

April 2023

I-495 Southside Transit/TDM Study

Final Report

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Acronyms

ACCS – Arlington County Commute Services
ACS – American Community Survey
AI-DSS – AI-Based Decision Support System
APC – Automated Passenger Counter
API – Application Program Interface
AV – Automated Vehicles
AVL – Automated Vehicle Location
BOS – Blue/Orange/Silver
BRT – Bus Rapid Transit
CAP – Commuter Assistance Program
CLRP – Constrained Long Range Transportation Plan
CPI – Consumer Price Index
CPIS – Commuter Parking Information System
DATA – Dulles Area Transportation Association
DDOT – District Department of Transportation
DEP – Data-Exchange Program
DHS – Department of Homeland Security
DI – Dynamic Incentivization
DRPT – Department of Rail and Public Transportation
EEA – Equity Emphasis Areas
EOL – End of Line
FCCS – Fairfax County Commuter Services
FCDOT – Fairfax County Department of Transportation
FHWA – Federal Highway Administration
FTE – Full-Time Equivalent
FY – Fiscal Year
GRH – Guaranteed Ride Home
GTFS – General Transit Feed Specification
HOV – High-Occupancy Vehicle
ICM – Integrated Corridor Management
IOEP – Interstate Operations and Enhancement Program
ITS – Intelligent Transportation Systems
JBAB – Joint Base Anacostia-Bolling
MDOT – Maryland Department of Transportation
MMAP – Multimodal Analytical Planner
mph – miles per hour

mphps – miles per hour per second
MTA – Maryland Transit Authority
MWCOG – Metropolitan Washington Council of Governments
NCR – National Capital Region
NEPA – National Environmental Policy Act
NTD – National Transit Database
NVRC – Northern Virginia Regional Commission
NVTA – Northern Virginia Transportation Authority
NVTC – Northern Virginia Transportation Commission
O&M – Operations and Maintenance
O-D – Origin-Destination
PRTC – Potomac and Rappahannock Transportation Commission (or OmniRide)
PSI – Potential for Safety Improvement
RM3P – Regional Multimodal Mobility Program
ROD – Record of Decision
ROI – Return on Investment
SHA – State Highway Authority (division of MDOT)
SOV – Single-Occupancy Vehicle
TAC – Technical Advisory Committee
TAGS – Transportation Association of Greater Springfield
TAZ – Transportation Analysis Zone
TDM – Transportation Demand Management
TDP – Transit Development Plan
TMA – Tysons Transportation Management Association
TMP – Transportation Management Plan
TNC – Transportation Network Company
TPB – Transportation Planning Board
TPI – Transit Propensity Index
TSP – Transit Signal Priority or Transit Strategic Plan
VDOT – Virginia Department of Transportation
VMT – Vehicle Miles Traveled
VRE – Virginia Railway Express
VTR – Vehicle Trip Reduction
WET – West End Transitway
WMATA – Washington Metropolitan Area Transit Authority (or Metro)

I. Introduction

This section describes the purpose of the study including a background on regional transportation trends.

Study Overview

The purpose of the I-495 Southside Transit/Transportation Demand Management (TDM) Study was to identify a range of current and future multimodal solutions that could be implemented to reduce congestion, improve trip reliability and regional connections, and enhance existing and planned multimodal mobility and connectivity in the study area with a potentially expanded Express Lanes system. The I-495 Southside Transit/TDM Study was conducted by the Virginia Department of Rail and Public Transportation (DRPT) to inform the National Environmental Policy Act (NEPA) evaluation process underway by the Virginia Department of Transportation (VDOT) for the I-495 Southside Express Lanes Study. The transit/TDM study was multifaceted and inventoried existing rail transit service, bus transit service, park and ride facilities, and TDM programs in the study area. The study also identified new transportation alternatives that could increase mobility; prioritized near-, mid- and long-term transit and TDM service improvements; identified ways to maximize use of multimodal facilities; and identified opportunities to utilize technology to support new travel options.

Study Area

For the purposes of this study, the study area was defined in two different ways. The *study corridor* was generally the area along I-495 for which transit routes were studied and identified. Acknowledging that demand for service in this corridor originates and is destined for other locations, a broader *demand area* was also identified. The sections below describe the two defined areas and provide maps.

Study Corridor

The study corridor extends along the I-495 Capital Beltway from the I-95/I-395/I-495 (Springfield) interchange in the west to the I-95/I-495 and Indian Head Highway (MD 210) interchange in the east. In Virginia, the study corridor begins in the Franconia and Springfield areas of Fairfax County and extends east through Alexandria and over the Woodrow Wilson Memorial Bridge into Maryland. In Maryland, the study corridor extends from the Woodrow Wilson Memorial Bridge into Prince George's County. The study corridor is shown in **Figure 1**.

In Fairfax County, the study corridor includes areas north and east of the Franconia-Springfield Metrorail and Virginia Railway Express (VRE) stations in Springfield and areas south of I-495 between Springfield and the Potomac River, including the Huntington Metrorail station on the Yellow Line. I-495 continues east from Springfield into Alexandria where the study corridor includes the Van Dorn Street Metrorail Station along the Blue Line and Eisenhower Avenue Metrorail Station on the Yellow Line. The Blue and Yellow Lines merge at King Street–Old Town Metrorail Station before continuing north into Arlington County and Washington, DC. The study corridor also includes the VRE/Amtrak stops at Alexandria Station. This area contains the dense, mixed-use neighborhoods of Eisenhower West and Eisenhower East as well as historic Old Town Alexandria. The I-495 Capital Beltway continues over the Potomac River via the Woodrow Wilson Memorial Bridge into Maryland.

Prince George's County fully encompasses the study corridor in Maryland. Within Prince George's County is the mixed-use and entertainment complex at National Harbor as well as the western edge of the Oxon Hill area. The study corridor abuts the southeast quadrant of Washington, DC, and includes the southern portion of I-295. There are currently no Metrorail or commuter rail lines in the study corridor of Prince George's County.

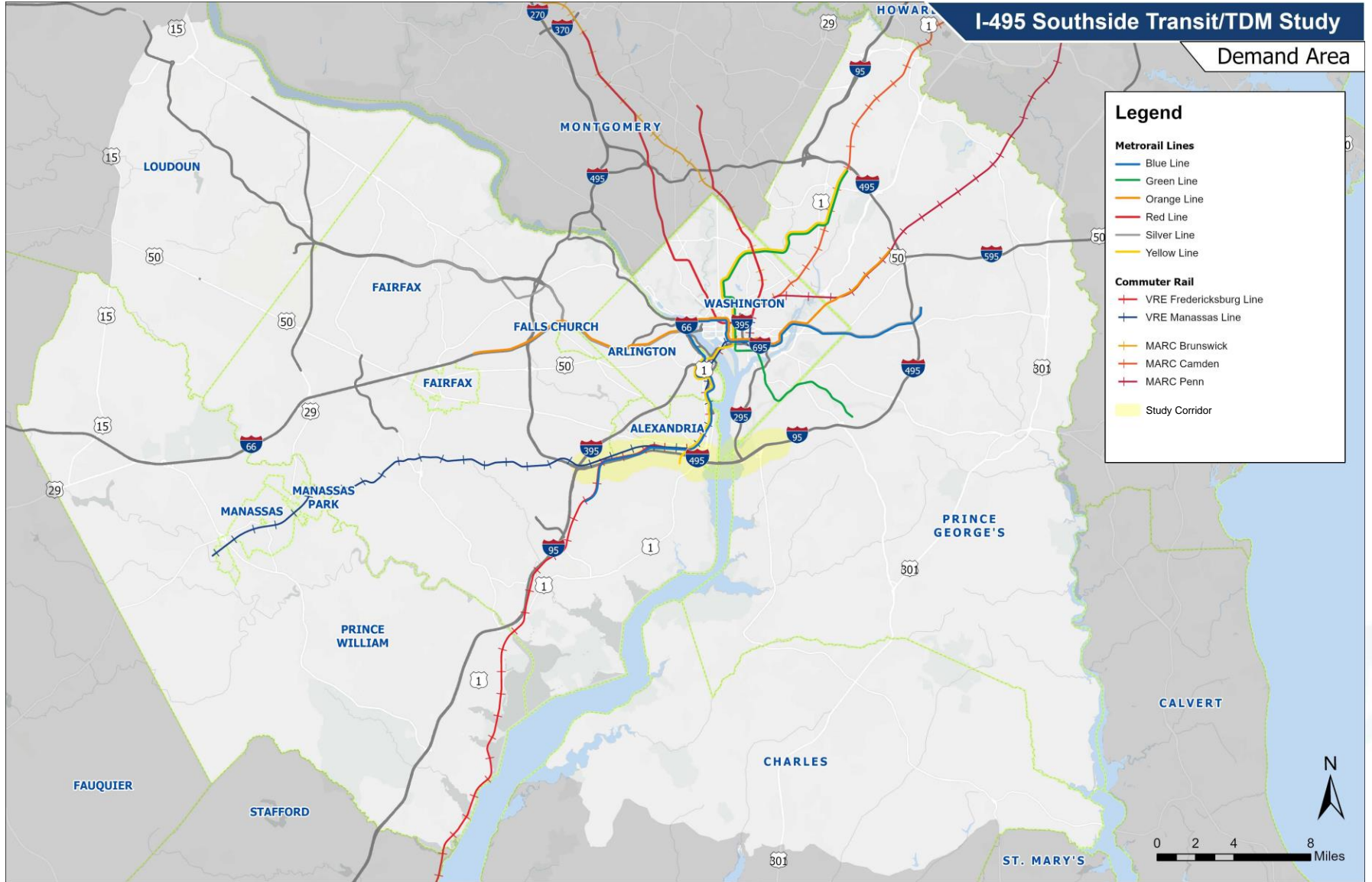
Demand Area

A larger demand area was necessary for this study because many of the trips that use the roadways and rail lines in the study corridor are used by people that begin or end their trip outside the study corridor.

The larger demand area encompasses Prince William, Fairfax, and Arlington Counties as well as eastern Loudoun County, and the independent cities of Alexandria, Manassas, Manassas Park, Falls Church, and Fairfax in Virginia. In Maryland this area includes Prince George's and northern Charles Counties. The entirety of Washington, DC is also included in the demand area.

Many of the municipalities in the demand area are densely populated and highly commercialized. The demand area lies within the Washington, DC Metropolitan Area and includes Ronald Reagan Washington National Airport (DCA) and Dulles International Airport (IAD) as well as numerous Metrorail and commuter rail stops, and bus routes operated by several transit providers. **Figure 2** shows the extent of the demand area.

Figure 2. I-495 Southside Transit/TDM Study Demand Area



Background

Woodrow Wilson Bridge Construction

The Woodrow Wilson Memorial Bridge (also known as the Woodrow Wilson Bridge) extends from the City of Alexandria, Virginia along the west bank of the Potomac River to National Harbor along the east bank in Maryland. It spans the Potomac River south of Washington DC. The current bridge opened in summer 2006 with the surrounding interchange work being completed throughout the following 8 years (the original span opened in 1961). It is the only Potomac River crossing between the I-395 14th Street bridges to the north and the US 301 Harry W. Nice Memorial Bridge, approximately 35 miles to the south. One of the four initial goals set by the Federal Highway Administration (FHWA) for the current bridge was to facilitate intermodal travel, such as transit or high-occupancy

Figure 3. Woodrow Wilson Bridge



vehicle (HOV) lanes, bicycling, and maritime access on the Potomac River.

The June 16, 2000, FHWA Record of Decision (ROD) for the Woodrow Wilson Bridge project indicated “each bridge should include four general use lanes, one HOV/express bus/rail transit lane, and one merging/diverging lane.” It goes on to further indicate “the full project includes HOV/express bus/rail transit lanes on the mainline, beginning immediately west of Telegraph Road in Virginia and extending east across the Potomac River and through the Maryland approach...However, these lanes will not open for normal use until the connecting systems are in place on both sides of the Potomac River in Maryland and Virginia. Following extensive coordination with officials at Washington Metropolitan Area Transit Authority (WMATA), the interchanges, lanes, and median will be designed to not preclude the future conversion to WMATA rail transit use when deemed appropriate by WMATA.”

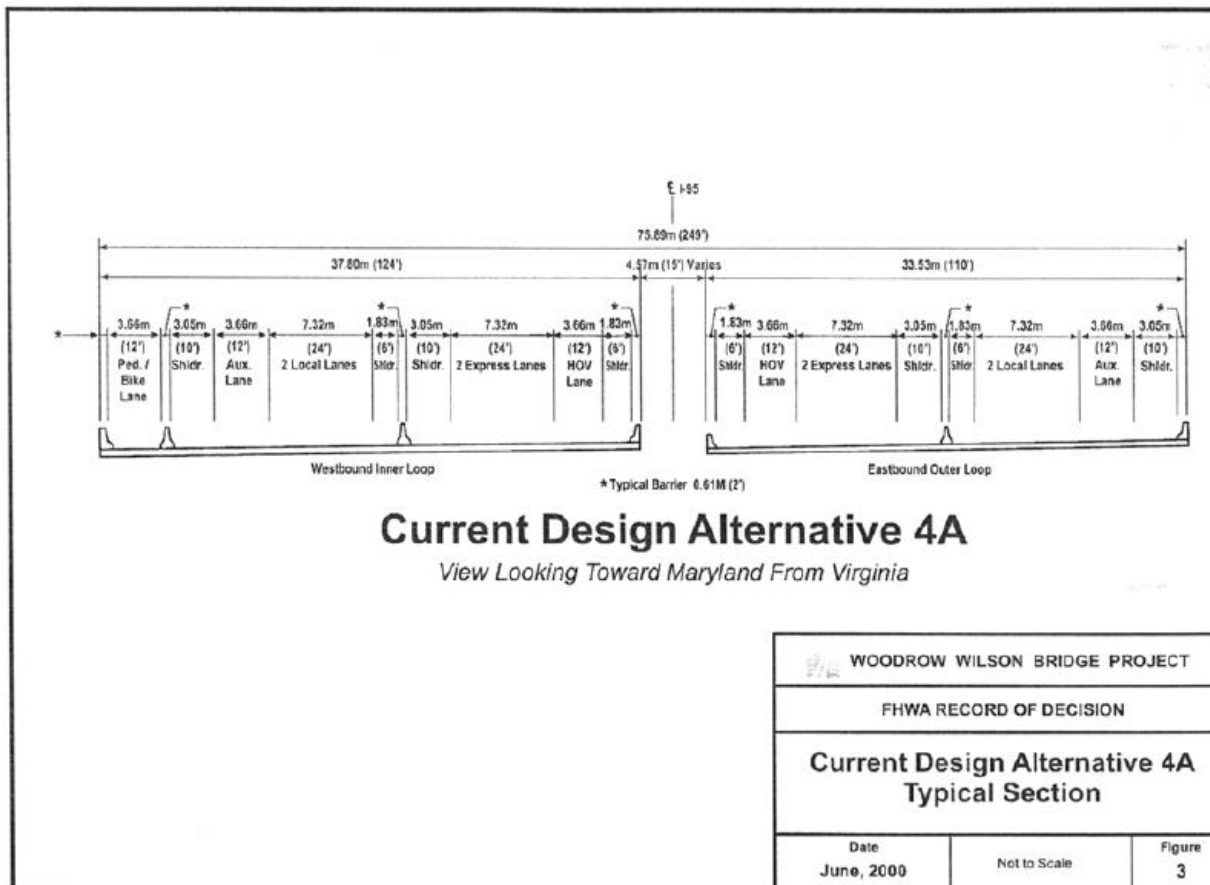
The ROD also indicated that the original transit ridership forecasts for the 2020 design horizon year identified a reduction in vehicular traffic of 1,500 vehicles per day with express bus service, and a reduction of 3,500 vehicles per day with rail transit.

Today, the bascule bridge consists of four spans with a total of 12 lanes of width, a barriered pedestrian facility along the north edge of the north span, and accommodation for potential future rail transit. The two outside spans of the structure currently serve a

total of six lanes of local traffic, with the two inner spans accommodating four lanes of through traffic. The two unused lanes are located along the inside of the center spans.

Figure 4 indicates the cross section of the design of the Woodrow Wilson Bridge as of the FHWA ROD.

Figure 4. FHWA Record of Decision Selected Alternative



Source:
<https://parkplanning.nps.gov/showFile.cfm?projectID=13128&MIMEType=application%252Fpdf&filename=Append%5FE%5Fopt%2Epdf&sfid=36841>

Regional Express Lanes Network

There is a growing network of express lanes in the Washington Metropolitan Area National Capital Region (NCR). In Virginia, the existing network along I-95, I-395, I-495, and I-66 is being expanded to include express lanes from the current northern terminus in Fairfax County to the American Legion Bridge (i.e., the I-495 Express Lanes Northern Extension or I-495 NEXT project). In addition, the I-95 Express Lanes are also being extended 10 miles south to Fredericksburg. **Figure 5** shows the entire express lane network. These expansions have generally been accompanied by transit studies which aim to identify accompanying multimodal service improvements that could benefit from the express lanes network.

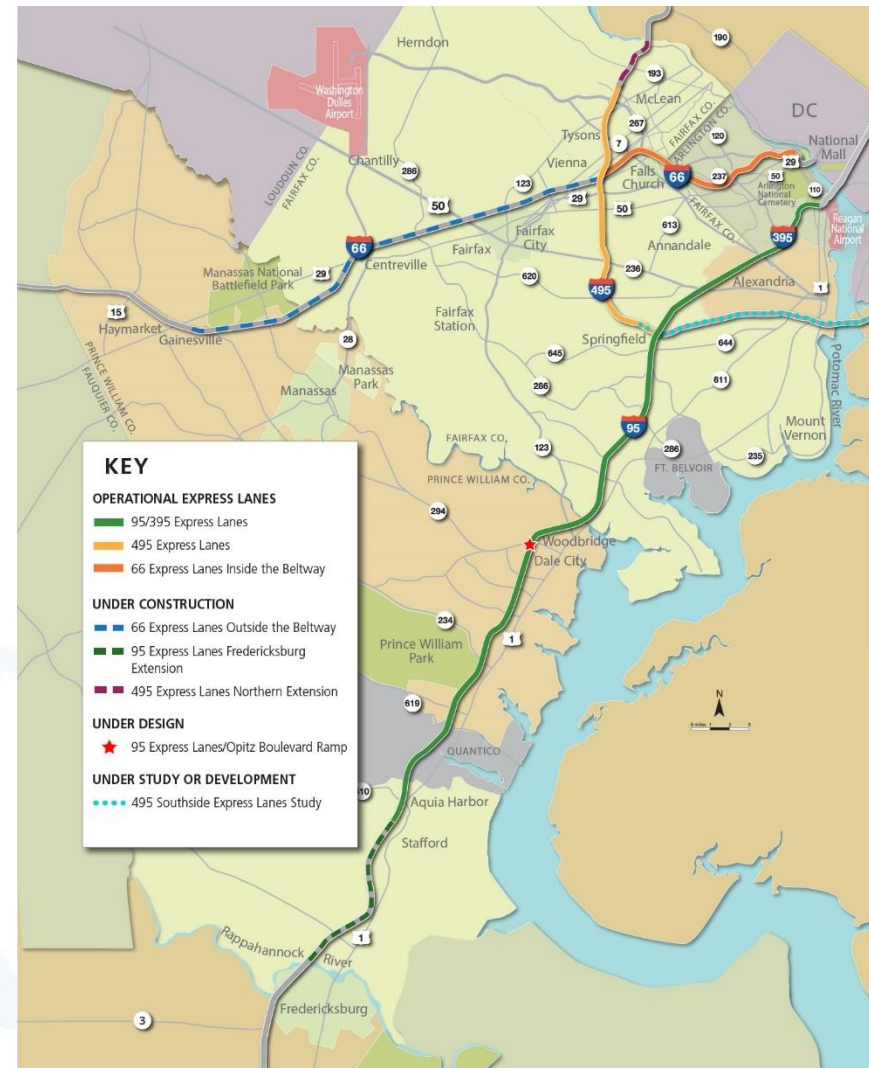
Ongoing Environmental Study

Concurrent to this study, VDOT is conducting an environmental study as part of the NEPA process. The goals and objectives of the I-495 Southside Express Lanes Study are to evaluate transportation improvements that extend and provide continuity of the Express Lanes system on I-495, provide additional travel choices, reduce congestion, improve travel reliability, improve safety, and provide consistency with local and regional plans. The environmental study area is 11 miles of the southern section of the I-95/I-495 Capital Beltway. The western terminus of the study area is the Springfield Interchange (I-95/I-395/I-495) in Fairfax County, Virginia and the eastern terminus is at the MD 210 Interchange in Prince George's County, Maryland.

Summary of Regional COVID Impacts to Transit

The COVID-19 global pandemic created an unprecedented disruption in transportation and other activities. Both transit ridership and vehicular demand dropped substantially in March 2020 and have slowly recovered over the past three years. In reaction, government agencies in Virginia and Maryland prepared crisis response strategies and recovery toolkits, including the DRPT COVID Recovery Toolkit for transit providers in Virginia. Many employers

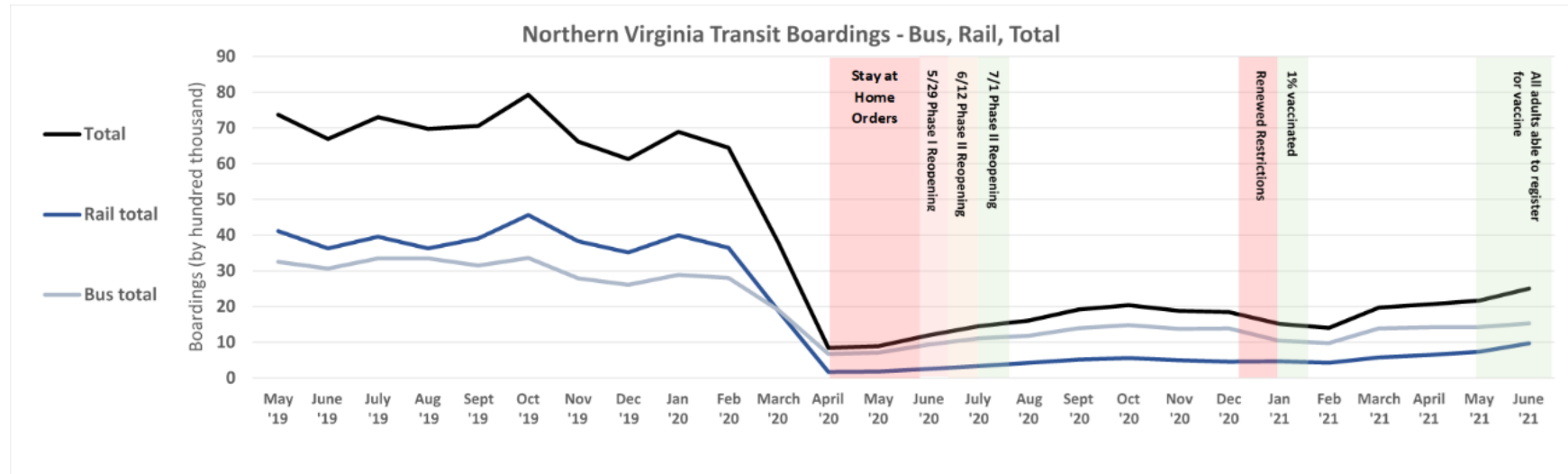
Figure 5. Express Lanes in Northern Virginia



(including the federal government) that were able to support remote work allowed employees to do so and many have continued to maintain hybrid work environments for office workers.

Public transportation agencies continue to monitor workforce, travel, and other trends to quantify the impact of COVID-19 on the transportation network. While both rail and bus modes experienced ridership decreases, bus ridership maintained more of its riders during the pandemic in both Washington, DC, and Northern Virginia as shown in **Figure 6**. This aligns with expectations as rail ridership in the region serves many suburban commuters, often white and middle to high income, that often had jobs in industries that could accommodate work from home. Those who continued to use the bus system were more often minority and lower-income riders who continued to work in-person during the pandemic¹.

Figure 6. Bus and Rail Ridership in Northern Virginia



Source: Washington Post

MWCOG found that in April 2020, traffic volumes had decreased approximately 50.5% when compared to April 2019. However, as of September 2021 traffic volumes were only 6.8% below pre-pandemic levels of September 2019.² However, WMATA system ridership experienced a greater decrease in use as compared to vehicular modes. As of June 2020, rail ridership was as low as 92% less than 2019 levels, with bus ridership as low as 81% less³. March 2022 rail ridership had only recovered to be 32% of pre-pandemic levels

¹ Humanizing COVID-19 travel trends to build a more equitable transportation system, D'Sa, 2021

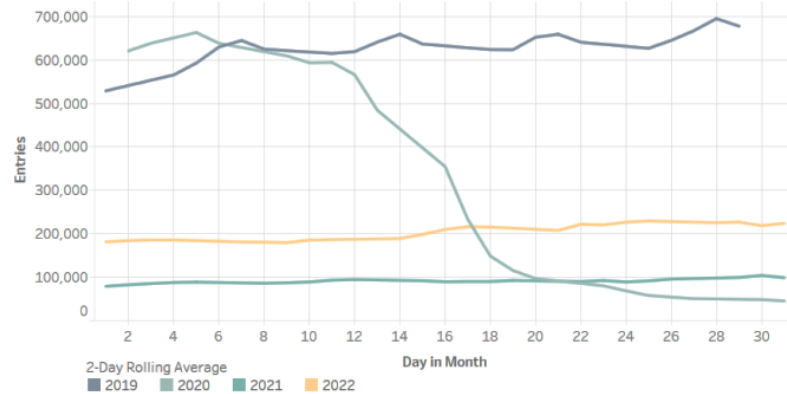
² <https://www.mwco.org/file.aspx?&A=paKb23lmJZhi84NGsMaZ4OFt6y91r5fPv6BcUTUKnV8%3D>

³ <https://www.wmata.com/service/covid19/Covid-19-Public-Information.cfm>

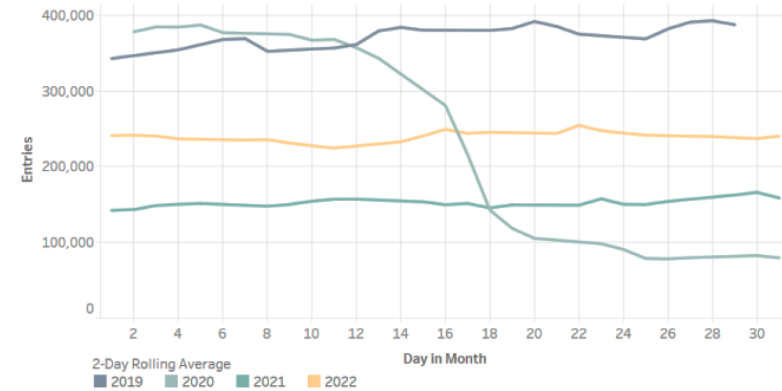
on weekdays, with higher retention on weekends. March 2022 bus ridership was at about 64% of pre-pandemic levels on weekdays with higher levels on weekends. A comparison of WMATA ridership between March 2019 and March 2022 is shown in **Figure 7**⁴.

Figure 7. WMATA Pre-Pandemic Ridership Comparison

March Weekday Rail Ridership over the Past Four Years



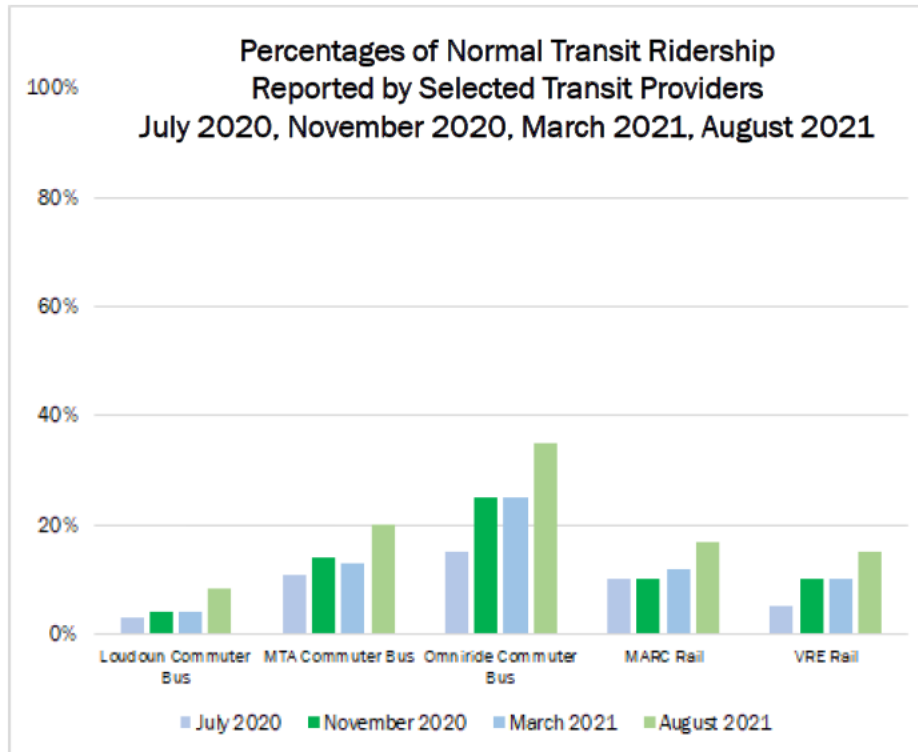
March Weekday Bus Ridership over the Past Four Years



Commuter transit ridership (bus and rail) has increased over the past two years, though recovery has lagged well behind pre-pandemic levels as shown in **Figure 8**. This is reflective of the overall regional mode shift to personal single-occupancy vehicles.

⁴ <https://www.wmata.com/initiatives/ridership-portal/upload/March-2022-Ridership-Snapshot.pdf>

Figure 8. Percentages of Normal Commuter Transit Ridership



While vehicular demand has returned to near pre-pandemic levels, as seen in **Figure 9**, transit ridership has struggled to return. A potentially unexpected effect on vehicular trends from the pandemic is that the initial reduction in travel time on roadways could have incentivized people to switch from other multimodal options to personal vehicles. The initial reduction in vehicular trips reduced the demand on interstates and commuter corridors, drastically reducing congestion and travel time. In urban areas, such as Washington, DC, and the surrounding areas, people who have the advantage of mode choice often use other modes such as transit or bike share to avoid congested roadways and reduce travel time.

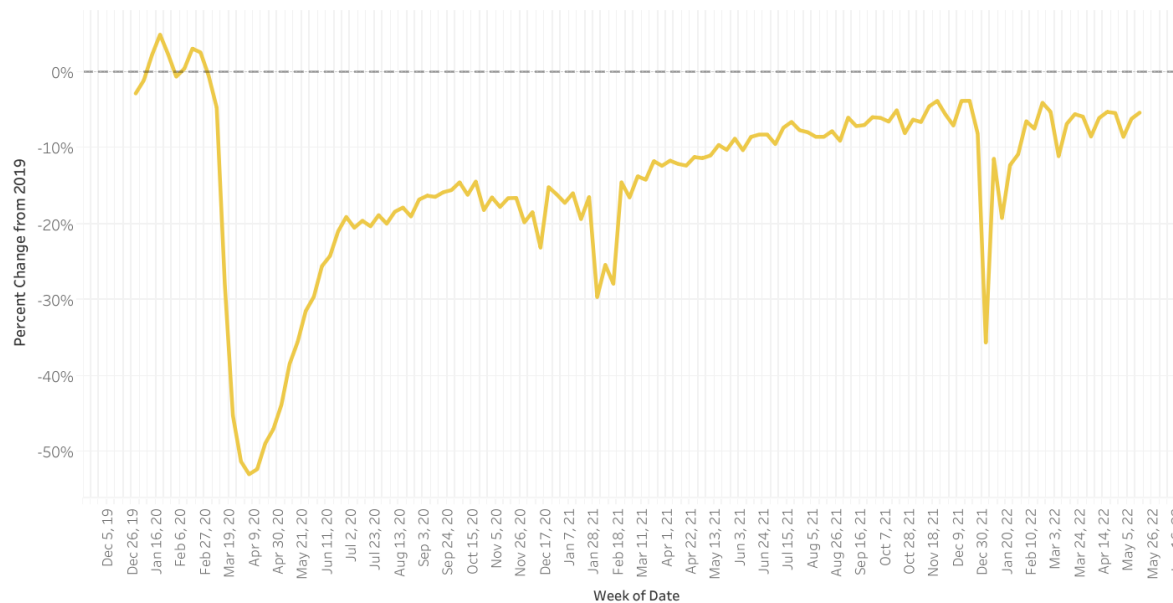
As noted above, the initial reduction in demand across the entire network changed the pre-COVID-19 conditions that previously shaped individuals' mode choices. With the reduction of travel time on roadways and the uncertainty of the safety of public transit or other modes, some people may have permanently switched from transit or bike share to vehicles (if accessible). However, it is difficult to determine what percentage of vehicle miles traveled (VMT) during the pandemic was attributed to people who switched to vehicles during the pandemic versus pre-COVID-19 everyday drivers.⁵

⁵ Humanizing COVID-19 travel trends to build a more equitable transportation system, D'Sa, 2021

Figure 9. Traffic Volume Change due to COVID-19

District Northern Virginia	Area Type All	Road Type All	Vehicle Type All Vehicles	District Northern Virginia
Date 1/1/2020 to 5/21/2022 and Null values	Day of Week All	Period of Day daily (24 hrs)		

Traffic Volume Change by District



Note: Data is updated every Monday. All detectors collect total volume (all vehicles), but only some detectors collect classification data (cars and trucks), so the number of all vehicles may be different from the sum of cars and trucks. This is due to the type of field detector, which is based on the needs of the statewide monitoring program.

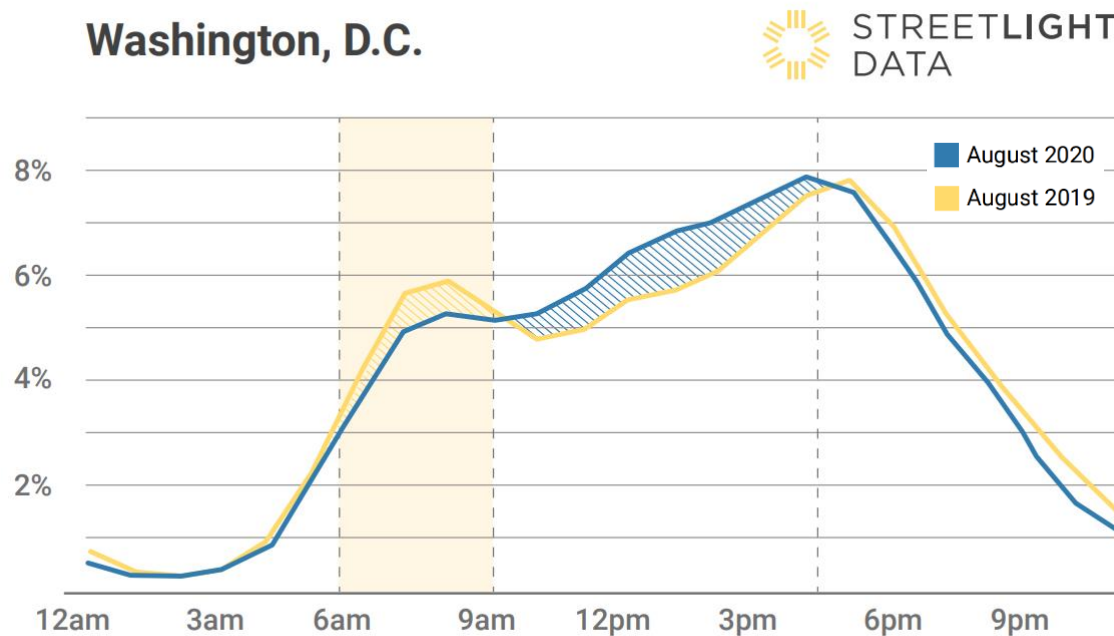
Anomalous Traffic Days

VDOT Traffic Engineering and Operations Divisions, Version 2, Updated 6/1/2022

Source: Virginia COVID-19 Traffic Trend Tool <https://public.tableau.com/app/profile/simona.babiceanu/viz/COVID-19VirginiaTrafficVolumes/ByLinkidDir>

What is evident from national transportation data from StreetLight Data is that while Vehicle Miles Traveled (VMT) has returned (or even increased in some cases) from pandemic lows, the time at which people are traveling has changed. Vehicular traffic in Washington, DC has spread such that morning and afternoon peak periods are less pronounced but more sustained over a longer period of time each day. These trends are demonstrated for the region in **Figure 10**.

Figure 10. Washington, DC Distribution of Daily VMT by Time of Day



Source: StreetLight Data, COVID Transportation Trends What You Need to Know About the “New Normal”, 2020

II. Previous Transit/TDM Planning

This section summarizes previous transit and transportation demand management plans, studies and projects in the study corridor.

Overview

Relevant and available data was collected and reviewed from a variety of sources to get a comprehensive inventory of planned transit and TDM services in the study corridor. Data, plans, and studies that fit into the following categories were considered:

- Previous corridor studies and plans
- Plans conducted by transit service providers in the corridor, including approved transit development plans (TDPs) and transit strategic plans (TSPs)
- Commuter assistance programs (CAPs) in the corridor, including approved TDM plans

This section includes overview descriptions the following plans, studies and projects in the study corridor:

- Duke Street in Motion plan
- MWCOG Constrained Long Range Transportation Plan (CLRP)
- WMATA Blue/Orange/Silver Capacity & Reliability (BOS) Study
- Richmond Highway Bus Rapid Transit study, plan and project
- Regional Multimodal Mobility Program (RM3P)
- Prince George's County BRT Study
- Southern Maryland Rapid Transit Study
- I-95 Corridor Improvement Plan
- Virginia Transit Equity and Modernization Study
- NVTa TransAction
- I-95/I-395 Transit/TDM Study
- Ferry Planning
- TDPs, TSPs and Network Redesigns

More details on existing transit services and TDM commuter assistance programs are included in **Section III. Baseline Conditions**.

Summaries of Previous Planning

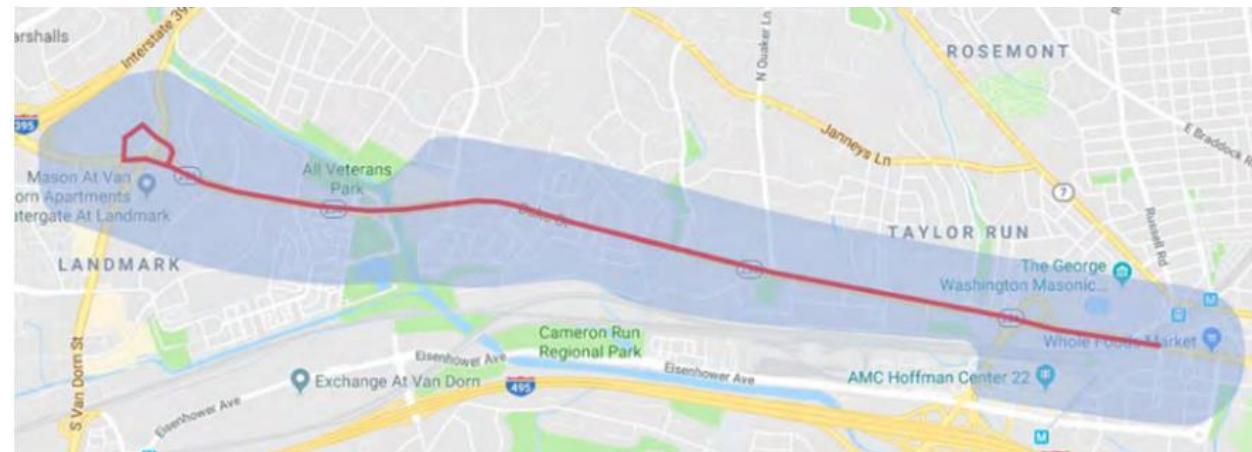
Duke Street in Motion

Duke Street in Motion is a multi-phased effort by the City of Alexandria focused on ensuring that transit improvements in the Duke Street corridor, from West End Alexandria to the King Street Metro station, provide transportation options that align with the community’s needs, provide efficient transportation choices, and keep the region moving. A program goal is to improve the bus riding experience for current and potential riders making transit convenient, efficient, equitable, safe, vibrant, and sustainable. Duke Street was initially identified as one of three high-capacity corridors in Alexandria in the 2008 Transportation Master Plan and confirmed in the latest Alexandria Mobility Plan. The 2012 Transit Corridors Feasibility Study evaluated transit alternatives for the three previously identified corridors. In 2020, the Northern Virginia Transportation Authority (NVRTA) granted \$75 million in its 2020–2025 Six Year Program to help construct the first phase of improvements, identified through the **Duke Street in Motion** process. The City of Alexandria conducted a survey that revealed most respondents would like to see improvements or are interested in:

- Pedestrian and bicycle access to/from bus stops
- Bus stop amenities
- Bus signal priority
- Dedicated bus lanes

The final endorsement of the preferred alternative by the City of Alexandria is scheduled to be approved in 2023. The study area of the Duke Street in Motion project is shown in **Figure 11**.

Figure 11. Duke Street in Motion Study Area Map



MWCOG Constrained Long Range Transportation Plan (CLRP)

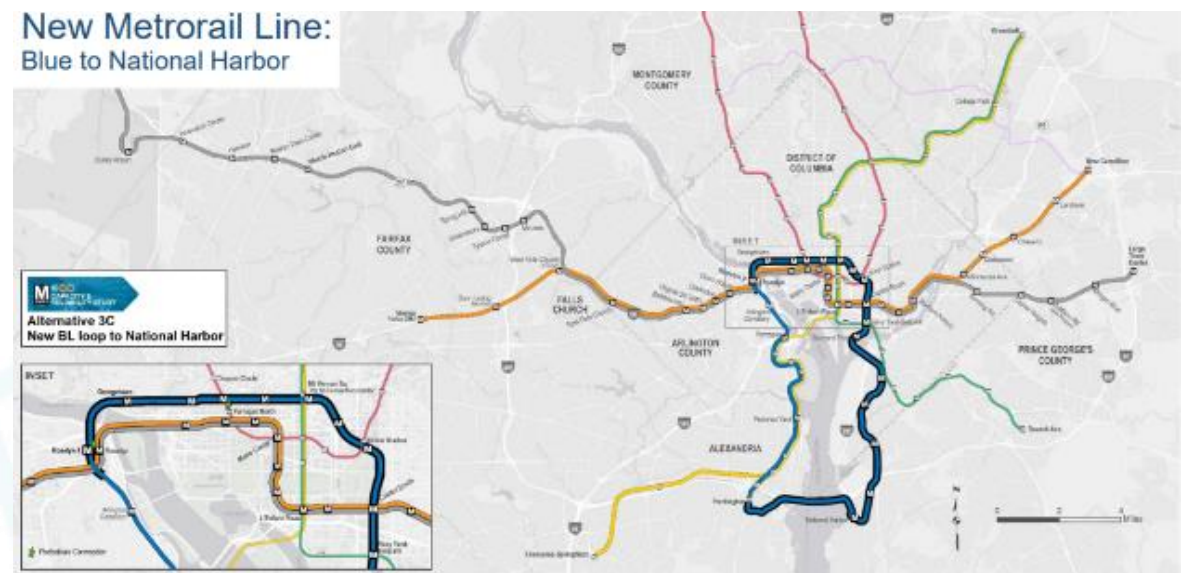
The National Capital Region Transportation Planning Board (TPB) of the Metropolitan Washington Council of Governments (MWCOG) has approved a constrained long-range transportation plan, Visualize 2045, that includes regionally significant projects and programs to move goods and people more efficiently using a variety of transportation modes. Multimodal projects near the study corridor are listed below and presented in the [Visualize 2045: Project Map](#) :

- Widening Richmond Highway (US Route 1 or US 1)
- US Route 1 Richmond Highway BRT
- A new bus rapid transit (BRT) that follows Van Dorn Street in Alexandria, West End Transitway
- Facility improvements for Metro–Eisenhower Avenue
- Construction of a fourth rail track in the City of Alexandria (VRE/Amtrak Corridor)
- MD 210 Corridor Study

WMATA Blue/Orange/Silver Capacity & Reliability (BOS) Study

The Washington Metropolitan Area Transit Authority (WMATA or Metro) launched the BOS Study in 2019. The purpose is to identify projects to address capacity constraints and crowding, reliability concerns, a lack of operational flexibility, and threats to Metrorail's long-term sustainability in the Blue/Orange/Silver Line corridors. Jobs along the BOS lines are projected to grow more than 30% by 2040, and Metro cannot run enough trains to handle the growth if the three lines run through the same tunnel under the Potomac River. After passing a four-step screening process, six alternatives for aiding in the study purpose were identified for further evaluation. In context of the I-495 Southside Transit/TDM Study, the Blue Line Loop to National Harbor alternative (see **Figure 12**) is the most relevant; however, a locally preferred alternative had not yet been selected by WMATA at the time of completion of this study. This alternative would realign the existing Blue Line into a loop north from the Arlington National Cemetery Station to a new second Rosslyn station in Arlington, continuing through a new Potomac River tunnel into Washington, DC serving multiple new stations plus Union

Figure 12. WMATA BOS Study, Alternative Blue Line Loop to National Harbor



Station and Navy Yard then continuing south to National Harbor in Maryland before turning west across the Woodrow Wilson Bridge to Huntington and then to Alexandria where it would rejoin its current alignment.

A cost-benefit analysis was performed on each of the six alternatives with the results showing that the Blue Line Loop to National Harbor alternative would deliver the highest level of benefits relative to the other options but would also require a significant capital investment. Selection of the locally preferred alternative plan by the WMATA Board is anticipated to take place in 2023.

Richmond Highway Bus Rapid Transit

Based on recommendations from DRPT's 2015 Multimodal Alternatives Analysis, the Fairfax County Department of Transportation (FCDOT) is constructing a BRT system in the Richmond Highway corridor. The project is underway and is being evaluated as part of the Federal Transit Administration's (FTA) New Starts process. The new BRT system will be called "The One" and is designed to travel along Richmond Highway north from Fort Belvoir to the Huntington Metrorail Station in dedicated lanes. Construction of the project is planned to take place between 2027–2030. Federal, state, regional and local funding will pay for the project. The goal of the new BRT is to increase transit ridership along the corridor and ultimately lead to a future Metrorail expansion to Hybla Valley. A high-level map is available at: <https://www.fairfaxcounty.gov/transportation/richmond-hwy-brt>

Regional Multimodal Mobility Program (RM3P)

The RM3P is a collaborative program to improve safety, reliability, and mobility for travelers in the Northern Virginia and Fredericksburg regions. RM3P is led by VDOT, NVTA, and DRPT. It is built upon previous VDOT led studies, including integrated corridor management (ICM) that focuses on multimodal travel and reducing congestion. It is consistent with NVTA's TransAction plan. Key transit corridors included in this program include I-95, I-495, and US 1.

RM3P is made up of five main program elements as described below. Each plays an important role in the efficient exchange of information between stakeholder agencies and allows them to quickly address incidents and congestion.

- **Data-Exchange Platform (DEP):** a continuously updated, cloud-based data storage, and exchange system that will allow regional partners and third-party providers to capture, process, and exchange real-time and historic multimodal travel conditions
- **Artificial Intelligence-Based Decision Support System (AI-DSS):** helps predict the impact of disruptions to the transportation network by using travel data to monitor emerging conditions and recommend plans for coordinated, multi-agency responses to congestion
- **Commuter Parking Information System (CPIS):** a real-time, app-based parking availability information system about parking space availability at lots serving bus, vanpool, and carpool commuters
- **Multimodal Analytical Planner (MMAP):** a collaboration tool for transportation service providers to pinpoint unmet needs in the transportation network. This element has been deferred by VDOT.

- **Dynamic Incentivization (DI):** a data-driven system offering the public incentives to modify their travel choices and behaviors in response to real-time conditions; incentives will be offered by third-party agencies

Prince George's County Bus Rapid Transit (BRT) Study

In 2019, Prince George's County was awarded funding from a Maryland State Transit Innovation Grant to evaluate the feasibility of BRT within the county. As of late 2022, Prince George's County was finalizing a study which identified five routes for advancement of BRT.

Southern Maryland Rapid Transit Study

The Maryland Department of Transportation (MDOT) Maryland Transit Administration (MTA) completed the Southern Maryland Rapid Transit (SMRT) Alternatives Final Report in May 2017. The study was an effort to further advance a rapid transit system along 18.7 miles of the MD 5 (Branch Avenue)/US 301 (Crain Highway) corridor, between Branch Avenue Metrorail Station in Prince George's County and the Waldorf-White Plains area in Charles County. The outcomes of the study were selection of Alternative 4 for the mainline alignment with Option 8A for crossing the Capital Beltway and selection of BRT as the preferred technology. More details can be found on the [study website](#).

I-95 Corridor Improvement Plan

VDOT published this plan in September 2021, which compiled a list of recommended operational, roadway, and transit improvements along the I-95 corridor to better safety, reliability, and travel flow. It is planned to achieve this through increasing multimodal ridership and maximizing the efficiency of existing infrastructure. Four new commuter bus routes were proposed that originate in Fredericksburg, and Prince William, Stafford, and Caroline Counties, connecting to key employment destinations such as Alexandria, Crystal City, the Pentagon, Rosslyn, and Downtown Washington, DC. The I-95 Corridor Improvement Plan also proposed additional rail service options, including an expansion of VRE service. Amtrak round-trip service between Washington, DC, and Richmond—which stops in Alexandria—will be doubled. Rail improvements are consistent with the Transforming Rail in Virginia Program and are subject to change. Funding for these improvements will come from dedicated funding from the Commonwealth of Virginia's Interstate Operations and Enhancement Program (IOEP). The I-95 Corridor Improvement Plan provides information on the estimated distribution of \$194.2 million in IOEP funding for I-95 from fiscal year (FY) 2022 through FY 2027. It should be noted that this plan is financially constrained.

Virginia Transit Equity and Modernization Study

During the 2021 Virginia General Assembly session, House Joint Resolution 542 (HJ 542) passed with support from interest groups across the Commonwealth. This legislation required DRPT to complete a needs assessment that focuses on the modernization of transit in Virginia and engagement opportunities for underserved and underrepresented communities.

DRPT embarked on the Virginia Transit Equity and Modernization Study to address the issues identified in HJ 542 in a manner that is reflective of the values and needs of Commonwealth residents, businesses, and leaders for 21st-century transit modernization. The study was designed to elicit those values and needs and define the actions that will guide the Commonwealth and local transit agencies in meeting the transit challenges of today and the future with an emphasis on shared outcomes. A strong, consistent focus on technical data, national and peer-state best practices, and community engagement informed the study.

The study's Action Plan identifies 29 recommendations that serve as a roadmap to direct subsequent efforts—by both DRPT and local transit agencies. The Action Plan recommendations were developed through consultation with local transit agencies, evaluated by technical experts and industry partners, and refined during a robust public process. Final recommendations were organized by their anticipated timeline for implementation—near-, mid-, and long-term. More information on this study can be found on the [study website](#).

NVTA TransAction

TransAction is Northern Virginia's long-range multi-modal transportation plan, prepared by NVTA in 2017, and most recently updated in December 2022. It serves as a roadmap for planning and funding various transportation projects in the region through 2045. It is updated every five years with input from public officials, regional stakeholders, member jurisdiction staff, and the public. The December 2022 update focused on post-COVID-19 commuting patterns; NVTA's core values of Equity, Sustainability and Safety; and adopting its inaugural Transportation Technology Strategic Plan (TTSP). The plan is an unfunded, financially unconstrained list of transportation projects, including transit, that could be implemented in Northern Virginia, using NVTA and other additional funds. Projects relevant to the study corridor include:

- Route 7 Bus Rapid Transit: Tysons to Mark Center via City of Falls Church (#31)
- Wilson Bridge High-Capacity Transit (#35)
- Route 1 BRT (#39)
- Alexandria Duke Street Transitway (#41)
- West End Transitway (#42)
- I-95/I-495 Managed Lanes from I-395 into Maryland via Woodrow Wilson Bridge (#78)
- DASH Transit Service Enhancements and Expansion (#85)
- King Street Metrorail Improvements (#87)
- Fredericksburg Line Rail Capacity Improvements (#93)
- Expansion of Metrobus and Fairfax Connector Bus Services (#107)
- South Fairfax County Feeder Bus Service (#110)
- Alexandria ITS Projects (#113)
- Metroway: Pentagon City Extension and Southern Extension to the City of Alexandria (#117)
- Metrorail Blue and Yellow Line Bus Facility Improvements (#128)
- Landmark Transit Station Improvements (#195)

- New Central and East Prince William County to Pentagon and DC OmniRide (#200)
- Metrorail Station Improvements within the City of Alexandria (#203)
- VRE Alexandria-DC Rail Capacity Improvements (#298)
- Fredericksburg and Manassas Lines Service Expansion (#300, #301, #302, #303, #304, #305)
- Van Dorn Intermodal Facility (#347)
- Tysons Express Bus (#331)
- Northern Virginia TDM Strategies (#340)
- Eisenhower East Improvements (#363)
- Duke Street at West Taylor Run Intersection Improvements (#366)
- Improvements to Expand Ferry Capacity (#367)
- Mobility Hub Program (Alexandria) (#370)
- King St-Old Town Metro Station Tunnel to Union Station (#371)
- Huntington Metro Station ADA Accessibility Improvements (#403)
- Metrorail Double Crossover and Sidings Infrastructure (includes Potomac Yard and King St) (#404)
- VRE Weekend Service (#410)
- Alexandria Metroway (#422)
- South Van Dorn Street: West End Transitway to Route 1 via Huntley Meadows Park Bike/Ped Connections (#444)
- Annandale to Fort Belvoir via Springfield High-Capacity Transit (#448)
- Franconia Road: Huntington Station to Springfield High-Capacity Transit (#455)
- RM3P (#460)

Figure 13. NVTa TransAction Major Travel Corridors



TransAction identifies 424 candidate projects in total. These projects are used to inform and develop NVTa's financially constrained Six Year Program for capital funding to prioritize transportation improvements. **Figure 13** shows major travel corridors that are contained in the TransAction plan⁶.

⁶ Full map: [TransActionPlanProjectMap.pdf \(nvtatransaction.org\)](https://nvtatransaction.org/wp-content/uploads/2022/12/NVTa_TransActn_Project-List_Dec2022_Final.pdf)

All projects: https://nvtatransaction.org/wp-content/uploads/2022/12/NVTa_TransActn_Project-List_Dec2022_Final.pdf

I-95/I-395 Transit/TDM Study

This August 2017 study was prepared for DRPT and catalogued multiple planned improvements along the I-95/I-395 corridor, from Arlington County in the north to Spotsylvania County in the south and included planned projects by VRE and WMATA. The final project list in the study was financially unconstrained.

The 2017 study identified the City of Alexandria's top transit service priority in the I-395 corridor as the West End Transitway (WET) BRT system, that will serve a corridor from the Van Dorn Metrorail station north to the Pentagon via the redeveloped Landmark Mall area and the Mark Center. Another planned premium bus service will be the Duke Street Transitway that will run parallel to I-495, connecting the King Street Metrorail station to the Landmark Mall area via Duke Street and that will connect to the WET. The study also identified planned transit facility expansions and service improvements in the DASH Transit Development Plan (TDP) that is currently being updated to a TSP.

In 2017, the Fairfax Connector TDP (also currently in the process of being updated to a TSP) recommended increasing the span of service, improving frequencies, and increasing service efficiency on existing routes. Likewise in the 2017 study, VRE had planned to have 20-minute headways by 2020 and had started planning to include new reverse peak service and more express trains between 2021–2030. Additional peak and midday service, along with new weekend services were also planned in the same timeframe. The study also documented several planned WMATA improvements to include enhanced service frequency, extended spans of service, route redesigns, bus stop consolidations, and limited stop service.

Since 2017 some of the projects in the study corridor have been completed, some are now underway, and some are still in the planning stage. Funding for some projects within the study corridor has been secured; however, the funding status greatly varies from project to project. The I-395/I-95 Commuter Choice program, which is administered by the Northern Virginia Transportation Commission (NVTC) has provided funding to many of the projects identified in the 2017 I-95/I-395 Transit/TDM Study.

Ferry Planning

Waterways have been a major influence on the settlement and growth of the Washington, DC, metropolitan area, but there has not been commuter ferry service on the lower part of the river for more than 100 years. As multiple Potomac River bridges age and reach capacity, alternatives are being evaluated to ensure the National Capital Region continues to enjoy cross-river mobility. A decade-long history of studies led by the Northern Virginia Regional Commission (NVRC) has offered evidence that service is feasible and that a market likely exists for commuter ferry service.

A market feasibility study and infrastructure gap analysis of commuter ferry service on the Potomac River was completed between 2012 and 2019. A third study is currently underway, as described below.

Business Case for Fast Ferry Passenger Service (January 2022–present): This business case is being developed by NVRC and is intended to assist the region in getting from concept to implementation of fast ferry passenger service. It is the most direct effort to

date to establish a road map to bring private-sector operators from a position of interest to a position of operating service. The details being addressed to make a business case fall into three essential categories:

- **Operational details:** These include, but are not limited to, routes, level of service, fares, market response to service levels, travel times and fare levels, terminal development, maintenance functions, and propulsion. NVRC's consultant team is currently working to identify service delivery models and prepare specific route profiles for the best three routes and service models.

It is assumed that initial service will serve Prince William County, Joint Base Anacostia-Bolling (JBAB)/ the Department of Homeland Security (DHS) in Washington, DC, with a third stop in SE/SW District of Columbia. Other possible origin and destination locations for passenger service include National Harbor in Maryland; one site serving National Landing (Amazon HQ2), Reagan National Airport, and the Pentagon in Virginia; and District of Columbia SE/SW waterfront sites. While the primary target market of the initial service is commuters traveling to and from work, ferry service stops for the tourism and recreational market are also being considered (e.g., MGM Grand Hotel & Casino, National Harbor, Mount Vernon, Audi Field, and the Washington Nationals Baseball Stadium).

- **Financial structure:** To date, operator interest has depended on the ability to clearly demonstrate a financial model that reduces risk for the operators and improves the probability the service can successfully launch and be sustained.
- **Governance:** The governance and funding structures are likely the most significant issues in terms of getting new passenger commuter ferry service operating on the Potomac River. To move into implementation, the program needs a lead agency with a recognized portfolio of infrastructure development; interstate, military, and regional partnerships; service delivery; and funding administration.

Transit Strategic Plans (TSP) and Network Redesigns

The transit strategic plan and network redesigns that are in progress or that have already been completed by transit providers in the study corridor include: Alexandria (DASH), Fairfax County (Connector) and the Potomac and Rappahannock Transportation Commission (OmniRide). Metrobus, TheBus (Prince George's County), and Montgomery County (RideOn) began redesign efforts in 2022. The City of Alexandria completed a bus network redesign in 2020 and has begun implementing those changes in the New DASH Network in advance of completing its new TSP. Each transit provider's specific planned improvements for the study corridor can be viewed in **Section III. Baseline Conditions**. The general themes from the studies were increasing frequency of routes, creating new and extending existing bus routes, fleet expansions, and expanding facilities to increase fleet capacity and support new ridership.

III. Baseline Conditions

This section identifies existing conditions and planned transit and transportation demand management improvements in the study corridor as well as travel patterns and a summary of corridor needs.

Transit Service and Facilities

Local, Express, and Commuter Bus Services

The study team inventoried all transit services that operate within one mile of the I-495 Southside corridor. Four transit providers operate bus services that intersect this area, including both local and commuter bus services. Baseline conditions reflect spring 2022 data.

Table 1 summarizes the existing local and commuter bus services in the corridor. In Virginia, local bus services are provided by Fairfax Connector and DASH. In Maryland, local bus service is provided by Prince George’s County’s TheBus. WMATA’s Metrobus operates across the study corridor in both Maryland and Virginia including the only route that operates on I-495 itself—NH2. **Figure 14** shows all transit routes operating in the area and **Figure 15** shows relevant routes that intersect the study corridor.

Table 1. Existing Local and Commuter Bus Services in Study Area

Operator	Types of Service	Bus Routes in Study Corridor	Weekday One-Way Trips in Study Corridor
Fairfax Connector	Local and Commuter	101, 109, 151, 152, 159, 161, 162, 171, 231/232, 301, 310, 321/322, 401/402	411
DASH	Local	30, 32, 34, 35	228
TheBus	Local	33, 35, 37	57
Metrobus	Local	NH1, NH2, REX, 7A, 10A, 10B, 11C, D12, D14, P18, 29K/N, W14	464

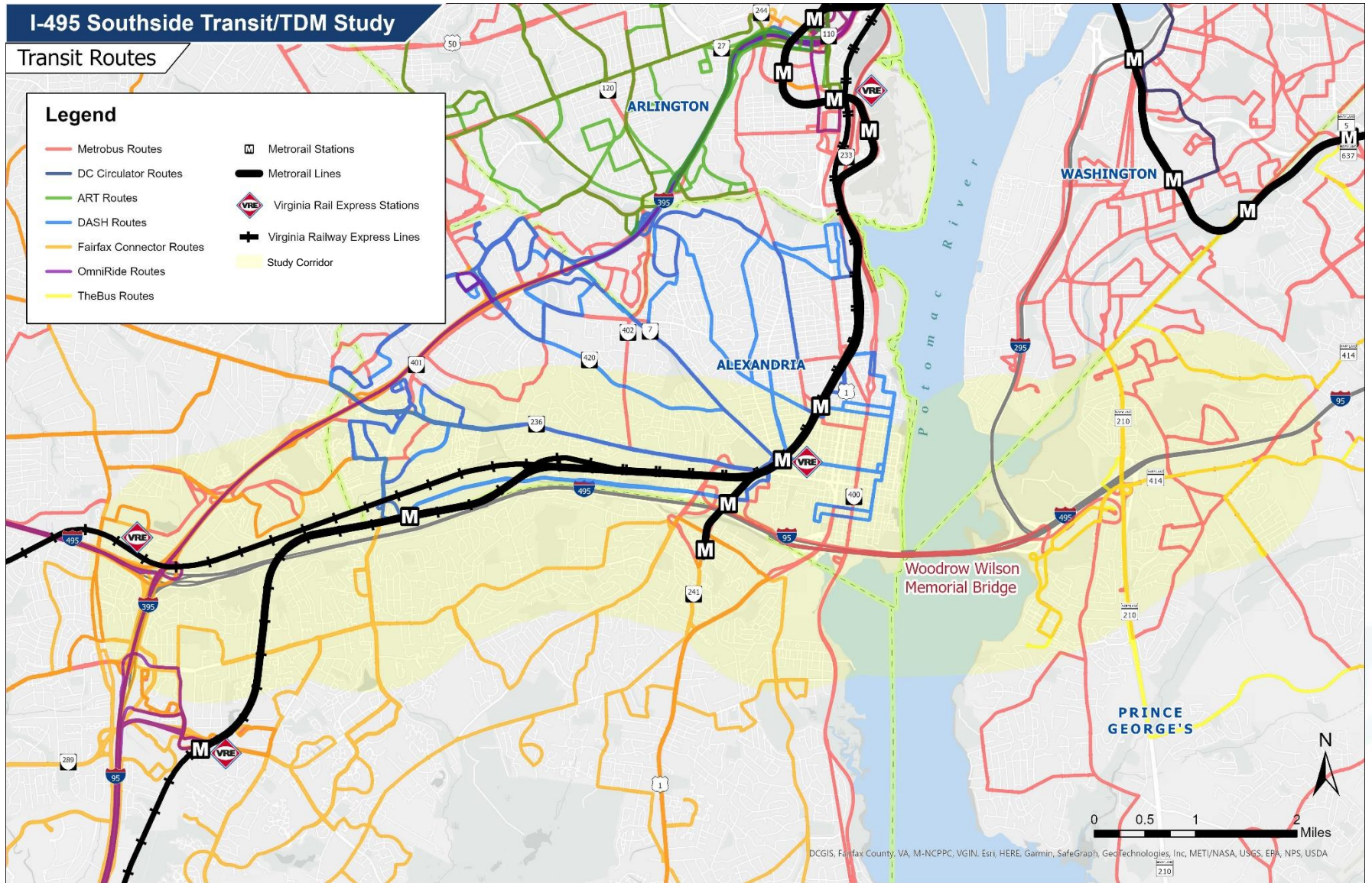
On a typical weekday, more than 500 scheduled bus trips cross the study corridor. Most bus service remains on local roads, although some commuter routes travel directly on I-495, I-95, MD-210, and MD-414. Metrobus NH2 is the only existing service that crosses

the Woodrow Wilson Bridge between Virginia and Maryland. Ample local and regional bus transit service currently operates north and south of the study corridor in both Virginia and Maryland. OmniRide currently does not have existing service within the study corridor as its commuter bus service travels north and south along I-95 and I-395 using the Express Lanes on those highways.

This section also describes the transit and facility improvements each transit provider has planned. The reviewed transit studies included new local and commuter bus service improvements for route extensions, increased service frequencies, and extended operating hours. Two of these projects are already underway and completed—DASH’s new network and Metrobus line 10A extension. All other projects are not yet completed. The studies and plans reviewed include:

- I-95 Corridor Improvement Plan (2021)
- I-95/I-395 Transit/TDM Study (2017)
- Alexandria Transit Vision Plan and DASH Transit Development Plan (2020)
- Fairfax County Transit Strategic Plan (Anticipated 2023)
- OmniRide Transit Strategic Plan (2020)
- Prince George’s County Transit Vision Plan (2018)

Figure 14. Existing Transit Routes



Fairfax Connector

Table 2. Existing Fairfax Connector Services in Study Corridor

Existing Route	Type of Service	Peak Frequency	Weekend Service	Key Destinations Served	Weekday (Midday + Peak) One-Way Scheduled Trips in Study Corridor
101	Local Bus	30 min	Yes	Huntington Metro, Fort Hunt Rd, Belle View, Collingwood Rd, Inova Mt. Vernon Hospital	31
109	Local Bus	30 min	Yes	Van Dorn St Metro / Huntington Metro	32
151	Local Bus	30 min	Yes	Huntington Metro, N Kings Hwy, Richmond Hwy/Rt 1, Buckman Rd, Lawrence St, Pole Rd, Sacramento Dr, Lukens Ln, Old Mill Rd, Mt. Vernon	39
152	Local Bus	30 min	Yes	Huntington Metro, N & S Kings Hwy, Beacon Hill Rd, Fort Hunt Rd, Sherwood Hall Ln, Inova Mt. Vernon Hospital, Mt. Vernon Hwy	34
159	Local Bus	20 min	Yes	Huntington Metro to Sacramento Dr	13
161/162	Local Bus	30 min	Yes	Huntington Metro to Mt. Vernon Square Apartments (Hybla Valley Circulator)	28
171	Local Bus	20 min	Yes	Huntington Metro, Huntington Ave, Richmond Hwy/Rt 1, Fairfax County Pkwy/ Rt 286, John Kingman Rd, Telegraph Rd, Pohick Dr, Lorton VRE	52
231/232	Local Bus	30 min	No	Van Dorn St Metro, Fleet Industrial Park, Manchester Lakes Center, Franconia-Springfield Pkwy	22
301	Local Bus	30 min	No	Franconia-Springfield Pkwy/Rt 289, Telegraph Rd, Huntington Ave, Huntington Metro, Franconia-Springfield Metro and VRE Station	15
310	Local Bus	20 min	Yes	Rolling Valley Park and Ride / Huntington Metro	44
321/322	Local Bus	30 min	Yes	Van Dorn St Metro / Franconia-Springfield Metro	36
401/402	Local Bus	30 min	Yes	Franconia-Springfield Metro / Tysons West Park Transit Station	65

Source: Fairfax Connector schedules via website – current as of May 2022

Table 3. Planned Fairfax Connector Services in Study Corridor

Study Name	Planned Improvements	Location	Service Type	Frequency	Timeframe	Financially Constrained?
I-95/ I-395 Transit/TDM Study	Increase frequency on Routes 161, 162, 321, 322	Outside of Beltway to study corridor boundary	Local bus	20 min	2019–2025	No
I-95/ I-395 Transit/TDM Study	New Routes 172 and 402	Outside of Beltway to study corridor boundary	Local bus	–	2019–2025	No
I-95/ I-395 Transit/TDM Study	New Multimodal Transit Hub	Springfield	Facility	–	2019–2025	No
Fairfax Connector TSP	Adjust Route 101 to connect between Huntington Metro and Inova Mt. Vernon Hospital and increase Saturday frequency on Route 101	Huntington Metro to Inova Mt. Vernon Hospital	Local Bus	30 min on weekdays and Saturday 60 min on Sunday	Mid- or Long-Term	To be determined
Fairfax Connector TSP	Restore Route 101 extension to George Washington's Mt. Vernon when Richmond Hwy BRT starts service	Huntington Metro to Mt. Vernon	Local Bus	30 min on weekdays and Saturday 60 min on Sunday	2030	To be determined
Fairfax Connector TSP	Increase weekday, Saturday and Sunday frequency on Route 109	Van Dorn Street Metro to Huntington Metro	Local Bus	30 min on weekdays and weekends	Mid- or Long-Term	To be determined
Fairfax Connector TSP	Replace Route 161/162 with Route 163	Huntington Metro to Inova Mt. Vernon Hospital	Local Bus	15-30 min on weekdays 30 min on weekends	Mid- or Long-Term	To be determined
Fairfax Connector TSP	Increase frequency of Route 151 as a replacement for Route 159	Huntington Metro to Mt. Vernon	Local Bus	15 min on weekdays 30 min on weekends	Mid- or Long-Term	To be determined
Fairfax Connector TSP	Replace Route 151 with Route 153 when Richmond Highway BRT begins service	Inova Mount Vernon Hospital and George Washington's Mount Vernon	Local Bus	15-30 min on weekdays 30 min on weekends	Mid- or Long-Term	To be determined
Fairfax Connector TSP	Replace portions of Route 101/161/162 with Route 164	Huntington Metro to Mt. Vernon	Local Bus	60 min on weekdays and weekends	Mid- or Long-Term	To be determined

Study Name	Planned Improvements	Location	Service Type	Frequency	Timeframe	Financially Constrained?
Fairfax Connector TSP	Increase frequency of Route 164 and shorten route when Richmond Hwy BRT begins service	Huntington Metro to Mt. Vernon	Local Bus	30 min on weekdays and weekends	Mid- or Long-Term	To be determined
Fairfax Connector TSP	Replace Route 152 with Route 165 when Richmond Highway BRT begins service	Huntington Metro, N & S Kings Hwy, Inova Mt. Vernon Hospital	Local Bus	30 min on weekdays and weekends	Mid or Long Term	To be determined
Fairfax Connector TSP	Increase weekday frequency on Route 171	Huntington Metro to Lorton VRE	Local Bus	20 min on weekdays 30 min on weekends	Mid or Long Term	To be determined
Fairfax Connector TSP	New Richmond Highway BRT	Huntington Metro, N Kings Hwy, Richmond Hwy/Rt 1, Fort Belvoir	BRT	3-12 min on weekdays 20 min on weekends	2030	To be determined
Fairfax Connector TSP	Increase peak frequency on Route 301	Huntington Metro to Franconia-Springfield Metro	Local Bus	30 min during weekday peak	Mid or Long Term	To be determined
Fairfax Connector TSP	Increase frequency on Route 310 and extend Saturday service hours	Rolling Valley Park and Ride to Huntington Metro	Local Bus	15-25 min on weekdays 25-30 min on weekends	Mid or Long Term	To be determined

DASH

Table 4. Existing DASH Services in Study Corridor

Existing Route	Type of Service	Peak Frequency	Weekend Service	Key Destinations Served	Weekday (Midday + Peak) One-Way Scheduled Trips in Study Corridor
30	Local Bus	10 min	Yes	Braddock Metro / Van Dorn Metro	69
32	Local Bus	30 min	Yes	King Street/Old Town Metro / Van Dorn Metro	27
34	Local Bus	10 min	Yes	Nannie J. Lee Center / Braddock Rd Metro	35
35	Local Bus	10 min	Yes	Van Dorn Metro / Pentagon Metro	97

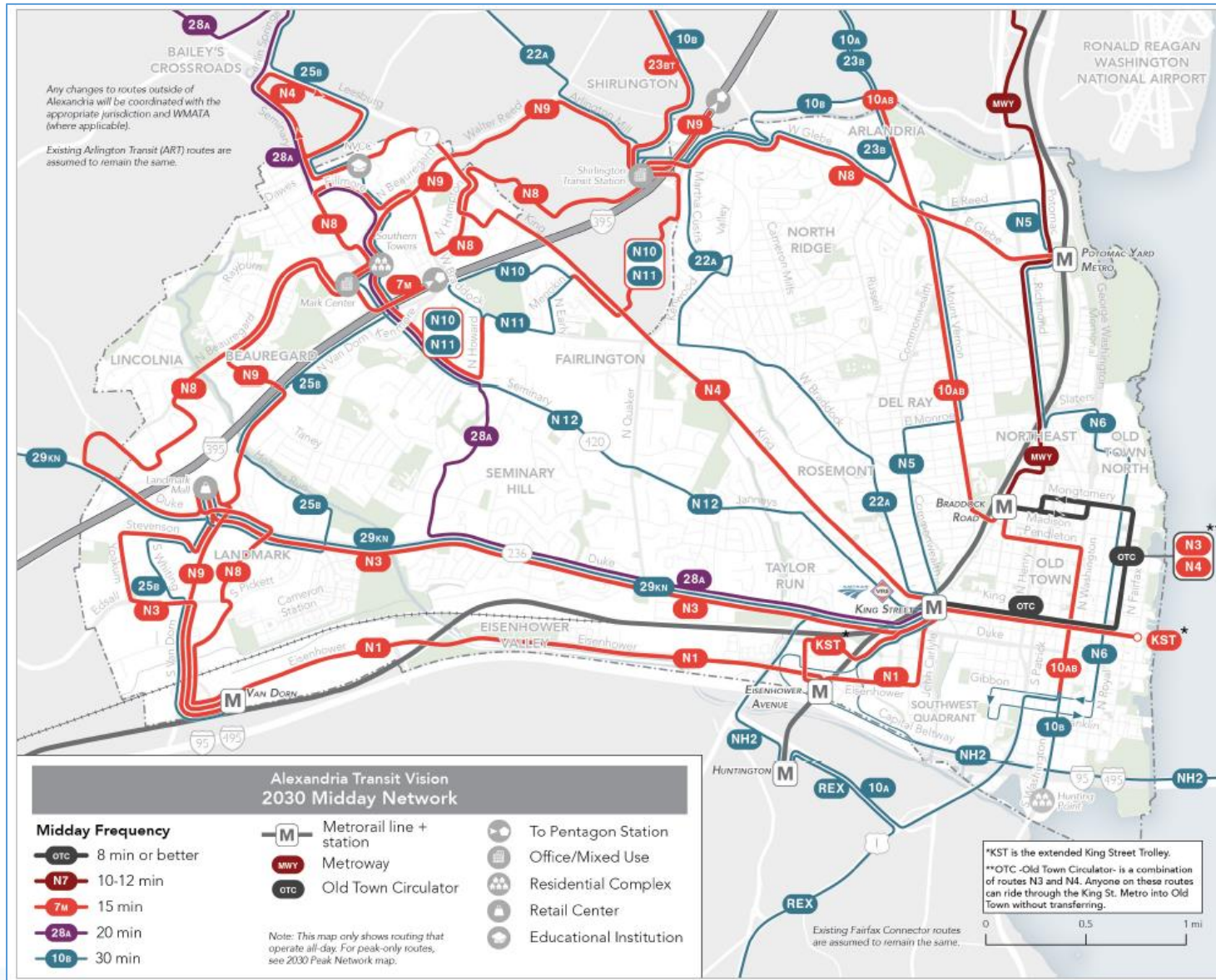
Source: DASH schedules via website – current as of May 2022

Table 5. Planned DASH Services in Study Corridor

Study Name	Planned Improvements	Location	Service Type	Frequency	Timeframe	Financially Constrained?
DASH TDP	Increase frequency on DASH Line 35	West End–Pentagon	Local bus	10-15 min, all day service, 7 days per week	2022–2023	Yes
DASH TDP	Extend DASH Line 30	Duke Street Corridor	Local bus	–	–	Yes
DASH TDP	Extend all DASH peak trips	King Street Metro to Braddock Road	Local bus	15 min, all day service, 7 days per week	2024	Yes
DASH TDP	DASH BRT	Duke Street Corridor	Local bus	High intensity bus service	2025	Yes
DASH TDP	Increase frequency on DASH Line 32	Landmark Mall to King Street Metro via Eisenhower Avenue	Local bus	Weekday Peak/Evening: 30 min, 5:00 AM to 10:00 PM Weekday Midday/Weekend: 60 min, 7:00 AM to 10:00 PM	2022	Yes

Study Name	Planned Improvements	Location	Service Type	Frequency	Timeframe	Financially Constrained?
DASH TDP	Extend and increase frequency on DASH Line 32	King Street Metro to Braddock Road Metro	Local bus	Weekday Midday/ Weekend: 30 min	2023	Yes
DASH TDP	Extend and increase frequency on DASH Line 32	King Street Metro to Braddock Road Metro	Local bus	Weekday Midday/ Weekend: 15 min	2024	Yes
DASH TDP	Resume operations for King Street Trolley (KST)	Union and Duke Street	Trolley	15 min, 7 days per week, 11:00 AM to 11:00 PM	2022	Yes
DASH TDP	Extend KST	King Street Metro to Eisenhower Avenue Metro	Trolley	15 min, 7 days per week, 11:00 AM to 11:00 PM	2024	Yes
I-95/I-395 Transit/TDM Study	Increase frequency on DASH Lines 35, 30, and 32	Old Town, Van Dorn Street, Eisenhower Avenue	Local bus	–	2019–2025	No
I-95/I-395 Transit/TDM Study	All-day service on DASH Line 30	Old Town/Duke Street	Local bus	–	2019–2025	No
I-95/I-395 Transit/TDM Study	Three new DASH Circulators	Van Dorn Street, Eisenhower Avenue, and Old Town	Local bus	–	2019–2025	No
I-95/I-395 Transit/TDM Study	Expand Landmark Mall bus transit center	Former Landmark Mall	Facility	–	2019–2025	No
I-95/I-395 Transit/TDM Study	Expand DASH facilities to hold 135 buses	William B. Hurd Transit Facility	Facility	–	2023–2024	No

Figure 16. 2030 Alexandria Transit Vision Plan Midday Network



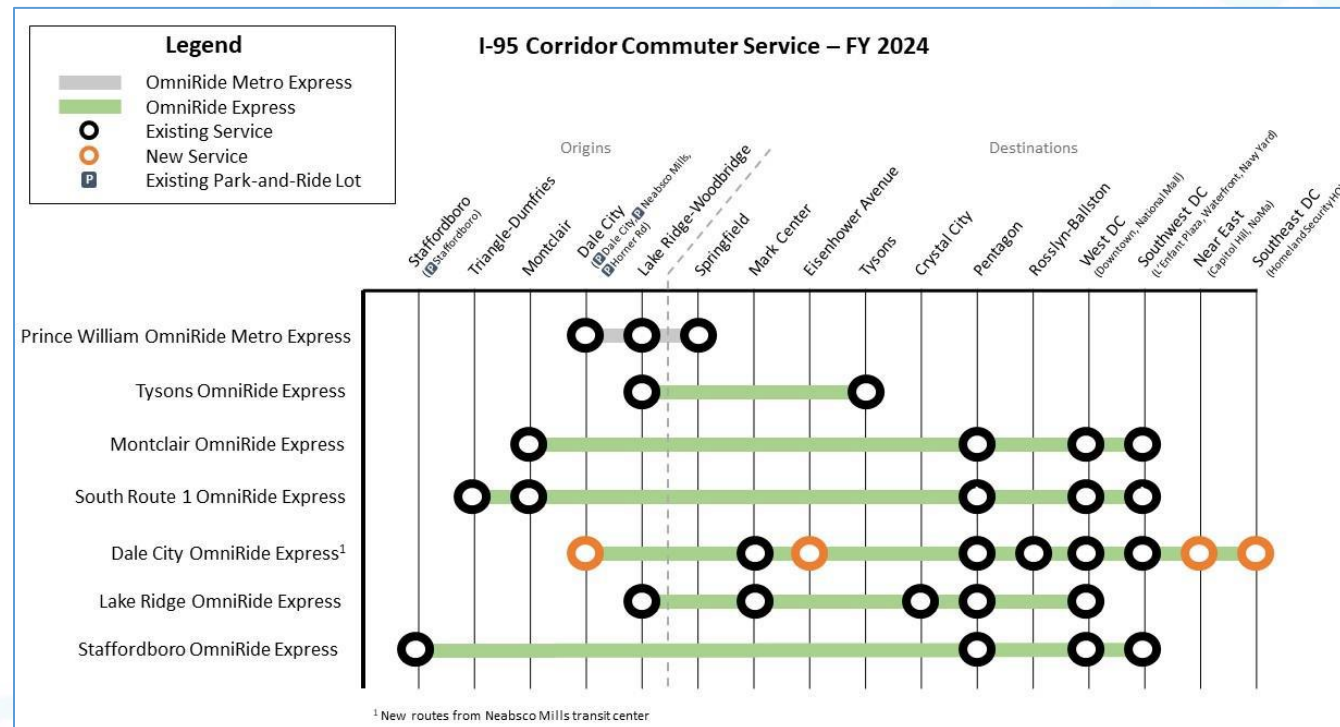
OmniRide

OmniRide currently does not have existing service within the study corridor, only north and south along I-95 and I-395. OmniRide is included due to future planned routes within the study corridor.

Table 6. Planned OmniRide Services in Study Corridor

Study Name	Planned Improvements	Location	Service Type	Frequency	Timeframe	Financially Constrained?
OmniRide TSP	New service Dale City OmniRide Express	Neabsco Mills to Eisenhower Avenue and Homeland Security Headquarters	Commuter bus	8 one-way trips (4 morning inbound, 4 evening outbound) for each destination	2024	Yes
I-95/I-395 Transit/TDM Study	New OmniRide Routes	Central Prince William County, Downtown Alexandria, Dale City	Commuter bus	45 min during weekday peak	2019–2025	No

Figure 17. Future OmniRide I-95 Corridor Commuter Service



TheBus (Prince George’s County)

Table 7. Existing TheBus Services in Study Corridor

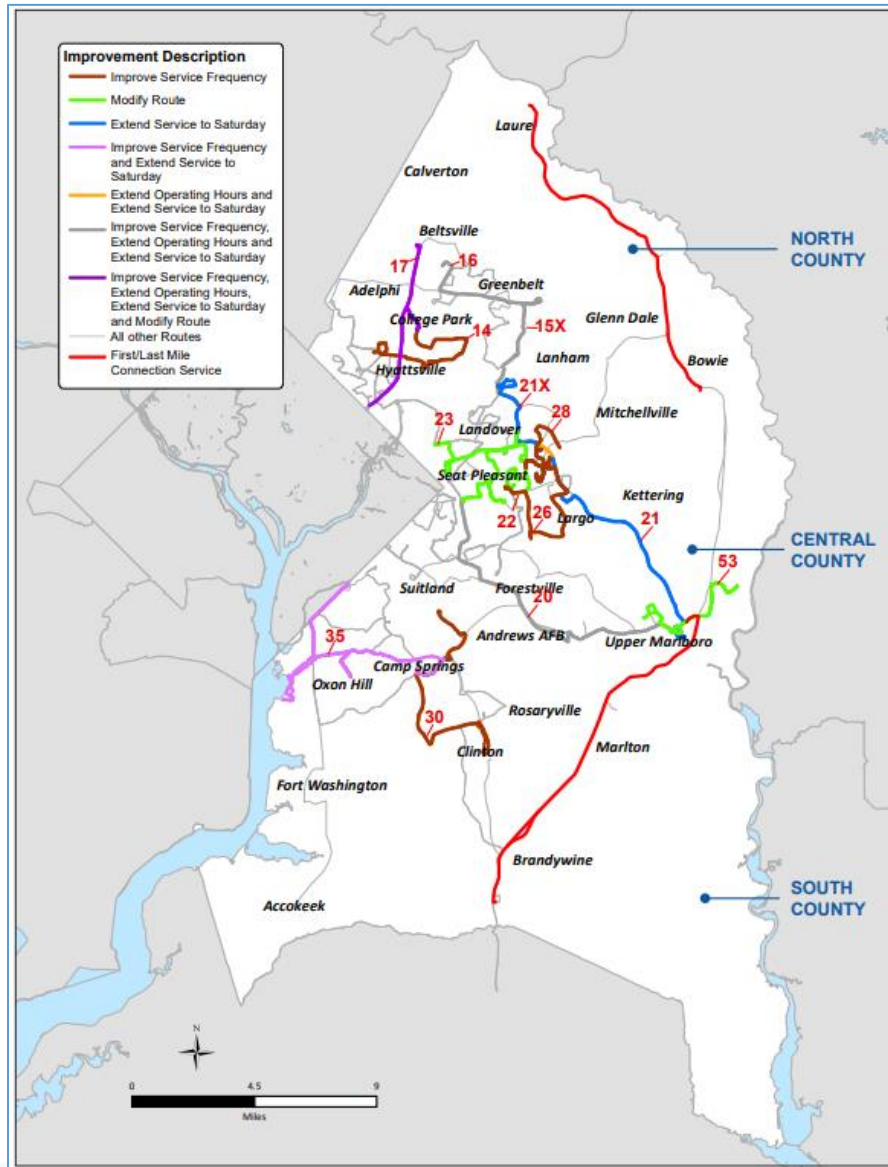
Existing Route	Type of Service	Peak Frequency	Weekend Service	Key Destinations Served	Weekday (Midday + Peak) One-Way Scheduled Trips in Study Corridor
33	Local Bus	30 min	No	Old Branch Avenue/ Southern Avenue Metro	25
35	Local Bus	30 min	Yes	Oxon Hill Fringe Park and Ride/ Rivertowne Commons	25
37	Local Bus	30 min	No	Old Branch Avenue/ Southern Avenue Metro	7

Source: TheBus schedules via website – current as of May 2022

Table 8. Planned TheBus Services in Study Corridor

Study Name	Planned Improvements	Location	Service Type	Frequency	Timeframe	Financially Constrained?
Prince George's County Transit Plan	Extend Route 35 service to Saturdays and improve off-peak frequency	Camp Springs – Southern Avenue Metro	Local bus	From 60 to 45 min	Mid-Term	Yes
Prince George's County Transit Plan	Extend Route 32 service to weekday evenings and Saturdays	Naylor Road – Clinton Fringe Park and Ride	Local bus	Weekday evening service until 9:00 PM	Short-Term	Yes
Prince George's County Transit Plan	Improve peak frequency on Route 32	Naylor Road – Clinton Fringe Park and Ride	Local bus	From 30 to 20 min	Short-Term	Yes
Prince George's County Transit Plan	Extend Route 32 weekday service to evenings	Naylor Road – Clinton Fringe Park and Ride	Local bus	Weekday evening service until 10:00 PM	Beyond 5 years	Yes
Prince George's County Transit Plan	Extend Route 33 service to weekday evenings and Saturdays	Southern Avenue – Padgett's Corner	Local bus	Weekday evening service until 9:00 PM	Long-Term	Yes
Prince George's County Transit Plan	Improve peak frequency on Route 33	Southern Avenue – Padgett's Corner	Local bus	From 40 to 30 min	Long-Term	Yes
Prince George's County Transit Plan	Improve peak and off-peak frequency on Route 30	Branch Ave – Southern MD Hospital	Local bus	Peak: From 50 to 30 min Off-peak: From 50 to 45 min	Mid-Term	Yes
Prince George's County Transit Plan	Extend Route 30 service to weekday evenings and Saturdays	Branch Avenue – Southern MD Hospital	Local bus	Weekday evening service until 9:00 PM	Long-Term	Yes
Prince George's County Transit Plan	Extend Route 37 service to weekday evenings and Saturdays	Camp Springs – Southern Avenue	Local bus	Weekday evening service until 9:00 PM	Beyond 5 years	Yes

Figure 18. TheBus Countywide Service Improvements – Mid-Term Timeframe



Metrobus

Table 9. Existing Metrobus Services in Study Corridor

Existing Route	Type of Service	Peak Frequency	Weekend Service	Key Destinations Served	Weekday (Midday + Peak) One-Way Scheduled Trips in Study Corridor
NH1	Local Bus	30 min	Yes	Southern Ave/Oxon Hill Rd/ National Harbor	33
NH2	Local Bus	30 min	Yes	King St–Old Town Metro/ St George Blvd & Waterfront St	38
REX	Express Bus	15 min	Yes	King St–Old Town Metro/ Eisenhower Metro/ Huntington Metro	59
7A	Local Bus	12 min	Yes	Van Dorn St Metro/ Pentagon Metro	70
10A	Local Bus	30 min	Yes	Huntington Metro/ Braddock Rd Metro/ Pentagon Metro	40
10B	Local Bus	30 min	Yes	Ballston–MU Metro/ Braddock Rd Metro/ Hunting Point	35
29K, 29N	Local Bus	20 min (combined)	Yes	Vienna Metro/ Duke & Walker St/ King St–Old Town Metro	50
11C	Commuter Bus	30 min	No	Mt Vernon Memorial Hwy/ Hunting Point/ Braddock Rd Metro	14
D12	Local Bus	20 min	Yes	Suitland Metro/Oxon Hill Rd/ Camp Springs/ Southern Ave Metro	52
D14	Local Bus	20 min	Yes	Suitland Metro/ Oxon Hill Rd/ Camp Springs/ Southern Ave Metro	29
P18	Local Bus	20 min	No	Fort Washington Park and Ride Lot/ Oxon Hill Rd/ Southern Ave Metro	25
W14	Local Bus	20 min	No	Fort Washington Forest/ Southern Ave Metro	19

Source: Metrobus schedules via website – current as of May 2022

Table 10. Planned Metrobus Services in Study Corridor

Study Name	Planned Improvements	Location	Service Type	Frequency	Timeframe	Financially Constrained?
I-95/I-395 Transit/TDM Study	Improve weekday peak frequency on Route 10B	Hunting Point/ Old Town area	Local bus	From 30 to 15 min	2019–2025	No
I-95/I-395 Transit/TDM Study	Extend Route 10A	Huntington	Local bus	–	2019–2025	No
I-95/I-395 Transit/TDM Study	New Metrobus Garage	Northern Virginia (location TBD)	Facility	–	2019–2025	No

Operations and Maintenance Transit Facilities

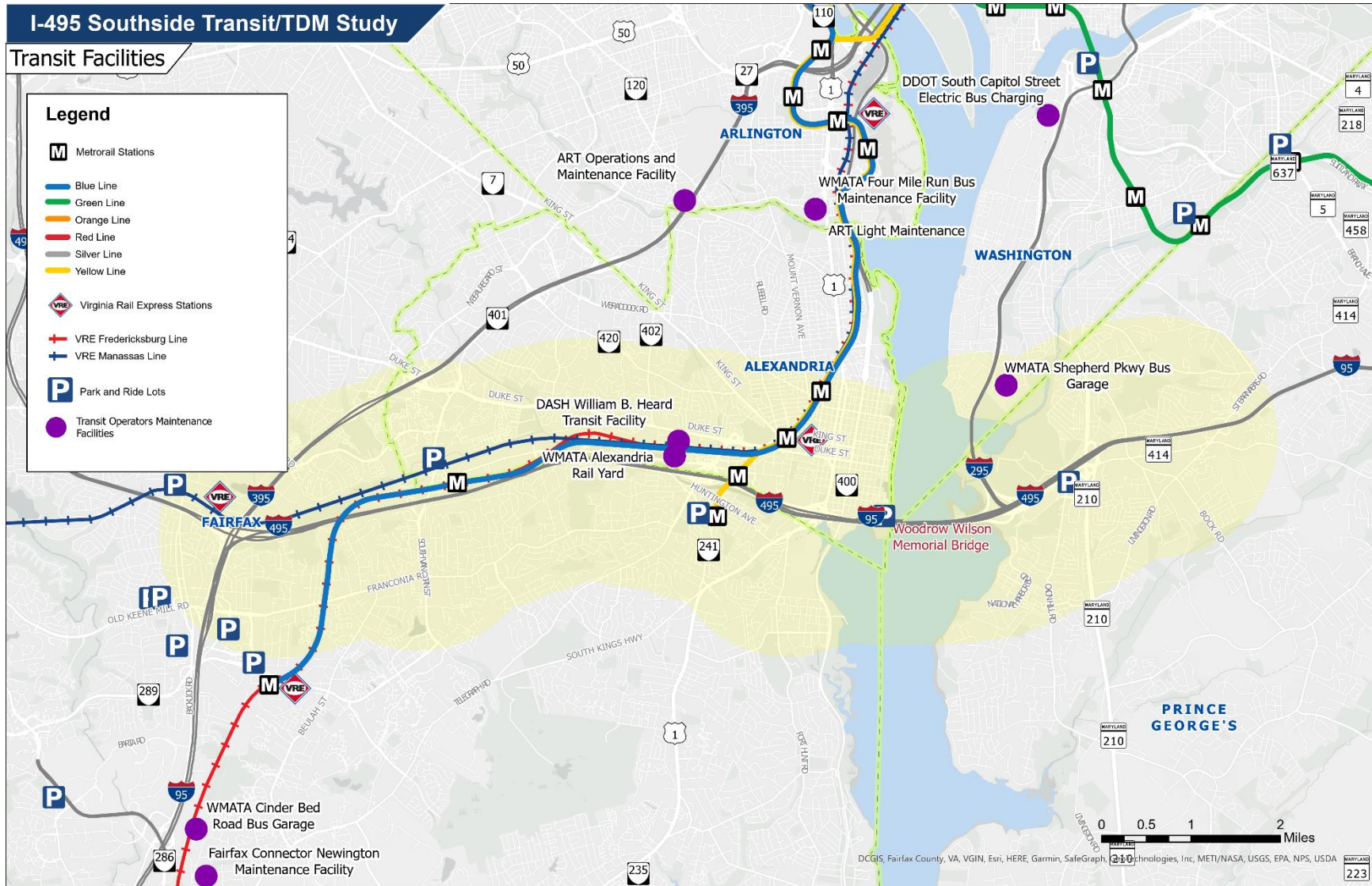
Future potential transit service would need to be assigned to an operations and maintenance transit based on location and proposed operator, which have not yet been identified. This section describes the existing inventory of operations and maintenance facilities of transit providers in the study corridor. WMATA is the main transit service provider within the study corridor that provides interjurisdictional service and utilizes operations and maintenance facilities for bus or rail. Fairfax Connector, DASH, and TheBus provide local and commuter bus service mainly within their respective jurisdictions. These transit providers also use transit operations and maintenance facilities near the study corridor as shown in **Table 11**. Prince George’s County, TheBus operates two vehicle maintenance facilities, both of which are located outside of the study corridor. **Figure 19** shows a map of facilities near the study corridor.

Table 11. Garage and Maintenance Facilities Near the Study Corridor

Operator	Facility Name	Location
WMATA	Shepherd Parkway Bus Garage	2 DC Village Ln SW, Washington, DC 20032
WMATA	Four Mile Run Bus Maintenance Facility	3501 S Glebe Rd, Arlington, VA 22202
WMATA	Cinder Bed Road Bus Garage	7901 Cinder Bed Road, Lorton, VA, 22079
Fairfax Connector	Newington Maintenance Facility	8201 Cinder Bed Road Lorton, VA, 22079
DASH	William B. Heard Transit Facility/ Alexandria Transit Center (ATC)	3000 Business Center Drive, Alexandria, VA 22314
DASH	*Fleet Facility Expansion	Land Parcel Immediately West of ATC

*Facility expansion set to open by Financial Year 2024

Figure 19. Transit Facilities Near the Study Corridor



Rail

Three providers operate rail service within the study corridor: VRE, WMATA (Metrorail) and Amtrak. As shown in **Figure 20** and **Table 12**, five rail lines cross the I-495 corridor. VRE provides peak-period commuter service oriented towards Washington, DC. WMATA provides all-day rapid service between the study corridor and Washington, DC and Maryland. Amtrak provides multiple daily trips through the study corridor with a stop at Alexandria Station.

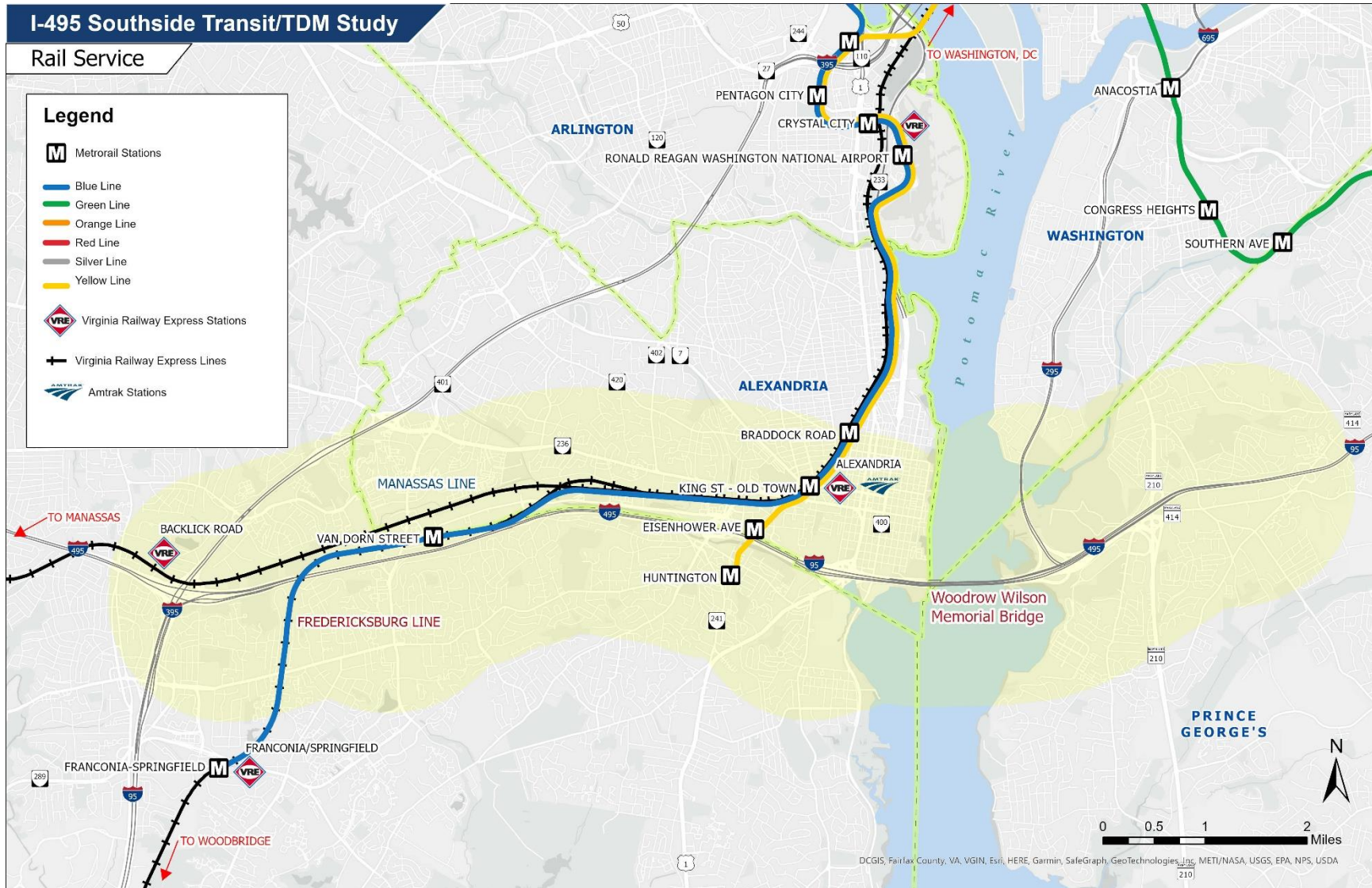
WMATA has planned for the Metrorail fleet to be increased to all eight-car trains during peak periods by 2025. Metrobus will also expand to implement frequency and service improvements. To accommodate Metrobus expansion, WMATA will need to add storage capacity at current facilities and possibly construct new facilities. The expansion of the Metrobus fleet will improve access and capacity at Metrorail stations. WMATA’s long term plans include bus circulation and loading improvements at all Blue and Yellow Line Metrorail stations in the study corridor.

Many rail stations serve as regional and local transit centers where riders can transfer between bus and rail routes. Key transfer stations near the study corridor include Franconia-Springfield Metro/VRE Stations, VRE/Amtrak Alexandria Station, VRE Backlick Road Station, and the four Metrorail stations serving the Alexandria area. VRE will lengthen all trains to eight-cars during its short-term plan (by 2025) and increase frequency during both peak and midday service during its long-term plan (2025–2040).

Table 12. Existing Rail Services in Study Corridor (As of 9/8/2022)

Agency	Rail Routes	Weekday Frequency
WMATA	Metrorail Blue Line	15 minutes, at all operating periods
WMATA	Metrorail Yellow Line	15 minutes, at all operating periods
VRE	Fredericksburg Line	8 trains, in both AM and PM
VRE	Manassas Line	8 trains, in both AM and PM
Amtrak	Northeast Regional	6 trains, in both AM and PM

Figure 20. Rail Service in the Study Corridor



Park and Ride

Park and ride lots are parking facilities at which travelers can park vehicles to meet up with carpools/vanpools or take public transportation to their destination. While VDOT does not own or maintain any park and ride lots within the study corridor, there are a few that owned and maintained by local government jurisdictions. In addition, some park and ride lots are maintained by private entities through agreements with the local jurisdictions in which they are located. Several of the WMATA Metrorail and VRE commuter rail stations in the study corridor also have adjacent parking lots or structures. While most of the users of these lots are parking at the station to use the rail service, many of these stations and parking lots are also serviced by local bus transit service providers, including Metrobus and Fairfax Connector.

Table 13 shows the existing and planned park and ride lots near the study corridor. **Figure 19** above also shows locations of park and ride lots. There are five existing park and ride lots immediately adjacent to the I-495 Southside study corridor. In addition, the Springfield Multi-Use Parking Garage with approximately 1,000 spaces is planned to be open to the public in 2023. In Virginia, there are several park and ride lots in suburban and exurban areas along I-95 and I-495 that are origin points for commuter buses to Northern Virginia and Washington, DC. These lots can be viewed using this interactive map from [Commuter Connections](#).

In Maryland, much of the parking is also connected to Metrorail stations. The Oxon Hill Park and Ride lot is the only park and ride along I-495 Southside in Maryland, but others are located further south and east in suburban areas.

Table 13. Existing Park and Ride Lots/Facilities Near the Study Corridor

Name	Location	Main Corridor	Connecting Service	Number of Spaces	Paid Parking	Operator	Rail Station
Fairfax County							
Huntington Metro	Route 241 (North Kings Highway) & Jefferson Drive (Fairfax County, VA)	I-495	Fairfax Connector, Metrorail Yellow Line, Metrobus	3,617	\$4.95/ day	WMATA	Huntington Metro
Backlick Road VRE	6900 Hechinger Dr, Springfield, VA 22151	I-495	Fairfax Connector, VRE Manassas Line, Metrobus	220	Free	Fairfax County	Backlick Rd VRE
American Legion Post 176	6500 Amherst Ave Springfield, VA 22150	I-95	Fairfax Connector, Metrobus	100	Free	American Legion	–
Springfield Multi-Use Parking Garage (Future)	7039 Old Keene Mill Road, Springfield, VA	I-95	Fairfax Connector, Metrobus	Approximately 1,000	Free	Fairfax County	–
Franconia-Springfield Metro	6880 Frontier Dr, Springfield, VA, 22150	I-95	Fairfax Connector, Metrobus, OmniRide, VRE, Metrorail	5,069	\$4.95 – 8.95/ day	WMATA	Franconia-Springfield Metro & VRE Station
Springfield Mall	6717 Frontier Dr, Springfield, VA, 22150	I-95	Fairfax Connector, Metrobus	500	Free	Springfield Mall	–
Springfield United Methodist Church	6501 Spring Rd, Springfield, VA 22150	I-95	Fairfax Connector, Metrobus	57	Free	Springfield United Methodist Church	–
City of Alexandria							
Van Dorn Street Metro	Cameron Station Blvd & UR 6575 (Pickett St), Alexandria, VA	I-495	Metrorail Blue Line, Metrobus	361	\$4.95/ day	WMATA	Van Dorn Street Metro
Jones Point Park	98 Jones Point Dr Alexandria, VA 22314	I-495	Metrobus	176	Free	City of Alexandria	–
Prince George's County							
Oxon Hill Park and Ride	6700 Oxon Hill Rd, Oxon Hill, MD 20745	I-495	TheBus, Metrobus	649	Free	Prince George's County	–

Summary

Existing and planned transit services provide a baseline for considering other new multimodal strategies. These strategies will help reduce congestion, improve trip reliability and regional connections, and enhance existing and planned multimodal mobility. The projects listed below are not a comprehensive list of all existing and planned projects but represent some of the more impactful projects to the study corridor.

Existing:

- Limited bus service on I-495/over Woodrow Wilson Bridge
- Parallel and Metrorail feeder bus service (Alexandria, Fairfax County, Prince George's County)
- National Harbor vicinity bus service
- VRE and Amtrak parallel to corridor

Planned:

- OmniRide Transit Strategic Plan improvements and future commuter service to Alexandria and St. Elizabeth's
- VRE and Amtrak service increases
- WMATA Bus Network Redesign underway
- New DASH Network/Alexandria Transit Vision Implementation
- Fairfax County Transit Strategic Plan improvements
- Richmond Highway BRT

TDM Commuter Assistance Programs

Transportation Demand Management (TDM) Commuter Assistance Programs (CAPs) are a program of strategies and incentives provided by local or regional organizations to educate people about available transportation modes and encourage them to use alternative methods of travel to single-occupancy vehicles (SOVs). The goal of CAPs is to optimize all modes in the transportation system and manage travel demand. Redistributing travel demand across modes is a cost-effective alternative to increasing capacity through expensive infrastructure improvements.

Within the study corridor, CAP programs are funded at the state, regional, and local level. This section details the CAP services offered in the region. CAPs within the study corridor mostly focus on providing commuters and businesses with the resources, knowledge, and, in some instances, financial incentives to begin using carpools, vanpools, transit, and telework. Local governments typically have a CAP that targets commuters and employers within its jurisdiction or major destinations such as downtown Washington, DC, or the Pentagon. There are no specific targeted coordination efforts to encourage non-SOV modes of travel along the I-495 Southside corridor and across the Woodrow Wilson Bridge.

Statewide CAP Programs

Commute!VA

Commute!VA is a DRPT resource for finding greener travel options such as carpool, vanpool, bus, bike, or telecommute within any Virginia county. If no CAP incentive programs are available, Commute!VA allows residents to record their own green trips and earn rewards to a variety of restaurants, retailers, shows, and attractions. This program is free for anyone.

Commuter Choice Maryland

Commuter Choice Maryland is a statewide Maryland Department of Transportation (MDOT) program designed to ease traffic congestion, provide employers and commuters with assistance programs, and connect commuters to transportation options that fit their lifestyle, schedule, and budget.

Regional CAP Programs

Commuter Connections

Commuter Connections is a regional network of CAPs in the Washington Metropolitan Area National Capital Region. MWCOG coordinates the Commuter Connections network's regional activities, with the CAPs operated by the local agencies in Northern Virginia and Maryland. The services of those CAPs are described later in this section. Within DC, GoDCGo operates a commuter assistance program that is operated and run by the District Department of Transportation (DDOT).

The Commuter Connections network delivers numerous regional commuter-focused services across the region. This includes carpool/vanpool matching, transit information with links to local transit providers, bicycle/walking information, telework information and resources, and other information and assistance services to residents and workers via the website and by telephone.

MWCOG, through the Commuter Connections network brand, conducts regionwide television, radio, and print marketing for non-SOV modes. They also coordinate with local jurisdictional partners in the study area on local delivery of services and regional commute campaigns and promote and support regional commute travel events such as Bike-to-Work Day and Car-Free Day.

While Commuter Connections operates as the regional network of CAPs in the region, none of its activities specifically target travel in the I-495 Southside corridor or across the Woodrow Wilson Bridge. Commuter Connections' services are likely used to arrange some trips in the study corridor each day, and a significantly large number of people who travel the corridor each day for work are the target audience for the organization's many marketing efforts and services. MWCOG, through the Commuter Connections brand, operates the following services:

Commute with Confidence

As the National Capital Region re-opens businesses after the COVID-19 pandemic, Commute with Confidence is a program designed to provide tips on how to stay safe during commuting and to share up-to-date information on what local transportation providers are doing to make shared commuting as safe as possible. The Commute with Confidence website provides links to the local transit responses to COVID-19 for each county along with additional Commuter Connections resources about other services the program provides.

Regional Ridematching

Commuter Connections is the regional carpool/vanpool rideshare matching service and is hosted by MWCOG. Commuters can apply online, by phone, or through employers and local jurisdictions for access to lists of potential carpool and vanpool partners. The CAPs in the study area also use the regional Commuter Connections ridematching system to find carpools, vanpools, and transit options for their customers. Local CAPs also provide follow-up assistance to commuters who received matches.

Guaranteed Ride Home

Commuter Connections Guaranteed Ride Home (GRH) program service provides up to four free rides home per year to commuters who work in the region and who use transit, carpool, vanpool, a bicycle, or who walk to get to work. Commuters may use GRH to get home for unexpected emergencies such as a personal illness or a sick child. GRH also can be used for unscheduled overtime when a commuter's employer mandates that they must stay late. Residents and workers in the study corridor are eligible to participate. GRH surveys have found that more than half of the commuters participating in the program started or increased their use of a new alternative mode. GRH is operated by MWCOG, which contracts with taxi and transportation network companies in the region to provide guaranteed rides home.

CarpoolNow

CarpoolNow is a smartphone app that provides on-demand carpool services by connecting drivers offering rides to passengers seeking rides. The app displays routes and estimated pick-up times and it confirms pick-up and drop-off locations. Drivers who register an account on the CarpoolNow app are eligible to earn \$10 per trip when picking up riders going to or from work.

Pool Rewards: Carpool/Vanpool Incentives

Pool Rewards provides financial incentives to drive-alone commuters who start carpooling or vanpooling to work sites within the 11-county National Capital Region. Eligible carpool members can receive \$2 per day for each day they carpool to work over a 90-day period (up to \$130). Commuters who form new vanpools can receive a \$200 per month incentive (ongoing). Vanpools must originate in Maryland, Pennsylvania, New Jersey, West Virginia, or Washington, DC. Virginia is an eligible destination but not an origin.

Flextime Rewards Program

The Flextime Rewards program pays registered commuters \$8 each time they avoid notoriously congested corridors in the region. After registering, users will receive email notifications from the Commuter Connections app suggesting alternative departure times if higher-than-average traffic congestion is projected along their commute route. Users will receive the incentive once a trip has been logged in their Commuter Connections app. A user's employer must also be registered in the Flextime Rewards Program to be eligible for the incentive. Of the four corridors currently eligible for the Flextime Rewards cash incentive, two are located within the study corridor: I-495 between I-95 and MD-193 and DC-295 southbound at Benning Road.

incentTrip

incentTrip is a comprehensive multimodal trip planning app that helps commuters in the region find optimal commuting options. Commuters with a registered Commuter Connections account earn points by commuting to work using modes that reduce congestion and improve air quality such as ridesharing, transit, or biking. Points can be redeemed for money (up to \$600 per calendar year). In addition to providing incentives for alternative modes of transportation, incentTrip also allows commuters to make more informed travel decisions by providing traffic congestion projections and real-time data feeds.

Marketing and Promotions

MWCOG undertakes a comprehensive regional media campaign to inform commuters of services available from Commuter Connections as one way to address commuters' frustration about their commute. Various special annual promotional events, such as Car-Free Day and Bike-to-Work Day, are also part of this effort. MWCOG coordinates these marketing efforts with involvement and input from local CAP staff via MWCOG committees and work groups. Additionally, all the local CAP partners in the study corridor also conduct local marketing and promotional activities in their service areas for the regional events and their own local events.

Employer Outreach

Commuter Connections network members also assist employers in the region to educate their employees on the transportation options available when commuting to work. CAPs do this by helping employers develop programs to incentivize employees to

commute via transit, carpool, vanpool, and bicycle. These incentives include preferential parking for carpools/vanpools, commuter benefits, bike lockers, and showers. To help employers offer the most appropriate commuting solutions for their employees, CAPs can provide on-site transportation assessments, confidential employee commute surveys, and mapping of employee residence patterns.

Moreover, CAPs offer the following program development assistance:

- Teleworking (in Virginia through DRPT's Telework!VA program)
- Transit information, including SmartBenefits, the region's commuter benefits program
- Bicycle commuting
- Work schedule alternatives
- Parking management strategies based on an evaluation of the current parking situation
- Emergency preparedness plans
- Air Quality Action Days
- Guaranteed Ride Home (GRH) registration and information
- Computerized and Dynamic Ridematching for carpools/vanpools
- Commuter incentives
- On-site rideshare promotions and displays
- New employee commute information
- Corporate relocation assistance
- Training an on-site transportation manager
- Commuter coordination with nearby companies

Vanpool Alliance

This Northern Virginia public-private partnership, operated by OmniRide, facilitates the collection of vanpool operation data for the National Transit Database (NTD). Vanpool Alliance is a TDM Program aimed at improving mobility and increasing regional connections in the DC/MD/VA (DMV) area.

Vanpool Alliance currently operates one trip daily originating in Maryland that uses the I-495 Southside corridor, from Mechanicsville, Maryland to George Mason University in Fairfax, Virginia. Conversely, they operate nine trips daily originating in Virginia and concluding in Maryland via the corridor (see **Table 14**).

Table 14. Existing Vanpools

From	To
Woodbridge, VA	Joint Base Andrews, MD
Stafford, VA	Joint Base Andrews, MD
Stafford, VA	Suitland, MD
Springfield, VA	Aberdeen, MD
Fredericksburg, VA	Suitland, MD
Dumfries, VA	Fort Meade, MD
Woodbridge, VA	Joint Base Andrews, MD
Stafford, VA	Suitland, MD
Springfield, VA	Fort Meade, MD
Mechanicsville, MD	George Mason University, VA

Casual Carpool Pick-Up (Slug Lines)

While not as prevalent along I-495, casual carpool formation, also known as “slugging,” along I-95 is facilitated by slug lines at some large parking locations. Morning pick-ups are made at various locations along northbound I-95. Six park and ride lots in the Springfield area host 12 slug lines, seven operate in the Woodbridge area and five operate near Stafford/Fredericksburg. Afternoon pick-ups are made at nine locations in Washington, DC, Arlington, and destinations to the south. Widely available transit service in the corridor supports casual carpooling by providing back-up return service for commuters who slug only in the morning. **Figure 21** shows a map of slug line pick-up and drop-off locations in Northern Virginia along the I-95 corridor.

As noted in the first Technical Advisory Committee (TAC) meeting for this study, during the pandemic slug lines were essentially non-existent. Slug lines are recovering and are reported to have been back in service since about March 2022. Park and ride occupancy rates are not what they were before the pandemic, however, slugging is creating a large boost to carpool activities once again.

New efforts have been developed to start slug lines on I-66 in Virginia to serve the Pentagon and Downtown Washington, DC. These efforts have been prompted by the addition of approximately 35 miles of Express Lanes on I-66 and originating at park and ride locations in Fairfax and Prince William counties.

Figure 21. Slug Lines Map



Local CAPs

Within the Commuter Connections network are several local CAPs that provide a wide array of services for commuters. Whereas MWCOG coordinates regional commuter assistance activities, including carpool/vanpool matching and commute options information services, local CAPs specifically target the commuters and employers within their jurisdiction. MWCOG and local CAPs do not offer specific programming or services for their users commuting via I-495 or the Woodrow Wilson Bridge, but CAPs work with local employers in their area to encourage carpooling, vanpooling and transit methods of commuting to work. Local CAPs also work with the local populace to educate them on different types of transportation options available through coordinated outreach efforts and events. Local CAPs are summarized in **Figure 22**.

GO Alex—City of Alexandria

GO Alex assists Alexandria residents, employers, workers, and visitors with travel/commuter options. GO Alex promotes transit, high-occupancy, and non-motorized travel modes and provides carpool/vanpool matching (through Commuter Connections ridematching), transit, and commuter information. The program also conducts outreach and assists employers who want to promote non-SOV modes and encourages and assists employers with employee commute benefits and incentives.

ACCS—Arlington County

The primary CAP organization in Arlington County is Arlington County Commuter Services (ACCS). ACCS has an extensive marketing program to promote the use of transit and high-occupancy commute modes. ACCS provides carpool/vanpool matching (through Commuter Connections ridematching); operates education programs about biking and walking; offers several multimodal trip planning and real-time information services; provides on-site information; shares fare sales with residents, workers, and visitors through its network of commuter stores; and operates an outreach and service program for employers, property managers, and schools.

FCCS—Fairfax County

Fairfax County Commuter Services (FCCS) serves as the primary CAP in Fairfax County. FCCS was formerly named Fairfax County RideSources and continues to use that name on its website and public-/commuter-focused materials. FCCS is an operating organization within the Fairfax County Department of Transportation (FCDOT). There are several transportation management associations (TMAs) that offer or promote TDM services within defined areas of Fairfax County, including the Dulles Area Transportation Association (DATA), LINK (Reston area), Tysons Transportation Management Association (TMA), and Transportation Association of Greater Springfield (TAGS).

OmniMatch—Prince William County and Cities of Manassas and Manassas Park

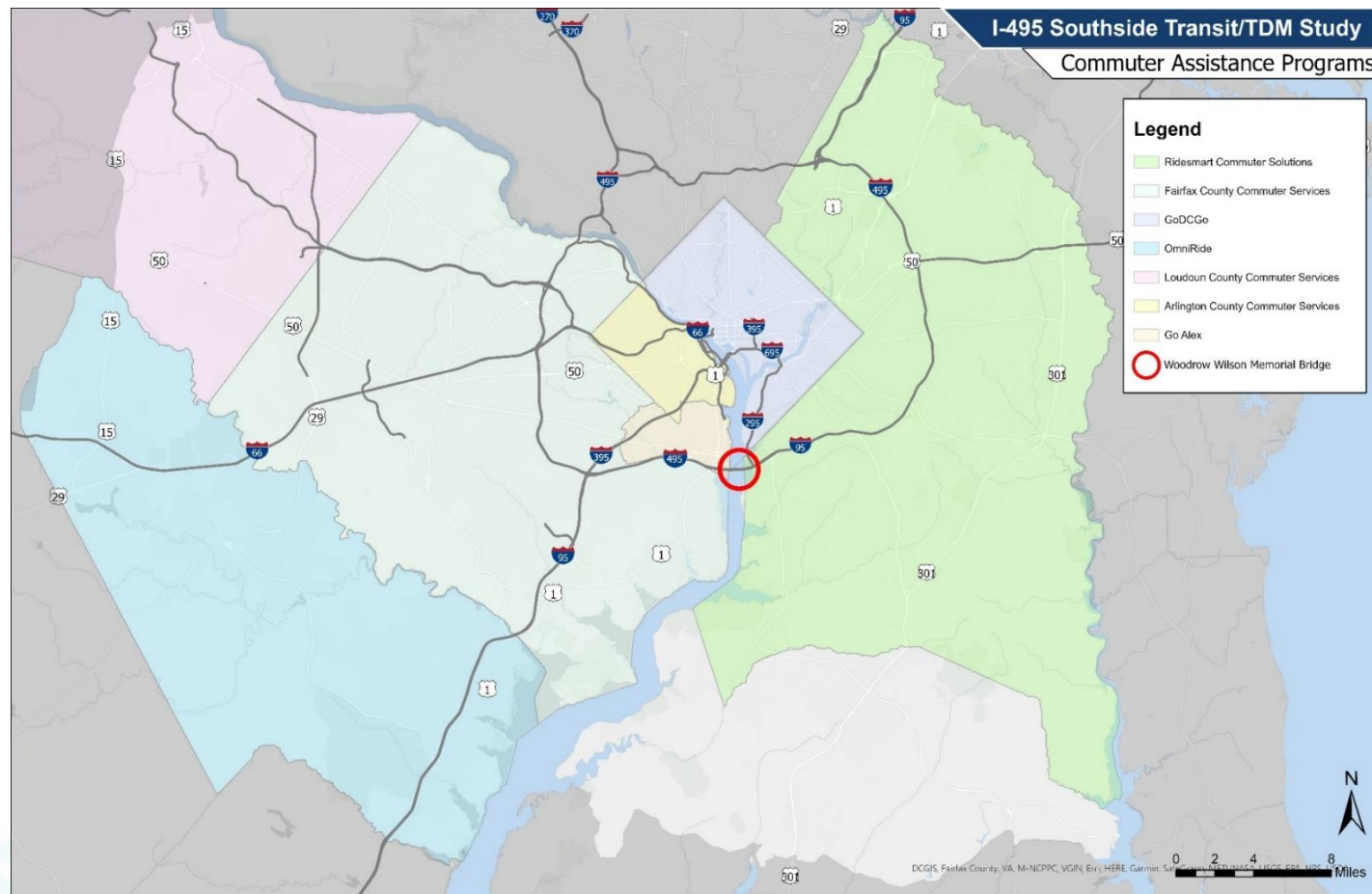
OmniMatch is the primary CAP for commuters in Prince William County and the cities of Manassas and Manassas Park. OmniMatch is operated by the Potomac and Rappahannock Transportation Commission (PRTC) and promotes transit and high-occupancy commute modes and provides TDM services to residents and workers with a primary focus on four elements: carpool/vanpool

matching (part of the Commuter Connections regional network), general promotion of non-SOV travel, vanpool services, and employer outreach.

RideSmart Solution—Prince George’s County

RideSmart Solutions is the primary CAP in Prince George’s County. RideSmart Solutions provides information and benefit programs for bus and rail services, carpooling, vanpooling, and telecommuting. RideSmart Solutions connects commuters and employers with resources to improve commuting, and it works closely with Commuter Connections to promote transportation alternatives.

Figure 22. Commuter Assistance Programs in Demand Area



Corridor Growth, Demographics and Employment Patterns

The study team looked at the distribution of population and employment across the study area as well as projected changes to population and employment between 2020 and 2045 based on the MWCOG 9.2 Cooperative Forecast. The study team also developed a transit propensity index (TPI) that included minority population, population living in zero-car households, and low-income population based on the American Community Survey 2019 5-year estimates. These analyses revealed the areas with the greatest development opportunities and growth potential over the next 25 years as well as areas with the greatest transit needs. The analyses were performed both at the regional level (within the demand area) and the local level (within the study corridor).

Population

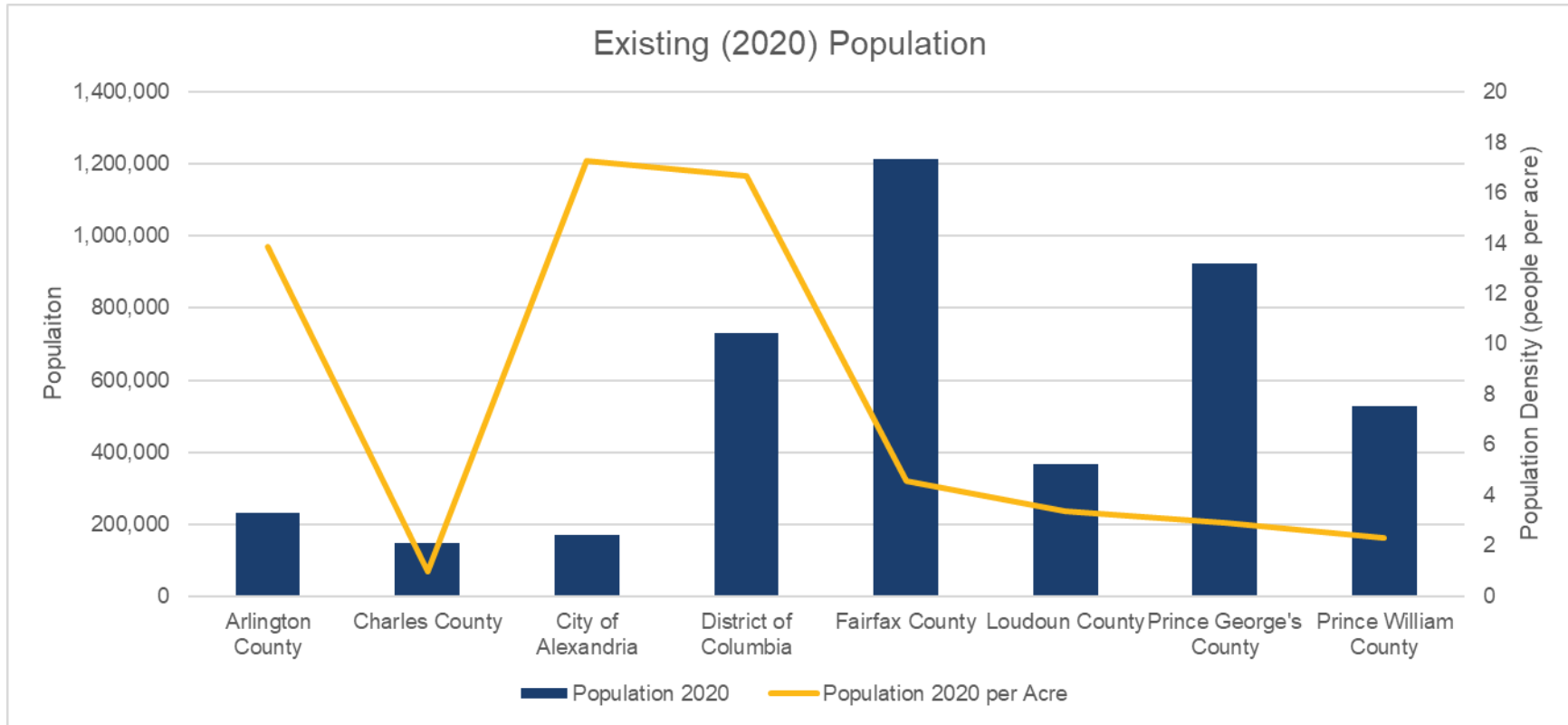
Existing (2020) Population

Within the demand area, population distribution follows different patterns for each jurisdiction (**Figure 25**). For Washington DC, Arlington County, and Alexandria, population clusters are around Metrorail stations/lines and interstate corridors. These three jurisdictions have the highest average population density (see **Figure 23**) in the demand area. For Fairfax County (and the nearby independent cities of Fairfax and Falls Church), population is clustered in multiple centers including Fairfax (city), Tysons and Reston and along the US Route 1 and the I-495 corridors.

In Prince George's County, population clusters near its border with DC and along commuter rail lines. In Prince William County, population is densest along the US Route 1 corridor and near Manassas. For Loudoun County, population clusters are generally located along VA-267.

When zoomed in to the study corridor (see **Figure 27**), population density is higher north of the I-495 Southside corridor than the south. Specific areas of high density are Old Town Alexandria and Alexandria's West End. The overall population density of the study corridor is moderate compared to the demand area.

Figure 23. Population Density

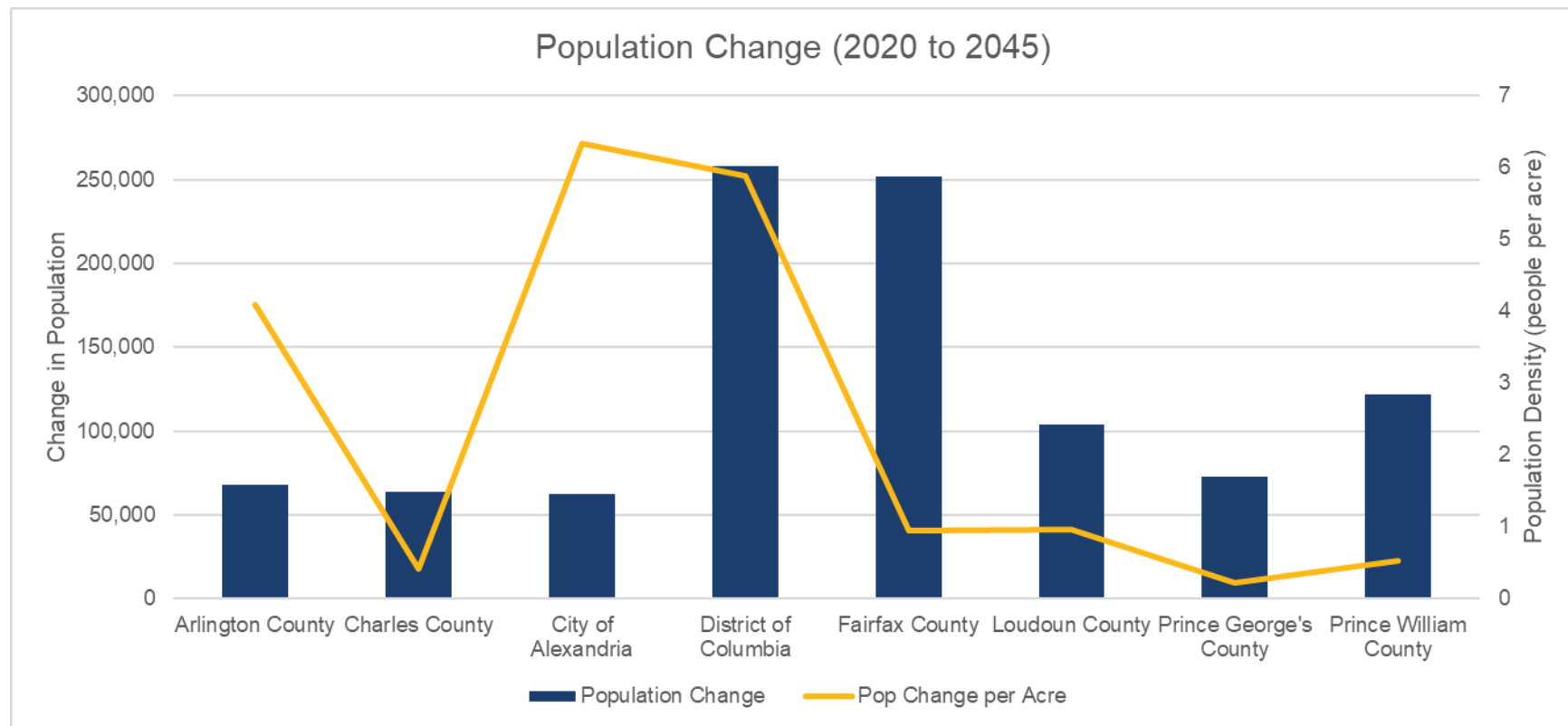


Note: Charles County and Loudoun County are partially contained within the demand area and do not reflect countywide totals

Forecast Population Growth

The overall distribution of population in 2045 is forecasted to stay similar to 2020 with the denser areas in 2020 continuing to have denser population in 2045 as well (see **Figure 26**). MWCOG forecasts estimate that population growth will be greatest within the DC area, Arlington County, Alexandria, Tysons, and along VA-267 in Fairfax County. When looking at forecasted average population growth per acre for each jurisdiction, DC, Arlington County, and Alexandria have average growth rates between four to six people per acre (see **Figure 24**). The other counties in the demand area have forecasted average growth rates lower than one person per acre. The exurban low-density areas in Prince William County and Prince George’s County will experience less population change. Along the I-495 corridor, population growth is projected mostly near Metrorail Stations (see **Figure 28**).

Figure 24. Population Density Change



Note: Charles County and Loudoun County are partially contained within the demand area and do not reflect countywide totals

Figure 25. Population Density Map

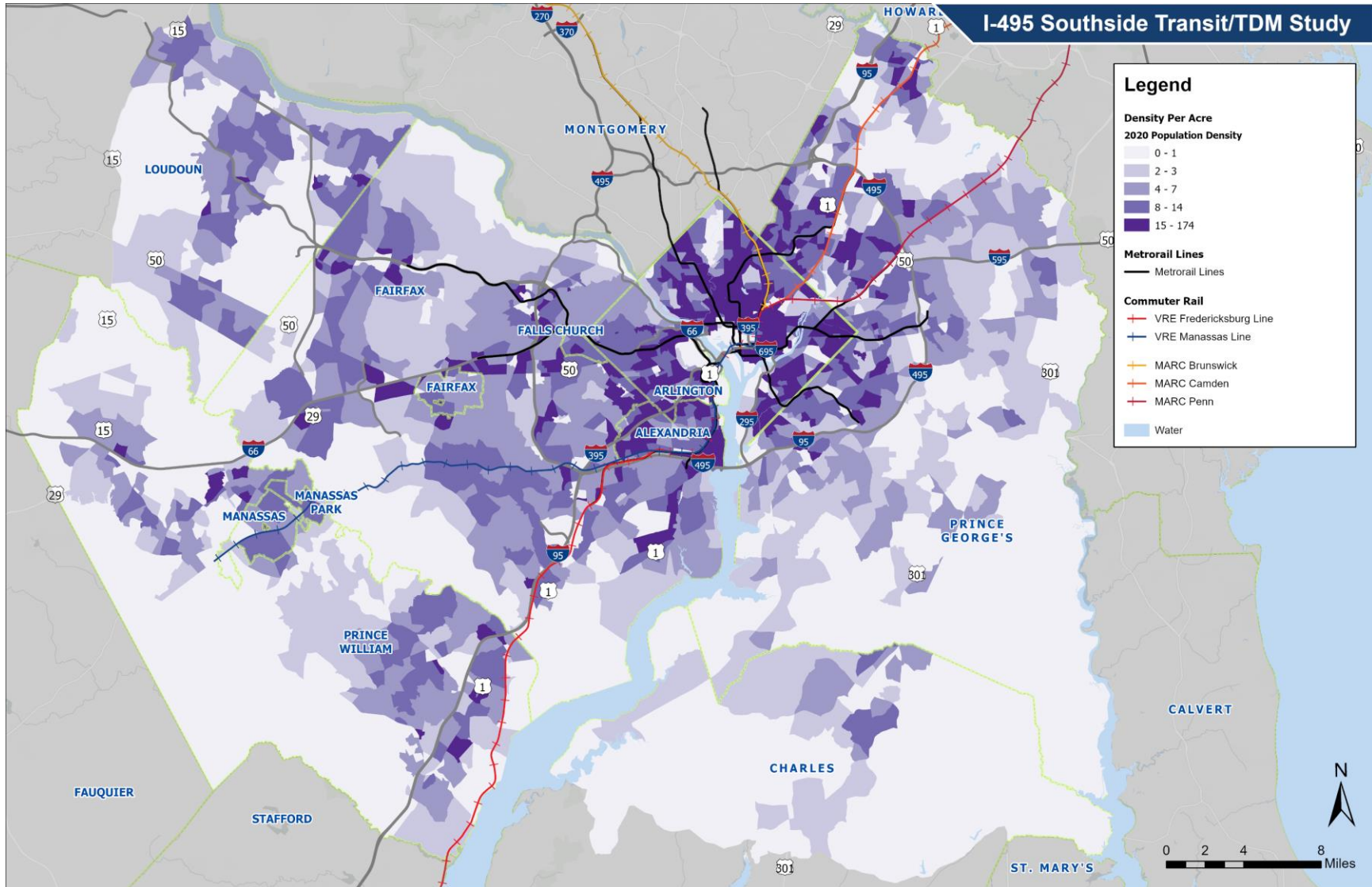


Figure 26. Population Density Change Map (2020 to 2045)

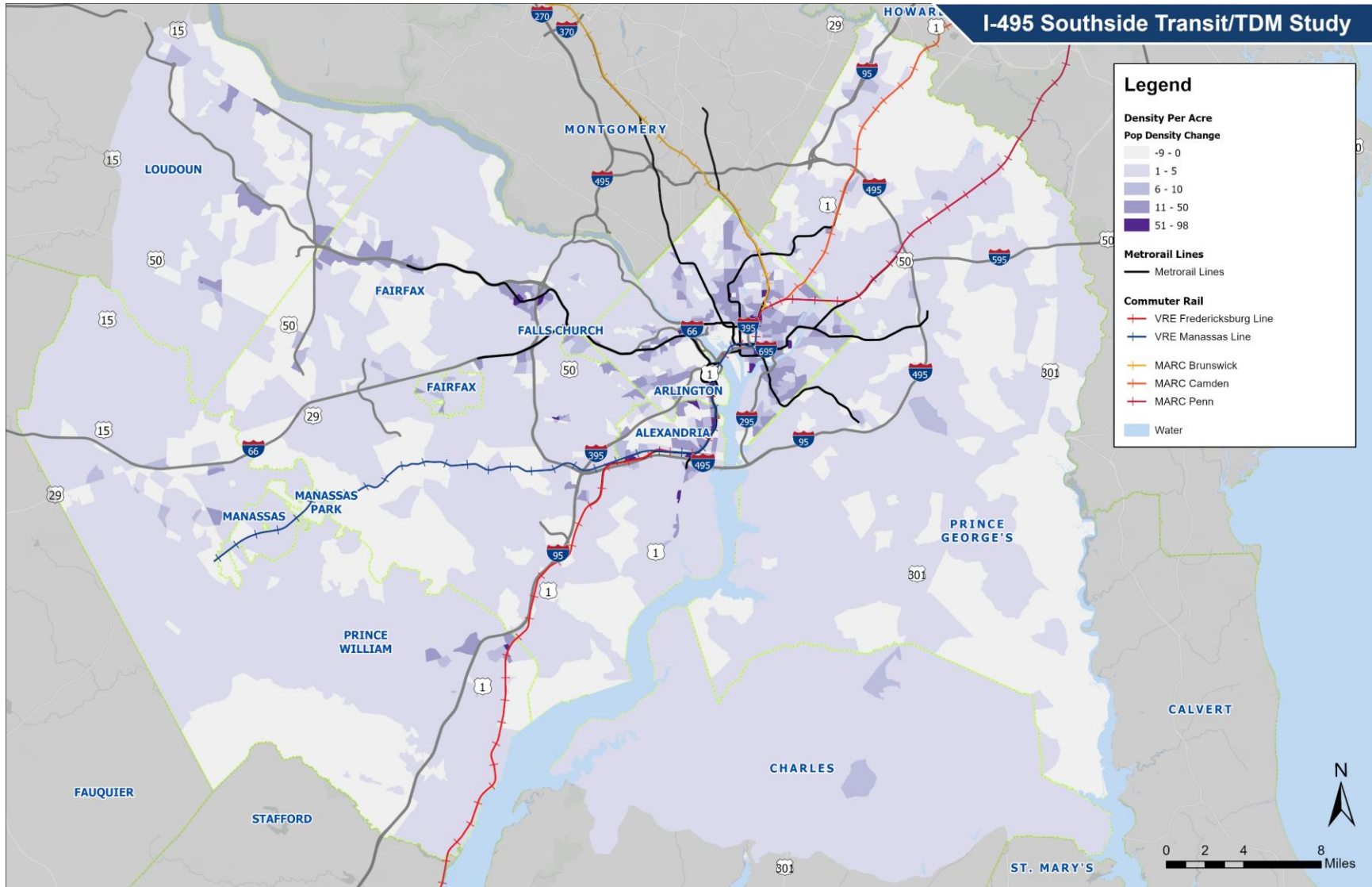


Figure 27. Corridor Population Density Map

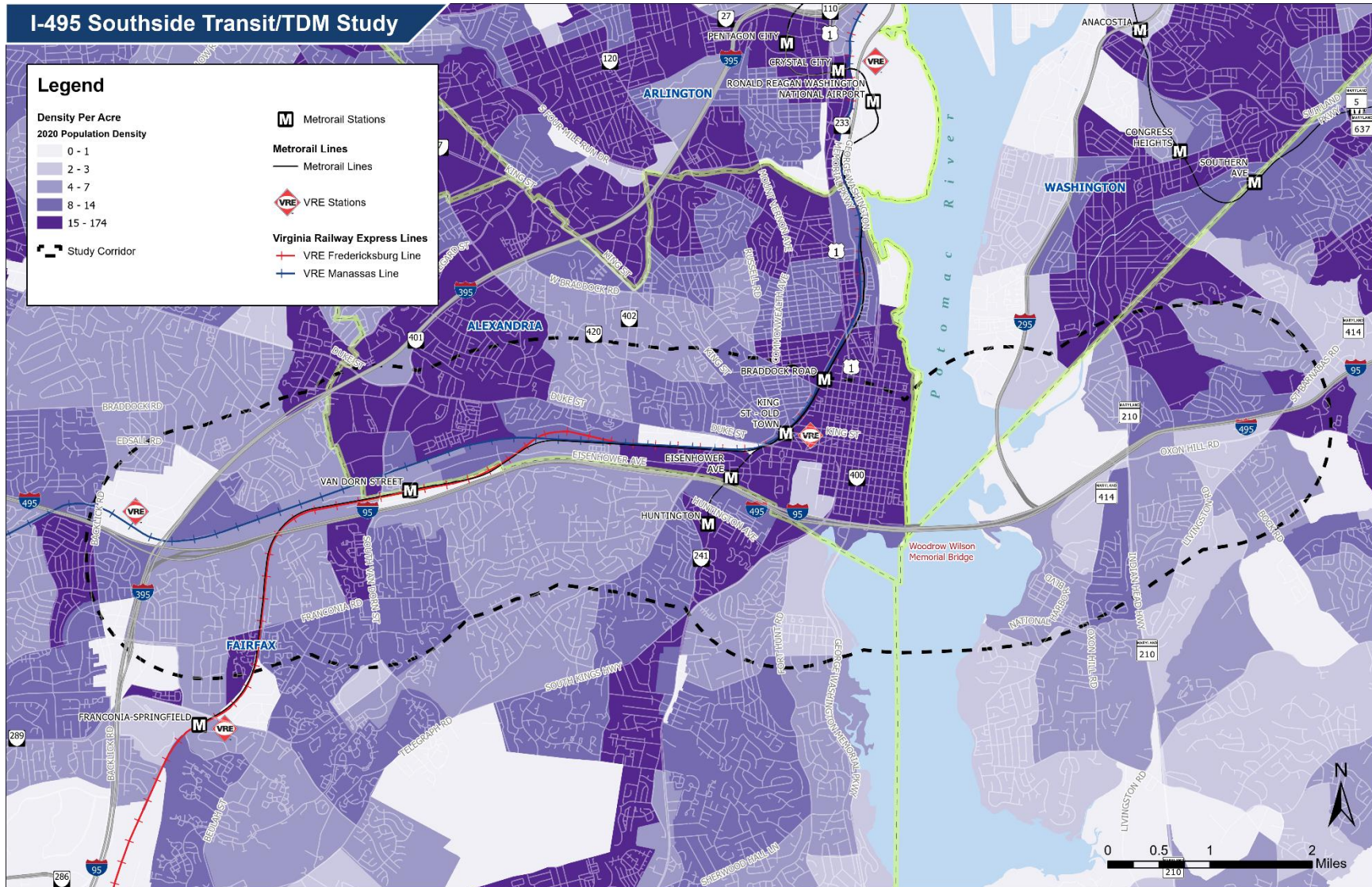
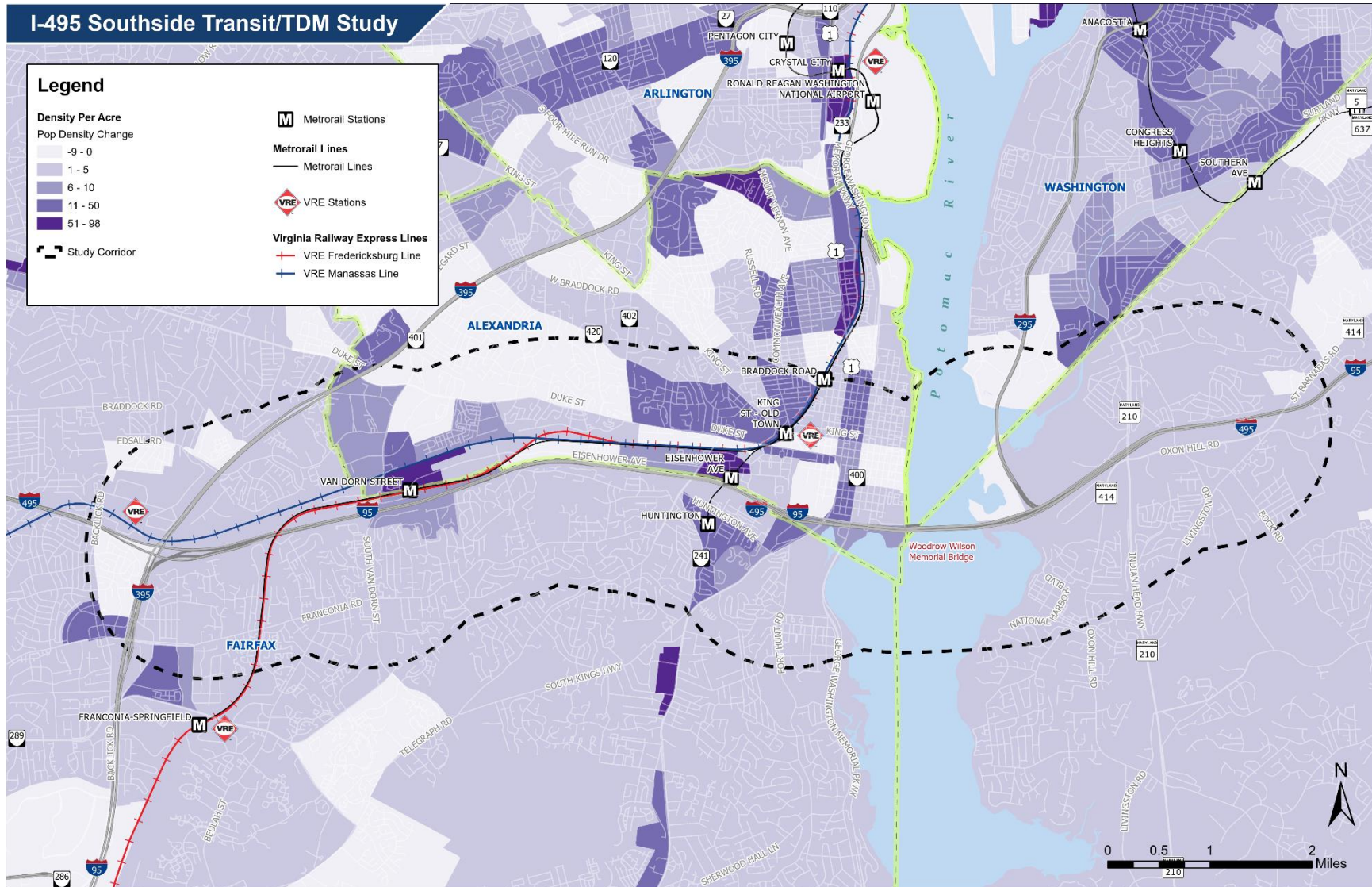


Figure 28. Corridor Population Density Change Map (2020 to 2045)

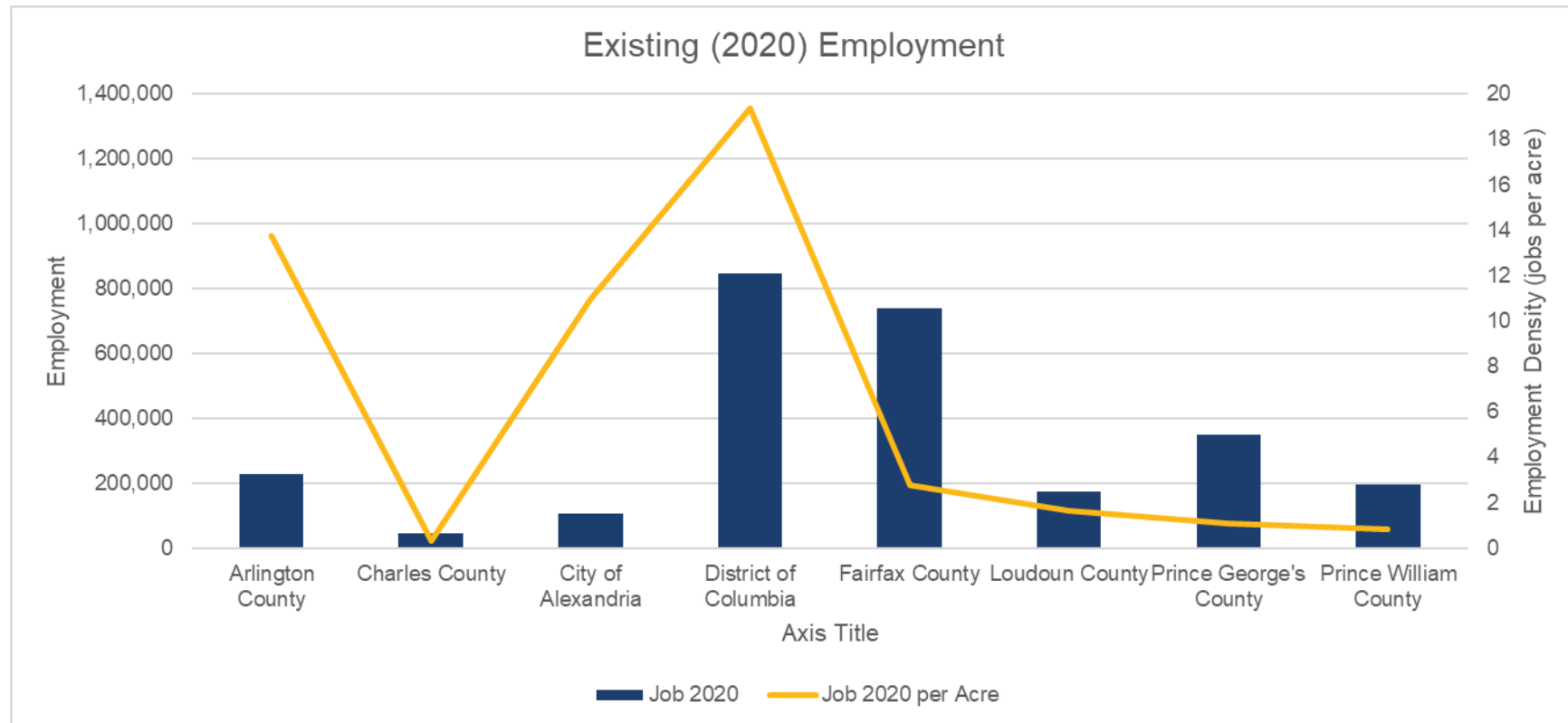


Employment

Existing (2020) Jobs

Employment within the demand area is concentrated in DC, jurisdictions adjoining DC and a few other major job centers. The job centers include Tysons, Reston, Fairfax City, Manassas, and south Fairfax County and east Prince William County along the US Route 1 corridor. Within Maryland, job centers include Suitland, National Harbor, and Waldorf. Most job centers are accessible via Metrorail and commuter rail lines. Other job centers are accessible through highways and major corridors (see **Figure 31**).

Figure 29. Employment Density



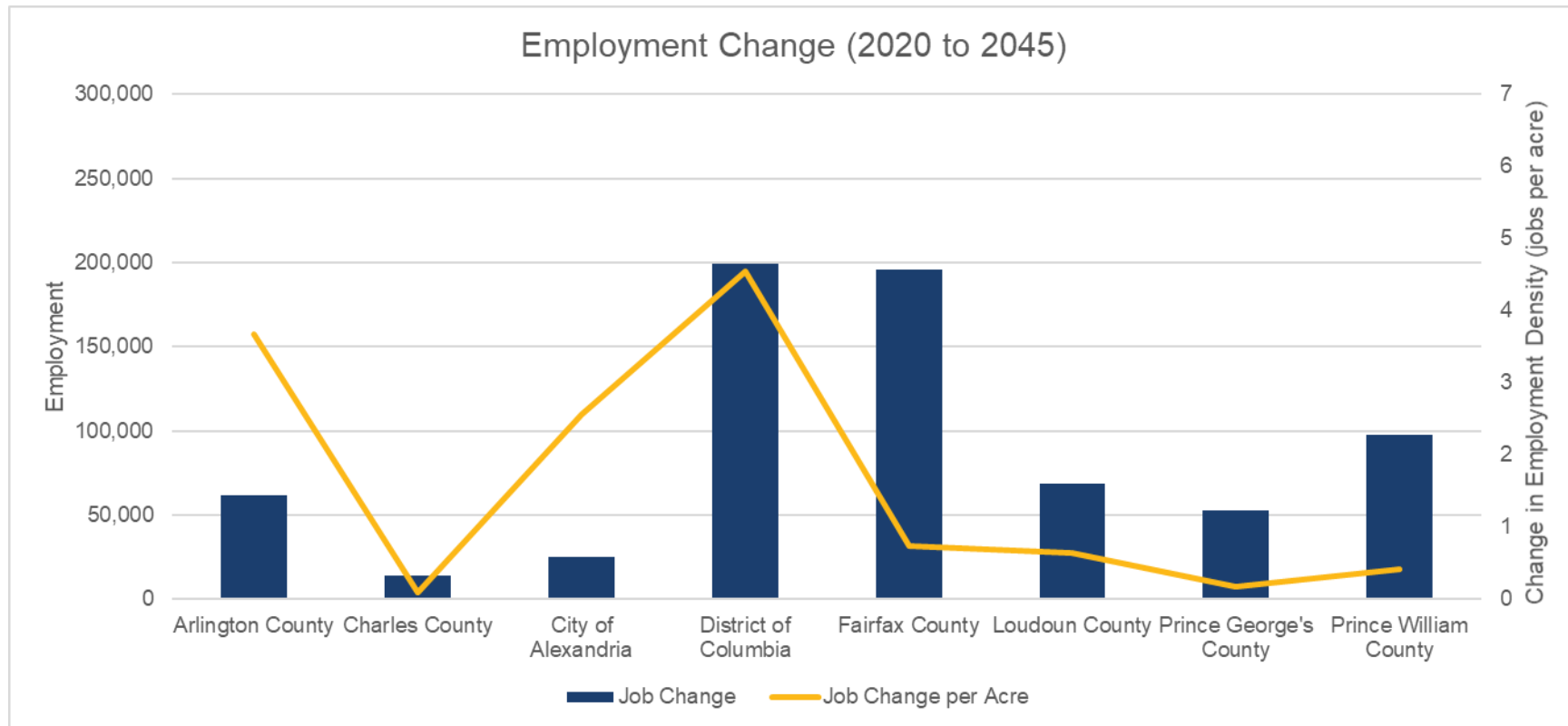
Note: Charles County and Loudoun County are partially contained within the demand area and do not reflect countywide totals

Forecasted Job Growth

Job growth over the next 25 years is projected to occur mostly within existing activity centers. Major job growth can be found in DC, Arlington County, City of Alexandria, Reston, Tysons, and western Prince William County (see **Figure 32**). Like population growth, Washington, DC, Arlington County, and City of Alexandria expect the highest job growth: between 2 to 5 jobs per acre. For the other counties, less than 1 job per acre are projected (see **Figure 30**).

For the I-495 corridor, the highest projected job growth is seen near the Huntington Metrorail Station (see **Figure 34**). Around the study corridor, there are also projected job increases in Virginia along the US Route 1 corridor, north of I-495 within Alexandria, and to the west in Springfield. In Maryland, there are projected job increases south of I-495 in the National Harbor and Oxon Hill area.

Figure 30. Employment Density Change



Note: Charles County and Loudoun County are partially contained within the demand area and do not reflect countywide totals

Figure 31. Employment Density Map

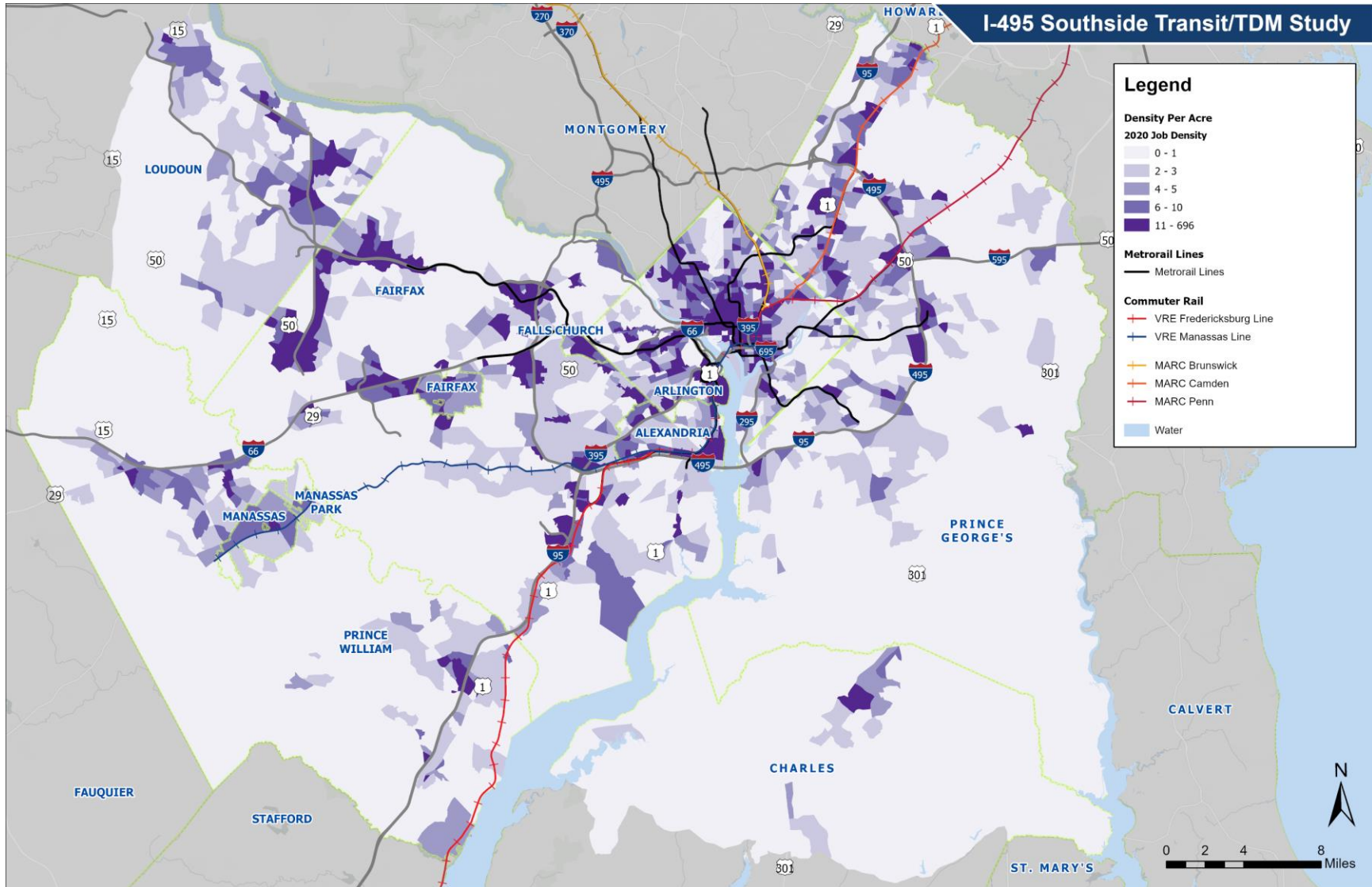


Figure 32. Employment Density Change Map (2020 to 2045)

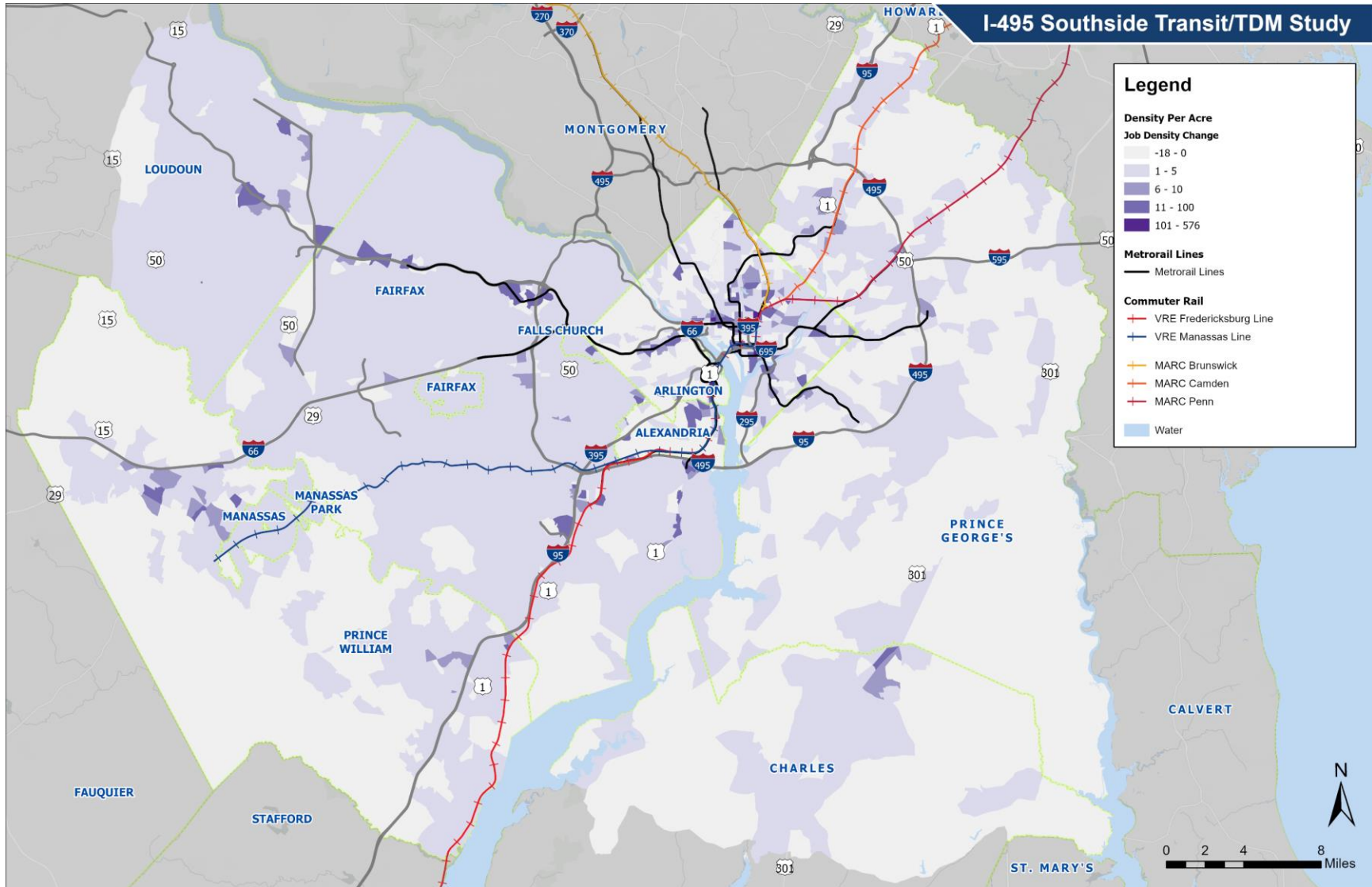
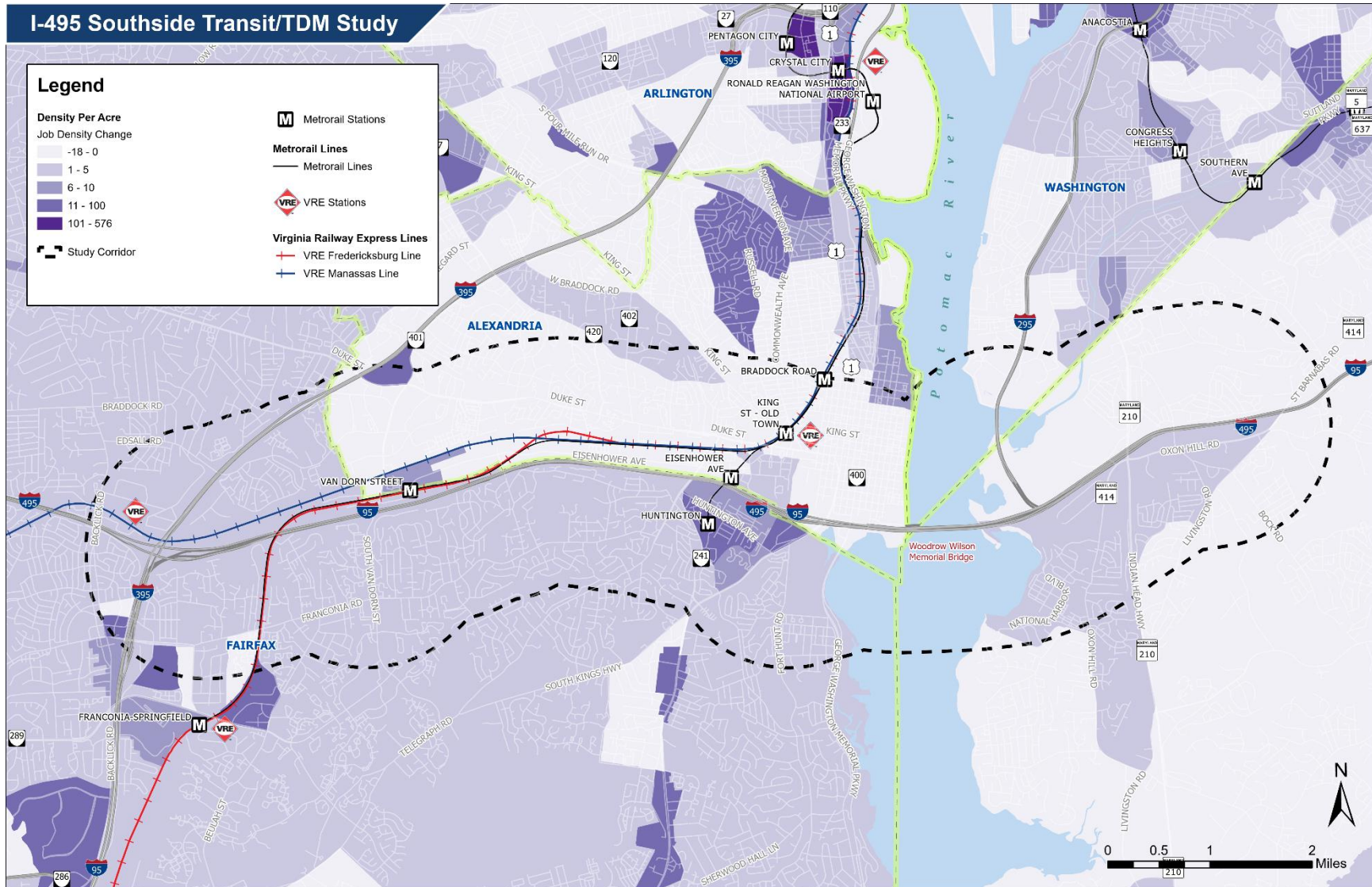


Figure 34. Corridor Employment Density Change Map



Transit Propensity Index

Methodology

Due to concerns with the credibility and data quality of the 2020 American Community Survey (ACS) resulting from the COVID-19 pandemic, the 2019 ACS 5-Year Estimates were used in this study. The ACS data were downloaded at the Census block groups level and then tabulated to transportation analysis zone (TAZ) boundaries to follow the same geographic unit of the previous population and employment analyses.

For the purposes of analyzing transit needs, the study team developed the Transit Propensity Index (TPI) based on the following formula:

TPI = Zero-Car Population + Low-Income Population + Minority Population

- Zero-car population was calculated by multiplying zero-car households and total population, and then dividing by the total number of households for each block group.
 - ***Zero-Car Population = (Zero-Car Households x Total Population) / (Total Households)***
- Low-income population was defined as the number of people living in households everyone earning less than 150% of the federal poverty line. The Census Bureau uses income thresholds that vary by family size and composition to determine who is in poverty.
- Minority population included all groups except for non-Hispanic White.

The Transit Propensity Index only reflects populations with a greater tendency for transit use. TPI can be compared across TAZs, but the individual TPI values do not refer to absolute numbers of people.

Distribution

Within the demand area, high TPI population clusters were found within and around Washington, DC, west Prince George's County, Arlington County, Alexandria, and east Fairfax County. Less dense TPI population clusters were found in Reston, Centreville, Manassas, and east Prince William County along the US Route 1 corridor (see **Figure 35**).

Along the study corridor, high TPI population clusters are located around Metrorail Stations and along the US Route 1 corridor. There is greater TPI density north of I-495 than south of I-495 (see **Figure 36**).

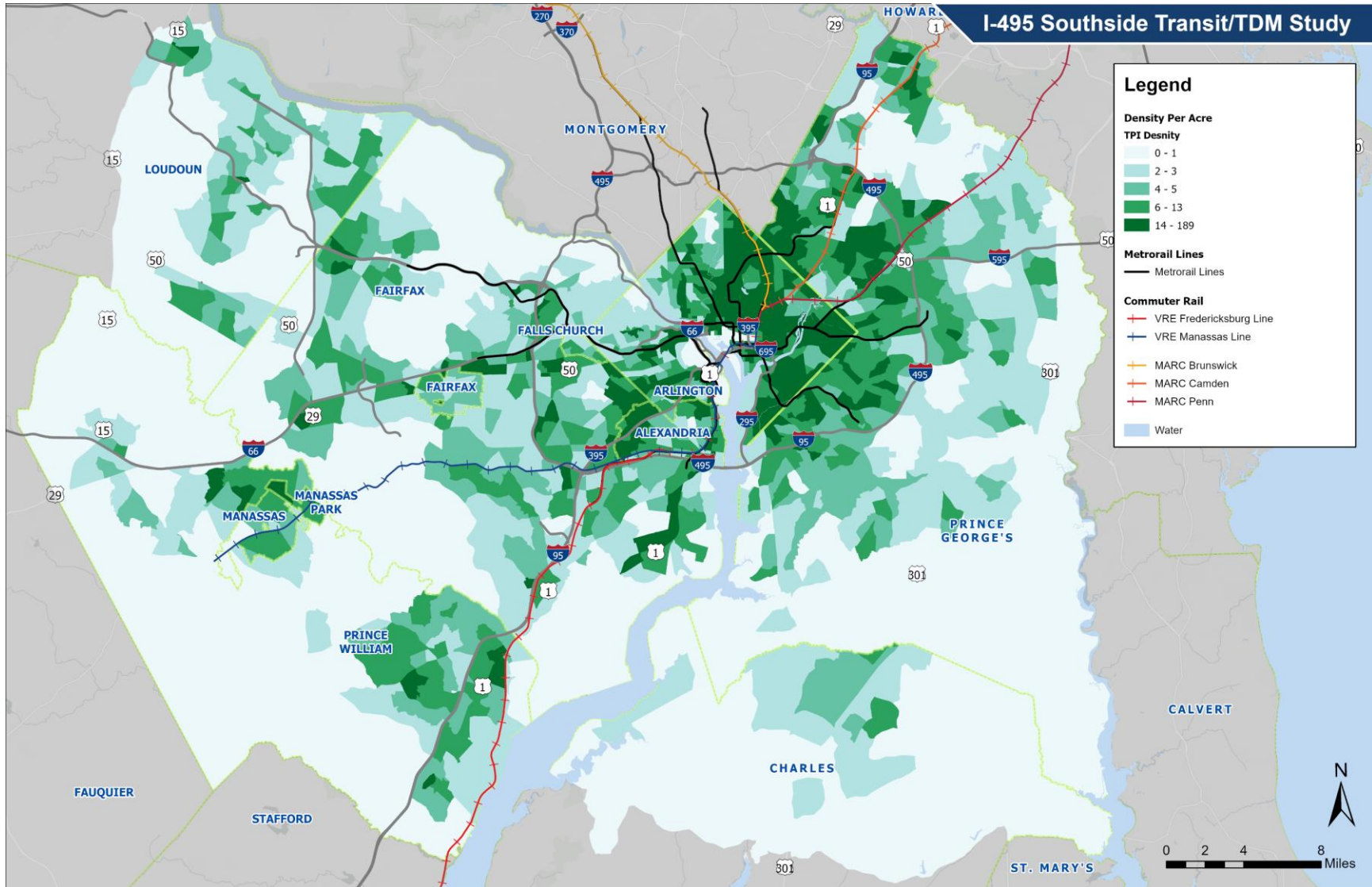
The TPI values were mostly made up of minority populations rather than zero-car and low-income populations. Minorities comprise 63% of the population for the study demand area (see **Table 15**).

Table 15. Demand Area Demographic Summary

Jurisdiction	Population*	Population Per Acre	Low Income Per Acre	% Poverty	Minority Per Acre	% Minority	No-Car Population Per Acre	% No-Car Population	TPI Per Acre
Arlington County, VA	233,395	2,402	247	10%	893	37%	321	13%	1,461
Charles County, MD (partial)	136,685	141	16	11%	99	70%	5	3%	120
City of Alexandria, VA	156,934	1,119	178	16%	530	47%	111	10%	819
District of Columbia	692,110	9,210	1,823	20%	5,301	58%	3,570	39%	10,695
Fairfax County, VA	1,181,747	3,942	500	13%	2,140	54%	222	6%	2,862
Loudoun County, VA (partial)	335,204	741	65	9%	375	51%	17	2%	457
Prince George's County, MD	906,754	3,703	632	17%	3,275	88%	425	11%	4,333
Prince William County, VA	518,029	1,268	168	13%	758	60%	38	3%	965

*This table uses the American Community Survey total population. These numbers are different from the MWCOC 9.2 Cooperative Forecast population numbers. Charles County and Loudoun County are partially contained within the demand area and do not reflect countywide totals.

Figure 35. Demand Area TPI Density Map



Travel Patterns

StreetLight Analysis

Streetlight Data was used to collect 2019 and 2022 historical travel patterns into activity centers. Streetlight Data is mainly sourced from cell phone apps utilizing location services. Count estimates from Streetlight Data can be collected at differing levels of granularity across several days or months. For this analysis, vehicle volumes were collected on weekdays (Tuesday through Thursday) during the AM peak period (6:00 AM to 9:00 AM), the PM peak period (3:00 PM to 7:00 PM), and 24 hours. Vehicles trips originating in TAZs in the study demand area that travel along the I-495 Southside corridor and then end their trip within an MWCOG-designated activity center were collected.

Table 16 shows the regional activity centers that are the most frequent destinations for trips using the I-495 Southside corridor. Many of the top destinations are immediately adjacent to I-495. The top ten origin-destination (O-D) pairings are shown in **Table 17** for 2019 and **Table 18** for 2022.

Table 16. 2022 StreetLight Data Top Activity Center Destinations for Trips using I-495 Southside Corridor

Activity Center Destination	AM Peak Period Trips	PM Peak Period Trips	24-Hour Trips	Top Center in 2019
Huntington Area (Huntington-Penn Daw, Beacon-Groveton)	1,037	2,812	8,669	Yes
National Harbor	502	2,525	7,708	Yes
Landmark-Van Dorn	1,114	1,810	6,863	Yes
Oxon Hill	445	1,593	5,003	Yes
DC Core Area (Farragut Square, Downtown DC, Monumental Core, West End)	1,913	642	4,675	Yes
King Street-Old Town	1,064	1,085	4,519	Yes
Carlyle-Eisenhower East	946	1,050	4,309	Yes
Braddock Road Metro Area	1,291	832	4,183	Yes
Suitland Area (Suitland, Naylor-Southern Ave, Branch Ave)	559	587	2,399	Yes
Hybla Valley-Gum Springs	196	800	2,155	Yes
Potomac Yard	472	463	2,144	Yes
Springfield	243	730	2,137	Yes
Dunn Loring-Merrifield	622	279	1,910	Yes
Beauregard	353	347	1,508	Yes
Tysons Area (Tysons East, Tysons Central 123, Tysons Central 7, Tysons West)	363	359	1,467	Yes
Rosslyn-Ballston Corridor Area (Rosslyn, Courthouse, Clarendon, Virginia Square, Ballston)	460	278	1,419	Yes
Beltway South	296	415	1,347	Yes
Crystal City	366	195	1,299	Yes
Baileys Crossroads-Western Gateway	238	330	1,266	Yes
Fairfax City Area	182	293	1,137	Yes
Fort Belvoir North Area	307	191	1,090	Yes
Waldorf	96	429	1,066	No
Fort Belvoir	257	258	1,026	Yes
NoMa (DC)	237	122	832	Yes
Largo Town Center-Morgan Blvd	161	186	787	No

Note: Activity center locations are mapped in **Figure 38**

Figure 37. 2022 StreetLight Data Top Activity Center Destinations for Trips using I-495 Southside Corridor

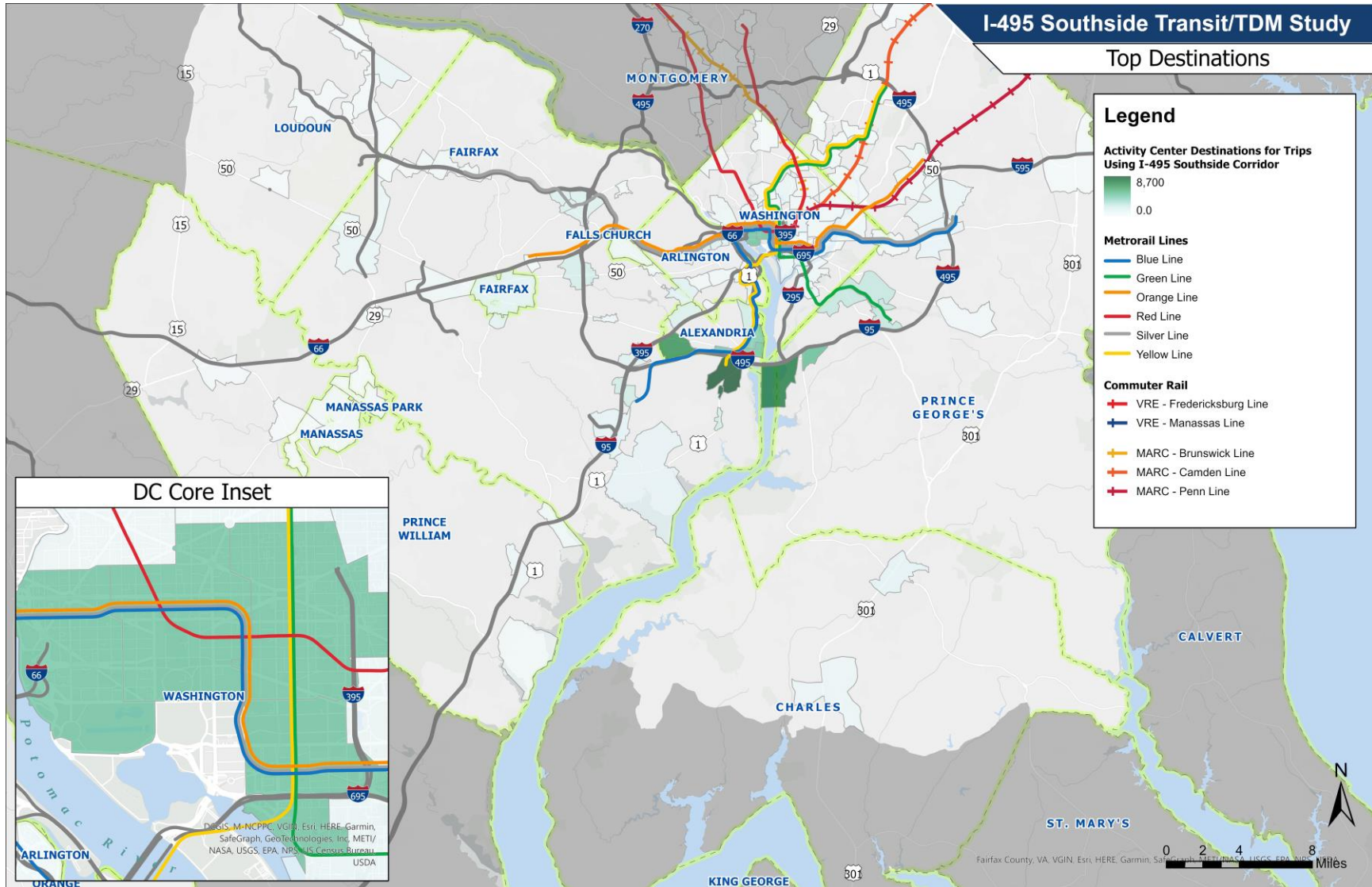


Table 17. 2019 StreetLight Data Top 10 O-D Pairs for Trips using I-495 Southside Corridor

Rank	Origin Area (see Figure 38 for numbered locations)	Destination Zone (Activity Center)	AM Peak Period Trips	PM Peak Period Trips	24-Hour Trips
1	Alexandria (3806)	Huntington Area (Combined)	441	2,365	6,010
2	Southeast Fairfax County (3804)	Landmark-Van Dorn	452	1,172	3,594
3	Southeast Fairfax County (3804)	King Street-Old Town	642	729	3,102
4	Southeast Fairfax County (3804)	DC Core (Combined)	1,597	279	2,925
5	Southeast Fairfax County (3804)	Carlyle-Eisenhower East	744	623	2,563
6	Southwest Prince George's County (3810)	DC Core (Combined)	880	361	2,547
7	Southeast Fairfax County (3804)	Braddock Road Metro Area	779	557	2,509
8	DC North of Anacostia River (3807)	National Harbor	92	675	2,071
9	Arlington County (3805)	Huntington Area (Combined)	131	838	2,012
10	Southwest Prince George's County (3810)	Oxon Hill	211	598	2,011

Table 18. 2022 StreetLight Data Top 10 O-D Pairs for Trips using I-495 Southside Corridor

Rank	Origin Area (see Figure 38 for numbered locations)	Destination Zone (Activity Center)	AM Peak Period Trips	PM Peak Period Trips	24-Hour Trips
1	Alexandria (3806)	Huntington Area (Combined)	155	858	2,377
2	Southeast Fairfax County (3804)	Landmark-Van Dorn	256	678	2,227
3	Southwest Prince George's County (3810)	Oxon Hill	178	524	2,014
4	Southwest Prince George's County (3810)	DC Core (Combined)	689	256	1,806
5	Southeast Fairfax County (3804)	King Street-Old Town	201	421	1,401
6	Southwest Prince George's County (3810)	National Harbor	147	348	1,277
7	Southeast Fairfax County (3804)	Braddock Road Metro Area	231	312	1,166
8	Southeast Fairfax County (3804)	Carlyle-Eisenhower East	263	291	1,106
9	Central-East Fairfax County (3807)	Huntington Area (Combined)	206	281	1,010
10	DC North of Anacostia River	National Harbor	33	399	966

Activity Centers Trip Demand Across Bridge

Whereas the StreetLight Data analysis was used to understand current and historical travel patterns, this analysis evaluated future travel demand in the region that would utilize the I-495 Southside corridor. MWCOG 2045 projections of auto trips during the AM peak period were used as a proxy for future travel behavior. The geographic level of the data is based on TAZs, which were aggregated into 20 larger origin areas and 29 destination (activity centers) geographic units⁷. Origin areas are shown in red outlines and activity centers are shown as orange shaded areas in **Figure 38**. Similar to data collected from StreetLight, the activity centers anticipated to be key destinations for trips using the I-495 Southside corridor were identified as:

King Street–Old Town	Poplar Point	Fort Belvoir
Carlyle–Eisenhower East	Southwest Waterfront	Fort Belvoir North Area
Landmark–Van Dorn	Capitol Riverfront	Tysons Area
Beltway South	Braddock Road Metro Area	Dunn Loring–Merrifield
Springfield	Potomac Yard	Dulles South/East
Huntington Area	Crystal City	Reston Herndon Area
National Harbor	Pentagon City	Fairfax City Area
Oxon Hill	Pentagon	Rosslyn–Ballston Corridor
St. Elizabeth’s	Beauregard	Suitland Area
DC Core	NoMa (DC)	

Using the MWCOG data, there are a projected 450,000 AM peak period trips from 580 O-D pairings in the demand area that travel to one of the 29 activity centers⁸. Of these, approximately 66,000 trips from 292 O-D pairs could reasonably utilize the I-495 Southside corridor to reach their destination. These trips constitute roughly 15% of total trips and half of O-D pairs. All 20 origin areas have trips that interact with the study corridor, with significant interactions originating from Washington, DC, Prince George’s County, and Fairfax County.

The top 25 O-D pairs were mapped in **Figure 38** and further detailed in **Table 19** to show the volume of trips. These 25 O-D pairs represent 29,000 total trips or nearly half (44%) of the demand area trips that utilize the corridor. This represents a strong concentration of trips from a few areas as opposed to a dispersed distribution.

Many of the trips originate from the southern origin areas of Alexandria and Fairfax County, Prince George’s County, and Charles County. Over half of the trips for the top O-D pairs originate from the three origin areas within Fairfax County (i.e., Central, Eastern

⁷ The origin areas were significantly larger and thus were not identified with geographic names, but rather numbers and a general description

⁸ Trip figures used in this analysis are not exhaustive nor representative of all trips in the region. All references to corridor trips only constitute the trips used from the MWCOG model and the origin areas and activity centers identified.

and Western Fairfax County). Eastern Fairfax County (3804) produces nearly 10,000 trips, whereas Central Fairfax County (3821) produces roughly 4,500 trips. Another strong origin location is nearby Alexandria with roughly 3,000 trips.

In terms of destinations, the top activity center is the DC Core, which represents roughly 7,700 trips from the study corridor, drawing primarily from Northern Charles County, Eastern Fairfax County, and Southwest Prince George's County. This is followed by the Tysons Area, largely drawing from Eastern Fairfax County and the Alexandria area with 3,700 trips. Landmark-Van Dorn is a close third with 3,600 trips mainly from Eastern, Central, and Western Fairfax County. There does not appear to be significant interactions between the corridor and the northeast origin areas, such as Northern Prince George's County (3813 and 3808).

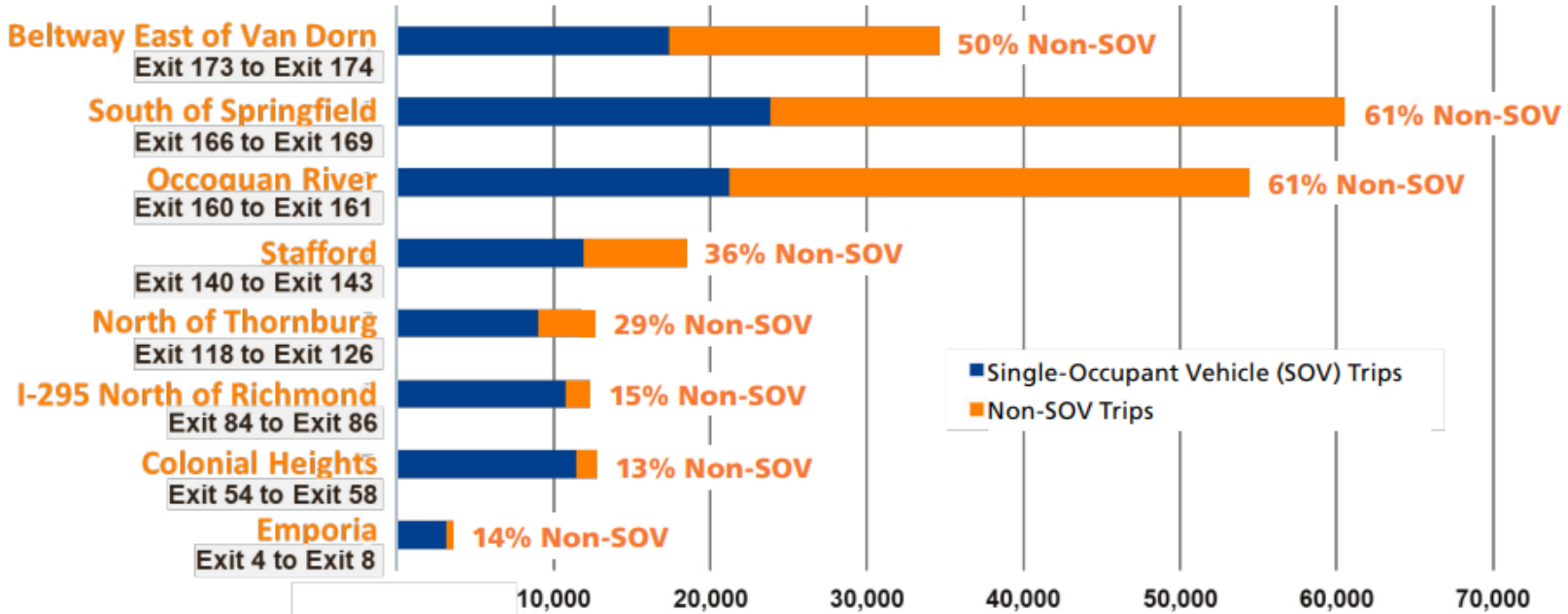
Table 19. 2045 Top 25 AM Peak O-D Pairs Interacting with the Study Corridor

Rank	Origin ID	Major Origin Areas	Activity Center Destination	2045 AM Peak Period Trips (MWCOG)
1	3814	North Charles County	DC Core	2,840
2	3810	Southwest Prince George's County	DC Core	2,527
3	3804	Southeast Fairfax County	DC Core	2,344
4	3804	Southeast Fairfax County	Tysons Area	1,936
5	3806	Alexandria	Tysons Area	1,773
6	3821	Central-East Fairfax County	Landmark-Van Dorn	1,649
7	3821	Central-East Fairfax County	Crystal City	1,281
8	3804	Southeast Fairfax County	Landmark-Van Dorn	1,174
9	3804	Southeast Fairfax County	Carlyle-Eisenhower East	1,164
10	3810	Southwest Prince George's County	National Harbor	1,102
11	3804	Southeast Fairfax County	Dunn Loring-Merrifield	1,003
12	3804	Southeast Fairfax County	King Street-Old Town	933
13	3806	Alexandria	Dunn Loring-Merrifield	865
14	3821	Central-East Fairfax County	Huntington Area	838
15	3821	Central-East Fairfax County	Carlyle-Eisenhower East	802
16	3803	Central-West Fairfax County	Landmark-Van Dorn	799
17	3804	Southeast Fairfax County	Braddock Road Metro Area	773
18	3806	Alexandria	Fort Belvoir North Area	744
19	3806	Alexandria	Fort Belvoir	687
20	3810	Southwest Prince George's County	Southwest Waterfront	672
21	3804	Southeast Fairfax County	Fairfax City Area	663
22	3814	North Charles County	NoMa (DC)	615
23	3810	Southwest Prince George's County	NoMa (DC)	613
24	3814	North Charles County	Southwest Waterfront	612
25	3810	Southwest Prince George's County	Capitol Riverfront	601
TOTAL				29,010

Corridor Person Throughput

As part of the I-95 Corridor Improvement Plan, developed by VDOT in 2021, an analysis was prepared using available (pre-COVID) data to approximate SOV and non-SOV travel along that corridor. This analysis included parallel rail corridors and was estimated based on occupancy count data, traffic volumes, and ridership data using a series of screen lines along the I-95 corridor. Following the development of the study recommendations, a potential future version was developed to show the estimated impact of the proposed study recommendations as well as other programmed improvements in the corridor. The section screen line that is listed first in the chart in **Figure 39** is the section of I-95/I-495 that comprises the study corridor for the I-495 Southside Transit/TDM Study. Non-SOV travel in this segment primarily comes from Amtrak, VRE, and Metrorail ridership. According to this analysis, approximately 17,500 people traveled across this screen line in non-SOV modes during pre-COVID conditions in a typical AM peak period. This data should only be used as a high-level reference as travel patterns likely shifted as a result of the COVID-19 pandemic and the numbers have not been updated. **Figure 39** shows the existing (2019 pre-COVID) SOV and non-SOV split. **Figure 40** shows just the non-SOV numbers for existing (2019 pre-COVID) conditions and the potential future conditions.

Figure 39. Existing Persons Moved Along I-95 Corridor (VDOT I-95 Corridor Improvement Plan) (2019)



Total
Persons
Moved

=



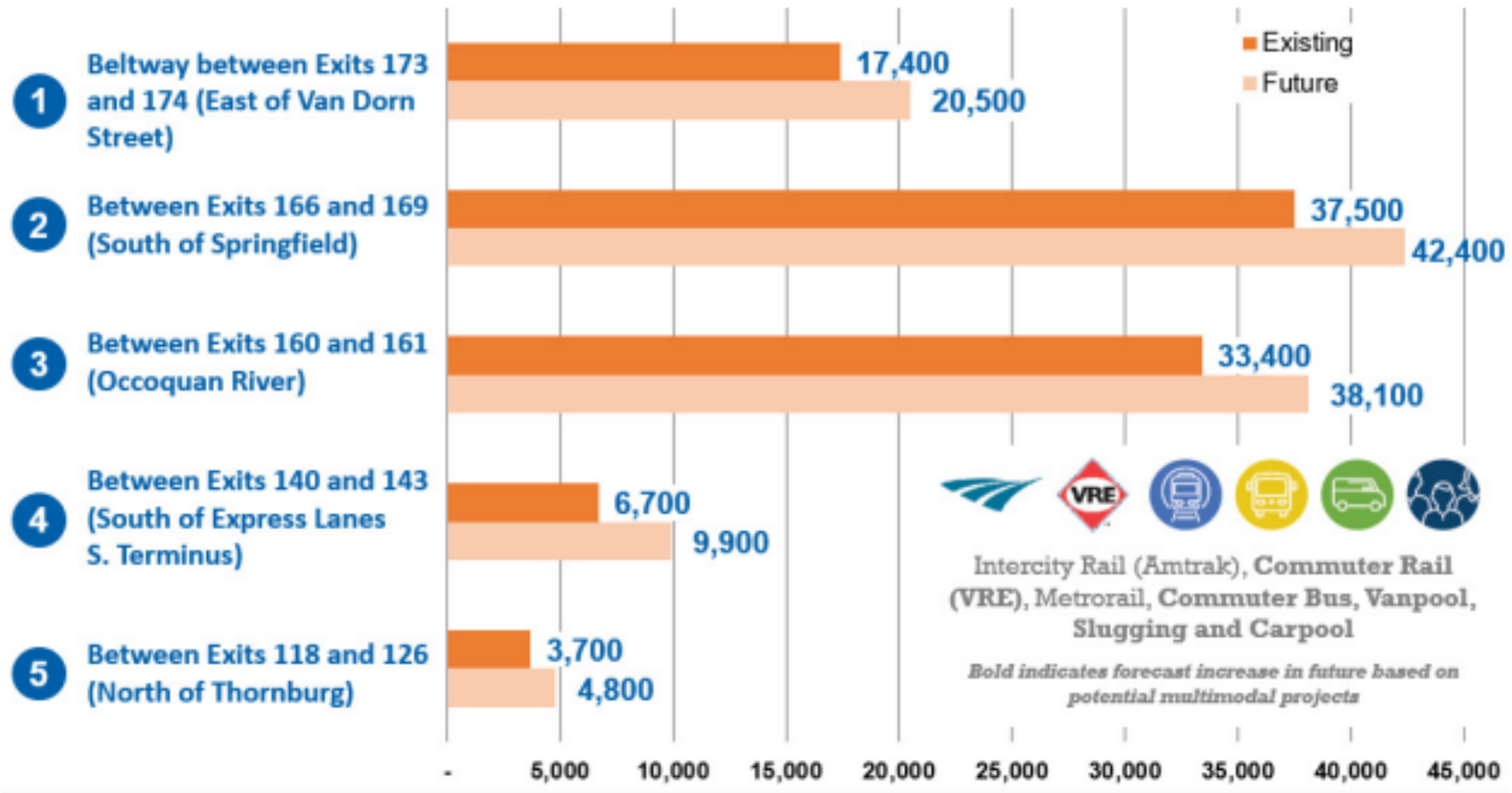
SOV

+



Intercity Rail (Amtrak), Commuter Rail (VRE), Metrorail, Commuter Bus, Vanpool, Slugging and Carpool

Figure 40. Future Non-SOV Persons Moved Along I-95 Corridor (VDOT I-95 Corridor Improvement Plan) (2019)



Summary of Baseline Conditions

This section has provided an overview of previous and ongoing planning efforts, existing transit and TDM services, and demographic and travel trends in the study corridor. Takeaways from the analysis of baseline conditions that were key considerations as this study progressed through the development of recommendations include:

- Coordination with the parallel VDOT I-495 Southside Express Lanes Study is critical. Recommendations from this transit/TDM study will be incorporated into potential alternatives considered for NEPA evaluation by VDOT.
- As the region continues to recover from the COVID-19 pandemic, it will be important to continue to monitor travel trends and transit ridership levels to gauge demand for future planned service.
- Some of the most relevant previous and ongoing studies that related to this corridor are the current WMATA BOS Study, which is analyzing rail service over the Woodrow Wilson Bridge as one of six alternatives, VDOT's 2021 I-95 Corridor Improvement Plan, which included funding for commuter bus services that will operate in the study corridor, and ongoing WMATA and Prince George's County bus network redesigns.
- There is very limited bus service over the Woodrow Wilson Bridge today (only the Metrobus NH2) and along I-495, but frequent service operates along parallel arterial routes on both the Virginia and Maryland side.
- Parallel rail service on the Virginia side consists of VRE, Amtrak, and Metrorail service. VRE and Amtrak are planning robust increases in service as part of the Transforming Rail in Virginia initiative.
- There are multiple Commuter Assistance Programs throughout the demand area. MWCOG's Commuter Connections focuses on cross-state travel, but there are no CAP programs specifically targeted for this corridor.
- The demand area and areas immediately adjacent to I-495 are forecast to see population and employment density grow significantly between 2020 and 2045. Some of the highest growth areas in the demand area that represent potential activity centers for future transit service include Crystal City in Arlington County, the Eisenhower East area in Alexandria, Southeast Washington, DC, Tysons in Fairfax County, National Harbor in Prince George's County and others.
- While there are activity centers throughout the study corridor, there is not one prominent origin-destination pattern that has an overwhelming trip share.
- Some of the origin-destination pairs that warrant further analysis include demand between Fairfax County and Alexandria, and Prince George's County to Tysons. There is also significant demand for north-south movements served by some of the parallel rail corridors.

Summary of Needs

Based on the factors identified in baseline conditions, there were a series of needs identified for the I-495 Southside corridor, which are consistent with several of the needs that have been identified through the VDOT I-495 Southside Express Lanes Study. The sections below describe these needs in more detail and discuss how multimodal solutions can help to address them.

Provide and Promote Convenient and Flexible Travel Choices for All

There is currently only one bus route (the Metrobus NH2) that provides transit service over the Woodrow Wilson bridge and along I-495, east of I-395. There is robust rail service that provides connections for much of the north-south travel demand, but east-west transit service is lacking, especially connecting Maryland and Virginia. In its highest ridership year (2018), the NH2 averaged almost 900 daily boardings but was down to approximately 330 boardings per day in 2022 as a result of the COVID-19 pandemic. Both figures are less than 0.5% of the overall number of vehicles that travel across the Woodrow Wilson Bridge each day. There is an opportunity to shift more of those trips to non-auto modes with more transit options serving new destinations with competitive trip frequencies. Travel demand management strategies, or Commuter Assistance Programs, can provide broader awareness, incentives, or coordination to make non-SOV options more understandable and convenient.

Data also has shown that as a result of the COVID-19 pandemic, people are now traveling at different times throughout the day. Vehicular traffic in Washington, DC, has spread such that morning and afternoon peak periods are less pronounced but more sustained throughout a longer period each day. This has resulted in a need for all day transit service and not just traditional peak-period, peak-direction service..

Improve Travel Reliability and Reduce Congestion

On average, more than 200,000 vehicles travel through the study corridor each day, causing the average travel speeds to be as low as 30 miles per hour during the morning and evening peak travel periods. As seen in **Figure 41**, the congestion becomes quite severe during the peak travel periods, causing frequent delays for motorists.

Figure 41. March 2019 Typical Weekday Traffic Congestion (Source: RITIS/University of Maryland)

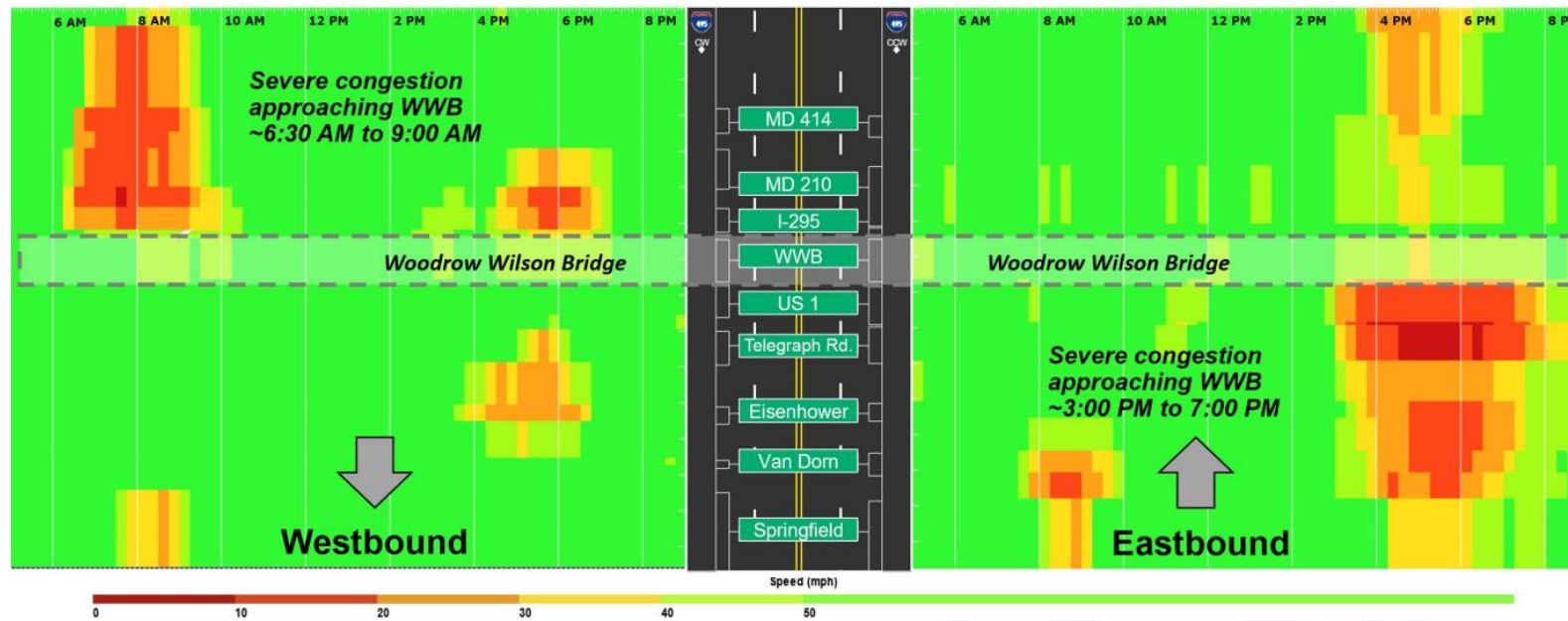
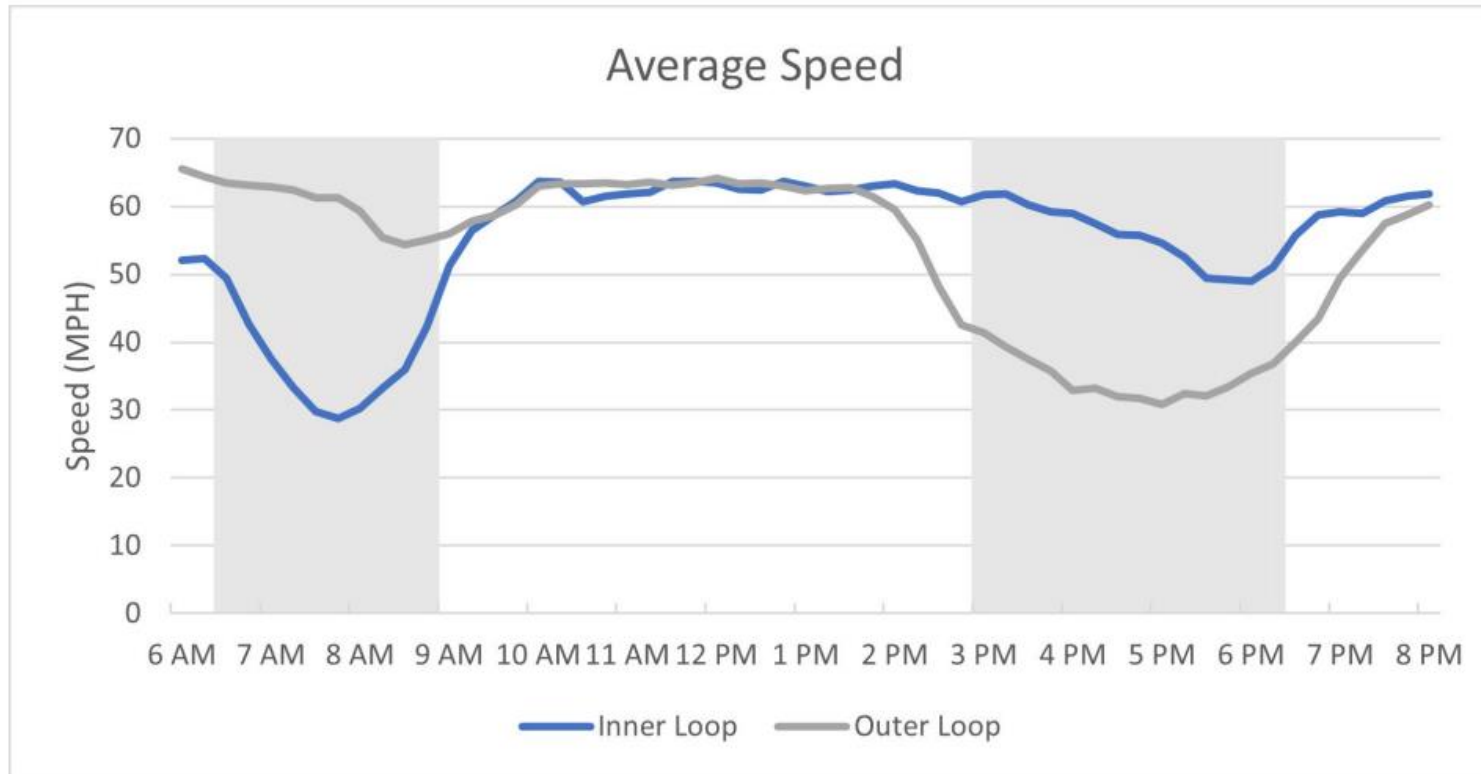


Figure 42 shows speeds are significantly reduced on average for multiple hours during peak periods compared to non-peak periods, which results in an unreliable trip that can impact other daily activities.

Figure 42. 2019 Average Weekday Speeds (Source: RITIS/University of Maryland, 2019)



Provide Consistency with Local and Regional Plans

The study corridor was identified in the Commonwealth Transportation Board’s adopted I-95 Corridor Improvement Plan as an area for additional study. The VDOT Southside Express Lanes Study is included in VDOT’s current Six-Year Improvement Plan and the NCR’s Visualize 2045 CLRP, as of June 2021. Additional transit service in the corridor has been examined in multiple studies such as VDOT’s I-95 Corridor Improvement Plan (2021), NVTA’s TransAction (2022), the WMATA Blue/Orange/Silver Corridor Capacity and Reliability Study (ongoing), and DRPT’s I-95/I-395 Transit/TDM Study (2017). The I-495 Southside Transit/TDM Study builds on previous efforts to assess new potential service alternatives in the corridor. The network improvements being studied in the VDOT I-495 Southside Express Lanes Study is the last portion of the Capital Beltway in Virginia without Express Lanes and would (pending environmental review) add to the more than 90 miles of currently planned and operational Express Lanes. It would provide continuity in the Express Lanes system and provide opportunities for improved travel reliability for transit and other non-SOV modes.

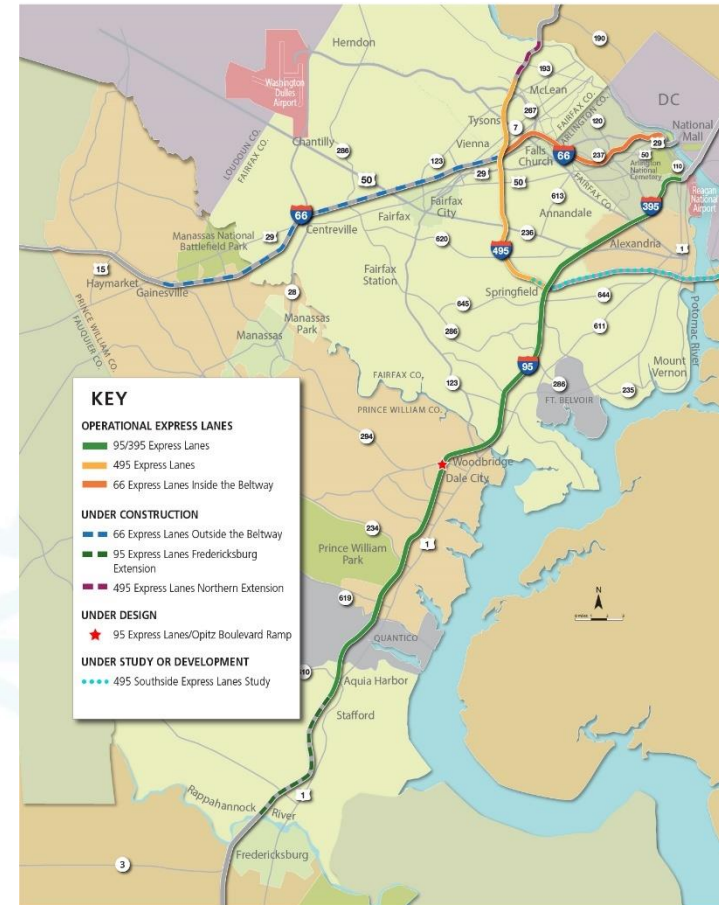
Accommodate Future Regional Growth

As the region continues to grow, the desire and need for suitable transportation is more important than ever. The **Corridor Growth, Demographics and Employment Patterns** section detailed projected population and employment growth in the study corridor. As discussed in that analysis, the MWCOG 9.2 Cooperative Forecast projects significant population growth in Washington, DC, Arlington County, Alexandria, Tysons, and along VA-267 in Fairfax County. The analysis also projects job growth to occur primarily within existing activity centers. Washington, DC, Arlington County, and Alexandria have the highest expected future job growth. **Figure 34** shows, in more detail, the areas close to the study corridor with a projected significant increase in employment density. These are important destinations to evaluate for transit connections and include areas such as Huntington, Potomac Yard, Eisenhower East, the Franconia-Springfield area and Southeast DC.

Improve Safety

I-495 has numerous segments identified by VDOT as having a high potential for safety improvement (PSI). PSI is a safety evaluation tool that compares the actual number of crashes in a segment over a 5-year period to the number of crashes that would be expected based on the characteristics of the roadway. Nine segments, totaling over three and a half miles, on eastbound I-495 (outer loop) between Van Dorn Street and Telegraph Road are identified as having a high PSI. This location correlates with the area of peak congestion shown in **Figure 41**. Congestion relief benefits of transit and TDM can also result in congestion-related safety benefits.

Figure 43. Northern Virginia Express Lanes Network (Source: VDOT)



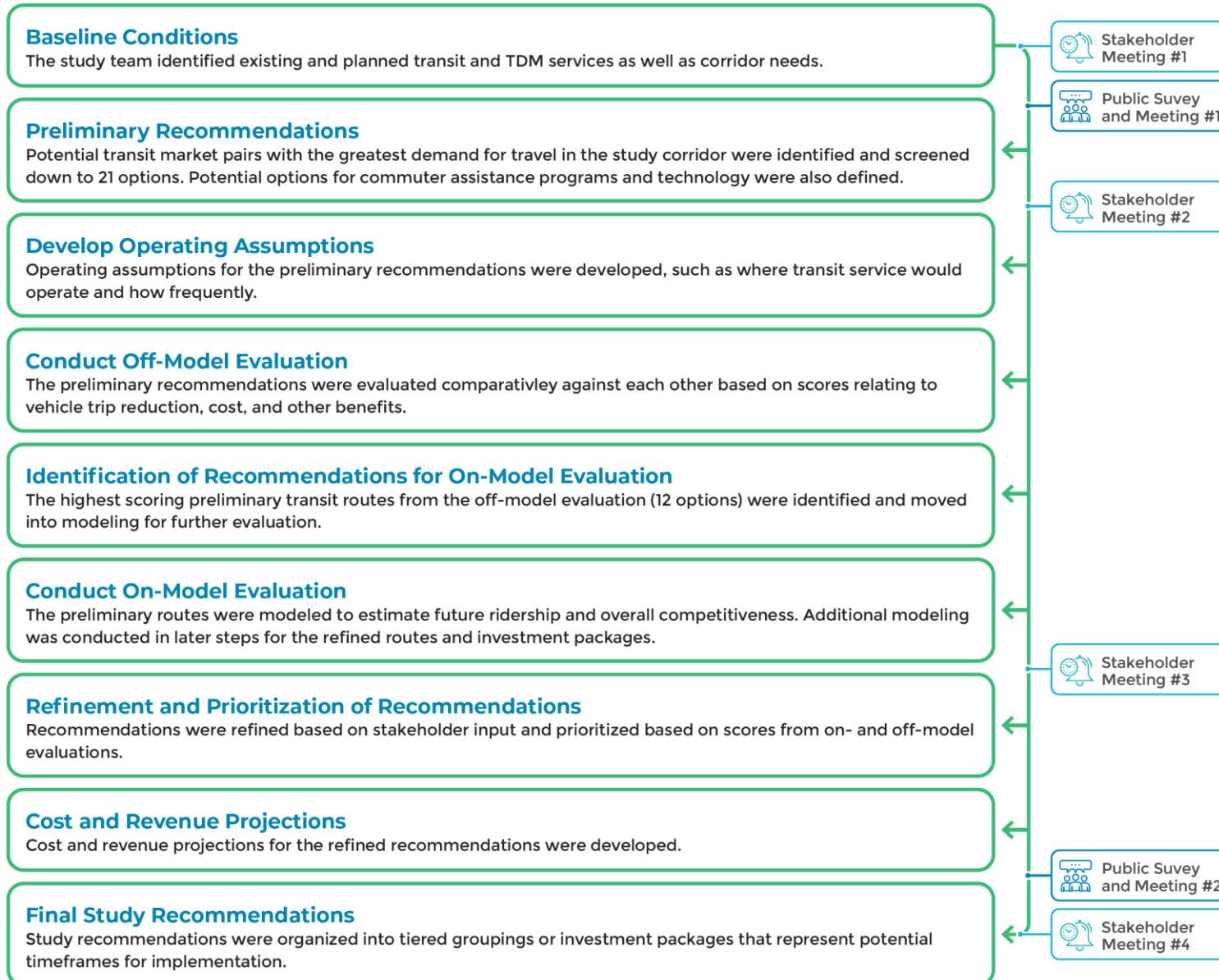
IV. Recommendations Development Process

This section describes the process used to develop study recommendations and how the public and stakeholders were engaged throughout the process.

Process Overview

To develop potential recommendations, the process shown in **Figure 44** was followed. It began by identifying options to address corridor needs that meet the purpose of the study. Throughout the process, the study team met with a group of stakeholders and gathered feedback through two rounds of public outreach as described in the next section. Public feedback was also gathered through the VDOT I-495 Southside Express Lanes Study. The DRPT study was conducted in close coordination with the VDOT study. Study recommendations were identified in three categories: transit services, Commuter Assistance Programs (CAPs), and technology improvements.

Figure 44. Recommendations Development Process



Public and Stakeholder Input

Approach

The purpose of the public outreach and stakeholder engagement for the study was to accomplish the following:

- Disseminate information about the study and provide opportunities for input
- Gather feedback on the study approach and recommendations
- Understand ongoing initiatives in the study corridor by partner agencies and other stakeholders

The outreach for the study included two public online surveys, six (6) in-person pop-up events within the study corridor, two public meetings and a Technical Advisory Committee (TAC) that met four times. Outreach efforts were concentrated during the summer of 2022 and winter of 2022/2023.

Survey

Two public online surveys were completed during the conduct of the study. The first survey focused on gathering data related to existing travel patterns, trip purposes, and corridor needs by users of the I-495 Southside corridor. The second survey gauged participants interests in the potential transit and TDM recommendations developed for this study.

Survey 1 was available from July 9, 2022, through July 31, 2022. 119 surveys were completed. Survey 2 was available from December 9, 2022, through January 13, 2023 and had 61 surveys completed. Summaries of the survey responses can be found in **Appendix A: Public Survey Summary—Summer 2022** and **Appendix B: Public Survey Summary—Winter 2022/2023**.

Pop-Up Events

During the duration of the study, six (6) in-person pop-up events were held to promote the surveys and public meetings, distribute information related to the study, and provide an opportunity for the public to engage with study team members. **Table 20** provides details on the pop-up events.

Table 20. Pop-Up Events

Location	Summer 2022 Outreach	Winter 2022 Outreach
Giant Supermarket at Springfield Plaza	7/15/2022	12/9/2022
Old Town Farmers Market in Alexandria	7/16/2022	12/10/2022
Giant Supermarket at Eastover Shopping Center	7/17/2022	12/11/2022

Public Meetings

Virtual public meetings were conducted on July 19, 2022 (35 attendees) and December 13, 2022 (39 attendees). Recordings of the meetings were posted to the study website.

Technical Advisory Committee (TAC)

Early in the project a Technical Advisory Committee, referred to as the TAC, was developed to guide the planning process and provide technical insight and input during milestone points in the study. The TAC was made up of representatives from the following local, regional, and state agencies:

- Virginia Department of Rail and Public Transportation (DRPT)
- Virginia Department of Transportation (VDOT)
- Maryland Department of Transportation (MDOT)
- City of Alexandria, Virginia
- Fairfax County, Virginia
- Prince William County, Virginia
- Prince George's County, Maryland
- Charles County, Maryland
- The Maryland-National Capital Park and Planning Commission
- Washington Metropolitan Area Transit Authority (WMATA)
- Potomac and Rappahannock Transportation Commission (PRTC) – OmniRide
- Virginia Railway Express (VRE)
- Virginia Passenger Rail Authority (VPRA)
- Northern Virginia Transportation Commission (NVTC)
- Metropolitan Washington Council of Governments (MWCOC)
- Northern Virginia Transportation Authority (NVTA)

Public Comment Period

A public comment period was conducted on the Draft Summary Report from January 20 to February 22, 2023.

V. Transit Recommendations

This section describes the development of recommendations for new or enhanced transit services that could benefit from the reliability of an expanded Express Lanes network in the I-495 Southside corridor.

Transit recommendations focus on the origins and destinations with the highest projected travel demand and are in addition to other already planned improvements such as more frequent commuter rail service, the future Richmond Highway Bus Rapid Transit (BRT) system, and other local bus improvements in the study corridor.

Potential transit connections were identified by evaluating market pairs with the greatest demand for travel in the study corridor to reach regional activity centers. Pairs that could be served by existing or planned transit services or that do not have sufficient projected future demand to support future transit connections were screened out. The following sections describe the process for screening, testing, and evaluating transit recommendations.

Initial List

To develop the matrix of potential origin-destination (O-D) pairs, the study team built on the travel pattern assessment presented in **Section III. Baseline Conditions** which identified top O-D travel patterns. To ensure all potential pairs were identified, the team isolated up to five origin areas with the highest travel flows to each of the top activity centers that could presumably use transit in the study corridor. These activity centers are either specifically identified as MWCOG activity centers or multiple adjacent activity centers were combined into a larger area and served as the assumed destination for trips. For origin locations, the study team used the regional zones identified in the baseline conditions. **Table 21** and **Table 22** below depict the origin zones and activity centers, respectively, which are also mapped in **Figure 45**. The combination of flows from the origin area to the destination activity center resulted in 110 potential O-D pairs which were screened down according to the methodology described in **Figure 46** and the Screening Methodology section below.

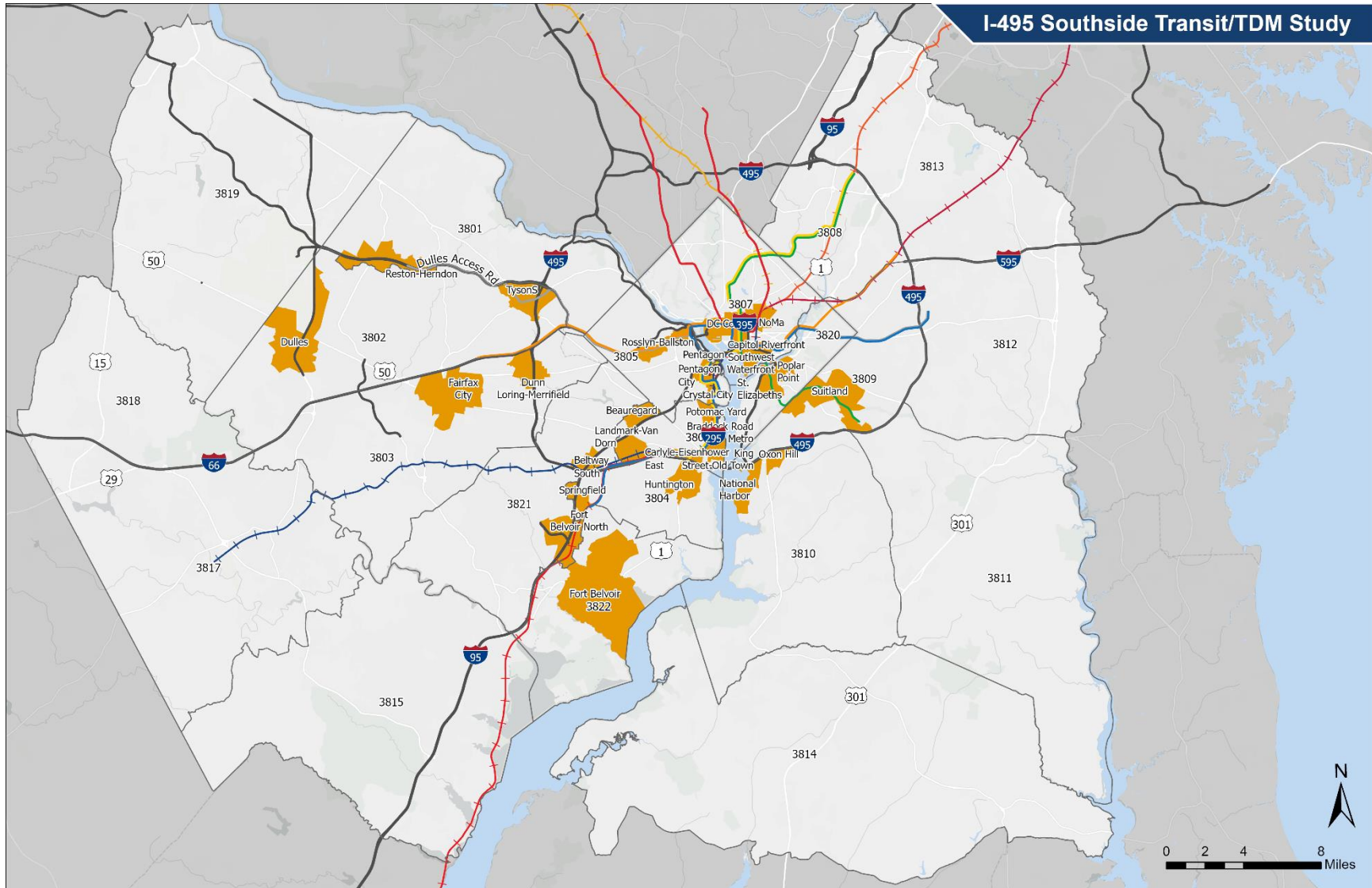
Table 21. Regional Origin Area Locations

Zone Number	Name
3802	Northwest Fairfax County
3803	Central-West Fairfax County
3804	Southeast Fairfax County
3805	Arlington County
3806	Alexandria
3807	DC North of Anacostia River
3809	Central-West Prince George's County
3810	Southwest Prince George's County
3811	Southeast Prince George's County
3812	Central-East Prince George's County
3814	North Charles County
3815	East Prince Williams County
3820	DC South of Anacostia River
3821	Central-East Fairfax County
3822	South Fairfax County

Table 22. Destination Activity Centers

Activity Center Name		
Beaugard	Fort Belvoir North Area	Potomac Yard
Braddock Road Metro Area	Huntington Area (Combined)	Rosslyn-Ballston Corridor (Combined)
Capitol Riverfront	King Street-Old Town	Southwest Waterfront
Carlyle-Eisenhower East	Landmark-Van Dorn	Springfield
Crystal City	National Harbor	St. Elizabeth's
DC Core (Combined)	NoMa (DC)	Suitland Area (Combined)
Dunn Loring-Merrifield	Oxon Hill	Tysons Area (Combined)
Fort Belvoir	Pentagon City	

Figure 45. Origin Area (numbered) and Destination Activity Center Locations



Screening Methodology

The initial screening for the transit services consisted of a three-step process to identify potential O-D pairs that could be served by enhanced or new transit service. The overall process is shown in the flow-chart in **Figure 46** and then described in more detail in the following sections. The 110 potential O-D pairs were screened according to this methodology. DRPT and TAC reviews were used in the process.

Overall Process

The purpose of the screening was to identify potential pairs that would present reasonable markets for transit service based on travel demand and land use, estimate the appropriate span for the potential transit service, and then assess if that demand is currently served by existing or planned transit service.

Figure 46. Transit Services Screening Process



Step 1: Transit Suitability

Peak Trip Demand

The first factor that was used to identify potential service pairs was the AM peak trip demand. This analysis was based on the MWCOG model 2045 forecasts, using auto (including SOV and non-SOV) trips and existing transit trips. To understand the total potential demand for transit trips, the study team added the transit trips in the model plus 5% of all auto trips that followed these patterns. This 5% represents a potential mode shift assumption. This summation provided an overall number of potential peak period transit trips. For the 110 pairs, these trip values were broken into three thresholds for high, medium, and low:

- **Low.** Less than 40 trips (approximately equivalent to one bus) per peak hour.
- **Moderate.** Between 40 and 160 trips (one to four buses) per peak hour.
- **High.** More than 160 trips (more than four buses) per peak hour.

Transit Supportive Land Use

Transit supportiveness considered both quantitative and qualitative factors. MWCOG 2045 forecasts for employment and population were gathered to identify the predominant use and density in each activity center (see **Table 23**). MWCOG activity center designations were used to assess the land use and function of each activity center within the greater metropolitan area. Qualitative factors considered included pedestrian accessibility, mix of land uses, existing or potential urban character, and the presence of unique circumstances that could make an area particularly suitable for transit—for example entertainment districts such as National Harbor.

Table 23. Transit Supportive Land Use Assessment

Activity Center	2045 Population Density (People/Acre)	2045 Employment Density (Jobs/Acre)	MWCOG Activity Center Designation	Transit Supportiveness Rating
Beauregard	27.74	15.00	Suburban Employment Centers	Moderate
Braddock Road Metro Area	36.36	29.07	N/A	High
Capitol Riverfront	33.52	94.59	N/A	High
Carlyle-Eisenhower East	46.50	48.59	Mixed-Use Centers	High
Crystal City	56.23	157.17	Mixed-Use Centers	High
DC Core (Combined)	33.13	209.99	DC Core	High
Dunn Loring-Merrifield	14.25	32.77	Employment Centers	Moderate
Fort Belvoir	1.15	4.03	N/A	Low
Fort Belvoir North Area	0.06	18.13	N/A	Low
Huntington Area (Combined)	19.49	7.71	N/A	Low
King Street-Old Town	27.84	46.87	N/A	High
Landmark-Van Dorn	31.95	10.90	N/A	Moderate
National Harbor	2.16	3.18	Emerging Employment Centers	High
NoMa (DC)	56.47	100.54	N/A	High
Oxon Hill	5.19	6.06	N/A	Low
Pentagon City	35.29	125.19	Mixed-Use Centers	High
Potomac Yard	29.12	12.48	N/A	High
Rosslyn-Ballston Corridor (Combined)	62.16	88.67	Mixed-Use Centers	High
Southwest Waterfront	57.51	60.68	N/A	High
Springfield	12.83	26.60	Suburban Employment Centers	Low
St. Elizabeth's	24.77	20.53	N/A	Moderate
Suitland Area (Combined)	8.04	4.60	N/A	Moderate
Tysons Area (Combined)	35.62	71.44	Employment Centers	Moderate

N/A = not originally designated by MWCOG

Transit Suitability Rating

Based on the rating for peak trip demand and transit supportive land use, transit suitability was assessed as follows in **Figure 47**.

Figure 47. Transit Suitability Rating

		Land Use Transit Supportiveness Rating		
		Low	Moderate	High
Peak Trip Demand	Low			
	Moderate			
	High			

Group A - High Priority	Qualifies for Some Service - Advance to Step 2
Group B - Medium Priority	May Qualify for Service - Advance to Step 2
Group C - Low Demand	Does not Qualify – Do not advance to Step 2

Step 2: Service Span

All-Day Trip Demand

To determine an appropriate span of service, the study team used the StreetLight Data trip analysis documented in baseline conditions, which looked at all-day demand for travel on I-495 Southside from the same origin areas and activity centers assessed using the MWCOG peak trip flows. For each of the 110 pairs, the number of all-day trips for all modes (using data for average weekdays [Tuesday through Thursday] for February 2022) was determined. The trip values were divided into three groups using percentiles as shown below:

- **Below the 33rd percentile (approximately 150 trips).** Low (Peak Only Service).
- **Between 33rd and 66th percentile (150 to 350 trips).** Medium (Peak-Focused Service—service throughout the day but service more often during the peak).
- **Above 66th percentile (Above 350 trips).** High (All-Day Service).

The results of the service span assessment for each O-D pair can be found in **Appendix C: Initial Transit Screening**.

Equity Emphasis Areas

MWCOG has identified Equity Emphasis Areas (EEAs) throughout the region. EEAs are approximately 350 of the region's more than 1,200 census tracts with high concentrations of low-income individuals and/or racial and ethnic minorities. Origin areas were assessed for the percentage of the origin area that was an MWCOG EEA, on average about 15% due to the large size of the origin areas. For the origins that were above this average, the service span was increased to all-day service. With high concentrations of low-income individuals, there is a greater tendency to work and rely on transit for jobs outside of the traditional peak commuting periods. This manual conversion occurred for origin zones 3806 (Alexandria) and 3809 (Central-West Prince George's County).

Step 3: Service Competitiveness

Existing and planned transit connections were identified for the remaining origin O-D pairs in the analysis. A qualitative assessment of whether the trip was feasible on transit (bus, commuter rail, Metrorail) with, at maximum, one transfer and a logically straightforward geographic routing was used. If existing or planned transit service already exists, the O-D pair was eliminated from further consideration. Planned transit services that are funded were also included in the assessment, including the Richmond Highway Bus Rapid Transit (BRT) system and the Potomac Yard Metrorail station. The planned but unfunded Route 7 BRT was also considered.

Outcomes

The screening methodology resulted in the 21 O-D pairs shown in **Table 24**. The next steps were to verify that the potential transit recommendations address the study purpose and determine whether O-D pairs could be logically combined and served by a single transit service.

Table 24. Outcomes of Transit O-D Screening

ID	Origin-Destination Pair	Peak Trip Rating	Activity Center Land Use Assessment	Step 1 Rating	Step 2 Service Span
A1	Central-West Fairfax County to King Street-Old Town	Moderate	High	Group A - High Priority	All-Day
A2	North Charles County to DC Core	High	High	Group A - High Priority	All-Day
A3	DC South of Anacostia River to National Harbor	Moderate	High	Group A - High Priority	All-Day
A4	Alexandria to Tysons Area	High	Moderate	Group A - High Priority	All-Day
A5	Northwest Fairfax County to King Street-Old Town	Moderate	High	Group A - High Priority	Peak-Focused
A6	Central-West Fairfax County to Braddock Road Metro Area	Moderate	High	Group A - High Priority	Peak-Focused
A7	Central-West Fairfax County to Carlyle-Eisenhower East	Moderate	High	Group A - High Priority	Peak-Focused
A8	Southeast Fairfax County to Tysons Area	High	Moderate	Group A - High Priority	Peak-Focused
A9	Southwest Prince George's County to Capitol Riverfront	High	High	Group A - High Priority	Peak-Focused
A10	Southwest Prince George's County to Rosslyn-Ballston Corridor	High	High	Group A - High Priority	Peak-Focused
A11	North Charles County to Rosslyn-Ballston Corridor	Moderate	High	Group A - High Priority	Peak-Focused
A12	Northwest Fairfax County to Braddock Road Metro Area	Moderate	High	Group A - High Priority	Peak-Only
A13	Northwest Fairfax County to Carlyle-Eisenhower East	Moderate	High	Group A - High Priority	Peak-Only
A14	Northwest Fairfax County to Potomac Yard	Moderate	High	Group A - High Priority	Peak-Only
A15	Southeast Prince George's County to Rosslyn-Ballston Corridor	Moderate	High	Group A - High Priority	Peak-Only
A16	North Charles County to NoMa (DC)	Moderate	High	Group A - High Priority	Peak-Only
A17	East Prince William County to Southwest Waterfront	Moderate	High	Group A - High Priority	Peak-Only
A18	Central-West Fairfax County to Landmark-Van Dorn	Moderate	Moderate	Group B - Medium Priority	All-Day
A19	Southeast Fairfax County to Dunn Loring-Merrifield	Moderate	Moderate	Group B - Medium Priority	All-Day
A20	Alexandria to Dunn Loring-Merrifield	Moderate	Moderate	Group B - Medium Priority	All-Day
A21	Central-West Prince George's County to Tysons Area	Moderate	Moderate	Group B - Medium Priority	All-Day

Transit Testing and Evaluation

Process, Metrics, and Assumptions

The potential transit recommendations from the initial screening represented 21 O-D pairs. Prior to developing high-level transit operating plans to serve these trip patterns, the O-D pairs were refined as summarized below. Several with similar origin and/or destination areas were merged together, others were modified to avoid redundancy with existing transit services, and one was screened out for limited relevance to the east-west I-495 Southside study corridor. Ultimately, the 21 O-D pairs from the initial list were narrowed down and merged into 15 recommended transit services (note, A2 has 3 service pattern variations).

No Change from Initial List

- **A1 (Central-West Fairfax County to King Street-Old Town)**
- **A5 (Northwest Fairfax County to King Street-Old Town)**
- **A9 (Southwest Prince George's County to Capitol Riverfront)**
- **A13 (Northwest Fairfax County to Carlyle-Eisenhower East)**
- **A16 (North Charles County to NoMa)**
- **A17 (East Prince William County to Southwest Waterfront)**
- **A18 (Central-West Fairfax County to Landmark-Van Dorn)**
- **A21 (Central-West Prince George's County to Tysons Area)**

Merged from Initial List

- **A4 (Alexandria to Tysons Area) and A8 (Southeast Fairfax County to Tysons Area):** Merged because of numerous local transit options and planned future BRT will be available to get from southeast Fairfax County to Huntington Metrorail Station.
- **A6 (Central-West Fairfax County to Braddock Road Metro Area) and A7 (Central-West Fairfax County to Carlyle-Eisenhower East):** Merged because of common origin area and close proximity of destination activity centers.
- **A10 (Southwest Prince George's County to Rosslyn-Ballston Corridor) and A11 (North Charles County to Rosslyn-Ballston Corridor):** Merged because of close proximity of origin areas and common destination activity center.
- **A12 (Northwest Fairfax County to Braddock Road Metro Area) and A14 (Northwest Fairfax County to Potomac Yard):** Merged because of common origin area and close proximity of destination activity centers.
- **A19 (Southeast Fairfax County to Dunn Loring-Merrifield) and A20 (Alexandria to Dunn Loring-Merrifield):** Merged because of numerous local transit options and planned future BRT will be available to get from southeast Fairfax County to Huntington Metrorail Station.

Modified from Initial List

- **A2 (North Charles County to DC Core):** Modified to be off-peak service only because peak is served by existing MTA commuter bus routes.
- **A15 (Southeast Prince George's County to Rosslyn-Ballston Corridor):** Modified to terminate route in Alexandria rather than continue to Rosslyn-Ballston corridor because of Metrorail service availability and A10/11 which provides service from Charles County and Prince George's County to the Rosslyn-Ballston corridor.

Screened Out from Initial List

- **A3 (DC South of Anacostia River to National Harbor):** Screened out for dispersed origin demand pattern, availability of local transit options, and because this is primarily a north/south movement that would not utilize east/west I-495 Express Lanes.

Transit Service Development

Potential Transit Mode

A potential transit mode for each service was identified by considering availability of existing infrastructure, need for new infrastructure, and peak trip rating from the initial screening. Modes that took advantage of proposed and existing Express Lanes were prioritized. As such, the modes for the 15 transit services were classified as either:

- Express bus for services that would operate all-day with fewer stops
- Commuter bus for services that would operate during peak commuting times with fewer stops
- Local bus for services that would operate all-day with more stops

As the evaluation progressed into transit demand forecasting, the need for higher-capacity modes was evaluated. Rail was tested as an option, in particular a Metrorail extension from the Blue/Yellow Lines in Virginia to the Green Line in Maryland via the I-495 Southside corridor, but in the context of this study, there was not a single travel movement or groups of O-D pairs that warranted a level of service such as rail. A summary of this high-level evaluation is included in **Appendix F: Metrorail Scenario Testing**. In short, the level of demand for new rail was something that could be supported by the capacity provided by lower-cost bus modes. However, the study recognized that improvements in the I-495 Southside corridor should not preclude future rail alternatives across the Woodrow Wilson Bridge.

Alignments and Stops

Route alignments for the O-D pairs were determined through a comprehensive assessment of area characteristics, including but not limited to:

- The geographic and numerical distribution of total (auto and transit) morning trips at the origin end
- Transit-oriented destinations within the activity centers
- Existing and proposed transit route alignments, particularly express bus routes
- Existing and proposed transit infrastructure, including park and ride lot locations, transit centers, rail stations, BRT and rail corridors
- Existing and proposed Express Lanes and access points on I-495, I-95, I-395, and I-66

Routing at the origin areas was prioritized at, preferably clustered, TAZs with the highest trip density that include existing or proposed park and ride lots, transit centers, and rail stations. Origin routing also connected disparate high-trip density TAZs, aiming to add intermediate stops at park and rides within those TAZs. For instance, A6/7 (Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area) was routed along I-66 to stop at several park and rides and at Vienna Metro Station due to their proximity to TAZs with high trip density.

Routing between origins and destinations utilized Express Lanes to the greatest extent possible and tended to follow existing public transit bus routing, where possible, to reduce the need for development of new bus infrastructure. For example, in the case of midday service proposed in the A2 corridor (North Charles County to DC Core), routing follows an amalgamation of peak period MTA routes 610, 630, 640, and 650. Consideration was also given to roadway capacity and transit infrastructure (e.g., A12/14 and A13 were drawn to have less activity center circulation at Tysons compared to A21 and A4/8, which follow the Fairfax Connector Route 494 local circulation pattern). Naturally, routes that took advantage of proposed and existing Express Lanes, Express Lane direct access connections, and BRT corridors were prioritized to maximize travel time savings.

Routing for end of line (EOL) stops also took cues from existing bus routing, and prioritized transit centers with bus bays for transfers to/from rail or other bus routes.

Level of Service

Span of service previously determined in the screening process was carried forward for each service:

- **All-Day:** Bi-directional service during peak and off-peak periods on weekdays.
- **Peak-Focused:** Directional service during peak periods and less frequent service during peak shoulder hours. A 4-hour peak and 2-hour peak shoulder were assumed for each morning and afternoon period on weekdays.
- **Peak-Only:** Directional service during peak periods. A 4-hour peak was assumed for each morning and afternoon on weekdays.

A preliminary standard operating headway of 30 minutes was assumed for peak periods and 60 minutes for peak shoulder and midday periods. As recommendations were refined with the TAC, proposed headways were reduced to 20/40 minutes, respectively, as described in the **Transit Refined Recommendations** section. Proposed weekday spans of service and service headways for the service span options (peak-only, peak-focused, and all-day) are presented in **Table 25**. An exception is A2 and its three patterns, which operate in the midday only, generally filling the gaps between morning and evening service on MTA Routes 610, 620, 630, 640, and 650 and operating in the peak direction only. The direction for these routes is towards DC in the morning and away from DC in the evening.

Table 25. Weekday Proposed Span of Service and Headways

Period	Schedule	Service Hours	Headway*	Applicability
AM Peak Shoulder	4:00 a.m. – 5:00 a.m. and 9:00 a.m. – 10 a.m.	2	60	Peak Focused and All Day
AM Peak	5:00 a.m. – 9:00 a.m.	4	30	All Routes
Midday	10:00 a.m. – 2:00 p.m.	4	60	All Day
PM Peak Shoulder	2:00 p.m. – 3:00 p.m. and 7:00 p.m. – 8:00 p.m.	2	60	Peak Focused and All Day
PM Peak	3:00 p.m. – 7:00 p.m.	4	30	All Routes

*The preliminary headways shown were refined and reduced to from 30 to 20 minutes and 60 to 40 minutes in later steps of the recommendation development process

Estimated Transit Times and Operating Assumptions

Transit travel time is the primary driver of total cycle time, vehicle requirements, and thus operating and maintenance (O&M) costs. Transit travel time is a result of several factors including distance, speed, and delay (delay may include congestion, dwell times, or signalized intersection delay). Average speed is calculated based on the mileage and travel time.

Travel time estimates and average speeds were calculated through use of a travel time model. Travel times consist of three components: the time the vehicle is in motion, time spent at intersections (where applicable), and time spent at stops.

The time in operation includes the time it takes for the vehicle to accelerate, the time the vehicle spends cruising at the designated top speed, and the time for the vehicle to decelerate. The following metrics were used to estimate time in operation for the route alignments:

- A maximum bus acceleration rate of 2.0 mphps was used, with the acceleration rate diminishing when accelerating to speeds greater than 20 mph.
- A constant deceleration rate of 2.0 mphps was also used.
- To err on the conservative side, segment speeds in existing and future Express Lanes were based on the dynamic pricing minimum speeds, as follows:
 - For the I-95, I-395, and I-66 Express Lanes, 55 mph in the peak periods and 65 mph in the off-peak periods
 - For the I-495 Express Lanes, 45 mph in the peak periods and 55 mph in the off-peak periods
- In general purpose lanes:
 - Segment speeds do not exceed posted speed limits
 - Speeds were adjusted downward based on best professional judgment to reflect existing traffic conditions and/or existing transit speeds
 - Speeds in segments on the destination end where intermediate bus stops were assumed were also adjusted downward to reflect these additional stops

Intersection delay is the amount of time the vehicle spends waiting at intersections and was added to the run times. Assumed intersection delays varied depending on their location and type, such as unassisted left turns or signalized intersections.

Dwell time is the time the vehicle spends waiting at major stops for passengers to board or alight the vehicle. Dwell times at major stops (i.e., park and ride lots, transit centers, rail stations, and terminal end-of-lines) were assumed to average 20 seconds.

Resulting one-way travel times in the peak direction were modeled based on the methodology presented above, considering travel characteristics for peak periods for all routes and also for off-peak periods for all-day routes. Average speeds were calculated based on the mileage and travel time.

Transit travel times were used to develop the cycle times and high-level operating plans for each of the 15 services. The cycle times were divisible by the headway in each service period for calculating the number of buses. They generally assumed a minimum 15% layover/recovery time at both ends of the alignment, with some flexibility in the case of peak direction only routes.

Proposed cycle times and vehicle requirements were developed by time period. The proposed service plan was used to calculate daily revenue miles and revenue hours and peak vehicle requirements. The service plan does not account for non-revenue/deadhead time nor time to report for service (either in hours or miles). A weekday annualization factor of 255 days was assumed.

To calculate fleet requirements, an industry-standard 20% spare ratio was assumed. Fleet requirement costs were included in capital cost estimates based on an assumed unit cost of \$1,000,000 for a zero-emission transit bus.

Operating and Maintenance (O&M) Cost Estimates

Estimated O&M costs were developed using a service weighted average for cost per revenue hour based on 2020 National Transit Database (NTD) statistics and inflated to 2022 dollars. The weighted average draws from the following agency statistics for either the Commuter Bus mode (for those agencies reporting this mode separately) or Motor Bus:

- Maryland Transit Administration (Commuter Bus)
- OmniRide (Commuter Bus)
- Fairfax County (Motor Bus)
- Prince George's County (Motor Bus)
- Arlington County (Motor Bus)

The resulting service weighted average for the five agencies' cost per revenue hour in 2020 was \$154. This average was then inflated by 11.6% to reflect 2022 dollars. This inflation rate was based on the average Consumer Price Index (CPI) for All Urban Consumers for the Washington-Arlington-Alexandria metropolitan area. The result is a cost per revenue hour of \$172, which was then applied to the statistics for each route to calculate the annual O&M costs.

Summary of Evaluation

Table 26 defines the off-model transit evaluation metrics and assumptions. Preliminary recommendations were scored for each metric by applying a weight and assigning points by comparing each route's metric to all other routes. For quantitative metrics such as population, transit propensity, and travel time savings, points were given based on the number of standard deviations away from the mean of all the values for the given metric:

- **1 point:** More than one standard deviation below the mean
- **2 points:** Between one standard deviation and half a standard deviation below the mean
- **3 points:** Within half a standard deviation in either direction from the mean
- **4 points:** Between half a standard deviation and one standard deviation above the mean
- **5 points:** More than one standard deviation above the mean

For qualitative metrics, descriptors (very low, low, average, high, and very high) were applied, which translated into between one and five points, respectively. All the weighted points for each metric were then tabulated and added together for the route to create the total score shown in **Table 27**. These scores were out of a maximum of 100.

Final ratings of **HIGH**, **MODERATE**, and **LOW** were given to the routes. Routes receiving the LOW rating, scored in the lowest third of all of the routes. Routes receiving the MODERATE rating scored in the middle third, and routes receiving a HIGH rating scored in the highest third of all routes.

One-page summary sheets of each of the preliminary transit service recommendations are included in this section. A detailed table of the metrics and scoring of all recommendations is included in **Appendix D: Preliminary Transit Recommendation Evaluation**.

Table 26. Off-Model Transit Evaluation Metrics

Transit Metrics	Weight	Definition and Assumptions
Future Residential Access (2045)	3	Calculated population totals within 3 miles of the origin stops along each service. Utilized MWCOG 2045 population projections and GIS to collect data only within specified buffer areas.
Future Job Access (2045)	3	Calculated employment totals within 0.5 miles of the destination stops along each service. Utilized MWCOG 2045 employment projections and GIS to collect data only within specified buffer areas.
Peak Trip Capture Potential (2045)	3	MWCOG 2045 projections of auto trips and transit trips originating within 3 miles of origin stops and destined for within 0.5 miles of destination stops. The following mode shifts were assumed: <ul style="list-style-type: none"> • 5% for auto mode • 100% for bus only mode • 75% for bus-to-rail modes • 10% for rail only modes Trip capture is reported for AM peak trips and for the peak direction only. It is also reported independently for each new potential service (i.e., interaction between adjacent or overlapping new services are not considered at this stage of analysis). Given this, the metric should only be interpreted as a proxy for demand rather than an actual ridership estimate.
Transit Propensity	3	Transit Propensity Index (TPI) of population within 3 miles of origin stops. $TPI = \text{Zero-Car Population} + \text{Low-Income Population} + \text{Minority Population}$ using 2019 American Community Survey (ACS). TPI was divided by 1,000 for ease of reporting.
Operational Cost (2022)	2	Assumed hourly cost of \$172 per revenue hour, a rate that represents the average hourly cost of bus service for study area operators based on fiscal year 2020 NTD inflated to 2022 dollars.
Capital Cost (2022)	1	Determined from the high-level transit operating plans and peak vehicle needs for each service. The total number of vehicles required for the service was calculated by assuming a 20% spare ratio. A unit capital cost of \$1,000,000 was assumed for a zero-emission transit bus.
Facility Availability - Origin	1	Higher rating if the origin of the transit service can be located at an existing designated park and ride facility with anticipated future parking space availability.
Facility Availability - Destination	1	Higher rating if the destination of the transit service has capacity for additional service and layovers at existing bus bay locations. A maximum capacity of 6 buses per hour per bus bay was assumed.
Impact to Corridor Travel Patterns	2	Relevancy to the study corridor represented as total distance the transit service would travel on new potential I-495 Express Lanes. ¹
Compatibility With Express Lanes Access Points		Access points the transit service would use to get to and from the new potential I-495 Express Lanes. ¹
Travel Time	1	Transit travel times were calculated through use of a travel time model and consist of three components: the time the vehicle is in motion, time spent at intersections (where applicable), and time spent at stops.
Travel Time Savings	1	Difference between SOV travel time and transit travel time along same (or similar non-HOV) routes. Average SOV travel times were taken for an average Tuesday AM peak (9:00 AM) in September 2022 from Google Maps.

¹Express Lanes configuration and access assumptions for this analysis were coordinated with the VDOT Southside Express Lanes Study in September 2022 and are subject to change. During the transit/TDM study, VDOT was considering interchange access options in Alexandria between Telegraph Road, Mill Road, and US Route 1. Additional analysis was conducted to identify impacts to transit routing as described in **Appendix G: Alternative Interchange Access**.

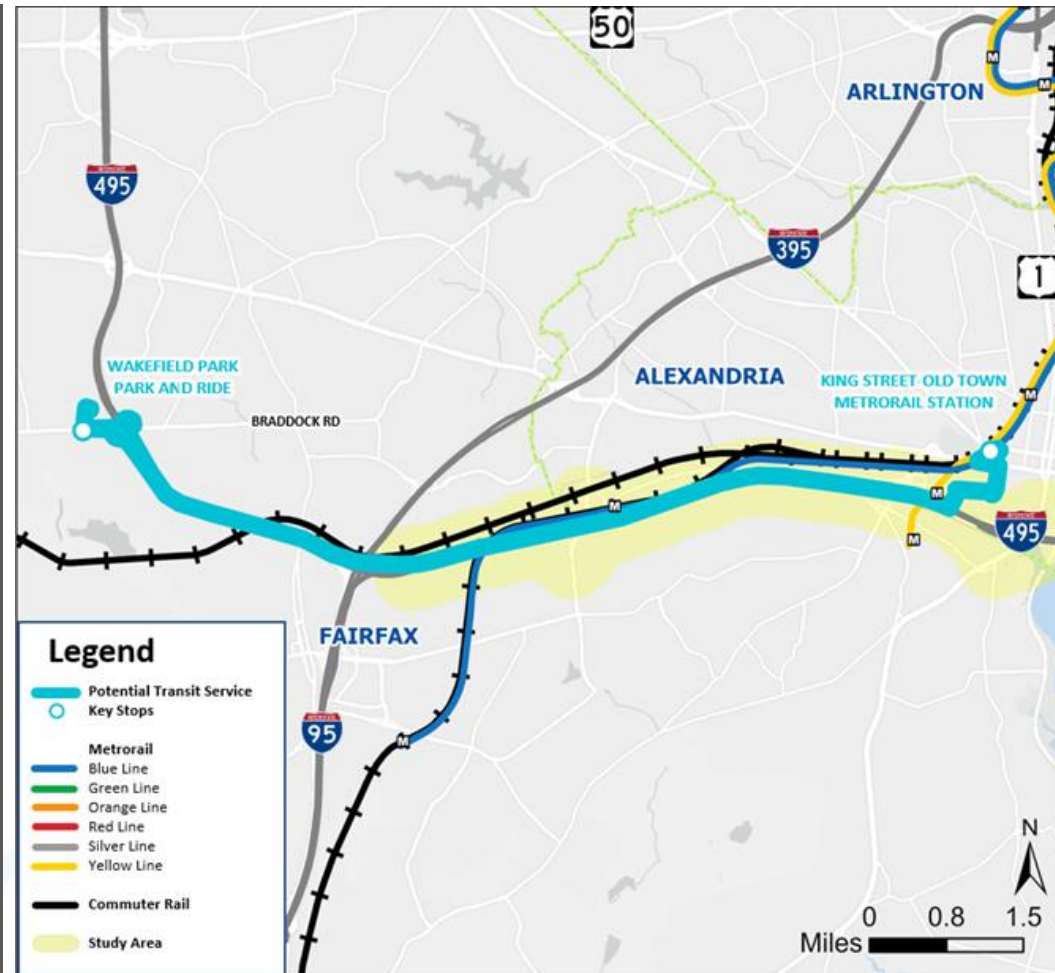
Table 27. Prioritized Preliminary Transit Recommendations

Rating	Total Score	Transit Service	Potential Transit Mode	Span of Service
HIGH	77	Alexandria to Tysons (A4/8)	Express Bus	All-Day Bidirectional
HIGH	69	Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield (A19/20)	Express Bus	All-Day Bidirectional
HIGH	68	Southwest Prince George's County to Capitol Riverfront (A9)	Commuter Bus	Peak-Focused Directional
HIGH	68	East Prince William County to Southwest Waterfront (A17)	Commuter Bus	Peak-Only Directional
HIGH	65	Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area (A6/7)	Commuter Bus	Peak-Focused Directional
HIGH	64	North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor (A10/11)	Commuter Bus	Peak-Focused Directional
MODERATE	60	North Charles County to NoMa (A16)	Commuter Bus	Peak-Only Directional
MODERATE	59	Central-West Prince George's County to Tysons (A21)	Express Bus	All-Day Bidirectional
MODERATE	57	Central-West Fairfax County to King Street-Old Town (A1)	Express Bus	All-Day Bidirectional
MODERATE	53	Northwest Fairfax County to Carlyle-Eisenhower East (A13)	Commuter Bus	Peak-Only Directional
MODERATE	53	Central-West Fairfax County to Landmark-Van Dorn (A18)	Express Bus	All-Day Bidirectional
MODERATE	52	North Charles County to DC Core (A2.3)	Express Bus	Off-Peak Directional
LOW	51	North Charles County to DC Core (A2.1)	Express Bus	Off-Peak Directional
LOW	51	Southeast Prince George's County to King Street-Old Town (A15)	Commuter Bus	Peak-Only Directional
LOW	48	Northwest Fairfax County to King Street-Old Town (A5)	Commuter Bus	Peak-Focused Directional
LOW	47	Northwest Fairfax County to Braddock Road Metro Area and Potomac Yard (A12/14)	Commuter Bus	Peak-Only Directional
LOW	46	North Charles County to DC Core (A2.2)	Express Bus	Off-Peak Directional

Central-West Fairfax County to King Street-Old Town (A1)

This service is **MODERATE** scoring and would connect the Braddock Road corridor and Old Town Alexandria with all-day bidirectional service.

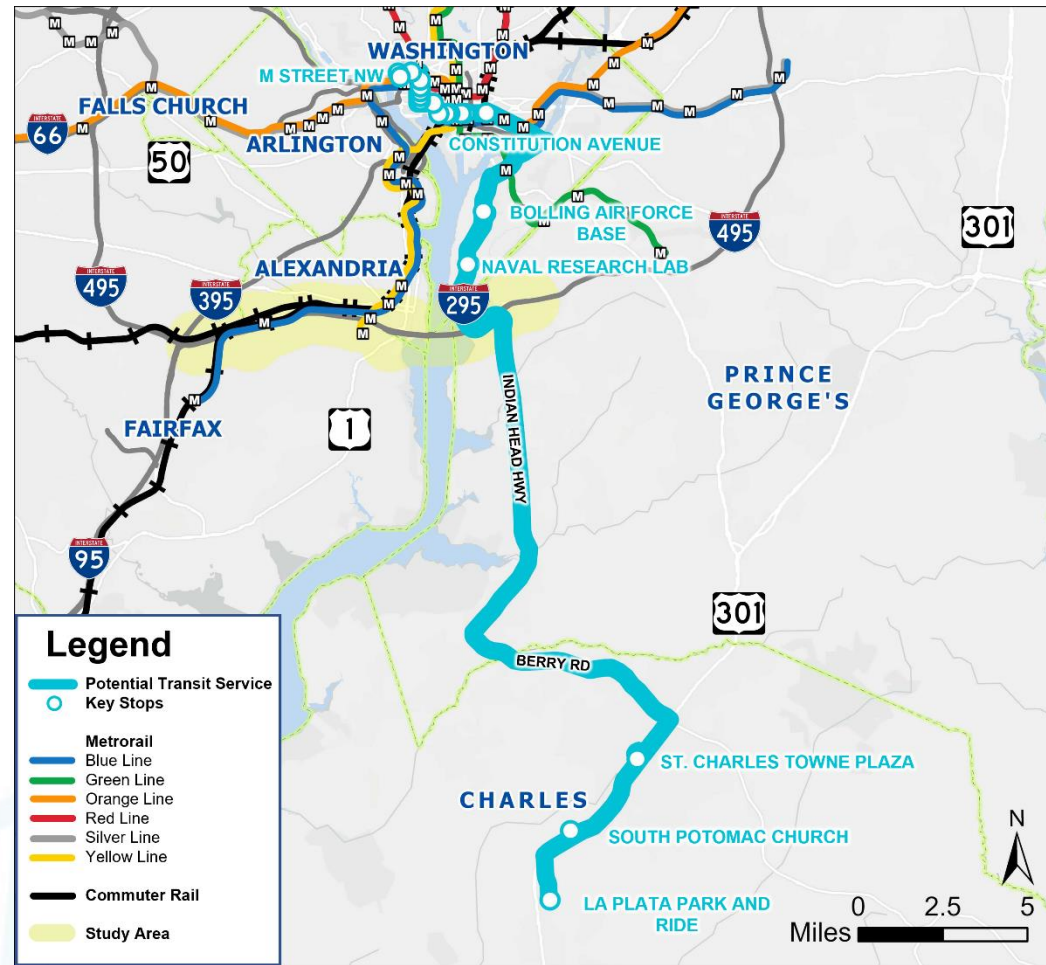
A1	
From	Central-West Fairfax County
To	King Street-Old Town
Via	Wakefield Park and Ride/ Braddock Road, King Street- Old Town Metrorail Station
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	30 (Peak), 60 (Off-Peak)
Total Population (2045)	132,500 people
Total Jobs (2045)	19,600 jobs
Peak Trip Potential (2045)	290 peak trips
Transit Propensity	88
Operational Cost	\$1,412,000 per year
Capital Cost	\$4,000,000
Facilities - Origin	Available park and ride spaces but potential future constraint
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry and Mill Road
Travel Time	25 minutes
Travel Time Savings	- 5 minutes



North Charles County to DC Core (A2.1)

This service is **LOW** scoring and would provide off-peak service similar to MTA commuter bus lines that currently operate only during peak periods.

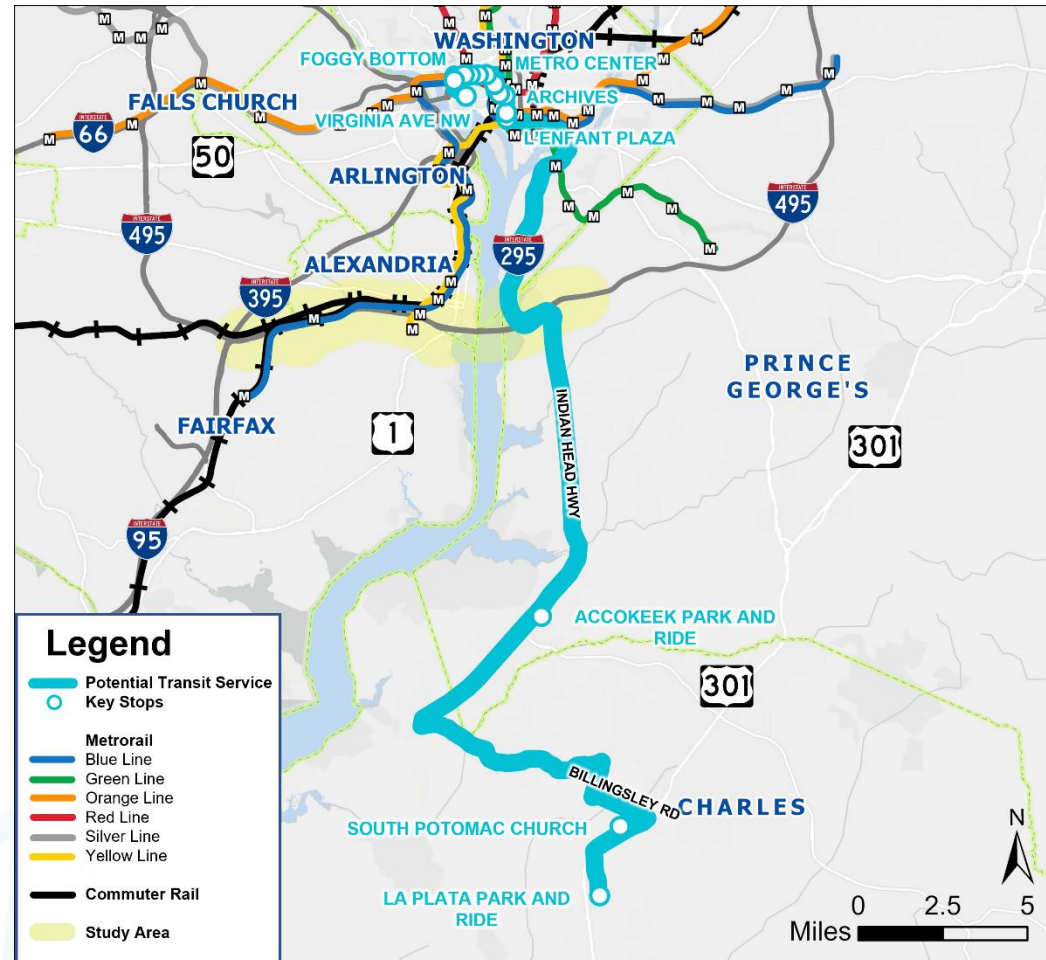
A2.1	
From	North Charles County
To	DC Core
Via	La Plata Park and Ride, South Potomac Church, St. Charles Towne Plaza, Naval Research Lab, Bolling AFB, Independence Avenue, Constitution Avenue, 18th Street NW, M Street NW
Potential Transit Mode	Express Bus
Span of Service	Off-Peak Directional
Headway (min.)	60 (Off-Peak)
Total Population (2045)	111,300 people
Total Jobs (2045)	482,200 jobs
Peak Trip Potential (2045)	N/A—Off-Peak Service Only
Transit Propensity	63
Operational Cost (2022)	\$620,000 per year
Capital Cost (2022)	\$5,000,000.
Facilities - Origin	Available park and ride spaces
Facilities - Destination	On-street location
Express Lanes Use and Access	None
Travel Time	93 minutes
Travel Time Savings	- 5 minutes



North Charles County to DC Core (A2.2)

This service is **LOW** scoring and would provide off-peak service similar to MTA commuter bus lines that currently operate only during peak periods.

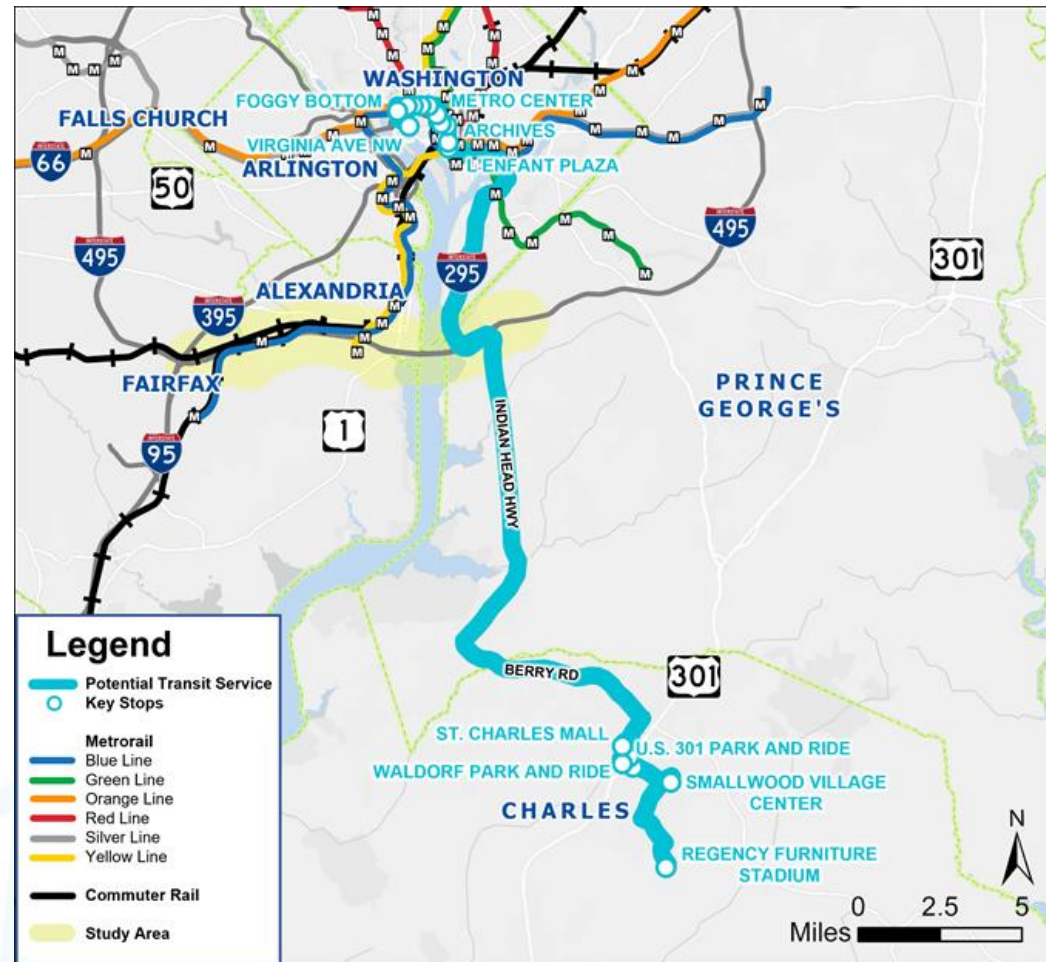
A2.2	
From	North Charles County
To	DC Core
Via	La Plata Park and Ride, South Potomac Church, Accokeek Park and Ride, L'Enfant Plaza, Archives, Metro Center, Foggy Bottom, Virginia Avenue NW
Potential Transit Mode	Express Bus
Span of Service	Off-Peak Directional
Headway (min.)	60 (Off-Peak)
Total Population (2045)	76,800 people
Total Jobs (2045)	431,800 jobs
Trip Potential (2045)	N/A—Off-Peak Service Only
Transit Propensity	39
Operational Cost (2022)	\$344,000 per year
Capital Cost (2022)	\$5,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	On-street location
Express Lanes Use and Access	None
Travel Time	89 minutes
Travel Time Savings	- 1 minute



North Charles County to DC Core (A2.3)

This service is **MODERATE** scoring and would provide off-peak service similar to MTA commuter bus lines that currently operate only during peak periods.

A2.3	
From	North Charles County
To	DC Core
Via	Regency Furniture Stadium, Smallwood Village Center, Waldorf Park and Ride, U.S. 301 Park and Ride, St. Charles Towne Mall, L'Enfant Plaza, Archives, Metro Center, Foggy Bottom, Virginia Avenue NW
Potential Transit Mode	Express Bus
Span of Service	Off-Peak Directional
Headway (min.)	60 (Off-Peak)
Total Population (2045)	121,800 people
Total Jobs (2045)	482,200 jobs
Trip Potential (2045)	N/A—Off-Peak Service Only
Transit Propensity	64
Operational Cost (2022)	\$344,000 per year
Capital Cost (2022)	\$5,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	On-street location
Express Lanes Use and Access	None
Travel Time	98 minutes
Travel Time Savings	+ 6 minutes



Alexandria to Tysons (A4/8)

This service is **HIGH** scoring and would connect Huntington, Van Dorn Street, and Tysons with all-day bidirectional service.

A4/8	
From	Alexandria
To	Tysons Area
Via	Huntington Metrorail Station, Van Dorn Street Metrorail Station, Spring Hill Metrorail Station, Jones Branch Drive
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	30 (Peak), 60 (Off-Peak)
Total Population (2045)	362,400 people
Total Jobs (2045)	125,600 jobs
Trip Potential (2045)	1,660 Peak Trips
Transit Propensity	204
Operational Cost (2022)	\$2,807,000 per year
Capital Cost (2022)	\$6,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays
Express Lanes Use and Access	4.3 miles West Entry, Mill Road, and Van Dorn Street
Travel Time	61 minutes
Travel Time Savings	- 2 minutes



Northwest Fairfax County to King Street-Old Town (A5)

This service is **LOW** scoring and would connect Tysons and Old Town Alexandria with peak-focused directional service (AM to Alexandria and PM to Tysons).

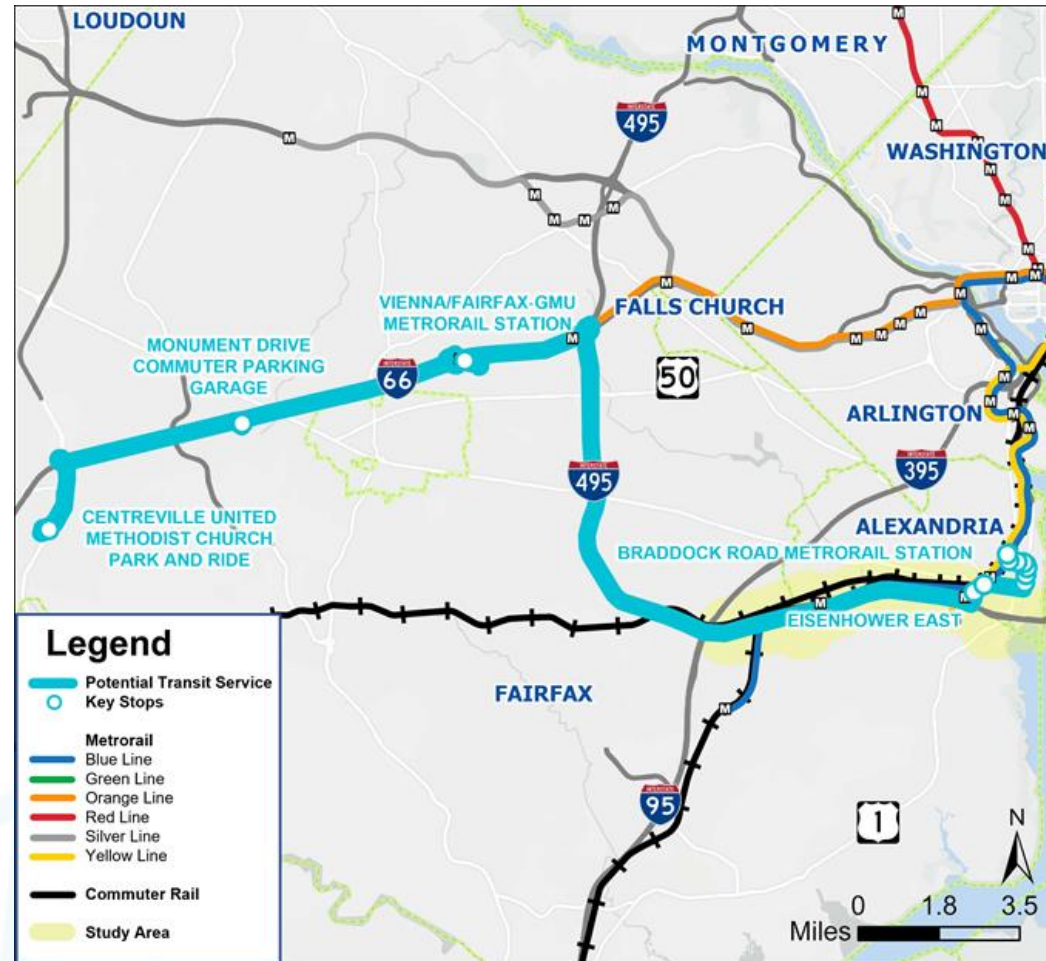
A5	
From	Northwest Fairfax County
To	King Street-Old Town
Via	Tysons Metrorail Station, Tysons West* Park Transit Station, Eisenhower East, King Street-Old Town Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Focused Directional
Headway (min.)	30 (Peak), 60 (Peak Shoulder)
Total Population (2045)	198,500 people
Total Jobs (2045)	32,400 jobs
Trip Potential (2045)	100 Peak Trips
Transit Propensity	60
Operational Cost (2022)	\$878,000 per year
Capital Cost (2022)	\$5,000,000
Facilities - Origin	No parking facilities
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry and Mill Road
Travel Time	48 minutes
Travel Time Savings	+ 5 minutes



Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area (A6/7)

This service is **HIGH** scoring and would connect the I-66 corridor, Eisenhower East, and Old Town Alexandria with peak-focused directional service (AM to Alexandria and PM to Centreville).

A6/7	
From	Central-West Fairfax County
To	Carlyle-Eisenhower East and Braddock Road Metro Area
Via	Centreville United Methodist Church Park and Ride, Monument Drive Commuter Parking Garage, Vienna/Fairfax-GMU Metrorail Station, Eisenhower East, Braddock Road Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Focused Directional
Headway (min.)	30 (Peak), 60 (Peak Shoulder)
Total Population (2045)	336,700 people
Total Jobs (2045)	53,700 jobs
Trip Potential (2045)	320 Peak Trips
Transit Propensity	173
Operational Cost (2022)	\$1,497,000 per year
Capital Cost (2022)	\$9,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry and Mill Road
Travel Time	76 minutes
Travel Time Savings	+ 6 minutes



Southwest Prince George's County to Capitol Riverfront (A9)

This service is **HIGH** scoring and would connect Clinton, Camp Springs, and Oxon Hill, MD, and Navy Yard in DC with peak-focused directional service (AM to DC and PM to Clinton).

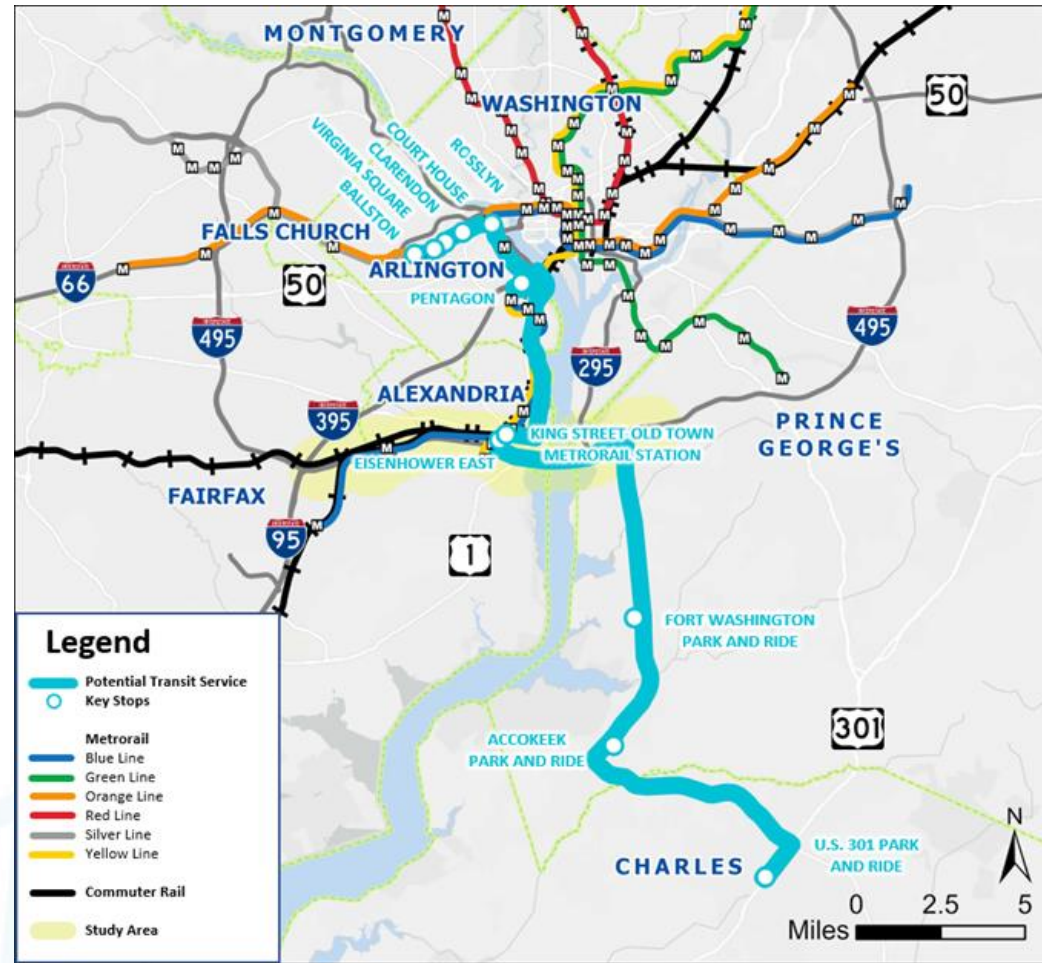
A9	
From	Southwest Prince George's County
To	Capitol Riverfront
Via	Clinton Park and Ride, Padgett's Corner Shopping Center, Rosecroft Shopping Center, Navy Yard-Ballpark Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Focused Directional
Headway (min.)	30 (Peak), 60 (Peak Shoulder)
Total Population (2045)	164,400 people
Total Jobs (2045)	76,200 jobs
Trip Potential (2045)	2,460 Peak Trips
Transit Propensity	183
Operational Cost (2022)	\$878,000 per year
Capital Cost (2022)	\$5,000,000
Facilities - Origin	Available park and ride spaces but potential future constraint
Facilities - Destination	On-street location
Express Lanes Use and Access	None
Travel Time	50 minutes
Travel Time Savings	+ 3 minutes



North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor (A10/11)

This service is **HIGH** scoring and would connect Waldorf, Accokeek, and Fort Washington, MD and Alexandria and Arlington, VA with peak-focused directional service (AM to Arlington and PM to Waldorf).

A10/11	
From	North Charles and Southwest Prince George's Counties
To	Rosslyn-Ballston Corridor
Via	U.S. 301 Park and Ride, Accokeek Park and Ride, Fort Washington Park and Ride, Eisenhower East, Pentagon Metrorail Station, Rosslyn, Court House, Clarendon, Virginia Square, Ballston
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Focused Directional
Headway (min.)	30 (Peak), 60 (Peak Shoulder)
Total Population (2045)	146,200 people
Total Jobs (2045)	189,500 jobs
Trip Potential (2045)	1,820 Peak Trips
Transit Propensity	96
Operational Cost (2022)	\$2,015,000 per year
Capital Cost (2022)	\$11,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays
Express Lanes Use and Access	4.0 miles Mill Road and MD-210
Travel Time	105 minutes
Travel Time Savings	+ 5 minutes



Northwest Fairfax County to Braddock Road Metro Area and Potomac Yard (A12/14)

This service is **LOW** scoring and would connect Tysons, Old Town Alexandria, and Potomac Yard with peak directional service (AM to Alexandria and PM to Tysons).

A12/14	
From	Northwest Fairfax County
To	Braddock Road Metro Area and Potomac Yard
Via	Tysons Metrorail Station, Braddock Road Metrorail Station, Potomac Yard Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	30 (Peak)
Total Population (2045)	183,500 people
Total Jobs (2045)	36,800 jobs
Trip Potential (2045)	170 Peak Trips
Transit Propensity	55
Operational Cost (2022)	\$878,000 per year
Capital Cost (2022)	\$6,000,000
Facilities - Origin	No parking facilities
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry and Mill Road
Travel Time	61 minutes
Travel Time Savings	+ 14 minutes



Northwest Fairfax County to Carlyle-Eisenhower East (A13)

This service is **MODERATE** scoring and would connect Tysons, Eisenhower East, and Old Town Alexandria with peak directional service (AM to Alexandria and PM to Tysons).

A13	
From	Northwest Fairfax County
To	Carlyle-Eisenhower East
Via	Tysons Metrorail Station, Tysons West*Park Transit Station, Eisenhower East, King Street-Old Town Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	30 (Peak)
Total Population (2045)	183,500 people
Total Jobs (2045)	32,400 jobs
Trip Potential (2045)	90 Peak Trips
Transit Propensity	55
Operational Cost (2022)	\$534,000 per year
Capital Cost (2022)	\$4,000,000
Facilities - Origin	No parking facilities
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry and Mill Road
Travel Time	32 minutes
Travel Time Savings	- 1 minute



Southeast Prince George's County to King Street-Old Town (A15)

This service is **LOW** scoring and would connect Clinton, MD with Old Town Alexandria with peak directional service (AM to Alexandria and PM to Clinton).

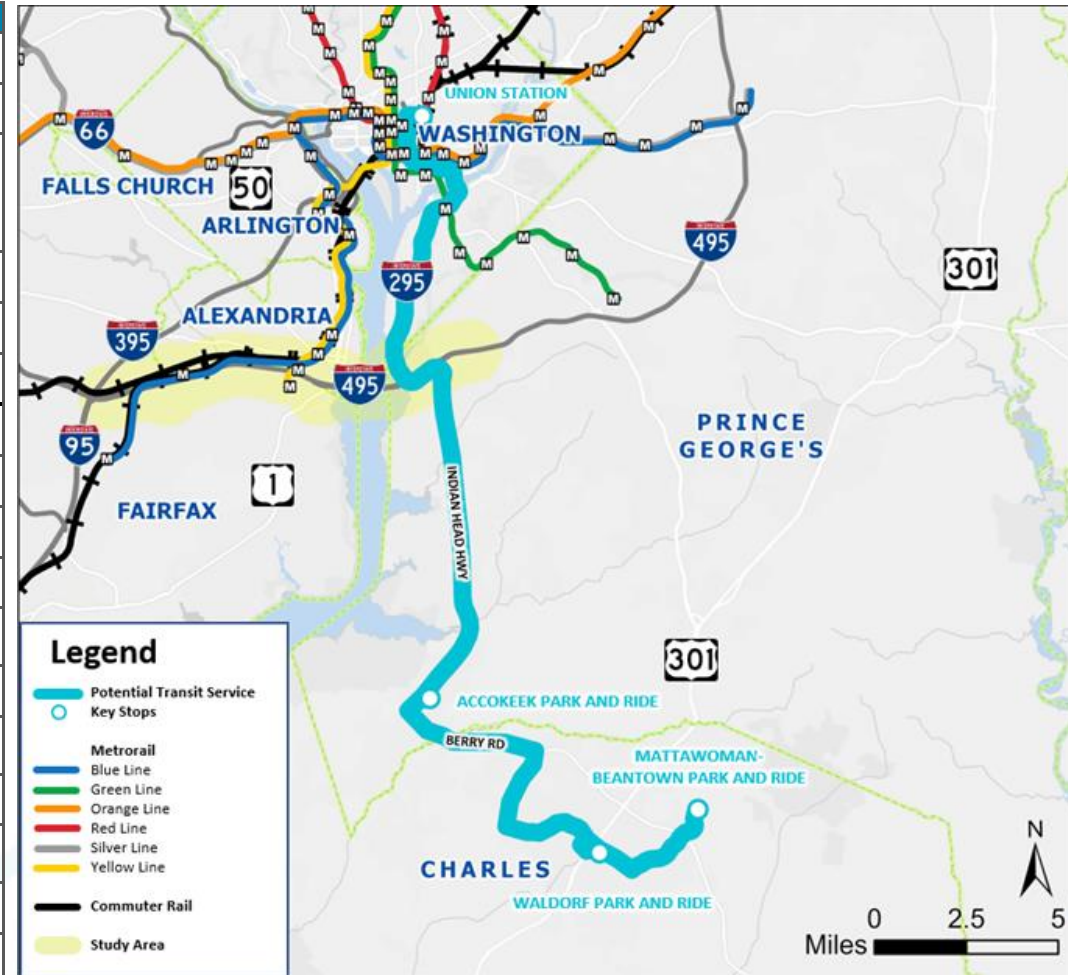
A15	
From	Southeast Prince George's County
To	King Street-Old Town
Via	Clinton Park and Ride, Eisenhower East, King Street-Old Town Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	30 (Peak)
Total Population (2045)	48,800 people
Total Jobs (2045)	32,400 jobs
Trip Potential (2045)	30 Peak Trips
Transit Propensity	47
Operational Cost (2022)	\$534,000 per year
Capital Cost (2022)	\$4,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.8 miles West Entry and Mill Road
Travel Time	30 minutes
Travel Time Savings	- 3 minutes



North Charles County to NoMa (A16)

This service is **MODERATE** scoring and would connect Waldorf and Accokeek, MD with NoMa/Union Station in DC with peak directional service (AM to DC and PM to Waldorf).

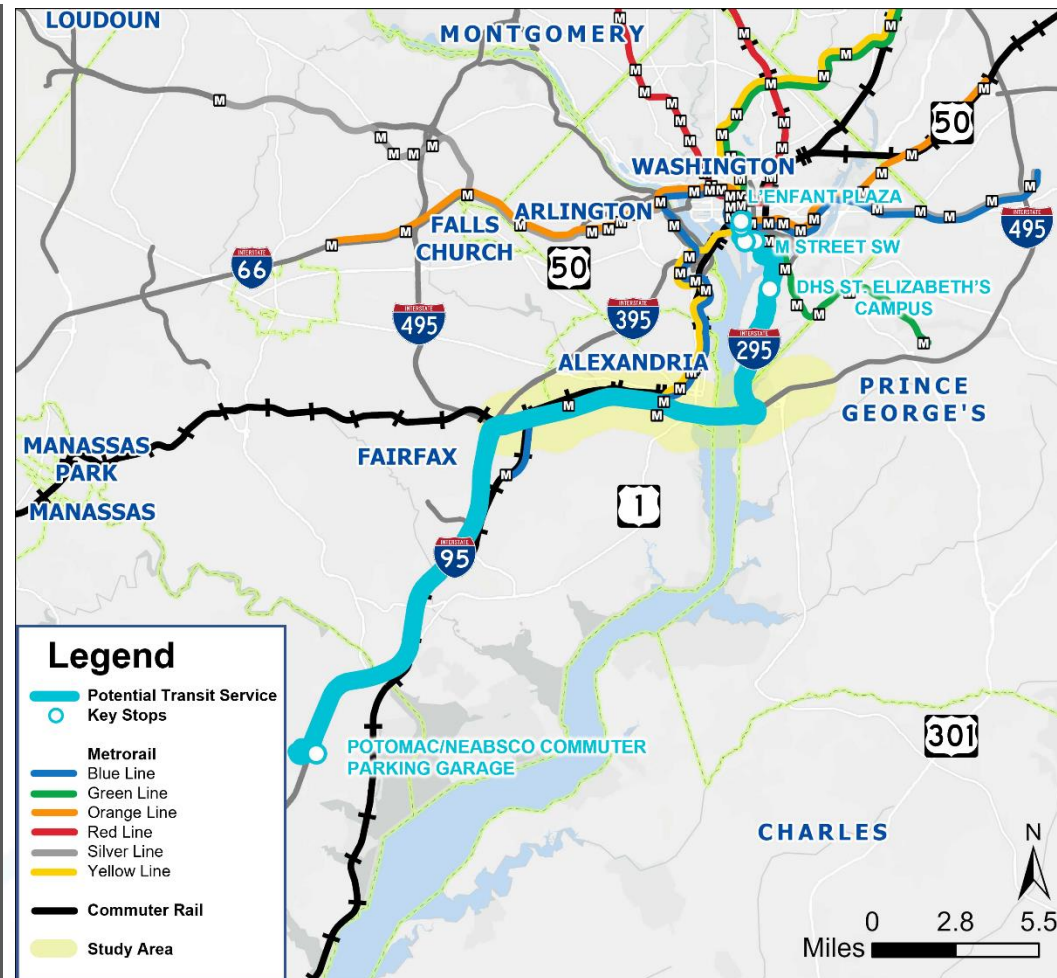
A16	
From	North Charles County
To	NoMa
Via	Mattawoman-Beantown Park and Ride, Waldorf Park and Ride, Accokeek Park and Ride, Union Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	30 (Peak)
Total Population (2045)	133,400 people
Total Jobs (2045)	93,200 jobs
Trip Potential (2045)	1,260 Peak Trips
Transit Propensity	76
Operational Cost (2022)	\$1,050,000 per year
Capital Cost (2022)	\$8,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays
Express Lanes Use and Access	None
Travel Time	72 minutes
Travel Time Savings	0 minutes



East Prince William County to Southwest Waterfront (A17)

This service is **HIGH** scoring and would connect east Prince William County/I-95 corridor, DHS St. Elizabeth's Campus, and southwest DC with peak directional service (AM to DC and PM to Prince William County).

A17	
From	East Prince William County
To	Southwest Waterfront
Via	Potomac/Neabsco Commuter Parking Garage, DHS St. Elizabeth's Campus, M Street SW, L'Enfant Plaza
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	30 (Peak)
Total Population (2045)	142,500 people
Total Jobs (2045)	132,300 jobs
Trip Potential (2045)	1,090 Peak Trips
Transit Propensity	101
Operational Cost (2022)	\$878,000 per year
Capital Cost (2022)	\$6,000,000
Facilities - Origin	Available park and ride spaces (future)
Facilities - Destination	On-street location
Express Lanes Use and Access	7.2 miles West Entry and I-295
Travel Time	54 minutes
Travel Time Savings	- 14 minutes



Central-West Fairfax County to Landmark-Van Dorn (A18)

This service is **MODERATE** scoring and would connect the Braddock Road corridor, Van Dorn Street, and West End Alexandria with all-day bidirectional service.

A18	
From	Central-West Fairfax County
To	Landmark-Van Dorn
Via	Parkwood Baptist Church Park and Ride/ Braddock Road, Van Dorn Street Metrorail Station, West End Alexandria
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	30 (Peak), 60 (Off-Peak)
Total Population (2045)	131,300 people
Total Jobs (2045)	11,500 jobs
Trip Potential (2045)	170 Peak Trips
Transit Propensity	79
Operational Cost (2022)	\$1,756,000 per year
Capital Cost (2022)	\$4,000,000
Facilities - Origin	Available park and ride spaces but potential future constraint
Facilities - Destination	Future transit hub
Express Lanes Use and Access	0.7 miles West Entry and Van Dorn Street
Travel Time	31 minutes
Travel Time Savings	+ 1 minute



Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield (A19/20)

This service is **HIGH** scoring and would connect Huntington, Van Dorn Street and Dunn Loring/Merrifield with all-day bidirectional service.

A19/20	
From	Southeast Fairfax County and Alexandria
To	Dunn Loring-Merrifield
Via	Huntington Metrorail Station, Van Dorn Street Metrorail Station, Gallows Road, Dunn Loring-Merrifield Metrorail Station
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	30 (Peak), 60 (Off-Peak)
Total Population (2045)	362,400 people
Total Jobs (2045)	39,500 jobs
Trip Potential (2045)	560 Peak Trips
Transit Propensity	204
Operational Cost (2022)	\$2,462,000 per year
Capital Cost (2022)	\$6,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays
Express Lanes Use and Access	4.3 miles West Entry, Mill Road, and Van Dorn Street
Travel Time	51 minutes
Travel Time Savings	- 2 minutes



Central-West Prince George's County to Tysons (A21)

This service is **MODERATE** scoring and would connect Branch Avenue, Eisenhower, and Tysons with all-day bidirectional service.

A21	
From	Central-West Prince George's County
To	Tysons Area
Via	Branch Avenue Metrorail Station, Eisenhower Metrorail Station, Spring Hill Metrorail Station, Jones Branch Drive
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	30 (Peak), 60 (Off-Peak)
Total Population (2045)	114,100 people
Total Jobs (2045)	145,000 jobs
Trip Potential (2045)	240 Peak Trips
Transit Propensity	129
Operational Cost (2022)	\$3,168,000 per year
Capital Cost (2022)	\$8,000,000
Facilities - Origin	Available park and ride spaces but potential future constraint
Facilities - Destination	Available bus bays
Express Lanes Use and Access	8.3 miles East Entry, Mill Road, West Entry
Travel Time	64 minutes
Travel Time Savings	- 21 minutes



Transit Facility Summary

Transit facility summary tables for the preliminary transit recommendations are shown in **Appendix D: Preliminary Transit Recommendation Evaluation**. Needs were revisited after on-model evaluation and recommendation refinement as described in the **Transit Refined Recommendations** section.

New transit services will require facility availability to operate efficiently and provide the most reliable experience for riders. For origin facilities, existing park and ride lots (including Metrorail parking areas, shopping centers, designated commuter lots, and churches) as well as future planned facilities were selected for evaluation based on the number of available parking spaces and typical occupancy, if available. Locations that were anticipated to reach capacity in the future were flagged as potential future facility needs.

In addition, destination facilities for new transit services were evaluated based on availability of bus bays at terminus locations. Most destination locations would be at Metrorail station bus loops; however, some would be existing on-street locations such as commuter bus stops in Washington, DC. Required capacity was calculated using the buses per hour that would operate on each of the recommended routes using the locations as a terminus location. Available capacity was calculated by considering bus bay assignments for transit services already using the facility and a maximum capacity of six buses per hour per bus bay. The availability per bus bay (if an individual bay is under capacity) was added to produce a total available bus capacity per hour at each facility. Locations that may experience capacity constraints in the future with new services were flagged as a potential facility need. This analysis did not consider capacity used by recommended transit routes that serve these facilities as interim stops because the time duration would be less than that needed for an end of line (EOL) layover.

Transit Demand Forecasting

This section summarizes the results of demand forecasting on the potential transit recommendations. To develop forecasts for transit services along the I-495 Southside study corridor, the MWCOG Travel Demand Forecasting Model (version 2.4, released March 15, 2021) was used to develop the regional demand and ridership forecasts in the study corridor. While this section includes basic information about the travel model, more detailed information is available from the MWCOG website.⁹

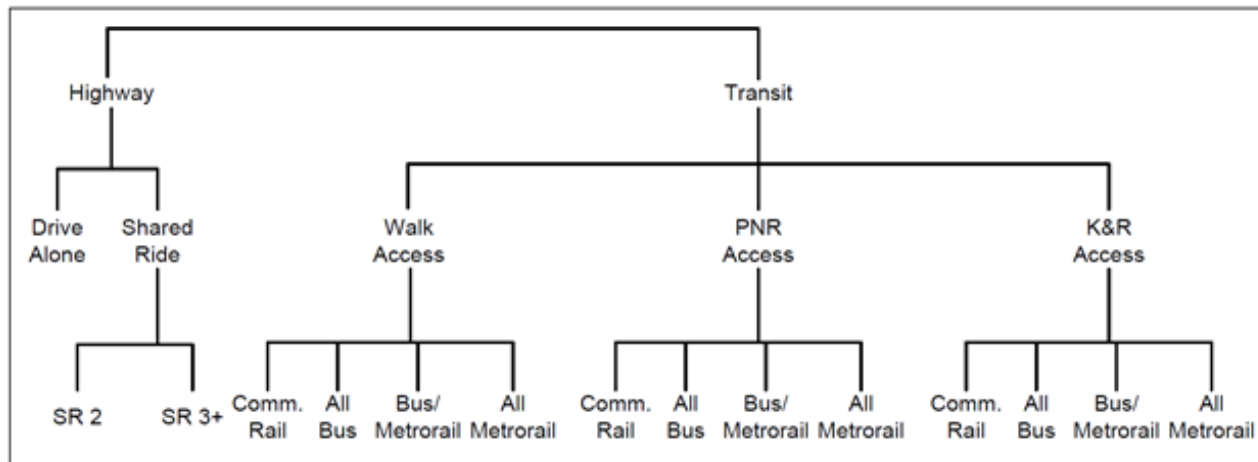
The MWCOG regional travel demand model is a state-of-the-practice, four-step regional travel demand model, similar to models used across the country for air-quality analysis and travel forecasting. The four-step process includes trip generation, trip distribution, mode choice, and traffic assignment. A simplistic description of the modeling process is described below. In practice, the regional travel forecasting model process is made up of dozens of individual models comprising hundreds of model parameters, variables, and assumptions applied through feedback loops in order to determine the future year transportation forecasts.

- **Trip generation** applies historic trip making patterns from household travel surveys and other sources to determine how many trips are generated or attracted to areas (called zones) based on the land use properties and socioeconomic data of those zones such as population, households, and employment. The number of trips is developed by trip purpose which include work, shopping, and other.
- **Trip distribution** uses household survey and census information to determine the trip patterns and distribution between geographic areas in the region by trip purpose. This develops the relationship between the trip productions and attractions developed in trip generation and turns the trip ends into combined trips.
- **Mode choice** models use probabilistic functions to calculate how people travel between areas, by using travel times, distances, and costs for the various highway and transit modes for the different trip purposes. Mode choice models develop the mode percentage for every trip out of trip distribution. The MWCOG model calculates each mode through a nest-logit model. The modes are “nested” or grouped together as sets of choices and are shown in **Figure 48** from the MWCOG Regional Model Users Guide. The modes include drive alone, shared ride, commuter rail, Metrorail, all bus, and bus/Metrorail trips.
- **Traffic assignment** (or trip assignment) physically assigns the trips between areas to specific roads and transit routes. For highway trips, the trip time and cost are minimized for each origin and destination. As the number of trips on a facility increases so does the congestion, resulting in reduced speeds and increased travel times. Through the feedback process of the model, this alters the trip generation, distribution, and mode choice models as well. Transit assignment has no congestion component. Transit trips are assigned to the best transit path for the different mode combinations available between the

⁹<https://www.mwcog.org/transportation/data-and-tools/modeling/current-model/>

zones, allowing us to see where the boardings and alightings take place and how many passengers are on the bus or train at a particular point.

Figure 48. MWCOG Travel Demand Forecasting Mode Choice Nesting Structure



Methodology

This study utilized the base MWCOG zonal demographic forecasts and the transportation (highway and transit) networks inputs to the model with minor modification. The validated 2019 base model and 2045 No-Build model from the VDOT I-495 Southside Express Lanes Study were used as a starting point for forecasting and for consistency with the VDOT study.

MWCOG maintains Cooperative Land Use forecasts which are updated regularly for all member jurisdictions. The forecast land use data from Round 9.1a were applied without modification for this analysis. MWCOG staff also maintains the transportation network for the constrained long-range plan (CLRP) for various years. The demand forecasting for this analysis was conducted using the 2045 model inputs. The regional model includes all the transportation network improvements in the region, including critical projects near the study corridor such as the Richmond Highway BRT. On the highway side, regionally significant highway improvements are included in the transportation networks.

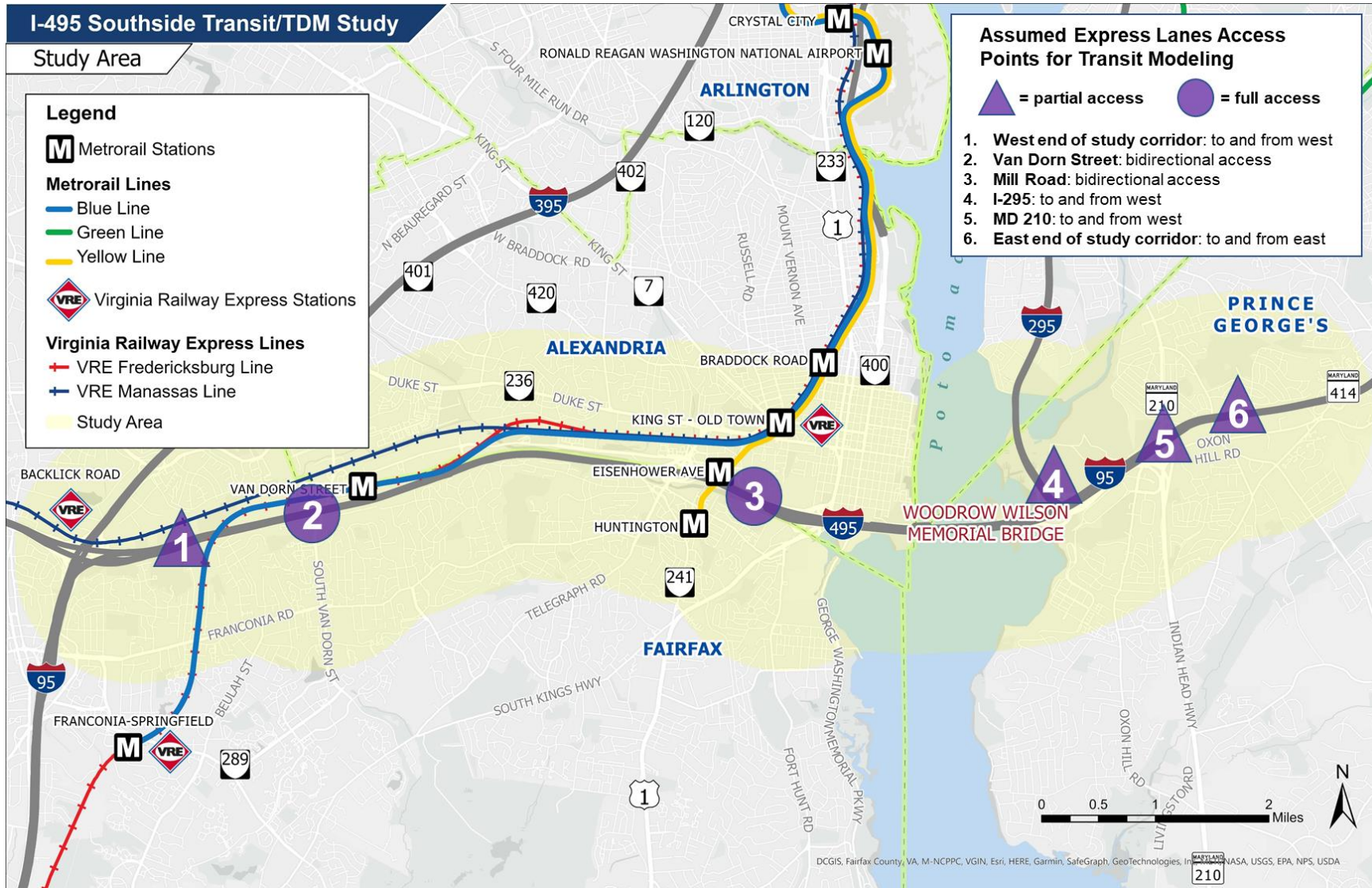
The study team modified the transportation networks in the I-495 Southside corridor to best represent an assumed configuration of Express Lanes and access points. This consisted of the addition of two Express Lanes in each direction between the I-95/I-395/I-495 interchange and the MD 210 interchange with access at the following locations (see **Figure 49**):

- **West end of study corridor:** to and from west
- **Van Dorn Street:** bidirectional access
- **Mill Road:** bidirectional access
- **I-295:** to and from west
- **MD 210:** to and from west
- **East end of study corridor:** to and from east

Toll factors in the model were iteratively set for the Express Lanes links to maximize throughput and reach similar volume to capacity ratios as the existing I-495 Express Lanes.

While modeling assumptions were coordinated with VDOT using the best available information at the time, the final project development decisions were still to be analyzed and determined. In coordination with VDOT, additional analysis was conducted to identify impacts to transit routing from various interchange access options in Alexandria as described in **Appendix G: Alternative Interchange Access**.

Figure 49. Assumed I-495 Southside Express Lanes Access Points for Transit Modeling



Results

The group of preliminary transit recommendations was coded, tested, and run through the MWCOG model to determine the specifics of the productions and attractions of the stops on the routes and how the run times and frequencies impact the ridership forecasts. The model runs were first conducted on the preliminary transit recommendations that had a high or moderate rating from the off-model evaluation. Results from the off-model evaluation, preliminary on-model evaluation, and feedback from TAC members were used to iterate and develop a set of refined transit recommendations. Additional model runs were conducted to assist in refining the recommendations.

Intended Use and Limitations of Modeling

The ridership forecasts developed in this study are meant to be relative to each other more than absolute values of passengers making specific trips due to the aggregate nature of the regional modeling process. The models within the MWCOG regional demand forecasting model are developed based on household travel survey information and are calibrated and validated to transit sub-mode trips—but not to individual lines. MWCOG validated its version 2.4 model to year 2014 highway and transit observed data. The validation showed that the model was within 4% of total transit trips with bus being 10% high and Metrorail 1% high. Estimated commuter rail trips were 40% lower than observed. The MWCOG model documentation advises caution about using the detailed model results as it is below the level of validation; however, there is no other existing tool to gain practical insight to the relative performance of the proposed transit routes. More detailed examination of the performance of the model on existing routes in the study corridor and model refinements that are not possible within the scope and schedule of this study would be required to use the model outputs as absolute ridership values. These ridership values were intended to provide another source for planning-level demand or trip potential information.

Impact to Vehicles in Study Corridor

With the inclusion of the refined transit recommendations by 2045, the share of daily non-SOV person trips would increase by around 0.5% across various cutlines in the study corridor compared to a scenario of only express lanes (see **Figure 48**). Furthermore, the number of daily non-SOV trips in the corridor would increase by 1% to 2% depending on location. Much of this change is attributed to increased bus trips. With the implementation of the refined transit recommendations, the model estimates that approximately 52% of the person trips across the Woodrow Wilson Bridge would be non-SOV trips. The share of bus trips is greatest in the segment east of I-295 in Maryland due to the relatively high ridership forecasted on the services connecting north to DC and Arlington and west to Alexandria and Tysons.

Summary of Results

The ridership projections for the preliminary and refined transit recommendations are shown in **Table 28** and **Table 29**. Profiles of each transit route and ridership forecasting results are presented in **Appendix E: Refined Transit Recommendation Evaluation**. Results shown in **Table 28** are based on the initial operating assumptions of the preliminary transit recommendations and tend to be more conservative with lower frequency service. The results presented in **Table 29** reflect more aggressive service policy and refined transit recommendations.

Table 28. Travel Demand Ridership by Route for Preliminary Transit Recommendations

Preliminary Route	Route Description	Directionality	Headway (minutes)	Run Time (minutes)	2045 Daily Ridership	Average Riders per Bus	Average Cost per Rider ¹
A1	Central-West Fairfax County to King Street-Old Town	All-Day Bidirectional	30 (Peak), 60 (Off-Peak)	25	125	3	\$33
A2.3	North Charles County to DC Core	Off-Peak Directional	60 (Off-Peak)	98	125	31	\$11
A4/8	Alexandria to Tysons Area	All-Day Bidirectional	30 (Peak), 60 (Off-Peak)	53	1,175	24	\$9
A6/7	Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area	Peak-Focused Directional	30 (Peak), 60 (Peak Shoulder)	76	300	15	\$17
A9	Southwest Prince George's County to Capitol Riverfront	Peak-Focused Directional	30 (Peak), 60 (Peak Shoulder)	50	950	48	\$4
A10/11	North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor	Peak-Focused Directional	30 (Peak), 60 (Peak Shoulder)	105	1,875	94*	\$4
A13	Northwest Fairfax County to Carlyle-Eisenhower East	Peak-Only Directional	30 (Peak)	32	125	8	\$17
A16	North Charles County to NoMa	Peak-Only Directional	30 (Peak)	72	1,150	72	\$4
A17	East Prince William County to Southwest Waterfront	Peak-Only Directional	30 (Peak)	54	100	6	\$34
A18	Central-West Fairfax County to Landmark-Van Dorn	All-Day Bidirectional	30 (Peak), 60 (Off-Peak)	31	50	1	\$138
A19/20	Southeast Fairfax County/Alexandria to Dunn Loring-Merrifield	All-Day Bidirectional	30 (Peak), 60 (Off-Peak)	51	600	13	\$14
A21	Central-West Prince George's County to Tysons Area	All-Day Bidirectional	30 (Peak), 60 (Off-Peak)	64	1,875	39	\$6
ALL					8,450	24	\$8

¹Based on planning-level operational cost (2022) and does not consider potential fare revenue

*Potential capacity constraints. Opportunities for greater levels of service

Table 29. Travel Demand Ridership by Route for Refined Transit Recommendations

Refined Route	Route Description	Directionality	Headway (minutes)	Run Time (minutes)	2045 Daily Ridership	Average Riders per Bus	Average Cost per Rider ¹
A2.3	North Charles County to DC Core	Off-Peak Directional	40 (Off-Peak)	98	300	50	\$7
A4/8	Alexandria to Tysons Area	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	49	550	8	\$23
A6/7	Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area	Peak-Focused Directional	20 (Peak), 40 (Peak Shoulder)	76	675	23	\$12
A9	Southwest Prince George's County to Capitol Riverfront	Peak-Focused Directional	20 (Peak), 40 (Peak Shoulder)	50	2,375	79	\$3
A10/11	North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor	Peak-Focused Directional	20 (Peak), 40 (Peak Shoulder)	90	2,825	94*	\$3
A13	Northwest Fairfax County to Carlyle-Eisenhower East	Peak-Only Directional	20 (Peak)	40	300	13	\$11
A16	North Charles County to NoMa	Peak-Only Directional	20 (Peak)	72	1,375	57	\$5
A17	East Prince William County to Southwest Waterfront	Peak-Only Directional	20 (Peak)	54	400	17	\$12
A19/20	Southeast Fairfax County/ Alexandria to Dunn Loring-Merrifield	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	46	625	9	\$20
A21.0	Central-West Prince George's County to Tysons Area (via Eisenhower)	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	54	1,275	18	\$11
A21.1	Central-West Prince George's County to Tysons Area (via Oxon Hill)	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	54	1,875	26	\$7
ALL					12,575	28	\$7

¹Based on planning-level operational cost (2022) and does not consider potential fare revenue

*Potential capacity constraints. Opportunities for greater levels of service

Summary of Findings by Route

Table 30 summarizes on-model evaluation findings and how they were used in the recommendation refinement process.

Table 30. Summary of Findings by Route

Route	Takeaways
A1: Central-West Fairfax County to King Street-Old Town	<ul style="list-style-type: none"> • Low relative ridership • Not recommended to advance • Alternative travel options available via VRE and planned improvements to Fairfax Connector for connections to Franconia-Springfield Metrorail Station
A2.3: North Charles County to DC Core	<ul style="list-style-type: none"> • Low relative ridership • Improved headways showed ridership and productivity benefits
A4/8: Alexandria to Tysons	<ul style="list-style-type: none"> • High relative ridership • Reducing circulation in Tysons resulted in lower ridership even with increased service levels • Recommend alignment remains as previously shown in preliminary recommendation for additional connection opportunities in Tysons
A6/7: Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area	<ul style="list-style-type: none"> • Moderate relative ridership • Improved headways showed ridership and productivity benefits
A9: Southwest Prince George's County to Capitol Riverfront	<ul style="list-style-type: none"> • High relative ridership • Improved headways and additional connection to Oxon Hill Park and Ride showed significant ridership and productivity benefits
A10/11: North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor	<ul style="list-style-type: none"> • High relative ridership • Small portion of riders continue west past Rosslyn • Improved headways and truncated route at Rosslyn showed ridership benefits and similar productivity
A13: Northwest Fairfax County to Carlyle-Eisenhower East	<ul style="list-style-type: none"> • Low relative ridership • Improved headways and modified connections in Tysons showed ridership and productivity benefits

Route	Takeaways
A16: North Charles County to NoMa	<ul style="list-style-type: none"> • High relative ridership • Improved headways and additional connection to Oxon Hill Park and Ride showed increased ridership but lower productivity • Recommend refined route advance given connectivity benefits
A17: East Prince William County to Southwest Waterfront	<ul style="list-style-type: none"> • Low relative ridership • DHS/St. Elizabeth's is a primary destination while few trips travel the full length from Prince William County to L'Enfant Plaza given alternative commuter bus and rail options • Demand also anticipated between DHS and DC destinations • Improved headways showed ridership and productivity benefits
A18: Central-West Fairfax County to Landmark-Van Dorn	<ul style="list-style-type: none"> • Low relative ridership • Not recommended to advance • Alternative travel options available via VRE, planned improvements to Fairfax Connector for connections to Franconia-Springfield Metrorail Station, and the Alexandria West End Transitway
A19/20: Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield	<ul style="list-style-type: none"> • Moderate relative ridership • Improved headways and realignment to I-495 Express Lanes ramps at US 29 did not show ridership and productivity benefits • Recommend alignment remain as previously shown in preliminary recommendation for additional connection opportunities along Gallows Road
A21.0/1: Central-West Prince George's County to Tysons	<ul style="list-style-type: none"> • High relative ridership • Improved headways, reduced circulation in Tysons, and second route pattern with a connection to Oxon Hill Park and Ride showed a net increase in ridership but slight decrease in productivity. • Recommend refined route(s) advance given connectivity benefits

The results from the demand forecasting model need to be understood within the context of the accuracy of the regional demand forecasting model for individual corridors and route options. The information provided generally aligns with the off-model trip potential analysis and provided valuable input to the recommendation refinement process. Ridership is only one of many factors which contribute to the success of a route.

The study team took the model results and further evaluated the refined recommendations in the next steps of the study. A final set of model runs was conducted to assess the ridership forecasted to result in a suite of near-term, mid-term, and long-term investment packages as summarized in **Section VIII. Potential Investment Packages**. The aggregate benefits of the final investment packages were summarized in terms of their potential effectiveness by recommendation and overall benefits of each investment package.

Transit Refined Recommendations

Recommendation Refinement

The following is a summary of the outcomes of the transit recommendation refinement process. Based on TAC input, levels of service for the refined transit recommendations were increased to provide 20-minute frequency during peak periods and 40-minute frequency during off-peak periods.

Preliminary recommendations screened out due to low score in off-model assessment:

- **A2.1—North Charles County to DC Core**
- **A2.2—North Charles County to DC Core**
- **A5—Northwest Fairfax County to King Street-Old Town**
- **A12/14—Northwest Fairfax County to Braddock Road Metro Area and Potomac Yard**
- **A15—Southeast Prince George's County to King Street-Old Town**

Preliminary recommendations screened out due to low ridership in on-model assessment:

- **A1—Central-West Fairfax County to King Street-Old Town**
- **A18—Central-West Fairfax County to Landmark-Van Dorn**

Preliminary recommendations carried forward into refined recommendations:

- **A2.3—North Charles County to DC Core:** increase frequency
- **A4/8—Alexandria to Tysons:** modify alignment in Tysons and increase frequency. *After reassessing, it was recommended that the alignment revert to the preliminary recommendation alignment which included additional connections in Tysons.*
- **A6/7—Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area:** increase frequency
- **A9—Southwest Prince George's County to Capitol Riverfront:** add connection to Oxon Hill Park and Ride and increase frequency
- **A10/11—North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor:** modify alignment in Arlington to end at Rosslyn and increase frequency
- **A13—Northwest Fairfax County to Carlyle-Eisenhower East:** modify alignment in Tysons and increase frequency
- **A16—North Charles County to NoMa:** add connection to Oxon Hill Park and Ride and increase frequency
- **A17—East Prince William County to Southwest Waterfront:** increase frequency

- **A19/20—Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield:** modify alignment in Merrifield and increase frequency. *After reassessing, it was recommended that the alignment revert to the preliminary recommendation alignment which included additional connections along Gallows Road.*
- **A21.0/1—Central-West Prince George's County to Tysons:** modify alignment in Tysons, increase frequency, and include two route patterns—one with an intermediate stop at Eisenhower Metrorail station and the other at Oxon Hill Park and Ride

The refined transit recommendations were reassessed using off-model and on-model evaluation processes. Like the preliminary evaluation, recommendations were scored for each metric by applying a weight and assigning points by comparing each metric for each route to the same metrics for all other routes. For quantitative metrics such as population, transit propensity, and travel time savings, points were assigned based on the number of standard deviations away from the mean of all the values for the given metric. For qualitative metrics, descriptors (very low, low, average, high, and very high) were applied, which translated into one through five points, respectively. All the weighted points for each metric were then tabulated and added together for the route to create the total score shown in **Table 31**. These scores were out of a maximum value of 100. Final ratings of **HIGH**, **MODERATE**, and **LOW** were given to the routes based on groupings of routes with similar scores.

One-page summary sheets of each of the refined transit service recommendations are included in this section. A detailed table of the metrics and scoring of all recommendations is included in **Appendix E: Refined Transit Recommendation Evaluation**.

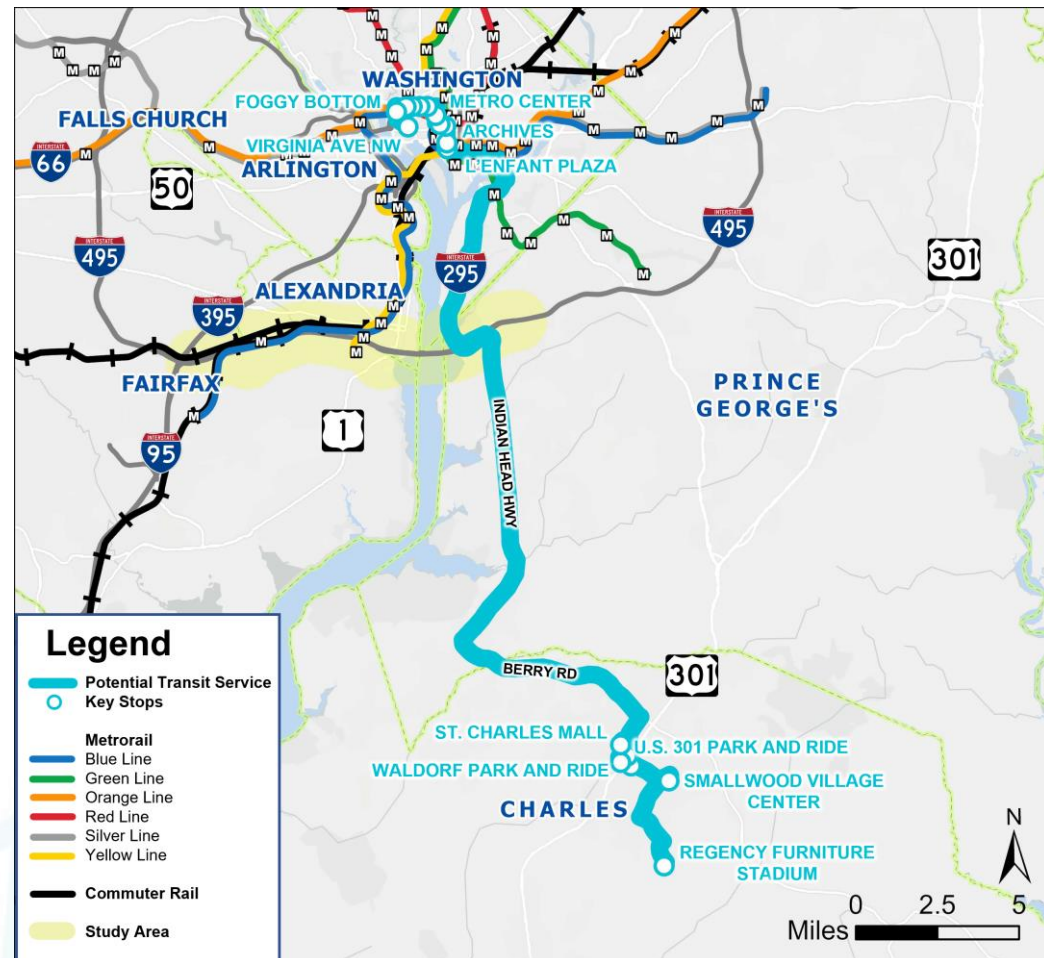
Table 31. Prioritized Refined Transit Recommendations

Off-Model Rating	Off-Model Total Score	Refined Transit Service	Potential Transit Mode	Span of Service	Headway (minutes)	2045 Daily Ridership	Average Riders per Bus
HIGH	70	Alexandria to Tysons (A4/8)	Express Bus	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	550	8
HIGH	70	Southwest Prince George's County to Capitol Riverfront (A9)	Commuter Bus	Peak-Focused Directional	20 (Peak), 40 (Peak Shoulder)	2,375	79
HIGH	70	Central-West Prince George's County to Tysons (A21.0/21.1) (via Eisenhower)	Express Bus	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	1,275	18
MODERATE	66	North Charles County to NoMa (A16)	Commuter Bus	Peak-Only Directional	20 (Peak)	1,375	57
MODERATE	66	Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield (A19/20)	Express Bus	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	625	9
MODERATE	61	East Prince William County to Southwest Waterfront (A17)	Commuter Bus	Peak-Only Directional	20 (Peak)	400	17
MODERATE	58	Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area (A6/7)	Commuter Bus	Peak-Focused Directional	20 (Peak), 40 (Peak Shoulder)	675	23
MODERATE	58	Central-West Prince George's County to Tysons (A21.0/21.1) (via Oxon Hill)	Express Bus	All-Day Bidirectional	20 (Peak), 40 (Off-Peak)	1,875	26
LOW	49	North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor (A10/11)	Commuter Bus	Peak-Focused Directional	20 (Peak), 40 (Peak Shoulder)	2,825	94
LOW	49	North Charles County to DC Core (A2.3)	Express Bus	Off-Peak Directional	40 (Off-Peak)	300	50
LOW	45	Northwest Fairfax County to Carlyle-Eisenhower East (A13)	Commuter Bus	Peak-Only Directional	20 (Peak)	300	13

North Charles County to DC Core (A2.3)

This service is **LOW** scoring and would provide off-peak service similar to MTA commuter bus lines that currently operate only during peak periods. In the refinement, headway was improved to 40 minutes from 60 minutes.

A2.3	
From	North Charles County
To	DC Core
Via	Regency Furniture Stadium, Smallwood Village Center, Waldorf Park and Ride, U.S. 301 Park and Ride, St. Charles Towne Mall, L'Enfant Plaza, Archives, Metro Center, Foggy Bottom, Virginia Avenue NW
Potential Transit Mode	Express Bus
Span of Service	Off-Peak Directional
Headway (min.)	40 (Off-Peak)
Total Population (2045)	121,800 people
Total Jobs (2045)	482,200 jobs
Trip Potential (2045)	N/A—Off-Peak Service Only
Transit Propensity	64
Operational Cost (2022)	\$534,000 per year
Capital Cost (2022)	\$8,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	On-street location
Express Lanes Use and Access	None
Travel Time	98 minutes
Travel Time Savings	+ 6 minutes



2045 Demand Forecast: 300 riders per day, 50 riders per bus

For future consideration: add connection to Oxon Hill Park and Ride/National Harbor

Alexandria to Tysons (A4/8)

This service is **HIGH** scoring and would connect Huntington, Van Dorn Street, and Tysons with all-day bidirectional service. In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and the alignment in Tysons was modified for less circulation. *Given the decrease in ridership with this change, it is recommended the alignment remain as previously shown in the preliminary recommendation to provide additional connection opportunities in Tysons.*

A4/8	
From	Alexandria
To	Tysons Area
Via	Huntington Metrorail Station, Van Dorn Street Metrorail Station, West*Park Transit Station, Spring Hill Metrorail Station
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	20 (Peak), 40 (Off-Peak)
Total Population (2045)	362,400 people
Total Jobs (2045)	73,500 jobs
Trip Potential (2045)	1,130 Peak Trips
Transit Propensity	204
Operational Cost (2022)	\$3,168,000 per year
Capital Cost (2022)	\$8,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry, Mill Road, and Van Dorn Street
Travel Time	49 minutes
Travel Time Savings	- 9 minutes

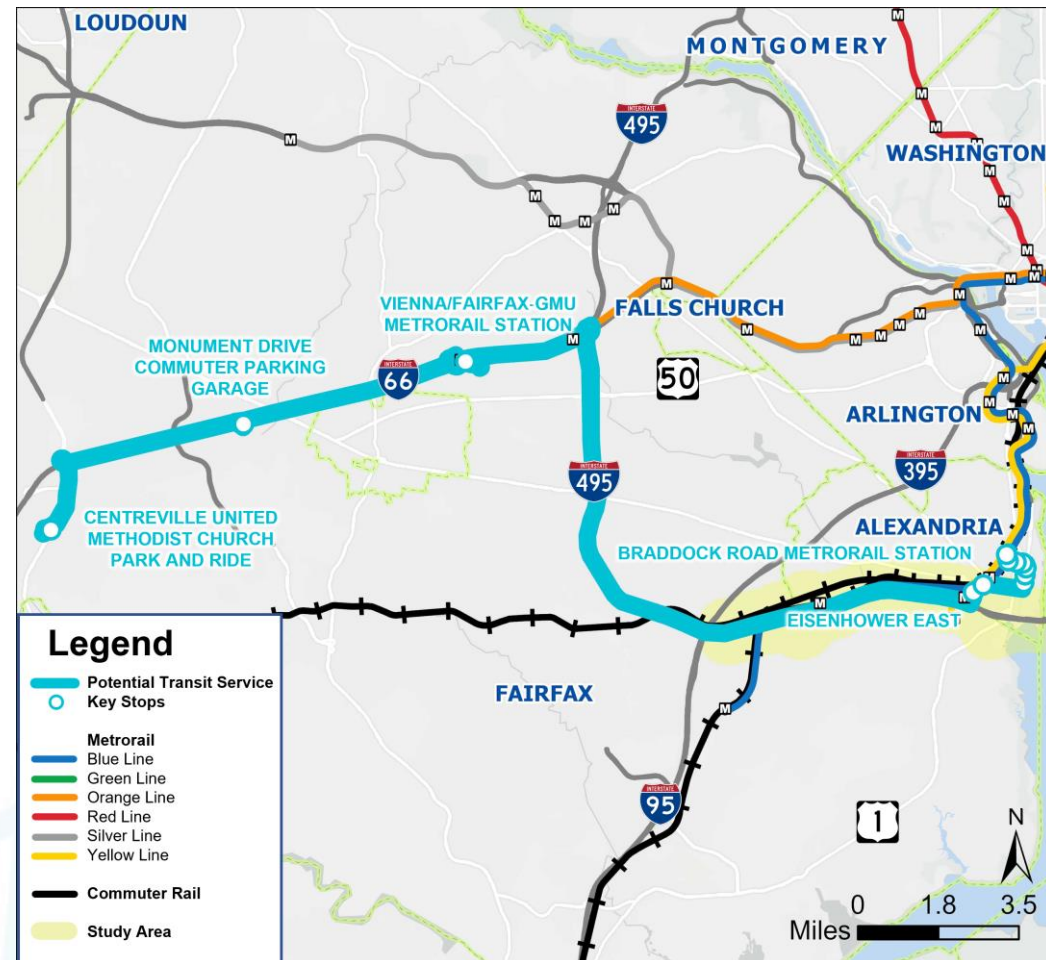


2045 Demand Forecast: 550 riders per day, 8 riders per bus

Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area (A6/7)

This service is **MODERATE** scoring and would connect the I-66 corridor, Eisenhower East, and Old Town Alexandria with peak-focused directional service (AM to Alexandria and PM to Centreville). In the refinement, headway was improved to 20/40 minutes from 30/60 minutes.

A6/7	
From	Central-West Fairfax County
To	Carlyle-Eisenhower East and Braddock Road Metro Area
Via	Centreville United Methodist Church Park and Ride, Monument Drive Commuter Parking Garage, Vienna/Fairfax-GMU Metrorail Station, Eisenhower East, Braddock Road Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Focused Directional
Headway (min.)	20 (Peak), 40 (Peak Shoulder)
Total Population (2045)	336,700 people
Total Jobs (2045)	53,700 jobs
Trip Potential (2045)	320 Peak Trips
Transit Propensity	173
Operational Cost (2022)	\$1,980,000 per year
Capital Cost (2022)	\$11,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry and Mill Road
Travel Time	76 minutes
Travel Time Savings	+ 6 minutes



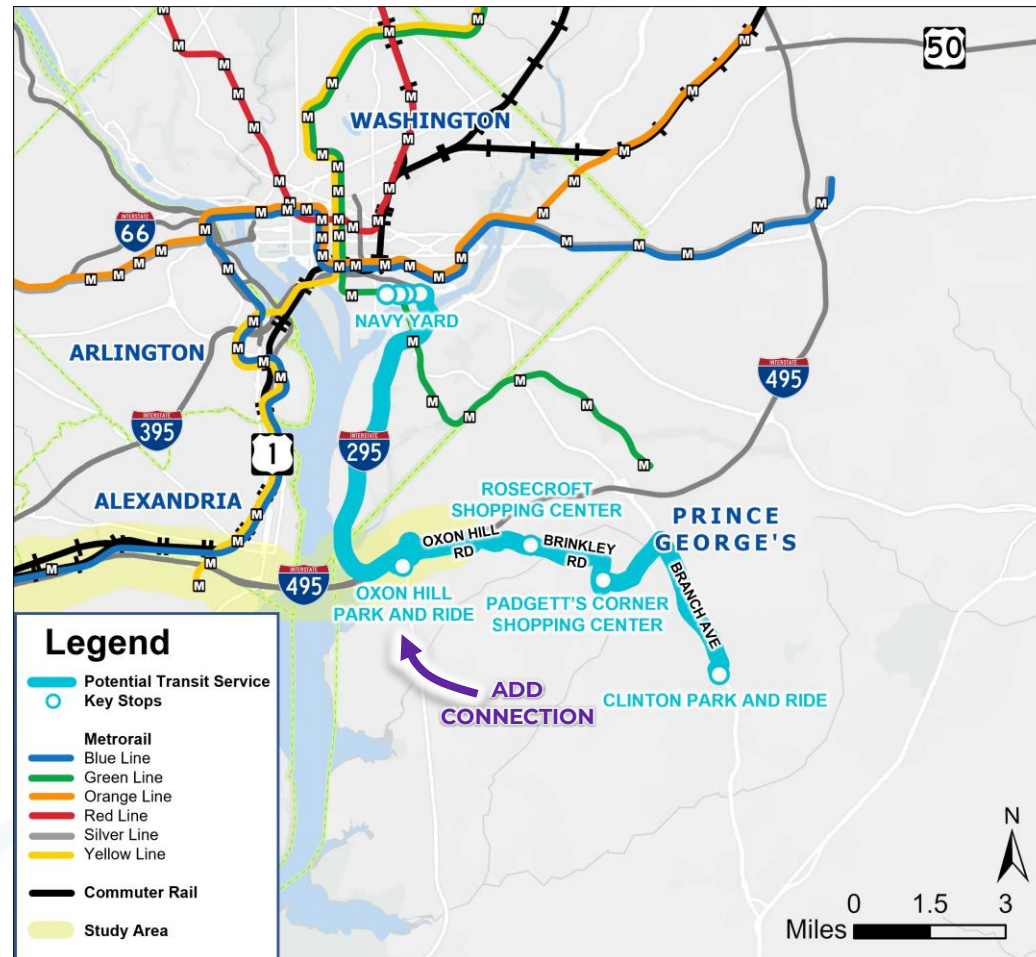
2045 Demand Forecast: 675 riders per day, 23 riders per bus

For future consideration: connection to King Street-Old Town Metrorail Station

Southwest Prince George's County to Capitol Riverfront (A9)

This service is **HIGH** scoring and would connect Clinton, Camp Springs, and Oxon Hill, MD and Navy Yard in DC with peak-focused directional service (AM to DC and PM to Clinton). In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and a connection was added to Oxon Hill Park and Ride.

A9	
From	Southwest Prince George's County
To	Capitol Riverfront
Via	Clinton Park and Ride, Padgett's Corner Shopping Center, Rosecroft Shopping Center, Oxon Hill Park and Ride, Navy Yard-Ballpark Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Focused Directional
Headway (min.)	20 (Peak), 40 (Peak Shoulder)
Total Population (2045)	241,100 people
Total Jobs (2045)	76,100 jobs
Trip Potential (2045)	3,490 Peak Trips
Transit Propensity	243
Operational Cost (2022)	\$1,584,000 per year
Capital Cost (2022)	\$9,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	On-street location
Express Lanes Use and Access	None
Travel Time	50 minutes
Travel Time Savings	+ 3 minutes



2045 Demand Forecast: 2,375 riders per day, 79 riders per bus

North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor (A10/11)

This service is **LOW** scoring and would connect Waldorf, Accokeek, and Fort Washington, MD and Alexandria and Arlington, VA with peak-focused directional service (AM to Arlington and PM to Waldorf). In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and the alignment was modified to end in Rosslyn.

A10/11	
From	North Charles and Southwest Prince George's Counties
To	Rosslyn-Ballston Corridor
Via	U.S. 301 Park and Ride, Accokeek Park and Ride, Fort Washington Park and Ride, Eisenhower East, Pentagon Metrorail Station, Rosslyn
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Focused Directional
Headway (min.)	20 (Peak), 40 (Peak Shoulder)
Total Population (2045)	146,200 people
Total Jobs (2045)	111,000 jobs
Trip Potential (2045)	1,820 Peak Trips
Transit Propensity	96
Operational Cost (2022)	\$2,376,000 per year
Capital Cost (2022)	\$14,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Potential future constraint
Express Lanes Use and Access	4.0 miles Mill Road and MD-210
Travel Time	90 minutes
Travel Time Savings	+ 5 minutes



2045 Demand Forecast: 2,825 riders per day, 94 riders per bus

For future consideration: add connection to Oxon Hill Park and Ride; truncate at King Street-Old Town Metrorail Station and utilize Metrorail Blue Line for remaining connections

Northwest Fairfax County to Carlyle-Eisenhower East (A13)

This service is **LOW** scoring and would connect Tysons, Eisenhower East, and Old Town Alexandria with peak directional service (AM to Alexandria and PM to Tysons). In the refinement, headway was improved to 20 minutes from 30 minutes, and the alignment in Tysons was modified to connect to Spring Hill Metrorail Station instead of Tysons Metrorail Station.

A13	
From	Northwest Fairfax County
To	Carlyle-Eisenhower East
Via	Spring Hill Metrorail Station, Tysons West*Park Transit Station, Eisenhower East, King Street-Old Town Metrorail Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	20 (Peak)
Total Population (2045)	179,600 people
Total Jobs (2045)	32,400 jobs
Trip Potential (2045)	80 Peak Trips
Transit Propensity	52
Operational Cost (2022)	\$878,000 per year
Capital Cost (2022)	\$6,000,000
Facilities - Origin	No parking facilities
Facilities - Destination	Available bus bays but potential future constraint
Express Lanes Use and Access	4.3 miles West Entry and Mill Road
Travel Time	40 minutes
Travel Time Savings	+ 4 minutes

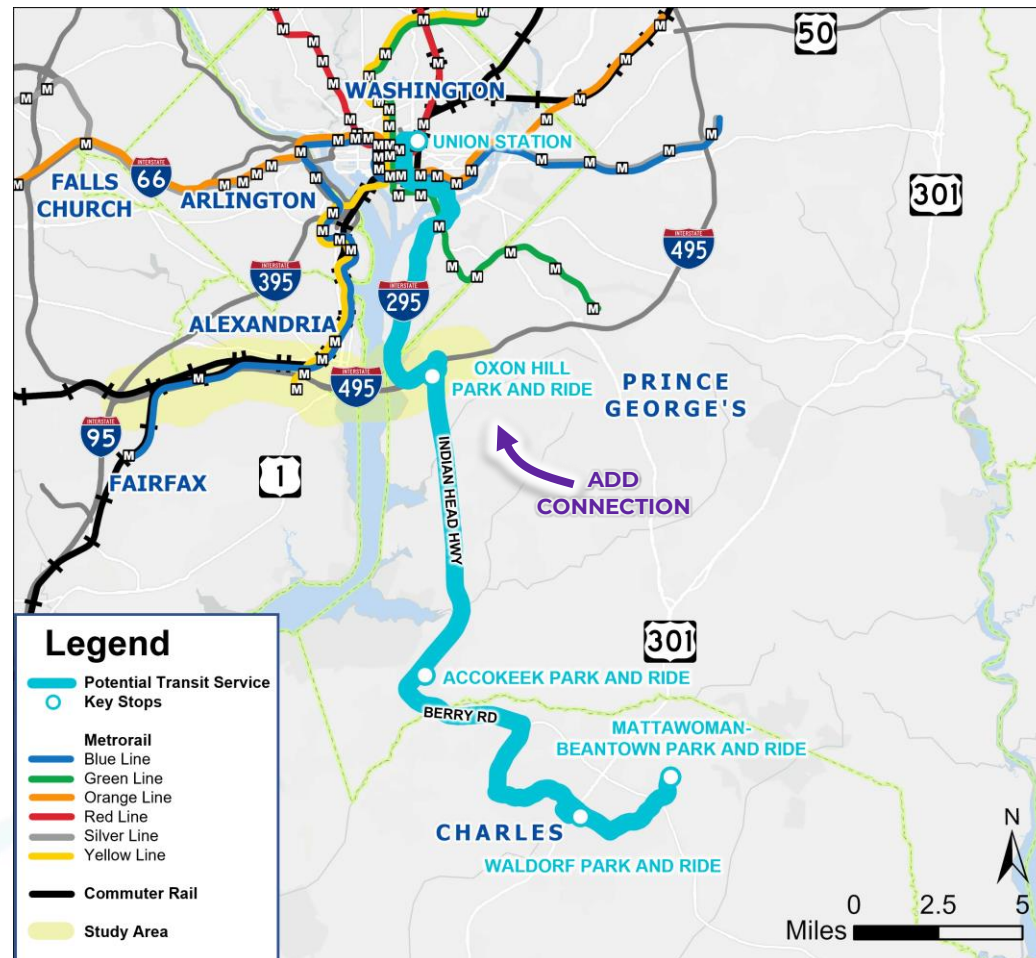


2045 Demand Forecast: 300 riders per day, 13 riders per bus

North Charles County to NoMa (A16)

This service is **MODERATE** scoring and would connect Waldorf and Accokeek, MD with NoMa/Union Station in DC with peak directional service (AM to DC and PM to Waldorf). In the refinement, headway was improved to 20 minutes from 30 minutes, and a connection was added to Oxon Hill Park and Ride.

A16	
From	North Charles County
To	NoMa
Via	Mattawoman-Beantown Park and Ride, Waldorf Park and Ride, Accokeek Park and Ride, Oxon Hill Park and Ride, Union Station
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	20 (Peak)
Total Population (2045)	276,300 people
Total Jobs (2045)	93,100 jobs
Trip Potential (2045)	2,990 Peak Trips
Transit Propensity	217
Operational Cost (2022)	\$1,756,000 per year
Capital Cost (2022)	\$12,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays
Express Lanes Use and Access	None
Travel Time	72 minutes
Travel Time Savings	0 minutes

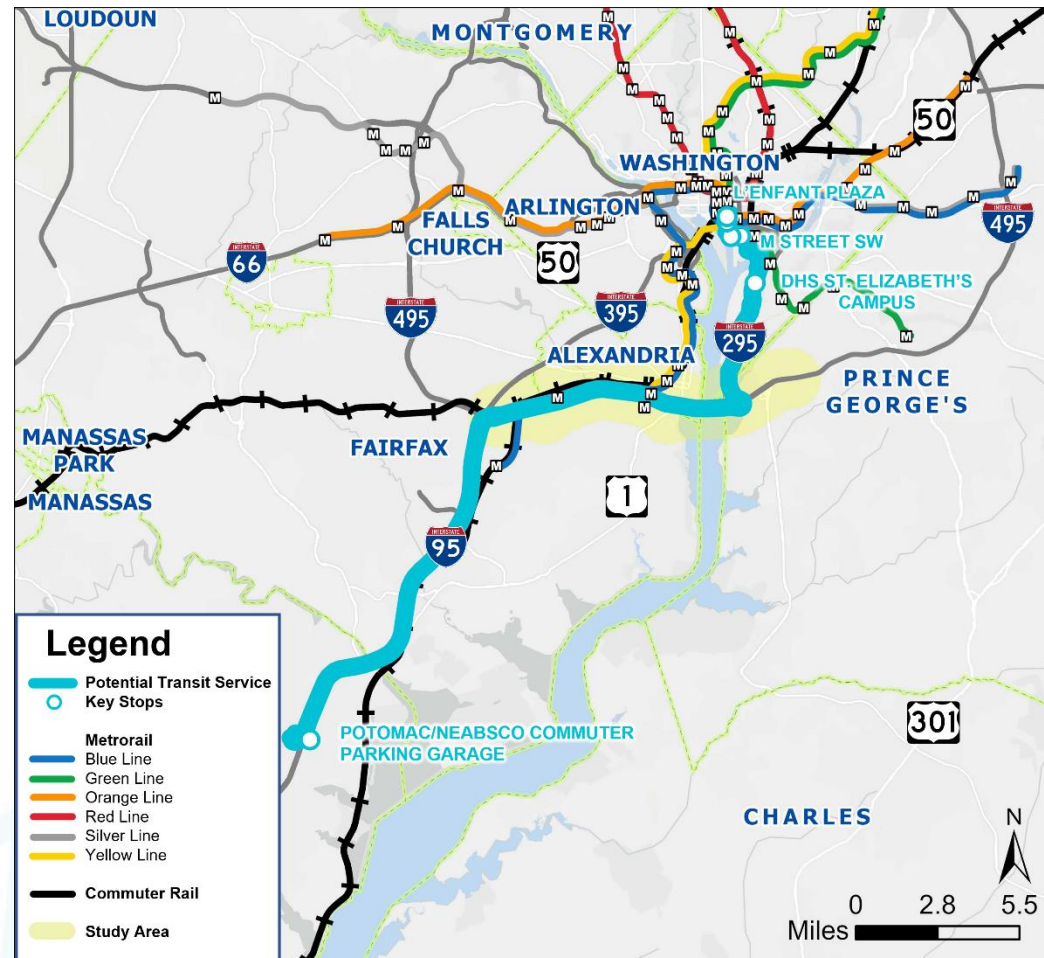


2045 Demand Forecast: 1,375 riders per day, 57 riders per bus

East Prince William County to Southwest Waterfront (A17)

This service is **MODERATE** scoring and would connect east Prince William County/I-95 corridor, DHS St. Elizabeth's Campus, and southwest DC with peak directional service (AM to DC and PM to Prince William County). In the refinement, headway was improved to 20 minutes from 30 minutes.

A17	
From	East Prince William County
To	Southwest Waterfront
Via	Potomac/Neabsco Commuter Parking Garage, DHS St. Elizabeth's Campus, M Street SW, L'Enfant Plaza
Potential Transit Mode	Commuter Bus
Span of Service	Peak-Only Directional
Headway (min.)	20 (Peak)
Total Population (2045)	142,500 people
Total Jobs (2045)	132,300 jobs
Trip Potential (2045)	1,090 Peak Trips
Transit Propensity	101
Operational Cost (2022)	\$1,223,000 per year
Capital Cost (2022)	\$9,000,000
Facilities - Origin	Available park and ride spaces (future)
Facilities - Destination	On-street location
Express Lanes Use and Access	7.2 miles West Entry and I-295
Travel Time	54 minutes
Travel Time Savings	- 14 minutes



2045 Demand Forecast: 400 riders per day, 17 riders per bus

For future consideration: travel to DC first via I-95/I-395 Express Lanes then serve DHS St. Elizabeth's Campus (note, would not utilize I-495 with this adjustment)

Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield (A19/20)

This service is **MODERATE** scoring and would connect Huntington, Van Dorn Street and Dunn Loring/Merrifield with all-day bidirectional service. In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and the alignment was modified to use I-495 Express Lanes ramps at US 29. *Given the decrease in ridership with this change, it is recommended the alignment remain as previously shown in the preliminary recommendation to provide additional connection opportunities along Gallows Road.*

A19/20	
From	Southeast Fairfax County and Alexandria
To	Dunn Loring-Merrifield
Via	Huntington Metrorail Station, Van Dorn Street Metrorail Station, Gallows Road, Dunn Loring-Merrifield Metrorail Station
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	20 (Peak), 40 (Off-Peak)
Total Population (2045)	362,400 people
Total Jobs (2045)	18,400 jobs
Trip Potential (2045)	330 Peak Trips
Transit Propensity	204
Operational Cost (2022)	\$3,168,000 per year
Capital Cost (2022)	\$8,000,000
Facilities - Origin	Available park and ride spaces
Facilities - Destination	Available bus bays
Express Lanes Use and Access	4.3 miles West Entry, Mill Road, and Van Dorn Street
Travel Time	46 minutes
Travel Time Savings	- 2 minutes

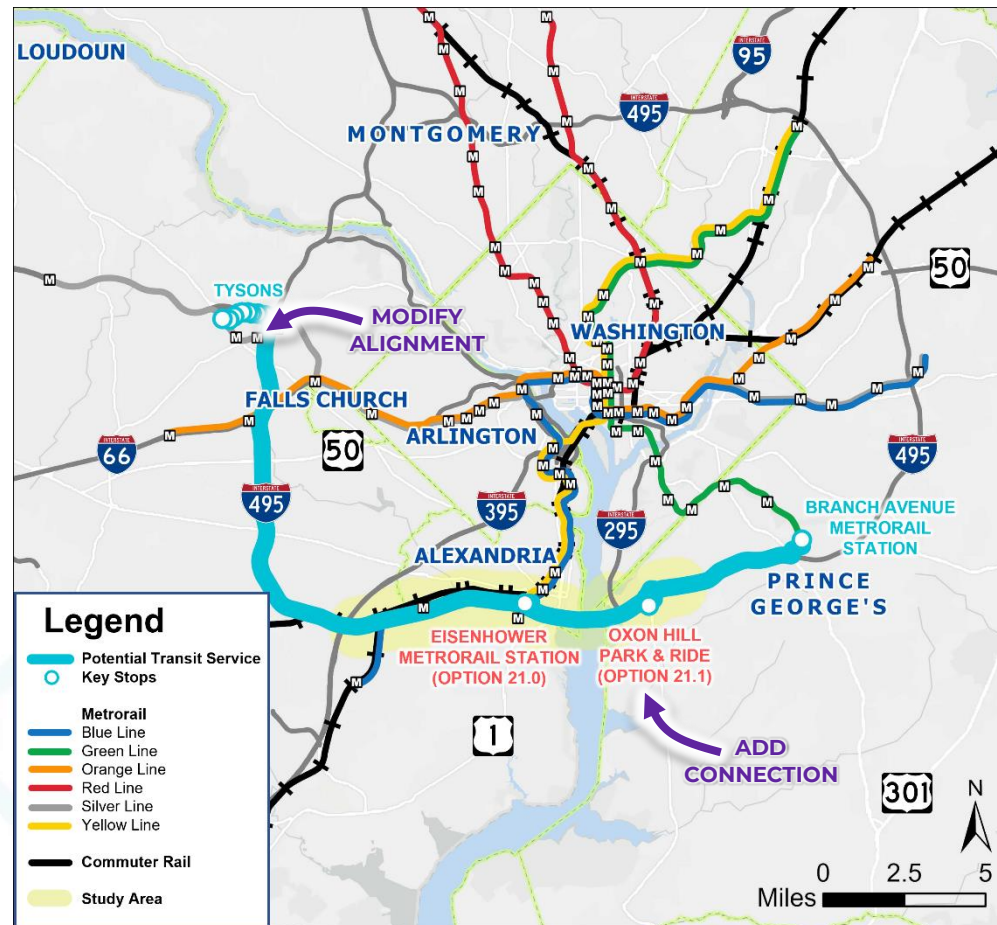


2045 Demand Forecast: 625 riders per day, 9 riders per bus

Central-West Prince George's County to Tysons (A21.0/21.1)

This service is **HIGH** scoring and would connect Branch Avenue, Eisenhower, and Tysons with all-day bidirectional service (A21.0). The service with a connection to Oxon Hill Park and Ride is **MODERATE** scoring (A21.1). In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and a second route pattern was introduced with an intermediate stop at Oxon Hill Park and Ride.

A21	
From	Central-West Prince George's County
To	Tysons Area
Via	Branch Avenue Metrorail Station, Eisenhower Metrorail Station/Oxon Hill Park and Ride, West*Park Transit Station, Spring Hill Metrorail Station
Potential Transit Mode	Express Bus
Span of Service	All-Day Bidirectional
Headway (min.)	20 (Peak), 40 (Off-Peak)
Total Population (2045)	248,500 people
Total Jobs (2045)	92,800 jobs
Trip Potential (2045)	900 Peak Trips
Transit Propensity	258
Operational Cost (2022)	\$3,513,000 per year (each pattern)
Capital Cost (2022)	\$9,000,000 (each pattern)
Facilities - Origin	Available park and ride spaces but potential future constraint
Facilities - Destination	Available bus bays
Express Lanes Use and Access	8.3 miles East Entry, Mill Road, MD-210, West Entry
Travel Time (21.0/21.1)	54/54 minutes
Travel Time Savings (21.0/21.1)	-16/-11 minutes



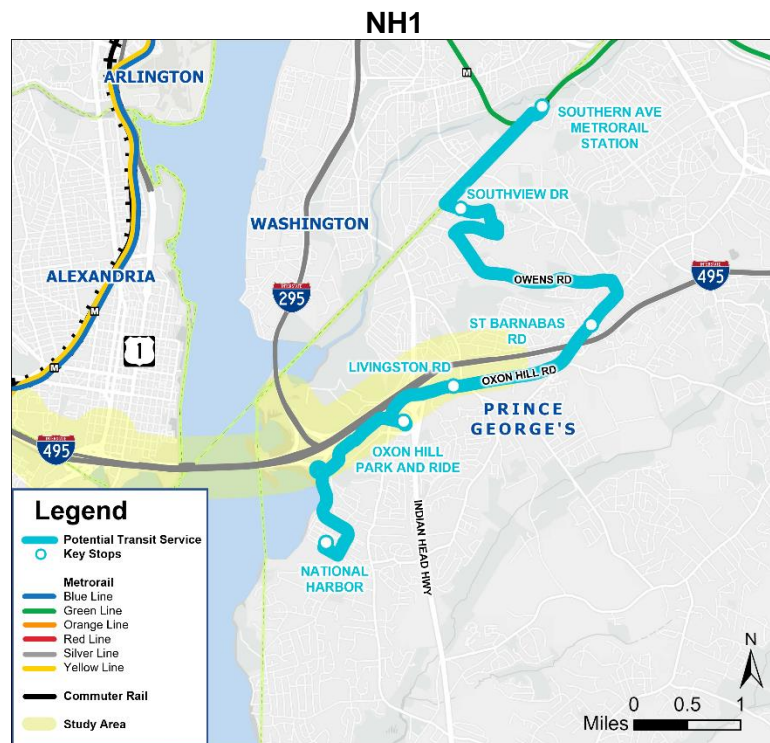
2045 Demand Forecast (21.0/21.1): 1,275/1,875 riders per day, 18/26 riders per bus

For future consideration: serve both Oxon Hill Park and Ride and Eisenhower Metrorail Station with the same route pattern

Metrobus NH1 and NH2

Metrobus NH1 and NH2 provide key connections along and adjacent to the I-495 study corridor. Given the recommended transit services connecting to Alexandria and Oxon Hill Park and Ride, increased frequency of these two routes would provide consistent levels of service during peak periods in the future and frequent connection opportunities between National Harbor and Oxon Hill Park and Ride throughout the day. The table below shows high-level incremental costs for increasing levels of service on these routes.

Route	Current Headway (min.)	Proposed Headway (min.)	Additional Operational Cost (2022)	Additional Capital Cost (2022)
NH1 National Harbor – Southern Ave	30 (Peak), 30 (Off-Peak)	20 (Peak), 30 (Off-Peak)	\$706,000 per year	\$1,000,000
NH2 National Harbor – King Street	30 (Peak), 38 (Off-Peak)	20 (Peak), 30 (Off-Peak)	\$482,000 per year	\$1,000,000



For future consideration: further improve off-peak headway to 20 minutes

Transit Facilities

New transit services will require facility availability and connectivity to operate efficiently and provide the most reliable experience for riders. Potential future facility needs were reassessed with the refined transit recommendations. This consisted of:

- **Parking Capacity:** Park and ride locations that may experience future capacity constraints were identified considering historical parking occupancy and future forecasted ridership and facility use.
- **Bus Bay Capacity:** Facilities that may experience future capacity constraints for bus layovers were identified considering current bus bay assignments and future recommended transit services.
- **Bicycle and Pedestrian Connectivity:** Park and ride locations that would benefit from improved bicycle and/or pedestrian connectivity were identified considering existing and planned networks and future recommended transit services.

The potential transit facility needs are summarized in **Table 32**. These needs are not considered fatal flaws that would preclude a transit route recommendation from advancing but will require further planning and stakeholder coordination in the future. Manifestation of these needs is also dependent on many factors including timing of bus service implementation, future changes to other bus services using these facilities, operator selection, and future commuter parking trends. Therefore, needs were not quantified into additional capital or operating costs at this early stage of planning. As transit recommendations are advanced in the future, additional planning and coordination with local stakeholders should occur to assess and mitigate potential facility needs. Another important consideration as services are planned in the future is the operating and maintenance facility capacity of the operator(s) that would run the transit services.

Table 32. Transit Facility Future Potential Needs

Facility	Location	Need	Routes Affected	Current Condition
King Street-Old Town Metrorail Station	Alexandria, VA	Future bus bay capacity (for 3 buses per hour)	A13	10 existing bus bays that collectively serve approximately 50 buses per hour
Huntington Metrorail Station (South Side)	Alexandria, VA	Future bus bay capacity (for 6 buses per hour)	A4/8, A19/20	4 existing bus bays that collectively serve approximately 15 buses per hour
Braddock Road Metrorail Station	Alexandria, VA	Future bus bay capacity (for 3 buses per hour)	A6/7	5 existing bus bays that collectively serve approximately 36 buses per hour
Van Dorn Street Metrorail Station	Alexandria, VA	Future parking capacity	A4/8, A19/20	361 spaces at 88% occupancy (2019)
Centreville United Methodist Church Park and Ride	Centreville, VA	Future parking capacity	A6/7	144 spaces at 32% occupancy (2019) and high utilization forecasted by A6/7
Rosslyn Metrorail Station	Arlington, VA	Future bus bay capacity	A10/11	8 existing bays/nearby stops and capacity for 3 buses per hour needed
Potomac/Neabsco Commuter Parking Garage	Woodbridge, VA	Bicycle/pedestrian access	A17	Limited east/west connectivity along Optiz Blvd
Fort Washington Park and Ride	Fort Washington, MD	Bicycle/pedestrian access and future parking capacity	A10/11	Limited east/west bicycle connections along Swan Creek Rd, 422 parking spaces and high utilization forecasted by A10/11
Accokeek Park and Ride	Accokeek, MD	Bicycle/pedestrian access and future parking capacity	A10/11, A16	Limited east/west connectivity along Livingston Rd, 500 parking spaces at 16% occupancy (2019) and high utilization forecasted by A10/11 and A16
St. Charles Towne Plaza	Waldorf, MD	Bicycle/pedestrian access	A2.3, A16	No crosswalks at US 301 and Smallwood Dr intersection, and gap in shared-use path connection along Smallwood Dr
U.S. 301 Park and Ride	Waldorf, MD	Bicycle/pedestrian access	A2.3, A10/11	
St. Charles Towne Mall	Waldorf, MD	Bicycle/pedestrian access	A2.3	No sidewalk or path connections
Union Station	Washington, DC	Future bus bay capacity (for 3 buses per hour)	A16	14 existing nearby bus stops that collectively serve approximately 76 buses per hour
Virginia Avenue NW and 19th Street NW	Washington, DC	Future on-street layover location (for 1 bus per hour)	A2.3	Bus stop/pad outside of travel lane
M Street SE and Canal Street SE	Washington, DC	Future on-street layover location (for 3 buses per hour)	A9	Bus only lane

Capital and Operating Costs

The evaluation and refinement process resulted in 13 recommendations for new or enhanced transit services. Estimated operating and maintenance (O&M) costs were developed using a service weighted average for cost per revenue hour based on 2020 National Transit Database (NTD) statistics and inflated to 2022 dollars. The weighted average draws from the following agency statistics for either the Commuter Bus mode (for those agencies reporting this mode separately) or Motor Bus:

- Maryland Transit Administration (Commuter Bus)
- OmniRide (Commuter Bus)
- Fairfax County (Motor Bus)
- Prince George's County (Motor Bus)
- Arlington County (Motor Bus)

Capital costs were based on peak-vehicle requirements plus a 20% spare ratio and assume electric-powered transit buses or commuter coaches at \$1,000,000 each. These capital costs only cover initial purchases of vehicles and do not include lifecycle replacements.

Revenue projections, or farebox recovery, for new services were estimated based on 2045 ridership estimates and an assumed passenger fare of \$4.25 based on WMATA and Fairfax Connector express fares. Farebox recovery for improvements to existing NH1 and NH2 were based on historical cost recovery.

Table 33 shows the estimated capital and O&M costs for each transit recommendation.

Table 33. Cost Estimates for Transit Recommendations

Transit Recommendation	Weekday Trips	Annual Service Hours	Annual Operating Cost (2022)	Farebox Recovery ³ (2022)	Net Operating Cost (2022)	Vehicles Required	Capital Cost (2022)
A2.3: North Charles County to DC Core	6	3,100	\$534,000	\$325,000	\$209,000	8	\$8,000,000
A4/8: Alexandria to Tysons¹	72	24,500	\$4,219,000	\$596,000	\$3,623,000	10	\$10,000,000
A6/7: Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area	30	11,500	\$1,980,000	\$732,000	\$1,248,000	11	\$11,000,000
A9: Southwest Prince George's County to Capitol Riverfront	30	9,200	\$1,584,000	\$2,574,000	-	9	\$9,000,000
A10/11: North Charles and Southwest Prince George's Counties to Rosslyn	30	13,800	\$2,376,000	\$3,062,000	-	14	\$14,000,000
A13: Northwest Fairfax County to Carlyle-Eisenhower East	24	5,100	\$878,000	\$325,000	\$553,000	6	\$6,000,000
A16: North Charles County to NoMa	24	10,200	\$1,756,000	\$1,490,000	\$266,000	12	\$12,000,000
A17: East Prince William County to Southwest Waterfront	24	7,100	\$1,223,000	\$434,000	\$789,000	9	\$9,000,000
A19/20: Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield¹	72	18,400	\$3,168,000	\$677,000	\$2,491,000	8	\$8,000,000
A21.0: Central-West Prince George's County to Tysons (via Eisenhower)	72	20,400	\$3,513,000	\$1,382,000	\$2,131,000	9	\$9,000,000
A21.1: Central-West Prince George's County to Tysons (via Oxon Hill)	72	20,400	\$3,513,000	\$2,032,000	\$1,481,000	9	\$9,000,000
NH1—Increase Frequency²	+ 25	+ 4,100	+ \$706,000	+ \$205,000	+ \$501,000	+ 1	\$1,000,000
NH2—Increase Frequency²	+ 22	+ 2,800	+ \$482,000	+ \$82,000	+ \$400,000	+ 1	\$1,000,000

¹Operating statistics and costs for A4/8 and A19/20 updated to reflect original preliminary recommendation alignments in Tysons and along Gallows Road, respectively

²Operating statistics and costs for NH1 and NH2 are high-level estimates of incremental increase for frequency improvements; farebox recovery based on FY19 cost recovery

³Farebox recovery based on assumed fare of \$4.25 and 2045 ridership estimate, except for NH1 and NH2 which use historical cost recovery of existing service

VI. TDM CAP Recommendations

This section describes the development of Transportation Demand Management (TDM) commuter assistance program (CAP) recommendations for the study corridor to encourage people to use alternative modes of transportation besides single-occupancy vehicles.

In addition to new transit services, Transportation Demand Management (TDM) strategies implemented through commuter assistance programs (CAPs) were also evaluated as potential options to reduce congestion, improve reliability and enhance mobility and connectivity in the study corridor. The CAP recommendations in this study would be for new or additional strategies beyond the baseline conditions for existing CAPs in the study corridor.

Initial List

The initial, or preliminary, recommended TDM CAP strategies were organized into two categories to better identify *what* the strategies are, termed Commuter Strategies, and *how* the strategies will be promoted and implemented, termed Communication Methods. Each strategy was also assigned a preliminary timeline to describe the duration of the strategy specific to this study corridor. Definitions are as follows:

- **Near-Term:** Present through the construction phase of the potential I-495 Southside Express Lanes (prior to 2030)
- **Mid-Term:** In conjunction with the opening of the potential Express Lanes in 2030 through 2045
- **Long-Term:** Following the opening and operation of the potential Express Lanes in years beyond 2045

Table 34. Preliminary TDM CAP Recommendations

ID	Name	Description	Timeline		
			Near-Term	Mid-Term	Long-Term
Commuter Strategies					
C1	Incorporate TDM strategies into traffic mitigation plans for new development in activity centers	Work with local partners to incorporate TDM strategies into traffic mitigation plans for new developments in key activity centers. TDM strategies could include priority parking for carpools/vanpools and parking cash-out programs.	X	X	X
C2	Family-based TDM strategies that can satisfy new development policy requirements	Develop a menu of family-based TDM strategies which may include secure locations for car seats and larger bicycle parking, on-site childcare, providing cargo strollers or bicycles, car-share memberships, and parking.	X		
C3	Personalized and dynamic travel demand management technology	Leverage existing partnership between Maryland and Virginia state and local governments and private partners, funded in part by a grant from FHWA to MWCOG, to develop a technology platform for the Washington, DC, and Baltimore, MD, metropolitan areas. This platform would provide dynamic incentives to travelers using real-time data and artificial intelligence to encourage the selection of high-occupancy travel modes and commute times that avoid peak congestion and incidents.	X	X	X
C4	Publication of commuter information in coordination with VDOT and DRPT's RM3P	Publish information to inform riders of mode options and trade-offs such as travel times, fares, and parking availability information from the Commuter Parking Information System (CPIS) component of the RM3P. This information can be published on dynamic information boards above key area arterials, and/or in the CPIS real-time app.	X	X	X
C5	Vanpool formation and expansion program	Expand the number of vanpools to fill existing capacity and serve new markets. The Vanpool Alliance currently supports one daily Vanpool trip between Maryland and Virginia that uses the I-495 Southside corridor (Mechanicsville, MD to George Mason University in Fairfax, VA). Conversely, they support nine daily trips from Virginia to Maryland via the corridor. Vanpools may also be a more financially feasible and targeted to reduce SOV trips than additional transit routes when there is a shared destination. Methodology would be coordinated with Vanpool Alliance and DRPT.		X	X
C6	Corridor-specific HOV incentive	Provide an extra incentive (using an existing app like incenTrip) to people who use alternative modes in the study corridor. "Try it" HOV financial incentives are short-term incentives to encourage commuters who drive alone to try an alternative mode for a limited period of time. The incentive in this package is assumed to be offered as a \$250 per commuter incentive for two months of alternative mode use. Commuters would log/report on the days they use transit, carpool, vanpool, or slug. At the end of the program period, they would receive a per-day incentive. This strategy is assumed to have		X	X

ID	Name	Description	Timeline		
			Near-Term	Mid-Term	Long-Term
		both a low scenario component and a high scenario component, with additional resources applied to more commuters.			
C7	Coordinate with mapping technology providers	Coordinate with mapping technology providers (e.g., Waze, Google, Apple) to update the vehicle, bicycle, and pedestrian networks at least once annually.	X	X	X
Communication Method					
C8	Corridor-specific mobility options marketing campaign	Develop a geotargeted marketing campaign that targets commuters along the study corridor and advertises new transit routes as they are implemented. The marketing campaign could include public-facing events, media coverage (print and digital), and advertisement via radio, news sites, and social media. For example, HOVs with three or more passengers ride free in the managed lanes could be a potential marketing message.*	X	X	X
C9	Targeted residential outreach	Target outreach to commuters in the study corridor advertising and promoting the new transit routes and carpool/vanpool incentives. Target locations of high-density residents in the study corridor where new services are available and residents would likely use the services. Incentives for higher occupancy vehicle travel could be marketed to residents, such as HOVs with three or more passengers would ride free in the managed lanes.*	X	X	X
C10	Targeted employer outreach	Target employers located in or around key activity centers in the study corridor with marketing campaigns. Commuter Connections already provides resources to employers and these resources can be leveraged to more outreach advertising new transportation options that cross state lines. Incentives for higher occupancy vehicle use could be marketed to employers, such as HOVs with three or more passengers would ride free in the managed lanes.*	X	X	X
C11	Carpool promotion programs	Expand the number of pick-up locations where drivers are eligible to receive the incentive (i.e., additional park and ride lots and activity centers in the study corridor). Carpool promotion programs could be expanded to other third-party applications such as TNCs. MWCOC manages the CarpoolNow app, which provides on-demand carpool services by connecting drivers and ride seekers. Drivers who register with the app are eligible to earn up to \$10 per trip when picking up riders going to work and could receive an additional benefit for this corridor. This strategy can be promoted by corridor-specific employer and residential outreach staff.	X	X	X
C12	Regional coordination to encourage increased parking rates	Coordinate parking rates and strategies between Maryland and Virginia state and local governments and private operators to dynamically adjust parking rates to disincentivize SOV travel and parking at high traffic destinations.	X	X	X

*Occupancy requirements for the managed lanes included in the I-495 Southside Transit/TDM Study have yet to be determined.

Screening Methodology

As part of the screening process, the study team recognized that there are ongoing regional commuter assistance initiatives that will help to promote and incentivize non-SOV travel in the study corridor but that are not specific to the study corridor. For the specific evaluation of potential recommendations for this study, the team focused on new or enhanced initiatives not already in development that could have a demonstrable benefit to the study corridor and meet the project needs. DRPT and TAC review were used in the process.

Outcomes

Six potential CAP options were moved forward from the initial screening to be analyzed quantitatively in terms of the return on investment:

- **Option C5.** Vanpool formation and expansion program.
- **Option C7.** Coordinate with mapping technology providers.
- **Option C8.** Corridor-specific mobility options marketing campaign.
- **Option C9.** Targeted residential outreach.
- **Option C10.** Targeted employer outreach.
- **Option C11.** Carpool promotion programs.

The six strategies that were not moved forward were those that already exist in the baseline and should continue to be supported beyond the potential construction of the I-495 Southside Express Lanes:

- **Option C1.** Incorporate TDM strategies into traffic mitigation plans for new development in activity centers.
 - Local efforts to incorporate these types of measures into development ordinances should be supported.
- **Option C2.** Family based TDM strategies that can satisfy new development policy requirements.
 - Local efforts to incorporate these types of measures into development ordinances should be supported.
- **Option C3.** Personalized and dynamic travel demand management technology.
 - Ongoing efforts by Commuter Connections incenTrip program and the Dynamic Incentivization tool being developed as part of Virginia's RM3P program will include incentives that will apply to corridor users.
- **Option C4.** Publication of commuter information in coordination with VDOT and DRPT's RM3P program.
 - Ongoing efforts to develop a real-time parking availability app as a part of the RM3P CPIS can be made available for publication for corridor users.
- **Option C6.** Corridor-specific HOV incentive.
 - Ongoing efforts by Commuter Connections incenTrip program will include incentives that will apply to corridor users
- **Option C12.** Regional coordination to encourage increased parking rates.
 - Ongoing coordination between Maryland and Virginia state and local governments should be supported.

TDM CAP Testing and Evaluation

Process, Metrics, and Assumption

A tool called the TDM Return on Investment (ROI) Calculator was used to quantitatively analyze the performance of each potential CAP option that moved forward from the initial screening. The primary metrics were reduction in both daily vehicle trips and vehicle-miles traveled. **Table 35** shows a summary of TDM CAPs metrics, definitions, and assumptions. Program costs were looked at in terms of one-time capital costs and annual operating expenses. Cost effectiveness was analyzed based on a combination of the annual results and the distribution of the one-time capital costs across a five-year horizon. The five-year horizon, assumed to begin at or slightly before the opening of the potential I-495 Southside Express Lanes in 2030 allows these programs to ramp up and reach maturity.

The TDM ROI Calculator tool, which was created by the Arlington County Commuter Services' Mobility Lab, provides information to make more informed decisions on transportation policies, and investments by calculating vehicle trips and miles traveled reduced resulting from TDM programs and to calculate benefit-cost ratios or ROI. As a part of this study, the following five TDM CAPs were analyzed:

- Corridor-Specific Mobility Options Marketing Campaign
- Targeted Residential Outreach
- Targeted Employer Outreach
- Carpool Promotion Programs
- Vanpool Formation and Expansion Program

These options were assessed using equivalent programs from the ROI calculator as shown in **Table 36**. Option C7 - Coordinate with mapping technology providers was considered as part of recommendations for Technology Improvements discussed later.

Table 35. Off-Model TDM CAP Evaluation Metrics

TDM CAPs Metrics	Definition and Assumptions ¹⁰
<p>Total Daily Vehicle Trips Reduced (VTR)</p>	<p>Total daily vehicle trips reduced (VTR) by commuters who made a continued change to a non-drive alone mode before and after they receive the TDM service – the total weekly trips (from data) reduced and divided again by five days per week to estimate the daily vehicle trips reduced. Assumed placement rates and influence factors of shifting modes were based on commuter survey data.</p>
<p>Total Daily Vehicle Miles Traveled Reduced (VMT)</p>	<p>The daily VMT reduced was calculated by multiplying the number of daily vehicle trips reduced by the average commute distance for commuters who made a travel change. The average distance is calculated from the same [commuter] survey data used to calculate the placement rate, influence factor, and VTR factor or from other service-specific data obtained from the commuter program.</p>
<p>Total Program Cost</p>	<p>Total cost of developing and delivering the TDM services. The total investment cost for the project will be equal to the sum of the one-time capital and ongoing operating cost. The total cost can be represented in either of two forms: 1) a “life-cycle” total cost, which includes the total capital cost plus the sum of the annual operating costs that will be expended over the life of the project, or 2) a cost that includes a discounted and prorated portion of the capital/start-up costs plus a periodic (e.g., annual) operating cost.</p>
<p>Cost per Vehicle Trip Reduced</p>	<p>Metric used to present the program cost-effectiveness. Calculated by dividing the total daily program cost (annual program cost divided by 250 annual peak period commute days, then divided by the total vehicle trips reduced).</p>
<p>Cost per VMT Reduced</p>	<p>Another metric used to present the program cost-effectiveness. Calculated by dividing the total daily program cost (annual program cost divided by 250 annual peak period commute days, then divided by the total VMT reduced).</p>
<p>Program Return on Investment (ROI)</p>	<p>The daily costs for each societal benefit (e.g., air pollution/emission reductions, global climate change mitigation, reduction in traffic congestion, deferral of new road construction, reduction in fuel consumption, improved road safety, and noise pollution reduction) were added together to produce a total daily cost saving. This number was multiplied by 250 peak period workdays per year to obtain an annual cost saving, which was divided by the total annual cost to produce or deliver the TDM services to estimate the ROI for the TDM program.</p>

Assumptions

A series of assumptions were made to accurately capture the ROI of each potential TDM CAP based on the structure of the tool. **Table 36** shows the assumed number of participants and program costs along with notes and sources for each input. In addition, the gray columns define the specific program and item categories selected within the tool.

¹⁰ Definitions are sourced from *The Transportation Demand Management Return on Investment Calculator: A User Manual*. For more details regarding methodology and assumptions, please see the User Manual.

Table 36. Potential Commuter Assistance Program Options Assumptions for the TDM ROI Calculator

Option	Participation (Selected ROI Calculator Elements)					Cost		
	Program	Description	Metric	Participants	Participation Notes/Source	Item	Cost	Cost Notes/Source
Corridor-Specific Mobility Options Marketing Campaign	General Marketing	Regional/area-wide informational mass marketing/advertising campaigns about commuting/TDM services	Commuter population in the program area who are targeted with messaging	822,000	Used 2019 US Census employment data to find the total <i>full-time, year-round work status in the past 12 months by age for the population 16 years and over</i> for the identified origins-and destinations for the study corridor. Note, the population does not include the population included as a part of the targeted residential marketing strategy.	Labor	\$ 18,750 (Annual – 5 yr)	Assumes 0.25 full time equivalent (FTE)
						Promotional Expenses	\$ 300,000 (One-Time)	Assumes focus on promoting new services (e.g., multimedia advertisements, bus wraps, signage, etc.)
Targeted Residential Outreach	Targeted Residential Marketing	Direct mail/mass marketing targeted to specific residents in specific geographic areas	Commuter population in the program area who are targeted with messaging	370,000	Generated a three-mile buffer around transit route origins (for those proposed in this study) using the 2019 US Census employment data to find the <i>full-time, year-round work status in the past 12 months by age for the population 16 years and over</i> population for the targeted residential marketing strategy.	Labor	\$ 56,250 (Annual – 2 yr)	Assumes 2 years: -0.5 full-time equivalent (FTE) before construction -1.5 (FTE) years after opening
						Promotional Expenses, Travel	\$ 50,000 (One-Time)	Print materials and giveaways
Targeted Employer Outreach	Employer Services (Low/Medium)	Assistance to employers that offer only commute information and other commute support (flextime, preferential parking, etc.)	Employees at low/moderate program worksites (on last day of the evaluation period)	129,000	Used Traffic Analysis Zone (TAZ) information to determine the combined 2020 employment at activity centers identified through this study. Not all employees have access to employer services through their employer, thus only 10% of the total employment population was utilized in the metric for this strategy.	Labor	\$ 85,000 (Annual – 5 yr)	Assume 5 years of 1 dedicated FTE focusing on low and moderate areas (Annual) Includes travel stipend
	Employer Services (High)	Assistance to employers that offer high level commute support services (financial incentives, company vanpool, parking charges, shuttles to transit stops, etc.)	Employees at high program worksites (on last day of the evaluation period)	64,000	Used Traffic Analysis Zone (TAZ) information to determine the combined 2020 employment at activity centers identified through this study. Similar to the above strategy, only 5% of the total employment population is utilized in the metric for this strategy.	Labor	\$ 85,000 (Annual – 5 yr)	Assume 5 years of 1 dedicated FTE focusing on high areas (Annual) Includes travel stipend
Carpool Promotion Programs	Carpool Ridematching	Service to match potential carpool/vanpool partners for regular, ongoing rideshare; typically, online matching	Commuters requesting/accessing ridematch service (cumulative total over the evaluation period)	80	Referenced the MWCOG FY2021 Annual Progress Report to determine the number of current <i>Commuter Connections</i> applications (ride match applications) with study origins. The data does not provide details about route; thus a 15% capture rate was applied to determine the approximate number of new carpools that could utilize the study corridor.	Labor	\$ 18,750 (Annual – 5 yr)	Supports ridematching in the corridor – assumes a subsidy to existing Commuter Connections or other CAP staff.
Vanpool Formation and Expansion Program	Vanpool Formation	Outreach and assistance to commuters to start/maintain commute vanpools; typically, residence-based outreach	Total [current and potential] riders in program supported vans (last day of the evaluation period)	160	Assumes 4 persons per vanpool. Referenced data provided by Vanpool Alliance to total number of current vanpools that have an origin and destination identified in the study and realistically route along the study corridor. Future vanpools aimed to serve demand that is not currently high enough to warrant new or additional transit service. Proposed bus routes along the study corridor that did not pass the transit screening process (for new bus service), did not duplicate existing transit services, and warranted demand for 1-4 peak hour buses (for 40-passenger vehicles) were considered for vanpool expansion. The person demand (2045 trips/hr) for each origin and destination pair considered was multiplied by 4 hours to capture peak-period. Assumed a capture of 10% of trips along the corridor.	Incentive Stipend	\$ 100,000 (One-Time)	Assumes each van is eligible for \$2,500. Assumes approximately \$500 total over 5 months per van and each van can only apply to the program once.
						Administrative Program Cost	\$ 4,000 (Annual – 5 yr)	Administrative costs are 20% of incentive (5 year – Annual). Assumes the 5-year program after project opening to provide for ramp up. Assume vanpools are evenly spaced over 5 years.

Table 37. TDM ROI Calculator Result Summary

	Employer Services (High)	Vanpool Formation	Employer Services (Low/Medium)	Targeted Residential Marketing	General Marketing	Carpool Ride-matching	All Strategies (TDM Program)
Travel Reduction							
Total Daily Trips Reduced	1,114	20	103	35	9	2	1,306
Total Daily VMT Reduced	17,044	973	1578	781	208	51	21,823
Program Cost							
Total Program Cost ((Annual) (Current Year Dollars))	\$ 85,000	\$ 24,000	\$ 85,000	\$ 66,250	\$ 78,750	\$ 18,750	\$ 357,750
Cost per Vehicle Trip Reduced	\$ 0.31	\$ 4.85	\$ 3.30	\$ 7.64	\$ 34.07	\$ 41.93	\$ 1.10
Cost per VMT Reduced	\$ 0.02	\$ 0.10	\$ 0.22	\$ 0.34	\$ 1.51	\$ 1.48	\$ 0.07
Program ROI	20.5	4.3	1.8	1.2	0.3	0.3	6.2
Rank	1	2	3	4	5	5	-

TDM CAP Refined Recommendations

Recommendation Refinement

The preliminary TDM CAP recommendations were advanced without further need for refinement or reassessment. The evaluation process resulted in five CAP recommendations. Based on feedback from stakeholders, the study team recommended that in potential future study phases, a potential funding source for last-mile pedestrian and bicycle improvements be explored in more detail. This could be a program, like Commuter Choice, that allows jurisdictions or entities to apply for final design/construction funding for active transportation connections to transit service start or end points. Specific costs or amounts have not been identified for such a program through this study.

Capital and Operating Costs

Program costs were estimated in terms of one-time capital costs and annual operating expenses, as detailed in **Table 36**. As previously described, a TDM Return on Investment (TDM ROI) Calculator was used to quantitatively analyze the performance of each recommendation. A series of assumptions were made to accurately capture each recommendation's ROI based on the structure of the tool. **Table 37** details the results of the TDM ROI calculator, including the total cost and ROI for each program. Yellow highlights mark the best scoring results for each category.

VII. Technology Recommendations

This section describes the development of recommendations for technology improvements for the study corridor to further encourage travelers to use transit and alternative transportation modes, support a modern travel experience, and assist with informed travel decision making.

Technology recommendations are geared toward encouraging travelers to use transit and alternative transportation modes and to assist with informed travel decision making in the study corridor. Technology improvements have the potential to improve the travel experience within the study corridor in several ways. Incorporating real-time transit and parking information into popular wayfinding information apps allows commuters to make more informed travel decisions before getting on the road, and incentivization platforms help increase the number of commuters who use transit and carpool/vanpool modes to get to work. Many of the recommendations are suited for regional and state agencies that have the resources and authority to implement and coordinate those programs, but support and promotion from localities, local CAPs, and transit agencies would greatly increase their success.

Initial List

To develop preliminary technology recommendations, the study team considered examples from other geographic regions, the state of the industry, trends in ICM, active transportation management, and transit technology. **Table 38** describes the preliminary recommendations for technology improvements that would provide broader awareness about the reliability and availability of viable travel options as well as support technology to allow for a more seamless and modern travel experience.

Screening Methodology

A qualitative screening was conducted to assess the planning-level feasibility, applicability, and any fatal flaws in the preliminary recommendations that would preclude advancing a recommendation to further refinement and evaluation through the study. DRPT and TAC review were used in the process.

Outcomes

All preliminary technology recommendations were selected to advance for further refinement and evaluation. Preliminary timeframes, as shown in **Table 38**, were also assigned to each recommendation based on anticipated technology readiness and ease of implementation. The majority of the preliminary technology recommendations could be implemented in the near- or mid-term, prior to or in conjunction with the potential opening of new Express Lanes in the I-495 Southside corridor. The adoption and readiness of automated transit vehicle technology is less certain, so the preliminary recommendation D7 (Automated, Connected, and Shared Mobility) was assigned a mid- to long-term timeframe after the potential opening of Express Lanes to beyond 2045.

Table 38. Preliminary Technology Recommendations

ID	Name	Description	Timeline		
			Near-Term	Mid-Term	Long-Term
D1	Transit Priority Technology	Provide transit signal priority (TSP) and/or queue jumps at high-priority bottleneck intersections or future potential freeway ramp meter traffic signals. Priority for new transit routes would improve transit travel time reliability.	X	X	
D2	Real-Time Travel and Transit Information	Work with transit operators, roadway managers, and private partners to incorporate real-time and predictive transit, congestion, and toll data into commonly used apps. Routine information sharing and integration of data among transit operators and roadway managers can result in more efficient use of the corridor and incident response. Providing transit data feeds in industry-standard formats such as GTFS Realtime can facilitate information sharing.	X	X	
D3	Real-Time Passenger Load Information	Provide travelers with reliable expected transit vehicle occupancy information. Work with private partners to incorporate real-time or predictive data in commonly used sources such as Google Maps and transit apps. Work with transit operators to provide data feeds using Automated Passenger Counters (APCs) and/or other predictive technologies.	X	X	
D4	Commuter Parking Information System	Provide travelers with reliable expected parking space availability for park and ride lots serving rail, bus, and carpool/vanpool users. The system may consist of sensors at lots and analytics/software to estimate the number of available spaces and generate a data feed that can be used by apps. Park and ride lots in Virginia could potentially leverage Virginia's RM3P.	X	X	
D5	Transit Payment Integration and Incentivization	Provide an automated payment system that supports modern contactless payment solutions, special fare programs (e.g., reduced or promotional fares), and integration with multiple mobility services. The payment system should interface with other dynamic incentivization programs in the region. Future enhancements to the existing regional transit payment system, SmarTrip, may be leveraged.	X	X	
D6	Zero-Emission Bus Charging Infrastructure	Provide on-route charging infrastructure at stations, bus bays, stops, and/or depots to support zero-emission buses. Depending on the state of technology, this may include inductive charging, plug-in charging for longer layovers, or high-power overhead pantographs. Implementation should be consistent with local and regional plans.	X	X	
D7	Automated, Connected, and Shared Mobility	Provide technology-enabled shared mobility services at mobility hubs (transit stations, transfer centers, park and ride lots), where connections can be made to other high-capacity transit services. These services would provide first/last mile connections using shared AVs.		X	X

Technology Testing and Evaluation

Process, Metrics, and Assumptions

The seven preliminary technology recommendations from the initial list were all carried forward to further evaluation using the metrics and assumptions shown in **Table 39**. Costs that are driven by the number of transit vehicles or facilities were developed using the full set of preliminary transit service recommendations presented earlier and were updated accordingly in later steps of the study as transit recommendations were refined. Additional assumptions specific to each technology are included in the following subsections.

Table 39. Off-Model Technology Evaluation Metrics

Technology Metrics	Definition and Assumptions
Technology Readiness	Technology readiness was rated as high, medium, or low based on the study team’s understanding of market availability, time to implement, and need for additional planning/refinement before implementation.
Capital Cost (2022)	Capital costs are initial high-level planning upfront costs for each technology. Ranges were developed using sources such as the US Department of Transportation’s ITS Deployment Evaluation Program and the study team’s experience with transportation and transit agencies that have implemented similar solutions.
Annual Operating and Maintenance Cost (2022)	Annual operating and maintenance (O&M) costs are the costs anticipated to be incurred on a yearly basis to maintain successful operation of the technology. O&M was estimated to be 10% of capital costs unless otherwise stated.
Cost Rank	Based on the overall capital cost plus 10 years of O&M of a specific technology, the strategies are ranked in terms of relative cost to deploy —1 being the lowest total cost.
Trip Reduction Potential	Trip reduction potential was rated as high, medium, or low based on the study team’s understanding at how effective the strategy would be at encouraging mode shift from SOV.

Transit Priority Technology

This recommendation would allow for priority treatment of buses approaching traffic signals to improve travel time reliability. Capital costs were assumed to consist of a per-queue jump cost ranging from \$16,500 to \$19,500; per-bus equipment cost ranging from \$5,500 to \$8,500; a per-intersection cost ranging from \$35,000 to \$59,000; and per-signal system operator cost ranging from \$56,000 to \$112,000 for hardware, installation, testing, and monitoring software. A 15% project and construction management cost and a 20% contingency were assumed. Annual O&M costs were assumed to be 10% of queue jump, bus, and intersection hardware capital costs and 20% of the software capital costs. Preliminary cost estimates assumed that the technology would be implemented for 101 buses, 9 queue jumps, 37 intersections, and 4 traffic signal system operators. Candidate intersections for transit signal priority (TSP) and intersection approaches for queue jumps were identified through a high-level desktop review of intersections traversed by the preliminary transit service recommendations. This technology was rated as Medium for technology readiness

because while some transportation and transit agencies in the region have experience with the technology, it will require additional feasibility study and preliminary engineering to refine implementation locations. It would potentially involve implementation by multiple operators of traffic signal systems in the study corridor.

Real-Time Travel and Transit Information

This recommendation would provide travelers with information to support real-time decision making. Capital costs were assumed to consist of a per-bus cost ranging from \$7,000 to \$13,000 for hardware, installation, and testing; \$145,500 to \$274,500 for the development of multiple application programming interfaces (APIs) and time to coordinate with third-party app providers to integrate data; and a per-operator cost ranging from \$84,500 to \$160,000 for software to develop the real-time data feed, installation, testing, and coordination with third-party app providers. Costs for overall backend software to support automated vehicle location (AVL) was not included because it was assumed new buses would leverage systems already in use by potential transit operators. A 15% project management cost and a 20% contingency were assumed. Annual O&M costs were assumed to be approximately 10% of the cost for developing the real-time data feed plus continued coordination time with app providers. Preliminary cost estimates assumed that the technology would be implemented for 101 buses, 17 routes, and 3 transit operators. This technology was rated as High for technology readiness because while it could require coordination with multiple managed lanes and transit operators to develop the needed data feeds for real-time information (e.g., toll prices, travel time, transit routes, transit fare, bus arrival), it is a foundational transit technology system that most operators have on their existing bus fleets.

Real-Time Passenger Load Information

This recommendation, like real-time travel and transit information, would provide travelers with information to support real-time decision making by sharing transit vehicle occupancy information. Capital costs were assumed to consist of a per-bus cost ranging from \$4,500 to \$7,500 for hardware, installation, and testing and a per-operator cost ranging from \$105,000 to \$220,500 for software to develop the real-time data feed, installation, testing, and coordination with third-party app providers. A 15% project management cost and a 20% contingency were assumed. Annual O&M costs were assumed to be 10% of bus hardware capital costs, 20% of the software capital costs, plus time for continued coordination with app providers. Preliminary cost estimates assumed that the technology would be implemented for 101 buses and 3 transit operators. This technology was rated as Medium for technology readiness because the accuracy of the underlying data collection technology (APCs) is evolving and, since the onset of the COVID-19 pandemic, more third-party app providers have started to offer high-level predictions of vehicle crowding using this data.

Commuter Parking Information System

This recommendation would provide commuters with reliable expected parking space availability for park and ride lots served by transit services in the study corridor. Capital costs were assumed to consist of a per-lot cost ranging from \$111,000 to \$246,000 for detection, installation, and testing and a per-lot operator cost ranging from \$67,500 to \$134,500 for management software—an application programming interface (API) that would allow the data feed to be integrated into third-party apps, installation, and testing. A 15% project and construction management cost and a 20% contingency were assumed. Annual O&M costs were assumed to be 20% of the detection, software/API capital costs. Preliminary cost estimates assumed that the technology would be implemented for six lots in Virginia with two operators and eight lots in Maryland with three operators. This technology was rated as Medium for

technology readiness because multiple lot operators would be involved in implementing the systems presenting an integration challenge, and potential dependence on Virginia's RM3P that is still under development.

Transit Payment Integration and Incentivization

This recommendation would provide an automated payment system that supports contactless payment solutions, special fare programs, and integration with multiple mobility services. It was assumed that this recommendation would leverage enhancements that WMATA has planned to the regional fare system, SmarTrip. Capital costs were assumed to consist of a per-bus cost ranging from \$35,000 to \$50,000 for a farebox/validator and a per-operator cost ranging from \$100,000 to \$400,000 for a back-office setup/integration. A 15% project management cost and a 20% contingency were assumed. Annual O&M costs were assumed to be 10% of capital costs. Preliminary cost estimates assumed that the technology would be implemented for 101 buses and three transit operators. This option was rated as Low for technology readiness because of its dependence on the region migrating to an account-based fare payment system.

Zero-Emission Bus Charging Infrastructure

This recommendation would provide on-route charging infrastructure at stations, bus bays, stops, and/or depots to support zero-emission buses. Capital costs were assumed to consist of a per location cost ranging from \$670,000 (on-route inductive/wireless charger) to \$1,034,000 (on-route overhead charger) for equipment and installation per charger, depending on the type of charger. A 15% project and construction management cost and a 25% contingency were assumed. Annual O&M costs were assumed to be 10% of the equipment capital costs. Preliminary cost estimates assumed that the technology would be implemented for 16 charging locations. This technology was rated as Medium for technology readiness because, while some transportation and transit agencies in the region have experience with the technology, it will require additional feasibility study, operator agreements, and preliminary engineering to refine implementation locations.

Automated, Connected, and Shared Mobility

This recommendation would provide technology-enabled shared mobility services at mobility hubs (transit stations, transfer centers, park and ride lots), where connections can be made to other high-capacity transit services. These services would provide first/last mile connections using shared automated vehicles (AVs). Capital costs were assumed to consist of a per vehicle purchase cost ranging from \$393,500 to \$434,000 for purchasing a vehicle and associated shipping costs and a per facility upgrade cost ranging from \$252,000 to \$277,500 for planning and developing a standard operating procedure, facility upgrades, and testing. A 15% project and construction management cost and a 20% contingency were assumed. Annual O&M costs were assumed to consist of a per vehicle cost ranging from \$57,000 to \$62,700 and a per operator cost ranging from \$58,400 to \$64,240. Preliminary cost estimates assumed that the technology would be implemented for eight vehicles, four facility upgrades and four operators. This option was rated as Low for technology readiness because while some transportation and transit agencies in the region have experience with the technology, it will require additional feasibility study and preliminary engineering to refine implementation locations and requirements.

Summary of Evaluation

A summary of the technology evaluation results for the preliminary recommendations is shown in **Table 40**.

Table 40. Preliminary Technology Recommendation Evaluation

Strategy	Capital Cost Estimate (2022)	Annual O&M Cost Estimate (2022)	Cost Rank	Technology Readiness	Trip Reduction Potential
Transit Priority Technology	\$3,000,000 - \$4,950,000	\$245,000 - \$411,000	3	Medium	High
Real-Time Travel and Transit Information	\$4,640,000 - \$8,720,000	\$344,000 - \$655,000	4	High	High
Real-Time Passenger Load Information	\$1,040,000 - \$1,920,000	\$138,000 - \$315,000	1	Medium	Low
Commuter Parking Information System	\$2,450,000 - \$5,340,000	\$192,000 - \$413,000	2	Medium	Medium
Transit Payment Integration and Incentivization	\$5,180,000 - \$8,440,000	\$384,000 - \$625,000	5	Low	Medium
Zero-Emission Bus Charging Infrastructure	\$15,010,000 - \$23,160,000	\$632,000 - \$1,184,000	7	Medium	Low
Automated, Connected, and Shared Mobility	\$5,610,000 - \$6,190,000	\$690,000 - \$759,000	6	Low	Low

Technology Refined Recommendations

Recommendation Refinement

The preliminary technology recommendations were advanced without further need for refinement aside from updating quantities to align with the final transit recommendations. For example, some quantities are dependent on the number of buses, routes, or park and ride lot facilities required as a result of the transit recommendations. No other refinement or reassessment of the technology recommendations were needed after evaluation and feedback from TAC members. The following quantities were assumed:

- 34 intersections for transit signal priority, 9 intersections for queue jump, 4 signal operators
- 103 buses operated by 3 transit operators for transit signal priority, real-time transit and passenger load information and fare payment equipment modernization
- 9 (2 in Virginia and 7 in Maryland) park and ride lots for commuter parking information systems operated by 5 operators (2 in Virginia and 3 in Maryland)
- 11 locations for on-route charging infrastructure
- 10 vehicles, 3 facilities, and 3 operators for mobility on-demand services

Capital and Operating Costs

Cost estimate ranges for technology were developed using sources such as the US Department of Transportation's Intelligent Transportation System (ITS) Deployment Evaluation Program and the study team's experience with transportation and transit agencies that have implemented similar solutions. Assumptions for each technology solution are detailed above in the **Process, Metrics, and Assumptions** section.

Table 41 summarizes the capital and O&M cost estimate ranges for each of the final technology recommendations. The average of low and high costs of the ranges were used for developing the tiered investment packages in the next section.

Table 41. Cost Estimates for Technology Recommendations

Recommendation	Capital Cost Estimate (2022)	Annual O&M Cost Estimate (2022)	Cost Rank (1 = Lowest)	Technology Readiness	Trip Reduction Potential
Transit Priority Technology	\$2,870,000 - \$4,730,000	\$235,000 - \$395,000	4	Medium	High
Real-Time Travel and Transit Information	\$1,470,000 - \$2,760,000	\$96,000 - \$187,000	2	High	High
Real-Time Passenger Load Information	\$1,050,000 - \$1,940,000	\$139,000 - \$318,000	3	Medium	Low
Commuter Parking Information System	\$1,320,000 - \$2,870,000	\$104,000 - \$224,000	1	Medium	Medium
Transit Payment Integration and Incentivization	\$5,270,000 - \$8,570,000	\$391,000 - \$635,000	5	Low	Medium
Zero-Emission Bus Charging Infrastructure	\$10,320,000 - \$15,920,000	\$435,000 - \$814,000	7	Medium	Low
Automated, Connected, and Shared Mobility	\$6,330,000 - \$6,980,000	\$745,000 - \$820,000	6	Low	Low

VIII. Potential Investment Packages

This section explores potential investment packages by timeframe for the study recommendations.

Transit/TDM/Technology recommendations were grouped into three investment packages:

- **Near-Term:** Present through the construction phase of the potential I-495 Southside Express Lanes (prior to 2030)
- **Mid-Term:** In conjunction with the opening of the potential I-495 Southside Express Lanes in 2030 to 2045
- **Long-Term:** Following opening of the potential I-495 Southside Express Lanes in years beyond 2045

The organization of Transit/TDM/Technology recommendations into the varying investment packages offers several advantages, including establishing a framework of services based on potential implementation timeframes and anticipated funding levels. In addition, organizing recommended improvements in this manner allows for modification based on agency and stakeholder preferences for groupings of services and associated costs and benefits. Tiering the recommendations also allows for further refinement and prioritization of the services based on changes in the operating environment, assumptions of the availability of express or managed lanes for transit service, and/or the level of service for each transit route.

Approach

Assignment of Transit/TDM/Technology recommendations into the various investment packages was based on several quantitative and qualitative factors. Quantitative factors used for tiering the recommendations were drawn from the off-model evaluation. Trip potential and demand forecasts were also used to consider whether a market for a given transit service exists today or would by 2030 or 2045. Qualitative factors were based on consistency and complementary activity between proposed transit, TDM CAP, and technology recommendations. Technology readiness and dependency on other regional initiatives was also considered.

A description of each investment package is included below along with a summary table listing the corresponding recommendations assigned to each. Investment packages are presented to be cumulative in their implementation, where the mid-term package is inclusive of all near-term package elements and the long-term investment package is inclusive of all near-term and mid-term package elements.

Recommendations in the mid-term and long-term packages could be advanced sooner than shown depending on funding availability and implementation readiness. In addition, planned improvements identified in baseline conditions that support connectivity with the transit recommendations should continue to be advanced.

Near-Term Investment Package

The near-term investment package consists of strategies that require lower levels of investment but could yield high benefits and that do not rely on construction of the express lanes for implementation. High-scoring services with moderate to high ridership potential (A4/8 and A21.0) were selected as near-term transit recommendations. These two routes utilize a large portion of the I-495 Southside study corridor (i.e., potential for mode shift in multiple segments during construction) and could operate using existing interchanges and access points until the express lanes are constructed. They would also provide service throughout the day and to areas with relatively high transit propensity. However, without the reliability and transit priority provided by express lanes, attractiveness of A21.0 in particular will need to be considered given congestion and travel time unreliability approaching the Woodrow Wilson Bridge. Other variations of A21, such as the connection to Oxon Hill/National Harbor in the mid-term package, could be implemented in the near term subject to funding.

The near-term investment package includes all the recommended TDM CAPs, which have relatively lower operating costs compared to the transit routes.

The near-term is the most critical for CAPs because it will require the most publicity of the potential strategies and desired behavior change. There are opportunities for employer outreach staff to build connections with employers and establish incentives, even potentially before or during construction, as part of a Transportation Management Plan (TMP). General marketing and promotional campaigns highlighting the new services would also be employed, as well as ridematching support for the corridor.

Near-term technology recommendations include real-time travel and transit information and a commuter parking information system to support the near-term transit recommendations. These would provide and promote real-time traveler information during the construction phase of the potential I-495 Southside Express Lanes.

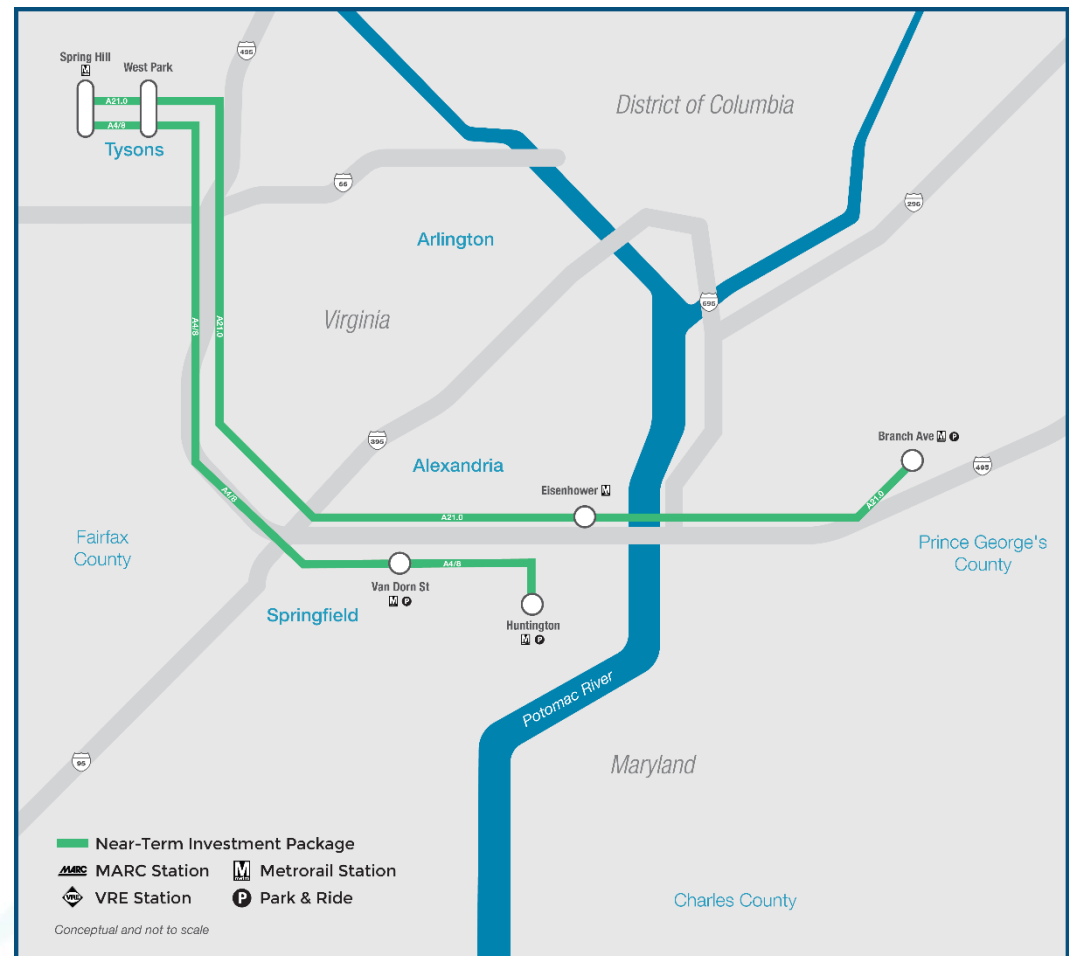


Table 42. Near-Term Investment Package

Category	Recommendation	Annual Operating Cost (2022)	Capital Cost (2022)*	Implementation Timeframe
Transit Service	A4/8 - Alexandria to Tysons	\$4,219,000	\$10,000,000	Near-Term
	A21.0 - Central-West Prince George's County to Tysons (via Eisenhower)	\$3,513,000	\$9,000,000	Near-Term
TDM Commuter Assistance Programs	Vanpool Formation and Expansion Program - Incentive Stipend		\$100,000	Near-Term
	Vanpool Formation and Expansion Program - Administrative Program Cost	\$4,000	-	Near-Term
	Corridor-Specific Mobility Options Marketing Campaign - Labor	\$18,750	-	Near-Term
	Corridor-Specific Mobility Options Marketing Campaign - Promotional Expenses	-	\$150,000	Near-Term
	Targeted Residential Outreach - Labor	\$56,250	-	Near-Term
	Targeted Employer Outreach - Promotional Expenses, Travel		\$25,000	Near-Term
	Targeted Employer Outreach (Low/Moderate) - Labor	\$85,000	-	Near-Term
	Targeted Employer Outreach (High) - Labor	\$85,000	-	Near-Term
	Carpool Promotion Programs - Labor	\$18,750	-	Near-Term
Technology	Real-Time Travel and Transit Information	\$53,500	\$785,000	Near-Term
	Commuter Parking Information System	\$33,000	\$375,000	Near-Term
Total		\$8,086,250	\$20,435,000	

*Capital costs are one-time expenses and do not include lifecycle replacement costs for buses or technology

Mid-Term Investment Package

The mid-term investment package consists of transit/TDM/technology recommendations that take advantage of the potential express lanes and are the most cost-effective options within their respective categories. Recommendations included in the mid-term investment package are outlined in **Table 43**.

The largest component of the mid-term investment package is transit service recommendations. In addition to the continuation of services implemented in the near-term package, additional services are added that provide improved connections to major regional activity centers, including Tysons, Dunn Loring-Merrifield, Landmark-Van Dorn, Carlyle-Eisenhower East, King Street-Old Town, Huntington, Pentagon, Rosslyn, Oxon Hill, National Harbor, Waldorf, NoMa (DC), and Capitol Riverfront.

Most of the TDM CAPs are also continued during the mid-term investment package, including marketing and promotion focused on new and successful transit and commuter services, and employer and residential outreach. Vanpooling and carpooling incentives are not included in the mid-term as it was assumed that the market will have reached self-sufficiency by then.

Mid-term technology recommendations include transit priority technology, traveler information-related recommendations for the new transit services, transit payment integration and incentivization, and zero-emission bus charging infrastructure for applicable on-route transit facilities.

When combined with the near-term investment package, the mid-term package stands as a dynamic group of improvements that offers benefits to a diverse set of express lane user groups including carpool, vanpool, and transit users.

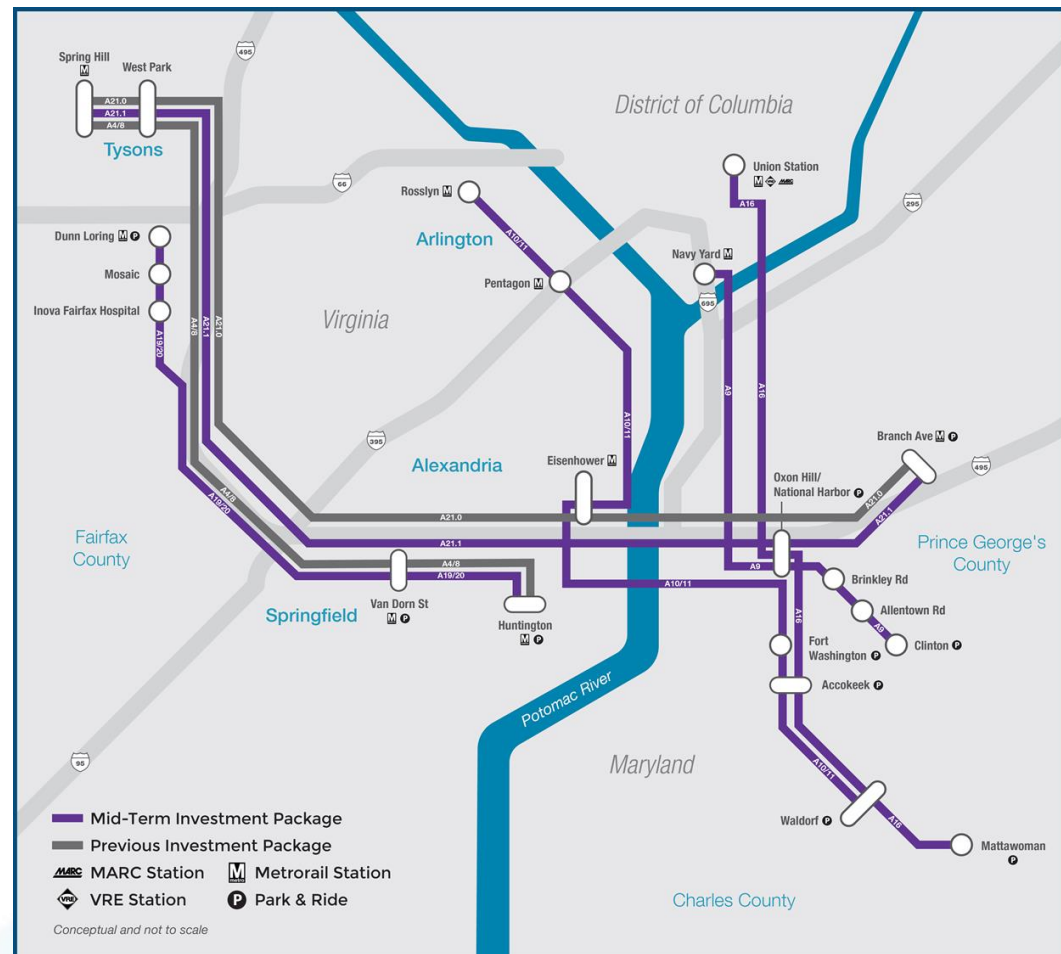


Table 43. Mid-Term Investment Package

Category	Recommendation	Annual Operating Cost (2022)	Capital Cost (2022)*	Implementation Timeframe
Transit Service	A9 - Southwest Prince George's County to Capitol Riverfront	\$1,584,000	\$9,000,000	Mid-Term
	A10/11 - North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor	\$2,376,000	\$14,000,000	Mid-Term
	A16 - North Charles County to NoMa (DC)	\$1,756,000	\$12,000,000	Mid-Term
	A19/20 - Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield	\$3,168,000	\$8,000,000	Mid-Term
	A21.1 - Central-West Prince George's County to Tysons (via Oxon Hill)	\$3,513,000	\$9,000,000	Mid-Term
	NH1 - Increase Frequency	\$706,000	\$1,000,000	Mid-Term
	NH2 - Increase Frequency	\$482,000	\$1,000,000	Mid-Term
TDM Commuter Assistance Programs	Corridor-Specific Mobility Options Marketing Campaign - Labor	\$18,750	-	Mid-Term
	Corridor-Specific Mobility Options Marketing Campaign - Promotional Expenses	-	\$150,000	Mid-Term
	Targeted Residential Outreach - Labor	\$56,250	-	Mid-Term
	Targeted Residential Outreach - Promotional Expenses, Travel	-	\$25,000	Mid-Term
	Targeted Employer Outreach (Low/Moderate) - Labor	\$85,000	-	Mid-Term
	Targeted Employer Outreach (High) - Labor	\$85,000	-	Mid-Term
Technology	Transit Priority Technology	\$315,000	\$3,800,000	Mid-Term
	Real-Time Travel and Transit Information	\$57,500	\$870,000	Mid-Term
	Real-Time Passenger Load Information	\$212,500	\$1,215,000	Mid-Term
	Commuter Parking Information System	\$131,000	\$1,715,000	Mid-Term
	Transit Payment Integration and Incentivization	\$368,500	\$4,975,000	Mid-Term
	Zero-Emission Bus Charging Infrastructure	\$397,500	\$8,350,000	Mid-Term
Total		\$15,312,000	\$75,100,000	

*Capital costs are one-time expenses and do not include lifecycle replacement costs for buses or technology

Long-Term Investment Package

The long-term investment package consists of transit and technology solutions that would expand and supplement the areas served by transit in the near-term and mid-term investments. Long-term recommendations are included in **Table 44**.

Long-term transit recommendations add the remaining four transit services: A2.3, A6/7, A13, and A17. These are moderate or low scoring recommendations with lower relative ridership than the other recommendations. These also supplement existing or future planned transit options.

Long-term TDM CAP recommendations are limited due to the need to assess and monitor the strategies that have been working and also adapt methodologies to current travel behavior at this time. The CAP that is retained is the employer services in high-density, high-effort areas, which has the highest ROI score. This strategy is not expected to lose efficacy as it is assumed there will also be people working for large employers with robust commute programs.

Long-term technology recommendations include the relevant traveler information-related, payment and incentivization, and bus charging infrastructure for the new transit services. The recommendation that is unique to this package is automated, connected, and shared mobility. This is dependent on technology maturity advancements and would provide first/last mile connections using shared automated vehicles to mobility hubs.

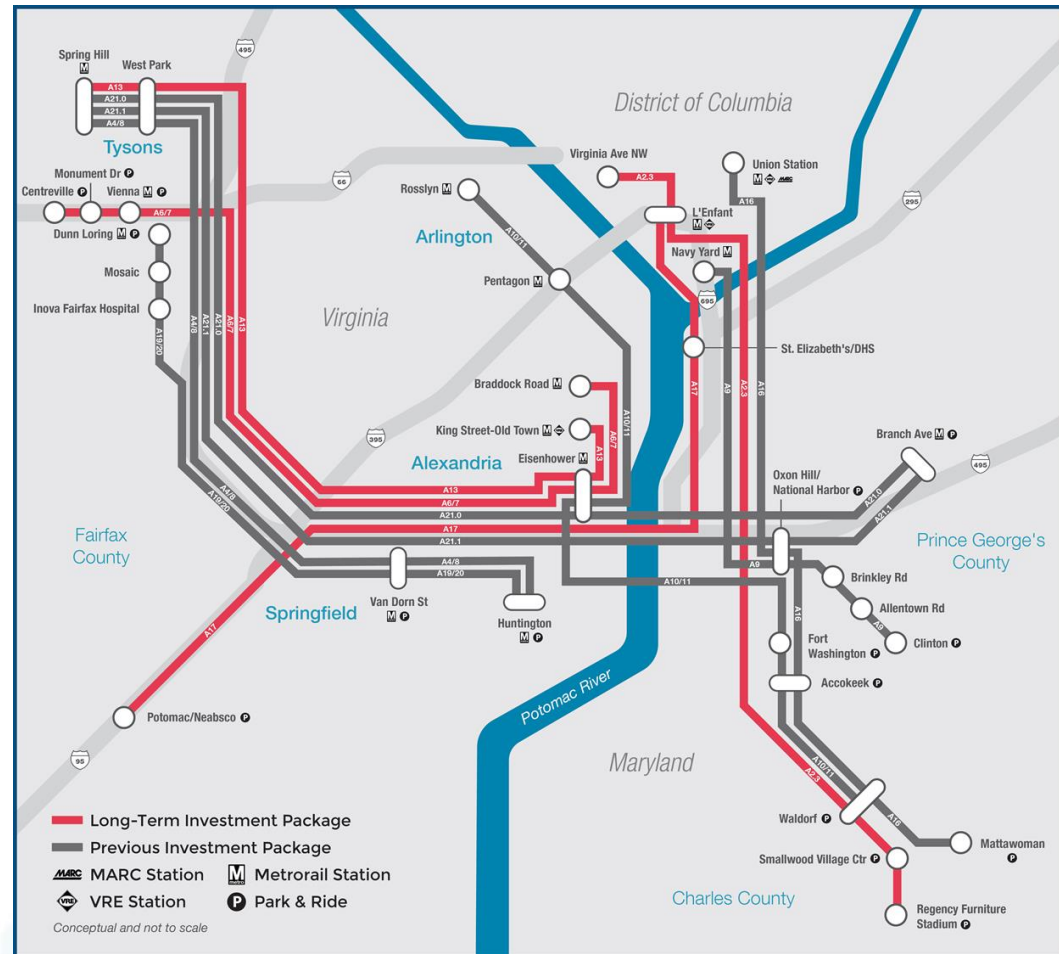


Table 44. Long-Term Investment Package

Category	Recommendation	Annual Operating Cost (2022)	Capital Cost (2022)	Implementation Timeframe
Transit Service	A2.3 - North Charles County to DC Core	\$534,000	\$8,000,000	Long-Term
	A6/7 - Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area	\$1,980,000	\$11,000,000	Long-Term
	A13 - Northwest Fairfax County to Carlyle-Eisenhower East	\$878,000	\$6,000,000	Long-Term
	A17 - East Prince William County to Southwest Waterfront	\$1,223,000	\$9,000,000	Long-Term
TDM Commuter Assistance Programs	Targeted Employer Outreach (High) - Labor	\$85,000	-	Long-Term
Technology	Real-Time Travel and Transit Information	\$31,000	\$460,000	Long-Term
	Real-Time Passenger Load Information	\$16,000	\$275,000	Long-Term
	Commuter Parking Information System	\$66,500	\$755,000	Long-Term
	Transit Payment Integration and Incentivization	\$144,500	\$1,955,000	Long-Term
	Zero-Emission Bus Charging Infrastructure	\$227,000	\$4,770,000	Long-Term
	Automated, Connected, and Shared Mobility	\$782,500	\$6,655,000	Long-Term
Total		\$5,967,500	\$48,870,000	

*Capital costs are one-time expenses and do not include lifecycle replacement costs for buses or technology

Summary

It is important to note that the investment packages as presented are cumulative in their implementation, where the mid-term package is inclusive of all near-term package recommendations and the long-term package is inclusive of all near-term and mid-term package recommendations. **Table 45** includes the total annual operating cost and capital cost based on the cumulative costs for the corresponding packages. **Table 46** shows the transit routes included in each investment package, the level of service at which the routes would operate, and the estimated daily riders.

Table 45. Cumulative Investment Package Costs

Investment Level Packages	Annual Operating Cost (2022)	Capital Cost (2022)*
Near-Term Investment Package	\$8,086,250	\$20,435,000
Mid-Term Investment Package	\$15,312,000	\$75,100,000
Mid-Term + Near-Term Investment Packages	\$23,398,250	\$95,535,000
Long-Term Investment Package	\$5,967,500	\$48,870,000
Long-Term + Mid-Term + Near-Term Investment Packages	\$29,365,750	\$144,405,000

*Capital costs are one-time expenses and do not include lifecycle replacement costs for buses or technology



Table 46. Transit Recommendations Summary

Connection	Potential Transit Mode	Direction	Near-Term Package			Mid-Term Package			Long-Term Package		
			Frequency (minutes)		Est. Daily Riders (2030)	Frequency (minutes)		Est. Daily Riders (2045)	Frequency (minutes)		Est. Daily Riders (2045)
			Peak	Off-Peak		Peak	Off-Peak		Peak	Off-Peak	
A2.3 - North Charles County to DC Core	Express Bus	Peak Direction Only							40	300	
A4/8 - Alexandria to Tysons	Express Bus	Both Directions	20	40	325	20	40	750	20	40	725
A6/7 - Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area	Commuter Bus	Peak Direction Only							20	40	675
A9 - Southwest Prince George's County to Capitol Riverfront	Commuter Bus	Peak Direction Only				20	40	2,400	20	40	2,400
A10/11 - North Charles and Southwest Prince George's Counties to Rosslyn	Commuter Bus	Peak Direction Only				20	40	2,825	20	40	2,825
A13 - Northwest Fairfax County to Carlyle-Eisenhower East	Commuter Bus	Peak Direction Only							20		300
A16 - North Charles County to NoMa (DC)	Commuter Bus	Peak Direction Only				20		1,375	20		1,375
A17 - East Prince William County to Southwest Waterfront	Commuter Bus	Peak Direction Only							20		400
A19/20 - Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield	Express Bus	Both Directions				20	40	650	20	40	650
A21.0 - Central-West Prince George's County to Tysons (via Eisenhower)	Express Bus	Both Directions	20	40	1,100	20	40	1,300	20	40	1,200
A21.1 - Central-West Prince George's County to Tysons (via Oxon Hill)	Express Bus	Both Directions				20	40	1,850	20	40	1,825
Metrobus NH1 – Increased Frequency	Local Bus	Both Directions	30*	30*	1,850	20	30	2,950	20	30	2,950
Metrobus NH2 – Increased Frequency	Local Bus	Both Directions	30*	38*	825	20	30	1,050	20	30	1,025
Total Estimated Daily Riders					4,100			15,150			16,650

* Current frequencies

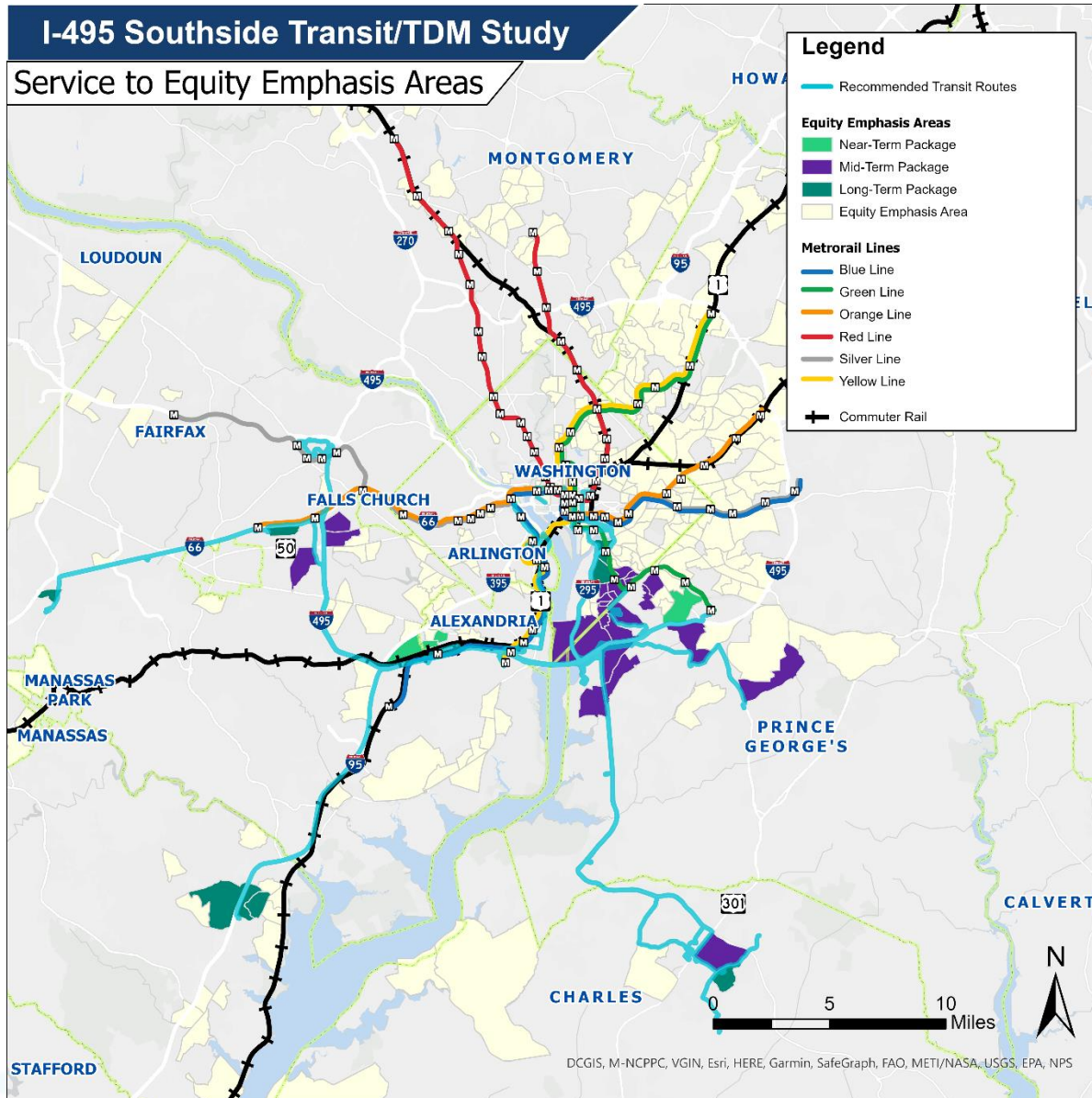
The recommendations for new and enhanced transit services will provide regional connectivity with other existing and planned transit services. Connectivity with other transit modes will increase ridership and has the potential to decrease the amount of driving and parking needed to support the recommended new routes. A summary of transit connections is shown in **Table 47**.

Table 47. Regional Transit Connections

System	Connections		
	Spring Hill ●●● Vienna ● Rosslyn ● Pentagon ● Braddock Road ●	King Street-Old Town ● Eisenhower Avenue ●●● Huntington ●● Van Dorn Street ●●	Navy Yard-Ballpark ●● L'Enfant Plaza ● Union Station ● Branch Avenue ●●
	Alexandria ● L'Enfant ● Union Station ●		Notes: <i>Italicized stops are served by planned transit connections, not existing</i> ● Denotes stops on routes included in near-term package ● Denotes stops on routes included in mid-term package ● Denotes stops on routes included in long-term package
LOCAL BUS	All Stops ●●●		
BUS RAPID TRANSIT	<i>Spring Hill</i> ●●● Braddock Road ● <i>King Street-Old Town</i> ●	<i>Van Dorn Street</i> ●● <i>Huntington</i> ●●	

Transit should also provide service to those who need it most, such as low-income populations who often rely on transit as their primary mode of transportation. Equity Emphasis Areas are small geographic areas identified by MWCOG that have significant concentrations of low-income populations, minority populations, or both. **Figure 51** shows the MWCOG Equity Emphasis Areas and highlights the Equity Emphasis Areas that are within ½ mile of the recommended transit routes in each investment package. The mid-term package is inclusive of the Equity Emphasis Areas in the near-term package, and the long-term package is inclusive of the Equity Emphasis Areas in both the mid-term and near-term packages.

Figure 51. Transit Service to Equity Emphasis Areas



IX. Advancing the Study

This section identifies possible next steps to promote transit and alternative travel modes in the study corridor upon completion of this study.

This study identified a series of potential investment packages to help meet the identified needs of providing new mobility choices to enhance travel along the I-495 Southside corridor. Each investment package includes a combination of recommended transit services, commuter assistance programs, and technology improvements.

While the recommendations identified through this study could be advanced without an expanded express lanes network in the study corridor, the travel reliability and transit priority provided by express lanes will be important for travel time competitiveness of the recommended transit services.

Prior to the implementation of the study recommendations, additional planning will be needed to refine specific transit operating assumptions, corresponding facility needs, and coordination between stakeholders. In addition, the levels of investment and timing of the packages should be further refined when more detailed information on funding availability and schedules for potential implementation of the express lanes become available. Recommendations in the investment packages could be advanced in earlier or later timeframes than shown depending on funding and implementation readiness.

Potential next steps include:

- Identify potential funding sources and secure funding
- Determine potential transit operator(s) and associated maintenance facility considerations
- Conduct more detailed analysis of specific transit operating assumptions such as frequencies, stops, and run times
- Identify available bus bay capacity at Metrorail stations and other transit stops and facilities closer to the time of implementation based on the anticipated service levels at those locations
- Coordinate with transit providers and property owners at park and ride locations to confirm the availability of parking for future bus service passengers
- Conduct public outreach to gather input during the refinement of recommended transit services before implementation
- Work with local stakeholders and transit providers to facilitate first-last mile connections and determine local service modifications
- Monitor technology maturity and the development of Virginia's Regional Multi-Modal Mobility Program (RM3P) for opportunities to deploy new technologies
- Coordinate between states, localities, transit operators and regional organizations on implementation of commuter assistance programs and technology improvements

Appendix A: Public Survey Summary—Summer 2022



I-495 Southside Transit/TDM Study

Survey Results



Survey Summary

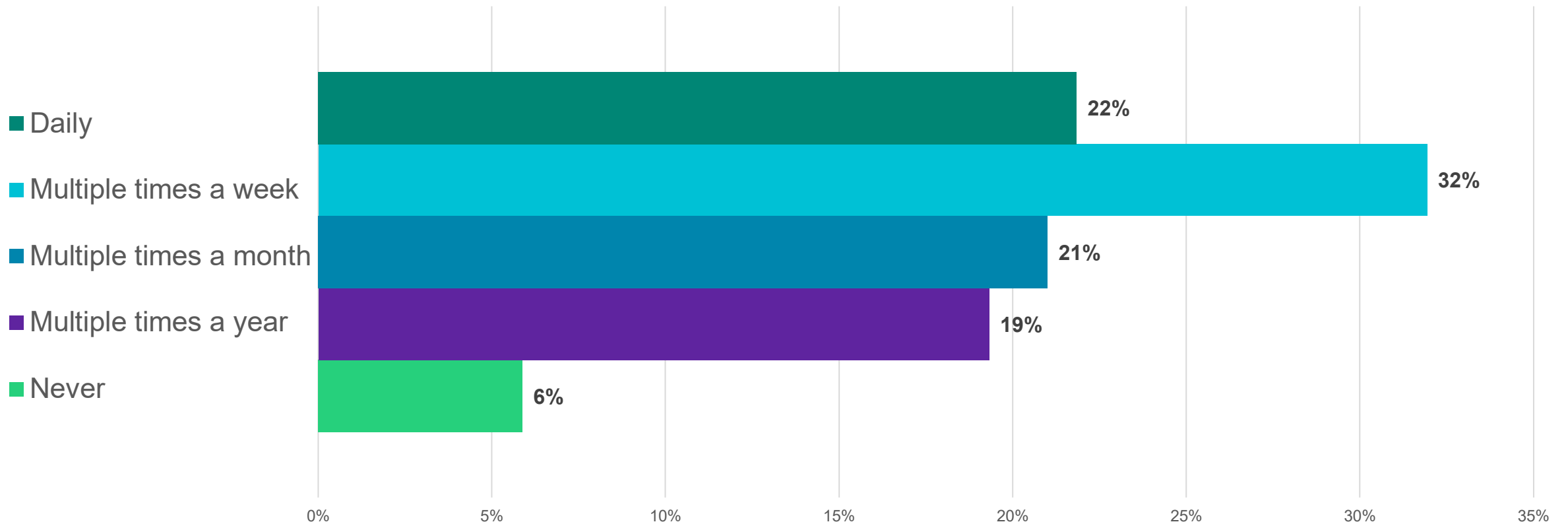
- Survey was open from July 9 through July 31
- Pop-up events occurred on July 15, 16, and 17 in Springfield, Alexandria, and Oxon Hill to promote the survey
- 119 surveys completed



Survey Results

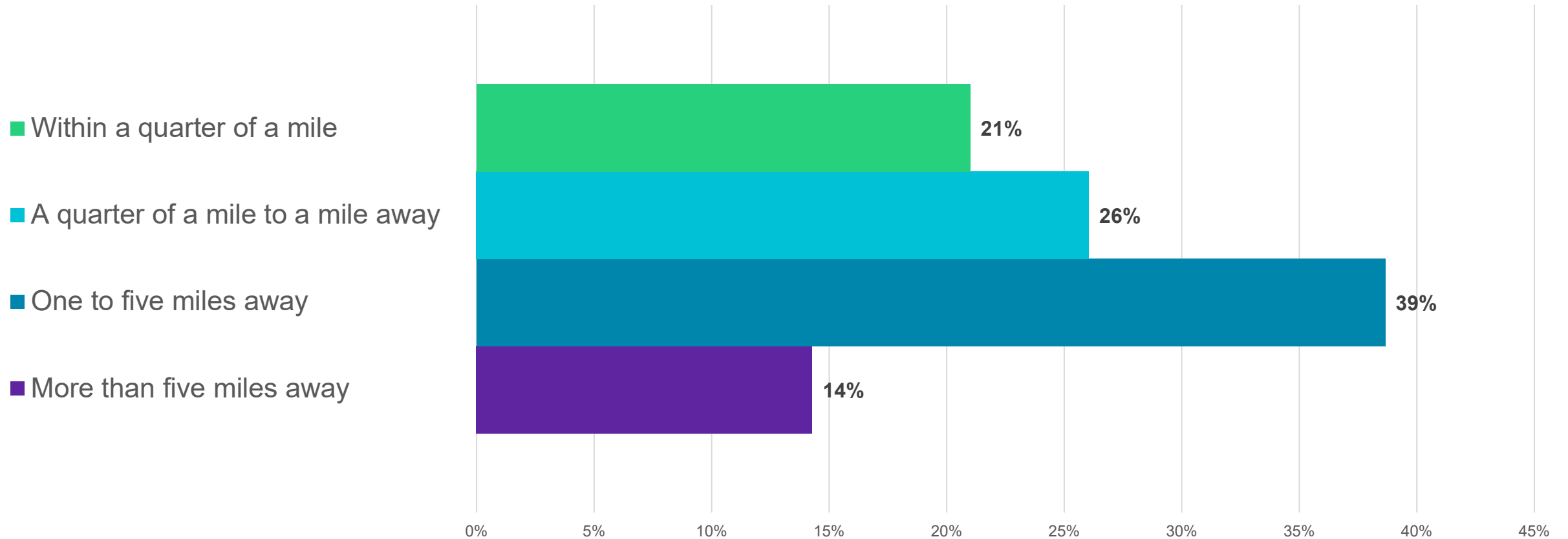
Survey Results

1. How often do you travel (using any mode of transportation) on the I-495 Southside Capital Beltway or nearby rail lines?

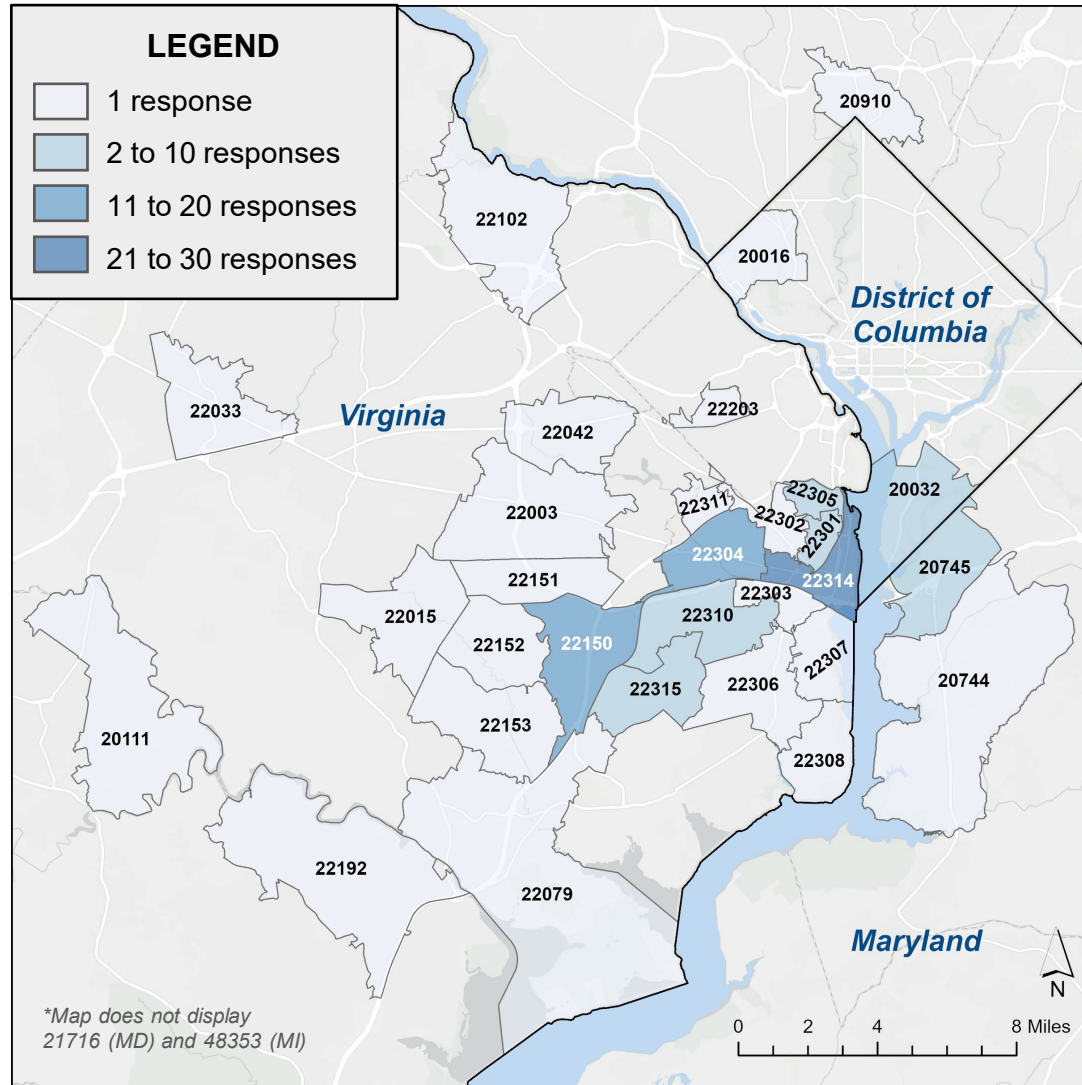


Survey Results

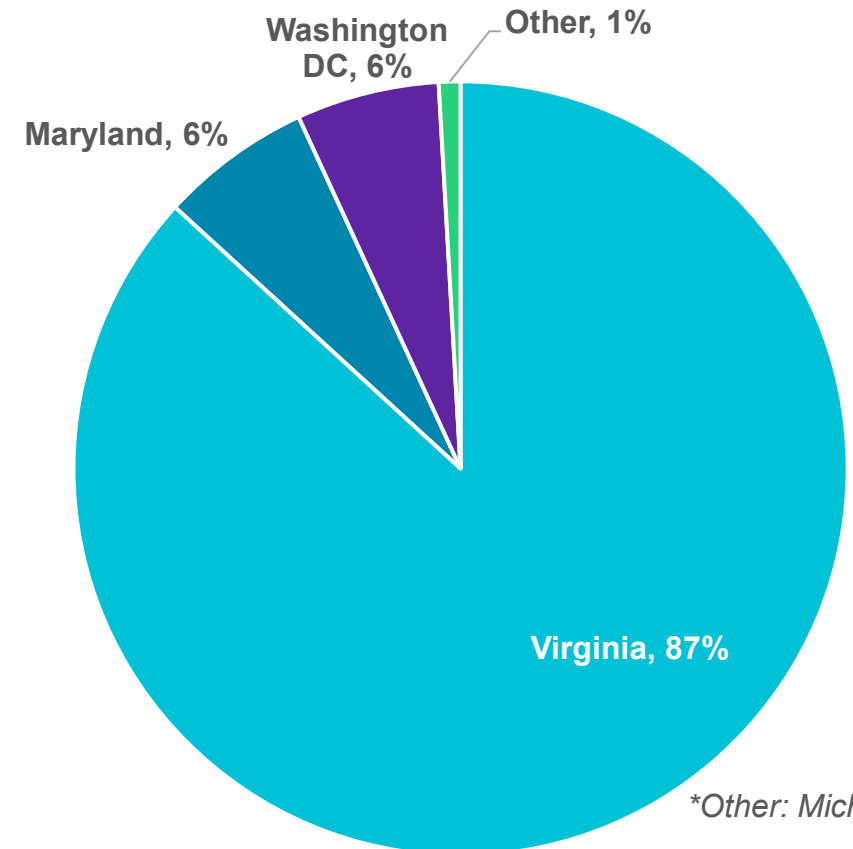
2. How close do you live to I-495?



Survey Results

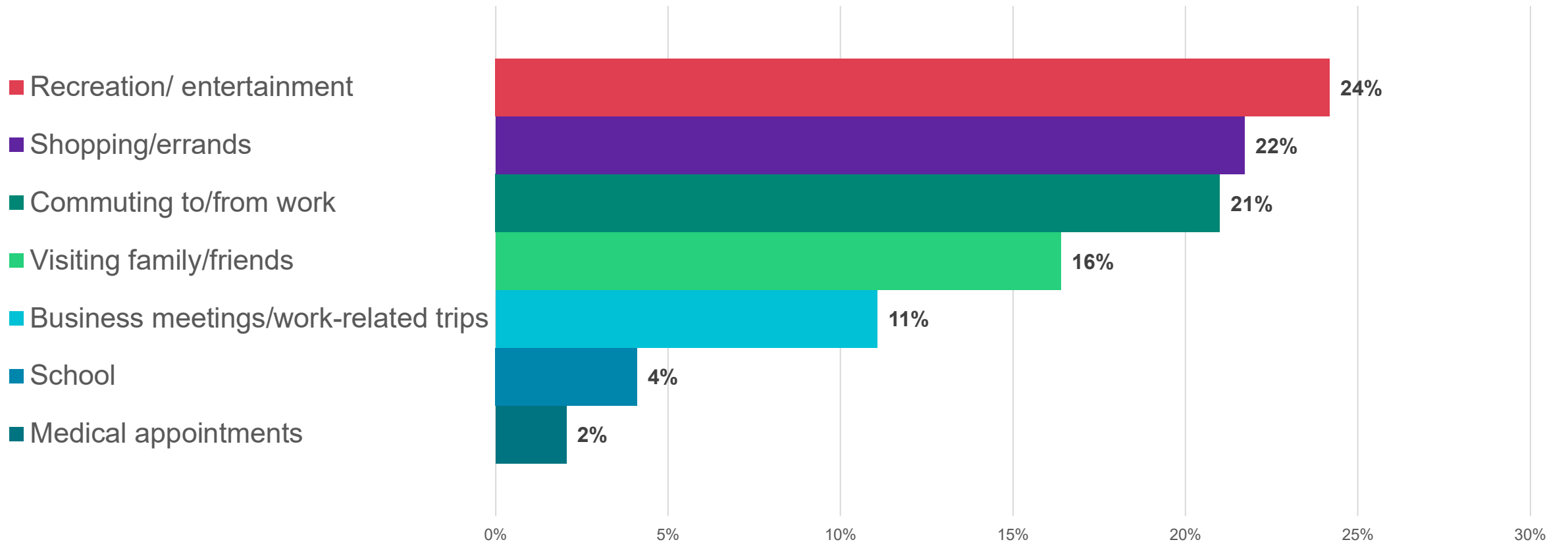


3. What is your home zip code?



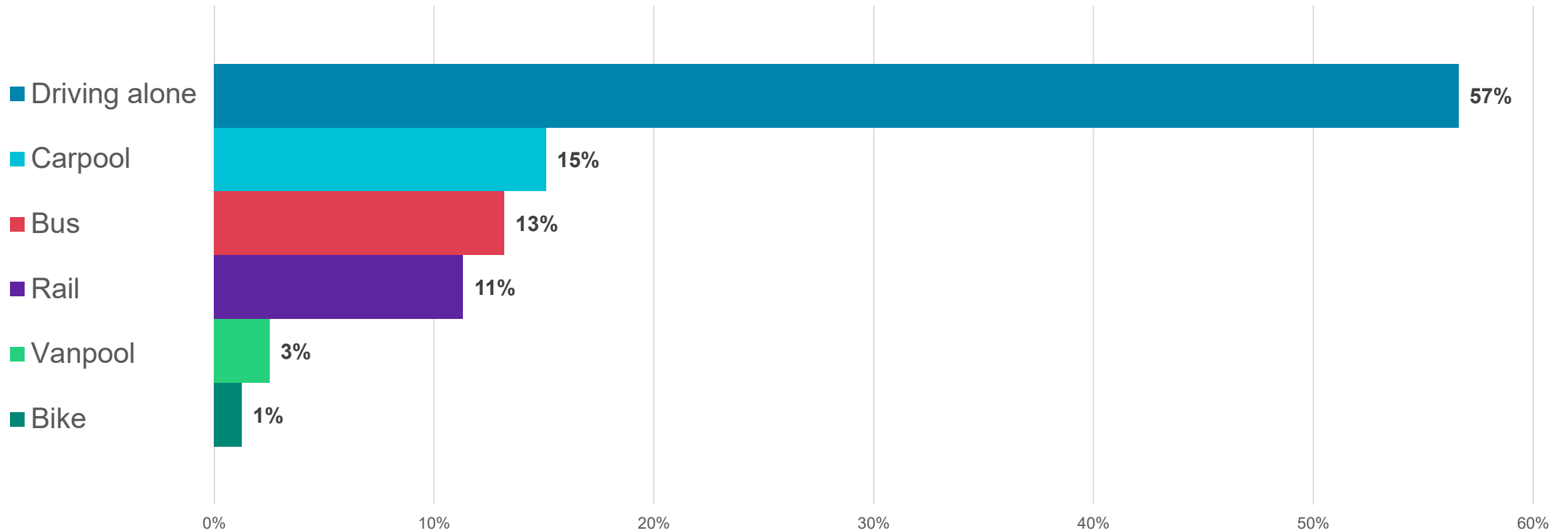
Survey Results

5. What are the most common purposes of your trips on the I-495 Southside Capital Beltway? (Choose all that apply)



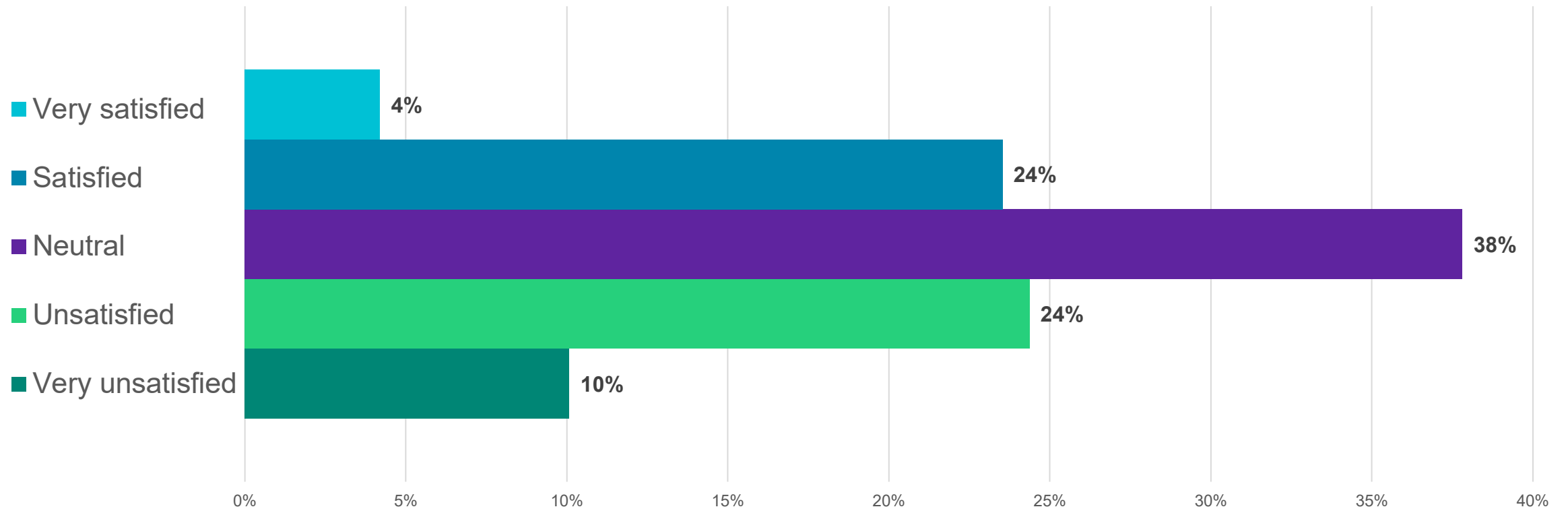
Survey Results

6. What type of transportation do you use when traveling on the I-495 Southside Capital Beltway corridor? (Choose all that apply)



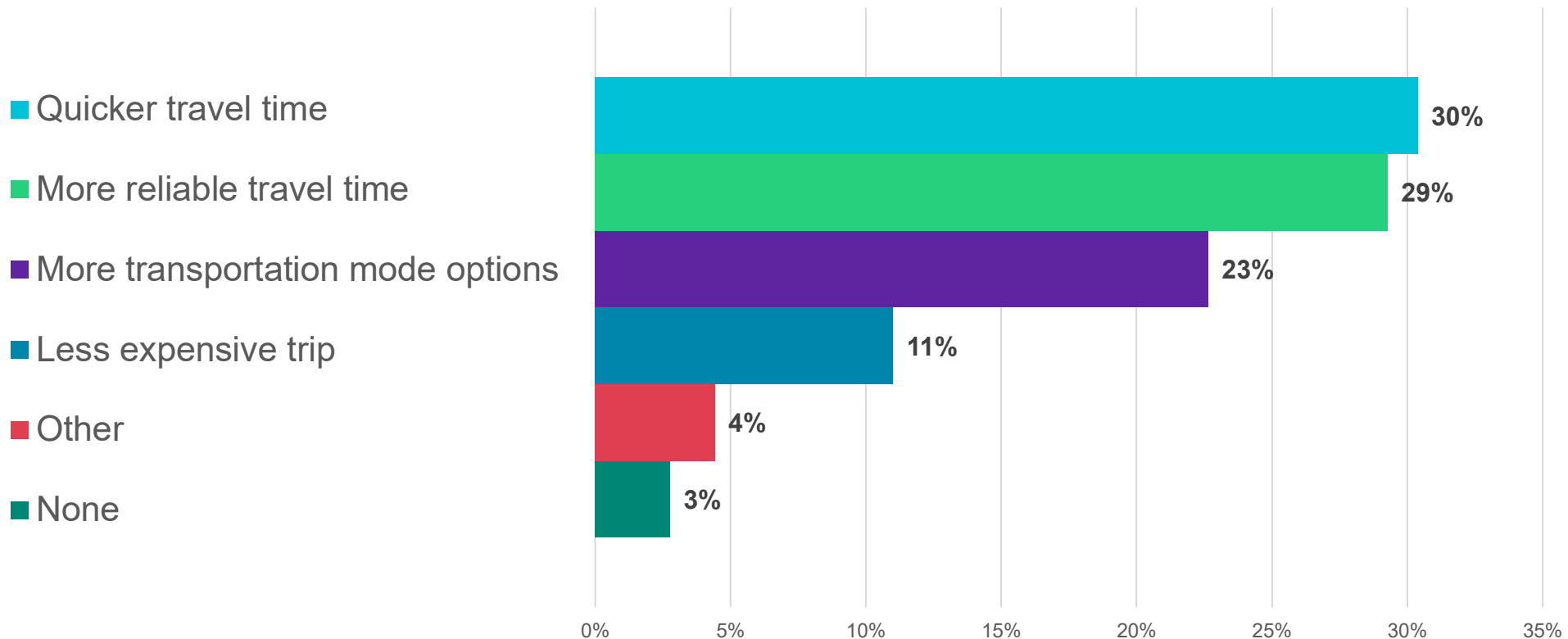
Survey Results

7. How satisfied are you with your travel experience on the I-495 Southside Capital Beltway corridor?



Survey Results

8. What would you make your travel experience on the I-495 Southside Capital Beltway corridor more satisfying? (Choose all that apply)

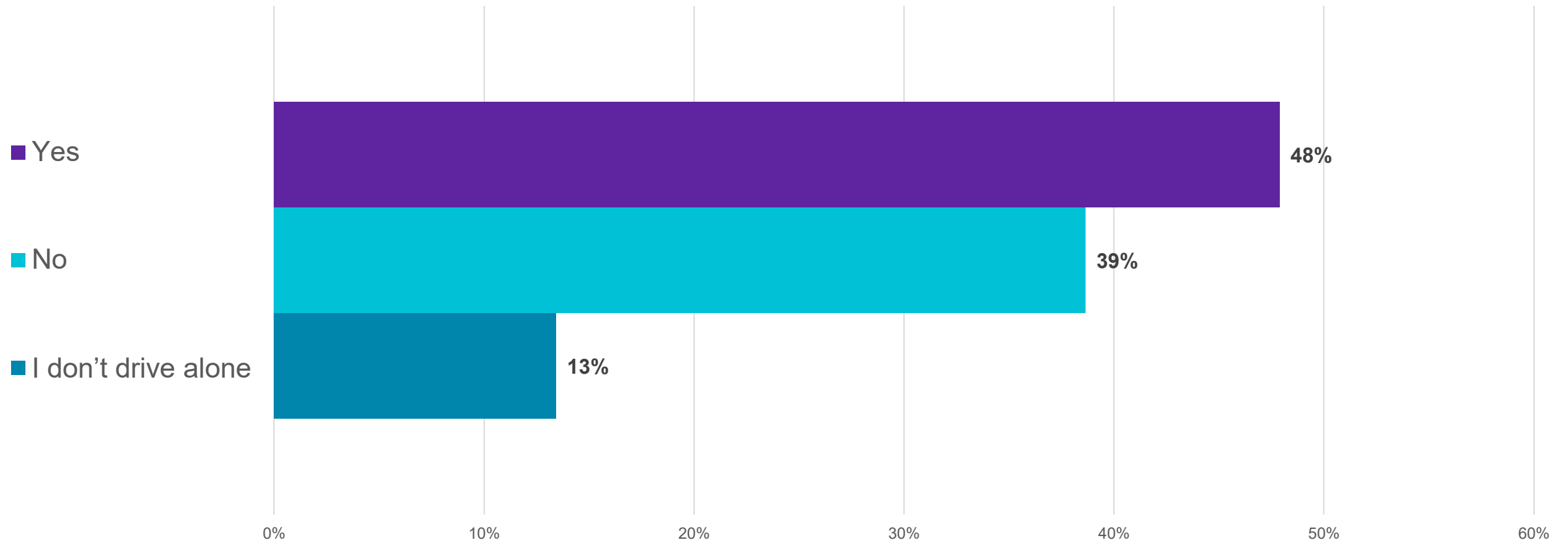


“Other” responses included:

- *Less traffic (4x)*
- *Less speeding*
- *Safety*
- *Bus station at Eisenhower Avenue Metro station*
- *Free Metro between King Street and Huntington*
- *Corridor to West End Alexandria*

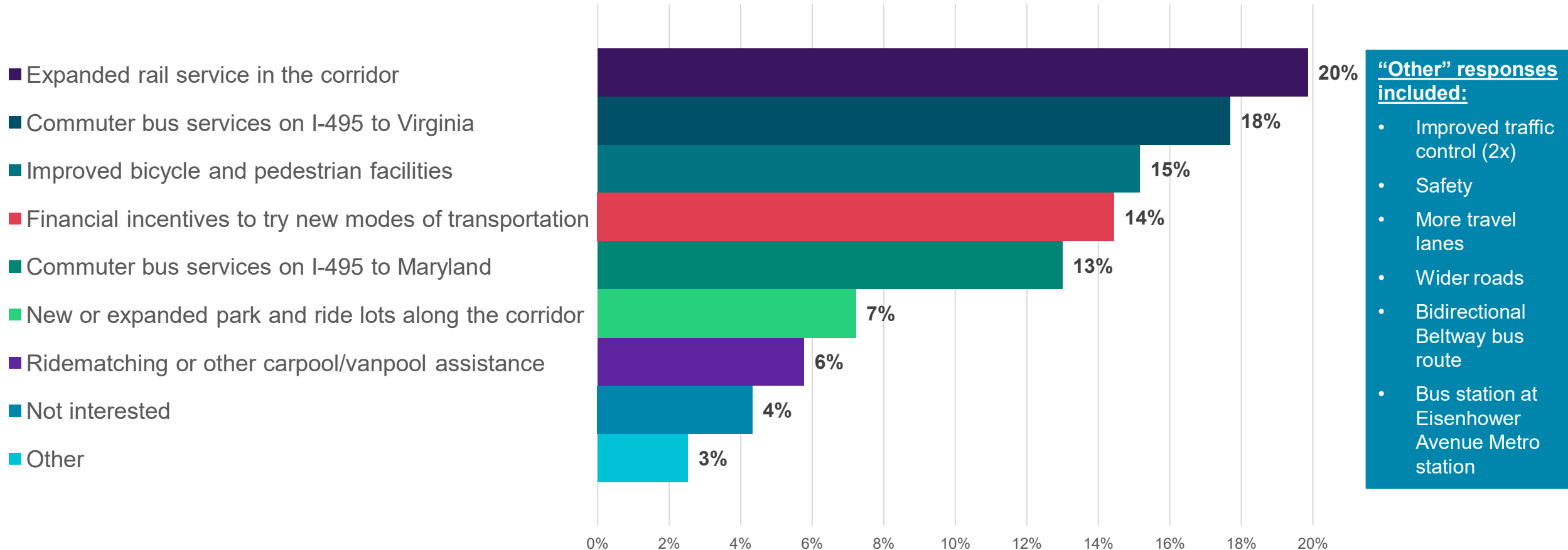
Survey Results

9. If you currently drive alone, are you interested in alternative ways to travel?



Survey Results

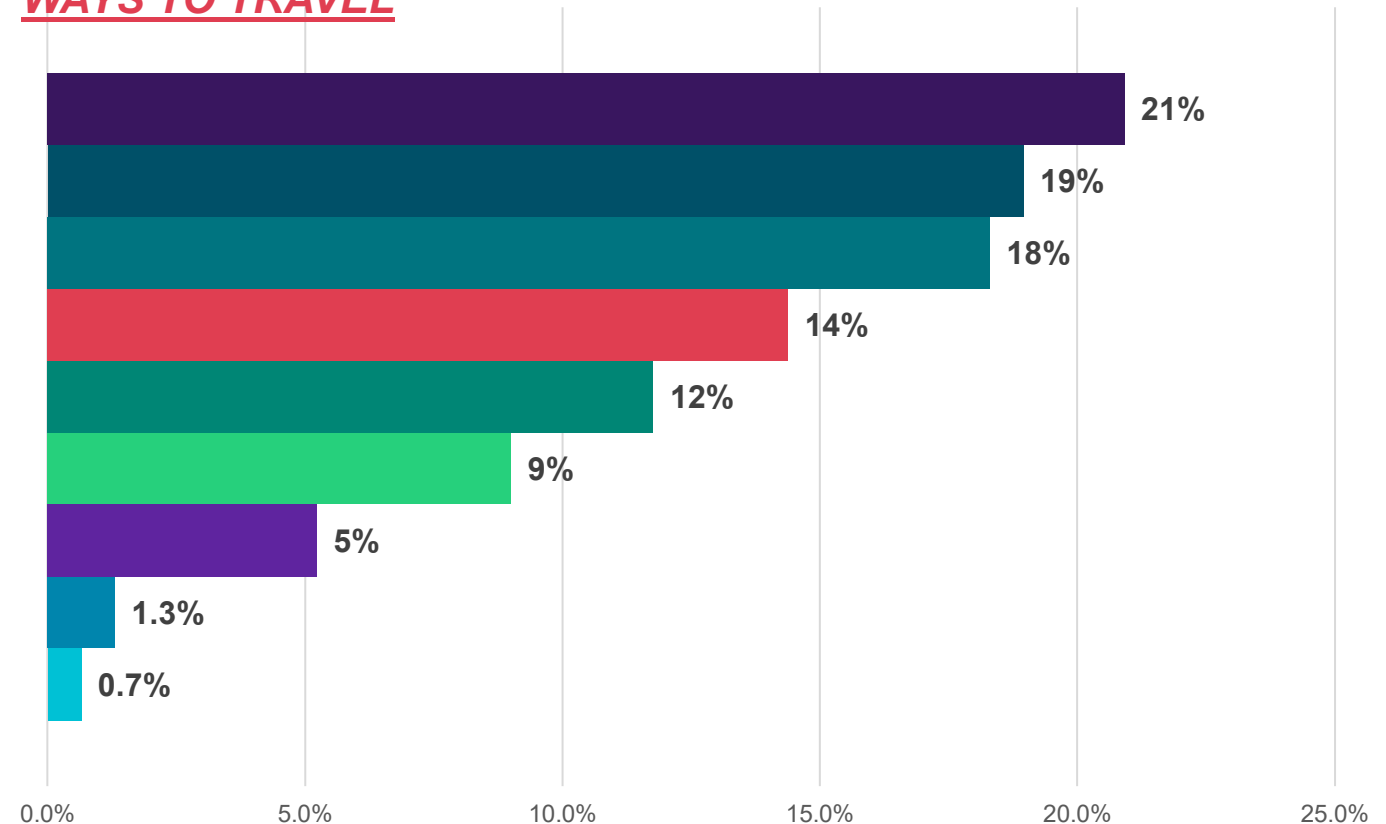
10. Which of these potential recommendations would you be most interested in seeing?



Survey Results

10. Which of these potential recommendations would you be most interested in seeing? *PREFERENCES OF RESPONDENTS WHO DRIVE ALONE AND ARE INTERESTED IN ALTERNATIVE WAYS TO TRAVEL*

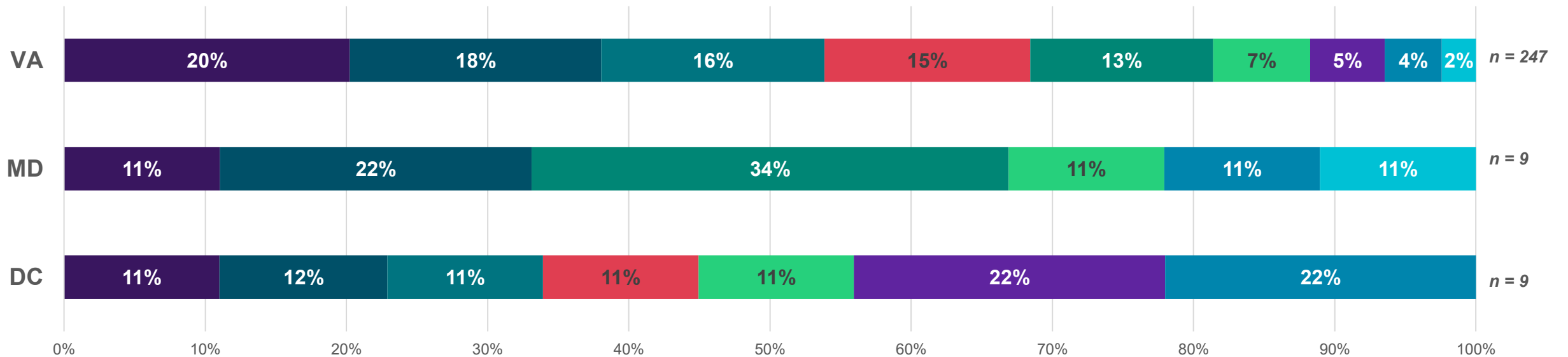
- Expanded rail service in the corridor
- Commuter bus services on I-495 to destinations in Virginia
- Improved bicycle and pedestrian facilities
- Financial incentives to try new modes of transportation
- Commuter bus services on I-495 to destinations in Maryland
- New or expanded park and ride lots along the corridor
- Ridematching or other carpool/vanpool assistance
- Not interested
- Other



*Other: one respondent answered widening I-495

Survey Results

10. Which of these potential recommendations would you be most interested in seeing? PREFERENCES BY HOME LOCATION



- Expanded rail service in the corridor
- Improved bicycle and pedestrian facilities
- Commuter bus services on I-495 to Maryland
- Ridematching or other carpool/vanpool assistance
- Other
- Commuter bus services on I-495 to Virginia
- Financial incentives to try new modes of transportation
- New or expanded park and ride lots along the corridor
- Not interested

Survey Results

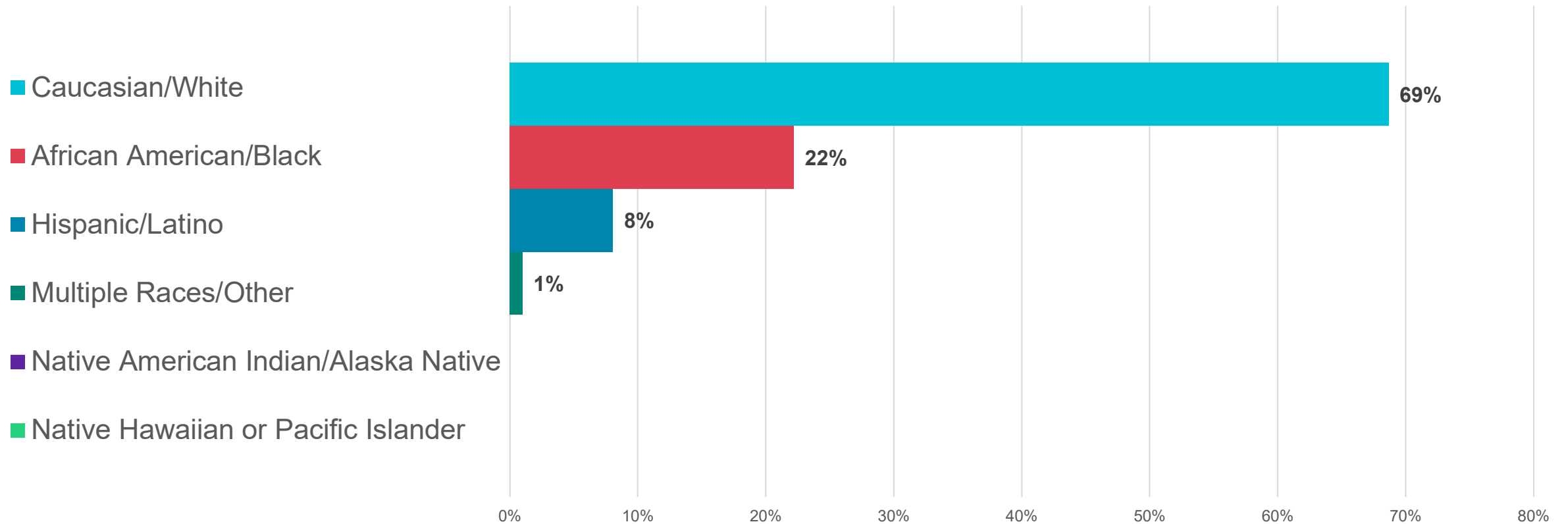
Additional input on the I-495 Southside Transit/TDM Study

(summarized open-response comment topics)

- Suggestions for more, reliable, transit options (9)
 - Examples included express bus on I-495, rail in median, bus station on I-495 at Eisenhower Ave, free Metro fare between Huntington and King Street, commuter bus between Kingstowne or Franconia-Springfield and Tysons
- Congestion (6)
- Pedestrian or bicycle access (4)
- Construction hours (4)
- Price of Express Lanes (4)
- Unsafe driving/safety (3)
- More lanes/widening (2)
- Traffic noise (1)
- More traffic enforcement needed (1)
- Alternative energy (1)
- Long travel time (1)

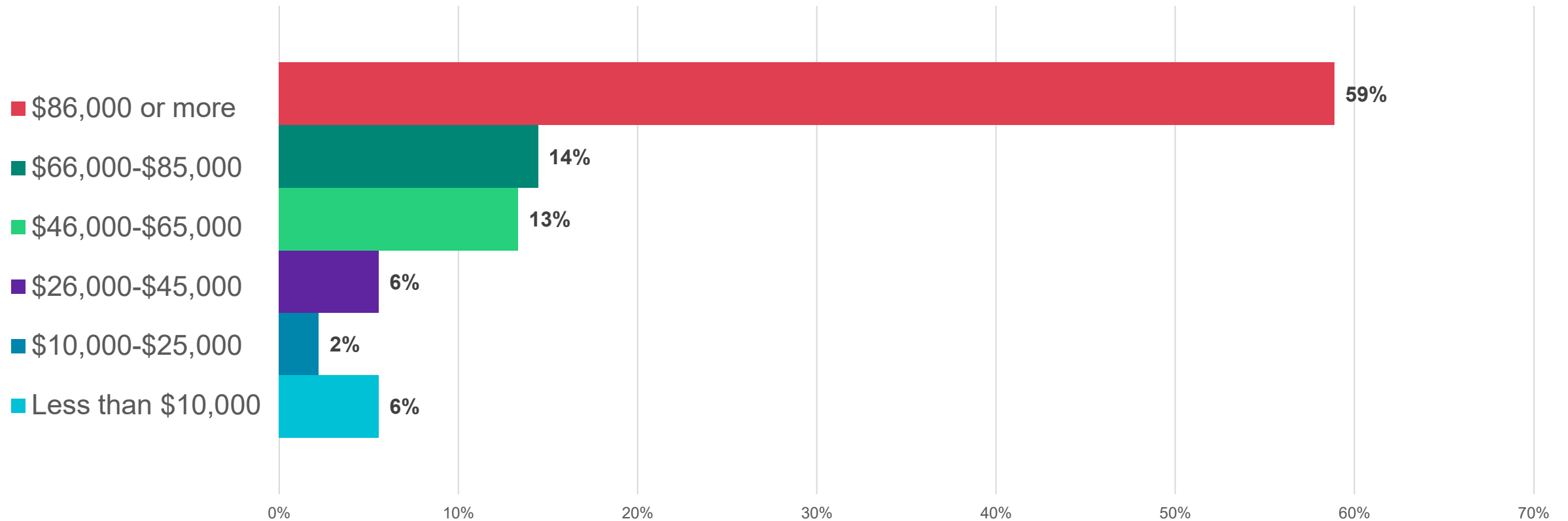
Demographic Information from Survey

12. Which do you consider yourself? (Choose all that apply)



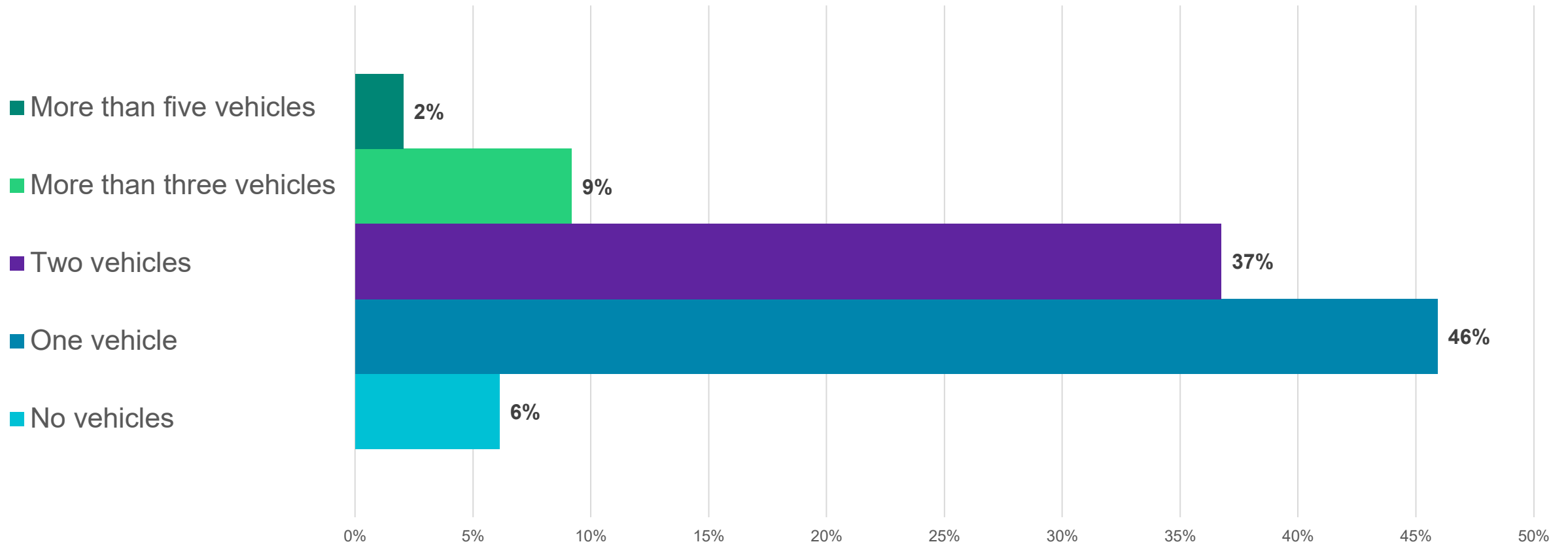
Demographic Information from Survey

13. What is your total annual household income?



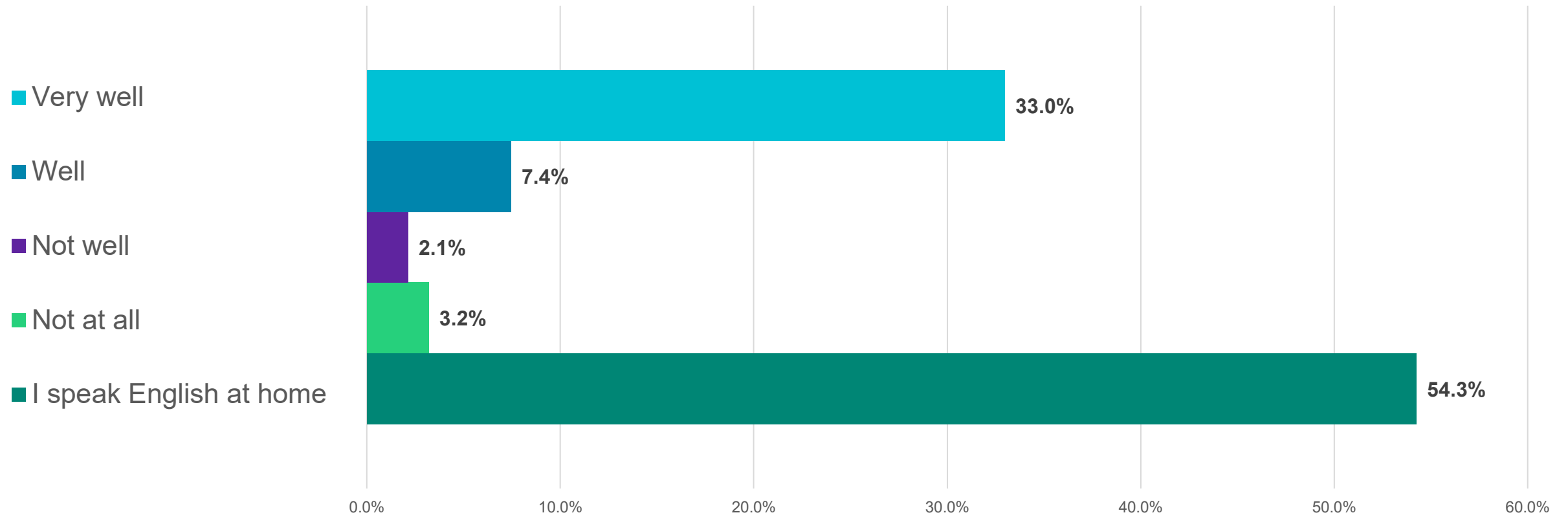
Demographic Information from Survey

14. How many vehicles are available to you and your household?



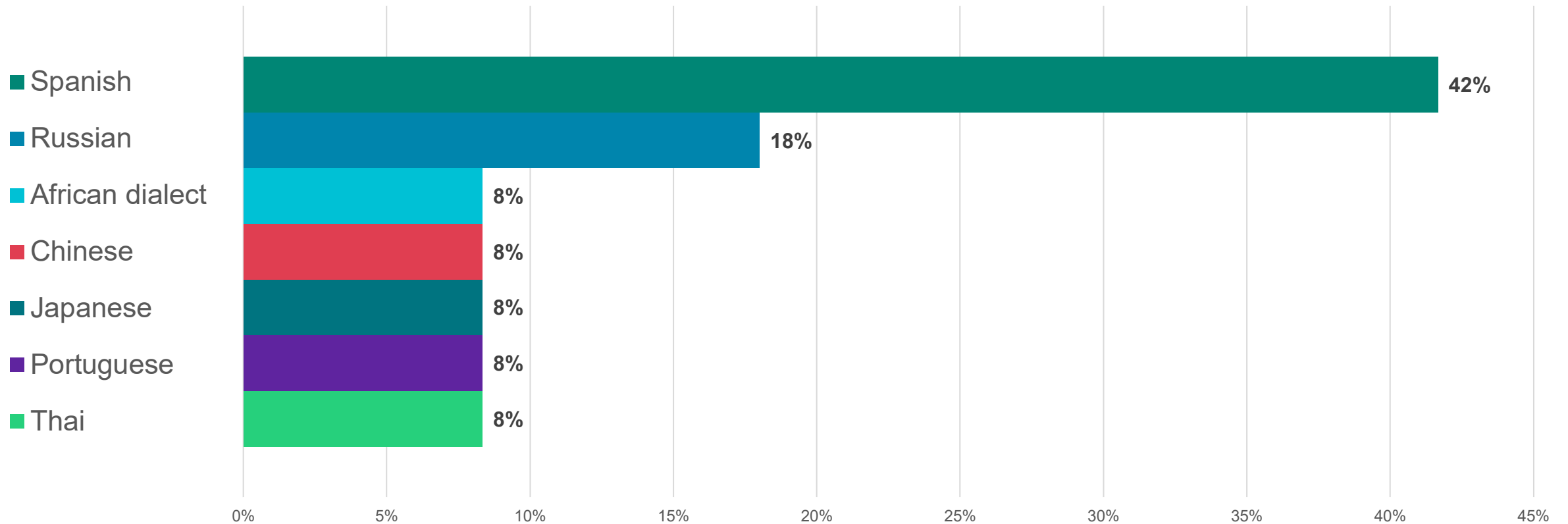
Demographic Information from Survey

15. If you speak another language at home, how well do you speak English?



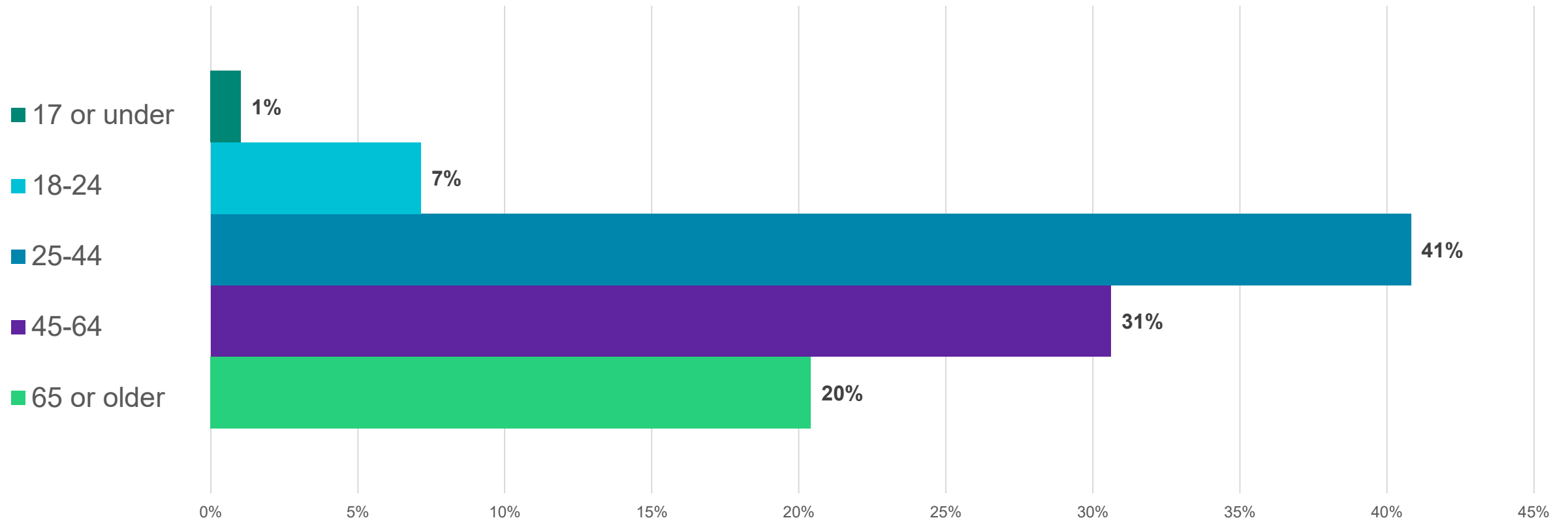
Demographic Information from Survey

16. If you speak another language at home, what language do you speak?



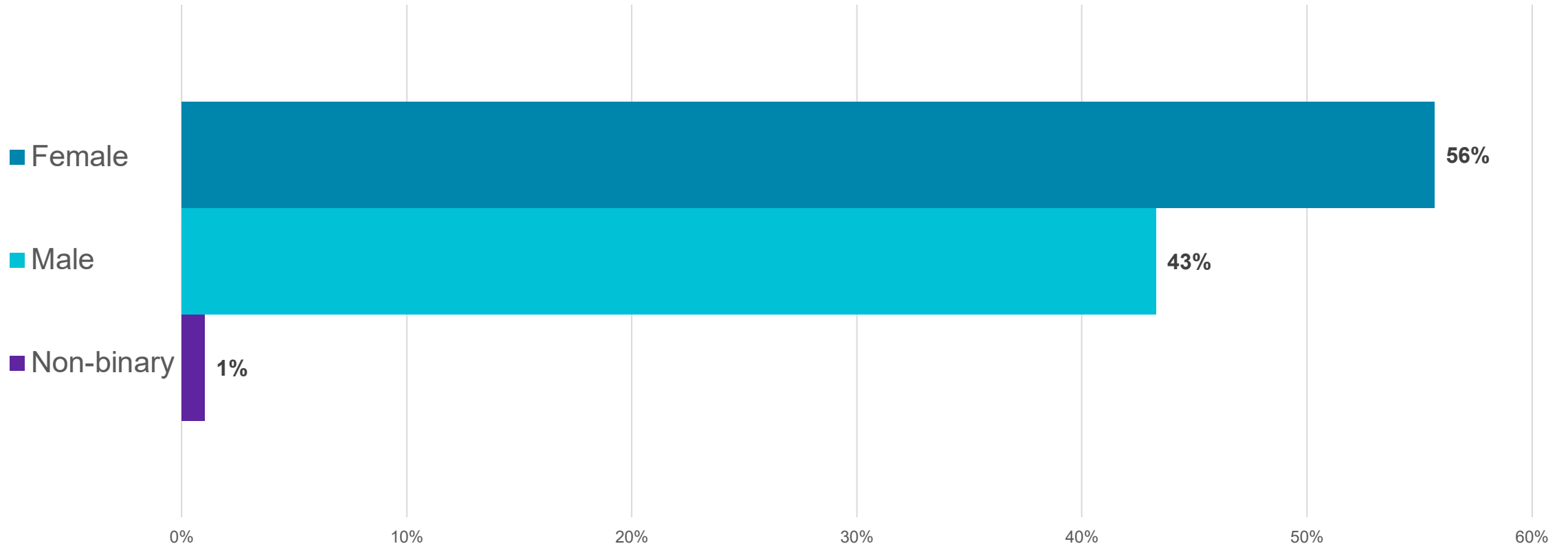
Demographic Information from Survey

17. What is your age group?



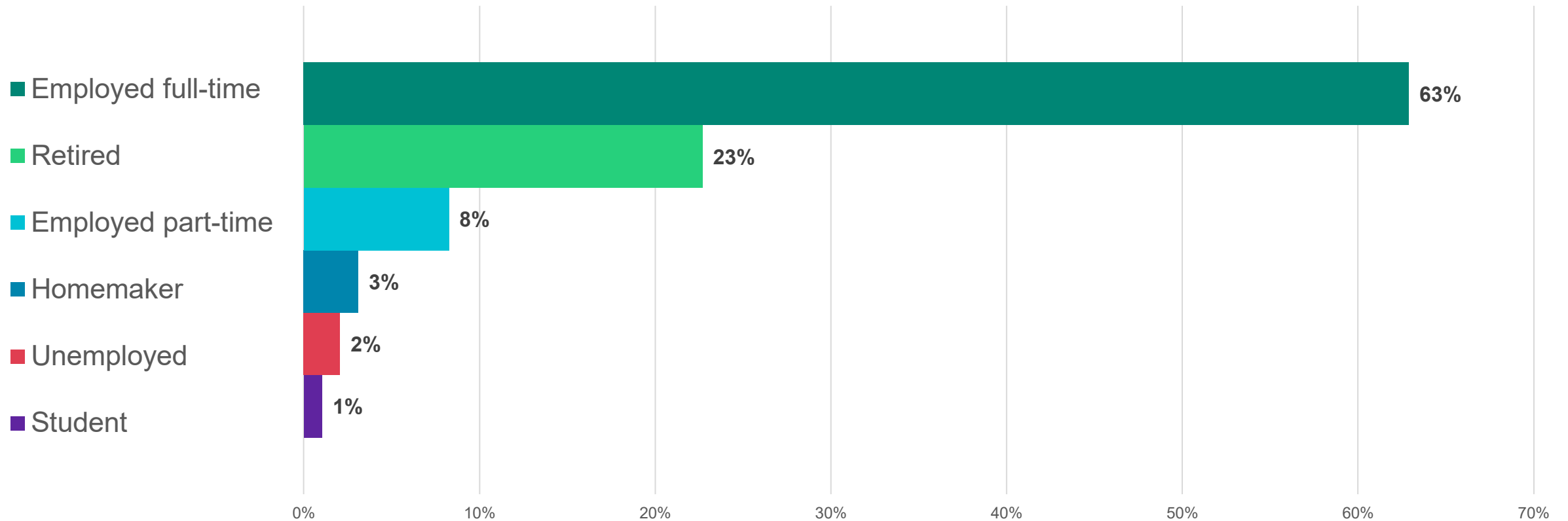
Demographic Information from Survey

18. What is your gender?



Demographic Information from Survey

19. What is your employment status?



Appendix B: Public Survey Summary—Winter 2022/2023



I-495 Southside Transit/TDM Study

Survey Results



VIRGINIA DEPARTMENT OF RAIL
AND PUBLIC TRANSPORTATION



Survey Summary

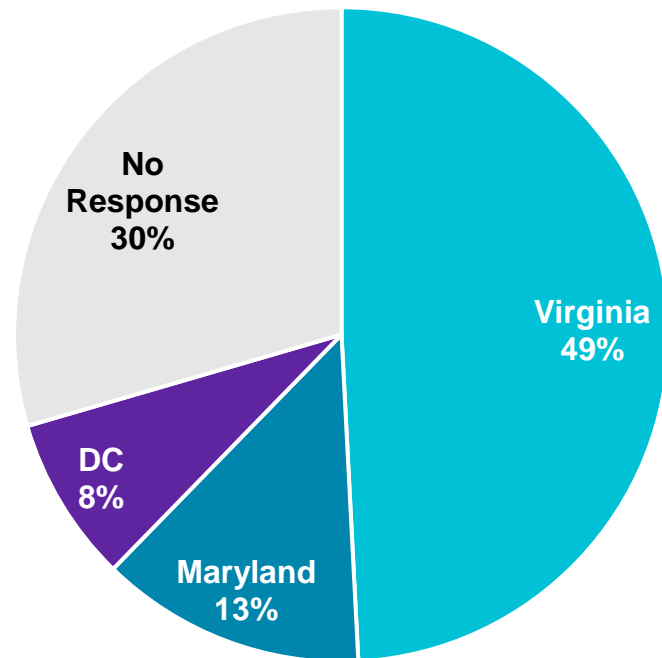
- Survey was open from December 9, 2022, to January 13, 2023
- Pop-up events occurred on December 9, 10, and 11 in Springfield, Alexandria, and Oxon Hill to promote the survey
- 61 surveys completed



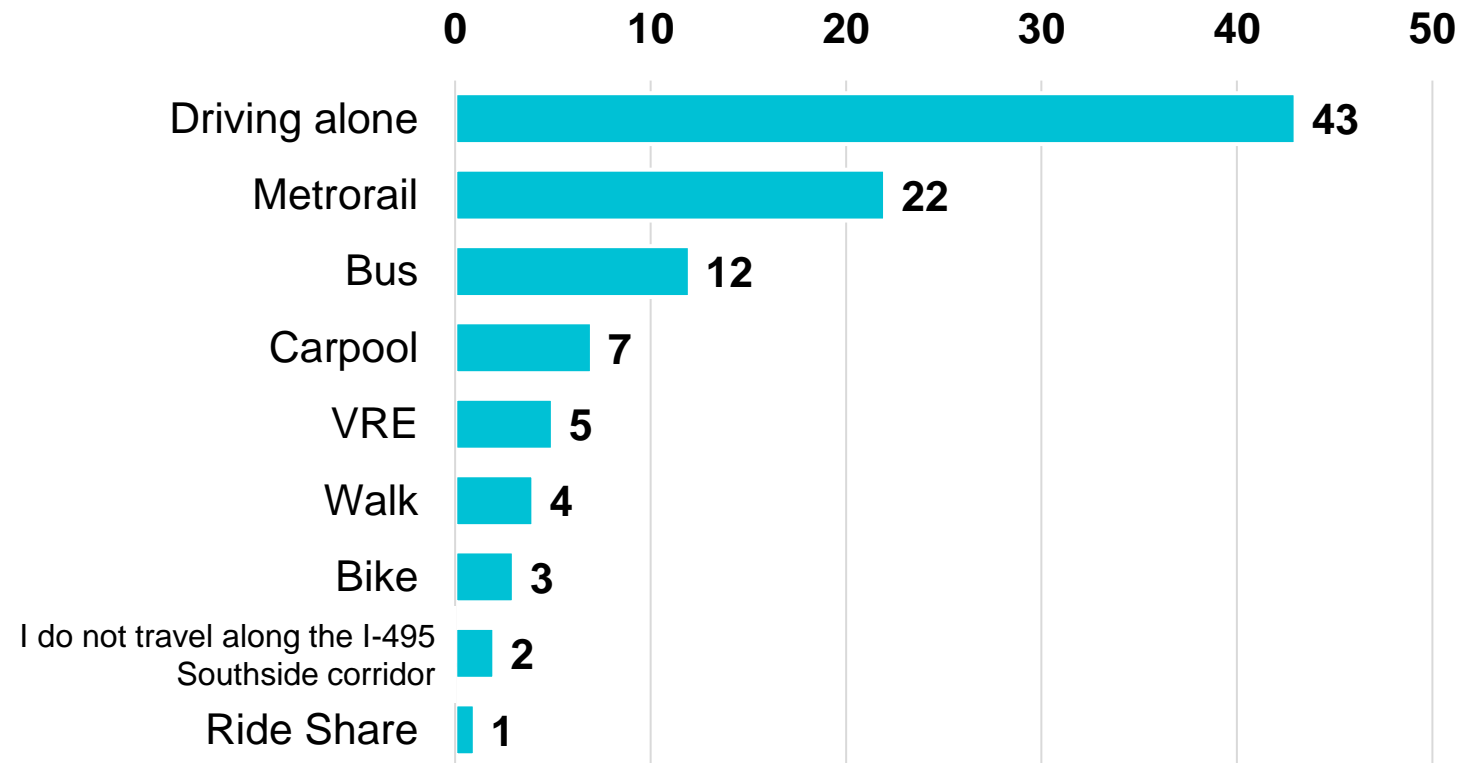
Survey Results

Survey Results – ZIP Code and Travel Mode

What is your home zip code?

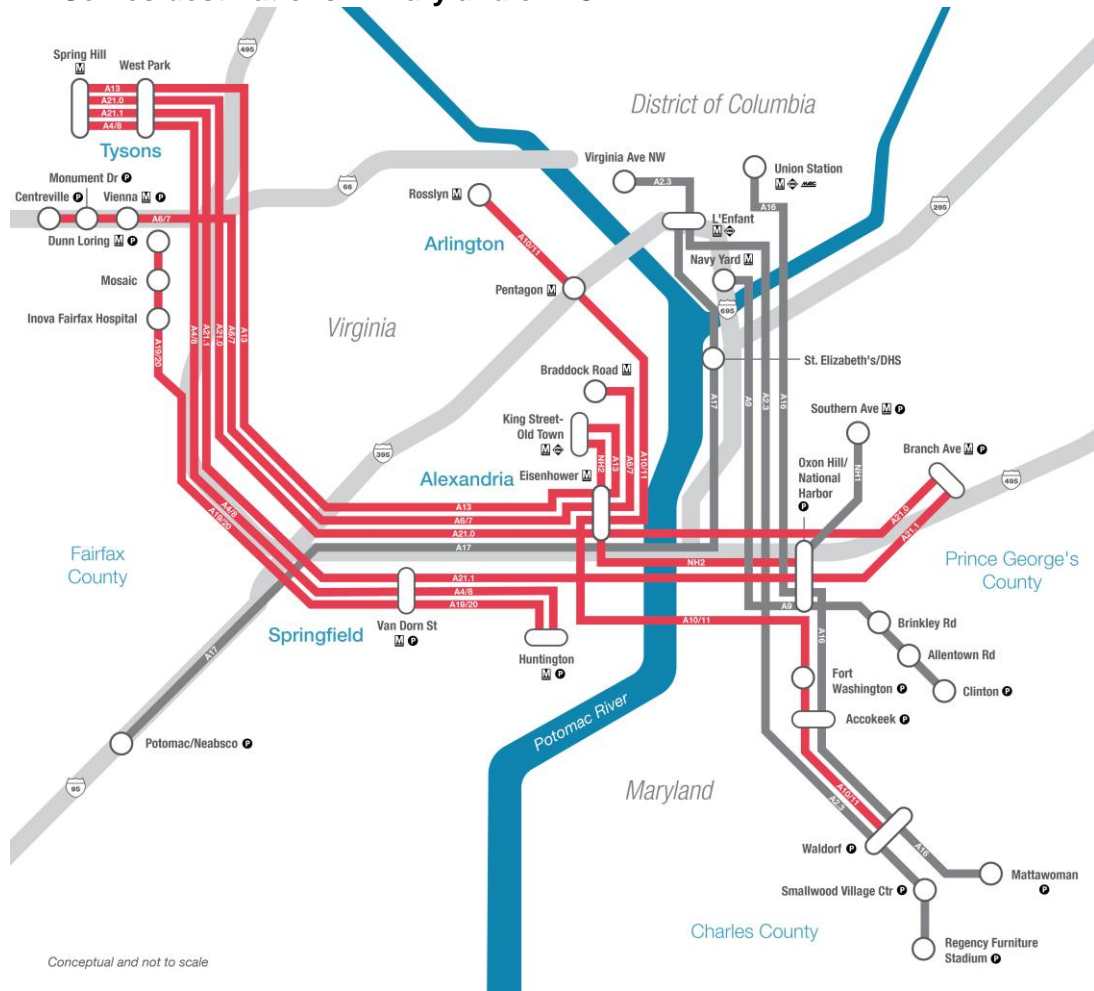


Which modes of transportation do you typically use to travel along the I-495 Southside corridor or nearby rail lines? Select all that apply.



Transit Recommendations Surveyed

- Serves destinations in Virginia
- Serves destinations in Maryland or DC

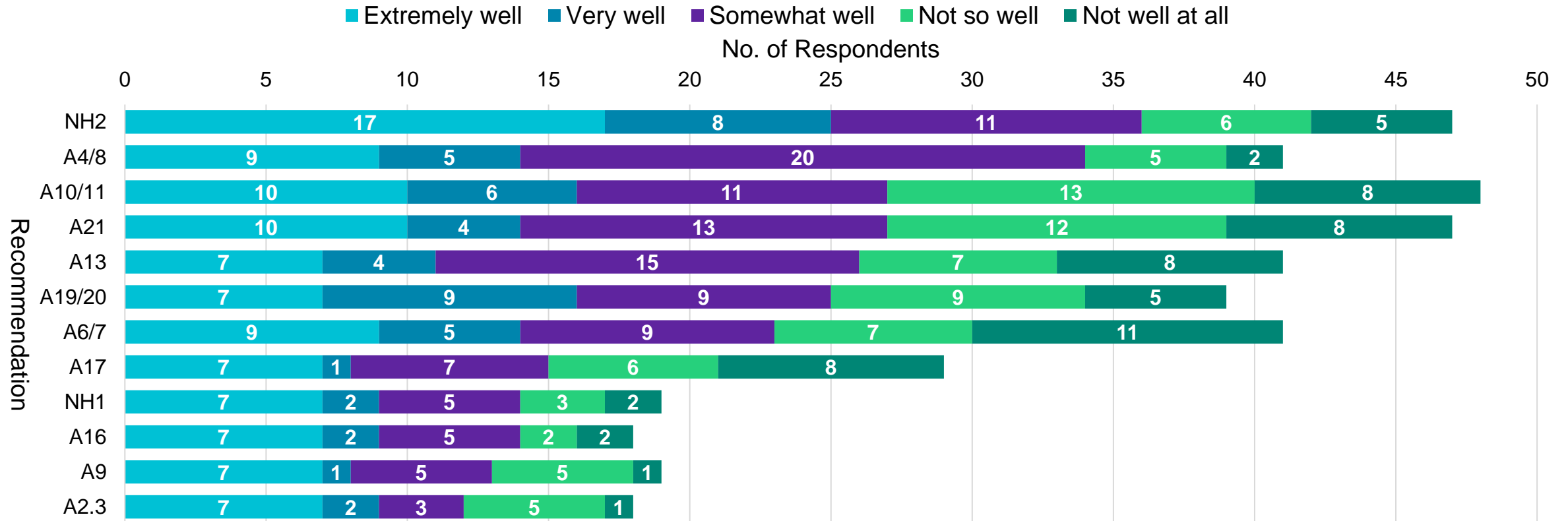


Route	Description
A2.3	North Charles County to DC Core
A4/8	Alexandria to Tysons
A6/7	Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area
A9	Southwest Prince George's County to Capitol Riverfront
A10/11	North Charles and Southwest Prince George's Counties to Rosslyn
A13	Northwest Fairfax County to Carlyle-Eisenhower East
A16	North Charles County to NoMa (DC)
A17	East Prince William County to Southwest Waterfront
A19/20	Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield
A21	Central-West Prince George's County to Tysons <ul style="list-style-type: none"> • A21.0 with Intermediate Stop at Oxon Hill/National Harbor • A21.1 with Intermediate Stop at Eisenhower Ave Metrorail Station
NH1	National Harbor to Southern Ave
NH2	National Harbor to Alexandria

Transit Recommendations – All Respondents

How well does this transit route serve your travel needs? In other words, how well does this route serve roads, destinations, or transit connections that are part of your current or potential future travel patterns?

ALL RESPONDENTS



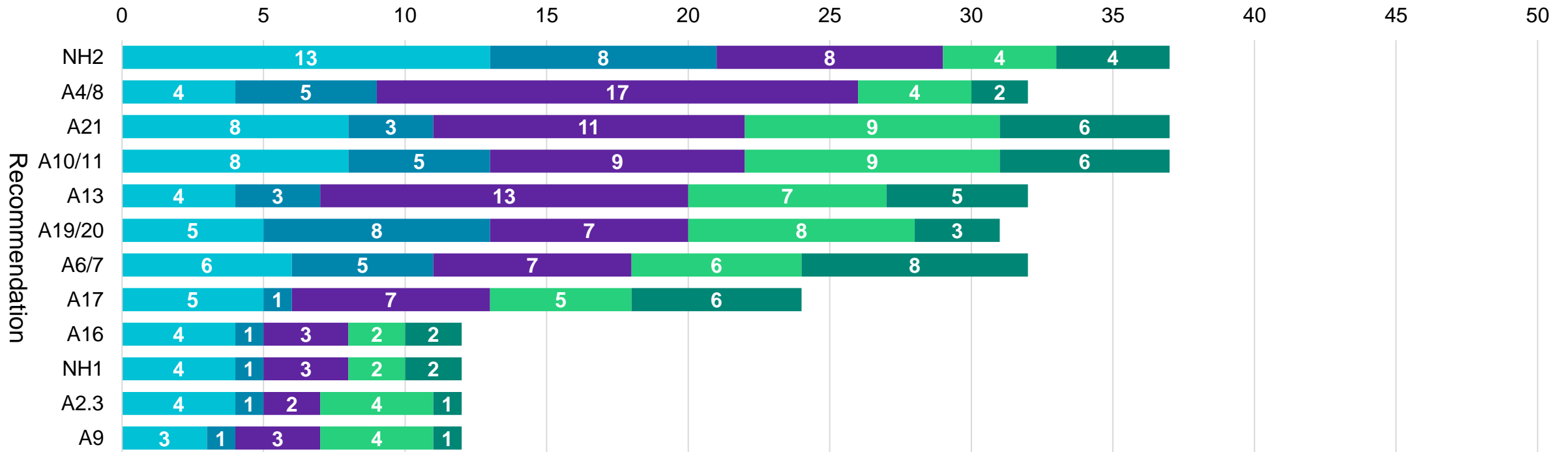
Transit Recommendations – Drive Alone Respondents

How well does this transit route serve your travel needs? In other words, how well does this route serve roads, destinations, or transit connections that are part of your current or potential future travel patterns?

RESPONDENTS THAT DRIVE ALONE

Extremely well Very well Somewhat well Not so well Not well at all

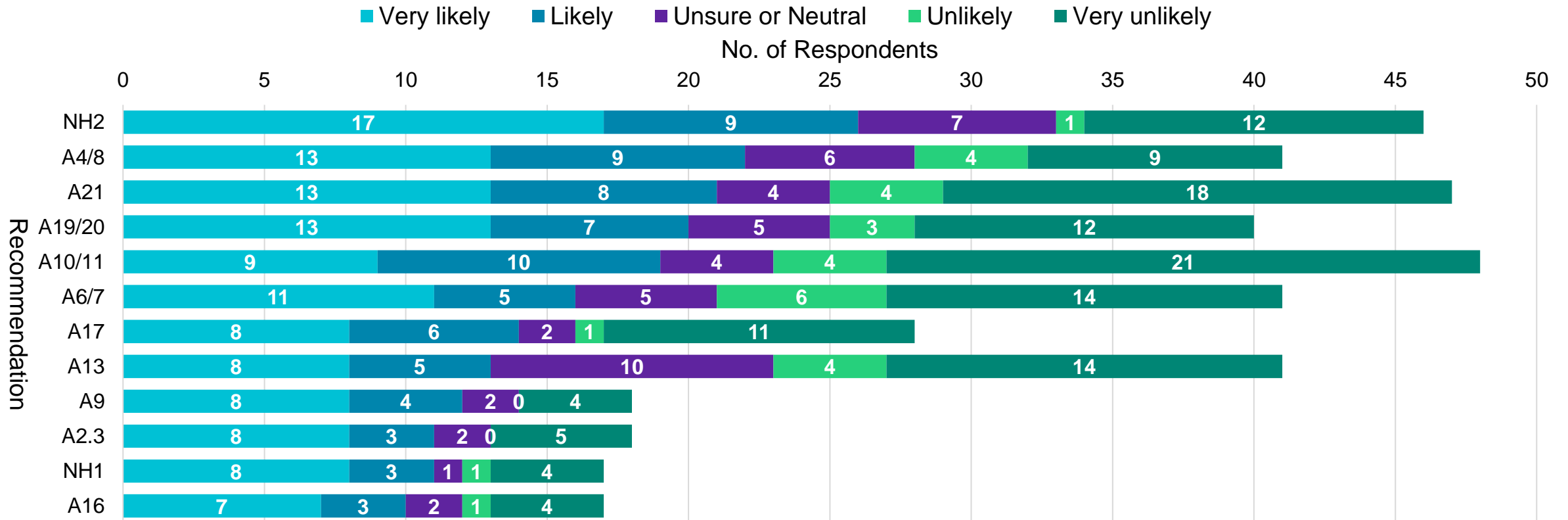
No. of Respondents



Transit Recommendations – All Respondents

If this transit route were available to you, how likely would you be to use transit over your current primary mode of transportation?

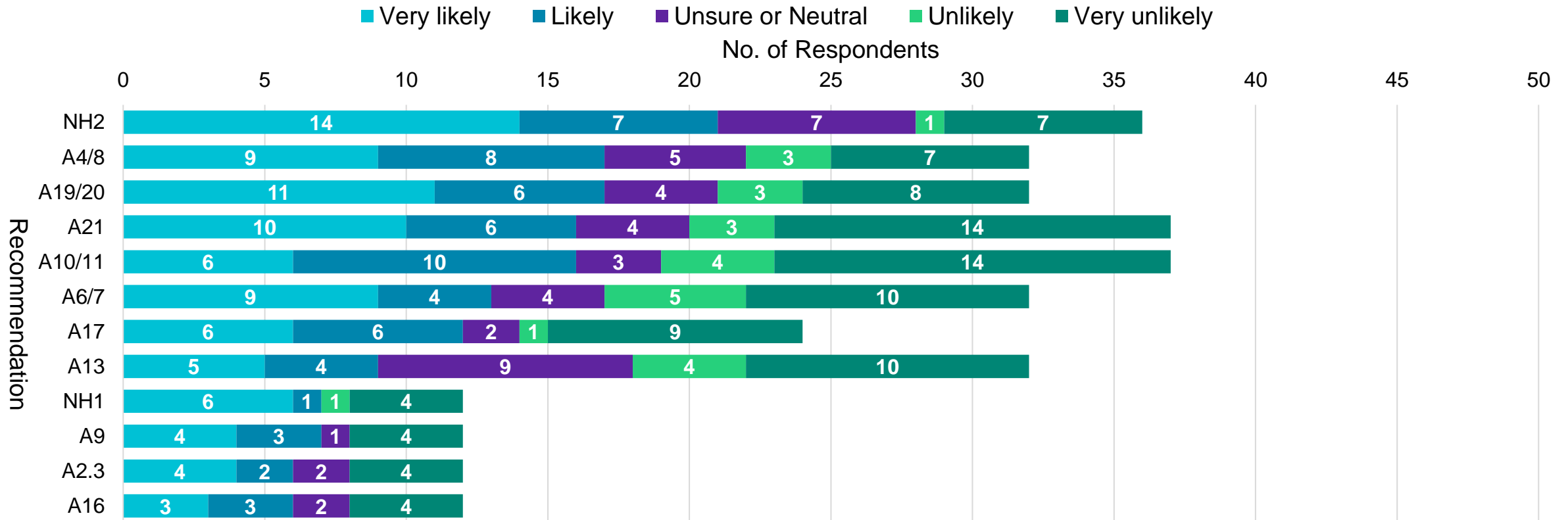
ALL RESPONDENTS



Transit Recommendations – Drive Alone Respondents

If this transit route were available to you, how likely would you be to use transit over your current primary mode of transportation?

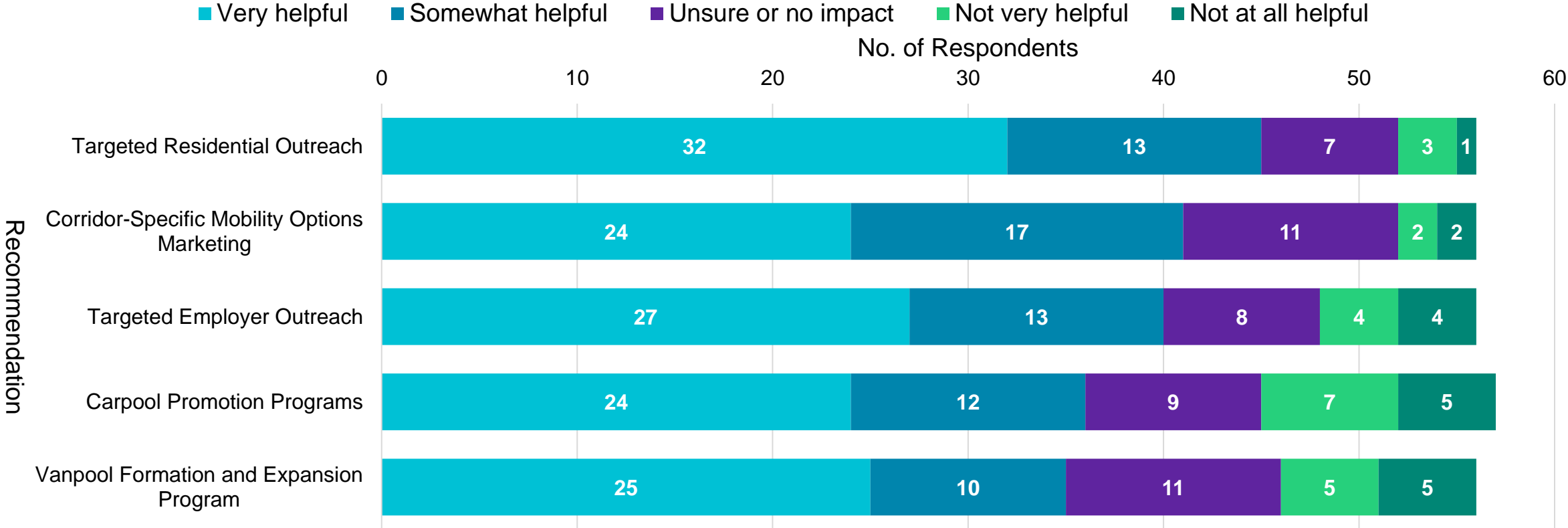
RESPONDENTS THAT DRIVE ALONE



Commuter Assistance Program Recommendations – All Respondents

If implemented, how helpful would this Commuter Assistance Program be to your travel along the I-495 Southside Corridor?

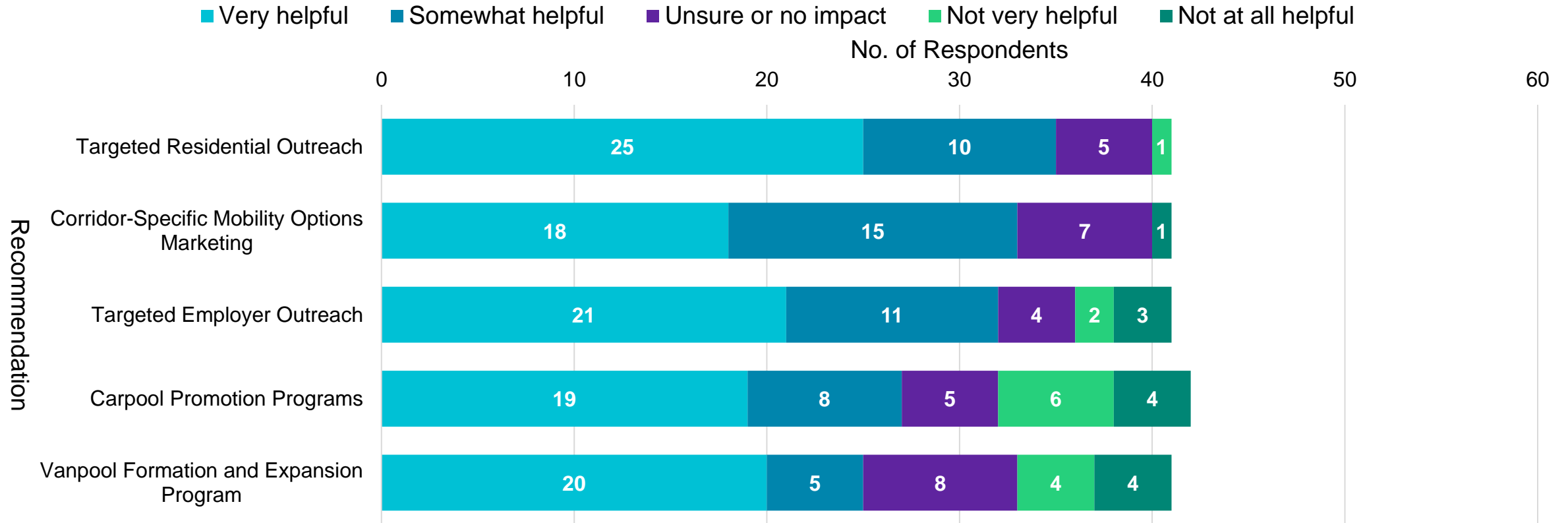
ALL RESPONDENTS



Commuter Assistance Program Recommendations – Drive Alone Respondents

If implemented, how helpful would this Commuter Assistance Program be to your travel along the I-495 Southside Corridor?

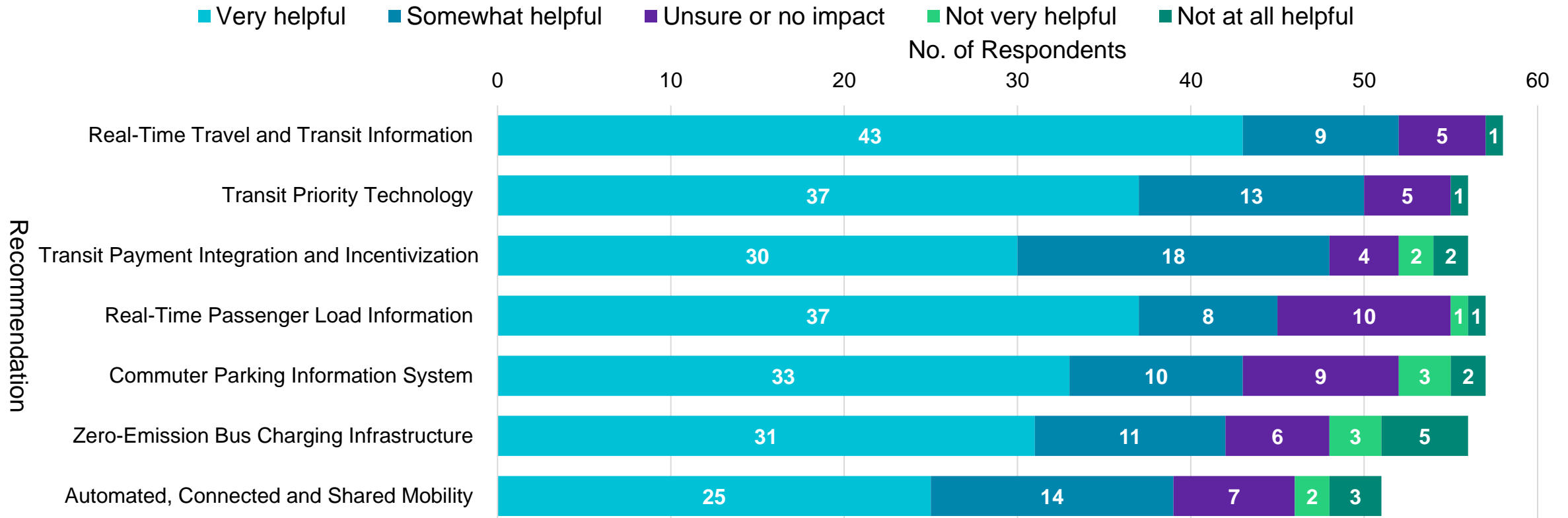
RESPONDENTS THAT DRIVE ALONE



Technology Recommendations – All Respondents

If implemented, how helpful would this technology recommendation be to your travel along the I-495 Southside Corridor?

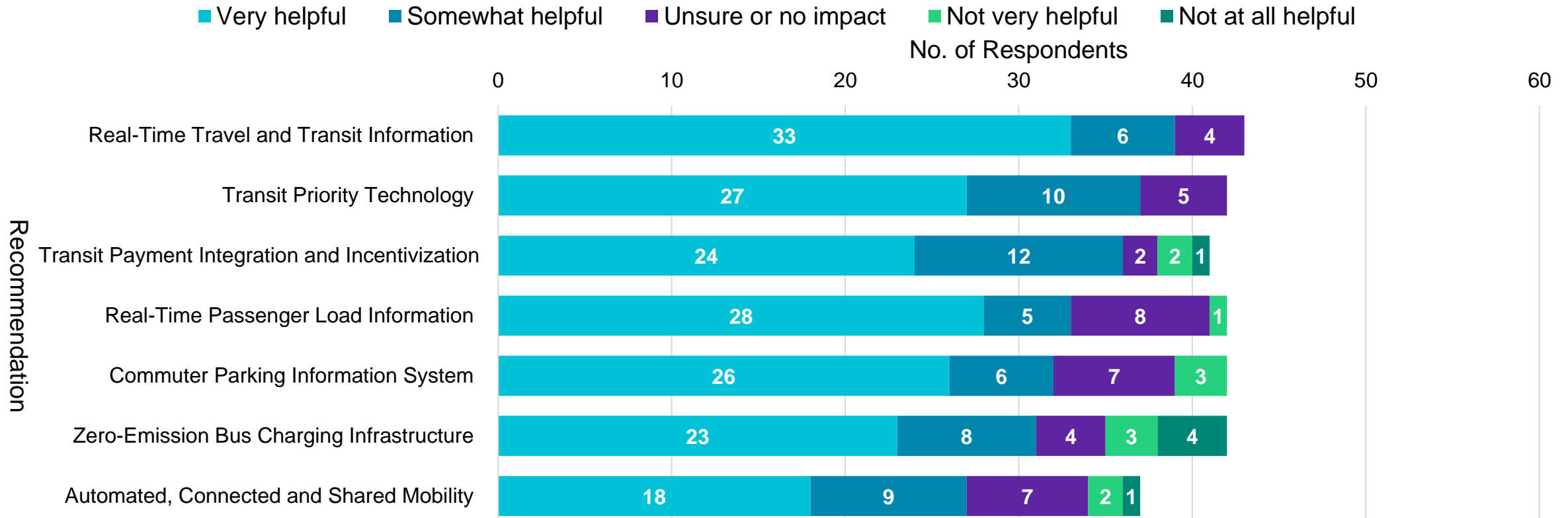
ALL RESPONDENT



Technology Recommendations – Drive Alone Respondents

If implemented, how helpful would this technology recommendation be to your travel along the I-495 Southside Corridor?

RESPONDENTS THAT DRIVE ALONE

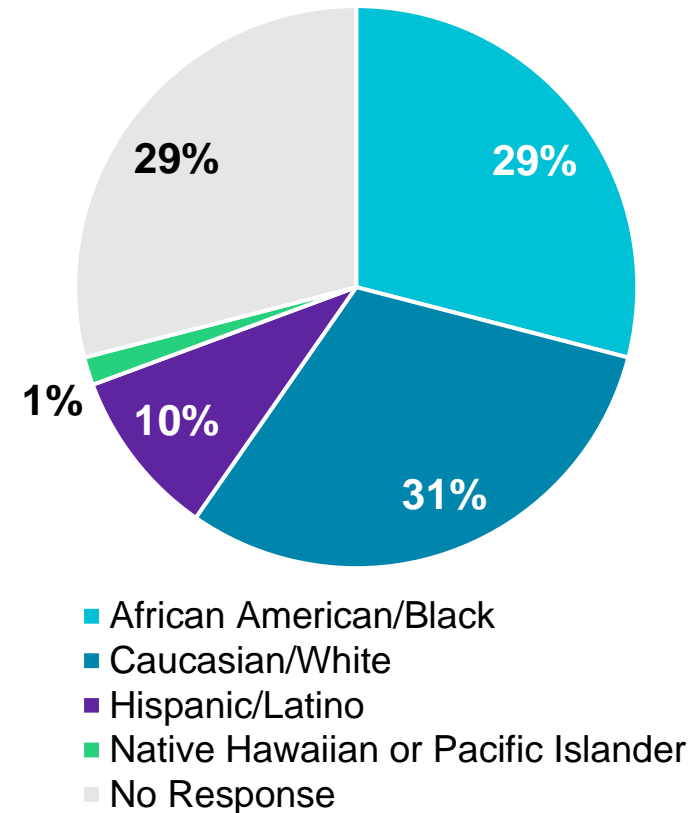


Demographics – ZIP Code and Race/Ethnicity

What is your home ZIP code?

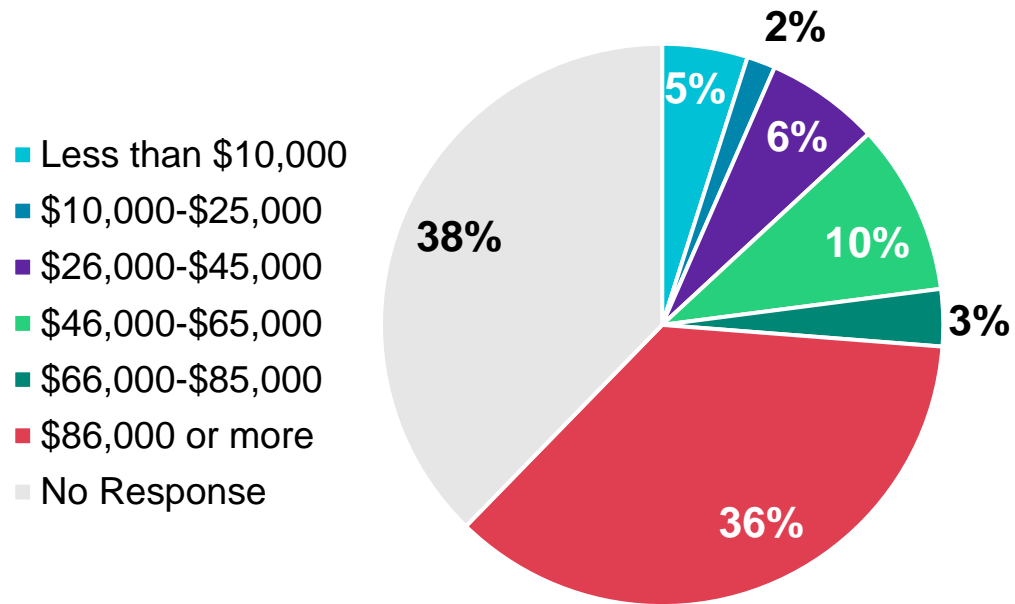
ZIP Code	Count	ZIP Code	Count
20110 (VA)	1	22305 (VA)	3
22003 (VA)	1	22310 (VA)	1
22030 (VA)	1	22314 (VA)	7
22150 (VA)	4	20720 (MD)	1
22151 (VA)	1	20743 (MD)	1
22152 (VA)	1	20744 (MD)	1
22153 (VA)	3	20745 (MD)	3
22206 (VA)	1	20748 (MD)	2
22301 (VA)	1	20020 (DC)	2
22303 (VA)	1	20032 (DC)	3
22304 (VA)	4	No Response	18

What do you consider yourself? Choose all that apply...

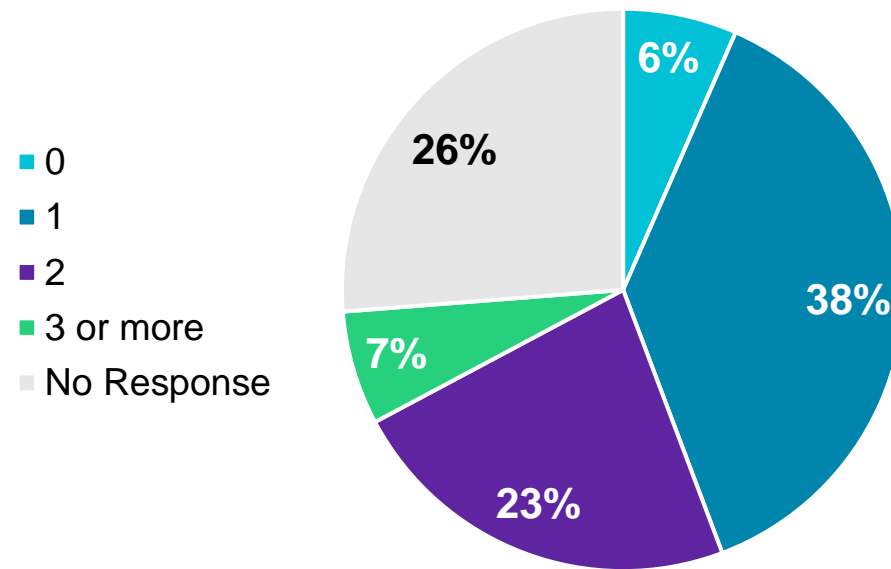


Demographics – Income and Vehicle Access

What is your total annual household income?

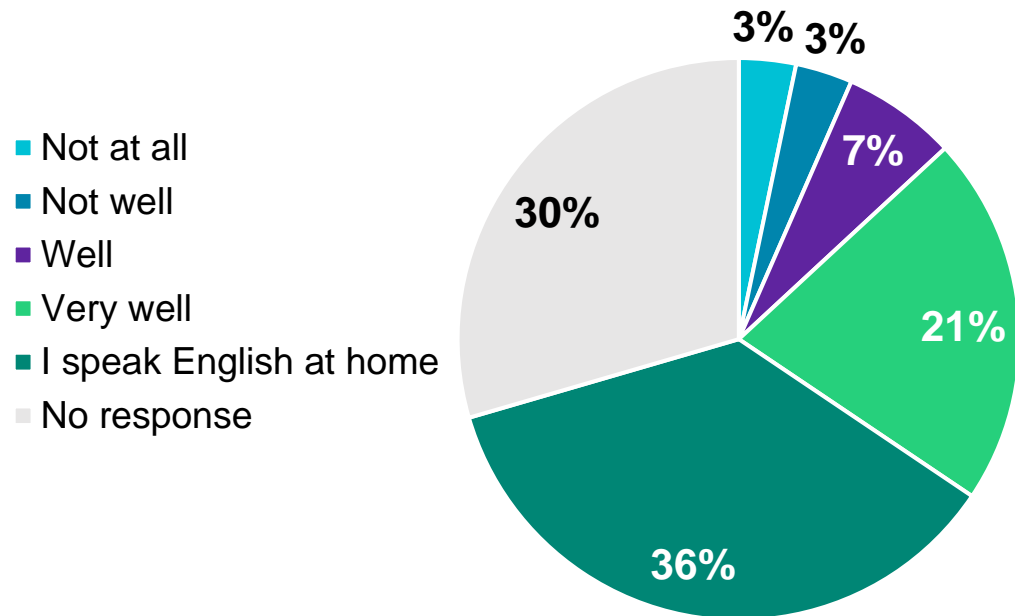


How many vehicles are available to you and your household?

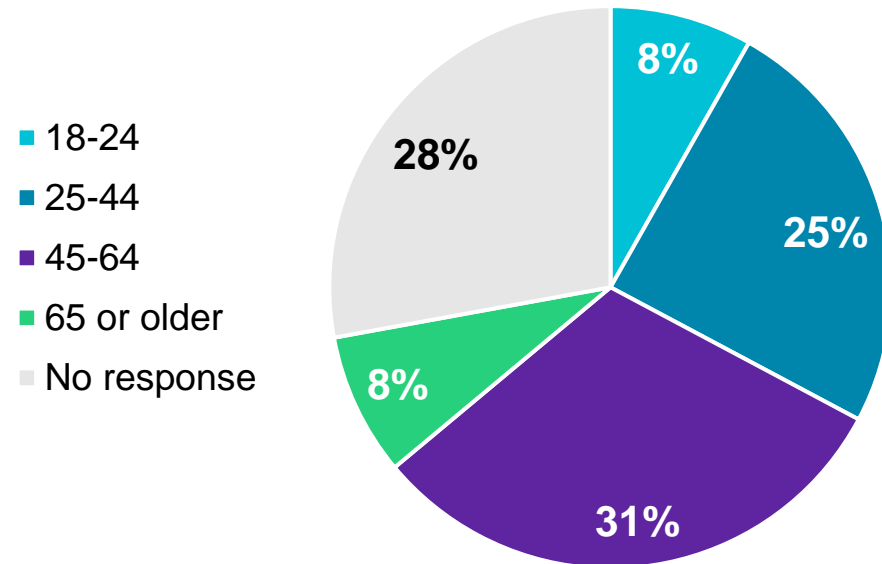


Demographics – English Proficiency and Age

If you speak another language at home, how well do you speak English?

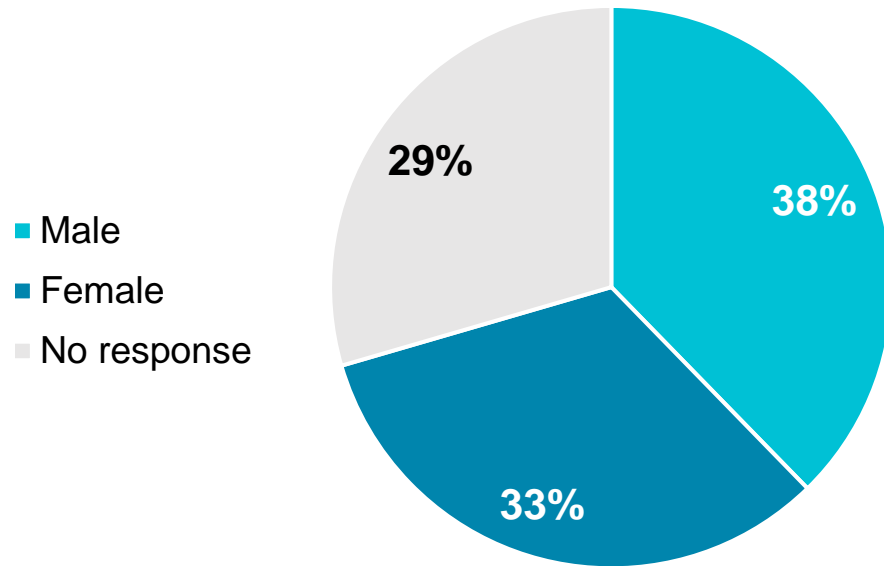


What is your age group?

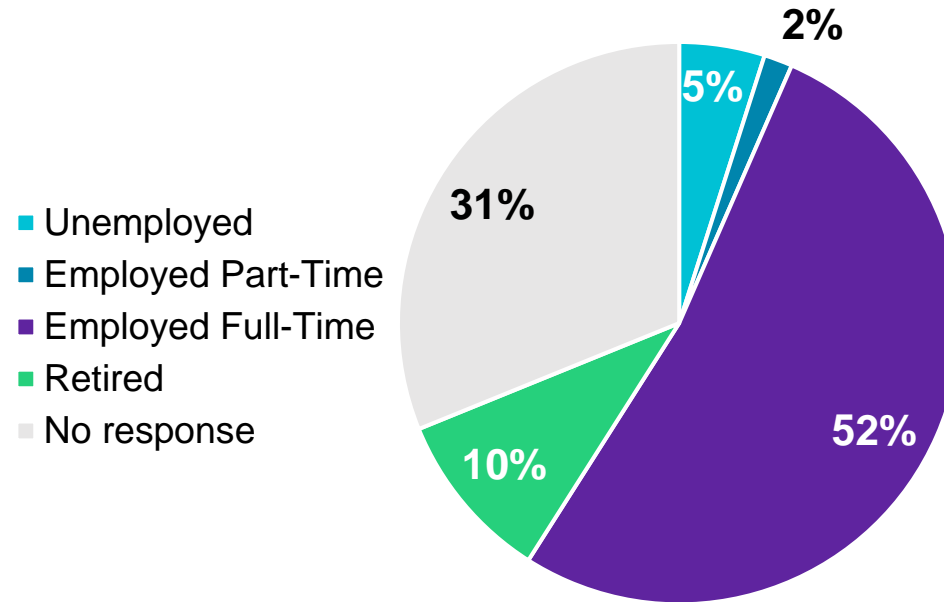


Demographics – Gender and Employment Status

What is your gender?



What is your employment status?



Appendix C: Initial Transit Screening

Origin-Destination Pair	2045 Transit Demand Potential (Trips/Hr)	Equivalent 40-Seat Buses per Hour	Peak Trip Rating	2045 Population Density (MWCOG)	2045 Employment Density (MWCOG)	MWCOG Activity Center Designation	Activity Center Land Use Assessment	Step 1 Rating	% Origin Area that is MWCOG Equity Emphasis Area	2022 StreetLight AM Peak Trips (All)	2022 StreetLight Daily Trips (All)	2022 SteetLight AM Period : Daily %	All-Day Trip Attraction Percentile	All-Day Trip Rating	Existing Transit/Rail? (Rail/Bus/None)	Existing Transit/Rail	Transit Competitive? (Existing or Future)	Service Span	Passes Screening
Central-West Prince George's County to Beaugard	2	1	Low	27.74	15.00	Suburban Employment Centers	MODERATE	Group C - Low Priority	71.0%	2	100	2%	0.238	Low	None		No	Peak-Only	No
North Charles County to Beaugard	2	1	Low	27.74	15.00	Suburban Employment Centers	MODERATE	Group C - Low Priority	10.0%	78	124	63%	0.302	Low	None		No	Peak-Only	No
Northwest Fairfax County to Beaugard	13	1	Low	27.74	15.00	Suburban Employment Centers	MODERATE	Group C - Low Priority	5.4%	0	2	0%	0.009	Low	Yes	Bus	No	Peak-Only	No
Southeast Fairfax County to Beaugard	34	1	Low	27.74	15.00	Suburban Employment Centers	MODERATE	Group C - Low Priority	6.6%	96	566	17%	0.825	High	Yes	Bus	No	All-Day	No
Southwest Prince George's County to Beaugard	3	1	Low	27.74	15.00	Suburban Employment Centers	MODERATE	Group C - Low Priority	10.1%	116	299	39%	0.605	Medium	Yes	Bus	No	Peak-Focused	No
Central-West Fairfax County to Braddock Road Metro Area	53	2	Moderate	36.36	29.07	N/A	HIGH	Group A - High Priority	10.0%	62	256	24%	0.55	Medium	Yes	Rail	No	Peak-Focused	Yes
Northwest Fairfax County to Braddock Road Metro Area	52	2	Moderate	36.36	29.07	N/A	HIGH	Group A - High Priority	5.4%	24	97	25%	0.22	Low	Yes	Rail	No	Peak-Only	Yes
Central-East Fairfax County to Braddock Road Metro Area	75	2	Moderate	36.36	29.07	N/A	HIGH	Group A - High Priority	13.7%	166	390	43%	0.688	High	Yes	Bus	Yes	All-Day	No
South Fairfax County to Braddock Road Metro Area	45	2	Moderate	36.36	29.07	N/A	HIGH	Group A - High Priority	2.8%	102	445	23%	0.77	High	Yes	Rail	Yes	All-Day	No
Southeast Fairfax County to Braddock Road Metro Area	148	4	Moderate	36.36	29.07	N/A	HIGH	Group A - High Priority	6.6%	210	1098	19%	0.963	High	Yes	Rail	Yes	All-Day	No
Central-East Fairfax County to Capitol Riverfront	94	3	Moderate	33.52	94.59	N/A	HIGH	Group A - High Priority	13.7%	28	31	90%	0.091	Low	Yes	Rail	Yes	Peak-Only	No
Southwest Prince George's County to Capitol Riverfront	170	5	High	33.52	94.59	N/A	HIGH	Group A - High Priority	10.1%	49	193	25%	0.44	Medium	Yes	Rail	No	Peak-Focused	Yes
North Charles County to Capitol Riverfront	243	7	High	33.52	94.59	N/A	HIGH	Group A - High Priority	10.0%	34	59	58%	0.155	Low	Yes	Rail	Yes	Peak-Only	No
Southeast Fairfax County to Capitol Riverfront	128	4	Moderate	33.52	94.59	N/A	HIGH	Group A - High Priority	6.6%	74	111	67%	0.266	Low	Yes	Rail	Yes	Peak-Only	No
Southeast Prince George's County to Capitol Riverfront	80	2	Moderate	33.52	94.59	N/A	HIGH	Group A - High Priority	5.4%	1	7	14%	0.027	Low	Yes	Rail	Yes	Peak-Only	No
Central-East Fairfax County to Carlyle-Eisenhower East	161	5	High	46.50	48.59	Mixed-Use Centers	HIGH	Group A - High Priority	13.7%	156	397	39%	0.706	High	Yes	Rail	Yes	All-Day	No
Central-West Fairfax County to Carlyle-Eisenhower East	103	3	Moderate	46.50	48.59	Mixed-Use Centers	HIGH	Group A - High Priority	10.0%	58	311	19%	0.614	Medium	Yes	Rail, Bus	No	Peak-Focused	Yes
Northwest Fairfax County to Carlyle-Eisenhower East	99	3	Moderate	46.50	48.59	Mixed-Use Centers	HIGH	Group A - High Priority	5.4%	21	120	18%	0.293	Low	Yes	Rail	No	Peak-Only	Yes
South Fairfax County to Carlyle-Eisenhower East	123	4	Moderate	46.50	48.59	Mixed-Use Centers	HIGH	Group A - High Priority	2.8%	85	430	20%	0.752	High	Yes	Rail	Yes	All-Day	No
Southeast Fairfax County to Carlyle-Eisenhower East	466	12	High	46.50	48.59	Mixed-Use Centers	HIGH	Group A - High Priority	6.6%	216	1001	22%	0.935	High	Yes	Rail	Yes	All-Day	No
Central-East Fairfax County to Crystal City	451	12	High	56.23	157.17	Mixed-Use Centers	HIGH	Group A - High Priority	13.7%	17	21	81%	0.073	Low	Yes	Rail	Yes	Peak-Only	No
East Prince William's County to Crystal City	235	6	High	56.23	157.17	Mixed-Use Centers	HIGH	Group A - High Priority	8.4%	23	41	56%	0.137	Low	Yes	Rail	Yes	Peak-Only	No
North Charles County to Crystal City	25	1	Low	56.23	157.17	Mixed-Use Centers	HIGH	Group C - Low Priority	10.0%	26	129	20%	0.311	Low	None *lots of transfers		No	Peak-Only	No
South Fairfax County to Crystal City	142	4	Moderate	56.23	157.17	Mixed-Use Centers	HIGH	Group A - High Priority	2.8%	47	104	45%	0.256	Low	Yes	Rail	Yes	Peak-Only	No
Southeast Fairfax County to Crystal City	419	11	High	56.23	157.17	Mixed-Use Centers	HIGH	Group A - High Priority	6.6%	132	505	26%	0.788	High	Yes	Rail	Yes	All-Day	No
North Charles County to DC Core (Combined)	1378	35	High	33.13	209.99	DC Core	HIGH	Group A - High Priority	10.0%	562	1092	51%	0.954	High	Yes	Rail	No	All-Day	Yes
Southeast Fairfax County to DC Core (Combined)	2011	51	High	33.13	209.99	DC Core	HIGH	Group A - High Priority	6.6%	352	935	38%	0.908	High	Yes	Rail	Yes	All-Day	No
Southeast Fairfax County to DC Core (Combined)	310	8	High	33.13	209.99	DC Core	HIGH	Group A - High Priority	6.6%	352	935	38%	0.908	High	Yes	Rail	Yes	All-Day	No
Southwest Prince George's County to DC Core (Combined)	1263	32	High	33.13	209.99	DC Core	HIGH	Group A - High Priority	10.1%	691	1819	38%	0.99	High	Yes	Rail	Yes	All-Day	No

Origin-Destination Pair	2045 Transit Demand Potential (Trips/Hr)	Equivalent 40-Seat Buses per Hour	Peak Trip Rating	2045 Population Density (MWCOG)	2045 Employment Density (MWCOG)	MWCOG Activity Center Designation	Activity Center Land Use Assessment	Step 1 Rating	% Origin Area that is MWCOG Equity Emphasis Area	2022 StreetLight AM Peak Trips (All)	2022 StreetLight Daily Trips (All)	2022 StreetLight AM Period : Daily %	All-Day Trip Attraction Percentile	All-Day Trip Rating	Existing Transit/Rail? (Rail/Bus/None)	Existing Transit/Rail	Transit Competitive? (Existing or Future)	Service Span	Passes Screening
Central-West Prince George's County to Dunn Loring-Merrifield	7	1	Low	14.25	32.77	Employment Centers	MODERATE	Group C - Low Priority	71.0%	92	230	40%	0.486	Medium	Yes	Rail	No	Peak-Focused	No
Southeast Fairfax County to Dunn Loring-Merrifield	56	2	Moderate	14.25	32.77	Employment Centers	MODERATE	Group B - Medium Priority	6.6%	130	545	24%	0.807	High	Yes	Rail	No	All-Day	Yes
Alexandria to Dunn Loring-Merrifield	78	2	Moderate	14.25	32.77	Employment Centers	MODERATE	Group B - Medium Priority	20.5%	81	320	25%	0.623	Medium	Yes	Rail	No	All-Day	Yes
North Charles County to Dunn Loring-Merrifield	14	1	Low	14.25	32.77	Employment Centers	MODERATE	Group C - Low Priority	10.0%	72	167	43%	0.412	Medium	None		No	Peak-Focused	No
Southwest Prince George's County to Dunn Loring-Merrifield	5	1	Low	14.25	32.77	Employment Centers	MODERATE	Group C - Low Priority	10.1%	133	323	41%	0.633	Medium	None		No	Peak-Focused	No
Alexandria to Fort Belvoir	36	1	Low	1.15	4.03	N/A	LOW	Group C - Low Priority	20.5%	96	275	35%	0.587	Medium	Yes	Bus	Yes	Peak-Focused	No
Central-West Prince George's County to Fort Belvoir	3	1	Low	1.15	4.03	N/A	LOW	Group C - Low Priority	71.0%	11	59	19%	0.155	Low	None		No	Peak-Only	No
DC North of Anacostia River to Fort Belvoir	3	1	Low	1.15	4.03	N/A	LOW	Group C - Low Priority	32.6%	0	33	0%	0.1	Low	Yes	Rail	No	Peak-Only	No
North Charles County to Fort Belvoir	3	1	Low	1.15	4.03	N/A	LOW	Group C - Low Priority	10.0%	37	117	32%	0.284	Low	None		No	Peak-Only	No
Southwest Prince George's County to Fort Belvoir	4	1	Low	1.15	4.03	N/A	LOW	Group C - Low Priority	10.1%	45	133	34%	0.321	Low	None		No	Peak-Only	No
Alexandria to Fort Belvoir North Area	16	1	Low	0.06	18.13	N/A	LOW	Group C - Low Priority	20.5%	53	241	22%	0.513	Medium	Yes	Bus	No	Peak-Focused	No
Central-West Prince George's County to Fort Belvoir North Area	2	1	Low	0.06	18.13	N/A	LOW	Group C - Low Priority	71.0%	48	152	32%	0.357	Medium	None		No	Peak-Focused	No
DC North of Anacostia River to Fort Belvoir North Area	4	1	Low	0.06	18.13	N/A	LOW	Group C - Low Priority	32.6%	0	18	0%	0.055	Low	Yes	Rail, Bus	No	Peak-Only	No
North Charles County to Fort Belvoir North Area	2	1	Low	0.06	18.13	N/A	LOW	Group C - Low Priority	10.0%	33	99	33%	0.229	Low	None		No	Peak-Only	No
Southwest Prince George's County to Fort Belvoir North Area	3	1	Low	0.06	18.13	N/A	LOW	Group C - Low Priority	10.1%	70	219	32%	0.467	Medium	None		No	Peak-Focused	No
Arlington County to Huntington Area (Combined)	49	2	Moderate	19.49	7.71	N/A	LOW	Group C - Low Priority	12.5%	42	852	5%	0.889	High	Yes	Rail	Yes	All-Day	No
Central-East Fairfax County to Huntington Area (Combined)	33	1	Low	19.49	7.71	N/A	LOW	Group C - Low Priority	13.7%	206	1005	20%	0.944	High	Yes	Rail, Bus	No	All-Day	No
Central-West Fairfax County to Huntington Area (Combined)	17	1	Low	19.49	7.71	N/A	LOW	Group C - Low Priority	10.0%	172	627	27%	0.844	High	Yes	Rail, Bus	No	All-Day	No
East Prince William County to Huntington Area (Combined)	36	1	Low	19.49	7.71	N/A	LOW	Group C - Low Priority	8.4%	63	269	23%	0.568	Medium	No		No	Peak-Focused	No
Northwest Fairfax County to Huntington Area (Combined)	17	1	Low	19.49	7.71	N/A	LOW	Group C - Low Priority	5.4%	6	249	2%	0.541	Medium	Yes	Rail	No	Peak-Focused	No
Central-East Fairfax County to King Street-Old Town	105	3	Moderate	27.84	46.87	N/A	HIGH	Group A - High Priority	13.7%	105	411	26%	0.743	High	Yes	Bus	Yes	All-Day	No
Central-West Fairfax County to King Street-Old Town	65	2	Moderate	27.84	46.87	N/A	HIGH	Group A - High Priority	10.0%	130	366	36%	0.678	High	Yes	Rail	No	All-Day	Yes
Northwest Fairfax County to King Street-Old Town	56	2	Moderate	27.84	46.87	N/A	HIGH	Group A - High Priority	5.4%	57	189	30%	0.422	Medium	Yes	Rail	No	Peak-Focused	Yes
South Fairfax County to King Street-Old Town	62	2	Moderate	27.84	46.87	N/A	HIGH	Group A - High Priority	2.8%	120	542	22%	0.798	High	Yes	Rail	Yes	All-Day	No
Southeast Fairfax County to King Street-Old Town	215	6	High	27.84	46.87	N/A	HIGH	Group A - High Priority	6.6%	189	1353	14%	0.981	High	Yes	Rail	Yes	All-Day	No
Central-East Fairfax County to Landmark-Van Dorn	85	3	Moderate	31.95	10.90	N/A	MODERATE	Group B - Medium Priority	13.7%	116	592	20%	0.834	High	Yes	Rail	Yes	All-Day	No
East Prince William County to Landmark-Van Dorn	20	1	Low	31.95	10.90	N/A	MODERATE	Group C - Low Priority	8.4%	141	397	36%	0.706	High	No		No	All-Day	No
Central-West Fairfax County to Landmark-Van Dorn	46	2	Moderate	31.95	10.90	N/A	MODERATE	Group B - Medium Priority	10.0%	60	475	13%	0.779	High	Yes	Bus	No	All-Day	Yes
Northwest Fairfax County to Landmark-Van Dorn	36	1	Low	31.95	10.90	N/A	MODERATE	Group C - Low Priority	5.4%	52	228	23%	0.477	Medium	Yes	Bus	No	Peak-Focused	No

Origin-Destination Pair	2045 Transit Demand Potential (Trips/Hr)	Equivalent 40-Seat Buses per Hour	Peak Trip Rating	2045 Population Density (MWCOG)	2045 Employment Density (MWCOG)	MWCOG Activity Center Designation	Activity Center Land Use Assessment	Step 1 Rating	% Origin Area that is MWCOG Equity Emphasis Area	2022 StreetLight AM Peak Trips (All)	2022 StreetLight Daily Trips (All)	2022 StreetLight AM Period : Daily %	All-Day Trip Attraction Percentile	All-Day Trip Rating	Existing Transit/Rail? (Rail/Bus/None)	Existing Transit/Rail	Transit Competitive? (Existing or Future)	Service Span	Passes Screening
Southeast Fairfax County to Landmark-Van Dorn	91	3	Moderate	31.95	10.90	N/A	MODERATE	Group B - Medium Priority	6.6%	250	2166	12%	1	High	Yes	Rail	Yes	All-Day	No
Central-West Prince George's County to National Harbor	39	1	Low	2.16	3.18	Emerging Employment Centers	HIGH	Group C - Low Priority	71.0%	60	904	7%	0.899	High	Yes	Bus	No	All-Day	No
DC North of Anacostia River to National Harbor	8	1	Low	2.16	3.18	Emerging Employment Centers	HIGH	Group C - Low Priority	32.6%	33	965	3%	0.926	High	Yes	Rail, Bus	No	All-Day	No
North Charles County to National Harbor	4	1	Low	2.16	3.18	Emerging Employment Centers	HIGH	Group C - Low Priority	10.0%	4	206	2%	0.449	Medium	None		No	Peak-Focused	No
DC South of Anacostia River to National Harbor	48	2	Moderate	2.16	3.18	Emerging Employment Centers	HIGH	Group A - High Priority	77.5%	35	650	5%	0.853	High	Yes	Bus	No	All-Day	Yes
Southwest Prince George's County to National Harbor	54	2	Moderate	2.16	3.18	Emerging Employment Centers	HIGH	Group A - High Priority	10.1%	146	1273	11%	0.972	High	Yes	Rail	Yes	All-Day	No
North Charles County to NoMa	85	3	Moderate	56.47	100.54	N/A	HIGH	Group A - High Priority	10.0%	60	143	42%	0.33	Low	Yes	Rail	No	Peak-Only	Yes
Southwest Prince George's County to NoMa	213	6	High	56.47	100.54	N/A	HIGH	Group A - High Priority	10.1%	81	326	25%	0.642	Medium	Yes	Rail	Yes	Peak-Focused	No
Alexandria to Oxon Hill	1	1	Low	5.19	6.06	N/A	LOW	Group C - Low Priority	20.5%	21	442	5%	0.761	High	Yes	Bus	No	All-Day	No
Central-East Fairfax County to Oxon Hill	1	1	Low	5.19	6.06	N/A	LOW	Group C - Low Priority	13.7%	18	239	8%	0.504	Medium	None		No	Peak-Focused	No
DC North of Anacostia River to Oxon Hill	3	1	Low	5.19	6.06	N/A	LOW	Group C - Low Priority	32.6%	23	673	3%	0.862	High	Yes	Rail, Bus	No	All-Day	No
DC South of Anacostia River to Oxon Hill	25	1	Low	5.19	6.06	N/A	LOW	Group C - Low Priority	77.5%	48	396	12%	0.697	High	Yes	Bus	No	All-Day	No
Southeast Fairfax County to Oxon Hill	1	1	Low	5.19	6.06	N/A	LOW	Group C - Low Priority	6.6%	27	404	7%	0.733	High	Yes	Rail, Bus	No	All-Day	No
Central-East Prince George's County to Pentagon City	48	2	Moderate	35.29	125.19	Mixed-Use Centers	HIGH	Group A - High Priority	10.6%	0	12	0%	0.036	Low	Yes	Rail	Yes	Peak-Only	No
Central-West Prince George's County to Pentagon City	84	3	Moderate	35.29	125.19	Mixed-Use Centers	HIGH	Group A - High Priority	71.0%	0	39	0%	0.119	Low	Yes	Rail	Yes	Peak-Only	No
North Charles County to Pentagon City	8	1	Low	35.29	125.19	Mixed-Use Centers	HIGH	Group C - Low Priority	10.0%	28	84	33%	0.192	Low	None		No	Peak-Only	No
Southeast Fairfax County to Pentagon City	146	4	Moderate	35.29	125.19	Mixed-Use Centers	HIGH	Group A - High Priority	6.6%	49	241	20%	0.513	Medium	Yes	Rail	Yes	Peak-Focused	No
Southwest Prince George's County to Pentagon City	40	1	Low	35.29	125.19	Mixed-Use Centers	HIGH	Group C - Low Priority	10.1%	10	218	5%	0.458	Medium	Yes	Rail, Bus	No	Peak-Focused	No
Central-East Fairfax County to Potomac Yard	68	2	Moderate	29.12	12.48	N/A	HIGH	Group A - High Priority	13.7%	68	149	46%	0.339	Medium	Yes	Bus	Yes	Peak-Focused	No
Central-West Fairfax County to Potomac Yard	58	2	Moderate	29.12	12.48	N/A	HIGH	Group A - High Priority	10.0%	14	62	23%	0.174	Low	Yes	Rail	Yes	Peak-Only	No
Northwest Fairfax County to Potomac Yard	60	2	Moderate	29.12	12.48	N/A	HIGH	Group A - High Priority	5.4%	4	21	19%	0.073	Low	Yes	Rail	No	Peak-Only	Yes
South Fairfax County to Potomac Yard	35	1	Low	29.12	12.48	N/A	HIGH	Group C - Low Priority	2.8%	89	190	47%	0.431	Medium	Yes	Rail	Yes	Peak-Focused	No
Southeast Fairfax County to Potomac Yard	115	3	Moderate	29.12	12.48	N/A	HIGH	Group A - High Priority	6.6%	135	729	19%	0.88	High	Yes	Rail	Yes	All-Day	No
Southwest Prince George's County to Rosslyn-Ballston Corridor (Combined)	207	6	High	62.16	88.67	Mixed-Use Centers	HIGH	Group A - High Priority	10.1%	43	248	17%	0.532	Medium	Yes	Rail	No	Peak-Focused	Yes
North Charles County to Rosslyn-Ballston Corridor (Combined)	159	4	Moderate	62.16	88.67	Mixed-Use Centers	HIGH	Group A - High Priority	10.0%	119	166	72%	0.394	Medium	Yes	Rail	No	Peak-Focused	Yes
Southeast Prince George's County to Rosslyn-Ballston Corridor (Combined)	110	3	Moderate	62.16	88.67	Mixed-Use Centers	HIGH	Group A - High Priority	5.4%	2	62	3%	0.174	Low	Yes	Rail	No	Peak-Only	Yes
Southeast Fairfax County to Rosslyn-Ballston Corridor (Combined)	634	16	High	62.16	88.67	Mixed-Use Centers	HIGH	Group A - High Priority	6.6%	183	555	33%	0.816	High	Yes	Rail	Yes	All-Day	No
North Charles County to Southwest Waterfront	149	4	Moderate	57.51	60.68	N/A	HIGH	Group A - High Priority	10.0%	77	151	51%	0.348	Medium	Yes	Rail	Yes	Peak-Focused	No
Southeast Fairfax County to Southwest Waterfront	117	3	Moderate	57.51	60.68	N/A	HIGH	Group A - High Priority	6.6%	11	93	12%	0.211	Low	Yes	Rail	Yes	Peak-Only	No

Origin-Destination Pair	2045 Transit Demand Potential (Trips/Hr)	Equivalent 40-Seat Buses per Hour	Peak Trip Rating	2045 Population Density (MWCOG)	2045 Employment Density (MWCOG)	MWCOG Activity Center Designation	Activity Center Land Use Assessment	Step 1 Rating	% Origin Area that is MWCOG Equity Emphasis Area	2022 StreetLight AM Peak Trips (All)	2022 StreetLight Daily Trips (All)	2022 StreetLight AM Period : Daily %	All-Day Trip Attraction Percentile	All-Day Trip Rating	Existing Transit/Rail? (Rail/Bus/None)	Existing Transit/Rail	Transit Competitive? (Existing or Future)	Service Span	Passes Screening
East Prince William's County to Southwest Waterfront	114	3	Moderate	57.51	60.68	N/A	HIGH	Group A - High Priority	8.4%	1	3	33%	0.018	Low	Yes	Rail	No	Peak-Only	Yes
Southeast Prince George's County to Southwest Waterfront	76	2	Moderate	57.51	60.68	N/A	HIGH	Group A - High Priority	5.4%	0	0	-	0	Low	Yes	Rail	Yes	Peak-Only	No
Southwest Prince George's County to Southwest Waterfront	176	5	High	57.51	60.68	N/A	HIGH	Group A - High Priority	10.1%	81	268	30%	0.559	Medium	Yes	Rail	Yes	Peak-Focused	No
Alexandria to Springfield	58	2	Moderate	12.83	26.60	Suburban Employment Centers	LOW	Group C - Low Priority	20.5%	105	702	15%	0.871	High	Yes	Rail, Bus	Yes	All-Day	No
DC North of Anacostia River to Springfield	26	1	Low	12.83	26.60	Suburban Employment Centers	LOW	Group C - Low Priority	32.6%	2	38	5%	0.11	Low	Yes	Rail	No	Peak-Only	No
North Charles County to Springfield	1	1	Low	12.83	26.60	Suburban Employment Centers	LOW	Group C - Low Priority	10.0%	29	115	25%	0.275	Low	None		No	Peak-Only	No
Southeast Fairfax County to Springfield	108	3	Moderate	12.83	26.60	Suburban Employment Centers	LOW	Group C - Low Priority	6.6%	21	365	6%	0.669	High	Yes	Bus	No	All-Day	No
Southwest Prince George's County to Springfield	2	1	Low	12.83	26.60	Suburban Employment Centers	LOW	Group C - Low Priority	10.1%	57	402	14%	0.724	High	None		No	All-Day	No
Central-East Fairfax County to St. Elizabeths	12	1	Low	24.77	20.53	N/A	MODERATE	Group C - Low Priority	13.7%	10	16	63%	0.045	Low	None		No	Peak-Only	No
North Charles County to St. Elizabeths	63	2	Moderate	24.77	20.53	N/A	MODERATE	Group B - Medium Priority	10.0%	25	39	64%	0.119	Low	Yes	Rail	Yes	Peak-Only	No
Southeast Fairfax County to St. Elizabeths	20	1	Low	24.77	20.53	N/A	MODERATE	Group C - Low Priority	6.6%	59	101	58%	0.247	Low	None		No	Peak-Only	No
Southeast Prince George's County to St. Elizabeths	16	1	Low	24.77	20.53	N/A	MODERATE	Group C - Low Priority	5.4%	1	19	5%	0.064	Low	Yes	Rail	Yes	Peak-Only	No
Southwest Prince George's County to St. Elizabeths	84	3	Moderate	24.77	20.53	N/A	MODERATE	Group B - Medium Priority	10.1%	71	157	45%	0.376	Medium	Yes	Rail	Yes	Peak-Focused	No
Alexandria to Suitland Area (Combined)	17	1	Low	8.04	4.60	N/A	MODERATE	Group C - Low Priority	20.5%	81	272	30%	0.577	Medium	Yes	Rail	No	Peak-Focused	No
Arlington County to Suitland Area (Combined)	19	1	Low	8.04	4.60	N/A	MODERATE	Group C - Low Priority	12.5%	0	45	0%	0.146	Low	Yes	Rail	No	Peak-Only	No
Central-East Fairfax County to Suitland Area (Combined)	3	1	Low	8.04	4.60	N/A	MODERATE	Group C - Low Priority	13.7%	82	234	35%	0.495	Medium	Yes	Rail	No	Peak-Focused	No
Central-West Fairfax County to Suitland Area (Combined)	5	1	Low	8.04	4.60	N/A	MODERATE	Group C - Low Priority	10.0%	36	166	22%	0.394	Medium	Yes	Rail	No	Peak-Focused	No
Northwest Fairfax County to Suitland Area (Combined)	7	1	Low	8.04	4.60	N/A	MODERATE	Group C - Low Priority	5.4%	1	92	1%	0.201	Low	Yes	Rail	No	Peak-Only	No
North Charles County to Tysons Area (Combined)	15	1	Low	35.62	71.44	Employment Centers	MODERATE	Group C - Low Priority	10.0%	21	153	14%	0.366	Medium	None		No	Peak-Focused	No
Alexandria to Tysons Area (Combined)	522	14	High	35.62	71.44	Employment Centers	MODERATE	Group A - High Priority	20.5%	24	287	8%	0.596	Medium	Yes	Rail	No	All-Day	Yes
Southeast Fairfax County to Tysons Area (Combined)	347	9	High	35.62	71.44	Employment Centers	MODERATE	Group A - High Priority	6.6%	154	362	43%	0.66	Medium	Yes	Rail	No	Peak-Focused	Yes
Central-West Prince George's County to Tysons Area (Combined)	97	3	Moderate	35.62	71.44	Employment Centers	MODERATE	Group B - Medium Priority	71.0%	26	158	16%	0.385	Medium	Yes	Rail	No	All-Day	Yes
Southwest Prince George's County to Tysons Area (Combined)	30	1	Low	35.62	71.44	Employment Centers	MODERATE	Group C - Low Priority	10.1%	126	348	36%	0.651	Medium	Yes	Bus	No	Peak-Focused	No

Appendix D: Preliminary Transit Recommendation Evaluation



Transit Service		A1	A2.1	A2.2	A2.3	A4/8	A5	A6/7	A9	A10/11	A12/14	A13	A15	A16	A17	A18	A19/20	A21
From		Central-West Fairfax County	North Charles County	North Charles County	North Charles County	Alexandria	Northwest Fairfax County	Central-West Fairfax County	Southwest Prince George's County	North Charles and Southwest Prince George's	Northwest Fairfax County	Northwest Fairfax County	Southeast Prince George's County	North Charles County	East Prince William County	Central-West Fairfax County	Southeast Fairfax County/Alexandria	Central-West Prince George's County
To		King Street-Old Town	DC Core	DC Core	DC Core	Tysons Area	King Street-Old Town	Carlyle-Eisenhower East and Braddock Road Metro	Capitol Riverfront	Rosslyn-Ballston Corridor	Braddock Road Metro Area and Potomac Yard	Carlyle-Eisenhower East	King Street-Old Town	NoMa (DC)	Southwest Waterfront	Landmark-Van Dorn	Dunn Loring-Merrifield	Tysons Area
Potential Transit Mode		Express Bus	Express Bus	Express Bus	Express Bus	Express Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Express Bus	Express Bus	Express Bus
Span of Service		All-Day Bidirectional	Off-Peak Directional	Off-Peak Directional	Off-Peak Directional	All-Day Bidirectional	Peak-Focused Directional	Peak-Focused Directional	Peak-Focused Directional	Peak-Focused Directional	Peak-Only Directional	Peak-Only Directional	Peak-Only Directional	Peak-Only Directional	Peak-Only Directional	All-Day Bidirectional	All-Day Bidirectional	All-Day Bidirectional
Headway (Minutes)		30 (Peak), 60 (Off-Peak)	60 (Off-Peak)	60 (Off-Peak)	60 (Off-Peak)	30 (Peak), 60 (Off-Peak)	30 (Peak), 60 (Peak Shoulder)	30 (Peak), 60 (Peak Shoulder)	30 (Peak), 60 (Peak Shoulder)	30 (Peak), 60 (Peak Shoulder)	30 (Peak)	30 (Peak)	30 (Peak)	30 (Peak)	30 (Peak)	30 (Peak), 60 (Off-Peak)	30 (Peak), 60 (Off-Peak)	30 (Peak), 60 (Off-Peak)
Metric	Weight	Score																
Total Population (2045)	3	Score	9	6	3	6	15	9	15	9	9	9	3	9	9	9	15	6
		Metric	132,500	111,300	76,800	121,800	362,400	198,500	336,700	164,400	146,200	183,500	183,500	48,800	133,400	142,500	131,300	362,400
Total Jobs (2045)	3	Score	6	15	15	15	9	6	6	9	9	6	6	9	9	6	6	9
		Metric	19,600	482,200	431,800	482,200	125,600	32,400	53,700	76,200	189,500	36,800	32,400	32,400	93,200	132,300	11,500	39,500
Peak Trip Potential (2045)	3	Score	6	0	0	0	15	6	6	15	15	6	6	12	9	6	9	6
		Metric	290 trips	N/A	N/A	N/A	1,660 trips	100 trips	320 trips	2,460 trips	1,820 trips	170 trips	90 trips	30 trips	1,260 trips	1,090 trips	170 trips	560 trips
Transit Propensity	3	Score	9	6	3	6	15	6	15	15	9	6	6	9	9	9	15	12
		Metric	88	63	39	64	204	60	173	183	96	55	55	47	76	101	79	204
Annual Operational Cost (2022)	2	Score	6	8	10	10	2	6	6	6	4	6	8	8	6	6	4	2
		Metric	\$1,412,000	\$620,000	\$344,000	\$344,000	\$2,807,000	\$878,000	\$1,497,000	\$878,000	\$2,015,000	\$878,000	\$534,000	\$534,000	\$1,050,000	\$878,000	\$1,756,000	\$2,462,000
Capital Cost (2022)	1	Score	5	3	3	3	3	3	1	3	1	3	5	5	1	3	5	3
		Metric	\$4,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$6,000,000	\$5,000,000	\$9,000,000	\$5,000,000	\$11,000,000	\$6,000,000	\$4,000,000	\$4,000,000	\$8,000,000	\$6,000,000	\$4,000,000	\$6,000,000
Facilities - Origin	1	Score	3	4	4	5	4	1	5	3	4	1	1	3	4	5	2	5
		Metric	Available park and ride spaces but potential future constraint	Available park and ride spaces	Available park and ride spaces	Available park and ride spaces	Available park and ride spaces	No parking facilities	Available park and ride spaces	Available park and ride spaces but potential future constraint	Available park and ride spaces	No parking facilities	No parking facilities	Available park and ride spaces	Available park and ride spaces	Available park and ride spaces (future)	Available park and ride spaces but potential future constraint	Available park and ride spaces but potential future constraint
Facilities - Destination	1	Score	3	3	3	3	5	3	3	3	5	3	3	3	5	3	5	5
		Metric	Available bus bays but potential future constraint	On-street location	On-street location	On-street location	Available bus bays	Available bus bays but potential future constraint	Available bus bays but potential future constraint	On-street location	Available bus bays	Available bus bays but potential future constraint	Available bus bays but potential future constraint	Available bus bays but potential future constraint	Available bus bays	On-street location	Future transit hub	Available bus bays
Express Lanes Use and Access	2	Score	6	2	2	2	6	6	6	2	6	6	6	8	2	10	4	6
		Metric	4.3 miles West Entry and Mill Road	None	None	None	4.3 miles West Entry, Mill Road, and Van Dorn Street	4.3 miles West Entry and Mill Road	4.3 miles West Entry and Mill Road	None	4.0 miles Mill Road, and MD-210	4.3 miles West Entry and Mill Road	4.3 miles West Entry and Mill Road	4.8 miles West Entry and Mill Road	None	7.2 miles West Entry and I-295	0.7 miles West Entry and Van Dorn Street	4.3 miles West Entry, Mill Road, and Van Dorn Street
Travel Time/Savings	1	Score	4	4	3	2	3	2	2	3	2	1	3	3	3	5	3	3
		Metric	25 minutes	93 minutes	89 minutes	98 minutes	61 minutes	48 minutes	76 minutes	50 minutes	105 minutes	61 minutes	32 minutes	30 minutes	72 minutes	54 minutes	31 minutes	51 minutes
			-5 minutes	-5 minutes	-1 minutes	+ 6 minutes	-2 minutes	+ 5 minutes	+ 6 minutes	+ 3 minutes	+ 5 minutes	+ 14 minutes	-1 minutes	-3 minutes	0 minutes	-14 minutes	+ 1 minutes	-2 minutes
Total Score (Max Possible Score = 100)			58	52	57	51	46	52	77	48	65	68	64	47	53	51	60	68
			MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	HIGH	LOW	HIGH	HIGH	HIGH	LOW	MODERATE	LOW	MODERATE	HIGH

Table 48. Origin Facility Summary (Preliminary Recommendations)

Park and Ride	Location	Preliminary Transit Recommendations	Lot Owner/ Operator	Parking Spaces ¹	Typical Occupancy ²	Facility Need
Huntington Metrorail Station (South)	Alexandria, VA	A4/8, A19/20	WMATA	3,617	64%	No
Van Dorn Street Metrorail Station	Alexandria, VA	A4/8, A19/20	WMATA	361	88%	Potentially in Future
Vienna/Fairfax-GMU Metrorail Station	Vienna, VA	A6/7	WMATA	5,169	73%	No
Dunn Loring-Merrifield Metrorail Station	Vienna, VA	A19/20	WMATA	1,963	55%	No
Monument Drive Commuter Parking Garage	Fairfax, VA	A6/7	Fairfax County	820—Planned	N/A—Future	No
Potomac/Neabsco Commuter Parking Garage	Woodbridge, VA	A17	Prince William County	1,400—Planned	N/A—Future	No
Centreville United Methodist Church Park and Ride	Centreville, VA	A6/7	Centreville United Methodist Church	144	32%	No
Wakefield Park Park and Ride	Annandale, VA	A1	Fairfax County	215	55%	Potentially in Future
Parkwood Baptist Church Park and Ride	Annandale, VA	A18	Parkwood Baptist Church	30	10%	Potentially in Future
Branch Avenue Metrorail Station	Camp Springs, MD	A21	WMATA	3,072	98%	Potentially in Future
La Plata Park and Ride	La Plata, MD	A2.1, A2.2	MDOT MTA	20	30%	No
South Potomac Church	La Plata, MD	A2.1, A2.2	South Potomac Church	200	Not Available	No
Accokeek Park and Ride	Accokeek, MD	A2.2, A10/11, A16	MDOT SHA	492	90%	Potentially in Future
St. Charles Towne Plaza	Waldorf, MD	A2.1, A2.3	Washington Prime Group	190	Not Available	No
Regency Furniture Stadium	Waldorf, MD	A2.3	Charles County	857	Not Available	No
Smallwood Village Center	St. Charles, MD	A2.3	Saul Centers	125	Not Available	No
Waldorf Park and Ride	Waldorf, MD	A2.3, A16	MDOT MTA	500	Not Available	No

Park and Ride	Location	Preliminary Transit Recommendations	Lot Owner/ Operator	Parking Spaces ¹	Typical Occupancy ²	Facility Need
U.S. 301 Park and Ride	Waldorf, MD	A2.3, A10/11	Charles County	425	Not Available	No
St. Charles Towne Mall	Waldorf, MD	A2.3	Simon Property Group, L.P.	254	Not Available	No
Mattawoman-Beantown Park and Ride	Waldorf, MD	A16	MDOT SHA	718	78%	Potentially in Future
Clinton Park and Ride	Clinton, MD	A9, A15	Prince George's County	424	Not Available	Potentially in Future
Fort Washington Park and Ride	Fort Washington, MD	A10/11	Prince George's County	412	Not Available	No
Padgett's Corner Shopping Center	Camp Springs, MD	A9	Undetermined	Not a designated park and ride	Not Available	No
Rosecroft Shopping Center	Fort Washington, MD	A9	Rosenthal Properties LLC	Not a designated park and ride	Not Available	No

¹Number of parking spaces for all existing locations were obtained from WMATA for Metrorail station locations and from Commuter Connections for all others.

²Occupancy for Virginia locations is based on 2018-2019 data from VDOT. Occupancy for Maryland locations is based on Fall 2019 from MDOT.

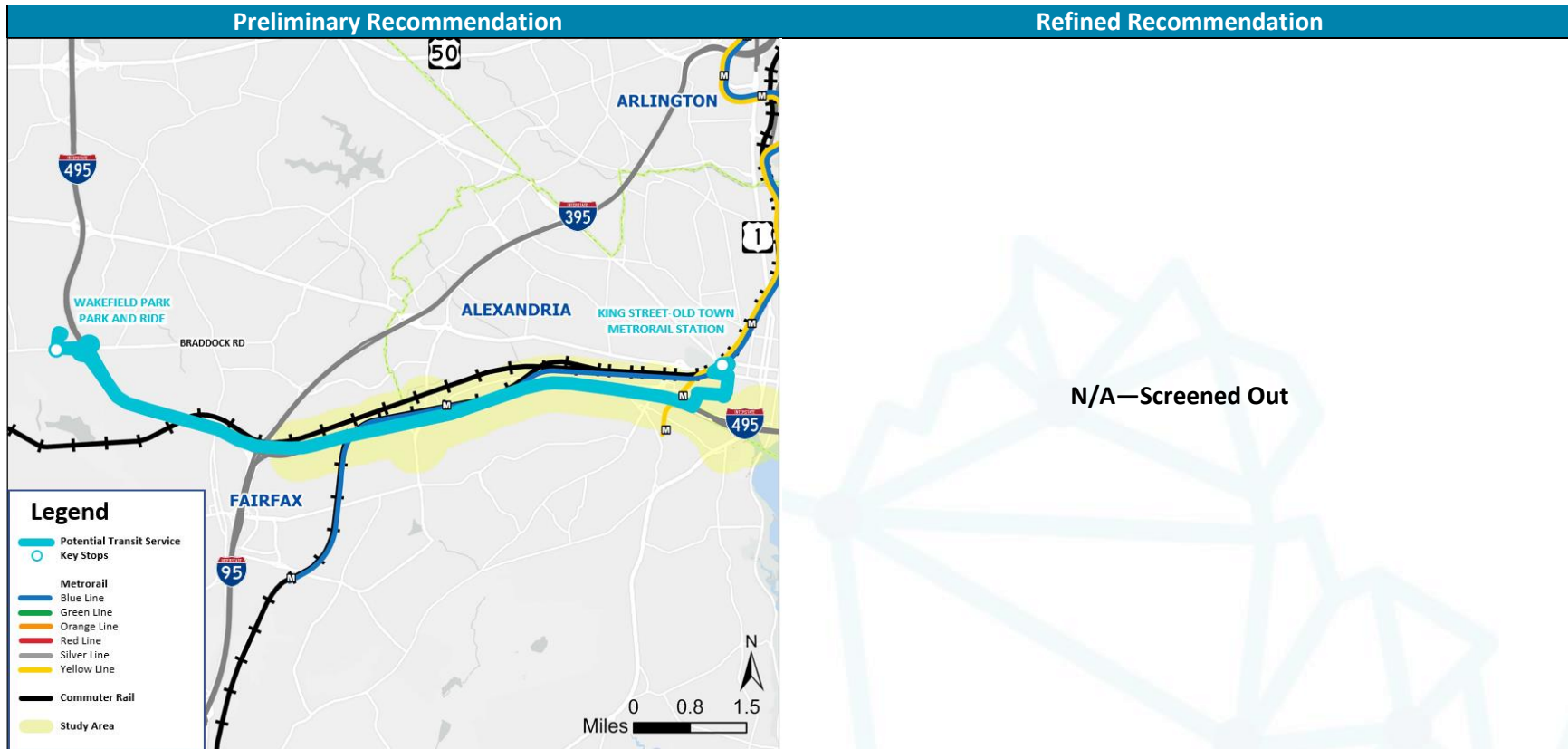
Table 49. Destination Facility Summary (Preliminary Recommendations)

Potential Destination Layover Point	Location	Preliminary Transit Recommendations	Required Capacity (vehicles per hour)	Available Capacity (vehicles per hour)	Facility Need
King Street-Old Town Metrorail Station	Alexandria, VA	A1, A5, A13, A15	8	13	Potentially in Future
Huntington Metrorail Station (South Side)	Alexandria, VA	A4/8, A19/20	4	9 to 10	Potentially in Future
West End (Landmark Mall) Transit Hub (Future)	Alexandria, VA	A18	2	Future	No
Braddock Road Metrorail Station	Alexandria, VA	A6/7	2	5	Potentially in Future
Potomac Yard Metrorail Station	Alexandria, VA	A12/14	2	Limited On-Street	Potentially in Future
Ballston Metrorail Station	Alexandria, VA	A10/11	2	22	Potentially in Future
Dunn Loring Metrorail Station	Vienna, VA	A19/20	2	27 to 31	No
Spring Hill Metrorail Station	Tysons, VA	A4/8, A21	4	14	No
Branch Avenue Metrorail Station	Camp Springs, MD	A21	2	16 to 17	No
M Street NW and 25 th Street NW	Washington, DC	A2.1	1	N/A	Potentially (On-Street Only)
Virginia Avenue NW and 19 th Street NW	Washington, DC	A2.2, A2.3	2	N/A	Potentially (On-Street Only)
M Street SE and Canal Street SE	Washington, DC	A9	2	N/A	Potentially (On-Street Only)
Union Station	Washington, DC	A16	2	15 to 19	No
L'Enfant Plaza Metrorail Station	Washington, DC	A17	2	22	No

Appendix E: Refined Transit Recommendation Evaluation

Central-West Fairfax County to King Street-Old Town (A1)

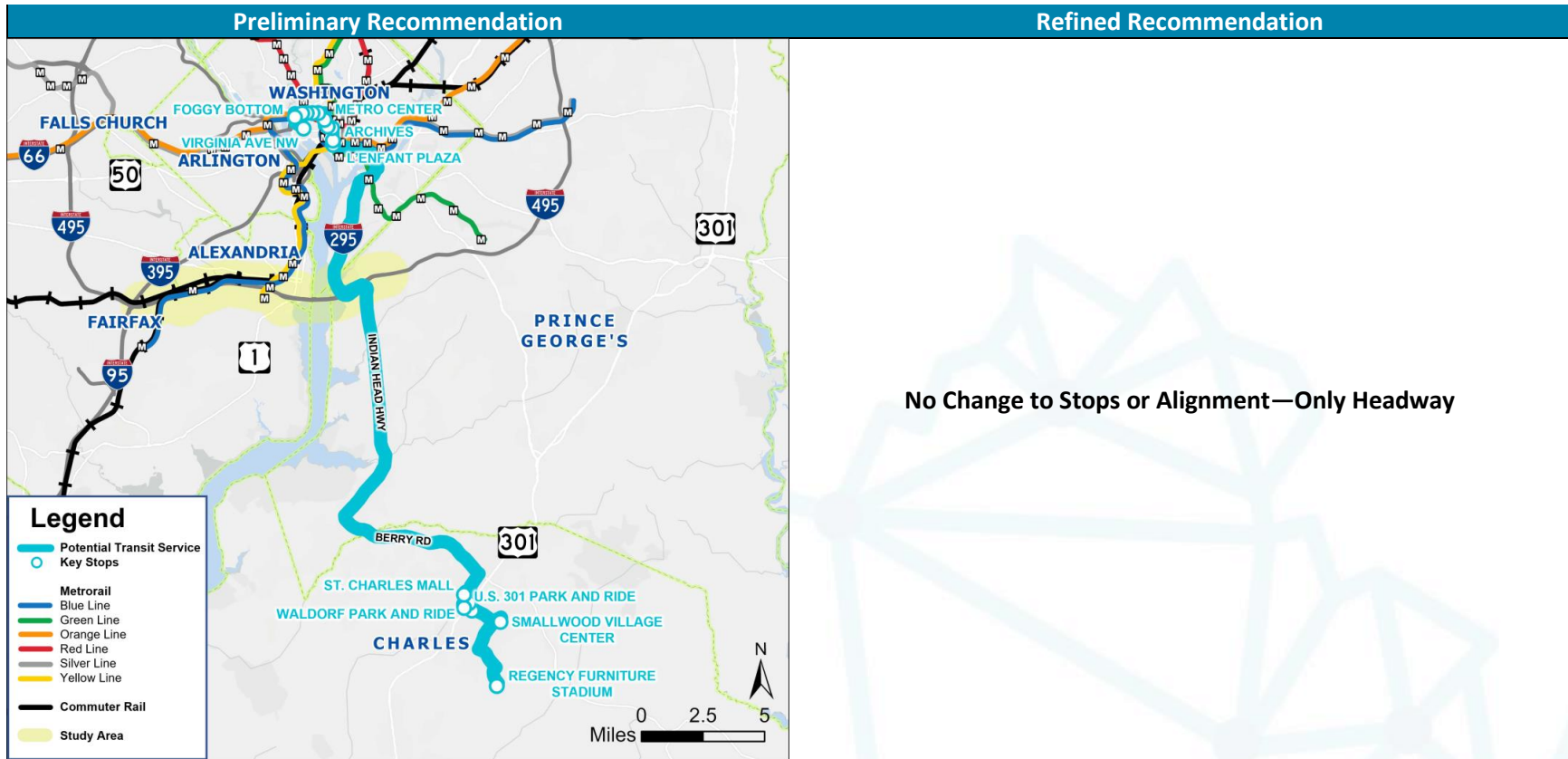
This preliminary recommendation was screened out due to low ridership and cost efficiency. Alternative travel options are available via VRE and planned improvements to Fairfax Connector for connections to Franconia-Springfield Metrorail Station (Blue Line).



2045 Demand Forecast: 125 riders per day / 3 riders per bus

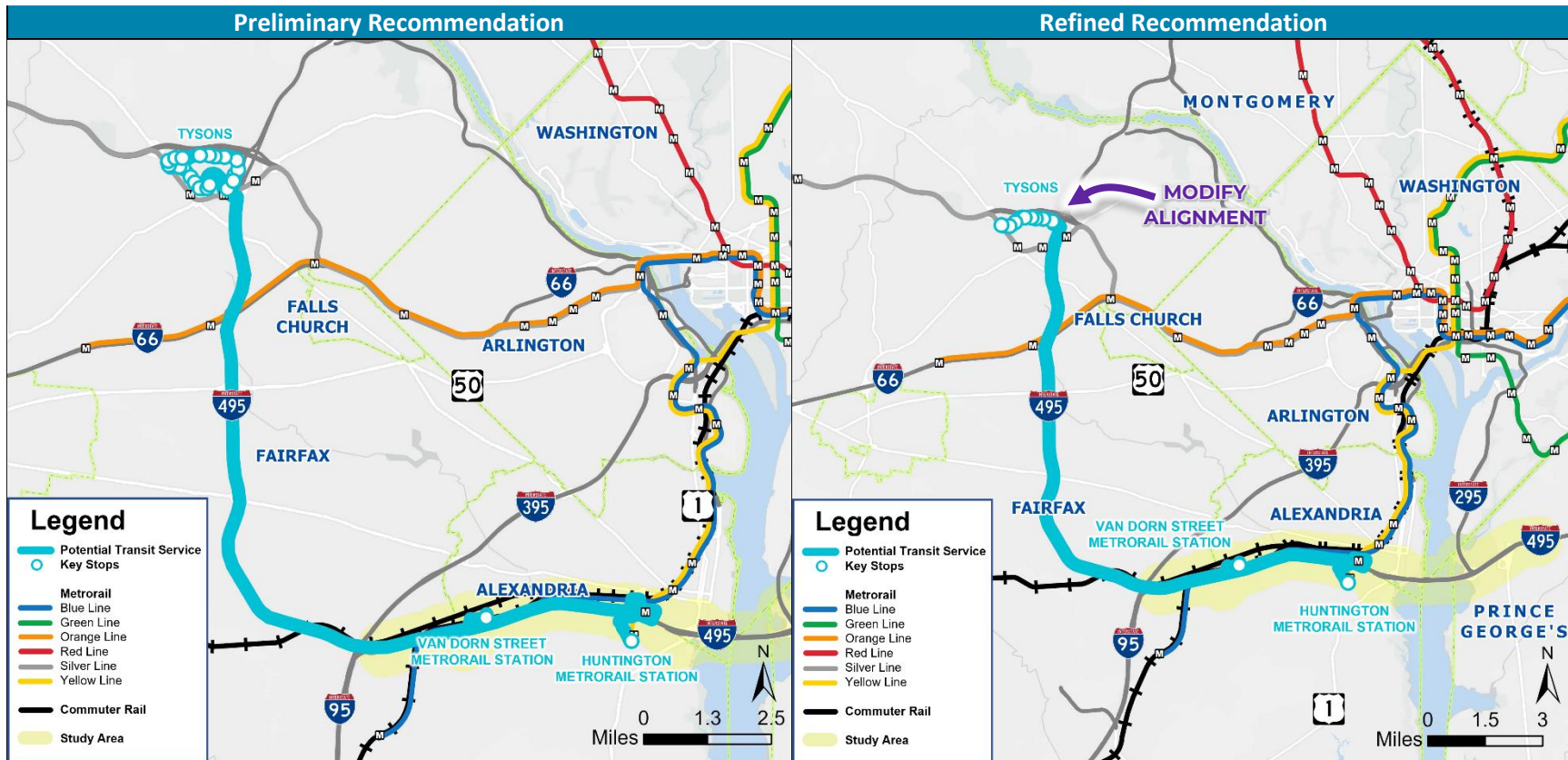
North Charles County to DC Core (A2.3)

This route showed relatively low daily ridership, but fairly high productivity given the number bus trips for this off-peak service. In the refinement, headway was improved to 40 minutes from 60 minutes which resulted in even better productivity.



Alexandria to Tysons (A4/8)

This route showed relatively high ridership and productivity. In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and the alignment in Tysons was modified for less circulation. This resulted in lower ridership even with the headway improvement. *Given the decrease in ridership with this change, it is recommended the alignment remain as previously shown in the preliminary recommendation to provide additional connection opportunities in Tysons.*

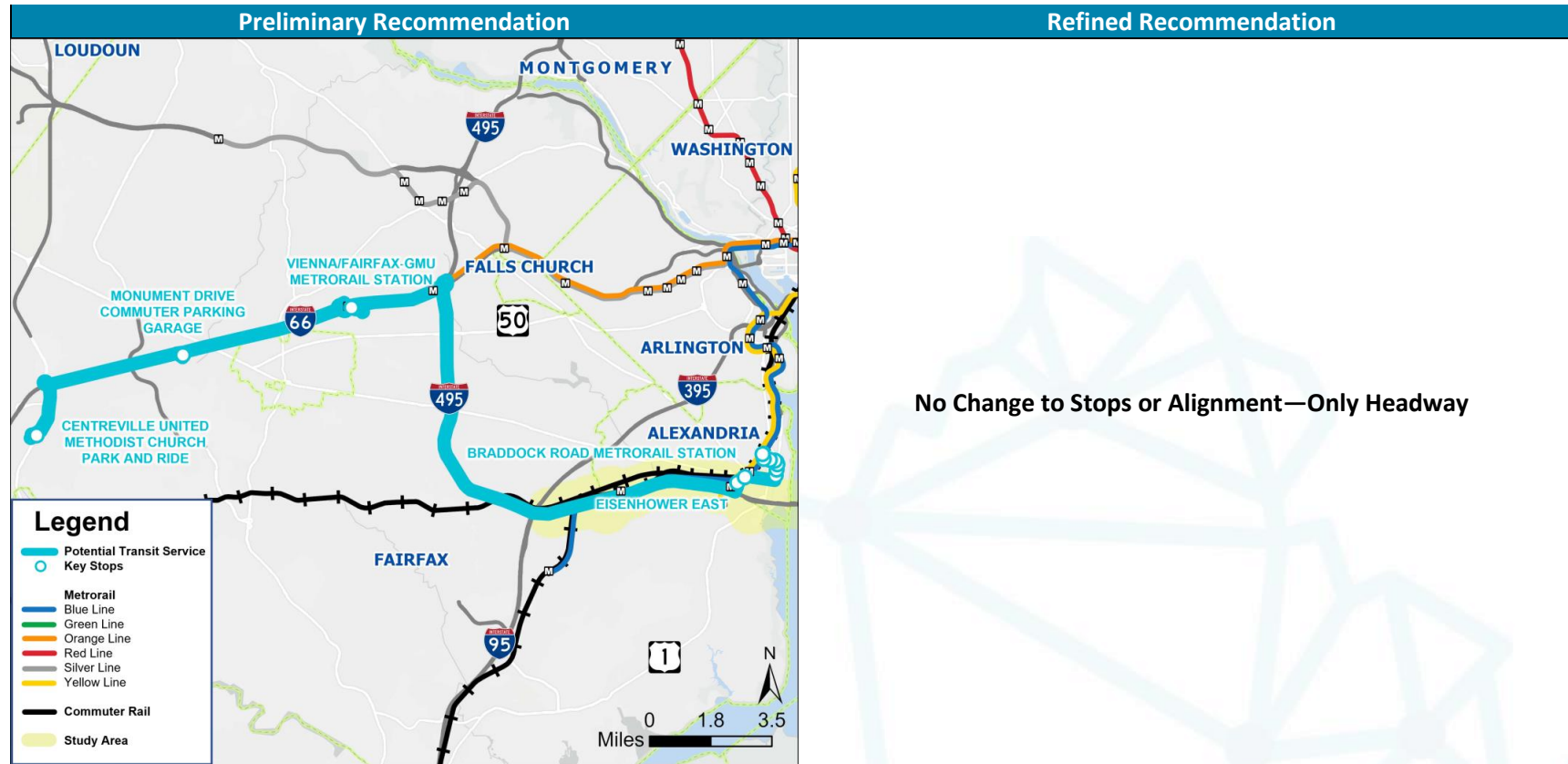


2045 Demand Forecast:
 1,175 riders per day / 24 riders per bus

2045 Demand Forecast:
 550 riders per day / 8 riders per bus

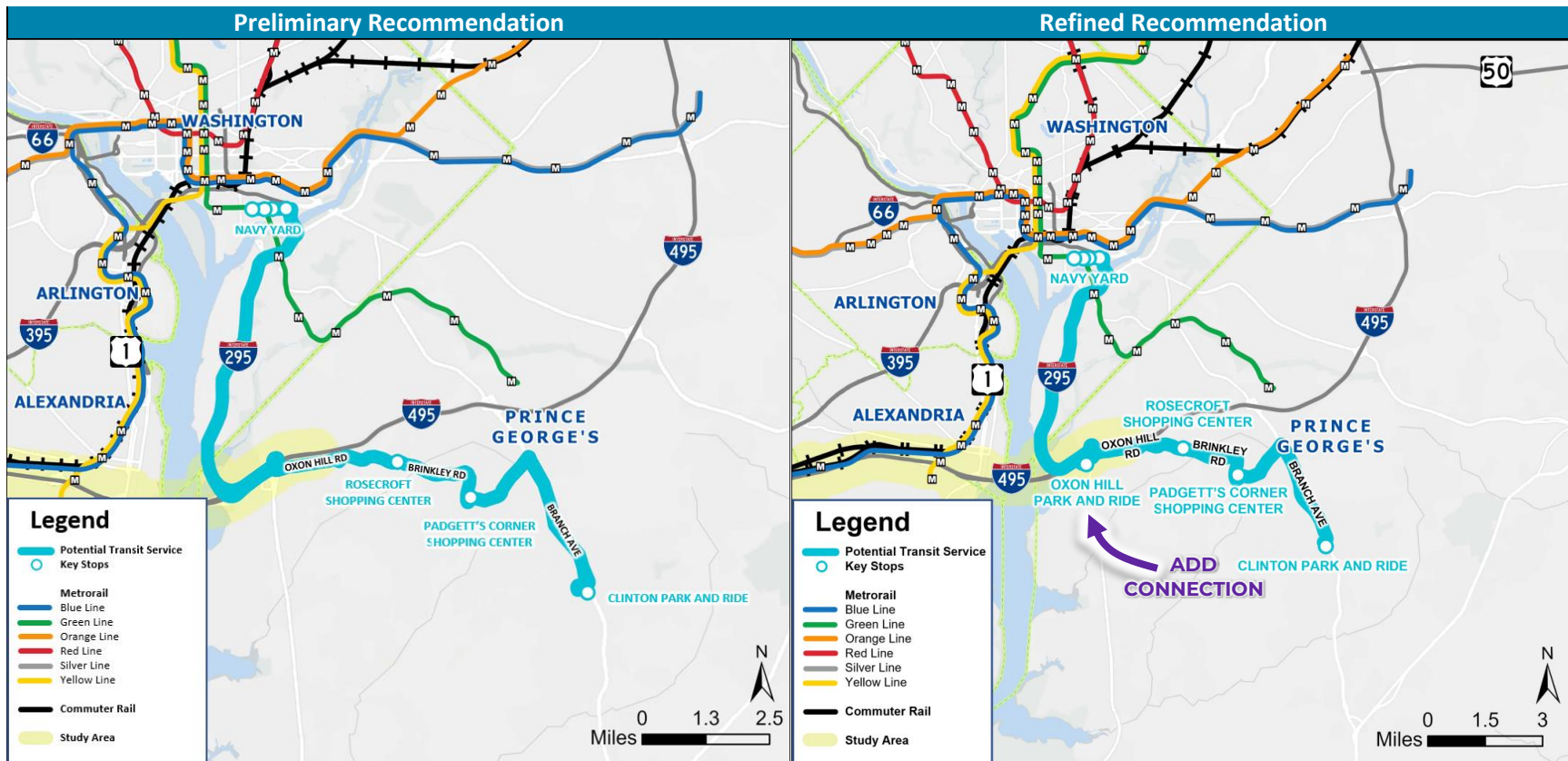
Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area (A6/7)

This route showed relatively moderate ridership and productivity. In the refinement, headway was improved to 20/40 minutes from 30/60 minutes. This resulted in increased ridership and better productivity.



Southwest Prince George's County to Capitol Riverfront (A9)

This route showed relatively high ridership and productivity. In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and a connection was added to Oxon Hill Park and Ride. This resulted in significantly increased ridership and better productivity.

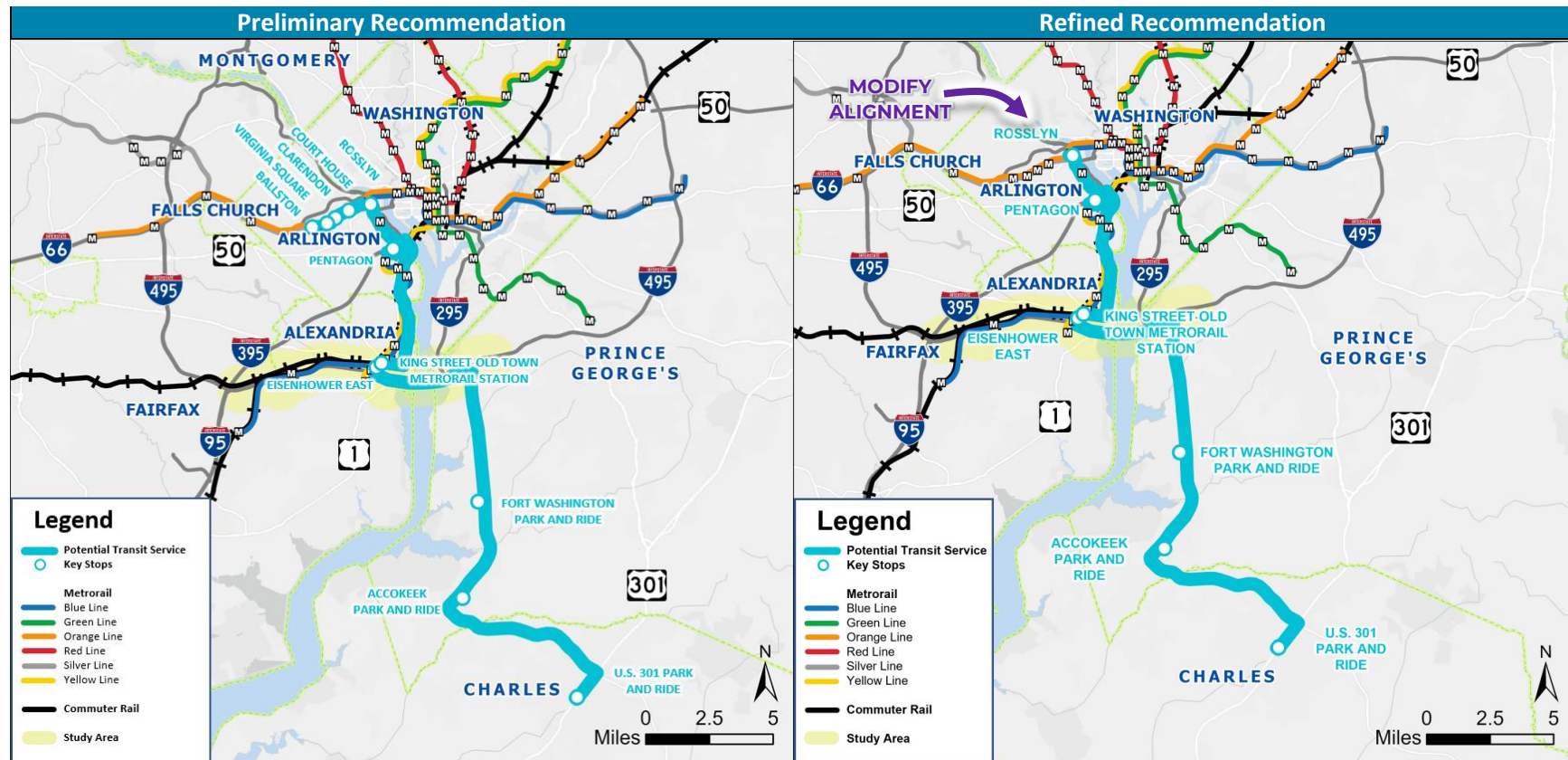


2045 Demand Forecast:
 950 riders per day / 48 riders per bus

2045 Demand Forecast:
 2,375 riders per day / 79 riders per bus

North Charles and Southwest Prince George's Counties to Rosslyn-Ballston Corridor (A10/11)

This route showed relatively high ridership and productivity. Given that less than 10% of the demand was estimated to travel west past Rosslyn, the alignment was modified to end in Rosslyn in the refinement. Headway was also improved to 20/40 minutes from 30/60 minutes. This resulted in increased ridership and similar productivity.

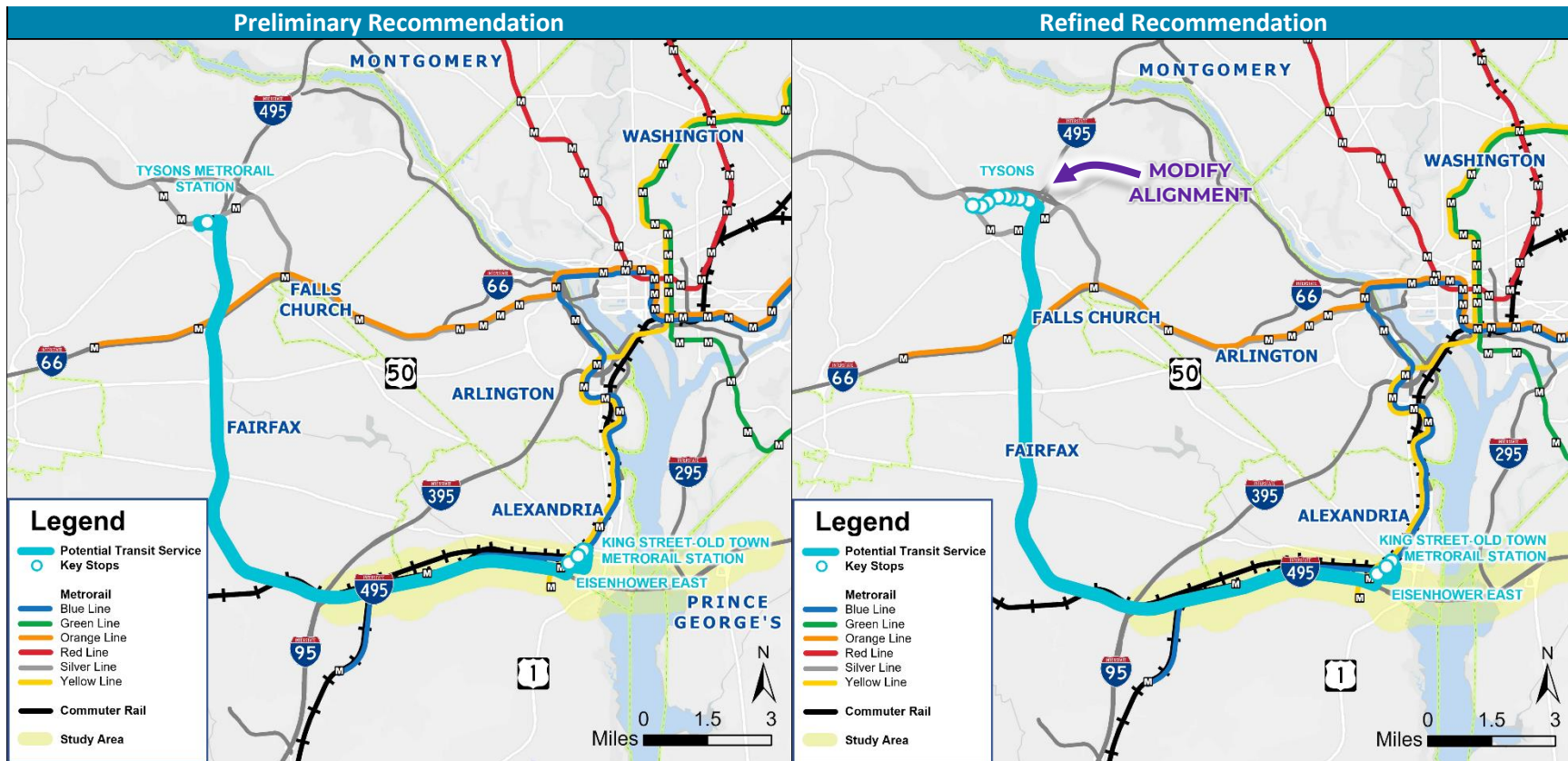


2045 Demand Forecast:
 1,875 riders per day / 94 riders per bus

2045 Demand Forecast:
 2,825 riders per day / 94 riders per bus

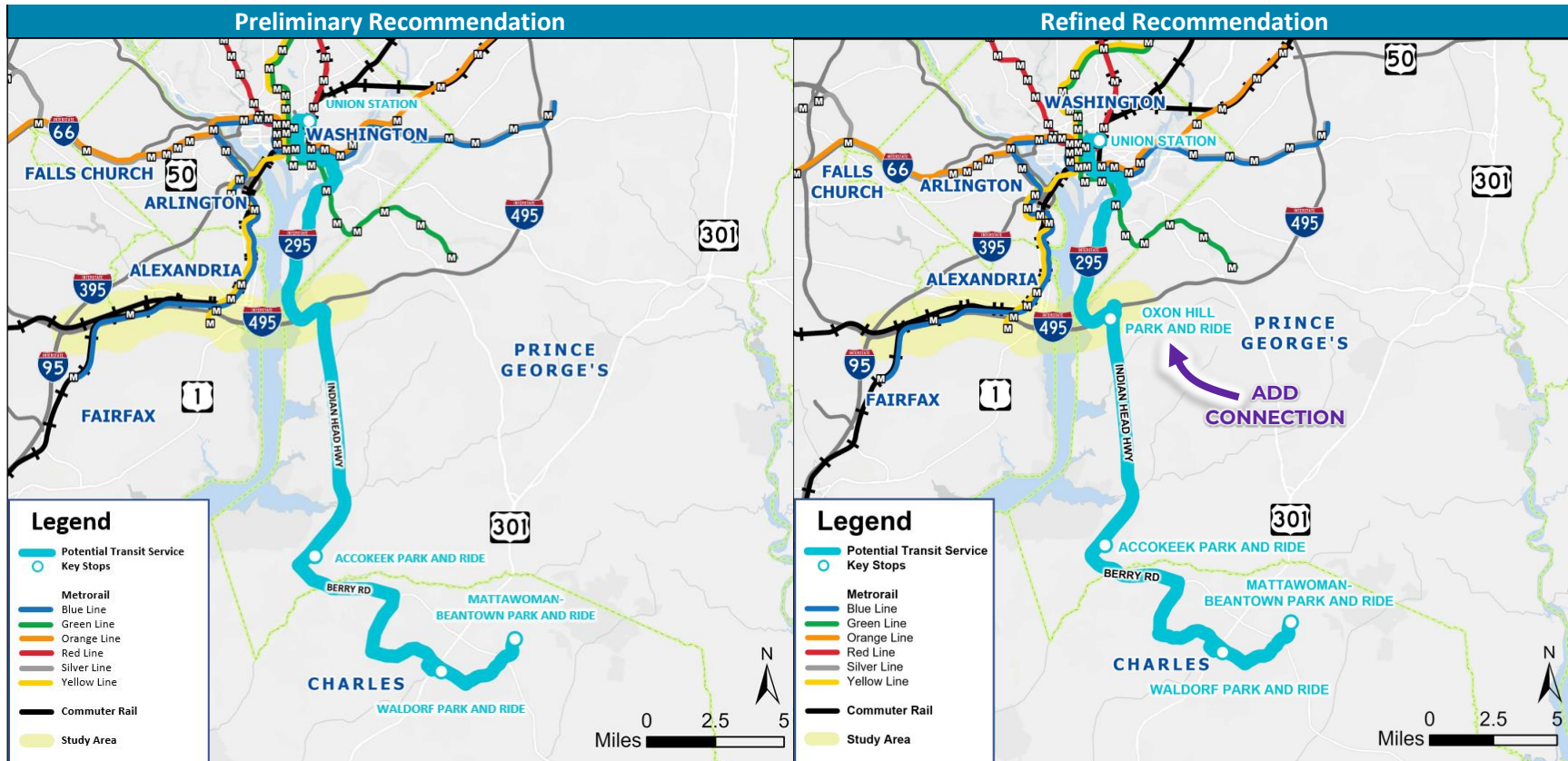
Northwest Fairfax County to Carlyle-Eisenhower East (A13)

This route showed relatively low ridership and productivity. In the refinement, headway was improved to 20 minutes from 30 minutes, and the alignment in Tysons was modified to connect to Spring Hill Metrorail Station instead of Tysons Metrorail Station. This resulted in increased ridership and better productivity.



North Charles County to NoMa (A16)

This route showed relatively high ridership and productivity. In the refinement, headway was improved to 20 minutes from 30 minutes, and a connection was added to Oxon Hill Park and Ride. This resulted in increased ridership but lower productivity.

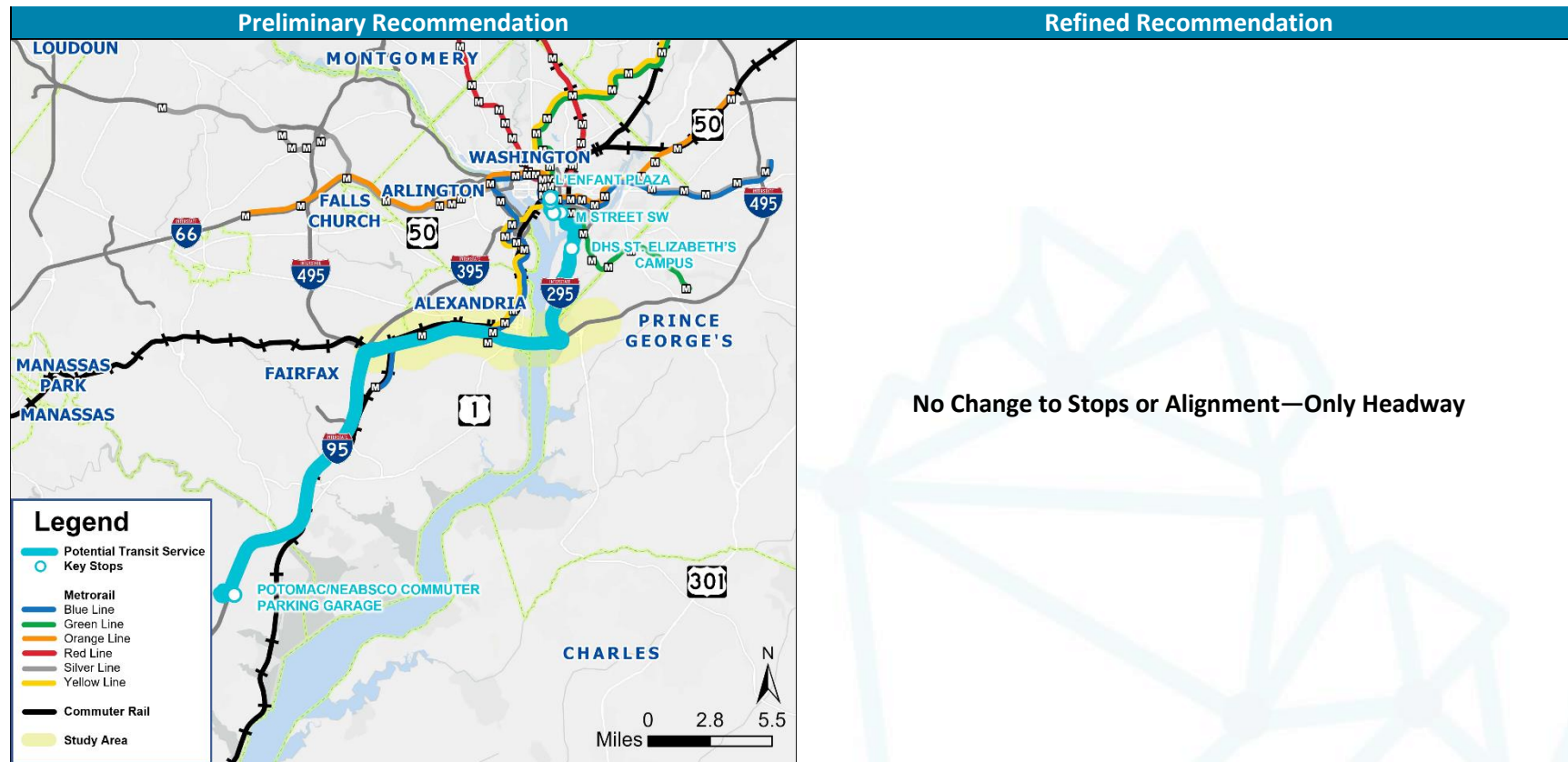


2045 Demand Forecast:
 1,150 riders per day / 72 riders per bus

2045 Demand Forecast:
 1,375 riders per day / 57 riders per bus

East Prince William County to Southwest Waterfront (A17)

This route showed relatively low ridership and productivity. In the refinement, headway was improved to 20 minutes from 30 minutes. This resulted in increased ridership and better productivity. The model showed that approximately half the demand travels to DHS/St. Elizabeth's while the other half travels from DHS/St. Elizabeth's to DC destinations.

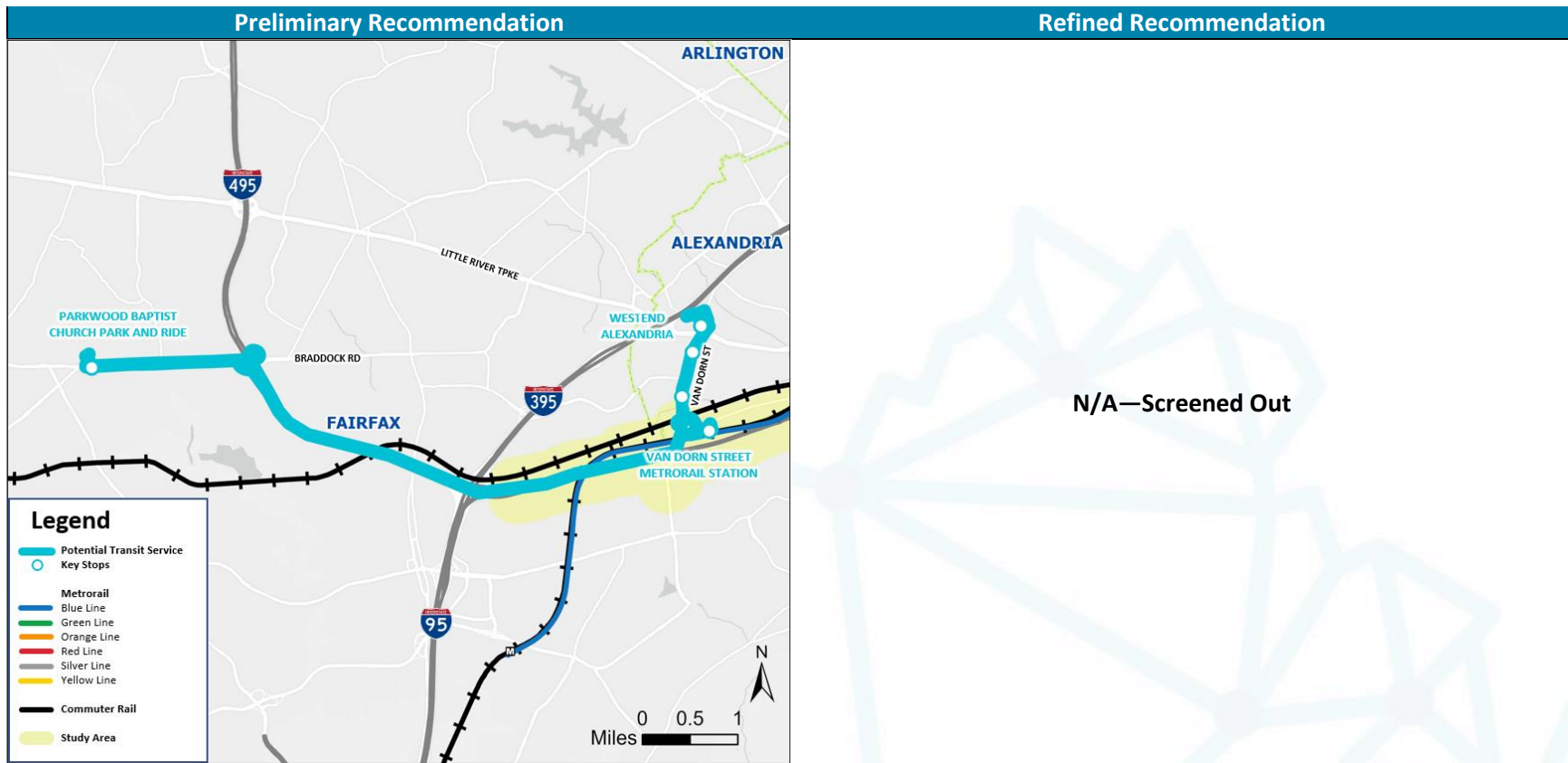


2045 Demand Forecast:
 100 riders per day / 6 riders per bus

2045 Demand Forecast:
 400 riders per day / 17 riders per bus

Central-West Fairfax County to Landmark-Van Dorn (A18)

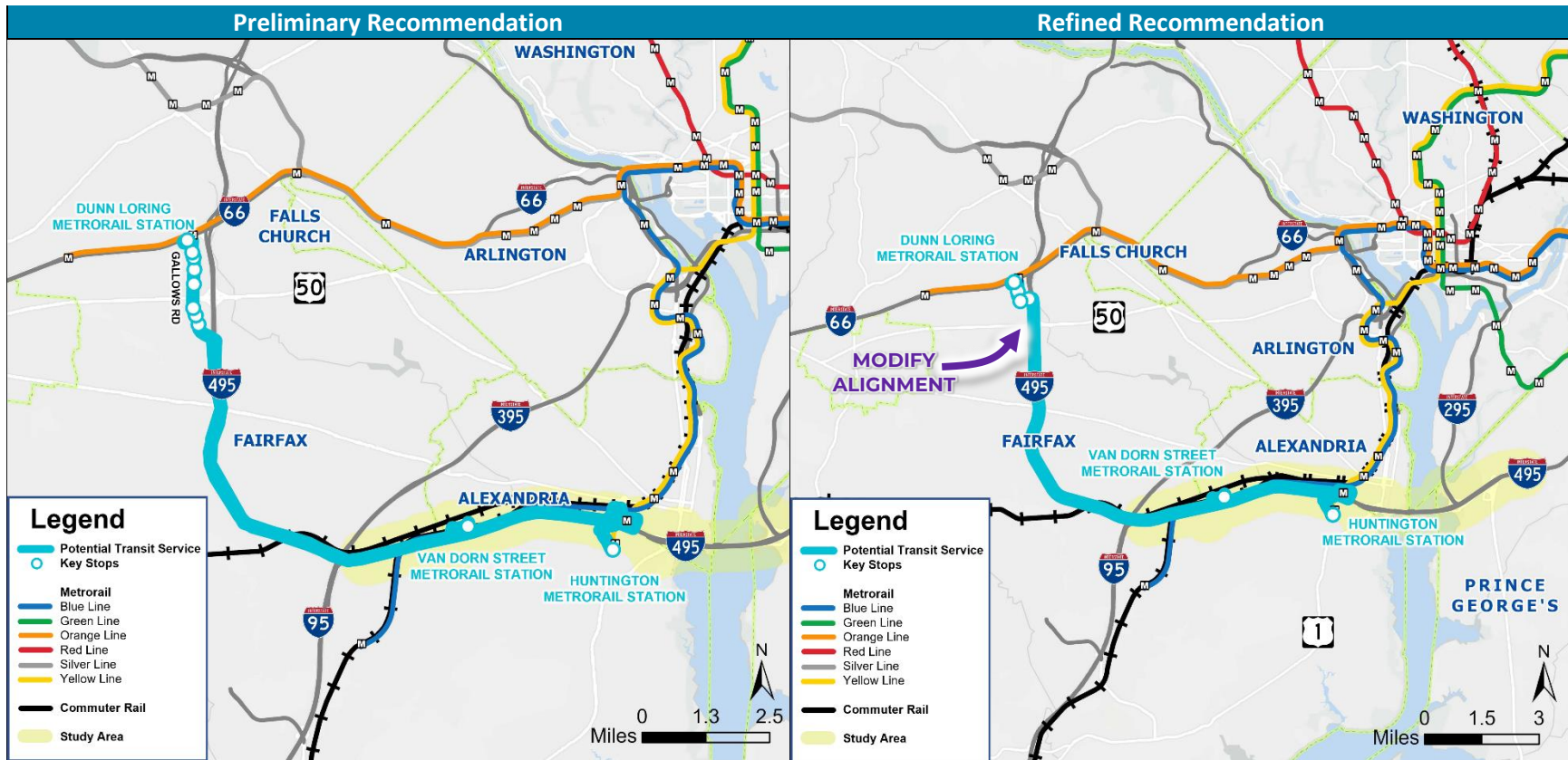
This preliminary recommendation was screened out due to low ridership and cost efficiency. Alternative travel options are available via VRE, planned improvements to Fairfax Connector for connections to Franconia-Springfield Metrorail Station (Blue Line), and the Alexandria West End Transitway



2045 Demand Forecast:
 50 riders per day / 1 riders per bus

Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield (A19/20)

This route showed relatively moderate ridership and productivity. In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and the alignment was modified to use I-495 Express Lanes ramps at US 29. This resulted in a slight increase in ridership but lower productivity. *Given the decrease in productivity with this change, it is recommended the alignment remain as previously shown in the preliminary recommendation to provide additional connection opportunities along Gallows Road.*

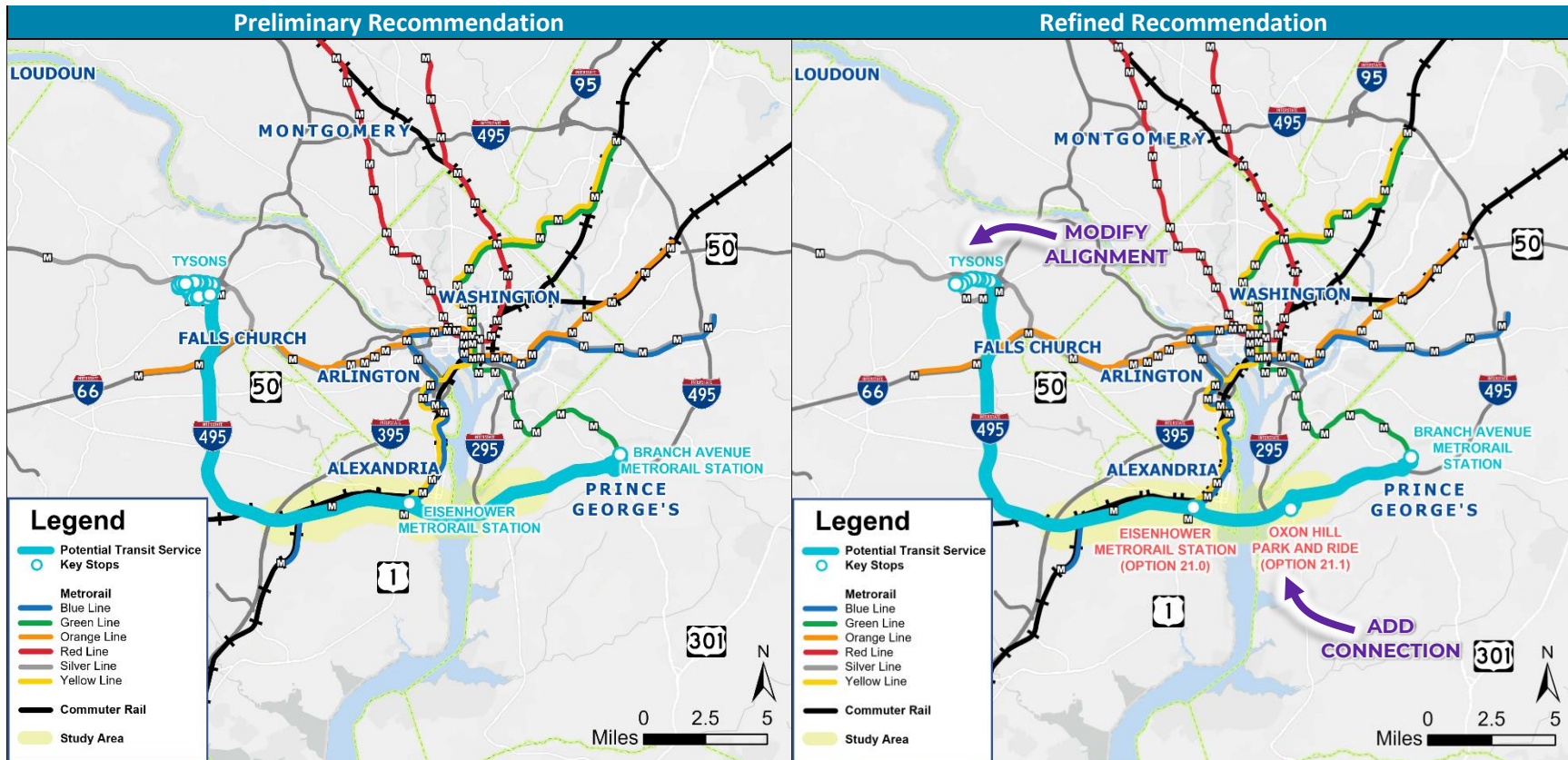


2045 Demand Forecast:
 600 riders per day / 13 riders per bus

2045 Demand Forecast:
 625 riders per day / 9 riders per bus

Central-West Prince George's County to Tysons (A21)

This route showed relatively high ridership and productivity. In the refinement, headway was improved to 20/40 minutes from 30/60 minutes, and a second route pattern was introduced with an intermediate stop at Oxon Hill Park and Ride. This resulted in an overall increase in ridership, but slightly lower productivity given the amount of additional bus trips from running two route patterns. The pattern with the connection to Oxon Hill Park and Ride showed greater ridership potential.



2045 Demand Forecast:
 1,875 riders per day / 39 riders per bus

2045 Demand Forecast (21.0/21.1):
 1,275 / 1,875 riders per day, 18 / 26 riders per bus

Metric	Weight		A2.3	A4/8	A6/7	A9	A10/11	A13	A16	A17	A19/20	A21.0	A21.1
From			North Charles County	Alexandria	Central-West Fairfax County	Southwest Prince George's County	North Charles County and Southwest Prince George's County	Northwest Fairfax County	North Charles County	East Prince William County	Southeast Fairfax County/Alexandria	Central-West Prince George's County	Central-West Prince George's County
To			DC Core	Tysons Area	Carlyle-Eisenhower East and Braddock Road Metro Area	Capitol Riverfront	Rosslyn-Ballston Corridor	Carlyle-Eisenhower East	NoMa (DC)	Southwest Waterfront	Dunn Loring-Merrifield	Tysons Area	Tysons Area
Potential Transit Mode			Express Bus	Express Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus	Express Bus	Express Bus	Express Bus
Span of Service			Off-Peak Directional	All-Day Bidirectional	Peak-Focused Directional	Peak-Focused Directional	Peak-Focused Directional	Peak-Only Directional	Peak-Only Directional	Peak-Only Directional	All-Day Bidirectional	All-Day Bidirectional	All-Day Bidirectional
Headway (Minutes)			40 (Off-Peak)	20 (Peak), 40 (Off-Peak)	20 (Peak), 40 (Peak Shoulder)	20 (Peak), 40 (Peak Shoulder)	20 (Peak), 40 (Peak Shoulder)	20 (Peak)	20 (Peak)	20 (Peak)	20 (Peak), 40 (Off-Peak)	20 (Peak), 40 (Off-Peak)	20 (Peak), 40 (Off-Peak)
Total Population (2045)	3	Score	3	15	15	9	3	6	9	3	15	9	9
		Metric	121,800 people	362,400 people	336,700 people	241,100 people	146,200 people	179,600 people	276,300 people	142,500 people	362,400 people	248,500 people	
Total Jobs (2045)	3	Score	15	9	6	9	9	6	9	9	6	9	9
		Metric	482,200 jobs	73,500 jobs	53,700 jobs	76,100 jobs	111,000 jobs	32,400 jobs	93,100 jobs	132,300 jobs	18,400 jobs	92,800 jobs	
Peak Trip Potential (2045)	3	Score	0	9	6	15	9	3	15	9	6	9	9
		Metric	N/A	1,130 Peak Trips	320 Peak Trips	3,490 Peak Trips	1,820 Peak Trips	80 Peak Trips	2,990 Peak Trips	1,090 Peak Trips	330 Peak Trips	900 Peak Trips	
Transit Propensity	3	Score	6	12	9	15	6	3	12	6	12	15	3
		Metric	64	204	173	243	96	52	217	101	204	258	
Operational Cost (2022)	2	Score	10	4	6	8	6	10	6	8	4	2	2
		Metric	\$534,000	\$3,168,000	\$1,980,000	\$1,584,000	\$2,376,000	\$878,000	\$1,756,000	\$1,223,000	\$3,168,000	\$3,513,000	\$3,513,000
Capital Cost (2022)	1	Score	4	4	2	3	1	5	1	3	4	3	3
		Metric	\$8,000,000	\$8,000,000	\$11,000,000	\$9,000,000	\$14,000,000	\$6,000,000	\$12,000,000	\$9,000,000	\$8,000,000	\$9,000,000	\$9,000,000
Facilities - Origin	1	Metric	Available park and ride spaces	Available park and ride spaces	Available park and ride spaces	Available park and ride spaces	Available park and ride spaces	No parking facilities	Available park and ride spaces	Available park and ride spaces (future)	Available park and ride spaces	Available park and ride spaces but potential future constraint	
Facilities - Destination	1	Score	3	3	3	3	3	3	5	3	5	5	5
		Metric	On-street location	Available bus bays but potential future constraint	Available bus bays but potential future constraint	On-street location	Potential future constraint	Available bus bays but potential future constraint	Available bus bays	On-street location	Available bus bays	Available bus bays	
Express Lanes Use and Access	2	Score	2	6	6	2	6	6	2	10	6	10	10
		Metric	None	4.3 miles West Entry, Mill Road, and Van Dorn Street	4.3 miles West Entry and Mill Road	None	4.0 miles Mill Road and MD-210	4.3 miles West Entry and Mill Road	None	7.2 miles West Entry and I-295	4.3 miles West Entry, Mill Road, and Van Dorn Street	8.3 miles East Entry, Mill Road, West Entry	8.3 miles East Entry, MD-210, West Entry
Travel Time / Savings	1	Score	1	4	1	2	2	2	3	5	3	5	5
		Metric	98 minutes	49 minutes	76 minutes	50 minutes	90 minutes	40 minutes	72 minutes	54 minutes	46 minutes	54 minutes	54 minutes
			+6 minutes	- 9 minutes	+ 6 minutes	+ 3 minutes	+ 5 minutes	+ 4 minutes	0 minutes	- 14 minutes	- 2 minutes	- 16 minutes	- 11 minutes
Total Score (Max Possible Score = 100)			49	70	58	70	49	45	66	61	66	70	58
			LOW	HIGH	MODERATE	HIGH	LOW	LOW	MODERATE	MODERATE	MODERATE	HIGH	MODERATE

Appendix F: Metrorail Scenario Testing

Assumptions

As part of the I-495 Southside Transit/TDM Study, a transit scenario was tested that consisted of a Metrorail extension along the I-495 Southside corridor between Virginia and Maryland. This scenario was evaluated separately from the transit options that were tested and evaluated for express bus, commuter bus, and local bus modes which ultimately made up the package of study recommendations.

The purpose of the Metrorail scenario was to conduct a high-level demand assessment for additional rail in the study corridor. Results of the testing could then be compared with those for bus modes to determine if rail should be further considered as a potential mode and study recommendation.

The approach to transit demand modeling was consistent with that of the overall study as described in the **Transit Demand Forecasting** section. The MWCOG/TPB Travel Model (version 2.4) was used with the Round 9.1a Cooperative Land Use forecast. The validated 2019 base model and 2045 No-Build model from the VDOT I-495 Southside Express Lane Study were used as a starting point for forecasting and for consistency with the VDOT study. The Metrorail scenario was conducted using a “no-build” highway network meaning the existing I-495 Southside roadway, no expansion of express lanes in the corridor, and existing/planned projects that are in the constrained long-range plan (CLRP).

The scenario assumed a Metrorail extension would be constructed from the current southern terminus of the Yellow Line at Huntington, extending east across the Woodrow Wilson Bridge and connecting to the current southern terminus of the Green Line at Branch Avenue. Intermediate stations were assumed at National Harbor and Oxon Hill. The National Harbor station was modeled near the intersection of National Harbor Boulevard and St. George Boulevard, and the Oxon Hill station was modeled along Oxon Hill Road adjacent to the Tanger Outlets. The alignment from Huntington to Oxon Hill was consistent with the WMATA Blue Line to National Harbor alternative from the Blue/Orange/Silver Capacity & Reliability Study that is currently nearing completion. Past Oxon Hill, the route alignment diverged from the WMATA alternative to follow I-495 toward the Branch Avenue Metrorail station.

The WMATA Manual of Design Criteria was consulted to determine speeds and travel times along the new corridor based on speed-time-distance curves. The segment length between Huntington and National Harbor was assumed to be 24,000 feet, or 4.5 miles long, and have a running time of 376 seconds and average speed of 43 mph. The segment between National Harbor and Oxon Hill was assumed to be 6,520 feet, or 1.2 miles long, and have a running time of 137 seconds and average speed of 32 mph. The last segment of the extension from Oxon Hill to Branch Avenue was assumed to be 34,135 feet, or 6.5 miles long, and have a running time of 514 seconds and average speed of 45 mph. These assumptions were coded into the travel demand model to determine the anticipated ridership on the new segments.

Outcomes

Table 50 shows a high-level estimate of ridership on segments of the tested rail extension. The segment across the Woodrow Wilson Bridge showed the greatest demand compared to the other two segments. **Table 51** shows a comparison of person-trips for two cutlines on the east end of the study corridor. While the Metrorail scenario showed a marginally greater amount of transit trips in the corridor, the scenario that included the package of study recommendations with express lanes expansion showed a greater number of total person-trips, non-SOV trips, and non-SOV mode share. The demand estimated for a rail extension was found to be an amount that could be served by lower cost and more flexible bus modes. Rail extension was not carried forward in the study recommendations, however the study recognized that improvements in the I-495 Southside corridor should not preclude potential future rail across the Woodrow Wilson Bridge.

Table 50. Metrorail Extension 2045 Ridership Estimate

Segment	Daily	Peak	Off-Peak
Huntington - National Harbor	8,100	6,900	1,200
National Harbor - Oxon Hill	7,700	6,600	1,100
Oxon Hill - Branch Avenue	3,400	2,800	600

Table 51. Person-Trip Comparison

2045 Daily Trips	No-Build – Without Metrorail Extension	Metrorail Extension Scenario Test	Study Transit Recommendations with Express Lanes (Express, Commuter, and Local Bus)
Woodrow Wilson Bridge			
Total Person Trips	313,900	320,800	363,500
Total Non-SOV Trips	155,400 (49.5%)	162,200 (50.6%)	190,000 (52.3%)
Total Transit Trips	1,500 (0.5%)	9,300 (2.9%)	5,100 (1.4%)
Between I-295 and MD 210			
Total Person Trips	260,200	262,100	278,200
Total Non-SOV Trips	136,900 (52.6%)	138,800 (53.0%)	149,200 (53.6%)
Total Transit Trips	13,500 (5.2%)	16,700 (6.4%)	14,400 (5.2%)

Appendix G: Alternative Interchange Access

Assumptions

The transit recommendations developed through the I-495 Southside Transit/TDM Study assumed interchange locations where Express Lanes access would be available. Assumptions were coordinated with the VDOT Southside Express Lanes Study in September 2022. As the DRPT and VDOT studies progressed, there was a need to better understand impacts to transit recommendations if Express Lanes access in Alexandria was moved from the preliminary assumed location of Mill Road to the US Route 1 interchange further east.

This appendix compares the transit recommendations and key evaluation metrics with Express Lanes access assumed at Mill Road versus US Route 1. Six of the recommended transit services were assumed to use Express Lanes access at Mill Road. To assess impacts to the recommendations if Express Lanes access would instead be provided at US Route 1, routing was modified, high-level operating plans were updated, and metrics were reevaluated following the same process and assumptions in **Section V. Transit Recommendations**. While not documented in this analysis, the routing of the existing Metrobus NH2 could also be affected by different interchange access assumptions in Alexandria.

Outcomes

In general, Express Lanes access at Mill Road is more favorable for transit compared to US Route 1 because it results in more direct routing to the destinations and activity centers in Alexandria such as Carlyle-Eisenhower East and King Street–Old Town Metrorail Station. In some instances when reevaluating recommendations with Express Lanes access at US Route 1, transit routing needed to be modified to minimize circuitous movements and lengthy travel time that would reduce the competitiveness of transit.

Recommendations A4/8, A19/20, and A21.0 would also need to utilize general-purpose lanes for portions of the corridor if Express Lanes access is provided at US Route 1.

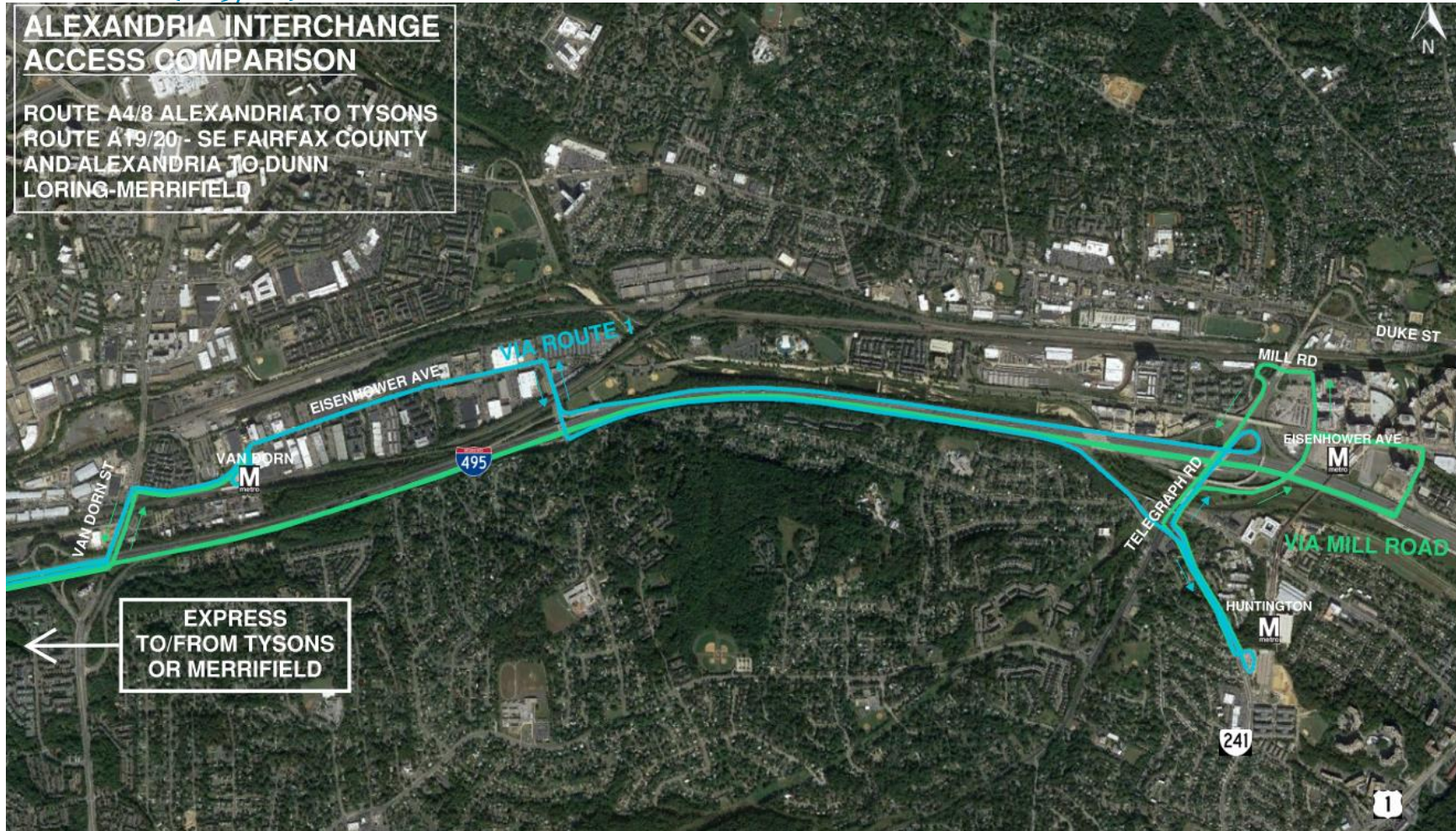
Table 52 shows a comparison of operational cost, capital cost, Express Lanes use and access, travel time and travel time savings compared to SOV travel, and estimated 2045 ridership for the affected transit recommendations. The conceptual maps that follow show the differences in assumed routing. Difference in travel time savings was not reported because it is not an intuitive value when the SOV route varies between the two interchange options.

Table 52. Transit Service Comparison (Mill Road vs US Route 1 Access)

Routes	Metrics	Access Provided by Mill Road Interchange	Access Provided by US Route 1 Interchange	Difference
A4/8: Alexandria to Tysons	Operational Cost (2022)	\$4,219,000 per year	\$3,513,000 per year	\$(706,000) per year
	Capital Cost (2022)	\$10,000,000	\$9,000,000	\$(1,000,000)
	Express Lane Use and Access	4.3 miles West Entry, Mill Road, and Van Dorn Street	0.8 miles West Entry and Van Dorn Street	- 3.5 miles
	Transit Travel Time	61 minutes	56 minutes	- 5 minutes
	Travel Time Savings Compared to SOV	- 2 minutes	+ 6 minutes	
	2045 Daily Ridership and Average Riders per Bus	725 riders per day 10 riders per bus	775 riders per day 11 riders per bus	+ 50 riders per day + 1 riders per bus
A6/7: Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area	Operational Cost (2022)	\$1,980,000 per year	\$1,619,000 per year	\$(361,000) per year
	Capital Cost (2022)	\$11,000,000	\$9,000,000	\$(2,000,000)
	Express Lane Use and Access	4.3 miles West Entry and Mill Road	5.1 miles West Entry and US Route 1	+ 0.8 miles
	Transit Travel Time	76 minutes	60 minutes	- 16 minutes
	Travel Time Savings Compared to SOV	+ 6 minutes	+ 3 minutes	
	2045 Daily Ridership and Average Riders per Bus	675 riders per day 23 riders per bus	575 riders per day 19 riders per bus	- 100 riders per day - 4 riders per bus
A10/11: North Charles and Southwest Prince George's Counties to Rosslyn	Operational Cost (2022)	\$2,376,000 per year	\$2,204,000 per year	\$(172,000) per year
	Capital Cost (2022)	\$14,000,000	\$12,000,000	\$(2,000,000)
	Express Lane Use and Access	4.0 miles Mill Road and MD-210	3.2 miles US Route 1 and MD-210	- 0.8 miles
	Travel Time	90 minutes	84 minutes	- 6 minutes
	Travel Time Savings	+ 5 minutes	+ 7 minutes	
	2045 Daily Ridership and Average Riders per Bus	2,825 riders per day 94 riders per bus	2,825 riders per day 94 riders per bus	-

Routes	Metrics	Access Provided by Mill Road Interchange	Access Provided by US Route 1 Interchange	Difference
A13: Northwest Fairfax County to Carlyle-Eisenhower East	Operational Cost (2022)	\$878,000 per year	\$878,000 per year	-
	Capital Cost (2022)	\$6,000,000	\$6,000,000	-
	Express Lane Use and Access	4.3 miles West Entry and Mill Road	5.1 miles West Entry and US Route 1	+ 0.8 miles
	Transit Travel Time	40 minutes	43 minutes	+ 3 minutes
	Travel Time Savings Compared to SOV	+ 4 minutes	+ 1 minutes	
	2045 Daily Ridership and Average Riders per Bus	300 riders per day 13 riders per bus	100 riders per day 4 riders per bus	- 200 riders per day -9 riders per bus
A19/20: Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield	Operational Cost (2022)	\$3,168,000 per year	\$3,168,000 per year	-
	Capital Cost (2022)	\$8,000,000	\$8,000,000	-
	Express Lane Use and Access	4.3 miles West Entry, Mill Road and Van Dorn Street	0.8 miles West Entry and Van Dorn Street	- 3.5 miles
	Transit Travel Time	51 minutes	44 minutes	- 7 minutes
	Travel Time Savings Compared to SOV	- 2 minutes	+ 3 minutes	
	2045 Daily Ridership and Average Riders per Bus	650 riders per day 9 riders per bus	825 riders per day 11 riders per bus	+ 175 riders per day + 2 riders per bus
A21.0: Central-West Prince George's County to Tysons (via Eisenhower)	Operational Cost (2022)	\$3,513,000 per year	\$4,563,000 per year	\$1,050,000 per year
	Capital Cost (2022)	\$9,000,000	\$11,000,000	\$2,000,000
	Express Lane Use and Access	8.3 miles East Entry, Mill Road and West Entry	3.1 miles East Entry and US Route 1	-5.2 miles
	Transit Travel Time	54 minutes	74 minutes	+ 19 minutes
	Travel Time Savings Compared to SOV	- 16 minutes	- 9 minutes	
	2045 Daily Ridership and Average Riders per Bus	1,200 riders per day 17 riders per bus	725 riders per day, 10 riders per bus	- 475 riders per day - 7 riders per bus

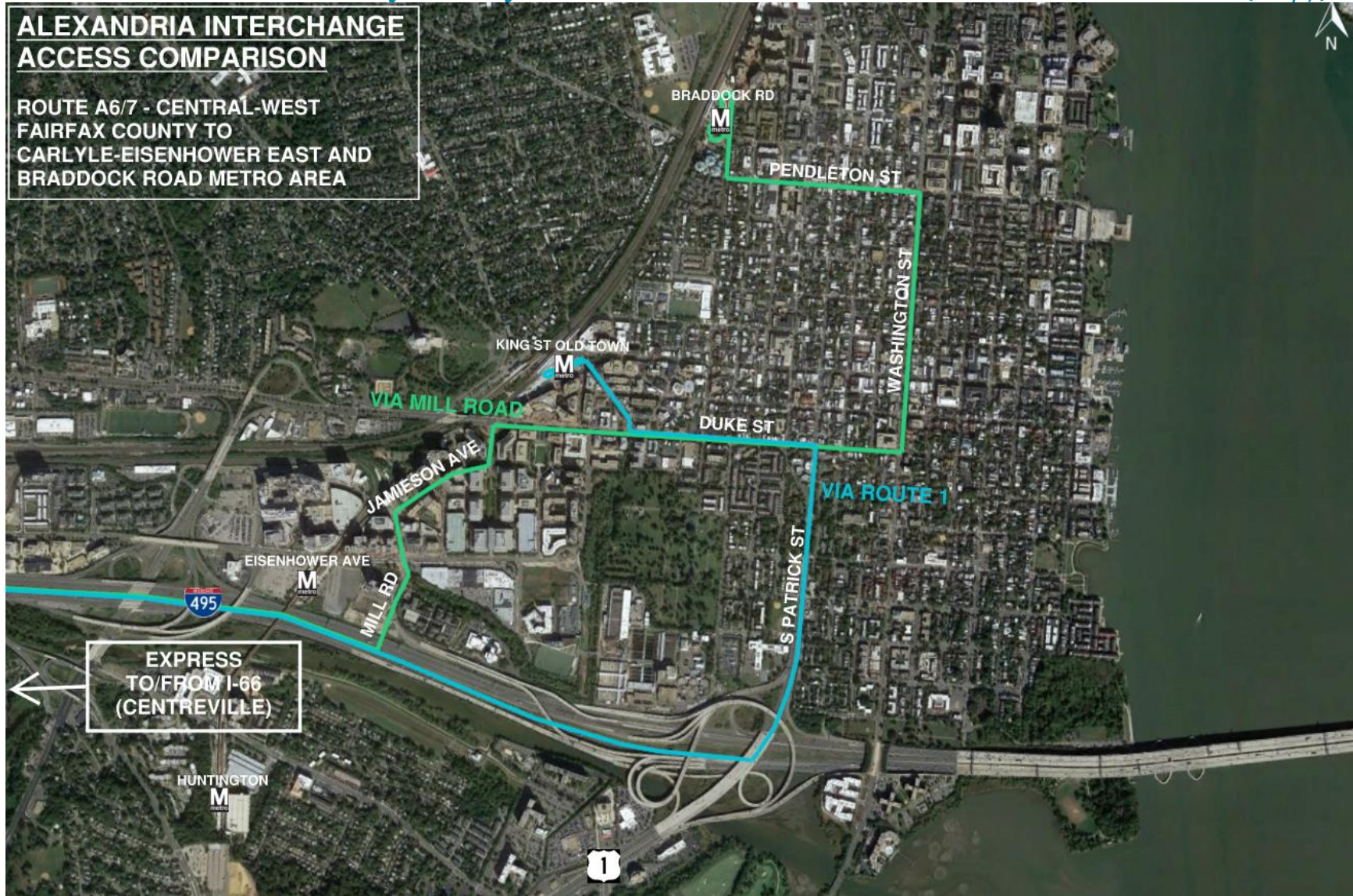
Alexandria to Tysons (A4/8) and Southeast Fairfax County and Alexandria to Dunn Loring-Merrifield (A19/20)



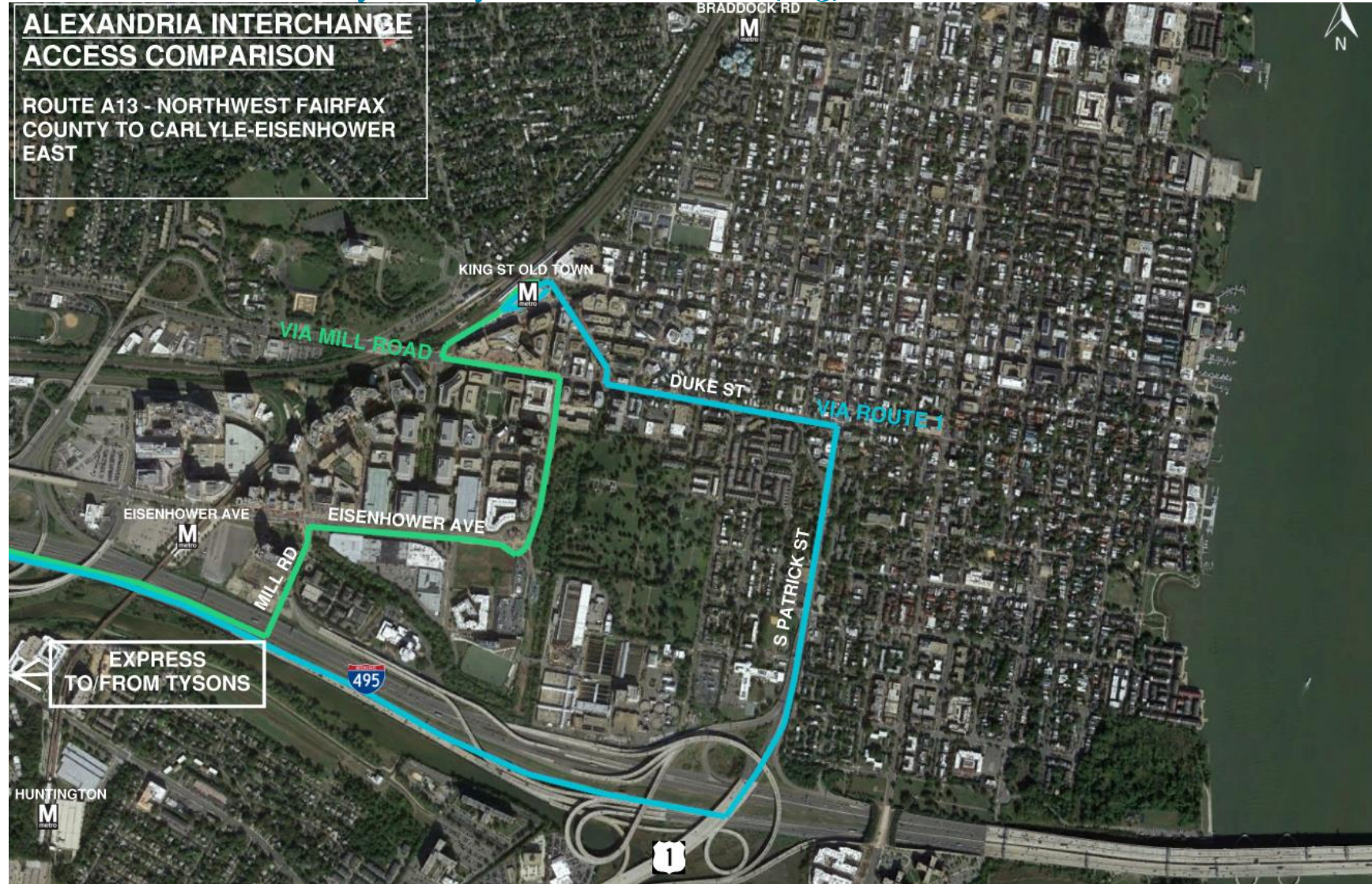
Central-West Fairfax County to Carlyle-Eisenhower East and Braddock Road Metro Area (A6/7)

ALEXANDRIA INTERCHANGE ACCESS COMPARISON

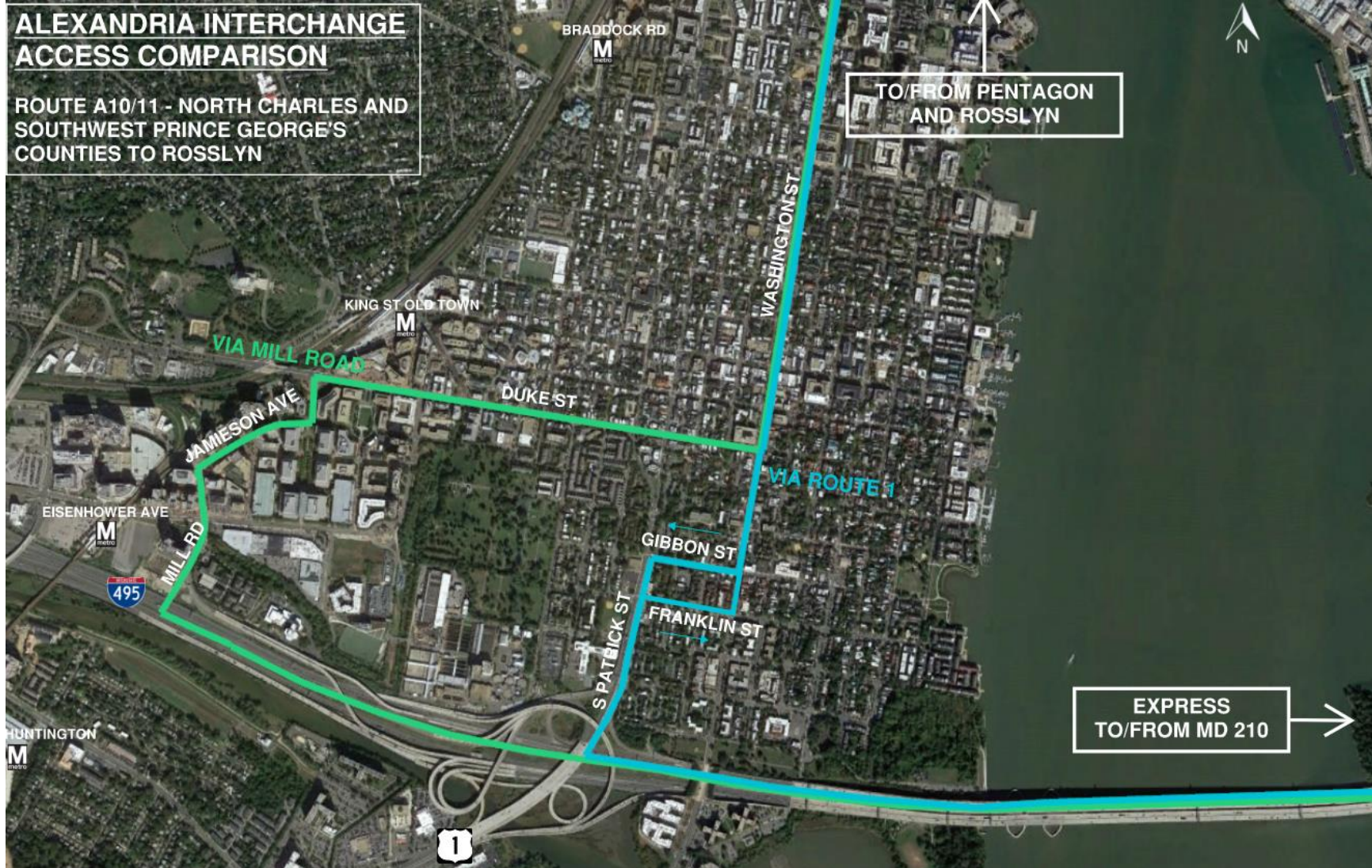
ROUTE A6/7 - CENTRAL-WEST
FAIRFAX COUNTY TO
CARLYLE-EISENHOWER EAST AND
BRADDOCK ROAD METRO AREA



Northwest Fairfax County to Carlyle-Eisenhower East (A13)



North Charles and Southwest Prince George's Counties to Rosslyn (A10/11)



Central-West Prince George's County to Tysons (A21.0)

