell High School
East Falls Church
East Falls Church Metro
Cherry Hill Park
Falls Church
Benjamin Banneker Park
TownePlace Suites Falls Church
Second Baptist Church Cemetery
Oakwood Cemetery
Greenway Downs Park
N Sycamore St
N Roosevelt St
N Underwood St
N Little Falls Rd
Meridian St
Dunbar Ln
Lincoln Ave
Park Ave
Fulton Ave
N Lee St
Pennsylvania Ave
Riley St
N Virginia Ave
W Columbia St
Little Falls St
W Jefferson St
N Maple Ave
E Columbia St
E Jefferson St
Gresham Pl
N Van Buren St
19th Rd N
19th St N
18th St N
16th St N
17th St N
Lawton St
N Fairfax St
N Cherry St
Midvale St
Noland St
Tyson Dr
Buxton Rd
Forest Dr
N Tuckahoe St
Villa Ridge Rd
Berry St
Meadow Ln
Linden Ln
Cleave Dr
Westover St
Brook Dr
Shady Ln
South St
Defense Dr
Cedar Ln
Mayfair Dr
Laurdale Dr
Random Rd
School Ln
James Lee St
Chestnut Ave
Jackson Ave
Kincaid Ave
Carlton Ave
Jefferson Ave
Custis Pkwy
Cavalier Trail
Summerfield Rd
Winchester Way
Bolling Rd
Cameron Rd
W Cameron Rd
W Greenway Blvd
W George Mason Rd
Marshall St
Monroe St
Woodlawn Ave
Rosemary Ln
W Rosemary Ln
W Marshall St
Jackson St
Parker Ave
Randolph St
S Spring St
Anne St
Timber Ln
Seaton Ln
Tracy Pl
Gibson Pl
Sherrow Ave
Rollins St
Gundry Dr
Shirley St
S Maple Ave
S Virginia Ave
S Oak St
S Lee St
Rees Pl
Lea Ct
Irving St
Kent St
Ellison St
Patterson St
Parker St
Highland Ave
Grove Ave
Mt Daniel Dr
Willow St
Birch St
Spruce St
Offutt Dr
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29th St N
28th St
27th St N
N Toronto St
N Trinidad St
N Quantico St
N Roosevelt St
Reach Q
Park Ride
County Rd 703
Mason School
Greenway Downs Park
Oakwood Cemetery
Rose Pl
Adams Pl
Monroe Pl
Jefferson Ave
Aspen
Corners Pl
Castle Pl
Leesburg
Rosemary Ln
Woodlawn Ave
Monroe St
Marshall St
W George Mason Rd
Greenway Blvd
Cameron Rd
Summerfield Rd
Winchester Way
Bolling Rd
Cavalier Trail
Custis Pkwy
Chestnut Ave
Jackson Ave
Kincaid Ave
Carlton Ave
Jefferson Ave
James Lee St
Scipio Ln
Liberty Ave
Annandale Rd
W Annandale Rd
Sherrow Ave
Rollins St
Gundry Dr
Shirley St
S Maple Ave
S Virginia Ave
S Oak St
S Lee St
Rees Pl
Lea Ct
Randolph St
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Spruce St
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Walnut St
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N Trinidad St
N Quantico St
N Roosevelt St
N Little Falls Rd
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N Van Buren St
N Tuckahoe St
N Sycamore St
N Roosevelt St
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N Roosevelt St
Meridian St
Dunbar Ln
Lincoln Ave
Park Ave
Fulton Ave
N Lee St
Pennsylvania Ave
Riley St
N Virginia Ave
W Columbia St
Little Falls St
W Jefferson St
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16th St N
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Buxton Rd
Forest Dr
N Tuckahoe St
Villa Ridge Rd
Berry St
Meadow Ln
Linden Ln
Cleave Dr
Westover St
Brook Dr
Shady Ln
South St
Defense Dr
Cedar Ln
Mayfair Dr
Laurdale Dr
Random Rd
School Ln
James Lee St
Chestnut Ave
Jackson Ave
Kincaid Ave
Carlton Ave
Jefferson Ave
Custis Pkwy
Cavalier Trail
Summerfield Rd
Winchester Way
Bolling Rd
Cameron Rd
W Cameron Rd
W Greenway Blvd
W George Mason Rd
Marshall St
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S Virginia Ave
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S Lee St
Rees Pl
Lea Ct

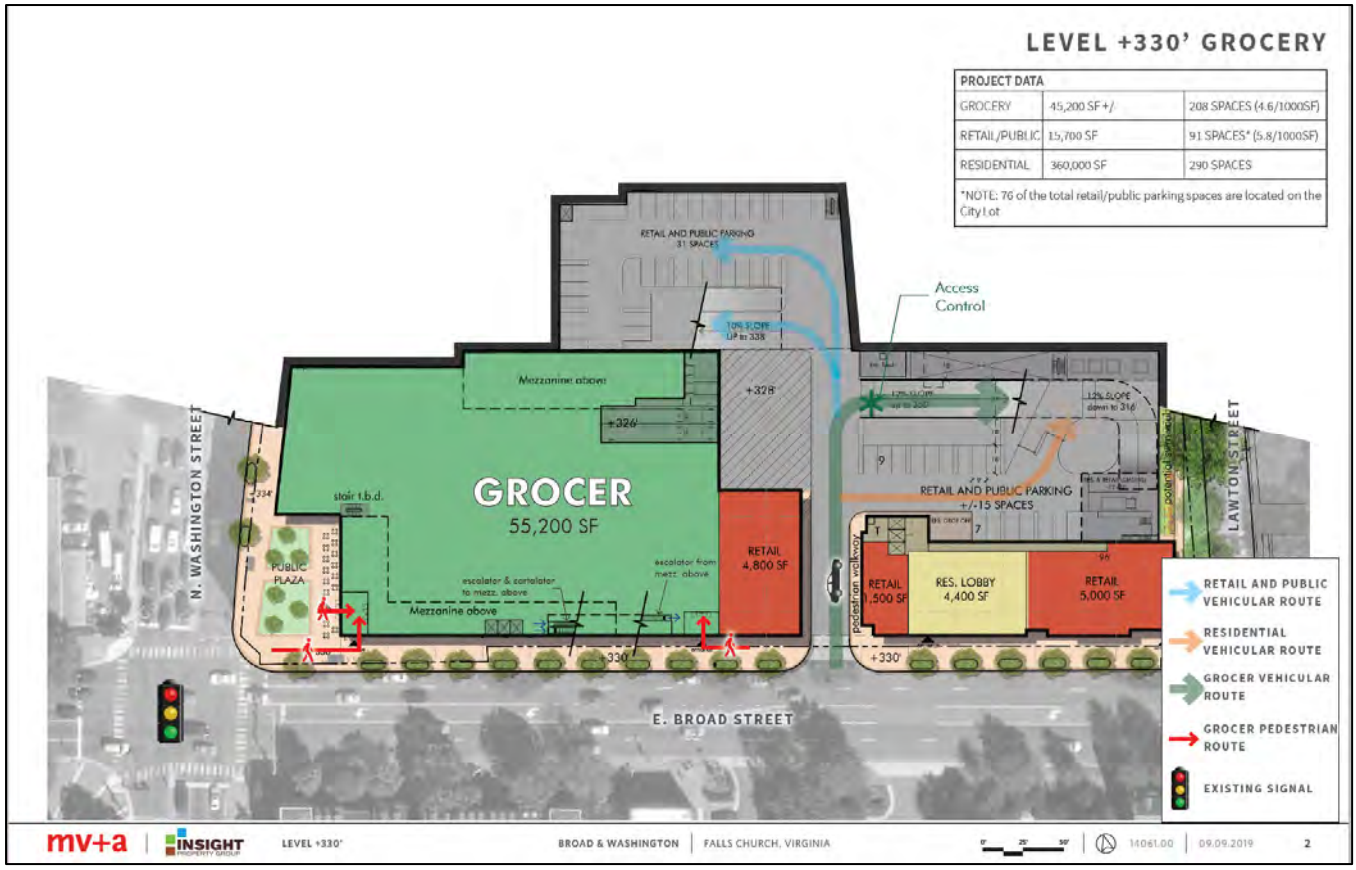

Figure 2: Proposed Development Plan

Roadway Network

A description of the major roadways within the immediate vicinity of the site is presented below. The existing lane configuration and traffic control in the study area is shown in Figure 3.

Broad Street (Route 7) is a four-lane undivided major arterial with left turn bays at its signalized intersections with Washington Street. The posted speed limit is 25 mph within the study area. Published historical traffic count data from VDOT shows that in 2018, W. Broad Street carried approximately 25,000 vehicles per day while E. Broad Street carried approximately 21,000 vehicles per day.

Washington Street (Route 29) is a four-lane divided major arterial with left turn bays at its signalized intersection with Broad Street. The posted speed limit is 30 mph within the study area. VDOT traffic count data from 2018 shows that N. Washington Street carried approximately 21,000 vehicles per day while S. Washington Street carried approximately 13,000 vehicles per day.

Great Falls Street is a two-lane minor arterial extending west from N. Washington Street. The posted speed limit is 25 mph within the study area. 2018 traffic count data from VDOT shows that Great Falls Street carried approximately 2,900 vehicles per day.

Columbia Street is a two-lane undivided collector street. The posted speed limit is 25 mph within the study area. Published historical traffic count data from VDOT shows that west of N. Washington Street, Columbia Street carried 2,900 vehicles and east of Washington Street carried 3,100 vehicles in 2018.

Park Avenue is a two-lane undivided collector street. On-street parking exists along both sides west of Little Falls Street and on the south side of the street along the section of Park Avenue between N. Washington Street and N. Maple Avenue. The posted speed limit is 25 mph within the study area. There is no published historical traffic count data from VDOT available on this roadway.

Park Place is a two-lane undivided local street. Park Avenue is only about 350 feet in length and extends east from N. Washington Street to its terminus at a cluster of single-family homes. On-street parking exists along both sides and the statutory speed limit is 25 mph. There is no published historical traffic count data from VDOT available on this roadway.

Lawton Street is a two-lane undivided local street with a statutory speed limit of 25 mph that spans from E. Broad Street to the south and E. Columbia Street to the north. No published historical traffic count data for this roadway is available from VDOT.

Bicycle/Pedestrian Facilities

Dedicated on-street bike lanes are absent within the study area and the entire City of Falls Church. The site is located approximately one mile from the Washington & Old Dominion (W&OD) Trail, which extends 45 miles from Shirlington to Purcellville. To improve future bicycling conditions within the study area, the City's Bicycle Master Plan recommends the implementation of on-street bicycle facilities in the study area along Columbia Street and Great Falls Street to complement the shared use pavement markings (sharrows) recently installed along Park Avenue. Washington Street, W. Broad Street, and Park Avenue are designated as future bike-share corridors within the study area. There is one Capital Bikeshare station in the study area, located along Park Place near the Broad & Washington site.

The roadways in the vicinity of the proposed development provide pedestrian facilities and connectivity throughout the area. Continuous 4 to 8-foot wide sidewalks line all of the study area's roadways on both sides of each street. Continental crosswalk markings link sidewalk segments at all of the study area's signalized intersections with the exception of the southern east/west crossing movement at the N. Washington Street/Park Avenue intersection.

Pedestrian countdown signals are present for all crossing movements at the Broad Street and Washington Street intersection. Countdown pedestrian indications are only installed for the crossing of N. Washington Street at Columbia Street; the remaining crossings do not have pedestrian signals. At the N. Washington Street/Park Avenue intersection, there are pedestrian signals serving both marked crossing movements; however, the pedestrian signals are an older model without the countdown display. Currently, these are in compliance with the Manual on Uniform Traffic Control Devices (MUTCD) until they reach the end of their serviceable life, when they will need to be replaced with pedestrian countdown signals since the pedestrian change interval for these crossings is longer than 7 seconds. The City's guidelines recommend the installation of pedestrian countdown signals for the crossing movements that either lack the countdown displays or lack pedestrian signals altogether.

To aid the movement of pedestrians and cyclists across E. Broad Street, the City is planning a new enhanced crossing at E. Fairfax Street between the widely-spaced existing crossings at Washington Street and Cherry Street. This crossing would improve connectivity in the area, enhancing mobility and encouraging non-motorized travel. The benefits of the new crossing would be supportive of, and complimentary to, the proposed mixed-use Broad & Washington redevelopment. Additionally, a HAWK signal is also planned at the E Broad Street and Fairfax Street. HAWK (High-Intensity Activated Crosswalk) beacon signals are button-activated traffic control devices that stop vehicular traffic to allow pedestrians to cross safely. The design of the signal is underway and is expected to be operational in 2021.

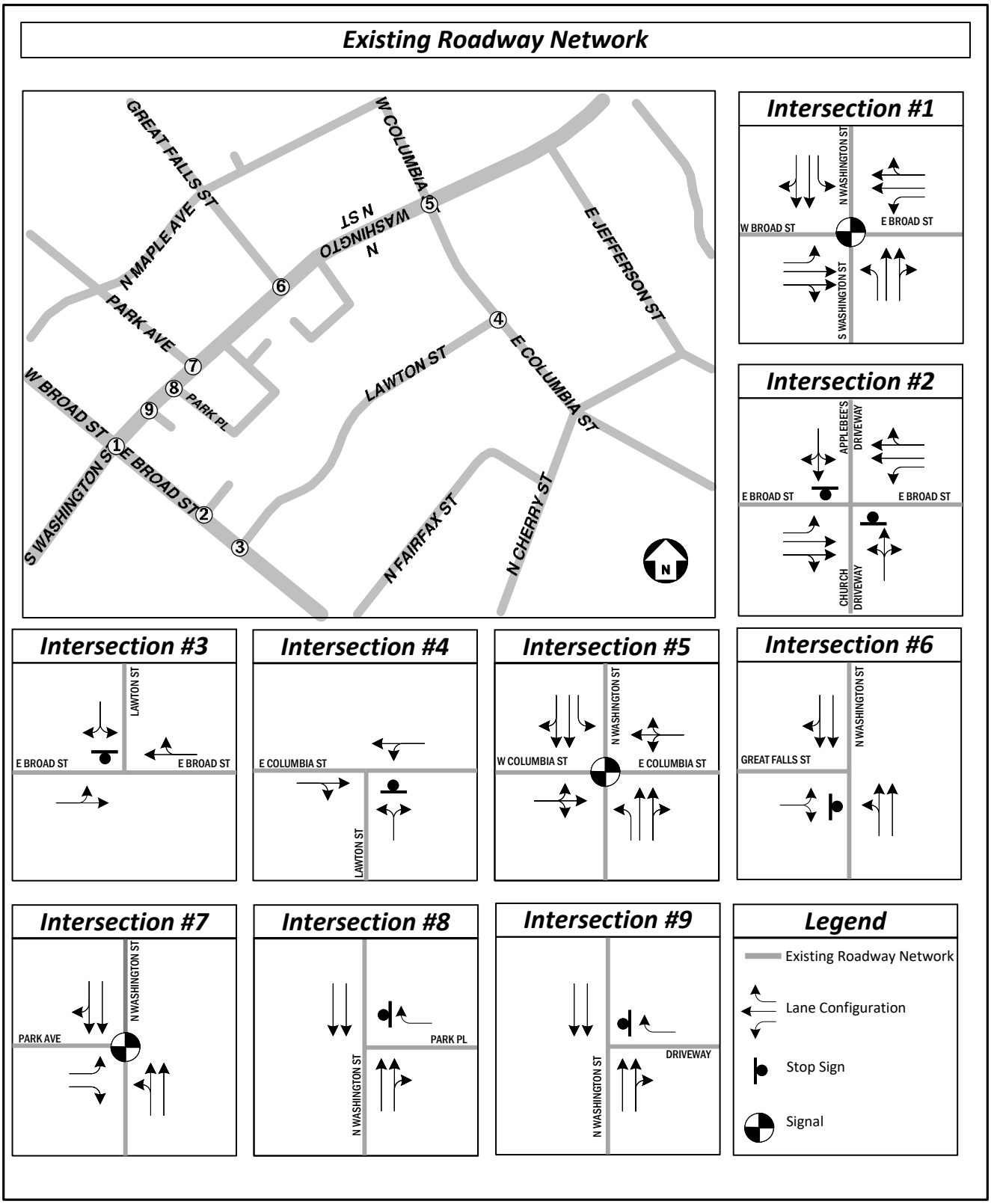

Figure 3: Existing (2019) Roadway Network

Transit

Transit service to the study area is provided by Metrorail. The East Falls Church Metrorail station is located at the I-66/ Sycamore Street interchange, approximately ¾ mile to the east, and operates on Metrorail's Orange and Silver Lines. Metro trains run on each line every six minutes during the morning and afternoon peak periods and every 12 to 20 minutes during the weekday off-peak periods and on weekends. Riders traveling to or from the east as far as the Stadium-Armory station may opt for either Orange or Silver Line trains, increasing the practical frequency of the service. From the station, it is approximately a 0.9-mile walk to the site's northern property line, or an 18-23 minute walk depending on walking speed.

The Washington Transit Metropolitan Authority (WMATA) Metrobus provides bus services to the study area. Table 1 shows a summary of the bus route information for the existing bus route lines that serve the site during weekdays with stops in the study area and Figure 4 illustrates the existing bus service. A bus stop serving westbound trips on the 28A Metrobus lines is located on the property along E. Broad Street. Stops for the 2A and 3A are located along S. Washington Boulevard within 250 feet of the site, and the nearest stop for eastbound 28A trips is approximately 400 feet west of the site. The 3T line can be access via stops located north of Park Avenue, approximately 375 feet north of the site.

As mentioned previously, the City of Falls Church's Comprehensive Plan calls for an increase in bus frequency along major corridors in the City, such as Broad Street and Washington Street, to have 15-minute headways throughout the day, as opposed to 20-minute or more headways currently.

Table 1: Weekday Bus Route Information

Route Number	Route Name	Destination	Service Hours	Peak Period Headway	Off-Peak Period Headway
WMATA 2A	Washington Boulevard-Dunn Loring Line	Ballston Metro, Dunn Loring metro	Weekdays 4:45 am-12:21 am Saturdays 5:45 am-1:44 am Sundays 5:45 am-12:58 am	15-30 min	30-45 min
WMATA 3A	Annandale Road Line	Annandale, East Falls Church Metro	Weekdays 5:40 am-9:43 pm Weekends 6:57 am-8:35 pm	30 min	60 min
WMATA 3T	Pimmit Hills Line	McLean Metro, East Falls Church Metro	Weekdays 5:35 am-10:58 pm Saturdays 6:35 am-10:57 pm	25-40 min	30-60 min
WMATA 28A	Leesburg Pike Line	Tysons Corner Metro, King Street Metro	Weekdays 4:18 am-1:42 am Saturdays 5:50 am-2:32 am Sundays 5:50 am-1:35 am	20 min	20-30 min

WMATA Bus Routes

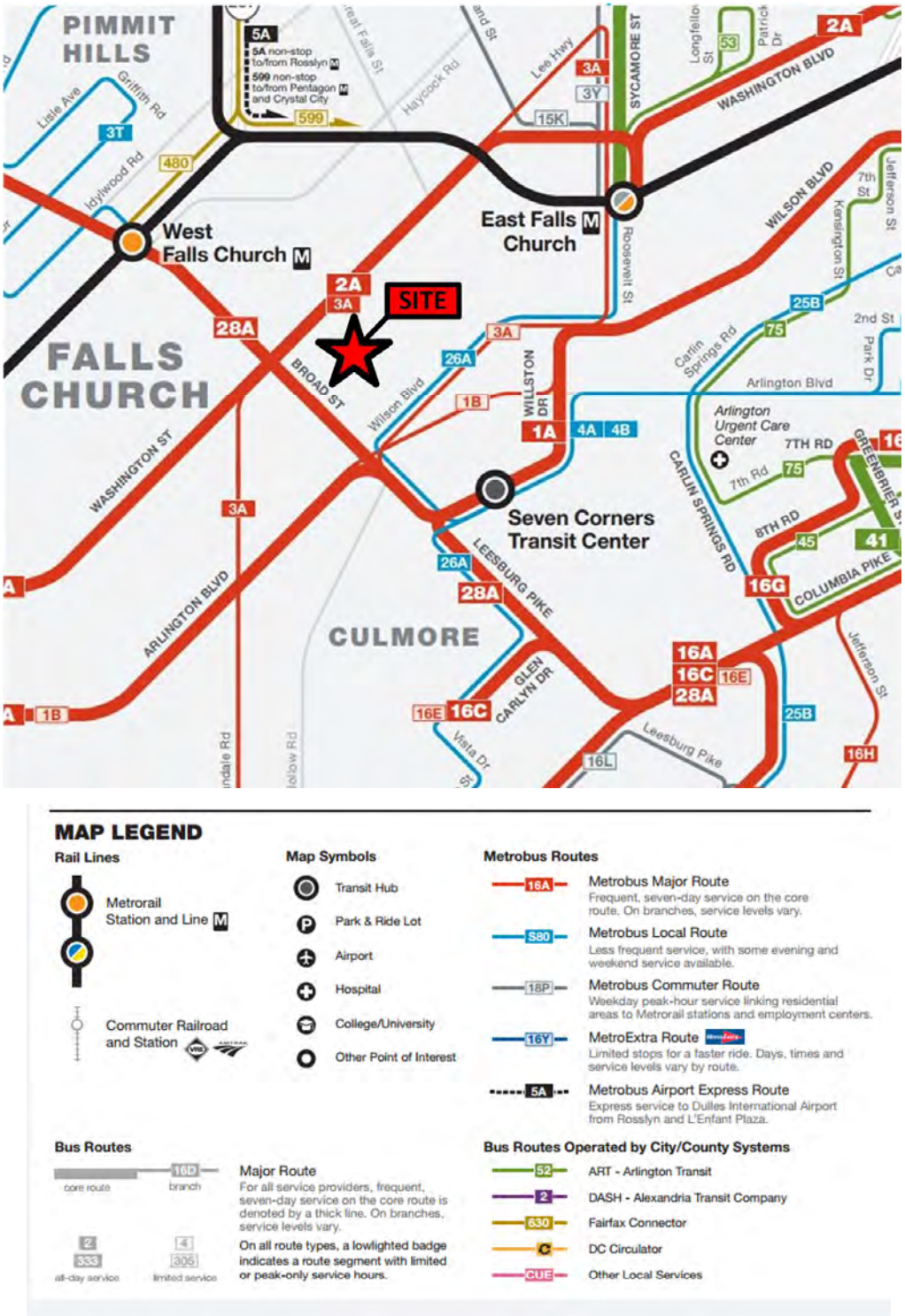

Figure 4: Existing Transit Service

EXISTING CONDITIONS (2019)

Historical Crash Data

Historical crash data was obtained from the Virginia Department of Transportation's (VDOT)'s Crash Analysis Tool for the existing study intersections for a five-year period from September 2014 through August 2019. During the five-year period, a total of 76 crashes were recorded at the nine intersections, as illustrated in Table 2. Of the 76 crashes, approximately 64% were classified as Injury Collisions (IC), while the remaining crashes were classified as Property Damage Only (PDO). No fatalities occurred at the nine study intersections during the five-year study period. It should be noted that the intersection of E. Broad Street and Lawton Street did not have any reported crashes occurring within the five-year study period.

The intersection crash rates were computed for the nine existing study intersections using the following formula and were calculated as crashes per one million entering vehicles (MEV). The approach average daily traffic volumes ($ADT_{approach}$) were derived from calculations based on the existing link ADTs presented in the TIA.

$$Rate_{intersection} = \frac{1{,}000{,}000 * \ \#\ of\ Crashes}{\#\ of\ Years * 365\ \left(\frac{days}{year}\right) * ADT_{approach}}$$

It should be noted that according to the Institute of Transportation Engineers' (ITE's) *Transportation Impact Analysis for Site Development*, a crash rate of 1.0 MEV or higher is an indication that further study is required. A rate over 1.0 MEV does not necessarily mean there is a significant problem at an intersection, but rather it is a threshold used to identify which intersections may have an elevated crash rates due to operational, geometric, or other deficiencies. Additionally, the crash data does not provide detailed location information. In some cases, the crashes were located near an intersection but not necessarily associated with or caused by the intersection.

Based on the crash rates, none of the study intersections were high crash locations.

Table 2: Historical Crash Data Summary (September 2014 through August 2019)

Intersection	Number of Crashes	Number of Property Damage Crashes	Number of Crashes Resulting in Injury	Number of Fatal Crashes	Crash Rate (Crashes per MEV)
Broad Street and Washington Street;	31	12	19	0	0.44
E. Broad Street and Applebee's Entrance/Proposed Site	3	3	0	0	0.08
E. Broad Street and Lawson Street;	0	0	0	0	0.00
Lawton Street and E. Columbia Street;	1	0	1	0	0.14
N. Washington Street and Columbia Street;	20	7	13	0	0.43
N. Washington Street and Great Falls Street;	10	2	8	0	0.30
N. Washington Street and Park Avenue;	7	1	6	0	0.17
N. Washington Street and Park Place;	3	1	2	0	0.08
N. Washington Street and Existing Driveway	1	1	0	0	0.03

A map of the study area showing the recorded crashes that occurred during the study period are illustrated in Figure 5.

Table 3 through Table 10 illustrate the crash data by study intersection. The VDOT crash data is included in Appendix B.

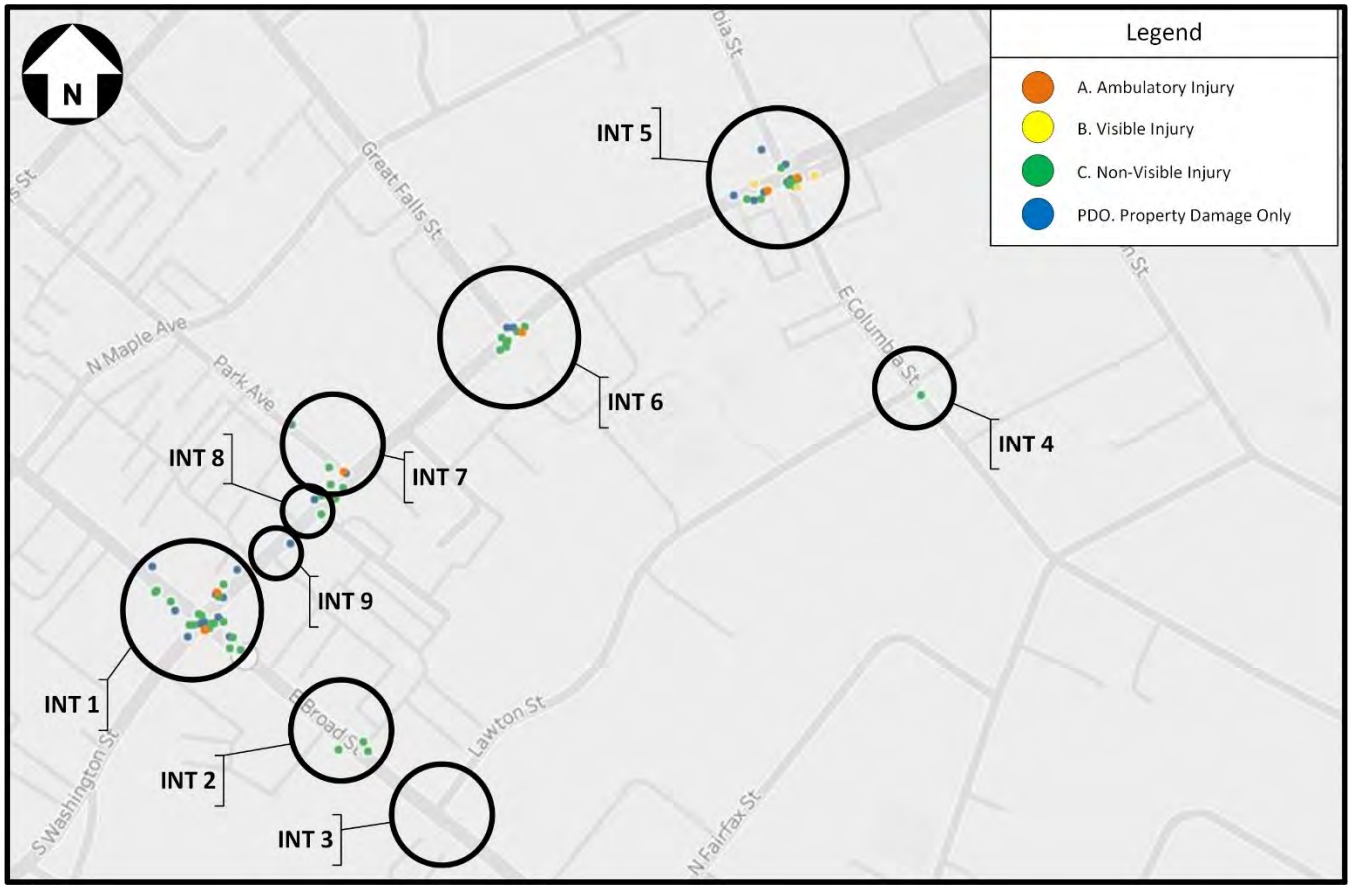

Figure 5: Crash Aerial Map

Table 3: Crash Data Breakdown (Broad Street & Washington Street)

	Crash Data for the Intersection of Broad Street and Washington Street (September 2014 - August 2019)							
	2014	2015	2016	2017	2018	2019	Total	Relative Frequency
Crash Severity								
Fatal Collision								0.00%
Injury Collision	3	1	6	2	6	1	19	61.29%
Type A	*1*		*1*		*1*		*3*	
Type B								
Type C	*2*	*1*	*5*	*2*	*5*	*1*	*16*	
Property Damage Only		4	2	3	2	1	12	38.71%
TOTAL*	3	5	8	5	8	2	31	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash								0.00%
Head-On								0.00%
Sideswipe / Same Direction		1				1	2	6.45%
Sideswipe / Opposite Direction			1				1	3.23%
Rear-End Collision	2	3	3	1	3	1	13	41.94%
Angle Collision	1	1	4	3	3		12	38.71%
Backed Into								0.00%
Pedestrian Collision					1		1	3.23%
Deer/Animal								0.00%
Other				1	1		2	6.45%
TOTAL*	3	5	8	5	8	2	31	100.00%
Other Factors								
Distracted Driver	2	1	3		2		8	25.81%
Alcohol Related**	1						1	3.23%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)			1	1	1		3	9.68%
Speeding			1				1	3.23%
Disregard of Traffic Control Device			1				1	3.23%
Pedestrian Injury***					2		2	N/A
CALCULATED CRASH RATE							***0.44***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Broad Street and Washington Street experienced the highest amount of crashes of the study intersections, with a total of 31 crashes during the five-year study period, as depicted in Table 3. Of the 31 crashes, 19 were classified as "Injury Collision (IC)" and 12 had a severity of "Property Damage Only (PDO)." A total of 13 crashes were angled collisions, 12 were rear-ends, two were sideswipe / same direction, one was sideswipe / opposite direction, one was pedestrian collision, and one was classified as "other."

Of the 31 recorded crashes, 8 were due to distracted driver, one was alcohol-related, one was due to disregard of a traffic control device, 3 crashes occurred during inclement weather (non-dry conditions), two involved pedestrian injury, and one involved speeding.

The crash rate of **0.44** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Table 4: Crash Data Breakdown (Broad Street & Applebee's Entrance/Proposed Site Entrance)

	Crash Data for the Intersection of Broad Street and Applebee's Entrance/Proposed Site Entrance (September 2014 - August 2019)							
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**Total**	**Relative Frequency**
Crash Severity								
Fatal Collision								0.00%
Injury Collision	1				1	1	3	100.00%
Type A								
Type B								
Type C	*1*				*1*	*1*	*3*	
Property Damage Only								0.00%
TOTAL*	1				1	1	3	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash	1						1	33.33%
Head-On								0.00%
Sideswipe / Same Direction								0.00%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision								0.00%
Angle Collision					1	1	2	66.67%
Backed Into								0.00%
Pedestrian Collision								0.00%
Deer/Animal								0.00%
Other								0.00%
TOTAL*	1	0	0	0	1	1	3	100.00%
Other Factors								
Distracted Driver								0.00%
Alcohol Related**								0.00%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)								0.00%
Speeding								0.00%
Disregard of Traffic Control Device								0.00%
Pedestrian Injury***								N/A
CALCULATED CRASH RATE							***0.08***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Broad Street and Applebee's entrance/Proposed Site Entrance experienced a total of 3 crashes during the five-year study period, as depicted in Table 4. All 3 crashes were classified as "Injury Collision (IC)." A majority of crashes (67%) were angled collisions, and one was a fixed object / single-vehicle crash. No other factors were related to the reported crashes.

The crash rate of **0.08** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

As previously noted, the intersection of Broad Street and Lawton Street experienced a total of zero (0) crashes during the five-year study period, and thus was not analyzed further.

Table 5: Crash Data Breakdown (Columbia Street & Lawton Street)

	Crash Data for the Intersection of Columbia Street and Lawton Street (September 2014 - August 2019)							
	2014	2015	2016	2017	2018	2019	Total	Relative Frequency
Crash Severity								
Fatal Collision								0.00%
Injury Collision			1				1	100.00%
Type A								
Type B								
Type C			*1*				*1*	
Property Damage Only								0.00%
TOTAL*			1				1	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash								0.00%
Head-On								0.00%
Sideswipe / Same Direction								0.00%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision			1				1	100.00%
Angle Collision								0.00%
Backed Into								0.00%
Pedestrian Collision								0.00%
Deer/Animal								0.00%
Other								0.00%
TOTAL*	0	0	1	0	0	0	1	100.00%
Other Factors								
Distracted Driver								0.00%
Alcohol Related**								0.00%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)								0.00%
Speeding								0.00%
Disregard of Traffic Control Device								0.00%
Pedestrian Injury***								N/A
CALCULATED CRASH RATE							***0.14***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Columbia Street and Lawton Street experienced one crash during the five-year study period, as depicted in Table 5. The crash was classified as “Injury Collision (IC),” and was a rear-end collision, with no other factors related to the reported crash.

The crash rate of **0.14** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Table 6: Crash Data Breakdown (Washington Street & Columbia Street)

	Crash Data for the Intersection of Washington Street and Columbia Street (September 2014 - August 2019)							
	2014	2015	2016	2017	2018	2019	Total	Relative Frequency
Crash Severity								
Fatal Collision								0.00%
Injury Collision	1	2	1	3	5	1	13	65.00%
Type A				*1*	*1*		*2*	
Type B	*1*				*1*	*1*	*3*	
Type C		*2*	*1*	*2*	*3*		*8*	
Property Damage Only		3	3			1	7	35.00%
TOTAL*	1	5	4	3	5	2	20	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash						1	1	5.00%
Head-On								0.00%
Sideswipe / Same Direction								0.00%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision		3		1	2	1	7	35.00%
Angle Collision	1	1	3	1	2		8	40.00%
Backed Into								0.00%
Pedestrian Collision		1		1	1		3	15.00%
Deer/Animal								0.00%
Other			1				1	5.00%
TOTAL*	1	5	4	3	5	2	20	100.00%
Other Factors								
Distracted Driver	1	2		1	1		5	25.00%
Alcohol Related**			1	1	1		3	15.00%
Work-Zone Related					1		1	5.00%
Inclement Weather (Non-Dry)								0.00%
Speeding								0.00%
Disregard of Traffic Control Device		1	1				2	10.00%
Pedestrian Injury***		1		1	1		3	N/A
CALCULATED CRASH RATE							***0.43***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Washington Street and Columbia Street experienced a total of 20 crashes during the five-year study period, as depicted in Table 6. Of the 20 crashes, 13 were classified as “Injury Collision (IC)” and 7 had a severity of “Property Damage Only (PDO).” A total of 8 crashes were angled collisions, 7 were rear-ends, 3 were pedestrian collisions, one was a fixed object / single-vehicle crash, and one was classified as “other.”

Of the 20 recorded crashes, 5 were due to distracted driver, 2 were due to disregard of a traffic control device, 3 involved pedestrian injury, 3 were alcohol-related, and one was work-zone related.

The crash rate of **0.43** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Table 7: Crash Data Breakdown (Washington Street & Great Falls Street)

	Crash Data for the Intersection of Washington Street and Great Falls Street (September 2014 - August 2019)							
	2014	2015	2016	2017	2018	2019	Total	Relative Frequency
Crash Severity								
Fatal Collision								0.00%
Injury Collision		1	4	2	1		8	80.00%
Type A				*1*			*1*	
Type B								
Type C		*1*	*4*	*1*	*1*		*7*	
Property Damage Only	1				1		2	20.00%
TOTAL*	1	1	4	2	2		10	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash								0.00%
Head-On								0.00%
Sideswipe / Same Direction					1		1	10.00%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision			3	1			4	40.00%
Angle Collision	1	1	1	1	1		5	50.00%
Backed Into								0.00%
Pedestrian Collision								0.00%
Deer/Animal								0.00%
Other								0.00%
TOTAL*	1	1	4	2	2	0	10	100.00%
Other Factors								
Distracted Driver		1	1				2	20.00%
Alcohol Related**								0.00%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)			1				1	10.00%
Speeding								0.00%
Disregard of Traffic Control Device								0.00%
Pedestrian Injury***								N/A
CALCULATED CRASH RATE							***0.30***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Washington Street and Great Falls Street experienced a total of 10 crashes during the five-year study period, as depicted in Table 7. Of the 10 crashes, 8 were classified as “Injury Collision (IC)” and two had a severity of “Property Damage Only (PDO).” A total of 5 crashes were angled collisions, 4 were rear-ends, and there was one sideswipe / same direction.

Of the 10 recorded crashes, two were due to distracted driver, and one crash occurred during inclement weather (non-dry conditions).

The crash rate of **0.30** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Table 8: Crash Data Breakdown (Washington Street & Park Avenue)

	Crash Data for the Intersection of Washington Street and Park Avenue (September 2014 - August 2019)							
	2014	2015	2016	2017	2018	2019	Total	Relative Frequency
Crash Severity								
Fatal Collision								0.00%
Injury Collision			2	1	3		6	85.71%
Type A					*1*		*1*	
Type B								
Type C			*2*	*1*	*2*		*5*	
Property Damage Only			1				1	14.29%
TOTAL*			3	1	3		7	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash					1		1	14.29%
Head-On								0.00%
Sideswipe / Same Direction					1		1	14.29%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision			1		1		2	28.57%
Angle Collision			1	1			2	28.57%
Backed Into			1				1	14.29%
Pedestrian Collision								0.00%
Deer/Animal								0.00%
Other								0.00%
TOTAL*	0	0	3	1	3	0	7	100.00%
Other Factors								
Distracted Driver			1		1		2	28.57%
Alcohol Related**								0.00%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)				1			1	14.29%
Speeding								0.00%
Disregard of Traffic Control Device			1				1	14.29%
Pedestrian Injury***								N/A
CALCULATED CRASH RATE							***0.17***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Washington Street and Park Avenue experienced a total of 7 crashes during the five-year study period, as depicted in Table 8. Of the 7 crashes, 6 were classified as “Injury Collision (IC)” and 1 had a severity of “Property Damage Only (PDO).” A total of two crashes were angled collisions, two were rear-ends, and one was a fixed object / single-vehicle crash, one was sideswipe / same direction, and one involved being backed into.

Of the 7 recorded crashes, two were due to distracted driver, one crash occurred during inclement weather (non-dry conditions), and one was due to disregard of a traffic control device.

The crash rate of **0.17** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Table 9: Crash Data Breakdown (Washington Street & Park Place)

	Crash Data for the Intersection of Washington Street and Park Place (September 2014 - August 2019)							
	2014	2015	2016	2017	2018	2019	Total	Relative Frequency
Crash Severity								
Fatal Collision								0.00%
Injury Collision	1	1					2	66.67%
Type A								
Type B								
Type C	*1*	*1*					*2*	
Property Damage Only		1					1	33.33%
TOTAL*	1	2					3	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash								0.00%
Head-On								0.00%
Sideswipe / Same Direction								0.00%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision	1	2					3	100.00%
Angle Collision								0.00%
Backed Into								0.00%
Pedestrian Collision								0.00%
Deer/Animal								0.00%
Other								0.00%
TOTAL*	1	2	0	0	0	0	3	100.00%
Other Factors								
Distracted Driver		1					1	33.33%
Alcohol Related**								0.00%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)								0.00%
Speeding								0.00%
Disregard of Traffic Control Device								0.00%
Pedestrian Injury***								N/A
CALCULATED CRASH RATE							***0.08***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Washington Street and Park Place experienced a total of 3 crashes during the five-year study period, as depicted in Table 9. Of the 3 crashes, two were classified as “Injury Collision (IC)” and one had a severity of “Property Damage Only (PDO).” All reported crashes were rear-end collisions. Of the 3 recorded crashes, one was due to distracted driver.

The crash rate of **0.08** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Table 10: Crash Data Breakdown (Washington Street & Existing Driveway)

	Crash Data for the Intersection of Washington Street and Driveway (September 2014 - August 2019)							
	2014	2015	2016	2017	2018	2019	Total	Relative Frequency
Crash Severity								
Fatal Collision								0.00%
Injury Collision								0.00%
Type A								
Type B								
Type C								
Property Damage Only			1				1	100.00%
TOTAL*			1				1	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash								0.00%
Head-On								0.00%
Sideswipe / Same Direction			1				1	100.00%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision								0.00%
Angle Collision								0.00%
Backed Into								0.00%
Pedestrian Collision								0.00%
Deer/Animal								0.00%
Other								0.00%
TOTAL*	0	0	1	0	0	0	1	100.00%
Other Factors								
Distracted Driver								0.00%
Alcohol Related**								0.00%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)								0.00%
Speeding								0.00%
Disregard of Traffic Control Device								0.00%
Pedestrian Injury***								N/A
CALCULATED CRASH RATE							***0.03***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The intersection of Washington Street and Existing Driveway experienced one crash during the five-year study period, as depicted in Table 10. The crash one had a severity of “Property Damage Only (PDO),” and was a sideswipe / same direction, with no other factors related to the reported crash.

The crash rate of **0.03** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Intersection of Broad Street and Washington Street Safety Assessment, 2009-2014

In addition to the historical crash data taken for the nine study intersections from September 2014 to August 2019, historical crash data was also taken for the intersection of Broad Street and Washington Street from September 2009 to August 2014 to better illustrate the data before and after the 301 W Broad Street Development, located near the Broad Street and Washington Street redevelopment property, as requested by City staff.

The intersection experienced a total of 27 crashes from September 2009 to August 2014, as depicted in Table 11. Of the 27 crashes, 22 (81.5%) were classified as “Injury Collision (IC)” and 4 had a severity of “Property Damage Only (PDO).” A total of 9 crashes were angled collisions, 9 were rear-ends, 4 were a fixed object / single-vehicle crash, two were head-on collisions, one was sideswipe / same direction, one involved a pedestrian collision, and one was classified as “other.”

Of the 10 recorded crashes, four were due to distracted driver, four occurred during inclement weather (non-dry conditions), four were due to disregard of a traffic control device, two were alcohol related, one involved speeding, and one involved a pedestrian injury.

The crash rate of **0.32** crashes per MEV is less than 1.0 and therefore, does not illustrate an elevated crash rate.

Table 11: Crash Data Summary (Intersection of Broad Street & Washington Street - Sept. 2009 to Aug. 2014)

	Crash Data for the Intersection of Broad Street and Washington Street (September 2009 - August 2014)							
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**	**Relative Frequency**
Crash Severity								
Fatal Collision		1					1	3.70%
Injury Collision	1	5	3	1	8	4	22	81.48%
Type A		*2*	*2*		*2*	*1*	*7*	
Type B						*1*	*1*	
Type C					*6*	*2*	*8*	
Property Damage Only		2	1			1	4	14.81%
TOTAL*	1	8	4	1	8	5	27	100.00%
Crash Type								
Fixed Object/ Single-Vehicle Crash		1		1	2		4	14.81%
Head-On		1	1				2	7.41%
Sideswipe / Same Direction						1	1	3.70%
Sideswipe / Opposite Direction								0.00%
Rear-End Collision		5	1		1	2	9	33.33%
Angle Collision	1	1	2		5		9	33.33%
Backed Into								0.00%
Pedestrian Collision						1	1	3.70%
Deer/Animal								0.00%
Other						1	1	3.70%
TOTAL*	1	8	4	1	8	5	27	100.00%
Other Factors								
Distracted Driver					3	1	4	14.81%
Alcohol Related**					1	1	2	7.41%
Work-Zone Related								0.00%
Inclement Weather (Non-Dry)		1	1		2		4	14.81%
Speeding						1	1	3.70%
Disregard of Traffic Control Device					4		4	14.81%
Pedestrian Injury***						1	1	N/A
CALCULATED CRASH RATE							***0.32***	***Crashes per MEV***

*It should be noted that an intersection radius of 250 ft. feet was used in this analysis. Crashes also thought to be caused by the intersection may have been added based on the description of the crash and engineering judgement.

**Instances where the event was classified as "Unknown", "Not Known Whether Impaired", "Ability Not Impaired" were classified as alcohol related to provide a more conservative analysis.

*** Pedestrian injuries are based on the number of pedestrians injured and may not be directly be related to the number of crash incidences (i.e., if one crash occurred injuring two pedestrians, the table would show a "2" instead of a "1").

The ten-year crash history illustrates that, during the recent number of years, there has been an average of 5 crashes per year at the intersection of Broad Street and Washington Street both before and after the completion of 301 W Broad Street development. Given the fairly constant average number of crashes before and after the construction of the development, and the fact that injury collisions have dropped by 20% between the two sets of five-year history, it can be anticipated that the redevelopment will not have a detrimental impact on traffic operations from a safety standpoint. The number of crashes in the complete years of the ten-year crash history is depicted in Figure 6.

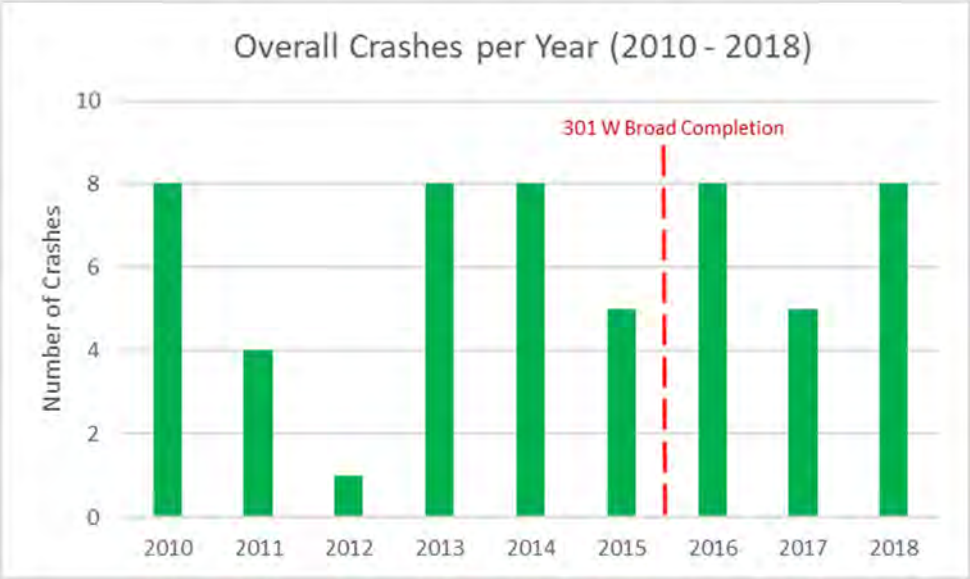

Figure 6: Full Year Crash History

Existing Traffic Volumes

In order to determine the weekday and Saturday peak hour turning movement traffic volumes, traffic counts were conducted at the study intersections on Saturday, January 31, 2015 during the midday peak period and on Tuesday, February 3, 2015 during the morning and afternoon peak periods. Based on VDOT's published historical traffic counts, traffic volumes on Broad Street and Washington Street in the vicinity of the project have not increased since 2015. Hence, no growth was applied to the 2015 counts at study intersections to develop 2019 baseline volumes. Analysis of the traffic data found the following peak hours:

- AM Peak Hour: 8:30 AM to 9:30 AM
- PM Peak Hour: 4:45 PM to 5:45 PM
- Saturday Peak Hour: 12:30 PM to 1:30 PM

The counts were balanced at two locations in the study area. The first area is along E. Broad Street between the E. Broad Street/Site Driveway and the E. Broad Street/Lawton Street intersections. The second area that is balanced is along N. Washington Street between the N. Washington Street/Park Avenue and the N. Washington Street/E. Broad Street intersections. The existing balanced peak hour traffic volumes for the intersections contained within the study area are shown in Figure 7. The existing traffic counts are contained in Appendix C.

Existing Conditions Capacity Analysis

Intersection capacity analyses were performed for the existing conditions at the study area intersections during the weekday morning and afternoon peak hours and the Saturday peak hour. Synchro 10 was used to analyze the study intersections with the results based on the Highway Capacity Manual (HCM 2000) methodology. The existing peak hour factors acquired from the traffic counts and restricted to within the range of 0.85 to 1.00, were used in the analysis along with the default heavy vehicle percentage of 2%. Synchro files were created based on current lane configurations and traffic signal timing information obtained from the City of Falls Church. The results of the intersection capacity analyses are presented in Table 12, and are expressed in level of service (LOS) and delay (seconds per vehicle) per lane group. A brief description of the level

of service is included in Appendix D. The intersections, approaches, and lane groups that operate at LOS E or F are shown in red. Lane groups where the queue length exceeds storage are also shown in red. The 95th and 50th percentile queue lengths are expressed in feet. The detailed analysis worksheets are contained in Appendix E.

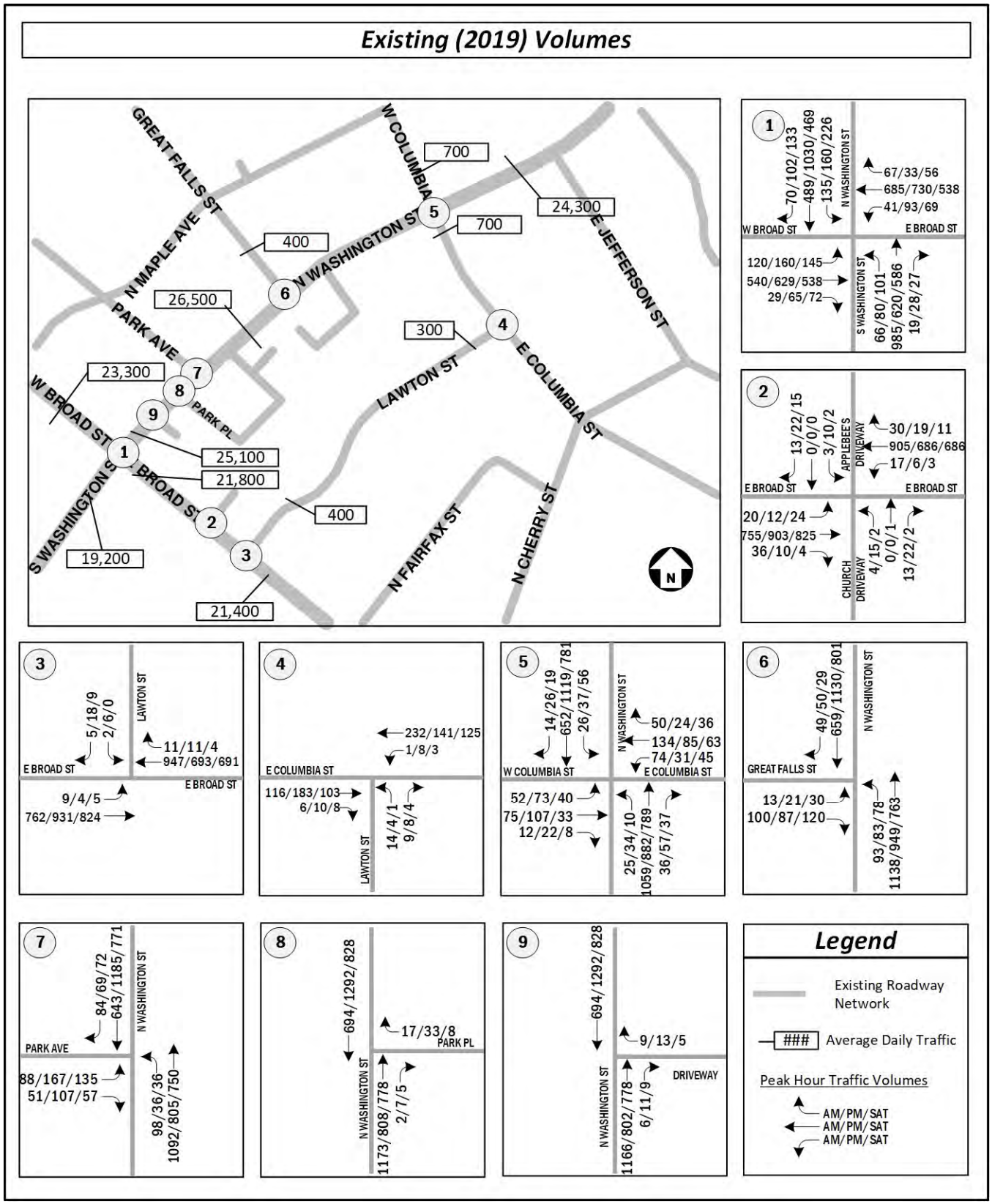

Figure 7: Existing (2019) Traffic Volumes

Table 12: Existing (2019) Intersection Capacity Analysis

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak				PM Peak				SAT Peak			
			50th Queue	95th Queue	LOS	Delay	50th Queue	95th Queue	LOS	Delay	50th Queue	95th Queue	LOS	Delay
1	E./W. Broad St & N./S. Washington St													
	Overall Intersection (Signalized)				**C**	**29.1**			**C**	**29.7**			**C**	**32.1**
	Eastbound Approach				*C*	*34.6*			*C*	*22.2*			*C*	*26.9*
	Eastbound Left	*275*	58	m#110	*D*	*37.0*	31	#126	*C*	*33.6*	56	125	*B*	*19.0*
	Eastbound Thru/Right	*450*	181	167	*C*	*34.2*	176	178	*B*	*19.5*	177	304	*C*	*28.7*
	Westbound Approach				*C*	*25.7*			*C*	*29.6*			*C*	*34.5*
	Westbound Left	255	8	m18	B	12.9	27	50	B	16.3	26	66	C	24.4
	Westbound Thru/Right	400	210	260	C	26.4	255	#322	C	31.2	185	323	D	35.7
	Northbound Approach				*C*	*33.7*			*C*	*33.4*			*D*	*36.6*
	Northbound Left	345	18	m47	B	19.8	37	m56	C	25.3	38	88	C	24.0
	Northbound Thru/Right	580	193	#428	C	34.6	226	291	C	34.4	192	333	D	38.6
	Southbound Approach				C	20.2			C	32.6			C	31.2
	Southbound Left	190	40	100	C	22.6	27	97	B	18.6	91	185	C	26.8
	Southbound Thru/Right	370	147	184	B	19.7	141	#506	C	34.5	178	302	C	32.8
2	E. Broad Street/Driveway													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach													
	Eastbound Left	75	*n/a*	2	B	10.4	*n/a*	1	A	9.4	*n/a*	2	A	9.4
	Westbound Approach													
	Westbound Left	165	*n/a*	2	A	9.1	*n/a*	1	A	9.5	*n/a*	0	A	9.3
	Northbound Approach				*C*	*15.5*			*C*	*21.7*			*D*	*26.1*
	Northbound Left/Thru/Right	25	*n/a*	4	C	15.5	*n/a*	14	C	21.7	*n/a*	2	D	26.1
	Southbound Approach				*C*	*17.6*			*C*	*17.7*			*B*	*13.1*
	Southbound Left/Thru/Right	25	*n/a*	4	C	17.6	*n/a*	9	C	17.7	*n/a*	3	B	13.1
3	Broad Street and Lawton Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach													
	Eastbound Left/Thru	165	*n/a*	1	A	0.5	*n/a*	0	A	0.2	*n/a*	0	A	0.2
	Southbound Approach				*B*	*14.3*			*B*	*13.9*			*B*	*10.7*
	Southbound Left/Right	1400	*n/a*	2	B	14.3	*n/a*	5	B	13.9	*n/a*	1	B	10.7
4	Lawton Street & Columbia Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Westbound Approach	*440*	*n/a*	*0*	*A*	*0.0*	*n/a*	*1*	*A*	*0.5*	*n/a*	*0*	*A*	*0.2*
	Northbound Approach				*B*	*10.6*			*B*	*10.2*			*A*	*9.1*
	Northbound Left/Right	1400	*n/a*	3	B	10.6	*n/a*	2	B	10.2	*n/a*	0	A	9.1
5	N Washington Street/W Columbia Street/E Columbia													
	Overall Intersection (Signalized)				**B**	**17.2**			**C**	**21.4**			**C**	**22.4**
	Eastbound Approach				*C*	*29.0*			*C*	*32.8*			*B*	*17.9*
	Eastbound Left/Thru/Right	370	69	123	C	29.0	111	184	C	32.8	27	68	B	17.9
	Westbound Approach				*C*	*34.0*			*C*	*29.3*			*B*	*19.1*
	Westbound Left/Thru/Right	485	137	221	C	34.0	70	126	C	29.3	46	107	B	19.1
	Northbound Approach				*B*	*12.1*			*B*	*16.2*			*C*	*25.6*
	Northbound Left	70	3	m8	A	8.5	7	m11	A	8.1	3	11	B	17.2
	Northbound Thru/Right	640	147	286	B	12.1	288	306	B	16.5	213	290	C	25.7
	Southbound Approach				*B*	*17.0*			*C*	*22.8*			*C*	*20.3*
	Southbound Left	125	7	18	B	14.2	10	24	B	13.0	16	35	B	14.7
	Southbound Thru/Right	475	148	196	B	17.1	335	424	C	23.1	153	265	C	20.7
6	N Washington Street/Great Falls													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach				*B*	*11.4*			*C*	*15.8*			*B*	*13.5*
	Eastbound Left/Right	440	n/a	16	B	11.4	n/a	25	C	15.8	n/a	27	B	13.5
	Northbound Approach													
	Northbound Thru/Left	425	n/a	8	A	2.8	*n/a*	10	A	3.4	*n/a*	7	A	2.8
7	N Washington Street/Park Avenue													
	Overall Intersection (Signalized)				**A**	**7.2**			**A**	**7.1**			**A**	**8.9**
	Eastbound Approach				*D*	*42.7*			*D*	*39.5*			*C*	*20.1*
	Eastbound Left	360	65	104	D	42.7	104	168	D	42.4	37	87	C	20.1
	Eastbound Right	360	0	31	D	39.6	0	45	D	35.1	0	24	B	17.9
	Northbound Approach				*A*	*5.9*			*A*	*4.5*			*A*	*4.2*
	Northbound Thru/Left	370	201	463	A	5.9	52	92	A	4.5	51	97	A	4.2
	Southbound Approach				*A*	*2.6*			*A*	*1.7*			*B*	*10.7*
	Southbound Thru/Right	425	48	83	A	2.6	33	41	A	1.7	98	167	B	10.7
8	N Washington Street & Park Place													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Westbound Approach				*A*	*9.8*			*A*	*9.2*			*A*	*9.0*
	Westbound Right	315	*n/a*	2	A	9.8	*n/a*	3	A	9.2	*n/a*	1	A	9.0
9	N Washington Street & Driveway													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Westbound Approach				*A*	*9.7*			*A*	*9.1*			*A*	*9.0*
	Westbound Right	105	*n/a*	1	A	9.7	*n/a*	1	A	9.1	*n/a*	1	A	9.0

Notes: *N/A – Not Applicable*
 # – 95th percentile volume exceeds capacity; queue may be longer. Queue shown is the maximum after two cycles.
m – Volume for 95th percentile queue is metered by upstream signal.
~ – Volume exceeds capacity, queue can be longer. Queue shown is maximum after two cycles.

Consistent with the scoping agreement, it is desirable to achieve a LOS D or better for each approach of an intersection. If an acceptable level of service cannot be achieved, then it is desirable for the future with development conditions to be no worse than the network without the new development. A description of the various levels of service is included in Appendix D.

All of the study intersections' approaches currently operate at acceptable levels of service during the weekday morning, afternoon, and Saturday peak hours.

Based on the queuing analysis, peak hour queue lengths currently exceed the storage lengths in one or more of the lane groups at the following intersections during one or more of the peak periods:

- Broad Street and Washington Street (PM only)
- N. Washington Street and Park Avenue (AM only)

The results of the intersection capacity analyses for the existing conditions are shown in Figure 8.

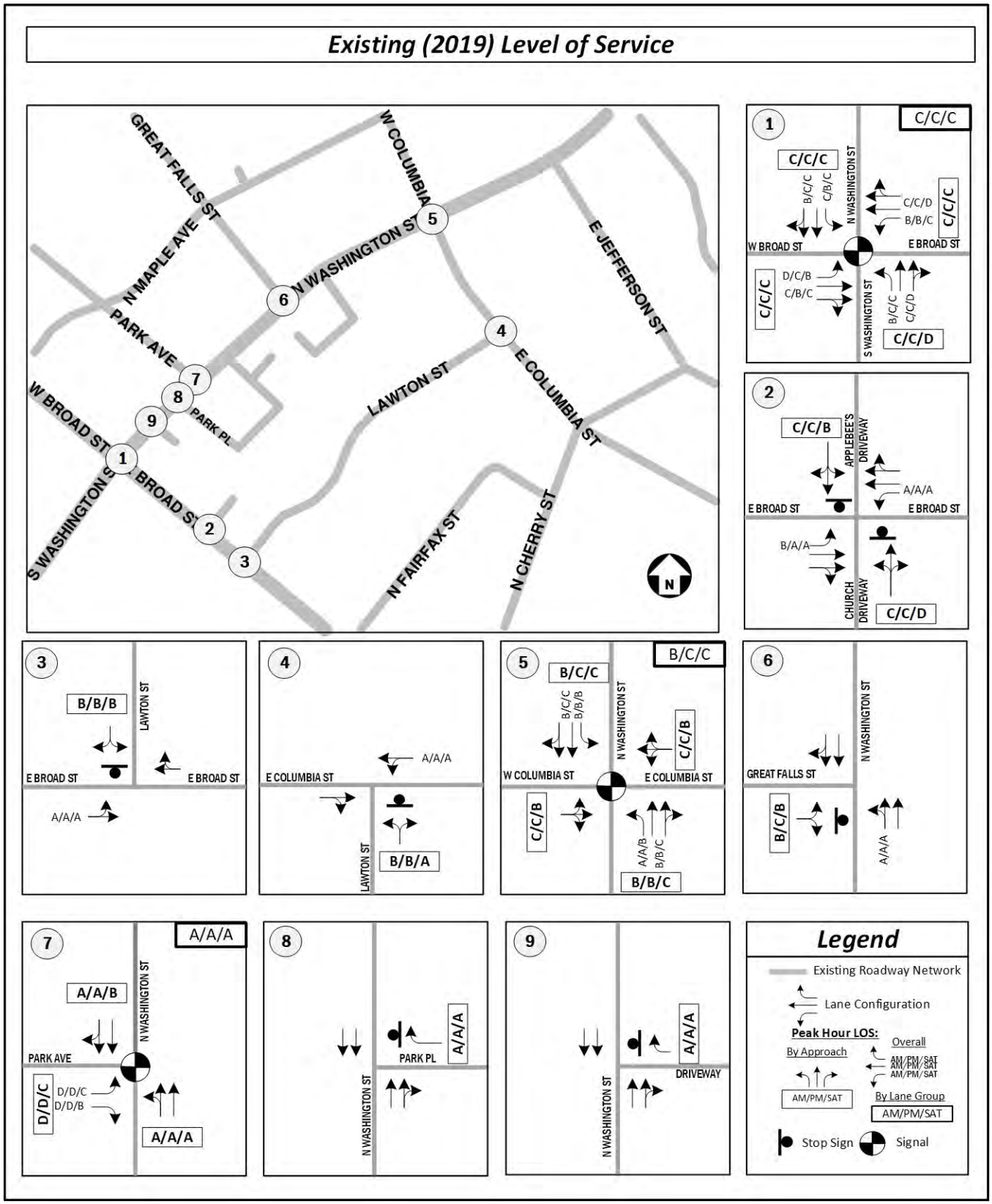

Figure 8: Existing (2019) Level of Service

FUTURE CONDITIONS WITHOUT DEVELOPMENT (2024)

Future without Development Traffic Volumes

The proposed Washington Street and Broad Street redevelopment is anticipated to be complete in 2024. Based on historic traffic counts published by VDOT, area traffic volumes have been stable in recent years. However, per the request of City staff, a growth rate of 0.15% compounded annually over a four-year period, totaling 0.6% growth of the existing volumes, was applied to all existing turning movement volumes at the study intersections to account for future conditions.

As mentioned previously, traffic counts at the study intersections were conducted in 2015. At the time the 301 W. Broad Street redevelopment was under construction. Since then, the development has been completed and is currently operational. However, traffic generated by the development was not included in the traffic counts, and was hence included as a background development. This redevelopment consists of one multi-use building featuring an approximately 60,000 square foot supermarket, 282 apartments, and 3,470 square feet of ground floor retail. The associated Traffic Impact Study, prepared by Gorove/Slade and dated January 23, 2013, was conducted assuming a 60,883 square foot supermarket, 297 apartments, and 4,011 square feet of ground floor retail. The traffic assignments from the 301. W. Broad Street study are included in all future conditions as a background development. The trips assignment as utilized in the 2013 TIS are included in Appendix F. As there are currently no road improvements being constructed at the study intersections, no changes to the lane configurations were assumed in the analysis of future scenarios. Additionally, there are no planned funded road improvements within the study area.

The volumes for Future without Development conditions are illustrated in Figure 9.

Future without Development Capacity Analysis

Intersection capacity analyses were performed for the future conditions without the proposed development at the intersections contained within the study area during the weekday morning and afternoon peak hours, as well as the Saturday peak hour. *Synchro 10* was used to analyze the study intersections with the results based on the Highway Capacity Manual (HCM 2000) methodology. The default peak hour factor of 0.92 has been used in the analysis. Heavy vehicle percentages, lane widths, road grades, and number of bus blockages per hour were kept the same as the existing conditions. The capacity and queuing analysis results are shown in Table 13. The detailed analysis worksheets are contained in Appendix G.

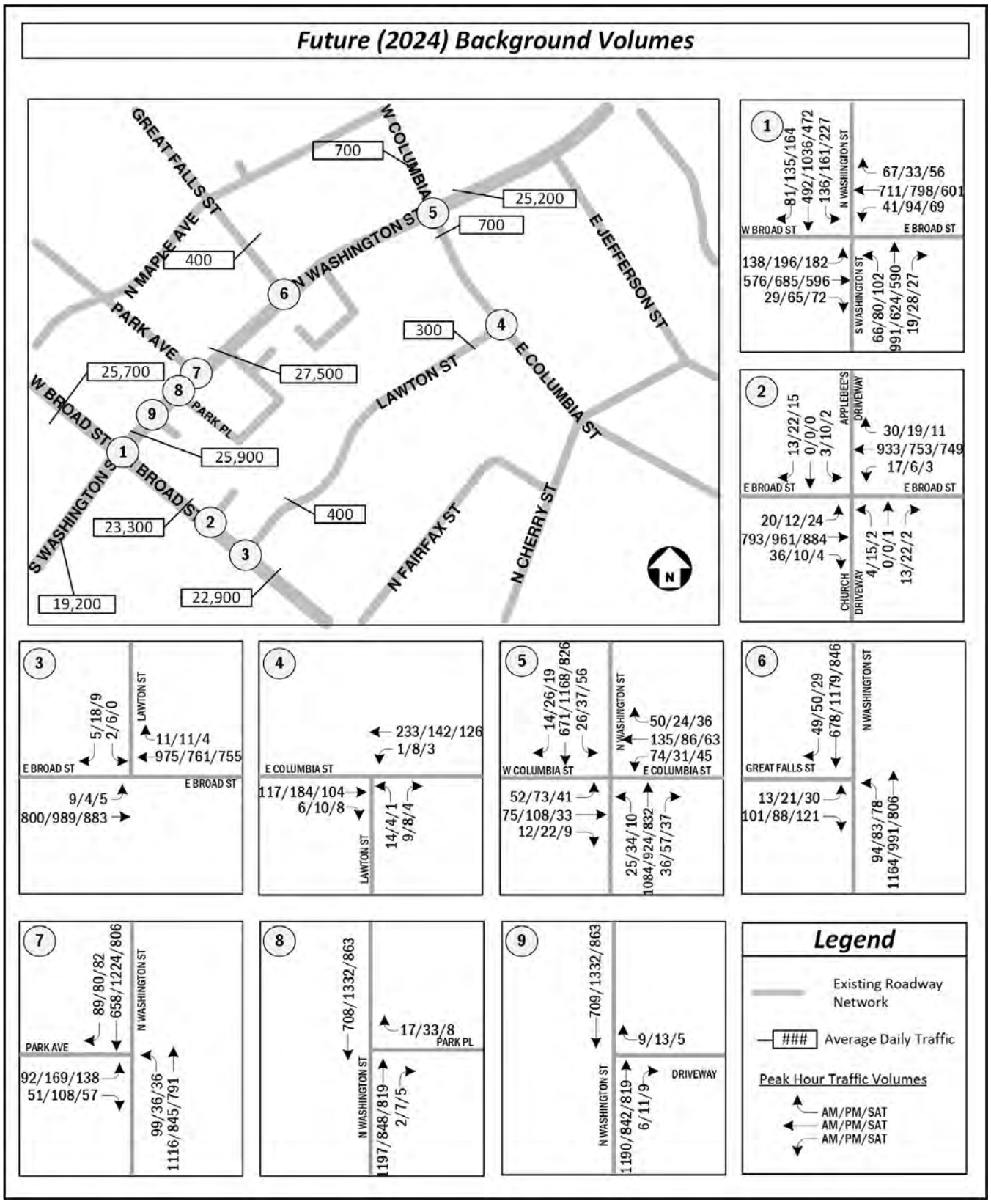

Figure 9: Future without Development (2024) Traffic Volumes

Table 13: Future without Development (2024) Intersection Capacity Analysis

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak 50th Queue	AM Peak 95th Queue	AM Peak LOS	AM Peak Delay	PM Peak 50th Queue	PM Peak 95th Queue	PM Peak LOS	PM Peak Delay	SAT Peak 50th Queue	SAT Peak 95th Queue	SAT Peak LOS	SAT Peak Delay
1	E./W. Broad St & N./S. Washington St													
	Overall Intersection (Signalized)				**C**	**29.1**			**D**	**35.7**			**C**	**34.8**
	Eastbound Approach				*C*	*29.7*			*C*	*28.3*			*C*	*27.4*
	Eastbound Left	*275*	*32*	*m#154*	*D*	*43.1*	*57*	*#214*	*E*	*61.3*	*77*	*158*	*C*	*21.2*
	Eastbound Thru/Right	*450*	*77*	*170*	*C*	*26.6*	*242*	*195*	*B*	*19.7*	*209*	*344*	*C*	*29.1*
	Westbound Approach				*C*	*30.2*			*D*	*37.7*			*D*	*37.9*
	Westbound Left	255	8	M18	B	14.2	30	51	B	17.7	27	67	C	25.9
	Westbound Thru/Right	400	240	317	C	31.1	282	#398	D	39.6	228	373	D	39.1
	Northbound Approach				*C*	*34.0*			*D*	*36.0*			*D*	*40.1*
	Northbound Left	345	19	m47	B	19.8	37	m71	C	29.5	43	96	C	26.7
	Northbound Thru/Right	580	195	#435	C	34.9	228	296	D	36.8	215	353	D	42.3
	Southbound Approach				B	19.7			D	39.6			D	35.2
	Southbound Left	190	37	98	C	21.7	31	98	B	19.2	104	200	C	31.3
	Southbound Thru/Right	370	153	186	B	19.2	178	#540	D	42.4	212	342	D	36.6
2	E. Broad Street/Driveway													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Eastbound Left	75	*n/a*	2	B	10.6	*n/a*	1	A	9.7	*n/a*	3	A	9.7
	Westbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Westbound Left	165	*n/a*	2	A	9.2	*n/a*	1	A	9.7	*n/a*	0	A	9.5
	Northbound Approach				*C*	*16.1*			*C*	*24.4*			*D*	*29.2*
	Northbound Left/Thru/Right	25	*n/a*	4	C	16.1	*n/a*	16	C	24.4	*n/a*	3	D	29.2
	Southbound Approach				*C*	*18.3*			*C*	*19.6*			*B*	*13.7*
	Southbound Left/Thru/Right	25	*n/a*	5	C	18.3	*n/a*	10	C	19.6	*n/a*	3	B	13.7
3	Broad Street and Lawton Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach				*A*	*0.2*			*A*	*0.1*			*A*	*0.1*
	Eastbound Left/Thru	165	*n/a*	1	A	0.5	*n/a*	0	A	0.2	*n/a*	0	A	0.2
	Southbound Approach				*B*	*14.7*			*B*	*14.8*			*B*	*10.5*
	Southbound Left/Right	1400	*n/a*	1	B	14.7	*n/a*	5	B	14.8	*n/a*	1	B	10.5
4	Lawton Street & Columbia Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Westbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Westbound Left	*440*	*n/a*	*0*	*A*	*0.0*	*n/a*	*1*	*A*	*0.5*	*n/a*	*0*	*A*	*0.2*
	Northbound Approach				*B*	*10.3*			*A*	*9.9*			*A*	*9.1*
	Northbound Left/Right	1400	*n/a*	3	B	10.3	*n/a*	1	A	9.9	*n/a*	0	A	9.1
5	N Washington Street/W Columbia Street/E Columbia Street													
	Overall Intersection (Signalized)				**B**	**16.6**			**C**	**22.1**			**C**	**22.8**
	Eastbound Approach				*C*	*29.0*			*C*	*32.8*			*B*	*18.6*
	Eastbound Left/Thru/Right	370	69	123	C	29.0	112	184	C	32.8	29	71	B	18.6
	Westbound Approach				*C*	*34.1*			*C*	*29.4*			*B*	*19.8*
	Westbound Left/Thru/Right	485	138	222	C	34.1	71	126	C	29.4	49	111	B	19.8
	Northbound Approach				*B*	*10.7*			*B*	*16.9*			*C*	*26.0*
	Northbound Left	70	3	m7	A	6.6	7	m13	A	9.4	3	11	B	17.0
	Northbound Thru/Right	640	168	248	B	10.8	294	335	B	17.1	228	307	C	26.1
	Southbound Approach				*B*	*17.1*			*C*	*23.8*			*C*	*20.5*
	Southbound Left	125	7	18	B	14.4	10	24	B	13.3	16	35	B	14.9
	Southbound Thru/Right	475	*154*	203	B	17.2	*360*	453	C	24.1	*165*	283	B	20.9
6	N Washington Street/Great Falls Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach				*B*	*11.7*			*C*	*16.2*			*B*	*13.6*
	Eastbound Left/Right	*440*	*n/a*	16	*B*	*11.7*	*n/a*	26	*C*	*16.2*	*n/a*	27	*B*	*13.6*
	Northbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Northbound Thru/Left	425	*n/a*	9	A	2.8	*n/a*	10	A	3.4	*n/a*	7	A	2.8
7	N Washington Street/Park Avenue													
	Overall Intersection (Signalized)				**A**	**6.4**			**A**	**7.2**			**A**	**9.0**
	Eastbound Approach				*D*	*46.1*			*D*	*39.5*			*C*	*20.5*
	Eastbound Left	360	*61*	*109*	D	48.8	*106*	*169*	D	42.4	*38*	*91*	C	21.5
	Eastbound Right	360	0	34	D	41.1	0	45	D	35.1	0	25	B	18.0
	Northbound Approach				*A*	*4.3*			*A*	*5.1*			*A*	*4.3*
	Northbound Thru/Left	370	105	m112	A	4.3	71	m107	A	5.1	55	106	A	4.3
	Southbound Approach				*A*	*2.3*			*A*	*1.8*			*B*	*11.0*
	Southbound Thru/Right	425	42	90	A	2.3	33	41	A	1.8	106	180	B	11.0

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak				PM Peak				SAT Peak			
			50th Queue	95th Queue	LOS	Delay	50th Queue	95th Queue	LOS	Delay	50th Queue	95th Queue	LOS	Delay
8	N Washington Street & Park Place													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Westbound Approach				*A*	*9.8*			*A*	*9.2*			*A*	*9.0*
	Westbound Right	315	n/a	2	A	9.8	n/a	3	A	9.2	n/a	1	A	9.0
9	N Washington Street & Driveway													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Westbound Approach				*A*	*9.7*			*A*	*9.1*			*A*	*9.0*
	Westbound Right	105	*n/a*	1	A	9.7	n/a	1	A	9.1	n/a	0	A	9.0

Notes: *N/A – Not Applicable*
 # – 95th percentile volume exceeds capacity; queue may be longer. Queue shown is the maximum after two cycles.
m – Volume for 95th percentile queue is metered by upstream signal.
~ – Volume exceeds capacity, queue can be longer. Queue shown is maximum after two cycles.

Most of the study intersections' approaches will continue to operate at acceptable levels of service during the weekday morning, weekday afternoon, and Saturday peak hours. The eastbound left movement at the Broad Street/Washington Street intersection would operate at LOS E conditions during the PM peak hours.

Based on the queuing analysis, peak hour queue lengths will continue to exceed the storage length in one or more of the lane groups at the following intersection during one or more of the peak periods:

- Broad Street and Washington Street (PM and Saturday)

The minimal improvements that occurred in the delay results at some of the study intersections' approaches and lane groups, when compared to the delay results of the existing conditions, are attributed to the use of existing peak hour factors (by approach) in the existing conditions; whereas the default peak hour factor of 0.92 was used in both future scenarios. The use of the peak hour factor in this way was agreed upon in the scoping document and is standard industry practice.

The results of the intersection capacity analyses for the future without development conditions are shown in Figure 10.

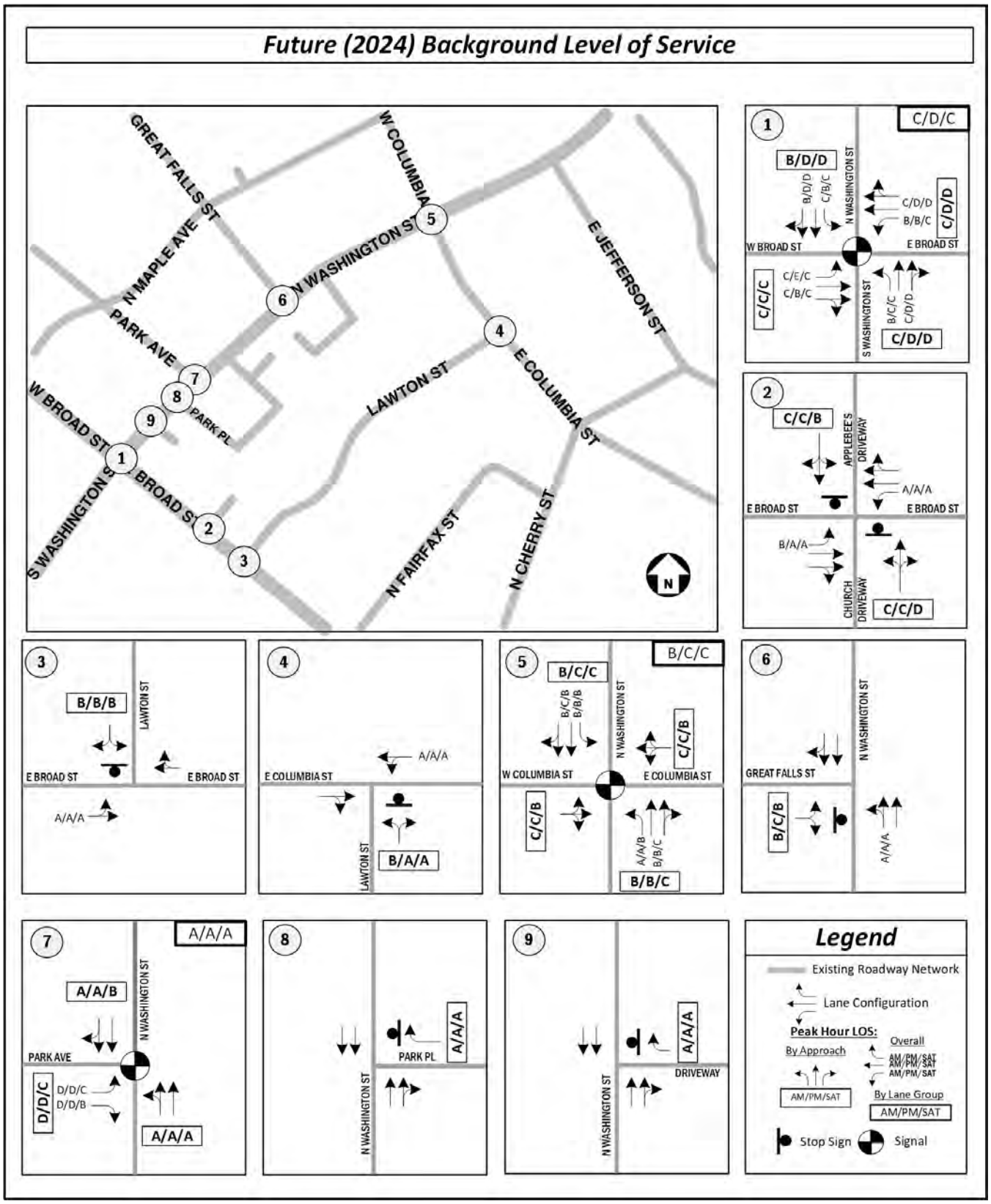

Figure 10: Future without Development (2024) Level of Service

TRIP GENERATION

In order to calculate the trip generation for the proposed redevelopment and to be consistent with the previous traffic studies for the site, the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 10th Edition was used to determine the trips into and out of the Broad & Washington site for the weekday morning, afternoon, and Saturday peak hours, as well as the typical weekday daily and Saturday (24-hour) trips to the site. To account for the synergy between the residential and retail land uses, a 5%, 10%, 15%, 10% internal capture reduction was applied to the weekday AM, PM, Daily, and Saturday site generated trips, respectively, as allowed per VDOT Chapter 870 guidelines. This reduction was calculated based on the site's residential trips, rather than the retail, because it is lesser trip generator of the two land uses. As agreed upon at the scoping meeting with City of Falls Church staff and as allowed per VDOT Chapter 870 guidelines, 36% of the new retail trips generated were assumed to be pass-by trips in order to recognize drivers already on the adjacent streets that will enter from the existing stream of traffic, and then continue in their original path after exiting the site. This rate represents the average pass-by trip percentage for the supermarket land use according to the ITE Trip Generation Manual, 10th Edition. The proposed Broad & Washington redevelopment's trip generation is shown in Table 14. Additional information related to Trip Generation is contained in Appendix H.

Table 14: Site Trip Generation

Land Use	ITE Code	Size	Weekday							Saturday			
			AM Peak Hour			PM Peak Hour			Daily	SAT Peak Hour			Daily
			In	*Out*	*Total*	*In*	*Out*	*Total*	*Total*	*In*	*Out*	*Total*	*Total*
Proposed Retail													
High Turnover Sit Down Restaurant	932	13.4 kSF	73	60	133	81	50	131	1,503	77	73	150	1,640
Grocery	850	56.6 kSF	130	86	216	261	250	511	5,225	305	294	599	10,053
Live Theater (ITE 9th ED)	441	100 Seats	-	-	-	1	1	2	20	1	1	2	20
Subtotal (Retail without reductions)			*203*	*146*	*349*	*343*	*301*	*644*	*6,748*	*383*	*368*	*751*	*11,713*
Internal Trips Reduction (Retail)			*-4*	*-2*	*-6*	*-5*	*-7*	*-12*	*-229*	*-6*	*-6*	*-12*	*-178*
Subtotal (Retail with internal reduction)			*199*	*145*	*343*	*338*	*294*	*632*	*6,519*	*377*	*362*	*739*	*11,535*
Transit/Walk Reduction - 2% (Retail Only)			*-4*	*-3*	*-7*	*-7*	*-6*	*-13*	*-130*	*-8*	*-7*	*-15*	*-231*
Subtotal (w/ Transit/Walk Reduction)			*195*	*142*	*336*	*332*	*288*	*620*	*6,389*	*369*	*355*	*724*	*11,305*
Pass by Trips Reduction - 36% (Retail Only)			*-70*	*-51*	*-121*	*-119*	*-104*	*-223*	*-2,300*	*-133*	*-128*	*-261*	*-4,070*
Existing Restaurant to be removed	*932*	*4.3 kSF*	*-23*	*-19*	*-42*	*-26*	*-16*	*-42*	*-477*	*-24*	*-24*	*-48*	*-521*
Existing Retail to be removed	*820*	*11.4 kSF*	*-97*	*-60*	*-157*	*-52*	*-57*	-109	-1,373	*-58*	*-53*	*-111*	-2,319
Total Proposed New External Retail Trips			*5*	*12*	*16*	*134*	*111*	*246*	*2,239*	*154*	*150*	*304*	*4,395*
Proposed Residential													
Apartment	220	350 DU	30	87	*117*	90	57	*147*	1,906	75	79	154	1,481
Internal Trips Reduction (Residential) 5% (AM), 10% (PM & SAT), 15% (Weekday/Weekend Daily)		-	-2	-4	-6	-9	-6	-15	-286	-8	-8	-15	-222
Subtotal (Residential with internal reduction)			*29*	*83*	*111*	*81*	*51*	*132*	*1,620*	*68*	*71*	*139*	*1,259*
Transit Reduction - 10% (Residential Only)			*-3*	*-8*	*-11*	*-8*	*-5*	*-13*	*-162*	*-7*	*-7*	*-14*	*-126*
Subtotal (w/ Transit Reduction)			*26*	*74*	*100*	*73*	*46*	*119*	*1,458*	*61*	*64*	*125*	*1,133*
Total Residential Trips			*26*	*74*	*100*	*73*	*46*	*119*	*1,458*	*61*	*64*	*125*	*1,133*
Office													
Office to be removed	*710*	*20.9 kSF*	*-40*	*-7*	*-47*	*-4*	*-22*	-26	*-233*	*-6*	*-5*	*-11*	*-46*
Total Office Trips			*-40*	*-7*	*-47*	*-4*	*-22*	*-26*	*-233*	*-6*	*-5*	*-11*	*-46*
Proposed Site Trips without Reductions			***233***	***233***	***466***	***433***	***358***	***791***	***8,654***	***458***	***447***	***905***	***13,194***
Proposed Site Trips with Reductions			***-10***	***79***	***69***	***203***	***135***	***339***	***3,464***	***209***	***209***	***418***	***5,482***

In the context of the trip generation table and discussion, "reductions" refer to deductions from the numbers of vehicle trips generated by a use due to the use of another mode or sharing of trip purpose. The reduction is relative to the raw numbers of trips published by ITE, rather than reflecting the removal of trips currently on the road network. The ITE trip rates represent

the number of vehicles expected to enter and exit a site in a location with high auto availability and few travel mode choices and are appropriately modified in environments like the City of Falls Church.

The trips currently associated with the partially-occupied site uses were then removed from the trip generation to account for the demolition of the existing buildings. Given the suburban nature of the buildings with surface parking lots, no reductions for transit use or internal capture, beyond those inherent in the ITE data, were applied. Thus, compared to the uses currently on site the proposed redevelopment will generate approximately 69 new external trips during the weekday morning peak hour, 339 new external trips during the weekday afternoon peak hour, 418 new external trips during the Saturday peak hour, and 3,464 new external weekday daily trips.

VDOT Mixed-Use Trip Generation Model

The results of the ITE trip generation analysis were compared with the VDOT Mixed-Use Trip Generation Model to evaluate the similarities and differences in the resulting trip generation. The model was developed for the San Diego Association of Governments (SANDAG) based on data collected at existing "smart growth" sites. Parameters included in the computation of internal and non-auto trip reductions include population, network connectivity, employment, and land area. While the model computes a larger share of non-auto trips than utilized in the ITE calculations above, no breakdown by lane use or trip direction (inbound vs. outbound) is provided. Additionally, the number of land use categories is limited in the Mixed-Use Trip Generation Model and leads to an overestimation of the retail trips in this case. No trip generation for the theater use is provided, so it was included with the retail. It is unclear whether simply modifying the "raw" trip estimates would lead to an accurate representation of the interaction of the land uses, as the underlying computations are not available to the user of the model.

The resulting trip reduction estimates from the model are shown in Table 15, without the adjustments for existing uses to be removed. Accounting for the existing trips, the model would yield 132 AM peak hour trips, 419 PM peak hour trips, and 3,938 daily trips; no estimates for Saturday are computed. Due to the more complete information provided by the ITE calculations, that methodology was used to derive the site traffic assignments and future with development traffic forecasts.

Table 15: Mixed-Use Trip Generation Model Results

	Daily				AM Peak Hour				PM Peak Hour			
	HBW	HBO	NHB	Total	HBW	HBO	NHB	Total	HBW	HBO	NHB	Total
Number of "Raw" ITE Trips Subject to Model	2456	4211	2250	8918	296	199	29	525	306	333	225	864
Predicted Probabilities:												
Internal Capture	4.48%	3.65%	5.59%	4.37%	4.48%	3.65%	5.59%	4.23%	4.48%	3.65%	5.59%	4.45%
Walking External	3.02%	35.31%	29.43%	24.96%	3.02%	35.31%	29.43%	16.81%	3.02%	35.31%	29.43%	22.36%
Transit External	13.44%	0.84%	1.37%	4.44%	13.44%	0.84%	1.37%	7.96%	13.44%	0.84%	1.37%	5.44%
Number of Trips:												
Internal Capture	110	154	126	390	13	7	2	22	14	12	13	38
Walking External	71	1433	625	2129	9	68	8	84	9	113	62	185
Transit External	315	34	29	379	38	2	0	40	39	3	3	45
Net Number of IXXI Vehicle Trips	**1960**	**2591**	**1470**	**6021**	**236**	**123**	**19**	**378**	**244**	**205**	**147**	**596**

	External Vehicle Trips			VMT		
Results	Raw	Net	Reduction %	Raw	Net	Reduction %
Daily	8,918	6,021	32%	37,318	26,244	30%
AM Peak Hour	525	378	28%	2,667	1,999	25%
PM Peak Hour	864	596	31%	3,834	2,759	28%

SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

Site Access

Vehicular access to the subject property is currently provided via:

- Three driveways along E. Broad Street
- Two driveways along Park Place
- One driveway on N. Washington Street (about 140 feet south of Park Place)

Access to the proposed development will be consolidated to the following:

- One full movement driveway along E. Broad Street
- One full movement driveway along Park Place

Distribution and Assignment

The distribution of site trips was based on previous studies performed in the area, existing traffic patterns, the City's TDM plan and the nature of the proposed development. Trips generated by the proposed residential and non-residential uses were assigned based on the abovementioned factors. The inbound and outbound trips calculated for the weekday morning, afternoon, and Saturday peak hours were routed through the roadway network to the site. The site direction of approach and trip distribution for the weekday and Saturday peak hours is illustrated in Figure 11. The site traffic assignment for the weekday and Saturday peak hours is illustrated in Figure 12. The trip assignments for the residential and non-residential land uses, as well as the pass-by trips, are included in Figure 12. It should be noted, in order to be conservative, trips were not removed from the network where the trip generation resulted in negative trips after the removal of existing use trips (net inbound AM peak hour trips).

With the proposed development, the intersection of N Washington Street and Park Place is proposed to operate as a full-movement intersection by extending the median break at Park Avenue to allow for left tuning movements into and out of the site at the intersection and incorporating the Park Place movements within the existing traffic signal.

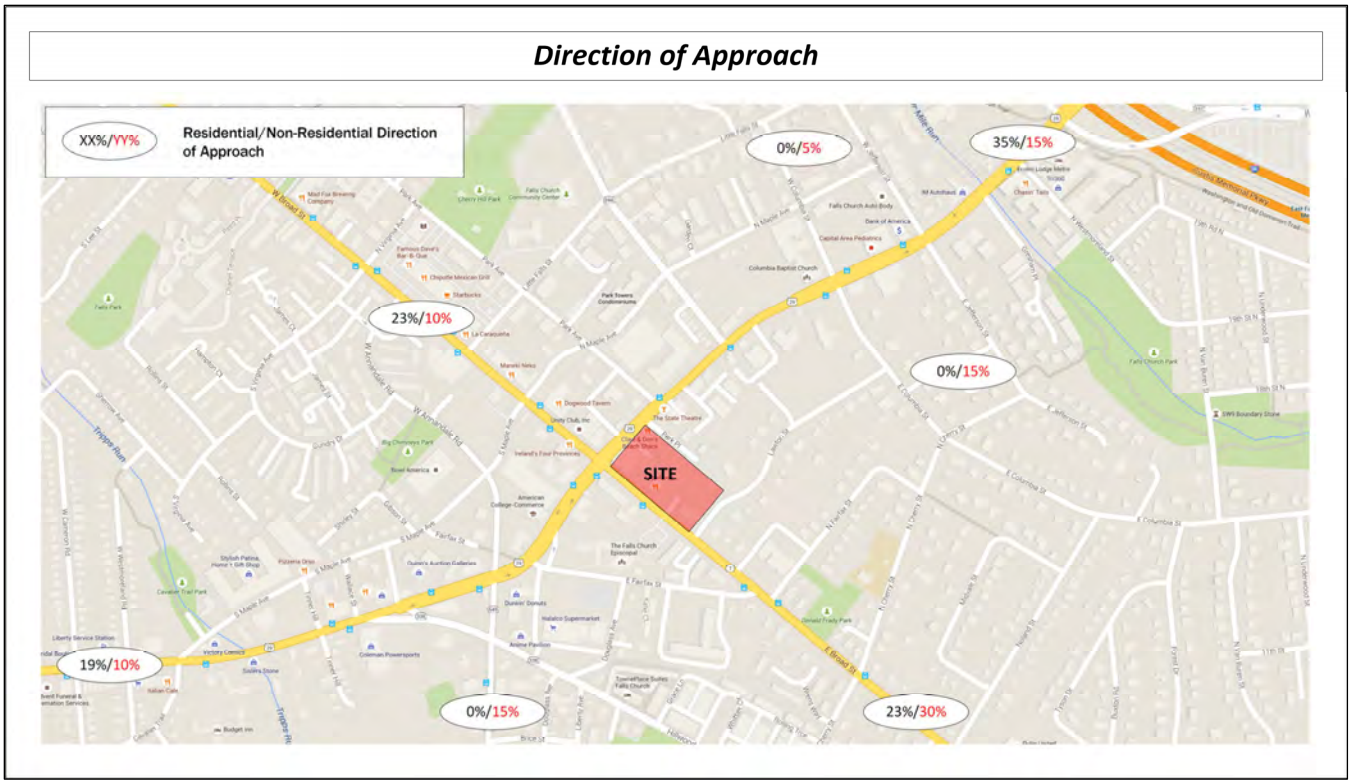

Figure 11: Directions of Approach

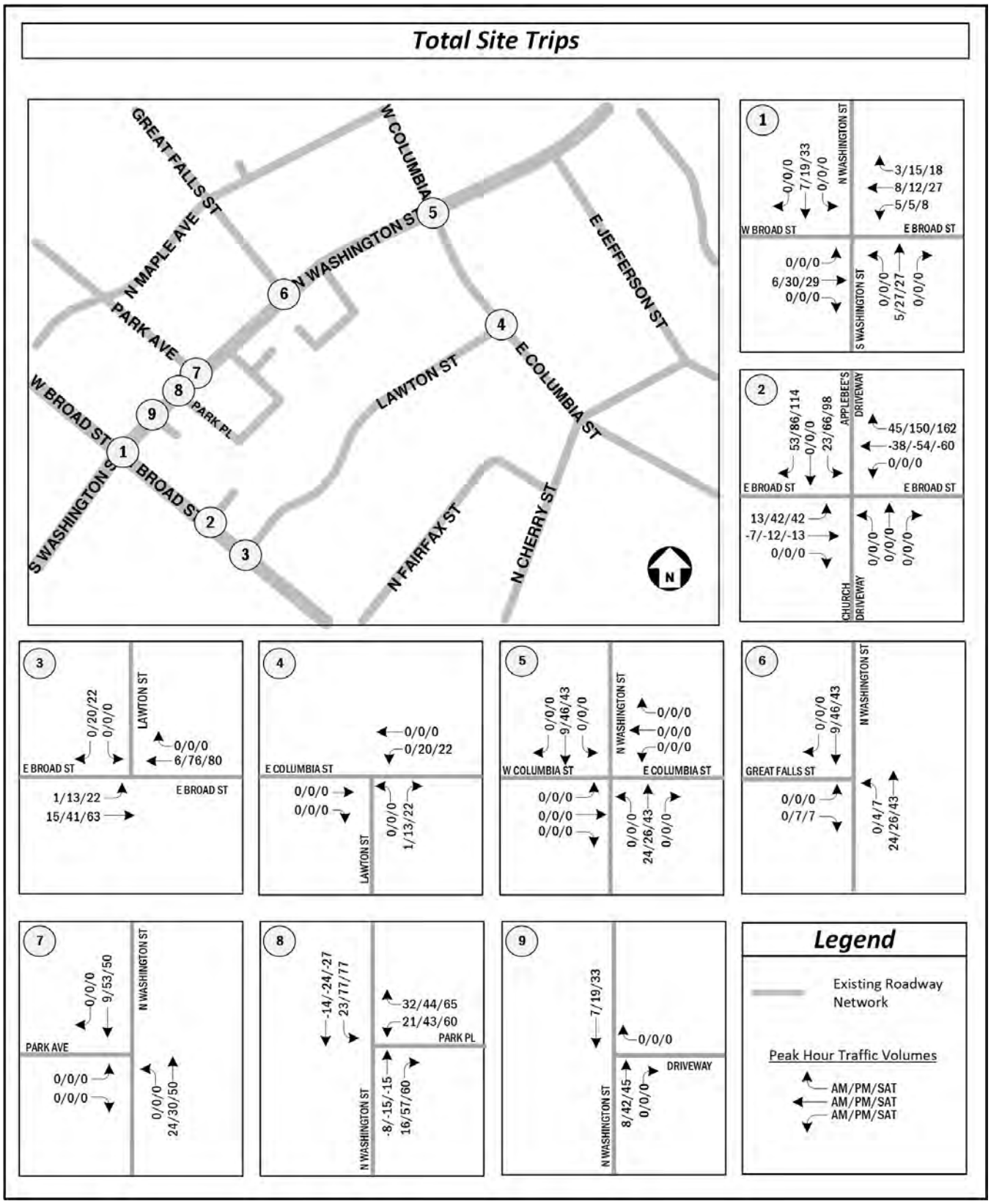

Figure 12: Site Generated Trips

FUTURE CONDITIONS WITH DEVELOPMENT (2024)

Future with Development Traffic Volumes

The proposed site generated development traffic volumes were added to the future without development traffic volumes to forecast the 2024 future with development conditions. The traffic volumes for the future with development traffic conditions are shown in Figure 13.

Future with Development Capacity Analysis

Intersection capacity analyses were performed for the future conditions with the proposed development at the intersections contained within the study area during the weekday morning and afternoon peak hours, as well as the Saturday peak hour. *Synchro 10* was used to analyze the study intersections with results based on the Highway Capacity Manual (HCM 2000) methodology. The default peak hour factor of 0.92 has been used in the analysis. Heavy vehicle percentages, lane widths, road grades, and number of bus blockages per hour were kept the same as the existing conditions. The capacity and queuing analysis results are presented in Table 16 and shown in Figure 14. The detailed analysis worksheets are contained in Appendix I.

Gorove/Slade Associate, Inc. has previously submitted a study to the City, titled 'Traffic Impact Study Broad and Washington Redevelopment, dated October 10, 2017' recommended, in part, the following improvements/mitigation measures:

- Convert the intersection of N Washington Street and Park Place into a full-movement intersection.
- Install a signal at the intersection
- Due to its proximity (approximately 100 feet center-to-center) to the intersection of N Washington Street and Park Ave to its north, cluster the intersections to essentially operate as one signalized intersection.

As such, the capacity analysis for the future conditions with development (2024) assume that the intersection of N Washington Street and Park Place would operate as a full-movement intersection under signal control. As the intersections of Park Place and Park Avenue along Washington Street are closely spaced (approximately 100 feet center to center), the proposed signal at Park Avenue would be clustered with the existing signal at Park Place for optimal traffic operations.

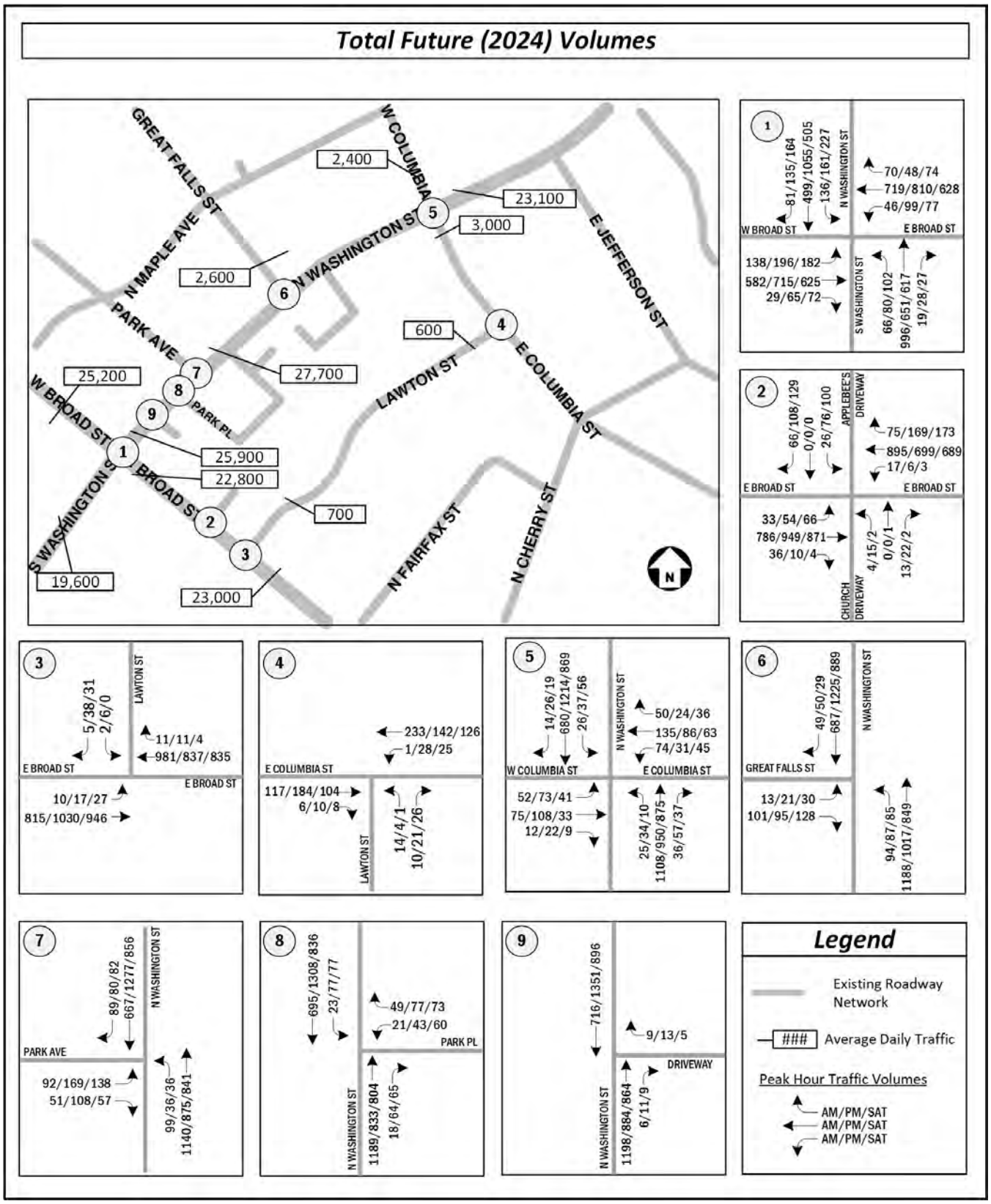

Figure 13: Future with Development (2024) Traffic Volumes

Table 16: Future with Development (2024) Intersection Capacity Analysis

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak 50th Queue	AM Peak 95th Queue	AM Peak LOS	AM Peak Delay	PM Peak 50th Queue	PM Peak 95th Queue	PM Peak LOS	PM Peak Delay	SAT Peak 50th Queue	SAT Peak 95th Queue	SAT Peak LOS	SAT Peak Delay
1	E./W. Broad St & N./S. Washington St													
	Overall Intersection (Signalized)				**C**	**27.9**			**D**	**35.8**			**D**	**36.7**
	Eastbound Approach				*C*	*30.1*			*C*	*28.7*			*C*	*30.5*
	Eastbound Left	*275*	*34*	*m#157*	*D*	*45.0*	*57*	*#214*	*E*	*61.6*	*81*	*164*	*C*	*23.4*
	Eastbound Thru/Right	*450*	*82*	*171*	*C*	*26.7*	*254*	*210*	*C*	*20.5*	*230*	*373*	*C*	*32.4*
	Westbound Approach				*C*	*31.0*			*D*	*40.8*			*D*	*40.6*
	Westbound Left	255	10	m22	B	14.7	33	56	B	19.3	32	75	C	25.8
	Westbound Thru/Right	400	244	323	C	32.0	294	#421	D	43.3	258	413	D	42.3
	Northbound Approach				*C*	*34.5*			*D*	*36.6*			*D*	*40.5*
	Northbound Left	345	19	m47	B	19.8	37	m70	C	29.5	46	99	C	27.0
	Northbound Thru/Right	580	196	#438	D	35.5	240	307	D	37.4	237	383	D	42.7
	Southbound Approach				B	12.0			D	37.0			D	36.0
	Southbound Left	190	7	49	B	16.0	39	m72	B	11.2	110	211	C	32.4
	Southbound Thru/Right	370	177	238	B	11.0	~297	#558	D	40.5	235	376	D	37.3
2	E. Broad Street/Driveway													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Eastbound Left	75	*n/a*	4	B	10.7	*n/a*	7	B	10.5	*n/a*	8	B	10.5
	Westbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Westbound Left	165	*n/a*	2	A	9.2	*n/a*	1	A	9.6	*n/a*	0	A	9.4
	Northbound Approach				*C*	*18.4*			*E*	*40.9*			*E*	*46.2*
	Northbound Left/Thru/Right	25	*n/a*	5	C	18.4	*n/a*	28	E	40.9	*n/a*	4	E	46.2
	Southbound Approach				*D*	*33.3*			*F*	*122.4*			*F*	*202.8*
	Southbound Left/Thru/Right	25	*n/a*	52	D	33.3	*n/a*	225	F	122.4	*n/a*	338	F	202.8
	Overall Mitigation: Add a Traffic Signal													
	Overall Intersection (Signalized)				**A**	**3.5**			**A**	**7.8**			**A**	**9.0**
	Eastbound Approach				*A*	*1.6*			*A*	*5.8*			*A*	*8.1*
	Eastbound Left	75	2	m7	A	1.6	6	m21	A	6.2	10	39	A	7.3
	Eastbound Thru/Right	400	34	m60	A	1.6	61	153	A	5.8	79	157	A	8.2
	Westbound Approach				*A*	*0.6*			*A*	*3.0*			*A*	*8.1*
	Westbound Left	165	0	m0	A	0.3	0	m1	A	1.5	0	4	A	5.8
	Westbound Thru/Right	165	2	4	A	0.6	17	22	A	3.0	71	146	A	8.1
	Northbound Approach				*D*	*43.4*			*C*	*32.6*			*B*	*12.8*
	Northbound Left/Thru/Right	25	0	12	D	43.4	4	32	C	32.6	1	8	B	12.8
	Southbound Approach				*D*	*46.0*			*D*	*37.3*			*B*	*16.3*
	Southbound Left/Thru/Right	25	17	65	D	46.0	79	155	D	37.3	44	124	B	16.3
3	Broad Street and Lawton Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Eastbound Left/Thru	165	*n/a*	1	A	0.6	*n/a*	2	A	0.7	*n/a*	3	A	1.2
	Southbound Approach				*B*	*14.8*			*B*	*13.8*			*B*	*11.1*
	Southbound Left/Right	1400	*n/a*	1	B	14.8	*n/a*	8	B	13.8	*n/a*	4	B	11.1
4	Lawton Street & Columbia Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Westbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Westbound Left	*440*	*n/a*	*0*	*A*	*0.0*	*n/a*	*2*	*A*	*1.4*	*n/a*	*1*	*A*	*1.4*
	Northbound Approach				*B*	*10.3*			*A*	*9.8*			*A*	*9.1*
	Northbound Left/Right	1400	*n/a*	3	B	10.3	*n/a*	3	A	9.8	*n/a*	2	A	9.1
5	N Washington Street/W Columbia Street/E Columbia Street													
	Overall Intersection (Signalized)				**B**	**16.2**			**C**	**21.9**			**C**	**23.2**
	Eastbound Approach				*C*	*29.0*			*C*	*32.8*			*B*	*19.2*
	Eastbound Left/Thru/Right	370	69	123	C	29.0	112	184	C	32.8	30	73	B	19.2
	Westbound Approach				*C*	*34.1*			*C*	*29.4*			*C*	*20.5*
	Westbound Left/Thru/Right	485	138	222	C	34.1	71	126	C	29.4	51	114	C	20.5
	Northbound Approach				*B*	*10.0*			*B*	*15.2*			*C*	*26.5*
	Northbound Left	70	1	m2	A	3.9	7	m14	B	11.6	3	11	B	16.9
	Northbound Thru/Right	640	197	354	B	10.2	262	281	B	15.3	245	327	C	26.6
	Southbound Approach				*B*	*17.2*			*C*	*24.9*			*C*	*20.8*
	Southbound Left	125	7	18	B	14.6	10	24	B	13.5	16	34	B	15.1
	Southbound Thru/Right	475	156	205	B	17.3	382	481	C	25.3	176	302	C	21.2
6	N Washington Street/Great Falls Street													
	Overall Intersection (Unsignalized)				**n/a**	**n/a**			**n/a**	**n/a**			**n/a**	**n/a**
	Eastbound Approach				*B*	*10.5*			*C*	*15.5*			*B*	*12.5*
	Eastbound Left/Right	*440*	*n/a*	13	*B*	*10.5*	*n/a*	26	*C*	*15.5*	*n/a*	25	*B*	*12.5*
	Northbound Approach				*n/a*	*n/a*			*n/a*	*n/a*			*n/a*	*n/a*
	Northbound Thru/Left	425	*n/a*	9	A	2.8	*n/a*	11	A	3.6	*n/a*	8	A	3.0

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak 50th Queue	AM Peak 95th Queue	AM Peak LOS	AM Peak Delay	PM Peak 50th Queue	PM Peak 95th Queue	PM Peak LOS	PM Peak Delay	SAT Peak 50th Queue	SAT Peak 95th Queue	SAT Peak LOS	SAT Peak Delay
7	N Washington Street/Park Avenue													
	Overall Intersection (Signalized)				**B**	**11.6**			**B**	**11.5**			**B**	**19.1**
	Eastbound Approach				*D*	*48.0*			*D*	*46.4*			*D*	*39.1*
	Eastbound Left	360	*63*	*#133*	D	51.5	*113*	*#214*	D	52.1	*91*	*159*	D	40.4
	Eastbound Right	360	0	37	D	41.6	0	49	D	37.5	0	37	D	36.2
	Northbound Approach				*A*	*6.3*			*A*	*3.3*			*A*	*1.3*
	Northbound Thru/Left	370	39	23	A	6.3	51	34	A	3.3	12	20	A	1.3
	Southbound Approach				*B*	*13.4*			*A*	*9.9*			*C*	*31.6*
	Southbound Thru/Right	425	210	273	B	13.4	121	211	A	9.9	293	346	C	31.6
8	N Washington Street & Park Place													
	Overall Intersection (Signalized)				**A**	**8.5**			**A**	**9.7**			**B**	**16.3**
	Westbound Approach				*D*	*48.0*			*D*	*52.0*			*D*	*44.2*
	Westbound Left/Right	315	14	#71	D	48.0	37	#125	D	52.0	60	#208	D	44.2
	Northbound Approach				*B*	*10.8*			*B*	*11.5*			*C*	*22.2*
	Northbound Thru/Right		94	m120	B	10.8	116	m240	B	11.5	238	235	C	22.2
	Southbound Approach				*A*	*0.9*			*A*	*4.9*			*A*	*6.6*
	Southbound Left/Thru		*10*	*7*	A	0.9	*70*	*48*	A	4.9	*60*	*61*	A	6.6
9	N Washington Street & Driveway													
	Overall Intersection (Unsignalized)													
	Westbound Approach				*A*	*9.7*			*A*	*9.1*			*A*	*9.1*
	Westbound Right	105		1	A	9.7		1	A	9.1		0	A	9.1

Notes: *N/A – Not Applicable*
 # – 95th percentile volume exceeds capacity; queue may be longer. Queue shown is the maximum after two cycles.
m – Volume for 95th percentile queue is metered by upstream signal.
~ – Volume exceeds capacity, queue can be longer. Queue shown is maximum after two cycles.

As mentioned previously, it is desirable to achieve a LOS D or better per approach. Similar to the existing and future without development conditions, most of the study intersections' approaches will continue to operate at acceptable levels of service during the weekday morning, afternoon, and Saturday peak hours. The eastbound left movement at the Broad Street and Washington Street intersection would continue to operate at LOS E conditions during the PM peak hours, with an increase in delay of 0.3 seconds. The side-street approaches at the site driveway on E. Broad Street will operate at LOS E and F conditions during the PM and Saturday peak hours under stop-sign control.

Based on the queuing analysis, peak hour queue lengths will continue to exceed the storage length in one or more of the lane groups at the following intersections during one or more of the peak periods:

- Broad Street and Washington Street (PM and Saturday)
- E. Broad Street and Site Driveway (AM, PM and Saturday)

To mitigate the driveway delays, installation of a traffic control signal was investigated at the intersection of the site driveway along E. Broad Street. With the addition of a traffic signal at the site driveway and E. Broad Street, the side streets of the intersection operate at acceptable levels of service. If this signal is not warranted or installed, users may choose to exit the garage via Park Place and the signalized access to N Washington Street in greater numbers than assumed here. A significant level of redistribution could be accommodated while maintaining acceptable levels of service at the signalized intersections, reducing delays at the Broad Street driveway by up to half. The intersection of N. Washington Street and Park Place operates at acceptable levels of service upon signalization and the westbound approach operates at level of service D under all the three study peak hours. It should be noted that the signal timings at the intersection of N. Washington Street and Park Avenue were modified to operate as a clustered signal along with the proposed signal at the intersection of N. Washington Street and Park Place. In summary, some approach delays at signalized intersections, and some stop-controlled side-street delays, will occur within the study area with or without the proposed Broad & Washington redevelopment. These conditions are consistent with an urban street network, particularly one with existing development that frames the streets and constrains the right-of-way. Traffic moving through the street grid "pulses" between closely spaced traffic signals, providing mobility for non-motorized travel as well as transit and private automobile traffic.

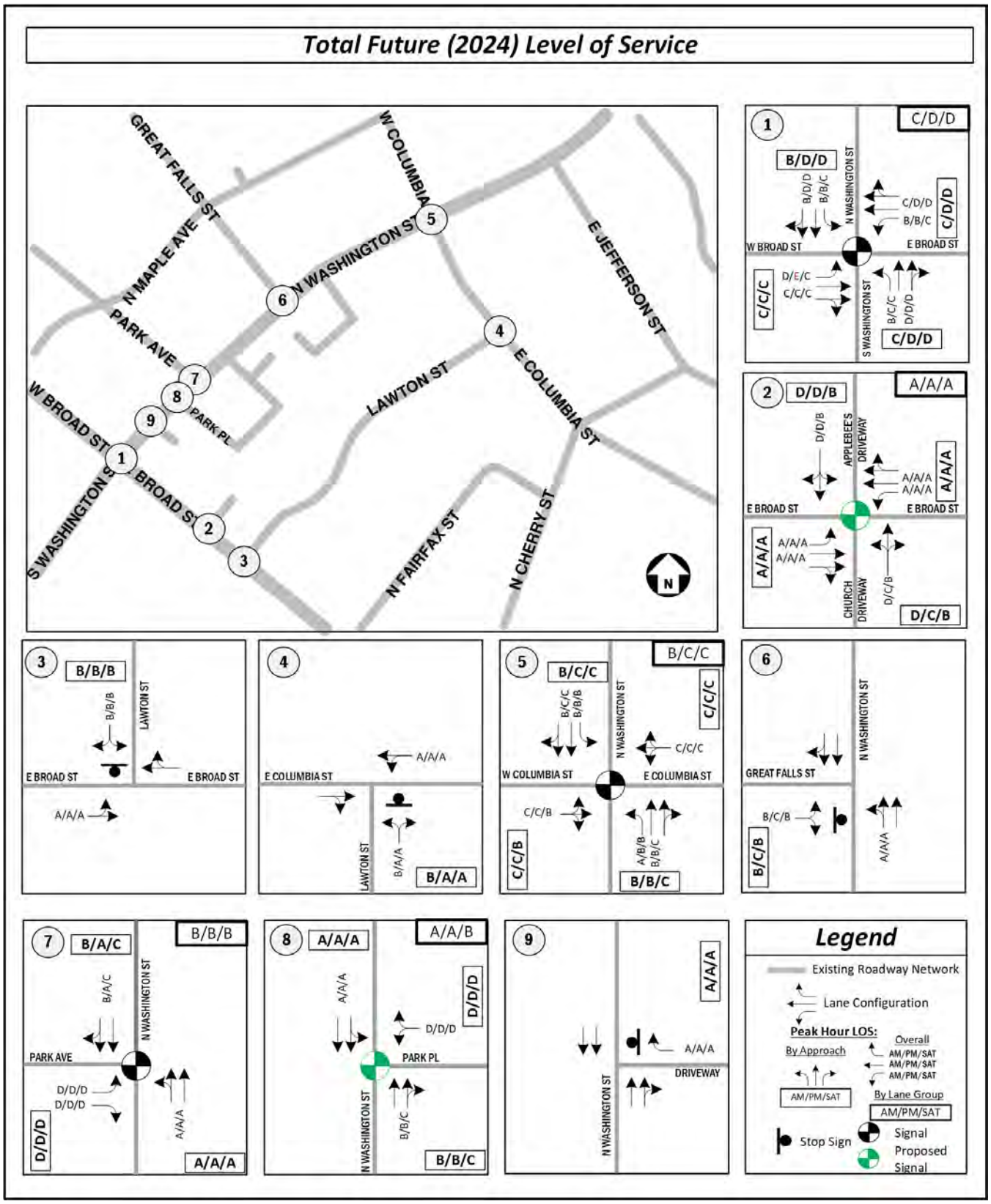

Figure 14: Future with Development and Proposed Mitigations (2024) Levels of Service

PEAK HOUR SIGNAL WARRANT ANALYSIS

A peak hour signal warrant analysis was conducted for the site driveway along E. Broad Street. Table 17 shows the volumes used in Figure 15 which utilizes the Warrant 3 graph provided in the MUTCD. The traffic volumes assume a full-movement intersection consistent with the configuration analyzed with a signal. As indicated in Figure 15, the peak hour warrant is met during the PM and Saturday peak hours.

Table 17: Volumes used for Peak Hour Warrant Analysis

Condition		Major Street - Total of Both Approaches (VPH)	Minor Street – Site Driveway (VPH)
1	2024 AM Peak	1,842	92
2	2024 PM Peak	1,887	184
3	2024 SAT Peak	1,806	229

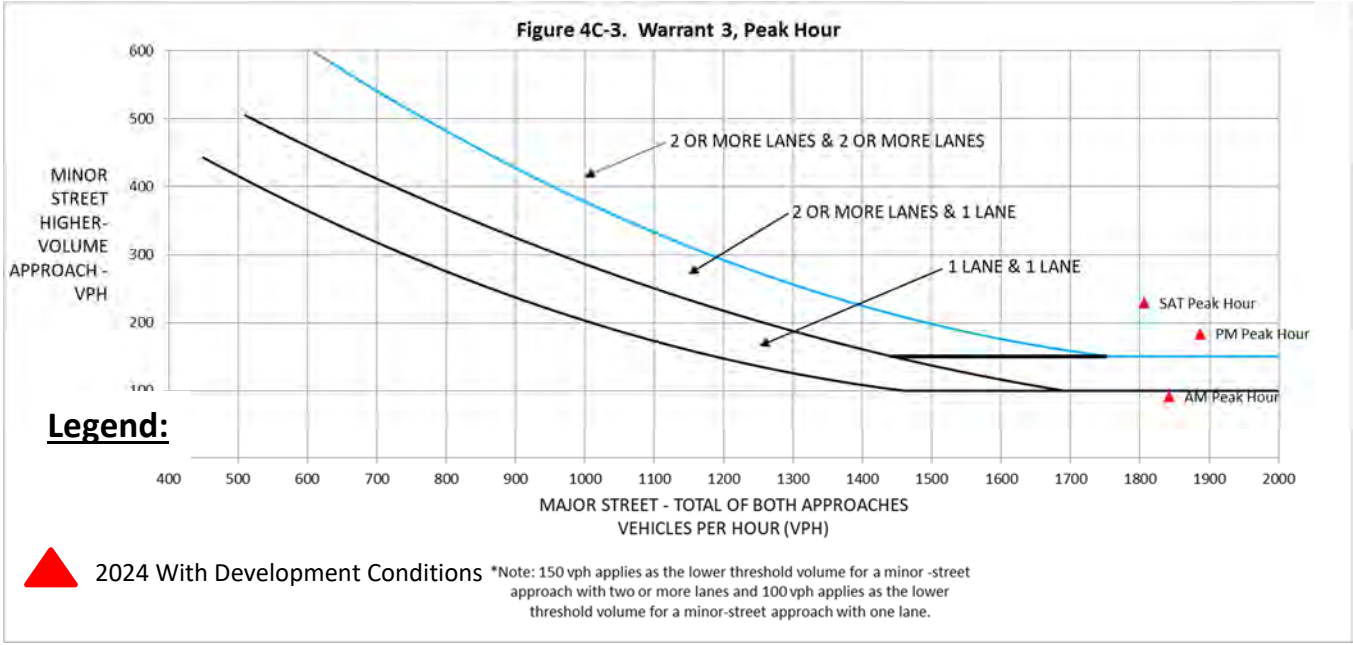

Figure 15: Warrant 3, Peak Hour Signal Warrant Analysis Results

It should be noted that the signal warrant analysis presented in this section analyzes only the Peak Hour warrant. Additional warrant analysis computations would have to be conducted prior to the installation of the traffic signal. This additional analysis may or may not warrant the need of a traffic signal at the intersection of the site driveway along E. Broad Street.

CONCLUSIONS

This report presents the findings of a traffic impact analysis for the proposed Broad & Washington redevelopment located in the City of Falls Church. The site is bounded by E. Broad Street to the south, N. Washington Street to the west, Lawton Street to the east and Park Place to the north. The development, which is planned to consist of a multi-use building containing retail, restaurant and residential space, is anticipated to be complete in 2024.

The analysis presented in this report supports the following major conclusions:

Existing Conditions (2019)

Weekday traffic counts were conducted at the study intersections during the AM and PM peak periods on Tuesday, February 3, 2015 and Saturday peak period traffic counts were conducted on January 31, 2015. The existing volumes were balanced across proximate intersections to reflect a consistent baseline for the volume projections within this report.

Intersection capacity analyses were performed for the existing conditions at the study area intersections during the weekday morning and afternoon peak hours, as well as the Saturday peak hour. *Synchro, version 10.0* was used to analyze the study intersections with results based on the Highway Capacity Manual (HCM 2000) methodology. For the purpose of this analysis, it is desirable to achieve a LOS D or better for each approach of an intersection. All of the study intersections' approaches currently operate at acceptable levels of service and most queue lengths can be accommodated during the weekday morning, afternoon, and Saturday peak hours, with the following exceptions:

- Broad Street and Washington Street (queues)
- N. Washington Street and Park Avenue (queues)

Future Conditions without Development (2024)

Traffic volumes were projected for the year 2024 without the proposed Broad & Washington redevelopment. While historical VDOT traffic counts for the road sections analyzed show a general reduction of traffic volumes over the past several years, per the request of the City, a growth rate of 0.15% compounded annually over a four- year period, totaling 0.6% growth of the existing volumes, was applied to all existing turning movement volumes at the study intersections. Furthermore, the traffic associated with the 301 W. Broad Street project was added to the existing traffic volumes to obtain the future conditions without development.

Most of the study intersections' approaches will continue to operate at acceptable levels of service with manageable queues during the weekday morning, afternoon, and Saturday peak hours, with the following exceptions:

- Broad Street and Washington Street (LOS and queues)

Future Conditions with Development (2024)

The proposed mixed-use redevelopment will generate approximately 69 new external trips during the weekday morning peak hour, 339 new external trips during the weekday afternoon peak hour, 418 new external trips during the Saturday peak hour, and 3,464 new external weekday daily trips, accounting for existing or potential trips associated with the existing buildings. Access to the proposed development will be provided via a full-movement driveway on E. Broad Street and one full-access point along Park Place. Future conditions with the development were derived from the future without development scenario and the site generated trips.

With the proposed development, the intersection of N Washington Street and Park Place is proposed to operate as full-movement signalized intersection incorporated within the Park Avenue signal.

As under the existing and future without development conditions, most of the study intersections' approaches will continue to operate at acceptable levels of service with manageable queues during the weekday morning, afternoon, and Saturday peak hours, with the following exceptions:

- Broad Street and Washington Street (LOS and queues)
- E. Broad Street and Site Driveway (LOS and queues)

Signalization of the Site Entrance on E. Broad Street was investigated as part of the mitigation. With the addition of a traffic signal at the intersection of E. Broad Street and site driveway, the side street movements operate at acceptable levels of service. Alternatively, additional site trips could be accommodated through with signalized intersections while maintaining acceptable levels of service and would reduce delays at the Broad Street driveway by up to half. With the signalization and clustering of the intersection of Park Ave and Park Place with N Washington Street, the intersections continue to perform acceptably with manageable queues during all study peak hours.

In summary, traffic operations within the study area will be similar with or without the proposed Broad & Washington redevelopment.

TECHNICAL APPENDIX

TECHNICAL APPENDIX TABLE OF CONTENTS

Appendix A: Scoping Document

Appendix B: Historic VDOT Crash Data

Appendix C: Existing (2019) Traffic Volumes & Count Sheets

Appendix D: Level of Service Definitions

Appendix E: Intersection Capacity Analysis - Existing Conditions (2019)

Appendix F: 301 W Broad Street Site Trips

Appendix G: Intersection Capacity Analysis - Future without Development Condition (2024)

Appendix H: Traffic Volumes for Each Use and Pass-by Trips

Appendix I: Intersection Capacity Analysis - Future with Development Condition (2024)

APPENDIX A

SCOPING DOCUMENT

APPENDIX B

Historic VDOT Crash Data

APPENDIX C

EXISTING (2019) TRAFFIC VOLUMES & COUNT SHEETS

APPENDIX D

LEVEL OF SERVICE DEFINITIONS

APPENDIX D: LEVEL OF SERVICE DEFINITIONS

All capacity analyses are based on the procedures specified by the Transportation Research Board, Special Report 209: *Highway Capacity Manual (HCM)*, 2010. Levels of service (LOS) range from A to F. A brief description of each level of service for signalized and unsignalized intersections is provided below.

Signalized Intersections: Level of service is based upon the traffic volume present in each lane on the roadway, the capacity of each lane at the intersection and the delay associated with each directional movement. The levels of service for signalized intersections are defined below:

- Level of Service A describes operations with very low average delay per vehicle, i.e., less than 10.0 seconds. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop. Short signal cycle lengths may also contribute to low delay.
- Level of Service B describes operations with average delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
- Level of Service C describes operations with delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level although many still pass through the intersection without stopping. This is generally considered the lower end of the range of the acceptable level of service in rural areas.
- Level of Service D describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and/or high traffic volumes as compared to the roadway capacity. Many vehicles are required to stop and the number of vehicles that do not have to stop declines. Individual signal cycle failures, where all waiting vehicles do not clear the intersection during a single green time, are noticeable. This is generally considered the lower end of the range of the acceptable level of service in urban areas.
- Level of Service E describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These higher delay values generally indicate poor progression, long cycle lengths, and high traffic volumes. Individual cycle failures are frequent occurrences. LOS E has been set as the limit of acceptable conditions.
- Level of Service F describes operations with average delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over-saturation, i.e., when traffic arrives at a flow rate that exceeds the capacity of the intersection. It may also occur at high volumes with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such delays.

Unsignalized Intersections: At an unsignalized intersection, the major street through traffic and right-turns are assumed to operate unimpeded and therefore receive no level of service rating. The level of service for the minor street and the major street left-turn traffic is dependent on the volume and capacity of the available lanes, and, the number and frequency of acceptable gaps in the major street traffic to make a conflicting turn. The level of service grade is provided for each conflicting movement at an unsignalized intersection and is based on the total average delay experienced by each vehicle. The delay includes the time it takes a vehicle to move from the back of a queue through the intersection.

The unsignalized intersection level of service analysis does not account for variations in driver behavior or the effects of nearby traffic signals. Therefore, the results from this analysis usually indicate worse levels of service than may be experienced in the field. The unsignalized intersection level of service descriptions are provided below:

- Level of Service A. Describes operations where there is very little to no conflicting traffic for a minor side street movement, i.e., an average total delay of less than 10.0 seconds per vehicle.
- Level of Service B. Describes operations with average total delay in the range of 10.1 to 15.0 seconds per vehicle.
- Level of Service C. Describes operations with average total delay in the range of 15.1 to 25.0 second per vehicle.
- Level of Service D. Describes operations with average total delay in the range of 25.1 to 35.0 seconds per vehicle.
- Level of Service E. Describes operations with average total delay in the range of 35.1 to 50.0 seconds per vehicle.
- Level of Service F. Describes operations with average total delay of 50 seconds per vehicle. LOS F exists when there are insufficient gaps of suitable size to allow a side street demand to cross safely through or enter a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queuing on the minor approaches. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal driver behavior.

APPENDIX E

INTERSECTION CAPACITY ANALYSIS – EXISTING CONDITIONS (2019)

APPENDIX F

301 W BROAD STREET DEVELOPMENT SITE TRIPS

APPENDIX G

INTERSECTION CAPACITY ANALYSIS –

FUTURE WITHOUT DEVELOPMENT CONDITIONS (2024)

APPENDIX H

TRAFFIC VOLUMES FOR PROPOSED LAND USES AND PASS-BY TRIPS

APPENDIX I

INTERSECTION CAPACITY ANALYSIS –

FUTURE WITH DEVELOPMENT CONDITIONS (2024)