MULTIMODAL TRANSPORTATION STUDY

EISENHOWER EAST SMALL AREA PLAN 2019 UPDATE

CITY OF ALEXANDRIA, VA

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GOROVE / SLADE
Transportation Planners and Engineers

Prepared by:

1140 Connecticut Avenue NW
Suite 600
Washington, DC 20036
Tel: 202.296.8625
Fax: 202.785.1276

3914 Centreville Road
Suite 330
Chantilly, VA 20151
Tel: 703.787.9595
Fax: 703.787.9905

15125 Washington Street
Suite 212
Haymarket, VA 20169
Tel: 703.787.9595
Fax: 703.787.9905

www.goroveslade.com

Contents

Figures

Tables

EXECUTIVE SUMMARY

The following report is a Multimodal Transportation Study (MTS) for the Eisenhower East Small Area Plan (EESAP) 2019 Update, located in the City of Alexandria, Virginia.

The purpose of this report is to evaluate whether the proposed increase in density and changes in uses in several blocks in the EESAP will generate a detrimental impact on the surrounding transportation network. This evaluation is based on a technical comparison of the existing conditions, future conditions with approved development, and future conditions with proposed development. Based on the capacity analysis results using macroscopic analysis tools (Synchro) and the microsimulation analysis results (using VISSIM) **this report concludes that the proposed increase in density and changes in uses included in the EESAP 2019 Update will have a manageable impact** on the surrounding transportation network, assuming this report's recommendations and mitigation measures are implemented.

Background

The original Small Area Plan, which was developed in 2003, envisioned a "vibrant, new, urban, mixed-use community centered on the Eisenhower Avenue Metro Station." This vision and the goal for Eisenhower East to remain one of the key economic development engines for the City has not changed since the original plan. The EESAP 2019 Update will consider the overall mix and density of land use, transportation infrastructure, and strategies based on current market conditions in order to fulfill the original vision for the area.

As market conditions have changed since the previous EESAP was developed, the desired mix of uses and density of uses has also changed. A number of parcels within the EESAP are seeking to convert approved office density to residential units. Several parcels are also seeking an overall increase in density, and given the proximity of the entire Eisenhower East area within one-half mile of Metrorail, increasing density within this section of the City is very desirable to take advantage of transit-oriented development.

Multimodal Study Area Overview

The EESAP is located along the southern end of the City of Alexandria, bordering I-495 and Fairfax County to the south. The EESAP has access to several roadways, transit, and bicycle options, making it convenient to travel between the EESAP and destinations in Virginia, the District, and Maryland.

Transit

The project area is served by regional and local transit services via Amtrak, VRE, Metrorail, Metrobus, and DASH. All EESAP blocks are located within 0.5 of both the King Street Metrorail Station and the Eisenhower Avenue Metrorail Station, which provide access to the Blue and Yellow Metrorail lines, and the Alexandria Union Station is located within approximately 1 mile of all blocks providing regional rail connectivity via Amtrak and VRE.

Existing Metrobus and DASH bus stops are conveniently located within and in the vicinity of the study area which connect EESAP to neighborhoods in the City of Alexandria and beyond.

Pedestrian

The pedestrian network in and around the project area is generally well established. Most roadways within a quarter-mile radius provide sidewalks, and acceptable crosswalks and curb ramps, particularly along the primary walking routes. As each block develops, pedestrian facilities will be improved such that they meet or exceed City of Alexandria requirements and provide an improved pedestrian environment.

Bicycle

The project area has access to existing on- and off-street bicycle facilities. These bicycle facilities connect the EESAP to neighborhoods within the City of Alexandria and Fairfax County, most notably via the Eisenhower Avenue Trail and the bicycle lanes on Mill Race Lane, Jamieson Avenue, and Prince Street. Other facilities include signed routes on Eisenhower Avenue, Mill Road, and Holland Lane.

A number of planned future improvements such as the extension of the Old Cameron Run trail will further enhance bicycle connectivity to and from the EESAP.

Vehicular

The EESAP is well-connected to regional roadways such as I-495 and US-1, arterials such as Duke Street, Telegraph Road, and Eisenhower Avenue, and an existing network of collector and local roadways.

In order to determine the potential impacts of the proposed development on the roadway network, this report projects and compares future conditions with approved development and future conditions with proposed development and performs analyses of intersection delays and queues. A total of 50 intersections were included for study in this report.

Existing Conditions

Intersection capacity analyses were performed for the morning and afternoon peak hours at study area intersections. Synchro version 9.2 was used to analyze the study intersections based on the *Highway Capacity Manual* (HCM) 2000 methodology.

The existing conditions analysis shows many intersections and movements that operate at an acceptable level of service during the morning and afternoon peak hours. However, of the 50 intersections in the study area, 16 intersections have one or more movements that operate at levels beyond Level of Service (LOS) D or better in one or more peak hour. LOS D is typically used as the acceptable LOS threshold in the City of Alexandria; although LOS E or F is generally accepted in urbanized areas if vehicular improvements would be a detriment to safety or to non-auto modes of transportation. The capacity analysis results also show that 25 intersections have 95th percentile queues that exceed the available storage length in one or more peak hour.

Under existing conditions, congestion occurs along the heavily traveled commuter routes, particularly along the Telegraph Road and Duke Street corridors, some side street approaches to those roadways, and also along Eisenhower Avenue and Mill Road near the connections to the Beltway.

A source of data for this report was StreetLight InSight®. StreetLight metrics are derived from a combination of two types of locational data: navigation-GPS data and Location-Based Services (LBS) data, which can be used to create origin and destination (OD) analyses. The relative level of cut-through traffic that is present in the study area under existing conditions during the morning and afternoon peak hours was determined by comparing the number of trips with an origin or destination in the EESAP to trips that pass through the EESAP with an origin or destination outside of the EESAP. Based on StreetLight data, it was found that approximately 50% of traffic entering or exiting the EESAP during the morning peak is cut-through traffic, and approximately 47% of traffic entering or exiting the EESAP during the afternoon peak is cut-through traffic. In order to provide a conservative analysis, it was assumed that existing traffic would remain on the network and no regional cut-through trips were rerouted.

Proposed Development

The original development program proposed for the EESAP 2019 Update (including existing, approved, and proposed uses) includes the following:

- Residential - 11,932,000 sf (11,932 units)
- Office – 5,324,835 sf
- Retail – 858,278 sf
- Hotel – 1,558,200 sf (4,452 rooms)

The originally proposed development program resulted in an increase in density of approximately 7.3 million square feet over what is currently approved.

The development program was modified as a result of the VISSIM analysis with a reduction in density or change in land uses at key development blocks, to include the following:

- Residential – 12,232,000 sf (12,232 units)
- Office – 4,524,835 sf
- Retail – 858,278 sf
- Hotel – 1,558,200 sf (4,452 rooms)

This revised development program resulted in an increase in density of approximately 6.8 million square feet over what is currently approved.

Although a significant increase in density is proposed, locating the additional development in a transit-oriented, walkable, urban location within the City is consistent with planning best practices. Regional cut-through traffic that currently travels through the EESAP is likely to be displaced by local traffic accessing the EESAP and surrounding neighborhoods.

Additional analysis may be needed on a case by case basis if a specific block's development program significantly deviates or changes from the uses proposed as part of the EESAP 2019 Update.

Travel Demand Assumptions

Mode split projections for the EESAP area are based primarily on trip generation data collection, observations, and surveys at comparable, metro accessible sites in Northern Virginia (including Eisenhower East) and Washington, DC. This data was then compared to the calculated number of trips that would be generated at each site using the methodology outlined in the

Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 10th Edition. The following auto mode splits were assumed in the analysis:

- Residential: 30-40% based on distance to Metro
- Office: 30-40% based on distance to Metro
- Retail: 10-65% depending on type of retail (neighborhood serving, destination or grocery)
- Hotel: 20% for all sites

Local and Regional trip distribution was based primarily on data collected from StreetLight, by mapping the general home location of commuters to the EESAP and the general work locations of residents in the EESAP. The results of the Home and Work Analysis were then used to define the major roadways used for regional trips, and the distribution of trips with an origin or destination in neighborhoods proximate to Eisenhower East. This analysis results in an assignment of trips to the roadway network.

Future Improvements

A number of planned transportation improvements in or near the EESAP are expected to be complete by 2030. The full list of improvements is detailed in the report, but examples include:

- Eisenhower Avenue Metrorail Station Platform Reconstruction
- Eisenhower Avenue Widening and Roadway Improvements
- King Street – Old Town Metro Access Improvements
- Old Cameron Run Trail
- Leading Pedestrian Intervals (LPIs)
- "No Turn on Red" Restrictions

A more complete, urban grid of streets is also proposed for the EESAP, particularly south of Eisenhower Avenue. The street grid assumed for this report was based generally on the roadways planned as part of the original Small Area Plan, and includes the following new connections:

- Dock Lane – extension from Port Street to Anchor Street;
- Port Street – extension from Dock Lane to Southern Street;
- Southern Street – extension from Mill Road to Block 9A/9B;
- Park Lane – new street from Hoofs Run Drive to Elizabeth Lane;
- Elizabeth Lane – extension from Eisenhower Avenue to Park Lane;
- Dulany Street – extension from Eisenhower Avenue to Park Lane; and
- John Carlyle Street - Eisenhower Avenue to Savoy Street.

Future Traffic Operations

A capacity analysis was developed to compare the future roadway network with the approved development program to the future roadway network with the proposed development program. Intersection capacity analyses were performed for the morning and afternoon peak hours at study area intersections. Synchro version 9.2 was used to analyze the study intersections based on the *Highway Capacity Manual* (HCM) 2000 methodology. VISSIM version 10.0 was used to analyze a subset of the study area intersections along Duke Street, Eisenhower Avenue, and Telegraph Road using an agreed upon set of Measures of Effectiveness (MOEs).

Traffic projections for 2030 are based on existing volumes, plus traffic generated by approved nearby background developments, inherent growth on the roadway, and traffic generated by the approved/proposed development program in the EESAP.

Based on City of Alexandria standards or as outlined in the approved scoping document, the proposed development is considered to have an impact at an intersection if the any of the following conditions are met:

- The capacity analyses show a LOS E or F at an intersection or along a movement in the future with the proposed development where one does not exist in the Approved conditions;
- There is an increase in delay at any movement or overall intersection operating under LOS E or F of greater than 10 percent when compared to the Approved conditions; or
- There is an increase in the 95th percentile queues by more than 150 feet at an intersection or along a movement where queues exceed available storage in the future conditions with the proposed development where one does not exist in the approved scenario.

Following these guidelines, there are impacts to 25 intersections as a result of the proposed development based on the Synchro analysis. Additional improvements were identified using VISSIM. Based on the Synchro and VISSIM analyses, mitigation measures and network-wide improvements were explored at these intersections, and included the following:

- Adjustments to signal timing at ten (10) intersections;
- Modifications to signal phasing or cycle length and adjustments to signal timing at 16 intersections;
- Restriping at 11 intersections;
- Adding a turn lane or pocket at three (3) intersections;
- Adding a new signal at five (5) intersections – including Mill Road and Dock Street, Mill Road at the Telegraph Road ramp, Telegraph Road at the Pershing Road ramp, Telegraph Road at the eastbound Duke Street ramp, and Telegraph Road at the westbound Duke Street ramp.
- Density reduction and changes in land use at key development blocks

With these mitigations in place, the analysis shows that traffic operations with proposed development will improve or are consistent with the approved development scenario at many intersections, and in some cases improves or is similar to existing conditions. Nevertheless, there are still certain locations that are projected to experience delay and queuing issues.

Monitoring of volumes within the EESAP is recommended before the mitigation measures and improvements identified in this report are implemented, to determine if observed volumes are in line with forecasted volumes.

Summary and Recommendations

The vehicular mitigation measures outlined above are important for vehicular operation. However, in order for the EESAP to realize the goal of becoming a more vibrant, urban, walkable and bikeable area, and to attain the non-auto mode splits assumed in this analysis, it is critical that alternate modes of travel are prioritized in this area. The following are important elements of achieving this vision:

- A complete grid of streets south of Eisenhower should be advanced to improve block sizes and connectivity. These connections would provide easy, direct access to Metrorail stations for pedestrians and cyclists, as well as dispersion of vehicular traffic.
- It is recommended that the City consider standardizing cycle lengths and consider using pretimed signals throughout the EESAP. Shorter signal cycles permit frequent gaps, allowing city streets to function as a complete network rather than a series of major corridors for commuter traffic. In addition, shorter more predictable signal cycles provide more consistent crossing opportunities for pedestrians and bicycles, while long cycle lengths may increase pedestrian and bicycle non-compliance and risk-taking behavior.
- The City should continue to study the feasibility of implementing increased bus service, such as the proposed Eisenhower East Circulator, particularly for blocks at the east end of the EESAP. This portion of the EESAP is outside the quarter-mile walkshed to Metrorail and there is limited bus service in this area today.
- Parking ratios should be provided in a manner that encourage the use of non-auto modes of travel.
- A robust Transportation Demand Management (TDM) Plan should be implemented for the EESAP to encourage use of non-auto modes.
- Continued improvements to bicycle infrastructure in and around EESAP, including additional bikeshare stations.
- Transportation technologies, such as those identified in the City's Smart Mobility program, should be implemented to the extent possible, to allow for improved traffic management.

Findings

This report reviews the transportation aspects of the proposed increase in density in several development blocks as compared to the currently approved development program.

Based on the capacity analysis results using macroscopic analysis tools (Synchro) and the microsimulation analysis results (using VISSIM) **this report concludes that the proposed increase in density and changes in uses included in the EESAP 2019 Update will have a manageable impact** on the surrounding transportation network, assuming this report's recommendations and mitigation measures are implemented.

INTRODUCTION

This report is a Multimodal Transportation Study (MTS) for the Eisenhower East Small Area Plan (EESAP) 2019 Update, located in the City of Alexandria, Virginia. This report reviews the transportation aspects of the proposed increase in density in several development blocks as compared to the currently approved development program.

PURPOSE OF STUDY

The purpose of this report is to:

1. Review existing and future transportation facilities in the area surrounding the project area.
2. Determine if the new transportation demand generated by the proposed changes to the development program would have detrimental impacts on the surrounding transportation network
3. Present recommendations to minimize the detrimental impact from the proposed change to the development program.

STUDY AND ANALYSIS METHODOLOGY

This study outlines the findings of a macroscopic vehicular analysis (using Synchro) and a microsimulation vehicular analysis (using VISSIM).

The scope of the analysis contained within this report was extensively discussed with and approved by City of Alexandria and VDOT staff. The general methodology of the analysis follows national, City of Alexandria, and VDOT guidelines on the preparation of transportation impact evaluations of site development.

PROJECT/DEVELOPMENT SUMMARY

The 2019 EESAP update includes changes to the development programs of 12 blocks within the EESAP. The resulting changes in land use and density will include a total increase in 5,706 units, 659,679 square feet of office, 185,723 square feet of retail, and 2,204 hotel rooms, as compared to the previously approved development program:

- Block 2 of the EESAP was previously approved for 661,386 square feet of office. Block 2 is now proposed to include a total of 1,000,000 square feet of office and 650 residential dwelling units.

  After further analysis and evaluation, a reduction in 250,000 square feet of office at Block 2 has been identified as a mitigation measure to reduce vehicular trips at key study area intersections. As such Block 2 is now proposed to include a total of 750,000 square feet of office and 650 residential dwelling units.

- Block 3 of the EESAP was previously approved for 187,874 square feet of office. Block 3 is now proposed to include a total of 1,000,000 square feet of office and 650 residential dwelling units.

  After further analysis and evaluation, a reduction in 250,000 square feet of office at Block 3 has been identified as a mitigation measure to reduce vehicular trips at key study area intersections. As such Block 3 is now proposed to include a total of 750,000 square feet of office and 650 residential dwelling units.

- Block 6 of the EESAP was previously approved for 83,500 square feet of retail, 322,966 square feet of office, and 629 residential dwelling units. Block 6 is now proposed to include a total of 118,947 square feet of retail, 587,501 square feet of office, 571 hotel rooms, and 629 residential dwelling units.

- Block 9A of the EESAP was previously approved for 1,575 hotel rooms. Block 9A is now proposed to include a total of 30,000 square feet of retail and 1,575 hotel rooms.

- Block 9B of the EESAP was previously approved for 30,000 square feet of retail and 749,284 square feet of office. Block 9B is now proposed to include a total of 30,000 square feet of retail, 350,000 square feet of office, and 1,078 residential dwelling units.

  After further analysis and evaluation, a conversion of 300,000 square feet of residential space (approximately 300 dwelling units) at Block 9B has been identified as a mitigation measure to reduce vehicular trips at key study area intersections. As such Block 9B is now proposed to include a total of 30,000 square feet of retail, 50,000 square feet of office, and 1,378 residential dwelling units.

- Block 15 of the EESAP was previously approved for 475 residential dwelling units. Block 15 is now proposed to include a total of 652 residential dwelling units, and 270,917 square feet of office.

- Block 22 of the EESAP was previously approved as open space. Block 22 is now proposed to include a total of 490 hotel rooms.

- Block 23 of the EESAP was previously approved for 402,000 square feet of office. Block 23 is now proposed to include a total of 398,000 square feet of office and 571 hotel rooms.
- Block 24 of the EESAP was previously approved for 176,007 square feet of office and 225 residential dwelling units. Block 24 is now proposed to include a total of 50,000 square feet of retail, 150,000 square feet of office, 571 hotel rooms, and 1,800 residential dwelling units.
- Block 25A of the EESAP was previously approved for 176 residential dwelling units. Block 25A is now proposed to include a total of 50,000 square feet of retail, 500,000 square feet of office, and 650 residential dwelling units.
- Block P of the EESAP was previously approved for 29,724 square feet of retail, and 342,162 square feet of office. Block P is now proposed to include 29,724 square feet of retail and 342 residential dwelling units.
- Block 32 of the EESAP was previously approved for 755,144 square feet of office and 632 residential dwelling units. Block 32 is now proposed to include 1,387 residential dwelling units.

Figure 1 shows a summary of the existing, approved, and proposed development programs for the EESAP 2019 Update.

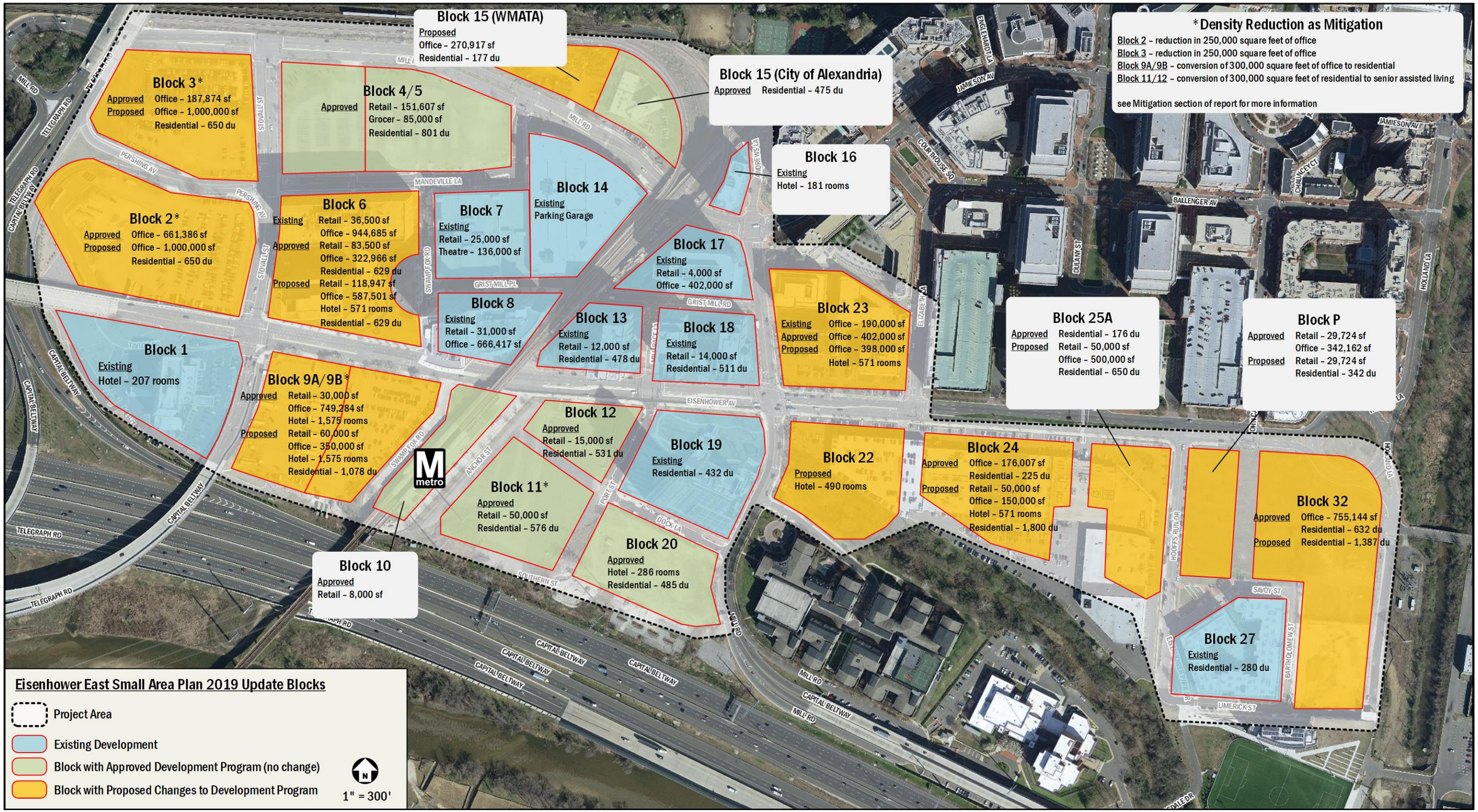


Figure 1: Development Program

STUDY AREA OVERVIEW

This section reviews the study area and includes an overview of the Eisenhower East Small Area Plan (EESAP) location, including a summary of the major transportation characteristics of the area and of future regional projects.

The following conclusions are reached within this chapter:

- The EESAP is surrounded by an extensive regional and local transportation system that will connect residents, employees, patrons, and visitors to the rest of the City of Alexandria and surrounding areas.
- The project area is served by public transportation with access to two Metrorail lines, regional and commuter rail, and several local and regional bus routes.
- There is existing bicycle infrastructure including the Mount Vernon Trail, and several bicycle lanes and signed routes within and surrounding the EESAP.
- Pedestrian conditions are generally good, particularly along anticipated major walking routes.
- Several local initiatives will positively impact the study area, including transit investments, pedestrian and bicycle improvements, and streetscape enhancements.

PROJECT STUDY AREA

The EESAP is located along the southern end of the City of Alexandria, bordering Huntington in Fairfax County to the south. Within the City of Alexandria, the EESAP is bordered by the Southwest Quadrant Small Area Plan (SAP) to the east, the King Street Metro/Eisenhower Avenue SAP and the Taylor Run/Duke Street SAP to the north, and the King Street Metro/Eisenhower Avenue SAP to the west. Figure 2 and Figure 3 show the project area within this regional context.

Zoning

The EESAP is bordered by residential, commercial, industrial, and institutional land uses. Figure 4 shows the existing zoning near the EESAP.

MAJOR TRANSPORTATION FEATURES

Overview of Regional Access

The EESAP has ample access to regional vehicular- and transit-based transportation options, as shown in Figure 2 and Figure 3, that connect the project area to destination within Virginia, the District, and Maryland.

The EESAP is accessible from several interstates such as I-495, US-1 (Richmond Highway), as well as State Routes such as SR-236 (Duke Street), SR-7 (King Street), SR-611 (Telegraph Road), and SR-241 (N Kings Highway). All of these roadways bring vehicular traffic within a half-mile of the site, at which point arterials and local roads can be used to access the EESAP directly.

The EESAP is proximate to the King Street and Eisenhower Avenue Metrorail stations. The Eisenhower Avenue Metrorail station is serviced by the Yellow line and the King Street Metrorail station is serviced by the Blue and Yellow lines. Both Metrorail stations provide connections to areas in Virginia, the District, and Maryland that are near Metrorail. All blocks within the EESAP are located within 0.5 miles of a Metrorail station.

The EESAP is also near Alexandria Union Station, which services VRE and Amtrak. The station serves Amtrak's Cardinal, Carolinian, Crescent, Northeast Regional, Palmetto, Silver Meteor, and Silver Star routes, as well as VRE's Manassas and Fredericksburg Lines. It is located between 0.6- and 1.1-miles walking distance of all blocks within the EESAP and is accessible by multiple bus routes from the EESAP.

All blocks within the EESAP are located within three (3) miles of the Mount Vernon Trail, an 18-mile off-street bicycle trail running along the Potomac River from George Washington's Mount Vernon estate to Theodore Roosevelt Island, just across the river from downtown Washington, DC. The Mount Vernon Trail connects to the W&OD, Four Mile Run, and Custis Trails in Arlington County, and to the Capital Crescent Trail in Washington, DC, providing regional bicycle connectivity. A detailed review of existing bicycle infrastructure is provided in a later section of this report.

Overall, the EESAP has access to several roadways, transit, and bicycle options, making it convenient to travel between the EESAP and destinations in Virginia, the District, and Maryland.

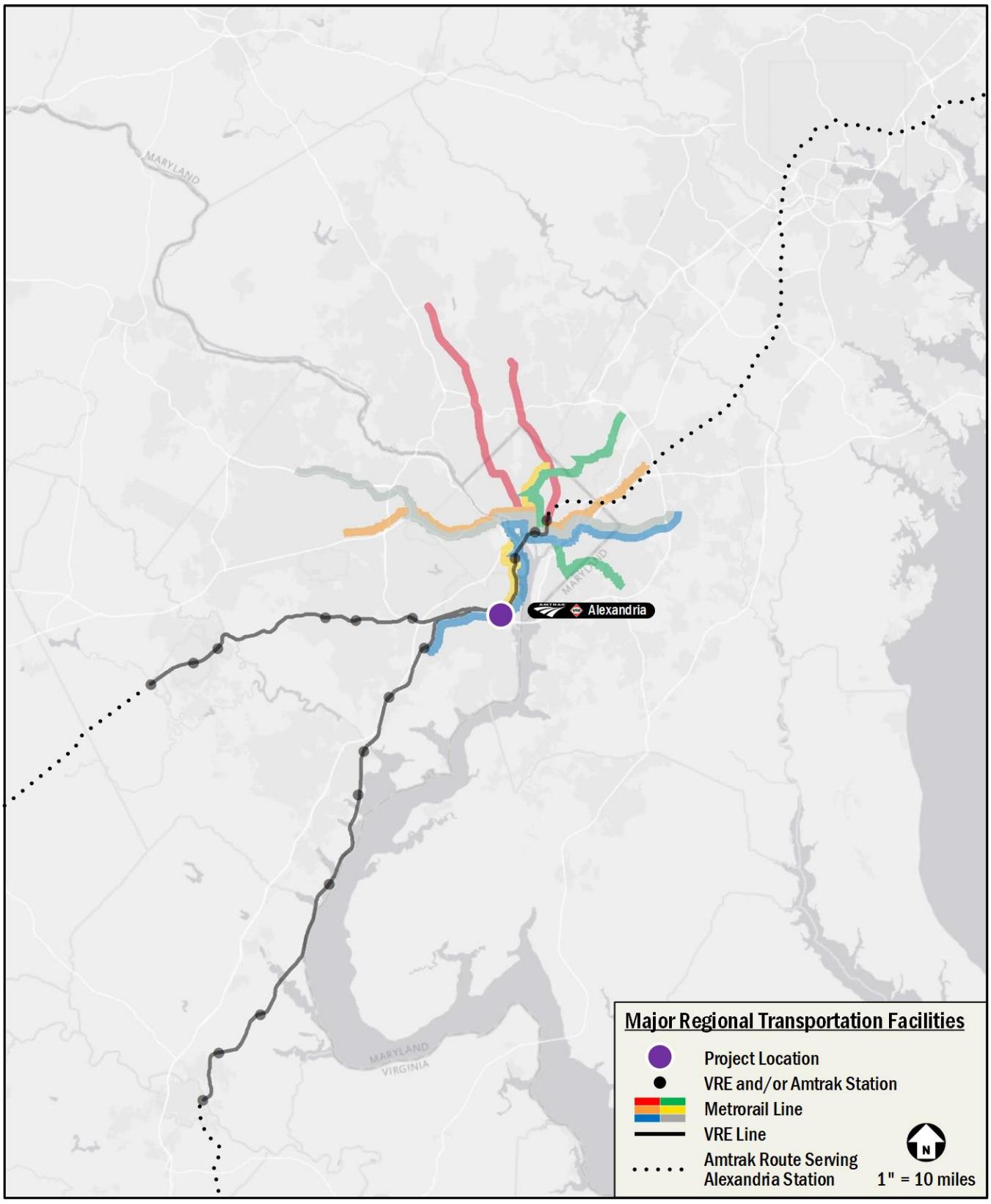


Figure 2: Major Regional Transportation Facilities (1 of 2)

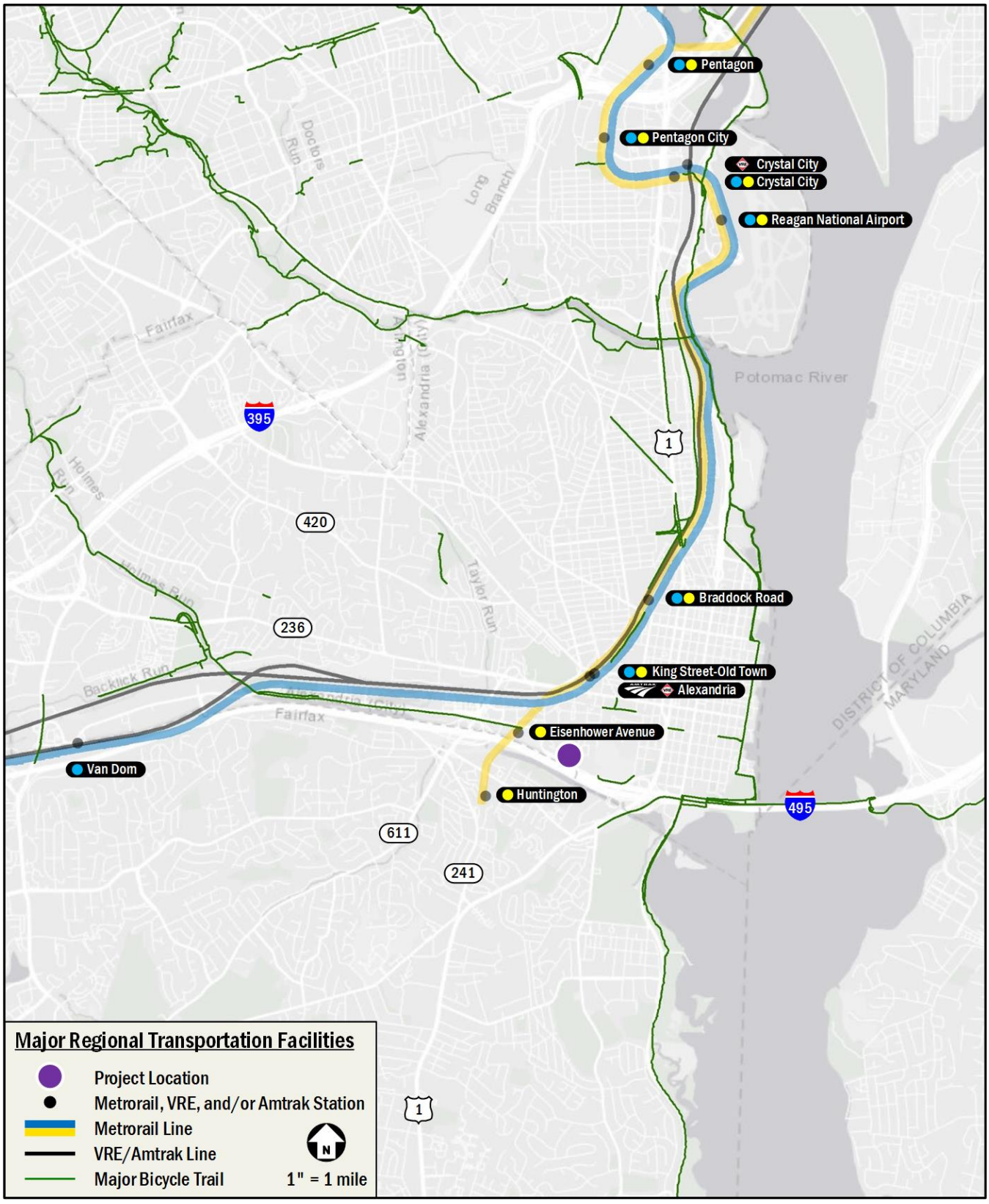


Figure 3: Major Regional Transportation Facilities (2 of 2)

Figure 4: Zoning

Overview of Local Access

There are several local transportation options near the EESAP that serve vehicular, transit, walking and cycling trips, as shown in Figure 6.

Blocks within the EESAP are served by a network of local roads and neighborhood streets that provide connections to and from regional roads and each block

The EESAP is serviced by both WMATA and DASH bus systems. Metrobus is the bus service operated by WMATA and interjurisdictional connections to and from the EESAP. DASH is a local bus system operated by the City of Alexandria. DASH supplements Metrobus with cross-city routes as well as connections to Metrorail. As shown in Figure 6, there are multiple bus routes that service the EESAP.

There are existing bicycle facilities that connect the EESAP to neighborhoods within the City of Alexandria and Fairfax County, most notably via the Eisenhower Avenue Trail and the bicycle lanes on Mill Race Lane, Jamieson Avenue, and Prince Street. Other facilities include signed routes on Eisenhower Avenue, Mill Road, and Holland Lane.

Overall, the quality of pedestrian facilities within and surrounding the EESAP is good. The pedestrian network in and around the project area is generally well established, with sidewalks on both sides of nearly all roadway segments and crosswalks at most signalized intersections and minor street approaches. Crosswalks, pedestrian signal push buttons, and curb ramps are provided at most signalized intersections. A detailed review of existing pedestrian infrastructure is provided in a later section of this report.

Walkscore

Walkscore.com is a website that provides scores and rankings for the walking, biking, and transit conditions within neighborhoods. The EESAP (classified by Walkscore.com as the Eisenhower East – Carlyle District) has a walk score of 70 (or "Very Walkable"), a transit score of 71 (or "Excellent Transit"), and a bike score of 59 (or "Bikeable"). Figure 5 shows the neighborhood borders in relation to the site location and displays a heat map for walkability and bikeability.

The EESAP is situated in an area with good walk scores because of the abundance of neighborhood serving retail locations that are in close proximity, where most errands can be completed by walking.

The EESAP is situated in an area with good transit scores due to its proximity to multiple bus lines, and the close proximity to two Metrorail stations and one railway station.

The bike scores are based on the EESAP proximity to regional bike trails, number of bike lanes, and relatively flat topography.

Overall, the Eisenhower East – Carlyle District neighborhood has high walk, transit, and bike scores. Planned roadway improvements will help improve the walk, bike, and transit scores in the Eisenhower East – Carlyle District neighborhood

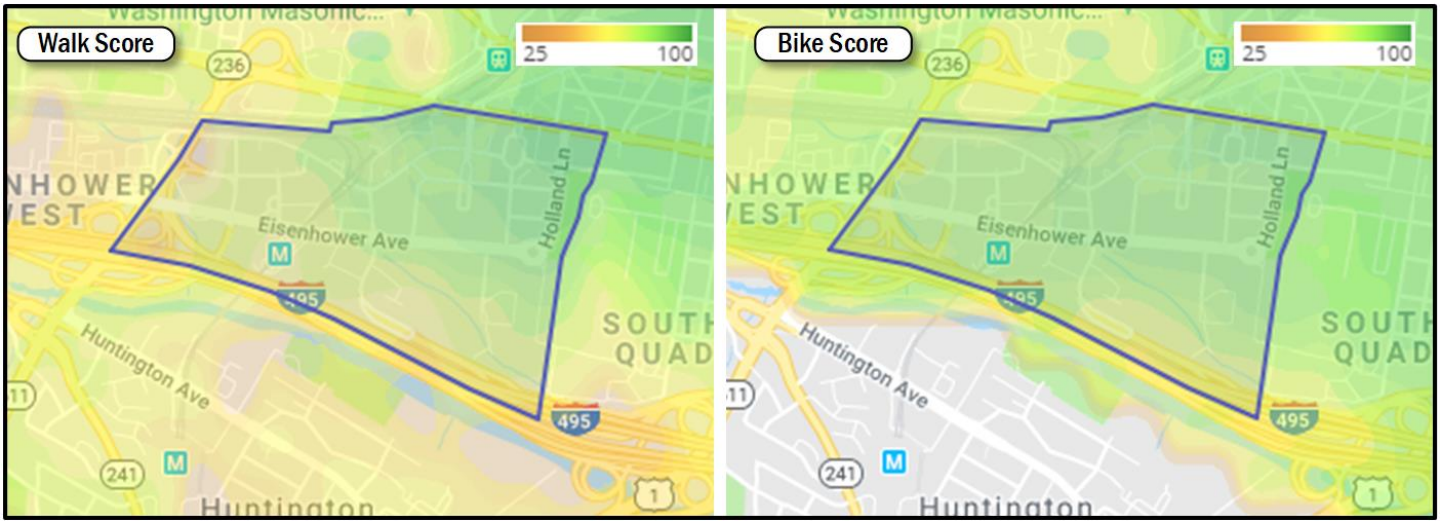


Figure 5: Summary of Walk and Bike Scores

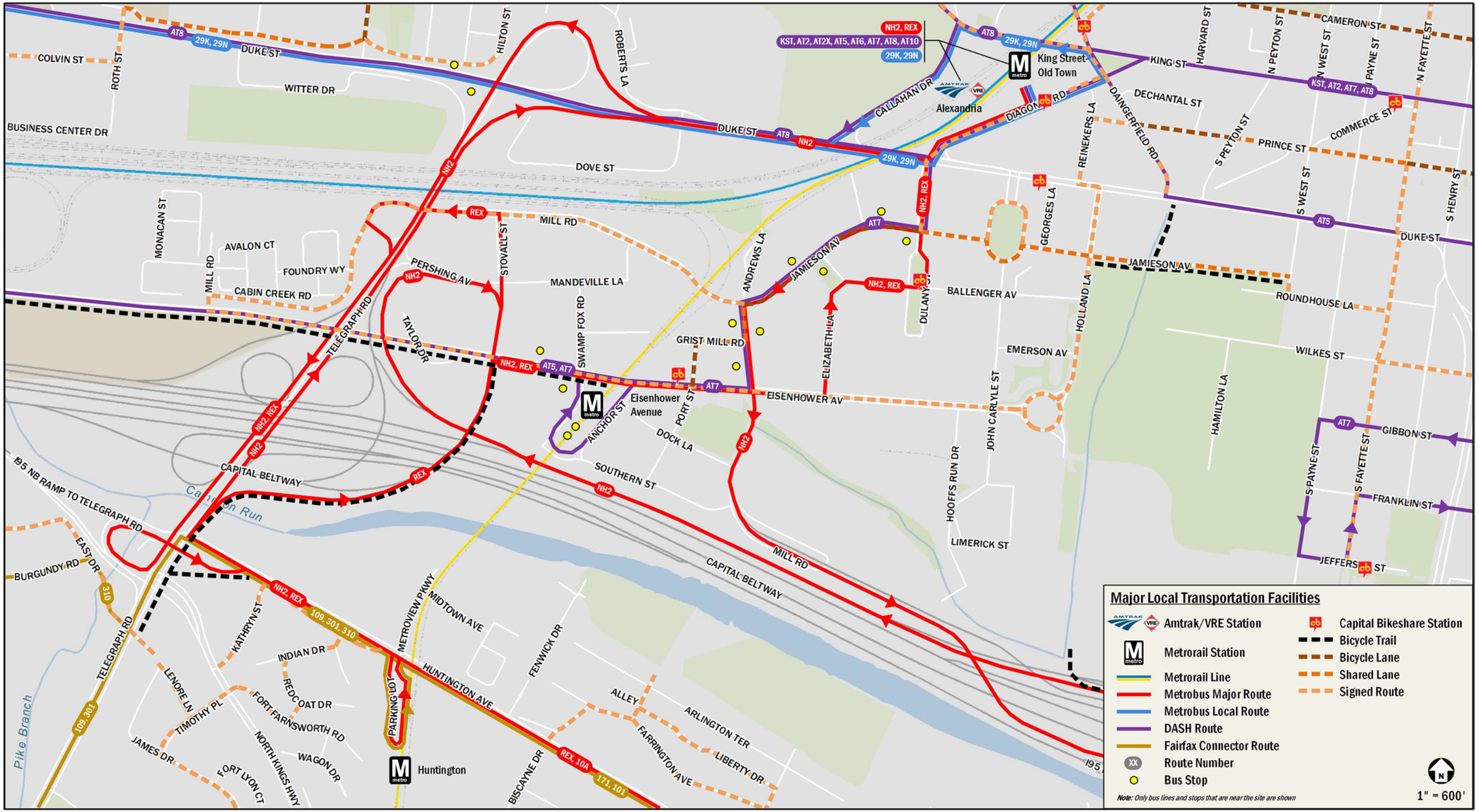


Figure 6: Major Local Transportation Facilities

EXISTING CONDITIONS

This section reviews the existing conditions of the pedestrian, bicycle, transit, and vehicular traffic networks in and around the project area.

PEDESTRIAN FACILITIES

The pedestrian network in and around the project area is generally well established, with sidewalks on both sides of nearly all roads, and crosswalks at most signalized intersections and minor street approaches. Crosswalks, pedestrian signal push buttons, and ramps are provided at most signalized intersections within the study area. Figure 7, Figure 8, and Figure 9 show the existing pedestrian peak hour volumes at all study area intersections. Figure 10 shows sidewalk coverage within and near the EESAP, including primary walking routes to and from the King Street-Old Town Metrorail Station.

BICYCLE FACILITIES

Under existing conditions, bicycle lanes are provided along Mill Race Lane within the project area and Jamieson Avenue east of the project area. Shared lanes are provided along Mill Road and Grist Mill Road within the project area, and Jamieson Avenue east of the project area. Bicycle trails are provided along Eisenhower Avenue west of the Metrorail station within the project area, and along the northbound Telegraph Road ramp to Eisenhower Avenue south of the project area. Eisenhower Avenue and Mill Road throughout the project area are signed bicycle routes. These facilities connect to the Holmes Run Trail west of the EESAP and the Mount Vernon Trail east of the EESAP, as well as other bicycle facilities to the northeast in Old Town Alexandria. Existing bicycle facilities in and around the project area are shown on Figure 11.

The project area contains one Capital Bikeshare station at the corner of Eisenhower Avenue and Mill Race Lane, as well as one 0.2 miles outside the project area at the corner of Ballenger Avenue and Dulany Street. These and other Capital Bikeshare stations near the area are shown on Figure 11.

Figure 12, Figure 13, and Figure 14 show the existing bicycle peak hour volumes at all study area intersections.

TRANSIT FACILITIES

The study area is served by numerous transit options under existing conditions, as shown in and described in the following sections.

Metrorail

The project area is served by two Metrorail stations under existing conditions as shown on Figure 15.

The Eisenhower Avenue Metrorail Station is located within the EESAP on Eisenhower Avenue between Swamp Fox Road and Mill Race Lane. The station serves the Yellow Line and is located within 0.5 miles walking distance of all blocks in the EESAP, with many being adjacent. The Yellow Line provides direct connections to areas in Virginia and the District, with access to Maryland via connecting lines. The Yellow Line connects Huntington in Fairfax County, Virginia to Fort Totten in the District while providing access to the District core and National Airport, Crystal City, and Pentagon City in Arlington, Virginia. Additionally, the Yellow Line connects to the Orange, Silver, Blue, and Green lines at L'Enfant Plaza Station, and the Red Line at Gallery Place Station. Yellow Line trains run approximately every eight (8) minutes during the morning and afternoon peak hours. The Yellow Line runs about every 12 minutes during weekday non-peak hours, every 20 minutes on weekday evenings after 9:30 pm and 12 to 20 minutes on the weekends. Eisenhower Avenue Station's average daily weekday ridership in 2016 was 1,591 boardings according to *Metrorail Average Weekday Daily Boardings* (WMATA, May 2016). Bike parking and car-sharing are available at the station.

The King Street-Old Town Metrorail Station is located 0.5 miles outside the project area on King Street between Callahan Drive and Daingerfield Road. The station serves the Blue and Yellow Lines and is located between 0.5- and 1.0-miles walking distance of all blocks within the project area. The Blue Line provides direct connections to areas in Virginia and the District, with access to Maryland via connecting lines. The Blue Line connects Franconia-Springfield in Fairfax County, Virginia to Largo Town Center in Prince George's County, Maryland while providing access to the District core and National Airport, Crystal City, and Pentagon City in Arlington, Virginia. Additionally, the Blue Line connects to the Orange, Silver, Yellow, and Green lines at L'Enfant Plaza Station, and the Red Line at Metro Center Station. Blue Line trains run approximately every eight (8) minutes during the morning and afternoon peak hours. The Blue Line runs about every 12

minutes during weekday non-peak hours, every 20 minutes on weekday evenings after 9:30 pm and 12 to 20 minutes on the weekends. King Street-Old Town Station's average daily weekday ridership in 2016 was 7,829 boardings according to *Metrorail Average Weekday Daily Boardings* (WMATA, May 2016). Bike parking and car-sharing are available at the station.

Bus

The project area is served by several bus stops under existing conditions as shown on Figure 15. These stops are served by the following bus services:

- **Metrobus (WMATA)** – Three (3) Metrobus routes service the project area.
- **DASH (Alexandria Transit Company)** – Three (3) DASH routes service the project area.

Table 1 shows a summary of information for the bus routes that serve the EESAP, including service hours, headway, and distance to the nearest bus stop. Table 2 shows a summary of weekday daily boardings and alightings from mid-April to mid-May in 2018 at each bus stop in the study area, as provided by DASH. Table 3 shows an inventory of all bus stops within or near the EESAP, including stop ID number, routes served, and passenger amenities.

Regional/Commuter Rail

The project area is served by regional and commuter rail services under existing conditions as shown on Figure 15.

The Alexandria Amtrak/VRE station is located 0.6 miles outside the project area on King Street between Callahan Drive and Daingerfield Road. The station serves Amtrak's Cardinal, Carolinian, Crescent, Northeast Regional, Palmetto, Silver Meteor, and Silver Star routes, as well as VRE's Manassas and Fredericksburg Lines. It is located between 0.6- and 1.1-miles walking distance of all blocks within the project area. Bike parking and car-sharing are available near the station.

Table 1: Existing Bus Route Information

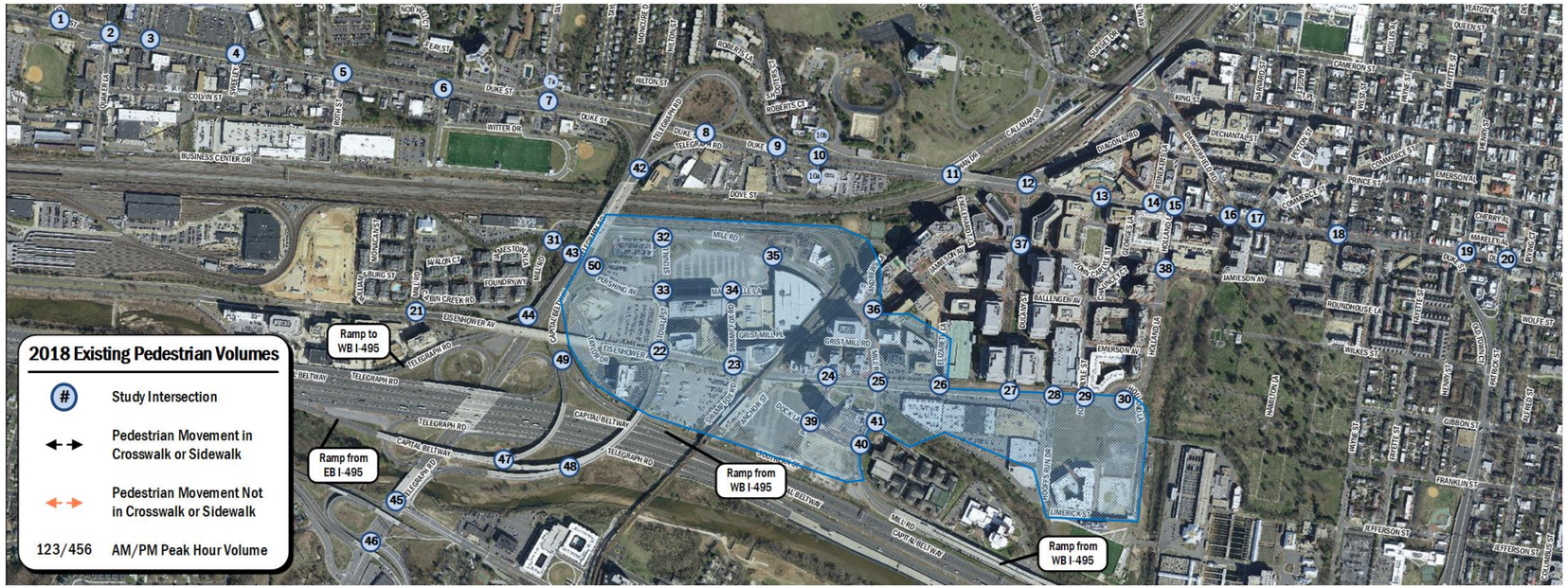
Route Number	Route Name	Service Hours	Headway	Nearest Bus Stop
29K, 29N (WMATA)	Alexandria-Fairfax Line	Weekdays: 5:44 AM – 12:29 PM	15-35 minutes	Within a ¼ mile walk of the project area boundary
REX (WMATA)	Richmond Highway Express	Weekdays: 5:38 AM – 11:36 PM Saturday: 5:34 AM – 10:40 PM Sunday: 5:36 AM – 9:41 PM	10-60 minutes	Within the project area
NH2 (WMATA)	National Harbor-Alexandria Line	Weekdays: 5:20 AM – 2:10 AM Saturday: 5:20 AM – 2:10 AM Sunday: 5:20 AM – 1:10 AM	30 minutes	Within the project area
AT5 (DASH)	Landmark Mall, Van Dorn Metro to Braddock Metro via Old Town	Saturday: 7:31 AM – 11:14 PM Sunday: 7:01 AM – 8:51 PM	30-60 minutes	Within the project area
AT7 (DASH)	Landmark Mall to King Street Metro, Old Town, Lee Center	Weekdays: 5:27 AM – 10:00 PM	30-60 minutes	Within the project area
AT8 (DASH)	Landmark Mall, Van Dorn Metro to Old Town	Weekdays: 4:45 AM – 12:33 AM Weekends: 6:38 AM – 11:36 PM	10-60 minutes	Within a ¼ mile walk of the project area boundary

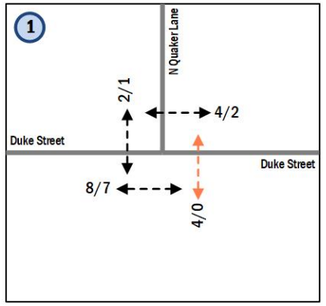
Table 2: Existing Bus Stop Weekday Daily Boardings and Alightings for DASH Routes (April-May, 2018)

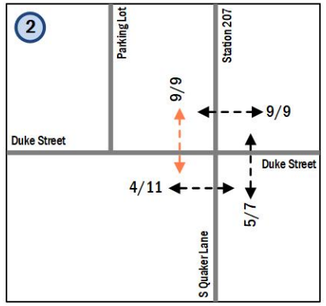
Location	Stop ID	Routes Served	Weekday Daily Boardings	Weekday Daily Alightings
Jamieson Ave & Englehardt Ln (WB)	4000553	AT7	17	1
Jamieson Ave & Dulany St (EB)	4000474	AT7	0	18
Jamieson Ave & Courthouse Sq. (WB)	4000554	AT7	0	2
Jamieson Ave & Courthouse Sq. (EB)	4000730	AT7	1	7
Mil Rd & Jamieson Ave (SB)	4000755	AT7	3	13
Mil Rd & Jamieson Ave (NB)	4000990	AT7	6	10
Mill Rd & Eisenhower Ave (SB)	4001075	AT7, NH2, REX	Data not available	Data not available
Eisenhower Ave & Swamp Fox Rd (WB)	4000496	AT5, AT7, REX	15	1
Eisenhower Ave & Swamp Fox Rd (EB)	4000495	AT5, AT7, NH2, REX	Data not available	Data not available
Eisenhower Ave Station Bus Bay E/F	4000602/4000603	AT5, AT7	59	44
Duke Street & Moncure Dr (EB)	4000034	AT8	17	6
Duke Street & Moncure Dr (WB)	4000035	AT8	16	97

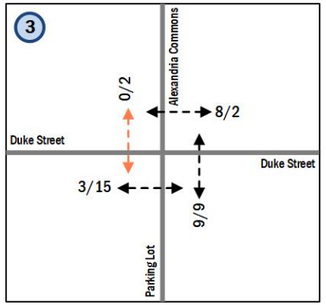
Table 3: Existing Bus Stop Inventory

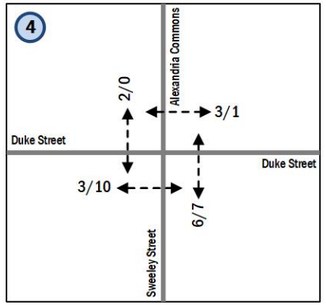
Location	Stop ID	Routes Served	Features							
			Sign	ADA Landing Pad	Sidewalk	Street Lighting	Info Case	Seating	Shelter	Trash Recep.
Jamieson Ave & Englehardt Ln (WB)	4000553	AT7	●	●	●	●				
Jamieson Ave & Dulany St (EB)	4000474	AT7	●	●	●	●				
Jamieson Ave & Courthouse Sq. (WB)	4000554	AT7	●	●	●	●				
Jamieson Ave & Courthouse Sq. (EB)	4000730	AT7	●	●	●	●		●	●	●
Mil Rd & Jamieson Ave (SB)	4000755	AT7	●	●	●	●		●	●	●
Mil Rd & Jamieson Ave (NB)	4000990	AT7	●	●	●	●		●	●	●
Mill Rd & Eisenhower Ave (SB)	4001075	AT7, NH2, REX	●	●	●	●		●		●
Eisenhower Ave & Swamp Fox Rd (WB)	4000496	AT5, AT7, REX	●	●	●	●		●	●	
Eisenhower Ave & Swamp Fox Rd (EB)	4000495	AT5, AT7, NH2, REX	●	●	●	●				
Eisenhower Ave Station Bus Bay E	4000602	AT5, AT7	●	●	●	●	●	●	●	●
Eisenhower Ave Station Bus Bay F	4000603	AT7	●	●	●	●	●	●	●	●
Duke Street & Moncure Dr (EB)	4000034	AT8	●	●	●	●				●
Duke Street & Moncure Dr (WB)	4000035	AT8	●	●	●	●				

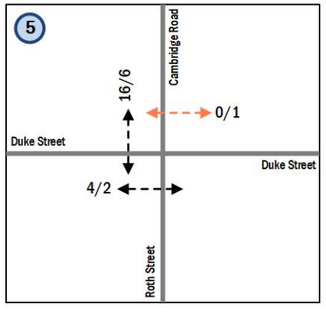


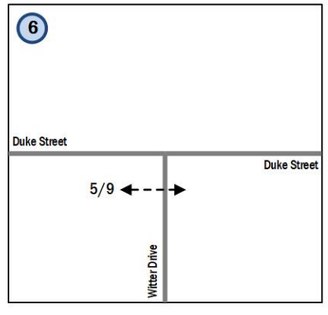


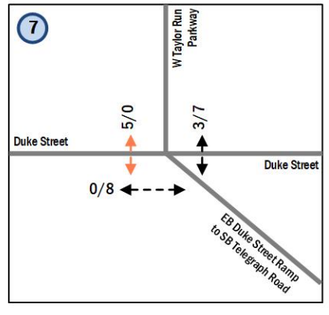


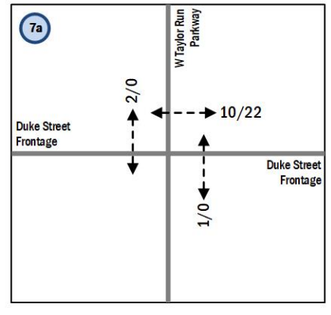


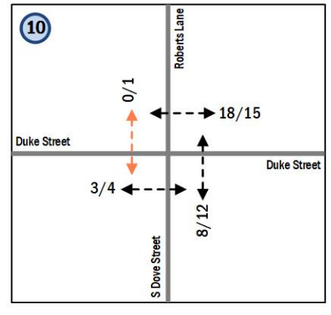


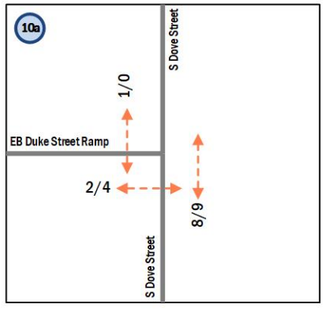


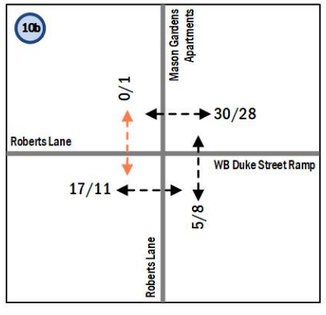


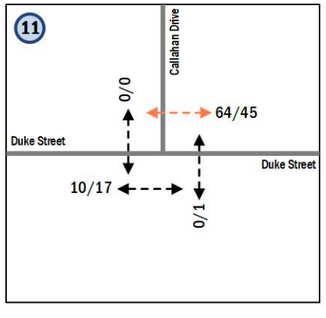


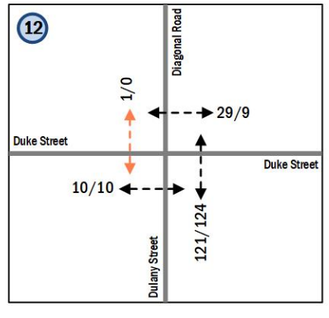


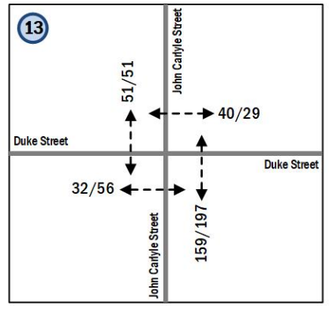


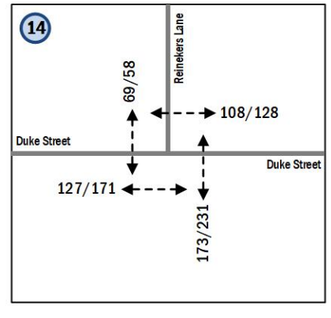












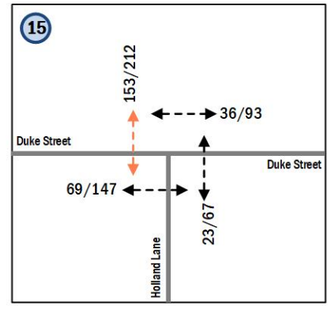


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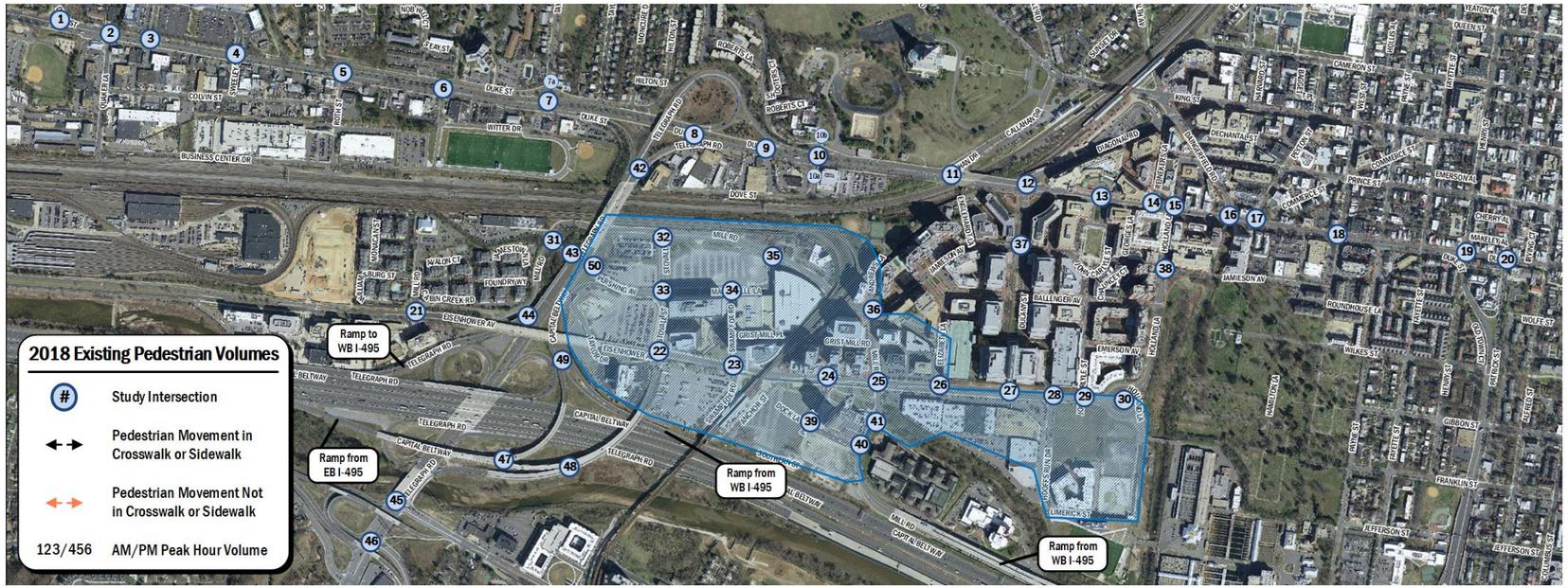
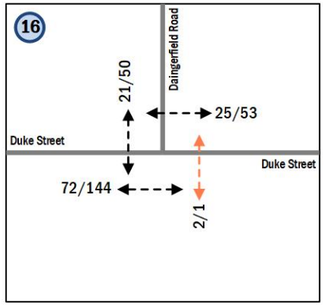
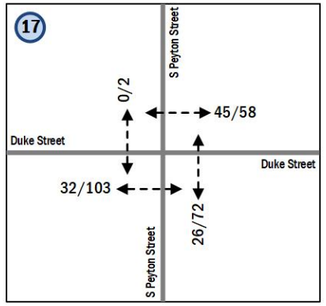
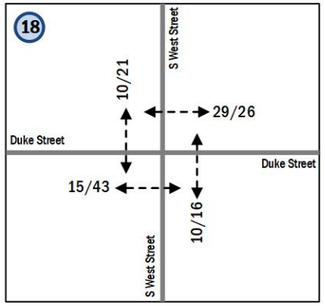
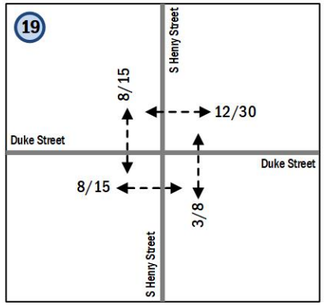
Figure 7: 2018 Existing Pedestrian Crossing Peak Hour Volumes (Intersections 1 – 15)

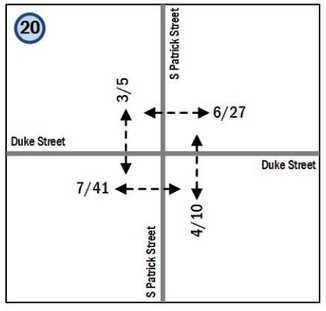


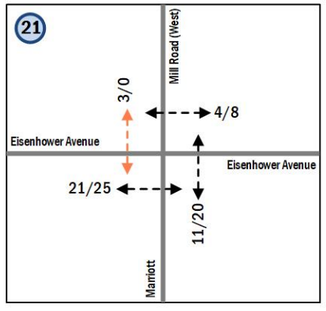


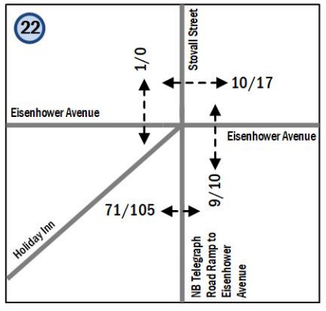


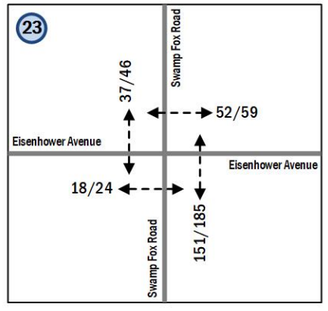


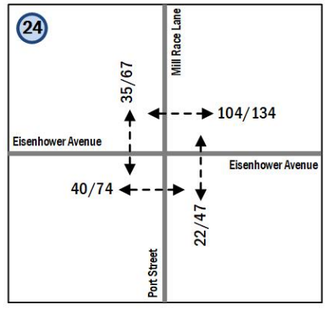


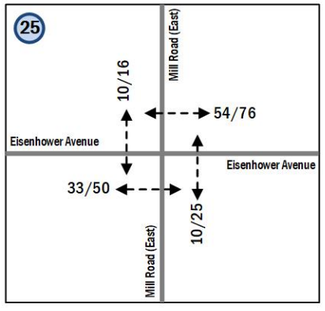


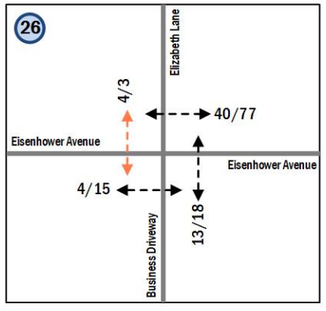


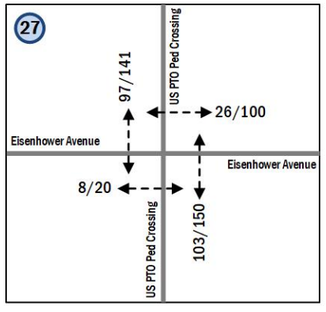


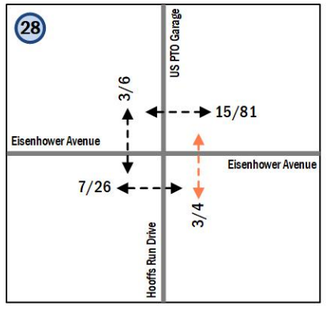


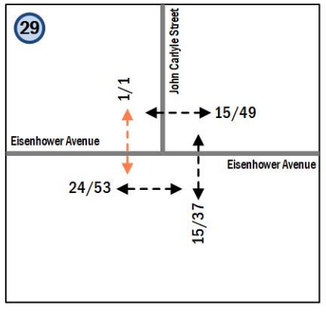


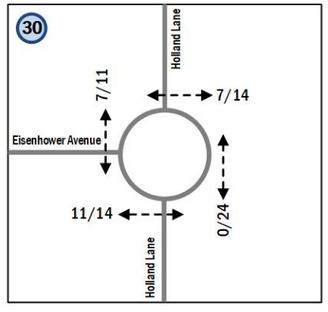


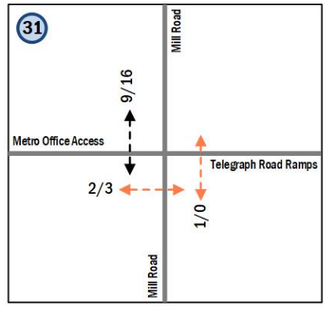


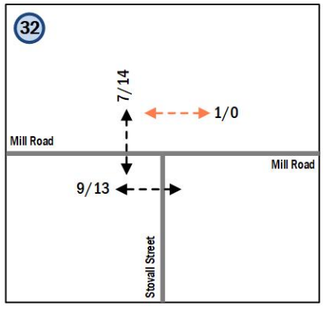












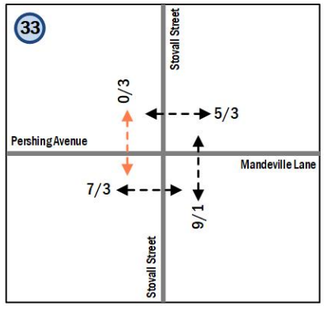
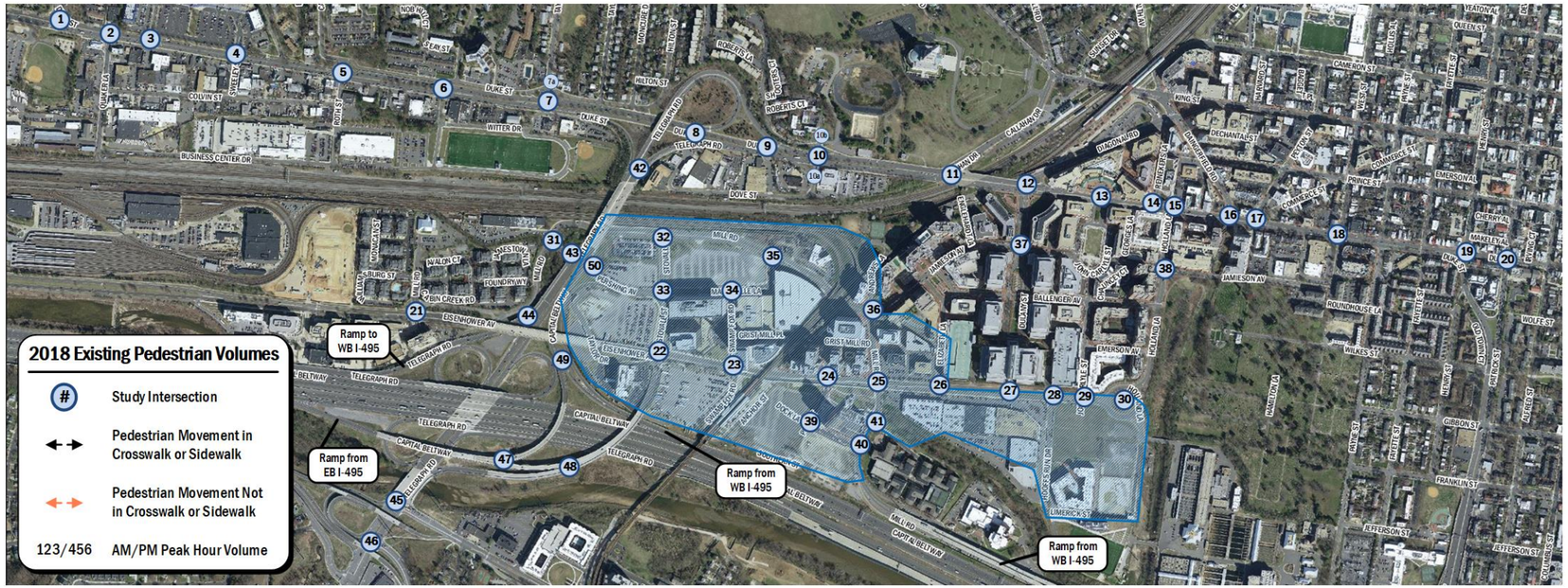
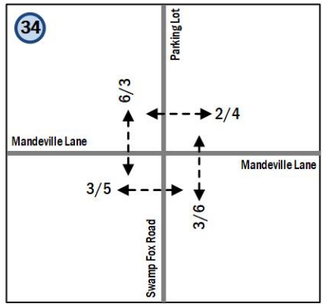
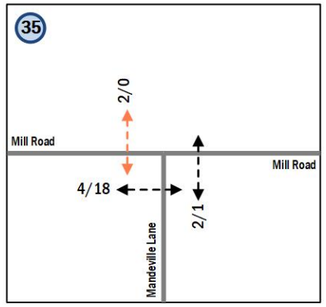
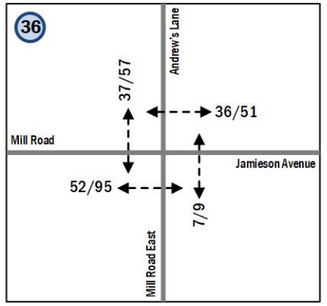


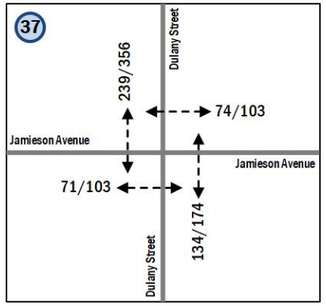
Figure 8: 2018 Existing Pedestrian Crossing Peak Hour Volumes (Intersections 16 – 33)

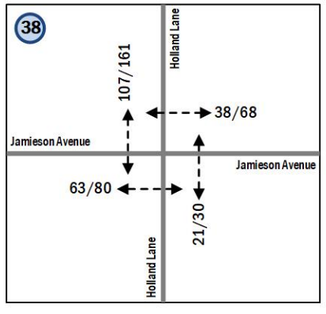


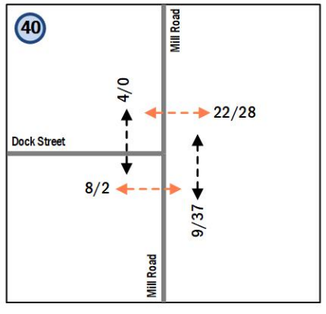


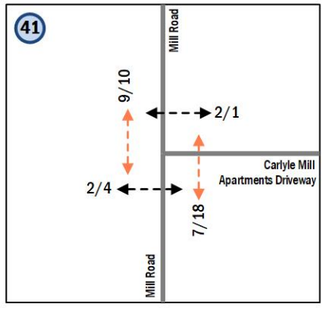


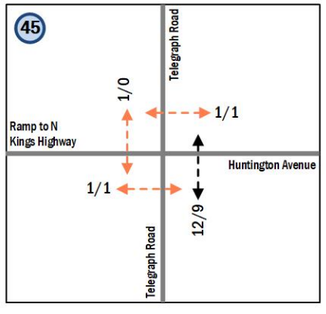












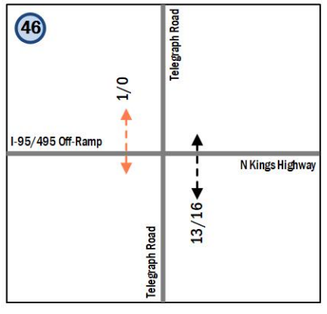


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Figure 9: 2018 Existing Pedestrian Crossing Peak Hour Volumes (Intersections 34 – 50)

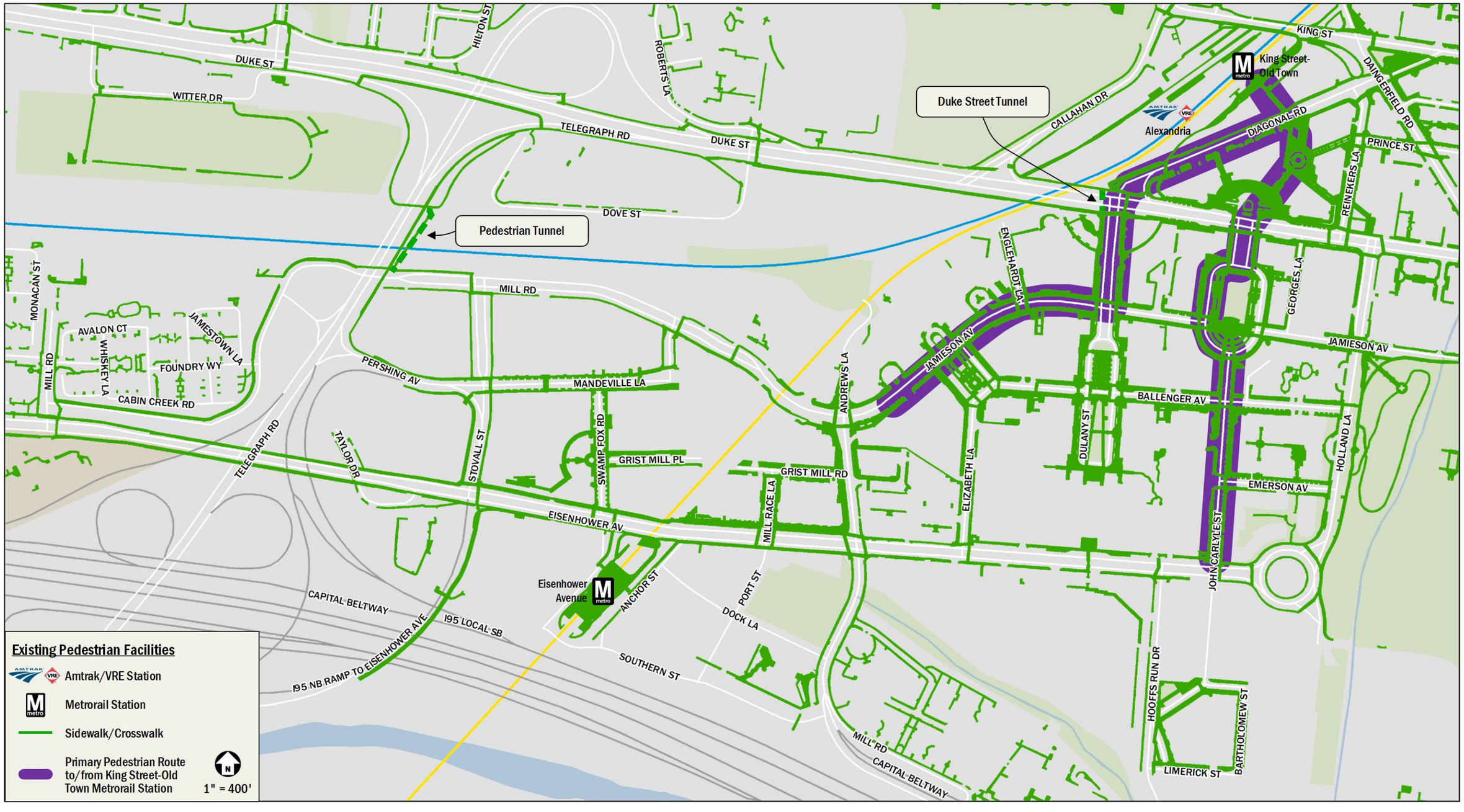


Figure 10: Existing Pedestrian Facilities

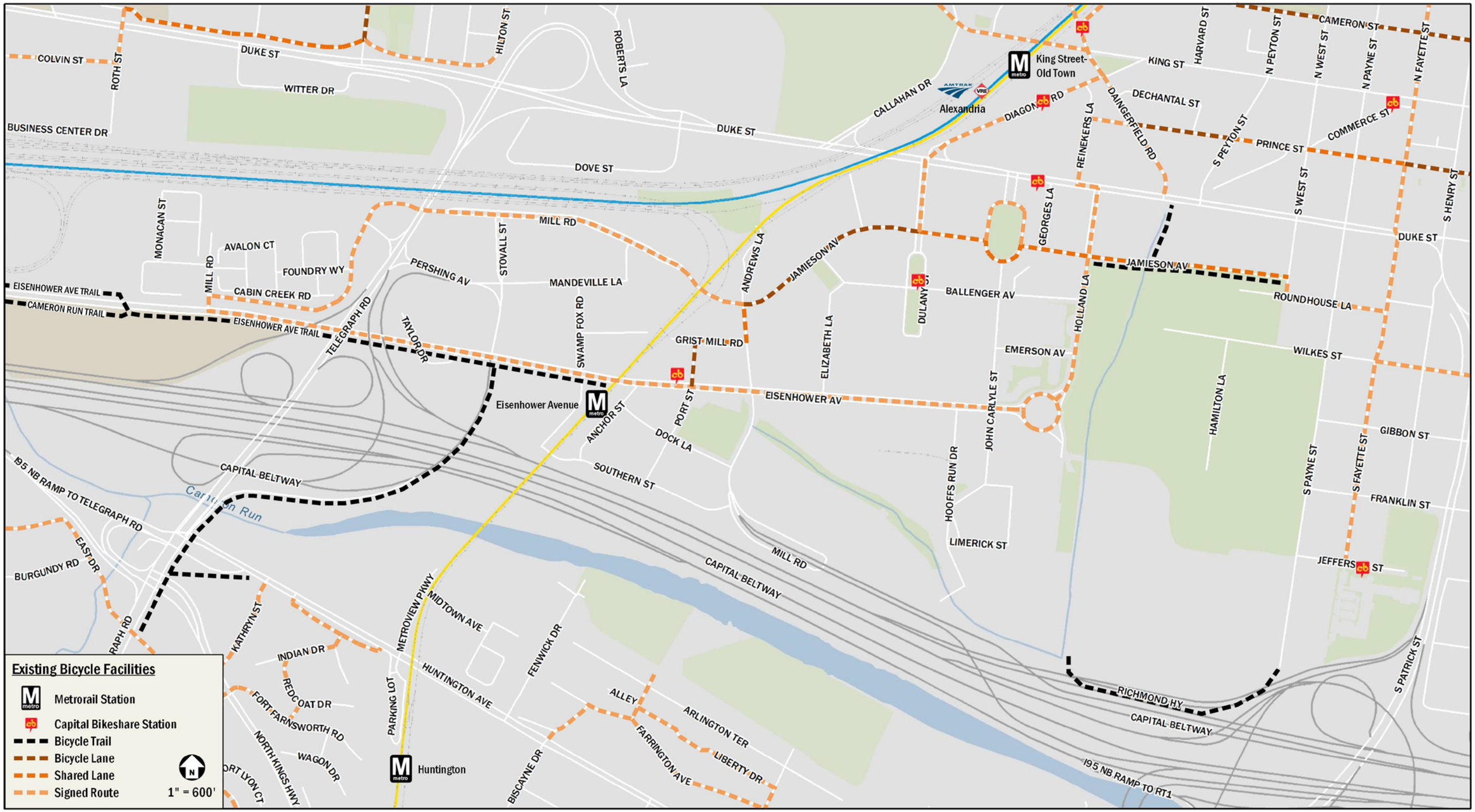
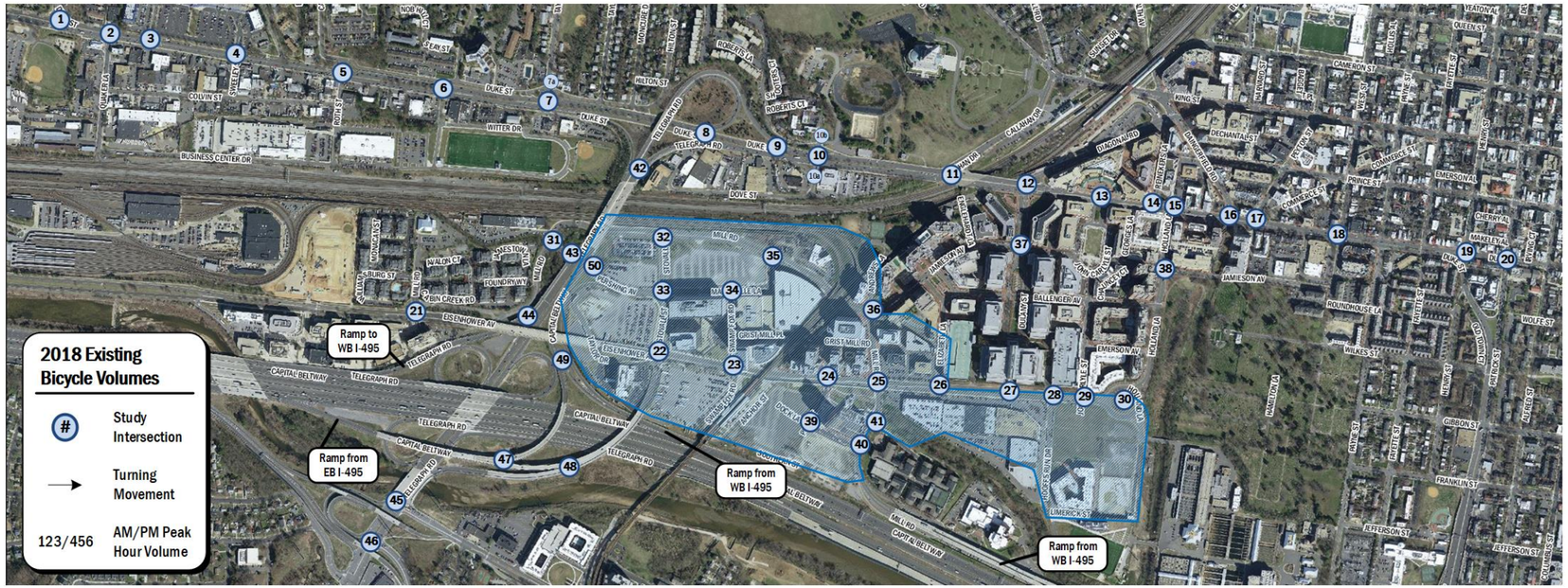


Figure 11: Existing Bicycle Facilities



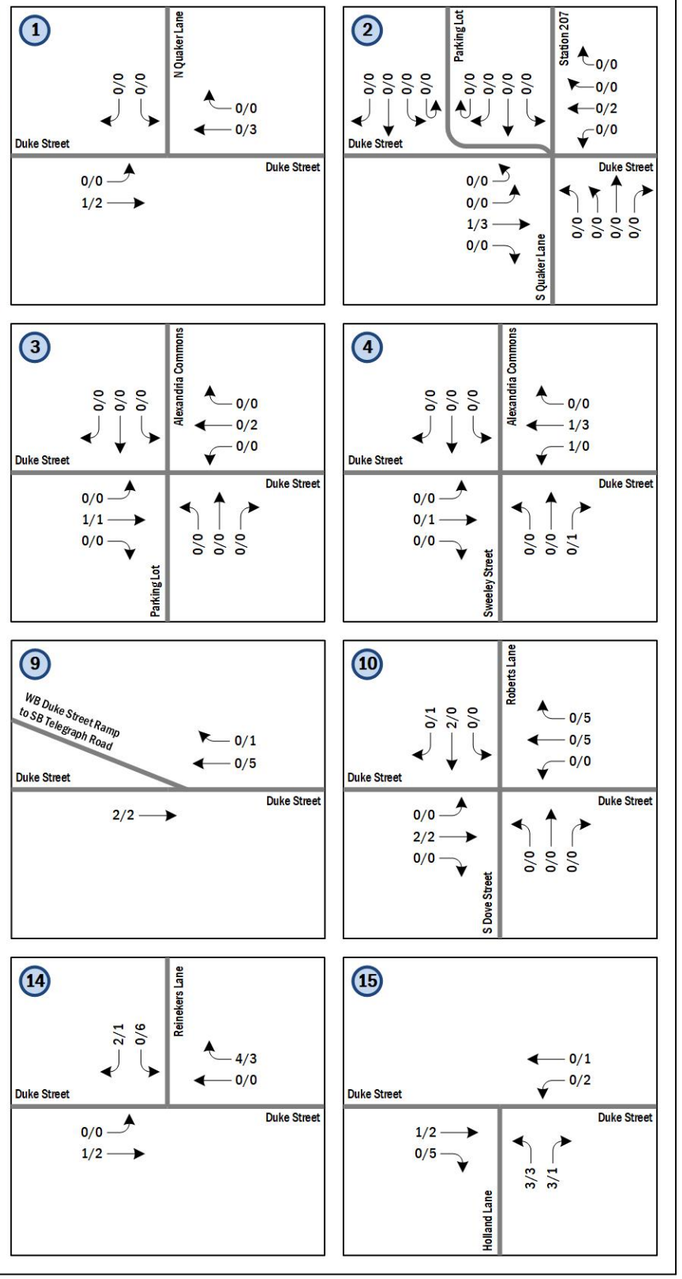
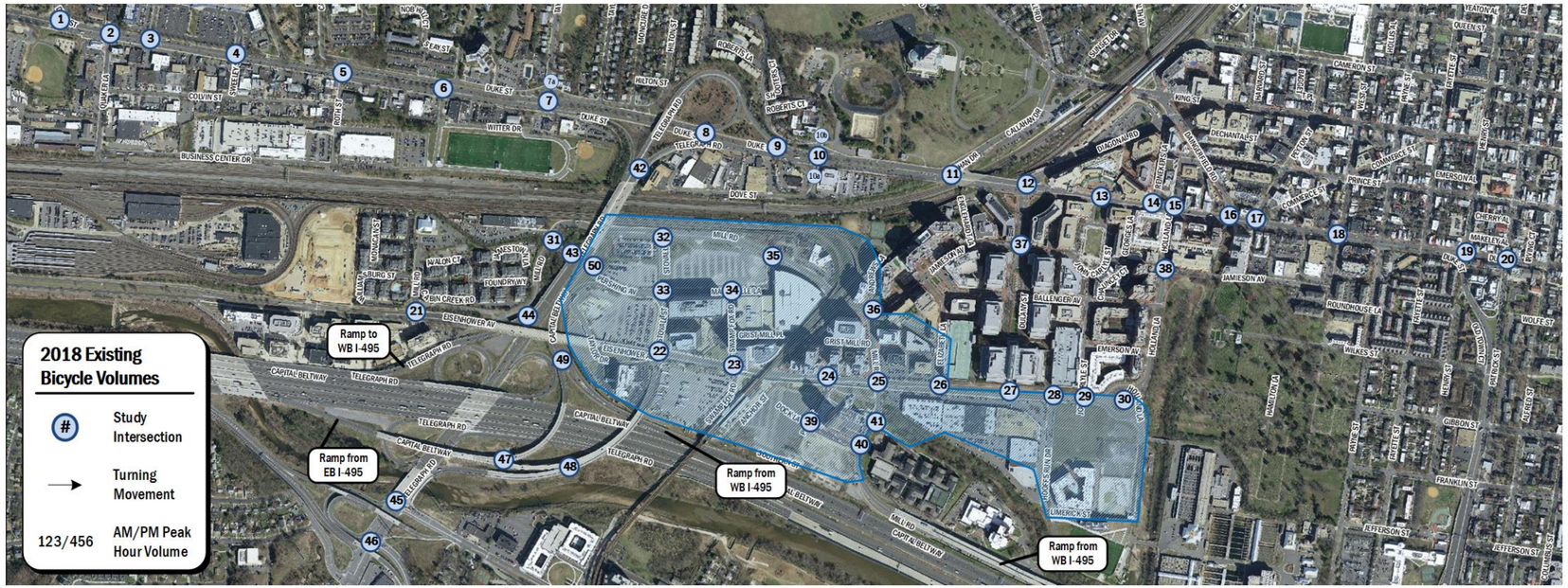


Figure 12: 2018 Existing Bicycle Peak Hour Volumes (Intersections 1 – 15)



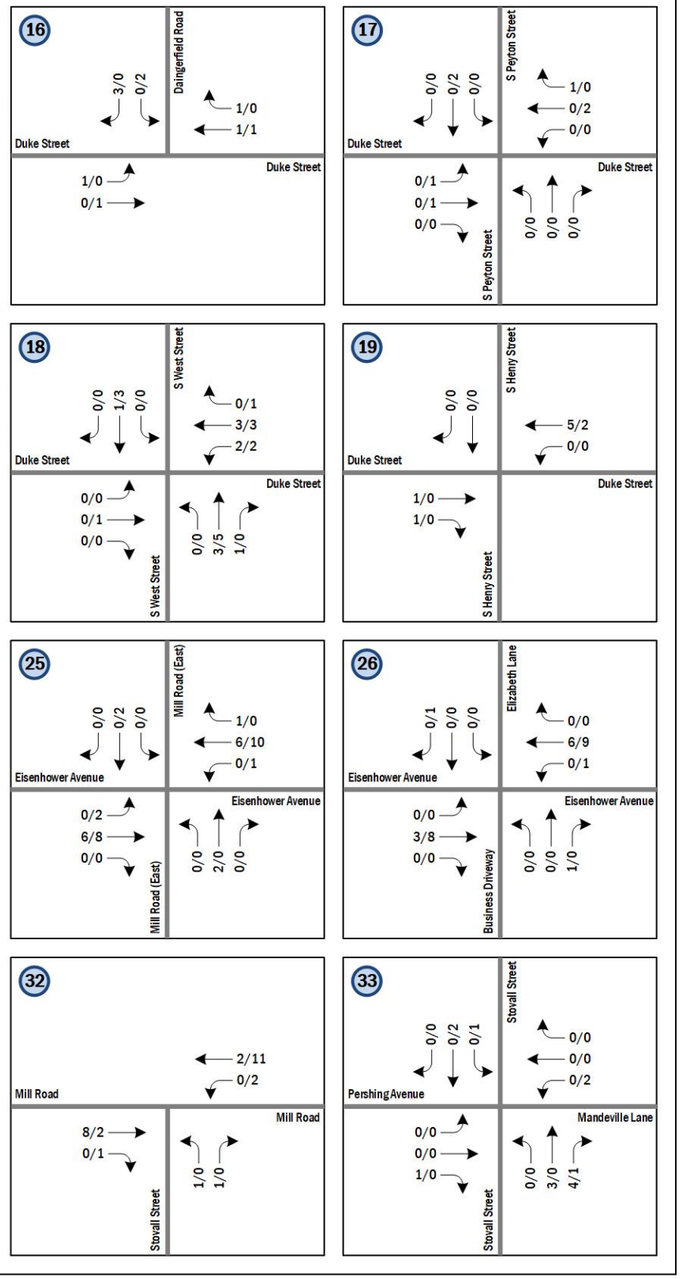
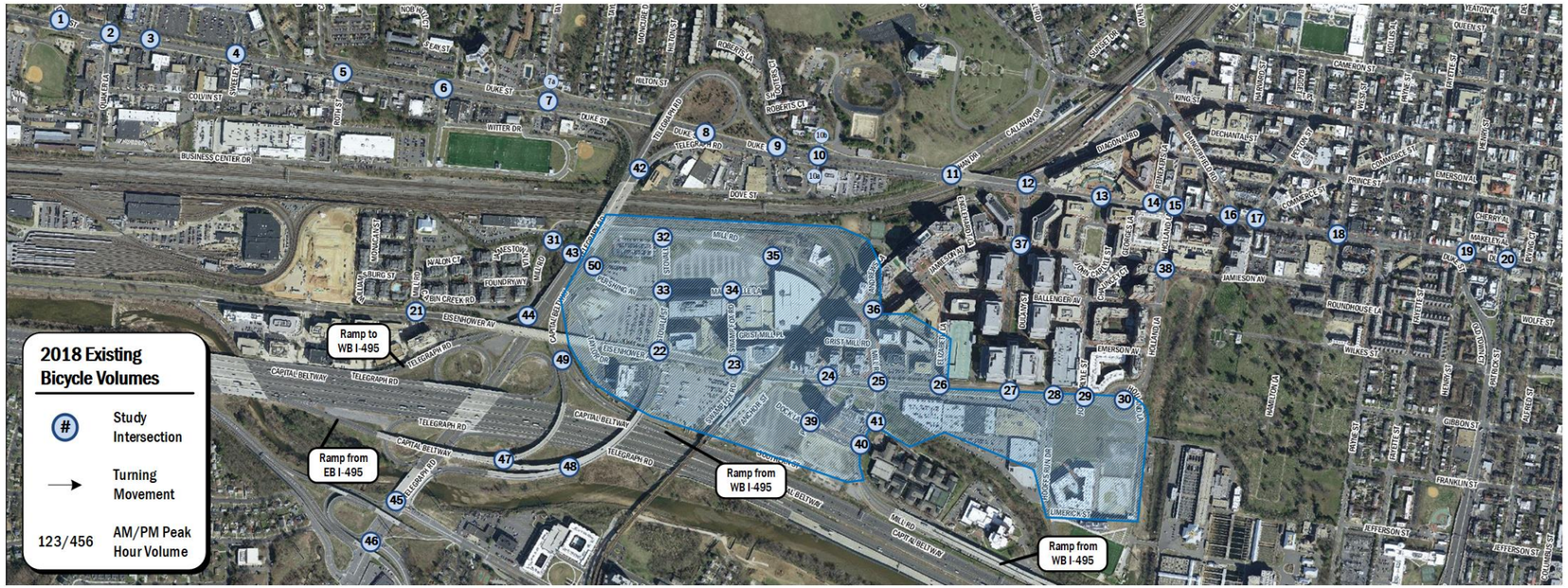
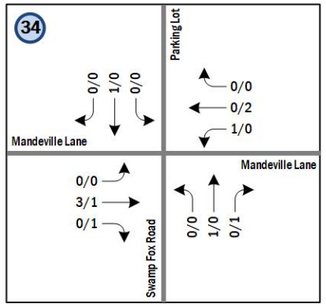
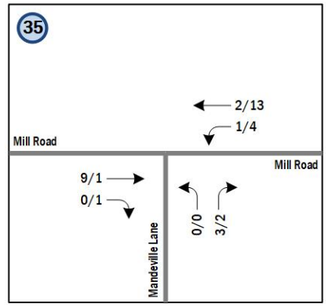
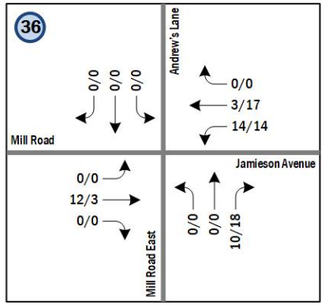


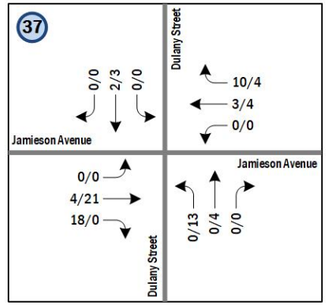
Figure 13: 2018 Existing Bicycle Peak Hour Volumes (Intersections 16 – 33)

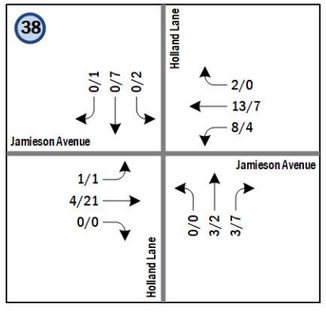


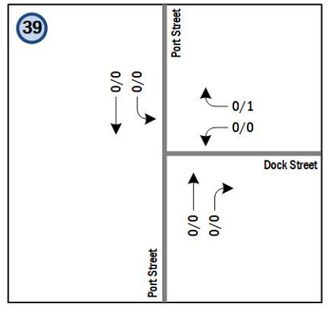


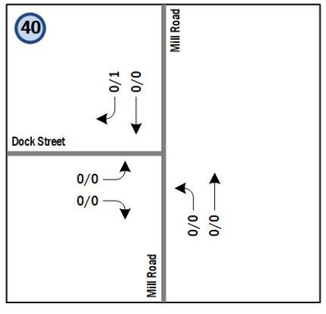


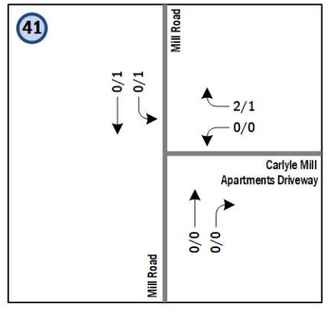


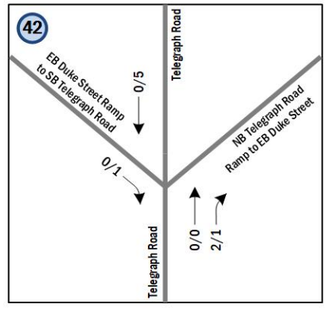


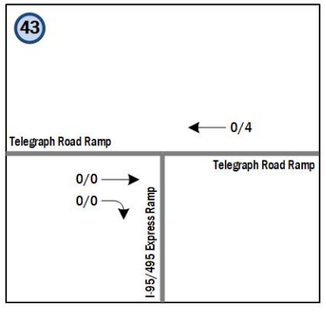


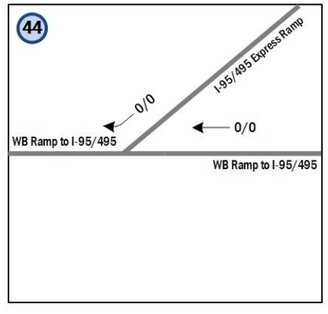


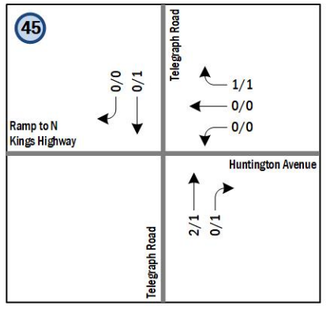


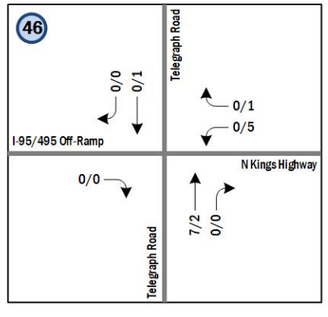


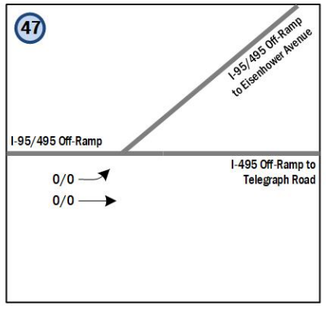


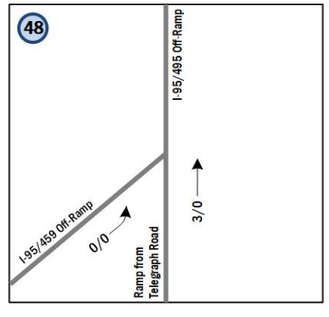


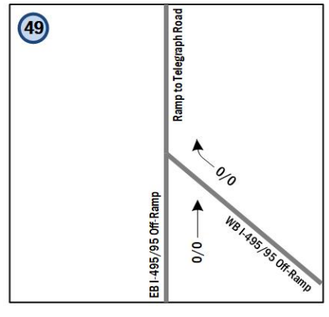












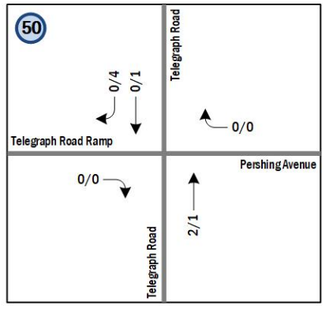


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Figure 14: 2018 Existing Bicycle Peak Hour Volumes (Intersections 34 – 50)

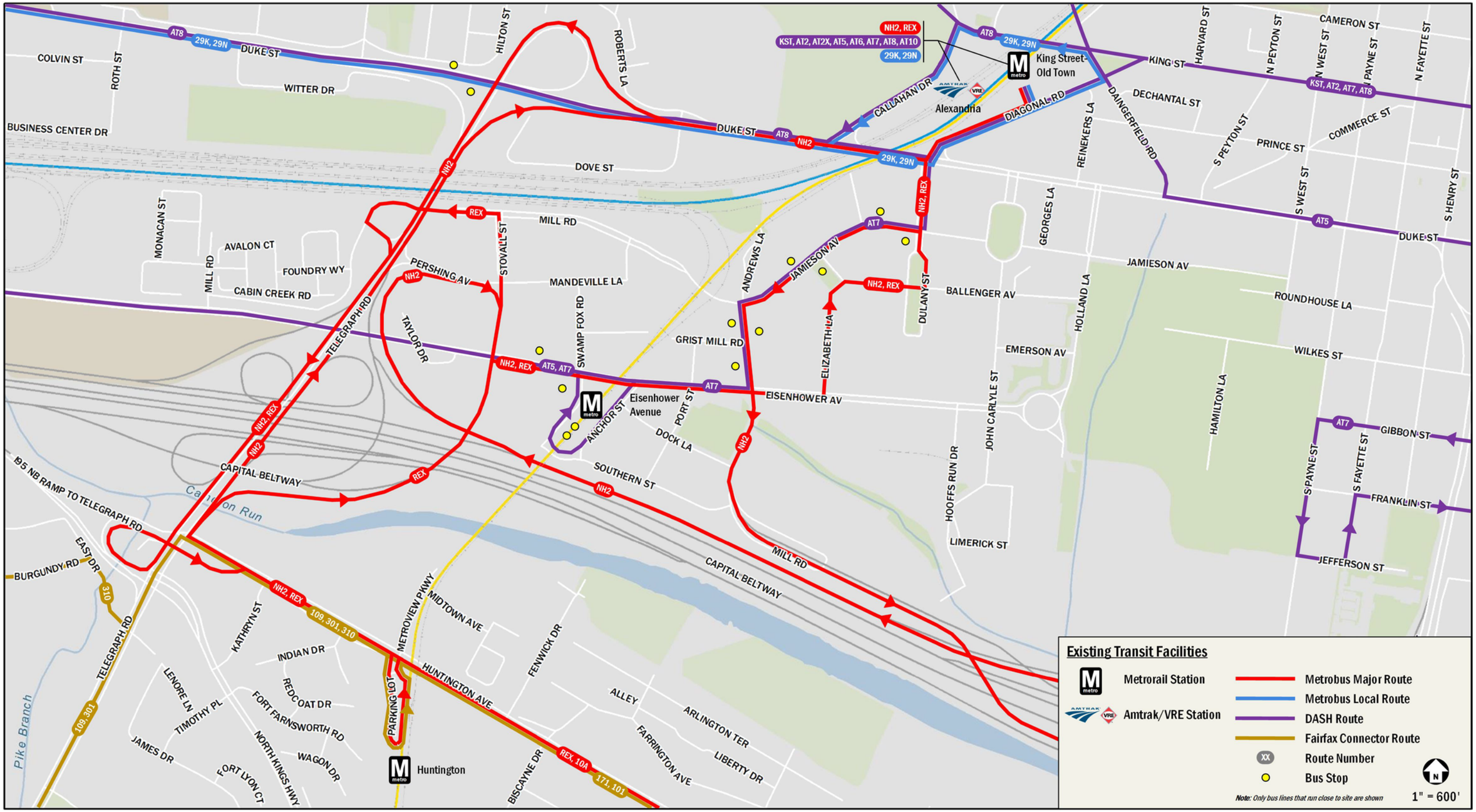


Figure 15: Existing Transit Facilities

EXISTING ROADWAY NETWORK

A description of the roadways within the study area is presented in Table 4. A road functional classification map is shown on Figure 16 and an emergency route map is shown Figure 17.

Table 4: Existing Roadway Network

Roadway	Functional Classification (VDOT)	Functional Classification (City of Alexandria)	Lanes	Speed (mph)	On-Street Parking	ADT
Andrews Lane	-	Urban Local	2	25	No	-
Callahan Drive	Major Collector	Urban Collector	4	25	No	15,000
Capital Beltway	Interstate	Urban Interstate	8	55	No	72,000
Daingerfield Road	Minor Arterial	Urban Minor Arterial	2 to 4	25	Yes	5,700
Diagonal Road	Major Collector	Urban Collector	2	25	Yes	6,300
Dock Street	-	Urban Local	2	25	Yes	-
Duke Street	Other Principal Arterial	Urban Other Principal Arterial	4	25	Yes	32,000
Dulany Street	-	Urban Local	4	25	Yes	-
Eisenhower Avenue	Minor Arterial	Urban Minor Arterial	4 to 6	25	No*	17,000
Elizabeth Lane	-	Urban Local	2	25	Yes	-
Holland Lane	Minor Arterial	Urban Minor Arterial	4 to 5	25	No	8,500
Hooffs Run Drive	-	Urban Local	2	25	Yes	-
Huntington Avenue	Minor Arterial	Urban Minor Arterial	4	30	No	15,000
Jamieson Avenue	Major Collector	Urban Local	2	25	Yes	-
John Carlyle Street	Major Collector	Urban Local	2	25	Yes	-
Mandeville Lane	-	Urban Local	4	25	No	-
Mill Race Lane	-	Urban Local	2	25	No	-
Mill Road	Major Collector	Urban Collector	4	25	No	7,000
N Kings Highway	Minor Arterial	Urban Minor Arterial	2 to 4	35	No	23,000
N Quaker Lane	Minor Arterial	Urban Minor Arterial	4	25	No	26,000
Pershing Avenue	Major Collector	Urban Collector	2		No	5,000
Port Street	-	Urban Local	2	25	Yes	-
Reinekers Lane	-	Urban Local	2	25	Yes	-
Roth Street	-	Urban Local	2	25	No	-
S Henry Street	Other Principal Arterial	Urban Other Principal Arterial	3	25	Yes	24,000
S Patrick Street	Other Principal Arterial	Urban Other Principal Arterial	3	25	Yes	27,000
S Peyton Street	-	Urban Local	2	25	Yes	-
S Quaker Lane	-	Urban Local	2	25	No	-
S West Street	Minor Arterial	Urban Minor Arterial	2	25	Yes	6,000
Stovall Street	Major Collector	Urban Collector	5	25	No	7,600
Swamp Fox Road	-	Urban Local	2	25	Yes	-
Sweeley Street	-	Urban Local	2	25	Yes	-
Telegraph Road	Minor Arterial	Urban Minor Arterial	4 to 8	35	No	58,000
W Taylor Run Parkway	Minor Collector	Urban Collector	2	25	Yes	4,700
Witter Drive	-	Urban Local	2	25	No	-

* Except between Mill Road and Eisenhower Avenue Metrorail Station in westbound direction

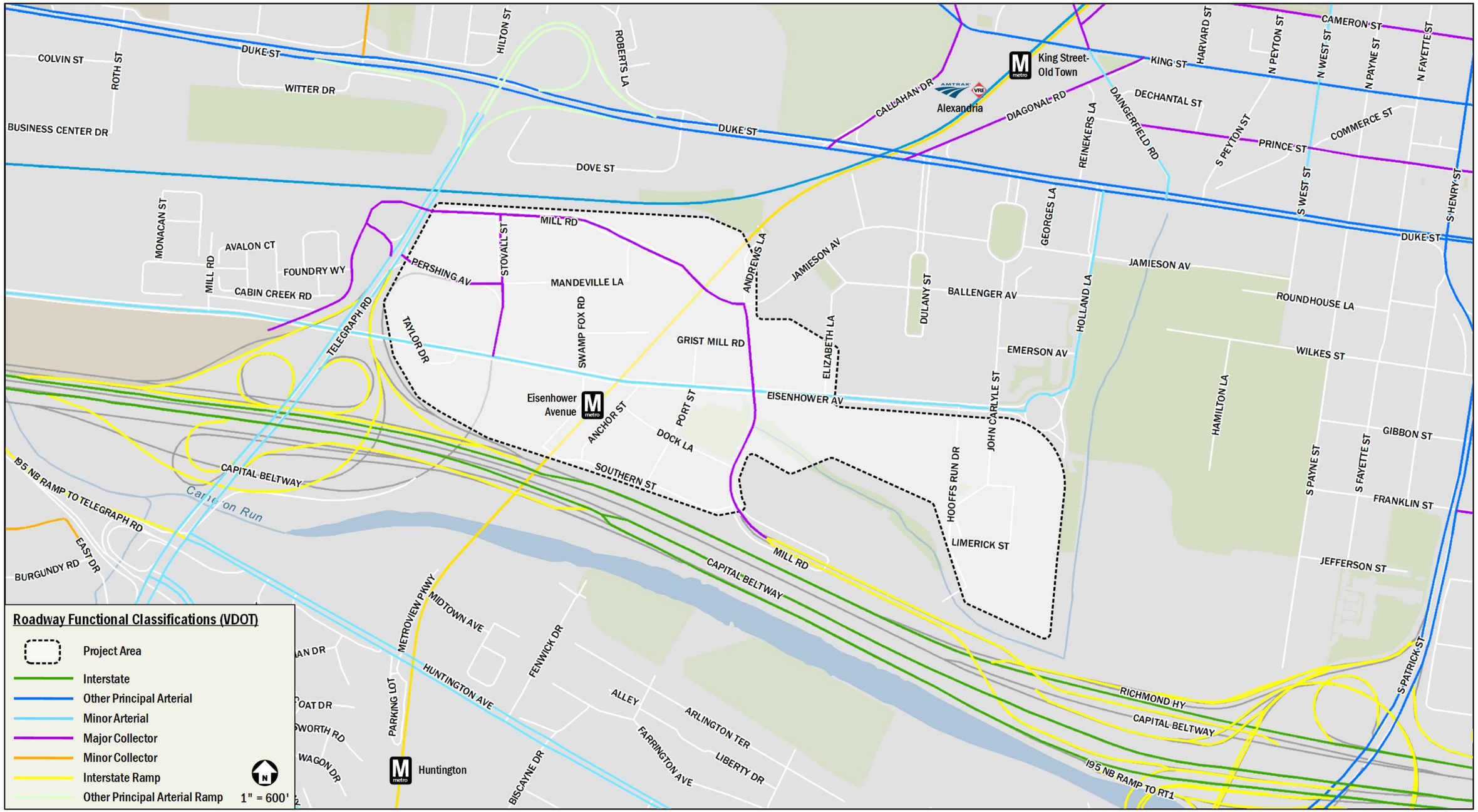


Figure 16: Road Functional Classifications

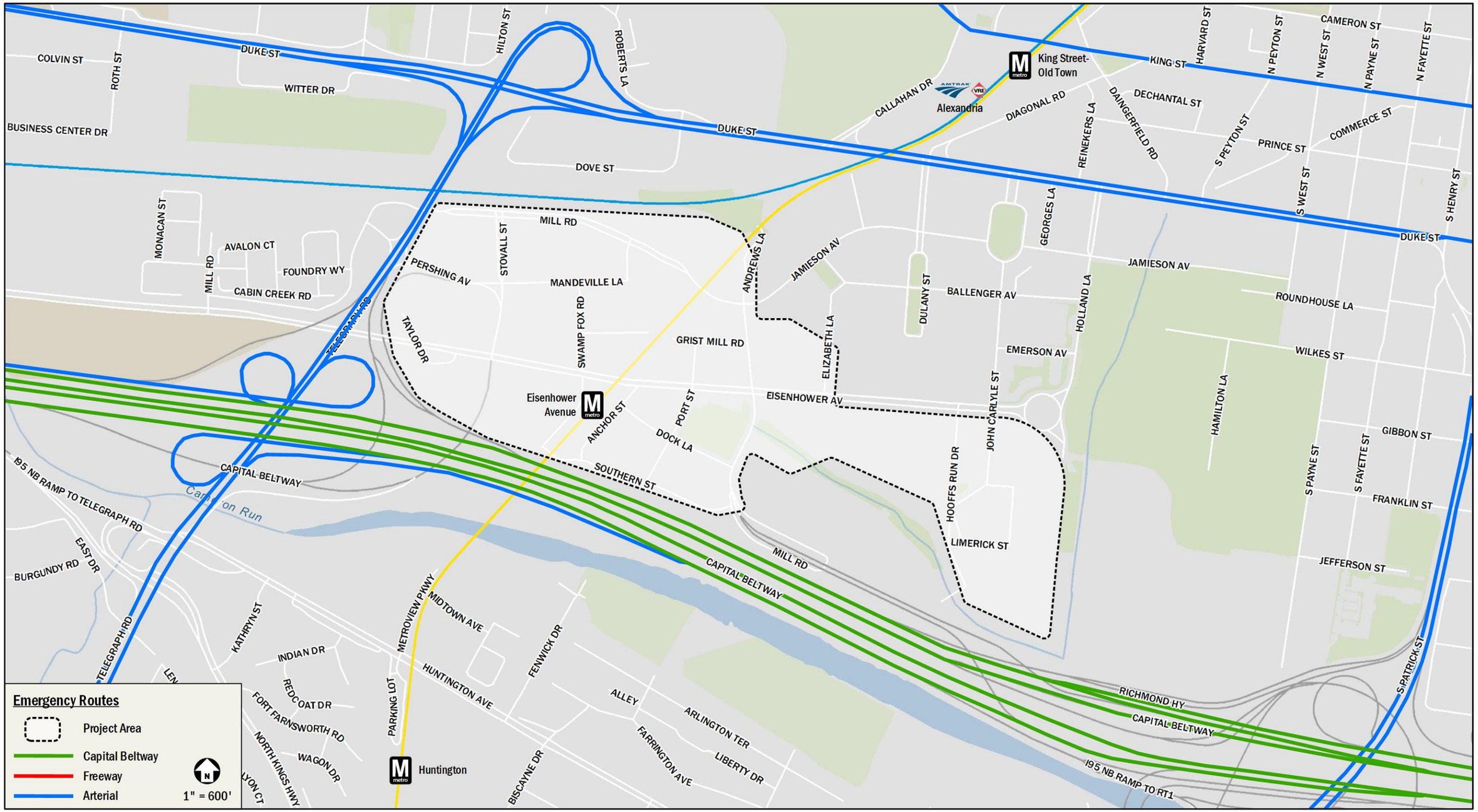


Figure 17: Emergency Routes

EXISTING TRAFFIC OPERATIONS – PART ONE (SYNCHRO)

This section provides a summary of a macroscopic analysis of the existing roadway capacity in the study area. The capacity analysis focuses on the weekday morning and afternoon peak hours, as determined by the existing traffic volumes in the study area. The scope of the capacity analysis was developed based on City of Alexandria and VDOT guidelines and approved by City of Alexandria and VDOT staff.

The following conclusions are reached within this section:

- Study area intersections generally operate at an acceptable level of service in existing conditions during both the morning and afternoon peak hours.
- Existing areas of congestion are primarily focused along the heavily traveled commuter routes such as Duke Street, Eisenhower Avenue, Telegraph Road, and Mill Road.

Study Area, Scope, and Methodology

This section outlines the assumptions used to develop the existing capacity analysis, including volumes, roadway geometries, and traffic operations. The scope of the analysis contained within this report was extensively discussed with and approved by City of Alexandria and VDOT staff. The general methodology of the analysis follows national, City of Alexandria, and VDOT guidelines on the preparation of transportation impact evaluations of site development.

Study area

The study area is a list of intersections where detailed capacity analyses were performed for the Existing Conditions scenario. It represents the intersections most likely to have potential impacts or require changes to traffic operations to accommodate the proposed project.

The study area intersections are based on the projected future trip generation and the location of the EESAP development blocks. As agreed to in this report's scoping agreement, the following intersections were included:

1. Duke Street & N Quaker Lane
2. Duke Street & S Quaker Lane
3. Duke Street & Alexandria Commons
4. Duke Street & Sweeley Street
5. Duke Street & Roth Street
6. Duke Street & Witter Drive
7. Duke Street & W Taylor Run Pkwy
8. Duke Street & Telegraph Road
9. Duke Street & Telegraph Road
10. Duke Street & Dove Street
11. Duke Street & Callahan Drive
12. Duke Street & Diagonal Road
13. Duke Street & John Carlyle Street
14. Duke Street & Reinekers Lane
15. Duke Street & Holland Lane
16. Duke Street & Daingerfield Road
17. Duke Street & S Peyton Street
18. Duke Street & S West Street
19. Duke Street & S Henry Street
20. Duke Street & S Patrick Street
21. Eisenhower Avenue & Mill Road (West)
22. Eisenhower Avenue & Stovall Street
23. Eisenhower Avenue & Swamp Fox Road
24. Eisenhower Avenue & Port Street
25. Eisenhower Avenue & Mill Road (East)
26. Eisenhower Avenue & Elizabeth Lane
27. Eisenhower Avenue & Dulany Street
28. Eisenhower Avenue & Hoofs Run
29. Eisenhower Avenue & John Carlyle Street
30. Eisenhower Avenue & Holland Lane
31. Telegraph Road Ramps & Mill Road
32. Stovall Street & Mill Road
33. Mandeville Lane & Stovall Street
34. Mandeville Lane & Swamp Fox Road
35. Mill Road & Mandeville Lane
36. Jamieson Avenue & Andrews Ln/Mill Road
37. Jamieson Avenue & Dulany Street
38. Holland Lane & Jamieson Avenue
39. Port Street & Dock Lane
40. Dock Lane & Mill Road
41. Carlyle Apartments Driveway & Mill Road
42. Telegraph Road On-Ramp & Duke Street
43. Telegraph Road & Telegraph to Mill
44. WB Ramp to I495 & Telegraph Road
45. Telegraph Rd & Huntington
46. Telegraph Rd & N Kings Hwy
47. I-495 EB Off- Ramp & Diverge to Telegraph or Eisenhower
48. I-495 EB Off- Ramp & Merge with NB Ramp from Telegraph
49. I-495 EB / WB Ramp & Merge to Telegraph
50. Telegraph Rd & Pershing Ave

Figure 18 shows a map of the study area intersections.

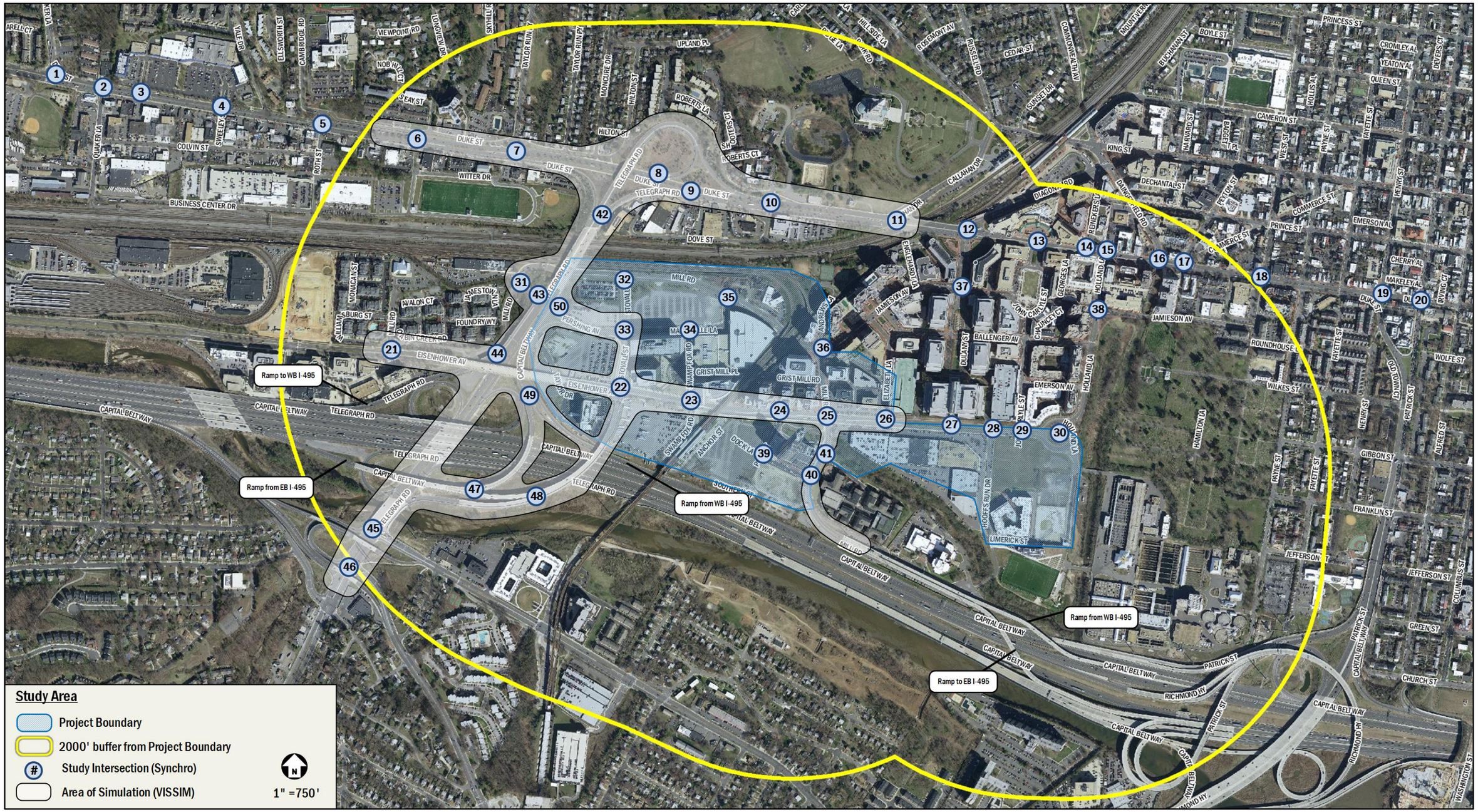


Figure 18: Study Intersections

Existing Traffic Volumes

The existing traffic volumes are comprised of turning movement data and automated traffic recorders, which were collected on Wednesday, November 2, 2016 and Wednesday June 6, 2018. The results of the traffic counts are included in the Technical Appendix.

For all intersections, the weekday morning and afternoon system peak hours were used. The weekday morning system peak hour was from 7:30AM-8:30AM and the afternoon system peak hour was from 5:00PM-6:00PM. The existing peak hour traffic volumes are shown in Figure 19, Figure 20, and Figure 21.

Existing Geometry and Operations Assumptions

The geometry and operations assumed in the Existing Conditions scenario were those present when the main data collection occurred. Gorove/Slade made observations and confirmed the existing lane configurations and traffic controls at the intersections within the study area. Existing signal timings and offsets were obtained from the City of Alexandria and VDOT and confirmed in the field. The lane configurations and traffic controls for the Existing Conditions are shown in Figure 22, Figure 23, and Figure 24.

Vehicular Capacity Analysis Results

Intersection Capacity Analysis

Intersection capacity analyses were performed for the morning and afternoon peak hours at study area intersections. Synchro version 9.2 was used to analyze the study intersections based on the *Highway Capacity Manual* (HCM) 2000 methodology.

The results of the capacity analyses are expressed in level of service (LOS) and delay (seconds per vehicle) for each approach. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS D is typically used as the acceptable LOS threshold in the City of Alexandria; although LOS E or F is generally accepted in urbanized areas if vehicular improvements would be a detriment to safety or to non-auto modes of transportation.

The LOS capacity analyses were based on: (1) the peak hour traffic volumes; (2) the lane use and traffic controls; and (3) the Highway Capacity Manual (HCM) methodologies (using Synchro software). The average delay of each approach and LOS is shown for the signalized intersections in addition to the overall average delay and intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Technical Appendix.

Table 5 shows the results of the capacity analyses including LOS and average delay per vehicle (in seconds) for the Existing Conditions scenario. Most study intersection operate at acceptable conditions during the weekday morning and afternoon peak hours in the Existing Conditions scenario; however, 16 intersections have one or more movement that operate at levels beyond acceptable thresholds in one or more peak hour:

- Duke Street & N Quaker Lane (AM/PM)
- Sweeley Street/Alexandria Commons & Duke Street (PM)
- Roth Street/Cambridge Road & Duke Street (AM/PM)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM/PM)
- Duke Street & Callahan Drive (AM)
- Dulany Street/Diagonal Road & Duke Street (AM/PM)
- S West Street & Duke Street (AM)
- S Henry Street & Duke Street (PM)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM/PM)
- Swamp Fox Road & Eisenhower Avenue (AM/PM)
- Driveway/Elizabeth Lane & Eisenhower Avenue (PM)
- Hoofs Run Drive & Eisenhower Avenue (PM)
- Mill Road & Driveway/Telegraph Road Ramp (PM)
- Telegraph Road & Huntington Avenue (PM)
- Telegraph Road & N Kings Highway (PM)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM/PM)

The following roadways categorized as minor arterials or above have one or more movements that experience a LOS E or LOS F in existing conditions:

- Duke Street & N Quaker Lane (AM/PM)
- Sweeley Street/Alexandria Commons & Duke Street (PM)
- Roth Street/Cambridge Road & Duke Street (AM/PM)
- Duke Street & Callahan Drive (AM)
- Dulany Street/Diagonal Road & Duke Street (AM/PM)
- S West Street & Duke Street (AM)
- S Henry Street & Duke Street (PM)

- Holiday Inn & Eisenhower Avenue & Stovall Street (AM/PM)
- Swamp Fox Road & Eisenhower Avenue (AM/PM)
- Driveway/Elizabeth Lane & Eisenhower Avenue (PM)
- Telegraph Road & Huntington Avenue (PM)
- Telegraph Road & N Kings Highway (PM)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM/PM)

This report identifies that the following roadways categorized as evacuation routes have one or more movements experience a LOS E or LOS F in existing conditions:

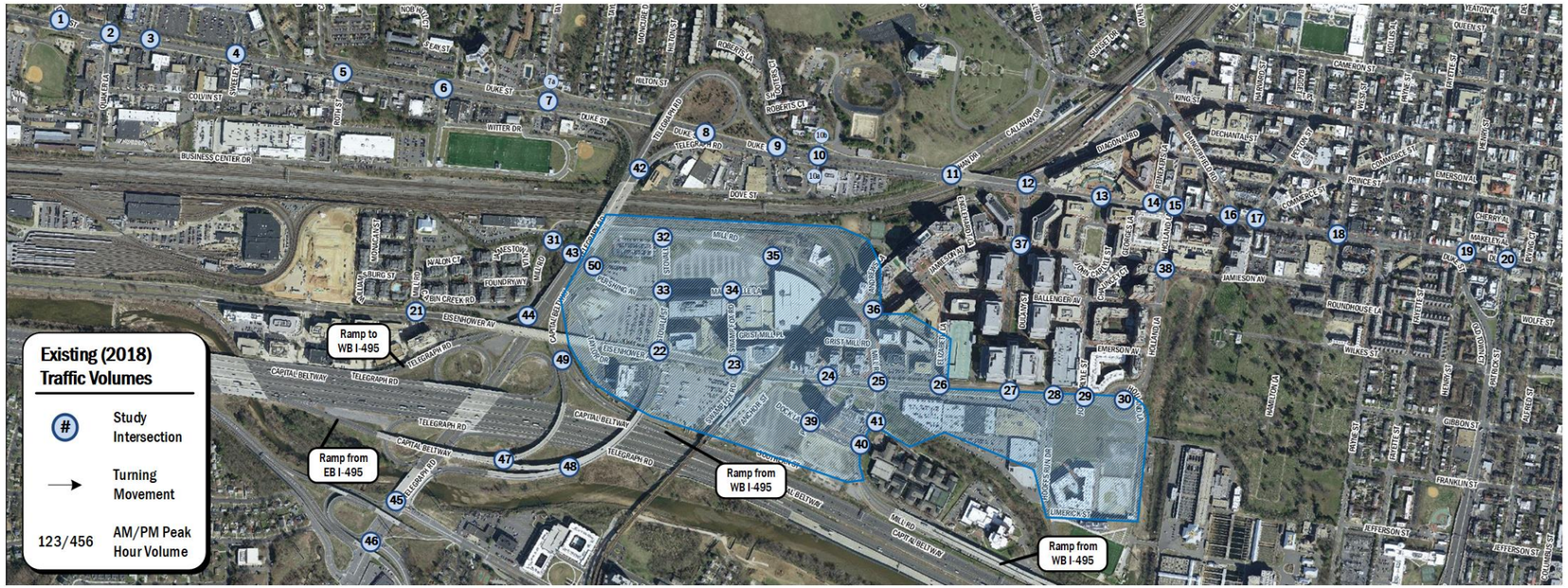
- Duke Street & N Quaker Lane (AM/PM)
- Sweeley Street/Alexandria Commons & Duke Street (PM)
- Roth Street/Cambridge Road & Duke Street (AM/PM)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM/PM)
- Duke Street & Callahan Drive (AM)
- Dulany Street/Diagonal Road & Duke Street (AM/PM)
- S West Street & Duke Street (AM)
- S Henry Street & Duke Street (PM)
- Telegraph Road & Huntington Avenue (PM)
- Telegraph Road & N Kings Highway (PM)

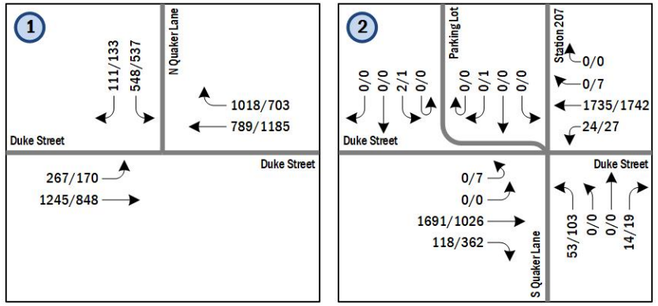
Queuing Analysis

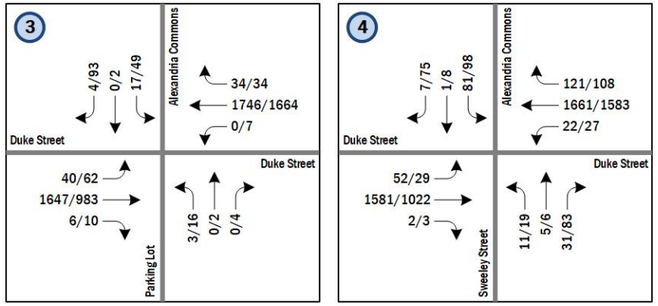
In addition to the capacity analyses presented above, a queuing analysis was performed at the study intersections. The queuing analysis was performed using Synchro version 9.2 software. The 50th percentile and 95th percentile queue lengths are shown for each lane group at the study area signalized intersections. The 50th percentile queue is the maximum back of queue on a median cycle. The 95th percentile queue is the maximum back of queue that is exceeded 5% of the time. For unsignalized intersections, only the 95th percentile queue is reported for each lane group (including free-flowing left turns and stop-controlled movements) based on the HCM 2000 calculations. HCM 2000 does not calculate queuing for all-way stops.

Table 5 shows the queuing results for the study area intersection for the Existing Condition scenario. The 95th percentile queues at most lane groups at study area intersections do not exceed their available storage length in the Existing Conditions scenario; however, 25 intersection do have 95th percentile queues that exceed the available storage length in the morning and/or afternoon peak hour:

- Duke Street & N Quaker Lane (AM/PM)
- S Quaker Lane & Duke Street (AM/PM)
- Duke Street & Alexandria Commons (AM)
- Sweeley Street/Alexandria Commons & Duke Street (AM/PM)
- Roth Street/Cambridge Road & Duke Street (AM/PM)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM/PM)
- Dove Street/Roberts Lane & Duke Street (AM/PM)
- Duke Street & Callahan Drive (AM/PM)
- Dulany Street/Diagonal Road & Duke Street (AM/PM)
- John Carlyle Street & Duke Street (AM/PM)
- Duke Street & Daingerfield Road (AM/PM)
- S Peyton Street & Duke Street (AM)
- S West Street & Duke Street (AM)
- S Henry Street & Duke Street (AM/PM)
- S Patrick Street & Duke Street (AM/PM)
- Marriott Driveway/Mill Road (West) & Eisenhower Avenue (AM/PM)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM/PM)
- Swamp Fox Road & Eisenhower Avenue (AM/PM)
- Mill Road (East) & Eisenhower Avenue (AM/PM)
- Driveway/Elizabeth Lane & Eisenhower Avenue (AM/PM)
- Pedestrian Crossing & Eisenhower Avenue (AM)
- Stovall Street & Pershing Avenue/Mandeville Lane (PM)
- Mill Road (East)/Andrews Lane & Mill Road/Jamieson Avenue (PM)
- Dulany Street & Jamieson Avenue (AM/PM)
- Telegraph Road & N Kings Highway (AM/PM







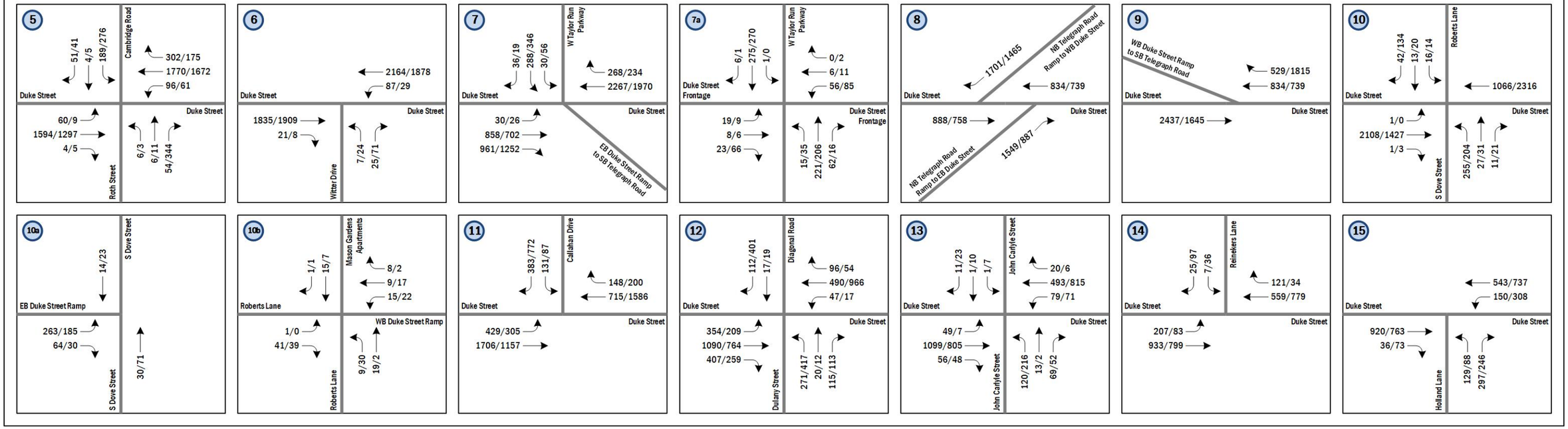
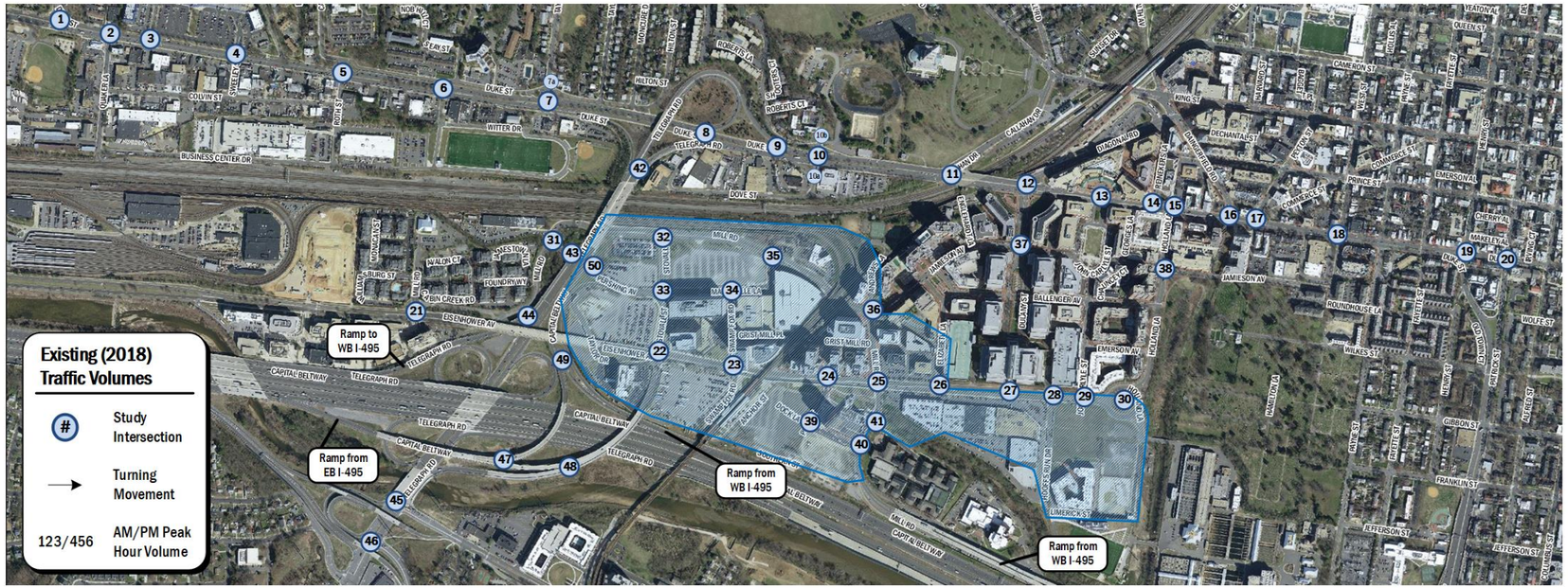
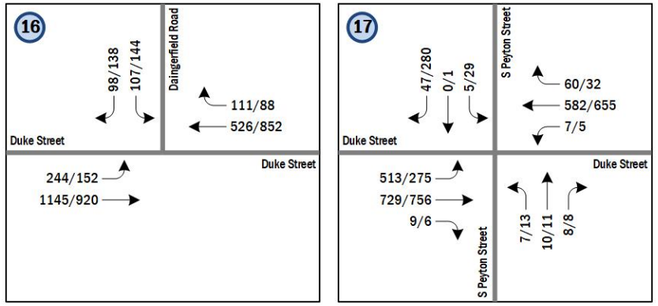


Figure 19: 2018 Existing Vehicle Peak Hour Volumes (Intersections 1 – 15)





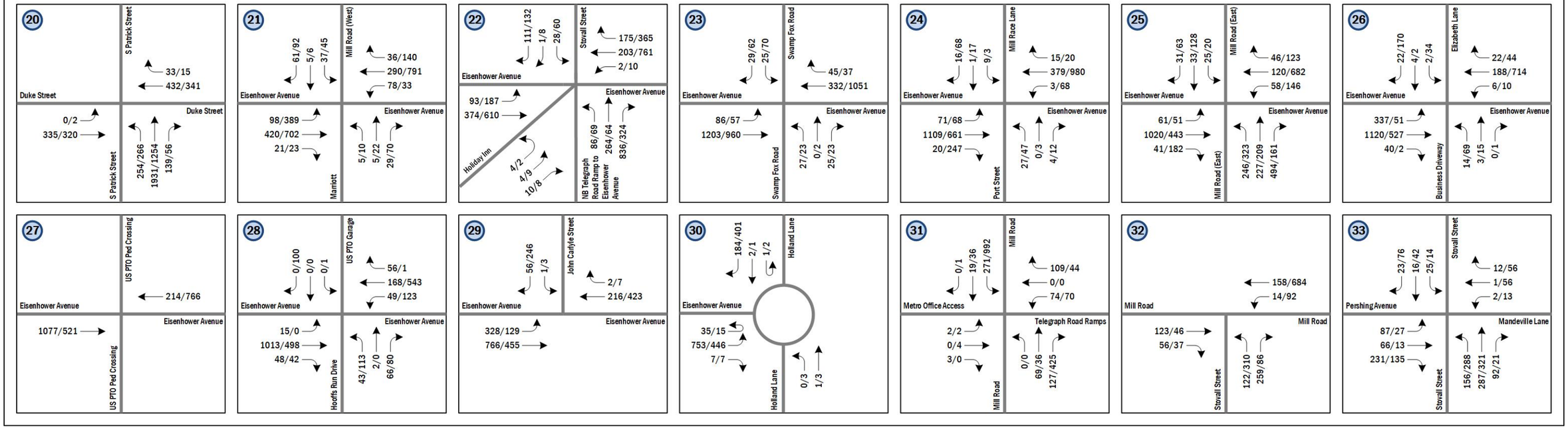
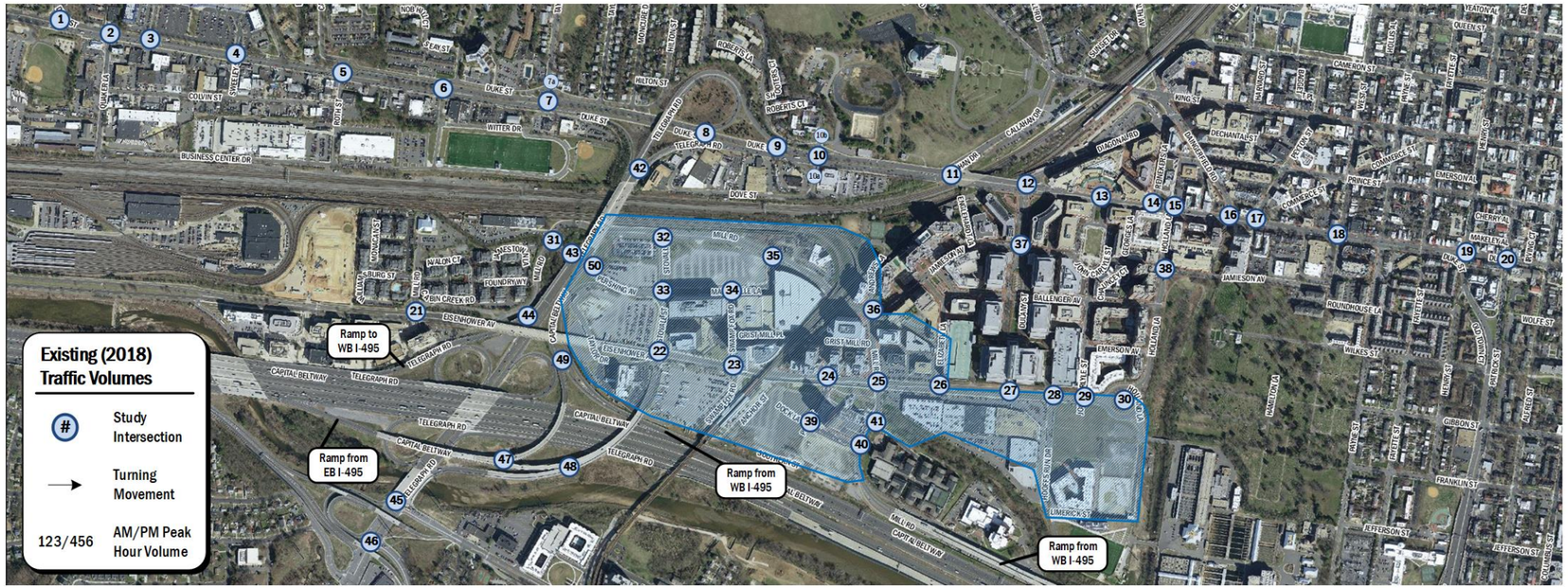
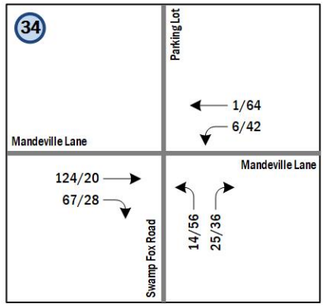
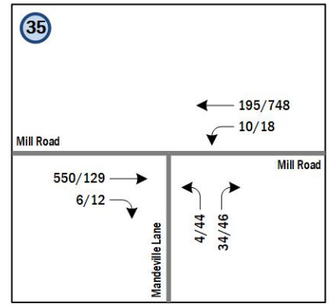
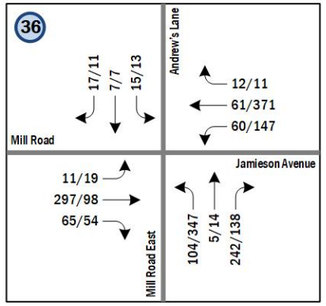


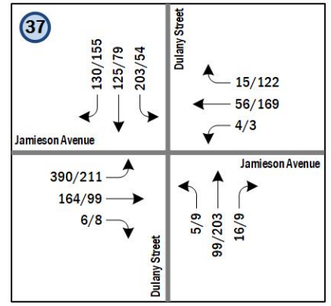
Figure 20: 2018 Existing Vehicle Peak Hour Volumes (Intersections 16 – 33)

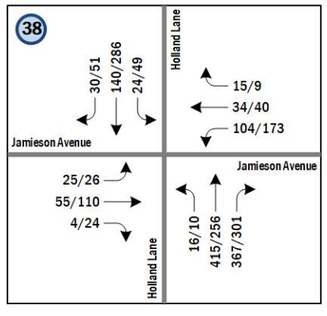


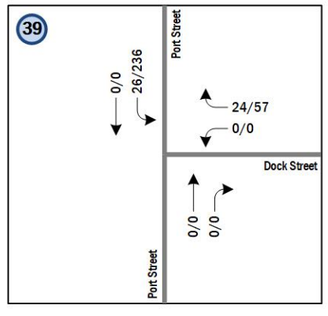


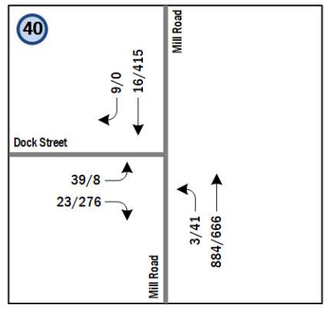


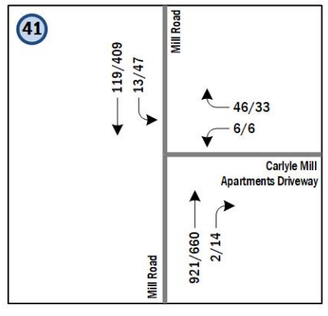


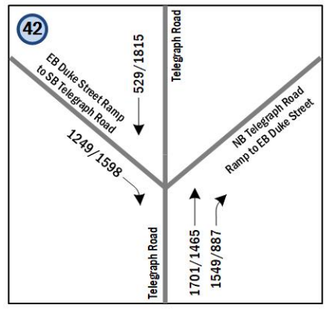


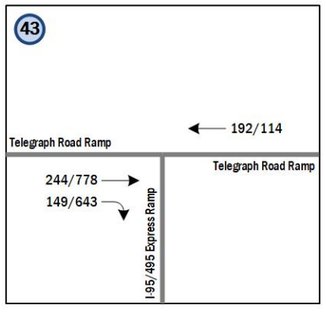


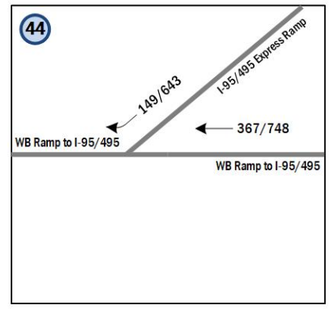


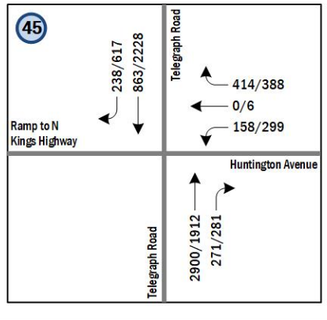


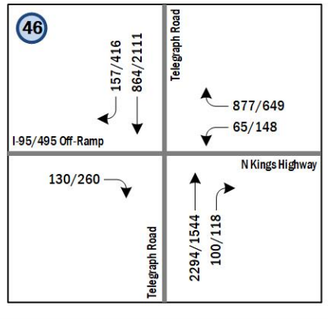


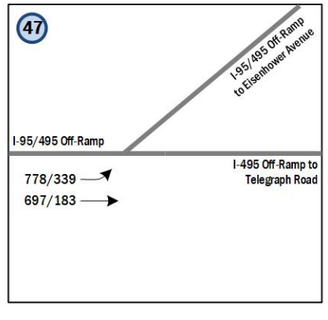


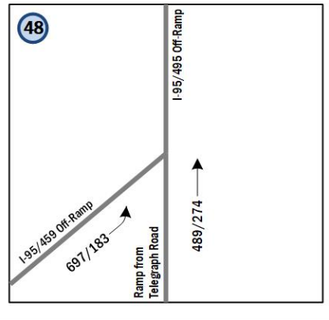


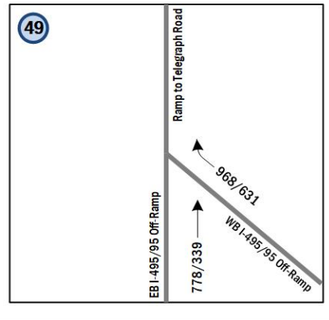












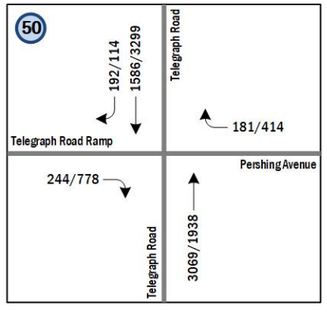


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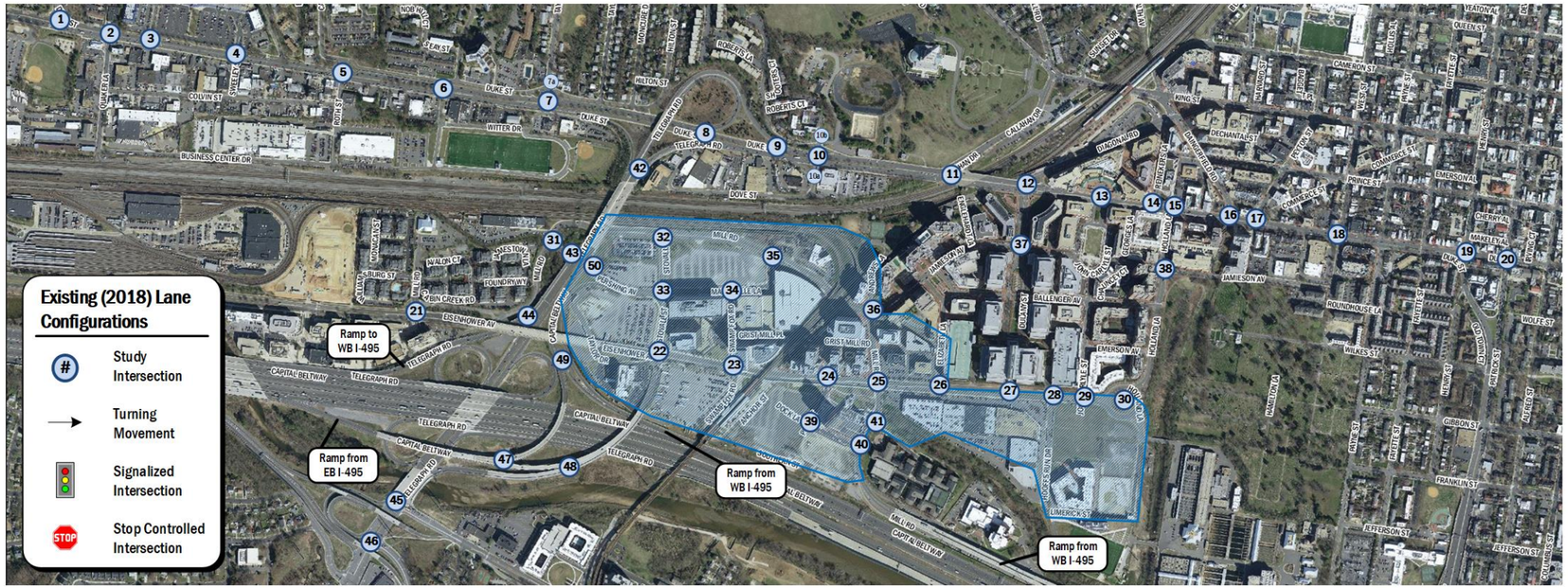
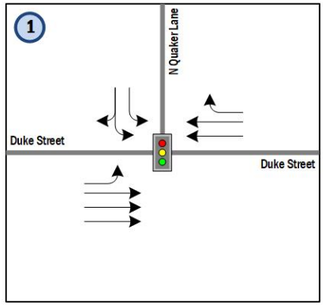
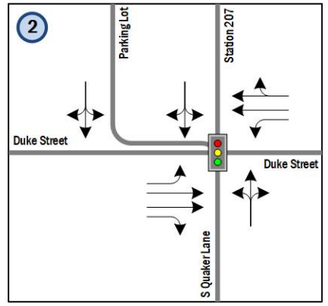
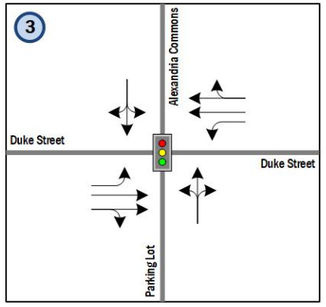
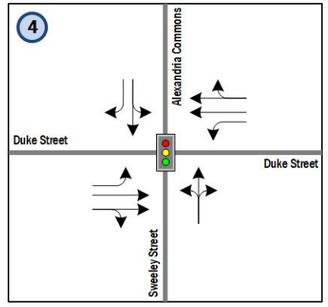
Figure 21: 2018 Existing Vehicle Peak Hour Volumes (Intersections 34 – 50)

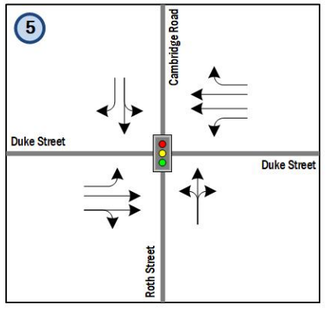


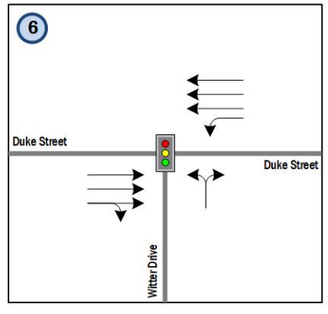


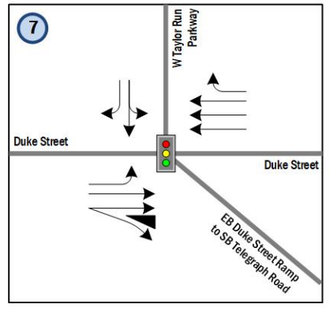


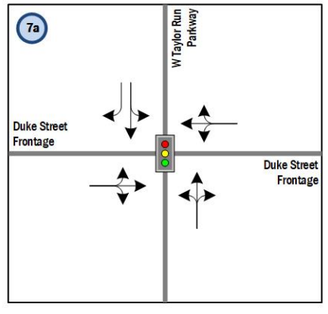


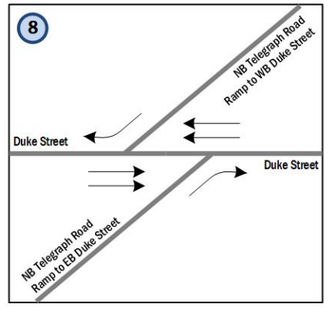


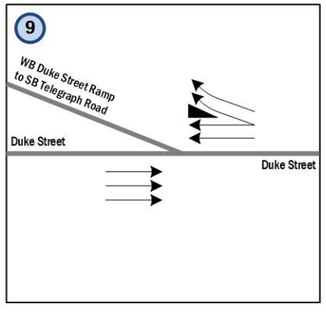


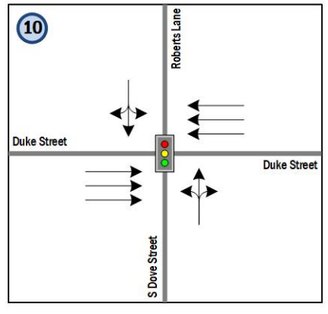


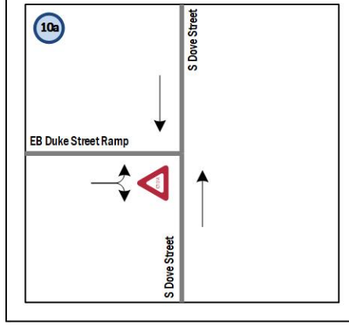


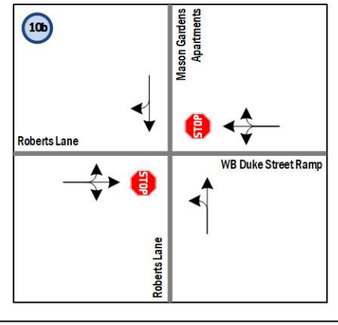


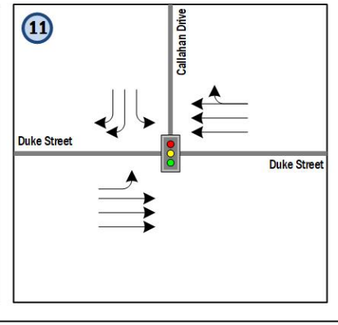


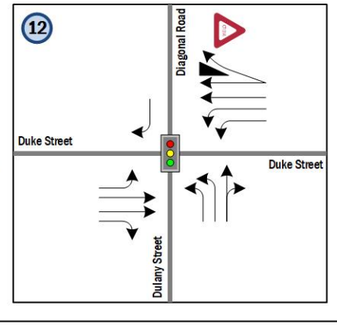


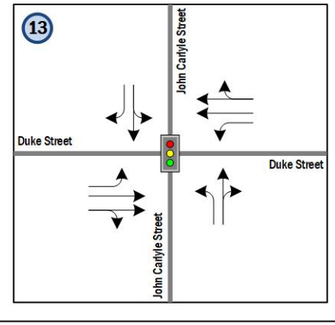


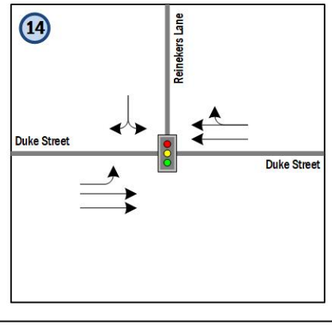












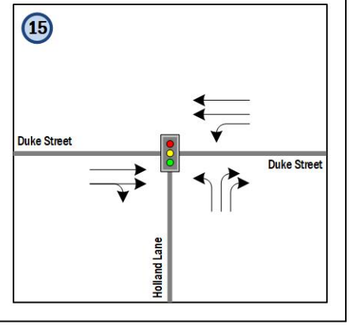


Figure 22: 2018 Existing Lane Configurations (Intersections 1 – 15)

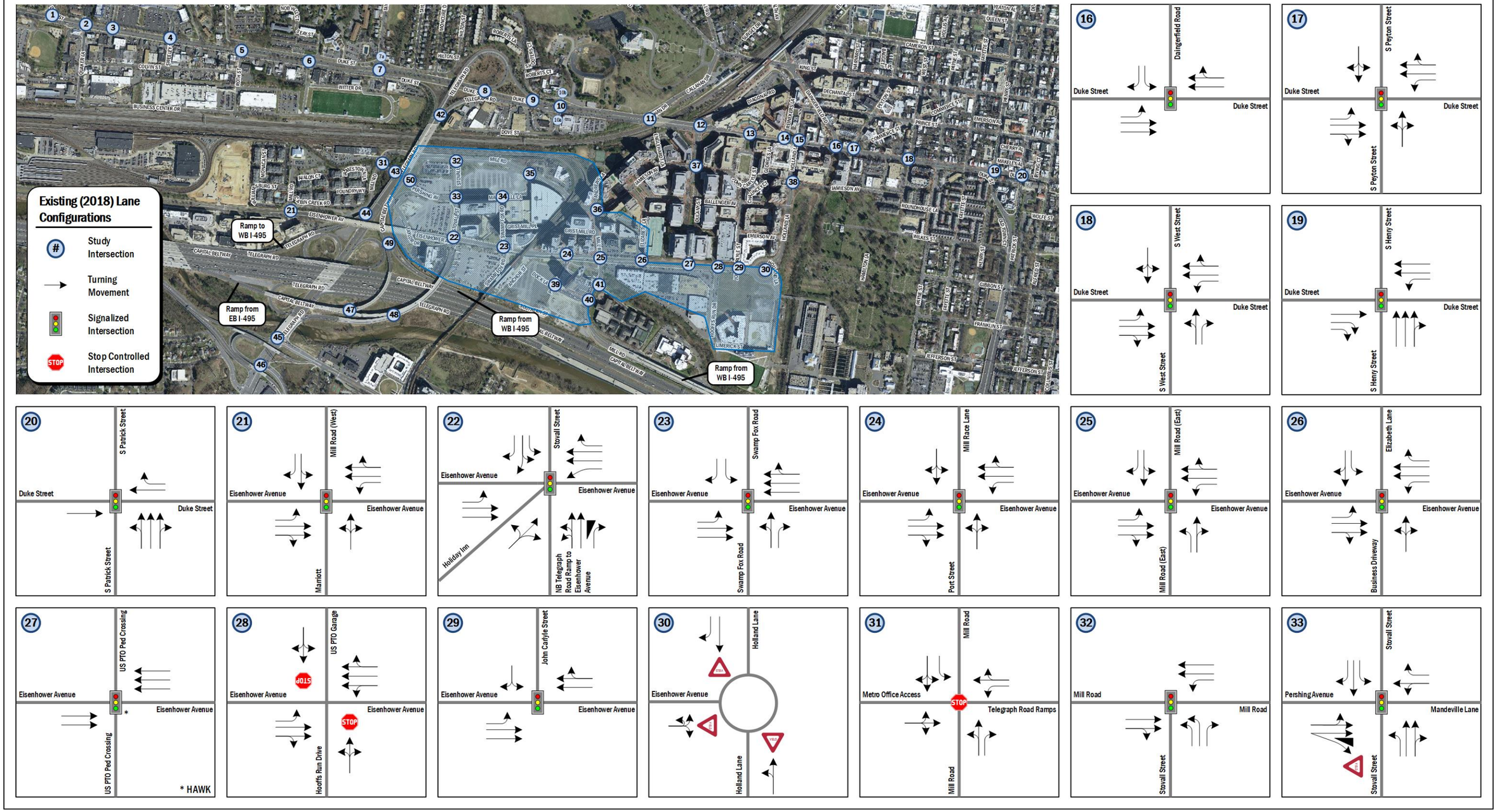
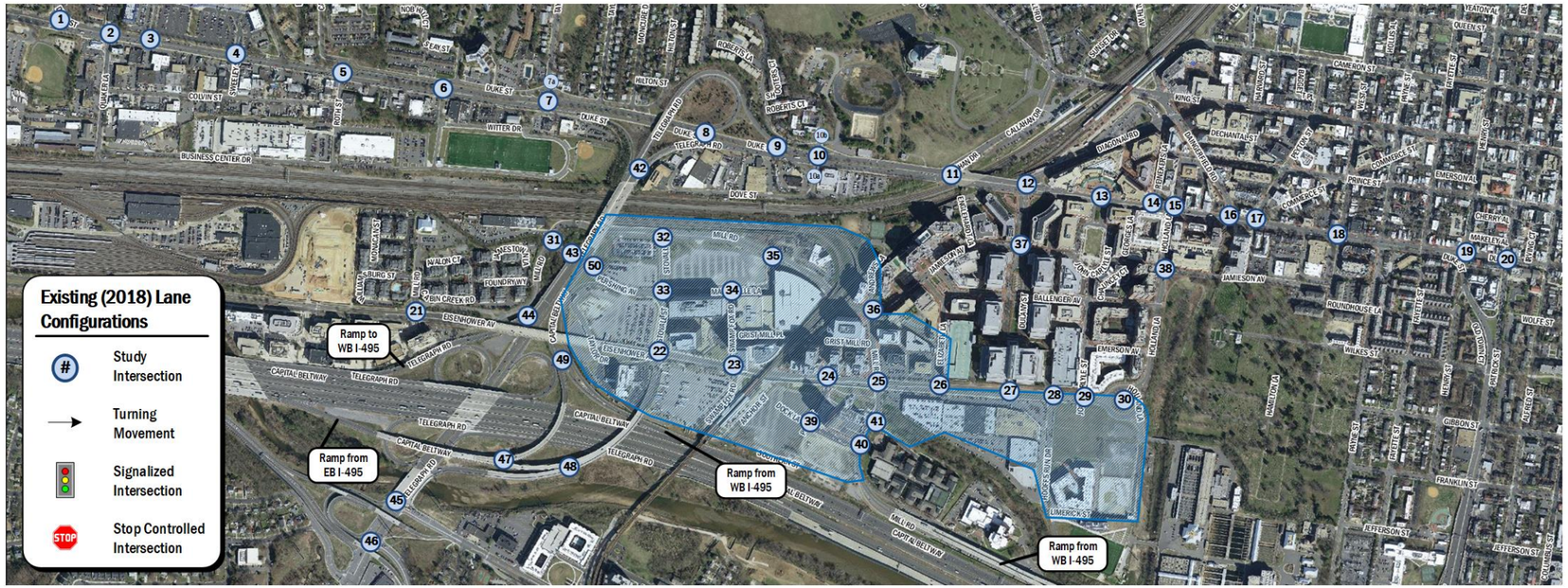
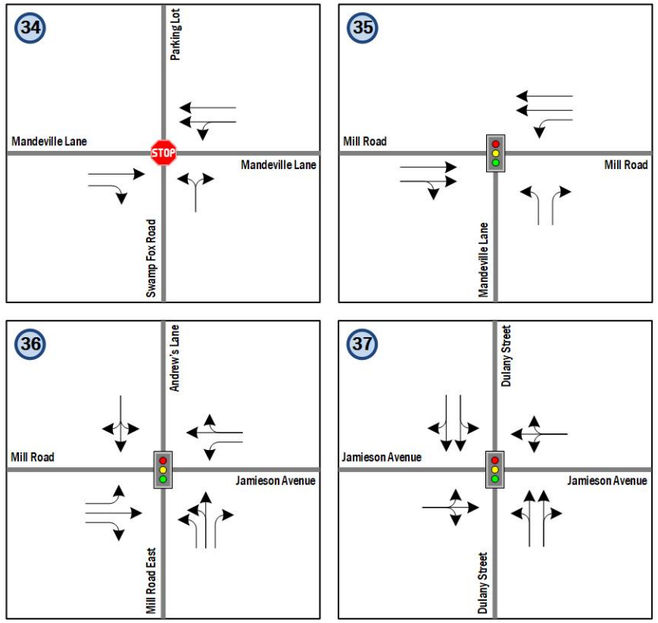


Figure 23: 2018 Existing Lane Configurations (Intersections 16 – 33)





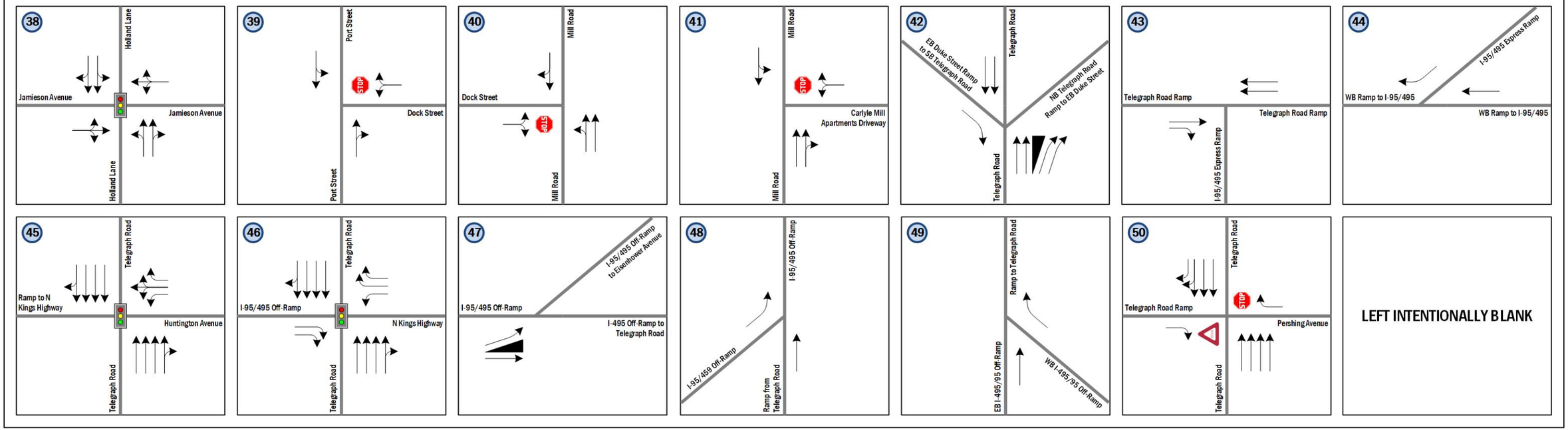


Figure 24: 2018 Existing Lane Configurations (Intersections 34 – 50)

Table 5: Existing Conditions Capacity Analysis

	Intersection (Movement)	Storage Length (ft)	Existing Conditions						
			AM Peak				*PM Peak*		
			LOS Delay		Queue (ft) 50th	Queue (ft) 95th	LOS Delay		Queue (ft) 50th	Queue (ft) 95th
1	**Duke St & N Quaker Ln**									
	Overall Intersection (Signalized)		**C**	**23.5**			**C**	**24.8**		
	Eastbound Left	210	B	11.5	74	110	B	15.5	46	104
	Eastbound Thru	390	A	7.9	144	169	A	7.1	91	109
	Westbound Thru	350	B	12.2	63	138	C	30.1	394	444
	Westbound Right	350	B	11.7	151	166	A	6.2	174	200
	Southbound Left	1290	F	89.7	~294	417	E	59.0	282	395
2	**S Quaker Ln & Duke St**									
	Overall Intersection (Signalized)		**A**	**9.5**			**B**	**13.9**		
	Eastbound Left	210	-	-	-	-	B	16.3	2	m9
	Eastbound Thru	330	B	16.4	561	m#868	B	17.6	239	m349
	Eastbound Right	330	A	6.1	6	m39	D	40.1	34	m78
	Westbound Left	90	A	4.2	0	m3	A	5.8	2	m4
	Westbound TR	240	A	1.0	4	80	A	3.4	80	121
	Northbound LTR	340	D	49.8	0	19	D	49.9	35	71
	Southbound LTR	50	D	45.6	1	8	D	36.5	0	0
3	**Duke St & Alexandria Commons**									
	Overall Intersection (Signalized)		**A**	**3.5**			**A**	**9.9**		
	Eastbound Left	110	A	7.5	0	m0	D	53.4	8	40
	Eastbound TR	220	A	1.1	1	20	A	0.4	2	5
	Westbound Left	320	-	-	-	-	A	6.2	2	m2
	Westbound TR	530	A	3.6	15	873	A	9.0	227	235
	Northbound LTR	150	D	50.3	9	7	D	46.1	18	33
	Southbound LTR	210	D	49.9	0	26	D	51.8	83	123
4	**Sweeley St/Alexandria Commons & Duke St**									
	Overall Intersection (Signalized)		**A**	**9.0**			**B**	**10.9**		
	Eastbound Left	200	C	33.0	5	m49	B	10.7	3	m8
	Eastbound TR	560	A	8.0	126	399	A	4.0	66	70
	Westbound Left	70	A	0.5	0	m0	A	4.6	1	m6
	Westbound TR	250	A	4.1	10	#92	A	6.1	45	167
	Northbound LTR	230	D	45.2	12	46	D	42.6	24	41
	Southbound LT	100	D	51.8	80	108	E	79.1	94	#165
	Southbound Right	100	D	44.9	0	29	D	41.3	0	37
5	**Roth St/Cambridge Rd & Duke St**									
	Overall Intersection (Signalized)		**C**	**25.5**			**E**	**79.5**		
	Eastbound Left	110	D	46.7	52	m81	E	63.4	8	m17
	Eastbound TR	370	C	23.8	476	#876	B	15.1	267	299
	Westbound Left	240	D	36.2	20	102	B	15.8	0	0
	Westbound Thru	670	C	24.0	822	#960	B	11.3	116	187
	Westbound Right	670	A	6.9	154	19	A	2.1	1	19
	Northbound LTR	150	D	37.7	7	44	D	38.6	120	231
	Southbound LT	40	E	60.7	161	240	F	823.2	~428	#580
	Southbound Right	40	D	37.4	0	22	C	32.8	0	12
6	**Witter Dr & Duke St**									
	Overall Intersection (Signalized)		**A**	**7.3**			**A**	**7.7**		
	Eastbound TR	670	B	12.0	327	483	A	4.5	165	m180
	Westbound Left	220	B	12.3	11	m47	B	13.2	5	m0
	Westbound Thru	700	A	2.4	8	680	A	7.1	365	146
	Northbound LR	170	D	53.3	7	31	D	51.9	30	29
7	**Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St**									
	Overall Intersection (Signalized)		**C**	**33.7**			**D**	**49.1**		
	Eastbound Left	190	E	59.7	25	m50	D	42.9	18	m44
	Eastbound Thru	700	A	6.7	140	127	B	15.1	165	285

	Intersection (Movement)	Storage Length (ft)	Existing Conditions							
			AM Peak				*PM Peak*			
			LOS Delay		Queue (ft) 50th	Queue (ft) 95th	LOS Delay		Queue (ft) 50th	Queue (ft) 95th
	Eastbound Right	700	C	29.0	311	#1342	F	85.1	820	#1617
	Westbound Thru	1960	C	30.9	481	#1041	C	26.1	396	#889
	Westbound Right	140	F	96.6	222	#400	E	56.9	188	#316
	Southbound LT	30	F	84.6	~117	m#356	F	111.9	~387	#558
	Southbound Right	30	D	40.2	1	m1	D	37.7	0	m0
8	**NB Telegraph Rd to EB Duke St/NB Telegraph Rd to WB Duke St & Duke St**									
	Overall Intersection (Unsignalized)		-	-			-	-		
9	**Duke St & WB Duke St to SB Telegraph Rd**									
	Overall Intersection (Unsignalized)		-	-			-	-		
10	**Dove St/Roberts Ln & Duke St**									
	Overall Intersection (Signalized)		**B**	**19.4**			**B**	**14.4**		
	Eastbound LTR	1970	B	18.9	423	497	A	9.9	152	247
	Westbound Thru	870	B	11.8	146	180	B	14.5	324	516
	Northbound LTR	50	D	44.5	210	257	C	34.4	147	214
	Southbound LTR	20	C	20.9	15	37	C	22.9	29	60
11	**Duke St & Callahan Dr**									
	Overall Intersection (Signalized)		**B**	**17.4**			**B**	**16.2**		
	Eastbound Left	320	E	55.2	365	#548	D	49.7	231	#357
	Eastbound Thru	860	A	5.2	144	163	A	6.4	96	113
	Westbound TR	490	B	12.8	74	79	B	10.2	230	m256
	Southbound Left	190	E	67.9	125	#200	D	44.4	69	120
	Southbound Right	870	C	21.5	93	126	C	27.2	298	368
12	**Dulany St/Diagonal Rd & Duke St**									
	Overall Intersection (Signalized)		**D**	**40.2**			**D**	**47.6**		
	Eastbound Left	310	D	49.8	266	#483	D	44.4	101	#217
	Eastbound Thru	450	D	37.2	494	603	C	25.4	219	333
	Eastbound Right	450	D	43.7	111	211	D	41.0	35	95
	Westbound Left	280	E	69.7	21	43	E	65.1	6	m15
	Westbound TR	440	C	22.8	127	176	E	61.7	342	#545
	Northbound Left	350	E	56.4	135	169	E	55.3	167	225
	Northbound TR	350	D	50.5	18	72	D	43.7	9	68
	Southbound TR	220	D	40.2	13	68	D	52.3	150	#317
13	**John Carlyle St & Duke St**									
	Overall Intersection (Signalized)		**A**	**7.3**			**B**	**12.9**		
	Eastbound Left	150	A	0.7	1	m1	A	5.4	1	m1
	Eastbound TR	440	A	2.2	27	43	A	7.3	60	82
	Westbound Left	80	A	8.7	6	28	A	8.1	11	34
	Westbound TR	290	A	5.4	69	94	A	8.9	71	175
	Northbound Left	110	D	41.3	92	156	D	41.7	162	243
	Northbound TR	110	D	37.2	9	53	C	31.5	1	33
	Southbound LT	40	D	36.3	3	7	C	31.4	11	28
	Southbound Right	40	D	36.3	0	0	C	31.1	0	0
14	**Duke St & Reinekers Ln**									
	Overall Intersection (Signalized)		**A**	**4.7**			**B**	**12.4**		
	Eastbound Left	180	A	5.7	7	67	A	4.8	6	34
	Eastbound Thru	280	A	6.1	32	124	B	18.2	117	264
	Westbound TR	70	A	0.5	4	4	A	0.8	6	18
	Southbound LR	340	D	43.0	6	32	D	41.9	60	80
15	**Holland Ln & Duke St**									
	Overall Intersection (Signalized)		**B**	**15.9**			**B**	**14.1**		
	Eastbound TR	40	A	0.1	0	0	A	0.4	2	2
	Westbound Left	180	A	8.0	11	47	C	27.5	72	159
	Westbound Thru	230	A	7.0	53	83	A	9.0	98	165
	Northbound Left	310	D	52.2	130	179	D	43.4	67	m121

	Intersection (Movement)	Storage Length (ft)	Existing Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Northbound Right	330	E	57.4	93	121	D	47.2	64	116
16	**Duke St & Daingerfield Rd**									
	Overall Intersection (Signalized)		**B**	**13.5**			**B**	**17.3**		
	Eastbound Left	90	B	12.8	84	142	C	25.8	64	137
	Eastbound Thru	290	B	13.9	247	314	C	20.5	218	270
	Westbound TR	130	A	2.6	17	18	A	4.5	44	41
	Southbound Left	400	D	45.6	95	139	D	41.4	127	163
	Southbound Right	60	D	42.1	0	37	D	37.0	0	28
17	**S Peyton St & Duke St**									
	Overall Intersection (Signalized)		**B**	**14.3**			**B**	**17.9**		
	Eastbound Left	130	C	21.0	148	252	A	4.9	37	40
	Eastbound TR	130	A	0.2	0	0	A	0.3	0	0
	Westbound Left	110	B	17.3	3	m10	C	22.5	3	12
	Westbound TR	530	C	20.2	160	191	C	29.7	238	325
	Northbound LTR	200	D	44.7	15	37	D	38.8	32	34
	Southbound LTR	360	D	44.5	0	1	D	39.5	21	87
18	**S West St & Duke St**									
	Overall Intersection (Signalized)		**C**	**20.4**			**B**	**18.4**		
	Eastbound LTR	530	A	1.3	6	12	B	11.0	127	173
	Westbound Left	80	A	8.0	27	53	B	12.2	23	56
	Westbound TR	240	A	7.4	105	133	A	9.8	75	106
	Northbound LT	130	E	64.2	317	#480	C	21.2	128	205
	Northbound Right	230	D	38.0	0	52	B	18.2	32	79
	Southbound LTR	350	D	50.4	105	106	D	43.2	157	#322
19	**S Henry St & Duke St**									
	Overall Intersection (Signalized)		**C**	**22.4**			**D**	**43.0**		
	Eastbound Thru	560	C	21.6	145	229	E	63.9	340	462
	Eastbound Right	580	B	17.8	49	88	E	64.0	290	376
	Westbound Left	230	A	7.2	18	m19	D	44.3	164	255
	Westbound Thru	230	A	6.5	55	m63	C	26.6	148	202
	Southbound TR	350	C	31.5	259	#337	D	37.2	738	805
20	**S Patrick St & Duke St**									
	Overall Intersection (Signalized)		**B**	**18.6**			**B**	**14.8**		
	Eastbound Thru	230	B	20.0	47	132	C	20.9	365	497
	Westbound Thru	230	C	34.4	210	#357	C	28.1	159	251
	Westbound Right	230	B	18.7	3	23	B	18.5	0	10
	Northbound LTR	760	B	15.4	313	384	B	10.5	171	210
21	**Marriott Driveway/Mill Rd (West) & Eisenhower Ave**									
	Overall Intersection (Signalized)		**A**	**10.0**			**B**	**19.7**		
	Eastbound Left	150	A	3.4	10	40	C	30.2	123	#347
	Eastbound TR	720	A	6.6	52	120	A	7.8	104	198
	Westbound Left	150	A	3.5	8	33	A	9.4	4	16
	Westbound TR	1720	A	6.4	38	91	B	18.4	242	358
	Northbound LTR	20	C	32.3	6	33	D	40.3	55	47
	Southbound LT	30	C	33.9	28	50	D	42.0	35	74
	Southbound Right	30	C	32.2	0	19	D	37.0	0	41
22	**Holiday Inn & Eisenhower Ave & Stovall St**									
	Overall Intersection (Signalized)		**F**	**119.1**			**C**	**27.2**		
	Eastbound Left	150	B	19.2	42	80	B	15.5	76	138
	Eastbound Thru	1700	C	28.4	118	167	B	19.5	182	258
	Westbound Left	270	E	61.6	1	m9	E	68.3	9	m19
	Westbound Thru	460	D	35.2	70	96	B	15.2	94	150
	Westbound Right	460	F	93.0	34	76	D	36.8	9	77
	Northbound LT	2300	D	41.9	133	183	D	47.6	54	78

	Intersection (Movement)	Storage Length (ft)	Existing Conditions							
			AM Peak				*PM Peak*			
			LOS Delay		Queue (ft) 50th	Queue (ft) 95th	LOS Delay		Queue (ft) 50th	Queue (ft) 95th
	Northbound Right	290	F	256.0	~662	#1073	D	43.6	42	85
	Southbound Left	220	D	50.7	58	98	D	52.3	29	66
	Southbound LT	380	D	50.8	60	98	D	52.3	29	65
	Southbound Right	380	D	37.5	0	28	D	40.2	0	42
	Northeastbound LTR	340	E	57.1	17	38	E	57.8	24	37
23	**Swamp Fox Rd & Eisenhower Ave**									
	Overall Intersection (Signalized)		**C**	**21.4**			**C**	**26.0**		
	Eastbound Left	60	B	14.3	36	m44	B	10.3	14	m28
	Eastbound Thru	440	C	20.6	305	m302	B	11.1	135	164
	Westbound TR	210	B	14.8	41	60	C	21.4	137	184
	Northbound LT	110	D	53.9	31	47	D	53.9	24	48
	Northbound Right	110	D	51.0	0	0	D	51.6	0	0
	Southbound Left	90	E	56.8	26	48	F	266.2	~82	#174
	Southbound Right	90	C	33.4	0	0	C	32.0	0	1
24	**Port St/Mill Race Ln & Eisenhower Ave**									
	Overall Intersection (Signalized)		**A**	**5.3**			**A**	**9.0**		
	Eastbound Left	120	A	0.8	2	m4	A	4.4	7	m12
	Eastbound TR	280	A	1.5	21	27	A	5.5	55	m63
	Westbound Left	90	A	4.1	1	m2	A	5.8	10	m17
	Westbound TR	290	A	9.0	104	133	A	7.8	94	120
	Northbound LTR	240	D	39.0	0	2	D	37.1	44	75
	Southbound LTR	190	D	39.6	12	16	D	35.9	16	41
25	**Mill Rd (East) & Eisenhower Ave**									
	Overall Intersection (Signalized)		**C**	**32.9**			**C**	**27.1**		
	Eastbound Left	160	A	3.8	14	13	C	25.5	22	m48
	Eastbound TR	290	C	25.6	454	537	C	28.2	139	184
	Westbound Left	200	D	38.4	24	47	B	13.3	35	73
	Westbound TR	360	C	27.2	49	41	B	17.7	116	165
	Northbound Left	250	C	21.1	124	188	D	45.8	194	#320
	Northbound TR	250	D	49.9	488	#762	C	31.6	211	313
	Southbound LT	230	D	43.1	46	81	D	37.4	108	165
	Southbound R	230	D	36.7	0	0	C	32.3	0	0
26	**Driveway/Elizabeth Ln & Eisenhower Ave**									
	Overall Intersection (Signalized)		**A**	**4.0**			**B**	**17.6**		
	Eastbound Left	140	A	1.5	17	m66	A	4.6	9	m21
	Eastbound TR	350	A	2.8	36	m184	A	6.1	56	87
	Westbound Left	120	A	4.8	0	7	A	6.2	3	m8
	Westbound Thru	470	A	3.8	4	67	A	9.9	134	171
	Westbound Right	470	A	5.9	0	0	C	33.5	0	12
	Northbound LTR	20	D	48.3	15	32	F	80.4	93	111
	Southbound Left	600	D	47.3	1	8	D	41.7	24	51
	Southbound TR	600	D	47.5	4	28	D	41.4	1	59
27	**Pedestrian Crossing & Eisenhower Ave**									
	Overall Intersection (Signalized)		**B**	**17.4**			**B**	**16.0**		
	Eastbound Thru	470	B	19.1	85	494	B	14.0	92	174
	Westbound Thru	270	A	9.4	24	23	B	17.4	116	132
28	**Hoofs Run Dr & Eisenhower Ave**									
	Overall Intersection (Unsignalized)		**-**	**-**			**-**	**-**		
	Eastbound Left	60	A	7.9	-	1	A	0.0	-	0
	Westbound LT	150	A	5.6	-	5	A	4.8	-	11
	Northbound Left	530	C	18.2	-	32	F	115.3	-	253
	Northbound Right	530	-	-	-	-	-	-	-	-
	Southbound LTR	80	A	0.0	-	0	B	11.3	-	18
29	**Eisenhower Ave & John Carlyle St**									

	Intersection (Movement)	Storage Length (ft)	Existing Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Overall Intersection (Signalized)		**A**	**4.1**			**B**	**13.4**		
	Eastbound Left	150	A	0.8	2	6	A	3.6	15	21
	Eastbound Thru	150	A	0.7	3	6	A	3.8	34	32
	Westbound LTR	120	A	5.6	26	54	A	9.6	74	104
	Southbound LTR	300	D	49.6	1	24	D	41.9	2	73
30	**Holland Ln & Eisenhower Ave**									
	Overall Intersection (Roundabout)		-	-			-	-		
	Eastbound Left	150	C	17.4	-	8	A	8.3	-	2
	Westbound Left	170	A	3.3	-	0	A	3.7	-	0
	Northbound Thru	170	A	6.0	-	0	A	5.6	-	0
	Southbound Thru	260	A	4.5	-	0	A	3.4	-	0
	Southbound Right	260	A	5.1	-	1	A	8.1	-	2
31	**Mill Rd & Driveway/Telegraph Rd Ramp**									
	Overall Intersection (All Way Stop)		-	-			-	-		
	Eastbound LTR	260	A	9.0	-	-	B	10.8	-	-
	Westbound Left	140	A	9.5	-	-	B	11.7	-	-
	Westbound TR	140	A	8.2	-	-	B	9.4	-	-
	Northbound LT	720	A	8.2	-	-	C	8.6	-	-
	Northbound Right	720	A	7.9	-	-	C	20.4	-	-
	Southbound Left	790	B	10.6	-	-	F	147.3	-	-
	Southbound LTR	790	B	9.1	-	-	F	20.4	-	-
32	**Stovall St & Mill Rd**									
	Overall Intersection (Signalized)		**B**	**13.2**			**B**	**13.5**		
	Eastbound TR	790	A	7.6	4	55	B	14.5	6	24
	Westbound Left	510	A	4.4	1	15	A	7.8	10	65
	Westbound Thru	780	A	4.6	6	46	A	9.8	47	211
	Northbound Left	300	C	20.4	14	48	C	21.3	44	109
	Northbound Right	310	C	20.3	0	58	B	18.9	0	30
33	**Stovall St & Pershing Ave/Mandeville Ln**									
	Overall Intersection (Signalized)		**B**	**13.9**			**B**	**14.8**		
	Eastbound LTR	230	C	22.4	32	47	B	19.2	7	22
	Westbound LT	410	B	19.8	1	6	C	30.7	37	63
	Westbound Right	410	B	19.8	0	0	C	28.4	0	0
	Northbound Left	150	A	4.6	18	65	A	8.7	64	174
	Northbound TR	370	A	8.1	22	94	B	11.0	38	120
	Southbound Left	100	A	7.6	3	14	B	12.6	3	15
	Southbound Thru	310	A	9.9	4	17	B	14.8	15	45
	Southbound Right	310	A	9.8	0	0	B	14.8	0	8
34	**Swamp Fox Rd & Mandeville Ln**									
	Overall Intersection (All Way Stop)		**A**	**7.1**			**A**	**7.5**		
	Eastbound Thru	420	A	7.6	-	-	A	6.9	-	-
	Eastbound Right	420	A	6.2	-	-	A	6.2	-	-
	Westbound LT	230	A	7.2	-	-	A	7.7	-	-
	Westbound Thru	230	A	6.6	-	-	A	7.0	-	-
	Northbound LR	170	A	7.4	-	-	A	7.9	-	-
35	**Mandeville Ln & Mill Rd**									
	Overall Intersection (Signalized)		**A**	**4.7**			**A**	**5.1**		
	Eastbound LTR	760	A	4.5	0	142	A	4.4	6	38
	Westbound Left	210	A	1.9	0	8	A	2.3	2	12
	Westbound TR	760	A	1.8	0	34	A	3.3	50	135
	Northbound Left	130	C	22.9	1	6	C	22.5	13	30
	Northbound Right	130	C	22.9	0	12	C	21.3	0	16
36	**Mill Rd (East)/Andrews Ln & Mill Rd/Jamieson Ave**									
	Overall Intersection (Signalized)		**B**	**18.1**			**C**	**20.1**		

	Intersection (Movement)	Storage Length (ft)	Existing Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Eastbound Left	210	B	12.6	3	13	B	16.8	6	19
	Eastbound Thru	760	B	18.8	152	253	C	20.8	49	90
	Eastbound Right	760	B	14.7	0	2	B	19.6	0	0
	Westbound Left	140	A	9.5	23	42	B	12.1	58	96
	Westbound TR	510	B	11.9	26	58	C	20.7	180	323
	Northbound Left	120	B	19.7	23	47	C	21.5	77	129
	Northbound LT	190	B	19.7	24	49	C	22.0	80	132
	Northbound Right	190	C	20.2	0	36	B	19.3	0	35
	Southbound LTR	630	C	27.4	15	30	C	31.1	15	29
37	**Dulany St & Jamieson Ave**									
	Overall Intersection (Signalized)		**C**	**31.9**			**B**	**16.7**		
	Eastbound LTR	280	D	41.4	278	#498	B	16.0	98	186
	Westbound LTR	340	A	9.2	17	33	B	10.9	88	97
	Northbound LTR	70	B	17.2	20	37	C	20.3	47	72
	Southbound LTR	350	C	29.0	121	138	C	22.2	28	63
38	**Holland Ln & Jamieson Ave**									
	Overall Intersection (Signalized)		**B**	**10.7**			**B**	**11.2**		
	Eastbound LTR	350	B	14.7	26	50	B	15.0	42	81
	Westbound LTR	1220	B	17.8	51	88	C	21.9	69	137
	Northbound LTR	210	A	9.7	47	82	A	8.1	24	48
	Southbound LTR	340	A	6.4	7	33	A	7.7	44	51
39	**Port St & Dock St**									
	Overall Intersection (Unsignalized)		-	-			-	-		
	Westbound LTR	360	A	9.0	-	3	A	9.5	-	8
	Southbound Left	240	A	7.3	-	2	A	7.9	-	23
40	**Mill Rd & Dock St**									
	Overall Intersection (Unsignalized)		-	-			-	-		
	Eastbound LR	360	B	13.3	-	12	C	20.5	-	95
	Northbound Left	-	A	0.1	-	0	A	1.6	-	3
41	**Mill Rd/Mill Rd (East) & Carlyle Apartments**									
	Overall Intersection (Unsignalized)		-	-			-	-		
	Westbound LR	550	C	15.0	-	15	C	16.2	-	12
	Southbound Left	260	A	1.2	-	2	A	1.7	-	5
42	**Telegraph Rd & Duke St Ramp to Telegraph Rd/NB Telegraph Rd to EB Duke St**									
	Overall Intersection (Unsignalized)		-	-			-	-		
43	**I-95 Express Ramp & Telegraph Rd Ramp**									
	Overall Intersection (Unsignalized)		-	-			-	-		
44	**WB Ramp to I-495 & I-95 Express Ramp**									
	Overall Intersection (Unsignalized)		-	-			-	-		
45	**Telegraph Rd & Huntington Ave**									
	Overall Intersection (Signalized)		**B**	**12.9**			**C**	**22.0**		
	Westbound Left	270	D	37.2	97	148	F	83.5	341	427
	Westbound LTR	500	D	46.6	165	240	F	89.7	340	435
	Westbound Right	500	D	44.3	157	227	F	84.9	311	397
	Northbound TR	230	A	9.7	170	376	B	13.8	588	670
	Southbound TR	350	A	6.4	72	111	B	12.6	498	656
46	**Telegraph Rd & N Kings Hwy**									
	Overall Intersection (Signalized)		**C**	**23.8**			**C**	**29.1**		
	Eastbound Right	-	C	27.7	0	0	F	80.7	78	142
	Westbound Left	350	D	48.3	51	90	F	93.0	235	281
	Westbound Right	620	C	27.3	331	341	E	79.1	539	531
	Northbound TR	250	C	25.8	408	526	B	15.0	298	338
	Southbound TR	280	B	14.1	91	106	B	14.5	688	347

	Intersection (Movement)	Storage Length (ft)	Existing Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
47	**I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)		-	-			-	-		
48	**Ramp from Telegraph Rd & I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)		-	-			-	-		
49	**I-495 WB Ramp & Telegraph Road**									
	Overall Intersection (Unsignalized)		-	-			-	-		
50	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave**									
	Overall Intersection (Unsignalized)		-	-			-	-		
	Eastbound Right	180	A	7.1	-	11	B	12.7	-	123
	Westbound Right	600	E	40.6	-	121	F	56.1	-	295
71	**W Taylor Run Pkwy**									
	Overall Intersection (Signalized)		**D**	**35.4**			**C**	**23.4**		
	Eastbound LTR	70	B	12.4	9	41	B	13.6	4	37
	Westbound LTR	310	B	12.8	23	70	B	14.9	40	105
	Northbound LTR	50	A	2.6	0	m0	A	1.8	1	m3
	Southbound LT	680	E	79.1	244	#394	D	51.3	207	#311
	Southbound Right	680	D	40.1	0	0	D	37.6	0	0
102	**Duke Street & Dove St (southern node)**									
	Overall Intersection (Unsignalized)		-	-			-	-		
	Eastbound LR	130	B	11.7	-	59	B	10.9	-	35
104	**Duke Street & Roberts Ln (northern node)**									
	Overall Intersection (Unsignalized)		-	-			-	-		
	Eastbound LTR	490	A	8.8	-	4	A	8.6	-	4
	Westbound LTR	150	A	9.8		4	B	10.6		10
	Northbound LT	50	A	2.4	-	1	A	6.9	-	2

m - Volume for 95th percentile queue is metered by upstream signal

- 95th percentile volume exceeds capacity, queue may be longer

~ - Volume exceeds capacity, queue is theoretically infinite

EXISTING TRAFFIC OPERATIONS – PART TWO (VISSIM)

This section provides a summary of the assumptions and calibration parameters used to develop the VISSIM network for the EESAP 2019 Update.

VISSIM model calibration and validation is the process of performing adjustments to the model to better simulate local driving behavior and operational performance. The calibration process typically compares field data (volumes, speed, travel time, queue length, etc.) to the simulation output so that the model represents actual traffic conditions in the study area. A model that is appropriately calibrated improves the model's ability to assess the future conditions of the study area. For the purpose of this analysis, the calibration criteria were scoped and approved by the City. All reasonable efforts were made to calibrate the VISSIM models to the calibration criteria and targets.

Study Area, Scope, and Methodology

The scope of the microsimulation analysis was extensively discussed with and approved by the City of Alexandria and VDOT. The general methodology of the microsimulation calibration and analysis follows national and City of Alexandria standards.

VISSIM Study area

The VISSIM study area is a list of intersections where the VISSIM microsimulation was performed to calibrate the Existing Conditions scenario. It represents the intersections most likely to have potential impacts or require changes to traffic operations to accommodate the proposed development.

These intersections are based on the projected future trip generation and the location of the EESAP development blocks. As agreed to in this report's scoping agreement, the following intersections were included in the VISSIM microsimulation analysis:

1. Duke Street & Witter Drive
2. Duke Street & W Taylor Run
3. Duke Street & Telegraph Road
4. Duke Street & Telegraph Road
5. Duke Street & Dove Street
6. Duke Street & Callahan Drive
7. Eisenhower Avenue & Mill Road (West)
8. Eisenhower Avenue & Stovall Street
9. Eisenhower Avenue & Swamp Fox Road
10. Eisenhower Avenue & Port Street
11. Eisenhower Avenue & Mill Road (East)
12. Eisenhower Avenue & Elizabeth Lane
13. Telegraph Road Ramps & Mill Road
14. Mandeville Lane & Stovall Street
15. Dock Lane & Mill Road
16. Carlyle Apartments Driveway & Mill Road
17. Telegraph Road On-Ramp & Duke Street
18. Telegraph Road & Telegraph to Mill
19. WB Ramp to I495 & Telegraph Road
20. Telegraph Rd & Huntington
21. Telegraph Rd & N Kings Hwy
22. I-495 EB Off- Ramp & Diverge to Telegraph or Eisenhower
23. I-495 EB Off- Ramp & Merge with NB Ramp from Telegraph
24. I-495 EB / WB Ramp & Merge to Telegraph
25. Telegraph Rd & Pershing Ave

Figure 25 shows a map of the VISSIM study intersections.

Existing Traffic Volumes

The existing traffic volumes are comprised of turning movement data and automated traffic recorders, which were collected on Wednesday, November 2, 2016 and Wednesday June 6, 2018. The results of the traffic counts are included in the Technical Appendix.

For all intersections, the weekday morning and afternoon system peak hours were used. The weekday morning system peak hour was from 7:30AM-8:30AM and the afternoon system peak hour was from 5:00PM-6:00PM. The existing peak hour traffic volumes are shown in Figure 19, Figure 20, and Figure 21.

Existing Geometry and Operations Assumptions

The geometry and operations assumed in the calibration of the Existing Conditions VISSIM microsimulation were those present when the main data collection occurred. Gorove/Slade made observations and confirmed the existing lane configurations and traffic controls at the intersections within the study area. Existing signal timings and offsets were obtained from the City of Alexandria and VDOT and confirmed in the field. The lane configurations and traffic controls for the Existing Conditions are shown in Figure 22, Figure 23, and Figure 24.

Simulation Model Development

Gorove/Slade used the existing geometry and turning movement volumes to create a VISSIM model that represents

current operating conditions. As part of calibrating the model, Gorove/Slade conducted field reviews to verify the following:

- Roadway Geometry – Gorove/Slade conducted field reviews to verify the current roadway geometry and operational aspects, such as signal phasing;
- Link Speed Distribution – The input for Desired Speed Decision was verified using the posted speed limits along the corridor. Reduced speed areas were used for left turns and right turns;
- Traffic Volumes – In order to establish a calibrated model, turning movement volumes were used to develop a balanced network using system peak data during AM and PM peak periods. The AM system peak period is from 7:30AM-8:30AM and the PM system peak period is from 5:00PM-6:00PM;
- Vehicle Composition – The North America vehicle fleet was used;
- Simulation Duration – The simulation results are based on an average of 5 model runs. Each model run is seeded for a 1-hour period and followed by a 1-hour simulation period;
- Simulation Resolution – The simulation results are based on a simulation resolution of 8 time steps per simulation second;
- Simulation Speed – The simulation results are based on a simulation speed of 10 simulation seconds per second;
- Driver Behavior – The simulation results are based on default driver behavior with advanced merging and cooperative lane change turned on with exceptions shown in Table 6; and
- Measures of Effectiveness (MOE) – Four parameters were used to measure characteristics of effectiveness:
    - Travel time sections evaluation to measure travel time for vehicles;
    - Link evaluation for speed and density;
    - Node/intersection evaluation to measure volumes and delay; and
    - Queue Counters evaluation to measure maximum queue length.

Model Calibration and Validation

Model calibration and validation is the process of performing adjustments to the model to better simulate local driving behavior and operational performance. The calibration process typically compares field data (volumes, speed, travel time, queue length, etc.) to the simulation output so that the model represents actual traffic conditions in the study area. A model that is appropriately calibrated improves the model's ability to assess the future conditions of the study area. For the purpose of this analysis, the calibration criteria were scoped and approved by the City. All reasonable efforts were made to calibrate the VISSIM models to the calibration criteria and targets.

Some model parameters were adjusted to reflect actual network performance and driver behaviors. The models were run with adjusted parameters and the outputs were examined against field measurements. In the models for this study, values of driving behavior parameters for most links used the default values. To validate and calibrate the model, the driver behavior parameters were changed from their default values to the values defined in Table 6 during the AM and PM analysis for the weaving and merge segments.

Table 6: Lane Change Calibration Parameters Used in AM and PM Analysis in Weaving and Merge Segment

Lane Change Parameters	Default	Used in Analysis
Accepted Deceleration of Trailing Vehicle	-3.28 ft/s2	-2.28 ft/s2
Minimum Headway	1.64 ft	1.54 ft
Safety Distance Reduction Factor	0.60	0.40

No vehicles were denied entry into the network in any of the AM or PM simulation model runs.

The VISSIM modeling calibration used in this analysis met the calibration acceptance targets defined in the City of Alexandria's Transportation Planning Administrative Guidelines in nearly 85% of cases, which is consistent with VDOT TOSAM guidance. Table 7 shows the results of the VISSIM modeling calibration criteria and results. Tables showing the MOEs for existing conditions are included in the Technical Appendix.

Please note that while queue length calibration criteria for the PM peak hour was not met, the City confirmed that the models were reasonable calibrated to represent existing conditions.

Table 7: VISSIM Modeling Calibration Criteria and Results

Calibration Criterion	Calibration Target	Results	
		AM	PM
Individual Link Flows[1]			
Within 100 veh/h (Flow < 700 veh/h)	>85% of cases[2]	100%	99%
Within 15% (Flow from 700 veh/h to 2700 veh/h)	>85% of cases[2]	100%	100%
Within 400 veh/h (Flow > 2700 veh/h)	>85% of cases[2]	100%	100%
Travel Times			
Within 30% of Observed Travel Times	>85% of cases[2]	88%	100%
Queuing			
Within 30% or 125 ft of Observed Queue lengths[4]	>85% of cases[2]	87%	73%

1. Based on City of Alexandria Criteria
2. Based on VDOT TOSAM Criteria
3. Travel times based primarily on data obtained from Streetlight
4. The threshold of 125 feet was used instead of 30% at locations with relatively short queues (<250') where a change of less than 125 feet could result in a high percentage.

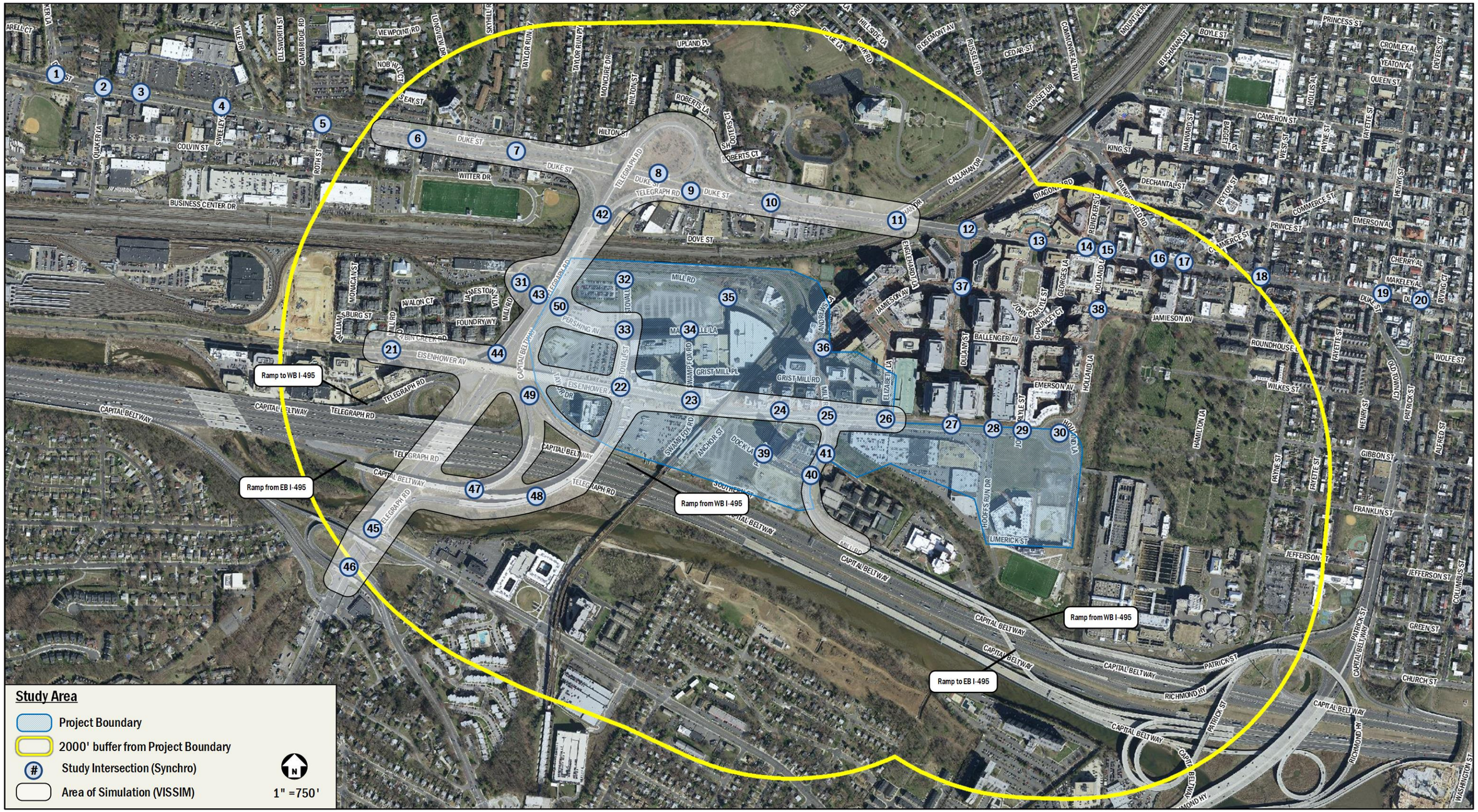


Figure 25: Study Area Intersections

TRAVEL DEMAND ASSUMPTIONS

This chapter outlines the transportation demand of the of the proposed EESAP update. This includes a review of the expected mode splits within the EESAP, multimodal trip generation, and the distribution and routing assumptions used in the analysis, as vetted and approved by the City of Alexandria and VDOT.

MODE SPLIT METHODOLOGY

Mode split (also called mode share) is the percentage of travelers using a particular type (or mode) of transportation when traveling. The main source of vehicular mode split information for this report was based on trip generation data collection, observations, and surveys at comparable sites in Northern Virginia (including Eisenhower East) and Washington, DC. This data was then compared to the calculated number of trips that would be generated at each site using the methodology outlined in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 10th Edition. In addition to the above methodology, Census data using Transportation Analysis Zones (TAZs) and data contained in the WMATA Ridership Survey were also consulted when determining mode splits for the EESAP.

Non-auto (transit, bicycle, and walking) mode split assumptions were primarily based on Census data and the WMATA Ridership Survey, and supplemented with trip generation data collection, observations, and surveys at comparable sites in Northern Virginia (including Eisenhower East) and Washington, DC where possible.

A detailed table showing the anonymized site attribute and trip generation results used for the mode split assumptions in this report are included in the Technical Appendix.

Residential Mode Splits

Residential mode splits were primarily based on trip generation data collection, including observations and surveys, from 11 residential sites within Northern Virginia (including Eisenhower East) and Washington, DC.

The number of observed vehicular trips to/from the site during the AM and PM peak hours were compared to the number of trips generated using ITE's Trip Generation, 10th Edition for each site. Sites were grouped by proximity to Metro and the average percentage of trips compared to ITE as shown in Table 8.

Table 8: Results of Observed Auto Trip Generation at Residential Sites as compared to ITE Trip Generation 10th Ed.

Distance to Metro	% of ITE		
	AM Peak Hour	PM Peak Hour	Combined
Adjacent to Metro	38%	24%	30%
<1/4 Mile to Metro	54%	38%	45%
>1/4 Mile and <1/2 Mile	50%	34%	41%
>1/2 Mile to Metro	62%	46%	53%

The auto mode split for the residential component of the EESAP update was determined to be 30% when the site is adjacent to Metro (within approximately 0.1 mile), 35% when the site is within 0.1 to 0.25 mile of Metro, and 40% when between 0.25 and 0.5 mile of Metro.

The above mode splits are generally consistent with Census data that showed a Single Occupancy Vehicle (SOV) mode split of 40% and WMATA Ridership Survey data that showed an auto mode split of 39% for residential sites inside the Beltway.

Non-auto mode split assumptions were primarily based on Census data and the WMATA Ridership survey, and supplemented with trip generation data collection, observations, and surveys at comparable sites in Northern Virginia (including Eisenhower East) and Washington, DC where possible. Based on this, the transit mode split for the residential component of the EESAP update was assumed to be 55% when the site is adjacent to Metro (within approximately 0.1 mile), 50% when the site is within 0.1 to 0.25 mile of Metro, and 45% when between 0.25 and 0.5 mile of Metro. The bike mode split was assumed to be 5% regardless of distance to the Metro, and the walk mode split was assumed to 10% regardless of the distance to Metro.

Office Mode Splits

Office mode splits were primarily based on trip generation data collection, including observations and surveys, from six (6) office sites within Northern Virginia (including Eisenhower East) and Washington, DC.

The number of observed vehicular trips to/from the site during the AM and PM peak hours were compared to the number of trips generated using ITE's Trip Generation, 10th Edition for each site. Sites were grouped by proximity to Metro and the

average percentage of trips compared to ITE as shown in Table 9.

Table 9: Results of Observed Auto Trip Generation at Office Sites as compared to ITE Trip Generation 10th Ed.

Distance to Metro	% of ITE		
	AM Peak Hour	PM Peak Hour	Combined
Adjacent to Metro	6%	9%	7%
<1/4 Mile to Metro	NA	NA	NA
>1/4 Mile and <1/2 Mile	17%	23%	20%
>1/2 Mile to Metro	28%	19%	24%

In addition, given the existing and planned level of density for the EESAP, the proposed auto mode split is close to the average of office sites in Central Business Districts (CBDs) (21% SOV). However, the "percent of ITE" values are considerably lower than the Census data (56% SOV) and office sites inside the beltway (66% SOV) from the WMATA Ridership Survey data.

Therefore, the auto mode split for the office component of the EESAP update was determined to be 30% when the site is adjacent to Metro (within approximately 0.1 mile), 35% when the site is within 0.1 to 0.25 mile of Metro, and 40% when between 0.25 and 0.5 mile of Metro.

Non-auto mode split assumptions were primarily based on Census data and the WMATA Ridership survey, and supplemented with trip generation data collection, observations, and surveys at comparable sites in Northern Virginia (including Eisenhower East) and Washington, DC where possible. Based on this, the transit mode split for the office component of the EESAP update was assumed to be 60% when the site is adjacent to Metro (within approximately 0.1 mile), 55% when the site is within 0.1 to 0.25 mile of Metro, and 50% when between 0.25 and 0.5 mile of Metro. The bike mode split was assumed to be 5% regardless of distance to the Metro, and the walk mode split was assumed to 5% regardless of the distance to Metro.

Retail Mode Splits

Retail mode splits were primarily based on trip generation data collection, including observations and surveys, from 12 retail sites within Northern Virginia (including Eisenhower East) and Washington, DC.

The number of observed vehicular trips to/from the site during the AM and PM peak hours were compared to the number of trips generated using ITE's Trip Generation, 10th Edition for each site, and are included in the Technical Appendix.

After careful examination of the available data, it was determined that separate mode splits for two categories of retail (Neighborhood Serving Retail and Destination Retail) would best capture the trip generating characteristics of retail in mixed-use and dense development.

Neighborhood Retail

ITE vehicle trip generation rates typically presume a stand-alone retail building with customer parking provided on-site, a characteristic common throughout the region except in more urban areas. Neighborhood Serving Retail presumes few new vehicle trips will be generated where a nominal amount of ancillary ground-floor retail is provided in a mixed-use building that is predominantly residential or office. An auto mode split of 10% was assumed for Neighborhood Serving Retail uses within Eisenhower East.

Destination Retail

ITE vehicle trip generation rates may be more suitable for large-format retail uses (like a big-box or grocery store) that are the primary reason that someone will drive to and from a site.

Therefore, for all blocks where the total amount of retail development exceeded 35,000 square feet and the amount of retail development exceeded 5% of its Gross Floor Area (GFA), an auto mode split of 50% was assumed, with the exception of the approved grocer in Block 4/5 (65% auto mode split). This is because an average grocery store in the United States can ranges between 35,000 square feet and 45,000 square feet, and small-format big-box retailers can range between 25,000 and 70,000 square feet. Devoting more than 5% of a block's GFA would mean that the retail use may not necessarily qualify as an ancillary use.

Grocery

While the exact nature of each retail berth in the EESAP update is unknown, Blocks 4 and 5 received a Development Special Use Permit (DSUP) approval for a grocery store in 2018 (DSUP #2017-0023).

Non-auto mode split assumptions were primarily based on Census data and the WMATA Ridership survey, and supplemented with trip generation data collection, observations, and surveys at comparable sites in Northern

Virginia (including Eisenhower East) and Washington, DC where possible. Based on this, the transit mode split for the retail component of the EESAP update was assumed to be 10% for Neighborhood Serving Retail and Destination Retail, and 5% for Grocery. The bike mode split was assumed to be 5% for all retail types, and the walk mode split was assumed to be 75% for Neighborhood Serving Retail, 35% for Destination Retail, and 25% for Grocery.

Hotel Mode Splits

Hotel mode splits were primarily based on trip generation data collection, including observations and surveys, from six (6) hotel sites within Northern Virginia (including Eisenhower East) and Washington, DC.

The number of observed vehicular trips to/from the site during the AM and PM peak hours were compared to the number of trips generated using ITE's Trip Generation, 10th Edition for each site. Sites were grouped by proximity to Metro and the average percentage of trips compared to ITE as shown in Table 10.

Table 10: Results of Observed Auto Trip Generation at Hotel Sites as compared to ITE Trip Generation 10th Ed.

Distance to Metro	% of ITE		
	AM Peak Hour	PM Peak Hour	Combined
Adjacent to Metro	26%	11%	16%
<1/4 Mile to Metro	NA	NA	NA
>1/4 Mile and <1/2 Mile	16%	9%	12%
>1/2 Mile to Metro	18%	4%	9%

The auto mode split results for hotel sites did not correspond to the same types of trends based on proximity to Metro that residential or office sites corresponded to; therefore, it was determined that an auto mode split of 20% was appropriate for all hotel sites within the EESAP.

Non-auto mode split assumptions were primarily based on Census data and the WMATA Ridership survey, and supplemented with trip generation data collection, observations, and surveys at comparable sites in Northern Virginia (including Eisenhower East) and Washington, DC where possible. Based on this, the transit mode split for the hotel component of the EESAP update was assumed to be 55%, the bike mode split was assumed to be 1%, and the walk mode split was assumed to 24%.

The mode split assumptions for all land uses included the EESAP update are summarized in Table 11.

Table 11: Summary of Mode Split Assumptions

Land Use	Proximity to Metro/Type	Assumed Mode Splits			
		Auto	Transit	Bike	Walk
Residential	Adjacent to Metro	30%	55%	5%	10%
	<1/4 Mile to Metro	35%	50%	5%	10%
	>1/4 and <1/2 Mile	40%	45%	5%	10%
Office	Adjacent to Metro	30%	60%	5%	5%
	<1/4 Mile to Metro	35%	55%	5%	5%
	>1/4 and <1/2 Mile	40%	50%	5%	5%
Retail	Neighborhood Serving	10%	10%	5%	75%
	Destination Retail	50%	10%	5%	35%
	Grocery Store	65%	5%	5%	25%
Hotel	All	20%	55%	1%	24%

Approved & Proposed Development Programs

As shown in Figure 26 and detailed in Table 12, the EESAP 2019 Update encompasses 31 blocks that generally border Telegraph Road to the west, rail tracks and Carlyle to the north, Four Mile Run to the east, and I-495 to the south. The approved development program for the EESAP includes a total of approximately 6,226 residential dwelling units, 4,665,210 square feet of office, 674,831 square feet of retail, and 2,248 hotel rooms. Figure 26 and Table 12 also show the density changes that are being proposed to several of the EESAP blocks. The proposed development program for the EESAP includes a total of approximately 11,932 residential dwelling units, 5,324,889 square feet of office, 860,554 square feet of retail, and 4,452 hotel rooms.

Trip Generation Methodology

Traditionally, weekday peak hour trip generation is calculated based on the methodology outlined in the ITE trip Generation Manual, 10th Edition. This methodology was supplemented to account for the urban nature of the site (the Trip Generation Manual provides data for non-urban, low transit use sites) and to generate trips for multiple modes, as vetted and approved by the City of Alexandria and VDOT.

Residential trip generation was calculated based on ITE land use 222, Multifamily Housing (High-Rise), splitting trips into different modes using the assumptions outlined in the mode split section of this report. As trip generation calculations for residential uses are based on the number of residential units, 1,000 square feet per unit was assumed.

Office trip generation was calculated based on ITE land use 710, General Office Building, splitting trips into different modes using the assumptions outlined in the mode split section of this report.

Neighborhood Serving Retail and Destination Retail trip generation was calculated based on ITE land use 820, Shopping Center, splitting trips into different modes using the assumptions outlined in the mode split section of this report.

Grocery trip generation was calculated based on ITE land use 850, Supermarket, splitting trips into different modes using the assumptions outlined in the mode split section of this report.

Hotel trip generation was calculated based on ITE land use 310, Hotel, splitting trips into different modes using the assumptions outlined in the mode split section of this report. As trip generation calculations for hotel uses are based on the number of hotel rooms, 350 square feet per room was assumed.

A summary of multimodal trip generation for the EESAP 2019 approved and proposed development programs is shown in Table 13. Detailed trip generation calculations for each block are included in the Technical Appendix.

A number of blocks have existing uses on them that will be replaced once redeveloped. Using similar methodologies trip generation was calculated for each of these uses, which are shown in Table 14.

Internal Capture

Internal trip capture is the portion of trips generated by a mixed-use development that both begin and end within the development.

In order to avoid double counting of internally captured trips, no internal capture trip credits were assumed in this study. Based on the mode split assumptions that were approved by the City and VDOT, it was determined that the internal capture of trips between land uses and blocks within the EESAP would be represented by the non-auto mode splits as all internal trips are assumed to be made by walking or bicycle.

Table 12: Existing, Approved, and Proposed Block Development Programs

Block	Existing	Approved	Proposed
Block 1	Hotel - 207 rooms	no change	no change
Block 2	Surface Parking Lot	Office - 661,386 sf	Office - 1,000,000 sf Residential - approx. 650 du
Block 3	Surface Parking Lot	Office - 187,874 sf	Office - 1,000,000 sf Residential - approx. 650 du
Block 4/5	Surface Parking Lot	Retail - 151,607 sf Grocery - 85,000 sf Residential - approx. 801 du	no change
Block 6 (incl. 6A, 6B, & 6C)	Retail - 83,500 sf Office - 322,966 sf Residential - approx. 629 du	Retail - 83,500 sf Office - 322,966 sf Residential - approx. 629 du	Retail - 118,947 sf Office - 587,501 sf Hotel - approx. 571 rooms Residential - approx. 629 du
Block 7	Retail - 25,000 sf Movie Theatre - 136,000 sf	no change	no change
Block 8	Retail - 31,000 sf Office - 666,417 sf	no change	no change
Block 9 (incl. 9A & 9B)	Surface Parking Lot	Retail - 30,000 sf Office - 749,284 sf Hotel - approx. 1575 rooms	Retail - 60,000 sf Office - 350,000 sf Hotel - approx. 1,575 rooms Residential - 1,078 du
Block 10	Metrorail Station	Retail - 8,000 sf	no change
Block 11	Surface Parking Lot	Retail - 50,000 sf Residential - approx. 576 du	no change
Block 12	Surface Parking Lot	Retail - 15,000 sf Residential - approx. 531 du	no change
Block 13	Retail - 12,000 sf Residential - 478 du	no change	no change
Block 14	Parking Garage	no change	no change
Block 15 (City of Alexandria)	Homeless Shelter	Residential - approx. 475 du	no change
Block 15 (WMATA)	Surface Parking Lot	none	Office - 270,917 sf Residential - approx. 177 du
Block 16	Hotel - 181 rooms	no change	no change
Block 17	Retail - 4,000 sf Office - 402,000 sf	no change	no change
Block 18	Retail - 14,000 sf Residential - 511 du	no change	no change
Block 19	Residential - 432 du	no change	no change
Block 20	Vacant Lot	Hotel - approx. 286 rooms Residential - approx. 485 du	no change
Block 22*	see note 1	Open Space	Hotel - approx. 490 rooms
Block 23	Office - 190,000 sf	Office - 402,000 sf	Office - 398,000 sf Hotel - approx. 571 rooms
Block 24*	see note 1	Office - 176,007 sf Residential - approx. 225 du	Retail - 50,000 sf Office - 150,000 sf Hotel - approx. 571 rooms Residential – approx. 1,800 du
Block 25A*	see note 1	Residential - approx. 176 du	Retail - 50,000 sf Office - 500,000 sf Residential - approx. 650 du
Block P	Vacant Lot	Retail - 29,724 sf Office - 342,162 sf	Retail - 29,724 sf Residential - approx. 342 du
Block 27	Residential - 280 du	no change	no change
Block 32	Vacant Lot	Office - 755,144 sf Residential - 632 du	Residential - approx. 1387 du
Total Eisenhower East 2019 Update	Retail[1,2] - 369,500 sf Office - 1,508,102 sf Hotel - 388 rooms Residential - 1,701 du	Retail[2] - 674,831 sf Office - 4,665,210 sf Hotel - 2,248 rooms Residential - 6,226 du	Retail[2] - 860,554 sf Office - 5,324,889 sf Hotel - 4,452 rooms Residential - 11,932 du

note 1: Blocks 22, 24, and 25 are improved by the 2000 Eisenhower Avenue shopping center comprised of Warehouse (77 ksf), Office (155 ksf), and Retail (34 ksf) uses under existing conditions; note 2: includes 85 ksf grocery and 136ksf movie theatre

Table 13: Trip Generation Summary for EESAP 2019 Update

Property Owner - Assignee	Block	Approved/ Proposed	Retail (sf)	Office (sf)	Hotel (rooms)[3]	Residential (du)[4]	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
							In	Out	Total	In	Out	Total
Wright Investments	1[1]	Approved	-	-	207	-	12	8	20	13	13	26
		Proposed	-	-	207	-	12	8	20	13	13	26
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Hoffman	2[5]	Approved	-	661,386	-	-	195	32	227	38	202	240
		Proposed	-	1,000,000	-	650	308	98	406	106	330	436
		+/(-)	-	338,614	-	650	113	66	179	68	128	196
		% of Total Increase	-	-	-	-	**22%**	**11%**	**16%**	**10%**	**18%**	**14%**
Hoffman	3[5]	Approved	-	187,874	-	-	70	11	81	13	70	83
		Proposed	-	1,000,000	-	650	352	113	465	121	377	498
		+/(-)	-	812,126	-	650	282	102	384	108	307	415
		% of Total Increase	-	-	-	-	**56%**	**17%**	**35%**	**16%**	**44%**	**30%**
Stonebridge (incl. 85ksf grocer)	4/5	Approved	236,607	-	-	801	217	192	409	468	451	919
		Proposed	236,607	-	-	801	217	192	409	468	451	919
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Hoffman	6A[2]	Approved	36,500	-	-	629	27	56	83	82	66	148
		Proposed	36,500	-	-	629	27	56	83	82	66	148
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Rubenstein	6B	Approved	39,100	322,966	-	-	111	24	135	55	141	196
		Proposed	24,565	337,501	-	-	106	16	122	24	113	137
		+/(-)	(14,535)	14,535	-	-	-5	-8	-13	-31	-28	-59
		% of Total Increase	-	-	-	-	**-1%**	**-1%**	**-1%**	**-5%**	**-4%**	**-4%**
Rubenstein	6C	Approved	7,900	-	-	-	1	0	1	2	1	3
		Proposed	57,882	250,000	571	-	129	45	174	110	176	286
		+/(-)	49,982	250,000	571	-	128	45	173	108	175	283
		% of Total Increase	-	-	-	-	**25%**	**8%**	**16%**	**16%**	**25%**	**21%**
Hoffman (incl. 136ksf Existing Theater)	7[1]	Approved	161,000	-	-	-	2	0	2	198	146	344
		Proposed	161,000	-	-	-	2	0	2	198	146	344
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
USAA	8[1]	Approved	31,000	666,417	-	-	171	28	199	39	180	219
		Proposed	31,000	666,417	-	-	171	28	199	39	180	219
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Hoffman	9A[2,5]	Approved	-	-	1,575	-	92	64	156	118	113	231
		Proposed	30,000	-	1,575	-	94	65	159	124	118	242
		+/(-)	30,000	-	-	-	2	1	3	6	5	11
		% of Total Increase	-	-	-	-	0%	0%	0%	1%	1%	1%

Property Owner - Assignee	Block	Approved/ Proposed	Retail (sf)	Office (sf)	Hotel (rooms)[3]	Residential (du)[4]	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
							In	Out	Total	In	Out	Total
Hoffman	9B[2,5]	**Approved**	30,000	749,284	-	-	190	32	222	43	199	242
		Proposed	30,000	350,000	-	1,078	117	87	204	93	142	235
		+/(-)	-	(399,284)	-	1,078	-73	55	-18	50	-57	-7
		% of Total Increase	-	-	-	-	**-14%**	**9%**	**-2%**	**7%**	**-8%**	**-1%**
WMATA	10	**Approved**	8,000	-	-	-	1	0	1	2	1	3
		Proposed	8,000	-	-	-	1	0	1	2	1	3
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Hoffman	11[5]	**Approved**	50,000	-	-	576	27	49	76	83	74	157
		Proposed	50,000	-	-	576	27	49	76	83	74	157
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Hoffman	12	**Approved**	15,000	-	-	531	13	38	51	38	25	63
		Proposed	15,000	-	-	531	13	38	51	38	25	63
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Paradigm	13[1]	**Approved**	12,000	-	-	478	12	33	45	33	22	55
		Proposed	12,000	-	-	478	12	33	45	33	22	55
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Hoffman	14[1]	**Approved**	18,000	-	-	-	1	1	2	3	4	7
		Proposed	18,000	-	-	-	1	1	2	3	4	7
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
City of Alexandria	15	**Approved**	-	-	-	475	14	44	58	42	26	68
		Proposed	-	-	-	475	14	44	58	42	26	68
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
WMATA	15	**Approved**	-	-	-	-	0	0	0	0	0	0
		Proposed	-	270,917	-	177	102	35	137	36	108	144
		+/(-)	-	270,917	-	177	102	35	137	36	108	144
		% of Total Increase	-	-	-	-	**20%**	**6%**	**13%**	**5%**	**15%**	**10%**
Miller Global	16[1]	**Approved**	-	-	181	-	10	7	17	11	11	22
		Proposed	-	-	181	-	10	7	17	11	11	22
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Carlyle Overlook	17[1]	**Approved**	4,000	402,000	-	-	121	22	143	25	127	152
		Proposed	4,000	402,000	-	-	121	22	143	25	127	152
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-

Property Owner - Assignee	Block	Approved/ Proposed	Retail (sf)	Office (sf)	Hotel (rooms)[3]	Residential (du)[4]	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
							In	Out	Total	In	Out	Total
Paradigm	18[1]	**Approved**	14,000	-	-	511	14	42	56	42	27	69
		Proposed	14,000	-	-	511	14	42	56	42	27	69
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Paradigm	19[1]	**Approved**	-	-	-	432	12	35	47	33	21	54
		Proposed	-	-	-	432	12	35	47	33	21	54
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Paradigm	20	**Approved**	-	-	286	485	28	52	80	56	42	98
		Proposed	-	-	286	485	28	52	80	56	42	98
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Perseus	22	**Approved**	-	-	-	-	0	0	0	0	0	0
		Proposed	-	-	490	-	28	20	48	35	33	68
		+/(-)	-	-	490	-	28	20	48	35	33	68
		% of Total Increase	-	-	-	-	**6%**	**3%**	**4%**	**5%**	**5%**	**5%**
Simpson, Phase 1	23[1]	**Approved**	-	98,000	-	-	41	7	48	7	38	45
		Proposed	-	98,000	-	-	41	7	48	7	38	45
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Simpson, Phase 2	23[2]	**Approved**	-	304,000	-	-	107	18	125	21	110	131
		Proposed	-	300,000	571	-	139	40	179	62	147	209
		+/(-)	-	(4,000)	571	-	32	22	54	41	37	78
		% of Total Increase	-	-	-	-	**6%**	**4%**	**5%**	**6%**	**5%**	**6%**
Perseus	24[2]	**Approved**	-	176,007	-	225	72	35	107	33	79	112
		Proposed	50,000	150,000	571	1,800	126	177	303	190	181	371
		+/(-)	50,000	(26,007)	571	1,575	54	142	196	157	102	259
		% of Total Increase	-	-	-	-	**11%**	**24%**	**18%**	**23%**	**15%**	**19%**
Perseus	25A	**Approved**	-	-	-	176	6	19	25	16	11	27
		Proposed	50,000	500,000	-	650	193	87	280	99	222	321
		+/(-)	50,000	500,000	-	474	187	68	255	83	211	294
		% of Total Increase	-	-	-	-	**37%**	**12%**	**23%**	**12%**	**30%**	**21%**
Mill Creek	27[1]	**Approved**	-	-	-	280	9	27	36	25	17	42
		Proposed	-	-	-	280	9	27	36	25	17	42
		+/(-)	-	-	-	-	-	-	-	-	-	-
		% of Total Increase	-	-	-	-	-	-	-	-	-	-
Carlyle Plaza	P	**Approved**	29,724	342,162	-		121	21	142	30	128	158
		Proposed	29,724		-	342	13	33	46	36	25	61
		+/(-)	-	(342,162)	-	342	-108	12	-96	6	-103	-97
		% of Total Increase	-	-	-	-	**-21%**	**2%**	**-9%**	**1%**	**-15%**	**-7%**

Property Owner - Assignee	Block	Approved/ Proposed	Retail (sf)	Office (sf)	Hotel (rooms)[3]	Residential (du)[4]	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
							In	Out	Total	In	Out	Total
Carlyle Plaza Two	32	**Approved**	-	755,114	-	632	272	99	371	105	295	400
		Proposed	-		-	1,387	38	122	160	117	75	192
		+/(-)	-	(755,114)	-	755	-234	23	-211	12	-220	-208
		% of Total Increase	-	-	-	-	**-46%**	**4%**	**-19%**	**2%**	**-32%**	**-15%**
TOTALS		**2018 Approved**	692,831	4,665,210	2,249	6,231	1969	996	2965	1674	2640	4314
		Proposed	858,278	5,324,835	4,452	11,932	2477	1579	4056	2353	3338	5691
		+/(-)	**165,447**	**659,625**	**2,203**	**5,701**	**508**	**583**	**1091**	**679**	**698**	**1377**
		% change	**24%**	**14%**	**98%**	**91%**	**26%**	**59%**	**37%**	**41%**	**26%**	**32%**

1. Existing Development or Use to Remain
2. Existing Development or Use to be Redeveloped
3. Assumes 350 square feet per room for hotel
4. Assumes 1,000 square feet per dwelling unit for residential
5. See Mitigation section for final development program for Blocks 2, 3, 9, and 11.

Table 14: Trip Generation Summary for Existing Trips Removed from Network

Property Owner - Assignee	Block(s)	Use(s)	Quantity	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
				In	Out	Total	In	Out	Total
Rubenstein	**6**	Retail	36,500 sf	2	1	3	7	7	14
Hoffman	**9A/9B**	Park-and-Ride Lot	275 spaces	87	23	110	34	100	134
Simpson	**23**	Office	92,000 sf	39	6	45	7	35	42
Perseus	**22/24/25**	Warehouse Office Retail	77,000 sf 155,000 sf 34,000 sf	88	19	107	28	92	817

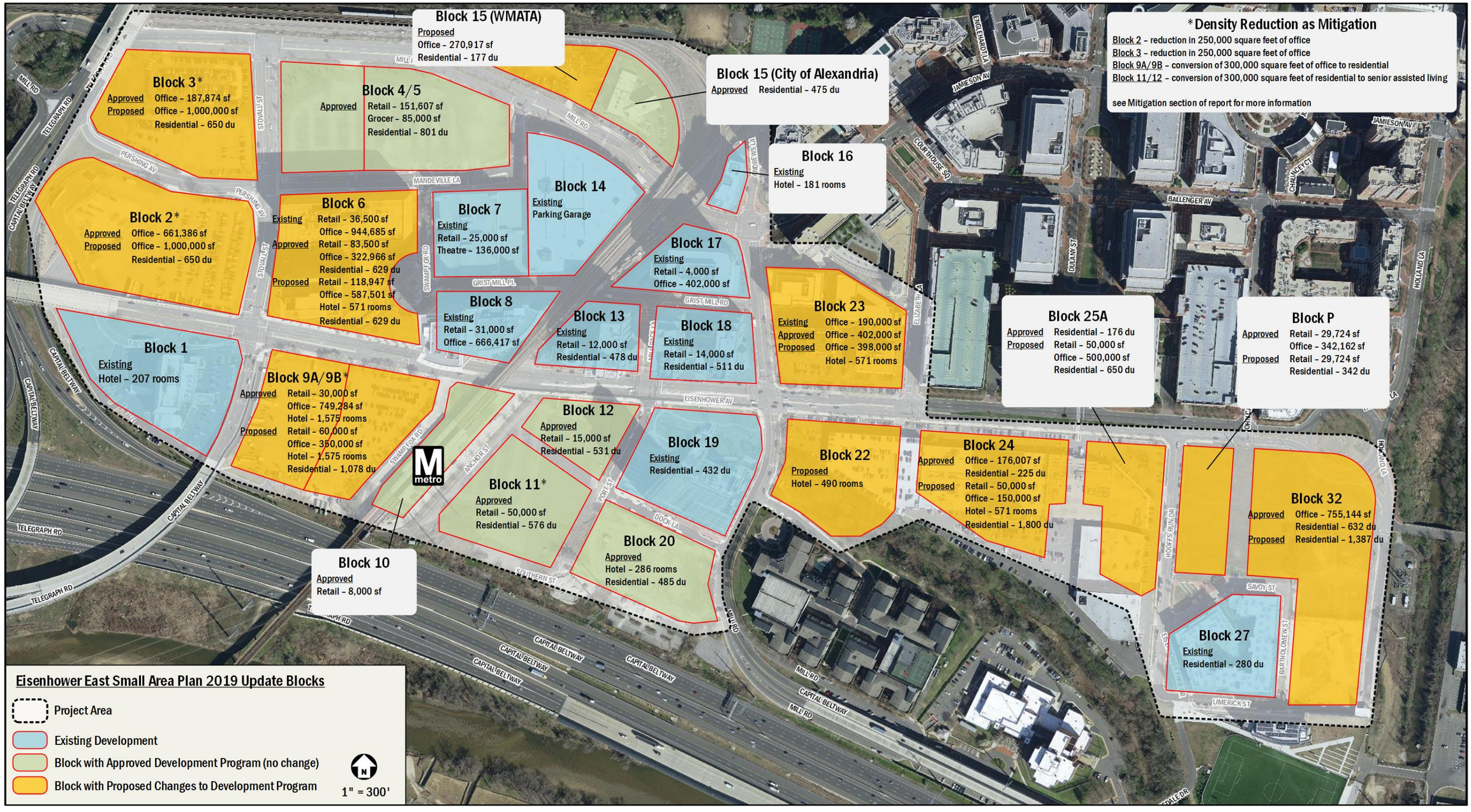


Figure 26: Development Program

Distribution and Assignment Methodology

The main source of distribution and trip assignment information for this report was based on StreetLight InSight® data and observations. StreetLight metrics are derived from a combination of two types of locational data: navigation-GPS data and Location-Based Services (LBS) data, including historical data, with a sample size of approximately 23% of the adult population. This data is then transformed into contextualized, aggregated, and normalized travel patterns that can be used to create origin and destination analyses, as was done for this report. More information about StreetLight InSight® is included in the Technical Appendix.

Local and Regional Distribution

Using StreetLight LBS data (October 2017 to April 2018), the general home location of commuters to the EESAP and the general work locations of residents in the EESAP were mapped. The results of the Home and Work Analysis are shown in Figure 29 and Figure 30. As can be seen, the results of the Home and Work Analysis show that the majority of home locations of commuters to the EESAP are to the south and west of the study area, while the most common work location of commuters from the EESAP is to the north of the study area in Washington, DC. The results of the Home and Work Analysis were then used to define the major roadways used for regional trips, and the distribution of trips with and origin or destination in neighborhoods proximate to Eisenhower East.

Using StreetLight GPS data for an average weekday (Tuesday – Thursday), during the morning (7:00AM-9:00AM) and afternoon (4:00PM-6:00PM) peak hours, from November 2016 to October 2017, specific paths and distributions were identified for trips going to/from the EESAP. Figure 31 shows the inbound distribution results for the morning and afternoon peak hours, and Figure 32 shows the outbound distribution results for the morning and afternoon peak hours.

It should be noted that the OD analysis performed for this report is based on existing travel data and patterns to/from the EESAP. Due to the EESAP's relatively large size, where the routes that travelers take to/from the eastern part of the EESAP might differ significantly from the routes that travelers take to/from the western part of the EESAP, the OD analysis instead examined the travel patterns of smaller, more discrete zones within the EESAP. Figure 33 shows the zones that were used for the OD analysis in lieu of an OD analysis that looked at the EESAP as one entity.

Trip Assignment

Trip assignment for each individual block was determined using StreetLight InSight® data. Trip assignments were based on applying middle filters between the same origin and destination pairs that were used to determine the local and regional distribution of trips, as explained in the previous section. By using middle filters, it was possible to establish the approximate number of vehicles that entered the study area, what route they took, how long each route took, and where they exited the study area. Based on the trip distribution and assignment assumptions, site-generated trips were distributed though the study area intersections. The origin of outbound and destination of inbound vehicular trips were the assumed access points at each block, as shown in Figure 34.

Cut-Through Traffic

As part of the OD analysis, this report examined the relative level of cut-through traffic that is present in the study area under existing conditions during the morning and afternoon peak hours.

In order to determine what percentage of traffic entering or leaving the EESAP is cut-through traffic, an analysis was performed which compared the number of trips with an origin or destination in the EESAP as compared to trips that pass through the EESAP with an origin or destination outside of the EESAP. This analysis was based on data for an average weekday (Tuesday – Thursday), during the morning (7:00AM-9:00AM) and afternoon (4:00PM-6:00PM) peak hours, from November 2016 to October 2017. Table 15 shows the results of the cut-through analysis for the morning and afternoon peak hours. As can be seen, approximately 50% of traffic entering or exiting the EESAP during the morning peak is cut-through traffic, and approximately 47% of traffic entering or exiting the EESAP during the afternoon peak is cut-through traffic.

Table 15:Cut-Through Analysis Results

Traffic Direction/Type	AM	PM	Total
To EESAP	4,518	2,154	6,672
From EESAP	1,530	4,663	6,193
Cut-Through	6,043	6,117	12,160
Total	*12,091*	*12,934*	*25,025*
Cut-Through % of Total	**50%**	**47%**	**49%**

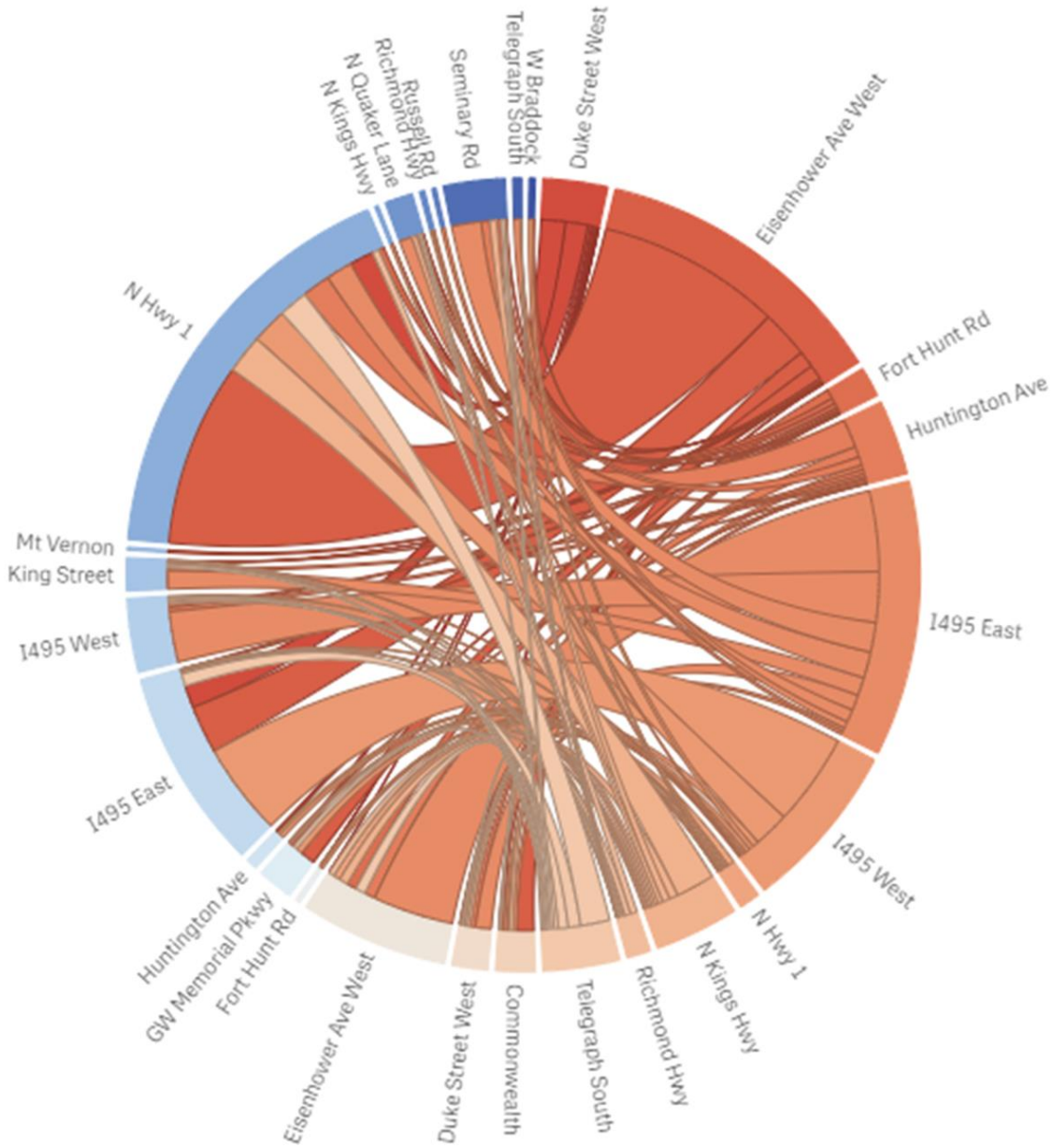
In addition, chord diagrams were produced to show the relative volume of traffic between OD pairs for cut-through traffic. At the chord base, blue indicates destination and orange indicates origin. Base widths are proportional to the traffic volume of the

origin and destination pair, and the shade of the chord reflects the number of trips from origin to the destination. Figure 27 shows a chord diagram for cut-through traffic during the morning peak hours and Figure 28 shows a chord diagram for cut through traffic during the afternoon peak hours.

During the morning peak, the most common destination for cut-through trips through the EESAP was northbound Highway 1 (Richmond Highway), with most trips entering the system on Eisenhower Avenue to the west of the EESAP. During the afternoon peak, the most common destination for cut-through trips through the EESAP is eastbound I-495 at the Wilson Bridge, with most trips entering the system either on Eisenhower Avenue to the west of the EESAP or on eastbound I-495 (both "gates" being to the west of Clermont Avenue), diverting onto Eisenhower Avenue and then merging back onto the Beltway.

In order to provide a conservative analysis, it was assumed that existing traffic would remain on the network and no regional cut-through trips were rerouted.

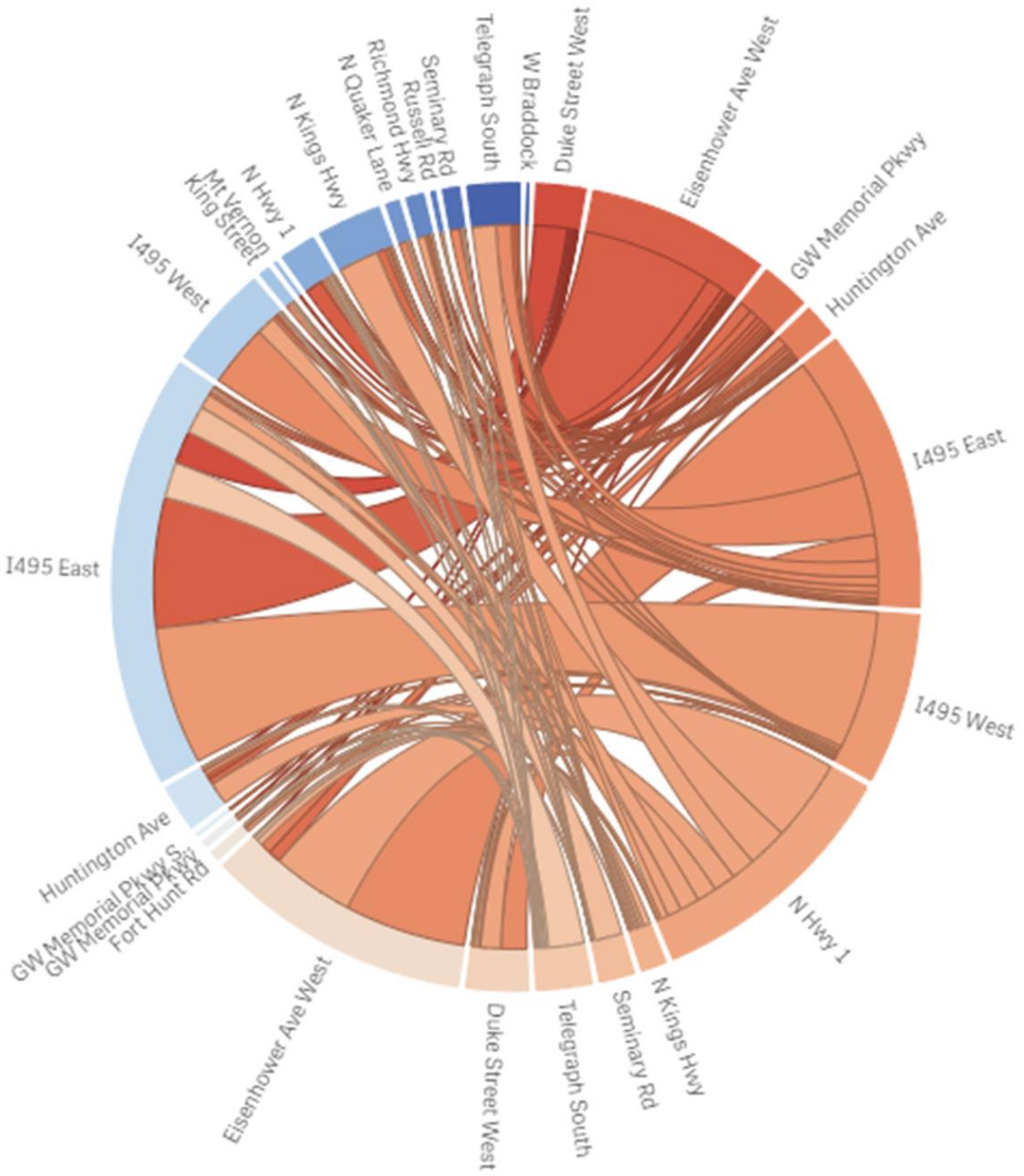
Chord Diagram (AM Peak)



This diagram shows the relative volume of traffic between selected O-D pairs. At the chord base, blue indicates destination and orange indicates origin. Base widths are proportional to the StL Index for the traffic volume of the O-D pair. The shade of the chord reflects the number of trips from origin to the destination.

Figure 27: AM Peak Cut-Through Results

Chord Diagram (PM Peak)



This diagram shows the relative volume of traffic between selected O-D pairs. At the chord base, blue indicates destination and orange indicates origin. Base widths are proportional to the StL Index for the traffic volume of the O-D pair. The shade of the chord reflects the number of trips from origin to the destination.

Figure 28: PM Peak Cut-Through Results

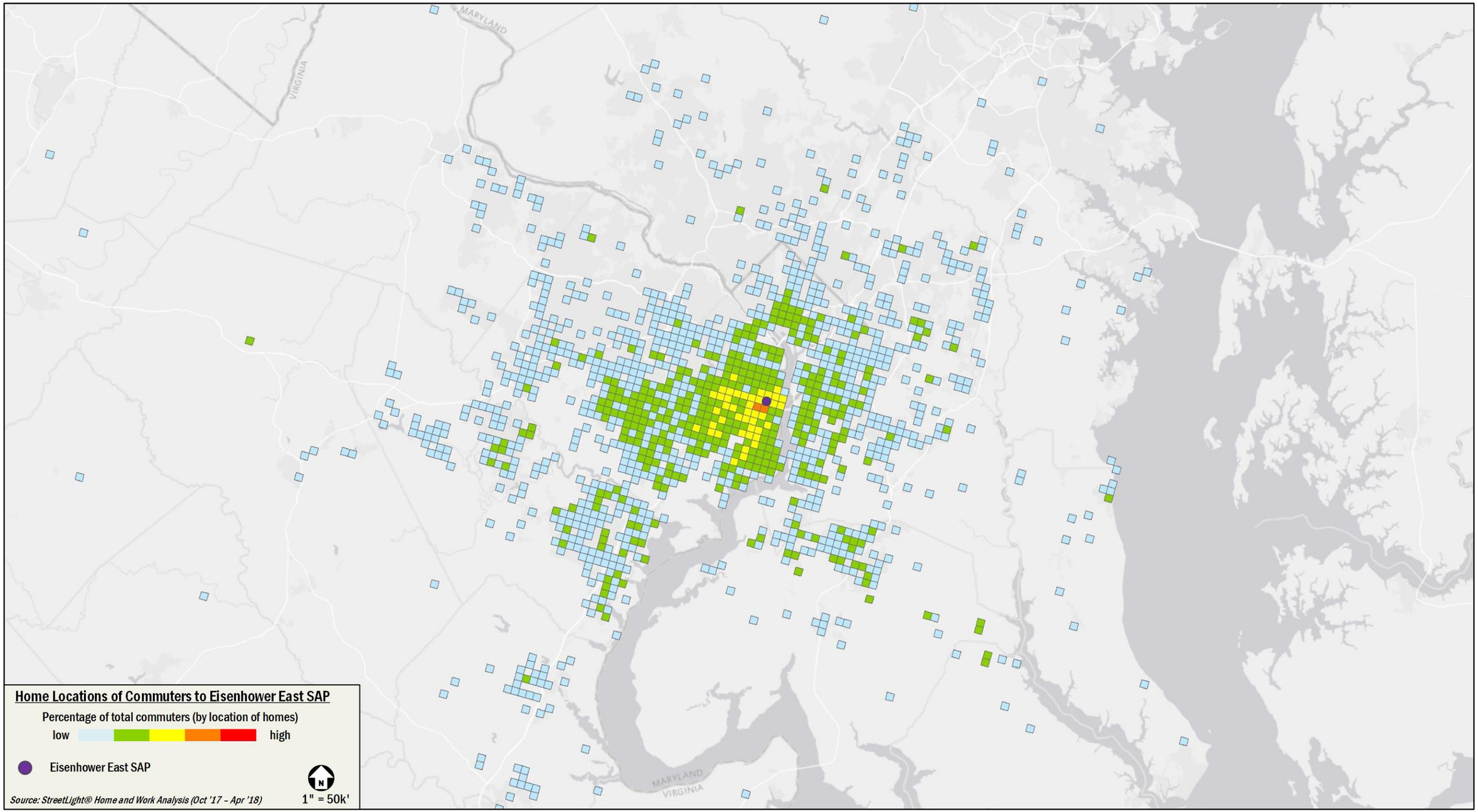


Figure 29: Home Locations of Commuters to Eisenhower East SAP

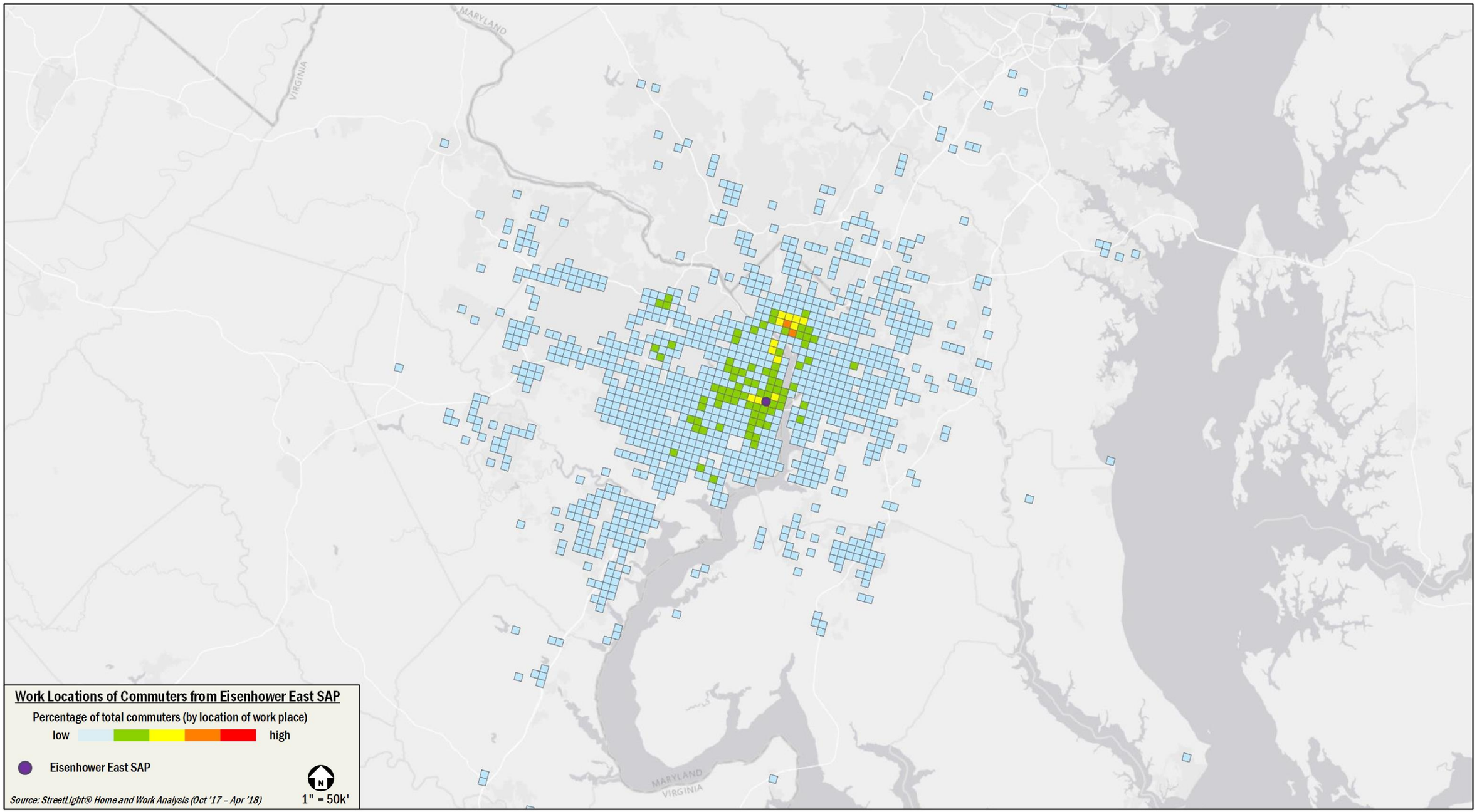


Figure 30: Work Locations of Commuters from Eisenhower East SAP

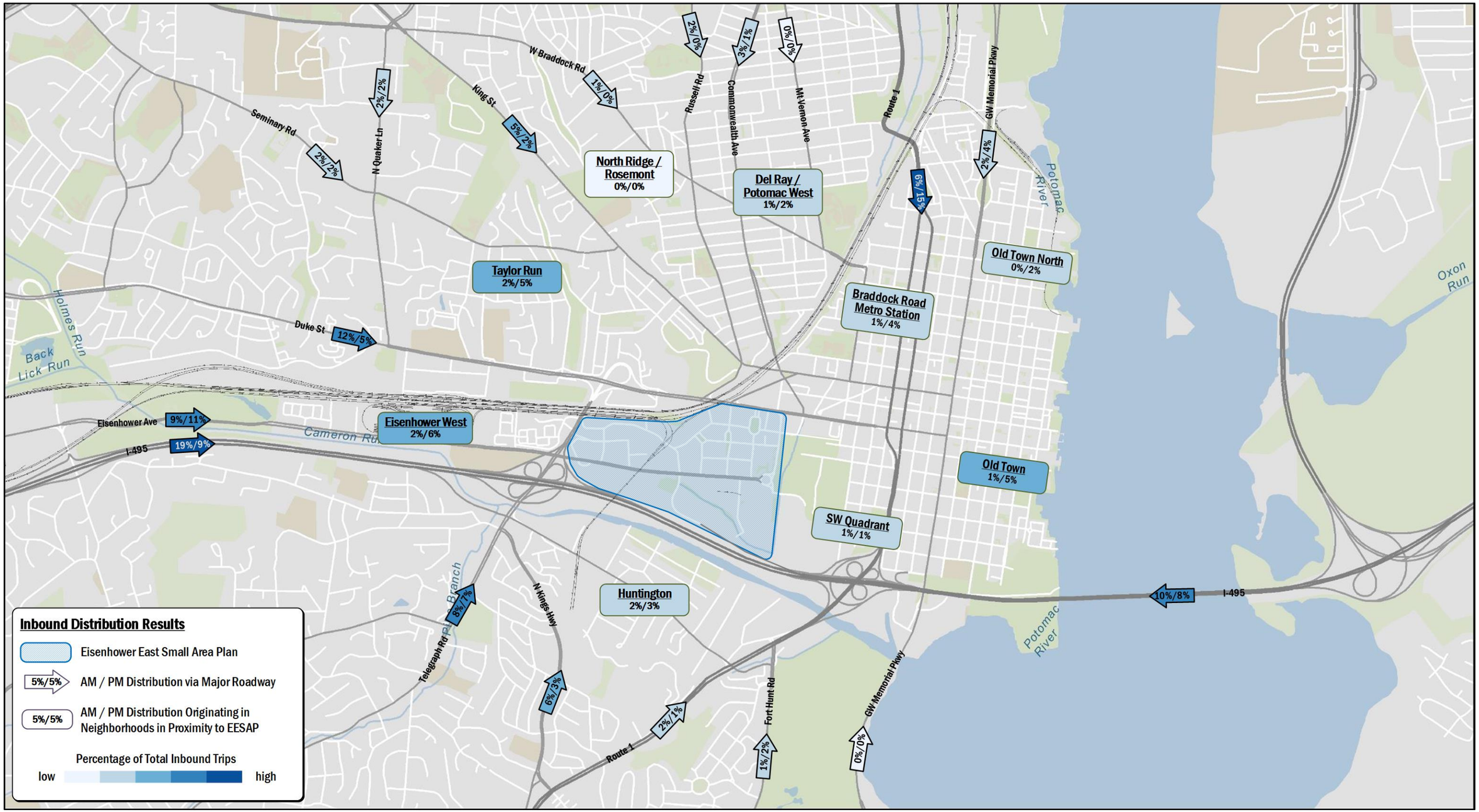


Figure 31: Inbound Distribution Results

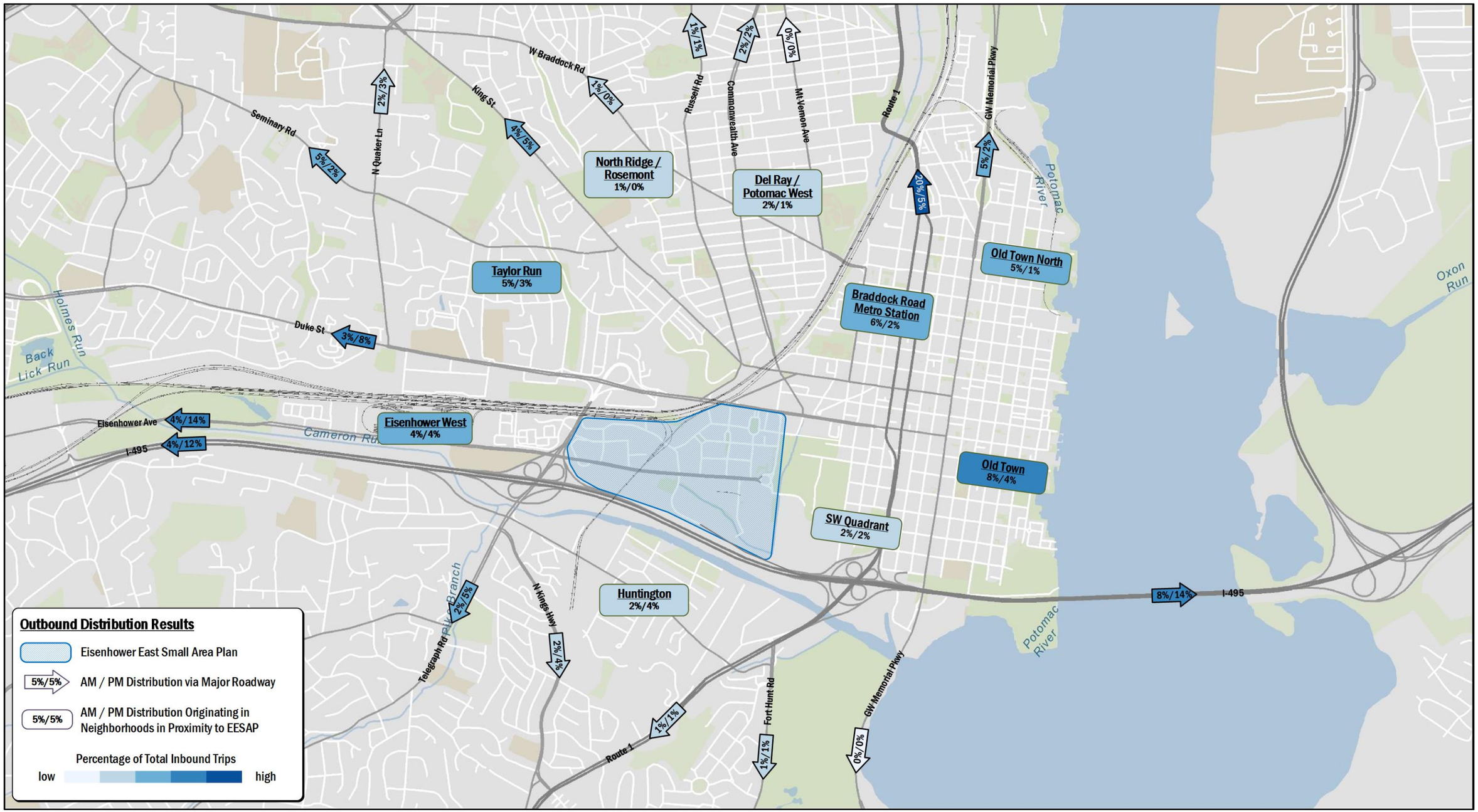


Figure 32: Outbound Distribution Results

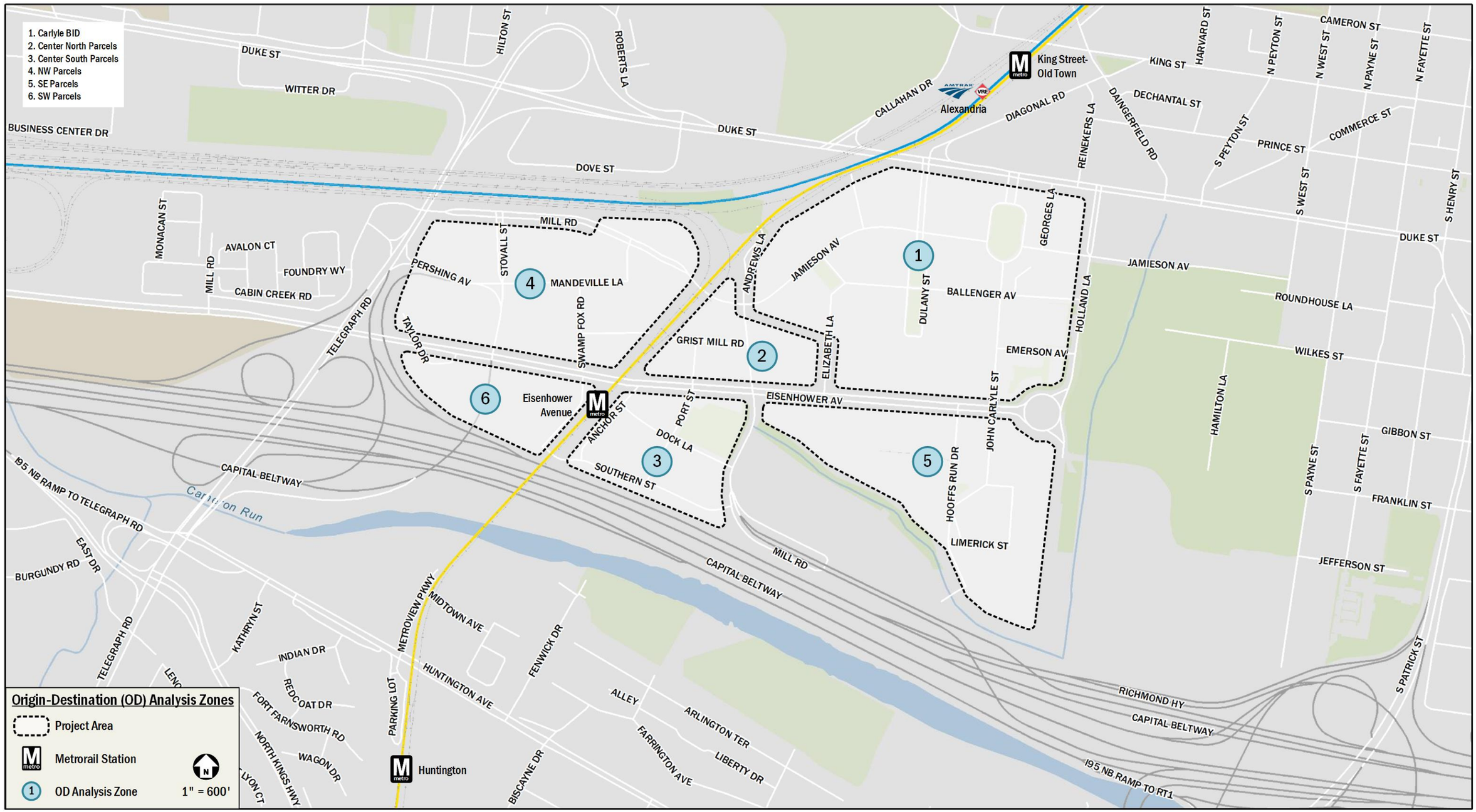


Figure 33: Origin-Destination Analysis Zones

Figure 34: Block Vehicular Access Locations

FUTURE CONDITIONS (2030)

This chapter reviews the future conditions of the pedestrian, bicycle, transit, and automobile traffic networks in and around the project area. Included is an analysis of the potential vehicular impacts of the proposed density changes to several Eisenhower East Small Area Plan (EESAP) blocks and a discussion of potential improvements. The assumed buildout year for both the approved and proposed development programs is 2030.

FUTURE PROJECTS

This section reviews city-wide and local initiatives, and planned transportation improvements that are expected to be complete by 2030. In addition to these projects, it is assumed that each EESAP block's Development Special Use Permit (DSUP) application will include curbside/public space enhancements that will improve the overall pedestrian, bicycle, and transit, and vehicular networks within the EESAP.

City-wide Initiatives

Comprehensive Transportation Master Plan (2008)

Adopted in April 2008, updated in 2016, and currently undergoing an update that will culminate in 2020, the City of Alexandria's Comprehensive Transportation Master Plan was developed to ensure wise, effective, and sustainable planning of the City's transportation future.

The Comprehensive Transportation Master Plan is driven by seven (7) guiding principles to inform transportation related decision making within the City. These guiding principles are (1) developing innovative local and regional transit options; (2) providing quality pedestrian and bicycle accommodations; (3) providing accessibility and mobility to all citizens, regardless of age or ability; (4) increasing the use of communications technology in transportation system; (5) promoting transportation policies that enhance quality of life and support livable, urban land use, and encourage neighborhood preservation; (6) leading the region in promoting environmentally friendly transportation policies; and (7) ensuring accessible, reliable, and safe transportation for older and disabled citizens.

The Comprehensive Transportation Master Plan's recommended approach to transportation in the City is outlined as follows:

- Transit – The City will create a network of three (3) transit corridors within secure rights-of-way dedicated exclusively for transit use. The Comprehensive Transportation Master Plan has identified the corridors of Route 1, Van Dorn/Shirlington, and Duke Street for these projects. In doing so the City will: (1) conduct public outreach regarding the concept and process; (2) coordinate with adjacent jurisdictions to ensure integration with existing transit and explore opportunities for future connections; (3) prioritize transit corridors for investments; (4) plan for dedicated transit lanes and ensure new developments do not preclude dedicated transit lanes; (5) identify locations for smart stations that serve both new and existing transportation modes; (6) ensure development does not preclude efforts to expand public transit; (7) identify transit technologies and techniques that suit the identified corridors; (8) integrate existing DASH service with new transit system elements; (9) incorporate traffic signal priority, traffic circulation changes, and other on-street enhancements into the new system; (10) create Transportation Management Plans, Transit Overlay Zoning Districts, Parking Management Zones, etc. to coordinate efforts to support the system; (11) investigate potential funding from existing and new revenue sources; (12) develop an outreach and marketing campaign to engage citizens about the City's transportation future; and (13) coordinate with pertinent Boards and Commissions to ensure special transportation needs of all citizens are considered.
- Pedestrian – The City will promote and encourage walking by creating a safe, well-maintained, comfortable and enjoyable pedestrian environment that encourages walking and is accessible for people of all ages and abilities. The City will provide a continuous, connected and accessible pedestrian network that enables people of all ages and abilities to move safely and comfortably between places and destinations. The City will promote walking as a means of improving transportation circulation, transit access, public health, environmental quality and recreation, with the ultimate goal of increasing walking trips as a percent of all travel in Alexandria. Finally, the City will educate users of all transportation modes about pedestrian safety, rights, and responsibilities.
- Bicycle – The City will promote and encourage the use of bicycles by creating a safe, well-maintained bicycling environment that encourages bicycling as an enjoyable and

convenient mode of travel and recreation for riders of all ages and abilities. The City will develop a connected bicycle network that includes both on-street and off-street facilities, as well as support facilities such as bicycle parking, that provide safe, enjoyable and comfortable accommodations for riders of all ages and abilities. The City will promote bicycling as a means of improving transportation circulation, transit access, public health, environmental quality and recreation, with the ultimate goal of increasing bicycling trips as a percent of all travel in Alexandria. Finally, the City will educate users of all transportation modes about bicycle safety, rights and responsibilities.

- Streets – The City will comprehensively address the City's street system and enhance the transportation network by: (1) ensuring that streets can accommodate all users; (2) formally adopt a Complete Streets policy; (3) develop new and enhance existing programs regarding Transportation Demand Management (TDM); (4) improve mobility on the City's arterials though the incorporation of technology into transportation infrastructure; (5) improve safety at intersections; (6) focusing on improvements that improve the natural and human environment, preservation of historic resources, and creation of more enjoyable public street spaces; (7) developing a comprehensive design manual for City street space; and (8) exploring opportunities to enhance the use of high-occupancy vehicle (HOV) lanes as a traffic management strategy for periods of peak travel demand.
- Parking – The City will comprehensively address the City's parking network by: (1) completing comprehensive studies on the City's parking supply, parking demand, and policies; (2) developing and implementing guidelines and requirements for Transit-Oriented Development (TOD); (3) ensuring parking availability with the City's commercial, residential, and tourist districts through the development of a curbside management program; (4) implementing policies to discourage the development of surface parking lots; (5) increasing the use of information technology to provide real-time parking location and availability information; (6) unbundling parking from building leases; and (7) minimizing, if not eliminating, tour bus traffic in residential areas of Old Town Alexandria.

In direct relation to the EESAP 2019 Update, the Comprehensive Transportation Master Plan includes the following:

- Transit
  - A Transit Corridor featuring dedicated right-of-way on Duke Street
  - Smart Shelters featuring real-time transit information, bicycle parking, and other amenities. Smart Shelters are proposed within the EESAP along Eisenhower Avenue at Stovall Street, Mill Road, and Hooffs Run Drive.
- Bicycling
  - An extension of the Old Cameron Run Trail east from Eisenhower Avenue and Mill Road to South Payne Street
  - Enhanced Bicycle Corridors, which can include many facility types located within the road right-of-way, including sidepaths and bicycle lanes of various protection/separation levels. Enhanced Bicycle Corridors are proposed along Eisenhower Avenue, Mill Road, Jamieson Avenue, Stovall Street, and Pershing Avenue

Alexandria Transit Choices Report (2018)

The Transit Choices Report is the first step in the Alexandria Transit Vision Study. Through the Transit Vision Study, the City of Alexandria is conducting a comprehensive review of how the bus network in the City can best serve existing needs, as well as new residents, business, and visitors who come to Alexandria over the next 10-20 years. The Transit Choices Report presents an overview of Alexandria's existing transit network, as well as the City's current and planned development patterns as they relate to transit performance. After several rounds of public engagement, the City plans to present a redesigned bus network in spring 2019, and a Final Transit Vision Plan and Near-Term Implementation Plan in summer 2019.

Because specific transit route recommendations are still forthcoming, plans directly relating to the EESAP 2019 Update are not provided in this report.

Complete Streets Design Guidelines (2016)

The Complete Streets Design Guidelines integrates existing City policy and design guidance related to roadway, sidewalk and trails, and incorporates new information to reflect best practices for developing a transportation system that serves the needs of people who walk, bike, ride transit or drive vehicles. The Complete Streets Design Guide identifies new

street types for Alexandria and provides direction on the design of sidewalks, roadways, intersections and curbsides.

The Complete Streets Design Guidelines are used by City staff, design professionals, developers, and consultants in the planning and design of all types of street improvements. The Guidelines ensure that new roadways, intersections, sidewalks and trails are achieving the City's objectives for a safe and effective multimodal transportation system.

Vision Zero

Vision Zero is a multi-national initiative that aims to eliminate road deaths and serious injuries for all users, regardless of transportation mode. The City of Alexandria is one of over 20 municipalities across the United States that has adopted its own Vision Zero program.

The City of Alexandria included the development of a Vision Zero program in a 2016 amendment to its Transportation Master Plan. In January 2017, the City adopted a Vision Zero resolution instructing the City Manager to develop an action plan. The resulting action plan was adopted by the City Council in December 2017.

The City's Vision Zero Action Plan includes the following strategies:

- Improve data collection and evaluation
- Enhance city processes and collaboration
- Build safe streets for everyone
- Promote a culture of safety

While the Vision Zero Action Plan's recommendations are more related to overall strategy than individual projects, the Action Plan references several funded City programs projects that are aligned with Vision Zero principles.

As part of Alexandria's Vision Zero Action Plan, new "no turn on red" restrictions will go into place at various intersections throughout the City. These restrictions are designed to improve pedestrian safety by reducing turning-movement vehicle crashes.

- New "no turn on red" restrictions at the following EESAP study intersection movements:
  - Mill Road onto Eisenhower Avenue
  - South Quaker Lane onto Duke Street
  - Cambridge Road onto Duke Street
  - Roth Street onto Duke Street

Another Vision Zero strategy includes Leading Pedestrian Interval (LPI) signal treatments, which will be implemented at various intersections throughout the City. LPIs are designed to improve pedestrian safety by increasing pedestrian visibility in intersections and reinforcing pedestrian priority over turning vehicles during shared signal phases.

- New Leading Pedestrian Intervals at the following EESAP study intersections:
  - Duke Street and Henry Street (both crossings)
  - Cambridge Street and Duke Street (both crossings)
  - North Quaker Lane and Duke Street
  - Duke Street and Holland Lane

Other projects aligned with Vision Zero that relate to the EESAP include:

- City Transportation Management Technologies that improve road safety and traffic management while preparing for emerging transportation technologies, as identified in the City's Smart Mobility program.
- Complete Streets Guidelines which integrate existing City policy and design guidance related to roadway, sidewalk and trails, and incorporate new information to reflect best practices for developing a transportation system that serves the needs of people who walk, bike, ride transit or drive vehicles.
- The City's network of shared use paths which cover 20 miles within the City. Shared use paths within or near the EESAP include the Eisenhower Avenue and Mount Vernon Trails, as well as the planned Old Cameron Run Trail.
- Sidewalk maintenance, which is performed through the City's Public Works Services and replaces and repairs more than 12,000 square feet of sidewalk per year.
- The Pedestrian and Bicycle Chapter of the City's Comprehensive Transportation Master Plan, which articulates a vision of safe walking and bicycling networks for users of all ages and abilities.

Local Initiatives

King Street-Old Town Metro Access Improvements

This project is a coordinated effort between the City of Alexandria and WMATA to improve pedestrian and bicyclist safety and comfort around the King Street-Old Town Metrorail Station while maintaining efficient bus and other transit access at the site. The project will also include three (3) new bus bays, designate specific areas for bikes, shuttles, Kiss & Ride, taxis, and carshare.

Since the King Street-Old Town Metrorail Station is a major walking and bicycling destination from the EESAP, improved access to this station will enhance the bicycling and pedestrian experience and will encourage more walking and biking trips overall, including to and from the EESAP.

Major construction began in 2018 and is expected to be completed by mid-2020.

Eisenhower Avenue Metrorail Station Platform Reconstruction

Eisenhower Avenue Station is one of 20 Metrorail stations where WMATA plans to rebuild outdoor platforms to remedy structural deficiencies. Between Memorial Day and Labor Day 2019, Eisenhower Avenue Station will be closed for construction, along with all Blue and Yellow Line stations south of Reagan National Airport, including Braddock Road, King Street, Huntington, Van Dorn Street, and Franconia-Springfield.

While the temporary closure of Eisenhower Avenue Station will have a negative effect on transit access to the EESAP, this project will perform needed safety improvements that will ensure the station's continued usefulness once it reopens.

Eisenhower East Circulator Transit Service

The Eisenhower East Circulator is a proposed DASH circulator route that would operate mostly within the EESAP area, connecting it with the King Street-Old Town and Eisenhower Avenue Metrorail Stations. The proposed route appears in the City of Alexandria's Long-Range Plan, as well as a 2014 Comprehensive Operational Analysis of the DASH system.

The proposed route would provide transit coverage within the EESAP area where none currently exists – namely the area east of Elizabeth Lane.

Transitway Corridor B (Duke Street)

Transitway Corridor B is a Bus Rapid Transit (BRT) project planned for Duke Street between Diagonal Road and Walker Street. The project will implement dedicated curbside transit lanes throughout the corridor through a mixture of repurposing existing travel lanes and adding new travel lanes.

This project will deliver faster, more convenient transit service within a 0.3 mile walk of the EESAP, specifically the 29N, 29K, and NH2 bus routes that serve the EESAP via Duke Street.

The Transitway Corridor B project calls for improved pedestrian facilities at intersections and near transit stations. Because Duke Street falls along the EESAP's primary walking routes to the King Street-Old Town Metrorail Station, improved pedestrian facilities along Duke Street will enhance the overall pedestrian experience near the EESAP.

Central Alexandria Traffic Study

The Central Alexandria Traffic Study was undertaken in response to resident concerns about traffic volumes, speeding, and safety in the Seminary Hill, Seminary Ridge, Clover College Park, and Taylor Run neighborhoods. The study's recommendations include afternoon turn restrictions on certain streets, traffic calming measures, and pedestrian safety improvements across the study area.

While none of the study's recommendations fall within the EESAP area, the nearest location of a recommended improvement is Duke Street and West Taylor Run Parkway, which is just beyond the quarter-mile walkshed from the perimeter of the EESAP, and is included as a study intersection in this analysis. The Central Alexandria Traffic Study recommends the intersection be redesigned to Complete Streets standards, complementing the existing turn restrictions already in place from West Taylor Run Parkway onto Duke Street.

Planned Improvements

Eisenhower Avenue Widening and Roadway Improvements

This project consists of rebuilding Eisenhower Avenue between Mill Road and Holland Lane as an urban boulevard featuring additional vehicle capacity, bicycle facilities, widened sidewalks, and streetscape improvements.

The entire project falls within the EESAP area. Specific project elements include:

- Increased capacity to three travel lanes in each direction in most locations, except between Holland Lane and John

Carlyle Street in the westbound direction, which will have two travel lanes and a left turn lane

- An eastbound bicycle lane between Hooffs Run Drive and Holland Lane, and a westbound bicycle lane between Holland Lane and John Carlyle Drive
- Replacing the traffic circle at Holland Lane with a signalized T-intersection
- Modifying the Mill Road intersection to include two through lanes and two left turn lanes onto southbound Mill Road, as well as two southbound receiving lanes on Mill Road
- Widened sidewalks on the northern curb of Eisenhower Avenue between Mill Road and Elizabeth Lane and between John Carlyle Street and Holland Lane, on the southern curb of Eisenhower Avenue between Hooffs Run Drive and Holland Lane, and on the northeast, southwest, and southeast corners of the intersection of Eisenhower Avenue and Mill Road

Mill Road and Mandeville Lane Road Diet

Road diets on Mill Road and Mandeville Lane are presented as part of the Hoffman Town Center – Block 4 & 5 project, which falls within the EESAP 2019 Update area. The roadways under consideration as part of Blocks 4 & 5 are Mill Road between Stovall Street and Mandeville Lane, and the entirety of Mandeville Lane itself. The proposal consists of the following:

- Reducing Mill Road to one 11' travel lane eastbound, and one 11' travel lane westbound and one 11' left turn lane westbound
- Adding to the north curb of Mill Road a shared use path between Stovall Street and Mandeville Lane
- Reducing Mandeville Lane to one 11' travel lane and a 7' parking bay in each direction, allowing for wider sidewalks on both sides
- Enhanced and/or added crosswalks throughout the proposal area

Old Cameron Run Trail

Construction of the Old Cameron Run Trail from the intersection of Eisenhower Avenue and Mill Road eastward to South Payne Street has been identified by the City of Alexandria as a priority for providing a connected bicycle and pedestrian trail network. The trail will fill a critical gap in Alexandria's pedestrian and bicycle trail network, providing a link between the Holmes Run and Eisenhower Avenue Trails to the west and the Mount Vernon Trail to the east. Figure 35 shows the location of the planned Old Cameron Run Trail.

The Old Cameron Run Trail will be located adjacent to several EESAP blocks, providing a bicycle and pedestrian connection to the Eisenhower Avenue Metrorail Station and the existing shared use trails which connect the greater region.

While the exact date for completing the Old Cameron Run Trail extension is unknown, it is expected to be completed by 2030.

Street Network

The EESAP includes improvements and additions to the area's existing street network. Existing streets that border approved project sites will be upgraded according to each projects' Development Special Use Permit (DSUP) application, which typically includes curbside/public space improvements. Additionally, a new urban-like street grid will be constructed in the area south of Eisenhower Avenue and east of the Eisenhower Avenue Metrorail Station, improving pedestrian, bicycle, and vehicular access throughout the EESAP. The new street grid is based primarily off of the previously approved EESAP updated in February 2018 and is shown on Figure 36. The following new connections are included:

- Dock Lane – extension from Port Street to Anchor Street;
- Port Street – extension from Dock Lane to Southern Street;
- Southern Street – extension from Mill Road to Block 9A/9B;
- Park Lane – new street from Hoofs Run Drive to Elizabeth Lane;
- Elizabeth Lane – extension from Eisenhower Avenue to Park Lane;
- Dulany Street – extension from Eisenhower Avenue to Park Lane; and
- John Carlyle Street - Eisenhower Avenue to Savoy Street.

Potential Developments

There are three (3) background development project in the vicinity of the EESAP which were considered for inclusion as part of this study. Figure 37 identifies the location of these developments.

Eisenhower Square

Located at 2901 Eisenhower Avenue, Eisenhower Square is a new residential community which will contain 67 townhouses and a 533-unit high rise apartment building. 134 parking spaces are planned for the townhouses, and 297 spaces planned for the apartment building.

Bishop Ireton High School Expansion

In order to increase enrollment from 800 to 925 students, a new 40,000 square foot building containing classroom, cafeteria, athletic, and administrative spaces will be constructed on the existing Bishop Ireton High School campus. The school's parking supply will also be increased from 247 to 314 spaces.

Eisenhower West Small Area Plan

The Eisenhower West Small Area Plan, adopted in 2015, provides a framework for developing the 620-acre plan area near the Van Dorn Street Metrorail Station over the next 25 years. The Small Area Plan has a projected development of 9.3 million square feet over existing development to remain. Major elements of the plan include:

- A new urban-like street grid throughout the plan area, including a straightened Eisenhower Avenue near the Van Dorn Metrorail Station
- Five potential alignments for north-south multimodal bridges providing connections across the railroad tracks that split the plan area
- Concentrated height and density at the Van Dorn Metrorail Station
- Mixed-use activity nodes throughout the plan area

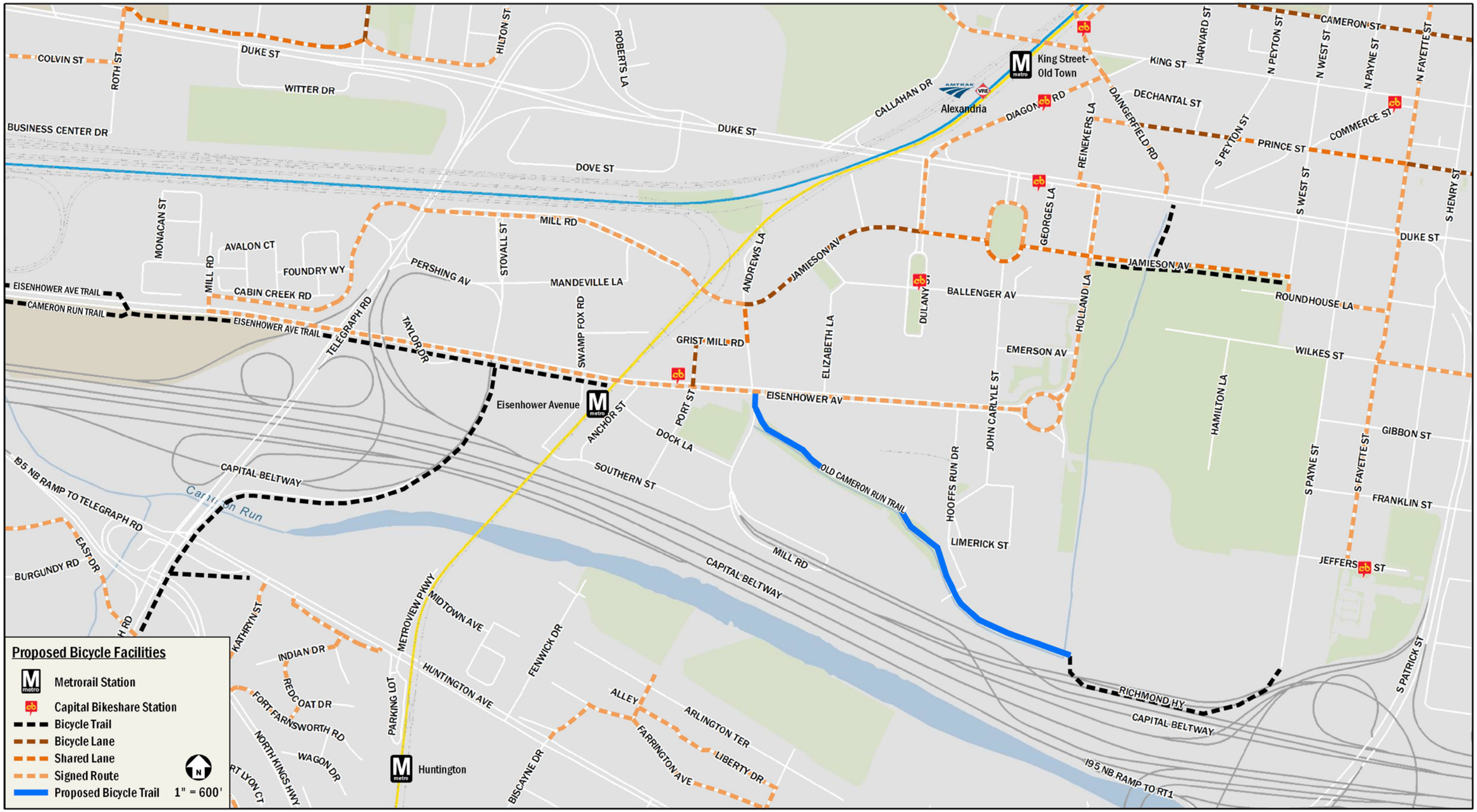


Figure 35: Proposed Bicycle Facilities

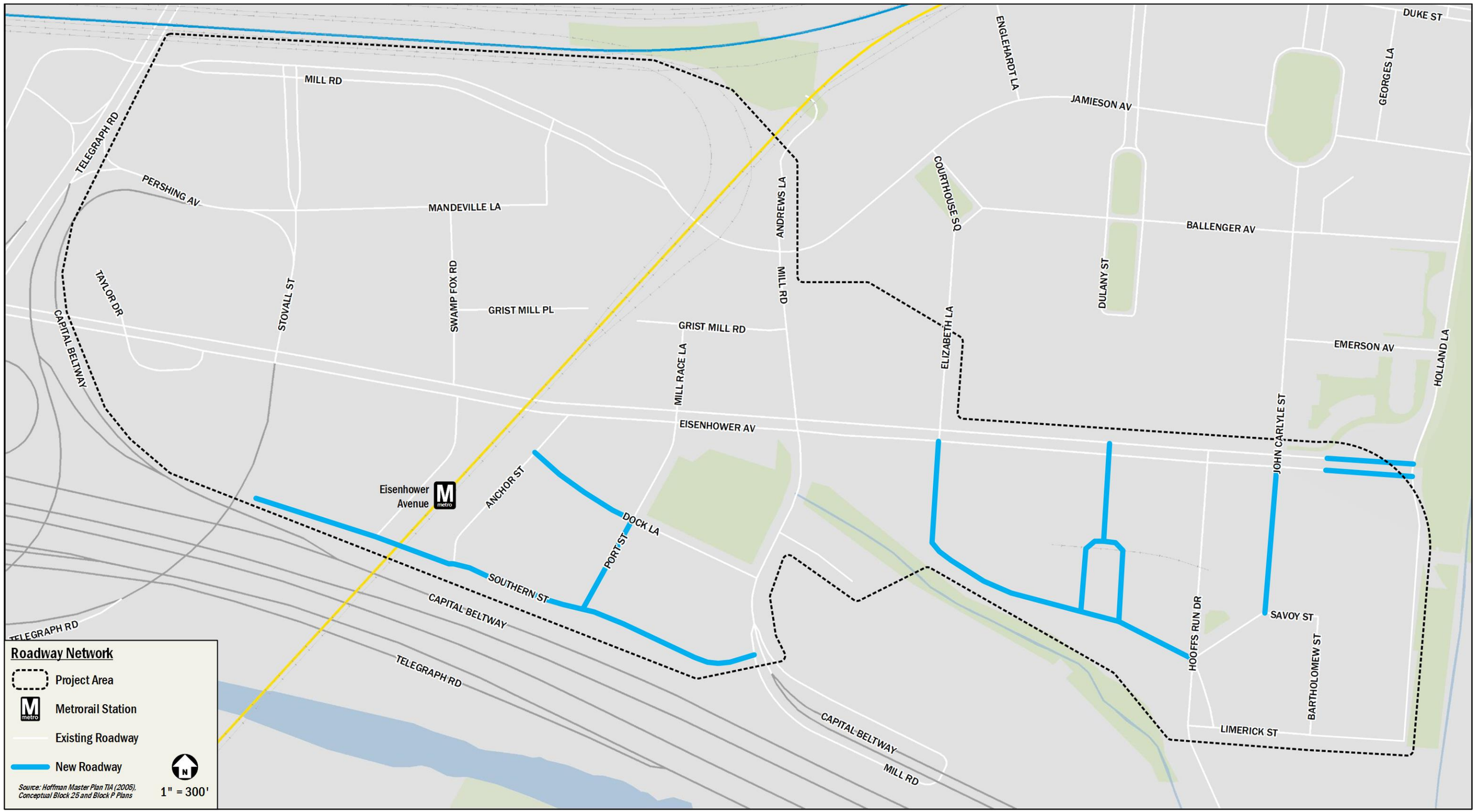


Figure 36: Roadway Network

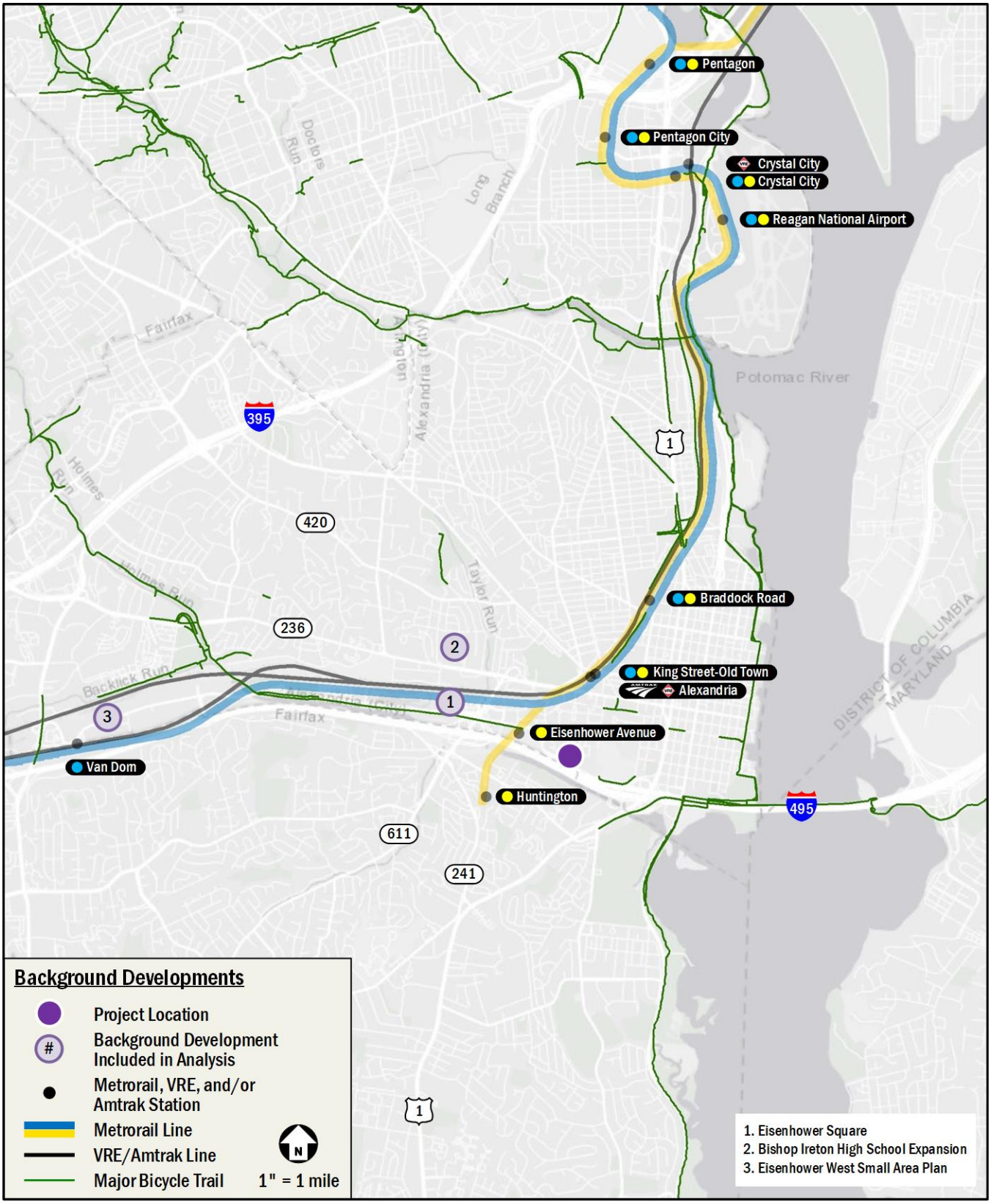


Figure 37: Background Developments

FUTURE TRAFFIC OPERATIONS (2030)

This section provides a summary of an analysis of the future roadway capacity in the study area, comparing the approved and proposed development programs. These capacity analyses focus on the weekday morning and afternoon peak hours, as determined by the existing traffic volumes in the study area. The scope of the capacity analysis was developed based on City of Alexandria and VDOT guidelines and approved by City of Alexandria and VDOT staff.

The purpose of the future roadway capacity analysis is to:

- Determine the overall impact of the proposed development program on the study area roadways during the morning and afternoon peak hours. This is done by projecting future conditions with and without the proposed development, which in this case involves comparing future conditions with the approved development and future conditions with the proposed development; and
- Discuss potential improvements and mitigation measures to accommodate the additional vehicular trips generated by the proposed changes to the development program.

The following conclusions are reached within this chapter:

- Existing areas of concern for roadway capacity which are primarily focused along the heavily traveled commuter routes such as Duke Street, Eisenhower Avenue, Telegraph Road, and Mill Road, which continue to experience heightened levels of delay and queueing.
- The addition of trips generated by background developments and regional growth along heavily trafficked commuter routes causes a number of intersections to experience unacceptable levels of delay and queuing.
- As is expected of urban infill developments of this size, the addition of traffic generated by the development in the EESAP results in the need to explore mitigations at 25 study area intersections.
- Mitigation measures were analyzed and discussed for these intersections, of which feasible solutions were recommended for implementation, subject to City of Alexandria and VDOT approval.
- This report concludes that, based on the Synchro and VISSIM analyses, the proposed increase in density will not have a detrimental impact on the surrounding transportation network as long as the report's recommendations and mitigation measures are implemented.

Study Area, Scope, and Methodology

This section outlines the assumptions used to develop the future roadway capacity analysis, which compares the future roadway network with the full buildout of the approved development program ("Approved Conditions") with the future roadway network with the full buildout of the proposed development program ("Proposed Conditions").

Future Traffic Volume Assumptions

The traffic projections for the 2030 future conditions consist of the existing volumes with three additions:

- Traffic generated by developments expected to be completed prior to 2030 (known as background developments);
- Inherent growth on the roadway (representing regional traffic growth); and
- Traffic generated by approved/proposed development in the EESAP.

Following national, City of Alexandria, and VDOT methodologies, a background development must meet the following criteria to be incorporated into the analysis:

- Be located in the study area, defined as having an origin or destination point within the cluster of study area intersection;
- Have entitlements; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, three (3) developments were included in the 2030 future conditions scenarios. These developments are:

1. Eisenhower Square (2901 Eisenhower Avenue)
2. Bishop Ireton High School Expansion
3. Eisenhower West Small Area Plan

Transportation studies were available for all three background developments. Trip generation and trip distribution assumptions for the background developments were based on the trip generation and distributions included in their respective studies and altered where necessary based on

anticipated travel patterns. Trip generation assumptions for the background developments are shown in Table 16.

While the background developments represent local traffic changes, regional traffic growth is typically accounted for using growth rates. The growth rates used in this analysis were derived using VDOT's Annual Average Daily Traffic (AADT) data and the Metropolitan Washington Council of Government's (MWCOG) currently adopted regional transportation model, comparing the difference between the 2017 and the 2040 volumes, as vetted and approved by the City of Alexandria and VDOT. The growth rates shown in this model forecasted a negative growth rate along regional study area roadways. However, at the request of VDOT a conservative growth rate of 0.25% per year for 12 years was applied to existing volumes along regional roadways.

2030 Future Traffic with Approved Development

The 2030 Future with Approved Development traffic volumes include traffic generated by: the existing volumes, background developments, inherent growth on study area roadways, and approved development in the EESAP.

Trip distribution and assignments for site-generated traffic was primarily determined using StreetLight InSight® data and observations, as detailed in the Travel Demand Assumptions chapter of this report. A summary of trip distribution assumptions is shown on Figure 31 for the inbound distribution assumptions and on Figure 32 for the outbound distribution assumptions.

The origin of outbound and destination of inbound vehicular trips were the assumed access points at each block, as shown in Figure 34. Trip distributions and assignment assumptions were vetted and approved by the City of Alexandria and VDOT.

Based on the trip distribution and assignment assumptions, site-generated trips were distributed though the study area intersections. The site-generated traffic volumes for the 2030 Approved scenario are shown on Figure 38, Figure 39, and Figure 40.

Thus, the traffic volumes for the 2030 Future with Approved Development conditions includes traffic generated by: existing volumes, background developments through the year 2030, inherent growth on the network, and approved development in the EESAP. The 2030 Future with Approved Development traffic volumes are shown in Figure 41, Figure 42, and Figure 43.

2030 Future Traffic with Proposed Development

The 2030 Future with Proposed Development traffic volumes include traffic generated by: the existing volumes, background developments, inherent growth on study area roadways, and proposed development in the EESAP.

Trip distribution and assignments for site-generated traffic were based on those determined for the approved development scenario and altered where necessary based on anticipated travel patterns. The site-generated traffic volumes for the 2030 Proposed scenario are shown on Figure 44, Figure 45, and Figure 46.

The traffic volumes for the 2030 Future with Proposed Development conditions includes traffic generated by: existing volumes, background developments through the year 2030, inherent growth on the network, and proposed development in the EESAP. The 2030 Future with Proposed Development traffic volumes are shown in Figure 47, Figure 48, and Figure 49.

Peak Hour Factors

The TRB *Highway Capacity Manual* (HCM) and the AASHTO *Policy on Geometric Design of Highways and Intersections* recommend evaluating traffic conditions during the worst 15 minutes of either a design hour or a typical weekday rush hour. Peak Hour Factor (PHF) is used to convert the hourly volume into the volume rate representing the busiest 15 minutes of the hour. The existing guidelines provide typical values of PHF and advise using the PHF calculated from vehicle counts at analyzed or similar locations. The HCM recommends a PHF of 0.88 for rural areas and 0.92 for urban areas and presumes that capacity constraints in congested areas reduce the short-term traffic fluctuation. The HCM postulates 0.95 as the typical PHF for congested roadways.

For the Existing Conditions analysis, PHF were calculated from the turning movement data that was collected in the field, using a minimum PHF of 0.85.

To account for the increase in peak hour traffic generated by local development on side streets, and regional growth along major corridors, a default PHF minimum of 0.92 was assumed in the Future Conditions analyses.

2030 Future Geometry and Operations Assumptions
The geometry and operations assumed in the 2030 Approved and Proposed Conditions analyses were those present when the main data collection occurred with a few exceptions.

Following national, City of Alexandria, and VDOT methodologies, a background geometry improvement must meet the following criteria to be incorporated into the analysis:

- Be funded; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, a number of geometry improvements were included in the 2030 Future scenarios:

- *"No Turn on Red" restriction*
  The addition of "No Turn on Red" restrictions at the following four (4) study intersections as part of the City of Alexandria's Vision Zero program: (1) Mill Road onto Eisenhower Avenue; (2) South Quaker Lane onto Duke Street; (3) Cambridge Road onto Duke Street; and (4) Roth Street onto Duke Street.
- *Leading Pedestrian Intervals (LPI)*
  The addition of LPIs at the following four (4) study intersections as part of the City of Alexandria's Vision Zero program: (1) Duke Street and N Quaker Lane; Duke Street and Cambridge Street / Roth Street; Duke Street and Holland Lane; and (4) Duke Street and S Henry Street.
- *Turn Restrictions at West Taylor Run*
  As one of the recommendations of the Central Alexandria Traffic Study, turn restrictions were added during the PM peak hour at the Duke Street Access Road with East Taylor Run Parkway, Moncure Drive, and Hilton Street. These turn restrictions effectively eliminate westbound traffic at the intersection of Duke Street Access Road and West Taylor Run Parkway.
- *Eisenhower Avenue Widening Project*
  The widening project includes the following modifications to Eisenhower Avenue from Mill Road (east) to Holland Lane:

  (1) the reconfiguration of the Eisenhower Avenue and Mill Road (east) intersection to add dual left turn lanes on Eisenhower Avenue, and two (2) receiving lanes on the southern leg of Mill Road (east);

  (2) expanding the western leg of Eisenhower Avenue at Elizabeth Lane to include three (3) receiving lanes;

  (3) expanding the eastern leg of Eisenhower Avenue at Hoofs Run Drive to include four (4) receiving lanes;

  (4) adding a southern leg at the intersection of Eisenhower Avenue and John Carlyle Street and expanding the eastern leg of Eisenhower Avenue to include three (3) receiving lanes; and

  (5) reconfiguration of the Eisenhower Avenue and Holland Lane intersection as a "T" intersection.
- *Eisenhower Avenue Metro Station Bus Loop Reconfiguration*
  At the intersection of Eisenhower Avenue and Swamp Fox Road, the project shows a realignment of the southern (bus loop) leg so that the intersection is no longer offset; and the southern (bus loop) leg is reconfigured to two-way operation.
- *Eisenhower East Small Area Plan*
  As part of the new street network associated with the EESAP, a new street was added as a southern leg of the intersection at Eisenhower Avenue and USPTO Pedestrian Crossing. The existing High-Intensity Activated Crosswalk (HAWK) signal was converted to a full traffic signal. The existing unsignalized intersection of Eisenhower Avenue and Hoofs Run Drive was assumed to remain unsignalized and a portion of existing northbound left turn volumes were re-routed to the USPTO crossing to use the new signal.

  A new street was also added as a northern leg of the Mill Road and Mandeville Lane intersection, to provide access to Block 15.
- *Approved Block 4/5 and Block 6A Site Plans*
  A road diet on Mill Road and Mandeville Lane is proposed as part of the Block 4/5 and Block 6A site plan. The modifications include:

  (1) the reconfiguration of the Stovall Street and Mill Road intersection to convert the eastbound approach from one thru lane and one thru/right lane to one thru lane and one right-turn lane, and the westbound approach from two thru lanes and one left-turn lane to one thru lane and one left-turn lane;

(2) the reconfiguration of the Stovall Street and Mandeville Lane intersection to convert the eastbound approach from one thru/left lane and one thru/right lane to one left-turn lane and one thru/right lane, and the westbound approach from one thru/left lane and one right-turn lane to one left/thru/right lane;

(3) the reconfiguration of the Swamp Fox Road and Mandeville Lane intersection to convert the eastbound approach from one thru lane and one right-turn lane to one thru/right lane, and the westbound approach from one thru lane and one left-turn lane to one thru/left lane; and

(4) the reconfiguration of the Mill Road and Mandeville Lane intersection to convert the eastbound approach from one thru lane and one thru/right lane to one left/thru/right lane, the westbound approach from two thru lanes and one left-turn lane to one thru/right lane and one left-turn lane, the northbound approach from one left-turn lane and one right-turn lane changed to one left/thru lane and one right-turn lane, and a southbound approach has been added in order to provide access to Block 15, as noted above.

- *Approved Block 20 Site Plan*
  The Block 20 site plan includes Southern Street, a new one-way westbound street that will connect Mill Road with the extension of Port Street, to complete the street grid surrounding the block. At Mill Road and Dock Lane, the plan also includes converting the northbound approach from one thru/left lane and one thru lane to one left-turn lane and two thru lanes, and the southbound approach maintains one thru/right lane.

No signal timing changes were made to existing signals. Signal timings for the reconfigured intersections outlined above were based on surrounding intersections and adjusted for projected peak hour volumes. Lane configurations and traffic controls for the 2030 Future (both Approved and Proposed) scenario are shown on Figure 50, Figure 51, and Figure 52.

Table 16: Summary of Background Development Trip Gen.

Background Development	Trip Generation Based On	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Eisenhower Square	Approved TIS	49	177	226	173	103	276
Bishop Ireton High School Expansion	Approved TIS	72	50	122	8	15	23
Eisenhower West Small Area Plan	Approved TIS	100	165	265	120	110	230
	Net Background Site Trips	**221**	**392**	**613**	**301**	**228**	**529**

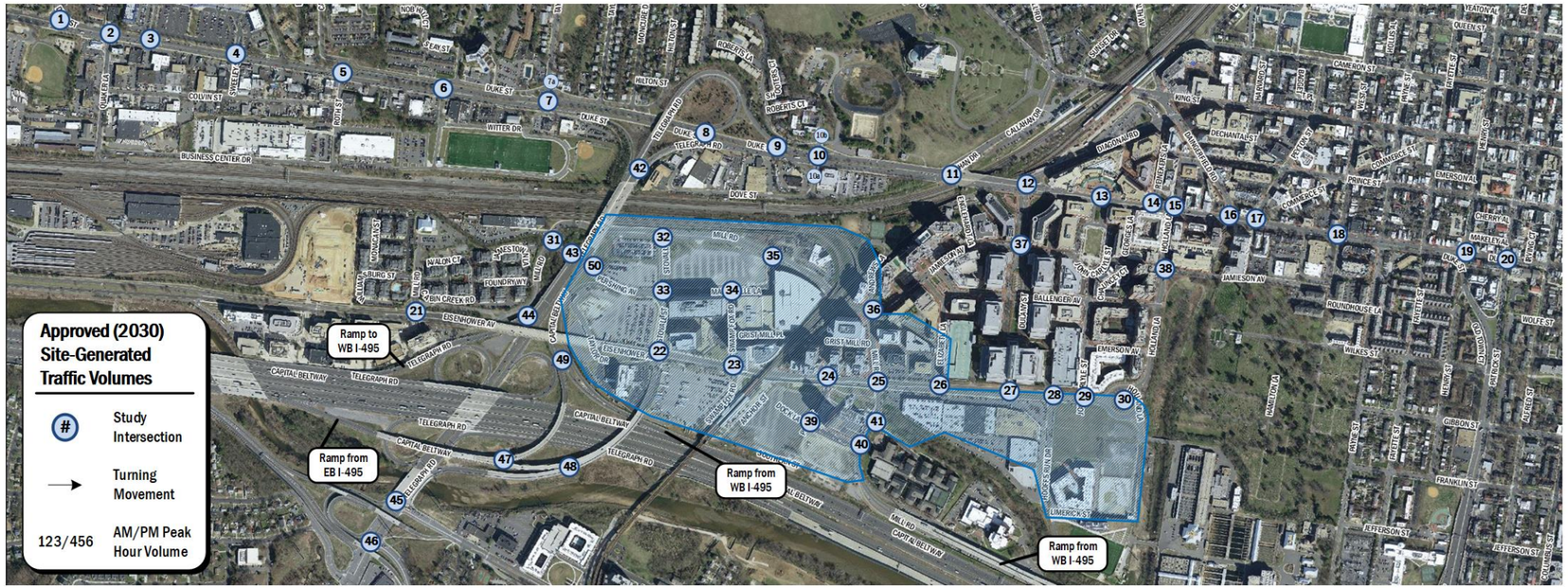
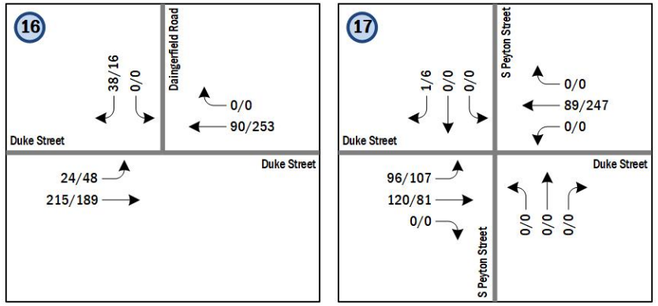


Figure 38: 2030 Approved Vehicle Site-Generated Volumes (Intersections 1 – 15)



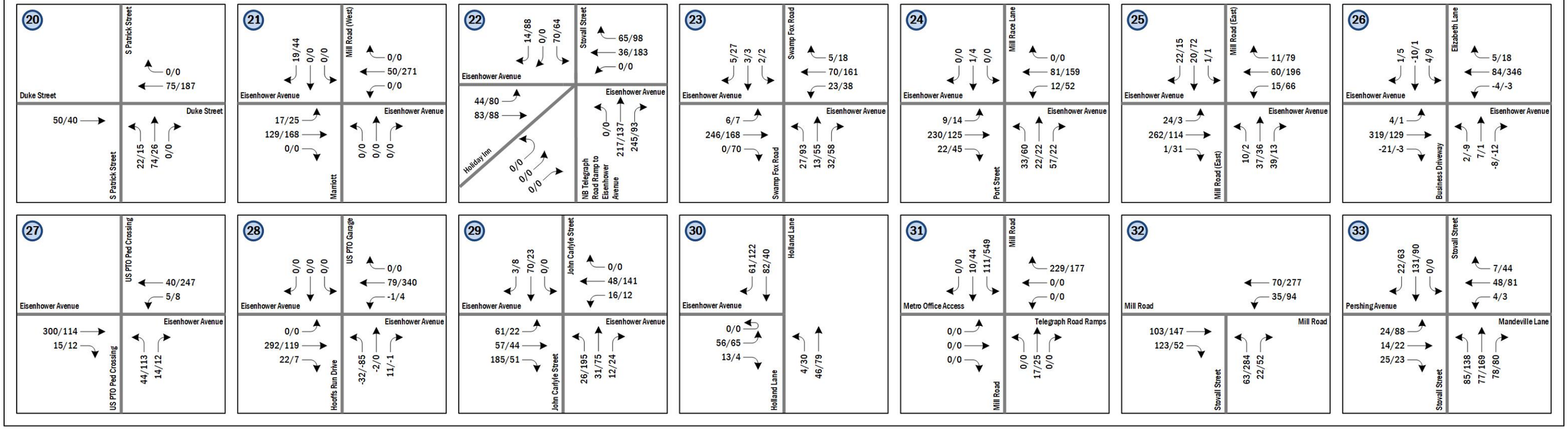
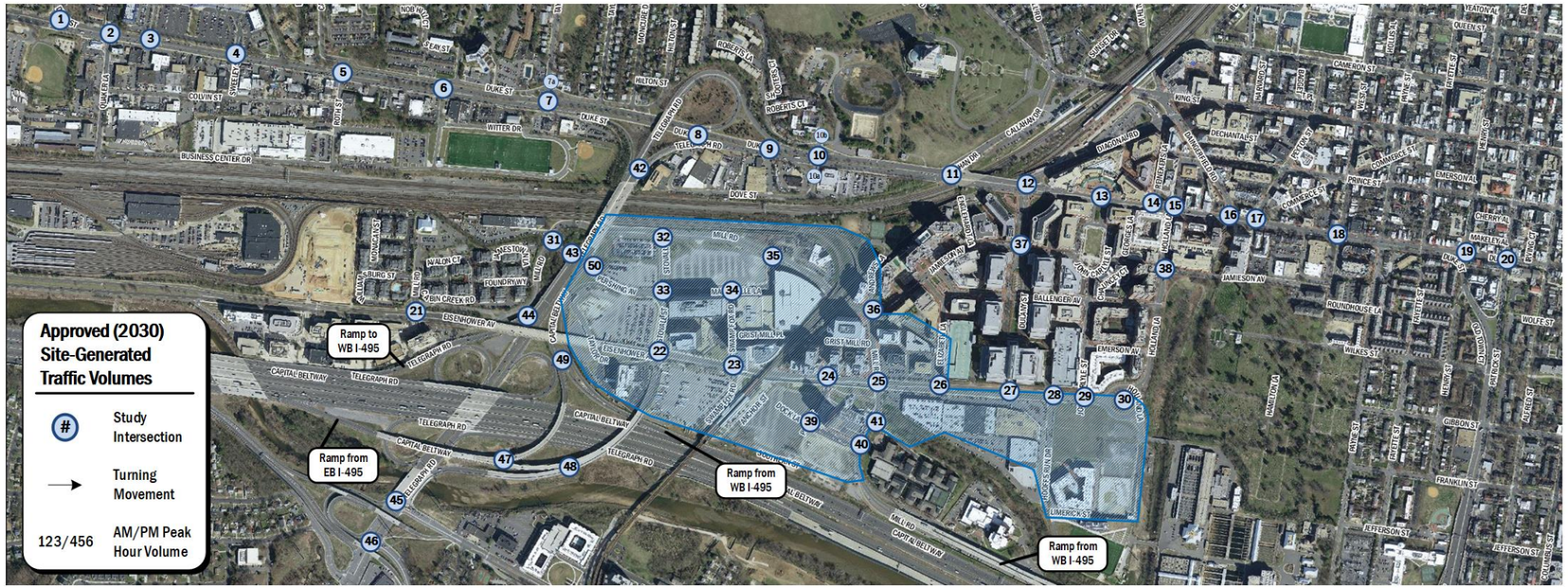


Figure 39: 2030 Approved Vehicle Site-Generated Volumes (Intersections 16 – 33)



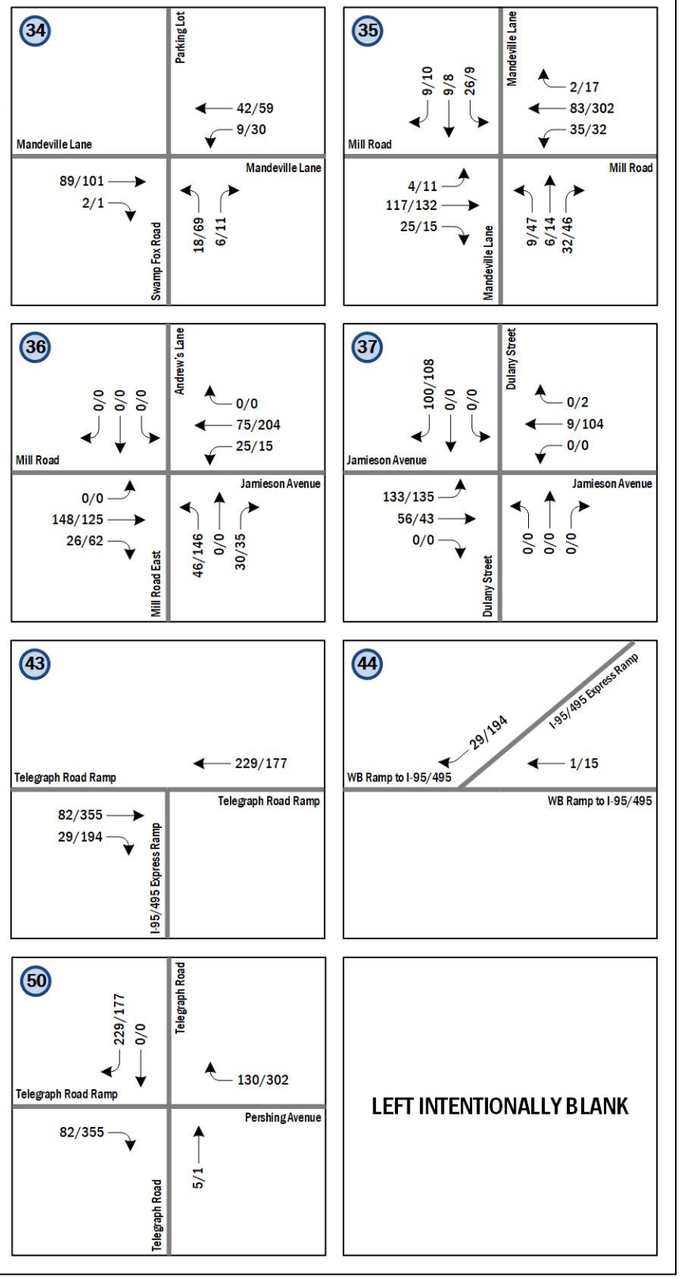
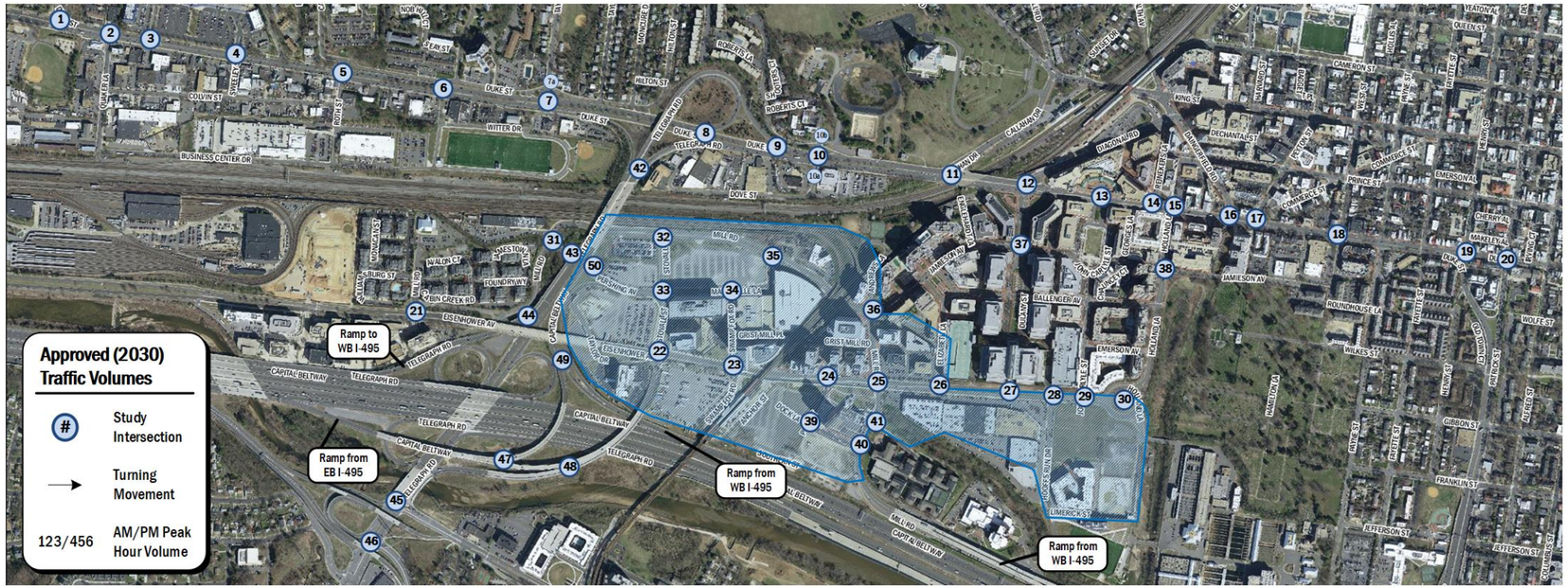
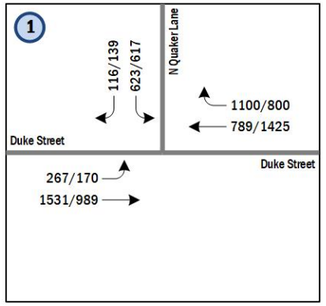
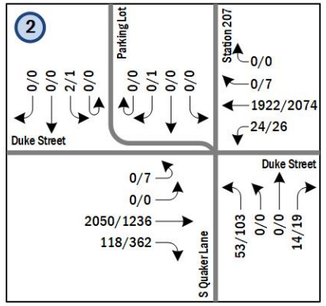
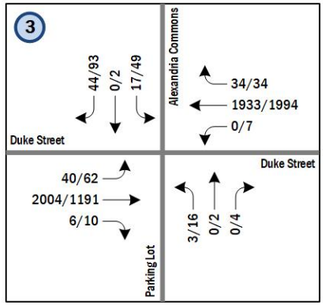


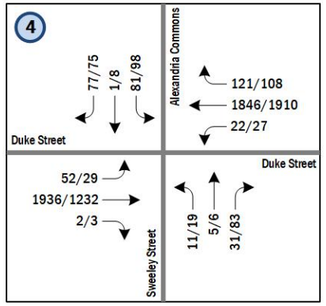
Figure 40: 2030 Approved Vehicle Site-Generated Volumes (Intersections 34 – 50)

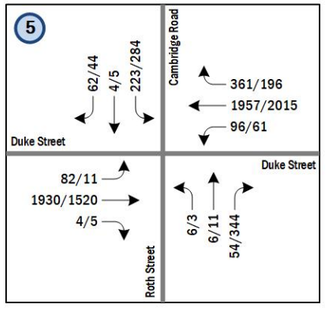


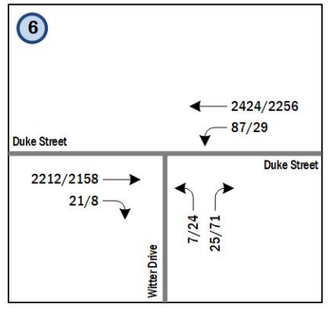


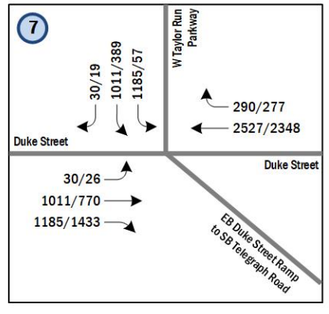


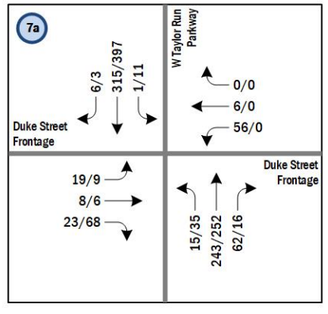


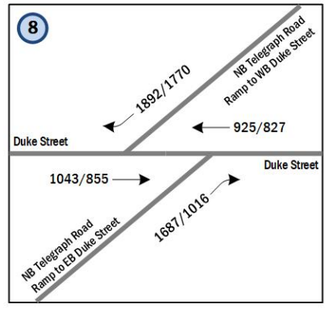


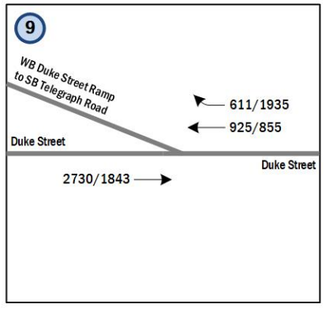


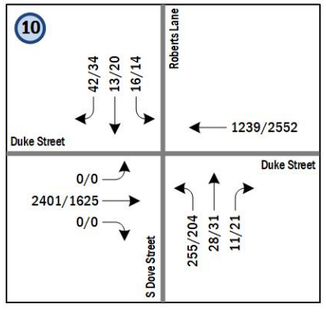


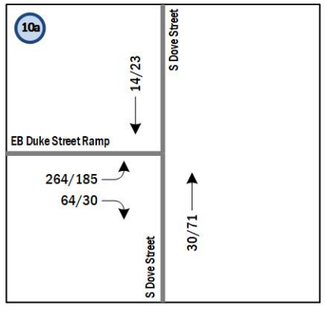


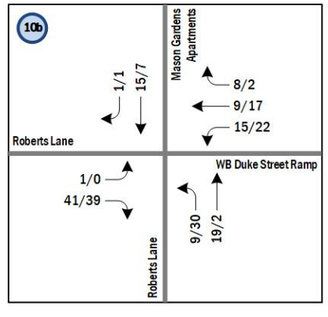


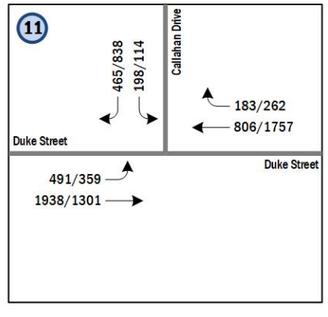


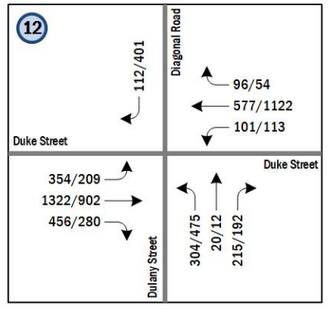


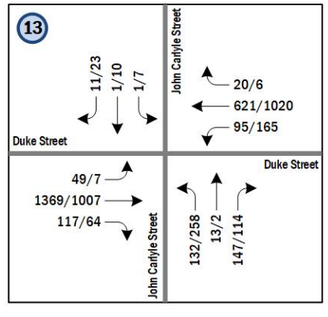


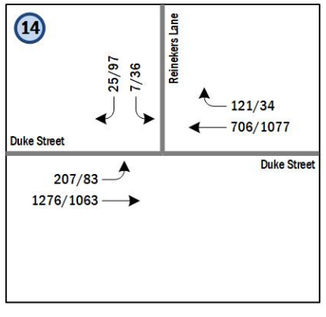












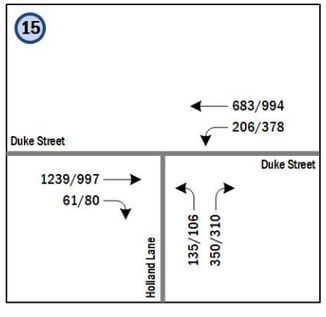
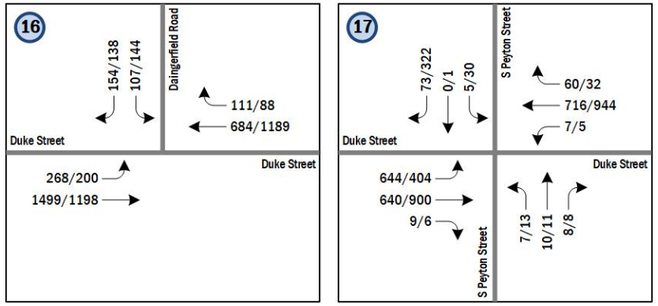
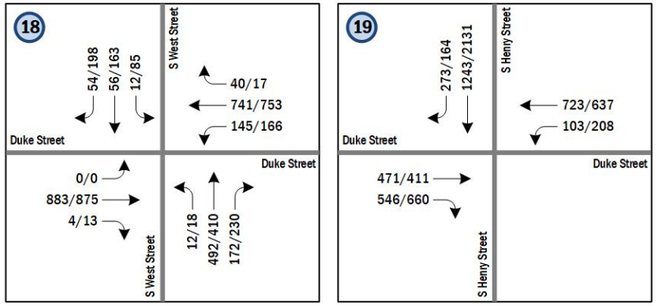


Figure 41: 2030 Approved Vehicle Peak Hour Volumes (Intersections 1 – 15)





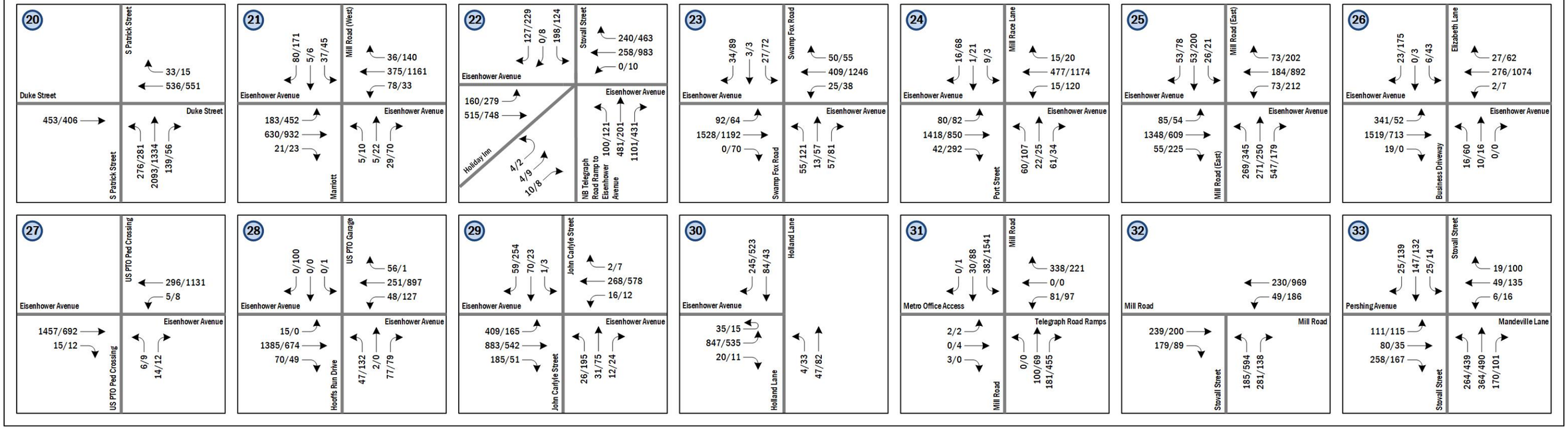
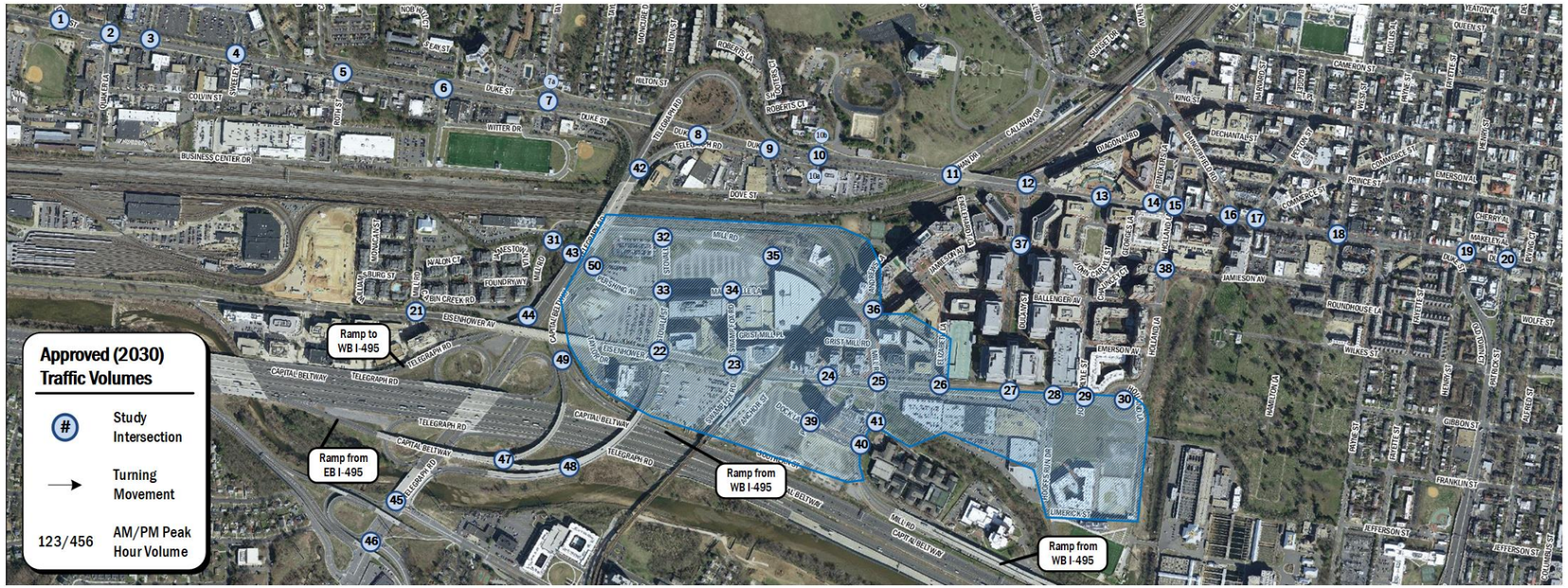
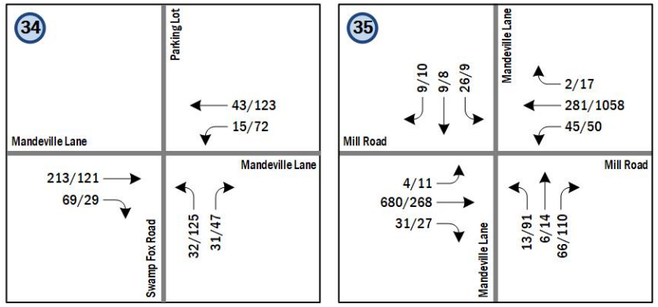
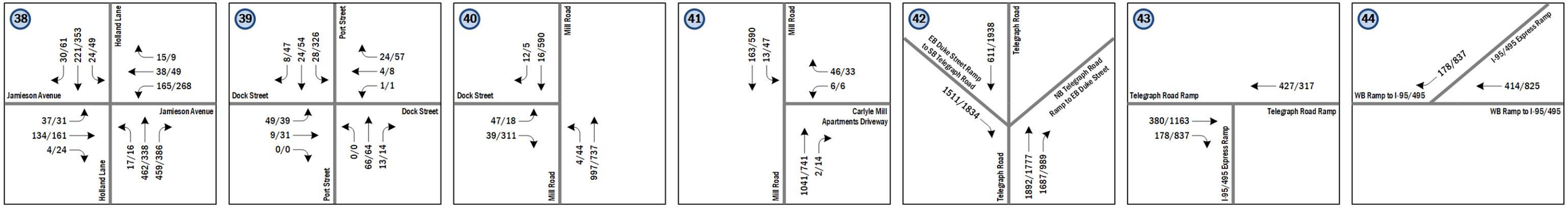


Figure 42: 2030 Approved Vehicle Peak Hour Volumes (Intersections 16 – 33)







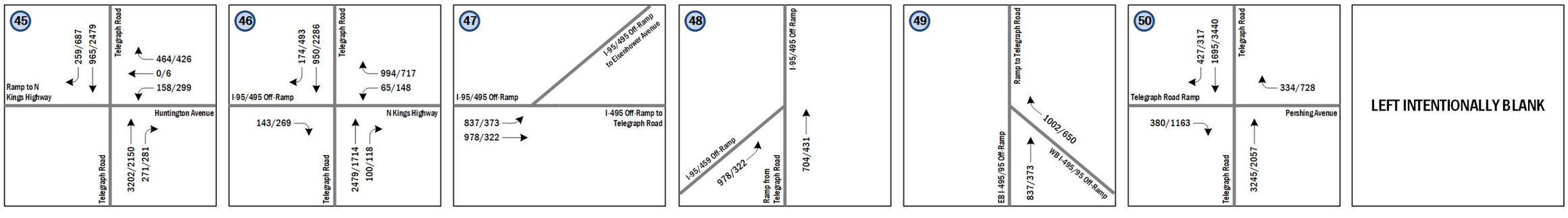


Figure 43: 2030 Approved Vehicle Peak Hour Volumes (Intersections 34 – 50)

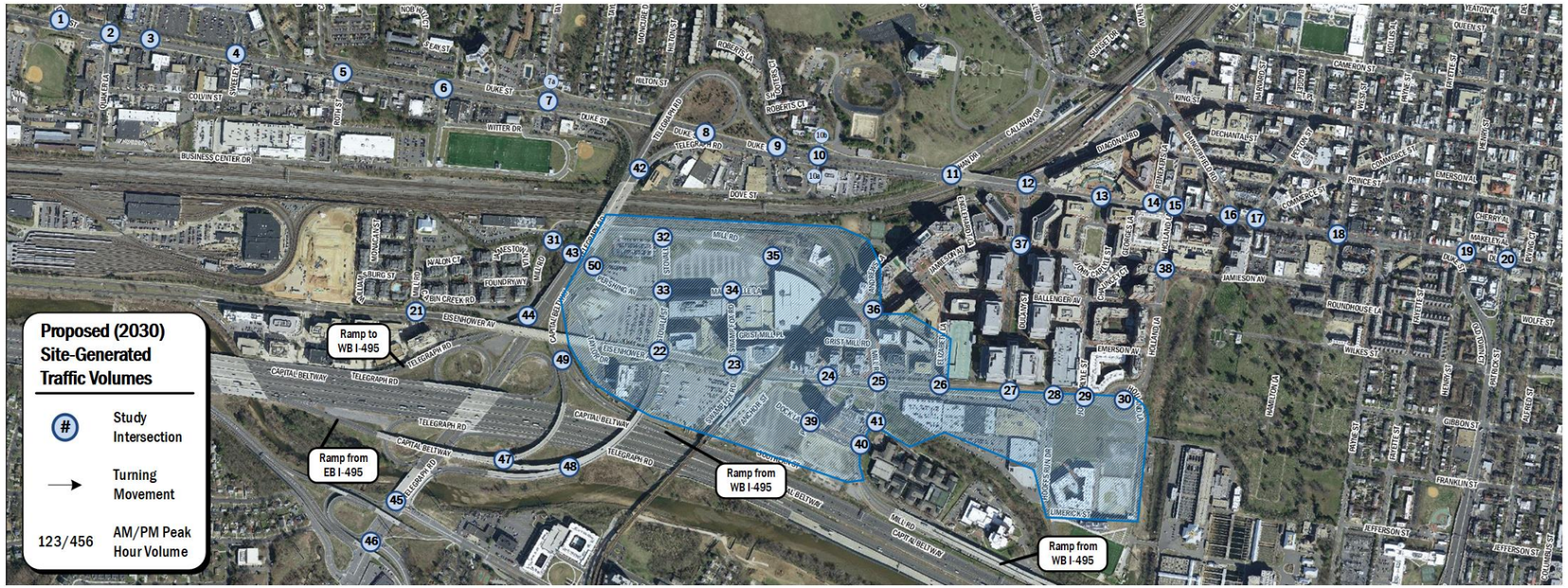
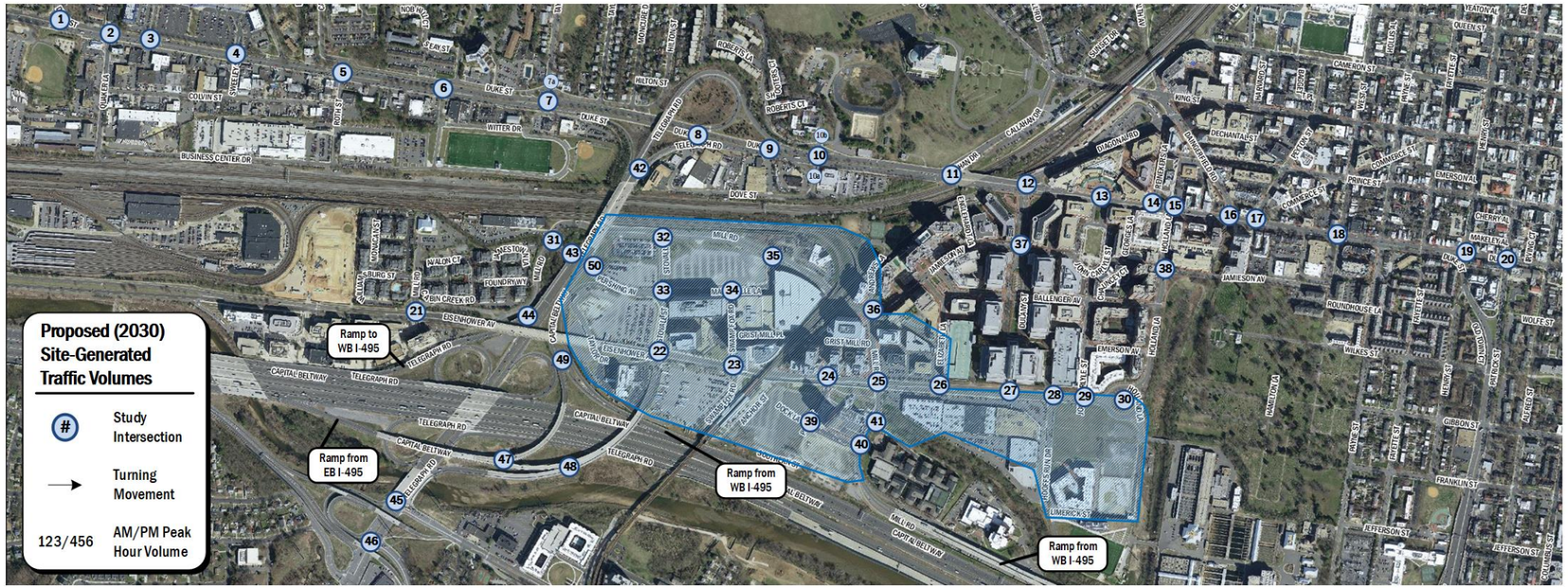


Figure 44: 2030 Proposed Vehicle Site-Generated Volumes (Intersections 1 – 15)

Figure 45: 2030 Proposed Vehicle Site-Generated Volumes (Intersections 16 – 33)



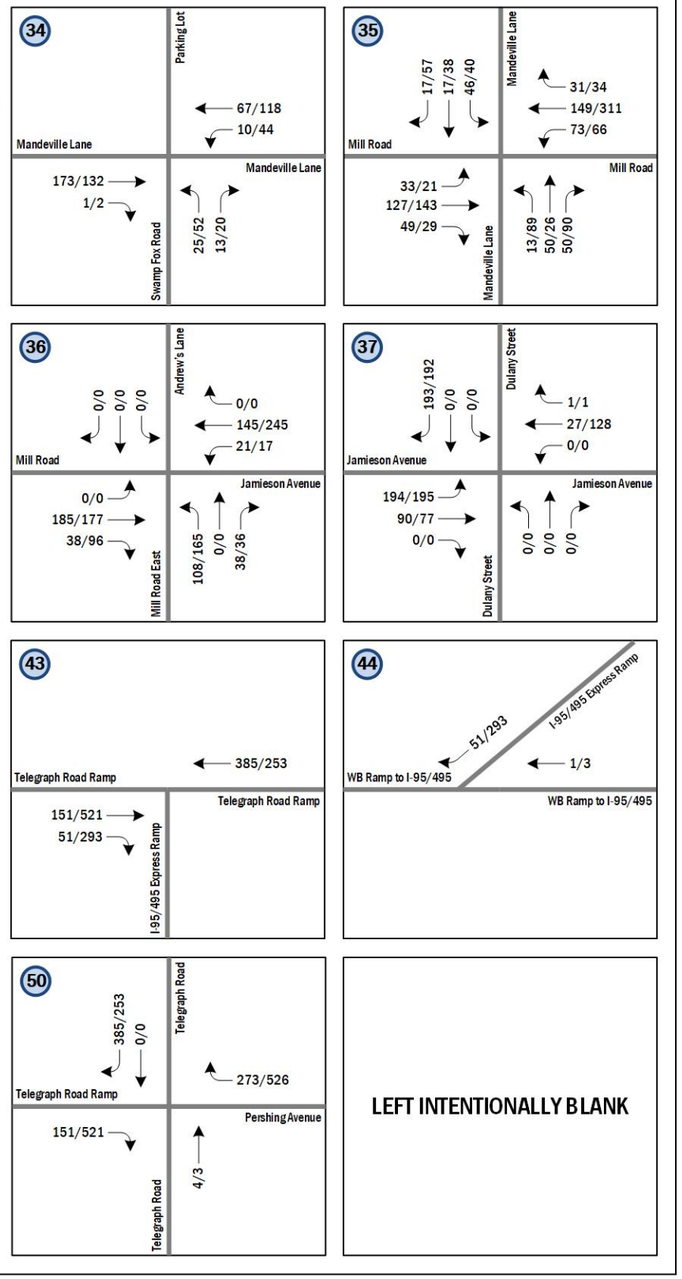


Figure 46: 2030 Proposed Vehicle Site-Generated Volumes (Intersections 34 – 50)

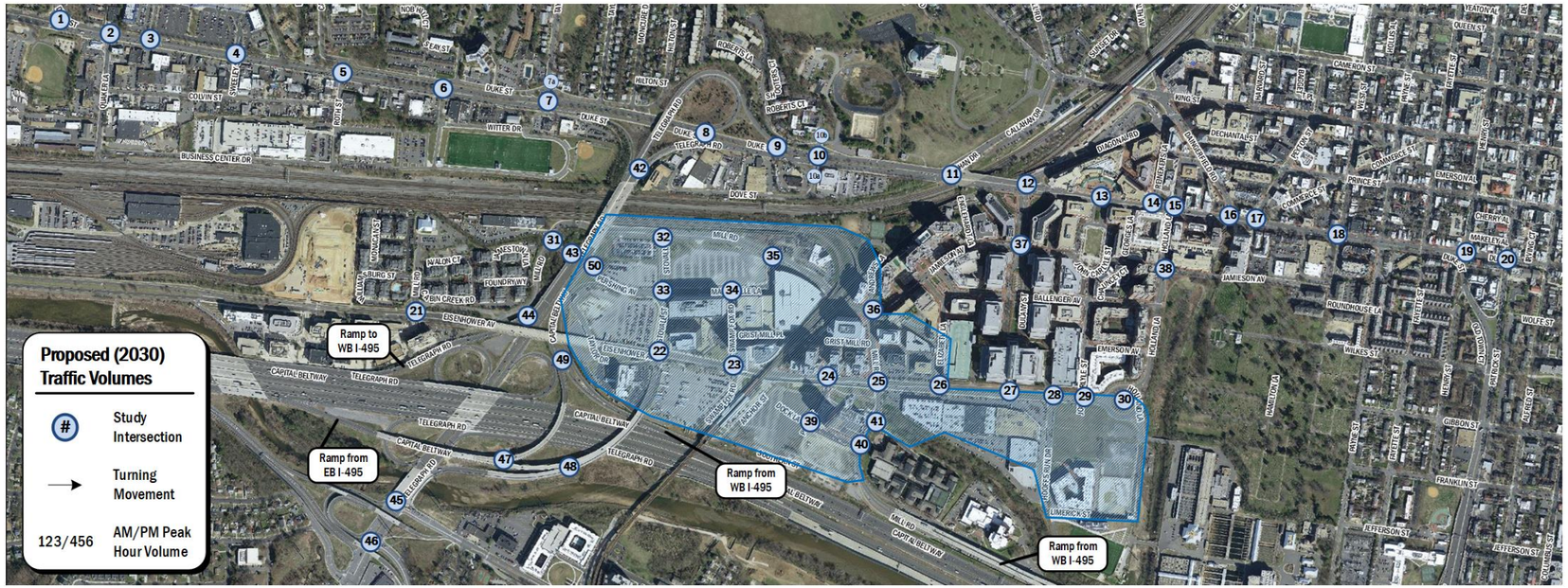
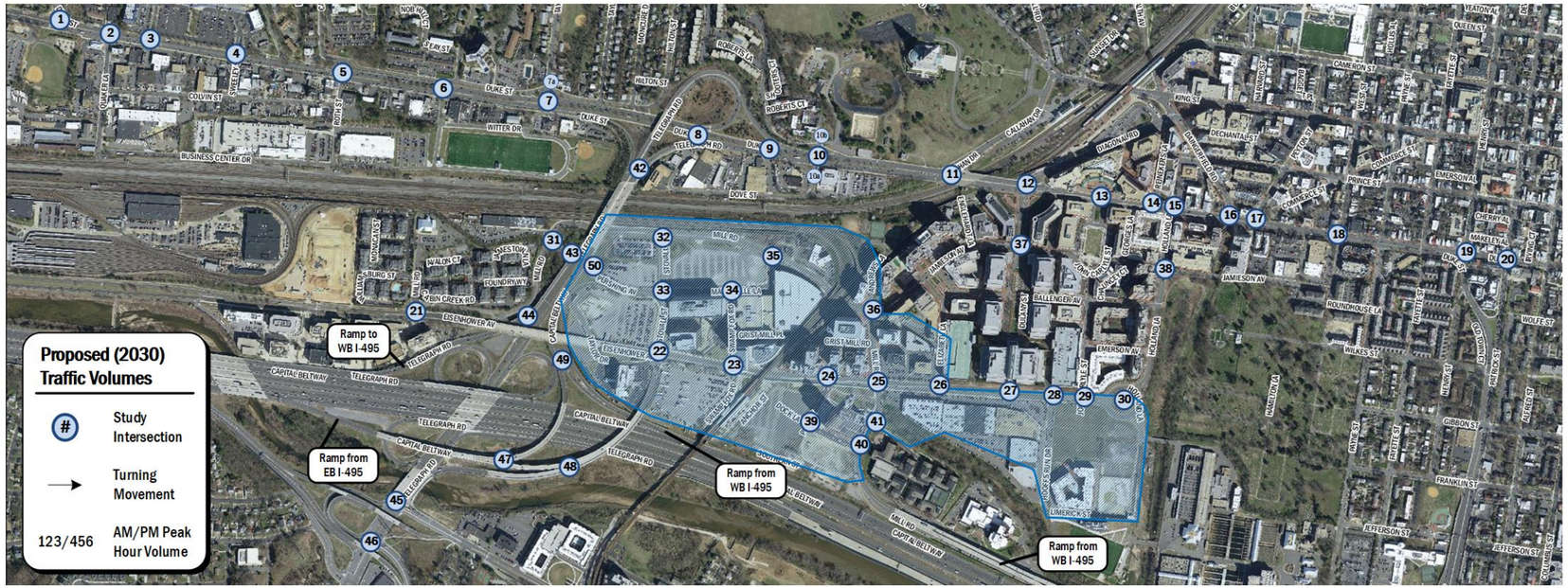
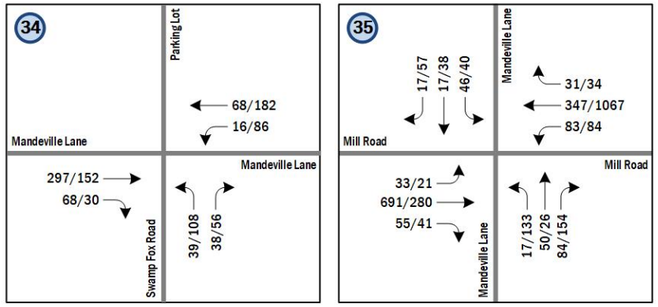
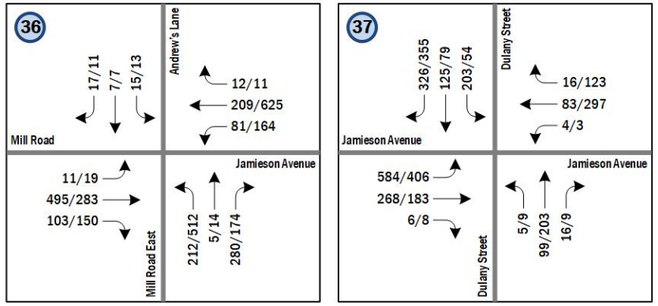


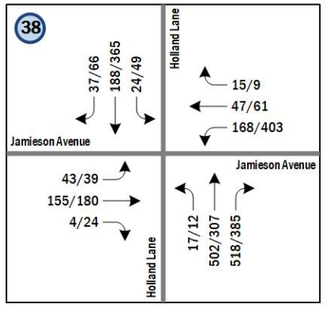
Figure 47: 2030 Proposed Vehicle Peak Hour Volumes (Intersections 1 – 15)

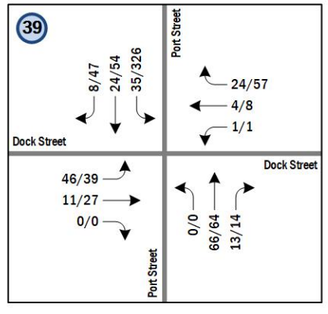
Figure 48: 2030 Proposed Vehicle Peak Hour Volumes (Intersections 16 – 33)

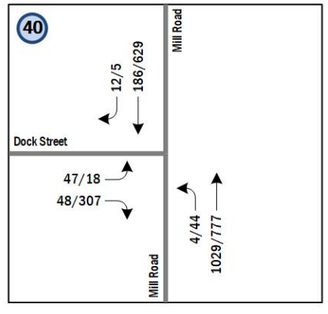


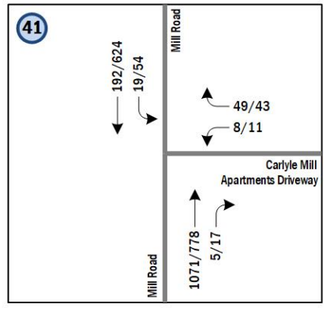


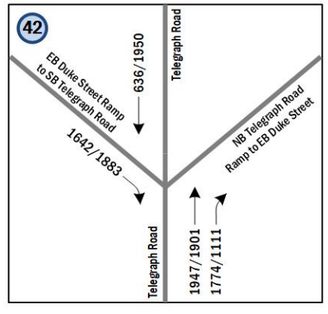


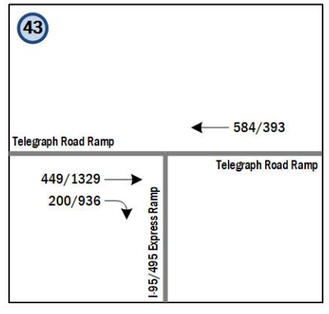


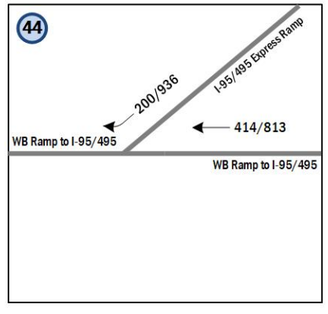


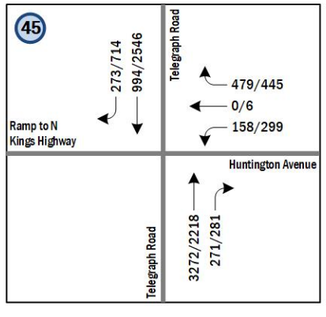


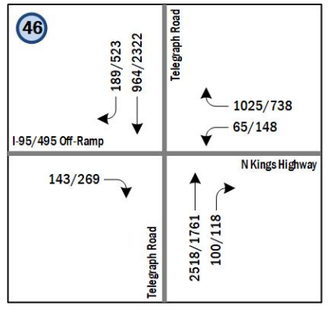


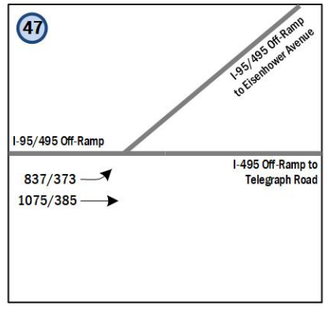


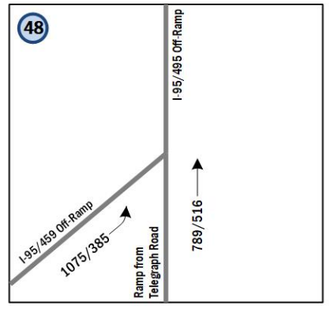


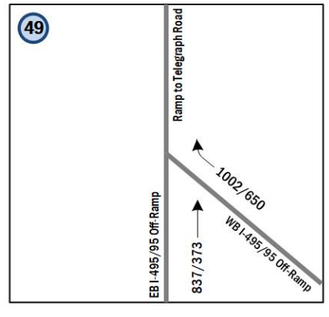












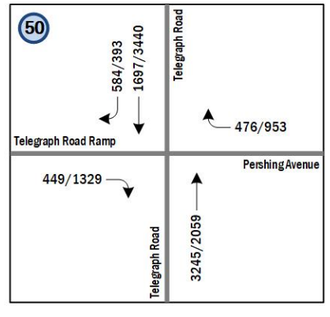


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Figure 49: 2030 Proposed Vehicle Peak Hour Volumes (Intersections 34 – 50)

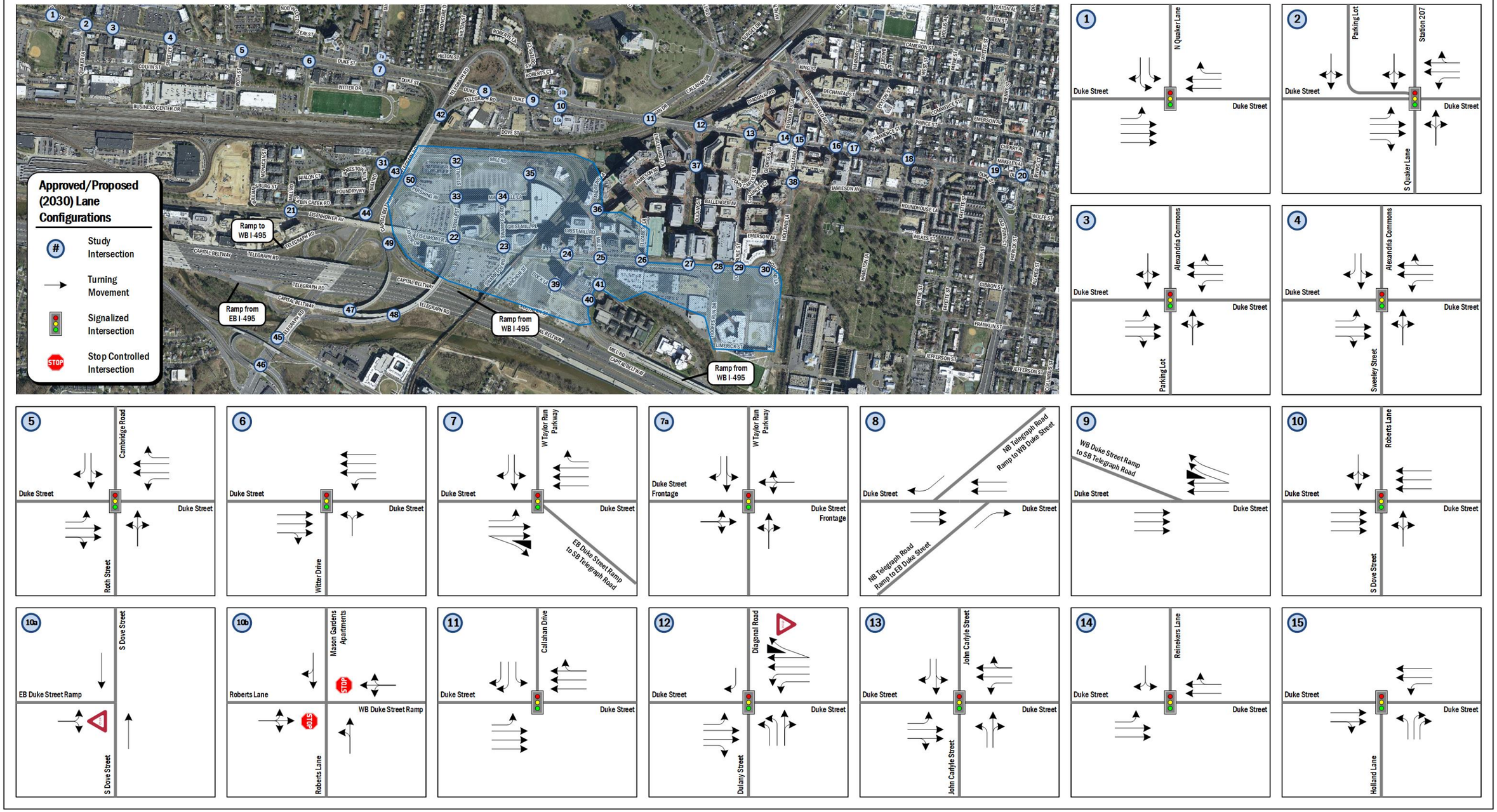


Figure 50: 2030 Approved & Proposed Lane Configurations (Intersections 1 – 15)

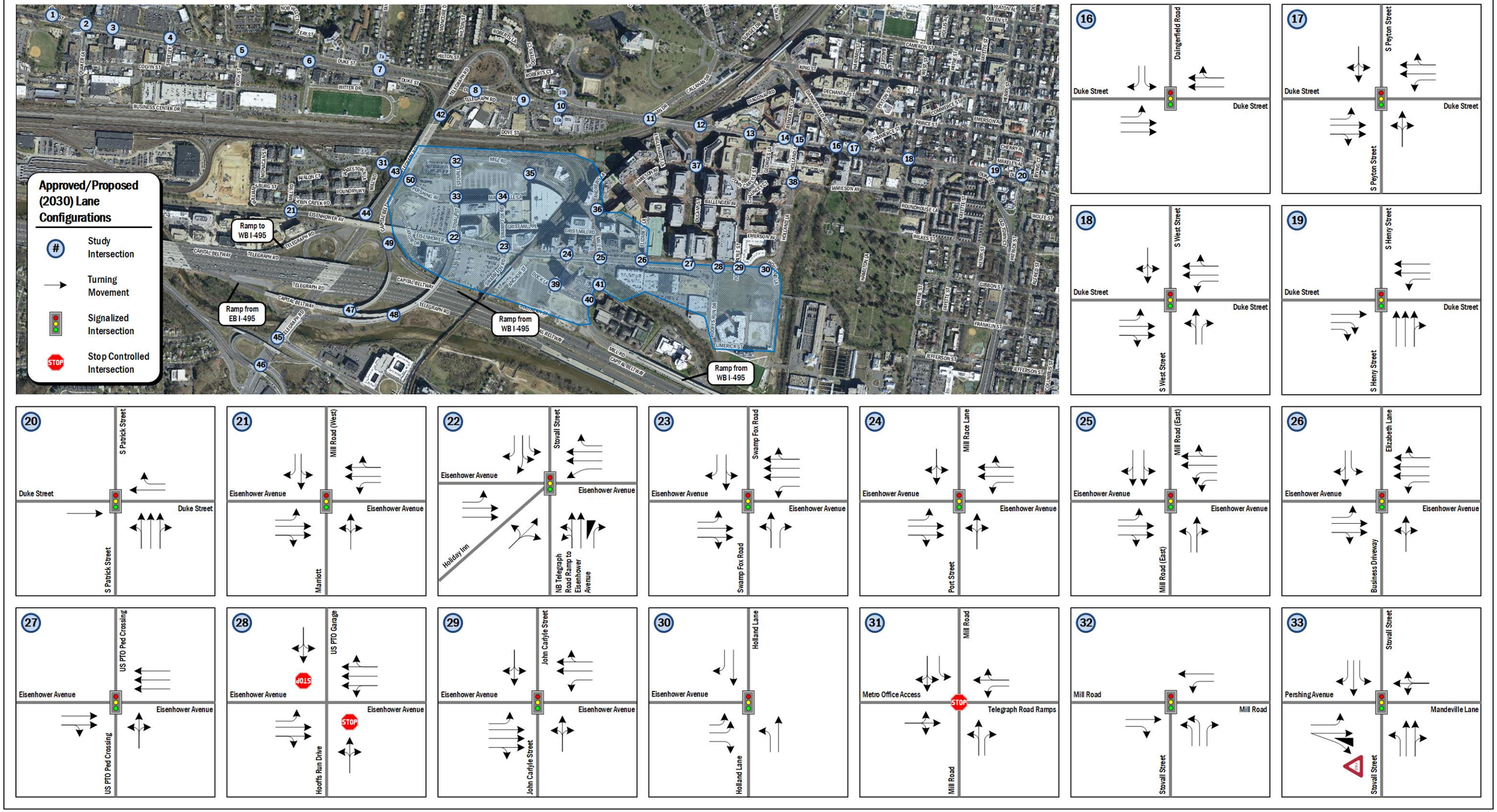
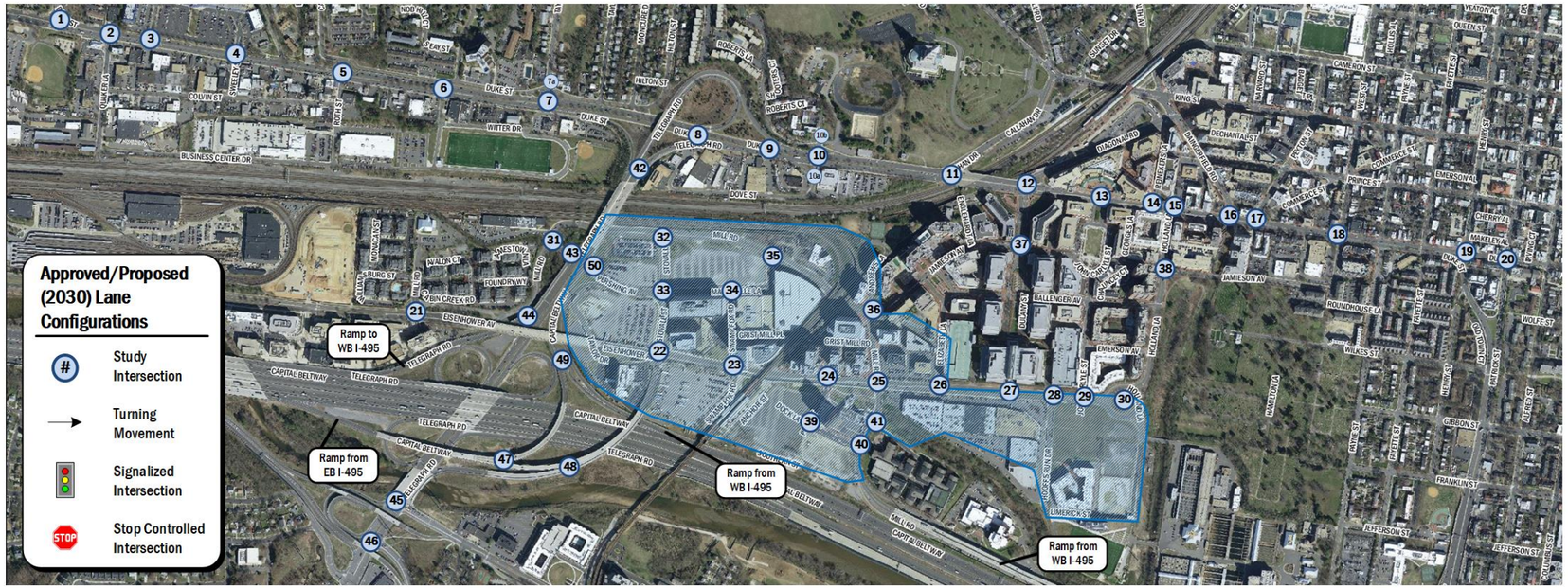
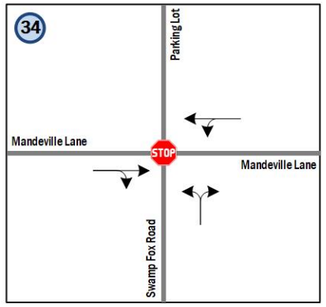
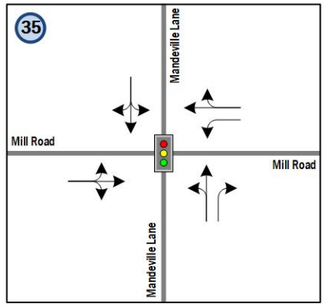
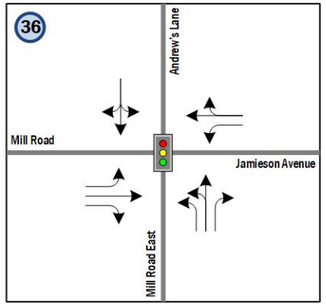


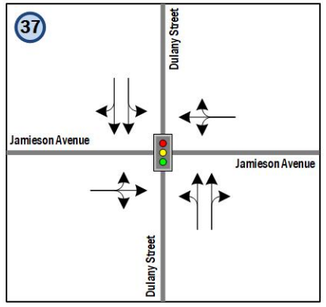
Figure 51: 2030 Approved & Proposed Lane Configurations (Intersections 16 – 33)

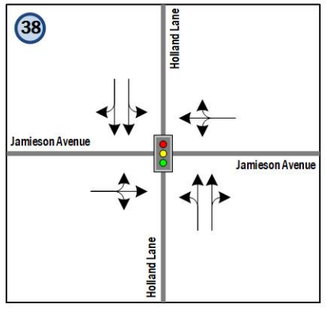


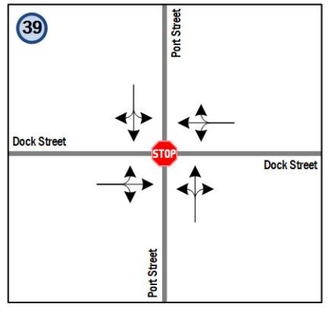


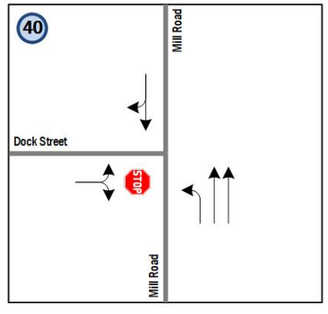


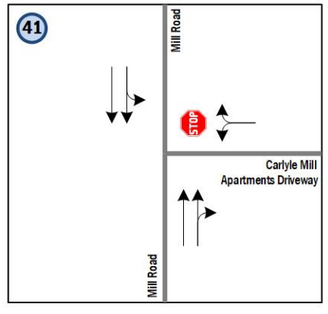


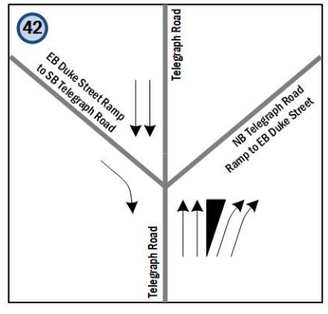


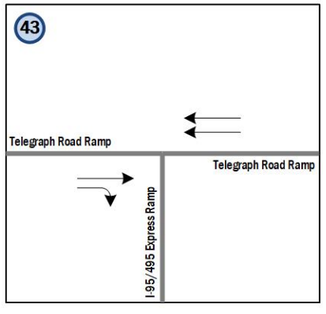


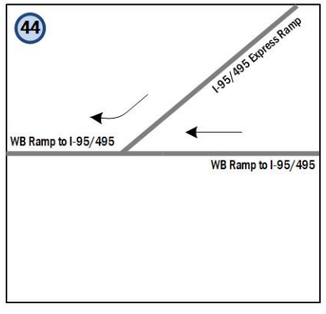


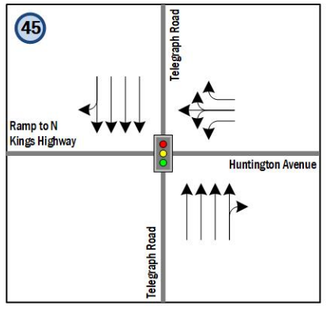


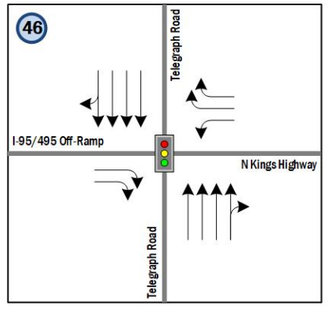


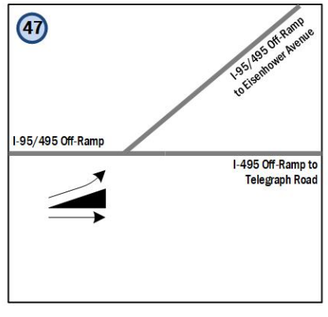


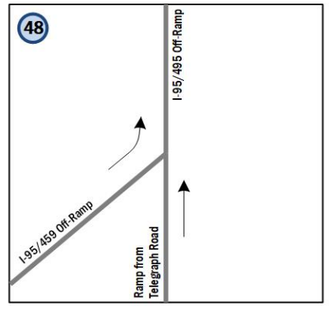


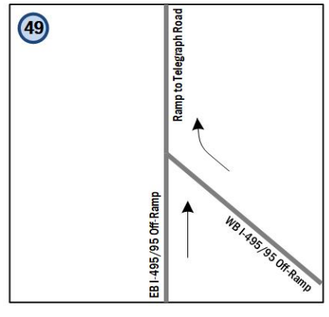












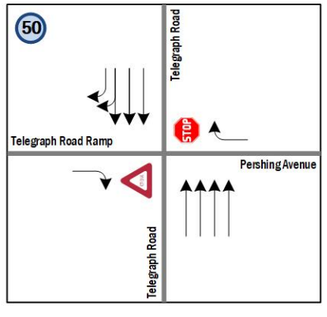


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Figure 52: 2030 Approved & Proposed Lane Configurations (Intersections 34 – 50)

Vehicular Capacity Analysis Results

Intersection Capacity Analysis

Intersection capacity analyses were performed for the morning and afternoon peak hours at study area intersections. Synchro version 9.2 was used to analyze the study intersections based on the *Highway Capacity Manual* (HCM) 2000 methodology.

The results of the capacity analyses are expressed in level of service (LOS) and delay (seconds per vehicle) for each approach. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS D is typically used as the acceptable LOS threshold in the City of Alexandria; although LOS E or F is generally accepted in urbanized areas if vehicular improvements would be a detriment to safety or to non-auto modes of transportation.

The LOS capacity analyses were based on: (1) the peak hour traffic volumes; (2) the lane use and traffic controls; and (3) the Highway Capacity Manual (HCM) methodologies (using Synchro software). The average delay of each approach and LOS is shown for the signalized intersections in addition to the overall average delay and intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Technical Appendix.

Table 17 shows the results of the capacity analyses including LOS and average delay per vehicle (in seconds) for the 2030 Future conditions (both the Approved and Proposed scenarios). Many study intersections operate at acceptable conditions during the weekday morning and afternoon peak hours in both 2030 Future Approved and 2030 Future Proposed; however, 27 intersections have one or more movement that operate at levels beyond acceptable thresholds in one or more peak hour:

- Duke Street & N Quaker Lane (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Alexandria Commons & Duke Street (PM Approved, AM Proposed and PM Proposed)
- Sweeley Street/Alexandria Commons & Duke Street (PM Approved and PM Proposed)
- Roth Street/Cambridge Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street & Callahan Drive (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Dulany Street/Diagonal Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Holland Lane & Duke Street (PM Proposed)
- S Peyton Street & Duke Street (AM Proposed)
- S West Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- S Henry Street & Duke Street (PM Approved and PM Proposed)
- S Patrick Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Marriott Driveway/Mill Road (West) & Eisenhower Avenue (PM Approved and PM Proposed)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Mill Road (East) & Eisenhower Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Elizabeth Lane/Driveway & Eisenhower Avenue (PM Proposed)
- Hoofs Run Drive & Eisenhower Avenue (AM Approved and PM Approved)
- John Carlyle Street & Eisenhower Avenue (PM Approved)
- Mill Road & Driveway/Telegraph Road Ramp (PM Approved, AM Proposed and PM Proposed)
- Stovall Street & Mill Road (PM Approved and PM Proposed)
- Dulany Street & Jamieson Avenue (AM Approved, AM Proposed and PM Proposed)
- Holland Lane & Jamieson Avenue (PM Approved and PM Proposed)
- Mill Road & Dock Street (PM Approved and PM Proposed)
- Telegraph Road & Huntington Avenue (PM Approved and PM Proposed)
- Telegraph Road & N Kings Highway (PM Approved and PM Proposed)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- W Taylor Run Parkway (AM Approved, PM Approved, AM Proposed and PM Proposed)

The following roadways categorized as minor arterials or above have one or more movements that experience a LOS E or LOS F in the 2030 Future conditions:

- Duke Street & N Quaker Lane (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Alexandria Commons & Duke Street (PM Approved, AM Proposed and PM Proposed)
- Sweeley Street/Alexandria Commons & Duke Street (PM Approved and PM Proposed)
- Roth Street/Cambridge Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street & Callahan Drive (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Dulany Street/Diagonal Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Holland Lane & Duke Street (PM Proposed)
- S Peyton Street & Duke Street (AM Proposed)
- S West Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- S Henry Street & Duke Street (PM Approved and PM Proposed)
- S Patrick Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Marriott Driveway/Mill Road (West) & Eisenhower Avenue (PM Approved and PM Proposed)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Mill Road (East) & Eisenhower Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Telegraph Road & Huntington Avenue (PM Approved and PM Proposed)
- Telegraph Road & N Kings Highway (PM Approved and PM Proposed)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)

This report identifies that the following roadways categorized as evacuation routes have one or more movements experience a LOS E or LOS F in the 2030 Future conditions:

- Duke Street & N Quaker Lane (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Alexandria Commons & Duke Street (PM Approved, AM Proposed and PM Proposed)
- Sweeley Street/Alexandria Commons & Duke Street (PM Approved and PM Proposed)
- Roth Street/Cambridge Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street & Callahan Drive (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Dulany Street/Diagonal Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Holland Lane & Duke Street (PM Proposed)
- S Peyton Street & Duke Street (AM Proposed)
- S West Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- S Henry Street & Duke Street (PM Approved and PM Proposed)
- S Patrick Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Telegraph Road & Huntington Avenue (PM Approved and PM Proposed)
- Telegraph Road & N Kings Highway (PM Approved and PM Proposed)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)

Queuing Analysis

In addition to the capacity analyses presented above, a queuing analysis was performed at the study intersections. The queuing analysis was performed using Synchro version 9.2 software. The 50th percentile and 95th percentile queue lengths are shown for each lane group at the study area signalized intersections. The 50th percentile queue is the maximum back of queue on a median cycle. The 95th percentile queue is the maximum back of queue that is exceeded 5% of the time. For unsignalized intersections, only the 95th percentile queue is reported for each lane group (including free-flowing left turns and stop-controlled movements) based on the HCM 2000 calculations. HCM 2000 does not calculate queuing for all-way stops.

Table 17 shows the queuing results for the study area intersection for the 2030 Future Approved and Proposed scenarios. The 95th percentile queues at most lane groups at study area intersections do not exceed their available storage

length in both 2030 Future Approved and 2030 Future Proposed; however, 33 intersections do have at least one movement with 95th percentile queues that exceed the available storage length in the morning and/or afternoon peak hour:

- Duke Street & N Quaker Lane (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Alexandria Commons & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Sweeley Street/Alexandria Commons & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Roth Street/Cambridge Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street & Roberts Lane/Dove Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street & Callahan Drive (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Dulany Street/Diagonal Road & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street & John Carlyle Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Duke Street & Reinekers Lane (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Holland Lane & Duke Street (PM Approved and PM Proposed)
- Duke Street & Daingerfield Road (AM Approved, PM Approved, AM Proposed and PM Proposed)
- S Peyton Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- S West Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- S Henry Street & Duke Street (PM Approved and PM Proposed)
- S Patrick Street & Duke Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Marriott Driveway/Mill Road (West) & Eisenhower Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Swamp Fox Road & Eisenhower Avenue (PM Approved, AM Proposed and PM Proposed)
- Port Street/Mill Race Lane & Eisenhower Avenue (PM Proposed)
- Mill Road (East) & Eisenhower Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Elizabeth Lane/Driveway & Eisenhower Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- John Carlyle Street & Eisenhower Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Stovall Street & Mill Road (PM Approved and PM Proposed)
- Stovall Street & Pershing Avenue/Mandeville Lane (PM Approved, AM Proposed and PM Proposed)
- Mandeville Lane & Mill Road (PM Proposed)
- Mill Road (East)/Andrews Lane & Mill Road/Jamieson Avenue (PM Approved and PM Proposed)
- Dulany Street & Jamieson Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Holland Lane & Jamieson Avenue (PM Proposed)
- Telegraph Road & Huntington Avenue (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Telegraph Road & N Kings Highway (AM Approved, PM Approved, AM Proposed and PM Proposed)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (PM Approved, AM Proposed and PM Proposed)
- W Taylor Run Parkway (PM Approved and PM Proposed)

Table 17: 2030 Approved and Proposed Conditions Capacity Analysis

Intersection (Movement)	Storage Length (ft)	Approved Conditions								Proposed Conditions							
		AM Peak				*PM Peak*				*AM Peak*				*PM Peak*			
		LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
1. Duke St & N Quaker Ln																	
Overall Intersection (Signalized)		**C**	**32.5**			**C**	**29.3**			**D**	**36.7**			**C**	**32.4**		
Eastbound Left	210	B	14.4	74	126	C	33.2	79	159	B	15.1	74	134	D	35.5	84	163
Eastbound Thru	390	A	8.7	194	224	A	7.3	106	127	A	8.8	206	238	A	7.4	110	132
Westbound Thru	350	B	12.6	72	151	C	30.0	465	535	B	13.0	122	154	C	30.4	438	m540
Westbound Right	350	B	16.9	937	#1153	A	5.7	182	m221	B	19.7	973	#1223	A	7.0	193	m221
Southbound Left	1290	F	136.2	~367	#493	E	79.9	~327	#463	F	156.1	~395	#522	F	93.0	~368	#496
2. S Quaker Ln & Duke St																	
Overall Intersection (Signalized)		**D**	**17.3**			**B**	**16.4**			**C**	**21.8**			**B**	**17.3**		
Eastbound Left	210	A	0.0	0	0	B	19.7	3	m8	-	-	-	-	B	19.6	3	m8
Eastbound Thru	330	C	30.8	825	m#1144	C	22.8	348	m418	D	39.8	897	m#1205	C	23.6	372	m435
Eastbound Right	330	A	6.3	8	m29	D	40.9	42	m74	A	6.3	8	m28	D	36.5	47	m76
Westbound Left	90	A	9.1	0	m3	A	7.9	2	m3	B	10.3	0	m3	A	8.6	2	m3
Westbound TR	240	A	2.2	4	101	A	6.3	81	#1032	A	2.4	6	#165	A	8.3	105	#1112
Northbound LTR	340	D	51.5	54	19	D	51.7	97	152	D	51.5	54	91	D	51.7	97	152
Southbound LTR	50	D	43.2	1	8	C	33.0	1	7	D	43.2	1	8	C	33.0	1	7
3. Duke St & Alexandria Commons																	
Overall Intersection (Signalized)		**A**	**5.8**			**A**	**8.9**			**A**	**5.1**			**B**	**10.4**		
Eastbound Left	110	D	52.8	0	m0	E	70.6	15	m45	E	58.9	0	m0	F	80.2	15	m435
Eastbound TR	220	A	2.9	1	184	A	0.4	1	4	A	3.2	1	m195	A	0.5	1	4
Westbound Left	320	-	-	-	-	A	5.0	1	m2	-	-	-	-	A	5.2	1	m2
Westbound TR	530	A	6.4	489	#1021	A	8.6	155	#1030	A	4.6	106	#1073	B	11.2	228	#1110
Northbound LTR	150	D	49.8	2	11	D	46.9	13	36	D	49.8	2	11	D	46.9	13	36
Southbound LTR	210	D	49.9	0	26	D	50.1	64	124	D	49.9	0	26	D	50.1	64	124
4. Sweeley St/Alexandria Commons & Duke St																	
Overall Intersection (Signalized)		**B**	**15.6**			**B**	**15.0**			**B**	**11.5**			**B**	**12.0**		
Eastbound Left	200	C	30.2	10	m30	D	53.9	2	m25	C	33.8	10	m27	E	61.4	2	m23
Eastbound TR	560	B	10.8	244	#577	A	3.7	64	76	B	11.9	284	#1025	A	3.8	67	79
Westbound Left	70	B	12.1	3	m11	A	5.8	4	m12	C	26.2	1	m1	A	6.8	4	m5
Westbound TR	250	B	16.6	536	m#1046	B	16.3	541	m#985	A	6.7	114	m50	B	11.0	183	m#752
Northbound LTR	230	D	46.3	12	45	D	44.0	19	69	D	46.3	12	45	D	44.0	19	69
Southbound LT	100	D	50.3	66	110	E	65.1	86	147	D	50.3	66	110	E	65.1	86	147
Southbound Right	100	D	45.9	0	43	D	43.1	0	43	D	45.9	0	43	D	43.1	0	43
5. Roth St/Cambridge Rd & Duke St																	
Overall Intersection (Signalized)		**D**	**51.5**			**E**	**75.1**			**E**	**62.5**			**E**	**77.0**		
Eastbound Left	110	D	53.2	67	m118	E	57.6	9	m28	D	47.3	72	m89	E	60.4	10	m20
Eastbound TR	370	D	52.8	~938	#1147	C	22.3	474	604	E	66.9	~1015	#1218	B	17.9	300	402
Westbound Left	240	D	41.5	24	101	D	40.1	10	m62	D	41.5	24	m100	D	41.9	9	m58
Westbound Thru	670	E	57.8	~1011	#1112	C	22.7	157	#1060	E	70.6	~1073	#1173	C	34.8	192	#1120
Westbound Right	670	A	9.4	210	50	A	4.2	1	57	A	9.1	193	60	A	4.6	1	66
Northbound LTR	150	D	37.7	42	82	E	59.7	277	#448	D	37.7	42	82	E	59.7	277	#448
Southbound LT	40	E	63.6	178	#299	F	775.8	~408	#590	E	63.6	178	#299	F	775.8	~408	#590
Southbound Right	40	D	37.5	41	80	C	33.6	28	61	D	37.5	41	80	C	33.6	28	61
6. Witter Dr & Duke St																	
Overall Intersection (Signalized)		**A**	**9.5**			**A**	**8.0**			**A**	**9.8**			**A**	**8.2**		
Eastbound TR	670	B	15.3	507	m541	A	4.4	204	m201	B	15.5	536	m540	A	4.4	204	m207
Westbound Left	220	B	18.8	33	m54	C	24.6	4	m0	B	19.7	35	m53	C	27.3	4	m0
Westbound Thru	700	A	3.3	8	m724	A	9.1	554	m251	A	3.6	8	m724	A	9.6	614	m253
Northbound LR	170	D	54.5	6	38	D	52.0	19	72	D	54.5	6	38	D	52.0	19	72
7. Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St																	
Overall Intersection (Signalized)		**E**	**55.6**			**E**	**75.6**			**E**	**74.2**			**F**	**88.3**		
Eastbound Left	190	E	59.1	24	m42	D	43.1	18	m38	E	58.2	24	m41	D	43.7	18	m36
Eastbound Thru	700	A	6.5	123	161	B	13.6	159	304	A	6.8	123	192	B	13.7	158	315
Eastbound Right	700	E	75.4	428	#1657	F	143.4	~1313	#1921	F	113.7	~689	#1842	F	160.6	~1395	#2001
Westbound Thru	1960	D	51.8	610	#1201	D	44.7	570	#1128	E	64.1	678	#1242	E	57.2	626	#1194
Westbound Right	140	F	120.3	~264	#443	E	79.4	231	#402	F	134.8	~285	#469	F	99.9	~258	#449
Southbound LT	30	F	105.3	~320	m#355	F	138.8	~416	m#377	F	141.0	~373	m#356	F	155.2	~443	m#377
Southbound Right	30	D	40.2	0	m0	D	37.7	0	m0	D	40.2	0	m0	D	37.7	0	m0
8. NB Telegraph Rd to EB Duke St/NB Telegraph Rd to WB Duke St & Duke St																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
9. Duke St & WB Duke St to SB Telegraph Rd																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		

Intersection (Movement)	Storage Length (ft)	Approved Conditions								Proposed Conditions							
		AM Peak				PM Peak				AM Peak				PM Peak			
		LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
10. Dove St/Roberts Ln & Duke St																	
Overall Intersection (Signalized)		**B**	**17.1**			**B**	**14.6**			**C**	**21.2**			**B**	**13.7**		
Eastbound LTR	1970	B	18.2	416	#645	A	9.8	169	296	C	25.0	482	#758	B	10.8	197	345
Westbound Thru	870	B	10.3	143	218	B	15.6	363	233	B	10.5	150	229	B	13.3	299	516
Northbound LTR	50	D	36.4	159	257	C	33.1	131	66	D	36.4	159	257	C	33.1	131	213
Southbound LTR	20	C	22.0	16	47	C	23.3	29	40	C	22.1	18	49	C	23.3	29	60
11. Duke St & Callahan Dr																	
Overall Intersection (Signalized)		**C**	**21.5**			**B**	**17.9**			**C**	**24.4**			**B**	**19.2**		
Eastbound Left	320	E	78.7	441	#674	E	63.7	284	#460	F	85.8	~464	#702	E	73.7	305	#499
Eastbound Thru	860	A	6.1	178	200	A	6.6	112	131	A	6.2	188	212	A	6.8	124	145
Westbound TR	490	A	4.7	23	49	B	11.0	252	m255	A	5.0	24	63	B	11.6	268	m271
Southbound Left	190	F	115.1	184	#349	D	45.3	87	150	F	147.8	~288	#398	D	46.6	107	177
Southbound Right	870	C	21.5	119	167	C	28.1	317	405	C	21.6	126	175	C	28.2	320	408
12. Dulany St/Diagonal Rd & Duke St																	
Overall Intersection (Signalized)		**D**	**49.7**			**E**	**61.1**			**E**	**55.5**			**E**	**61.5**		
Eastbound Left	310	E	62.6	268	m#493	D	52.7	127	#215	E	68.8	273	m#499	D	52.8	130	#217
Eastbound Thru	450	D	54.9	658	m#835	D	37.0	341	432	E	67.2	~714	m#863	D	42.3	390	#511
Eastbound Right	450	D	41.7	156	m269	E	56.8	43	105	D	44.8	190	m316	D	47.8	62	127
Westbound Left	280	E	58.5	45	77	E	56.2	46	m63	E	59.3	61	96	E	57.5	66	81
Westbound TR	440	C	33.9	232	262	F	89.4	~538	#681	C	34.1	238	261	F	83.2	~521	#665
Northbound Left	350	E	56.5	136	187	E	62.1	194	#283	E	58.9	156	212	E	76.4	218	#327
Northbound TR	350	D	51.4	16	112	D	43.9	9	86	D	51.0	16	118	D	44.0	9	88
Southbound TR	220	D	40.1	0	0	D	49.1	136	266	D	40.1	12	69	D	53.4	158	#328
13. John Carlyle St & Duke St																	
Overall Intersection (Signalized)		**B**	**12.9**			**B**	**18.0**			**B**	**14.6**			**C**	**20.7**		
Eastbound Left	150	A	1.0	2	m1	B	15.0	1	m3	A	1.1	2	m1	B	18.2	1	m3
Eastbound TR	440	A	7.3	43	m87	B	16.3	136	261	A	8.8	61	m90	C	21.6	200	310
Westbound Left	80	D	41.4	50	99	C	22.6	44	101	D	38.3	52	103	C	34.2	61	152
Westbound TR	290	A	9.8	74	144	B	11.4	168	202	B	11.0	88	163	B	11.0	164	195
Northbound Left	110	D	41.9	102	171	D	43.7	196	305	D	42.5	111	183	D	42.4	164	280
Northbound TR	110	D	38.0	9	70	C	23.1	5	32	D	39.1	17	94	C	30.9	6	45
Southbound LT	40	D	36.2	1	8	C	30.8	11	29	D	36.2	1	8	C	31.1	11	29
Southbound Right	40	D	36.3	0	0	C	30.6	0	0	D	36.3	0	0	C	30.8	0	0
14. Duke St & Reinekers Ln																	
Overall Intersection (Signalized)		**A**	**18.9**			**B**	**13.8**			**C**	**22.0**			**B**	**16.4**		
Eastbound Left	180	A	3.9	15	m2	A	4.2	11	m17	A	4.8	16	m10	A	4.1	10	m17
Eastbound Thru	280	C	32.9	626	704	C	24.2	278	401	D	37.4	696	#799	C	29.7	346	#483
Westbound TR	70	A	0.7	0	0	A	1.2	0	0	A	0.8	0	0	A	1.2	0	0
Southbound LR	340	D	42.8	6	36	D	39.8	27	87	D	42.8	6	36	D	40.0	31	92
15. Holland Ln & Duke St																	
Overall Intersection (Signalized)		**B**	**11.2**			**B**	**17.0**			**B**	**12.0**			**C**	**18.8**		
Eastbound TR	40	A	0.4	4	0	A	0.7	6	1	A	1.0	1	22	A	1.3	8	m21
Westbound Left	180	B	10.8	8	19	D	48.4	187	294	B	12.4	8	45	E	59.4	233	#375
Westbound Thru	230	A	6.2	73	78	B	9.6	150	249	A	6.1	79	83	B	10.4	184	278
Northbound Left	310	D	44.5	111	184	D	45.5	74	m131	D	44.2	115	188	D	48.7	66	m120
Northbound Right	330	D	45.8	119	186	D	49.9	89	m146	D	49.0	159	231	D	54.0	91	m146
16. Duke St & Daingerfield Rd																	
Overall Intersection (Signalized)		**C**	**29.2**			**C**	**23.8**			**C**	**30.3**			**C**	**26.4**		
Eastbound Left	90	C	32.8	192	273	D	46.1	136	221	C	32.5	214	293	D	46.6	138	222
Eastbound Thru	290	D	40.3	738	823	C	28.7	322	416	D	41.9	848	926	C	31.0	364	458
Westbound TR	130	A	3.0	22	24	B	12.3	99	148	A	3.1	23	24	B	161.1	144	m175
Southbound Left	400	D	43.3	83	140	D	39.9	102	167	D	43.3	83	140	D	39.7	102	167
Southbound Right	60	D	40.9	0	56	D	36.7	0	55	D	40.8	0	56	D	36.7	0	58
17. S Peyton St & Duke St																	
Overall Intersection (Signalized)		**C**	**22.8**			**C**	**25.5**			**C**	**26.1**			**C**	**29.0**		
Eastbound Left	130	D	50.9	345	457	C	25.6	159	264	E	63.8	418	#581	C	28.9	189	301
Eastbound TR	130	A	0.1	0	0	A	0.2	0	0	A	0.1	0	0	A	0.2	0	0
Westbound Left	110	B	19.5	3	m8	C	25.6	3	13	C	20.0	3	m8	C	26.3	3	13
Westbound TR	530	C	24.4	183	m215	D	43.5	408	#546	C	25.0	193	m224	D	51.8	452	#607
Northbound LTR	200	D	43.5	13	40	D	35.8	16	44	D	43.4	13	40	D	35.6	16	44
Southbound LTR	360	D	43.4	0	32	D	38.2	21	114	D	43.4	0	35	D	38.0	21	114
18. S West St & Duke St																	
Overall Intersection (Signalized)		**C**	**33.7**			**C**	**26.4**			**D**	**47.4**			**E**	**62.3**		
Eastbound LTR	530	A	0.8	3	4	B	14.2	160	212	A	0.9	3	4	B	14.7	175	232
Westbound Left	80	B	13.9	54	110	E	55.3	93	m#196	B	19.8	67	156	F	360.5	~450	m#631
Westbound TR	240	A	8.5	132	163	B	10.8	99	m114	A	8.6	138	171	B	10.3	98	m111
Northbound LT	130	F	131.6	~524	#745	C	20.6	170	290	F	193.9	~653	#884	C	21.4	180	312

Intersection (Movement)	Storage Length (ft)	Approved Conditions								Proposed Conditions							
		AM Peak				PM Peak				AM Peak				PM Peak			
		LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th
Northbound Right	230	D	38.2	28	92	B	16.2	56	107	D	38.8	43	112	B	16.1	58	109
Southbound LTR	350	D	49.4	79	#172	E	77.6	~242	#426	D	51.5	83	#184	F	130.8	~298	#488
19. S Henry St & Duke St																	
Overall Intersection (Signalized)		**C**	**26.9**			**D**	**49.7**			**C**	**25.9**			**E**	**53.4**		
Eastbound Thru	560	D	35.1	230	#392	E	71.5	433	#619	D	41.2	258	#443	E	76.2	457	m#665
Eastbound Right	580	C	23.1	92	148	E	69.8	356	#484	C	25.1	119	184	E	77.1	383	m#528
Westbound Left	230	C	24.4	34	m37	E	67.2	178	m186	C	22.9	19	m20	E	73.5	192	m174
Westbound Thru	230	C	20.7	147	m153	C	31.3	230	m227	A	9.7	86	m83	C	32.1	274	m238
Southbound TR	350	C	28.7	263	327	D	43.5	853	926	C	29.1	265	#333	D	47.2	893	970
20. S Patrick St & Duke St																	
Overall Intersection (Signalized)		**C**	**23.0**			**D**	**39.2**			**C**	**28.9**			**E**	**63.3**		
Eastbound Thru	230	A	8.8	0	m#10	D	50.1	360	m443	C	32.1	122	m#174	D	52.3	382	m444
Westbound Thru	230	E	57.1	284	#490	F	115.6	~366	#561	E	68.1	~311	#522	F	204.9	~487	#694
Westbound Right	230	B	18.7	3	23	B	18.5	0	10	B	18.7	3	23	B	18.5	0	10
Northbound LTR	760	B	18.1	367	450	B	10.9	187	229	B	19.4	386	475	B	11.1	194	239
21. Marriott Driveway/Mill Rd (West) & Eisenhower Ave																	
Overall Intersection (Signalized)		**A**	**9.4**			**C**	**31.3**			**A**	**9.4**			**D**	**36.3**		
Eastbound Left	150	A	2.9	17	69	F	98.7	~251	#573	A	3.0	21	81	F	128.3	~306	#626
Eastbound TR	720	A	7.0	79	180	A	8.4	135	273	A	7.0	83	187	A	8.8	155	312
Westbound Left	150	A	4.2	7	32	A	9.8	3	16	A	4.3	7	32	A	9.8	3	17
Westbound TR	1720	A	7.6	48	120	C	23.5	340	571	A	7.8	55	136	C	25.7	382	#690
Northbound LTR	20	C	33.8	5	33	D	38.9	20	37	C	34.1	5	33	D	38.9	20	67
Southbound LT	30	D	35.1	22	54	D	40.5	33	70	D	35.4	22	54	D	40.5	33	70
Southbound Right	30	C	33.8	0	38	D	38.3	0	57	C	34.1	0	40	D	38.5	0	61
22. Holiday Inn & Eisenhower Ave & Stovall St																	
Overall Intersection (Signalized)		**F**	**220.7**			**D**	**39.6**			**F**	**201.1**			**D**	**50.8**		
Eastbound Left	150	B	18.9	63	129	F	113.0	~165	#386	B	19.2	74	149	F	179.0	~229	#450
Eastbound Thru	1700	C	30.1	147	232	C	25.1	207	322	C	29.8	144	229	C	27.8	233	359
Westbound Left	270	E	57.7	1	m9	E	68.4	9	m20	E	63.2	1	m9	E	70.3	9	m19
Westbound Thru	460	D	40.2	80	162	C	28.8	283	393	D	39.2	86	177	C	31.4	291	415
Westbound Right	460	F	108.9	63	103	C	21.4	73	117	E	62.1	78	114	C	21.7	97	196
Northbound LT	2300	D	51.7	241	311	D	44.3	125	173	F	116.1	~397	#526	D	43.9	152	205
Northbound Right	290	F	550.0	~1353	#1597	D	50.2	150	#258	F	510.1	~1285	#1526	F	84.7	241	#469
Southbound Left	220	D	51.3	80	142	E	55.5	56	109	D	51.1	74	133	E	56.9	67	124
Southbound LT	380	D	51.4	81	143	E	55.3	55	107	D	51.1	74	133	E	57.0	67	124
Southbound Right	380	C	34.6	0	37	D	40.9	19	76	C	34.3	0	38	D	44.4	80	156
Northeastbound LTR	340	E	59.3	14	39	E	58.9	16	42	E	59.3	14	39	E	58.9	16	42
23. Swamp Fox Rd & Eisenhower Ave																	
Overall Intersection (Signalized)		**B**	**18.7**			**B**	**15.5**			**B**	**18.8**			**B**	**15.1**		
Eastbound Left	60	A	9.6	31	m29	B	11.6	11	m21	A	9.8	31	m31	B	13.2	14	m22
Eastbound TR	440	C	20.1	620	m280	B	11.0	216	250	B	19.2	535	m285	B	12.3	291	m290
Westbound Left	60	D	35.8	6	14	B	12.0	6	m8	D	41.9	5	m14	B	15.0	8	m13
Westbound TR	210	A	7.6	39	50	B	11.7	141	151	B	10.2	51	68	B	11.4	125	187
Northbound LT	110	D	37.6	47	93	D	49.1	139	#229	D	38.9	65	120	D	42.5	108	180
Northbound Right	110	C	34.9	0	29	C	33.7	0	41	D	35.0	0	41	C	33.9	0	37
Southbound LT	90	D	35.6	19	47	D	39.4	53	104	D	35.7	19	47	D	39.4	55	105
Southbound Right	90	C	34.7	0	6	C	34.5	0	42	C	34.8	0	8	D	35.1	4	49
24. Port St/Mill Race Ln & Eisenhower Ave																	
Overall Intersection (Signalized)		**A**	**8.7**			**B**	**11.7**			**A**	**9.5**			**B**	**12.8**		
Eastbound Left	120	A	1.1	2	m4	A	7.8	7	m19	A	1.7	7	m5	B	10.1	7	m16
Eastbound TR	280	A	4.8	22	238	A	7.1	65	108	A	5.4	70	216	A	8.7	68	204
Westbound Left	90	A	6.1	3	m7	B	13.7	20	m29	A	7.8	4	m9	C	31.4	21	m43
Westbound TR	290	A	9.8	131	166	A	10.0	125	234	B	11.3	137	173	A	9.9	131	323
Northbound LTR	240	D	42.0	81	147	D	43.4	118	196	D	42.0	81	147	D	43.4	118	196
Southbound LTR	190	D	37.9	7	32	D	35.5	16	61	D	37.9	7	32	D	35.5	16	61
25. Mill Rd (East) & Eisenhower Ave																	
Overall Intersection (Signalized)		**E**	**67.8**			**D**	**37.7**			**E**	**72.1**			**D**	**40.9**		
Eastbound Left	160	E	55.1	58	m102	F	86.2	47	m72	E	61.0	68	m118	F	97.3	57	m#81
Eastbound TR	290	E	57.7	~677	#820	C	28.9	158	206	E	62.5	~659	#803	C	33.2	185	267
Westbound Left	200	E	78.2	31	61	E	65.3	97	140	E	71.2	38	73	E	66.9	96	138
Westbound TR	360	B	15.4	37	33	D	39.6	375	451	B	16.1	64	46	D	43.0	446	#597
Northbound Left	250	C	21.9	138	206	C	29.4	189	274	C	22.0	143	213	C	31.9	193	280
Northbound TR	250	F	121.7	~791	#1036	C	29.0	258	368	F	133.1	~831	#1076	C	31.1	293	416
Southbound LTR	230	C	34.9	46	79	D	47.2	120	170	D	35.1	48	81	D	49.6	140	194
26. Driveway/Elizabeth Ln & Eisenhower Ave																	
Overall Intersection (Signalized)		**A**	**4.0**			**B**	**10.9**			**A**	**7.2**			**B**	**14.6**		

Intersection (Movement)	Storage Length (ft)	Approved Conditions								Proposed Conditions							
		AM Peak				*PM Peak*				*AM Peak*				*PM Peak*			
		LOS	Queue (ft)			LOS	Queue (ft)			LOS	Queue (ft)			LOS Delay	Queue (ft)		
		Delay	50th	95th		Delay	50th	95th		Delay	50th	95th			50th	95th	
Eastbound Left	140	A	1.4	17	m48	A	3.4	8	m13	A	2.5	32	m52	A	4.0	8	m14
Eastbound TR	350	A	2.7	50	m208	A	4.7	69	100	A	4.3	102	m200	A	5.6	74	111
Westbound Left	120	A	5.7	0	2	A	5.0	1	m4	A	5.8	0	m2	A	4.0	1	m4
Westbound TR	470	A	5.0	17	25	A	6.4	98	120	A	6.0	23	53	A	4.9	57	113
Northbound LTR	20	D	48.6	21	43	D	51.3	55	109	D	47.0	75	119	F	106.9	118	#207
Southbound Left	600	D	47.4	5	17	D	42.8	29	62	D	44.7	26	54	D	39.7	36	67
Southbound TR	600	D	47.2	0	0	D	42.1	2	62	D	43.0	8	37	D	39.9	23	85
27. Pedestrian Crossing & Eisenhower Ave																	
Overall Intersection (Signalized)		**A**	**5.7**			**A**	**7.6**			**A**	**6.8**			**A**	**11.8**		
Eastbound Thru	470	A	4.2	173	41	A	4.2	81	6	A	2.5	152	16	A	3.6	84	11
Westbound Thru	270	A	7.0	33	47	A	6.4	156	m71	A	7.7	43	60	A	7.3	165	191
Northbound LTR	250	D	38.9	23	63	D	36.3	68	128	D	43.0	99	171	D	47.6	223	321
28. Hoofs Run Dr & Eisenhower Ave																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
Eastbound Left	60	A	8.1	-	1	A	0.0	-	0	A	8.1	-	1	A	0.0	-	0
Westbound LT	150	A	6.7	-	9	A	4.6	-	13	A	8.8	-	18	A	5.6	-	18
Northbound LTR	530	C	19.5	-	142	C	16.9	-	196	C	18.4		37	B	15.0	-	35
Southbound LTR	80	A	0.0	-	0	A	9.9	-	11	A	0.0	-	0	B	10.1	-	12
29. Eisenhower Ave & John Carlyle St																	
Overall Intersection (Signalized)		**A**	**9.3**			**C**	**30.1**			**A**	**9.7**			**C**	**25.4**		
Eastbound Left	150	A	4.9	34	281	C	25.4	99	149	A	6.8	71	358	C	31.1	118	m207
Eastbound TR	150	A	3.6	26	195	C	22.9	128	156	A	3.4	45	178	C	22.2	134	171
Westbound Left	120	A	8.3	5	18	B	18.0	5	m12	A	8.2	0	m2	B	18.2	4	m10
Westbound TR	120	A	8.4	42	76	C	21.1	142	179	A	8.8	54	92	C	21.8	163	244
Northbound LTR	300	D	49.2	48	81	E	66.0	231	#416	D	52.2	70	122	C	25.5	38	75
Southbound LTR	300	D	50.0	78	136	C	29.7	9	91	D	45.6	8	57	C	34.6	19	91
30. Holland Ln & Eisenhower Ave																	
Overall Intersection (Signalized)		**A**	**7.0**			**A**	**7.2**			**A**	**5.6**			**A**	**6.7**		
Eastbound Left	150	A	2.4	5	67	A	2.3	19	m15	A	4.0	22	74	A	1.8	20	7
Eastbound Right	150	A	0.8	0	0	A	0.0	0	m1	A	0.4	0	m0	A	0.0	0	0
Northbound Left	170	D	35.4	2	9	D	35.7	23	42	D	36.1	3	12	D	35.2	7	19
Northbound Thru	170	D	36.0	36	52	D	37.0	59	86	D	38.2	47	65	D	36.1	17	34
Southbound Thru	260	D	51.2	67	115	D	45.7	34	m58	D	47.7	9	28	D	45.7	39	m56
Southbound Right	260	A	2.0	0	17	A	2.8	4	m0	A	2.1	0	18	A	6.5	22	m2
31. Mill Rd & Driveway/Telegraph Rd Ramp																	
Overall Intersection (All Way Stop)		-	-			-	-			-	-			-	-		
Eastbound LTR	260	B	10.1	-	-	B	12.0	-	-	B	11.2	-	-	B	12.4	-	-
Westbound Left	140	B	10.4	-	-	B	13.0	-	-	B	11.2	-	-	C	13.1	-	-
Westbound TR	140	B	16.0	-	-	B	15.5	-	-	E	50.9	-	-	C	21.9	-	-
Northbound LT	720	B	10.1	-	-	E	10.4	-	-	B	12.8	-	-	E	11.4	-	-
Northbound Right	720	B	10.6	-	-	E	41.5	-	-	B	12.8	-	-	E	48.8	-	-
Southbound Left	790	B	16.2	-	-	F	577.5	-	-	C	28.1	-	-	F	816.5	-	-
Southbound LTR	790	B	11.8	-	-	F	169.0	-	-	C	15.4	-	-	F	314.6	-	-
32. Stovall St & Mill Rd																	
Overall Intersection (Signalized)		**B**	**12.2**			**D**	**46.5**			**B**	**12.8**			**E**	**67.1**		
Eastbound Thru	790	B	11.2	23	#215	C	25.9	60	171	B	14.7	72	#306	C	28.1	72	#217
Eastbound Right	790	A	3.8	0	19	A	9.1	0	14	A	4.7	0	21	A	9.1	0	16
Westbound Left	510	A	6.3	0	39	B	12.5	27	112	A	8.2	5	45	B	13.9	28	115
Westbound Thru	780	A	6.1	4	144	E	76.6	287	#939	A	7.1	33	195	F	120.8	~441	#1052
Northbound Left	300	B	19.8	22	68	C	27.1	96	#260	B	19.3	29	85	C	31.3	113	#313
Northbound Right	310	B	19.4	22	59	B	19.6	0	46	B	18.6	0	59	B	19.5	0	46
33. Stovall St & Pershing Ave/Mandeville Ln																	
Overall Intersection (Signalized)		**B**	**16.8**			**C**	**21.9**			**B**	**18.2**			**C**	**32.6**		
Eastbound Left	230	C	27.0	45	95	C	23.7	49	87	C	27.6	59	118	C	24.7	71	119
Eastbound TR	230	C	30.8	79	187	C	21.5	14	60	C	31.5	96	211	C	21.1	19	68
Westbound LTR	410	C	32.4	28	70	D	42.4	136	223	D	35.3	46	102	D	47.9	176	277
Northbound Left	150	A	7.9	50	134	B	18.5	172	288	B	10.9	104	245	D	54.6	~269	#580
Northbound TR	370	A	9.5	44	134	B	17.0	107	207	B	10.6	50	141	B	19.4	135	233
Southbound Left	100	A	6.5	4	18	B	11.5	4	15	A	7.2	4	18	B	13.0	4	15
Southbound Thru	310	B	14.6	47	130	B	19.6	58	110	C	20.5	71	180	C	22.3	96	157
Southbound Right	310	B	12.9	0	0	B	18.6	0	41	B	17.1	0	0	C	20.1	0	42
34. Swamp Fox Rd & Mandeville Ln																	
Overall Intersection (All Way Stop)		-	-			-	-			-	-			-	-		
Eastbound TR	420	A	9.1	-	-	A	8.8	-	-	B	10.6	-	-	A	9.4	-	-

Intersection (Movement)	Storage Length (ft)	Approved Conditions								Proposed Conditions							
		AM Peak				*PM Peak*				*AM Peak*				*PM Peak*			
		LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th
Westbound LT	230	A	7.8	-	-	A	9.5	-	-	A	8.2	-	-	B	10.6	-	-
Northbound LR	170	A	8.0	-	-	A	9.4	-	-	A	8.4	-	-	A	9.7	-	-
35. Mandeville Ln & Mill Rd																	
Overall Intersection (Signalized)		**B**	**10.7**			**B**	**18.2**			**C**	**20.4**			**C**	**31.9**		
Eastbound LTR	760	B	13.1	84	#591	B	10.9	70	152	C	30.9	~315	#663	D	37.7	~125	#315
Westbound Left	210	A	3.6	1	22	A	3.6	5	17	A	5.5	8	36	A	4.6	10	33
Westbound TR	760	A	2.5	0	108	C	21.3	278	#668	A	3.8	44	148	D	37.8	~450	#784
Northbound LT	130	C	20.7	3	17	C	20.8	30	66	B	20.0	18	41	C	22.9	47	95
Northbound Right	130	B	15.3	3	17	B	12.7	0	19	B	13.1	6	22	B	12.3	0	22
Southbound LTR	130	C	21.4	5	28	B	18.2	5	20	C	20.4	17	43	B	18.2	23	59
36. Mill Rd (East)/Andrews Ln & Mill Rd/Jamieson Ave																	
Overall Intersection (Signalized)		**B**	**19.8**			**C**	**24.1**			**C**	**20.6**			**C**	**25.5**		
Eastbound Left	210	B	12.9	3	13	B	19.2	6	19	B	13.2	4	13	C	20.0	6	19
Eastbound Thru	760	C	23.7	268	#465	C	24.6	125	197	C	25.7	303	#531	C	26.2	160	244
Eastbound Right	760	B	15.2	0	18	C	21.0	0	35	B	15.5	0	26	C	21.3	0	45
Westbound Left	140	B	11.5	28	58	B	13.3	61	103	B	12.4	27	57	B	13.8	62	104
Westbound TR	510	B	12.8	51	118	C	29.2	314	#626	B	14.1	82	176	C	32.2	348	#691
Northbound Left	120	C	20.0	30	63	C	22.7	114	182	C	20.4	44	83	C	23.1	120	188
Northbound LT	190	C	20.2	31	65	C	23.6	120	187	C	20.6	45	86	C	24.0	125	195
Northbound Right	190	C	20.3	0	48	B	19.2	0	39	C	20.2	0	48	B	19.2	0	39
Southbound LTR	630	C	27.6	10	38	C	31.5	11	35	C	28.0	11	38	C	31.5	11	35
37. Dulany St & Jamieson Ave																	
Overall Intersection (Signalized)		**E**	**77.1**			**C**	**29.6**			**F**	**108.6**			**E**	**55.8**		
Eastbound LTR	280	F	132.1	~521	#741	D	54.3	237	#464	F	194.9	~633	#860	F	126.4	~386	#587
Westbound LTR	340	A	9.1	17	38	B	10.9	98	163	A	8.8	19	46	B	11.3	108	177
Northbound LTR	70	B	17.1	19	37	C	20.2	44	72	B	17.1	19	37	C	20.2	44	72
Southbound LTR	350	C	25.2	77	140	C	24.0	27	75	C	27.6	82	157	C	27.8	43	107
38. Holland Ln & Jamieson Ave																	
Overall Intersection (Signalized)		**B**	**12.0**			**C**	**27.0**			**B**	**12.9**			**E**	**57.7**		
Eastbound LTR	350	B	16.2	52	98	B	17.7	66	120	B	16.9	62	113	B	18.5	79	118
Westbound LTR	1220	C	22.1	71	139	E	57.2	121	#277	C	24.1	78	152	F	183.0	~225	#386
Northbound LTR	210	B	10.7	67	115	C	25.0	110	167	B	11.6	91	147	C	26.7	134	241
Southbound LTR	340	A	5.5	34	45	B	13.2	84	150	A	4.7	27	28	B	15.7	138	m152
39. Port St & Dock St																	
Overall Intersection (All Way Stop)		-	-			-	-			-	-			-	-		
Eastbound LTR	240	A	7.8	-	-	A	9.2	-	-	A	7.8	-	-	A	9.1	-	-
Westbound LTR	360	A	7.0	-	-	A	8.4	-	-	A	7.0	-	-	A	8.3	-	-
Northbound LTR	240	A	7.6	-	-	A	8.4	-	-	A	7.6	-	-	A	8.3	-	-
Southbound LTR	240	A	7.6	-	-	B	13.6	-	-	A	7.7	-	-	B	13.6	-	-
40. Mill Rd & Dock St																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
Eastbound LR	360	B	14.7	-	18	F	63.6	-	252	C	15.2	-	21	F	80.9	-	284
Northbound Left	-	A	7.6	-	0	A	9.1	-	4	A	7.7	-	0	A	9.3	-	4
Northbound Thru	-	A	0.0	-	0	A	0.0	-	0	A	0.0	-	0	A	0.0	-	0
Southbound TR	-	A	0.1	-	0	0	1.8	-	0	A	0.0	-	0	0	0.0	-	0
41. Mill Rd/Mill Rd (East) & Carlyle Apartments																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
Westbound LR	550	C	16.1	-	13	B	15.3	-	9	C	17.5	-	16	C	17.6	-	15
Southbound LT	260	A	2.3	-	2	A	2.5	-	5	A	2.9	-	3	A	2.8	-	6
42. Telegraph Rd & Duke St Ramp to Telegraph Rd/NB Telegraph Rd to EB Duke St																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
43. I-95 Express Ramp & Telegraph Rd Ramp																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
44. WB Ramp to I-495 & I-95 Express Ramp																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
45. Telegraph Rd & Huntington Ave																	
Overall Intersection (Signalized)		**B**	**14.7**			**C**	**23.8**			**B**	**15.4**			**C**	**24.5**		
Westbound Left	270	D	35.9	94	148	F	81.3	354	442	D	35.3	93	148	F	80.7	363	449
Westbound Thru	500	D	47.9	184	269	F	88.9	360	454	D	48.2	192	283	F	88.7	369	464

Intersection (Movement)	Storage Length (ft)	Approved Conditions								Proposed Conditions							
		AM Peak				*PM Peak*				*AM Peak*				*PM Peak*			
		LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th	LOS	Delay	Queue (ft) 50th	95th
Westbound Right	500	D	45.3	175	255	F	83.5	328	414	D	44.4	177	260	F	82.9	335	421
Northbound TR	230	B	12.0	720	#823	B	15.5	677	768	B	13.1	756	#877	B	16.7	711	807
Southbound TR	350	A	7.2	89	127	B	15.5	653	848	A	7.6	96	132	B	16.8	714	923
46. Telegraph Rd & N Kings Hwy																	
Overall Intersection (Signalized)		**C**	**26.7**			**C**	**27.3**			**C**	**28.4**			**C**	**27.6**		
Eastbound Right	-	C	26.2	0	0	E	78.5	72	133	C	25.5	0	0	E	77.6	71	133
Westbound Left	205	D	48.3	47	90	F	93.5	207	288	D	48.3	47	90	F	93.5	207	288
Westbound Right	620	C	26.6	349	390	E	78.6	534	615	C	26.4	356	411	E	79.6	550	639
Northbound TR	250	C	31.4	483	#656	B	15.5	339	385	C	34.6	511	#674	B	16.0	346	284
Southbound TR	280	B	15.0	96	110	B	13.5	698	299	B	15.5	97	111	B	13.7	723	260
47. I-495 Off-Ramp																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
48. Ramp from Telegraph Rd & I-495 Off-Ramp																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
49. I-495 WB Ramp & Telegraph Road																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
50. Telegraph Rd & Telegraph Rd Ramp/Pershing Ave																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
Eastbound Right	180	A	7.4	-	20	D	30.7	-	424	A	7.5	-	25	F	64.0	-	739
Westbound Right	600	F	183.2	-	437	F	314.1	-	1121	F	408.6	-	864	F	537.6	-	1853
71. W Taylor Run Pkwy & Duke Street Access Road																	
Overall Intersection (Signalized)		**D**	**46.0**			**E**	**79.2**			**E**	**61.2**			**E**	**91.7**		
Eastbound LTR	70	B	12.3	8	46	B	14.1	4	43	B	12.6	9	46	B	14.1	4	43
Westbound LTR	310	B	12.7	19	71	--	--	--	--	B	12.9	20	71	--	--	--	--
Northbound LTR	50	A	5.4	16	m12	C	24.2	77	m106	A	7.0	46	m31	C	32.8	100	m106
Southbound LT	680	F	99.2	~270	#465	F	133.3	~386	#588	F	129.2	~333	#526	F	152.3	~414	#618
Southbound Right	680	D	40.1	0	0	D	37.6	0	0	D	40.1	0	0	D	37.6	0	0
102. Duke Street & Dove St (southern node)																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
Eastbound LR	130	B	10.8	-	42	B	10.9	-	35	B	10.8	-	42	B	10.9	-	35
104. Duke Street & Roberts Ln (northern node)																	
Overall Intersection (Unsignalized)		-	-			-	-			-	-			-	-		
Eastbound LTR	490	A	8.7	-	4	A	8.6	-	4	A	8.7	-	4	A	8.6	-	4
Westbound LTR	150	A	9.5		3	B	10.6		10	A	9.5		3	B	10.6		10
Northbound LT	50	A	2.4	-	0	A	6.9	-	2	A	2.4	-	0	A	6.9	-	2

m - Volume for 95th percentile queue is metered by upstream signal
- 95th percentile volume exceeds capacity; queue may be longer
~ - Volume exceeds capacity, queue is theoretically infinite

Mitigations

Based on City of Alexandria standards and as outlined in the approved scoping document, the proposed development is considered to have an impact at an intersection if the any of the following conditions are met:

- The capacity analyses show a LOS E or F at an intersection or along a movement in the future with the proposed development where one does not exist in the Approved conditions;
- There is an increase in delay at any movement or overall intersection operating under LOS E or F of greater than 10 percent when compared to the Approved conditions; or
- There is an increase in the 95th percentile queues by more than 150 feet at an intersection or along a movement where queues exceed available storage in the future conditions with the proposed development where one does not exist in the approved scenario.

Following these guidelines, there are impacts to 25 intersections as a result of the proposed development. Mitigation measures were tested at these intersections, with results shown for the morning peak hour on Table 18 and the afternoon peak hour on Table 19, with detailed Synchro and VISSIM reports included in the Technical Appendix.

Mitigation measures were determined first using Synchro and then verified based on the VISSIM analysis for the intersections included in the VISSIM study area. In locations where mitigation measures differ between the Synchro and VISSIM analyses, the VISSIM mitigation measures were recommended due to the increased level of definition that VISSIM provides as a microsimulation tool. The VISSIM analyses also included network-wide MOEs, whereas Synchro capacity analysis results are reported on an intersection by intersection basis. Therefore, a limited number of locations may show increased delay and/or queuing when comparing individual movements in VISSIM or Synchro.

The mitigation measures listed below include those identified using both Synchro and VISSIM. Unless otherwise noted, the comparisons of delay and queuing results outlined below are based on the results of the Synchro analysis. Additional information on the VISSIM microsimulation analysis results are presented in a subsequent section of this report.

It should be noted that a number of modifications to lane configurations along Eisenhower Avenue between Stovall Street/I-495 Ramp and Mill Road (east) have been identified based on the results of the VISSIM analysis. As discussed in a previous section of this report, StreetLight InSight® data was used to determine that approximately 50% of traffic entering or exiting the EESAP in the morning peak and 47% of traffic entering or exiting the EESAP in the afternoon peak is cut-through traffic. One of the predominant routes used to cut through the EESAP area is along this section of Eisenhower Avenue, which connects the I-495 off-ramp at Stovall Street, and the I-495 Express Lanes via Mill Road (east). In order to provide a conservative analysis, no cut-through trips were removed from the traffic volumes in the analysis; therefore, the eastbound volumes along Eisenhower Avenue at this section may be overestimated. Monitoring of this corridor is recommended before these modifications are implemented, to determine if observed volumes are in line with forecasted volumes.

The following conclusions were made:

- *Density Reduction*

  Based on the results of the initial Synchro analysis, with mitigation measures identified for the intersections within the study area, traffic operations with proposed development will improve or are consistent with the approved development scenario at many intersections, and in some cases improves or is similar to existing conditions. Nevertheless, there were still certain locations projected to experience delay and queuing issues.

  The additional VISSIM analysis showed the need for reduced density or a change in land use to decrease the number of inbound morning trips or outbound evening trips, consistent with patterns generated by office.

  As shown in Table 20, a reduction in density or change in land use was identified as a mitigation measure for the following parcels:

  Block 2 – Reduction of 250,000 square feet of office;

  Block 3 - Reduction of 250,000 square feet of office;

  Blocks 9A/9B – Conversion of 300,000 square feet from office to residential; and

  Blocks 11/12 – Conversion of 300,000 square feet from residential to senior housing.

In addition, trips were rerouted within the network to account for the changes in density. The 2030 volumes including the reduction in density are shown in Figure 53, Figure 54, and Figure 55.

- Duke Street & N Quaker Lane (Int. 1)

Under the 2030 Proposed Conditions, the southbound left operates at LOS F in both the morning and afternoon peak periods. Delay for the southbound left increases by more than 10 percent over the Approved Conditions during the morning and afternoon peak periods.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments.

- Duke Street & Alexandria Commons (west) (Int. 3)

Under the 2030 Proposed Conditions, delay for the eastbound left increases to LOS E from LOS D in the Approved Conditions during the morning peak period, and to LOS F from LOS E during the afternoon peak period. Delay for the eastbound left increases by more than 10 percent over the Approved Conditions during the morning and afternoon peak periods.

The increase in delay at this intersection attributable to the proposed development can be mitigated by changing the eastbound left and westbound left movements to protected in both the morning and afternoon peak hours.

With mitigation, the eastbound left movement will operate at LOS E during the morning peak hour. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.

The increase in vehicular trips attributable to the proposed development at this intersection are all either eastbound or westbound thru trips, which increases the average delay experienced by relatively few vehicles that make the eastbound left turn (40 vehicles in the morning peak hour and 62 vehicles in the afternoon peak hour) and relatively few vehicles that make the westbound left turn (0 in the morning peak hour and 7 vehicles in the afternoon peak hour). A number of mitigations were tested at this intersection, and in all cases mitigations to improve this movement was overly detrimental to throughput on Duke Street.

- Duke Street & Alexandria Commons (east) (Int. 4)

Under the 2030 Proposed Conditions, there is an increase in the 95th percentile queues by more than 150 feet for the eastbound thru/right movement which exceeds its storage length in the morning peak hour. During the afternoon peak hour, delay for the eastbound left increases to LOS E from LOS D in the Approved Conditions.

The increase in delay and queuing issues at this intersection attributable to the proposed development can be mitigated by changing the eastbound left and westbound left phases from leading to lagging.

The increase in vehicular trips attributable to the proposed development at this intersection are all either eastbound or westbound thru trips, which increases the average delay experienced by relatively few vehicles that make the eastbound left turn (52 vehicles in the morning peak hour and 29 vehicles in the afternoon peak hour) and relatively few vehicles that make the westbound left turn. (22 in the morning peak hour and 27 vehicles in the afternoon peak hour)

- Duke Street & Roth Street/Cambridge Road (Int. 5)

Under the 2030 Proposed Conditions, delay for the overall intersection and the eastbound through/right increases to LOS E from LOS D in the Approved Conditions during the morning peak period. Delay for the westbound through also increases by more than 10 percent over the Approved Conditions during the morning peak periods.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments.

- With mitigation, the eastbound left movement will operate at LOS E during the afternoon peak hour. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.
  Duke Street & West Taylor Run (Int. 7 & 71)

At the intersection of Duke Street and West Taylor Run, under the 2030 Proposed Conditions during the morning peak hour, delay for the overall intersection, eastbound right, westbound right, and southbound left/thru movements increases by more than 10 percent over the Approved Conditions, delay for the westbound thru movement increases to LOS E from LOS D, and there is an increase in the 95th percentile queues by more than

150 feet for the eastbound right movement which exceeds its storage length. During the afternoon peak hour, delay for overall intersection, eastbound right, westbound right, and southbound left/thru movements increases by more than 10 percent over LOS E in the Approved Conditions, and delay for the westbound thru movement increases to LOS E from LOS D.

At the intersection of West Taylor Run and Duke Street Frontage Road, under the 2030 Proposed Conditions, delay for the overall intersection increased to LOS E from LOS D in the in the Approved Condition, and delay for the southbound left/thru increased by more than 10 percent over LOS F in the Approved Conditions during the morning peak hour. During the afternoon peak hour, delay for the overall intersection increased by more than 10 percent over LOS E in the Approved Conditions, and delay for the southbound left/thru increased by more than 10 percent over LOS F in the Approved Conditions.

The increase in delay and queuing issues at this clustered intersection attributable to the proposed development can be mitigated by: (1) removing the pedestrian only phase and adding pedestrian phases to the protected eastbound left phase and the westbound thru phase; (2) adding a protected westbound thru/right phase; and (3) signal timing adjustments.

Based on the VISSIM microsimulation analysis, the following additional mitigation measure was identified: (4) restriping the southbound left/thru lane to a left turn lane (to eastbound Duke Street) and a thru/right (to the Telegraph Road ramp and to westbound Duke Street);

- Duke Street & Telegraph Road Ramps (Int. 8 & 9)

This intersection does not meet the thresholds required for mitigation due to the proposed development based on the Synchro analysis; however, the need for operational and geometrical improvements was identified by the VISSIM microsimulation analysis.

Based on the VISSIM microsimulation analysis, the following improvements were identified: (1) converting the intersection from an unsignalized merge to a traffic signal; and (2) restriping the Telegraph Road Ramps to include two lanes at the intersections with Duke Street.

VISSIM results are discussed in more detail in a subsequent section of this report.

- Duke Street & Dove Street/Roberts Lane (Int.10)

This intersection does not meet the thresholds required for mitigation due to the proposed development based on the Synchro analysis.

Based on additional VISSIM microsimulation analysis, the following improvements were identified: (1) convert the signal from actuated-uncoordinated to actuated-coordinated; (2) adjust cycle length to be consistent with other signals along the Duke Street corridor; and (3) signal timing adjustments.

With mitigation, the northbound left/thru/right movement will operate at LOS E during the afternoon peak hour. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.

VISSIM results are discussed in more detail in a subsequent section of this report.

- Duke Street & Callahan Drive (Int. 11)

Under the 2030 Proposed Conditions, delay for the southbound left movement increases by more than 10 percent over LOS F in the Approved Conditions during the morning peak hour. During the afternoon peak hour, delay for the eastbound left movement increases by more than 10 percent over LOS E in the Approved Conditions.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments. With mitigation, the southbound left movement will operate at LOS E during the afternoon peak hour. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.

- Duke Street & Dulany Street / Diagonal Road (Int. 12)

Under the 2030 Proposed Conditions, delay for the overall intersection and for the eastbound thru movement increase to LOS E from LOS D in the Approved Conditions in the morning peak hour. During the afternoon peak hour, delay for the northbound left movement increases by more than 10 percent over LOS E in the Approved Conditions.

The increase in delay at this intersection attributable to the proposed development can be mitigated by: (1) restriping the dual westbound left turn lanes to a single

westbound left turn lane and a westbound thru lane; (2) switching the eastbound thru phase from lagging to leading; and (3) signal timing adjustments.

- With mitigation, the eastbound left movement and southbound thru/right will operate at LOS E during the afternoon peak hour. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations. Duke Street & Reinekers Lane / Holland Lane (Int. 14 & 15)

Under the 2030 Proposed Conditions, during the afternoon peak hour delay for the westbound left movement at Holland Lane increases to LOS E from LOS D in the Approved Conditions.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments.

With mitigation, the westbound left movement and northbound right will operate at LOS E during the afternoon peak hour. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.

- Duke Street & Daingerfield Road / S Peyton Street (Int. 16 & 17)

Under the 2030 Proposed Conditions, delay for the for the eastbound left movement at S Peyton Street increases to LOS E from LOS D in the Approved Conditions in the morning peak hour.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments.

- Duke Street & S West Street (Int. 18)

Under the 2030 Proposed Conditions, delay for the northbound left/thru movement increases by more than 10 percent over LOS F in the Approved Conditions. During the afternoon peak hour, delay for the overall intersection increases to LOS E from LOS C in the Approved Conditions, delay for westbound left and southbound movement increases by more than 10 percent over LOS E in the Approved Conditions, and there is an increase in the 95th percentile queues by more than 150 feet for the westbound left movement which exceeds its storage length.

The increase in delay and queuing issues at this intersection attributable to the proposed development can be mitigated by adding a westbound protected left turn phase and making signal timing adjustments.

- Duke Street & S Henry Street (Int. 19)

Under the 2030 Proposed Conditions delay for the eastbound right movement increases by more than 10 percent over LOS E in the Approved Conditions during the afternoon peak hour.

The increase in delay at this intersection attributable to the proposed development can be mitigated by adding a westbound protected permissive left turn ("Dallas") display and through signal timing adjustments.

- Duke Street & S Patrick Street (Int. 20)

Under the 2030 Proposed Conditions, delay for the westbound thru movement increases by more than 10 percent over LOS E in the Approved Conditions during the morning peak hour. During the afternoon peak hour delay for the overall intersection increases to LOS E from LOS D in the Approved Conditions and the delay for the westbound thru movement increases by more than 10 percent over LOS F in the Approved Conditions.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments.

- Eisenhower Avenue & Mill Road (west) (Int. 21)

Under the 2030 Proposed Conditions, delay for the eastbound left movement increases by more than 10 percent over LOS F in the Approved Conditions during the afternoon peak hour.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments.

- Eisenhower Avenue & Stovall Street (Int. 22)

Under the 2030 Proposed Conditions, delay for the northbound left/thru movement increases to LOS F from LOS D in the Approved Conditions in the morning peak hour. During the afternoon peak hour, delay for the northbound right movement increases to LOS F from LOS D in the Approved Conditions, the delay for the eastbound left movement increases by more than 10 percent over LOS F in the Approved Conditions, and

there is an increase in the 95th percentile queues by more than 150 feet for the northbound right movement which exceeds its storage length.

The increase in delay and queuing issues at this intersection attributable to the proposed development can be mitigated by: (1) adding an eastbound protected permissive left turn ("Dallas") display; (2) changing the westbound left and northbound right overlap to lagging from leading; and (3) signal timing adjustments.

Based on additional VISSIM microsimulation analysis, the following additional mitigation measures were identified: (4) converting the northbound approach from a left/thru, thru, and right turn lane to a left/thru, thru/right, and right turn lane; and (5) relocate the crosswalk across Eisenhower Avenue from the east side to the west side of the intersection.

With the mitigation measures identified above, the northbound left/thru will operate at LOS F during the morning peak hour; however, the northbound right will improve to LOS D, and the delay and queuing for the northbound approach will improve significantly overall. The northbound right will operate at LOS E during the afternoon peak hour with the mitigation measures identified. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.

VISSIM results are discussed in more detail in a subsequent section of this report.

- Eisenhower Avenue & Swamp Fox Road (Int. 23)

This intersection does not meet the thresholds required for mitigation due to the proposed development; however, as requested by the City of Alexandria, the prioritization of pedestrian crossing at this intersection was explored.

As a result: (1) Leading Pedestrian Intervals were added to each of the pedestrian crossings at this intersection.

Based on the VISSIM microsimulation analysis, the following additional mitigation measures were identified: (2) restriping and modifications to the median to convert the eastbound approach from a left, thru, and thru/right to a left/thru, thru, and thru/right; (3) restriping and modifications to the median to convert the westbound approach from a left, two thru lanes, and a thru/right to a left, thru, and thru/right; (4) relocate the bus shelter along Eisenhower Avenue from the near side to the far side of the intersection; and (5) signal timing adjustments.

VISSIM results are discussed in more detail in a subsequent section of this report.

- Eisenhower Avenue & Mill Race Lane (Int. 24)

This intersection does not meet the thresholds required for mitigation due to the proposed development based on the Synchro analysis.

Based on additional VISSIM microsimulation analysis, the following mitigation measures were identified: (1) restriping and modifications to the median to provide an additional eastbound thru lane; and (2) signal timing adjustments.

VISSIM results are discussed in more detail in a subsequent section of this report.

- Eisenhower Avenue & Mill Road (east) (Int. 25)

Under the 2030 Proposed Conditions, delay for the eastbound left movement increases by more than 10 percent over LOS E in the Approved Conditions during the morning and afternoon peak hour.

In addition, as requested by the City of Alexandria this report examined whether dual WB left-turn lanes and dual receiving lanes at the southern leg of the intersection are needed.

The increase in delay at this intersection attributable to the proposed development can be mitigated by: (1) restriping the dual westbound left turn lanes to a single westbound left turn lane and a westbound thru lane; (2) widening the northbound approach to include separate left turn, thru, and right turn lanes; (3) adding an northbound right turn overlap to the westbound protected left turn phase; and (4) signal timing adjustments.

Based on additional VISSIM microsimulation analysis, the following additional mitigation measures were identified: (5) restriping and modifications to the median to convert the eastbound approach from a left, thru, and thru/right lane to a left, two thru lanes, and a right turn lane; and (6) restriping and modifications to the median to convert the westbound approach from a left, two thru

lanes, and thru/right lane to a left, two thru lanes, and a right turn lane.

- VISSIM results are discussed in more detail in a subsequent section of this report. Eisenhower Avenue & Elizabeth Lane (Int. 26)

Under the 2030 Proposed Conditions, delay for the northbound left/thru/right movement increases to LOS F from LOS D in the Approved Conditions in the afternoon peak hour.

The increase in delay at this intersection attributable to the proposed development can be mitigated by converting the signal from actuated-coordinated to pretimed and through signal timing adjustments.

In addition to the operational improvements at this intersection, converting the signal at this intersection from actuated-coordinated to pretimed would further the City's goal of making city streets a complete network rather than a series of major corridors for commuter traffic. More predictable and frequent signal cycles provide more consistent gaps for cross streets and more consistent crossing opportunities for pedestrians and bicycles, while long or unpredictable cycle lengths may increase pedestrian and bicycle non-compliance and risk-taking behavior.

- Eisenhower Avenue & USPTO Ped Crossing (Int. 27)

Under the 2030 Proposed Conditions, there is an increase in the 95th percentile queues by more than 150 feet for the northbound left/thru/right movement which exceeds its storage length.

The increase in queuing at this intersection attributable to the proposed development can be mitigated by converting the signal from actuated-coordinated to pretimed and through signal timing adjustments.

In addition to the operational improvements at this intersection, converting the signal at this intersection from actuated-coordinated to pretimed would further the City's goal of making city streets a complete network rather than a series of major corridors for commuter traffic. More predictable and frequent signal cycles provide more consistent gaps for cross streets and more consistent crossing opportunities for pedestrians and bicycles, while long or unpredictable cycle lengths may increase pedestrian and bicycle non-compliance and risk-taking behavior.

- Mill Road & Telegraph Road Ramp/Driveway (Int. 31)

Under the 2030 Proposed Conditions, delay for the westbound thru/right movement increases to LOS F from LOS B in the Approved Conditions in the morning peak hour. During the afternoon peak hour, the northbound right movement increases by more than 10 percent over LOS E in the Approved Conditions, and the southbound left and southbound left/thru/right increase by more than 10 percent over LOS F in the Approved Conditions.

The increase in delay at this intersection attributable to the proposed development can be mitigated by converting the intersection from all-way stop controlled to a traffic signal. In addition to signalizing the intersection, the westbound approach should be re-striped to include a thru-left lane and a right-turn lane, and the southbound approach should be reconfigured to include dual left-turn lanes and a thru-right lane.

Based on the VISSIM microsimulation analysis, an additional mitigation measure to provide a second northbound right turn lane was identified. With mitigation, the eastbound left/thru/right movement will operate at LOS E during the morning and afternoon peak hours. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.

VISSIM results are discussed in more detail in a subsequent section of this report.

- Stovall Street and Mill Road (Int. 32)

Under the 2030 Proposed Conditions, delay for the overall intersection increases to LOS E from LOS D in the Approved Conditions, and delay for the westbound thru movement increases to LOS F from LOS E in the Approved Conditions in the afternoon peak hour.

The increase in delay and queuing issues at this intersection attributable to the proposed development can be mitigated by: (1) removing the pedestrian only phase and adding pedestrian phases to the northbound phase and the eastbound thru phase; (2) converting the signal from semi actuated-uncoordinated to pretimed; and (3) signal timing adjustments including reducing the cycle length.

In addition to the operational improvements at this intersection, reducing the cycle length and converting the signal at this intersection from semi actuated-uncoordinated to pretimed would further the City's goal of making city streets a complete network rather than a series of major corridors for commuter traffic. More predictable and frequent signal cycles provide more consistent gaps for cross streets and more consistent crossing opportunities for pedestrians and bicycles, while long or unpredictable cycle lengths may increase pedestrian and bicycle non-compliance and risk-taking behavior.

- Stovall Street and Pershing Avenue/Mandeville Lane (Int. 33)

Under the 2030 Proposed Conditions, there is an increase in the 95th percentile queues by more than 150 feet for the northbound left movement which exceeds its storage length in the afternoon peak hour.

The increase in delay at this intersection attributable to the proposed development can be mitigated by: (1) converting the signal from semi actuated-uncoordinated to pretimed, (2) increasing the cycle length: (3) and through signal timing adjustments.

In addition to the operational improvements at this intersection converting the signal at this intersection from semi actuated-uncoordinated to pretimed would further the City's goal of making city streets a complete network rather than a series of major corridors for commuter traffic. More predictable signal cycles provide more consistent gaps for cross streets and more consistent crossing opportunities for pedestrians and bicycles, while long or unpredictable cycle lengths may increase pedestrian and bicycle non-compliance and risk-taking behavior.

- Dulany Street and Jamieson Avenue (Int. 37)

Under the 2030 Proposed Conditions, delay for the overall intersection increases to LOS F from LOS E in the Approved Conditions, and delay for the eastbound left/thru/right movement increases by more than 10 percent over LOS F in the Approved Conditions during the morning peak hour. During the afternoon peak hour, delay for the overall intersection increases to LOS E from LOS C in the Approved Conditions, and delay for the eastbound left/thru/right movement increases to LOS F from LOS D in the Approved Conditions.

The increase in delay at this intersection attributable to the proposed development can be mitigated by reconfiguring the eastbound approach to include a permitted/protected left-turn and a thru-right lane. This can be done by removing approximately 50 feet (~2 parking spaces) of on-street parking on Jamieson Avenue. In addition,

With mitigation, the eastbound left movement will operate at LOS E during the afternoon peak hour. LOS E is above the target of LOS D; however, LOS E is generally considered acceptable for urban locations.

- Holland Lane and Jamieson Avenue (Int. 38)

Under the 2030 Proposed Conditions, delay for the overall intersection increases to LOS E from LOS C in the Approved Conditions, and delay for the westbound left/thru/right movement increases to LOS F from LOS E in the Approved Conditions during the afternoon peak hour.

The increase in delay at this intersection attributable to the proposed development can be mitigated through signal timing adjustments.

- Mill Road and Dock Street (Int. 40)

Under the 2030 Proposed Conditions, delay for the eastbound left/right movement increases by more than 10 percent over LOS F in the Approved Conditions during the afternoon peak hour.

The increase in delay at this intersection attributable to the proposed development can be mitigated by converting the intersection from stop controlled to a traffic signal.

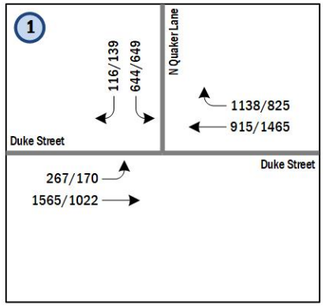
- Telegraph Road and Telegraph Road Ramps (Int. 50 & 51)

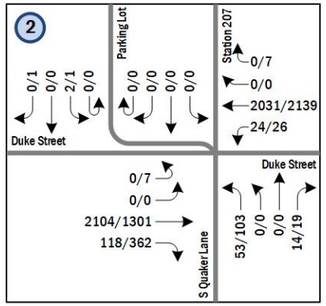
Under the 2030 Proposed Conditions, delay for the westbound right movement increases by more than 10 percent over LOS F in the Approved Conditions during the morning peak hour, and there is an increase in the 95th percentile queues by more than 150 feet for the westbound right movement which exceeds its storage length. During the afternoon peak hour, delay for the eastbound right movement increases to LOS F from LOS D in the Approved Conditions, the westbound right

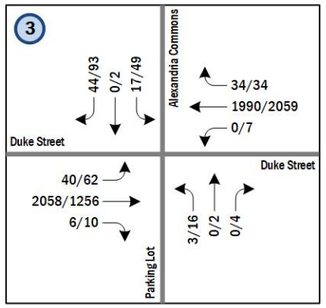
movement increases by more than 10 percent over LOS F in the Approved Conditions, and there is an increase in the 95th percentile queues by more than 150 feet for the eastbound and westbound right movements which exceeds its storage length.

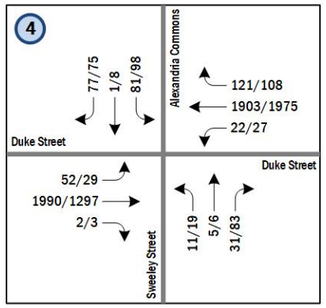
The increase in delay at this intersection attributable to the proposed development can be mitigated by adding a traffic signal along northbound Telegraph Road. In addition to signalizing the intersection, the westbound approach should be reconfigured to include dual right-turn lanes.

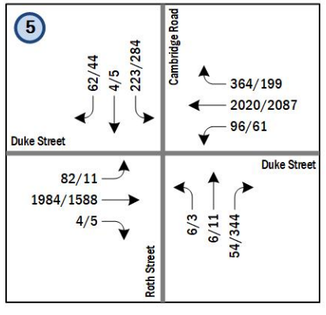
Signalizing the intersection of northbound Telegraph Road and the Pershing Avenue ramps will create a metering effect on traffic at this location, creating the gaps necessary for vehicles attempting to merge onto Telegraph Road. In addition, the installation of a traffic signal would give the City the flexibility to modify the phasing of the signal in the future. This includes adjustments to phasing due to special events or due to changes in development and traffic patterns. Lane configurations and traffic controls for the 2030 Future Proposed scenario with mitigations are shown on Figure 56, Figure 57, and Figure 58.

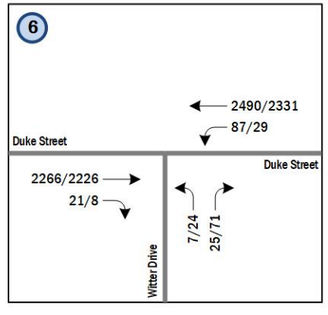


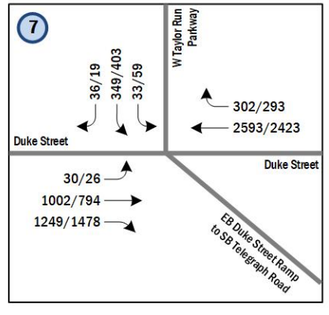


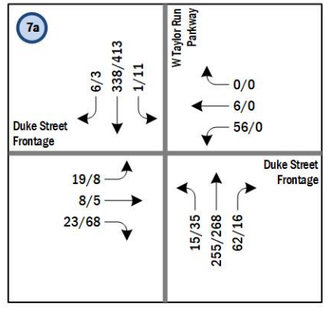


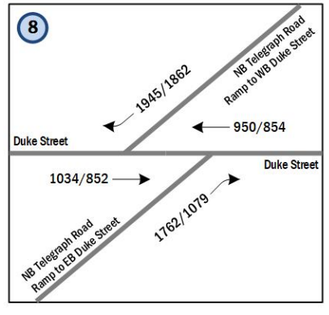


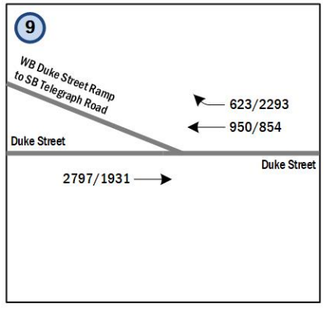


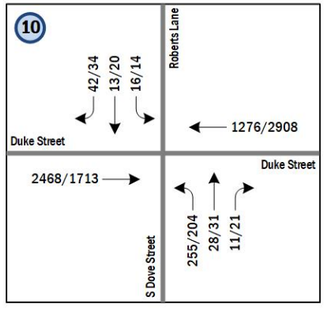


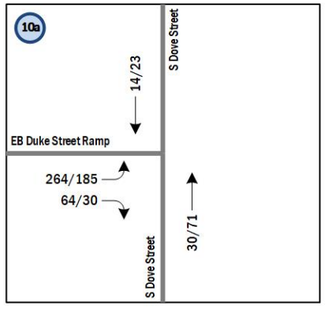


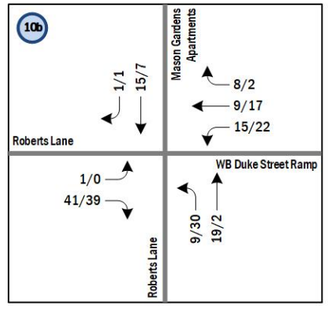


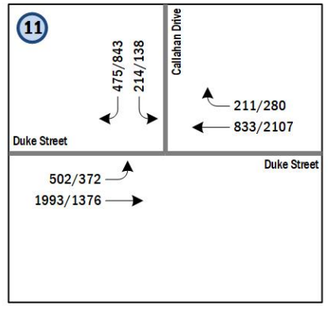


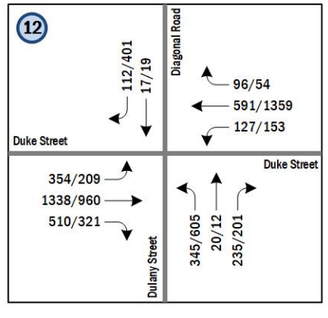


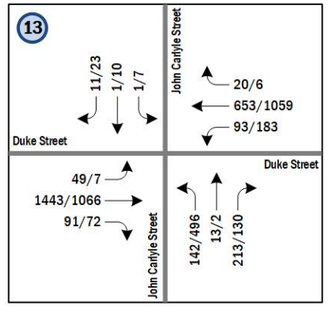


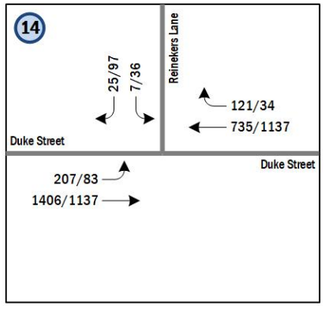












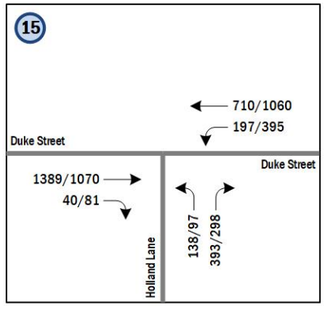
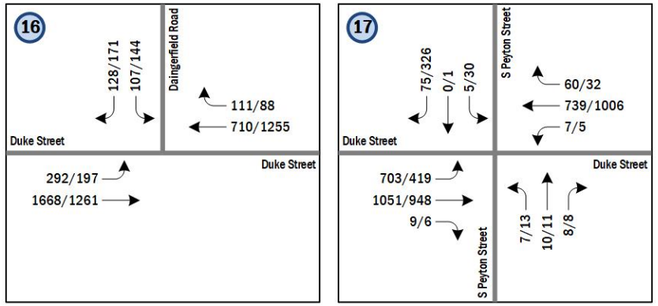


Figure 53: 2030 Mitigated Vehicle Peak Hour Volumes (Intersections 1 – 15)



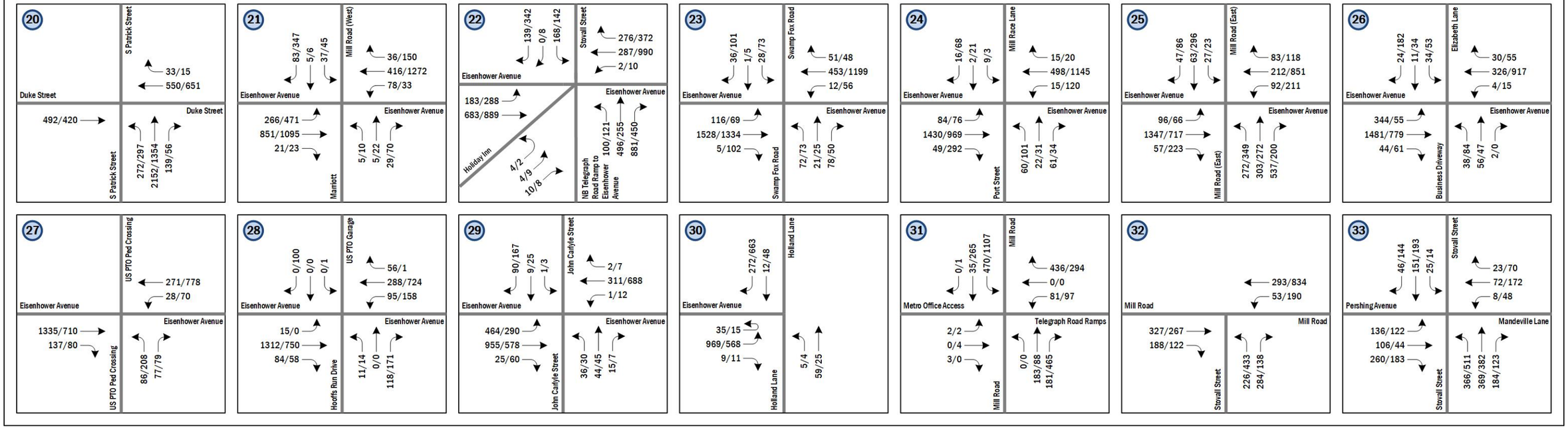
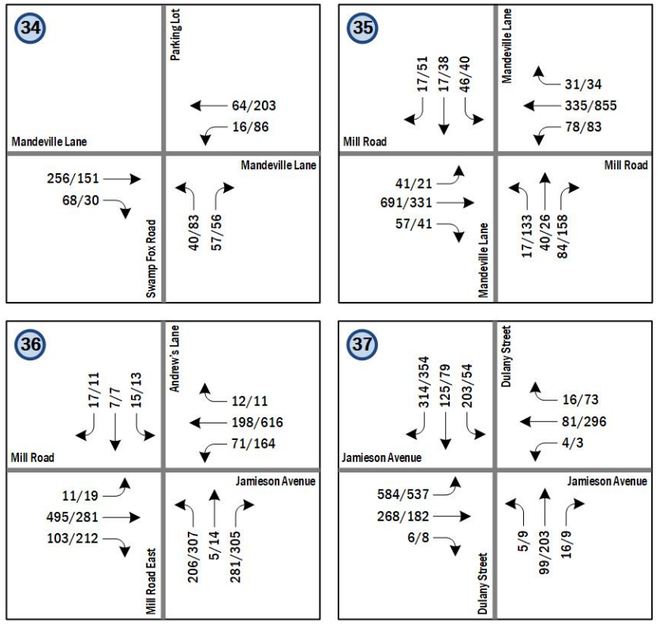


Figure 54: 2030 Mitigated Vehicle Peak Hour Volumes (Intersections 16 – 33)



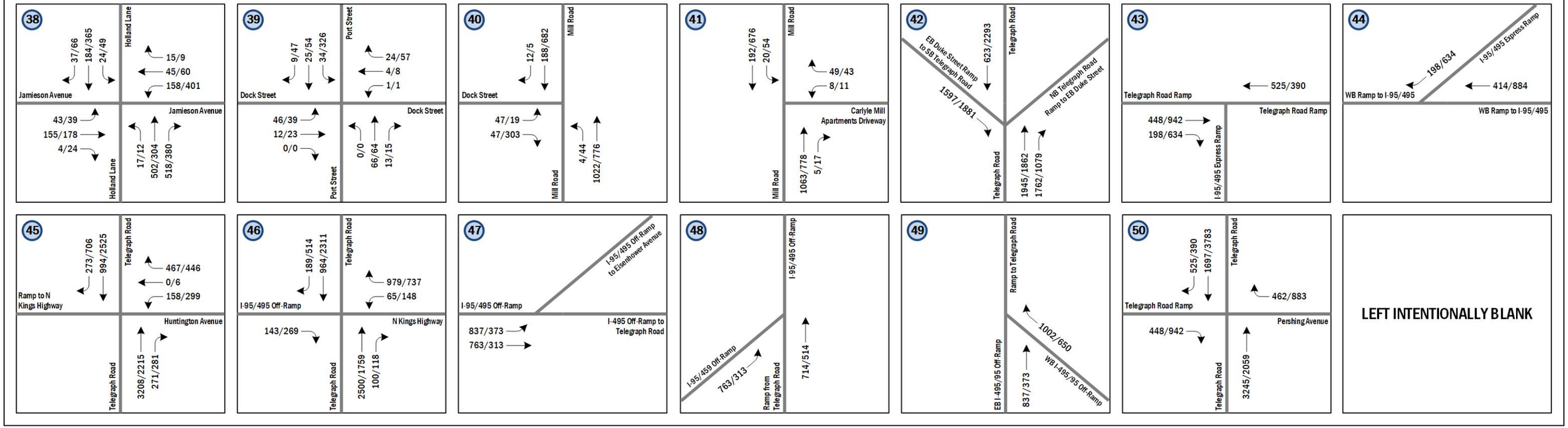


Figure 55: 2030 Mitigated Vehicle Peak Hour Volumes (Intersections 34 – 50)

Table 18: 2030 Proposed (Mitigated) Conditions Capacity Analysis Results (AM Peak)

	Intersection (Movement)	Storage Length (ft)	AM Peak										
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
1	**Duke St & N Quaker Ln**													
	Overall Intersection (Signalized)		**C**	**32.5**			**D**	**36.7**			**C**	**24.9**		
	Eastbound Left	210	B	14.4	74	126	B	15.1	74	134	C	22.6	91	#189
	Eastbound Thru	390	A	8.7	194	224	A	8.8	206	238	B	12.4	246	284
	Westbound Thru	350	B	12.6	72	151	B	13.0	122	154	B	19.5	178	235
	Westbound Right	350	B	16.9	937	#1153	B	19.7	973	#1223	C	21.0	977	#1220
	Southbound Left	1290	F	136.2	~367	#493	F	156.1	~395	#522	E	64.1	311	#443
3	**Duke St & Alexandria Commons**													
	Overall Intersection (Signalized)		**A**	**5.8**			**A**	**5.1**			**A**	**5.3**		
	Eastbound Left	110	D	52.8	0	m0	E	58.9	0	m0	E	67.9	35	m37
	Eastbound TR	220	A	2.9	1	184	A	3.2	1	m195	A	3.7	1	m194
	Westbound Left	320	-	-	-	-	-	-	-	-	-	-	-	-
	Westbound TR	530	A	6.4	489	#1021	A	4.6	106	#1073	A	4.2	17	#1073
	Northbound LTR	150	D	49.8	2	11	D	49.8	2	11	D	49.8	2	11
	Southbound LTR	210	D	49.9	0	26	D	49.9	0	26	D	49.9	0	26
4	**Sweeley St/Alexandria Commons & Duke St**													
	Overall Intersection (Signalized)		**B**	**15.6**			**B**	**11.5**			**B**	**10.8**		
	Eastbound Left	200	C	30.2	10	m30	C	33.8	10	m27	C	28.2	8	m18
	Eastbound TR	560	B	10.8	244	#577	B	11.9	284	#1025	B	11.1	313	#685
	Westbound Left	70	B	12.1	3	m11	C	26.2	1	m1	A	9.6	0	m0
	Westbound TR	250	B	16.6	536	m#1046	A	6.7	114	m50	A	6.2	111	m63
	Northbound LTR	230	D	46.3	12	45	D	46.3	12	45	D	46.3	12	45
	Southbound LT	100	D	50.3	66	110	D	50.3	66	110	D	50.3	66	110
	Southbound Right	100	D	45.9	0	43	D	45.9	0	43	D	46.0	1	44
5	**Roth St/Cambridge Rd & Duke St**													
	Overall Intersection (Signalized)		**D**	**51.5**			**E**	**62.5**			**D**	**42.2**		
	Eastbound Left	110	D	53.2	67	m118	D	47.3	72	m89	D	53.0	73	m94
	Eastbound TR	370	D	52.8	~938	#1147	E	66.9	~1015	#1218	D	47.9	~963	#1108
	Westbound Left	240	D	41.5	24	101	D	41.5	24	m100	D	48.1	40	m104
	Westbound Thru	670	E	57.8	~1011	#1112	E	70.6	~1073	#1173	D	39.6	~983	#1121
	Westbound Right	670	A	9.4	210	50	A	9.1	193	60	A	4.6	38	95
	Northbound LTR	150	D	37.7	42	82	D	37.7	42	82	D	38.4	42	84
	Southbound LT	40	E	63.6	178	#299	E	63.6	178	#299	E	69.8	181	#317
	Southbound Right	40	D	37.5	41	80	D	37.5	41	80	D	38.2	42	82
7	**Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St**													
	Overall Intersection (Signalized)		**E**	**55.6**			**E**	**74.2**			**D**	**42.0**		
	Eastbound Left	190	E	59.1	24	m42	E	58.2	24	m41	E	64.6	25	m38
	Eastbound Thru	700	A	6.5	123	161	A	6.8	123	192	A	5.4	54	64
	Eastbound Right	700	E	75.4	428	#1657	F	113.7	~689	#1842	E	76.1	~1192	#1458
	Westbound Thru	1960	D	51.8	610	#1201	E	64.1	678	#1242	D	42.0	~708	m814
	Westbound Right	140	F	120.3	~264	#443	F	134.8	~285	#469	B	16.5	149	m141
	Southbound LT	30	F	105.3	~320	m#355	F	141.0	~373	m#356	--	--	--	--
	Southbound Right	30	D	40.2	0	m0	D	40.2	0	m0	--	--	--	--
	Southbound Left (proposed mitigation)		--	--	--	--	--	--	--	--	B	17.6	6	m12
	Southbound TR (proposed mitigation)		--	--	--	--	--	--	--	--	D	46.6	71	m#430
8	**NB Telegraph Rd Ramp to WB Duke St & Duke St (western node)**													
	Overall Intersection (Signalized)		--	--			--	--			**D**	**51.0**		
	Eastbound Thru	1110	--	--	--	--	--	--	--	--	D	0.2	0	0
	Westbound Thru	800	--	--	--	--	--	--	--	--	E	66.5	~398	#542
	Southbound Right	1780	--	--	--	--	--	--	--	--	E	70.0	~983	#1131
81	**NB Telegraph Rd to EB Duke St & Duke St (eastern node)**													
	Overall Intersection (Signalized)		--	--			--	--			**D**	**37.5**		
	Eastbound Thru	1110	--	--	--	--	--	--	--	--	D	44.7	415	514
	Westbound Thru	800	--	--	--	--	--	--	--	--	A	0.2	0	0
	Northbound Right	1050	--	--	--	--	--	--	--	--	D	53.0	~848	#999
10	**Dove St/Roberts Ln & Duke St**													

	Intersection (Movement)	Storage Length (ft)	AM Peak									
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Overall Intersection (Signalized)		**B**	**17.1**			**C**	**21.2**			**B**	**17.7**		
	Eastbound LTR	1970	B	18.2	416	#645	C	25.0	482	#758	B	16.2	535	m625
	Westbound Thru	870	B	10.3	143	218	B	10.5	150	229	B	11.4	190	254
	Northbound LTR	50	D	36.4	159	257	D	36.4	159	257	D	54.5	226	323
	Southbound LTR	20	C	22.0	16	47	C	22.1	18	49	C	30.9	20	53
11	**Duke St & Callahan Dr**													
	Overall Intersection (Signalized)		**C**	**21.5**			**C**	**24.4**			**C**	**23.3**		
	Eastbound Left	320	E	78.7	441	#674	F	85.8	~464	#702	D	41.0	394	#662
	Eastbound Thru	860	A	6.1	178	200	A	6.2	188	212	A	10.0	260	382
	Westbound TR	490	A	4.7	23	49	A	5.0	24	63	D	38.7	357	409
	Southbound Left	190	F	115.1	184	#349	F	147.8	~288	#398	E	55.9	187	259
	Southbound Right	870	C	21.5	119	167	C	21.6	126	175	B	11.5	105	139
12	**Dulany St/Diagonal Rd & Duke St**													
	Overall Intersection (Signalized)		**D**	**49.7**			**E**	**55.5**			**D**	**46.1**		
	Eastbound Left	290	E	62.6	268	m#493	E	68.8	273	m#499	C	31.4	180	264
	Eastbound Thru	450	D	54.9	658	m#835	E	67.2	~714	m#863	E	59.7	~703	#844
	Eastbound Right	450	D	41.7	156	m269	D	44.8	190	m316	B	15.9	37	71
	Westbound Left	280	E	58.5	45	77	E	59.3	61	96	E	75.6	113	182
	Westbound TR	440	C	33.9	232	262	C	34.1	238	261	D	36.8	150	175
	Northbound Left	350	E	56.5	136	187	E	58.9	156	212	E	58.9	156	212
	Northbound TR	350	D	51.4	16	112	D	51.0	16	118	D	51.0	16	116
	Southbound TR	220	D	40.1	0	0	D	40.1	12	69	D	40.1	12	69
14	**Duke St & Reinekers Ln**													
	Overall Intersection (Signalized)		**A**	**18.9**			**C**	**22.0**			**C**	**22.7**		
	Eastbound Left	180	A	3.9	15	m2	A	4.8	16	m10	A	4.4	16	m8
	Eastbound Thru	280	C	32.9	626	704	D	37.4	696	#799	D	38.6	691	#790
	Westbound TR	70	A	0.7	0	0	A	0.8	0	0	A	1.1	0	0
	Southbound LR	340	D	42.8	6	36	D	42.8	6	36	D	42.8	6	36
15	**Holland Ln & Duke St**													
	Overall Intersection (Signalized)		**B**	**11.2**			**B**	**12.0**			**B**	**15.4**		
	Eastbound TR	40	A	0.4	4	0	A	1.0	1	22	A	0.9	0	16
	Westbound Left	180	B	10.8	8	19	B	12.4	8	45	D	46.6	87	164
	Westbound Thru	230	A	6.2	73	78	A	6.1	79	83	B	10.4	72	162
	Northbound Left	310	D	44.5	111	184	D	44.2	115	188	D	44.2	115	188
	Northbound Right	330	D	45.8	119	186	D	49.0	159	231	D	48.9	158	230
16	**Duke St & Daingerfield Rd**													
	Overall Intersection (Signalized)		**C**	**29.2**			**C**	**30.3**			**B**	**16.2**		
	Eastbound Left	90	C	32.8	192	273	C	32.5	214	293	C	31.6	137	253
	Eastbound Thru	290	D	40.3	738	823	D	41.9	848	926	B	16.3	287	464
	Westbound TR	130	A	3.0	22	24	A	3.1	23	24	A	3.2	23	24
	Southbound Left	400	D	43.3	83	140	D	43.3	83	140	D	43.3	83	140
	Southbound Right	60	D	40.9	0	56	D	40.8	0	56	D	40.8	0	55
17	**S Peyton St & Duke St**													
	Overall Intersection (Signalized)		**C**	**22.8**			**C**	**26.1**			**C**	**21.7**		
	Eastbound Left	130	D	50.9	345	457	E	63.8	418	#581	D	51.9	381	#518
	Eastbound TR	130	A	0.1	0	0	A	0.1	0	0	A	0.1	0	0
	Westbound Left	110	B	19.5	3	m8	C	20.0	3	m8	B	17.6	2	m5
	Westbound TR	530	C	24.4	183	m215	C	25.0	193	m224	C	20.8	128	150
	Northbound LTR	200	D	43.5	13	40	D	43.4	13	40	D	43.4	13	40
	Southbound LTR	360	D	43.4	0	32	D	43.4	0	35	D	43.4	0	35
18	**S West St & Duke St**													
	Overall Intersection (Signalized)		**C**	**33.7**			**D**	**47.4**			**C**	**23.7**		
	Eastbound LTR	530	A	0.8	3	4	A	0.9	3	4	B	15.5	247	347
	Westbound Left	80	B	13.9	54	110	B	19.8	67	156	C	23.3	62	112
	Westbound TR	240	A	8.5	132	163	A	8.6	138	171	B	17.3	212	284
	Northbound LT	130	F	131.6	~524	#745	F	193.9	~653	#884	D	45.4	455	583
	Northbound Right	230	D	38.2	28	92	D	38.8	43	112	C	25.9	12	57
	Southbound LTR	350	D	49.4	79	#172	D	51.5	83	#184	C	27.2	51	97
19	**S Henry St & Duke St**													
	Overall Intersection (Signalized)		**C**	**26.9**			**C**	**25.9**			**C**	**26.7**		
	Eastbound Thru	560	D	35.1	230	#392	D	41.2	258	#443	D	41.0	257	#442
	Eastbound Right	580	C	23.1	92	148	C	25.1	119	184	C	25.0	118	182
	Westbound Left	230	C	24.4	34	m37	C	22.9	19	m20	C	23.4	24	m28

	Intersection (Movement)	Storage Length (ft)	AM Peak											
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Westbound Thru	230	C	20.7	147	m153	A	9.7	86	m83	B	14.0	106	m122
	Southbound TR	350	C	28.7	263	327	C	29.1	265	#333	C	29.0	264	#330
20	**S Patrick St & Duke St**													
	Overall Intersection (Signalized)		**C**	**23.0**			**C**	**28.9**			**C**	**26.1**		
	Eastbound Thru	230	A	8.8	0	m#10	C	32.1	122	m#174	B	14.6	35	m76
	Westbound Thru	230	E	57.1	284	#490	E	68.1	~311	#522	D	46.1	283	#483
	Westbound Right	230	B	18.7	3	23	B	18.7	3	23	B	17.4	3	22
	Northbound LTR	760	B	18.1	367	450	B	19.4	386	475	C	24.1	415	#580
21	**Marriott Driveway/Mill Rd (West) & Eisenhower Ave**													
	Overall Intersection (Signalized)		**A**	**9.4**			**A**	**9.4**			**A**	**9.4**		
	Eastbound Left	150	A	2.9	17	69	A	3.0	21	81	A	3.2	27	100
	Eastbound TR	720	A	7.0	79	180	A	7.0	83	187	A	7.7	117	256
	Westbound Left	150	A	4.2	7	32	A	4.3	7	32	A	4.6	7	32
	Westbound TR	1720	A	7.6	48	120	A	7.8	55	136	A	8.1	56	141
	Northbound LTR	20	C	33.8	5	33	C	34.1	5	33	C	34.6	5	34
	Southbound LT	30	D	35.1	22	54	D	35.4	22	54	D	35.9	22	55
	Southbound Right	30	C	33.8	0	38	C	34.1	0	40	C	34.6	0	40
22	**Holiday Inn & Eisenhower Ave & Stovall St**													
	Overall Intersection (Signalized)		**F**	**220.7**			**F**	**201.1**			**F**	**80.1**		
	Eastbound Left	150	B	18.9	63	129	B	19.2	74	149	C	28.2	84	177
	Eastbound Thru	1700	C	30.1	147	232	C	29.8	144	229	C	33.4	185	#374
	Westbound Left	270	E	57.7	1	m9	E	63.2	1	m9	D	48.0	1	m6
	Westbound Thru	460	D	40.2	80	162	D	39.2	86	177	C	24.6	59	122
	Westbound Right	460	F	108.9	63	103	E	62.1	78	114	B	17.7	8	64
	Northbound LT	2300	D	51.7	241	311	F	116.1	~397	#526	F	181.2	~580	#720
	Northbound Right	290	F	550.0	~1353	#1597	F	510.1	~1285	#1526	D	43.2	128	294
	Southbound Left	220	D	51.3	80	142	D	51.1	74	133	D	52.8	85	m125
	Southbound LT	380	D	51.4	81	143	D	51.1	74	133	D	53.9	90	m134
	Southbound Right	380	C	34.6	0	37	C	34.3	0	38	D	37.2	5	m6
	Northeastbound LTR	350	E	59.3	14	39	E	59.3	14	39	E	60.5	14	40
23	**Swamp Fox Rd & Eisenhower Ave**													
	Overall Intersection (Signalized)		**B**	**18.7**			**B**	**18.8**			**B**	**12.7**		
	Eastbound Left	60	A	9.6	31	m29	A	9.8	31	m31	--	--	--	--
	Eastbound TR	440	C	20.1	620	m280	B	19.2	535	m285	--	--	--	--
	Eastbound LTR (proposed mitigation)	440	--	--	--	--	--	--	--	--	B	11.7	156	m213
	Westbound Left	210	D	35.8	6	14	D	41.9	5	m14	B	5.8	1	m4
	Westbound TR	210	A	7.6	39	50	B	10.2	51	68	A	2.7	23	35
	Northbound LT	110	D	37.6	47	93	D	38.9	65	120	D	44.6	71	126
	Northbound Right	110	C	34.9	0	29	D	35.0	0	41	D	39.2	0	20
	Southbound LT	90	D	35.6	19	47	D	35.7	19	47	D	40.2	20	47
	Southbound Right	90	C	34.7	0	6	C	34.8	0	8	D	38.8	0	0
24	**Port St/Mill Race Ln & Eisenhower Ave**													
	Overall Intersection (Signalized)		**A**	**8.7**			**A**	**9.5**			**B**	**11.7**		
	Eastbound Left	120	A	1.1	2	m4	A	1.7	7	m5	A	4.0	20	m24
	Eastbound TR	280	A	4.8	22	238	A	5.4	70	216	B	7.0	162	126
	Westbound Left	90	A	6.1	3	m7	A	7.8	4	m9	A	8.5	6	m9
	Westbound TR	290	A	9.8	131	166	B	11.3	137	173	B	16.2	165	199
	Northbound LTR	240	D	42.0	81	147	D	42.0	81	147	D	42.1	82	148
	Southbound LTR	190	D	37.9	7	32	D	37.9	7	32	D	37.9	7	32
25	**Mill Rd (East) & Eisenhower Ave**													
	Overall Intersection (Signalized)		**E**	**67.8**			**E**	**72.1**			**C**	**33.1**		
	Eastbound Left	160	E	55.1	58	m102	E	61.0	68	m118	A	3.8	5	16
	Eastbound TR	290	E	57.7	~677	#820	E	62.5	~659	#803	-	-	-	-
	Eastbound Thru (proposed mitigation)	290	-	-	-	-	-	-	-	-	B	10.5	264	258
	Eastbound Right (proposed mitigation)	160	-	-	-	-	-	-	-	-	B	12.8	2	0
	Westbound Left	200	E	78.2	31	61	E	71.2	38	73	D	44.7	38	99
	Westbound TR	360	B	15.4	37	33	B	16.1	64	46	--	--	--	--
	Westbound Thru (proposed mitigation)	360	-	-	-	-	-	-	-	-	B	14.0	41	67

	Intersection (Movement)	Storage Length (ft)	AM Peak											
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Westbound Right (proposed mitigation)	360	-	-	-	-	-	-	-	-	C	25.8	1	13
	Northbound Left	250	C	21.9	138	206	C	22.0	143	213	D	49.1	207	302
	Northbound TR	250	F	121.7	~791	#1036	F	133.1	~831	#1076	-	-	-	-
	Northbound Thru (proposed mitigation)	250	-	-	-	-	-	-	-	-	D	45.1	234	337
	Northbound Right (proposed mitigation)	250	-	-	-	-	-	-	-	-	F	85.1	~430	#555
	Southbound LTR	230	C	34.9	46	79	D	35.1	48	81	D	46.9	55	84
26	**Driveway/Elizabeth Ln & Eisenhower Ave**													
	Overall Intersection (Signalized)		**A**	**4.0**			**A**	**7.2**			**B**	**16.1**		
	Eastbound Left	140	A	1.4	17	m48	A	2.5	32	m52	A	6.3	65	m73
	Eastbound TR	350	A	2.7	50	m208	A	4.3	102	m200	B	17.4	603	m523
	Westbound Left	120	A	5.7	0	2	A	5.8	0	m2	B	10.2	1	m0
	Westbound TR	470	A	5.0	17	25	A	6.0	23	53	A	8.9	33	42
	Northbound LTR	20	D	48.6	21	43	D	47.0	75	119	D	40.5	67	119
	Southbound Left	600	D	47.4	5	17	D	44.7	26	54	D	38.2	23	54
	Southbound TR	600	D	47.2	0	0	D	43.0	8	37	D	36.7	7	37
27	**Pedestrian Crossing & Eisenhower Ave**													
	Overall Intersection (Signalized)		**A**	**5.7**			**A**	**6.8**			**A**	**5.9**		
	Eastbound TR	470	A	4.2	173	41	A	2.5	152	16	A	1.0	1	46
	Westbound LT	270	A	7.0	33	47	A	7.7	43	60	A	8.3	42	60
	Northbound LTR	-	D	38.9	23	63	D	43.0	99	171	D	45.3	96	171
31	**Mill Rd & Driveway/Telegraph Rd Ramp**													
	Overall Intersection (Signalized)*		**-**	**-**			**-**	**-**			**D**	**35.7**		
	Eastbound LTR	260	B	10.1	-	-	B	11.2	-	-	E	57.1	0	0
	Westbound LT	140	B	10.4	-	-	B	11.2	-	-	D	46.8	63	101
	Westbound Right	140	B	16.0	-	-	E	50.9	-	-	D	46.3	0	91
	Northbound LT	720	B	10.1	-	-	B	12.8	-	-	B	20.3	78	180
	Northbound Right	720	B	10.6	-	-	B	12.8	-	-	A	9.6	0	11
	Southbound Left	790	B	16.2	-	-	C	28.1	-	-	D	42.2	182	242
	Southbound LTR	790	B	11.8	-	-	C	15.4	-	-	-	-	-	-
	Southbound TR (proposed mitigation)	790	-	-	-	-	-	-	-	-	A	4.6	5	26
32	**Stovall St & Mill Rd**													
	Overall Intersection (Signalized)		**B**	**12.2**			**B**	**12.8**			**B**	**14.1**		
	Eastbound Thru	790	B	11.2	23	#215	B	14.7	72	#306	B	17.3	119	189
	Eastbound Right	790	A	3.8	0	19	A	4.7	0	21	A	2.5	0	8
	Westbound Left	510	A	6.3	0	39	A	8.2	5	45	B	11.7	11	26
	Westbound Thru	780	A	6.1	4	144	A	7.1	33	195	A	8.9	72	116
	Northbound Left	300	B	19.8	22	68	B	19.3	29	85	B	19.4	44	71
	Northbound Right	310	B	19.4	22	59	B	18.6	0	59	B	19.6	0	51
33	**Stovall St & Pershing Ave/Mandeville Ln**													
	Overall Intersection (Signalized)		**B**	**16.8**			**B**	**18.2**			**C**	**24.7**		
	Eastbound Left	230	C	27.0	45	95	C	27.6	59	118	D	35.2	85	141
	Eastbound TR	230	C	30.8	79	187	C	31.5	96	211	D	42.9	202	321
	Westbound LTR	410	C	32.4	28	70	D	35.3	46	102	D	41.0	66	120
	Northbound Left	370	A	7.9	50	134	B	10.9	104	245	B	11.2	110	m133
	Northbound TR	370	A	9.5	44	134	B	10.6	50	141	B	10.4	74	m97
	Southbound Left	100	A	6.5	4	18	A	7.2	4	18	B	10.4	7	18
	Southbound Thru	310	B	14.6	47	130	C	20.5	71	180	D	43.3	109	178
	Southbound Right	310	B	12.9	0	0	B	17.1	0	0	D	36.1	0	0
37	**Dulany St & Jamieson Ave**													
	Overall Intersection (Signalized)		**E**	**77.1**			**F**	**108.6**			**C**	**24.3**		
	Eastbound LTR	280	F	132.1	~521	#741	F	194.9	~633	#860	--	--	--	--
	Eastbound Left (proposed mitigation)	280	-	-	-	-	-	-	-	-	C	23.9	192	#369
	Eastbound TR (proposed mitigation)	280	-	-	-	-	-	-	-	-	A	9.4	69	113
	Westbound LTR	340	A	9.1	17	38	A	8.8	19	46	B	15.8	30	62
	Northbound LTR	70	B	17.1	19	37	B	17.1	19	37	B	19.2	20	40
	Southbound LTR	350	C	25.2	77	140	C	27.6	82	157	C	33.3	39	#198
38	**Holland Ln & Jamieson Ave**													

	Intersection (Movement)	Storage Length (ft)	AM Peak											
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Overall Intersection (Signalized)		**B**	**12.0**			**B**	**12.9**			**B**	**12.7**		
	Eastbound LTR	350	B	16.2	52	98	B	16.9	62	113	B	16.9	61	113
	Westbound LTR	1220	C	22.1	71	139	C	24.1	78	152	C	22.6	72	141
	Northbound LTR	210	B	10.7	67	115	B	11.6	91	147	B	11.6	91	147
	Southbound LTR	340	A	5.5	34	45	A	4.7	27	28	A	4.8	18	21
40	**Mill Rd & Dock St**													
	Overall Intersection (Signalized)*		**-**	**-**			**-**	**-**			**A**	**6.0**		
	Eastbound LR	360	B	14.7	-	18	C	15.2	-	21	D	50.8	43	96
	Northbound Left	-	A	7.6	-	0	A	7.7	-	0	A	1.7	1	3
	Northbound Thru	-	A	0.0	-	0	A	0.0	-	0	A	2.7	70	128
	Southbound TR	-	A	0.1	-	0	A	0.0	-	0	A	0.9	6	9
50	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (western node)**													
	Overall Intersection (Unsignalized)		**-**	**-**			**-**	**-**			**A**	**0.6**		
	Eastbound Right	180	A	7.4	-	20	A	7.5	-	25	A	7.5	--	25
	Northbound Thru										--	--	--	--
	Southbound Thru	1700	-	-	-	-	-	-	-	-	--	--	--	--
	Southbound Right	80	-	-	-	-	-	-	-	-	--	--	--	--
51	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (eastern node)**													
	Overall Intersection (Signalized)*		**-**	**-**			**-**	**-**			**B**	**17.0**		
	Westbound Right	400	F	183.2	-	437	F	408.6	-	864	E	66.0	386	468
	Northbound Thru	1900	-	-	-	-	-	-	-	-	C	28.9	856	856
	Southbound Thru		-	-	-	-	-	-	-	-	A	0.3	0	0
71	**W Taylor Run Pkwy & Duke Street Access Road**													
	Overall Intersection (Signalized)		**D**	**46.0**			**E**	**61.2**			**C**	**25.7**		
	Eastbound LTR	70	B	12.3	8	46	B	12.6	9	46	C	31.1	16	54
	Westbound LTR	310	B	12.7	19	71	B	12.9	20	71	C	32.5	38	84
	Northbound LTR	50	A	5.4	16	m12	A	7.0	46	m31	A	0.2	1	1
	Southbound LT	680	F	99.2	~270	#465	F	129.2	~333	#526	D	48.4	264	#387
	Southbound Right	680	D	40.1	0	0	D	40.1	0	0	C	33.0	0	0

* - Intersection signalized as proposed mitigation
m - Volume for 95th percentile queue is metered by upstream signal
- 95th percentile volume exceeds capacity; queue may be longer
~ - Volume exceeds capacity, queue is theoretically infinite

Table 19: 2030 Proposed (Mitigated) Conditions Capacity Analysis Results (PM Peak)

	Intersection (Movement)	Storage Length (ft)	PM Peak									
			Approved Conditions			Proposed Conditions			Proposed (Mitigated) Conditions			
			LOS Delay		Queue (ft) 50th	95th	LOS Delay		Queue (ft) 50th	95th	LOS Delay		Queue (ft) 50th	95th
1	**Duke St & N Quaker Ln**													
	Overall Intersection (Signalized)		**C**	**29.3**			**C**	**32.4**			**C**	**22.2**		
	Eastbound Left	210	C	33.2	79	159	D	35.5	84	163	D	35.1	84	163
	Eastbound Thru	390	A	7.3	106	127	A	7.4	110	132	A	9.5	128	153
	Westbound Thru	350	C	30.0	465	535	C	30.4	438	m540	C	22.6	421	m472
	Westbound Right	350	A	5.7	182	m221	A	7.0	193	m221	A	5.0	288	m21
	Southbound Left	1290	E	79.9	~327	#463	F	93.0	~368	#496	D	52.5	321	#434
3	**Duke St & Alexandria Commons**													
	Overall Intersection (Signalized)		**A**	**8.9**			**B**	**10.4**			**A**	**15.8**		
	Eastbound Left	110	E	70.6	15	m45	F	80.2	15	m435	D	53.2	55	m81
	Eastbound TR	220	A	0.4	1	4	A	0.5	1	4	A	4.3	54	165
	Westbound Left	320	A	5.0	1	m2	A	5.2	1	m2	D	45.6	4	m81
	Westbound TR	530	A	8.6	155	#1030	B	11.2	228	#1110	B	18.9	367	#1096
	Northbound LTR	150	D	46.9	13	36	D	46.9	13	36	D	47.0	13	36
	Southbound LTR	210	D	50.1	64	124	D	50.1	64	124	D	50.2	64	124
4	**Sweeley St/Alexandria Commons & Duke St**													
	Overall Intersection (Signalized)		**B**	**15.0**			**B**	**12.0**			**B**	**14.3**		
	Eastbound Left	200	D	53.9	2	m25	E	61.4	2	m23	B	18.3	3	m14
	Eastbound TR	560	A	3.7	64	76	A	3.8	67	79	A	2.9	78	35
	Westbound Left	70	A	5.8	4	m12	A	6.8	4	m5	B	15.2	5	m6
	Westbound TR	250	B	16.3	541	m#985	B	11.0	183	m#752	B	16.3	373	m#485
	Northbound LTR	230	D	44.0	19	69	D	44.0	19	69	D	44.0	19	69
	Southbound LT	100	E	65.1	86	147	E	65.1	86	147	E	65.1	86	147
	Southbound Right	100	D	43.1	0	43	D	43.1	0	43	D	43.1	0	43
5	**Roth St/Cambridge Rd & Duke St**													
	Overall Intersection (Signalized)		**E**	**75.1**			**E**	**77.0**				**75.5**		
	Eastbound Left	110	E	57.6	9	m28	E	60.4	10	m20	E	66.2	9	m20
	Eastbound TR	370	C	22.3	474	604	B	17.9	300	402	B	11.5	198	374
	Westbound Left	240	D	40.1	10	m62	D	41.9	9	m58	D	45.6	13	m61
	Westbound Thru	670	C	22.7	157	#1060	C	34.8	192	#1120	D	35.3	224	#1094
	Westbound Right	670	A	4.2	1	57	A	4.6	1	66	A	8.0	25	74
	Northbound LTR	150	E	59.7	277	#448	E	59.7	277	#448	E	59.7	277	#448
	Southbound LT	40	F	775.8	~408	#590	F	775.8	~408	#590	F	775.8	~408	#590
	Southbound Right	40	C	33.6	28	61	C	33.6	28	61	C	33.6	28	61
7	**Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St**													
	Overall Intersection (Signalized)		**E**	**75.6**			**F**	**88.3**			**E**	**59.0**		
	Eastbound Left	190	D	43.1	18	m38	D	43.7	18	m36	D	47.0	21	m36
	Eastbound Thru	700	B	13.6	159	304	B	13.7	158	315	B	12.2	164	201
	Eastbound Right	700	F	143.4	~1313	#1921	F	160.6	~1395	#2001	F	140.4	~1437	#1712
	Westbound Thru	1960	D	44.7	570	#1128	E	57.2	626	#1194	D	39.6	666	m#718
	Westbound Right	140	E	79.4	231	#402	F	99.9	~258	#449	B	13.9	116	m116
	Southbound LT	30	F	138.8	~416	m#377	F	155.2	~443	m#377	--	--	--	--
	Southbound Right	30	D	37.7	0	m0	D	37.7	0	m0	--	--	--	--
	Southbound Left (proposed mitigation)		--	--	--	--	--	--	--	--	B	12.3	7	m15
	Southbound TR (proposed mitigation)		--	--	--	--	--	--	--	--	C	22.4	50	m#111
8	**NB Telegraph Rd Ramp to WB Duke St & Duke St (western node)**													
	Overall Intersection (Signalized)		--	--			--	--			**D**	**41.6**		
	Eastbound Thru	1110	--	--	--	--	--	--	--	--	C	0.2	0	0
	Westbound Thru	800	--	--	--	--	--	--	--	--	D	54.5	340	#467
	Southbound Right	1780	--	--	--	--	--	--	--	--	D	54.4	~937	#1089
81	**NB Telegraph Rd to EB Duke St & Duke St (eastern node)**													
	Overall Intersection (Signalized)		--	--			--	--			**B**	**18.9**		
	Eastbound Thru	1110	--	--	--	--	--	--	--	--	C	20.5	264	361
	Westbound Thru	800	--	--	--	--	--	--	--	--	A	0.1	0	m0
	Northbound Right	1050	--	--	--	--	--	--	--	--	C	31.5	394	457

	Intersection (Movement)	Storage Length (ft)	PM Peak										
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
10	**Dove St/Roberts Ln & Duke St**													
	Overall Intersection (Signalized)		**B**	**14.6**			**B**	**13.7**			**B**	**13.5**		
	Eastbound LTR	1970	A	9.8	169	296	B	10.8	197	345	A	7.9	138	334
	Westbound Thru	870	B	15.6	363	233	B	13.3	299	516	B	12.5	348	596
	Northbound LTR	50	C	33.1	131	66	C	33.1	131	213	E	55.5	198	288
	Southbound LTR	20	C	23.3	29	40	C	23.3	29	60	D	35.0	44	80
11	**Duke St & Callahan Dr**													
	Overall Intersection (Signalized)		**B**	**17.9**			**B**	**19.2**			**C**	**30.4**		
	Eastbound Left	320	E	63.7	284	#460	E	73.7	305	#499	E	79.3	326	#522
	Eastbound Thru	860	A	6.6	112	131	A	6.8	124	145	A	1.5	72	126
	Westbound TR	490	B	11.0	252	m255	B	11.6	268	m271	C	33.5	460	m562
	Southbound Left	190	D	45.3	87	150	D	46.6	107	177	E	59.5	113	#207
	Southbound Right	870	C	28.1	317	405	C	28.2	320	408	C	37.5	258	457
12	**Dulany St/Diagonal Rd & Duke St**													
	Overall Intersection (Signalized)		**E**	**61.1**			**E**	**61.5**			**D**	**50.3**		
	Eastbound Left	290	D	52.7	127	#215	D	52.8	130	#217	E	58.5	112	m#228
	Eastbound Thru	450	D	37.0	341	432	D	42.3	390	#511	D	48.5	358	#495
	Eastbound Right	450	E	56.8	43	105	D	47.8	62	127	D	43.4	54	100
	Westbound Left	280	E	56.2	46	m63	E	57.5	66	81	E	57.1	123	m#179
	Westbound TR	440	F	89.4	~538	#681	F	83.2	~521	#665	D	43.4	396	#497
	Northbound Left	350	E	62.1	194	#283	E	76.4	218	#327	E	65.1	248	#356
	Northbound TR	350	D	43.9	9	86	D	44.0	9	88	D	40.6	8	81
	Southbound TR	220	D	49.1	136	266	D	53.4	158	#328	E	59.4	192	#376
14	**Duke St & Reinekers Ln**													
	Overall Intersection (Signalized)		**B**	**13.8**			**B**	**16.4**			**C**	**17.2**		
	Eastbound Left	180	A	4.2	11	m17	A	4.1	10	m17	B	10.5	20	m27
	Eastbound Thru	280	C	24.2	278	401	C	29.7	346	#483	C	31.2	210	m260
	Westbound TR	70	A	1.2	0	0	A	1.2	0	0	A	1.2	0	0
	Southbound LR	340	D	39.8	27	87	D	40.0	31	92	D	40.0	31	92
15	**Holland Ln & Duke St**													
	Overall Intersection (Signalized)		**B**	**17.0**			**C**	**18.8**			**C**	**20.7**		
	Eastbound TR	40	A	0.7	6	1	A	1.3	8	m21	A	0.7	4	1
	Westbound Left	180	D	48.4	187	294	E	59.4	233	#375	E	60.3	224	#369
	Westbound Thru	230	B	9.6	150	249	B	10.4	184	278	C	14.2	217	312
	Northbound Left	310	D	45.5	74	m131	D	48.7	66	m120	D	50.7	73	m130
	Northbound Right	330	D	49.9	89	m146	D	54.0	91	m146	E	59.1	94	m155
16	**Duke St & Daingerfield Rd**													
	Overall Intersection (Signalized)		**C**	**23.8**			**C**	**26.4**			**B**	**24.4**		
	Eastbound Left	90	D	46.1	136	221	D	46.6	138	222	D	49.1	129	168
	Eastbound Thru	290	C	28.7	322	416	C	31.0	364	458	C	28.5	320	362
	Westbound TR	130	B	12.3	99	148	B	161.1	144	m175	B	13.4	117	m162
	Southbound Left	400	D	39.9	102	167	D	39.7	102	167	D	39.7	102	167
	Southbound Right	60	D	36.7	0	55	D	36.7	0	58	D	36.7	0	58
17	**S Peyton St & Duke St**													
	Overall Intersection (Signalized)		**C**	**25.5**			**C**	**29.0**			**C**	**27.6**		
	Eastbound Left	130	C	25.6	159	264	C	28.9	189	301	C	32.1	153	302
	Eastbound TR	130	A	0.2	0	0	A	0.2	0	0	A	0.2	0	0
	Westbound Left	110	C	25.6	3	13	C	26.3	3	13	C	25.3	3	12
	Westbound TR	530	D	43.5	408	#546	D	51.8	452	#607	D	46.7	438	#580
	Northbound LTR	200	D	35.8	16	44	D	35.6	16	44	D	35.6	16	44
	Southbound LTR	360	D	38.2	21	114	D	38.0	21	114	D	38.0	21	114
18	**S West St & Duke St**													
	Overall Intersection (Signalized)		**C**	**26.4**			**E**	**62.3**			**C**	**34.0**		
	Eastbound LTR	530	B	14.2	160	212	B	14.7	175	232	D	40.5	255	#380
	Westbound Left	80	E	55.3	93	m#196	F	360.5	~450	m#631	D	43.4	136	m#213
	Westbound TR	240	B	10.8	99	m114	B	10.3	98	m111	B	15.8	224	m267
	Northbound LT	130	C	20.6	170	290	C	21.4	180	312	B	18.6	179	267
	Northbound Right	230	B	16.2	56	107	B	16.1	58	109	B	12.3	9	40
	Southbound LTR	350	E	77.6	~242	#426	F	130.8	~298	#488	E	69.6	~244	#450
19	**S Henry St & Duke St**													
	Overall Intersection (Signalized)		**D**	**49.7**			**D**	**53.4**			**D**	**53.5**		
	Eastbound Thru	560	E	71.5	433	#619	E	76.2	457	m#665	E	71.6	465	m#629
	Eastbound Right	580	E	69.8	356	#484	E	77.1	383	m#528	E	71.7	391	m#507

	Intersection (Movement)	Storage Length (ft)	PM Peak											
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Westbound Left	230	E	67.2	178	m186	E	73.5	192	m174	E	65.8	177	m#206
	Westbound Thru	230	C	31.3	230	m227	C	32.1	274	m238	C	35.0	306	m333
	Southbound TR	350	D	43.5	853	926	D	47.2	893	970	D	49.8	906	m#1008
20	**S Patrick St & Duke St**													
	Overall Intersection (Signalized)		**D**	**39.2**			**E**	**63.3**			**C**	**26.1**		
	Eastbound Thru	230	D	50.1	360	m443	D	52.3	382	m444	B	17.3	185	m263
	Westbound Thru	230	F	115.6	~366	#561	F	204.9	~487	#694	D	44.0	333	#569
	Westbound Right	230	B	18.5	0	10	B	18.5	0	10	B	11.8	0	8
	Northbound LTR	760	B	10.9	187	229	B	11.1	194	239	C	21.4	276	338
21	**Marriott Driveway/Mill Rd (West) & Eisenhower Ave**													
	Overall Intersection (Signalized)		**C**	**31.3**			**D**	**36.3**			**C**	**32.1**		
	Eastbound Left	150	F	98.7	~251	#573	F	128.3	~306	#626	E	76.1	260	#579
	Eastbound TR	720	A	8.4	135	273	A	8.8	155	312	A	9.1	172	341
	Westbound Left	150	A	9.8	3	16	A	9.8	3	17	B	11.6	4	16
	Westbound TR	1720	C	23.5	340	571	C	25.7	382	#690	C	33.1	436	#762
	Northbound LTR	20	D	38.9	20	37	D	38.9	20	67	D	39.4	20	68
	Southbound LT	30	D	40.5	33	70	D	40.5	33	70	D	41.1	33	71
	Southbound Right	30	D	38.3	0	57	D	38.5	0	61	D	41.3	24	116
22	**Holiday Inn & Eisenhower Ave & Stovall St**													
	Overall Intersection (Signalized)		**D**	**39.6**			**D**	**50.8**			**D**	**42.3**		
	Eastbound Left	150	F	113.0	~165	#386	F	179.0	~229	#450	F	82.8	178	#408
	Eastbound Thru	1700	C	25.1	207	322	C	27.8	233	359	C	26.6	224	453
	Westbound Left	270	E	68.4	9	m20	E	70.3	9	m19	D	52.8	7	m15
	Westbound Thru	460	C	28.8	283	393	C	31.4	291	415	D	37.2	248	#672
	Westbound Right	460	C	21.4	73	117	C	21.7	97	196	B	17.3	26	70
	Northbound LT	2300	D	44.3	125	173	D	43.9	152	205	D	48.3	159	217
	Northbound Right	290	D	50.2	150	#258	F	84.7	241	#469	E	71.3	156	#387
	Southbound Left	220	E	55.5	56	109	E	56.9	67	124	D	47.9	63	m109
	Southbound LT	380	E	55.3	55	107	E	57.0	67	124	D	48.3	64	m113
	Southbound Right	380	D	40.9	19	76	D	44.4	80	156	D	41.9	85	m133
	Northeastbound LTR	350	E	58.9	16	42	E	58.9	16	42	E	59.9	16	43
23	**Swamp Fox Rd & Eisenhower Ave**													
	Overall Intersection (Signalized)		**B**	**15.5**			**B**	**15.1**			**B**	**12.8**		
	Eastbound Left	60	B	11.6	11	m21	B	13.2	14	m22	--	--	--	--
	Eastbound TR	440	B	11.0	216	250	B	12.3	291	m290	--	--	--	--
	Eastbound LTR (proposed mitigation)	440	--	--	--	--	--	--	--	--	B	13.4	169	m340
	Westbound Left	210	B	12.0	6	m8	B	15.0	8	m13	A	7.3	7	m13
	Westbound TR	210	B	11.7	141	151	B	11.4	125	187	A	5.0	107	129
	Northbound LT	110	D	49.1	139	#229	D	42.5	108	180	D	42.7	72	133
	Northbound Right	110	C	33.7	0	41	C	33.9	0	37	D	37.2	0	0
	Southbound LT	90	D	39.4	53	104	D	39.4	55	105	D	43.5	57	112
	Southbound Right	90	C	34.5	0	42	D	35.1	4	49	D	38.3	0	43
24	**Port St/Mill Race Ln & Eisenhower Ave**													
	Overall Intersection (Signalized)		**B**	**11.7**			**A**	**9.5**			**B**	**12.0**		
	Eastbound Left	120	A	7.8	7	m19	A	1.7	7	m5	A	8.5	7	m20
	Eastbound TR	280	A	7.1	65	108	A	5.4	70	216	A	8.5	45	101
	Westbound Left	90	B	13.7	20	m29	A	7.8	4	m9	B	19.3	22	m25
	Westbound TR	290	A	10.0	125	234	B	11.3	137	173	A	9.0	126	m143
	Northbound LTR	240	D	43.4	118	196	D	42.0	81	147	D	43.3	118	199
	Southbound LTR	190	D	35.5	16	61	D	37.9	7	32	D	35.7	16	61
25	**Mill Rd (East) & Eisenhower Ave**													
	Overall Intersection (Signalized)		**D**	**37.7**			**D**	**40.9**			**C**	**33.1**		
	Eastbound Left	160	F	86.2	47	m72	F	97.3	57	m#81	D	36.8	25	m68
	Eastbound TR	290	C	28.9	158	206	C	33.2	185	267	-	-	-	-
	Eastbound Thru (proposed mitigation)	290	-	-	-	-	-	-	-	-	C	23.7	155	132
	Eastbound Right (proposed mitigation)	160	-	-	-	-	-	-	-	-	D	19.0	31	12
	Westbound Left	200	E	65.3	97	140	E	66.9	96	138	C	27.0	74	140
	Westbound TR	360	D	39.6	375	451	D	43.0	446	#597	D	36.5	266	410

	Intersection (Movement)	Storage Length (ft)	PM Peak											
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Westbound Thru (proposed mitigation)	360	-	-	-	-	-	-	-	-	-	-	-	-
	Westbound Right (proposed mitigation)	360	-	-	-	-	-	-	-	-	C	34.3	4	31
	Northbound Left	250	C	29.4	189	274	C	31.9	193	280	D	51.5	209	#330
	Northbound TR	250	C	29.0	258	368	C	31.1	293	416	-	-	-	-
	Northbound Thru (proposed mitigation)	250	-	-	-	-	-	-	-	-	C	23.3	119	142
	Northbound Right (proposed mitigation)	250	-	-	-	-	-	-	-	-	B	11.7	45	53
	Southbound LTR	230	D	47.2	120	170	D	49.6	140	194	D	52.7	169	229
26	**Driveway/Elizabeth Ln & Eisenhower Ave**													
	Overall Intersection (Signalized)		**B**	**10.9**			**B**	**14.6**			**B**	**14.2**		
	Eastbound Left	140	A	3.4	8	m13	A	4.0	8	m14	A	7.9	9	m16
	Eastbound TR	350	A	4.7	69	100	A	5.6	74	111	A	9.8	88	99
	Westbound Left	120	A	5.0	1	m4	A	4.0	1	m4	A	9.4	3	m6
	Westbound TR	470	A	6.4	98	120	A	4.9	57	113	B	11.7	87	105
	Northbound LTR	20	D	51.3	55	109	F	106.9	118	#207	C	33.3	83	143
	Southbound Left	600	D	42.8	29	62	D	39.7	36	67	C	28.6	30	63
	Southbound TR	600	D	42.1	2	62	D	39.9	23	85	C	30.1	37	102
27	**Pedestrian Crossing & Eisenhower Ave**													
	Overall Intersection (Signalized)		**A**	**6.8**			**A**	**11.8**			**B**	**14.0**		
	Eastbound TR	470	A	2.5	152	16	A	3.6	84	11	B	15.1	103	120
	Westbound LT	270	A	7.7	43	60	A	7.3	165	191	A	8.9	56	73
	Northbound LTR	-	D	43.0	99	171	D	47.6	223	321	C	26.3	157	242
31	**Mill Rd & Driveway/Telegraph Rd Ramp**													
	Overall Intersection (Signalized)*		**-**	**-**			**-**	**-**			**C**	**20.7**		
	Eastbound LTR	260	B	12.0	-	-	B	12.4	-	-	E	59.0	5	19
	Westbound LT	140	B	13.0	-	-	C	13.1	-	-	D	49.2	75	133
	Westbound Right	140	B	15.5	-	-	C	21.9	-	-	A	5.6	0	19
	Northbound LT	720	E	10.4	-	-	E	11.4	-	-	D	51.8	63	127
	Northbound Right	720	E	41.5	-	-	E	48.8	-	-	D	37.3	97	150
	Southbound Left	790	F	577.5	-	-	F	816.5	-	-	B	16.6	291	356
	Southbound LTR	790	F	169.0	-	-	F	314.6	-	-	-	-	-	-
	Southbound TR (proposed mitigation)	790	-	-	-	-	-	-	-	-	A	5.1	45	102
32	**Stovall St & Mill Rd**													
	Overall Intersection (Signalized)		**D**	**46.5**			**E**	**67.1**			**B**	**15.8**		
	Eastbound Thru	790	C	25.9	60	171	C	28.1	72	#217	B	12.7	81	132
	Eastbound Right	790	A	9.1	0	14	A	9.1	0	16	A	2.3	0	7
	Westbound Left	510	B	12.5	27	112	B	13.9	28	115	A	9.3	36	62
	Westbound Thru	780	E	76.6	287	#939	F	120.8	~441	#1052	B	13.8	271	426
	Northbound Left	300	C	27.1	96	#260	C	31.3	113	#313	C	26.3	101	146
	Northbound Right	310	B	19.6	0	46	B	19.5	0	46	C	22.0	0	41
33	**Stovall St & Pershing Ave/Mandeville Ln**													
	Overall Intersection (Signalized)		**C**	**21.9**			**C**	**32.6**			**C**	**27.2**		
	Eastbound Left	230	C	23.7	49	87	C	24.7	71	119	C	32.7	70	118
	Eastbound TR	230	C	21.5	14	60	C	21.1	19	68	C	27.7	27	88
	Westbound LTR	410	D	42.4	136	223	D	47.9	176	277	D	54.0	218	#348
	Northbound Left	370	B	18.5	172	288	D	54.6	~269	#580	C	26.4	216	m#262
	Northbound TR	370	B	17.0	107	207	B	19.4	135	233	B	15.7	110	m137
	Southbound Left	100	B	11.5	4	15	B	13.0	4	15	B	12.9	5	14
	Southbound Thru	310	B	19.6	58	110	C	22.3	96	157	C	21.4	99	154
	Southbound Right	310	B	18.6	0	41	C	20.1	0	42	B	19.6	0	38
37	**Dulany St & Jamieson Ave**													
	Overall Intersection (Signalized)		**C**	**29.6**			**E**	**55.8**			**C**	**31.8**		
	Eastbound LTR	280	D	54.3	237	#464	F	126.4	~386	#587	--	--	--	--
	Eastbound Left (proposed mitigation)	280	-	-	-	-	-	-	-	-	E	57.3	150	#370
	Eastbound TR (proposed mitigation)	280	-	-	-	-	-	-	-	-	A	8.5	42	74
	Westbound LTR	340	B	10.9	98	163	B	11.3	108	177	C	22.7	148	237
	Northbound LTR	70	C	20.2	44	72	C	20.2	44	72	C	20.2	44	72

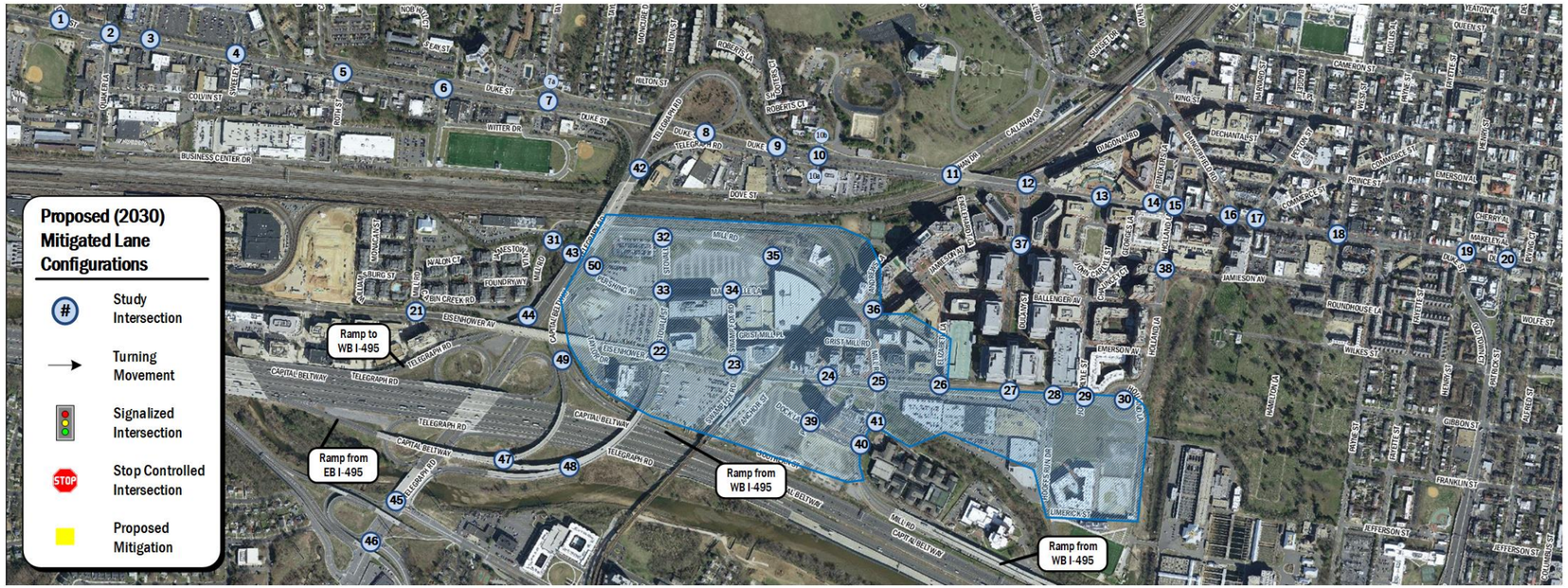
	Intersection (Movement)	Storage Length (ft)	PM Peak											
			Approved Conditions				Proposed Conditions				Proposed (Mitigated) Conditions			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Southbound LTR	350	C	24.0	27	75	C	27.8	43	107	C	25.6	27	85
38	**Holland Ln & Jamieson Ave**													
	Overall Intersection (Signalized)		**C**	**27.0**			**E**	**57.7**			**C**	**28.6**		
	Eastbound LTR	350	B	17.7	66	120	B	18.5	79	118	B	11.2	60	91
	Westbound LTR	1220	E	57.2	121	#277	F	183.0	~225	#386	C	30.6	146	#339
	Northbound LTR	210	C	25.0	110	167	C	26.7	134	241	D	39.6	121	178
	Southbound LTR	340	B	13.2	84	150	B	15.7	138	m152	C	20.1	110	m148
40	**Mill Rd & Dock St**													
	Overall Intersection (Signalized)*		**-**	**-**			**-**	**-**			**B**	**12.6**		
	Eastbound LR	360	F	63.6	-	252	F	80.9	-	284	D	53.6	85	179
	Northbound Left	-	A	9.1	-	4	A	9.3	-	4	A	3.2	7	25
	Northbound Thru	-	A	0.0	-	0	A	0.0	-	0	A	3.7	73	150
	Southbound TR	-	0	1.8	-	0	0	0.0	-	0	A	3.8	89	242
50	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (western node)**													
	Overall Intersection (Unsignalized)		**-**	**-**			**-**	**-**			**A**	**2.6**		
	Eastbound Right	180	D	30.7	-	424	F	64.0	-	739	C	19.8	--	
	Northbound Thru										--	--	--	--
	Southbound Thru	1700	-	-	-	-	-	-	-	-	--	--	--	--
	Southbound Right	80	-	-	-	-	-	-	-	-	--	--	--	--
51	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (eastern node)**													
	Overall Intersection (Signalized)*		**-**	**-**			**-**	**-**			**C**	**21.0**		
	Westbound Right	400	F	314.1	-	1121	F	537.6	-	1853	C	31.0	479	557
	Northbound Thru	1900	-	-	-	-	-	-	-	-	D	54.6	733	773
	Southbound Thru		-	-	-	-	-	-	-	-	A	2.2	0	0
71	**W Taylor Run Pkwy & Duke Street Access Road**													
	Overall Intersection (Signalized)		**E**	**79.2**			**E**	**91.7**			**C**	**34.8**		
	Eastbound LTR	70	B	14.1	4	43	B	14.1	4	43	D	36.7	7	54
	Westbound LTR	310	--	--	--	--	--	--	--	--	--	--	--	--
	Northbound LTR	50	C	24.2	77	m106	C	32.8	100	m106	A	2.8	45	79
	Southbound LT	680	F	133.3	~386	#588	F	152.3	~414	#618	E	58.4	332	#516
	Southbound Right	680	D	37.6	0	0	D	37.6	0	0	C	31.6	0	0

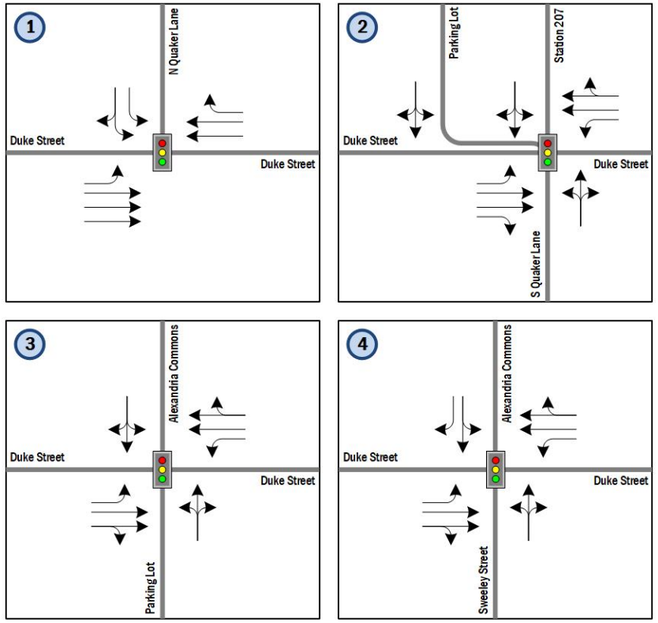
* - Intersection signalized as proposed mitigation
m - Volume for 95th percentile queue is metered by upstream signal
- 95th percentile volume exceeds capacity; queue may be longer
~ - Volume exceeds capacity, queue is theoretically infinite

Table 20: Density Reduction and Land Use Changes as Mitigation

Property Owner - Assignee	Block(s)	Reduction in Density	Change in Land Use	Change in Trip Generation					
				AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
				In	Out	Total	In	Out	Total
Hoffman	**2**	250,000 sf Office	--	-71	-11	-81	-14	-71	-85
Hoffman	**3**	250,000 sf Office	--	-72	-13	-95	-15	-82	-97
Hoffman	**9A/9B**	--	300,000 sf Office to Residential	-68	+8	-60	+4	-67	-63
Perseus	**11/12**	--	300,000 sf Residential to Senior Housing*	--	--	--	--	--	--
Total				**-221**	**-16**	**-237**	**-25**	**-220**	**-245**

*for purposes of this analysis trip generation for Senior Housing was calculated as Residential





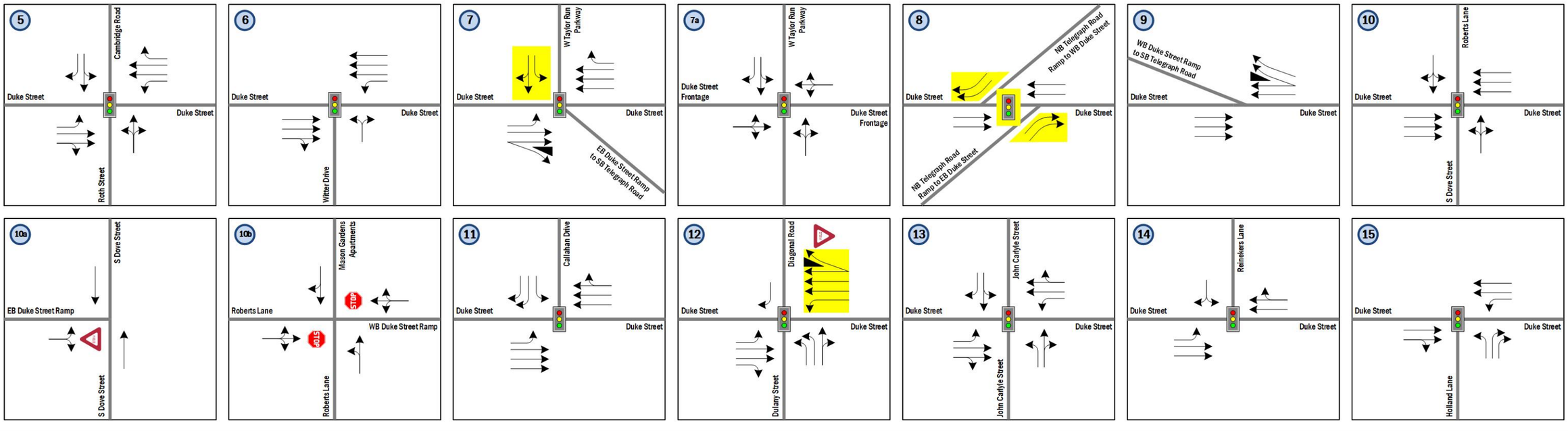
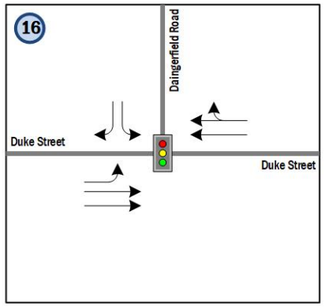
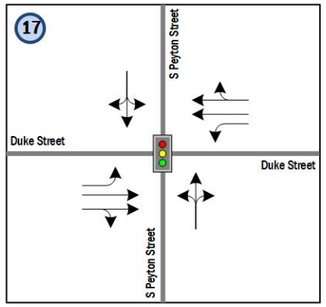
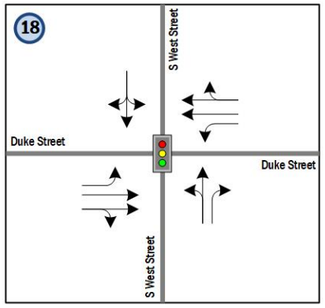
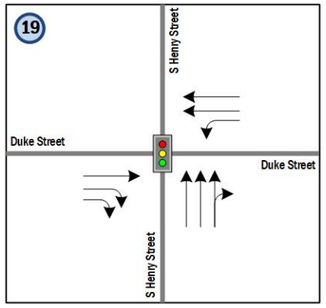


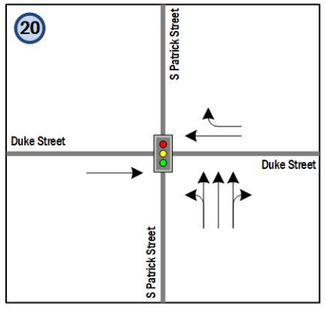
Figure 56: 2030 Proposed Lane Configurations with Mitigations (Intersections 1 – 15)

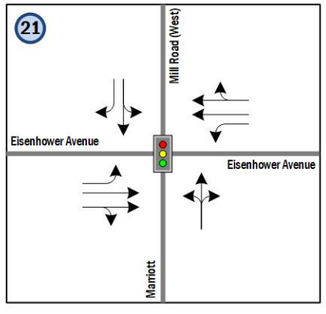


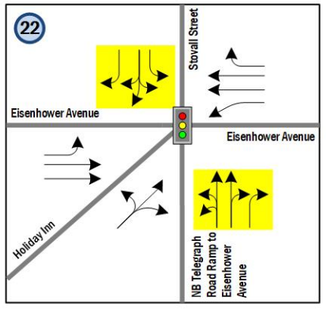


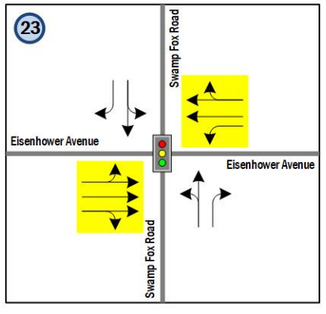


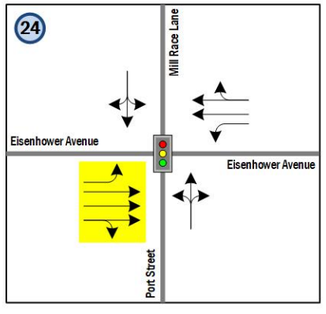


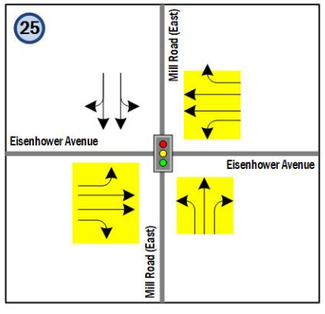


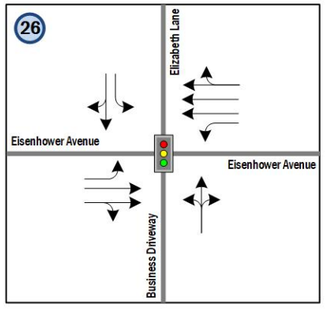


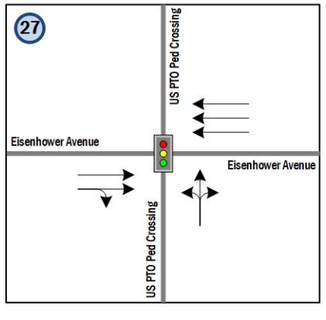


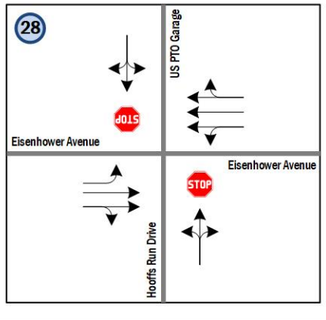


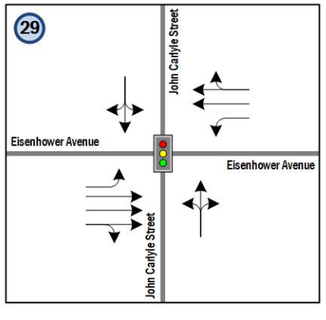


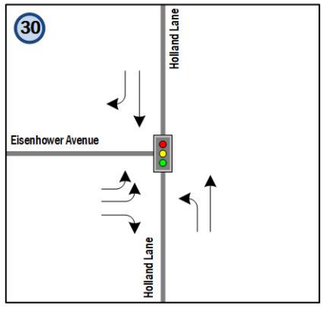


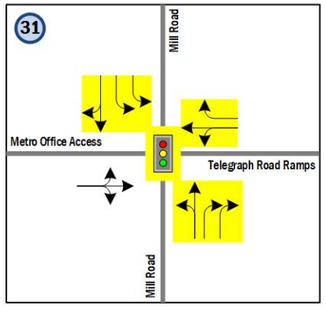


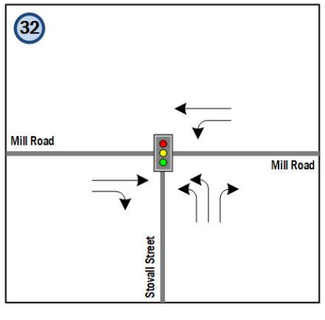












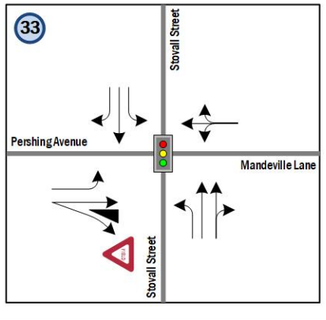


Figure 57: 2030 Proposed Lane Configurations with Mitigations (Intersections 16 – 33)

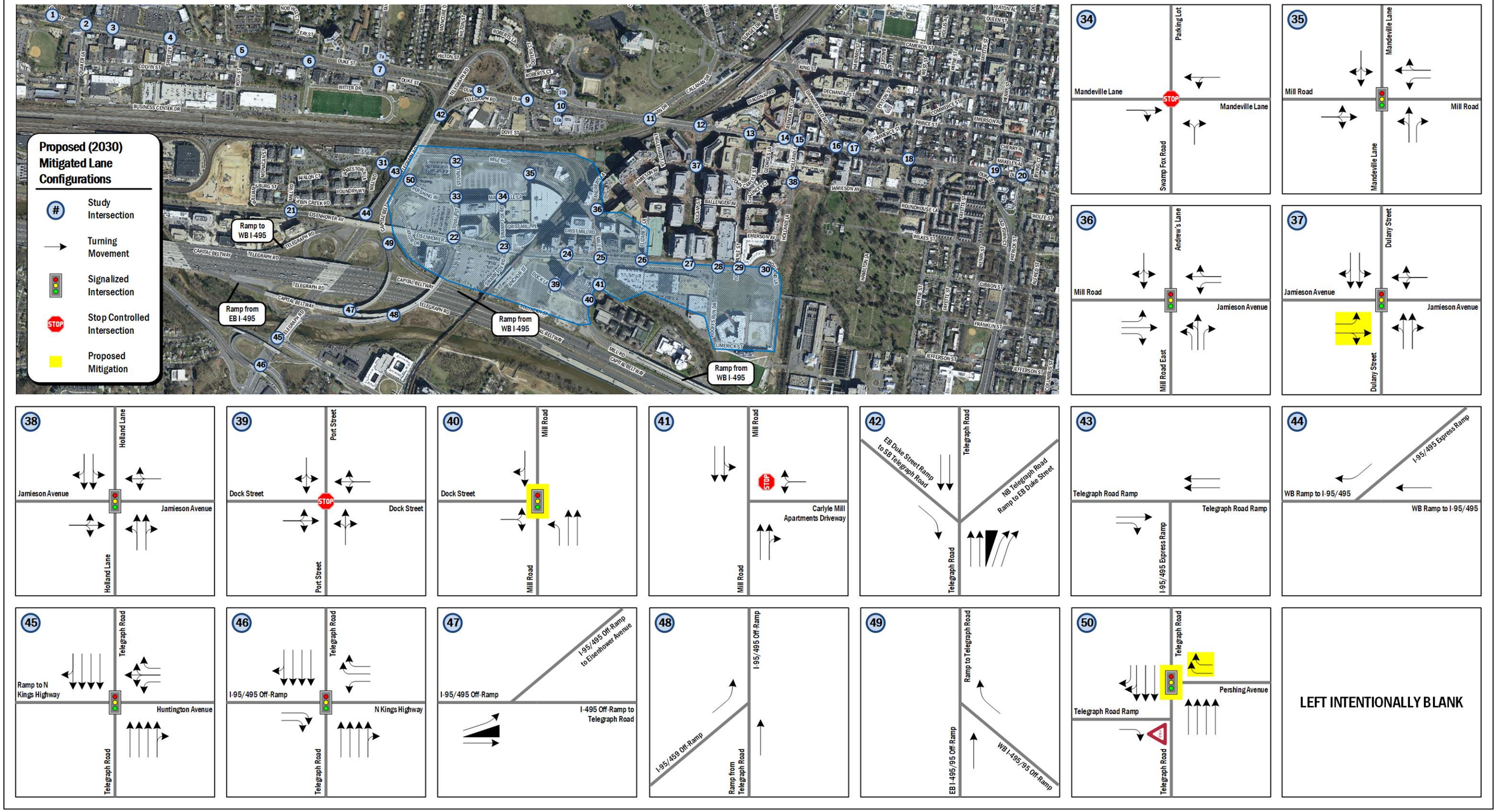


Figure 58: 2030 Proposed Lane Configurations with Mitigations (Intersections 34 – 50)

Microsimulation Analysis Results

This section includes the VISSIM microsimulation analysis results which were used to further evaluate proposed mitigations for the EESAP 2019 Update. This was accomplished by comparing queueing and other Measures of Effectiveness (MOEs) results across analysis scenarios.

The results of the VISSIM microsimulation indicate that the proposed increase in density and changes in uses included in the EESAP 2019 update will have a manageable impact on the surrounding transportation network, assuming this report's recommendations and mitigation measures are implemented.

Measures of Effectiveness

The MOEs used to evaluate the VISSIM microsimulation results were scoped and approved by the City. These are:

- **Number of Vehicles Denied Entry into Network** – this metric is used to help identify each analysis scenario's ability to process volumes through the network, thus identifying issues related to capacity;
- **Individual Link Vehicular Volumes/Throughput –** measured in vehicles per hour, this metric is used to help identify individual link's ability to process volumes in each of the analysis scenario, thus identifying issues related to capacity;
- **Simulated Vehicular Travel Times –** measured in seconds, this metric is used to help compare the simulated average amount of time it takes a vehicle to travel between two specified points;
- **Maximum Queues –** measured in feet, this metric is used to help compare and identify where there is potential for vehicular queues to spill back to upstream intersections and impact traffic operations; and
- **Intersection Delay –** measured in seconds of delay per vehicle, this metric measures the difference between the actual vehicle travel time and its desired travel time.

Simulated Vehicular Volumes

Vehicular volume results are used to help identify each scenario's ability to process vehicular volumes on a macro and micro level. These results are expressed as the number of vehicles denied entry into network, or as individual link vehicular volumes (throughput).

The number of vehicles denied entry into the network for each of the analysis scenarios is shown in Table 21. As can be seen, there are a significant number of vehicles that are denied entry in most analysis scenarios; however, the proposed mitigations identified for the proposed increase in density and changes in land use will create additional capacity and allow more vehicles to be processed through the study area, especially when compared to the 2030 Approved scenario.

Simulated individual link volumes results, also known as throughput results, for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 Proposed (Mitigated) analysis scenarios are included in the Technical Appendix.

Simulated Vehicular Travel Times

Travel time, which is the amount of time it takes for a motorist to travel from point A to point B. It is a direct reflection of motorist experience. The eight (8) travel times that were analyzed as part of the VISSIM microsimulation analysis were:

1. Eastbound Duke Street from Witter Street to Dove Street
2. Westbound Duke Street from Callahan Drive to W Taylor Run Parkway
3. Eastbound Eisenhower Avenue from Mill Road (west) to Mill Road (east)
4. Westbound Eisenhower Avenue from Elizabeth Lane to Stovall Street

Table 21: Number of Vehicles Denied Entry into Network

	Existing (2019)*		Approved (2030)		Proposed (2030)		Proposed (2030) - Mitigated	
	AM Peak Hour (vph)	PM Peak Hour (vph)	AM Peak Hour (vph)	PM Peak Hour (vph)	AM Peak Hour (vph)	PM Peak Hour (vph)	AM Peak Hour (vph)	PM Peak Hour (vph)
Number of Vehicles Denied Entry into Network	0	0	1,903	5,050	3,272	10,838	26	649

* for a VISSIM model to be considered calibrated, no vehicles are denied entry in existing conditions

5. Northbound Telegraph Road from Kings Highway to eastbound Duke Street at Dove Street
6. Northbound Telegraph Road from Kings Highway to westbound Dike Street at W Taylor Run Parkway
7. Westbound Duke Street at Callahan Drive to southbound Telegraph Road at Huntington Avenue
8. Eastbound Duke Street from Witter Street southbound Telegraph Road at Huntington Avenue

Simulated travel time results for the eight (8) travel time runs that were analyzed using VISSIM in the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 Proposed (Mitigated) analysis scenarios are shown in Table 22 for the AM peak hour and Table 23 for the PM peak hour.

Simulated Maximum Queues

Simulated maximum queue results identify where there is potential for vehicular queues to spill back to upstream intersections and impact traffic operations. The maximum queue (in feet) is the maximum distance from the stop bar to the back of the queue over the analysis period. Table 24 shows the AM peak hour simulated maximum queues for study area intersections for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 (Mitigated) analysis scenarios. Table 25 shows the PM peak hour simulated maximum queues for study area intersections for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 (Mitigated) analysis scenarios.

Simulated Intersection Delay

Simulated intersection delay results show the difference between the actual vehicle travel time and its desired travel time and is measured in seconds of delay per vehicle. Table 24 shows the AM peak hour simulated intersection delay for study area intersections for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 (Mitigated) analysis scenarios. Table 25 shows the PM peak hour simulated intersection delay for study area intersections for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 (Mitigated) analysis scenarios.

Evaluation of Proposed Mitigations

Based on the results of the VISSIM microsimulation analysis, the following mitigations are proposed in addition to the mitigations that were identified using Synchro, which are discussed in the previous section:

- Density Reduction in Neighborhood 1
  - A reduction in 250,000 square feet of office in Block 2 and reduction in 250,000 square feet of office in Block 3
  - A conversion of 300,000 square feet of office from Block 9B to residential dwelling units
  - A conversion of 300,000 square feet of residential space to senior housing in Blocks 11 and 12
- Duke Street & W Taylor Run Parkway (Int. 7)
  - Re-striping southbound approach to include a left turn onto Duke Street and a shared left turn lane onto Telegraph Road and right turn lane onto Duke Street
- Duke Street & Telegraph Road Off-Ramp – westbound (Int. 8)
  - New signal
  - Re-striping the off-ramp to include two lanes
- Duke Street & Telegraph Road Off-Ramp – eastbound (Int. 9)
  - New signal
  - Re-striping the off-ramp to include two lanes
- Duke Street & Dove Street/Roberts Lane (Int. 10)
  - Signal timing adjustments
- Eisenhower Avenue & Stovall Street/Holiday Inn (Int. 22)
  - Signal timing adjustments
  - Re-stripe the northbound approach to include a left/thru lane, thru/right lane, and a right-turn lane and move the crosswalk from east leg to west leg
- Eisenhower Avenue & Swamp Fox Road (Int. 23)
  - Signal timing adjustments
  - Relocating eastbound bus shelter (may include relocation to Eisenhower Avenue Metro Station or relocating stop/shelter from near side to far side of intersection)
  - Reconfiguring the eastbound approach to include a left/thru lane, thru lane, and thru/right lane. This maintains the existing cartway width
- Eisenhower Avenue & Port Street / Mill Race Lane (Int. 24)
  - Signal timing adjustments
  - Reconfiguring the eastbound approach to include a left-turn lane, two thru lanes, and a thru/right lane. This maintains the existing cartway width
- Eisenhower Avenue & Mill Road East (Int. 25)
  - Signal timing adjustments
  - Reconfiguring the eastbound approach to include a left turn lane, two thru lanes, and a right-turn lane. This maintains the existing cartway width
- Mill Road & Telegraph Road Ramp (Int. 31)
  - Additional northbound right-turn lane

- Telegraph Road & Pershing Avenue (Int. 50)
  - Additional westbound lane

Table 22: AM Peak Hour Travel Time Results

Travel Time Segment	Existing (2019)	Approved (2030)	Proposed (2030)		Proposed (2030) - Mitigated	
	AM Peak (sec)	AM Peak (sec)	AM Peak (sec)	Change**	AM Peak (sec)	Change**
EB Duke St from Witter St to Dove St*	92	93	94	*+1*	129	*+36*
WB Duke St from Callahan Dr to W Taylor Run Pkwy*	111	116	118	*+2*	150	*+39*
EB Eisenhower Ave from Mill Rd West to Mill Rd (east)	137	154	179	*+25*	280	*+143*
WB Eisenhower Ave from Elizabeth Ln to Stovall St	118	120	141	*+21*	124	*+6*
NB Telegraph Rd from Kings Hwy to EB Duke St at Dove St*	217	239	238	*-1*	176	*-41*
NB Telegraph Rd from Kings Hwy to WB Duke St at W Taylor Run Pkwy*	271	314	320	*+6*	218	*-53*
WB Duke St at Callahan Dr to SB Telegraph Rd at Huntington Ave	158	159	159	*0*	163	*+5*
EB Duke St from Witter St to SB Telegraph Rd at Huntington Ave	149	187	203	*+16*	178	*+29*

* condition changed from free-flow to signalized in mitigated scenario

** difference from Approved (2030) scenario

Table 23: PM Peak Hour Travel Time Results

Travel Time Segment	Existing (2019)	Approved (2030)	Proposed (2030)		Proposed (2030) - Mitigated	
	PM Peak (sec)	PM Peak (sec)	PM Peak (sec)	Change**	PM Peak (sec)	Change**
EB Duke St from Witter St to Dove St*	94	92	95	*+3*	126	*+34*
WB Duke St from Callahan Dr to W Taylor Run Pkwy*	117	132	110	*-22*	171	*+39*
EB Eisenhower Ave from Mill Rd West to Mill Rd (east)	162	1345	1834	*+489*	196	*-1149*
WB Eisenhower Ave from Elizabeth Ln to Stovall St	110	696	1100	*+404*	152	*-544*
NB Telegraph Rd from Kings Hwy to EB Duke St at Dove St*	131	195	247	*+52*	154	*-41*
NB Telegraph Rd from Kings Hwy to WB Duke St at W Taylor Run Pkwy*	212	335	314	*-21*	218	*-117*
WB Duke St at Callahan Dr to SB Telegraph Rd at Huntington Ave	186	199	193	*-6*	229	*+30*
EB Duke St from Witter St to SB Telegraph Rd at Huntington Ave	180	200	208	*+8*	261	*+61*

* condition changed from free-flow to signalized in mitigated scenario

** difference from Approved (2030) scenario

Table 24: VISSIM Microsimulation Delay and Maximum Queue Results – AM Peak Hour

	Intersection (Movement)	Storage Length (ft)	*AM Peak*							
			Existing		Approved 2030		Proposed 2030		Proposed 2030 Mitigated	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
7	**Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St**									
	Overall Intersection (Signalized)		**27.7**		**34.1**		**34.4**		**26.5**	
	Eastbound Left	190	70.7	98	70.3	88	73.0	100	67.3	98
	Eastbound Thru	700	12.39	781	13.9	801	14.1	799	8.8	794
	Eastbound Right	700	18.20	794	45.2	822	47.9	820	33.0	817
	Westbound Thru	1960/1000	26.42	964	28.0	1265	28.5	1454	18.3	963
	Westbound Right	140	52.4	907	50.5	953	49.7	1367	23.7	545
	Southbound LT	30	82.3	303	78.1	381	65.8	387	84.8	421
	Southbound Right	30	38.0	110	37.8	94	35.2	100	88.4	118
8	**NB Telegraph Rd to WB Duke St**									
	Overall Intersection (Unsignalized)*		-		-		-		**25.4**	
	Westbound Thru	780	0.4	0	0.6	0	0.6	0	38.9	587
	Southbound Right	1700	3.6	817	4.2	1429	4.6	1444	18.8	1231
	NB Telegraph Rd to EB Duke St									
	Overall Intersection (Unsignalized)*		-		-		-		**25.6**	
	Eastbound Thru	1200	1.2	0	1.0	0	0.9	0	33.6	781
	Northbound Right	1300	14.8	544	12.9	534	11.9	527	20.7	705
10	**Dove St/Roberts Ln & Duke St**									
	Overall Intersection (Signalized)		**15.5**		**15.1**		**14.0**		**18.9**	
	Eastbound Thru	1970	13.5	939	12.9	977	12.1	934	17.8	785
	Eastbound Right	1970	31.0	364	31.0	331	29.9	469	38.3	724
	Westbound Thru	870	10.0	262	10.8	316	9.6	286	11.0	386
	Westbound Right	870	19.5	70	21.6	62	20.7	57	24.4	76
	Northbound Left	40	35.1	440	34.6	407	34.1	395	42.8	774
	Northbound Right	40	30.6	440	29.1	407	28.2	395	27.3	774
	Northbound Left	40	13.8	439	21.5	390	16.9	393	20.1	773
	Southbound Left	20	30.4	124	35.2	122	33.7	115	44.2	134
	Southbound Thru	20	27.9	71	29.6	63	31.3	58	37.6	77
	Southbound Right	20	11.7	97	10.8	93	11.2	81	12.8	93
22	**Holiday Inn & Eisenhower Ave & Stovall St**									
	Overall Intersection (Signalized)		**26.7**		**33.5**		**58.3**		**39.4**	
	Eastbound Left	150	19.25	111	18.56	240	82.8	597	38.5	510
	Eastbound Thru	1700	21.64	205	21.62	282	30.5	614	49.1	656
	Westbound Left	270	62.07	37	68.46	29	68.0	29	67.2	28
	Westbound Thru	460	22.80	102	30.05	165	37.1	344	40.8	182
	Westbound Right	460	13.60	162	16.09	215	56.3	433	29.7	342
	Northbound Left	3200	47.95	424	50.12	1270	134.5	1292	44.3	911
	Northbound Thru	3200	43.51	424	49.47	1270	143.0	1292	44.8	911
	Northbound Right	300	20.67	823	36.42	1296	24.9	1297	27.1	911
	Southbound Left	220	49.86	112	53.24	196	76.0	287	57.5	287
	Southbound Thru	380	67.18	112	43.81	196	112.1	287	64.0	287
	Southbound Right	380	36.08	165	33.93	249	34.8	388	38.3	252
	Northeastbound LTR	350	62.90	68	59.16	68	63.8	68	66.3	78
23	**Swamp Fox Rd & Eisenhower Ave**									
	Overall Intersection (Signalized)		**13.0**		**11.8**		**15.3**		**22.3**	
	Eastbound Left	60	13.50	315	12.87	393	13.80	426	26.2	563
	Eastbound Thru	440	12.55	514	12.45	563	11.96	593	25.1	563
	Eastbound Right	440	-	-	0.0	563	0.0	593	0.0	563
	Westbound Left	100	-	-	45.06	65	43.88	45	26.7	24
	Westbound Thru	210	9.16	98	5.94	107	16.33	273	6.6	187
	Westbound Right	210	9.01	98	7.34	107	20.43	273	5.9	187
	Northbound Left	400	65.98	90	35.49	105	39.16	160	40.6	191
	Northbound Thru	400	0.0	90	33.83	105	39.07	160	38.6	191
	Northbound Right	400	11.89	91	5.94	107	14.23	161	31.1	193
	Southbound Left	90	42.82	72	45.89	80	62.79	114	50.9	80
	Southbound Thru	170	-	-	43.50	80	38.98	114	59.2	80
	Southbound Right	170	4.87	35	4.50	46	61.82	178	5.0	38
24	**Port St/Mill Race Ln & Eisenhower Ave**									

	Intersection (Movement)	Storage Length (ft)	AM Peak							
			Existing		Approved 2030		Proposed 2030		Proposed 2030 Mitigated	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
	Overall Intersection (Signalized)		**7.2**		**17.1**		**18.1**		**36.8**	
	Eastbound Left	120	4.7	48	11.3	52	12.9	50	27.7	371
	Eastbound Thru	280	6.5	243	19.5	568	21.6	691	48.2	700
	Eastbound Right	280	8.4	264	15.0	589	18.5	712	24.0	718
	Westbound Left	90	16.5	4	17.5	39	14.4	31	25.4	46
	Westbound Thru	290	6.0	142	5.6	141	5.9	173	9.9	200
	Westbound Right	290	10.6	147	4.8	147	5.6	178	8.9	206
	Northbound Left	240	43.2	78	43.3	221	43.0	221	40.6	184
	Northbound Thru	240	0.0	78	41.1	221	41.2	221	4.6	184
	Northbound Right	240	19.8	83	33.5	227	33.0	227	24.5	189
	Southbound Left	190	45.8	68	46.9	68	46.7	68	45.9	54
	Southbound Thru	190	68.0	68	41.2	68	41.3	68	44.0	54
	Southbound Right	60	11.2	72	8.2	72	8.4	72	9.1	58
25	**Mill Rd (East) & Eisenhower Ave**									
	Overall Intersection (Signalized)		**19.3**		**30.3**		**31.2**		**32.5**	
	Eastbound Left	160	9.8	67	70.1	347	67.5	402	28.6	363
	Eastbound Thru	290	12.6	406	19.3	426	20.8	416	32.4	429
	Eastbound Right	290	9.4	429	16.3	449	17.4	438	18.5	453
	Westbound Left	200	23.5	93	58.7	101	59.8	95	55.2	144
	Westbound Thru	360	19.2	128	25.5	185	25.4	187	18.7	166
	Westbound Right	360	11.9	131	18.9	189	17.4	191	11.3	169
	Northbound Left	250	25.8	277	25.4	312	25.5	308	26.0	265
	Northbound Thru	250	30.2	757	47.7	781	48.4	779	37.7	766
	Northbound Right	250	26.1	763	44.2	787	43.5	785	40.0	775
	Southbound Left	230	44.9	101	36.2	139	36.3	138	41.2	126
	Southbound Thru	230	36.7	101	31.8	139	32.7	138	32.2	126
	Southbound Right	230	7.4	61	35.2	139	35.5	138	33.2	126
31	**Mill Rd & Driveway/Telegraph Rd Ramp**									
	Overall Intersection (Signalized)*		-		-		-		**23.9**	
	Eastbound Left	260	7.8	0	14.0	0	9.5	0	17.8	27
	Eastbound Thru	260	0.0	0	0.0	0	0.0	0	0.0	27
	Eastbound Right	260	6.2	0	6.5	0	6.4	0	24.2	27
	Westbound Left	180/210	8.2	53	11.9	239	17.4	232	45.6	202
	Westbound Thru	180/210	0.0	53	0.0	239	0.0	232	0.0	202
	Westbound Right	180/210	5.6	53	17.0	239	19.9	232	8.8	202
	Northbound Left	720	0.0	72	0.0	76	0.0	82	0.0	0
	Northbound Thru	720	8.0	72	8.7	76	9.4	82	49.3	348
	Northbound Right	720	6.4	72	7.0	76	7.5	82	48.7	279
	Southbound Left	790	8.4	24	10.7	88	15.2	228	16.7	321
	Southbound Thru	790	1.1	24	2.1	88	2.7	228	3.3	47
	Southbound Right	790	0.0	24	0.0	88	0.0	228	0.0	47
42	**Telegraph Rd & Duke St Ramp to Telegraph Rd/NB Telegraph Rd to EB Duke St**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Northbound Thru	760	38.6	765	49.5	775	53.4	784	2.0	499
	Northbound Right	760	40.9	765	38.6	775	38.5	784	11.3	499
	Southbound Thru	1900	0.5	0	0.6	0	0.6	0	0.7	0
	Southbound Right	900	3.0	0	3.5	82	5.6	238	3.5	0
45	**Telegraph Rd & Huntington Ave**									
	Overall Intersection (Signalized)		**8.7**		**17.0**		**21.8**		**9.2**	
	Westbound Left	270	37.3	377	38.8	524	47.1	660	36.4	402
	Westbound Thru	500	0.0	377	0.0	524	78.3	660	0.0	402
	Westbound Right	500	40.8	353	53.9	500	23.3	636	43.6	378
	Northbound Thru	230	6.9	398	18.3	421	23.0	405	7.2	389
	Northbound Right	230	4.9	431	22.2	454	9.7	438	4.3	422
	Southbound Thru	350	8.5	187	9.4	191	9.1	199	8.9	205
	Southbound Right	350	7.5	130	7.8	134	21.8	142	7.6	147
47	**I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Eastbound Left	1470	21.2	911	68.1	1689	54.0	1456	0.5	0
	Eastbound Thru	1470	0.4	0	82.1	1697	115.2	1699	3.7	153

	Intersection (Movement)	Storage Length (ft)	AM Peak							
			Existing		Approved 2030		Proposed 2030		Proposed 2030 Mitigated	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
48	**Ramp from Telegraph Rd & I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Eastbound Thru	2400	0.3	0	42.7	599	60.8	608	4.7	233
	Northbound Thru	1300	0.6	0	91.5	1309	108.7	1312	7.7	300
49	**I-495 WB Ramp & Telegraph Road**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Westbound Thru	1500	16.3	888	29.0	1681	31.0	1692	2.8	84
	Northbound Thru	1550	30.9	697	68.9	1165	58.4	1159	1.6	0
50	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (western node)**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Eastbound Right	180	0.9	0	1.2	0	1.3	0	1.9	5
	Southbound Thru	1700	0.3	24	0.5	338	0.7	567	0.5	148
	Southbound Right	650	2.4	25	13.9	341	27.9	571	5.7	151
51	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (eastern node)**									
	Overall Intersection (Unsignalized)*		-		-		-		**17.1**	
	Westbound Right	600	44.5	331	68.4	548	146.9	713	91.0	444
	Northbound Thru	2200	20.8	883	30.1	975	32.8	976	7.6	713

* - Intersection signalized as proposed mitigation

Table 25: VISSIM Microsimulation Delay and Maximum Queue Results – PM Peak Hour

	Intersection (Movement)	Storage Length (ft)	PM Peak							
			Existing		Approved 2030		Proposed 2030		Proposed 2030 Mitigated	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
7	**Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St**									
	Overall Intersection (Signalized)		**49.5**		**38.7**		**37.4**		**46.3**	
	Eastbound Left	190	56.2	70	56.6	79	56.4	73	66.4	78
	Eastbound Thru	700	20.2	814	21.7	811	23.6	798	14.1	798
	Eastbound Right	700	39.3	817	48.1	820	48.1	810	64.0	822
	Westbound Thru	1960/1000	39.4	1047	32.2	1451	27.6	669	19.3	1143
	Westbound Right	140	50.2	977	53.8	1452	45.8	610	28.5	814
	Southbound LT	30	226.1	932	65.5	713	70.9	969	204.1	620
	Southbound Right	30	191.0	224	70.8	210	80.0	407	669.2	767
8	**NB Telegraph Rd to WB Duke St**									
	Overall Intersection (Unsignalized)*		-		-		-		**24.1**	
	Westbound Thru	780	0.2	0	0.4	0	0.6	0	39.8	505
	Southbound Right	1700	3.8	531	6.4	1447	2.6	0	16.7	1051
	NB Telegraph Rd to EB Duke St									
	Overall Intersection (Unsignalized)*		-		-		-		**24.2**	
	Eastbound Thru	1200	0.6	0	0.8	0	0.7	0	40.4	677
	Northbound Right	1300	1.2	67	1.2	45	0.7	0	11.1	445
10	**Dove St/Roberts Ln & Duke St**									
	Overall Intersection (Signalized)		**16.3**		**17.8**		**14.6**		**19.0**	
	Eastbound Thru	1970	11.7	376	12.0	485	10.3	495	10.8	492
	Eastbound Right	1970	30.6	244	30.0	175	26.6	410	43.6	305
	Westbound Thru	870	15.4	811	18.6	1003	14.9	969	19.4	1034
	Westbound Right	870	23.7	74	24.6	68	25.1	65	26.4	80
	Northbound Left	40	33.1	320	33.0	251	31.2	486	46.5	381
	Northbound Right	40	28.4	320	30.6	251	29.4	486	32.9	381
	Northbound Left	40	18.8	319	21.2	250	18.0	485	27.5	380
	Southbound Left	20	31.1	125	33.8	119	25.9	161	40.5	130
	Southbound Thru	20	32.6	75	30.8	69	33.8	66	36.3	81
	Southbound Right	20	11.4	77	12.3	77	12.4	99	12.2	77
22	**Holiday Inn & Eisenhower Ave & Stovall St**									
	Overall Intersection (Signalized)		**21.2**		**134.6**		**175.1**		**38.5**	
	Eastbound Left	150	25.7	296	2601.5	806	1217.5	597	75.9	759
	Eastbound Thru	1700	20.6	345	192.7	805	57.2	614	28.2	735
	Westbound Left	270	68.5	91	63.3	61	59.2	29	91.3	86
	Westbound Thru	460	18.5	315	47.7	627	58.9	344	38.1	559
	Westbound Right	460	12.8	290	422.1	627	384.3	433	24.1	485
	Northbound Left	3200	48.4	195	170.6	943	605.9	1292	50.7	34
	Northbound Thru	3200	46.6	195	256.9	943	561.1	1292	50.7	351
	Northbound Right	300	6.3	163	9.7	783	21.6	1297	17.3	376
	Southbound Left	220	49.3	84	63.4	169	82.3	287	62.9	386
	Southbound Thru	380	57.1	84	57.5	169	58.2	287	63.8	386
	Southbound Right	380	35.0	195	56.0	343	48.5	388	47.1	461
	Northeastbound LTR	350	64.2	80	123.0	71	102.5	68	65.1	70
23	**Swamp Fox Rd & Eisenhower Ave**									
	Overall Intersection (Signalized)		**11.5**		**126.0**		**161.7**		**14.6**	
	Eastbound Left	60	17.3	122	41.6	226	55.1	163	34.7	504
	Eastbound Thru	440	9.7	412	8.0	403	8.7	258	11.1	504
	Eastbound Right	440	-	-	12.8	403	11.7	258	10.0	504
	Westbound Left	100	-	-	64.8	487	103.7	321	33.8	81
	Westbound Thru	210	8.8	325	182.8	755	272.2	739	13.8	578
	Westbound Right	210	8.2	325	297.6	755	373.0	739	13.1	578
	Northbound Left	400	64.4	79	131.8	343	169.5	335	45.8	145
	Northbound Thru	400	56.6	79	86.4	343	129.1	335	34.3	145
	Northbound Right	400	9.2	80	23.4	345	41.7	337	9.9	147
	Southbound Left	90	41.4	165	997.9	528	1616.3	419	47.2	256
	Southbound Thru	170	-	-	728.6	528	1131.0	419	35.7	256
	Southbound Right	170	30.2	125	1565.4	525	2175.5	517	32.3	188
24	**Port St/Mill Race Ln & Eisenhower Ave**									

	Intersection (Movement)	Storage Length (ft)	PM Peak							
			Existing		Approved 2030		Proposed 2030		Proposed 2030 Mitigated	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
	Overall Intersection (Signalized)		**13.8**		**85.8**		**129.4**		**12.8**	
	Eastbound Left	120	13.1	49	13.5	59	15.6	40	19.5	69
	Eastbound Thru	280	14.5	478	7.1	206	6.0	204	10.2	432
	Eastbound Right	280	24.9	499	7.2	227	7.4	225	11.0	452
	Westbound Left	90	13.0	76	73.6	271	116.0	265	26.4	158
	Westbound Thru	290	8.7	403	154.2	437	234.2	429	9.1	344
	Westbound Right	290	12.9	408	97.5	443	155.7	434	7.9	350
	Northbound Left	240	38.3	112	129.1	237	232.4	217	42.5	215
	Northbound Thru	240	41.6	112	114.6	237	143.0	217	41.6	215
	Northbound Right	240	23.2	118	94.7	242	175.1	223	32.1	220
	Southbound Left	190	55.6	104	210.6	200	552.4	216	55.0	136
	Southbound Thru	190	36.2	104	160.7	200	304.0	216	36.7	136
	Southbound Right	60	16.8	108	178.2	204	377.5	220	15.3	139
25	**Mill Rd (East) & Eisenhower Ave**									
	Overall Intersection (Signalized)		**27.7**		**151.3**		**181.6**		**33.1**	
	Eastbound Left	160	16.1	67	76.0	103	75.8	76	35.5	140
	Eastbound Thru	290	21.4	406	25.6	280	19.6	273	26.6	362
	Eastbound Right	290	16.1	429	19.2	302	16.6	291	8.6	383
	Westbound Left	200	13.7	93	119.7	210	128.0	87	31.0	216
	Westbound Thru	360	17.0	128	242.6	511	365.4	503	25.5	448
	Westbound Right	360	15.7	131	213.4	515	287.2	507	24.6	452
	Northbound Left	250	75.4	277	632.6	1101	1099.6	1090	77.4	766
	Northbound Thru	250	33.1	757	26.8	433	28.2	496	27.5	443
	Northbound Right	250	25.4	763	21.5	438	22.6	502	18.4	253
	Southbound Left	230	54.1	101	225.6	733	199.5	732	68.2	531
	Southbound Thru	230	39.8	101	21.3	733	225.9	732	62.1	531
	Southbound Right	230	7.8	61	384.2	734	1393.3	733	10.2	518
31	**Mill Rd & Driveway/Telegraph Rd Ramp**									
	Overall Intersection (Signalized)*		-		-		-		**21.1**	
	Eastbound Left	260	3.6	29	4.4	29	3.2	47	55.1	37
	Eastbound Thru	260	22.4	29	21.7	29	7.2	47	72.3	37
	Eastbound Right	260	3.1	29	3.8	29	6.2	47	73.7	37
	Westbound Left	180/210	16.7	98	40.4	180	45.6	223	51.5	139
	Westbound Thru	180/210	0.0	97	0.0	179	0.0	222	0.0	139
	Westbound Right	180/210	0.7	77	2.6	159	3.0	201	6.0	139
	Northbound Left	720	0.0	261	0.0	459	0.0	883	0.0	0
	Northbound Thru	720	4.1	261	6.6	459	5.4	883	49.4	173
	Northbound Right	720	13.3	261	18.2	459	16.0	883	39.6	415
	Southbound Left	790	26.9	837	48.4	2569	49.6	2554	16.4	541
	Southbound Thru	790	38.3	837	61.2	2569	62.6	2554	4.2	139
	Southbound Right	790	0.0	837	0.0	2569	0.0	2554	0.0	139
42	**Telegraph Rd & Duke St Ramp to Telegraph Rd/NB Telegraph Rd to EB Duke St**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Northbound Thru	760	3.4	101	39.9	712	4.0	343	1.2	147
	Northbound Right	760	0.4	104	0.2	717	0.1	346	1.0	150
	Southbound Thru	1900	2.5	0	5.0	486	5.6	1134	12.4	1058
	Southbound Right	900	2.4	28	6.1	721	7.5	764	20.8	906
45	**Telegraph Rd & Huntington Ave**									
	Overall Intersection (Signalized)		**16.4**		**26.9**		**38.3**		**17.1**	
	Westbound Left	270	68.0	627	72.8	708	82.3	718	67.6	664
	Westbound Thru	500	71.4	627	115.2	708	136.3	718	70.7	664
	Westbound Right	500	69.8	603	106.8	684	245.4	694	70.5	640
	Northbound Thru	230	10.7	397	28.4	412	66.2	406	11.0	401
	Northbound Right	230	3.6	430	30.6	445	75.5	439	3.5	434
	Southbound Thru	350	15.1	989	17.0	1590	13.4	1477	15.8	1704
	Southbound Right	350	13.9	932	15.2	1533	12.1	1419	15.0	1647
47	**I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Eastbound Left	1470	0.3	0	6.3	0	16.1	0	0.3	0
	Eastbound Thru	1470	0.1	0	218.7	1393	492.8	1464	0.3	0

	Intersection (Movement)	Storage Length (ft)	PM Peak							
			Existing		Approved 2030		Proposed 2030		Proposed 2030 Mitigated	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
48	**Ramp from Telegraph Rd & I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Eastbound Thru	2400	0.1	0	153.1	606	254.0	660	0.2	0
	Northbound Thru	1300	0.2	0	247.2	1315	392.0	1293	0.4	0
49	**I-495 WB Ramp & Telegraph Road**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Westbound Thru	1500	1.4	0	1.8	62	1.4	405	1.6	0
	Northbound Thru	1550	0.3	0	0.8	0	1.0	0	0.6	0
50	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (western node)**									
	Overall Intersection (Unsignalized)		-		-		-		-	
	Eastbound Right	180	2.6	105	3.1	152	3.1	70	2.2	240
	Southbound Thru	1700	2.2	198	4.6	654	5.8	888	6.7	943
	Southbound Right	650	4.2	201	9.7	648	11.6	891	9.4	944
51	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (eastern node)**									
	Overall Intersection (Unsignalized)*		-		-		-		**27.6**	
	Westbound Right	600	32.5	503	83.9	756	73.0	741	61.3	713
	Northbound Thru	2200	0.5	0	6.4	263	1.1	247	13.4	516

* - Intersection signalized as proposed mitigation

Summary and Conclusions

In completing the technical capacity analysis, several overall trends regarding existing and expected future travel patterns in the study area during the morning and afternoon peak hours were identified. The majority of vehicular capacity concerns in the study area can be alleviated through signal timing changes that adapt to changes in volume patterns, but at some locations, operational changes alone cannot mitigate future delays. Duke Street, Telegraph Road, and especially Eisenhower Avenue are heavily used by cut-through traffic, and it is likely that drivers will alter their patterns as future conditions change.

As such, an essential component for effective operations in this area will be to minimize the vehicular trip generation of new development, thus reducing the overlap between new local traffic and existing local or regional traffic. It is recommended that the EESAP be planned as a heavily multi-modal area with low vehicular trip generation. Instead of investing in widening roadways to alleviate capacity concerns, the strategy should be to promote non-vehicular modes of travel where possible and leverage existing and planned transit, pedestrian, and bicycle infrastructure.

However, this report does recommend that a number of intersections within the study area be improved with either signal timing adjustments, modifications to signal phasing, restriping, the addition of turn lanes or turn pockets, or new traffic signals. With these mitigations in place, the analysis shows that traffic operations with proposed development will improve or will be consistent with expected operations under the approved development scenario at many intersections, and in some cases improves or is similar to existing conditions. Nevertheless, as can be expected of urban infill there are still certain locations that are projected to experience delay and queuing issues.

It should be noted that there was significant congestion observed in certain portions of the study area under existing conditions, that the Synchro and VISSIM analysis may not be fully representing, such as Mill Road onto the I-495 ramps in the evening. The delay and queuing observed within the EESAP at this location stems from issues outside the study area along the Beltway.

As more development is realized in the EESAP this report recommends that the City of Alexandria consider standardizing cycle lengths and consider using pretimed signals throughout the EESAP. Shorter signal cycles permit frequent gaps, allowing city streets to function as a complete network rather than a series of major corridors for commuter traffic. In addition, shorter more predictable signal cycles provide more consistent crossing opportunities for pedestrians and bicycles, while long cycle lengths may increase pedestrian and bicycle non-compliance and risk-taking behavior. Almost all signalized intersections in the EESAP apart from those connecting the Mill Road express lanes ramp and the Pershing Avenue ramp at Telegraph Road via Eisenhower Avenue and Stovall Street could benefit from this treatment.

Monitoring of volumes within the EESAP is recommended before the mitigation measures identified in this report are implemented, to determine if observed volumes are in line with forecasted volumes.

A summary of mitigation measures is shown in Figure 59.

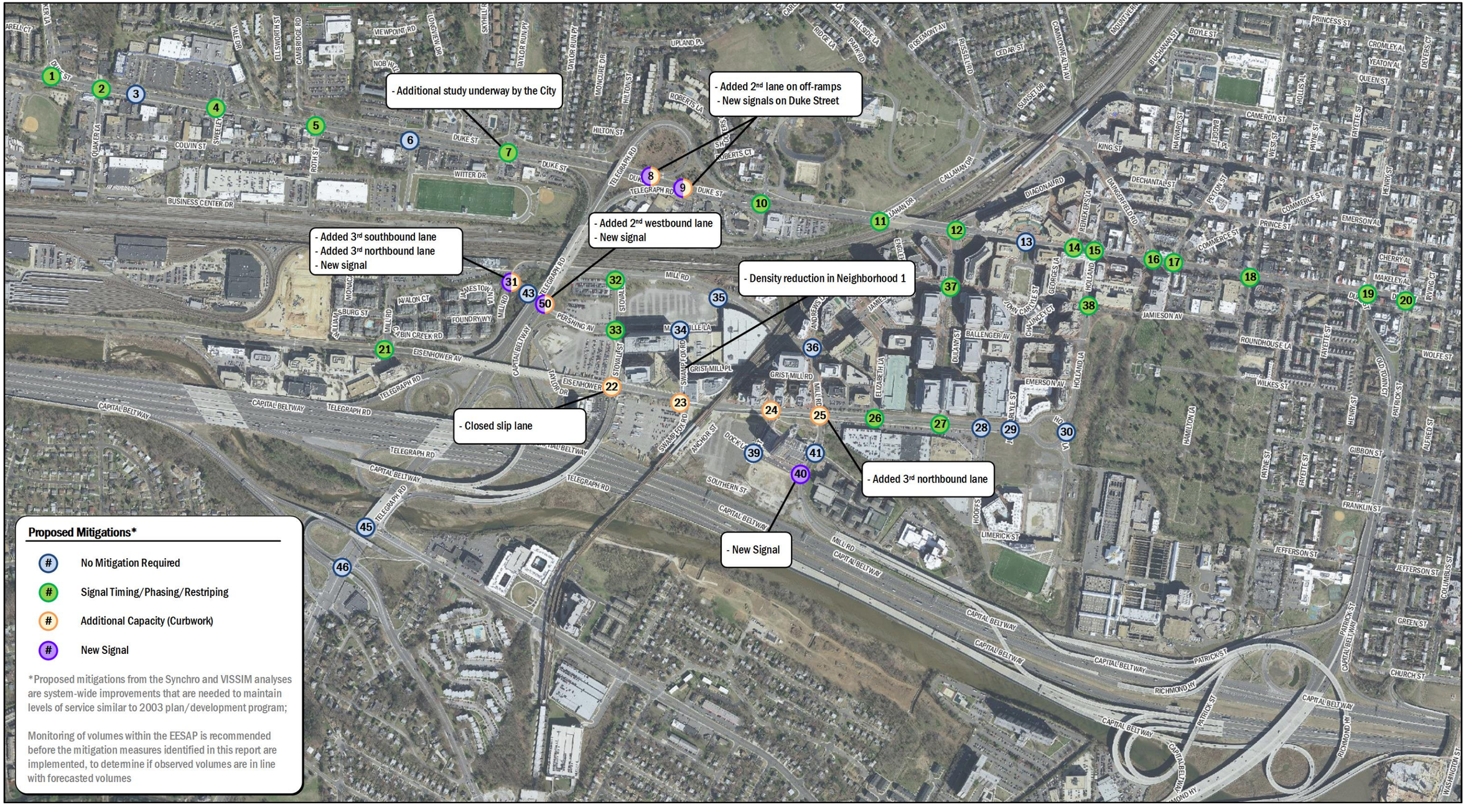


Figure 59: 2030 Proposed Lane Mitigations Summary

FUTURE CONDITIONS (2036)

As agreed to by the City of Alexandria and VDOT, this report includes a "plus six" planning-level analysis for the EESAP 2019 Update for the year 2036.

FUTURE PROJECTS

The future bicycle, pedestrian, transit improvements identified to be complete by 2036 have not changed from those outlined for the 2030 scenario in the previous chapter. Vehicular mitigation measures identified in the 2030 Proposed scenario have been assumed as the baseline for the 2036 scenario.

FUTURE TRAFFIC OPERATIONS (2036)

This section provides a summary of an analysis of the future roadway capacity in the study area for 2036. These capacity analyses focus on the weekday morning and afternoon peak hours, as determined by the existing traffic volumes in the study area. The scope of the capacity analysis was developed based on City of Alexandria and VDOT guidelines and approved by City of Alexandria and VDOT staff.

The purpose of the future roadway capacity analysis is to provide a planning-level analysis for the future conditions in 2036 with additional inherent growth on the roadway network, which includes the mitigation measures identified and proposed in the 2030 analysis.

Study Area, Scope, and Methodology

This section outlines the assumptions used to develop the future roadway capacity analysis for 2036.

Future Traffic Volume Assumptions

The traffic projections for the 2036 future conditions consist of the existing volumes with three additions:

- Traffic generated by developments expected to be completed prior to 2036 (known as background developments);
- Inherent growth on the roadway (representing regional traffic growth); and
- Traffic generated by proposed development in the EESAP.

Following national, City of Alexandria, and VDOT methodologies, a background development must meet the following criteria to be incorporated into the analysis:

- Be located in the study area, defined as having an origin or destination point within the cluster of study area intersection;
- Have entitlements; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, three (3) developments were included in the 2036 future conditions scenarios. These developments are unchanged from the 2030 analysis, and include:

1. Eisenhower Square (2901 Eisenhower Avenue)
2. Bishop Ireton High School Expansion
3. Eisenhower West Small Area Plan

Transportation studies were available for all three background developments. Trip generation and trip distribution assumptions for the background developments were based on the trip generation and distributions included in their respective studies and altered where necessary based on anticipated travel patterns. Trip generation assumptions for the background developments were previously shown in Table 16.

While the background developments represent local traffic changes, regional traffic growth is typically accounted for using growth rates. The growth rates used in this analysis were derived using VDOT's Annual Average Daily Traffic (AADT) data and the Metropolitan Washington Council of Government's (MWCOG) currently adopted regional transportation model, comparing the difference between the 2017 and the 2040 volumes, as vetted and approved by the City of Alexandria and VDOT. The growth rates shown in this model forecasted a negative growth rate along regional study area roadways. However, at the request of VDOT a conservative growth rate of 0.25% per year for 18 years was applied to existing volumes along regional roadways.

2036 Future Traffic with Proposed Development

The 2036 Future with Proposed Development traffic volumes include traffic generated by: the existing volumes, background developments, inherent growth on study area roadways, and proposed development in the EESAP. For purposes of the 2036 analysis, the only change to traffic volumes includes the additional six (6) years of inherent growth along regional roadways within the study area.

Trip distribution and assignments for site-generated traffic was primarily determined using StreetLight InSight® data and observations, as detailed in the Travel Demand Assumptions

chapter of this report. A summary of trip distribution assumptions is shown on Figure 31 for the inbound distribution assumptions and on Figure 32 for the outbound distribution assumptions.

The origin of outbound and destination of inbound vehicular trips were the assumed access points at each block, as shown in Figure 34. Trip distributions and assignment assumptions were vetted and approved by the City of Alexandria and VDOT.

Based on the trip distribution and assignment assumptions, site-generated trips were distributed though the study area intersections. The site-generated traffic volumes for the 2036 Proposed scenario are the same as those for the 2030 Proposed scenario, and are shown on Figure 44, Figure 45, and Figure 46.

The traffic volumes for the 2036 Future with Proposed Development conditions includes traffic generated by: existing volumes, background developments through the year 2036, inherent growth on the network, and proposed development in the EESAP. The 2036 Future with Proposed Development traffic volumes are shown in Figure 60, Figure 61, and Figure 62.

Peak Hour Factors

The TRB *Highway Capacity Manual* (HCM) and the AASHTO *Policy on Geometric Design of Highways and Intersections* recommend evaluating traffic conditions during the worst 15 minutes of either a design hour or a typical weekday rush hour. Peak Hour Factor (PHF) is used to convert the hourly volume into the volume rate representing the busiest 15 minutes of the hour. The existing guidelines provide typical values of PHF and advise using the PHF calculated from vehicle counts at analyzed or similar locations. The HCM recommends a PHF of 0.88 for rural areas and 0.92 for urban areas and presumes that capacity constraints in congested areas reduce the short-term traffic fluctuation. The HCM postulates 0.95 as the typical PHF for congested roadways.

For the Existing Conditions analysis, PHF were calculated from the turning movement data that was collected in the field, using a minimum PHF of 0.85.

To account for the increase in peak hour traffic generated by local development on side streets, and regional growth along major corridors, a default PHF minimum of 0.92 was assumed in the Future Conditions analyses.

2036 Future Geometry and Operations Assumptions

Lane configurations and traffic controls for the 2036 Future with Proposed Development scenario are the same as those identified as mitigations for the 2030 Proposed scenario, shown on Figure 56, Figure 57, and Figure 58.

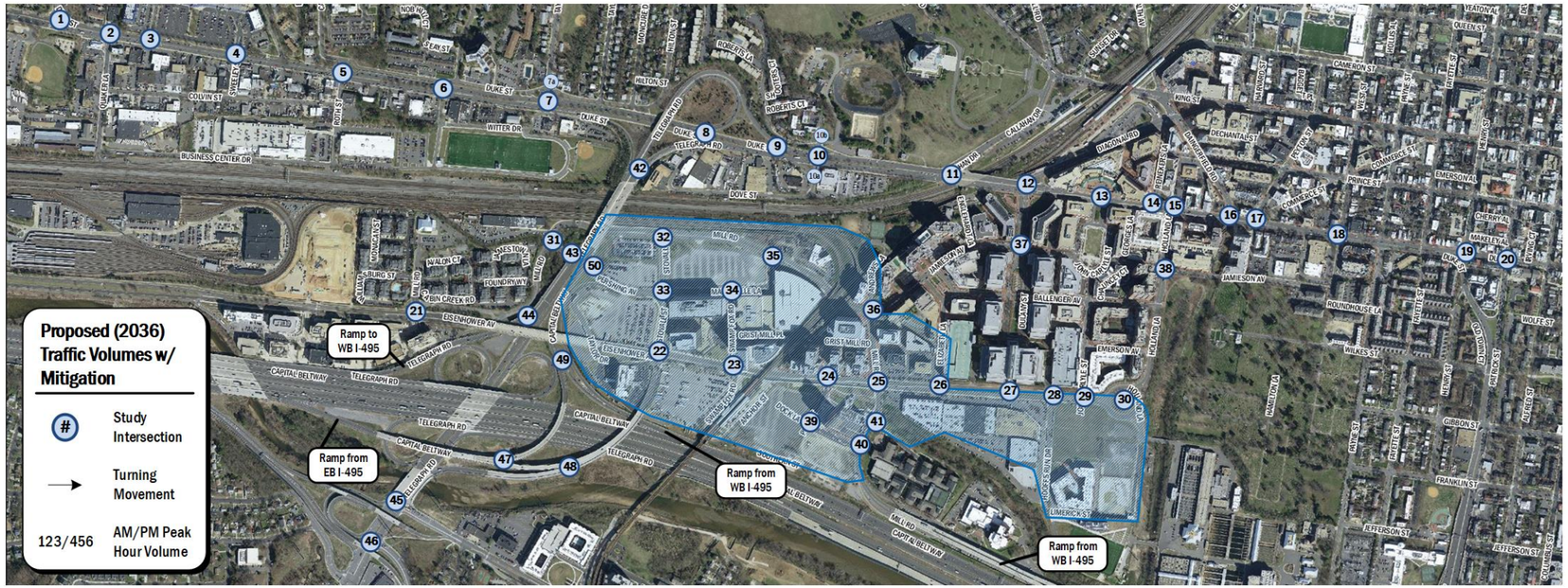
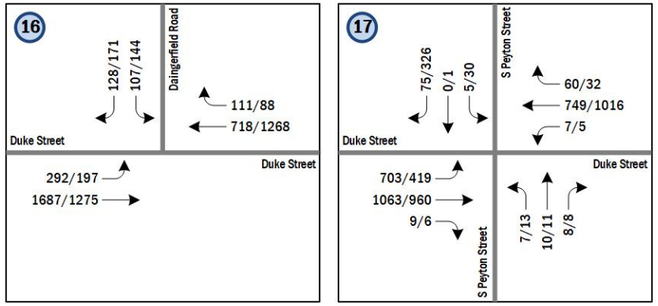


Figure 60: 2036 Proposed Vehicle Peak Hour Volumes (Intersections 1 – 15)



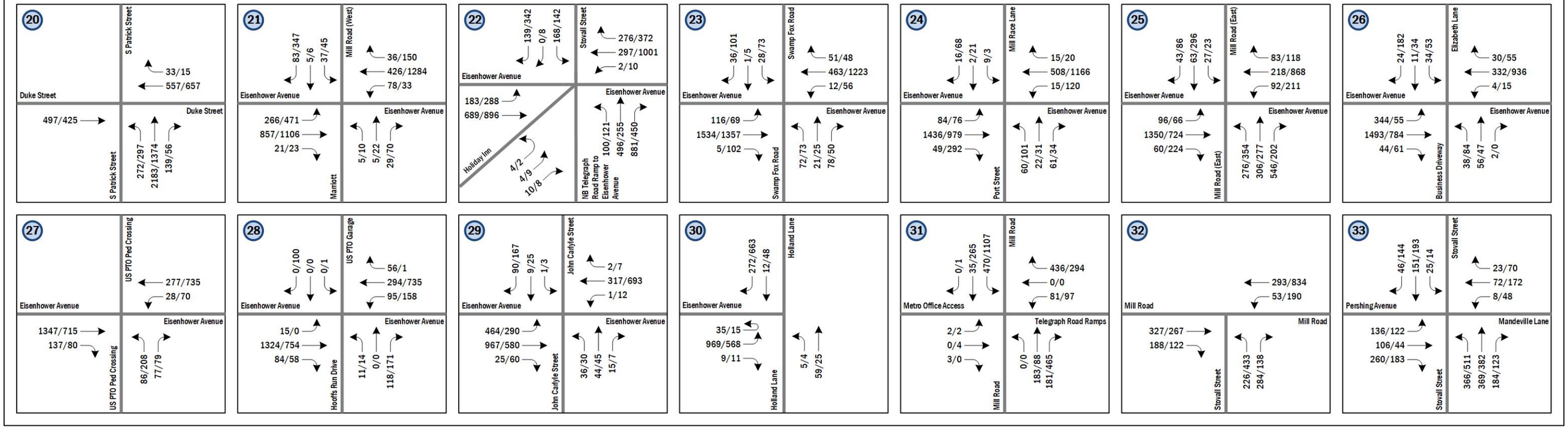
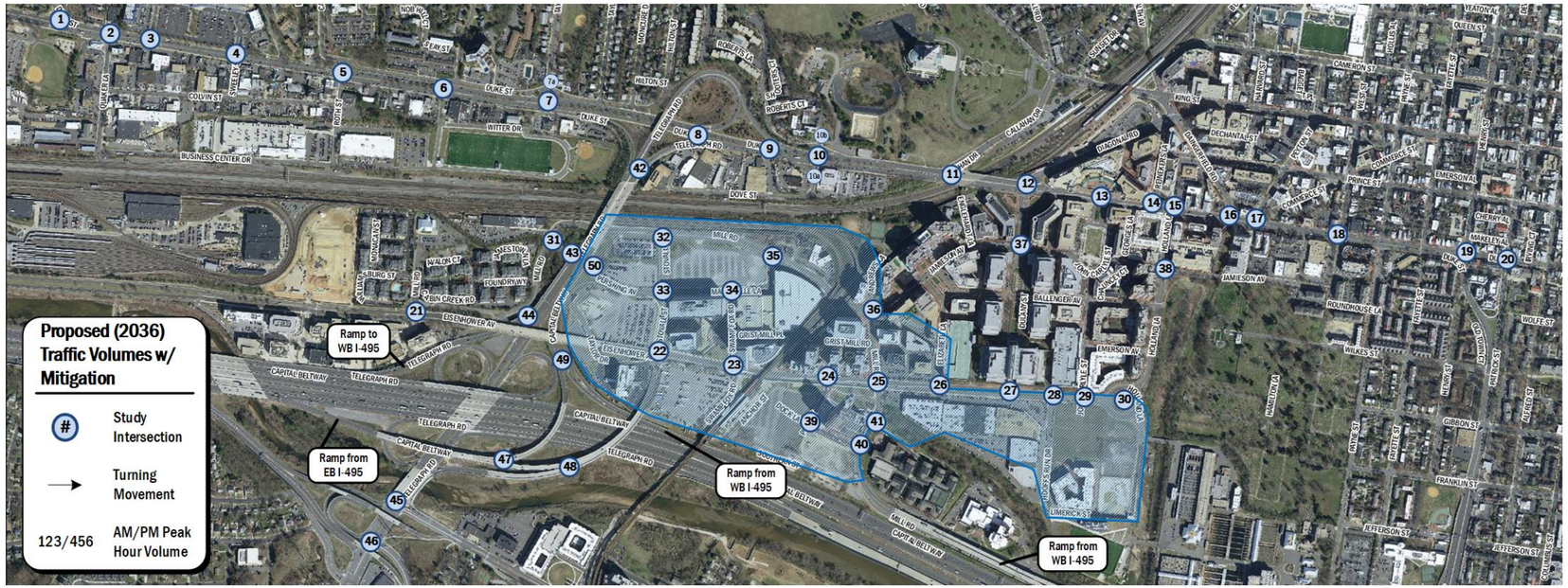
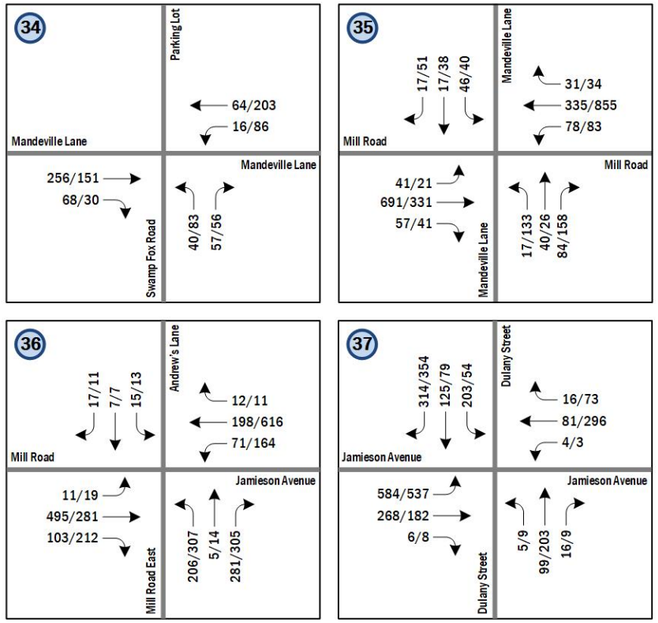
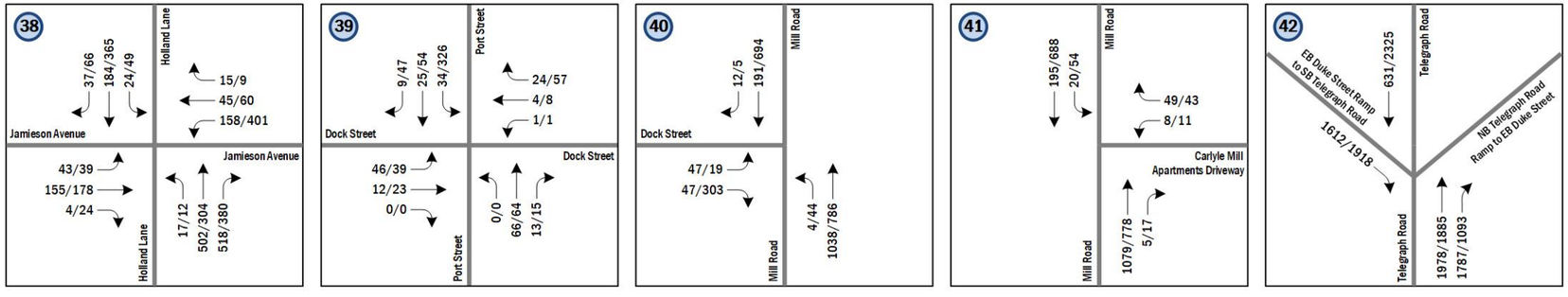


Figure 61: 2036 Proposed Vehicle Peak Hour Volumes (Intersections 16 – 33)







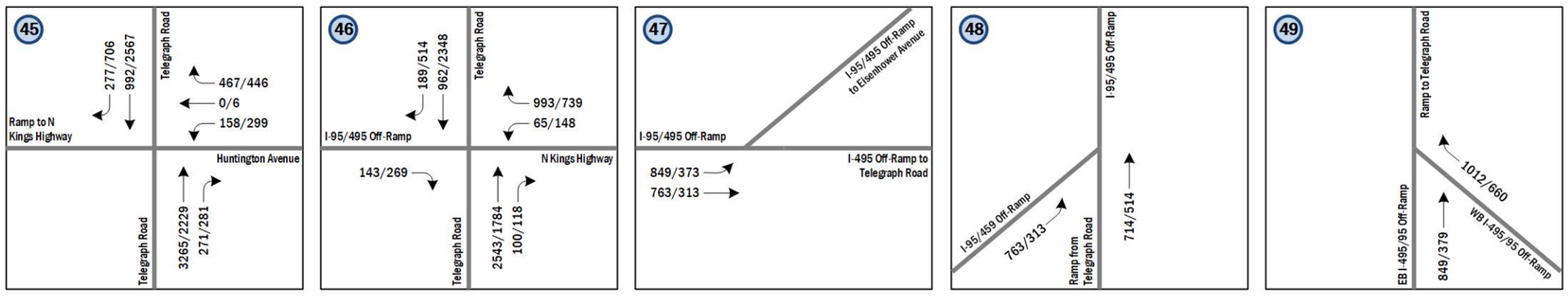


Figure 62: 2036 Proposed Vehicle Peak Hour Volumes (Intersections 34 – 50)

Vehicular Capacity Analysis Results

Intersection Capacity Analysis

Intersection capacity analyses were performed for the morning and afternoon peak hours at study area intersections. Synchro version 9.2 was used to analyze the study intersections based on the *Highway Capacity Manual* (HCM) 2000 methodology.

The results of the capacity analyses are expressed in level of service (LOS) and delay (seconds per vehicle) for each approach. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS D is typically used as the acceptable LOS threshold in the City of Alexandria; although LOS E or F is generally accepted in urbanized areas if vehicular improvements would be a detriment to safety or to non-auto modes of transportation.

The LOS capacity analyses were based on: (1) the peak hour traffic volumes; (2) the lane use and traffic controls; and (3) the Highway Capacity Manual (HCM) methodologies (using Synchro software). The average delay of each approach and LOS is shown for the signalized intersections in addition to the overall average delay and intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Technical Appendix.

Table 26 shows the results of the capacity analyses including LOS and average delay per vehicle (in seconds) for the 2036 Future conditions (the Proposed scenario including Mitigations identified in the 2030 scenario). Many study intersections operate at acceptable conditions during the weekday morning and afternoon peak; however, 21 intersections have one or more movement that operate at levels beyond acceptable thresholds in one or more peak hour:

- Duke Street & N Quaker Lane (AM 2036 Proposed with Mitigation)
- Alexandria Commons & Duke Street (AM 2036 Proposed with Mitigation)
- Sweeley Street/Alexandria Commons & Duke Street (PM 2036 Proposed with Mitigation)
- Roth Street/Cambridge Road & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road Ramp to Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street & Callahan Drive (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Dulany Street/Diagonal Road & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- John Carlyle Street & Duke Street (PM 2036 Proposed with Mitigation)
- Holland Lane & Duke Street (PM 2036 Proposed with Mitigation)
- S West Street & Duke Street (PM 2036 Proposed with Mitigation)
- S Henry Street & Duke Street (PM 2036 Proposed with Mitigation)
- Marriott Driveway/Mill Road (West) & Eisenhower Avenue (PM 2036 Proposed with Mitigation)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Mill Road (East) & Eisenhower Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Mill Road & Telegraph Road Ramp (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Dulany Street & Jamieson Avenue (PM 2036 Proposed with Mitigation)
- Telegraph Road & Huntington Avenue (PM 2036 Proposed with Mitigation)
- Telegraph Road & N Kings Highway (PM 2036 Proposed with Mitigation)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- W Taylor Run Parkway & Duke Street Access Road (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)

The following roadways categorized as minor arterials or above have one or more movements that experience a LOS E or LOS F in the 2036 Future conditions:

- Duke Street & N Quaker Lane (AM 2036 Proposed with Mitigation)
- Alexandria Commons & Duke Street (AM 2036 Proposed with Mitigation)
- Roth Street/Cambridge Road & Duke Street (PM 2036 Proposed with Mitigation)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road Ramp to Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street & Callahan Drive (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Dulany Street/Diagonal Road & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- John Carlyle Street & Duke Street (PM 2036 Proposed with Mitigation)
- Holland Lane & Duke Street (PM 2036 Proposed with Mitigation)
- S West Street & Duke Street (PM 2036 Proposed with Mitigation)
- S Henry Street & Duke Street (PM 2036 Proposed with Mitigation)
- Marriott Driveway/Mill Road (West) & Eisenhower Avenue (PM 2036 Proposed with Mitigation)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Mill Road (East) & Eisenhower Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Mill Road & Telegraph Road Ramp (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road & Huntington Avenue (PM 2036 Proposed with Mitigation)
- Telegraph Road & N Kings Highway (PM 2036 Proposed with Mitigation)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)

This report identifies that the following roadways categorized as evacuation routes have one or more movements experience a LOS E or LOS F in the 2036 Future conditions:

- Duke Street & N Quaker Lane (AM 2036 Proposed with Mitigation)
- Alexandria Commons & Duke Street (AM 2036 Proposed with Mitigation)
- Sweeley Street/Alexandria Commons & Duke Street (PM 2036 Proposed with Mitigation)
- Roth Street/Cambridge Road & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road Ramp to Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street & Callahan Drive (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Dulany Street/Diagonal Road & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- John Carlyle Street & Duke Street (PM 2036 Proposed with Mitigation)
- Holland Lane & Duke Street (PM 2036 Proposed with Mitigation)
- S West Street & Duke Street (PM 2036 Proposed with Mitigation)
- S Henry Street & Duke Street (PM 2036 Proposed with Mitigation)
- Mill Road & Telegraph Road Ramp (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road & Huntington Avenue (PM 2036 Proposed with Mitigation)
- Telegraph Road & N Kings Highway (PM 2036 Proposed with Mitigation)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)

Queuing Analysis

In addition to the capacity analyses presented above, a queuing analysis was performed at the study intersections. The queuing analysis was performed using Synchro version 9.2 software. The 50th percentile and 95th percentile queue lengths are shown for each lane group at the study area signalized intersections. The 50th percentile queue is the maximum back of queue on a median cycle. The 95th percentile queue is the maximum back of queue that is exceeded 5% of the time. For unsignalized intersections, only the 95th percentile queue is reported for each lane group (including free-flowing left turns and stop-

controlled movements) based on the HCM 2000 calculations. HCM 2000 does not calculate queuing for all-way stops.

Table 26 shows the queuing results for the study area intersection for the 2036 Future Proposed scenario. The 95th percentile queues at most lane groups at study area intersections do not exceed their available storage length in the 2036 Proposed scenario; however, 31 intersections do have at least one movement with 95th percentile queues that exceed the available storage length in the morning and/or afternoon peak hour:

- Duke Street & N Quaker Lane (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- S Quaker Lane & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Alexandria Commons & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Sweeley Street/Alexandria Commons & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Roth Street/Cambridge Road & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street Ramp to Telegraph Road/W Taylor Run Parkway (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road Ramp to Duke Street (AM 2036 Proposed with Mitigation)
- Duke Street & Roberts Lane/Dove Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street & Callahan Drive (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Dulany Street/Diagonal Road & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street & John Carlyle Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Duke Street & Reinekers Lane (AM 2036 Proposed with Mitigation)
- Holland Lane & Duke Street (PM 2036 Proposed with Mitigation)
- Duke Street & Daingerfield Road (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- S Peyton Street & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- S West Street & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- S Henry Street & Duke Street (PM 2036 Proposed with Mitigation)
- S Patrick Street & Duke Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Marriott Driveway/Mill Road (West) & Eisenhower Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Holiday Inn & Eisenhower Avenue & Stovall Street (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Swamp Fox Road & Eisenhower Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Mill Road (East) & Eisenhower Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Elizabeth Lane/Driveway & Eisenhower Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- John Carlyle Street & Eisenhower Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Holland Lane & Eisenhower Avenue (AM 2036 Proposed with Mitigation)
- Stovall Street & Pershing Avenue/Mandeville Lane (AM 2036 Proposed with Mitigation)
- Mill Road (East)/Andrews Lane & Mill Road/Jamieson Avenue (PM 2036 Proposed with Mitigation)
- Dulany Street & Jamieson Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road & Huntington Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road & N Kings Highway (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- Telegraph Road & Telegraph Road Ramp/Pershing Avenue (AM 2036 Proposed with Mitigation and PM 2036 Proposed with Mitigation)
- W Taylor Run Parkway (PM 2036 Proposed with Mitigation)

Table 26: 2036 Proposed Conditions Capacity Analysis Results

	Intersection (Movement)	Storage Length (ft)	2036 Proposed (Mitigated) Conditions						
			AM Peak			*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
1	**Duke St & N Quaker Ln**									
	Overall Intersection (Signalized)		**C**	**26.2**			**C**	**21.2**		
	Eastbound Left	210	C	25.4	91	#217	D	35.3	84	163
	Eastbound Thru	390	B	12.5	252	290	A	9.5	131	156
	Westbound Thru	350	B	19.6	203	253	B	18.3	397	m475
	Westbound Right	350	C	23.9	992	#1250	A	5.7	271	m21
	Southbound Left	1290	E	66.9	317	#452	D	53.8	327	#443
2	**S Quaker Ln & Duke St**									
	Overall Intersection (Signalized)		**C**	**20.6**			**C**	**22.9**		
	Eastbound Left	210	--	--	--	--	B	15.6	3	m8
	Eastbound Thru	330	D	38.6	894	m#1313	C	22.5	496	m613
	Eastbound Right	330	A	6.1	6	m29	C	20.9	44	m70
	Westbound Left	90	A	6.0	0	m1	B	11.1	5	m5
	Westbound TR	240	A	1.7	4	#1074	C	21.9	992	#1168
	Northbound LTR	340	D	51.5	54	91	D	51.7	97	152
	Southbound LTR	50	D	43.2	1	8	C	33.0	1	7
3	**Duke St & Alexandria Commons**									
	Overall Intersection (Signalized)		**A**	**5.4**			**B**	**16.0**		
	Eastbound Left	110	E	67.6	35	m37	D	52.9	55	m80
	Eastbound TR	220	A	3.8	1	m195	A	4.4	55	173
	Westbound Left	320	--	--	--	--	D	45.2	4	m8
	Westbound TR	530	A	4.6	19	#1128	B	19.3	368	#1120
	Northbound LTR	150	D	49.8	2	11	D	47.0	13	36
	Southbound LTR	210	D	49.9	0	26	D	50.2	64	124
4	**Sweeley St/Alexandria Commons & Duke St**									
	Overall Intersection (Signalized)		**B**	**11.6**			**B**	**14.4**		
	Eastbound Left	200	C	30.4	9	m17	B	18.7	3	m12
	Eastbound TR	560	B	11.5	328	#1007	A	2.9	79	35
	Westbound Left	70	B	10.1	0	m0	B	15.6	5	m6
	Westbound TR	250	A	7.8	140	m65	B	16.5	373	m#711
	Northbound LTR	230	D	46.3	12	45	D	44.0	19	69
	Southbound LT	100	D	50.3	66	110	E	65.1	86	147
	Southbound Right	100	D	46.0	1	44	D	43.1	0	43
5	**Roth St/Cambridge Rd & Duke St**									
	Overall Intersection (Signalized)		**D**	**49.2**			**E**	**76.9**		
	Eastbound Left	110	D	52.9	73	m92	E	66.5	9	m20
	Eastbound TR	370	D	53.4	~994	#1137	B	12.0	202	383
	Westbound Left	240	D	47.5	40	m101	D	46.6	13	m60
	Westbound Thru	670	D	51.1	~1035	#1174	D	39.2	236	#1117
	Westbound Right	670	A	4.7	38	100	A	8.2	26	75
	Northbound LTR	150	D	38.4	42	84	E	59.7	277	#448
	Southbound LT	40	E	69.8	181	#317	F	775.8	~408	#590
	Southbound Right	40	D	38.2	42	82	C	33.6	28	61
6	**Witter Dr & Duke St**									
	Overall Intersection (Signalized)		**A**	**8.4**			**A**	**4.0**		
	Eastbound TR	670	B	14.2	521	m505	A	4.8	220	m239
	Westbound Left	220	B	10.7	26	m28	B	12.3	0	m0
	Westbound Thru	700	A	2.5	70	m78	A	1.1	0	m3
	Northbound LR	170	D	54.5	6	38	D	52.0	19	72
7	**Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St**									
	Overall Intersection (Signalized)		**D**	**44.3**			**E**	**62.0**		
	Eastbound Left	190	E	64.8	24	m38	D	47.3	21	m35
	Eastbound Thru	700	A	5.4	54	63	B	12.3	168	204
	Eastbound Right	700	F	81.1	~1218	#1483	F	148.4	~1472	#1748
	Westbound Thru	1960	D	44.3	~844	m#826	D	41.3	658	m#847
	Westbound Right	140	B	19.1	150	m140	B	13.9	119	m117
	Southbound LT	30	B	17.6	6	m12	B	12.3	7	m15
	Southbound Right	30	D	46.6	71	m#430	C	23.8	50	m#111
8	**NB Telegraph Rd Ramp to WB Duke St & Duke St (western node)**									
	Overall Intersection (Signalized)		**E**	**57.8**			**D**	**46.5**		
	Eastbound Thru	1110	A	0.2	0	0	A	0.2	0	0

	Intersection (Movement)	Storage Length (ft)	2036 Proposed (Mitigated) Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Westbound Thru	800	E	69.3	390	#533	E	65.3	354	#485
	Southbound Right	1780	F	82.1	~1022	#1174	E	59.0	~960	#1111
81	**NB Telegraph Rd to EB Duke St & Duke St (eastern node)**									
	Overall Intersection (Signalized)		**F**	**469.9**			**C**	**27.0**		
	Eastbound Thru	1110	A	5.3	43	67	C	20.8	266	362
	Westbound Thru	800	A	0.2	0	0	--	--	--	--
	Northbound Right	1050	F	994.4	~323	#422	C	31.6	400	471
9	**Duke St & WB Duke St to SB Telegraph Rd**									
	Overall Intersection (Unsignalized)									
10	**Dove St/Roberts Ln & Duke St**									
	Overall Intersection (Signalized)		**C**	**20.1**			**B**	**12.1**		
	Eastbound LTR	1970	C	20.2	586	750	A	8.6	160	320
	Westbound Thru	870	B	11.5	195	259	A	8.4	221	m239
	Northbound LTR	40	D	54.1	227	324	E	55.5	198	288
	Southbound LTR	20	C	30.9	21	54	C	34.8	36	73
11	**Duke St & Callahan Dr**									
	Overall Intersection (Signalized)		**C**	**23.3**			**C**	**31.2**		
	Eastbound Left	320	D	40.8	393	#660	F	80.4	327	#526
	Eastbound Thru	860	B	10.2	269	395	A	4.9	78	137
	Westbound TR	490	D	39.0	361	414	C	34.6	488	m#577
	Southbound Left	190	E	55.9	187	259	E	59.5	113	#207
	Southbound Right	870	B	11.5	107	142	D	38.5	367	468
12	**Dulany St/Diagonal Rd & Duke St**									
	Overall Intersection (Signalized)		**D**	**47.4**			**D**	**51.0**		
	Eastbound Left	290	C	31.4	179	264	E	63.2	112	m#229
	Eastbound Thru	450	E	63.2	~721	#864	D	53.3	350	#505
	Eastbound Right	450	B	15.9	39	73	D	40.0	47	103
	Westbound Left	280	E	75.5	113	182	D	50.9	123	m#174
	Westbound TR	440	D	36.6	151	175	D	50.2	403	#506
	Northbound Left	350	E	58.9	156	212	E	65.1	248	#356
	Northbound TR	350	D	51.0	16	116	D	40.6	8	81
	Southbound TR	220	D	40.1	12	69	E	59.4	192	#376
13	**John Carlyle St & Duke St**									
	Overall Intersection (Signalized)		**B**	**12.4**			**D**	**41.1**		
	Eastbound Left	150	A	1.0	2	m1	D	43.1	3	m4
	Eastbound TR	440	A	6.6	85	m60	E	57.8	~367	m#584
	Westbound Left	80	B	19.4	19	72	E	62.4	86	#245
	Westbound TR	290	A	9.8	196	193	C	22.5	354	#493
	Northbound Left	110	D	42.5	111	183	D	43.3	362	#524
	Northbound TR	110	D	39.2	18	97	C	25.5	0	37
	Southbound LT	40	D	36.2	1	8	B	16.8	7	19
	Southbound Right	40	D	36.3	0	0	B	16.7	0	0
14	**Duke St & Reinekers Ln**									
	Overall Intersection (Signalized)		**C**	**23.0**			**B**	**17.4**		
	Eastbound Left	180	A	4.6	16	m9	B	10.9	20	m27
	Eastbound Thru	280	D	39.1	699	#804	C	31.7	215	m261
	Westbound TR	70	A	1.1	0	0	A	1.1	0	0
	Southbound LR	340	D	42.8	6	36	D	40.0	32	93
15	**Holland Ln & Duke St**									
	Overall Intersection (Signalized)		**B**	**15.4**			**C**	**21.1**		
	Eastbound TR	40	A	1.0	0	24	A	1.1	5	3
	Westbound Left	180	D	46.7	88	167	E	64.4	231	#389
	Westbound Thru	230	B	10.6	74	165	B	14.5	230	324
	Northbound Left	310	D	44.2	115	188	D	50.7	73	m130
	Northbound Right	330	D	49.0	159	231	E	58.8	96	m157
16	**Duke St & Daingerfield Rd**									
	Overall Intersection (Signalized)		**B**	**16.6**			**C**	**23.2**		
	Eastbound Left	90	C	31.9	140	254	D	49.9	130	211
	Eastbound Thru	290	B	17.0	300	475	C	25.0	321	368
	Westbound TR	130	A	3.3	24	25	B	14.0	123	m165
	Southbound Left	400	D	43.3	83	140	D	39.7	102	167
	Southbound Right	60	D	40.8	0	55	D	36.7	0	58
17	**S Peyton St & Duke St**									

	Intersection (Movement)	Storage Length (ft)	2036 Proposed (Mitigated) Conditions						
			AM Peak			*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Overall Intersection (Signalized)		**C**	**21.9**			**C**	**28.0**		
	Eastbound Left	130	D	52.9	387	#524	C	32.3	162	304
	Eastbound TR	130	A	0.1	0	0	A	0.2	0	0
	Westbound Left	110	B	17.7	2	m5	C	25.3	3	12
	Westbound TR	530	C	21.0	130	152	D	47.8	444	#588
	Northbound LTR	200	D	43.4	13	40	D	35.6	16	44
	Southbound LTR	360	D	43.4	0	35	D	38.0	21	114
18	**S West St & Duke St**									
	Overall Intersection (Signalized)		**C**	**23.7**			**C**	**34.5**		
	Eastbound LTR	530	B	15.7	254	355	D	42.0	260	#387
	Westbound Left	80	C	23.9	62	116	D	43.4	136	m#216
	Westbound TR	240	B	17.4	215	287	B	15.9	227	m270
	Northbound LT	130	D	45.4	455	583	B	18.6	179	267
	Northbound Right	230	C	25.9	12	57	B	12.3	9	40
	Southbound LTR	350	C	27.2	51	97	E	69.6	~244	#450
19	**S Henry St & Duke St**									
	Overall Intersection (Signalized)		**C**	**27.3**			**E**	**55.6**		
	Eastbound Thru	560	D	42.2	261	#448	E	72.8	471	m#639
	Eastbound Right	580	C	25.2	120	185	E	73.4	398	m#516
	Westbound Left	230	C	23.5	25	m28	E	69.7	180	m#211
	Westbound Thru	230	B	14.1	108	m122	C	34.9	308	m333
	Southbound TR	350	C	29.7	270	#344	D	52.7	931	#1065
20	**S Patrick St & Duke St**									
	Overall Intersection (Signalized)		**C**	**27.5**			**C**	**26.7**		
	Eastbound Thru	230	B	14.8	38	m75	B	17.7	192	m263
	Westbound Thru	230	D	47.8	288	#490	D	45.8	339	#576
	Westbound Right	230	B	17.4	3	22	B	11.8	0	8
	Northbound LTR	760	C	25.6	425	#593	C	21.7	281	345
21	**Marriott Driveway/Mill Rd (West) & Eisenhower Ave**									
	Overall Intersection (Signalized)		**A**	**9.4**			**C**	**32.4**		
	Eastbound Left	150	A	3.2	27	100	E	76.2	260	#579
	Eastbound TR	720	A	7.7	118	259	A	9.1	174	346
	Westbound Left	150	A	4.6	7	32	B	11.6	4	16
	Westbound TR	1720	A	8.2	58	144	C	33.8	444	#773
	Northbound LTR	20	C	34.6	5	34	D	39.4	20	68
	Southbound LT	30	D	35.9	22	55	D	41.1	33	71
	Southbound Right	30	C	34.6	0	40	D	41.3	25	117
22	**Holiday Inn & Eisenhower Ave & Stovall St**									
	Overall Intersection (Signalized)		**E**	**79.9**			**D**	**42.7**		
	Eastbound Left	150	C	28.3	84	177	F	82.8	178	#408
	Eastbound Thru	1700	C	33.5	187	#380	C	26.8	227	458
	Westbound Left	270	D	48.1	1	m6	D	52.9	7	m15
	Westbound Thru	460	C	24.9	63	133	D	38.4	261	#681
	Westbound Right	460	B	17.7	8	63	B	17.7	29	69
	Northbound LT	2300	F	181.2	~580	#720	D	48.3	159	217
	Northbound Right	290	D	43.4	129	295	E	72.0	157	#390
	Southbound Left	220	D	52.8	85	m125	D	47.9	63	m109
	Southbound LT	380	D	53.9	90	m134	D	48.3	64	m113
	Southbound Right	380	D	37.2	5	m6	D	41.9	85	m133
	Northeastbound LTR	350	E	60.5	14	40	E	59.9	16	43
23	**Swamp Fox Rd & Eisenhower Ave**									
	Overall Intersection (Signalized)		**B**	**13.6**			**B**	**12.9**		
	Eastbound Left	60	--	--	--	--	--	--	--	--
	Eastbound TR	440	--	--	--	--	--	--	--	--
	Eastbound LTR (proposed mitigation)	440	B	13.2	272	m212	B	13.8	173	m346
	Westbound Left	210	A	6.7	1	m4	A	7.1	7	m12
	Westbound TR	210	A	3.3	25	36	A	4.7	107	128
	Northbound LT	110	D	41.9	68	126	D	42.7	72	133
	Northbound Right	110	D	37.3	0	21	D	37.2	0	0
	Southbound LT	90	D	38.0	19	48	D	43.5	57	112
	Southbound Right	90	D	37.0	0	0	D	38.3	0	43
24	**Port St/Mill Race Ln & Eisenhower Ave**									
	Overall Intersection (Signalized)		**B**	**11.7**			**B**	**12.0**		

	Intersection (Movement)	Storage Length (ft)	2036 Proposed (Mitigated) Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Eastbound Left	120	A	4.1	20	m23	A	8.6	7	m19
	Eastbound TR	280	A	6.9	163	125	A	8.4	46	100
	Westbound Left	90	A	8.5	6	m9	B	19.9	22	m33
	Westbound TR	290	B	16.1	167	201	A	9.0	128	m148
	Northbound LTR	240	D	42.1	82	148	D	43.3	118	199
	Southbound LTR	190	D	37.9	7	32	D	35.7	16	61
25	**Mill Rd (East) & Eisenhower Ave**									
	Overall Intersection (Signalized)		**D**	**35.3**			**C**	**33.5**		
	Eastbound Left	160	A	3.7	5	16	D	37.0	25	m68
	Eastbound TR	290	--	--	--	--	--	--	--	--
	Eastbound Thru (proposed mitigation)	290	B	10.4	263	254	C	24.0	156	137
	Eastbound Right (proposed mitigation)	160	E	73.7	2	0	B	19.8	31	15
	Westbound Left	200	D	44.8	38	101	C	26.9	71	145
	Westbound TR	360	--	--	--	--	--	--	--	--
	Westbound Thru (proposed mitigation)	360	B	14.2	43	70	D	36.9	278	420
	Westbound Right (proposed mitigation)	360	C	27.3	1	15	C	31.4	4	30
	Northbound Left	250	D	49.7	211	309	D	54.4	213	#338
	Northbound Thru	250	D	45.4	237	340	C	23.2	113	143
	Northbound Right	250	F	90.3	~448	#572	B	11.6	45	52
	Southbound LTR	230	D	46.9	54	82	D	52.7	169	229
26	**Driveway/Elizabeth Ln & Eisenhower Ave**									
	Overall Intersection (Signalized)		**B**	**15.8**			**B**	**14.4**		
	Eastbound Left	140	A	6.3	66	m73	A	7.7	9	m15
	Eastbound TR	350	B	17.1	567	m531	A	9.6	88	98
	Westbound Left	120	B	10.6	1	m0	A	9.7	3	m7
	Westbound TR	470	A	8.9	33	43	B	12.4	97	115
	Northbound LTR	20	D	40.5	67	119	C	33.3	83	143
	Southbound Left	600	D	38.2	23	54	C	28.6	30	63
	Southbound TR	600	D	36.7	7	37	C	30.2	38	104
27	**Pedestrian Crossing & Eisenhower Ave**									
	Overall Intersection (Signalized)		**A**	**5.9**			**B**	**14.1**		
	Eastbound TR	470	A	1.0	1	1	B	15.1	102	132
	Westbound LT	270	A	8.4	43	58	A	8.7	52	68
	Northbound LTR	-	D	45.3	96	171	C	26.3	157	242
28	**Hoofs Run Dr & Eisenhower Ave**									
	Overall Intersection (Unsignalized)		**--**	**--**			**--**	**--**		
	Eastbound Left	60	A	8.1	--	1	--	--	--	0
	Eastbound Thru	260			--				--	
	Eastbound Right	260			--				--	
	Westbound LT	150	A	9.0	--	19	A	5.7	--	17
	Westbound Thru	170			--				--	
	Westbound TR	170			--				--	
	Northbound LTR	530	C	18.1	--	37	B	11.4	--	27
	Southbound LTR	80	A	0.0	--	0	A	10.0	--	11
29	**Eisenhower Ave & John Carlyle St**									
	Overall Intersection (Signalized)		**B**	**12.1**			**C**	**27.4**		
	Eastbound Left	150	B	10.1	171	302	D	39.7	165	258
	Eastbound TR	150	A	6.7	128	187	C	20.0	117	122
	Westbound Left	120	A	8.1	0	m2	C	22.3	5	m13
	Westbound TR	120	A	8.8	52	91	C	27.1	202	293
	Northbound LTR	300	D	52.2	70	122	C	25.3	43	81
	Southbound LTR	300	D	45.6	8	57	D	35.6	23	71
30	**Holland Ln & Eisenhower Ave**									
	Overall Intersection (Signalized)		**A**	**6.1**			**A**	**5.1**		
	Eastbound Left	150	A	4.6	41	212	A	1.6	17	7
	Eastbound Right	150	A	1.2	0	m3	A	0.0	0	0
	Northbound Left	170	D	36.1	3	12	D	35.7	2	10
	Northbound Thru	170	D	38.2	47	65	D	37.0	19	34
	Southbound Thru	260	D	47.7	9	28	D	46.6	39	m54
	Southbound Right	260	A	2.1	0	17	A	3.8	6	m11
31	**Mill Rd & Driveway/Telegraph Rd Ramp**									
	Overall Intersection (Signalized)		**D**	**35.7**			**C**	**20.7**		
	Eastbound LTR	260	E	57.1	0	0	E	59.0	5	19

	Intersection (Movement)	Storage Length (ft)	2036 Proposed (Mitigated) Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Westbound LT	140	D	46.8	63	101	D	49.2	75	133
	Westbound Right	140	D	46.3	0	91	A	5.6	0	19
	Northbound LT	720	C	20.3	78	180	D	51.8	63	127
	Northbound Right	720	A	9.6	0	11	D	37.3	97	150
	Southbound Left	790	D	42.2	182	242	B	16.6	291	356
	Southbound LTR	790	A	4.6	5	26	A	5.1	45	102
32	**Stovall St & Mill Rd**									
	Overall Intersection (Signalized)		**B**	**14.1**			**B**	**15.8**		
	Eastbound Thru	790	B	17.3	119	189	B	12.7	81	132
	Eastbound Right	790	A	2.5	0	8	A	2.3	0	7
	Westbound Left	510	B	11.7	11	26	A	9.3	36	62
	Westbound Thru	780	A	8.9	72	116	B	13.8	271	426
	Northbound Left	300	B	19.4	44	71	C	26.3	101	146
	Northbound Right	310	B	19.6	0	51	C	22.0	0	41
33	**Stovall St & Pershing Ave/Mandeville Ln**									
	Overall Intersection (Signalized)		**C**	**23.2**			**C**	**27.2**		
	Eastbound Left	230	D	35.2	85	141	C	32.7	70	118
	Eastbound TR	230	D	42.9	202	321	C	27.7	27	88
	Westbound LTR	410	D	41.0	66	120	D	54.0	218	#348
	Northbound Left	370	A	9.2	82	m59	C	26.5	217	m#262
	Northbound TR	370	A	7.1	53	m43	B	15.8	110	m137
	Southbound Left	100	B	10.4	7	18	B	12.9	5	14
	Southbound Thru	310	D	43.3	109	178	C	21.4	99	154
	Southbound Right	310	D	36.1	0	0	B	19.6	0	38
34	**Swamp Fox Rd & Mandeville Ln**									
	Overall Intersection (All Way Stop)		**--**	**--**			**--**	**--**		
	Eastbound TR	420	B	10.0	--	--	A	9.2	--	--
	Westbound LT	230	A	8.2	--	--	B	10.7	--	--
	Northbound LR	170	A	8.4	--	--	A	9.3	--	--
35	**Mandeville Ln & Mill Rd**									
	Overall Intersection (Signalized)		**C**	**22.4**			**B**	**13.8**		
	Eastbound LTR	760	C	34.2	~324	#676	B	12.5	101	218
	Westbound Left	210	A	5.5	8	34	A	4.8	10	32
	Westbound TR	760	A	3.7	42	143	B	13.3	216	#577
	Northbound LT	130	B	19.7	15	36	C	22.6	47	95
	Northbound Right	130	B	13.1	6	22	B	12.4	0	22
	Southbound LTR	130	C	20.4	17	43	B	18.0	21	56
36	**Mill Rd (East)/Andrews Ln & Mill Rd/Jamieson Ave**									
	Overall Intersection (Signalized)		**C**	**20.5**			**C**	**23.6**		
	Eastbound Left	210	B	13.0	4	13	B	18.7	6	19
	Eastbound Thru	760	C	25.4	299	#527	C	24.8	158	243
	Eastbound Right	760	B	15.4	0	26	C	20.9	0	52
	Westbound Left	140	B	12.2	24	51	B	12.9	62	104
	Westbound TR	510	B	14.0	77	167	C	29.1	339	#677
	Northbound Left	120	C	20.2	42	81	C	21.4	68	115
	Northbound LT	190	C	20.4	43	83	C	21.8	70	118
	Northbound Right	190	C	20.0	0	48	C	20.6	0	49
	Southbound LTR	630	C	27.8	11	38	C	30.8	11	35
37	**Dulany St & Jamieson Ave**									
	Overall Intersection (Signalized)		**C**	**24.2**			**C**	**31.8**		
	Eastbound Left	280	C	23.6	192	#369	E	57.3	150	#370
	Eastbound TR	280	A	9.4	69	113	A	8.5	42	74
	Westbound LTR	340	B	15.8	30	62	C	22.7	148	237
	Northbound LTR	70	B	19.2	20	40	C	20.2	44	72
	Southbound LTR	350	C	33.3	93	#198	C	25.6	27	85
38	**Holland Ln & Jamieson Ave**									
	Overall Intersection (Signalized)		**B**	**12.7**			**C**	**28.7**		
	Eastbound LTR	350	B	16.9	61	113	B	11.2	60	91
	Westbound LTR	1220	C	22.6	72	141	C	30.6	146	#339
	Northbound LTR	210	B	11.6	91	147	D	39.5	121	177
	Southbound LTR	340	A	4.6	18	21	C	20.2	115	m145
39	**Port St & Dock St**									
	Overall Intersection (All Way Stop)		**--**	**--**			**--**	**--**		

	Intersection (Movement)	Storage Length (ft)	2036 Proposed (Mitigated) Conditions							
			AM Peak				*PM Peak*			
			LOS	Delay	Queue (ft) 50th	Queue (ft) 95th	LOS	Delay	Queue (ft) 50th	Queue (ft) 95th
	Eastbound LTR	240	A	7.9	--	--	A	9.1	--	--
	Westbound LTR	360	A	7.0	--	--	A	8.3	--	--
	Northbound LTR	240	A	7.6	--	--	A	8.3	--	--
	Southbound LTR	240	A	7.7	--	--	B	13.5	--	--
40	**Mill Rd & Dock St**									
	Overall Intersection (Signalized)*		**A**	**6.0**			**B**	**12.7**		
	Eastbound LR	360	D	50.8	43	96	D	54.1	90	183
	Northbound Left	-	A	1.7	1	3	A	3.3	7	25
	Northbound Thru	-	A	2.7	72	131	A	3.8	76	154
	Southbound TR	-	A	0.9	5	12	A	4.0	104	253
41	**Mill Rd/Mill Rd (East) & Carlyle Apartments**									
	Overall Intersection (Unsignalized)		--	--			--	--		
	Westbound LR	550	C	15.2	--	13	B	13.9	--	11
	Southbound LT	260	A	2.9	--	3	A	2.6	--	6
42	**Telegraph Rd & Duke St Ramp to Telegraph Rd/NB Telegraph Rd to EB Duke St**									
	Overall Intersection (Unsignalized)									
43	**I-95 Express Ramp & Telegraph Rd Ramp**									
	Overall Intersection (Unsignalized)									
44	**WB Ramp to I-495 & I-95 Express Ramp**									
	Overall Intersection (Unsignalized)									
45	**Telegraph Rd & Huntington Ave**									
	Overall Intersection (Signalized)		**B**	**14.9**			**C**	**24.3**		
	Westbound Left	270	D	35.8	94	148	F	81.2	364	450
	Westbound LTR	500	D	47.7	184	270	F	89.7	370	465
	Westbound Right	500	D	45.5	177	258	F	83.4	337	425
	Northbound TR	230	B	12.4	746	#873	B	15.9	713	808
	Southbound TR	350	A	7.3	94	132	B	16.8	716	922
46	**Telegraph Rd & N Kings Hwy**									
	Overall Intersection (Signalized)		**C**	**27.6**			**C**	**27.8**		
	Eastbound Right	-	C	26.2	0	0	E	77.3	72	134
	Westbound Left	620	D	48.3	47	90	F	93.5	207	288
	Westbound Right	620	C	26.6	348	390	E	79.7	554	646
	Northbound TR	250	C	33.2	505	#685	B	16.4	370	406
	Southbound TR	280	B	15.0	97	111	B	14.1	765	279
47	**I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)									
48	**Ramp from Telegraph Rd & I-495 Off-Ramp**									
	Overall Intersection (Unsignalized)									
49	**I-495 WB Ramp & Telegraph Road**									
	Overall Intersection (Unsignalized)									
50	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (western node)**									
	Overall Intersection (Unsignalized)		--	--			--	--		
	Eastbound Right	180	A	7.5	--	25	C	20.8	--	262
	Northbound Thru	-	--	--	--	--	--	--	--	--
	Southbound TR	130	--	--	--	--	--	--	--	--
	Southbound Right	130	--	--	--	--	--	--	--	--
51	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (eastern node)**									
	Overall Intersection (Signalized)		**C**	**21.5**			**C**	**21.1**		
	Westbound Right	400	E	66.0	355	430	C	31.0	479	557
	Northbound Thru	170	C	29.7	1104	1104	E	55.0	743	783
	Southbound Thru	-	A	0.3	0	0	A	2.4	0	0
71	**W Taylor Run Pkwy**									
	Overall Intersection (Signalized)		**C**	**29.8**			**C**	**34.5**		
	Eastbound LTR	70	C	30.2	16	52	D	36.7	7	54
	Westbound LTR	310	C	31.4	38	82	--	--	--	--
	Northbound LTR	50	A	0.2	1	1	A	2.8	45	67
	Southbound LT	680	E	58.2	274	#435	E	58.4	332	#516
	Southbound Right	680	D	35.3	0	0	C	31.6	0	0
102	**Dove St**									
	Overall Intersection (Unsignalized)		--	--			--	--		
	Eastbound LR	130	B	10.8	--	42	B	10.9	--	35

	Intersection (Movement)	Storage Length (ft)	2036 Proposed (Mitigated) Conditions							
			AM Peak				*PM Peak*			
			LOS Delay		Queue (ft) 50th	Queue (ft) 95th	LOS Delay		Queue (ft) 50th	Queue (ft) 95th
104	**Roberts Ln**									
	Overall Intersection (Unsignalized)		--	--			--	--		
	Eastbound LTR	490	A	8.7	--	4	A	8.6	--	4
	Westbound LTR	150	A	9.5	--	3	B	10.6	--	10
	Northbound LT	50	A	2.4	--	0	A	6.9	--	2

m - Volume for 95th percentile queue is metered by upstream signal
- 95th percentile volume exceeds capacity, queue may be longer
~ - Volume exceeds capacity, queue is theoretically infinite

Microsimulation Analysis Results

This section includes the VISSIM microsimulation analysis results for the study area for 2036.

Measures of Effectiveness

The MOEs used to evaluate the VISSIM microsimulation results were scoped and approved by the City. These are:

- **Number of Vehicles Denied Entry into Network** – this metric is used to help identify each analysis scenario's ability to process volumes through the network, thus identifying issues related to capacity;
- **Individual Link Vehicular Volumes/Throughput –** measured in vehicles per hour, this metric is used to help identify individual link's ability to process volumes in each of the analysis scenario, thus identifying issues related to capacity;
- **Simulated Vehicular Travel Times –** measured in seconds, this metric is used to help compare the simulated average amount of time it takes a vehicle to travel between two specified points;
- **Maximum Queues –** measured in feet, this metric is used to help compare and identify where there is potential for vehicular queues to spill back to upstream intersections and impact traffic operations; and
- **Intersection Delay –** measured in seconds of delay per vehicle, this metric measures the difference between the actual vehicle travel time and its desired travel time.

Simulated Vehicular Volumes

Vehicular volume results are used to help identify each scenario's ability to process vehicular volumes on a macro and micro level. These results are expressed as the number of vehicles denied entry into network, or as individual link vehicular volumes (throughput).

The number of vehicles denied entry into the network for each of the analysis scenarios is shown in Table 27. As can be seen, there are a significant number of vehicles that are denied entry in most analysis scenarios; however, the proposed mitigations identified for the proposed increase in density and changes in land use will create additional capacity and allow more vehicles to be processed through the study area, especially when compared to the 2030 Approved scenario.

Simulated individual link volumes results, also known as throughput results, for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 Proposed (Mitigated) analysis scenarios are included in the Technical Appendix.

Simulated Vehicular Travel Times

Travel time, which is the amount of time it takes for a motorist to travel from point A to point B. It is a direct reflection of motorist experience. The eight (8) travel times that were analyzed as part of the VISSIM microsimulation analysis were:

1. Eastbound Duke Street from Witter Street to Dove Street
2. Westbound Duke Street from Callahan Drive to W Taylor Run Parkway
3. Eastbound Eisenhower Avenue from Mill Road (west) to Mill Road (east)
4. Westbound Eisenhower Avenue from Elizabeth Lane to Stovall Street
5. Northbound Telegraph Road from Kings Highway to eastbound Duke Street at Dove Street
6. Northbound Telegraph Road from Kings Highway to westbound Dike Street at W Taylor Run Parkway

Table 27: Number of Vehicles Denied Entry into Network-2036

	Existing (2019)*		Approved (2030)		Proposed (2030)		Proposed (2030) - Mitigated		Proposed (2036) - Mitigated	
	AM Peak Hour (vph)	PM Peak Hour (vph)	AM Peak Hour (vph)	PM Peak Hour (vph)	AM Peak Hour (vph)	PM Peak Hour (vph)	AM Peak Hour (vph)	PM Peak Hour (vph)	AM Peak Hour (vph)	PM Peak Hour (vph)
Number of Vehicles Denied Entry into Network	0	0	1,903	5,050	3,272	10,838	26	649	58	673

* for a VISSIM model to be considered calibrated, no vehicles are denied entry in existing conditions

7. Westbound Duke Street at Callahan Drive to southbound Telegraph Road at Huntington Avenue
8. Eastbound Duke Street from Witter Street southbound Telegraph Road at Huntington Avenue

Simulated travel time results for the eight (8) travel time runs that were analyzed using VISSIM in the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 Proposed (Mitigated) analysis scenarios are shown in Table 28 for the AM peak hour and Table 29 for the PM peak hour.

Simulated Maximum Queues

Simulated maximum queue results identify where there is potential for vehicular queues to spill back to upstream intersections and impact traffic operations. The maximum queue (in feet) is the maximum distance from the stop bar to the back of the queue over the analysis period. Table 30 shows the simulated maximum queues for study area intersections for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 (Mitigated) analysis scenarios.

Simulated Intersection Delay

Simulated intersection delay results show the difference between the actual vehicle travel time and its desired travel time and is measured in seconds of delay per vehicle. Table 30 shows the simulated intersection delay for study area intersections for the 2019 Existing, 2030 Approved, 2030 Proposed, and 2030 (Mitigated) analysis scenarios.

Table 28: AM Peak Hour Travel Time Results - 2036

Travel Time Segment	Existing (2019)	Approved (2030)	Proposed (2030)		Proposed (2030) - Mitigated		Proposed (2036) - Mitigated	
	AM Peak (sec)	AM Peak (sec)	AM Peak (sec)	Change**	AM Peak (sec)	Change**	AM Peak (sec)	Change**
EB Duke St from Witter St to Dove St*	92	93	94	*+1*	129	*+36*	129	*+36*
WB Duke St from Callahan Dr to W Taylor Run Pkwy*	111	116	118	*+2*	150	*+38*	150	*+39*
EB Eisenhower Ave from Mill Rd West to Mill Rd (east)	137	154	179	*+25*	280	*+143*	300	*+164*
WB Eisenhower Ave from Elizabeth Ln to Stovall St	118	120	141	*+21*	124	*+7*	123	*+6*
NB Telegraph Rd from Kings Hwy to EB Duke St at Dove St*	217	239	238	*-1*	176	*-40*	184	*-33*
NB Telegraph Rd from Kings Hwy to WB Duke St at W Taylor Run Pkwy*	271	314	320	*+6*	218	*-54*	223	*-48*
WB Duke St at Callahan Dr to SB Telegraph Rd at Huntington Ave	158	159	159	*0*	163	*+5*	164	*+6*
EB Duke St from Witter St to SB Telegraph Rd at Huntington Ave	149	187	203	*+16*	178	*+29*	179	*+30*

* condition changed from free-flow to signalized in mitigated scenario

** difference from Approved (2030) scenario

Table 29: PM Peak Hour Travel Time Results - 2036

Travel Time Segment	Existing (2019)	Approved (2030)	Proposed (2030)		Proposed (2030) - Mitigated		Proposed (2036) - Mitigated	
	AM Peak (sec)	AM Peak (sec)	AM Peak (sec)	Change**	AM Peak (sec)	Change**	AM Peak (sec)	Change**
EB Duke St from Witter St to Dove St*	94	92	95	*+3*	126	*+34*	126	*+34*
WB Duke St from Callahan Dr to W Taylor Run Pkwy*	117	132	110	*-22*	171	*+39*	170	*+38*
EB Eisenhower Ave from Mill Rd West to Mill Rd (east)	162	1345	1834	*+489*	196	*-1149*	194	*-1151*
WB Eisenhower Ave from Elizabeth Ln to Stovall St	110	696	1100	*+404*	152	*-544*	153	*-543*
NB Telegraph Rd from Kings Hwy to EB Duke St at Dove St*	131	195	247	*+52*	154	*-41*	156	*-39*
NB Telegraph Rd from Kings Hwy to WB Duke St at W Taylor Run Pkwy*	212	335	314	*-21*	218	*-117*	224	*-111*
WB Duke St at Callahan Dr to SB Telegraph Rd at Huntington Ave	186	199	193	*-6*	229	*+30*	228	*+29*
EB Duke St from Witter St to SB Telegraph Rd at Huntington Ave	180	200	208	*+8*	261	*+61*	254	*+54*

* condition changed from free-flow to signalized in mitigated scenario

** difference from Approved (2030) scenario

Table 30: VISSIM Microsimulation Delay and Maximum Queue Results – Proposed 2036

	Intersection (Movement)	Storage Length (ft)	Proposed 2036			
			AM Peak		PM Peak	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
7	**Duke St Ramp to Telegraph Rd/W Taylor Run Pkwy & Duke St**					
	Overall Intersection (Signalized)		**26.1**		**44.8**	
	Eastbound Left	190	64.3	90	60.9	83
	Eastbound Thru	700	8.6	794	14.6	804
	Eastbound Right	700	34.5	816	61.0	825
	Westbound Thru	1000	18.1	1021	19.4	1043
	Westbound Right	140	24.2	555	28.2	793
	Southbound L	30	75.6	410	208.5	733
	Southbound TR	30	82.0	103	559.1	787
8	**NB Telegraph Rd to WB Duke St**					
	Overall Intersection (Unsignalized)*		**26.0**		**25.0**	
	Westbound Thru	780	39.7	581	39.2	462
	Southbound Right	1700	19.3	1370	18.4	1165
	NB Telegraph Rd to EB Duke St					
	Overall Intersection (Unsignalized)*		**25.8**		**24.1**	
	Eastbound Thru	1200	32.7	813	40.4	620
	Northbound Right	1300	21.7	713	11.1	483
10	**Dove St/Roberts Ln & Duke St**					
	Overall Intersection (Signalized)		**19.7**		**19.8**	
	Eastbound Thru	1970	18.9	812	10.8	476
	Eastbound Right	1970	38.5	754	50.5	430
	Westbound Thru	870	11.8	371	19.9	1032
	Westbound Right	870	25.8	62	24.7	68
	Northbound Left	40	42.9	830	51.9	506
	Northbound Right	40	36.2	830	34.4	506
	Northbound Left	40	21.9	820	25.0	505
	Southbound Left	20	39.3	114	37.4	119
	Southbound Thru	20	39.4	63	32.6	69
	Southbound Right	20	12.6	81	12.5	79
22	**Holiday Inn & Eisenhower Ave & Stovall St**					
	Overall Intersection (Signalized)		**41.4**		**38.5**	
	Eastbound Left	150	38.4	510	76.3	791
	Eastbound Thru	1700	52.8	656	28.3	788
	Westbound Left	270	74.8	28	95.8	87
	Westbound Thru	460	41.3	182	37.9	583
	Westbound Right	460	29.5	342	23.2	417
	Northbound Left	3200	45.7	911	53.6	45
	Northbound Thru	3200	46.6	911	50.6	350
	Northbound Right	300	29.7	911	18.7	374
	Southbound Left	220	59.0	287	61.1	369
	Southbound Thru	380	66.5	287	68.8	369
	Southbound Right	380	39.0	252	46.7	427
	Northeastbound LTR	350	66.2	78	64.0	70
23	**Swamp Fox Rd & Eisenhower Ave**					
	Overall Intersection (Signalized)		**22.7**		**14.9**	
	Eastbound Left	60	25.5	578	38.1	480
	Eastbound Thru	440	26.1	578	11.0	480
	Eastbound Right	440	0.0	578	11.9	480
	Westbound Left	100	30.0	26	33.5	103
	Westbound Thru	210	6.5	199	14.5	612
	Westbound Right	210	6.2	199	14.1	612
	Northbound Left	400	40.8	189	46.1	142
	Northbound Thru	400	39.8	189	34.3	142
	Northbound Right	400	29.6	191	9.7	144
	Southbound Left	90	50.5	80	47.1	256
	Southbound Thru	170	60.5	80	35.8	256

	Intersection (Movement)	Storage Length (ft)	Proposed 2036			
			AM Peak		PM Peak	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
	Southbound Right	170	5.2	35	32.3	188
24	**Port St/Mill Race Ln & Eisenhower Ave**					
	Overall Intersection (Signalized)		**36.5**		**12.8**	
	Eastbound Left	120	29.7	317	22.2	70
	Eastbound Thru	280	47.5	737	10.1	482
	Eastbound Right	280	21.6	755	10.8	502
	Westbound Left	90	31.7	47	25.3	217
	Westbound Thru	290	9.9	195	9.2	361
	Westbound Right	290	8.5	201	7.3	368
	Northbound Left	240	42.0	185	42.5	215
	Northbound Thru	240	42.1	185	41.6	215
	Northbound Right	240	24.9	190	32.1	220
	Southbound Left	190	45.0	55	54.8	136
	Southbound Thru	190	41.4	55	36.5	136
	Southbound Right	60	8.6	59	15.9	139
25	**Mill Rd (East) & Eisenhower Ave**					
	Overall Intersection (Signalized)		**32.0**		**33.8**	
	Eastbound Left	160	27.4	211	32.9	140
	Eastbound Thru	290	31.6	421	26.9	355
	Eastbound Right	290	16.8	445	8.3	376
	Westbound Left	200	50.5	144	31.1	209
	Westbound Thru	360	18.2	152	25.8	414
	Westbound Right	360	11.2	155	24.1	418
	Northbound Left	250	26.5	270	83.9	856
	Northbound Thru	250	37.6	767	27.5	448
	Northbound Right	250	40.3	783	18.3	251
	Southbound Left	230	41.8	126	68.1	526
	Southbound Thru	230	32.3	126	61.5	526
	Southbound Right	230	33.4	126	9.7	512
31	**Mill Rd & Driveway/Telegraph Rd Ramp**					
	Overall Intersection (Signalized)*		**24.1**		**12.6**	
	Eastbound Left	260	12.1	35	54.9	37
	Eastbound Thru	260	0.0	35	71.1	37
	Eastbound Right	260	50.1	35	73.9	37
	Westbound Left	210	47.3	208	56.3	199
	Westbound Thru	210	0.0	208	0.0	199
	Westbound Right	210	9.2	208	6.7	199
	Northbound Left	720	0.0	0	0.0	0
	Northbound Thru	720	48.7	349	50.4	159
	Northbound Right	720	46.3	273	40.6	442
	Southbound Left	790	17.1	314	16.3	547
	Southbound Thru	790	2.9	47	4.0	142
	Southbound Right	790	0.0	47	0.0	142
42	**Telegraph Rd & Duke St Ramp to Telegraph Rd/NB Telegraph**					
	Overall Intersection (Unsignalized)		-		-	
	Northbound Thru	760	3.3	597	1.1	217
	Northbound Right	760	15.4	597	1.6	218
	Southbound Thru	1900	0.7	0	12.2	1194
	Southbound Right	900	3.6	0	20.5	910
45	**Telegraph Rd & Huntington Ave**					
	Overall Intersection (Signalized)		**9.0**		**16.9**	
	Westbound Left	270	36.6	388	68.5	658
	Westbound Thru	500	0.0	388	70.5	658
	Westbound Right	500	42.6	364	70.3	634
	Northbound Thru	230	6.9	384	11.1	388
	Northbound Right	230	4.2	417	3.8	421
	Southbound Thru	350	9.3	212	15.6	1722

	Intersection (Movement)	Storage Length (ft)	Proposed 2036			
			AM Peak		PM Peak	
			Delay (sec)	Max Queue (ft)	Delay (sec)	Max Queue (ft)
	Southbound Right	350	8.4	155	13.9	1664
47	**I-495 Off-Ramp**					
	Overall Intersection (Unsignalized)		-		-	
	Eastbound Left	1470	0.5	0	0.3	0
	Eastbound Thru	1470	2.8	105	0.3	0
48	**Ramp from Telegraph Rd & I-495 Off-Ramp**					
	Overall Intersection (Unsignalized)		-		-	
	Eastbound Thru	2400	5.1	229	0.2	0
	Northbound Thru	1300	10.7	387	0.4	0
49	**I-495 WB Ramp & Telegraph Road**					
	Overall Intersection (Unsignalized)		-		-	
	Westbound Thru	1500	3.2	62	1.7	0
	Northbound Thru	1550	1.9	17	0.6	0
50	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (western**					
	Overall Intersection (Unsignalized)		-		-	
	Eastbound Right	180	1.8	0	2.4	248
	Southbound Thru	1700	0.6	150	7.0	860
	Southbound Right	650	6.0	154	10.4	862
51	**Telegraph Rd & Telegraph Rd Ramp/Pershing Ave (eastern**					
	Overall Intersection (Unsignalized)*		**18.3**		**27.5**	
	Westbound Right	600	92.3	432	61.0	706
	Northbound Thru	2200	9.0	810	13.6	470

* - Intersection signalized as proposed mitigation

MULTIMODAL TRANSPORTATION RECOMMENDATIONS

There are a number of city-wide and local initiatives, and planned improvements that focus on multimodal improvements and enhancements. The City's Comprehensive Transportation Master Plan, Vision Zero, Complete Streets Design Guidelines, and Alexandria Transit Choices Report are all important documents that provide guidance on creating a pedestrian, bicycle, and transit-oriented infrastructure, which is a primary goal of the EESAP 2019 Update.

Several planned transportation improvements in or near the EESAP are expected to be complete by 2030. The full list of improvements is detailed in earlier sections of the report, but examples include:

- Eisenhower Avenue Metrorail Station Platform Reconstruction
- Eisenhower Avenue Widening and Roadway Improvements, including a new bicycle lane and wider sidewalks for certain portions
- King Street – Old Town Metro Access Improvements
- Old Cameron Run Trail
- Leading Pedestrian Intervals (LPIs)
- "No Turn on Red" Restrictions

A more complete, urban grid of streets is also proposed for the EESAP, particularly south of Eisenhower Avenue.

The elements identified above are important steps in improving the multimodal infrastructure. However, in order for the EESAP to realize the goal of becoming a more vibrant, urban, walkable and bikeable area, and to attain the non-auto mode splits assumed in this analysis, it is critical that alternate modes of travel are prioritized in this area. The following are important elements of achieving this vision:

1. A complete grid of streets south of Eisenhower should be advanced to improve block sizes and connectivity. These connections would improve allow easy, direct access to Metro station for pedestrians and cyclists, as well as dispersion of vehicular traffic.
2. The City should continue to study the feasibility of implementing increased bus service, such as the proposed Eisenhower East Circulator, particularly for blocks at the east end of the EESAP. This portion of the EESAP is outside the quarter-mile walkshed to Metrorail and there is limited bus service in this area today.
3. Parking ratios should be provided in a manner that encourage the use of non-auto modes of travel.
4. A robust Transportation Demand Management (TDM) Plan should be implemented for the EESAP to encourage use of non-auto modes.
5. Continued improvements to bicycle infrastructure in and around EESAP, including additional bikeshare stations.
6. Transportation technologies, such as those identified in the City's Smart Mobility program, should be implemented to the extent possible, to allow for improved traffic management.

In addition to these projects, it is assumed that each EESAP block's Development Special Use Permit (DSUP) application will include curbside/public space enhancements that will improve the overall pedestrian, bicycle, and transit, and vehicular networks within the EESAP.

SUMMARY AND CONCLUSIONS

This report concludes that, based on the capacity analysis results using macroscopic analysis tools (Synchro) and the microsimulation analysis results (using VISSIM), **the proposed increase in density and changes in uses included in the EESAP 2019 Update will have a manageable impact** on the surrounding transportation network, assuming this report's recommendations and mitigation measures are implemented.

Under existing conditions, congestion occurs along the heavily traveled commuter routes, particularly along the Telegraph Road and Duke Street corridors, and some side street approaches to those roadways, and also along Eisenhower Avenue and Mill Road near the connections to the Beltway.

It was determined that about half of the traffic in the EESAP is cut-through traffic, which is taking up capacity that was meant to support development within the EESAP. Regional cut-through traffic that currently travels through the EESAP is likely to be displaced by local traffic accessing the EESAP and surrounding neighborhoods; however, in order to provide a conservative analysis, it was assumed that existing traffic would remain on the network and no regional cut-through trips were rerouted.

The originally proposed program for the EESAP 2019 Update results in an increase over approved development by approximately 7.3 million square feet. The development program was modified as a result of the VISSIM analysis with a reduction in density or change in land uses at key development blocks, resulting in an increase over approved development by approximately 6.8 million square feet. Although a significant increase in density is proposed, locating the additional development in a transit-oriented, walkable, urban location within the City abides by planning best practices.

A number of planned transportation improvements in or near the EESAP are expected to be complete by 2030. The full list of improvements is detailed in the report, but examples include:

- Eisenhower Avenue Metrorail Station Platform Reconstruction
- Eisenhower Avenue Widening and Roadway Improvements
- King Street – Old Town Metro Access Improvements
- Old Cameron Run Trail
- Leading Pedestrian Intervals (LPIs)
- "No Turn on Red" Restrictions

A more complete, urban grid of streets is also proposed for the EESAP, particularly south of Eisenhower Avenue.

A capacity analysis was developed to compare the future roadway network with the approved development program to the future roadway network with the proposed development program.

In completing the technical capacity analysis, several overall trends regarding existing and expected future travel patterns in the study area during the morning and afternoon peak hours were noted. The majority of vehicular capacity concerns in the study area can be alleviated through signal timing changes that adapt to changes in volume patterns, but at some locations, operational changes alone cannot mitigate future delays. Duke Street, Telegraph Road, and especially Eisenhower Avenue are heavily used by cut-through traffic, and it is likely that drivers will alter their patterns as future conditions change.

As such, an essential component for effective operations in this area will be to minimize the vehicular trip generation of new development, thus reducing the overlap between new local traffic and existing local or regional traffic. It is recommended that the EESAP be planned as a heavily multi-modal area with low vehicular trip generation. Instead of investing in widening roadways to alleviate capacity concerns, the strategy should be to promote non-vehicular modes of travel where possible and leverage existing and planned transit, pedestrian, and bicycle infrastructure.

However, this report does recommend that a number of intersections within the study area be improved with either signal timing adjustments, modifications to signal phasing, restriping, the addition of turn lanes or turn pockets, or new traffic signals; specifically:

- Adjustments to signal timing at ten (10) intersections;
- Modifications to signal phasing or cycle length and adjustments to signal timing at 16 intersections;
- Restriping at three (11) intersections;
- Adding a turn lane or pocket at three (3) intersections;
- Adding a new signal at five (5) intersections – including Mill Road and Dock Street, Mill Road at the Telegraph Road

ramp, Telegraph Road at the Pershing Road ramp, Telegraph Road at the eastbound Duke Street ramp, and Telegraph Road at the westbound Duke Street ramp.

- Density reduction and changes in land use at key development blocks

With these mitigations in place, the analysis shows that traffic operations with proposed development will improve or will be consistent with expected operations under the approved development scenario at many intersections, and in some cases improves or is similar to existing conditions. Nevertheless, as can be expected of urban infill there are still certain locations that are projected to experience delay and queuing issues.

This report recommends that the City of Alexandria consider standardizing cycle lengths and consider using pretimed signals throughout the EESAP. Shorter signal cycles permit frequent gaps, allowing city streets to function as a complete network rather than a series of major corridors for commuter traffic. In addition, shorter more predictable signal cycles provide more consistent crossing opportunities for pedestrians and bicycles, while long cycle lengths may increase pedestrian and bicycle non-compliance and risk-taking behavior. Almost all signalized intersections in the EESAP apart from those connecting the Mill Road express lanes ramp and the Pershing Avenue ramp at Telegraph Road via Eisenhower Avenue and Stovall Street could benefit from this treatment.

As more development is realized in the EESAP this report recommends the monitoring of volumes within the EESAP before the mitigation measures and improvements identified in this report are implemented, to determine if observed volumes are in line with forecasted volumes.