I-495 AMERICAN LEGION BRIDGE TRANSIT/TDM STUDY

I-495 AMERICAN LEGION BRIDGE TRANSIT/TDM PLAN

Final Report

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MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND TRANSIT ADMINISTRATION

DRPT
Virginia Department of Rail and Public Transportation

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1. INTRODUCTION

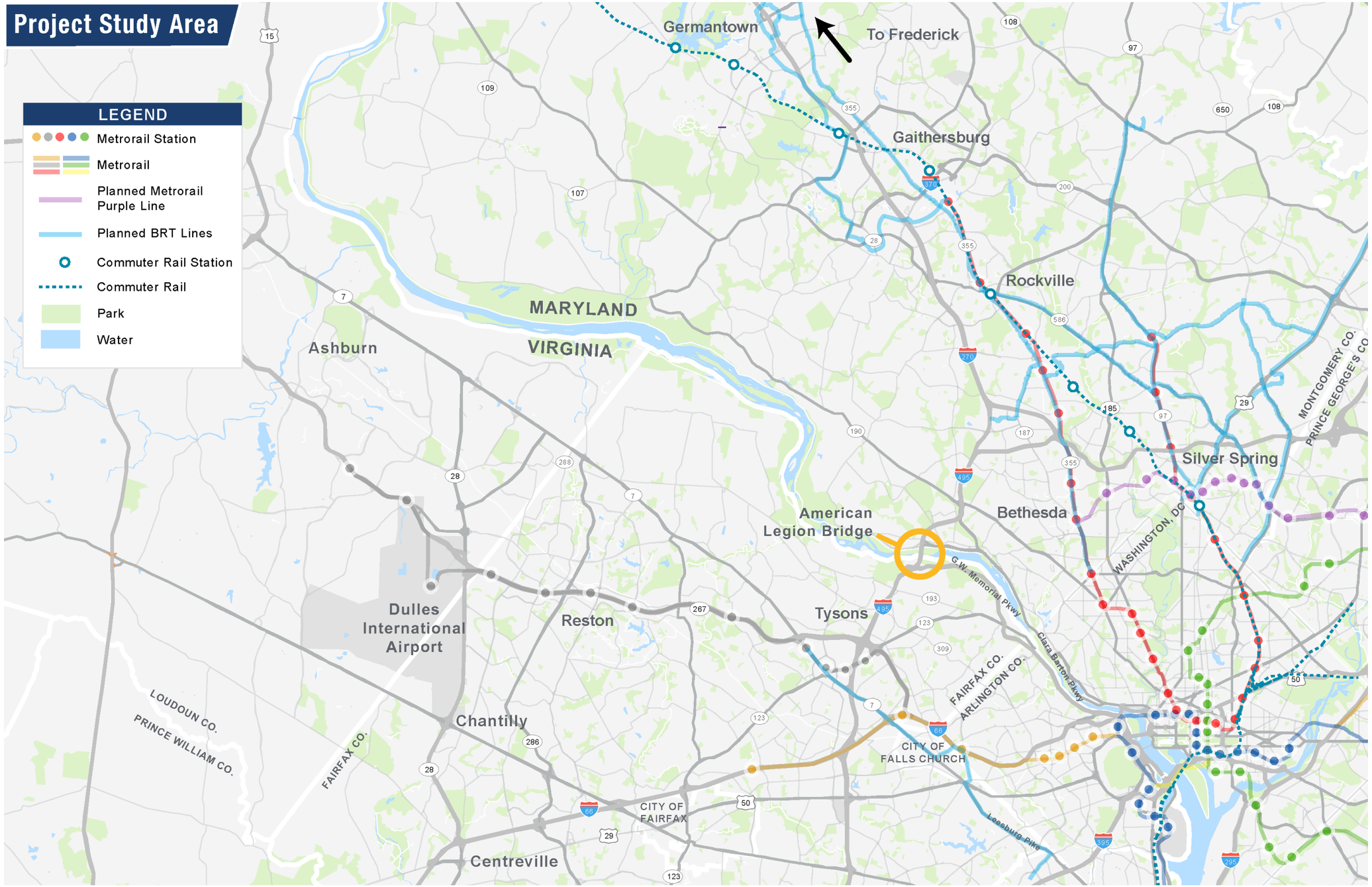
The purpose of the I-495/American Legion Bridge Transit/Transportation Demand Management Study (the Study) is to identify a range of current and future potential multimodal solutions that could be implemented to reduce congestion, improve trip reliability and regional connections, and enhance existing and planned multimodal mobility and connectivity for bi-state travel across the American Legion Bridge (the Bridge).

The Study is a joint effort between Maryland and Virginia and was announced shortly after the announcement of the Capital Beltway Accord to rebuild the American Legion Bridge and connect the Interstate Highway System by Governors Hogan and Northam in Fall 2019. The Study complements Virginia's I-495 NEXT project and Maryland's Managed Lanes Study and their efforts to develop a region-wide seamless network of reliable travel options around the Capital Beltway, I-270, I-95, I-395 and I-66. The potential construction of managed lanes in both states represents an opportunity to implement new transit service options that take advantage of this infrastructure and provide riders with congestion-free service.

Study Area

The study area focuses on the Bridge and I-495 west and south of the MD Route 97 interchange and north of the I-495/I-95/I-395 interchange in Virginia. The Bridge is the only crossing point between Virginia and Maryland connecting the employment hubs in Montgomery, Fairfax, and Loudoun counties besides US 15 that is roughly 30 miles west of I-495. Given that the Bridge is the main crossing point between Virginia and Maryland for commuters in both states, major corridors intersecting I-495 are being considered, including I-270 to Germantown and VA Route 267 to Dulles International Airport. Other major intersecting routes within 1 mile of I-495 are also being evaluated in the study area. These intersecting routes span several jurisdictions, including Montgomery County in Maryland and Fairfax County, City of Fairfax, City of Falls Church, and Loudoun County in Virginia. Of particular focus in the Study are key transit destinations near and connecting to I-495 such as Tysons and Bethesda, as well as the Washington Metropolitan National Capital Region's major activity centers, including Dulles International Airport, Reston, Rockville, and Silver Spring. The complete study area is shown in **Figure 1-1**.

Figure 1-1: Study Area



Background

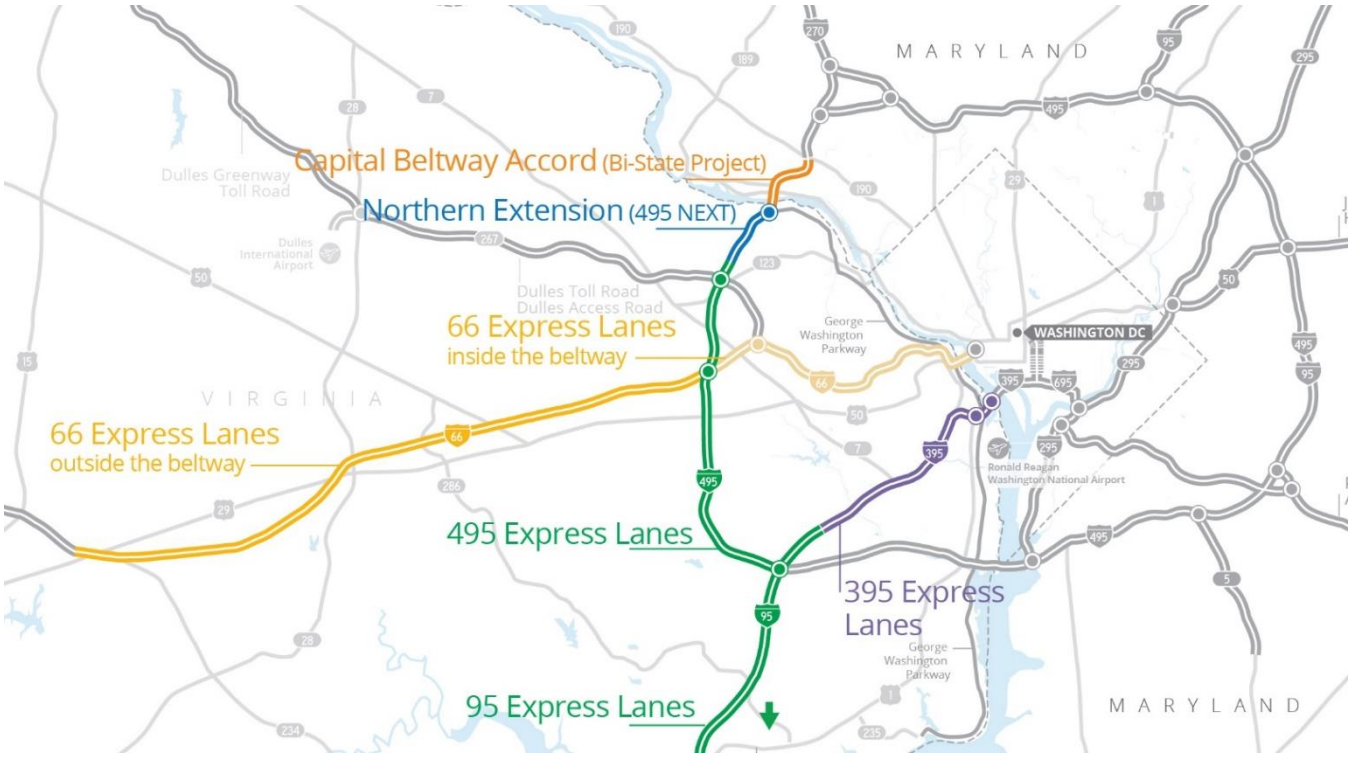
Previous Transit Service across the Bridge

A Metrobus route (Route 14) operated between Tysons and Bethesda from 1998 to 2003. In Maryland, the bus was permitted to operate on the shoulders of I-495 to avoid congestion but could not use the shoulder in Virginia due to Virginia Department of Transportation (VDOT) safety concerns.[1] According to the Fairfax County Transit Development Plans (TDP), this constraint and the bottleneck of the Bridge caused the bus to experience long delays on the interstate. Additionally, the high number of stops added to the length of a trip. Because of these challenges, the Metrobus route was discontinued in 2003.

Ongoing Related Efforts

Overall, there is a growing network of Express Lanes in the Washington Metropolitan Area National Capital Region. In Virginia, as shown in **Figure 1-2,** the existing network along I-95, I-395, I-495, and I-66 inside I-495 is being expanded to include Express Lanes along I-66 outside I-495. This network also includes the Virginia Private-Public Partnerships (P3) Express Lanes Northern Extension Project (495 NEXT) that will extend the I-495 Express Lanes to the Potomac River in the vicinity of the George Washington Memorial Parkway. In Maryland, the I-495 & I-270 Managed Lanes Study (MLS) is also being conducted to identify alternatives and assess potential impacts of new managed lanes in Montgomery and Prince George's counties along I-270 and I-495/I-95. This Study is separate from these efforts but will be coordinated closely. This Study is also separate from the ongoing National Environmental Policy Act (NEPA) studies for VDOT's 495 NEXT and Maryland Department of Transportation State Highway Administration's (MDOT SHA) MLS but is intended to complement these efforts.

Figure 1-2: Northern Virginia Express Lanes Network



[1] (National Capital Region Transportation Planning Board, 2013)

I-495 NEXT

I-495 NEXT[2] is a 2.5-mile extension of the I-495 Express Lanes running north from the current terminus near the I-495 and Dulles Toll Road (DTR) interchange to the vicinity of the George Washington Memorial Parkway. Two new Express Lanes will run in each direction to address the following needs:

- Reduce congestion and improve roadway safety
- Provide additional travel choices
- Improve travel reliability

Maryland's I-495 & I-270 P3 Program

The MDOT SHA I-495 & I-270 P3 Program[3] is a historic effort to reduce congestion for millions of Maryland travelers in the Washington Metropolitan Area National Capital Region by seeking input from the private sector to design, build, finance, operate, and maintain improvements on both I-495 and I-270. Improvements will transform these overloaded interstates to allow people to reach their destinations faster and to remove overflow traffic from the local roads. There are two main components of the program (shown in **Figure 1-3**).

> **The I-495 & I-270 MLS** is being conducted to identify ways managed lanes can specifically help in program efforts. The I-495 & I-270 MLS is the first element in the P3 Program undergoing environmental review. The I-495 & I-270 MLS Draft Environmental Impact Statement (EIS) will include a review of existing and future traffic, roadway, and environmental conditions to identify alternatives and assess potential impacts. This study extends along I-495 from south of the George Washington Memorial Parkway—including improvements to the Bridge—to west of MD 5 and along I-270 from I-495 to north of I-370—including the east and west I-270 spurs.[4]
>
> **I-270 from I-370 to I-70 Pre-NEPA** activities extend along I-270 from I-370 in Montgomery County to I-70 in Frederick County, MD. During these initial activities, MDOT SHA will conduct environmental planning activities prior to starting a study under NEPA. This will include identifying this segment's purpose and need, developing a range of alternatives, reviewing existing and future traffic volumes, reviewing existing environmental conditions, and engaging the public.

Figure 1-4 shows the proposed managed lanes access location in Maryland as currently proposed by the I-495 & I-270 MLS Draft EIS.

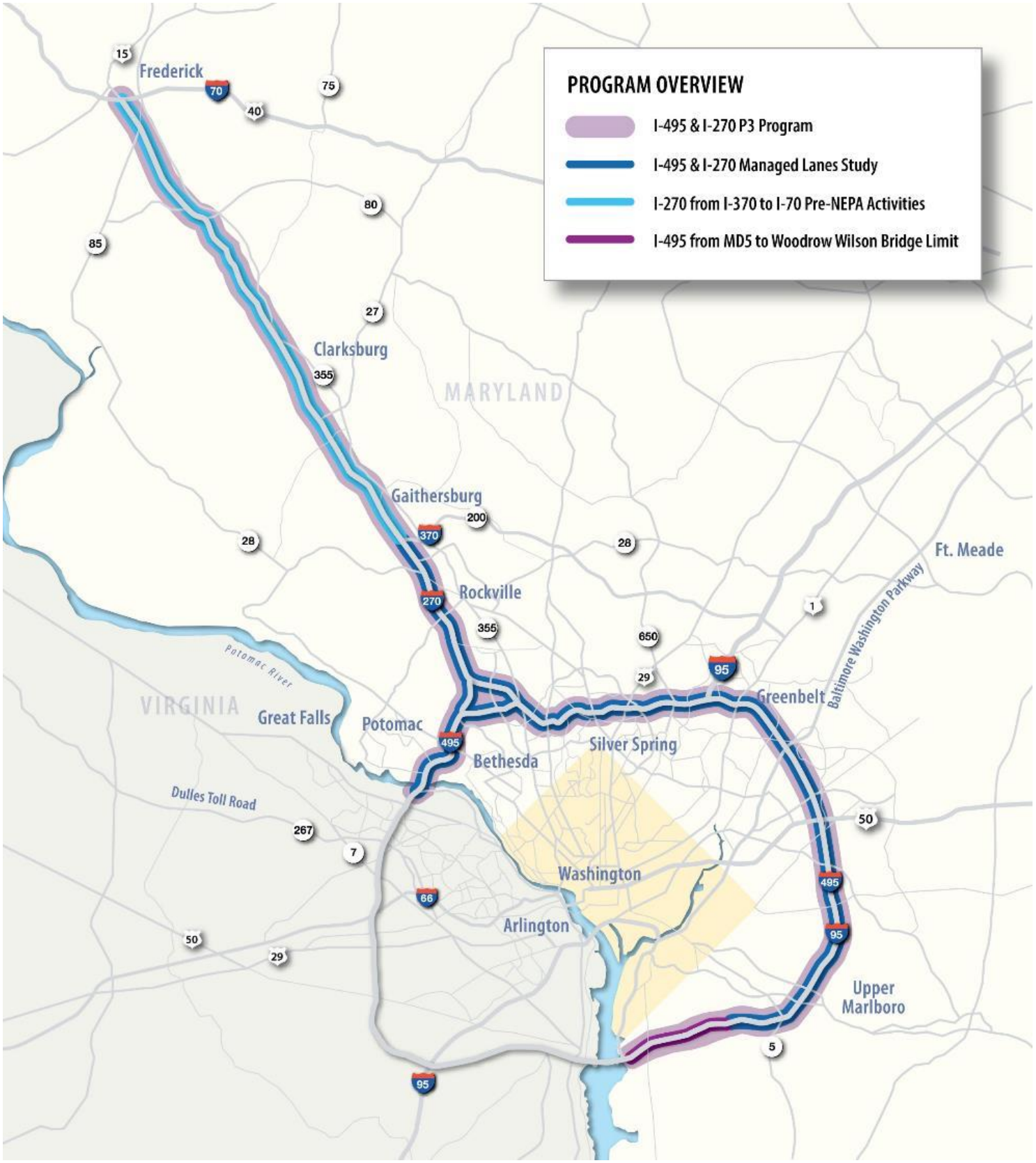
As part of the I-495 & I-270 P3 Program, a Transit Work Group consisting of local and regional transit providers and stakeholders met throughout the study to identify where there may be feasible opportunities for transit to use the managed lanes. This work resulted in the Maryland Transit Service Coordination Report documenting the analysis and potential opportunities. A summary of these potential transit concepts across the Bridge and parking needs along I-270 can be found in **Planned Improvements on the Corridor** section.

The Transit Working Group focused on the following activities:

- Reviewing existing and planned transit services
- Reviewing managed lanes access points
- Analyzing casual carpooling (also known as "slugging"), van pooling, and other ridesharing methods such as ride-hailing, taxi services, and airport shuttles
- Evaluating the current capacity and usage of park-and-ride lot locations near the I-495 and I-270 corridors
- Examining potential markets for regional express bus service which would benefit from the managed lanes
- Identifying potential new or modified routes

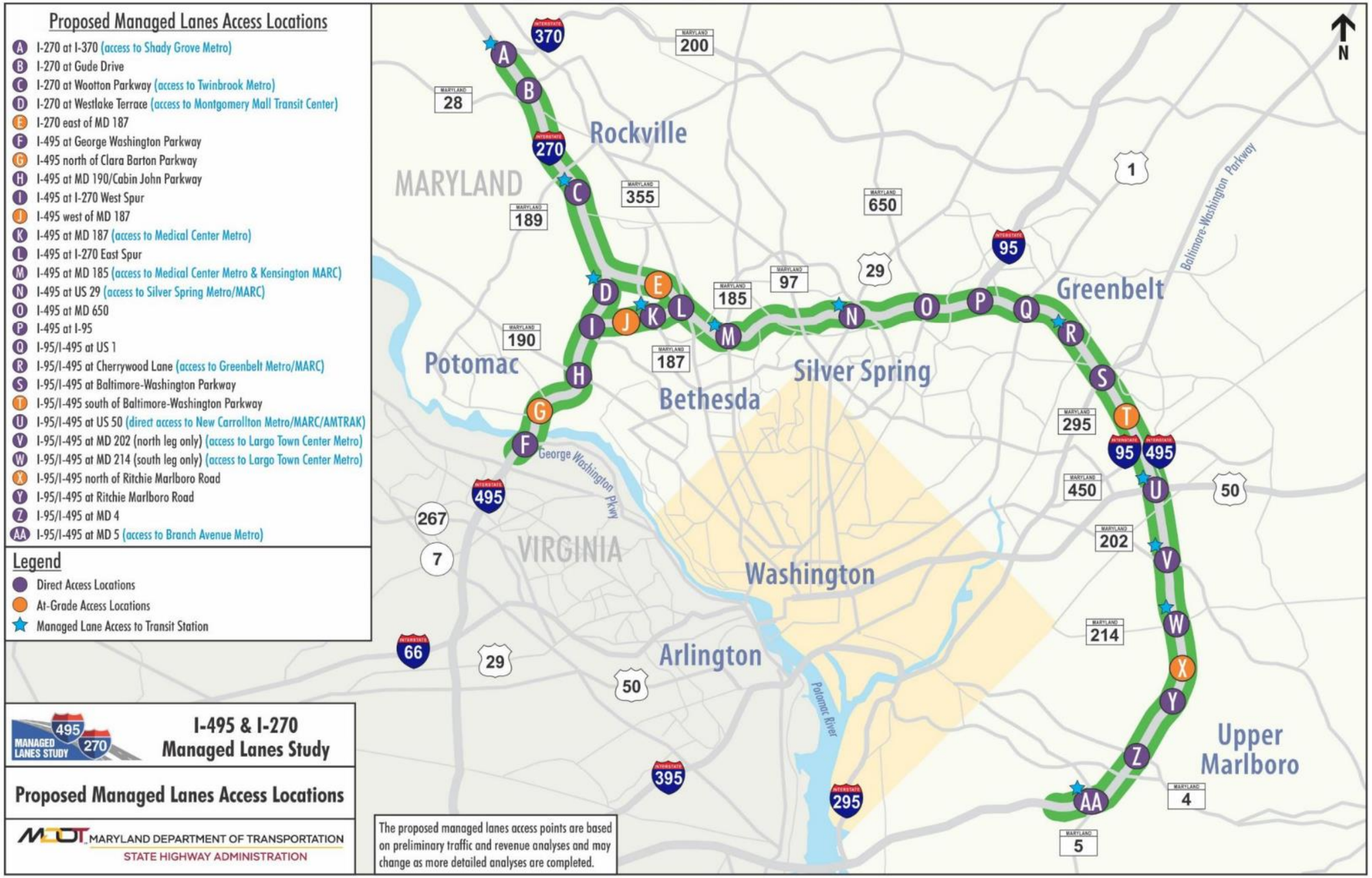
[2] (Virginia Department of Transportation, 2019)
[3] (Maryland Department of Transportation, 2020)
[4] (Maryland Department of Transportation State Highway Administration, 2019)

Figure 1-3: I-495 & I-270 P3 Program Components



Source: (Maryland Department of Transportation, 2020)

Figure 1-4: I-495 & I-270 MLS — Proposed Access Points (June 2020)



Source: (Maryland Department of Transportation State Highway Administration, 2020)

Maryland Corridor Forward: I-270 Transit Plan

Montgomery County is considering potential transit opportunities that could serve the I-270 corridor.[5] This plan defines the "I-270 corridor" as the transportation network extending through Montgomery County between the City of Frederick in Frederick County, MD, and Tysons in Fairfax County, VA. The plan will take a strategic look at the potential transit options that could serve Montgomery County's main north-south corridor. It will prioritize these options based on the County's strategic, economic, environmental, and community needs and will create a roadmap detailing the major steps to be taken to realize the highest-priority project(s). In late 2020, 15 initial transit options were evaluated and by January 2021 six options were identified based on their mobility, economic, environmental, and equity benefits. The project team plans to solicit feedback from stakeholders and the public on these identified options in the Spring and Summer of 2021 and develop an implementation plan for these prioritized options in the Fall of 2021.

[5] (Montgomery County, MD, 2020)

2. EXISTING SERVICES AND FACILITIES IN THE STUDY AREA

To better understand existing travel conditions in the region, the study team analyzed existing local and commuter transit services, park-and-ride facilities, passenger rail, commuter assistance programs, and operations and maintenance facilities across a broad area that included jurisdictions outside of the study area.

Local and Commuter Bus Services

The study team inventoried all transit services within 1 mile of the major highways that feed into the Bridge, including I-495, I-270, I-66, SR-267, and I-95 (**Figure 2-1**). Ten agencies operate transit services that intersect these corridors. The majority of these services are local suburban bus service; however, a number of operators provide trunk line or commuter bus service into Washington, DC.

Table 2-1 summarizes the existing local and commuter bus services in the corridor. In Virginia, local bus services are provided by the City of Fairfax City-University Energysaver (CUE), Fairfax Connector, Alexandria's DASH service, Arlington Transit (ART), and OmniRide. In Maryland, local bus services are provided by Frederick TransIT and Montgomery County Department of Transportation's (MCDOT) Ride On in Frederick and Montgomery counties. The Washington Metropolitan Area Transit Authority's (WMATA) Metrobus operates across the study area in both Maryland and Virginia.

Commuter bus routes from Maryland and Virginia cross I-495 to provide peak-period service into job centers in Arlington and Alexandria, VA, and Washington, DC. In Virginia, Loudoun County Transit, Fairfax Connector, and OmniRide offer commuter bus service from Loudoun, Fairfax, and Prince William counties. In Maryland, the Maryland Department of Transportation Maryland Transit Administration (MDOT MTA) Commuter Bus routes connect commuters from Frederick, Washington, Montgomery, Howard, and Anne Arundel counties to Bethesda, Silver Spring, Baltimore/Washington International Thurgood Marshall Airport (BWI), and Washington, DC.

On a typical weekday, more than 11,000 scheduled weekday one-way bus trips cross the study area. Most bus service remains on local roads, although some commuter routes travel directly on I-270, I-495, I-66, SR-267, and I-95. None of these services cross the Bridge between Maryland and Virginia. No local or regional bus transit service currently operates between Maryland and Virginia north of Washington, DC. The Bridge is used by intercity and other private bus service traveling along I-95 to points north and south often through Washington, DC or the inner suburbs. Specific numbers of private bus trips across the Bridge are not known.

Takeaway:

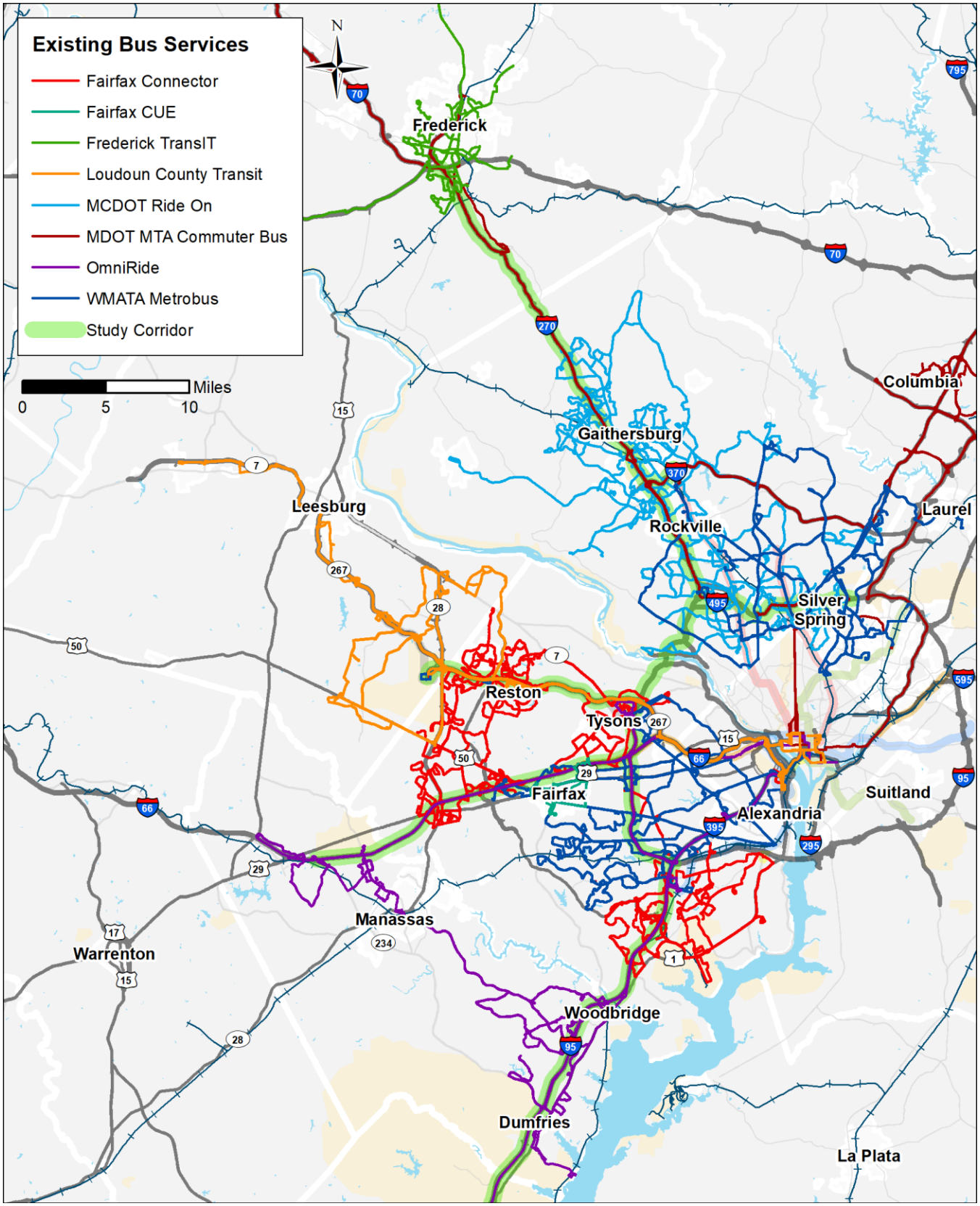
Within the study area, there is an abundance of local bus services operating between jurisdictions in each state. However, there is currently no service between Virginia and Maryland across the Bridge.

Table 2-1: Existing Local and Commuter Bus Service

Agency	Types of Service	Bus Routes in Study Area	Weekday, One-Way Bus Trips in Study Area
Arlington Transit	Local	21	1,174
DASH	Local	13	983
Fairfax CUE	Local	4	220
Fairfax Connector	Local and Commuter	84	2,988
Frederick TransIT	Local and Commuter	16	219
Loudoun County Transit	Local and Commuter	123*	218
MDOT MTA	Commuter	10	172
OmniRide	Local and Commuter	28	562
MCDOT Ride On	Local	63	3,706
WMATA Metrobus	Local	57	2,766

Note: *Loudoun Transit designates each trip as a separate route in their GTFS feeds. The service operates service with 33 unique headsigns.*

Figure 2-1: Existing Transit Service Within the Study Area



Park-and-Ride

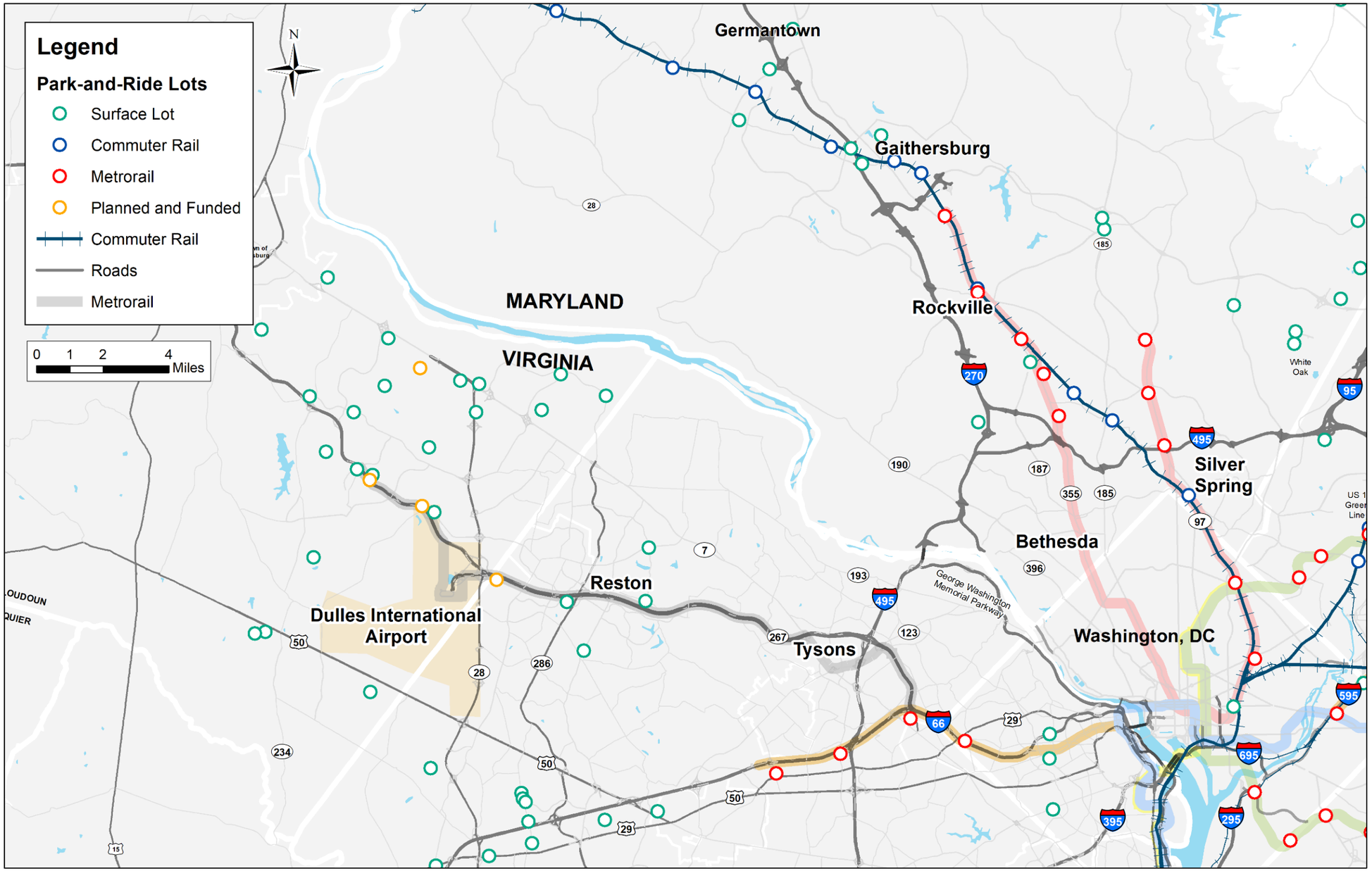
Park-and-ride lots are parking facilities at which commuters can park vehicles to meet with carpools/vanpools or take public transportation to their final destination. Within the study area, there is a robust network of park-and-ride lots administered and maintained by MDOT, VDOT, and local jurisdictions. 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, Maryland Area Regional Commuter (MARC) rail lines, and Virginia Railway Express (VRE) commuter rail lines also have parking lots at their stations outside of Washington, DC. 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 served by local transit service providers, including MDOT MTA commuter buses, WMATA Metrobus, Fairfax Connector, Fairfax CUE, Montgomery County's Ride On, Loudoun County Transit, OmniRide, ART, and Dash.

Figure 2-2 shows the existing, planned, and funded park-and-ride lots within the study area. Excluding the park-and-ride lots in Prince George's County and Washington, DC, which are outside the area of analysis, there are 78 existing park-and-ride lots in the study area. These park-and-ride lots are detailed in **Appendix A: Existing Park-And-Ride Lots.** In Virginia, there are several park and-ride lots in suburban and exurban areas along I-66, Route 267, and Route 7 that are origin points for commuter buses to Arlington and Washington, DC. Many of the existing Metrorail stations on the Metrorail Orange and Silver lines in Fairfax County, as well as planned Silver Line stations in Loudoun County, have adjacent parking structures that could be used as origin points for commuter buses. In Maryland, much of the parking is connected to MARC and Metrorail Red Line stations. There are a few standalone surface parking lots along I-270 in Germantown and Gaithersburg, as well as along the US 29 corridor north of I-495. There is a lack of park-and-rides along I-495 between Tysons in Virginia and the I-270 spur in Maryland, and new transit service over the Bridge could benefit from more commuter parking facilities adjacent to I-495.

Takeaway:

There are several park-and-ride facilities located along the I-270 corridor in Maryland that provide parking for existing commuter bus routes operating within Maryland. There are limited park-and-ride opportunities for areas along the I-495 loop, including high-demand origin and destinations such as Tysons, Bethesda, and the Westfield Montgomery Mall Transit Center.

Figure 2-2: Study Area Park-and-Rides



Rail

Three agencies operate regional rail services within the study area: VRE, WMATA—which operates Metrorail—and MDOT MTA—which operates Maryland Area Regional Commuter (MARC) Rail. As shown in **Table 2-2**, six rail lines cross the I-495 corridor. VRE and MARC provide peak-period commuter service oriented towards Washington, DC. and the inner suburbs. WMATA offers hundreds of weekday, one-way trips on each Metrorail line, providing all-day rapid service between Washington, DC, and the bordering counties in both Virginia and Maryland.

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 area include Shady Grove, Rockville, Silver Spring, Franconia-Springfield, Vienna/Fairfax-GMU, East Falls Church, and the four Metrorail stations serving the Tysons area.

MDOT MTA will introduce additional light rail services in the corridor with the Purple Line, originally set to open in 2022 but is currently delayed as of November 2020. The light rail line will generally parallel the I-495 corridor between New Carrollton in Prince George's County and Bethesda in Montgomery County, providing connections to local bus, commuter bus and rail, and Metrorail services.

Table 2-2: Existing Rail Services in the Study Area

Agency	Rail Routes	Weekday, One-Way Scheduled Rail Trips in Study Area
MDOT MTA	MARC Brunswick Line	18
VRE	Fredericksburg and Manassas Lines	32
WMATA	Metrorail Blue, Orange, Silver, and Red Lines	1,064

Takeaway:

Existing rail service is oriented for travel to Washington, DC, from the surrounding counties in Virginia and Maryland. Metrorail stations are potential transfer points for riders.

Commuter Assistance Programs (CAPs)

CAPs are programs of strategies and incentives, sometimes referred to as Transportation Demand Management (TDM) strategies provided by local or regional organizations to educate people about available transportation modes and encourage them to use alternative methods of travel besides single-occupancy vehicles (SOV). 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 area, CAPs are provided at the state, regional, and local level. This section details the CAPs' services offered in the region. CAPs within the study area 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 jurisdictions typically have a CAP that targets commuters and employers within its jurisdiction or major destinations such as downtown Washington, DC, or the Pentagon. As a result, there are no specific targeted coordination efforts to encourage non-SOV modes of travel along I-495 and across the Bridge.

Regional CAPs

Commuter Connections

Commuter Connections is a regional network of CAPs in the Washington Metropolitan Area National Capital Region. Metropolitan Washington Council of Governments (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.

The Commuter Connections network delivers numerous regional commuter-focused services and programs across the Washington Metropolitan Area National Capital Region, including:

- Regional Ridematching
- Regional Guaranteed Ride Home (GRH)
- CarpoolNow
- Pool Rewards: Carpool/Vanpool Incentives
- Flextime Rewards Program
- incenTrip
- Marketing and Promotions
- Employer Outreach

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 across the Bridge. However, a portion of Commuter Connections' users likely use its services to arrange trips across the Bridge, and a significantly large number of people who travel across the Bridge each day for work are the target audience for the organization's many marketing efforts and services.

Vanpool Alliance

This Northern Virginia program, operated by the Potomac and Rappahannock Transportation Commission (PRTC), facilitates the collection of vanpool operation data for the National Transit Database (NTD). Currently, nearly all participating vanpools are registered in Prince William County and in the Fredericksburg/Stafford area. To date, the program has 683 vanpools. Roughly 20 percent of the vanpools in the program cross state boundaries and utilize the Bridge as shown in **Table 2-3** below. Most of the other 80 percent of vanpools in the program travel I-95 within Virginia.

Table 2-3: Vanpool Alliance Between-State Travel Utilizing the Bridge

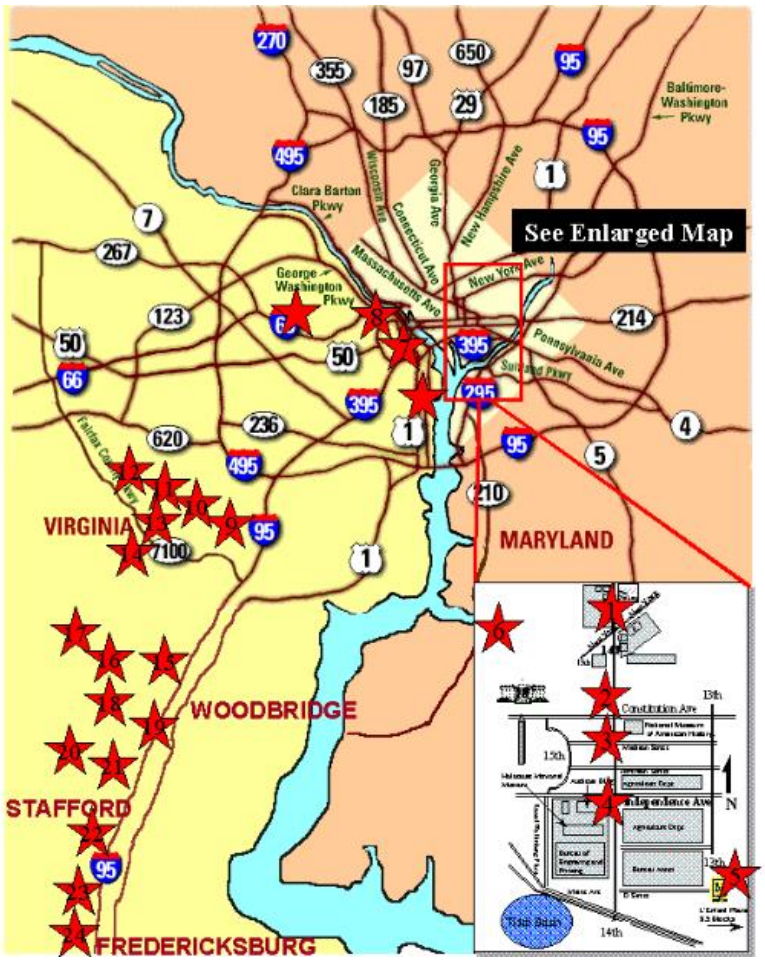
From	To	Number of Vans
West Virginia	Virginia (via I-270 in Maryland)	4
Maryland	Virginia	43
Virginia	Maryland	77
	Total	**124**

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 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.[6] Afternoon pick-ups are made at nine locations in Washington, DC; Arlington, VA; 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 2-3** shows a map of slug line pick-up and drop-off locations in Northern Virginia along the I-95 corridor.

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 Express Lanes on I-66 inside I-495 and planned Express Lanes on I-66 outside I-495, originating at park-and-ride locations in Fairfax and Prince William Counties.

Figure 2-3: Slug Lines Map



Source: (Forel Publishing Company, LLC, 2020)

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

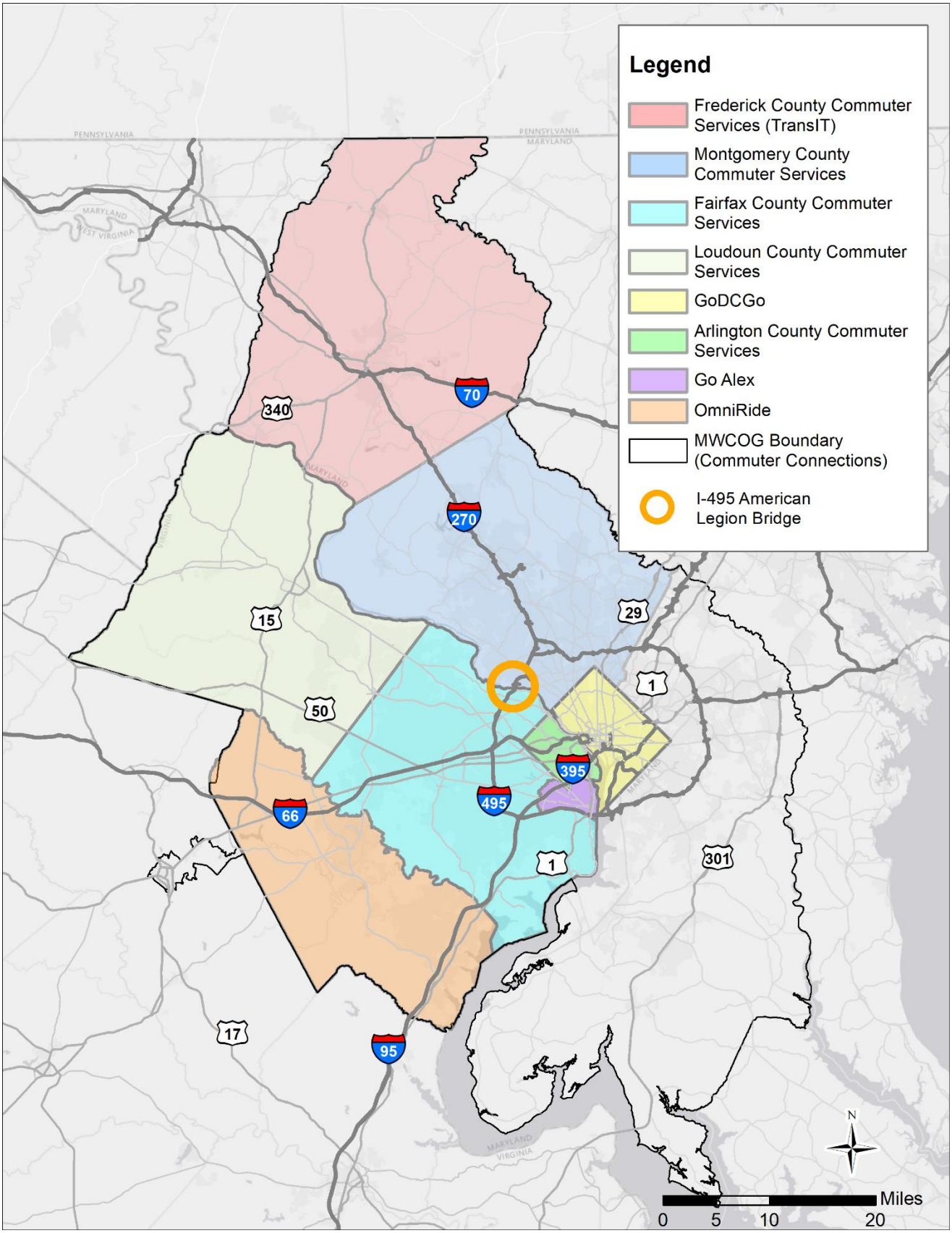
[6] (Forel Publishing Company, LLC, 2020)

matching and commute options information services, local CAPs specifically target the commuters and employers within each jurisdiction. MWCOG and local CAPs do not offer specific programming or services for their users commuting via the 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. **Figure 2-4**: Local CAPs shows local CAPs in the study area. Specific details about each local CAP can be found in **Appendix B: Local CAPs**.

Takeaway:

There are a variety of regional programs provided by Commuter Connections that promote alternative travel options and incentives to commuters in the region. Each of the study area jurisdictions also has a CAP that coordinates with Commuter Connections to provide information about available travel options. However, there is no coordinated effort or programming that specifically targets travel between Virginia and Maryland.

Figure 2-4: Local CAPs



Operations and Maintenance Facilities

Future potential service may need to be assigned to an operations and maintenance transit facility based on location and proposed operator. However, operators for potential transit routes have not been identified. This section outlines the existing inventory of operations and maintenance facilities of transit providers in the study area. MDOT MTA and WMATA are the two main transit service providers within the study area that provide inter-jurisdictional service and utilize operations and maintenance facilities for bus or rail. Fairfax County's Fairfax Connector and Montgomery County's Ride On provide local and commuter bus service mainly within their respective jurisdictions. These transit providers also utilize operations and maintenance transit facilities within the study area adjacent to key destinations and activity centers. **Table 2-4** shows the existing operations and maintenance facilities for transit providers in the study area that are potential candidates for future service across the Bridge. This is not a comprehensive list of operations and maintenance facilities of all the transit providers in the study area..

Table 2-4: Operations and Maintenance Facilities of Potential Transit Service Providers

Transit Provider	Facility Name	Location
WMATA	Montgomery Bus Division Complex	5400 Marinelli Rd. Rockville, MD 20852
	West Ox Road	4970 Alliance Dr. Fairfax, VA 22035
	Western Division Bus Complex	5230 Wisconsin Ave. NW Washington, DC 20015
Fairfax Connector	Reston-Herndon (North County)	268 Spring St. Herndon, VA 22079
	West Ox (West/Central County)	4970 Alliance Dr. Fairfax, VA 22035
Ride On	Equipment Maintenance and Transit Operations Center (EMTOC)	16700 Crabbs Branch Way Rockville, MD 20855
	Brookville Maintenance Facility Transit Shop	8710 Brookville Rd., Building D Silver Spring, MD 20910
	Nicholson Court Small Transit Shop	4925 Nicholson Ct. Kensington, MD 20895
MDOT MTA	None	N/A

Takeaway:

Operators for the potential transit routes have not been identified. Except for MDOT MTA, each of the transit providers in the study area have maintenance facilities. Once operators have been identified for transit routes, a capacity and needs analysis should be conducted to determine any constraints on their operations.

3. PLANNED IMPROVEMENTS IN THE CORRIDOR

Relevant and available data was collected and reviewed from a variety of sources to provide a comprehensive inventory of planned services in the corridor. Data, plans, and studies in the following categories were considered:

- Previous corridor studies and plans by Virginia Department of Rail and Public Transportation (DRPT), MDOT MTA, VDOT, MDOT, and regional stakeholders, including the I-495 & I-270 P3 Program Transit Work Group
- Transit service providers in the corridor, including approved TDPs
- CAPs in the corridor, including approved transportation demand management plans
- Regional travel patterns
- Existing and future land use, population, and employment projections
- Existing and future comprehensive plans

Of the information reviewed, three sources contained planned potential transit routes across the Bridge:

- Fairfax County Transit Development Plan (TDP)
- Maryland Transit Service Coordination Report
- Northern Virginia Transportation Authority (NVTA) Transaction Report

These routes are summarized in **Table 3-1** and shown in **Figure 3-1.**

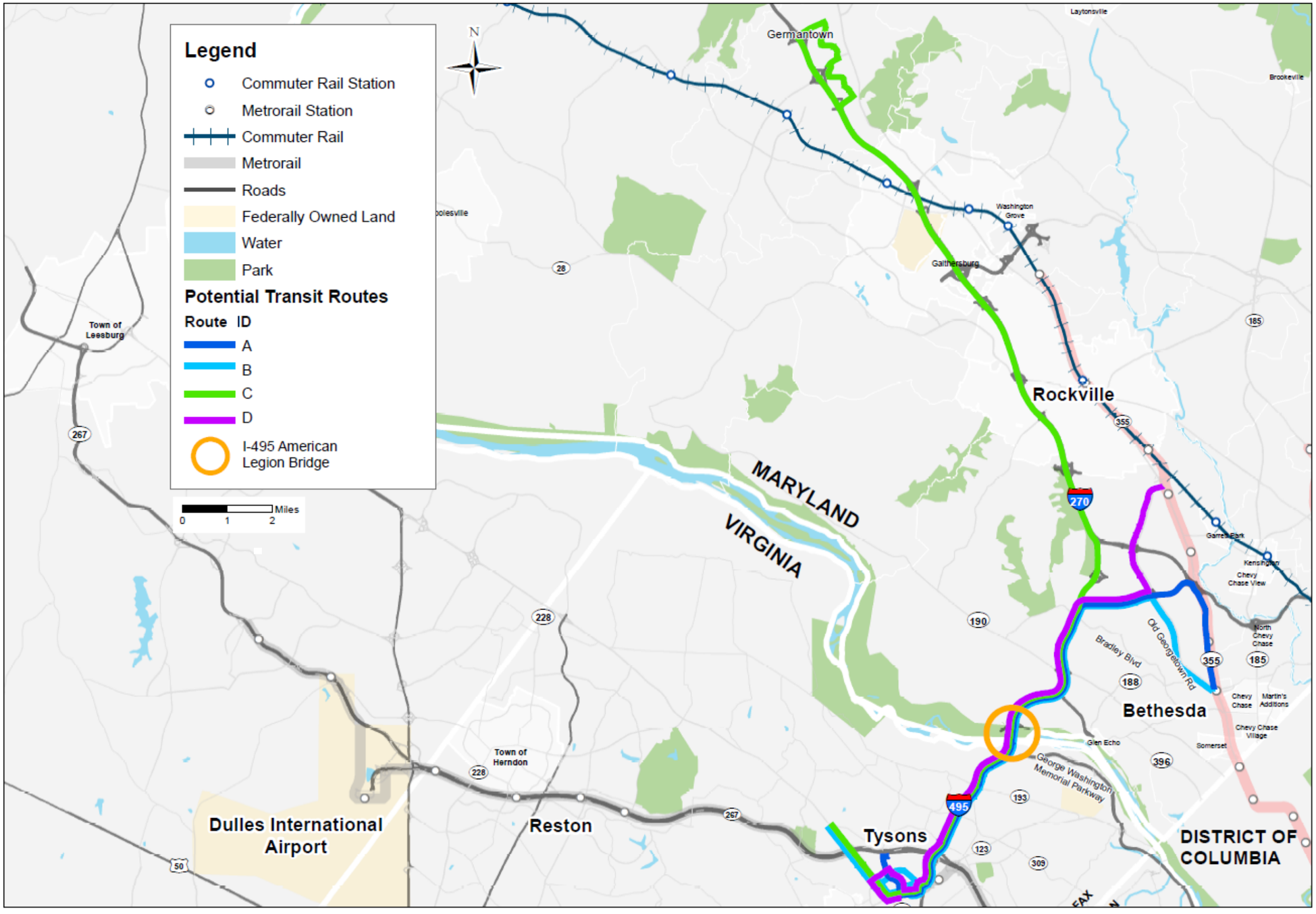
Summary of Currently Planned Transit Improvements

Table 3-1: Planned Transit Service Across the Bridge

Route	Service Type (e.g., commuter bus/, express bus, etc.)	Source	Virginia Destination(s)	Maryland Destination(s)	Proposed Frequency	Span and Direction of Service	Other Information
A	Metrobus	Fairfax County TDP[7]	Tysons	Bethesda Metrorail, Medical Center Metrorail	20 min during peak 60 min during nonpeak	Weekdays: 5:30 AM to 7:30 PM	N/A
B	Express Bus Transit	Maryland Transit Service[8] Coordination Report	Tysons	Bethesda	15 min during peak 30 min during nonpeak	Full Week: 6:00 AM to 12:00 AM	2045 Ridership: 1,000 daily passengers
C	Express Bus Transit	Maryland Transit Service Coordination Report	Tysons	Germantown, Gaithersburg, North Bethesda	15 min	Weekdays: Peak Periods Only	2045 Ridership: 1,500 daily passengers
D	Bus Rapid Transit (BRT)	NVTA Transaction Report[9]	Tysons	White Flint Metrorail	N/A	N/A	Cost: $61.5M Fiscal Year (FY) 2017

[7] (Fairfax County, 2020)
[8] (Maryland Department of Transportation State Highway Administration, 2020)
[9] (Northern Virginia Transportation Authority, 2018)

Figure 3-1: Planned Potential Transit Service Across the Bridge



Planned Park-and-Ride Lots

There are four new park-and-ride lots planned in the study area. Three of these park-and-ride locations will be parking structures adjacent to future stations on the Metrorail Silver Line in Virginia. These stations are the Innovation Center in Fairfax County and the Loudoun Gateway and Ashburn Stations in Loudoun County. Each station will have 2,100, 1,900, and 1,500 parking spaces for commuters, respectively. The fourth planned park-and-ride lot is located in Virginia off of Route 7 in Loudoun County (reference

Figure 2-2)**.** This park-and-ride lot is located adjacent to several other surface park-and-ride lots that are served by Loudoun County Transit and adjacent to large commuting populations. This park-and-ride lot will be owned and administrated by Loudoun County and will have 500 spaces with electric vehicle (EV) charging stations.

The Maryland Transit Service Coordination Report (MTSCR) does not propose any new park-and-ride lots or expansions to existing lots but does identify park-and-ride areas along I-270 that would need additional spaces to accommodate regional growth and the ridership of the routes proposed in the study. These areas are outlined in **Table 3-2**.

Table 3-2: I-270 Corridor Parking Estimate[10]

Potential Park-and-Ride Areas	Number of Additional Spaces Needed (from MTSCR)
Monocacy	500
Urbana	500
Hyattstown	250
Clarksburg	400
Germantown	500
Metropolitan Grove	300
Westfield/Rock Springs	300
Total	**2750**

[10] (Maryland Department of Transportation State Highway Administration, 2020)

4. SUMMARY OF CORRIDOR NEEDS

This Study identifies seven distinct corridor needs derived from the existing characteristics of the study area. These needs inform the **Recommendation Development Process** and the recommendations presented in the **Potential Investment Packages**. The following corridor needs are outlined in the following sections:

- Congestion relief along the Bridge
- Accommodation of future regional growth
- New mobility choices to serve travel between Virginia and Maryland
- Solutions to address dispersed travel demand
- Broader awareness about affordable and viable commuting options
- Technology to support real-time decision making and flexible travel patterns
- Efficient and equitable transportation choices

Congestion Relief Along the Bridge

Maryland

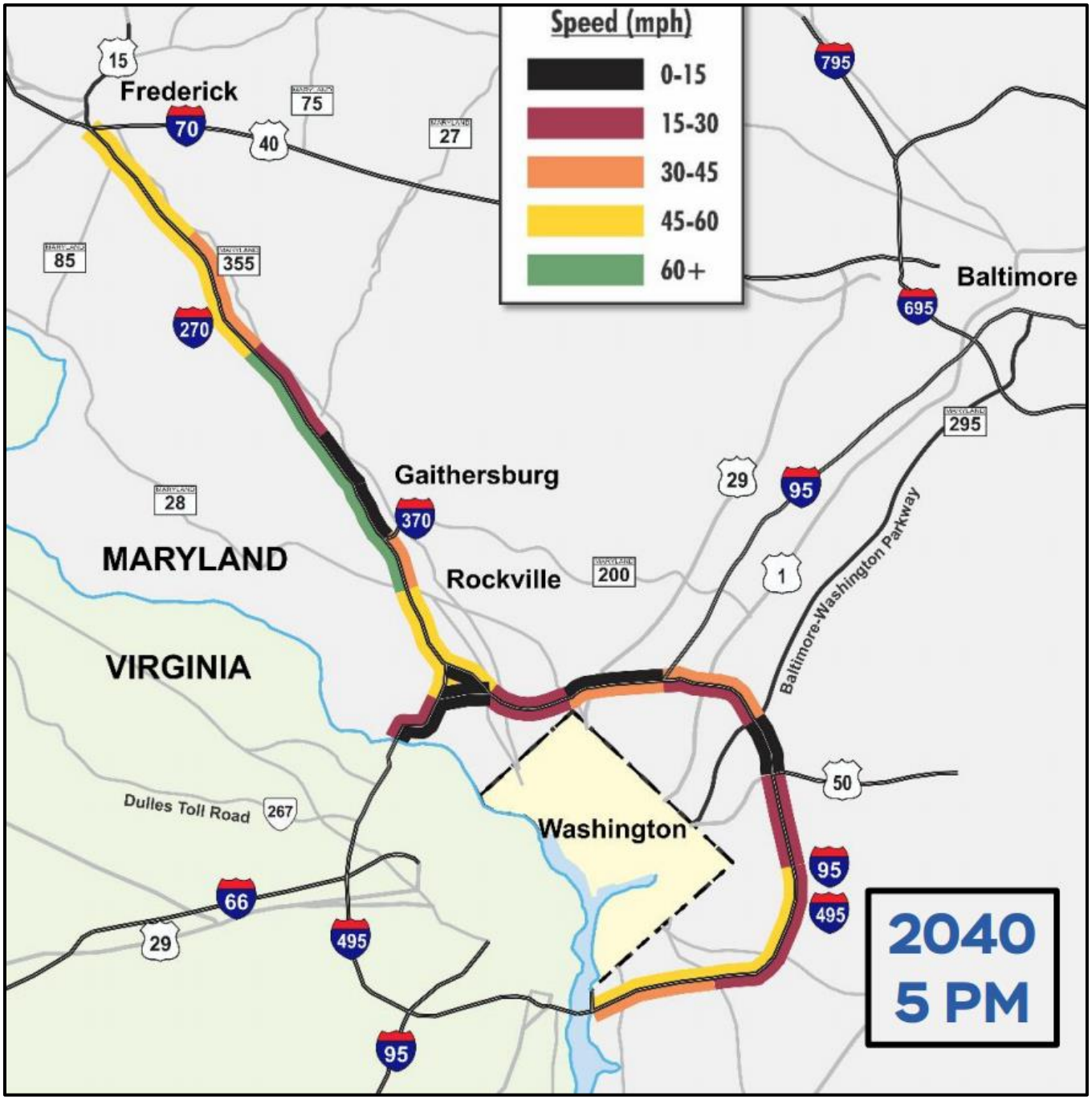
I-495 is one of the most congested roadways in both Maryland and Virginia. According to the 2019 Maryland State Highway Mobility Report, four of the five highest volume segments of freeway in Maryland are located in the study area: I-270 north of the I-270 split, I-270 North of Montrose Road, I-495 north of Virginia State Line, and I-95/I-495 west of US 1.[11] Additionally, traffic volumes on I-495 and I-270 in Maryland are expected to increase in the future as population and employment grows in the region. According to the I-495 MLS Draft EIS and Draft Section 4(f) Evaluation, traffic volumes are projected to increase by 7 to 17 percent between now and the design year 2040 under the No Build Alternative.[12] **Figure 4-1** shows the projected travel speed on I-495 and I-270 in Maryland in 2040 during the evening peak hour.

Virginia

Similar trends have been observed on I-495 in Virginia. Between 2002 and 2017, the traffic volumes on the Bridge increased by 18 percent. Population and employment growth is projected to continue in the region, specifically in Tysons and the surrounding area, putting further strain on the existing infrastructure. The Traffic and Transportation Technical Report for the I-495 Express Lanes Northern Extension also found that trips travelling across the Bridge have a wide-range of origins and destinations, with many existing and projected future trips originating and ending in locations outside of Fairfax County and Montgomery County—the two jurisdictions connected by the Bridge.

[11] (Maryland Department of Transportation State Highway Administration, 2019)
[12] (Maryland Department of Transportation State Highway Administration, 2020)

Figure 4-1: 2040 No-Build — Projected Travel Speeds in Maryland at 5:00 PM



Source: (Maryland Department of Transportation State Highway Administration, 2020a)

Accommodation of Future Regional Growth

The study team defined an extended study area for the purposes of looking at corridor population, growth, and travel trends. The team pulled projected population and employment growth data for the following areas:

Maryland

- Frederick County
- Montgomery County

Virginia

- Loudoun County
- Fairfax County
- Arlington County
- Prince William County
- Stafford County
- City of Alexandria
- City of Falls Church
- City of Fairfax
- City of Manassas Park
- City of Manassas
- City of Fredericksburg
- Fauquier County

Based on travel patterns in the study area, Fredericksburg, Fauquier County, and Stafford County were dropped from maps and subsequent analysis due to the small amount of travel demand between those jurisdictions and Maryland.

MWCOG's Cooperative Forecast projects population growth to be higher in Virginia than in Maryland, concentrating in existing activity centers. Maryland's growth will be less than that in Virginia but will likewise be concentrated in and around activity centers. Already established patterns of exurban development are expected to continue throughout the study area. Employment is also projected to grow within existing activity and exurban job centers, with the highest growth in major existing job centers.

The majority of existing trips are generated in Maryland, clustered along the MD 355 corridor, along with smaller clusters around Frederick and the US 29 corridor. In Virginia, trip generation is concentrated in the activity centers of Tysons, Dunn Loring, Alexandria, and Arlington.

The reverse of this analysis was also conducted, looking at activity centers with the most trip attraction from the other state. Maryland produces most of the trips between states, with Virginia being the attraction. These trips are concentrated in Tysons, the Rosslyn-Ballston corridor, and Crystal City. In Maryland, Bethesda and Friendship Heights (area around Metrorail Station and Chevy Chase) are the largest attractors for Virginia, followed by areas along the MD 355 corridor.

Future Trip Growth

As population and employment grow in the study area, trips across the study area are forecasted to grow as well. Trips produced in the study area that are attracted by study area activity centers in the other state are projected to increase by 31 percent, with those produced in Maryland projected to increase faster than those produced in Virginia (see **Table 4-1**). On average, trips produced in Maryland and ending in activity centers in Virginia will increase by an average of 1,333 trips per year, over twice as many as the number of trips produced in Virginia and ending in activity centers in Maryland (an increase of an average of 517 trips per year).

Table 4-1: Study Area Projected Growth in Trips

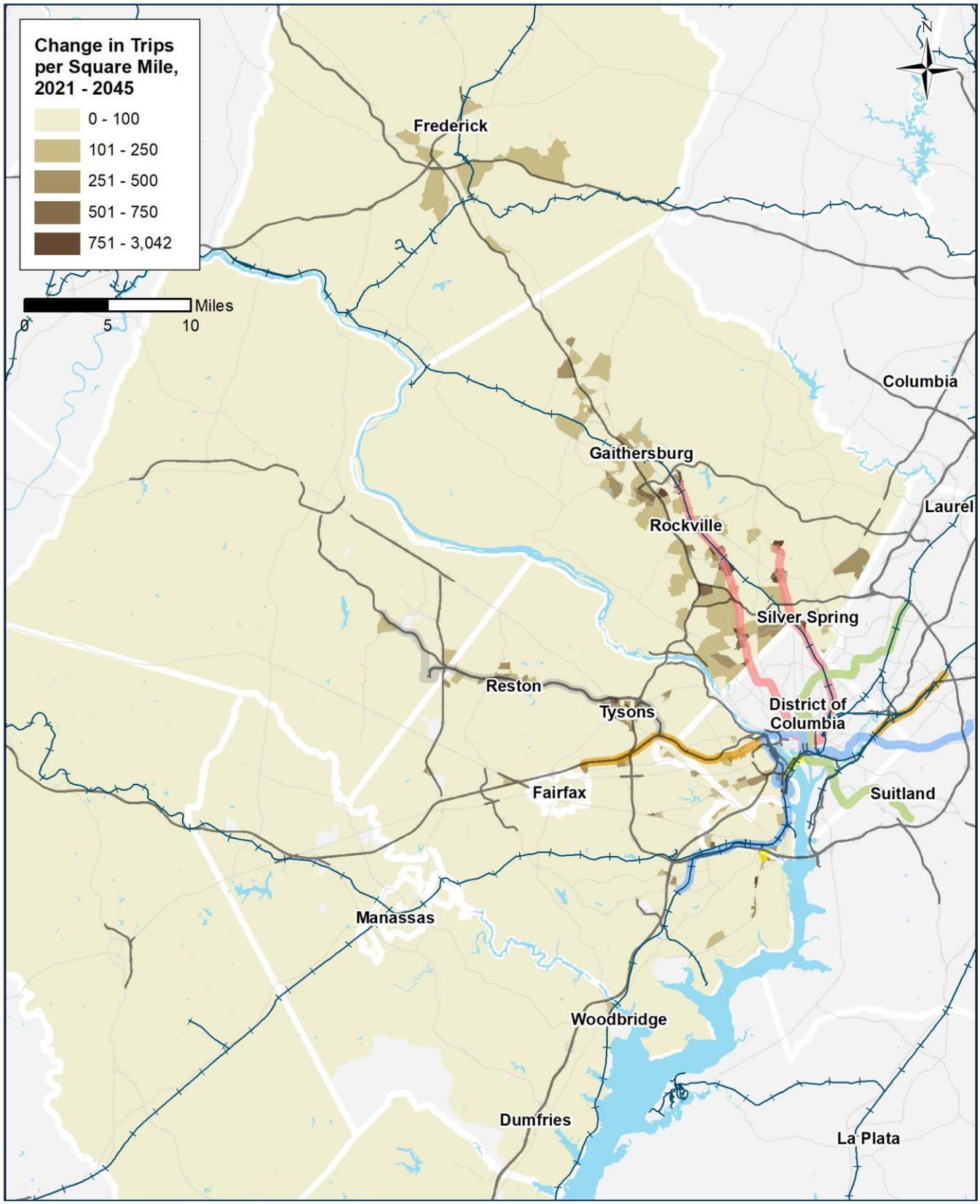
Trip Type	Trips 2021	Trips 2045	Growth	Percent Increase	Average Trip Increase per Year
Produced in Virginia; Attracted by Maryland Activity Center	58,200	70,600	12,400	21%	517
Produced in Maryland; Attracted by Virginia Activity Center	84,400	116,300	32,000	38%	1,333
Produced in Study Area; Attracted by Study Area Activity Center in Other State (Total)	142,600	187,000	44,000	31%	1,833

Source: (Metropolitan Washington Council of Governments, 2020c)

Trip production from Maryland to Virginia is forecasted to continue growing along the Metrorail Red Line and MD 355. In Virginia, production to Maryland is concentrated in activity centers such as Reston, Tysons, and Arlington (**Figure 4-2**).

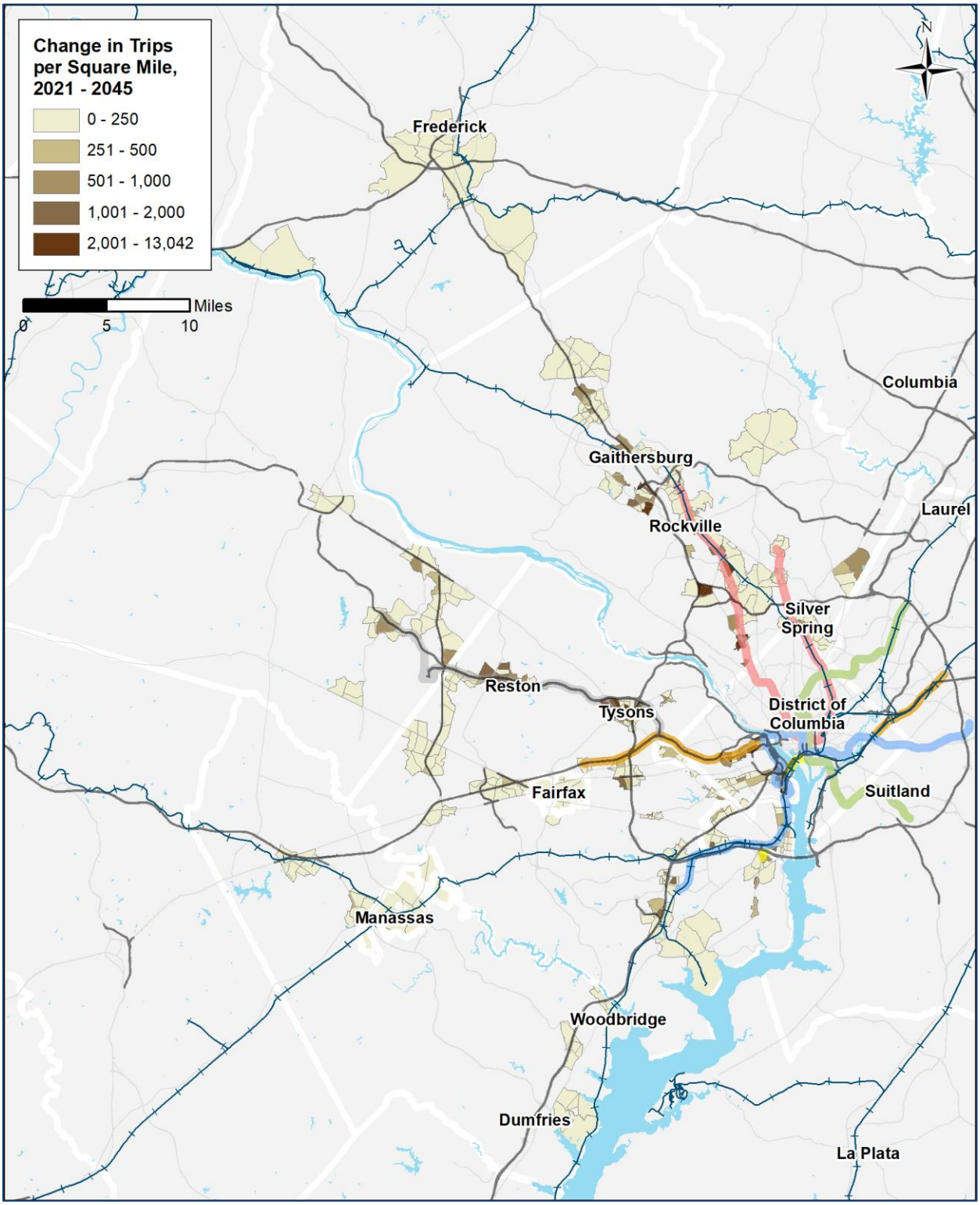
The study team also examined the attractors for these trips to study area activity centers. Bethesda, Friendship Heights, White Flint, Rock Spring, and Life Sciences Center-Gaithersburg Crown are forecasted to increase the number of attracted trips from Virginia. Maryland to Virginia trips are forecasted to grow fastest in Reston, Tysons, the Rosslyn-Ballston Corridor, and the corridor from the Pentagon to Carlyle-Eisenhower East (**Figure 4-3**).

Figure 4-2: Growth in Density of Trip Production to Activity Centers — Study Area Trips Between MD and VA



Source: (Metropolitan Washington Council of Governments, 2020b)

Figure 4-3: Growth in Density of Trip Attraction to Activity Centers — Study Area Trips Between MD and VA



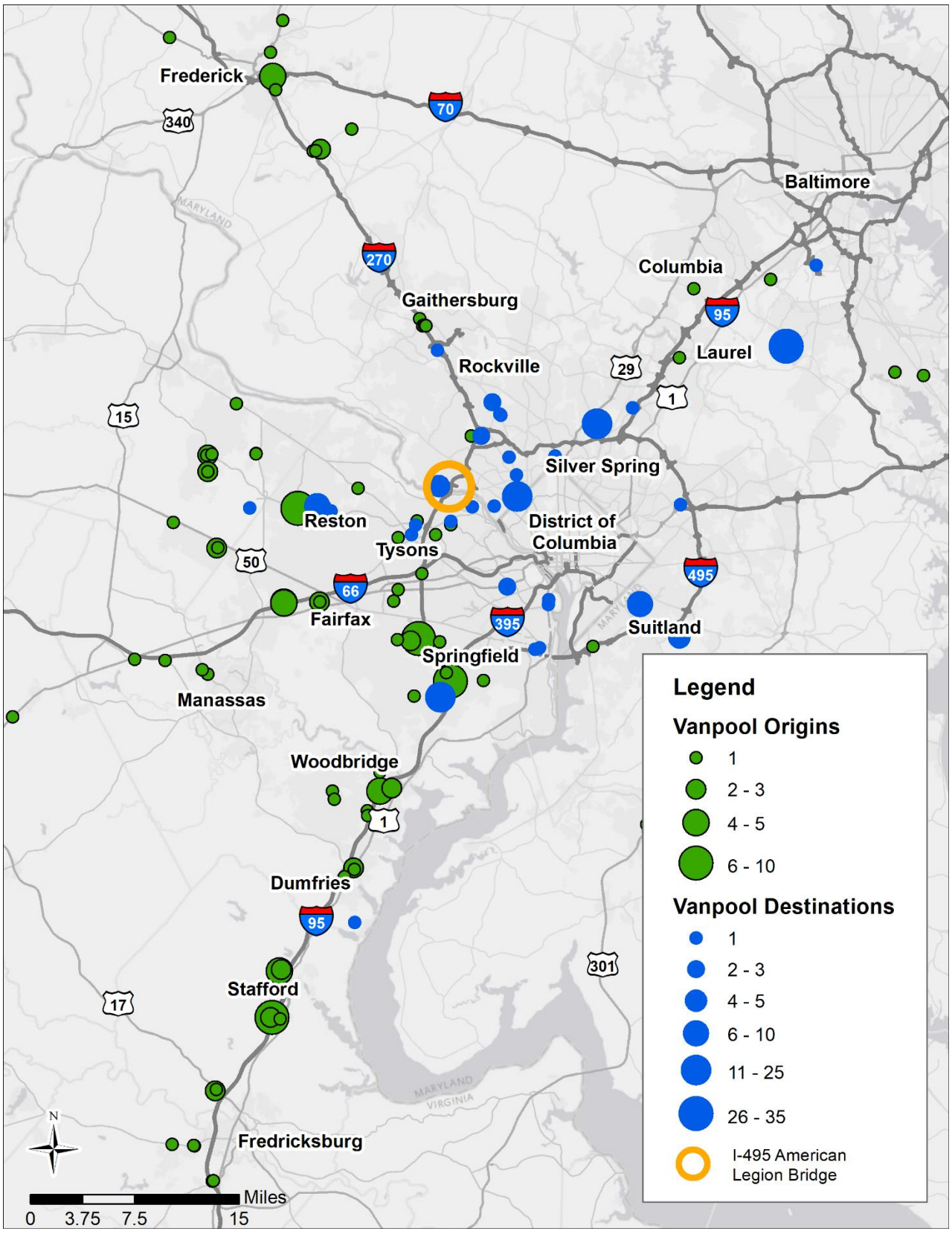
Source: (Metropolitan Washington Council of Governments, 2020b)

New Mobility Choices to Serve Travel Between Virginia and Maryland

Currently 10 transit agencies operate transit service within 1 mile of I-495, I-270, I-66, SR 267, and I-95. The majority of these services are local suburban bus services, but some transit providers operate commuter or trunk-line routes to Bethesda, MD; Arlington, VA; and Washington, DC. Of these 10 transit agencies, none provide transit service between Virginia and Maryland over the Bridge. Metrorail provides interstate travel to key destinations away from I-495, including the Rosslyn-Ballston corridor, Pentagon/Crystal City, and Friendship Heights; however, several of these trips go to activity centers that are farther out in the Metrorail system and closer to I-495 or I-270, including Tysons, Reston, Bethesda, and Gaithersburg. Commuter bus routes running on managed lanes could be more efficient to commuters travelling between these key activity centers rather than a circuitous transit trip on Metrorail.

In addition to local and commuter bus service, access to managed lanes can drastically improve travel times for carpool and vanpool users. The Vanpool Alliance currently has 683 registered vanpools, and about 124 of these 683 vanpools (20 percent) cross state boundaries and utilize the Bridge. Specifically, 77 vanpools travel from Virginia to Maryland, 43 travel from Maryland to Virginia, and four travel from West Virginia to Virginia via I-270 in Maryland. Faster and more reliable travel conditions could make vanpooling and carpooling a much more attractive commuting option for commuters in Maryland and Virginia. **Figure 4-4** shows existing vanpool origins and destinations in Virginia and Maryland. These vanpool trips are between the two states but not all of these necessarily cross the Bridge.

Figure 4-4: Existing Vanpool Origins and Destinations in Maryland and Virginia



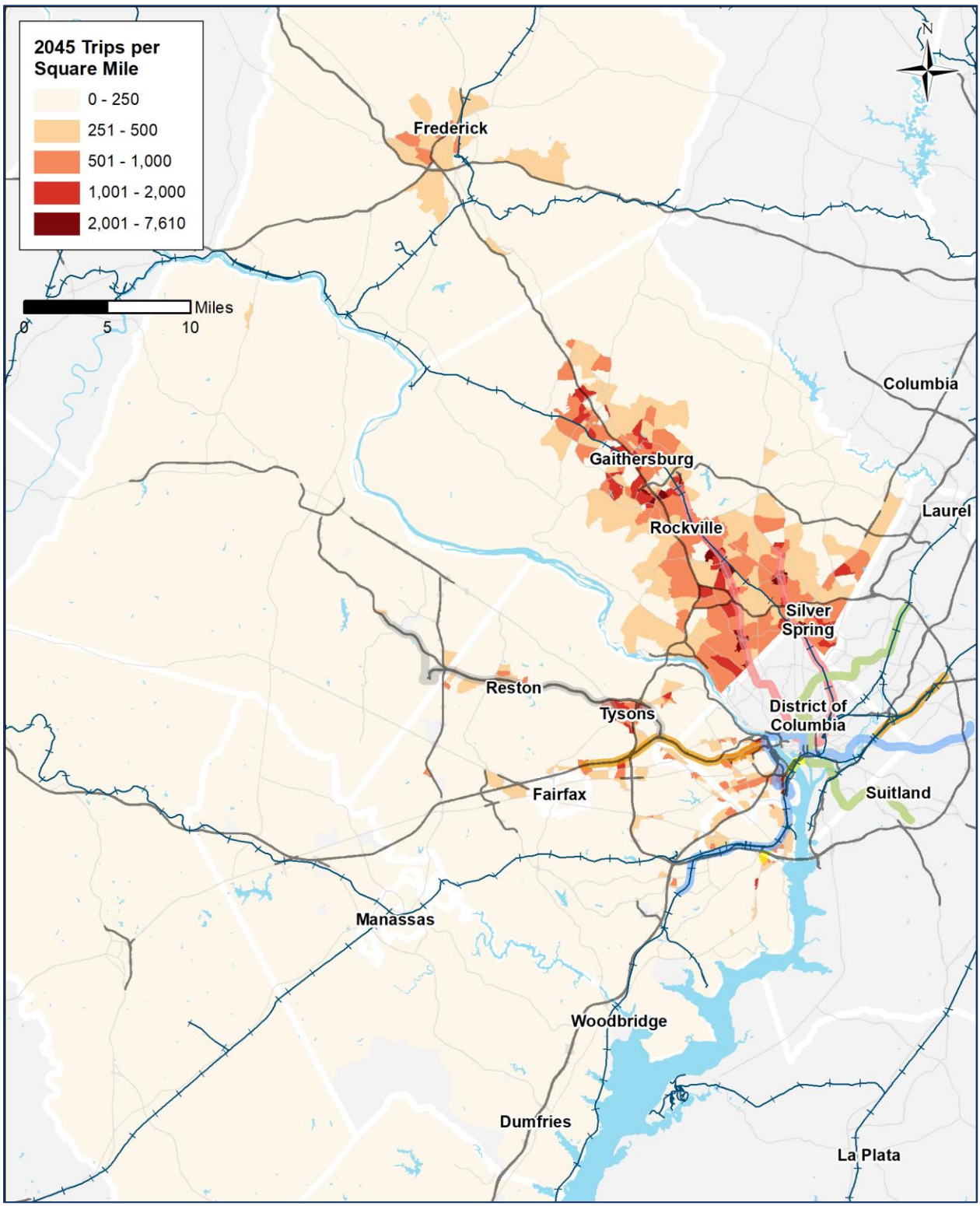
Solutions to Address Dispersed Travel Demand

The study area encompasses three tiers of development which creates dispersed travel demand spread across a wide area.

1. Dense, urban activity centers such as the Rosslyn-Ballston corridor and Tysons in Virginia as well as Bethesda and Silver Spring in Maryland. These areas are characterized by high residential and employment densities, walkable streets, robust transit options, and multimodal connectivity.
2. More suburban areas of the study area, which include suburban Fairfax and Loudoun counties in Virginia and Montgomery County in Maryland. Suburban areas are less dense than the more urban environment, and people who live in the suburbs rely on cars to complete their trips. Suburban areas typically have access to park-and-ride lots and commuter bus routes to job centers, and some areas even have access to Metrorail, such as Vienna on the Orange Line or Rockville on the Red Line.
3. Exurban environments include areas beyond the suburban environment, such as in the more rural areas of Loudoun County and Frederick County. These areas typically have limited access to transit and rely on driving, carpool/vanpool, or commuter bus routes to get to work.

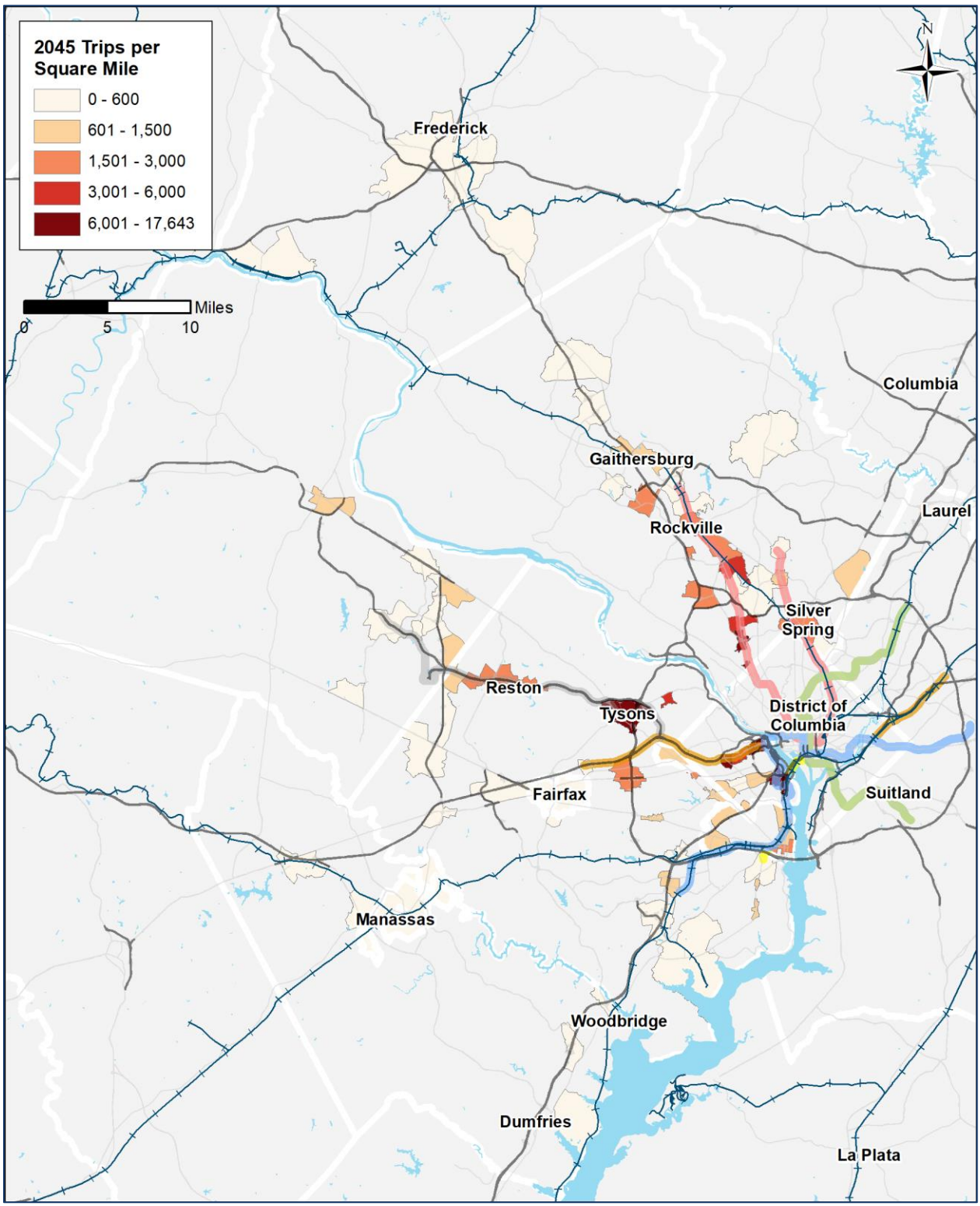
As shown in **Figure 4-5** and **Figure 4-6**, demand for trips across the Bridge in 2045 will continue to have a majority of origins spread along the I-270 and I-495 corridors, connecting to more concentrated activity centers in Virginia at Tysons, Reston, and the Rosslyn-Ballston corridor. The dispersed nature of this trip production along with varying residential density in Maryland presents a challenge for planning efficient transit services. To effectively serve a large area of trip production, any potential transit service should serve a few well-connected locations on the origin-side where trips can aggregate. Study stakeholders indicated that the lack of available parking at park-and-ride lots in exurban areas is a constraint to carpool/vanpool options. Expanding existing and building new parking facilities at potential origin points in suburban and exurban areas can provide first-mile connectivity to commuters and promote new mobility choices. Likewise, on the destination side, the number of stops should be limited and clustered to the degree possible. Potential destination points have less available land for expansion of parking facilities. First- and last-mile connectivity at potential destination points could be augmented with connections to other travel modes, such as Metrorail, local bus, bikeshare, microtransit shuttles, and ride-hailing and sharing services.

Figure 4-5: Density of Trip Production by TAZ, 2045 – Study Area Trips Between MD and VA



Source: (Metropolitan Washington Council of Governments, 2020b)

Figure 4-6: Density of Trip Attraction to Activity Centers, 2045 – Study Area Trips Between MD and VA



Source: (Metropolitan Washington Council of Governments, 2020b)

Broader Awareness About Affordable and Viable Commuting Options

There are several transit agencies within the study area that provide commuter and local bus service, but there is limited cross-jurisdictional coordination for promoting travel options between Maryland and Virginia. The managed lanes projects are unique opportunities to assist with promoting new transit routes and carpool/vanpool programs. Increasing awareness about the availability of new viable commuting options with the construction of the managed lanes will increase the number of people who use transit, vanpools, and carpools to travel across the Bridge.

Evidence shows that travel behavior in the region has changed over time as commuters adapt to travel conditions. According to MWCOG's 2019 State of the Commute Survey, strong marketing campaigns targeting employers and residential areas along the corridor in conjunction with the new managed lanes could increase the number of commuters carpooling and vanpooling to work. Results from MWCOG's State of the Commute Survey indicate that commuters who use the Express Lanes several times per week commute using transit and carpool/vanpool. While 73 percent of all Express Lanes travel (both frequent and infrequent) was done by commuters driving alone, 75 percent of commuters who used the Express Lanes 3 or more days per week used transit or carpools/vanpools.[13] Educating commuters who typically drive alone about the time and cost savings benefits of taking transit, carpooling, or vanpooling to work as well as incentive programs could be an effective strategy for reducing single occupancy vehicle commuting across the Bridge.

Technology to Support Real-Time Decision Making and Flexible Travel Patterns

One strategy to promote new transit service and carpool/vanpool is providing commuters with the knowledge to make more informed transportation decisions. Commuters are more likely to take a commuter bus if they can easily see when the bus will arrive at their closest stop. Providing real-time transit arrival and toll pricing data into popular apps, such as Google Maps and Transit, would provide a large audience with traveler information to which they previously did not have access.

MWCOG's Congestion Management Process (CMP) recommends that the region continue providing and enhancing real-time, historical, and multimodal traveler information and continue to look for ways to safely interface with the public through new technology, such as mobile devices and social media. Providing travelers with information before and during their trip can help them make decisions to avoid congestion and delays and better utilize transit and road infrastructure.[14] The CMP also recommends local jurisdictions and transit agencies work closely to explore transit priority strategies, such as traffic signal priority to provide more reliable arrival times for buses.

Efficient and Equitable Transit Choices

To better understand where transit demand exists across the study area, the study team conducted a transit propensity analysis using Foursquare ITP's Transit Propensity tool. Transit propensity is a way to summarize a range of underlying socioeconomic and demographic conditions that relate to high transit usage. Foursquare ITP has several iterations of the Transit Propensity Tool to measure different kinds of transit demand. For this analysis, the study team ran two of these models:

[13] (Metropolitan Washington Council of Governments, 2019)
[14] (Metropolitan Washington Council of Governments, 2018)

1. **Commuter Propensity Index** measures the concentration of residents who are employed and/or of employment age and with the concentration of residents who commute by public transit or non-SOV modes like carpooling or biking. These areas highlight where one would expect the greatest demand for commuter-oriented transit service. The model assumes that higher reliance on non-SOV modes for commuting indicates a greater likelihood to utilize new transit commuter services if they were available.
2. **Transit-Oriented Population Propensity Index** measures the socioeconomic characteristics associated with areas with high public transit usage including higher population densities, youth below driving age, seniors, low-income households, zero- and one-car households, and persons with disabilities.

These two indices often have considerable overlap yet may differ in places. For example, higher-income suburban communities may maintain a high-transit commute mode share, but the prevalence of car-ownership among households depresses non-commute related transit demand. Alternatively, there are areas that may have low concentrations of commuters but high concentrations of people outside the labor force that rely on transit for most of their travel needs.

Commuter Propensity Index

The highest Commuter Propensity in the region (**Figure 4-7**) is concentrated in areas inside I-495. Within Virginia, that includes the Rosslyn-Ballston, Columbia Pike, VA 7, and Route 1 (Pentagon and points south) corridors. In Maryland, areas of the highest Commuter Propensity include Bethesda, Silver Spring, and Friendship Heights. There are nodes of moderate Commuter Propensity demand in places outside of I-495 such as along the MD 355/I-270 corridor, around Tysons, and along the I-66 corridor in Fairfax County.

Transit-Oriented Population Propensity Index

The Transit-Oriented Population Propensity index (**Figure 4-8**) shows where there is comparatively the greatest demand for all-day transit in the study area. All of the areas that scored well in Commuter Propensity also score well in Transit-Oriented Population Propensity.

In Maryland, Gaithersburg and Germantown score moderate to high on the index, as do areas along the Red Line and US 29 corridor in Montgomery County.

In Virginia, the highest scoring areas in the Transit-Oriented Population Propensity Index include all the areas that score well under Commuter Propensity along with the I-395 corridor (e.g. Van Dorn and Landmark) and US 1 in southern Fairfax County, Annandale, Tysons, and Reston. There are also several exurban areas that show moderate to high transit propensity, including Manassas and surrounding areas and southern Prince William County around Woodbridge and Dale City.

Figure 4-7: Commuter Propensity Index

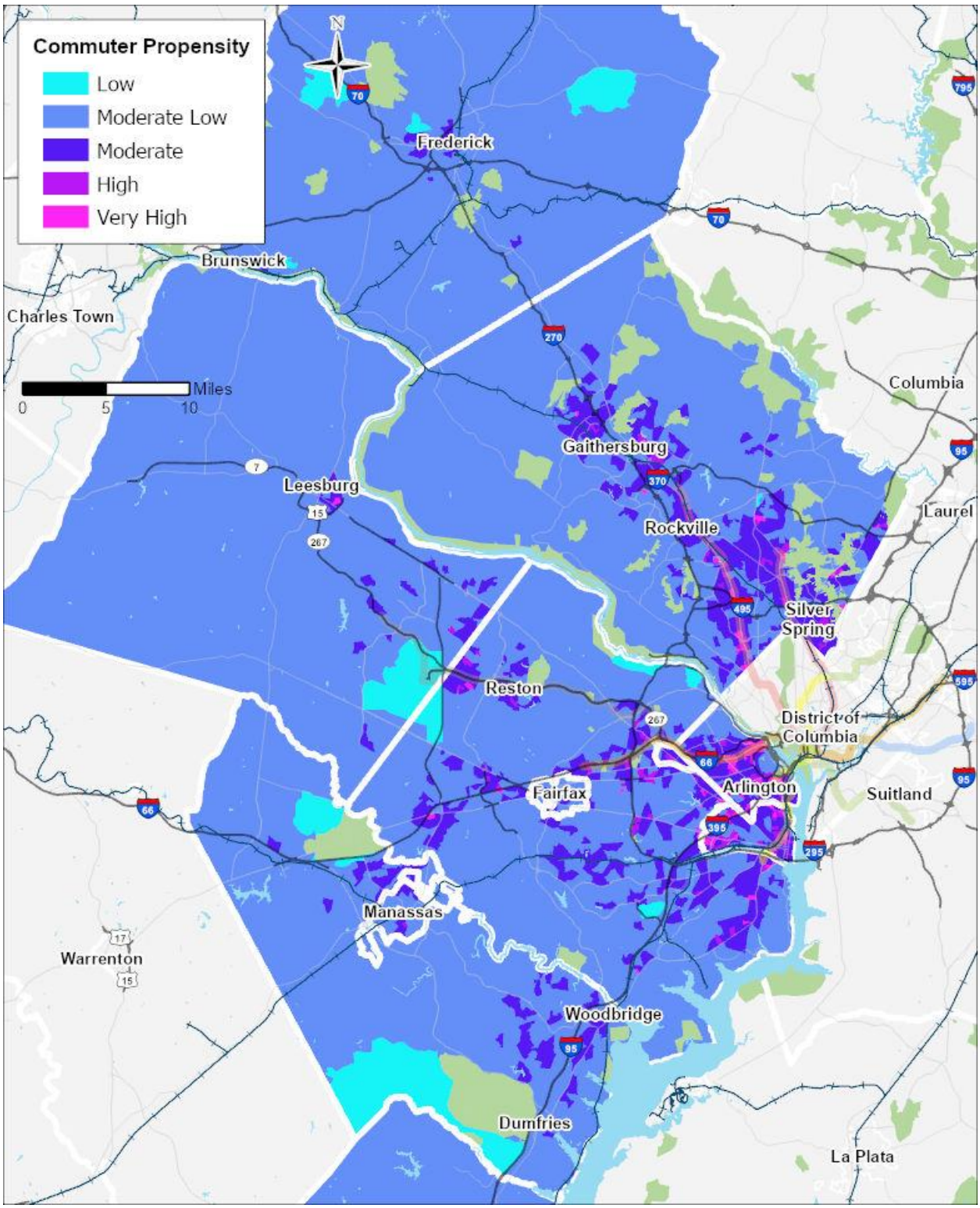
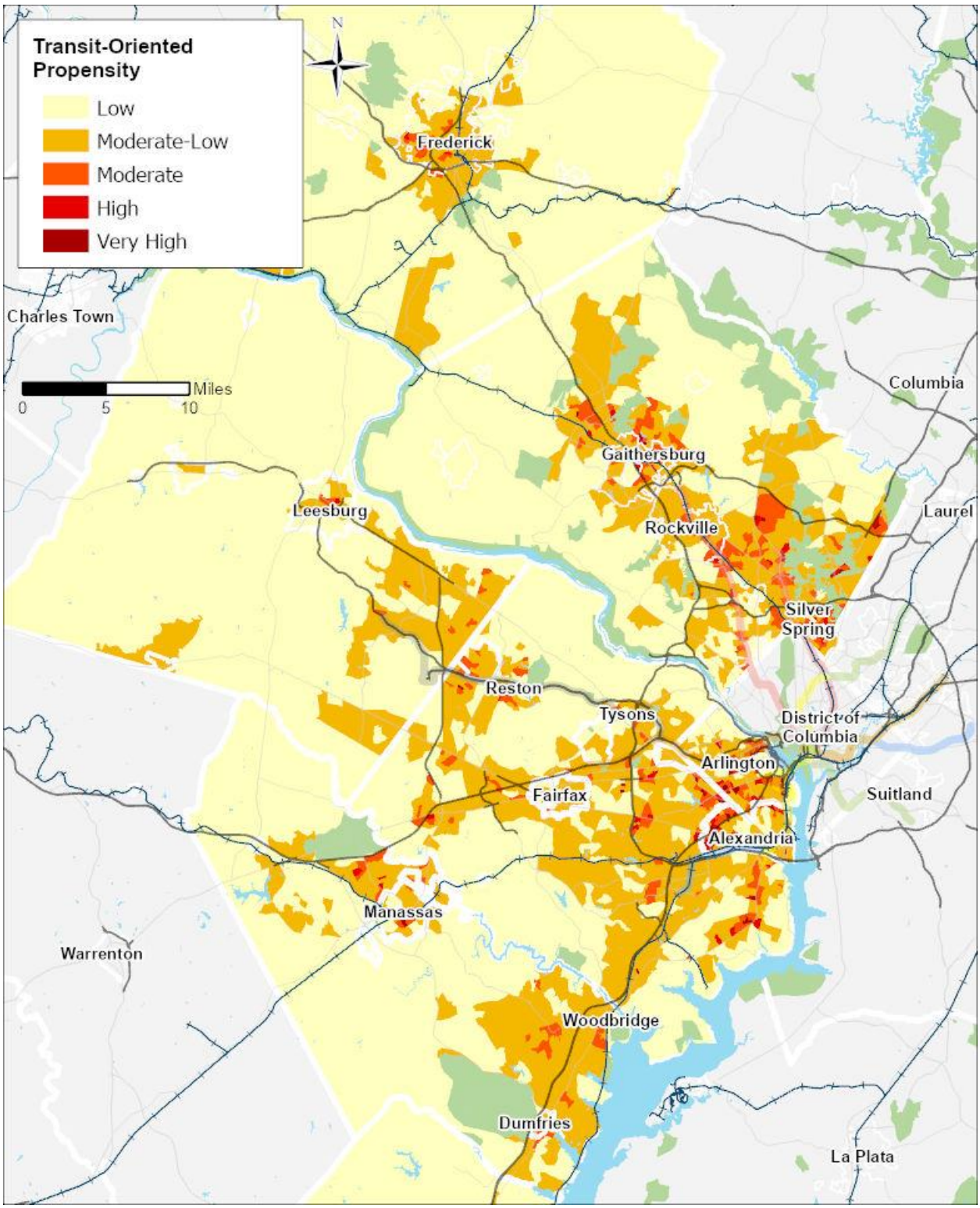


Figure 4-8: Transit-Oriented Population Propensity Index



Summary of Study Area Gaps

The analyses and summaries presented in the previous sections highlight the needs and gaps in transit service between Maryland and Virginia along corridors connecting to the Bridge. The analysis examined the following within the study area: the availability of transit service, the distribution of people and jobs, interstate travel patterns, and transit demand.

Today, the areas with transit supportive characteristics like high transit mode-share, high development densities, and lower rates of car ownership are concentrated along the transit-oriented corridors like the Metrorail Red Line between Montgomery County and the Tysons area in Fairfax County.

A great deal of transit services operate in the study area; however, no transit service today directly links Virginia to Montgomery County or Frederick County in Maryland.

The existing transit networks are oriented toward providing either local transit service or service into Washington, DC. The result is that riders travelling between Virginia and Maryland by transit in the study area are forced to travel via Washington, DC. For trips between Maryland and the inner ring jurisdictions of Arlington and Alexandria, travelling through Washington, DC, is fairly direct. For people travelling between two destinations outside of I-495, trips via Washington, DC, can be circuitous. For example, a Metrorail trip from Rockville to Tysons takes approximately an hour compared to less than 25 minutes in free-flow traffic by car.

Key Gaps

Almost two-thirds of all trips between the states in the study area originate in Maryland.

The most significant gap in the cross-Potomac transit service in the study area is between trip producers in Maryland and trip attractors in Virginia. **Figure 4-9** shows the relative scale of travel to an area in one state from the opposite state. There is significant travel between activity centers on the MD 355 corridor and Silver Spring in Maryland to Virginia destinations like Tysons, Dunn Loring, and the VA 7 corridor. There currently is no transit service that directly connects these areas together (other major Virginia activity centers inside I-495, like Rosslyn and the Pentagon, also attract a good number of trips from Montgomery County but are better served by the existing Metrorail network). Today, there is only moderate demand for trips from Maryland to exurban activity centers like the Dulles Route 28 corridor, Reston, and Manassas.

There is less travel demand from Virginia to activity centers in the Maryland study area and the demand that does exist is geographically dispersed.

Trip production is most concentrated in activity centers along the MD 355 Corridor and Silver Spring in Maryland, while trip attraction is concentrated in Tysons and Fairfax County.

Overall, the analysis found the greatest demand for transit service across the Bridge along a few corridors:

- From Frederick to the Bridge along the I-270 and I-495 corridor
- From the Montgomery County/Prince George's County line to the Bridge along I-495
- From Springfield to the Bridge via I-495

Within these corridors, the segments with the highest number of trips per mile that cross the Bridge are the segments close to the Bridge. These are:

- I-270/I-270 spur from I-495 to I-370 (Maryland)
- I-495 from the Bridge to SR-267 (Dulles Toll Road) (Virginia)
- I-495 from the I-270 spur junction to Prince George's County line

- I-495 from the Bridge to the I-270 spur junction (Maryland)

Looking to the future, many of the areas with strong cross-Potomac travel demand in the study area today are forecasted to see the most significant increases in population and employment over the next 25 years. One notable trend is the projected growth of exurban job centers in places like Loudoun County, Manassas, and Gaithersburg. Today, these areas attract limited cross-Potomac travel demand, a dynamic that may change as these areas add jobs and people.

Figure 4-9: Activity Centers by Travel Demand Between States

5. POTENTIAL RECOMMENDATIONS DEVELOPMENT PROCESS

This section describes the process to develop potential recommendations. It provides an overview of the methodologies and key outcomes of each step. The components described in this section are:

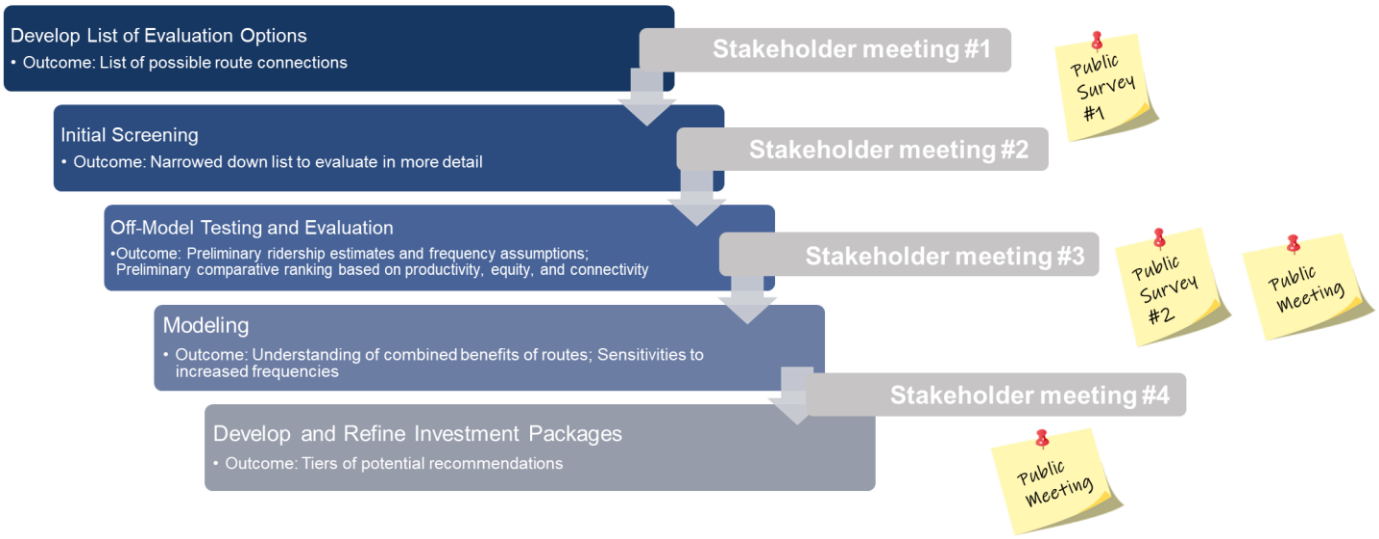
- Transit Service
- CAPs
- Technology Enhancements
- Parking Needs

These components make up the **Potential Investment Packages** of potential multimodal improvements for the Bridge.

Transit Service

To develop potential recommendations for transit, a five-step process was followed. The first four steps are described in this section, and the potential investment packages are described in the **Potential Investment Packages** section. The process began by developing a list of possible route connections based on travel demand and culminated in a set of building blocks of transit routes that could be used in a series of investment packages. Throughout the process the study team met with a group of stakeholders and solicited feedback through a public survey. More detail can be found in the **Stakeholder and Public Engagement** section.

Figure 5-1: Transit Potential Recommendations Development Process



Methodology

Step 1: Develop list of Evaluation Options

The study team began its transit evaluation by identifying the markets in Maryland and Northern Virginia with the greatest demand for cross-Potomac travel. MWCOG's Regional Travel Demand model and the Census Transportation Planning Package (CTPP) data provide valuable insights into travel behavior in the region. The study team found that the highest volumes of travel across the Potomac north of Washington, DC, were between Frederick and Montgomery Counties in Maryland and Fairfax and Arlington counties in Northern Virginia.

The study team used travel demand data to identify specific markets that could be served by transit service across the Bridge. These markets were broadly defined as areas where a high concentration of cross-Potomac trips start or end. Markets were defined as primarily origins (i.e. trip production), destinations (i.e. trip attraction), or a combination of both. Generally, trips originated in residential areas while major employment and retail centers were trip destinations. These groupings helped the study team then identify potential combinations of attraction and production zones in Maryland and Virginia that could be connected by transit service across the Bridge.

At the conclusion of the transit market assessment, the study team identified key nodes that could be served by transit service crossing the Bridge. **Figure 5-2** highlights these major nodes, including:

Virginia

- Tysons
- Arlington (Rosslyn-Ballston Corridor, Pentagon/Crystal City)
- Dunn Loring/Merrifield
- Reston

Maryland

- Bethesda
- Friendship Heights
- Silver Spring
- White Oak
- Rockville
- Gaithersburg
- Germantown
- Frederick

As part of the travel demand analysis, a much larger set of potential origins and destinations for transit service across the Bridge were considered but not all origins and destinations were carried forward. In the case of activity centers in Virginia south of Dunn Loring, the team found that there was insufficient travel demand to support a direct transit service to Maryland. Overall, the study team found that the majority of travel demand in the study area was produced in Maryland and attracted to key destinations in Virginia.

The final list of transit service nodes resulted in 31 potential transit service options, including four options that were identified in previous plans (see **Table 5-1**).

Table 5-1: Initial List of Potential Preliminary Recommendations

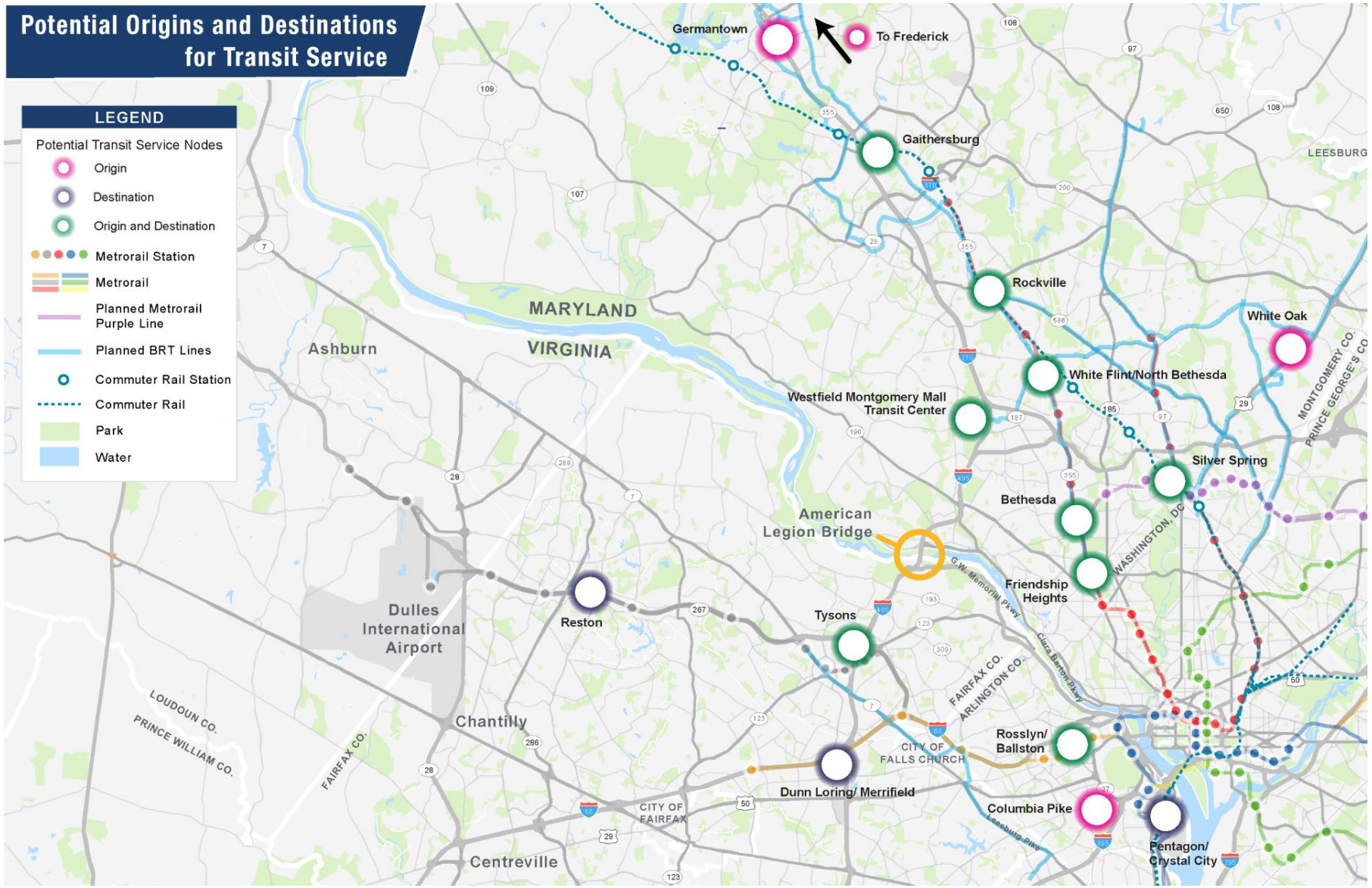
Option	Corridor Ends		Description
	Virginia	Maryland	
1	Tysons	Bethesda	High-frequency bus service with stops at Bethesda and Medical Center Metrorail in Maryland and Tysons in Virginia. This proposal was included in the Fairfax County Transit Development Plan.[15]
2a		Bethesda	Express bus service from Bethesda to Tysons. Stops include Bethesda Metrorail Station and the National Institutes of Health (NIH) in Maryland and Tysons and McLean in Virginia. This proposal was included in the Maryland Transit Service Coordination Report.
2b		Friendship Heights	Extension of proposed service from Tysons to Bethesda to terminate in Friendship Heights.

[15] (Fairfax County, 2020)

3a		Germantown	Express bus route with potential stops to include Germantown, Gaithersburg, and North Bethesda in Maryland and Tysons and McLean in Virginia. This proposal was included in the Maryland Transit Service Coordination Report.
3b		Gaithersburg	Alternative to the Germantown option that circulates in Gaithersburg before running express to Tysons.
3c		Rockville	Express bus service between Rockville and Tysons. Possible interim stop at Twinbrook or Montgomery Mall Transit Center.
4		White Flint	BRT route connecting the White Flint Metrorail Station and Tysons, VA. This proposal was included in the NVTA TransAction Report.
5a		Silver Spring	Service between Silver Spring and Tysons. Potential to include an interim stop in Bethesda.
5b		White Oak	Transit service between White Oak in Maryland and Tysons. Option could include stops in Silver Spring and Bethesda.
6		Frederick	Service between Frederick and Tysons. Service could include interim stops along the I-270 corridor.
7a	Reston	Frederick	Service between Frederick and Reston. Option to include interim stops along the I-270 corridor and/or Tysons.
7b		Germantown	Service between Germantown and Reston. Option to include interim stops along the I-270 corridor and/or Tysons.
7c		Gaithersburg	Service between Germantown and Reston. Option to include interim stops along the I-270 corridor and/or Tysons.
7d		Rockville	Service between Rockville and Reston. Option could include interim along the MD 355 corridor and/or Tysons.
7e		Silver Spring	Service between Silver Spring and Reston. Option could include interim stops in Bethesda and/or Tysons.
7f		White Oak	Service between White Oak and Reston. Option could include interim stop in Silver Spring, Bethesda, and/or Tysons.
7g		Bethesda	Express bus service between Bethesda and Reston. Interim stops possible in Tysons.
8a	Dunn Loring (via Tysons)	Frederick	Service from Frederick to Dunn Loring via Tysons. Option can include stops along the I-270 corridor.
8b		Germantown	Service from Germantown to Dunn Loring via Tysons. Option can include stops along the I-270 corridor.
8c		Gaithersburg	Service from Gaithersburg to Dunn Loring via Tysons. Option can include stops along the I-270 corridor.
8d		Rockville	Service between Rockville and Dunn Loring via Tysons. Option to include interim along the MD 355 corridor and/or Tysons.
8e		Silver Spring	Service between Silver Spring and Dunn Loring via Tysons. Option could include interim stops in Bethesda.
8f		White Oak	Service between White Oak and Dunn Loring via Tysons. Option could include interim stop in Silver Spring and/or Bethesda
8g		Bethesda	Express bus service between Bethesda and Dunn Loring via Tysons.
9a	Arlington	Frederick	Service from Frederick to Arlington. Option can include stops along the I-270 corridor.
9b		Germantown	Service from Germantown to Arlington. Option can include stops along the I-270 corridor.

9c		Gaithersburg	Service from Gaithersburg to Arlington. Option can include stops along the I-270 corridor.
9d		Rockville	Service between Rockville and Arlington. Option to include interim along the MD 355 corridor.
9e		Bethesda	Service between Bethesda and Arlington.
9f		Silver Spring	Service between Silver Spring and Arlington. Interim stop possible in Bethesda.
9g		White Oak	Service between White Oak and Arlington. Interim stops possible in Silver Spring and/or Bethesda.

Figure 5-2: Potential Nodes for Transit Service



Step 2: Initial Screening

At the end of Step 1, the study team had identified 31 transit corridor options, representing various combinations of possible origins and destinations with high cross-Potomac travel demand. The team recognized that not all of these options would be feasible nor generate sufficient ridership to warrant direct transit service. Before detailed route planning could commence, an initial screening was needed to eliminate options with clear deficiencies.

Each corridor was screened based on the following criteria:

- Can an option be eliminated in its entirety because the existing transit network more competitively serves the travel need? For example, existing bus and Metrorail service may already connect certain key trip producers and attractors together in the study area in a time-competitive manner.
- Should any segments of a proposed service option be eliminated because they duplicate existing transit service?
- Is the proposed transit option feasible based on known geographic and infrastructure constraints? For example, does serving destinations on an alignment via the Bridge and/or the proposed managed lane network require circuitous routing or unrealistic infrastructure investments?
- Upon a review of commuter origin-destination data from the CTPP, is the travel demand along a corridor too low to warrant transit service? The initial transit options were developed based on underlying trip generation and attraction and did not account for zone-to-zone travel demand. For example, Frederick, Maryland, may produce a large concentration of trips to the Virginia side of the study area but few of those trips may be clustered along the proposed transit corridor options.

If an option did not satisfy the criteria listed above, it was eliminated from further consideration.

Through the initial screening, the study team identified eight transit options that warranted additional development and study. Results of the Initial Screening of the transit route options are shown in **Table 5-2**. The most common reasons for eliminating a corridor was either insufficient travel demand or uncompetitive travel times compared to existing transit service. The screening eliminated many lengthier routes in favor of simpler alignments. For example, while there was strong demand for travel from several markets to Tysons, there was insufficient demand to extend these services to Reston or Dunn Loring with the exception of Bethesda service. A few options did not perform particularly well in the initial screening but warranted additional investigation (e.g., Silver Spring to Tysons). Results from the Initial Screening are in **Appendix C: Initial Screening Results.**

Table 5-2: Results of Initial Transit Option Screening

Option	Corridor Ends		Included	Decision
	Virginia	Maryland		
1	Tysons	Bethesda	Eliminated	Proposal is eliminated in favor of 2a which is largely identical.
2a		Bethesda	Retained	Proposal provides a new connection between lower Montgomery County and Tysons. Does not duplicate any existing transit service.
2b		Friendship Heights	Eliminated	Metrorail to Tysons from Friendship Heights has similar travel times as bus service via the Bridge.
3a		Germantown	Retained	Existing transit service not time competitive with driving. Moderate demand between Germantown and Tysons.
3b		Gaithersburg	Retained	Existing transit service not time competitive with driving. Moderate demand between Gaithersburg and Tysons.
3c		Rockville	Eliminated	Proposed managed lanes do not provide time-competitive access between Rockville and I-270. Option 2a could serve trips on the Red Line via Medical Center.
4		White Flint	Eliminated	Insufficient travel demand from White Flint to Tysons. Other options better serve demand along the I-270 corridor.
5a		Silver Spring	Retained	Move option to next phase. Unclear from initial screening whether travel time and ridership benefits are great enough to warrant implementation. Further analysis needed.
5b		White Oak (via Silver Spring)	Eliminated	Insufficient demand between White Oak and Fairfax County to warrant direct service. Service would have to bypass other nodes of demand near the route alignment like Silver Spring and Bethesda.
6		Frederick	Retained	Only option between Frederick and Fairfax County that appears to have suitable demand for service.
7a	Reston	Frederick	Eliminated	Not time competitive with driving. Insufficient demand to extend service.
7b		Germantown	Eliminated	Insufficient demand.
7c		Gaithersburg	Eliminated	Insufficient demand.
7d		Rockville	Eliminated	No efficient way to connect to Rockville from the planned I-270 managed lanes.
7e		Silver Spring	Eliminated	Insufficient demand. Travelers to Reston could use proposed Silver Spring–Tysons option instead and transfer to the Silver Line.
7f		White Oak	Eliminated	Insufficient demand.
7g		Bethesda	Retained	Moderate demand. Option would have to skip Tysons to remain time competitive.
8a	Dunn Loring	Frederick	Eliminated	Insufficient demand from travelers from Frederick to Dunn Loring. Frederick to Tysons service would cover most of the demand in the study area.
8b		Germantown	Eliminated	Insufficient demand for service from Germantown to Dunn Loring
8c		Gaithersburg	Eliminated	Insufficient demand for service from Gaithersburg to Dunn Loring.

8d		Rockville	Eliminated	Rockville lacks a time-efficient link between the proposed I-270 managed lanes and the Metrorail station.
8e		Silver Spring	Eliminated	Existing Metrorail provides a faster connection
8f		White Oak	Eliminated	Insufficient demand.
8g		Bethesda	Retained	Moderate demand. Move to next phase of analysis for further evaluation.
9a	Arlington	Frederick	Retained	Provides faster connection than existing services, allowing travelers from Frederick to bypass Washington, DC. Service could connect to Rosslyn and Pentagon.
9b		Germantown	Eliminated	Existing transit service provides similar or better travel time.
9c		Gaithersburg	Eliminated	Existing transit service provides similar or better travel time.
9d		Rockville	Eliminated	Existing transit service provides similar or better travel time.
9e		Bethesda	Eliminated	Existing transit service provides similar or better travel time.
9f		Silver Spring	Eliminated	Existing transit service provides similar or better travel time.
9g		White Oak	Eliminated	Existing transit service provides similar or better travel time.

Step 3: Off-Model Testing and Evaluation

Up to this stage in the planning process, the route options did not have specific stops and alignments defined. As such, the study team had to approximate travel demand along each corridor based on travel to and from pre-defined zones like Gaithersburg or Tysons. In order to conduct a more detailed analysis of the eight remaining service options, the study team identified specific alignments and stops for each route option.

Once the stops were identified, the study team estimated potential travel demand off-model based on FY2021 and FY2045 forecasted zone-to-zone travel demand, as defined in MWCOG's Version 2.3.78 Travel Demand Model. The demand figures capture the number of trips produced in a traffic analysis zone (TAZ) within 3 miles of a stop and the number of trips attracted to a destination within a ½ mile of a stop. For example, Bethesda to Tysons ridership represents the number of trips produced within 3 miles of Bethesda stops and attracted to destinations within ½ a mile of the Tysons stop or vice versa. The travel demand figures represent average weekday trips across all modes. The study team assumed that the Bridge's future service would capture 5 percent of cross-Potomac trips within a given route's catchment area. This figure was based on mode share assumptions documented in similar regional efforts (e.g. the WMATA Blue Orange Silver Alternatives Analysis, MARC-VRE Run-Through Study).

The level of service was estimated based on ridership and cycle times. Services that did not have strong bi-directional demand were scoped as peak direction services, while services with moderate to strong bi-directional demand were assumed to operate in both directions.

The team arrived at the following options retained for further evaluation (see **Summary of Results** section for Maps):

- 2a — Bethesda to Tysons
- 3a — Germantown Express to Tysons
- 5a — Silver Spring to Tysons
- 5c — Gaithersburg to Tysons
- 6 — Frederick to Tysons
- 7g — Bethesda to Reston
- 8g — Bethesda to Dunn Loring
- 9a — Frederick to L'Enfant via Arlington

This final list of routes was developed across multiple off-model iterations. Originally, the study team examined several options for servicing Tysons, including operating multiple service patterns per route in Tysons. The off-model (supported by the on-model results in the **Step 4: Travel Demand Modeling** section) found that the additional ridership did not outweigh the added complexity and cost associated with operating multiple service patterns. Similarly, initially option 9a operated from Frederick to Arlington. After determining that most of the demand for this route originated in the Washington, DC, the service was extended to L'Enfant.

Each option was evaluated across a range of metrics that look at total ridership, service productivity, connectivity to jobs and households, transit connectivity, and equity (as shown in **Table 5-3**). Each option was scored based on how it performed compared to the highest scoring option for any respective indicator. For example, if the best performing route achieving 30 boardings per revenue hour, a route with 15 boardings per revenue hour would receive a score of 0.5. For metrics where a lower figure represented better performance (e.g., cost per trip), options were scored based on the inverse metric so that the lowest figure received the maximum score of 1. The team gave triple weighting to overall potential ridership.

Table 5-3: Evaluation Metrics

Category	Metric	Description
Productivity	Cost per Trip	Operating costs (assumes $152 per revenue hour) divided by trips.
	Trips	Number of trips per day on route.
	Passengers per Hour	Number of passengers divided by daily revenue hours.
	Vehiclel Cost per Passenger	Total fleet costs divided by daily trips
Equity	Minority Population Served	Percent of population which identifies as non-white within 3 miles of a stop. Only estimated for production side of peak direction trips.
	Low-Income Population Served	Percent of population below the federal poverty line within 3 miles of a stop. Only estimated for production side of peak direction trips.
Connectivity	Total Jobs Served	Total number of jobs within ½ mile of a stop. Only estimated for attraction side of a trip.
	Population Served	Total population within 3 miles of a stop. Only estimated for production side of a trip.
	Transit Connectivity	Total number of weekday transit trips that operate within 0.1 miles of a stop.

To calculate productivity metrics, the study team estimated each route's average weekday revenue hours, costs, and peak vehicle requirements. Operating costs assumed an hourly cost of $152 per revenue hour, a rate that represents the average hourly cost of bus service in the National Capital Region based on FY2018 NTD data. Vehicle costs were based on peak vehicle requirements and assume a $600,000 cost per vehicle. To calculate cycle times, the study team assumed that buses in revenue service operated at 45 miles per hour on highways and 15 miles per hour on local roads, with an average dwell time of 60 seconds per stop. Any options that only operated in the peak direction were assumed to deadhead (return via a non-revenue trip) back to their start location.

The study team evaluated each route across several iterations, adjusting stop location, alignment, service levels, and service directionality. The final off-model results resulted in the final conclusions:

Prioritization

- The top-rated corridors were Frederick to L'Enfant (9a); Bethesda to Dunn Loring via Tysons (8g); Bethesda to Tysons (2a); and, Gaithersburg to Tysons (5c). All these options performed well in terms of ridership but differed in score based on productivity, accessibility, and equity measures.
- Silver Spring to Tysons (5a) and Germantown to Tysons (3) ranked in the middle. Silver Spring scored well on equity and accessibility measures, while Germantown performed well based on ridership.
- Frederick to Tysons (6) and Bethesda to Reston (7g) performed the worst of all options evaluated.

Direction of Service

- Only Bethesda to Tysons (2a); Bethesda to Dunn Loring via Tysons (8g); and Bethesda to Reston (7g) had enough demand in both directions to support all-day, bi-directional service.
- The remaining routes disproportionately had demand for service from Maryland to Virginia in the morning and Virginia to Maryland in the afternoon.

Level of Service

- The study team found that the off-model results underestimated travel demand compared to the on-model analysis in Step 4. Ultimately the span of service and service frequencies were based on the travel demand identified in Step 4.

Step 4: Travel Demand Modeling

The purpose of the travel demand modeling phase was to understand the overall impact of the routes, test different combinations of routes, and test sensitivity to increasing frequencies.

The MWCOG regional travel demand forecasting model is the best available tool to understand the regional impacts of multimodal transportation changes. This study is utilizing the base MWCOG zonal demographic forecasts and the transportation (highway and transit) networks inputs to the model with minor modification. Sensitivity tests can be conducted in future tasks by modifying the demographic assumptions for the entire region or specific areas to understand the impact on the transit ridership in the study area. MWCOG maintains Cooperative Land Use forecasts that are updated regularly for all member jurisdictions. The forecast land use data 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 to the region, including critical projects within the study areas such as Metrorail Silver Line expansion to Dulles International Airport and Loudoun County and the Purple Line light rail line between Bethesda and New Carrollton, connecting the Red, Green, and Orange Metrorail lines in Maryland. 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 and I- 270 corridors to best represent the current Maryland Managed Lanes Draft EIS access points and the interaction between the Managed Lanes between Maryland and Virginia at the Bridge.

The suite of transit options was coded, tested, and run through the MWCOG model to determine the specifics of the productions and attractions of the stops in the routes and how the run times and frequencies impact the ridership forecasts. The runs were first conducted on the base defined routes with the assigned frequency and run time. Sensitivity tests were conducted on preliminary route options to determine that the MWCOG model sensitivity to travel time and frequency were in line with national experience. Ridership results for two separate model runs are shown in **Table 5-4** and **Table 5-5**. The results in **Table 5-4** were based on a first cut of route operations assumptions based on the off-model analysis and tend to be more conservative with lower frequency service. Additional runs were also conducted to assist in refining the alternatives. The results presented in **Table**

5-5 reflect a more aggressive service policy with higher frequency service. Together these results show the extent to which route frequency and run time impact ridership forecasts.

Table 5-4: Travel Demand by Route Option in 2045

Route Option	Route Description	Directionality	Headway (minutes)	Run Time (minutes)	2045 Daily Bridge Ridership*	Avg Riders per Bus*
2a-East	Bethesda to Tysons East	Peak Bi-Directional	60	38	-	-
2a-West	Bethesda to Tysons West	Peak Bi-Directional	40	40	200	10
3a-East	Germantown to Tysons East	Peak Direction Only	60	53	50	10
3a-West	Germantown to Tysons West	Peak Direction Only	40	50	650	70
5a	Silver Spring to Tysons	Peak Direction Only	60	41	100	20
5c-East	Gaithersburg to Tysons East	Peak Direction Only	60	74	50	10
5c-West	Gaithersburg to Tysons West	Peak Direction Only	40	71	350	40
6	Frederick to Tysons	Peak Direction Only	90	86	100	30
7g	Bethesda to Reston	Peak Bi-Directional	180	45	-	-
8g	Bethesda to Dunn Loring via Tysons	Peak Bi-Directional	30	47	350	10
9a	Frederick to Arlington	Peak Direction Only	60	102	700	120
				Total	**2,600**	

Note: **Ridership is not constrained by bus capacity. Results with "-"produced negligible ridership from the model*

Table 5-5: Optimistic Travel Demand Ridership by Route Option in 2045

Route Option	Route Description	Directionality	Headway (min)	Run Time (min)	2045 Daily American Legion Bridge Ridership*	Avg Riders per Bus*
2a-East	Bethesda to Tysons East	REMOVED	-	-	-	-
2a-West	Bethesda to Tysons West	All Day, Bi-Directional	20 Peak/ 30 Off-Peak	40	550	10
3a-East	Germantown to Tysons East	REMOVED	-	-		-
3a-West	Germantown to Tysons West	All Day, Peak Direction, Off Peak Bi-Directional	20 Peak/ 30 Off-Peak	50	1,550	30
5a	Silver Spring to Tysons	Peak Direction Only	20	50	850	50
5c-East	Gaithersburg to Tysons East	REMOVED	-	-	-	-
5c-West	Gaithersburg to Tysons West	Peak Direction Only	20	71	650	40
6	Frederick to Tysons	Peak Direction Only	20	71	2,550	100
7g	Bethesda to Reston	REMOVED	-	-		-
8g	Bethesda to Dunn Loring via Tysons	All Day, Bi-Directional	20 Peak/ 30 Off-Peak	47	700	20
9a	Frederick to Arlington	Peak Direction Only	60	102	300	50
				Total	**7,150**	

Note: *Model ridership is not constrained by bus capacity.*

Table 5-6 is a summary of findings from modeling efforts that represent potential modifications to explore during the development on investment packages

Table 5-6: Summary of Findings by Route

Route	Takeaways from Model Findings
2a: Bethesda to Tysons	• West branch capturing more demand than east branch • Higher frequencies increase Tysons to Bethesda ridership • Consider managed lanes access location to MD 187 given lack of access point at MD 355 • The service to Tysons Corner Metrorail Station is supplemented with the 8g service which continues to Dunn Loring
3a: Germantown to Tysons	• West branch capturing more demand than east branch • Good distribution across intermediate stops in Maryland and through Tysons although Tysons Corner Metrorail Station is the largest • One of the strongest ridership routes
5a: Silver Spring to Tysons	• Low ridership from the model in base case due to low frequency • Connections to Purple Line allows connections from Bethesda
5c: Gaithersburg to Tysons	• West branch capturing more demand than east branch • Majority of the trips seem to come from Westfield Montgomery Mall Transit Center to Tysons Corner Metrorail Station
6: Frederick to Tysons	• Base case had low ridership and low frequency, which was improved with higher frequency service in the aggressive service plan • Higher costs due to long run times and long non-revenue runs
7g: Bethesda to Reston	• Low ridership and low frequency which does not seem to improve at higher service levels
8g: Bethesda to Dunn Loring via Tysons Corner	• Strong ridership potential with frequency bi-directional service • Competes with route 2a on trips between Bethesda and Tysons
9a: Frederick to L'Enfant via Arlington[16]	• Strong relative ridership potential with hourly frequency and directional service • Higher service operating costs due to route length and peak direction demand • Ridership that is destined for Arlington is connecting to other modes and actually capturing demand to Washington, DC

Summary of Results

From 31 potential transit service options, the study team narrowed down the recommendations to eight transit corridors. The off-model and on-model analysis allowed the study team to determine each route's alignment, potential ridership, direction of service, and level of service. These eight options became the building-blocks for

[16] This route was extended to L'Enfant Plaza from the original terminus of Arlington based on preliminary modeling which showed demand to Washington DC

the final set of transit service potential recommendations. The following sections outline the eight service patterns and how each one performed relative to one another in a range of metrics. **Table 5-7** to **Table 5-14** show the normalized score of each option and its ranking among the eight service options. **Appendix: D Off-Model Testing and Evaluation Results** provides more detailed statistics for each alignment. Note that all services below operate during the AM and PM peak periods.

2a: Bethesda to Tysons Service

This service would run in both directions between Bethesda Metrorail Station and Tysons. The route would make stops along MD 355, including the Medical Center Metrorail Station, before running on Managed Lanes to Tysons. Between Medical Center Metrorail and I-495, the routing has been modified to operate via Old Georgetown Road, providing direct access to future Managed Lanes. The Tysons East alignment has been eliminated.

2a-West was the third highest scoring option in the off-model evaluation. The travel demand model generally aligned with the off-model findings.

Figure 5-3: Option 2a — Bethesda to Tysons

Table 5-7: Option 2a Off Model Performance Score

Metric	2a
Boardings/Hour	0.86
Cost/Trip	0.90
Trips	1.84
Vehicle Costs/ Boardings	0.90
Minority	0.52
Low-Income	0.33
Total Jobs	0.90
Total Population	0.73
Transit Connectivity	0.68
Final Score	**7.66**
Final Rank	**#3**

Note: Scores and rankings in the table are relative to the other routes

3a: Germantown to Tysons

This service would run in the peak direction only (to Tysons in the morning and from Tysons in the afternoon/evening) between the Germantown Transit Center and Tysons. The service would make interim stops at Montgomery Mall Transit Center. This option is envisioned to operate in tandem with the Gaithersburg to Tysons service (5c)

In the off-model evaluation, this route scored well under the total ridership metric and under the equity metrics. Because the service only operates in the peak direction due to the lack of demand for reverse trips, the route underperformed in terms of productivity. Overall 3a-West ranked six out of 11 options.

The travel demand model showed strong ridership demand for this route, especially when operating in tandem with the Gaithersburg service.

Figure 5-4: Option 3a — Germantown to Tysons

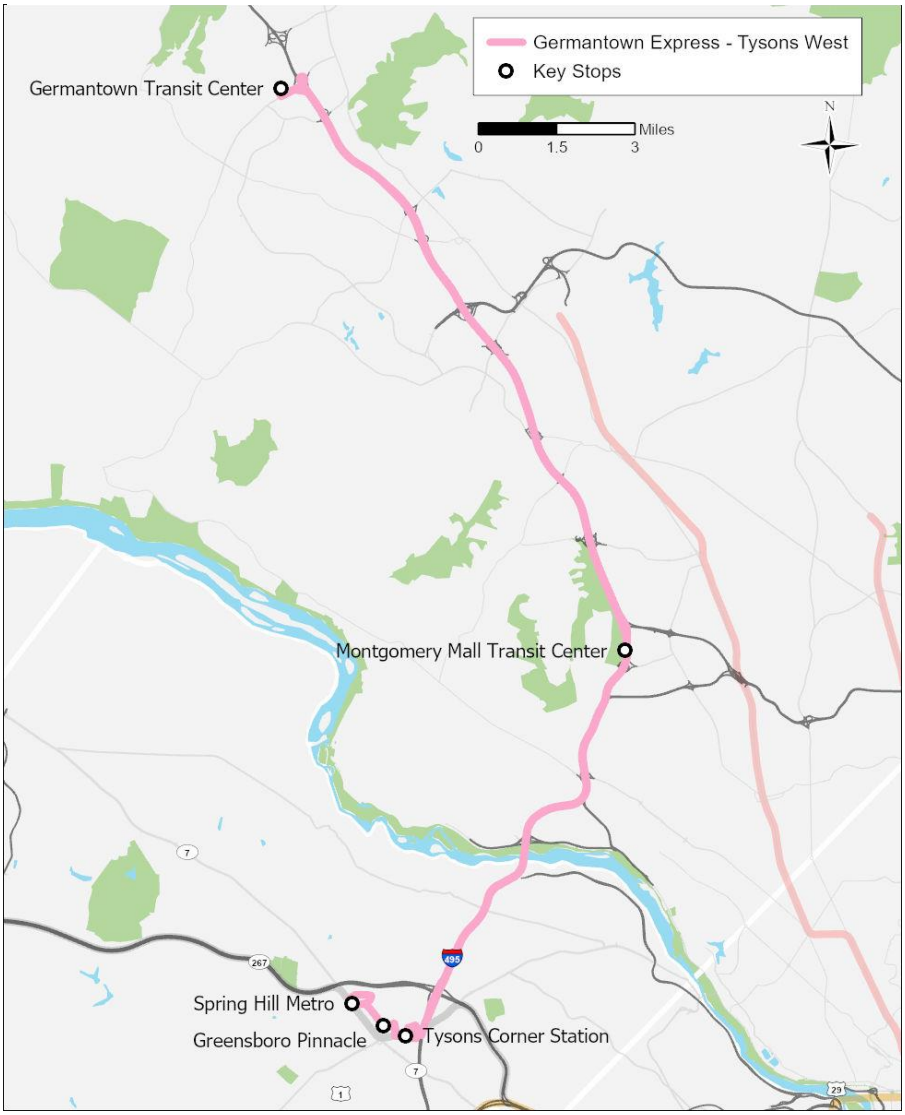


Table 5-8: Option 3a Off-Model Performance Score

Metric	3a
Boardings/Hour	0.71
Cost/Trip	0.75
Trips	1.52
Vehicle Costs/ Boardings	0.75
Minority	0.89
Low-Income	0.67
Total Jobs	0.54
Total Population	0.44
Transit Connectivity	0.54
Final Score	**6.81**
Final Rank	**#6**

Note: Scores and rankings in the table are relative to the other routes

5a: Silver Spring to Tysons

This service would run in the peak direction only (to Tysons in the morning and from Tysons in the afternoon/evening) between the Silver Spring Transit Center and Tysons. In Tysons, buses would utilize only the Tysons West pattern.

In the off-model assessment, the route scored poorly in the ridership metric but well in measures of productivity and equity. Overall, this option ranked number five out of eight options. With the completion of the Purple Line, riders from Silver Spring would have a convenient link to catch any Tysons service out of Bethesda. The travel demand model showed strong ridership for the service.

Figure 5-5: Option 5a — Silver Spring to Tysons

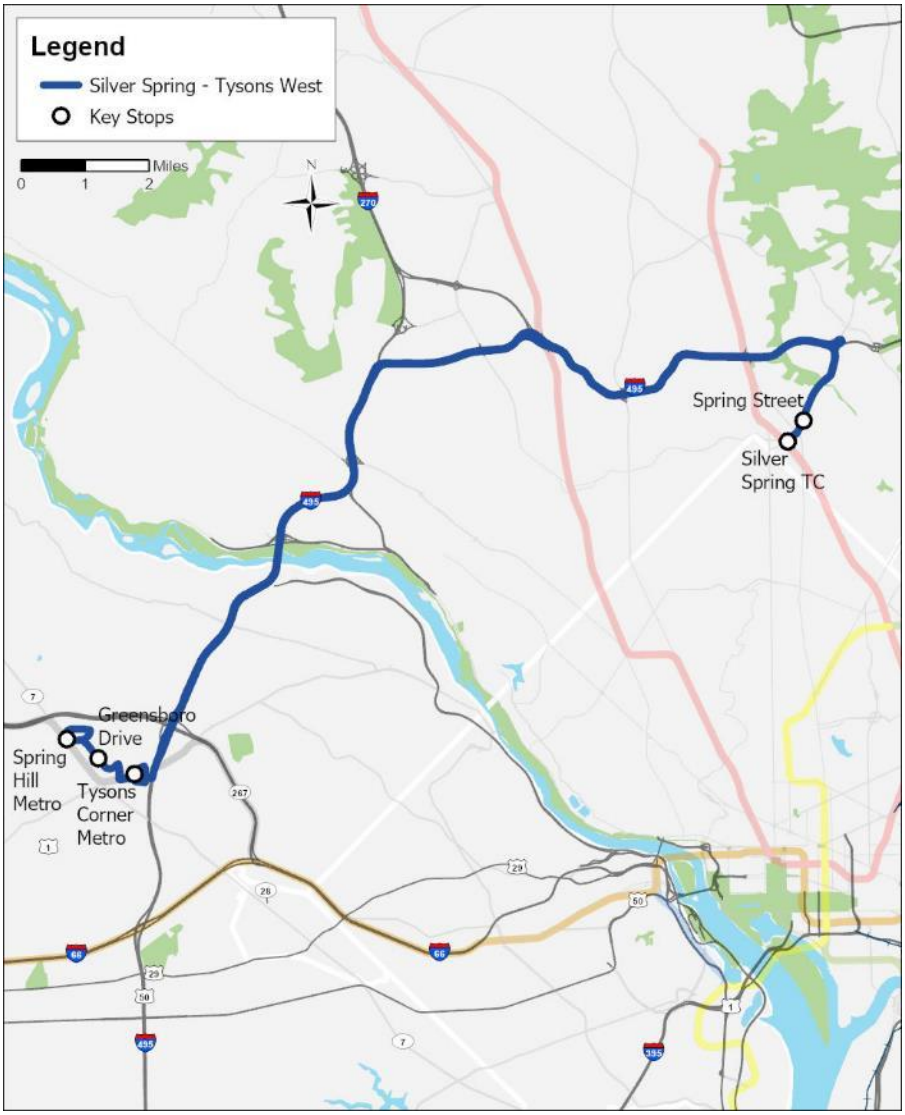


Table 5-9: Option 5a Off-Model Performance Score

Metric	5a
Boardings/Hour	0.78
Cost/Trip	0.83
Trips	0.84
Vehicle Costs/ Boardings	0.83
Minority	1.00
Low-Income	1.00
Total Jobs	0.54
Total Population	0.56
Transit Connectivity	1.00
Final Score	**7.38**
Final Rank	**#5**

Note: Scores and rankings in the table are relative to the other routes

5c: Gaithersburg to Tysons

This service would run in the peak direction only (to Tysons in the morning and from Tysons in the afternoon/evening) between the Lakeforest Mall Transit Center in Gaithersburg and Tysons. The service would run on local streets (mainly MD 355) from Lakeforest Mall to Shady Grove Metrorail, providing access to the Gaithersburg MARC and Old Town. This option would complement Germantown to Tysons (3).

Off model, this option scored well for total trips and the equity measures. The route served the highest total population of all the options. The service did not score as well in terms of connectivity to jobs and productivity. Overall, the 5c-West was the fourth highest scoring alternative. The travel demand model showed strong demand for this option as well.

Figure 5-6: Option 5c — Gaithersburg to Tysons

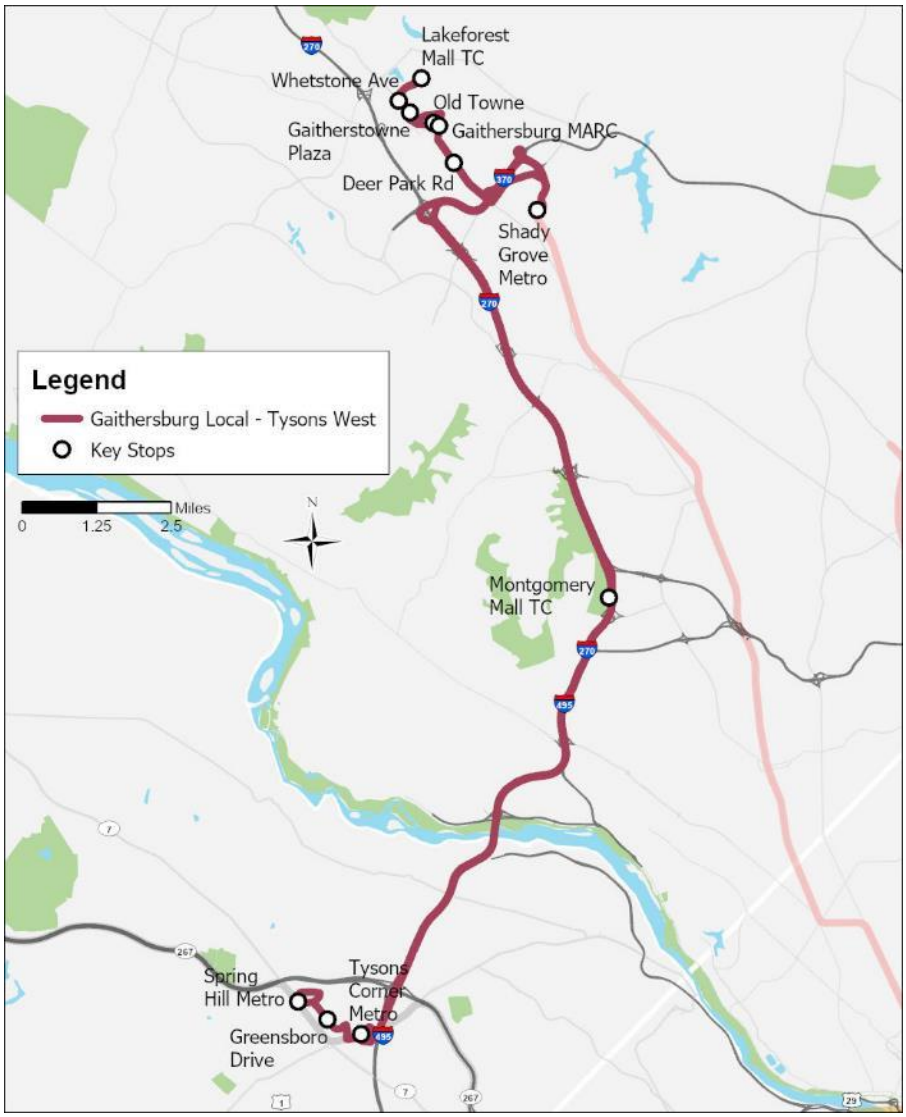


Table 5-10: Option 5c Off-Model Performance Score

Metric	5c
Boardings/Hour	0.61
Cost/Trip	0.61
Trips	1.63
Vehicle Costs/ Boardings	0.61
Minority	0.85
Low-Income	0.67
Total Jobs	0.54
Total Population	1.00
Transit Connectivity	0.96
Final Score	**7.48**
Final Rank	**#4**

Note: Scores and rankings in the table are relative to the other routes

6: Frederick to Tysons

This service would run in the peak direction only (to Tysons in the morning and from Tysons in the afternoon/evening) between the Frederick MARC Station and Tysons.

In the off-model analysis, the route scored poorly in the ridership and productivity metrics. Overall, this was the lowest scoring option. The route's length, low overall ridership demand, and low productivity due to operating only in the peak direction resulted in its poor performance compared to the other options evaluated. This route performed moderately well in the travel demand analysis.

Figure 5-7: Option 6 — Frederick to Tysons

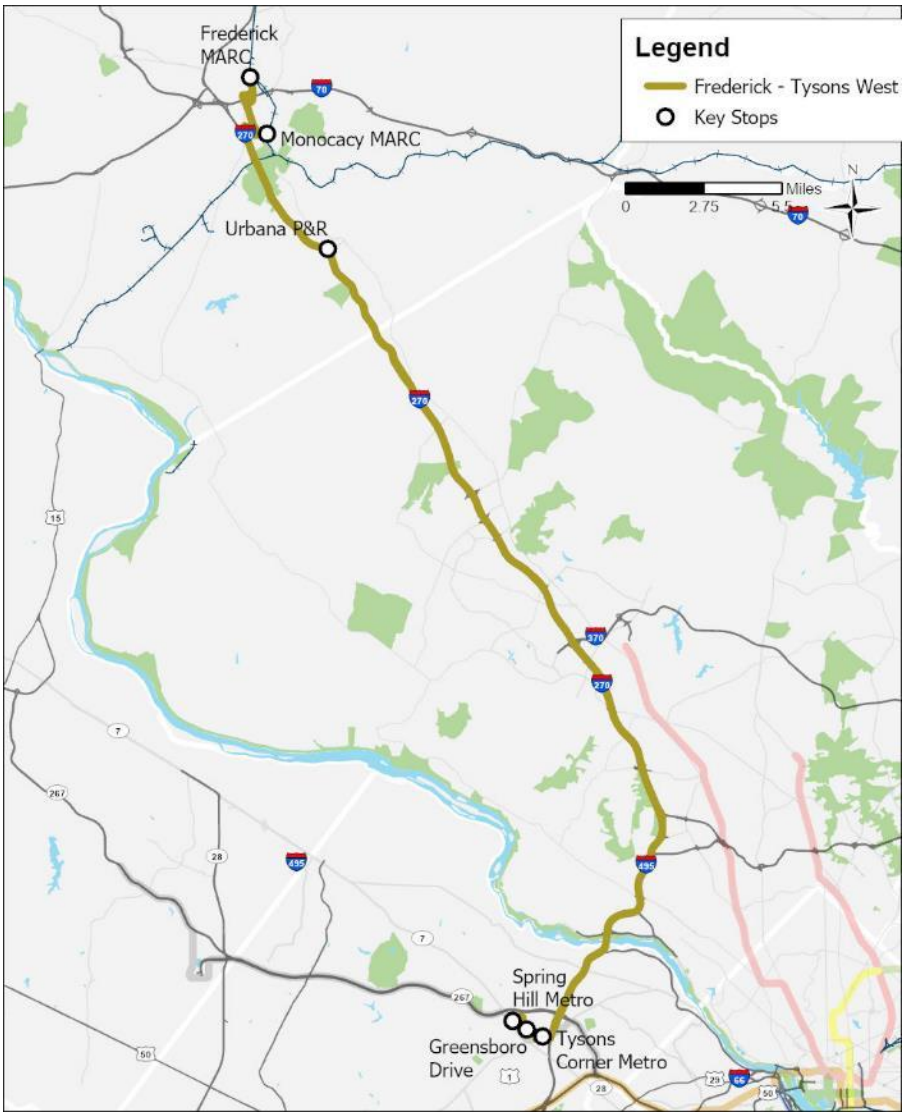


Table 5-11: Option 6 Off-Model Performance Score

Metric	6
Boardings/Hour	0.37
Cost/Trip	0.00
Trips	0.40
Vehicle Costs/ Boardings	0.00
Minority	0.62
Low-Income	0.89
Total Jobs	0.54
Total Population	0.53
Transit Connectivity	0.48
Final Score	**3.83**
Final Rank	**#8**

Note: Scores and rankings in the table are relative to the other routes

7g: Bethesda to Reston

This service would run in both directions between Bethesda and Reston.

In the off-model analysis, this route scored poorly in the ridership but moderately well in productivity due to there being a fairly balanced demand in both the Reston and Bethesda peak directions. The corridor ranked as number seven out of the eight options evaluated. The low overall ridership demand makes it unclear whether this route would provide much benefit over other options. The travel demand model confirmed these results by showing very low travel demand for the route.

Note that in the final recommendations, this route was extended to Dulles Airport, with an additional interim stop at the Montgomery Mall.

Figure 5-8: Option 7g — Bethesda to Reston

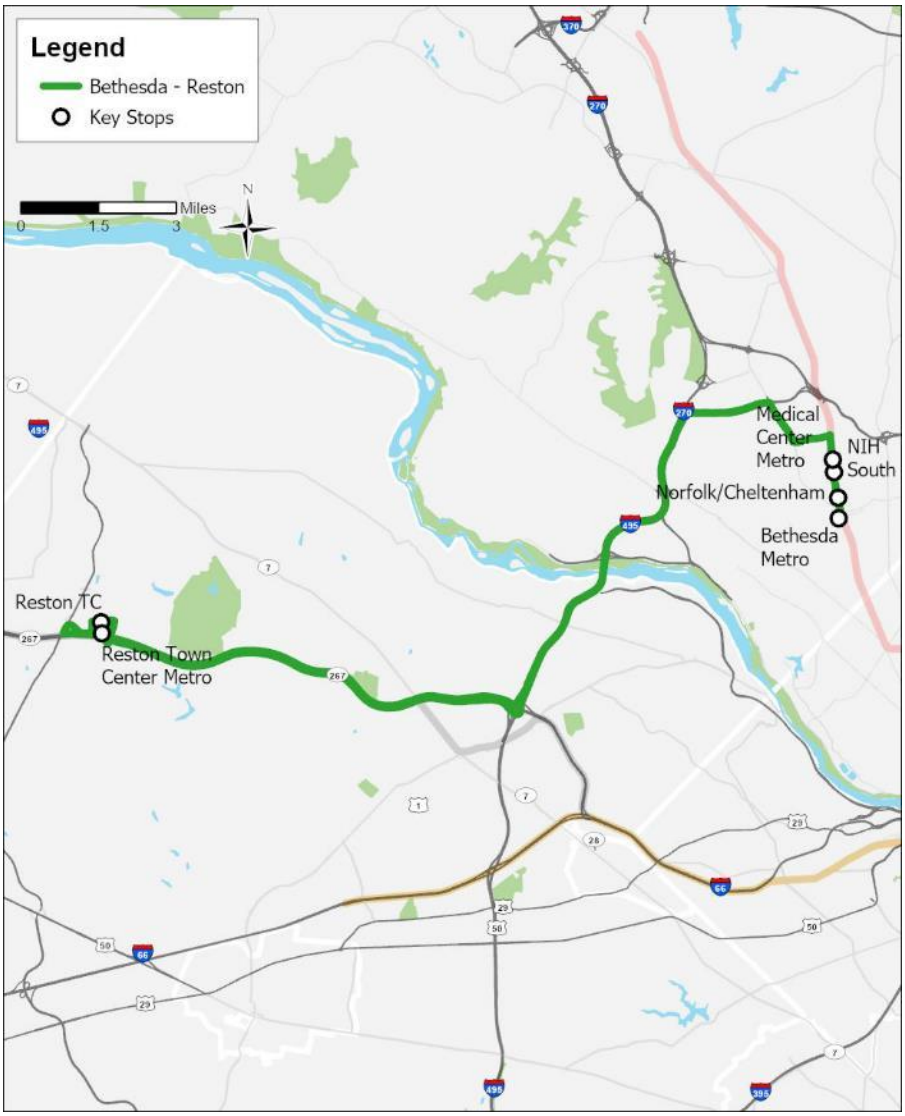


Table 5-12: Option 7g Off Model Performance Score

Metric	7g
Boardings/Hour	0.89
Cost/Trip	0.92
Trips	0.32
Vehicle Costs/ Boardings	0.92
Minority	0.57
Low-Income	0.45
Total Jobs	0.63
Total Population	0.57
Transit Connectivity	0.40
Final Score	5.67
Final Rank	#7

Note: Scores and rankings in the table are relative to the other routes

8g: Bethesda to Dunn Loring via Tysons

This service would run in both directions between Bethesda and Dunn Loring. The service would make two stops in Tysons Corner and provide a direct transfer to Metrorail at the Bethesda, Medical Center, Tysons Corner, and Dunn Loring Metrorail stations. The proposed alignment continues south of Dunn Loring station to serve the Mosaic District. This option would operate in tandem with Bethesda to Tysons (2a) and overlaps considerably with that route.

This route was the second highest scoring option in the off-model assessment. The travel demand model results showed that most ridership was generated between Tysons Corner Metrorail and Bethesda and would significantly overlap with option 2a.

Figure 5-9: Option 8g — Frederick to Tysons

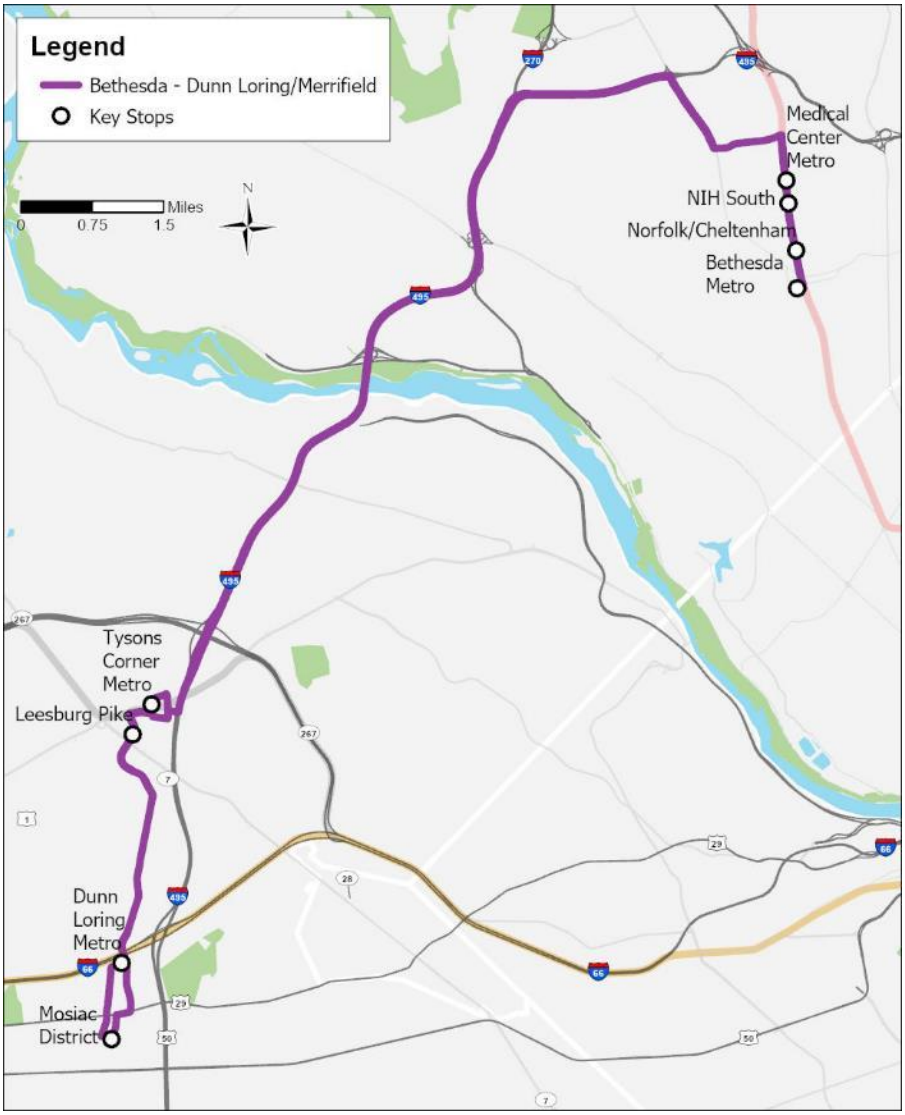


Table 5-13: Option 8g Off-Model Performance Score

Metric	8g
Boardings/Hour	1.00
Cost/Trip	1.00
Trips	2.14
Vehicle Costs/ Boardings	1.00
Minority	0.58
Low-Income	0.44
Total Jobs	1.00
Total Population	0.82
Transit Connectivity	0.58
Final Score	**8.56**
Final Rank	**#2**

Note: Scores and rankings in the table are relative to the other routes

9a: Frederick to L'Enfant via Arlington

This service would run in the peak direction between Frederick and L'Enfant via Arlington with interim stops at major park-and-rides off of the I-270 corridor. In Arlington the service would stop at Rosslyn Metrorail station before crossing back over the Potomac to a terminus at the L'Enfant Metrorail station. The route would operate via VA-267 and I-66 managed lanes instead of taking the more direct George Washington Parkway due to commercial vehicle and height restrictions.

In the off-model assessment, the route was the highest scoring option. It should be noted that a large portion of the ridership is based on the connection to downtown Washington, DC.

Figure 5-10: Option 9a — Frederick to L'Enfant

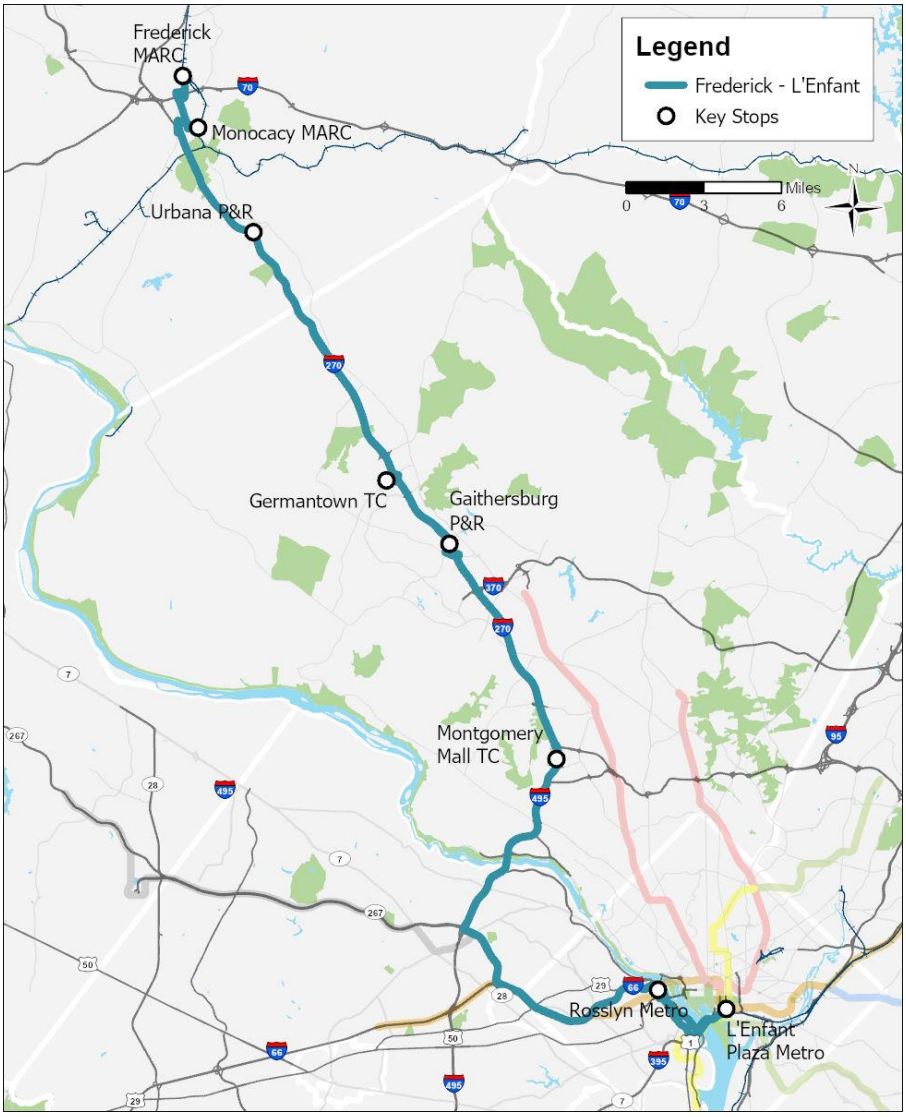


Table 5-14: Option 9a Off-Model Performance Score

Metric	9a
Boardings/Hour	0.80
Cost/Trip	0.85
Trips	3.00
Vehicle Costs/ Boardings	0.85
Minority	0.83
Low-Income	0.73
Total Jobs	0.76
Total Population	0.77
Transit Connectivity	0.53
Final Score	**9.12**
Final Rank	**1**

Note: Scores and rankings in the table are relative to the other routes

Commuter Assistance Programs

Earlier, this report documented some of the existing CAPs in the region that will benefit travel in the corridor. This effort focused on identifying programs that would be specifically targeted at travel over the Bridge.

Methodology

Step 1: Develop list of Evaluation Options

Eight CAPs were identified as potential options to enhance service across the Bridge and are shown in **Table 5-15** below.

Table 5-15: Preliminary Potential CAP Options

Name	Description
TDM Strategies Incorporated into Traffic Mitigation Plans for New Development in Activity Centers	Work with local partners to incorporate TDM Strategies into Traffic Mitigation Plans for new development in key activity centers. TDM Strategies could include priority parking for carpools/vanpools and parking cash-out programs.
Corridor-Specific Mobility Options Marketing Campaign	Develop a geotargeted marketing campaign that targets commuters along the study area 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, high-occupancy vehicles (HOVs) with three or more passengers ride free in the managed lanes could be a potential marketing message. *
Targeted Residential Outreach	Target outreach to commuters in the study area advertising and promoting the new transit routes and carpool/vanpool incentives. Target locations of high-density residents in the study area where new services are available and would utilize the study area-specific marketing campaign. Incentives for higher occupancy could be marketed to residents, such as HOVs with three or more passengers would ride free in the managed lanes. *
Targeted Employer Outreach	Target employers located in and around key activity centers in the study area with marketing campaigns. Commuter Connections already provides resources to employers, and these resources can be leveraged to more targeted outreach advertising new transportation options that cross state lines. Incentives for higher occupancy could be marketed to employers, such as HOVs with three or more passengers would ride free in the managed lanes. *
Personalized and Dynamic Travel Demand Management Technology	Partnership between Maryland and Virginia state and local governments and private partners, funded in part by a grant from Federal Highway Administration (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.
Vanpool Formation and Expansion Program	Currently there are 124 vans that cross the Bridge registered with Vanpool Alliance. This robust number could be expanded to fill any existing capacity and serve new markets. Methodology would be coordinated with Vanpool Alliance and the Virginia DRPT.

Name	Description
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 area). Carpool promotion programs could be expanded to other third-party applications such as transportation network companies (TNCs).
Corridor-Specific HOV Incentive	Provides an extra incentive (using an existing tracking app like IncenTrip) to people who use alternative modes in the study area. "Try it" HOV financial incentives: 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 both a low scenario component and a high scenario component, with additional resources applied to serve a larger number of commuters.

** Occupancy requirements for free access to the managed/express lanes on I-495 and I-270 in Maryland have yet to be determined.*

Step 2: Initial Screening

CAPs were screened to identify any fatal flaws that would preclude a recommendation from advancing and to ensure that there is a demonstrable benefit to travel in the study area beyond existing or planned initiatives.

As part of the screening process, the study team recognizes that there are ongoing regional commuter assistance initiatives that will help to promote and incentivize non-SOV travel in the study area but are not specific to the study area. 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 area and meet the Study needs.

The three strategies that were assumed to be present in the baseline and should be supported as the managed lanes projects progress are:

- TDM Strategies Incorporated into Traffic Mitigation Plans for New Development in Activity Centers
  - Local efforts to incorporate these types of measures into development ordinances should be supported
- 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 Regional Multimodal Mobility Program (RM3P) program will include incentives that will apply to corridor users
- Carpool Promotion Programs
  - MWCOG manages the CarpoolNow app, which provides on-demand carpool services by connecting drivers and rider seekers. Drivers who register with the app are eligible to earn up to $10 per trip when picking up riders going to work. This strategy can be promoted by corridor-specific employer and residential outreach staff.

The other five potential CAP options were moved forward from the initial screening to be analyzed quantitatively in terms of the return on investment of specific study-related funding. These options will provide direct assistance to SOV travel across the Bridge in a way that provides new or additional services beyond the baseline of existing CAPs.

Step 3: Evaluation

The study team utilized a tool called the TDM Return on Investment (RIO) Calculator to quantitatively analyze the performance of each potential CAP option that moved forward from the initial screening. The primary metrics involved travel impact in terms of daily vehicle trips reduced and daily vehicle-miles traveled. Program costs were

looked at terms of one-time capital costs and annual operating expenses. Cost effectiveness was analyzed based on annual results.

The tool, which was created through Arlington County Commuter Services' Mobility Lab[17], provides information to make more informed decisions on transportation policies, programs, and investments by calculating vehicle trips and miles travelled reduced by their TDM programs and to calculate benefit-cost ratios or ROI. As a part of this study, the following five potential CAP options where analyzed:

- Corridor-Specific Mobility Options Marketing Campaign
- Targeted Residential Outreach
- Targeted Employer Outreach
- Vanpool Formation and Expansion Program
- Corridor-Specific HOV Incentive

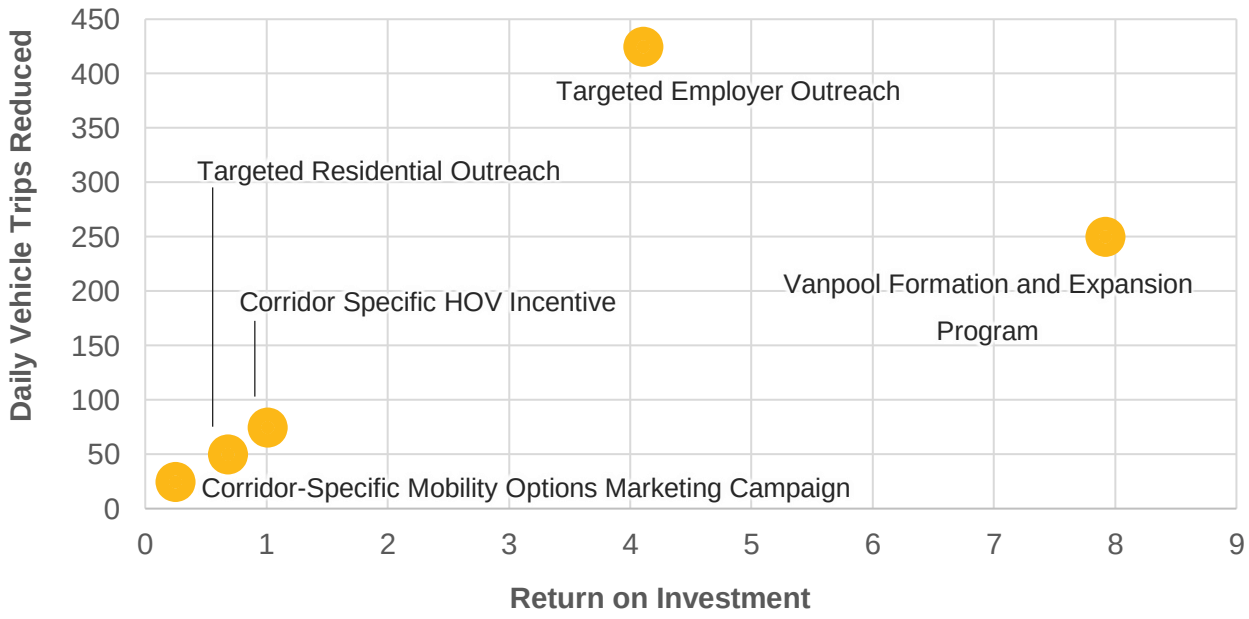
Detailed assumptions are included in **Appendix D: CAPs Evaluations Assumptions**.

Summary of Results

Figure 5-11 is a graphical representation of individual CAPs calculated ROI.

According to the calculations, the most cost-effective program is the vanpool incentive and employer outreach is forecasted to reduce the most trips as shown below. Understanding the specific value of individual strategies is an important aspect of developing a full package of commuter assistance strategies to promote multimodal options in the corridor.

Figure 5-11: Commuter Assistance Return on Investment Results



Existing Regional and Statewide Programs

In addition to the Study-specific CAPs evaluated as part of this study, the region has a multitude of existing programs that will be accessible to commuters traveling across the Bridge. These programs are summarized below:

[17] (Mobility Lab, 2020)

- CarpoolNow— A smartphone app that provides on-demand carpool services by connecting drivers offering rides to passengers seeking rides
- PoolRewards — Financial incentives to drive-alone commuters who start carpooling or vanpooling within the MWCOG region
- IncenTrip Program — IncenTrip is a comprehensive trip planning app that helps commuters find commuting options and rewards users with points that can be redeemed for financial rewards
- Regional ride matching through Commuter Connections
- Regional Guaranteed Ride Home (GRH) program which offers up to four free rides home per year to commuters who use non-SOV modes in case of unexpected emergencies
- Local Residential and Employer Outreach Programs and Development Ordinances — Local jurisdictions work with large employers and residential developments to promote non-SOV options and work in legal requirements for new development to promote multimodal options, especially in denser urban areas when parking is scarce
- First and Last Mile Connections — Safe multimodal connections at transit stops will help improve the experience for the user and promote non-SOV access to stations

Virginia's RM3P

RM3P is a collaborative program to improve safety, mobility, and reliability for Virginia travelers. It is a multimodal technology initiative involving public- and private-sector transportation safety and service providers across Northern Virginia. Funded under the Commonwealth of Virginia's Innovative Technology and Transportation Fund (ITTF), the program is being delivered under the leadership of the VDOT, the NVTA, and the Virginia DRPT.[18] Currently implementation planning is underway for the I-66 and I-395 corridors in Northern Virginia. The I-495 corridor is a potential corridor for expansion of this program through coordination with DRPT and VDOT. Some common elements of the program that are shared with the proposed strategies include real-time parking availability and dynamic incentivization (a data-driven incentive system where varying incentives are provided in response to real-time travel conditions).

Technology Enhancements

Methodology

Step 1: Develop List of Evaluation Options

Technology improvements were considered as potential options to spread broader awareness about affordable and viable commuting options and support real-time customer decision making. The team identified six technology options, as shown in **Table 5-16**. Initial screening consisted of a review from the study team and stakeholders for fatal flaws. All technology options were identified to have merit and were carried on to the second round of testing and evaluation.

[18] (Northern Virginia Transportation Authority, 2020)

Table 5-16: Preliminary Potential Technology Recommendations

Option	Name	Description
10a	Virginia Commuter Parking Information System	Provides commuters with reliable expected parking space availability for parking lots serving rail, bus, and carpool/vanpool commuters, potentially leveraging RM3P.
10b	Maryland Commuter Parking Information System	Provides commuters with reliable expected parking space availability for parking lots serving rail, bus, and carpool/vanpool commuters, similar to what is planned in Virginia through RM3P.
11a	Real-Time Toll and Transit Information	Work with private partners to incorporate real-time toll, congestion, and transit data into commonly used apps like Google Maps and Waze.
11b	Real-Time Transit Arrival Information	Work with transit agencies to make real-time arrival data available for public use. Once available, transit agencies can work with private partners to incorporate real-time transit arrival time information in commonly used apps such as Google Maps Transit and Transit App.
11c	Real-Time Passenger Load Information	Work with private partners to incorporate real-time passenger load information for transit services in commonly used apps such as Google Maps Transit and Transit App using automated passenger counters (APCs).
12	Transit Signal Priority	Transit signal priority and/or queue jumps at high-priority, bottleneck intersections on new transit routes to improve transit travel time reliability.

Step 2: Evaluation

The study team evaluated technology options in terms of readiness, capital cost, and annual operating and maintenance (O&M) cost. 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. Project stakeholders were also polled on ease of implementation of the solutions based on their industry experience. Cost estimate ranges were developed using sources such as the US Department of Transportation's Intelligent Transportation System (ITS) Deployment Evaluation Program[19] and the study team's experience with transportation and transit agencies that have implemented similar solutions. Detailed assumptions can be found in **Appendix F: Technology Evaluation Assumptions**.

Summary of Results

A summary of the technology evaluation results is shown in **Table 5-17**.

[19] (United States Department of Transportation, 2020)

Table 5-17: Technology Evaluation Results Summary

Option	Name	Technology Readiness	Cost Rank (1 = Lowest)	Capital Cost Estimate (2020 $)	Annual O&M Costs (2020 $)
10a	Virginia Commuter Parking Information System	Medium	2	$350,000 – $760,000	$28,000 – $60,000
10b	Maryland Commuter Parking Information System	Medium	6	$1,160,000 – $2,540,000	$111,000 – $240,000
11a	Real-Time Toll and Transit Information	Low	1	$180,000 – $330,000	$22,000 – $44,000
11b	Real-Time Transit Arrival Information	High	4	$500,000 – $980,000	$36,000 – $75,000
11c	Real-Time Passenger Load Information	Low	3	$440,000 – $850,000	$74,000 – $174,000
12	Transit Signal Priority	Medium	5	$1,090,000 – $1,910,000	$74,000 – $144,000

Parking Needs Assessment

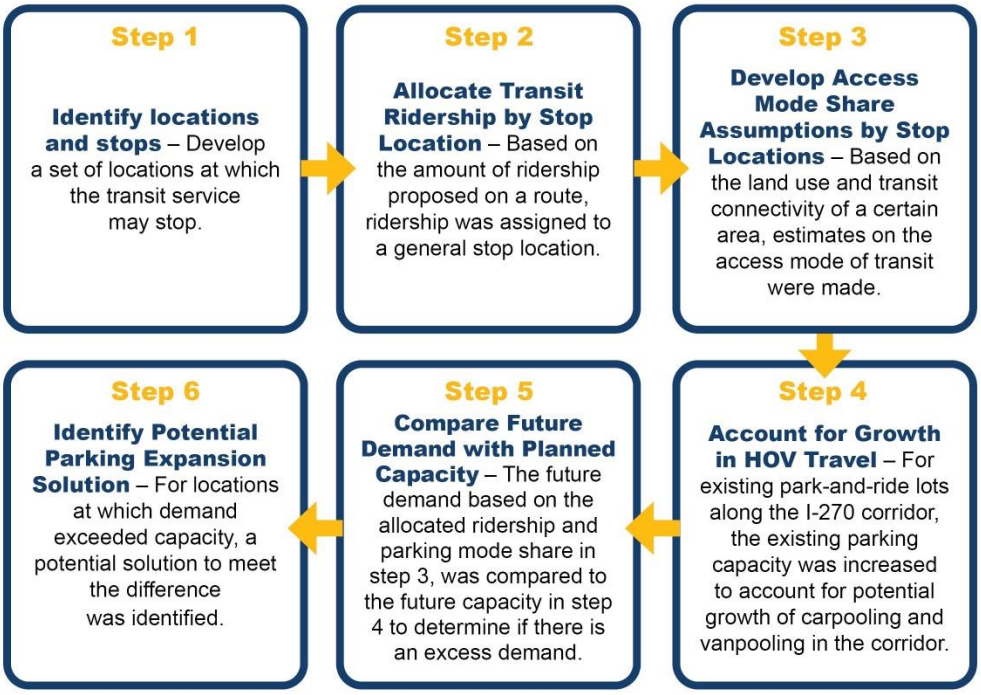
New commuter bus services will require additional facilities to operate efficiently and provide the most reliable experience for riders. The **Parking Needs Assessment** section includes an evaluation of existing parking capacity and new parking demand generated by the proposed routes. Additionally, growth in parking demand from vanpools and carpools utilizing the new managed lanes is also factored into the parking needs assessment analysis for prioritizing transit recommendations.

It is important to note that there are other key factors that will impact parking demand in the region and that those impacts will be in addition to the parking needs identified in this report. Key factors include new transit services beyond the Bridge commuter service proposals and changes in development patterns and growth. In order to conduct the granular parking analysis for those factors—such as what has been prepared for the Bridge's proposed commuter services—new transit services and land use changes will need to be better defined and integrated into the regional travel demand model. In this way, a better assessment of the combined impacts on parking demand throughout the region can be determined along with the impacts of the commuter bus proposals presented in this study.

Methodology

The following methodology was conducted to develop potential parking needs associated with potential transit service as shown in **Figure 5-12**.

Figure 5-12: Parking Needs Methodology Flow Chart



This section identifies the results of the process through step 4. Potential parking expansion solutions and excess demand are included in the Potential Investment Packages section.

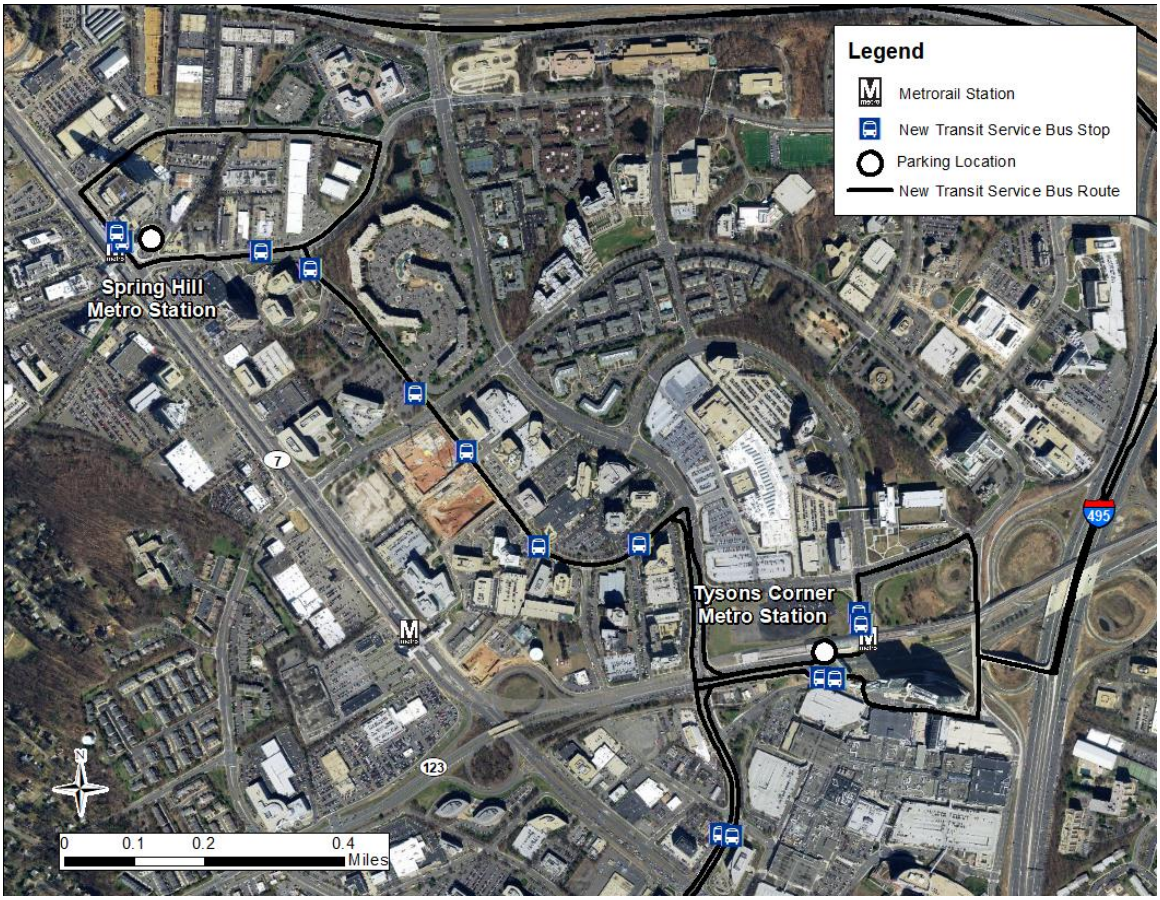
Identify Parking Locations

The first step of the **Parking Needs Assessment** is identification of stop locations along each proposed transit route and a number of proposed bus stop locations. Not all of these stops have parking facilities and are bus stops along the side of the road. Only stops at major transfer points or locations with sufficient parking were considered for analysis. Stops on the side of local roads at existing bus stops were not evaluated. Stops were grouped based on their proximity to key origins and destinations along the routes to agglomerate available parking capacity and estimated parking demand and identify locations with parking needs. **Figure 5-13** to **Figure 5-25** show the parking locations evaluated in this report.

Tysons

The Tysons West parking area consists of the Tysons Corner and Spring Hill Metrorail stations. Neither of the Metrorail stations has existing parking, but both are major transfer points for several Metrobus and Fairfax Connector routes, provide service to the Silver Line, and have bike racks. Spring Hill Metrorail Station has a kiss-and-ride loop and a Bikeshare station. The planned Route 7 BRT route is also anticipated to stop at the Spring Hill Metrorail Station. Tysons Corner Metrorail Station has seven existing bus bays and Spring Hill Metrorail Station has five bus bays.

Figure 5-13: Tysons West Parking and Facilities Location



Dunn Loring

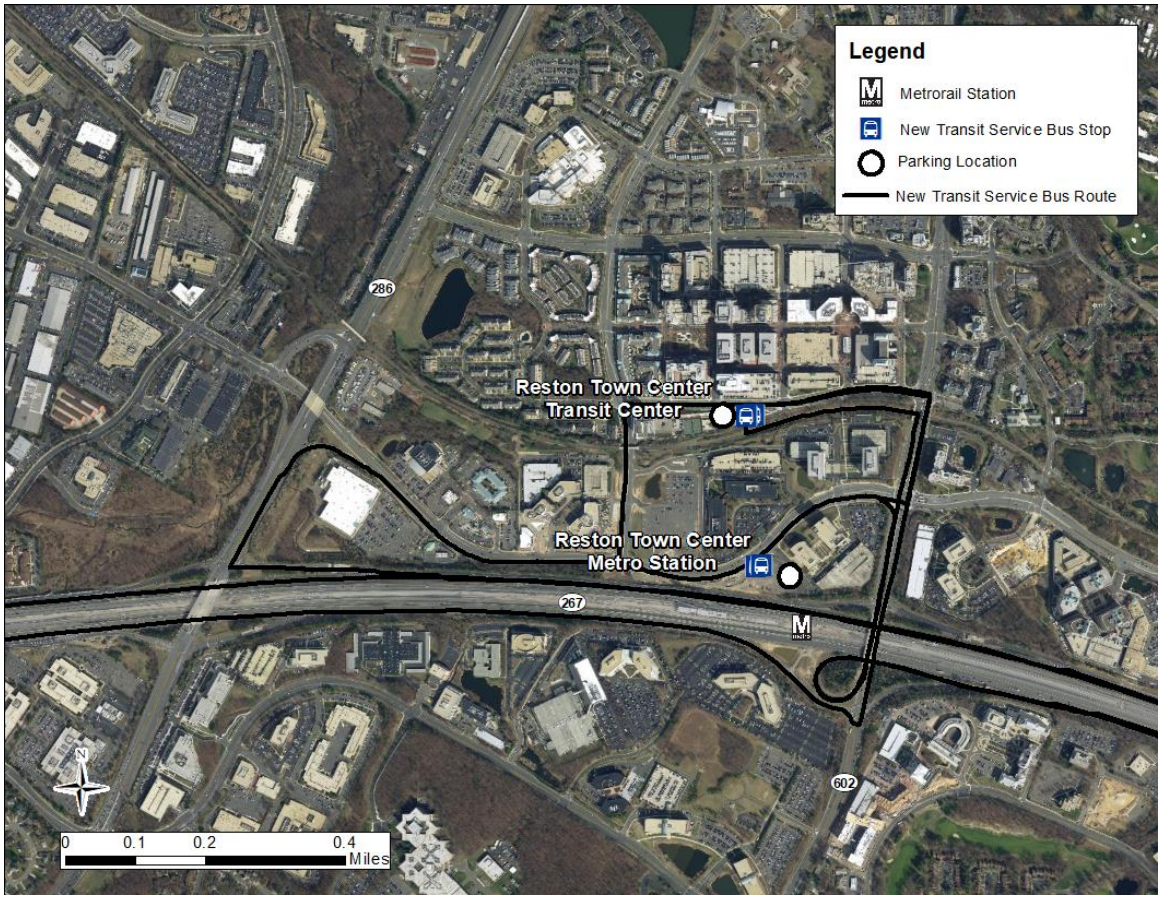
The Dunn Loring parking area consists of the Dunn Loring Metrorail Station and Mosaic District. The Dunn Loring Metro Station provides service to the Orange Line and several Fairfax Connector and WMATA Metrobus routes and has significant existing parking capacity with approximately 2,083 spaces— only 52 percent of which are used—providing access to potential riders. The Mosaic District is a major retail and restaurant destination in the area but has no existing, dedicated park-and-ride capacity. Dunn Loring Metrorail Station has eight existing bus bays, but Mosaic District has zero bus bays. A few routes do stop at the Fairfax Plaza Shopping Mall on Gallows Road.

Figure 5-14: Dunn Loring Parking and Facilities Location

Reston

The Reston parking area consists of the future Reston Town Center Metrorail Station and Reston Town Center Transit Center. The Reston Town Center Metrorail Station is planned to open for service in 2021 and will have bus bays, kiss-and-ride loops, and bike racks on both sides of the Dulles Toll Road but no parking capacity.[20] Reston Town Center Transit Center also has no parking capacity but is a transfer point for several Fairfax Connector routes and has eight bus bays. The Reston Town Center Metrorail Station will allow for bus drop-off and pick-up at two on-street shelters on Sunset Hills Road, and there will be three bus bays within the bus loop adjacent to the station pavilion entrance.

Figure 5-15: Reston Parking and Facilities Location

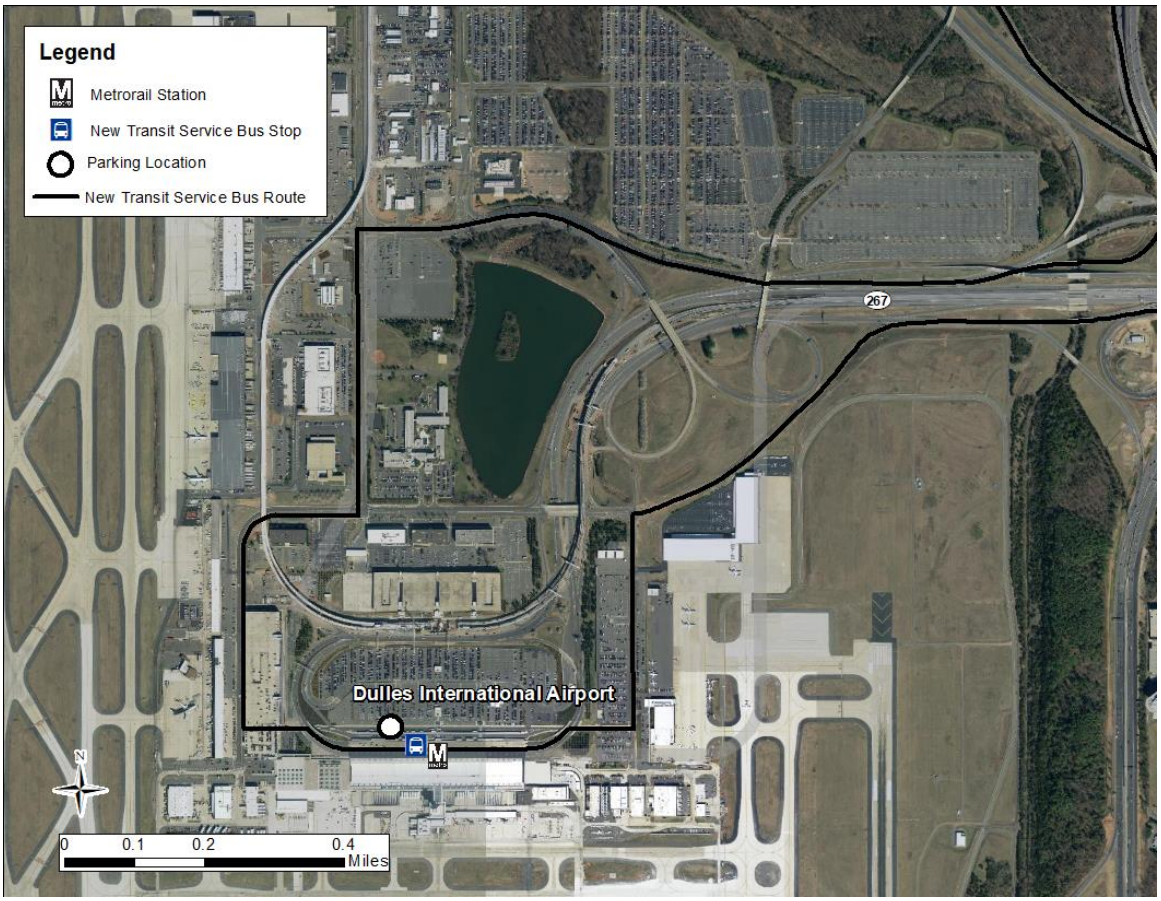


[20] **Invalid source specified.**

Dulles Airport

The Dulles Airport parking area consists of the area at Dulles International Airport. Since the predominant amount of parking is costly and for daily airline patrons, despite an abundance of parking, it is likely that dedicated low cost or free parking for patrons accessing the bus network would not be added since no parking was added for the Silver Line rail patrons at this location since parking demand is associated with airport activities and priced accordingly.

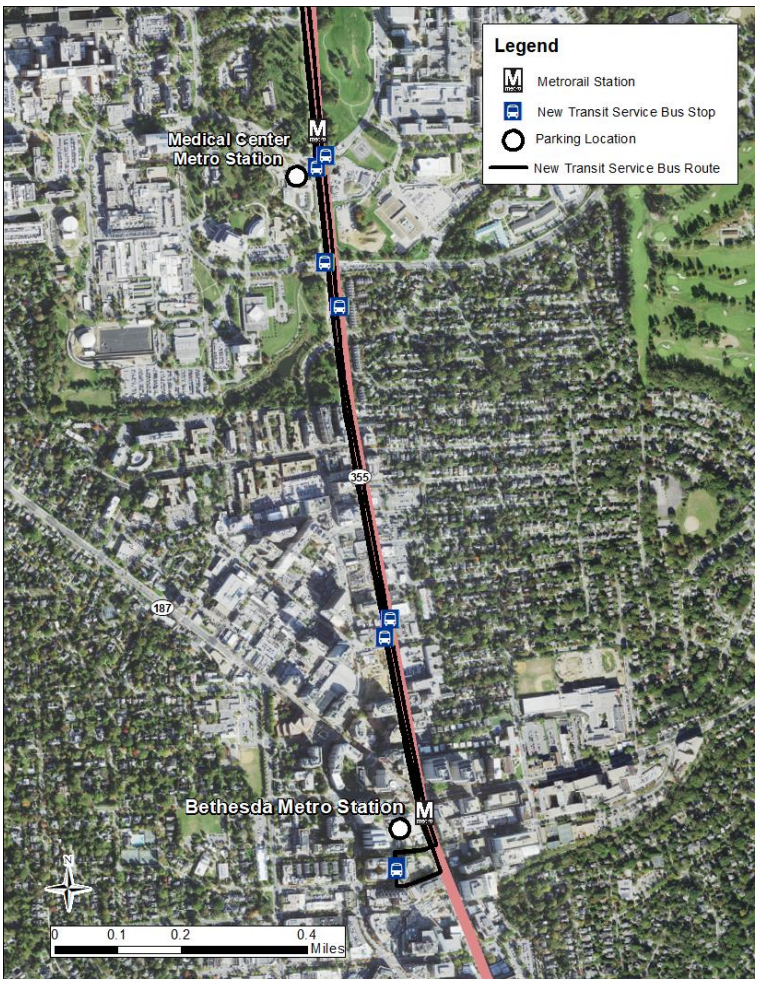
Figure 5-16: Dulles Parking and Facilities Location



Bethesda

The Bethesda parking area consists of the Bethesda and Medical Center Metrorail stations. Both stops provide access to the Red Line and are transfer points for numerous Metrobus and Montgomery County Ride On routes. The Bethesda Metrorail Station is also serviced by the Bethesda Circulator, a shuttle bus service operating within the Bethesda central business district. The Purple Line, currently under construction, will stop at the Bethesda Metrorail Station, and the planned MD 355 BRT corridor is proposed to also stop at the Bethesda and Medical Center Metrorail stations. Neither stop has existing parking capacity dedicated for park-and-ride use. Both stops have existing bus bays, with Bethesda Metrorail Station providing seven bus bays and the Medical Center Metrorail Station supplying six bus bays.

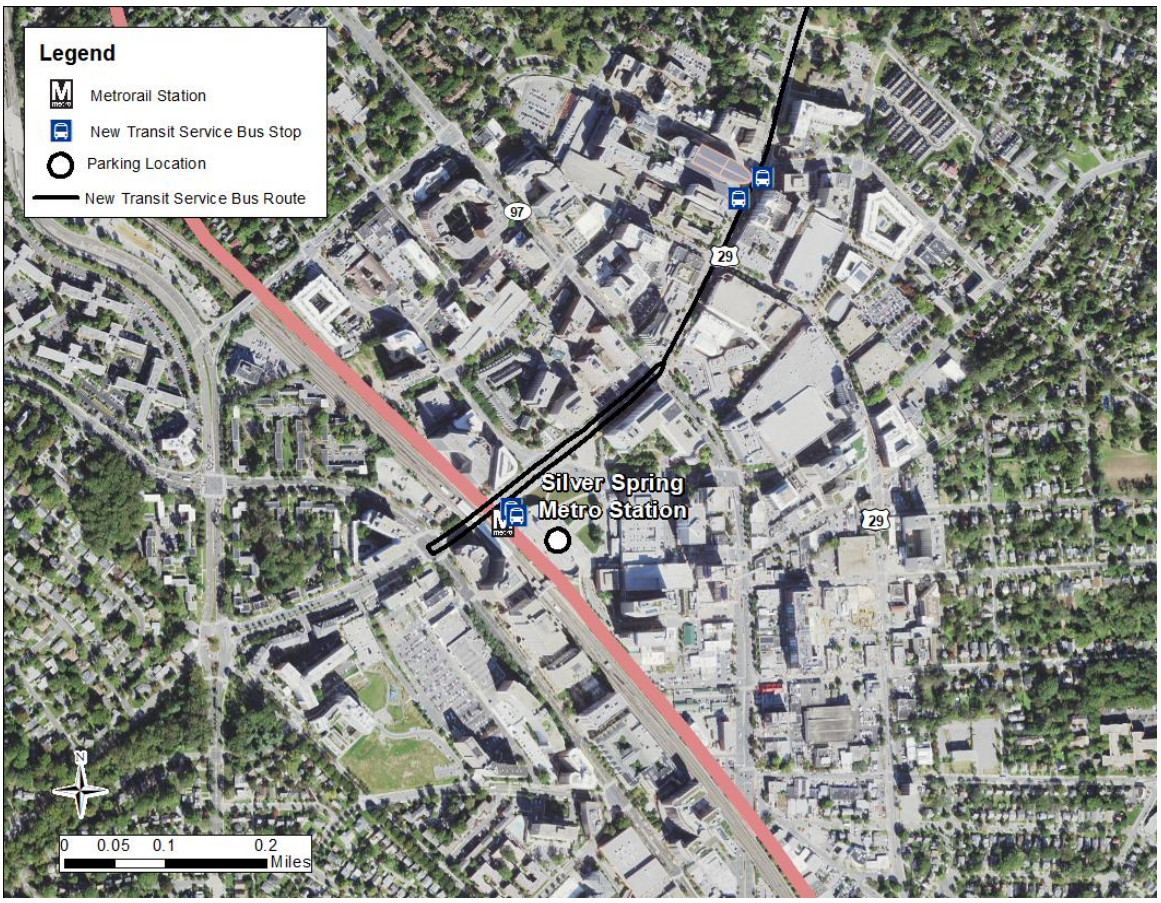
Figure 5-17: Bethesda Parking and Facilities Location



Silver Spring

The Silver Spring parking area consists of the Silver Spring Metrorail Station. Despite being on the edge of this project's study area, this location is a major multimodal hub. The Silver Spring Metrorail Station provides service to the WMATA Red Line and provides access to the Silver Spring MARC Station for service on the Brunswick Line. The Purple Line will also stop at the Silver Spring Metrorail Station. The Sarbanes Transit Center, adjacent to the Metrorail station, is a major hub for several Metrobus and Ride On routes and is also served by the University of Maryland (UMD) College Park campus shuttle. The Sarbanes Transit Center has 30 existing bus bays servicing these routes. This stop is also located in walkable downtown Silver Spring and has a plentiful supply of bike racks and bikesharing infrastructure.

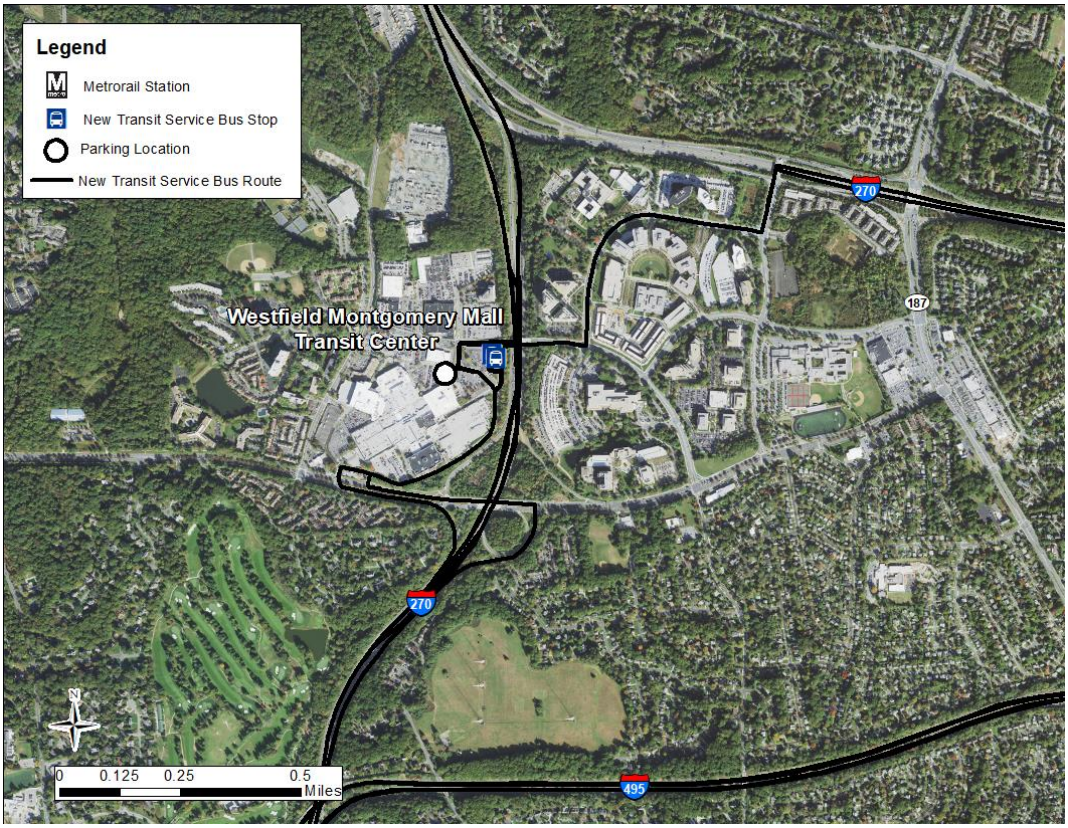
Figure 5-18: Silver Spring Parking and Facilities Location



Rock Spring – Westfield Montgomery Mall Transit Center

The only stop in the Rock Spring parking area is the Westfield Montgomery Mall Transit Center. This stop is strategically located along the I-270 spur with easy access to managed lanes on I-270 and I-495. The Westfield Montgomery Mall Transit Center is also a key origin and destination for Metrobus routes and several Ride On routes and has five existing bus bays. Future FLASH BRT service is also proposed to connect to the Mall. Currently, the Westfield Montgomery Mall Transit Center has 200 surface parking spaces being utilized at 50 percent capacity.[21] One vanpool travelling between Virginia and Maryland originates at the Westfield Montgomery Mall.

Figure 5-19: Rock Spring Parking and Facilities Location



[21] (Maryland Department of Transportation State Highway Administration, 2020)

Gaithersburg

The Gaithersburg parking area is comprised of four stops: Shady Grove Metrorail Station, the Gaithersburg MARC Station, Lake Forest Mall Transit Center, and Gaithersburg Park-and-Ride. Each of these stops has existing parking capacity with varying levels of occupancy, as shown below:

- Shady Grove Metrorail Station — 5,745 spaces (100 percent average occupancy)
- Gaithersburg MARC Station — 280 spaces (average occupancy N/A)
- Lake Forest Transit Center — 417 spaces (25 percent average occupancy)
- Gaithersburg Park-and-Ride — 470 spaces (65 percent average occupancy)[22]

Each of these stops is a suburban stop with ample parking and some transit connectivity. Of these four stops, the Shady Grove Metrorail Station has the most multimodal connections with several Ride On and MDOT MTA commuter buses stopping at the station. Shady Grove also has a kiss-and-ride loop on the east side to allow for drop-offs and pick-ups. The remaining three stops all have existing parking capacity and are served by a variety of Ride On and MDOT MTA commuter bus routes. The planned MD 355 BRT route is also proposed to stop at the Shady Grove Metrorail Station and Lake Forest Mall Transit Center, and the Corridor Cities Transitway is proposed to stop at the Shady Grove Metrorail Station. Stops in Gaithersburg have varying levels of bus bay capacity, as shown below:

- Shady Grove Metrorail Station — 12 bus bays
- Lake Forest Transit Center — Three bus bays
- Gaithersburg Park-and-Ride — One bus bay
- Gaithersburg MARC — One bus bay

One vanpool originates at the Gaithersburg Park-and-Ride and three originate at the Diamond Avenue Park-and-Ride lot nearby.

[22] (Maryland Department of Transportation State Highway Administration, 2020)

Figure 5-20: Gaithersburg Parking and Facilities Location

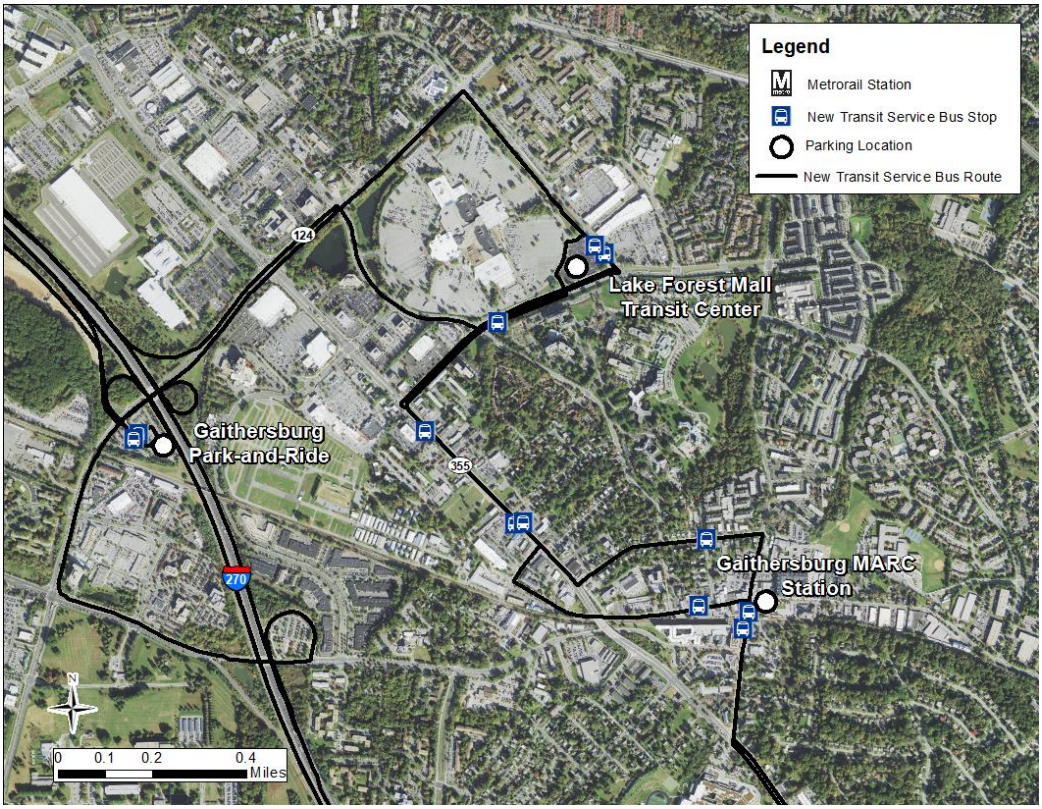
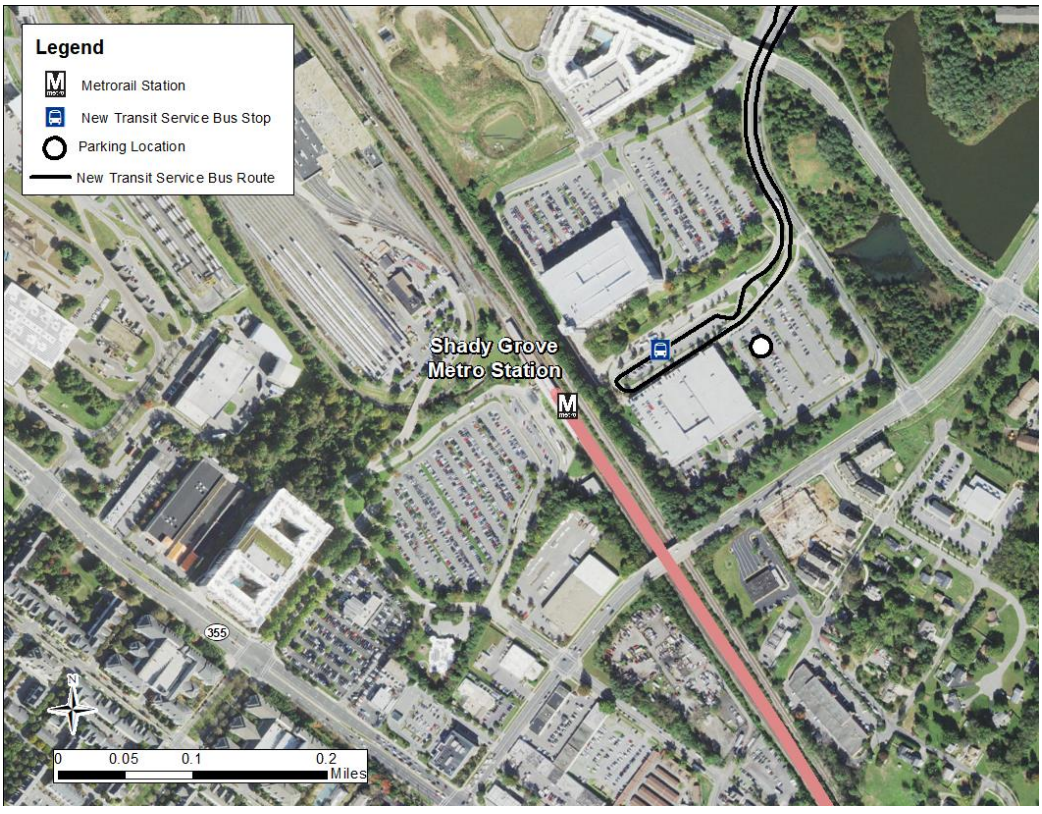


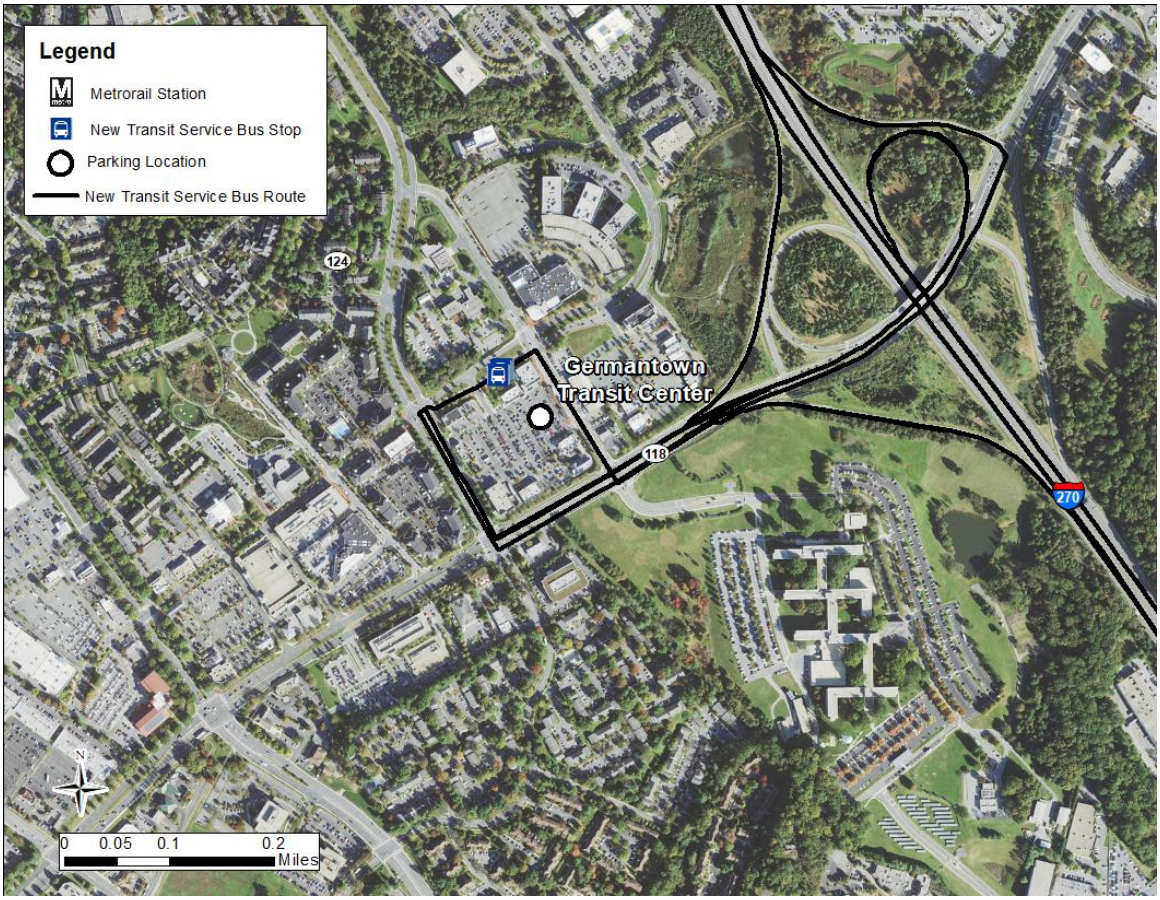
Figure 5-21: Shady Grove Metrorail Station Stop



Germantown

The Germantown parking area consists solely of the Germantown Transit Center, located conveniently off of I-270. This stop is an existing 175-space parking lot, but 100 percent of these spaces are utilized on the average day, indicating a lack of available parking. Despite the lack of parking, the Germantown Town Transit Center is a major transfer point for several Ride On routes. There are six existing bus bays.

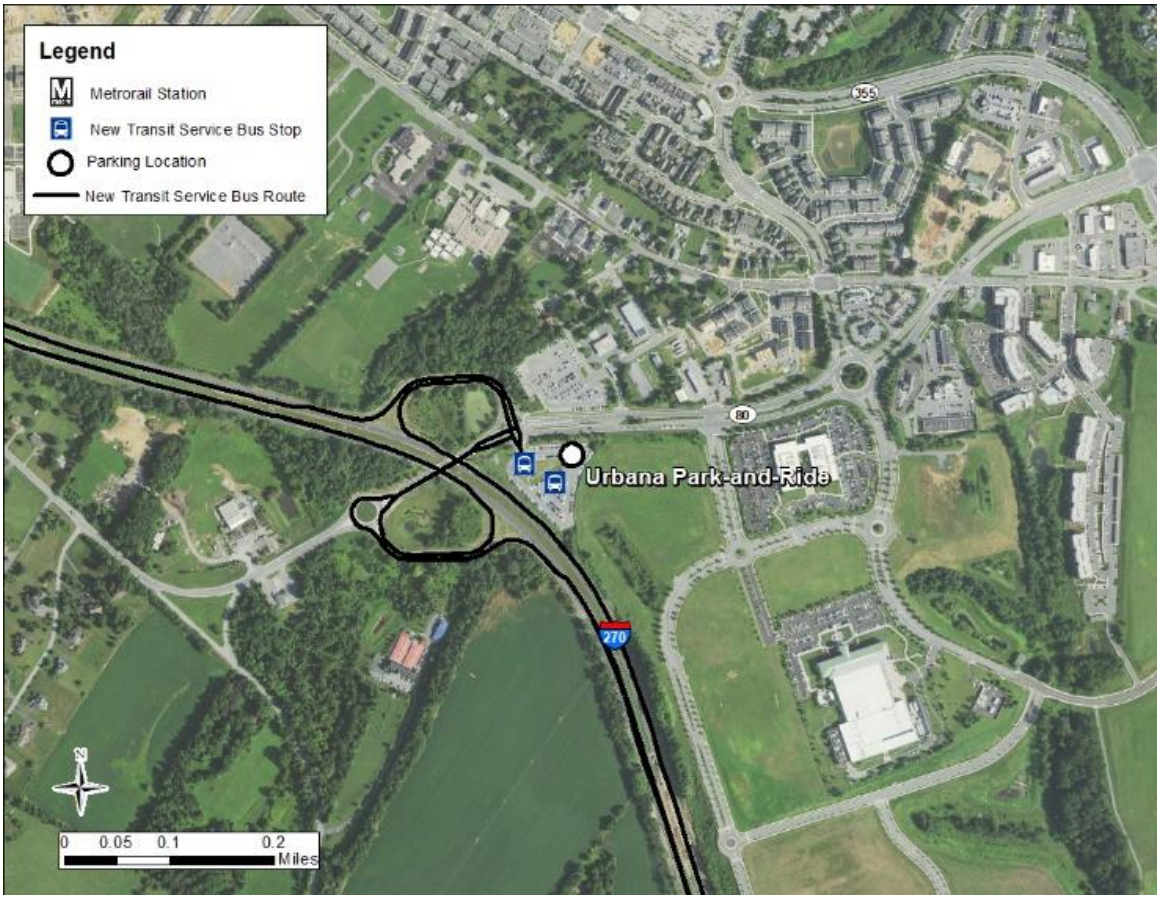
Figure 5-22: Germantown Parking and Facilities Location



Urbana

The Urbana parking area consists of the Urbana Park-and-Ride lot adjacent to I-270. Urbana itself is located further north of I-270 on MD 355, but the park-and-ride is conveniently located off of the freeway for easy access and is an ideal intermediate stop to capture riders, carpoolers, and vanpoolers between Frederick and Germantown. The park-and-ride lot has 511 existing parking spaces, which are currently utilized at a 62 percent capacity (315 available spaces). Currently, one of MDOT MTA commuter bus routes operating between Frederick and Rock Spring stops at the park-and-ride lot. This park-and-ride lot has one bus bay. Currently five vanpools originate in the Urbana area.

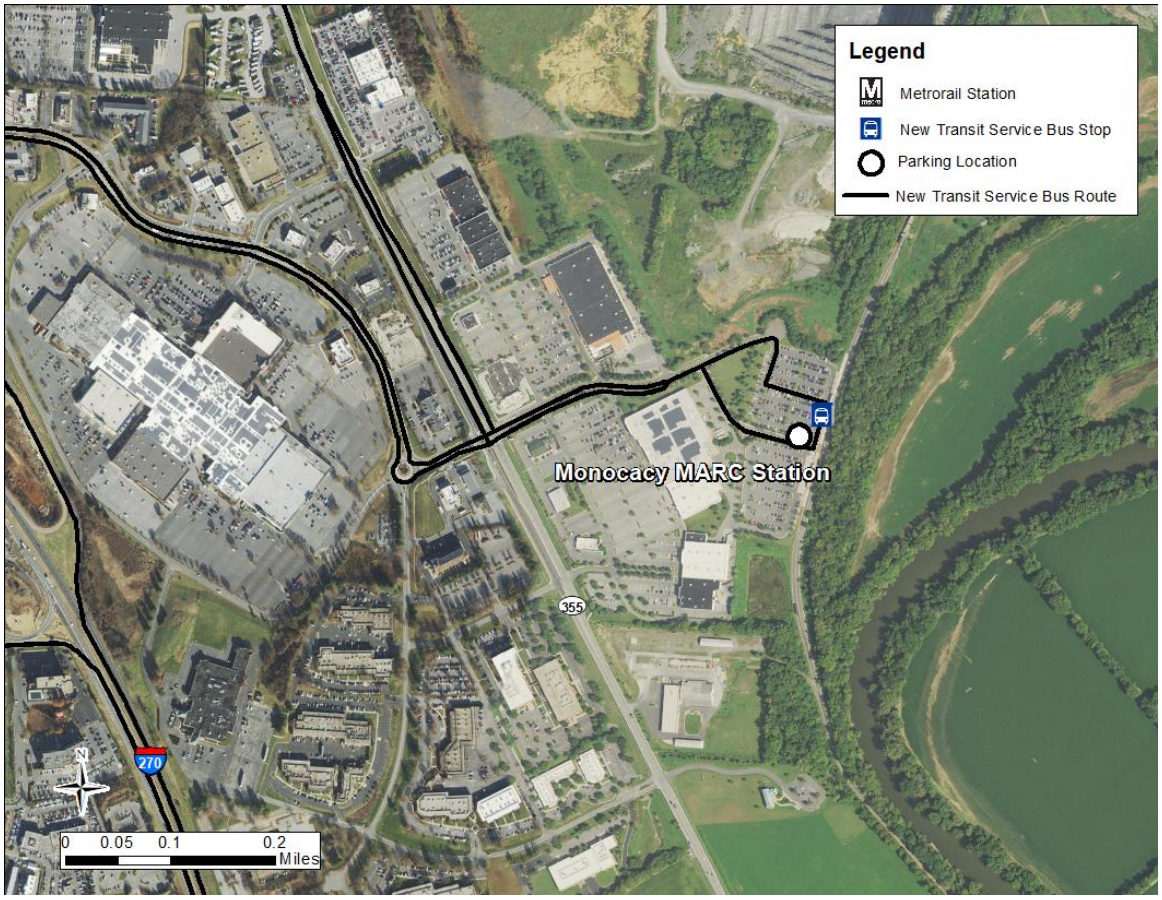
Figure 5-23: Urbana Parking and Facilities Location



Monocacy

The only stop in the Monocacy parking area is at the Monocacy MARC Station. The Monocacy MARC Station is the second-to-last stop on the Frederick Branch of the MARC Brunswick Line, located on the outskirts of Monocacy with convenient access to I-270. Monocacy is mostly a suburban stop with just a few existing MDOT MTA commuter buses and TransIT local routes stopping at the station and an abundance of parking. The station has 800 existing surface parking spaces, of which approximately 85 percent of the spaces are occupied on average.[23] The Monocacy MARC Station has four existing bus bays. Currently one vanpool leaves from the Francis Scott Key Mall adjacent to the Monocacy MARC Station.

Figure 5-24: Monocacy Parking and Facilities Location



[23] (Maryland Department of Transportation State Highway Administration, 2020)

Frederick

The Frederick parking area consists of the Frederick MARC station in downtown Frederick. Frederick is the final stop of the Frederick Branch of the Brunswick Line and a transfer point for several Frederick County TransIT routes, as well as MDOT MTA commuter bus routes. The station has approximately 100 surface parking spaces and an average occupancy of 9 percent.[24] Six vanpools originate in the City of Frederick—five at the park-and-ride lot at the intersection of I-70 and New Design Road.

Figure 5-25: Frederick Parking and Facilities Location

[24] (Maryland Department of Transportation Maryland Transit Administration, 2015)

Allocate Transit Ridership by Stop

Parking demand was calculated based on estimated preliminary 2045 ridership for each transit route. Estimated ridership was calculated for both outbound and inbound route directions, by stop, and consisted of the following steps. Ridership estimates for each route were developed based on total travel flows between the stops on each route alignment, as defined in the **Transit Service** section. Ridership was then estimated for each individual parking area by observing Streetlight travel flows between activity centers in each state. Streetlight data is the largest and most robust available source of travel flow data that includes all modes of travel. The proportion of trips for all modes of travel produced at each stop, including SOV, to the total number of trips produced on the route within each state was calculated to see which stops produced the most trips along each route alignment. These proportions for each stop were then applied to the total transit ridership for each route to estimate the total number of transit riders that would be utilizing each station. Bidirectional and peak direction only service types were taken into consideration when calculating ridership for each route. Since ridership estimates include both legs of work trips, ridership estimates were divided by two to only include the origin end of trips at each parking area. Importantly, varying demand estimates were calculated for each investment package—introduced in the **Potential Investment Packages** section—as each investment package reflects a varying level of transit service with commensurate ridership levels.

Parking Facility Access Mode Share

Because some stops are located in different development environments with varying levels of parking availability and accessibility from non-driving modes of transportation, assumptions were made regarding the share of riders getting to each stop by non-driving means. These assumptions are shown in **Table 5-18.**

As a check on the non-driving mode share assumptions for each of the potential stops, WMATA access mode ridership data from 2016 was evaluated for Metrorail stations within the study area. For Metrorail stations located in urban areas with good transit connectivity and minimal parking capacity, the initial assumption was that 90 percent of riders would access the proposed transit service by means other than driving a car. However, Metrorail stations located in suburban areas, such as Shady Grove and Dunn Loring Metrorail stations, had higher non-driving access mode shares. The access mode assumptions for all Metrorail stations were then adjusted to provide the most accurate estimated parking demand for Metrorail parking locations. The non-parking mode share assumptions for each parking and facilities location evaluated is detailed in **Table 5-20.**

Table 5-18: Parking and Facilities Location Assumptions

Development Intensity	Transit Connectivity	Parking Availability	Non-Parking Mode Share
Urban	Above Average	None	90%
Urban	Average	Some	75%
Suburban	Average	Abundant	25%
Rural	Below Average	Abundant	10%

Accounting for Growth in HOV travel

To provide an estimate of expected growth of existing lot usage, the new parking demand estimates consider carpool/vanpool growth in the study area by evaluating the HOV mode share on I-495 and I-270 during peak periods in the future. To assess the growth of carpool/vanpool travel within the timeframes of this study, the increase in HOV usage between 2019 and 2045 on segments of I-495 and I-270 was evaluated in the MWCOG Travel Demand Model. The results of that analysis indicated that between 2019 and 2045, HOV usage on I-495 in

Virginia and Maryland would increase by six percent and HOV usage on I-270 would increase by 14 percent. The growth factor of 14 percent was applied to existing occupancy rates at all parking locations along the I-270 corridor in Maryland since the majority of stops with existing parking, with the exception of Metrorail stations, are located in Maryland. This carpool/vanpool factor was not applied to Metrorail stations since WMATA charges users to park at the station, and it is unlikely that carpool/vanpool users would pay for parking when other locations have available parking.

Special Case - Westfield Montgomery Mall Transit Center

The Westfield Montgomery Mall is ready to proceed with a major redevelopment project that will impact the existing commuter parking capacity. On July 16, 2020, the Montgomery County Planning Board approved a site plan which would expand the Mall's overall commercial square footage, add residential units, and reconfigure the access and parking areas on the mall property. The approved site plan (Site Plan #82005003E)[25] maintains the location of the transit center in its current placement, on the northeast corner of the mall property and at the intersection of Westlake Terrace and the I-270 spur. The existing designated commuter parking area will be reconfigured and the impact to the current commuter parking capacity as a result of the redevelopment project is an overall reduction of dedicated commuter parking spaces. Currently, the Westfield Montgomery Mall Transit Center has 200 designated commuter parking spaces being utilized at 50 percent capacity. This equates to a utilization of approximately 100 spaces daily. The approved redevelopment plan (Site Plan #82005003E) indicates a reduction in the number of dedicated commuter spaces to 161. The new parking capacity identified in the mall redevelopment plan was used to calculate the total carpool/vanpool and transit demand for parking and is shown in **Table 5-19**.

Table 5-19: Westfield Montgomery Mall Parking Analysis

Existing Commuter Parking Spaces	Existing Commuter Parking Utilization	Redevelopment Plan Commuter Parking Spaces	Future Commuter Parking Utilization
200	100 (50%)	161	81

In addition to local bus services and the commuter services proposed in this report, the future Randolph Road Rapid Transit Corridor is proposed to connect to the mall.[26] Consequently, efforts to preserve adequate access to those services are important and should commence before further development in and around the mall property precludes the opportunity for safe, efficient, and practical access to the mall's major public transportation amenity.

Given the combination of Westfield Montgomery Mall's redevelopment plan and the scale of parking demand estimated with the proposed commuter services outlined in the **Potential Investment Packages** section, there is a need to consider investment in expanded or new parking facilities at or near the mall for commuters and transit users. That determination should occur through the development of a comprehensive parking demand study for the mall that considers all existing and proposed public transportation services. An objective determination of parking requirements that includes the preliminary needs documented in this report sets the foundation for discussions with the Westfield Montgomery Mall and their future interests in the parking and transit station area.

Compare Future Demand with Existing Capacity

Using these assumptions, the study team calculated the proportion of riders who would drive and park at a stop to access one of the proposed commuter bus services or participate in a new vanpool/carpool. From there, the

[25] (Montgomery County Planning Department, n.d.)
[26] (Montgomery County Department of Transportation, 2014)

number of parking spaces required at each stop facility or parking location area was calculated using existing parking capacity and occupancy numbers at each location.

Existing parking capacity and occupancy rates at Metrorail stations, MARC stations, and park-and-rides are documented in **Table 5-20**.

Identify Potential Parking Expansion Solutions

Three different types of potential parking and facility solutions were determined to support bus services across the Bridge:

- Demand can be served by existing parking capacity
- Potential expansion of existing parking facilities by negotiating new or by leveraging existing parking agreements for more spaces
- Potential expansion by construction of new surface or structured parking facilities

A parking location's solution was dependent on two factors: the total parking demand and availability of land. Several stops had very low demand for parking (<30 spaces) due to their assumed high non-driving mode share. These stops were also typically in urban areas where there is a considerable lack of available land for parking facilities, such as Tysons or Bethesda, and areas where pedestrian amenities and multimodal connections are prioritized over traditional parking infrastructure. For these stops, negotiating new or expanding existing shared used parking agreements with private landowners is an effective method for providing relatively small numbers of parking spaces without building expensive facilities.

Other parking locations have sufficient demand to warrant expansion of existing surface parking lots or construction of new lots. In areas where there is little available land to construct large enough surface lots, such as the Westfield Montgomery Mall Transit Center, a new parking structure may be warranted. Solutions for each parking location and the associated parking demand broken down by investment package can be found in **Appendix G: Parking Assessments**.

Table 5-20: Parking and Facilities Location Areas

Parking and Facilities Locations	Stops	Non-Driving Mode Share	Existing Parking Capacity	Existing Parking Occupancy (%)	Existing Parking Occupancy (Spaces)	Future Growth in HOV	Future Occupied Spaces***	Other Considerations
Tysons	Tysons Corner Metrorail Station	91%*	0	N/A	0	0	0	Metrorail Stations, planned Route 7 BRT, Potential alternative stop location at McLean Bible Church
	Spring Hill Metrorail Station	87%*	0	0	0	0	0	
Dunn Loring	Dunn Loring Metrorail Station	62%*	2,083	52%	1,076	0	1,076	Metrorail Stations
	Mosaic District	10%	0	N/A	0	0	0	
Reston	Reston Metrorail Station	75%*	0	N/A	0	0	0	Future Metrorail Station
	Reston Transit Center	75%	0	N/A	0	0	0	
Bethesda	Bethesda Metrorail Station	87%*	0	N/A	0	0	0	Metrorail Station, future Purple Line stop, Planned MD 355 BRT
	Medical Center Metrorail Station	99%*	0	N/A	0	0	0	
Silver Spring	Silver Spring Metro Station	94%*	0	N/A	0	0	0	Metrorail Station, future Purple Line stop, Flash BRT
Rock Spring–Westfield Montgomery Mall Transit Center	Westfield Montgomery Mall Transit Center	25%	161**	62%	100	6	106	Planned Randolph Road Corridor Rapid Transit[27]
Gaithersburg	Shady Grove Metrorail Station	54%*	5,745	100%	5,745	0	0	Metrorail Station, MARC Station, Planned Corridor Cities Transitway[28], Planned MD 355 BRT[29]
	Gaithersburg MARC Station	25%	280	N/A****	N/A****	N/A****	280****	
	Lake Forest Mall Transit Center	10%	417	25%	104	15	119	
	Gaithersburg Park-and-Ride	10%	470	65%	306	42	348	
Germantown	Germantown Transit Center	10%	175	100%	175	25	200	Planned Corridor Cities Transitway
Urbana	Urbana Park-and-Ride	10%	511	62%	317	44	361	N/A

[27] (Montgomery County Department of Transportation, 2014)
[28] (Maryland Department of Transportation Maryland Transit Administration, 2020)
[29] (Montgomery County Department of Transportation, 2020)

Parking and Facilities Locations	Stops	Non-Driving Mode Share	Existing Parking Capacity	Existing Parking Occupancy (%)	Existing Parking Occupancy (Spaces)	Future Growth in HOV	Future Occupied Spaces***	Other Considerations
Monocacy	Monocacy MARC Station	10%	800	85%	680	95	775	MARC Station
Frederick	Frederick MARC Station	10%	100	9%	9	1	10	MARC Station

Notes:

**Non-Driving Mode Share based on Metrorail data for access to stations by mode share (2016)*

***Existing parking capacity for the Westfield Montgomery Mall Transit Center reflects the number of spaces in the Mall's proposed redevelopment plan.*

****Future occupied spaces include the estimated growth in carpool/vanpools at each stop.*

*****Parking occupancy data for the Gaithersburg MARC station was unavailable.*

6. STAKEHOLDER AND PUBLIC ENGAGEMENT

Stakeholder Engagement

The study team, in partnership with MDOT MTA and DRPT, developed a Key Stakeholder Group for the Study which included representation from partner agencies and other regional stakeholders. The Key Stakeholder Group actively participated in the development of the Study by providing guidance and feedback to the study team and reviewing milestone documents prepared during the Study development process.

The Study stakeholder organizations are summarized below:

- Arlington County, VA
- Bethesda Transportation Solutions
- City of Alexandria, VA
- City of Falls Church, VA
- City of Fairfax, VA
- Dulles Area Transportation Association
- Fairfax County, VA
- Frederick County, MD
- Loudoun County, VA
- MDOT
- MNCPPC
- Montgomery County, MD
- MWCOG
- NVTA
- NVTC
- OmniRide
- Prince Georges County, MD
- Prince William County, VA
- Tysons Partnership
- Vanpool Alliance
- VDOT
- WMATA

Representatives from each organization were involved in the stakeholder meetings and the distribution and participation in project surveys.

Summary of Stakeholder Meetings

Because of the COVID-19 pandemic, all stakeholder meetings were held virtually over the Zoom platform. In many of the meetings, breakout sessions were utilized to encourage discussion. Additionally, real-time polling was used to gauge the stakeholders' interest in different preliminary potential recommendations. This section describes the meetings that were held. Meeting summaries are included in **Appendix H: Stakeholder Meeting Summaries.**

Stakeholder Meeting 1

The first stakeholder meeting was held on July 16, 2020, from 9:30 AM to 12:00 PM prior to the beginning of the recommendation development process to discuss existing conditions and needs in the study area.

Summary of Feedback Received

- Potential stops to consider for transit service: Lake Forest Mall Transit Center in Gaithersburg and Westfield Montgomery Mall Transit Center in Rock Spring
- Short-term potential routes might have lower frequencies and build over time to become more frequent
- Parking opportunities are limited in Virginia along I-495, but parking should be limited in activity centers such as Tysons and Reston as well as Bethesda and Silver Spring in Maryland

- Relationship building with employers and residential contacts and robust marketing campaigns are the most effective strategies for promoting carpool and vanpooling

Stakeholder Meeting 2

The second stakeholder meeting was held on August 28, 2020, from 9:30 AM to 12:00 PM following the completion of the **Initial Screening (Step 2)** of the preliminary potential recommendations.

Summary of Feedback Received

- Stakeholders emphasized that the transit route origin-destination pairs that would move the most people are between Bethesda and activity centers in Virginia including Tysons, Reston, Arlington, and Dunn Loring
- Stakeholders indicated that service to Dulles International Airport in Virginia and to White Oak in Maryland would be ideal origins and destinations for potential transit service
- Stakeholders ranked real-time arrival information the highest of all the preliminary potential technology recommendations in terms of ease of implementation and usefulness to the user
- Stakeholders ranked a vanpool formation and expansion program the highest in terms of managing congestion and moving more people, and ranked targeted employer outreach the highest based on ease of implementation

Stakeholder Meeting 3

The third stakeholder meeting was held on October 16, 2020, from 9:30 AM to 12:00 PM following the completion of the **Off-Model Testing and Evaluation (Step 3).**

Summary of Feedback Received

- Stakeholders indicated that the frequencies of the initial route recommendations seemed very low and that scenarios of higher frequency routes should be explored
- Stakeholders were concerned about the potential for transit routes to pull vanpool users from existing vanpool routes. A potential solution could be incentives for vanpool routes that show a reduction in riders due to new transit services.
- The Westfield Montgomery Mall Transit Center was emphasized again as an important interim stop on several routes
- The possibility of extending the Frederick–Arlington route to Washington, DC, via I-66 was also discussed
- Stakeholders agreed that the challenge moving forward is how to coordinate transit and CAPs as part of a traffic mitigation plan during the construction of the Managed Lanes and the Bridge

Stakeholder Meeting 4

The fourth stakeholder meeting was held on December 11, 2020, from 9:30 AM to 12:00 PM following the completion of the **Travel Demand Modeling (Step 4)** in the potential recommendation development process.

Summary of Feedback Received

- Branding and marketing around the managed lanes should emphasize the travel times savings associated with transit and carpool/vanpool
- Stakeholders agreed that next steps for implementing transit service include determining the operator, level of service, alignment, and maintenance facilities.

- Additional technology improvements, such as a universal transit fare payment system and coordinated departure times between services could make transit more attractive to users.
- Transit options during construction of the managed lanes should be considered as a traffic mitigation strategy and to help bolster support for future transit service across the bridge, but buses are not likely to be able to use the shoulder in Virginia and will be in general traffic.
- The West Park Transit Center in Tysons is planning to be redeveloped and might be a more suitable terminus for routes arriving or leaving Tysons than the Spring Hill Metrorail Station due to its bus bay capacity and layover space.

Public Outreach

As a part of public engagement efforts associated with the Study, two surveys were created by the study team and were distributed to the public via the study team and project stakeholders.

Summary of Survey 1

The first survey was published following **Step 1: Develop List of Evaluation Options** in the recommendation development process. The purpose of the first survey was to gain a better understanding of who is using the Bridge and for what purpose they are choosing that travel pattern. Additionally, the survey sought to capture respondents' perceptions of travel conditions over the Bridge and any multimodal preferences they might have.

The survey was live from July 21, 2020, to August 28, 2020. A total of 114 responses were received. According to responses, commuter bus service had the highest desirability of the multimodal options for travel across the Bridge. The availability of a park-and-ride near one's home or along route increased desirability of multimodal options. A monetary incentive to try this service created a similar increase in desirability. A full summary of Survey 1 results can be found in **Appendix I: Survey #1 Results.**

Summary of Survey 2

The second survey was published following the completion of **Off-Model Testing and Evaluation (Step 3)** in the recommendation development process. The survey updated the public on the preliminary potential recommendations being developed and asked respondents to react to potential recommendations. Feedback from the survey will be used in finalizing the potential recommendations in the final report.

The survey was live from November 12, 2020, to December 15, 2020. A total of 117 responses were received. 46 percent of respondents selected that a preliminary potential bus route served one of their most frequent travel patterns. Bethesda (home) to Tysons (destination) was the most popular route. Both high bus frequency during commute hours and a wide range of service times throughout the day were factors that would encourage transit use. Additionally, respondents valued technology strategies that could provide users with real-time bus arrival information. To recognize the impact the COVID-19 pandemic might have on future travel, the survey asked if respondents expected to telework more in the future of which, 59 percent of respondents selected yes. A full summary of Survey 2 results can be found in **Appendix J: Survey #2 Results**.

Joint Public Meeting with I-495 Next

On November 18, 2020, VDOT and DRPT held a virtual joint public meeting to present the I-495 NEXT and the Study. Each agency updated attendees on the status of their respective projects and provided

updates of progress made since the last public meeting. After each presentation, attendees asked questions to the VDOT and DRPT presenters about aspects of the projects. The meeting was held following the completion of **Step 3: Off-Model Testing and Evaluation**. DRPT presented the results of the off-model testing and evaluation process and laid out the next steps in the Study. The feedback regarding transit planning across the Bridge is summarized below.

Takeaways

- Parking in and around Tysons will be an issue for commuter bus services leaving from Tysons.
- Interstate transit service is being considered now because commuter buses would operate much faster on the Managed Lanes than they would in the general-purpose lanes.
- Participants asked about a Metrorail alternative, but no prior plans call for a Metrorail route to be built across the Bridge.
- Participants express interest in autonomous transit shuttles and freeway median stations as considerations for transit service.

Public Input

On December 21, 2020, a Summary Report of this study was posted to the DRPT website. The Summary Report was a condensed version of this document and outlined the project background, methodological approach, and proposed investment packages. DRPT received public comments on the Summary Report between December 2020 and February 1, 2021. Many of the comments were in regard to the I-495 NEXT and Maryland MLS projects, and not transit service and TDM programming across the Bridge. A revised version of the Summary Report with responses to key themes in the comments was returned to DRPT and is included in **Appendix K**. A brief synopsis of the comments related to transit service across the Bridge are summarized below:

- Request that some transit service should be implemented in the near-term to alleviate congestion immediately while the managed lanes are under construction.
- Concern that the proposed transit service is not enough to meet future demand.
- Request that additional planning and analysis be conducted to further refine transit routes and level of service.
- Noting importance of identifying a service operator and ongoing coordination between the two states.
- Request that recommendations be embedded in final procurement documents for Public Private Partnership projects in both states.

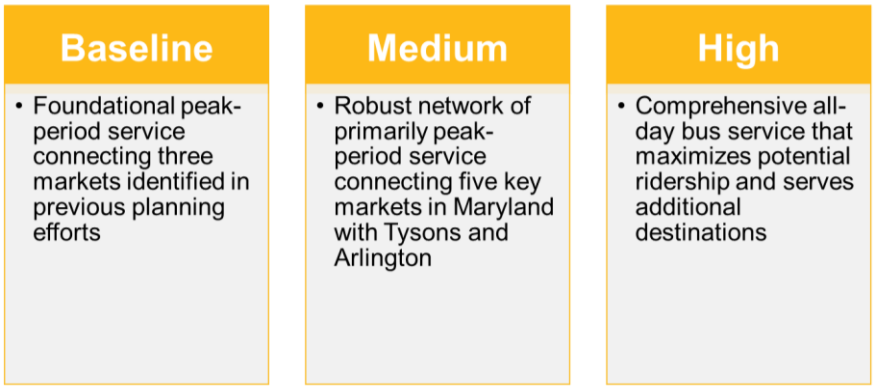
7. POTENTIAL INVESTMENT PACKAGES

Approach

Potential transit and TDM recommendations discussed in the previous section have been grouped into three investment level packages: baseline, medium, and high. The organization of improvements into the varying investment packages offers several advantages, most importantly, establishing a framework of services based on anticipated funding levels. Organizing improvements into the investment packages also allows for modification of priorities based on agency and stakeholder preferences for groupings of services and associated costs and benefits. Furthermore, changes in the operating environment, assumptions on the availability of managed lanes for transit service, and/or even changes in the level of commuter bus service can be factored into the investment packages once desired funding levels are established.

Each package is built around the level of transit service. Packages were developed to provide three varying levels of service in terms of frequency, markets served, and span (time of day). **Figure 7-1** provides a summary of the level of transit service in each investment package.

Figure 7-1: Investment Package Transit Levels of Service



Identification of complementary technology enhancements, CAPs, and parking needs within each investment package reflect consistency in terms of their implementation timeframe and their supportive role to the bus services. **Although the various investment packages lend themselves to an incremental and cumulative implementation approach, it is important to note that each investment package can stand on its own as an overall bundle of Transit/TDM enhancements.**

A framework for rollout for the potential recommendations improvements in each investment package was developed. That framework provides guidance for development of implementation timeframes in which complementary projects can be grouped together for delivery at the same time. The following considerations were examined when determining the timeframes of projects in each investment package:

- **Infrastructure Assumptions** — The anticipated status of the construction of the managed lanes network in Virginia and Maryland
- **Implementation Effort** — Length of time or amount of effort involved in implementing the service
- **Demand Served** — Whether the Study is serving an existing demand or one that is forecast to grow over time

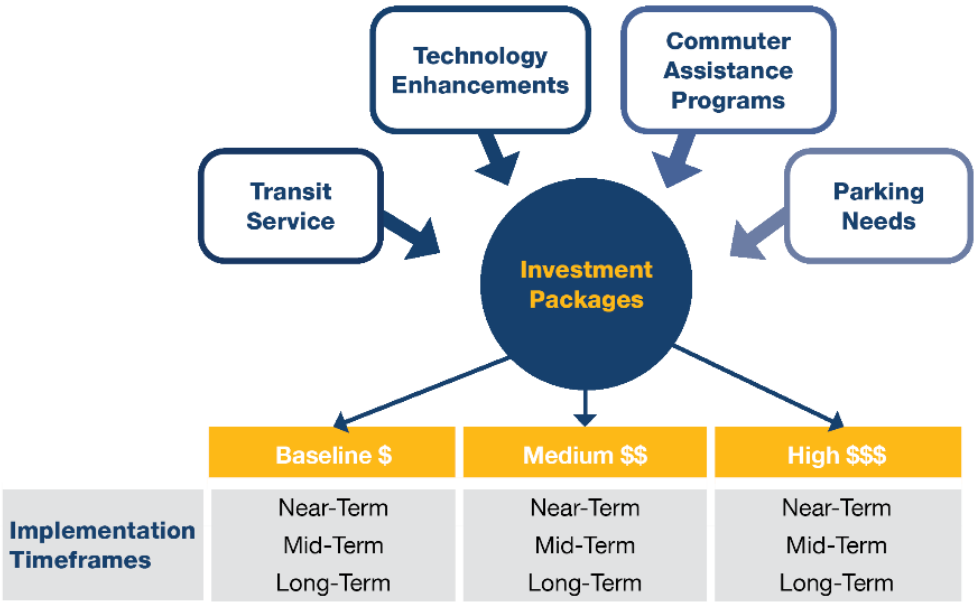
- **Complementary Service** — Grouping of projects that supplement or enhance the use of new infrastructure or transit service.

For the purpose of this study, given the uncertainty in timing of potential managed lanes, timeframes have been assigned as follows:

- **Near-Term** — Prior to the opening of the managed lanes up to and over the Bridge in both Maryland and Virginia
- **Mid-Term** — In conjunction with the opening of the managed lanes up to and over the Bridge in both Maryland and Virginia
- **Long-Term** — Following opening of the managed lanes in Maryland and Virginia.

Figure 7-2 shows the components that are included in the investment packages and associated timeframes.

Figure 7-2: Potential Investment Package Framework



Package Elements

The following summarizes the elements that are included in the three packages. These vary package to package in terms of service levels and implementation timeframe. The process to develop these elements is described in the **Potential Recommendations Development Process** section.

Transit Service Routes

These represent the connections analyzed in the potential recommendations development process section. Throughout the packages, if a route is included, the alignments are consistent, but service levels vary depending on frequency and the provision of off-peak service. Individual maps can be found in the **Summary of Results** section.

- Bethesda to Tysons
- Bethesda to Dunn Loring via Tysons

- Bethesda to Reston/Dulles
- Silver Spring to Tysons
- Germantown to Tysons
- Gaithersburg to Tysons
- Frederick to Tysons
- Frederick to L'Enfant via Arlington

Technology Enhancements

- **Virginia and Maryland Commuter Parking Information Systems** — Provides commuters with reliable expected parking space availability for parking lots serving rail, bus, and carpool/vanpool commuters, potentially leveraging RM3P
- **Real-Time Toll and Transit Information** — Work with private partners to incorporate real-time toll, congestion, and transit data into commonly used apps like Google Maps and Waze.
- **Real-Time Transit Arrival Information** — Work with transit agencies to make real-time arrival data available for public use. Once available, transit agencies can work with private partners to incorporate real-time transit arrival time information in commonly used apps such as Google Maps Transit and Transit App.
- **Real-Time Passenger Load Information** — Work with private partners to incorporate real-time passenger load information for transit services in commonly used apps such as Google Maps Transit and Transit App using APCs
- **Transit Signal Priority**: — Transit signal priority and/or queue jumps at high-priority, bottleneck intersections on new transit routes to improve transit travel time reliability. This would need to be coordinated with local roadway and traffic signal operators. This study does not propose any specific locations for transit signal priority.

Commuter Assistance Programs

The following are elements of a study-specific CAP that will target commuters going over the Bridge:

- **Corridor-Specific Mobility Options Marketing Campaign** — Public-facing media coverage (e.g., print, radio/TV, and digital) and advertisement via radio, news sites, and social media regarding transit service across the Bridge
- **Targeted Residential Outreach** — Target outreach to commuters in the study area advertising and promoting the new transit routes and vanpool/carpool incentives as they become available
- **Targeted Employer Outreach** — Target employers located in and around key activity centers in the study area with promoting the new transit routes and vanpool/carpool incentives as they are available
- **Vanpool Formation and Expansion Program** — Financial incentives to start new vanpools and retain existing ones that travel over the Bridge
- **Corridor-Specific HOV Incentive** — Short-term financial benefit to try a new mode (e.g., car/vanpool or transit) that travels along the Bridge. This could be implemented using an existing or planned mobile platform.

Parking Needs

Three different types of potential parking and facility solutions were identified to support the Bridge's commuter bus services:

- Demand can be served by existing parking capacity
- Potential expansion of existing parking facilities by negotiating new or by leveraging existing parking agreements for more spaces
- Potential expansion by constructing new surface or structured parking facilities

The parking and facilities solutions are closely tied to the transit route services that provided services to each parking and facilities location. In several instances, the demand for parking at each location did not warrant construction of new surface or structured parking. In those cases, shared use agreements with private landowners were the most cost-efficient way to satisfy the demand for parking. These parking cost estimates are related only to the parking demand generated by the proposed services evaluated in this Study. Additional parking demand resulting from regional growth and other planned transit services are not considered in these parking demand and cost estimates. Operating, maintenance, and capital cost assumptions for each of the two types of facility solutions are documented below.

Assumptions

Preliminary high-level operating, maintenance, and capital cost estimates were developed for each of the commuter bus services, CAPs, technology, and parking needs. The following section documents cost estimates for all projects and the assumptions used to develop those cost estimates, and it presents the resulting baseline, medium, and high investment packages. All cost estimates are presented in 2020 dollars.

Transit Operating Costs

At this point, a potential operator for these potential services has not been identified. Therefore, there is a need for an approach that uses a blended rate. Annual net operating costs assumed weekday service only, a farebox recovery rate of 37 percent, and an hourly cost of $152 per revenue hour. The cost per revenue hour represents a weighted, average hourly operating cost for the 14 transit agencies operating bus services in the Washington Metropolitan National Capital Region.(**Table 7-1**). The operating cost per revenue hour for all agencies was obtained from the FY2018 NTD. Weighting of hourly costs was based on the number of revenue hours operated by each agency where more weight was given to the hourly cost of those agencies operating more service hours throughout the region.

It is important to note that the blended average cost per hour is slightly overstated. As shown in **Table 7-1**, systems reporting under the mode Commuter Bus – Purchased Transportation (CB-PT) report a higher cost per revenue hour. This is consistent with contract provisions that require operators to supply revenue vehicles and/or perform associated preventative maintenance activities. At this phase in the service development process, the mechanism for service delivery remains unknown, and the blended rate presented in **Table 7-1**—inclusive of the various public bus agencies in the region—is considered a reasonable and conservative planning estimate for developing costs. Additionally, this methodology allows for a more accurate depiction of equipment requirements and the associated calculation of capital costs and revenue vehicle costs as part of the assessment of needed funding levels.

The farebox recovery rate was calculated using NTD farebox recovery data for all NTD commuter bus reporters. That list of commuter bus reporters includes both directly operated services and purchased transportation. The resulting average operating ratio is approximately 37 percent. This farebox ratio is higher than the average farebox ratio for the 15 transit agencies listed in **Table 7-1**(e.g., 24 percent). Similar to the cost per revenue hour, this new farebox ratio reflects a reasonable and conservative planning level estimate and safeguards against possible overestimate of farebox returns, regardless of who eventually operates the service.

Table 7-1: Hourly Operating Cost of National Capital Region Transit Agencies

Agency	Mode	Cost per Hour	Vehicle Revenue Hours
WMATA	MB-DO	$179.88	3,767,231
MDOT MTA	CB-PT	$268.34	241,797
PRTC	CB-PT	$241.39	68,421
Montgomery County, MD: Ride On, Montgomery County Transit	MB-DO	$113.04	1,051,439
Fairfax County, VA, dba: Fairfax Connector Bus System	MB-PT	$114.78	749,786
Prince George's County, MD, dba: Prince George's County Transit	MB-PT	$117.75	229,277
City of Alexandria, VA	MB-DO	$78.20	218,422
Loudoun County, VA, dba: Loudoun County Transit	CB-PT	$165.00	71,766
Loudoun County, VA, dba: Loudoun County Transit	MB-PT	$72.25	58,611
Arlington County, VA, dba: Arlington Transit	MB-PT	$83.39	175,417
County of Howard, MD	MB-PT	$96.54	82,129
District Department of Transportation (DDOT): Progressive Transportation Services Administration	MB-PT	$105.48	238,018
Frederick County, MD: TransIT Services of Frederick County	MB-DO	$79.92	64,816
City of Baltimore, MD	MB-PT	$59.64	54,647
City of Fairfax, VA dba: CUE Bus	MB-DO	$118.20	33,576
Straight Average		**$126.25**	
Service Weighted Average		**$152.59**	

MB-DO = Motorbus-Directly Operated
MB-PT = Motorbus-Purchased Transportation
CB-DO = Commuter-Bus-Directly Operated
CB-PT = Commuter-Bus-Purchased Transportation

Vehicle Costs

Vehicle costs were based on peak-vehicle requirements and assume 40-foot, diesel-powered transit buses at $600,000 each. These vehicle costs do not include spare vehicles. A spare vehicle ratio of 20 percent was included in the final vehicle cost for the investment packages because spare buses are based on the grouping of routes—not individual services. These vehicle costs only cover initial purchases of vehicles and do not include life-cycle replacements.

CAP

The TDM ROI Calculator utilizes user-entered assumptions and costs for each proposed CAP program to develop program benefits. For each program, a series of assumptions were made to accurately capture each potential option's ROI based on the structure of the tool. Among the various assumptions are the number of participants anticipated to use each program. The assumptions used to develop costs and ROI are documented in **Appendix E: CAPs Evaluation Assumptions**. A 25 percent growth factor was added to assumed cost to capture the range implementation costs. Program costs were looked at in terms of one-time capital costs and annual operating expenses and are shown in **Table 7-2**.

Table 7-2: CAP Program Costs

CAP Program	Capital Cost (FY 20 $)	Annual Operating Cost (FY 20 $)
Corridor-Specific Mobility Options Marketing Campaign	$100,000 – $125,000	$187,000 – $233,000
Targeted Residential Outreach	-	$160,000 – $200,000
Targeted Employer Outreach	-	$160,000 – $200,000
Vanpool Formation and Expansion Program	-	$158,000 – $198,000
Corridor-Specific HOV Incentive	-	$166,000 – $207,000

Technology

Cost estimate ranges for technology options 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.[30] Specific capital unit cost and O&M cost assumptions are described for each recommendation in **Appendix F: Technology Evaluation Assumptions**. The total costs for each of the technology recommendations increases based on the proposed frequencies of the transit routes and number of vehicles required to operate the service.

Parking and Facility Needs

Parking Operating and Maintenance Costs

Maintenance for new park-and-ride spaces includes routine and periodic upkeep activities such as patching, striping, painting, drainage clean-out, landscaping, and snow removal and replacement of pavement, traffic control devices, fences, and guardrails. An industry standard O&M cost of $150 per space per year was assumed for new structured parking facilities and park-and-ride expansions.

O&M costs for shared use parking agreements depend on a number of factors. Since there is no standard practice for a public entity to lease parking spaces from a private landowner and the parameters and responsibilities in these agreements can vary drastically from one to the next, an annual cost per space was calculated for this cost estimate. The cost of leasing parking spaces is dependent upon the market in which the parking facility is located. Most of the areas in which shared use parking agreements are located are highly developed urban areas or suburban shopping malls in the Washington Metropolitan National Capital Region. To estimate the cost to lease spaces in this market, monthly parking rates for available spaces listed on SpotHero.com in Tysons, Rosslyn, Bethesda, and Silver Spring were analyzed. The average monthly rate for a parking space across these four areas was $143, which equates to $1,713 annually.[31] This number represents the cost to lease just one space and could possibly be lower if a local jurisdiction or state agency wanted to lease several spaces owned by the same owner for longer periods of time. This $1,713 annual lease does not include any of the O&M activities that are included in the new park-and-ride O&M cost because the terms and responsibilities of these agreements can vary. As a result, it was assumed that all traditional parking maintenance and upkeep activities would be performed by the owner of the parking facility and not the lessee.

Parking Capital Costs

The cost of new parking spaces depends primarily on the market in which the spaces are being constructed and the site on which parking is being developed. An estimate of $21,090 per space, was

[30] (United States Department of Transportation, 2020)
[31] (Spot Hero, 2020)

used to calculate the cost of constructing a new structured parking facility.[32] An estimate of $12,600 per space was used to calculate the cost of expanding an existing surface parking lot. This unit cost was developed based on a review of proposed park-and-ride project cost estimates from Virginia FY2020 SMART SCALE applications.[33] This unit cost does not include right of way (ROW) costs and utilities, so a 125-percent-of-construction-rate was used to estimate the cost of ROW and utilities.[34] No capital costs were assumed for shared-use agreements since the parking spaces have already been constructed.

Additional Parking Analysis

The estimated demand for parking is based on the demand associated with the Bridge's proposed commuter services and future carpool and vanpool travel between Virginia and Maryland. As indicated earlier in this report, the parking demand of other transit service enhancements—beyond the Bridge's proposed commuter services—are not included in this analysis. To integrate the parking demand for other services with the estimates developed for the Bridge's commuter services, the same granular station-by-station analysis will need to be performed as was conducted for this effort. That analysis may need to be supported by the MWCOG regional travel demand model. Two options exist for conducting a comprehensive parking demand analysis.

1. **Conduct a regional parking demand analysis** — In addition to integrating new transit services, this analysis may require modifications to the travel demand model to reflect growth throughout the region.
2. **Replicate the Bridge commuter services parking demand analysis using other transit service enhancements** — The following steps will need to be performed prior to performing this analysis:

    1. Prioritize new transit service enhancements defined in the recently completed Transit Service Coordination Report and other relevant transit development plans in the region. That prioritization effort should include general guidelines for phasing and implementation.
    2. Define the operating characteristics of those prioritized services to include stop locations, frequency or number of morning and evening commuter trips, service span, and service days
    3. Build the new services into the MWCOG model in order to forecast new transit ridership levels and gauge any impacts to the carpool/vanpool mode share

Maintenance Facility Needs

The study team acknowledges that the implementation of new service and thus new vehicles, introduces the need for storage and maintenance of these vehicles. Given that a potential operator has not been identified, maintenance facility locations, needs, and associated costs have not been identified as part of the Study and should be done in coordination with the assignment of an operator.

Implementation Effort

Each package of improvements is characterized largely by its level of transit services and the premise for implementation of those services within the near-, mid-, and long-term phases of each package is tied to the availability of the managed lanes. Additional package elements, including the commuter assistance programs, technology, and parking needs, serve a complementary or supportive role to those transit services. Factors that describe the implementation effort of each of the supportive elements are defined in order to convey the amount of effort needed to roll those programs out as proposed. The more factors

[32] (Smith, 2020)
[33] (Richmond Regional Transportation Planning Organization, 2019)
[34] (Virginia Department of Transportation, 2015)

identified for each transit/TDM enhancement, the more effort and complexity is assumed to implement the projects proposed for each investment package. Implementation factors include the following:

- Multi-Entity Coordination — Coordination is required between multiple entities (private or public) for any one project
- Multiple Locations — Deployment or coordination at multiple locations is required to proceed with a full implementation as proposed
- Technology/Software Integration — Technologies that require software integration between multiple operators, including transit, parking, and traffic management system operators
  Major Capital Investment — Includes new major parking facilities

Non-transit package elements were given an implementation effort score of low, medium, or high.

Ridership Forecasts

Each of the potential transit service routes includes an estimate for forecast total daily riders over the Bridge. This is a number of people per day in 2045 forecast to cross the Bridge on the transit service. It should be noted that forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors. The model also produced passenger miles traveled (PMT) that is a measure of total distance per day in 2045 traveled by passengers on the route. This includes passengers that do not necessarily pass over the Bridge. These should be treated as high-level forecasts based on available data and tools today. More detailed forecasting should be done closer to potential implementation with more refined data for that specific route.

Routing and Stop Locations

Stop locations and specific routing within a general area (such as Tysons) were identified to show feasibility. The process took into account infrastructure limitations such as which direction one can access bus bays. In some cases, there is limited stop service in the origin location before accessing the interstate. This is a tradeoff between overall travel time and providing more access—especially in locations without parking access. The routing and stop locations should be refined in close coordination with the potential operator, local jurisdictions, and connecting transit operators prior to implementation.

Baseline Package

Overview

- The baseline investment package focuses on low-cost traffic mitigation strategies with high rates of ROI that do not rely heavily on construction of the managed lanes for implementation
- The key distinguishing feature of the baseline investment package is that minimal infrastructure investment is required to implement projects. This equates to an investment package with a lower initial funding requirement and a minimal annual operating expense.
- Transit service in the base package is consistent with markets that have been identified in previous studies

Transit Service Elements

The baseline investment package focuses on providing service on the two corridors identified in previous plans: Bethesda to Tysons and Gaithersburg to Tysons. These services would operate every 30 minutes during the peak period only. The Bethesda to Tysons service would run in both directions, while Gaithersburg to Tysons would operate to Tysons in the morning and from Tysons in the afternoon/evening. Routing for the two routes is illustrated in **Figure 7-3** and **Table 7-3** details the proposed level of service for each. These routes are anticipated in the mid-term in conjunction with the opening of the managed lanes. It should be noted that mid-term service could be advanced to begin in the near-term prior to the managed lanes opening.

Table 7-3: Transit Service – Baseline Investment Package

Alignment	Direction	Peak Frequency (min)	Daily Bridge Riders (2045)	Time Frame
Bethesda to Tysons	Bi-Directional	30	400	Mid-Term
Gaithersburg to Tysons	Peak Direction Only	30	600	Mid-Term

***Note**: Bethesda to Tysons could be advanced into near-term.*

Figure 7-3: Schematic Map of Proposed Routes and Stops —– Baseline Investment Package

Additional Package Elements

Technology Enhancements and Commuter Assistance Programs

The baseline package includes technology enhancements in the near-term that support carpooling and vanpooling. Technology enhancements include the Virginia and Maryland Commuter Parking Information Systems.

The CAPs include all of the CAP elements except for the study area specific mobility marketing campaign. Those programs are assumed in the baseline package as they focus primarily on increasing carpooling and vanpooling use in the corridor.

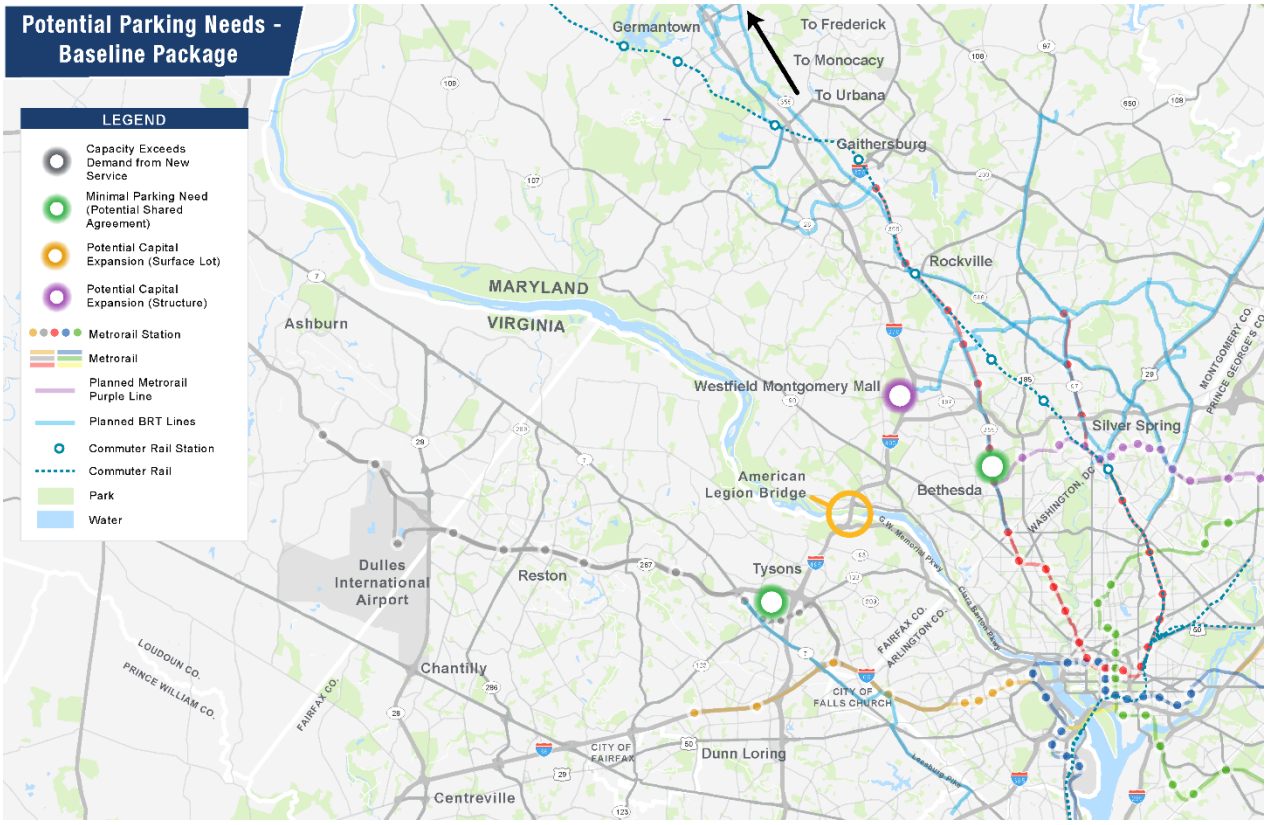
Parking and Facility Needs

To satisfy the parking demand for the Tysons to Bethesda and Tysons to Gaithersburg routes in the Baseline Investment Package, a modest number of spaces would be needed in the Bethesda and Tysons areas through shared use agreements. A new parking structure may be required at the Westfield Montgomery Mall Transit Center. **Table 7-4** lists the parking demand and type of parking expansion for each location. **Figure 7-4** shows the location of the potential parking need locations in association with the location of the Bridge and other transit services operating throughout the region.

Table 7-4: Parking and Facilities Needs Assessment – Baseline Investment Package

Parking and Facilities Location	Potential Type of Expansion	Number of Spaces
Tysons	Shared Use Agreement	< 30
Bethesda	Shared Use Agreement	< 30
Westfield Montgomery Mall Transit Center	New Parking Structure	90

Figure 7-4: Potential Parking Needs – Baseline Package



Implementation

Full implementation of the baseline package is anticipated to occur in the near and mid-term phases. That approach to programming is commensurate with the level of transit services proposed and the availability of managed lanes to support the two transit services and the carpool/vanpools benefitting from the commuter services programs and commuter parking information system.

Near-Term

Prior to the availability of managed lanes, commuter services programs and technology could be implemented to support and expand on the existing commuter traveler market. The commuter assistance programs provide a strong basis for incentivizing carpools and vanpools and provide funding for targeted outreach that can expand the network of commuters identifying themselves as available for group travel.

Additionally, commuters that carpool or vanpool throughout the region could benefit from the commuter parking information system that would provide parking availability and other important traffic and traveler information via dynamic messaging signs at parking facilities, on the highway, and via mobile applications.

As indicated, implementation of these programs does not require the opening of the managed and reflect a low relative annual operating cost when compared to other transit/TDM projects.

Transit service slated for mid-term has the potential to be advanced to be offered before or during construction as a possible congestion mitigation strategy.

Mid-Term

The two new transit services would be assumed to be in place with the opening of the new managed lanes. Implementation of those services would require supporting parking expansion to meet the associated demand. In terms of implementation effort, expansion of the Westfield Montgomery Mall is a major capital infrastructure need that would require coordination between multiple agencies, including the integration with the commuter parking information system.

Table 7-5 organizes the other Transit/TDM supportive elements into their respective implementation timeframes and indicates the level of effort in order to implement them as proposed.

Table 7-5: Implementation Effort - Baseline Package

Key Implementation Effort: = Low = Medium = High	**Implementation Effort**
Technology Enhancements	
Near-Term • VA and Maryland Commuter Parking Information	
Commuter Assistance Programs	

Near-Term
• Corridor-Specific Commuter Assistance Program
  ◦ Targeted Residential Outreach
  ◦ Targeted Employer Outreach
  ◦ Vanpool Formation and Expansion Program
  ◦ Corridor-Specific HOV Incentive Program
Continual
• Ongoing Regional and Statewide Programs	

Capital Parking Expansion Needs	
Mid-Term • Westfield Montgomery Mall Transit Center	

Summary of Benefits and Costs

In addition to the MWCOG equity emphasis areas and transit connections shown in **Figure 7-3**, the baseline investment package affords a number of person-throughput benefits including new transit ridership over the Bridge, more passenger miles traveled (PMT) using transit, and reductions in daily trips from CAP programs. Key transit services benefits are illustrated in **Figure 7-7** and salient benefits for all of the baseline package improvements include the following:

Figure 7-5: Baseline Investment Package Summary of Benefits

Each element included in the baseline investment package, along with their respective operating and capital cost requirements, are outlined in **Table 7-6.**

Transit Operational Costs

Operating costs shown represent a potential range of annual expenses to operate the service based on the lack of identified operator at this stage of planning. The low end of the range is based on the blended rate as described in the ***Cost Assumptions*** *section. The high end of the range is based on the FY2018 NTD-reported operating costs of the Commuter Bus-Purchase Transportation (CB-PT) delivery model. This number is notably higher than the blended rate of $152 per hour due in part to practices of including expenses such as preventative maintenance and use of vehicles as part of the reported operating cost. Regardless of which operator is selected, more refined cost estimates for operating and vehicle purchases will need to be developed in future phases of planning using costs specific to that operator.*

Table 7-6: Operating and Capital Costs — Baseline Investment Package

Category	Transit/TDM Improvements	Annual Service Hours	Net Annual Operating Cost Range ($K)	Vehicle/Capital Cost Range ($M)	Implementation Timeframe
Transit Service	Bethesda to Tysons	6,050	$579 – $1,021	$2.40 – $3.00	Mid-Term
	Gaithersburg to Tysons	7,560	$724 – $1,276	$3.00 – $3.75	Mid-Term
	Spare Vehicle Requirement (20%)			$1.20 – $1.50	
	Total Transit Service		**$1,303 – $2,279**	**$6.60 – $8.25**	
CAPs	Targeted Residential Outreach		$160 – $200	-	Near-Term
	Targeted Employer Outreach		$160 – $200	-	Near-Term
	Vanpool Formation and Expansion Program		$158 – $198	-	Near-Term
	Corridor-Specific HOV Incentive		$166 – $207	-	Near-Term
	Total CAP		**$644 – $805**	-	
Technology	Virginia Commuter Parking Information System		$38 – $80	$0.43 – $0.92	Near-Term
	Maryland Commuter Parking Information System		$102 – $220	$1.08 – $2.36	Near-Term
	Total Technology		**$140 – $300**	**$1.51 – $3.28**	
Parking	Tysons Agreement		$17 – $21	-	Mid-Term
	Bethesda Agreement		$34 – $43	-	Mid-Term
	Westfield Montgomery Mall Transit Center		$14 – $17	$1.90 – $2.37	Mid-Term
	Total Parking		**$65 – $81**	**$1.90 – $2.37**	
	Total		**$2,152 – $3,483**	**$10.01 – $13.90**	

Notes:

- *See* **Assumptions** *section for more details on operating and capital costs*
- *All costs are in $FY20*
- *Capital costs for transit service only include costs associated with vehicle purchases. The costs only cover the initial purchase of vehicles and do not include life-cycle replacements or new/expanded vehicle maintenance facilities*
- *Bethesda to Tysons West – Possible implementation in the Near-Term*
- *Total values may be equal to sum of recommendations due to rounding*

Medium Package

Overview

- The medium investment package consists of transit/TDM enhancements that take advantage of the managed lanes over the Bridge.
- A key characteristic of the medium package is a significant increase in commuter bus services and supporting technologies that enhance the commuter experience.
- The medium package also introduces off-peak midday service for one high-ranking route.

Transit Service Elements

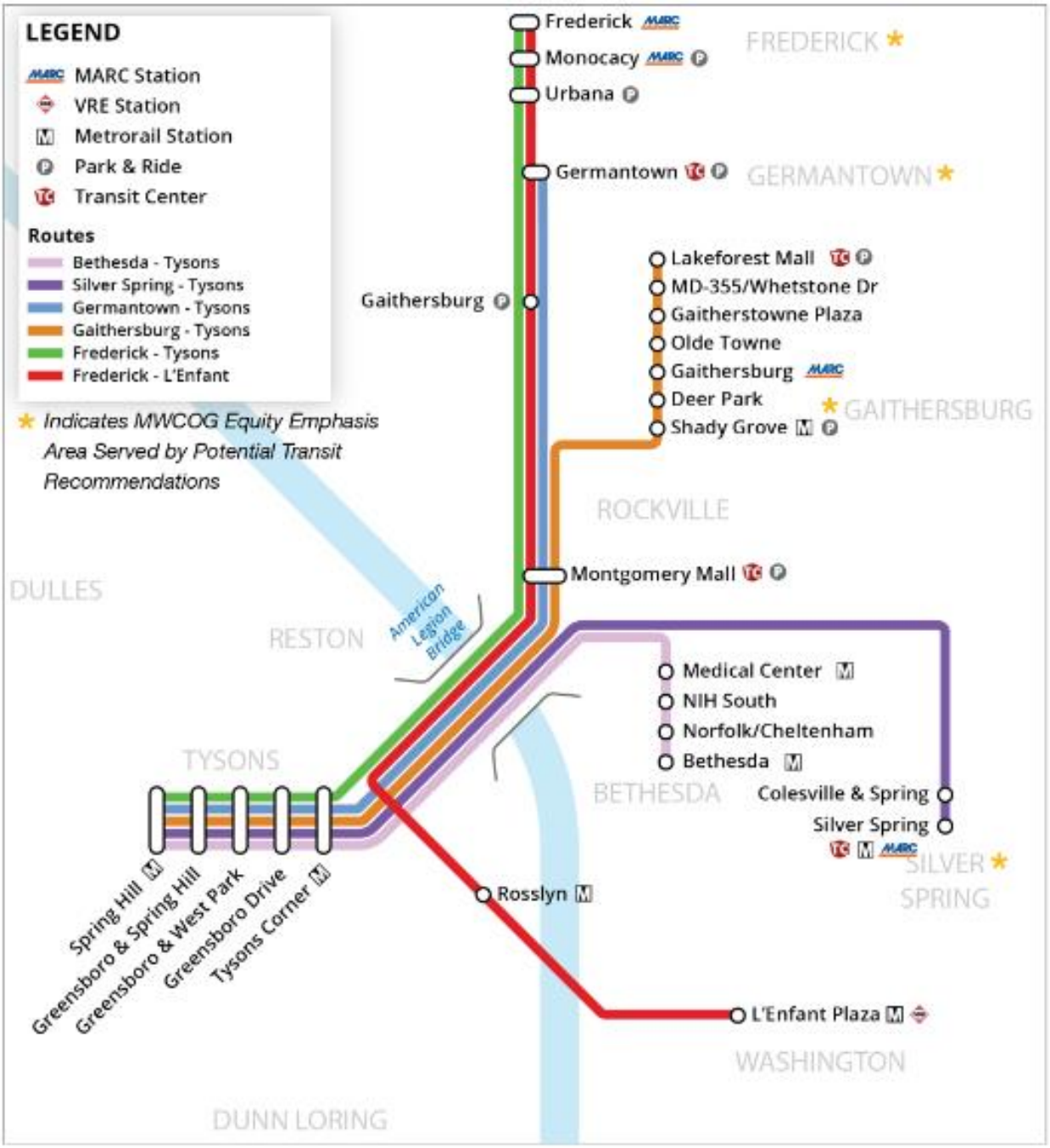
The medium-investment package focuses on introducing peak-period commuter service between the key transit markets identified in this Study's demand analysis. All but one route would connect Maryland to Tysons with a minimum headway of 30 minutes. The Bethesda to Tysons and Gaithersburg to Tysons options feature an increase in service frequency over the baseline-investment package, with the Bethesda to Tysons route including off-peak service. Frederick to L'Enfant service would provide a peak-period service to Rosslyn and L'Enfant Plaza, complimenting existing MARC service, which has limited capacity to operate additional trips into Washington, DC from Frederick. Routing for the medium package commuter bus services is illustrated in **Figure 7-6** and **Table 7-7** details the proposed level of service for each. It should be noted that mid-term service could be advanced to begin in the near-term prior to the managed lanes opening.

Table 7-7: Transit Services - Medium Investment Package

Alignment	Direction	Peak Frequency (min)	Off-Peak Service	Daily Bridge Riders (2045)	Time Frame
Bethesda to Tysons	Bi-Directional	30	✓	600	Mid-Term
Silver Spring to Tysons	Peak Direction Only	30		600	Mid-Term
Germantown to Tysons	Peak Direction Only	30		600	Mid-Term
Gaithersburg to Tysons	Peak Direction Only	20		800	Mid-Term
Frederick to Tysons	Peak Direction Only	30		600	Long-Term
Frederick to L'Enfant via Arlington	Peak Direction Only	40		500	Long-Term

***Note**: Bethesda to Tysons could be advanced into near-term.*

Figure 7-6: Schematic Map of Routes and Stops — Medium Investment Package



Additional Package Elements

Technology Enhancements and Commuter Assistance Programs

Similar to the baseline package, the medium package includes technology enhancements in the near-term that support carpooling and vanpooling. Technology enhancements include the Virginia and Maryland Commuter Parking Information Systems. With the opening of managed lanes anticipated to occur in the mid-term implementation phase, the full set of proposed technology enhancements are then deployed to support all of the new commuter bus services that could commence in the mid-term along with the Frederick routes that could begin operation in the long-term phase.

The CAPs include all of the CAP elements for the study area including the corridor-specific mobility marketing campaigns.

Parking and Facility Needs

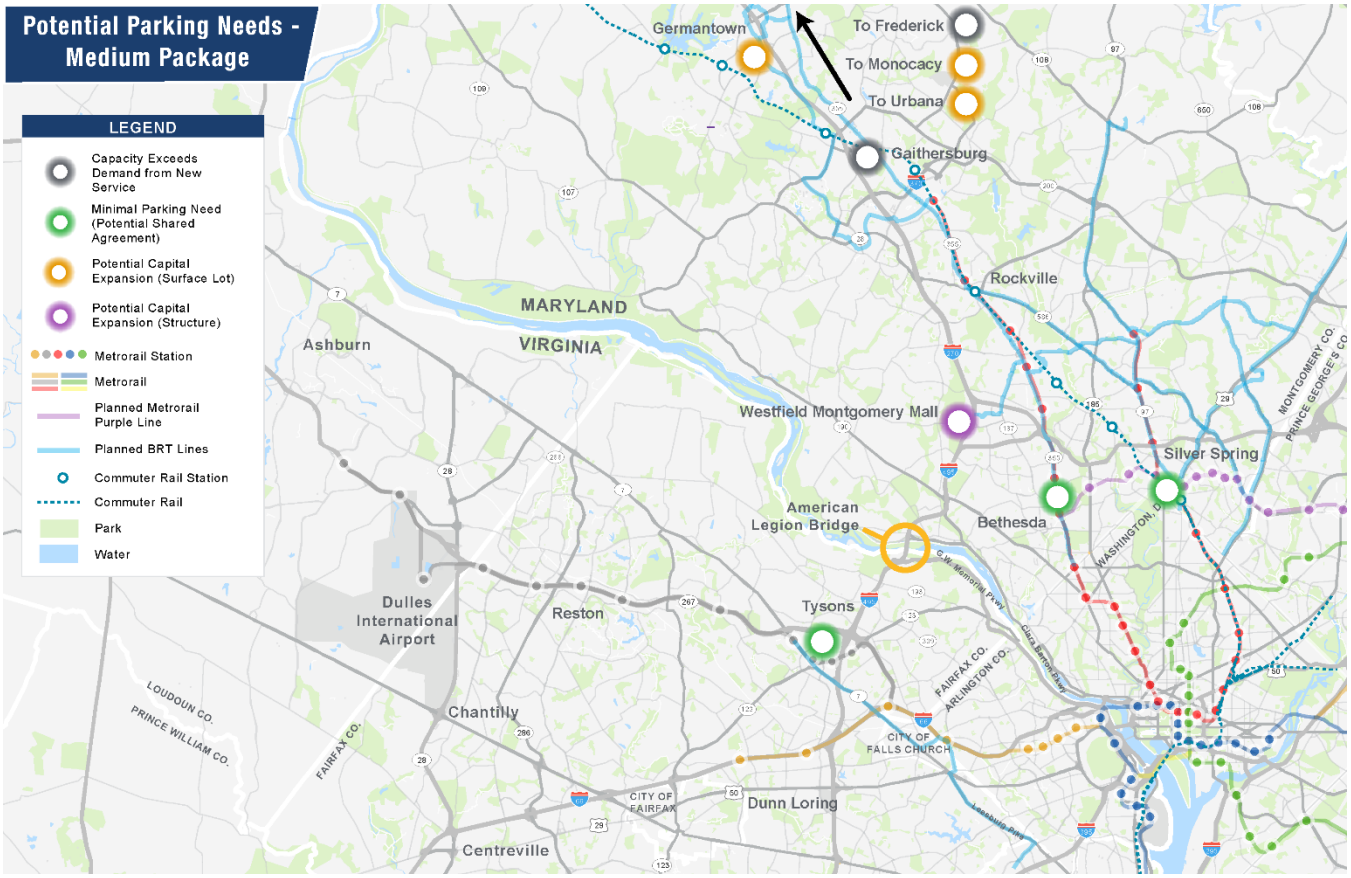
In the medium investment package, an increase in frequencies on the Bethesda-Tysons and Gaithersburg-Tysons routes results in an increased demand for parking in Tysons, Bethesda, and the Westfield Montgomery Mall Transit Center. The addition of the Silver Spring to Tysons, Germantown to Tysons, Frederick to Tysons, and Frederick to L'Enfant routes also increases demand for parking at Tysons and the Westfield Montgomery Mall Transit Center, as well as increases in demand for parking in Silver Spring, Germantown, Urbana, and Monocacy. Parking demand in Silver Spring could be satisfied through a shared use agreement, while demand for parking in Germantown, Urbana, and Monocacy would need to be satisfied through new or expansion of existing surface parking lots.

Table 7-8 lists the parking demand and type of parking expansion for each location. **Figure 7-6** illustrates the location of the potential parking need locations in association with the location of the Bridge and other transit services operating throughout the region.

Table 7-8: Parking and Facilities Needs Assessment – Medium Investment Package

Parking and Facilities Location	Potential Type of Expansion	Number of Spaces
Tysons	Shared Use Agreement	< 30
Bethesda	Shared Use Agreement	< 30
Silver Spring	Shared use Agreement	< 30
Westfield Montgomery Mall Transit Center	Parking Expansion	350
Germantown	Parking Expansion	170
Urbana	Parking Expansion	30
Monocacy	Parking Expansion	80

Figure 7-7: Parking and Facilities Locations –Medium Investment Package



Implementation

Full implementation of the medium package is proposed to occur over the course of the entire planning horizon, near-, mid-, and long-term phases.

Near-Term

Near-term improvements in the medium package mirror the baseline investment package near-term improvements. Implementation would include all commuter services programs, except the corridor-specific mobility marketing campaigns, and technology that supports and expands on the existing commuter carpool and vanpool traveler market. The commuter assistance programs provide a strong basis for incentivizing carpools and vanpools and provide funding for targeted outreach that could expand the network of commuters identifying themselves as available for group travel.

In the medium investment package, commuters that carpool or vanpool throughout the region could benefit from the commuter parking information system that would provide parking availability and other important traffic and traveler information via dynamic messaging signs at parking facilities, on the highway, and via mobile applications.

Bethesda to Tysons could be advanced into near-term as a potential congestion mitigation strategy.

Mid-Term

The medium package calls for a much more robust set of transit alternatives than the low investment package that are well distributed across the region. Given the number of new commuter bus service routes and the higher level of service afforded over the base package, expanded technology and commuter assistance programs would also need to be in place to draw and enhance the user experience. Real-time information systems would complement the opening of the managed lanes in the mid-term and would also offer bus users and commuters valuable information on real-time bus departure times, capacity and loads, toll information, and estimated travel times.

Commuter bus service would be improved via the deployment of transit signal priority which creates a second layer of bus preferential treatment, the first layer being the use of managed lanes on the highway and the second being signal priority on off-highway sections. Implementation of transit signal priority further improves travel times, schedule adherence, and conveys the level of importance for multi-passenger vehicles over single occupancy use.

Parking demand would also need to be addressed in the mid-term in support of the increase in commuter bus users and expansion of the parking facilities at the Westfield Montgomery Mall and Germantown are included in this implementation phase.

Long-Term

The last pieces of the medium investment package include the implementation of commuter bus service operations north of I-370. The two Frederick routes, Frederick to Tysons, and Frederick to L'Enfant via Arlington, warrant the need for potential parking facility expansions at Urbana and Monocacy. Consequently, those service and parking elements are the major components of the long-term implementation phase.

Table 7-9 organizes the other transit/TDM supportive elements into their respective implementation timeframes and indicates the level of effort in order to implement them as proposed.

Table 7-9: Implementation Effort — Medium Package

Key Implementation Effort:
= Low
= Medium
= High

	Implementation Effort
Technology Enhancements	
Near-Term • Virginia and Maryland Commuter Parking Information	

Mid-Term
• Maintain or Adjust Near-Term Program
• Technology Enhancements to Existing Efforts (Levels Based on Proposed Service)
  ◦ Real-Time Toll and Transit Information
  ◦ Real-Time Transit Arrival Information
  ◦ Real-Time Passenger Load Information
  ◦ Transit-Signal Priority	

Commuter Assistance Programs	

Near-Term
• Corridor-Specific Commuter Assistance Program
  ◦ Targeted Residential Outreach
  ◦ Targeted Employer Outreach
  ◦ Vanpool Formation and Expansion Program
  ◦ Corridor-Specific HOV Incentive Program	

Mid-Term • Maintain or Adjust Near-Term Programs based on Performance • New Addition to Program: Corridor-Specific Mobility Marketing Campaign	
Long-Term • Maintain or Adjust Mid-Term Program based on Performance **Continual** • Ongoing Regional and Statewide Programs	N/A
Capital Parking Expansion Needs	
Mid-Term • Westfield Montgomery Mall Transit Center • Germantown	
Long-Term • Urbana • Monocacy	

Summary of Benefits and Costs

The medium investment package affords benefits that are above and beyond the baseline package in terms of more new transit ridership, a larger reduction in daily trips from the CAP programs, and substantially more connections to other transit services in the service area and equity emphasis areas served. Key person throughput service benefits are illustrated in **Figure 7-8**:

Additional benefits of the medium investment package include an equitable geographic distribution of high performing commuter bus services. The operation of those routes can be further augmented through the use of signal priority which affords the commuter bus services an important travel time advantage over typical mixed-route operations.

Figure 7-8: Medium Investment Package Summary of Benefits

Each Transit/TDM enhancement included in the medium investment package, along with their respective operating and capital cost requirements, are outlined in **Table 7-10**. The combination of CAPs, real-time bus and commuter parking information system technologies, along with the commuter bus services creates a dynamic package of improvements that offers benefits to a diverse set of managed lane user groups including carpool, vanpool, and commuter bus users.

Transit Operational Costs

Operating costs shown represent a potential range of annual expenses to operate the service based on the lack of identified operator at this stage of planning. The low end of the range is based on the blended rate as described in the ***Cost Assumptions*** *section. The high end of the range is based on the FY2018 NTD-reported operating costs of the Commuter Bus-Purchase Transportation (CB-PT) delivery model. This number is notably higher than the blended rate of $152 per hour due in part to practices of including expenses such as preventative maintenance and use of vehicles as part of the reported operating cost. Regardless of which operator is selected, more refined cost estimates for operating and vehicle purchases will need to be developed in future phases of planning using costs specific to that operator.*

Table 7-10: Operating and Capital Cost - Medium Investment Package

Category	Transit/TDM Improvements	Annual Service Hours	Net Annual Operating Cost Range ($K)	Vehicle/Capital Cost Range ($M)	Implementation Timeframe
Transit Service	Bethesda to Tysons	15,620	$1,496 – $2,368	$3.00 – $3.75	Mid-Term
	Germantown to Tysons	6,050	$579 – $1,021	$2.40 – $3.00	Mid-Term
	Gaithersburg to Tysons	10,580	$1,014 – $1,787	$4.20 – $5.25	Mid-Term
	Silver Spring to Tysons	6,050	$579 – $1,021	$2.40 – $3.00	Mid-Term
	Frederick to Tysons	9,070	$869 – $1,532	$3.60 – $4.50	Long-Term
	Frederick to L'Enfant via Arlington	9,070	$869 – $1,532	$3.60 – $4.50	Long-Term
	Spare Vehicle Requirement (20%)			$4.20 – $5.25	
	Total Transit Service		**$5,406 – $9,531**	**$23.40 – $29.25**	
.CAPs	Corridor Specific Mobility Marketing Campaigns		$187 – $233	$0.10 – $0.13	Mid-Term
	Targeted Residential Outreach		$160 – $200	-	Near-Term
	Targeted Employer Outreach		$160 – $200	-	Near-Term
	Vanpool Formation and Expansion Program		$158 – $198	-	Near-Term
	Corridor-Specific HOV Incentive		$166 – $207	-	Near-Term
	Total CAP		**$831 – $1,038**	**$0.10 – $0.13**	
Technology	Virginia Commuter Parking Information System		$38 – $80	$0.43 – $0.92	Near-Term
	Maryland Commuter Parking Information System		$102 – $220	$1.08 – $2.36	Near-Term
	Real-Time Toll and Transit Information		$22 – $44	$0.18 – $0.33	Mid-Term
	Real-Time Transit Arrival Information		$36 – $75	$0.50 – $0.98	Mid-Term
	Real-Time Passenger Load Information		$74 – $174	$0.44 – $0.85	Mid-Term
	Transit Signal Priority		$74 – $144	$1.09 – $1.91	Mid-Term
	Total Technology		**$346 – $737**	**$3.72 – $7.35**	
Parking	Tysons Agreement		$34 – $43	-	Near-Term
	Bethesda Agreement		$34 – $43	-	Near-Term
	Silver Spring Agreement		$34 – $43	-	Mid-Term
	Westfield Montgomery Mall Transit Center		$53 – $66	$7.38 – $9.22	Mid-Term
	Germantown		$26 – $32	$2.68 – $3.45	Mid-Term
	Urbana		$5 – $6	$0.47– $0.59	Long-Term
	Monocacy		$12 – $15	$1.26 – $1.58	Long-Term
	Total Parking		**$198 – $248**	**$11.79 – $14.40**	
	Total		**$6,781 – $11,554**	**$39.01 – $51.46**	

Notes:

- *See* ***Assumptions*** *section for more details on operating and capital costs*
- *All costs are in $FY20*
- *Capital costs for transit service only include costs associated with vehicle purchases. The costs only cover the initial purchase of vehicles and do not include life-cycle replacements or new/expanded vehicle maintenance facilities*
- *Bethesda to Tysons West – Possible implementation in the Near-Term*
- *Total values may be equal to sum of recommendations due to rounding*

High Package

Overview

- The high investment package reflects the most robust level of service for the proposed commuter bus routes, with connections and service route extensions to all major destinations for users of the Bridge.
- The high package ensures comprehensive coverage of key locations within the service area.
- Frequencies are consistent with those outlined in the Constrained Long-Range Transportation Plan (CLRP) for planned routes
- Includes significant off-peak midday service for five of the seven commuter bus service options. The mid-day off peak service is added, mostly in the form of bi-directional service

Transit Service Elements

The high investment package envisions all-day transit service across the Bridge. For routes that operate only in one direction, off-peak service would be bi-directional. The Germantown and Gaithersburg to Tysons route would be combined during the off-peak period. The Bethesda to Tysons service would be complimented by an alternative service pattern that would operate to Dunn Loring via the Tysons Corner Metrorail station during the peak period. A new peak period service would operate between Bethesda and Dulles International Airport via the Montgomery Mall transit center and Reston Town Center. The Frederick to Tysons service would remain unchanged from the medium investment package. Routing for the high package commuter bus services is illustrated in **Figure 7-9** and **Table 7-11** details the proposed level of service for each. It should be noted that mid-term service could be advanced to begin in the near-term prior to the managed lanes opening.

Table 7-11: Transit Recommendations — High Investment Package

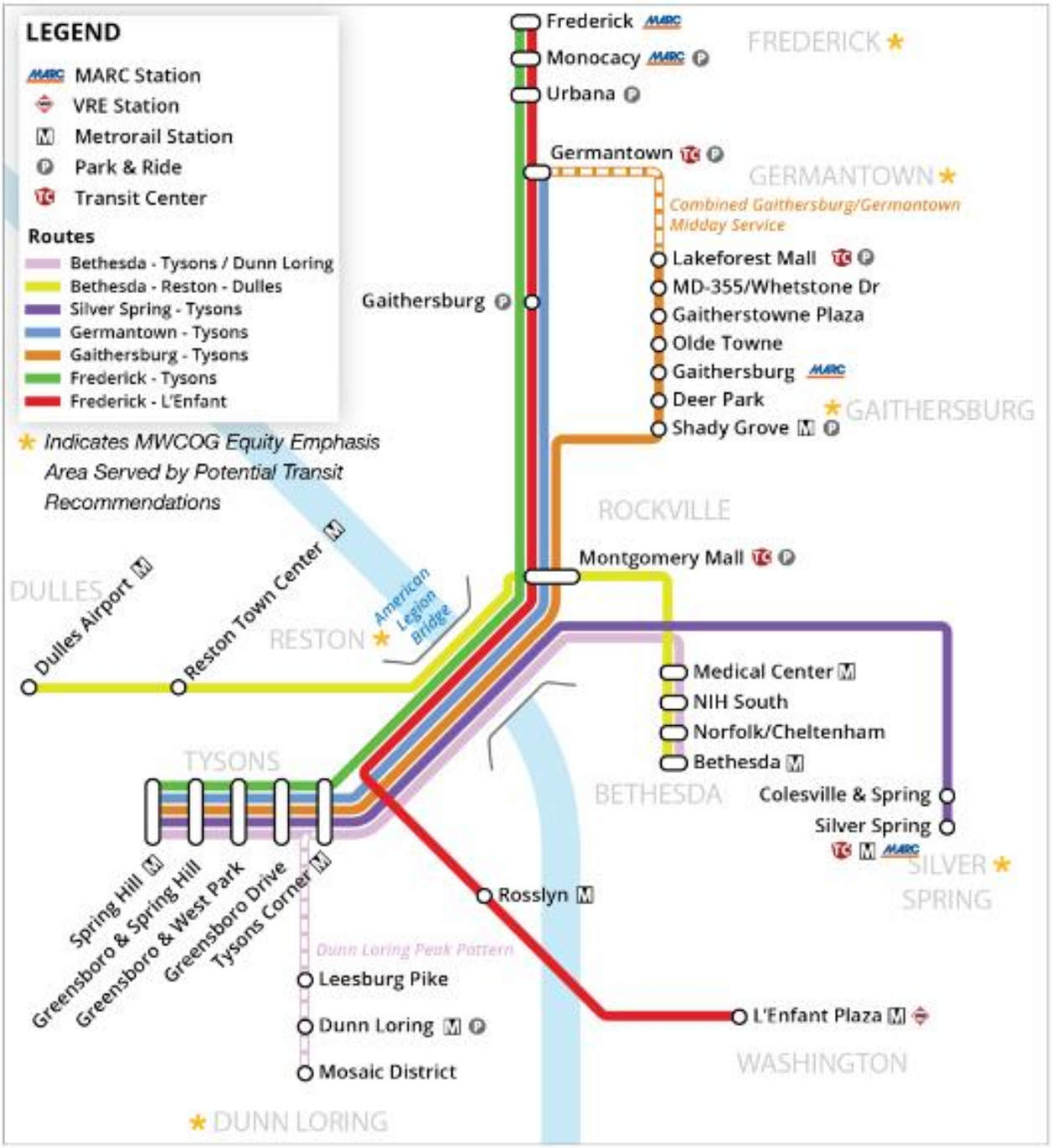
Alignment	Direction	Peak Frequency (min)	Off-Peak Service	Daily Bridge Riders (2045)	Time Frame
Bethesda to Dunn Loring via Tysons	Bi-Directional	12*	✓	800	Mid-Term
Bethesda to Reston/Dulles	Bi-Directional	30		300	Mid-Term
Silver Spring to Tysons	Peak Direction Only	20	✓	1000	Mid-Term
Germantown to Tysons	Peak Direction Only	20	✓	1000	Mid-Term
Gaithersburg to Tysons	Peak Direction Only	15	✓	700	Mid-Term
Frederick to Tysons	Peak Direction Only	20		900	Long-Term
Frederick to L'Enfant via Arlington	Peak Direction Only	30	✓	900	Long-Term

Notes:

** Combined frequency; two buses per hour extended to Dunn Loring during the peak.*

- *Bethesda to Tysons could be advanced into near-term.*

Figure 7-9: Schematic Map of Routes and Stops — High Investment Package



Additional Package Elements

Technology Enhancements and CAPs

The high investment package is inclusive of all proposed technology enhancements and CAPs. The key distinction between the medium and high investment packages for these two transit/TDM elements is the size of the fleet required to meet the higher level of transit services defined in the high investment package. Whereas 39 (i.e., 32 peak vehicles plus seven in the spare ratio) vehicles would be required to implement services in the medium package, 60 (i.e., 50 peak vehicles plus 10 in the spare ration) would be required for the high package. Implementation of the technology and CAP elements in this package remain consistent with the approach in the medium package.

Parking and Facility Needs

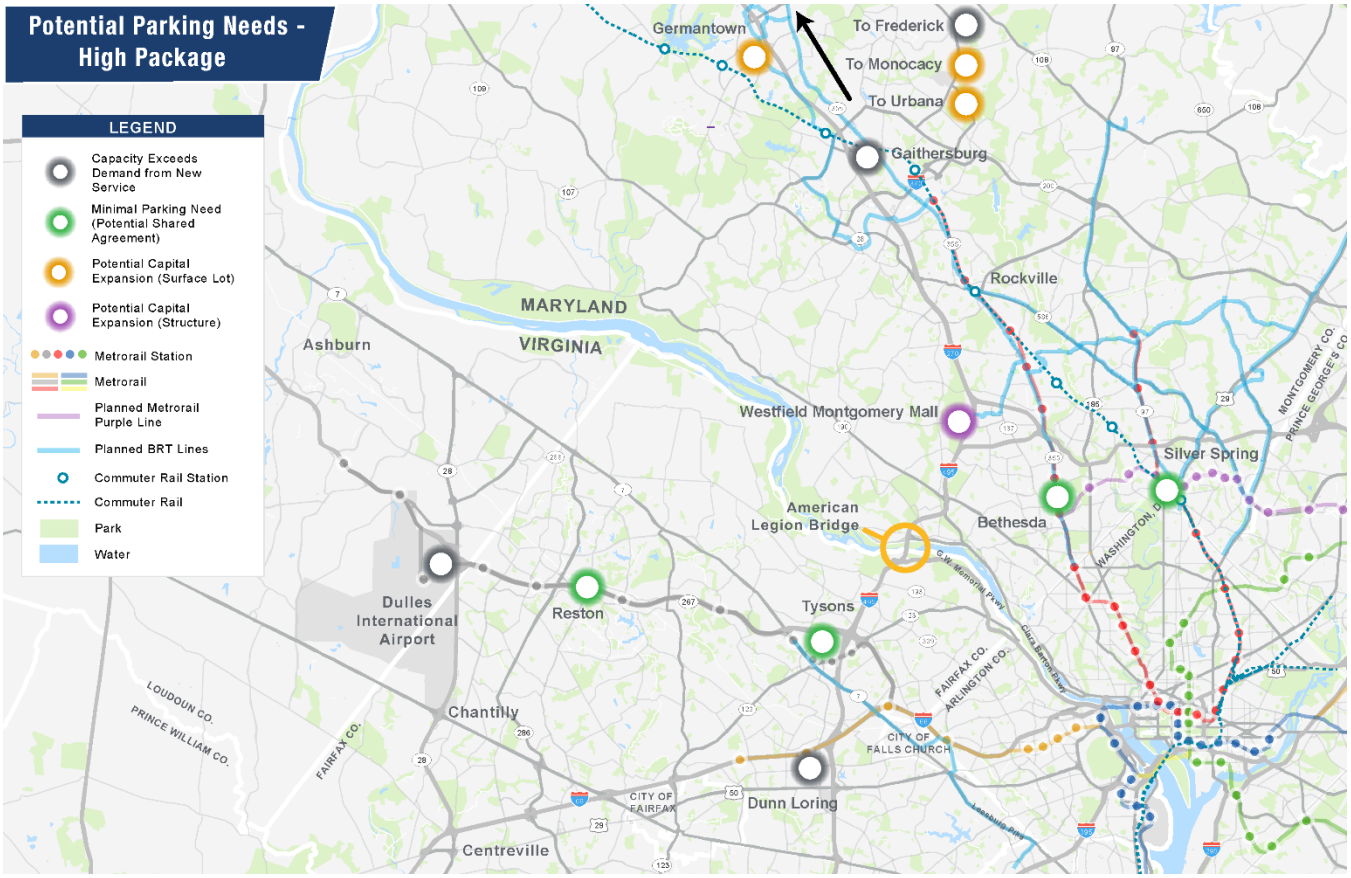
In the high investment package, new service from Bethesda to Dunn Loring via Tysons and Bethesda to Dulles via Reston is proposed. Parking demand generated from these new routes in Dunn Loring and Dulles does not exceed the existing supply of parking at each location, warranting no parking expansion. The modest amount of demand for parking at Reston could be accommodated through a shared use agreement.

Table 7-12 lists the parking demand and type of parking expansion for each location. **Figure 7-10** illustrates the parking locations in association with the location of the Bridge and other transit services operating throughout the region.

Table 7-12: Parking and Facilities Needs Assessment – High Investment Package

Parking and Facilities Location	Potential Type of Expansion	Number of Spaces
Tysons	Shared Use Agreement	< 30
Reston	Shared Use Agreement	< 30
Bethesda	Shared Use Agreement	< 30
Silver Spring	Shared use Agreement	30
Westfield Montgomery Mall Transit Center	New Structured Parking Deck	434
Germantown	Surface Lot Expansion	224
Urbana	Surface Lot Expansion	110
Monocacy	Surface Lot Expansion	120

Figure 7-10: Potential Parking Needs –High Investment Packages



Implementation

Similar to the medium package, full implementation of the high package is proposed to occur over the course of all three implementation phases. That approach to programming remains consistent with the availability of managed lanes to support the higher level of transit services and carpool/vanpools throughout the region.

Near-Term

Near-term improvements in the high package mirror the baseline and medium investment package near-term improvements. Implementation would include all commuter services programs—except the corridor-specific mobility marketing campaigns—and technology that supports and expands on the existing commuter carpool and vanpool traveler market. The commuter assistance programs would support and incentivize carpools and vanpools and would provide funding for targeted outreach that could expand the network of commuters identifying themselves as available to participate in group travel.

In the high investment package, commuters that carpool or vanpool throughout the region could benefit from the commuter parking information system that could provide parking availability and other important traffic and traveler information via dynamic messaging signs at parking facilities, on the highway, and via mobile applications.

Bethesda to Tysons could be advanced into near-term to provide a potential congestion mitigation strategy.

Mid-Term

The high package calls for implementation of the highest level of service for transit alternatives using managed lanes on I-495 and I-270. Given the number of new commuter bus service routes, the higher level of service proposed, and the expanded off-peak level of service, new technology and commuter assistance programs would also need to be in place to draw and enhance the user experience. As in the medium package, real-time information systems would complement the opening of the managed lanes and will also offer bus users and commuters valuable information on real-time bus departure times, capacity and loads, toll information, and estimated travel times.

Commuter bus service could be improved via the deployment of transit signal priority which creates a second layer of bus preferential treatment. The first layer is the use of managed lanes on the highway and the second is signal priority on off-highway sections. Implementation of transit signal priority further improves travel times, schedule adherence, and conveys the level of importance for multi-passenger vehicles over single occupancy use.

Parking demand would also need to be addressed in the mid-term in support of the potential increase in commuter bus users and expansion of the parking facilities at the Westfield Montgomery Mall and Germantown are included in this implementation phase.

Long-Term

The last pieces of the high investment package include the implementation of two commuter bus service operations north of I-370 connecting to Frederick (utilizing the northern expansion of the MLS on I-270) and the service to Reston and Dulles International Airport. The two potential Frederick routes include Frederick to Tysons and Frederick to L'Enfant. The Frederick to L'Enfant service is proposed to also operate in the midday. With the implementation of the Frederick services, parking facility expansion would be required at Urbana and Monocacy. Consequently, those service and parking elements are the major components of the long-term implementation phase.

Table 7-13 organizes the other transit/TDM supportive elements into their respective implementation timeframes and indicates the level of effort in order to implement them as proposed.

Table 7-13:Implementation Effort – High Investment Package

Key Implementation Effort: 🔧 = Low 🔧🔧 = Medium 🔧🔧🔧 = High	**Implementation Effort**
Technology Enhancements	
Near-Term • VA and Maryland Commuter Parking Information	🔧🔧

Mid-Term
• Maintain or Adjust Near-Term Program
• Technology Enhancements to Existing Efforts (Levels Based on Proposed Service)
  ◦ Real-Time Toll and Transit Information
  ◦ Real-Time Transit Arrival Information
  ◦ Real-Time Passenger Load Information
  ◦ Transit-Signal Priority
	🔧🔧🔧

Commuter Assistance Programs	

Near-Term
• Corridor-Specific Commuter Programming
  ◦ Targeted Residential Outreach
  ◦ Targeted Employer Outreach
  ◦ Vanpool Formation and Expansion Program
  ◦ Corridor-Specific HOV Incentive Program	

Mid-Term • Maintain or Adjust Near-Term Programs based on Performance • New Addition to Program: Corridor-Specific Mobility Marketing Campaign	
Long-Term • Maintain or Adjust Near-Term Programs based on Performance **Continual** • Ongoing Regional and Statewide Programs	N/A
Capital Parking Expansion Needs	
Mid-Term • Westfield Montgomery Mall Transit Center • Germantown	
Long-Term • Urbana • Monocacy	

Summary of Benefits and Costs

The high investment package affords benefits that are above and beyond the baseline and medium packages. Key transit services benefits are illustrated in **Figure 7-11** and salient benefits for all of the high package improvements include the following:

Figure 7-11: High Investment Package Summary of Benefits

The high investment package would expand the frequency of commuter bus services, providing more options and better access to service for potential users, serving more transit connections and equity emphasis areas. Off-peak service offerings would also expand travel options and provide a ride home “safety net” for commuter bus service users.

Transit services are supported with a full complement of technologies that would enhance the traveler experience. That experience is augmented by real-time travel information for parking, toll, and transit services which enables users to make informed travel decisions. Users are able to access that information via their mobile devices, signage along the interstate and at parking facilities, and/or through other outlets. Additional parking capacity would also facilitate access to the managed lanes for a variety of users.

Each transit/TDM enhancement included in the high investment package, along with their respective operating and capital cost requirements, are outlined in **Table 7-14.**

Table 7-14: Operating and Capital Costs — High Investment Package

Transit Operational Costs

*Operating costs shown represent a potential range of annual expenses to operate the service based on the lack of identified operator at this stage of planning. The low end of the range is based on the blended rate as described in the **Cost Assumptions** section. The high end of the range is based on the FY2018 NTD-reported operating costs of the Commuter Bus-Purchase Transportation (CB-PT) delivery model. This number is notably higher than the blended rate of $152 per hour due in part to practices of including expenses such as preventative maintenance and use of vehicles as part of the reported operating cost. Regardless of which operator is selected, more refined cost estimates for operating and vehicle purchases will need to be developed in future phases of planning using costs specific to that operator.*

Category	Transit/TDM Improvements	Annual Service Hours	Net Annual Operating Cost Range ($K)	Vehicle/Capital Cost Range ($M)	Implementation Timeframe
Transit Service	Bethesda to Tysons (20/Peak, 30/Off-Peak)	15,620	$1,496 – $2,638	$3.00 – $3.75	Mid-Term
	Bethesda to Dunn Loring via Tysons (30/Peak)	6,050	$579 – $1,021	$2.40 – $3.00	Mid-Term
	Germantown to Tysons (20/Peak, 60/Off-Peak)	9,070	$869 – $1,532	$3.60 – $4.50	Mid-Term
	Gaithersburg to Tysons (15/Peak, 60 Off-Peak)	13,610	$1,303 – $2,298	$5.40 – $6.75	Mid-Term
	Gaithersburg/Germantown Midday	8,060	$772 – $1,362	$ – $ -	Mid-Term
	Silver Spring to Tysons (20/Peak)	7,560	$724 – $1,276	$3 – $3.75	Mid-Term
	Silver Spring to Tysons (60/Off-Peak)	4,030	$386 – $681	-	Mid-Term
	Frederick to Tysons (20/Peak)	13,610	$1,303 – $2,298	$5.40 –$6.75	Long-Term
	Bethesda to Reston to Dulles (30/Peak)	7,560	$724 – $1,276	$3.00 – $3.75	Long-Term
	Frederick to L'Enfant via Arlington (30/Peak)	10,580	$1,014 – $1,787	$4.2 – $5.25	Long-Term
	Frederick to L'Enfant via Arlington (60/Off-Peak)	8,060	$772 – $1,362		Long-Term
	Spare Vehicle Requirement (20%)			$6.00 – $7.50	
	Total Transit Service		**$9,942 – $17,531**	**$36.00 – $45.00**	
CAPs	Corridor Specific Mobility Marketing Campaigns		$187 – $233	$0.10 – $0.13	Mid-Term
	Targeted Residential Outreach		$160 – $200	-	Near-Term
	Targeted Employer Outreach		$160 – $200	-	Near-Term
	Vanpool Formation and Expansion Program		$158 – $198	-	Near-Term
	Corridor-Specific HOV Incentive		$166 – $207	-	Near-Term
	Total CAP		**$831 – $1,038**	**$0.10 – $0.13**	
Technology	Virginia Commuter Parking Information System		$38 – $80	$0.43 – $0.92	Near-Term
	Maryland Commuter Parking Information System		$102– $220	$1.08 – $2.36	Near-Term
	Real-Time Toll and Transit Information		$22 – $44	$0.18 – $0.33	Mid-Term
	Real-Time Transit Arrival Information		$46 – $95	$0.65 – $1.28	Mid-Term
	Real-Time Passenger Load Information		$80 – $184	$0.53 – $1.02	Mid-Term
	Transit Signal Priority		$80 – $154	$1.22 – $2.1	Mid-Term
	Total Technology		**$368 – $777**	**$4.09 – $8.01**	
Parking	Tysons West Agreement		$34 – $43	-	Near-Term
	Reston Agreement		$34 – $43	-	Mid-Term
	Bethesda Agreement		$34 – $43	-	Near-Term
	Silver Spring Agreement		$51 – $64	-	Mid-Term
	Westfield Montgomery Mall Transit Center		$66 – $83	$9.28 – $11.60	Mid-Term
	Germantown		$34 – $342	$3.52 – $4.41	Mid-Term
	Urbana		$17 – $21	$1.73 – $2.17	Long-Term
	Monocacy		$18 – $23	$1.89 – $2.36	Long-Term
	Total Parking		**$288 – $362**	**$16.43 – $20.53**	
	Total		**$11,429 – $19,708**	**$56.62 – $73.67**	

Notes:

- *See **Assumptions** section for more details on operating and capital costs*
- *All costs are in $FY20; total values may be equal to sum of recommendations due to rounding*
- *Capital costs for transit service only include costs associated with vehicle purchases. The costs only cover the initial purchase of vehicles and do not include life-cycle replacements or new/expanded vehicle maintenance facilities*
- *Bethesda to Tysons West – Possible implementation in the Near-Term*

8. INVESTMENT PACKAGE COMPARISON

Each package of improvements is characterized largely by its level of transit services and the premise for implementation of those services within the near-, mid-, and long-term phases of each package is tied to the availability of the managed lanes. Other package elements, including the commuter assistance programs, technology, and parking needs, serve a complementary or supportive role to those transit services. Together, these improvements provide quantifiable metrics for which packages can be evaluated and compared relative to their level of investment. **Figure 8-1, Figure 8-2, and Figure 8-3** are summaries of the baseline, medium, and high investment packages, respectively.

Transit Level of Service

Because transit service is the main component of the investment packages and the other improvements support and promote transit usage, it is important to recognize the effect that level of service (i.e. route frequency) has on transit ridership. **Table 8-1** shows the routes included in each investment package, the level of service at which the routes would operate, the resulting number of riders across the Bridge taking each route, and the estimated total number of daily riders and passenger miles across the Bridge associated with each investment package.

Table 8-1: Comparison of Investment Package Levels of Service

Alignment	Direction	Baseline Package			Medium Package			High Package		
		Peak Frequency (min)	Off-Peak Frequency (min)	Daily Bridge Riders (2045)	Peak Frequency (min)	Off-Peak Frequency (min)	Daily Bridge Riders (2045)	Peak Frequency (min)	Off-Peak Frequency (min)	Daily Bridge Riders (2045)
Bethesda to Tysons*	Bi-Directional	30		400	20	60	600	12*	30	800
Bethesda to Reston/Dulles	Bi-Directional							30		300
Silver Spring to Tysons	Peak Direction Only				30		600	20	60	1,000
Germantown to Tysons	Peak Direction Only				30		600	20	60	1,000
Gaithersburg to Tysons	Peak Direction Only	30		600	20		800	15	60	700
Frederick to Tysons	Peak Direction Only				30		600	20		900
Frederick to L'Enfant via Arlington	Peak Direction Only				40		500	30	60	900
Total Forecast Daily Bridge Riders				**1,000**			**3,700**			**5,600**
Total Forecast PMT				**17,000**			**101,000**			**151,000**

Notes:

- *In high package, 2 buses per hour during peak extend to Dunn Loring. Frequency shown is a combined frequency for Bethesda-Tysons*
- *Ridership and person-trips based on 2045 MWCOG Model runs and represents daily riders (AM and PM peak periods plus off-peak) over the American Legion Bridge; Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors*
- *Peak Periods assumed 3 hours in AM and 3 in PM; Off-peak - 8 hours*
- *Passenger Miles Traveled: Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)*

Figure 8-1: Baseline Investment Package Summary

Baseline Package

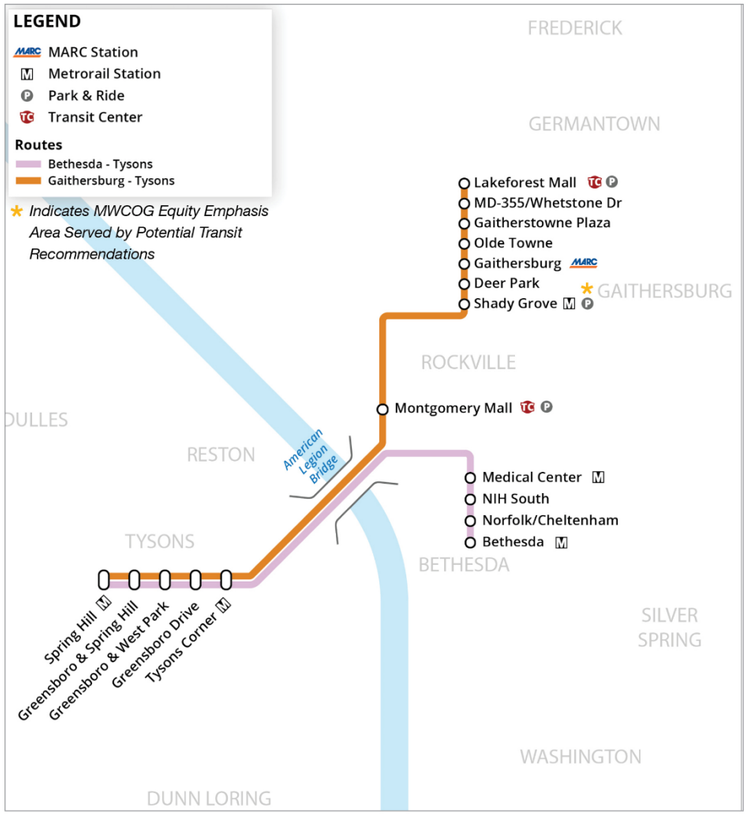
Potential Transit Recommendations

Key

Cost:
$ = Low
$$ = Medium
$$$ = High

Implementation Effort:
= Low
= Medium
= High

- **Alignment** - Start and end points of the route
- **Direction** - Indicates whether the service operates in both directions or just MD to VA in the AM and VA to MD in the PM
- **Peak Frequency** - How often the bus would come during peak period
- **Daily Bridge Riders (2045)** - Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service



Summary of Potential Transit Recommendations

Alignment	Direction	Peak Frequency (min)	Daily Bridge Riders (2045)	Time Frame
Bethesda - Tysons	Bi-Directional	30	400	Mid-Term
Gaithersburg - Tysons	Peak Direction Only	30	600	Mid-Term

- *Maintenance facility or expansion may be needed to advance potential recommendations and is dependent on operator.*
- *The Bethesda - Tysons Transit Route could be advanced as part of the Near-Term timeframe.*

	Cost	Implementation Effort
Technology Enhancements		
Near-Term • VA and Maryland Commuter Parking Information	$$	
Commuter Assistance Programs		
Near-Term • Corridor-Specific Commuter Assistance Program ◦ Targeted Residential Outreach ◦ Targeted Employer Outreach ◦ Vanpool Formation and Expansion Program ◦ Corridor-Specific HOV Incentive Program **Continual** • Ongoing Regional and Statewide Programs	$	
Capital Parking Expansion Needs		
Mid-Term • Westfield Montgomery Mall	$$	

Summary of Benefits

Total Forecasted Daily Riders (Over Bridge)[1]: 1,000

Total Passenger Miles[2]: 17,000

1: Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service (Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors)

2: Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)

Near-Term
Prior to the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Mid-Term
In conjunction with the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Long-Term
Following opening of the Managed Lanes

Figure 8-2: Medium Investment Package Summary

Medium Package

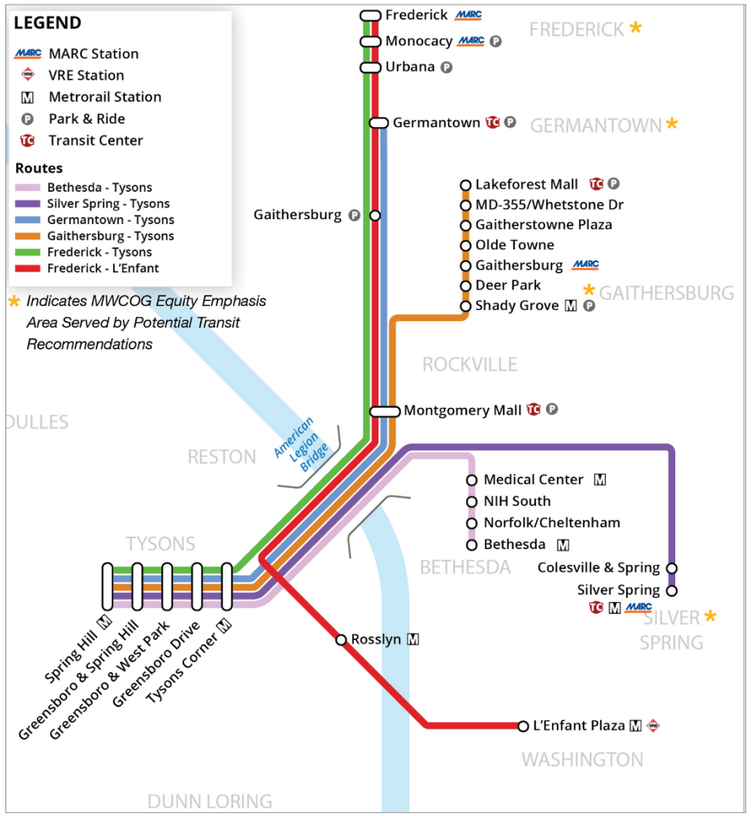
Potential Transit Recommendations

Key

Cost:
$ = Low
$$ = Medium
$$$ = High

Implementation Effort:
= Low
= Medium
= High

- **Alignment** - Start and end points of the route
- **Direction** - Indicates whether the service operates in both directions or just MD to VA in the AM and VA to MD in the PM
- **Peak Frequency** - How often the bus would come during peak period
- **Daily Bridge Riders (2045)** - Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service



Summary of Benefits

Total Forecasted Daily Riders (Over Bridge)[1]: 3,700
Peak: 3,500 Off-Peak: 200

Total Passenger Miles[2]: 101,000

1: Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service (Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors)

2: Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)

Summary of Potential Transit Recommendations

Alignment	Direction	Peak Frequency(min)	Off-Peak Service	Daily Bridge Riders (2045)	Time Frame
Bethesda - Tysons	Bi-Directional	30	✓	600	Mid-Term
Silver Spring - Tysons	Peak Direction Only	30		600	Mid-Term
Germantown - Tysons	Peak Direction Only	30		600	Mid-Term
Gaithersburg - Tysons	Peak Direction Only	20		800	Mid-Term
Frederick - Tysons	Peak Direction Only	30		600	Long-Term
Frederick - L'Enfant via Arlington	Peak Direction Only	40		500	Long-Term

- *Maintenance facility or expansion may be needed to advance potential recommendations and is dependent on operator.*
- *The Bethesda - Tysons Transit Route could be advanced as part of the Near-Term timeframe.*

	Cost	Implementation Effort
Technology Enhancements		
Near-Term • VA and Maryland Commuter Parking Information	$$	
Mid-Term • Maintain or Adjust Near-Term Program • Technology Enhancements to Existing Efforts (Levels Based on Proposed Service) • Real-Time Toll and Transit Information • Real-Time Transit Arrival Information • Real-Time Passenger Load Information • Transit-Signal Priority	$$	
Commuter Assistance Programs		
Near-Term • Corridor-Specific Commuter Assistance Program • Targeted Residential Outreach • Targeted Employer Outreach • Vanpool Formation and Expansion Program • Corridor-Specific HOV Incentive Program	$	
Mid-Term • Maintain or Adjust Near-Term Programs based on Performance • **New Addition to Program:** Corridor-Specific Mobility Marketing Campaign	$	
Long-Term • Maintain or Adjust Mid-Term Program based on Performance **Continual** • Ongoing Regional and Statewide Programs	N/A	N/A
Capital Parking Expansion Needs		
Mid-Term • Westfield Montgomery Mall • Germantown	$$$	
Long-Term • Urbana • Monocacy	$$	

Near-Term
Prior to the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Mid-Term
In conjunction with the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Long-Term
Following opening of the Managed Lanes

Figure 8-3: High Investment Package Summary

High Package

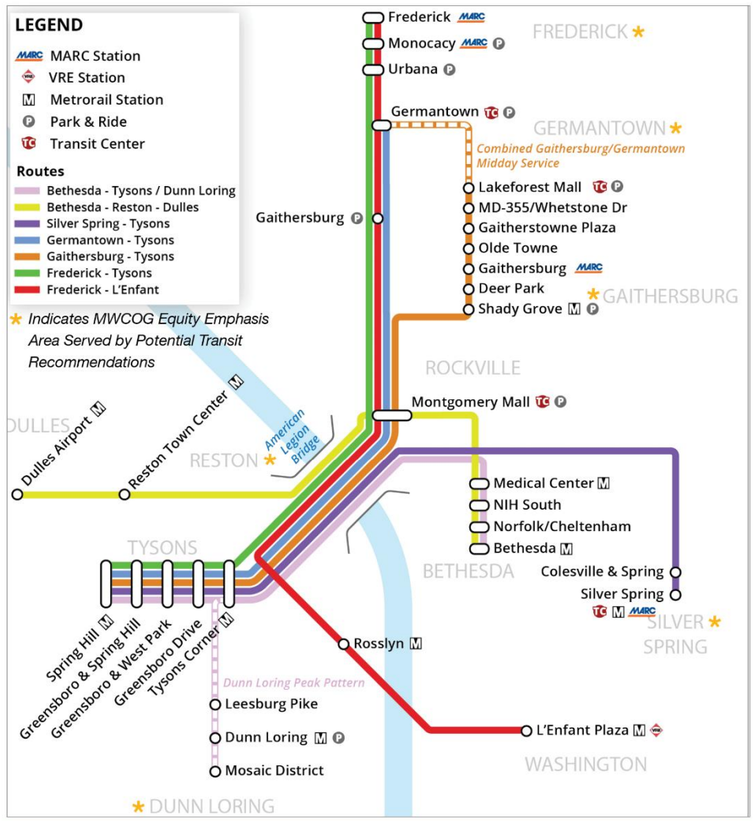
Potential Transit Recommendations

Key

Cost:
$ = Low
$$ = Medium
$$$ = High

Implementation Effort:
= Low
= Medium
= High

- **Alignment** - Start and end points of the route
- **Direction** - Indicates whether the service operates in both directions or just MD to VA in the AM and VA to MD in the PM
- **Peak Frequency** - How often the bus would come during peak period
- **Daily Bridge Riders (2045)** - Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service



Summary of Benefits

Total Forecasted Daily Riders (Over Bridge)[1]: 5,600
Peak: 4,500 Off-Peak: 1,100

Total Passenger Miles[2]: 152,000

1: Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service (Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors)

2: Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)

Summary of Potential Transit Recommendations

Alignment	Direction	Peak Frequency (min)	Off Peak Service	Daily Bridge Riders (2045)	Time Frame
Bethesda - Tysons/Dunn Loring	Bi-Directional	12*	✓	800	Mid-Term
Bethesda - Reston/Dulles	Bi-Directional	30		300	Mid-Term
Silver Spring - Tysons	Peak Direction Only	20	✓	1000	Mid-Term
Germantown - Tysons	Peak Direction Only	20	✓	1000	Mid-Term
Gaithersburg - Tysons	Peak Direction Only	15	✓	700	Mid-Term
Frederick - Tysons	Peak Direction Only	20		900	Long-Term
Frederick - L'Enfant via Arlington	Peak Direction Only	30	✓	900	Long-Term

**Combined frequency; 2 buses per hour extend to Dunn Loring during the peak period*

- *Maintenance facility or expansion may be neededto advance potential recommendations and is dependent on operator.*
- *The Bethesda - Tysons Transit Route could be advanced as part of the Near-Term timeframe.*

	Cost	Implementation Effort
Technology Enhancements		
Near-Term • VA and Maryland Commuter Parking Information	$$	
Mid-Term • Maintain or Adjust Near-Term Program • Technology Enhancements to Existing Efforts (Levels Based on Proposed Service) ◦ Real-Time Toll and Transit Information ◦ Real-Time Passenger Load Information ◦ Real-Time Transit Arrival Information ◦ Transit-Signal Priority	$$	
Commuter Assistance Programs		
Near-Term • Corridor-Specific Program ◦ Targeted Residential Outreach ◦ Vanpool Formation and Expansion Program ◦ Targeted Employer Outreach ◦ Corridor-Specific HOV Incentive Program	$	
Mid-Term • Maintain or Adjust Near-Term Programs based on Performance • **New Addition to Program:** Corridor-Specific Mobility Marketing Campaign	$	
Long-Term • Maintain or Adjust Mid-Term Program based on Performance **Continual** • Ongoing Regional and Statewide Programs	N/A	N/A
Capital Parking Expansion Needs		
Mid-Term • Westfield Montgomery Mall • Germantown	$$$	
Long-Term • Urbana • Monocacy	$$	

Near-Term
Prior to the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Mid-Term
In conjunction with the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Long-Term
Following opening of the Managed Lanes

Level of Investment

The level of investment for each of the packages varies in accordance with the differing levels of transit service and support parking, CAP, and technology improvements. Investment package components were organized so that there is a baseline level of transit service and supporting recommendations in the baseline investment package, and the medium and high packages have increased levels of transit service and more supporting parking, CAP, and technology improvements. Although the investment packages lend themselves to an incremental and cumulative implementation approach, it is important to note that each investment package can stand on its own as an overall bundle of transit/TDM improvements. **Table 8-2** shows the level of investment for each improvement category in each investment package. Organizing the improvements in this way also allows for modifications of implementation priorities based on agency and stakeholder preferences for bundling of services and the associated cost and benefits of each. The costs shown represent preliminary ranges and will need to be refined closer to implementation once an operator is determined.

Table 8-2: Comparison of Package Levels of Investment

	Baseline	Medium	High
Annual Operating Cost	**$2.15 - $3.48**	**$6.78 - $11.55**	**$11.43 - $19.71**
Transit Service	$1.30 - $2.30	$5.41 - $9.53	$9.94 - $17.53
Parking	$0.07 - $0.08	$0.20 - $0.25	$0.29 - $0.36
CAP/Technology	$0.78 - $1.10	$1.17 - $1.78	$1.20 - $1.82
Total Capital Cost	**$10.00 - $13.90**	**$39.01 - $51.46**	**$56.62 - $73.70**
Transit Service	$6.60 - $8.25	$23.40 - $29.25	$36.00 - $45.00
Parking	$1.90 - $2.37	$11.79 – $14.74	$16.43 – $20.53
CAP/Technology	$1.50 - $3.28	$3.82 - $7.48	$4.19 - $8.13

Notes:

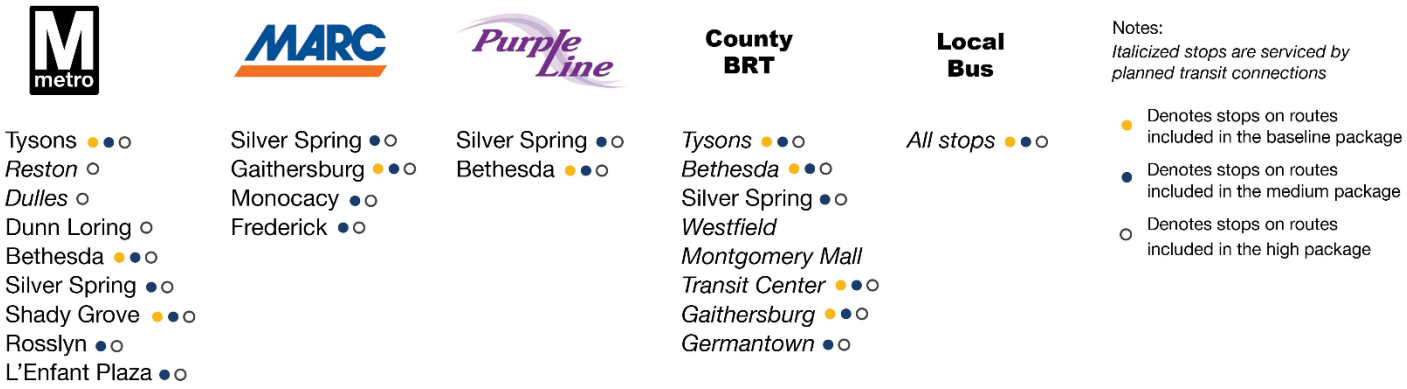
- *Costs reflected in millions*
- *All costs are in $FY20*
- *Capital costs for transit service only include costs associated with vehicle purchases. The costs only cover the initial purchase of vehicles and do not include life-cycle replacements or new/expanded vehicle maintenance facilities*
- *Total values may be equal to sum of recommendations due to rounding*

Transit Operational Costs - *Operating costs shown represent a potential range of annual expenses to operate the service based on the lack of identified operator at this stage of planning. The low end of the range is based on the blended rate as described in the* ***Cost Assumptions*** *section. The high end of the range is based on the FY2018 NTD-reported operating costs of the Commuter Bus-Purchase Transportation (CB-PT) delivery model. This number is notably higher than the blended rate of $152 per hour due in part to practices of including expenses such as preventative maintenance and use of vehicles as part of the reported operating cost. Regardless of which operator is selected, more refined cost estimates for operating and vehicle purchases will need to be developed in future phases of planning using costs specific to that operator.*

Transit Connections

In addition to providing efficient service to key activity centers, effective transit service should also connect with other transit modes to increase regional connectivity and provide first and last mile connections. Connectivity with other transit service will increase ridership and has the potential to decrease the amount of driving and parking needed to support the routes. **Figure 8-4** is a comparison of the investment packages' connectivity with other transit providers in the study area.

Figure 8-4: Comparison of Investment Package Transit Service Connectivity

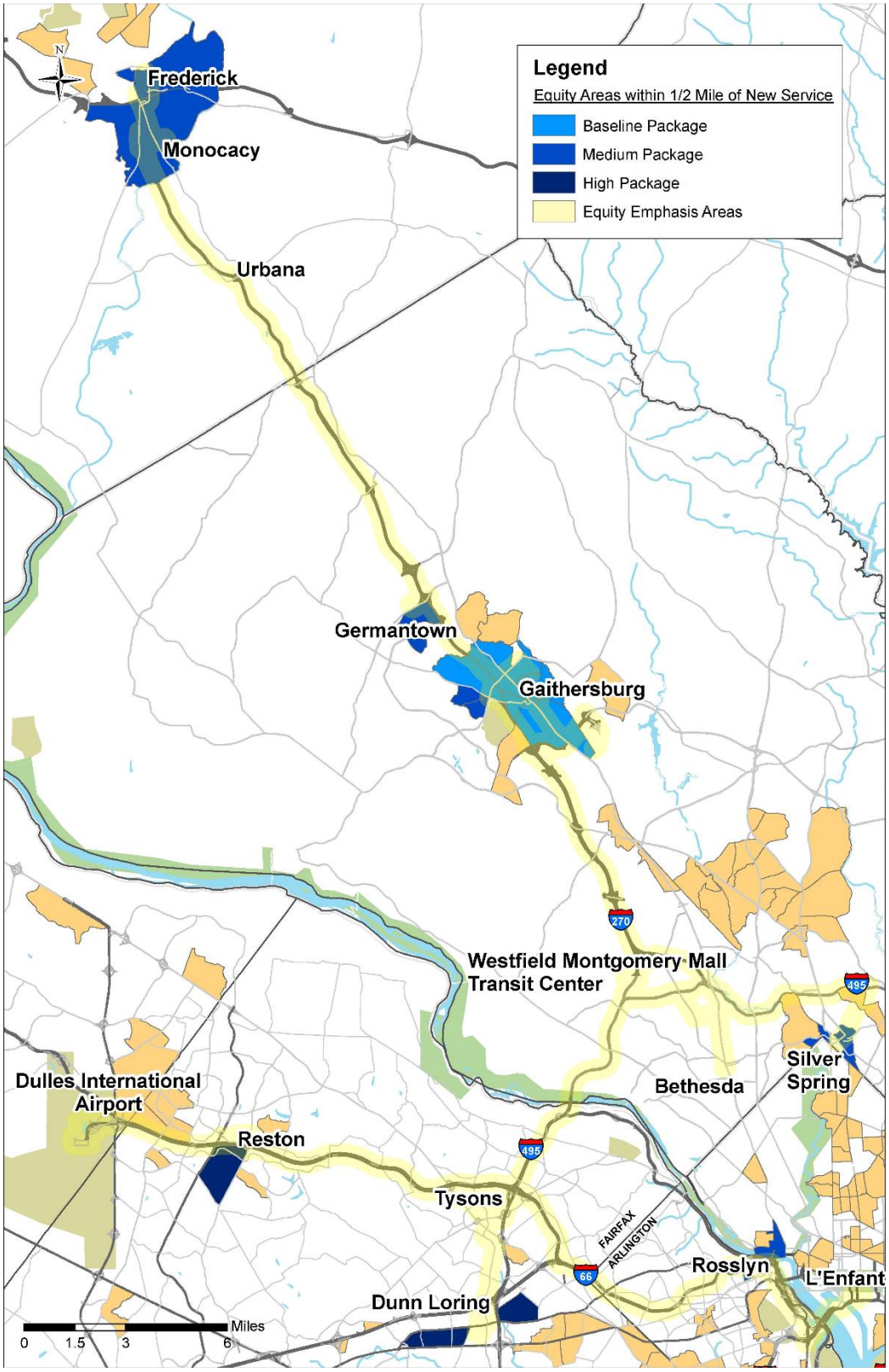


Serving Equity Areas

Transit should also provide service to those who need it most, such as low-income populations who rely on transit as their main mode of transportation. Equity Emphasis Areas are small geographic areas identified by MWCOG that have significant concentrations of low-income, minority populations, or both.[35] **Figure 8-5** shows the MWCOG Equity Emphasis Areas and highlights the areas that are within ½ mile of each investment package's new transit routes. It's worth noting that the medium package includes the baseline package's Equity Investment Areas, and the high package includes the medium and baseline package Equity Emphasis Areas.

[35] (Metropolitan Washington Council of Governments (MWCOG), 2020)

Figure 8-5: Comparison of Investment Package Service to Equity Emphasis Areas



Greenhouse Gas Emissions Reduction

Transit is a more environmentally friendly mode of transportation compared to SOV because a bus carrying 40 passengers emits significantly less greenhouse gas (GHG) emissions than 40 vehicles. The addition of new transit service has the potential to decrease the number of vehicles driving on the Bridge. The typical passenger vehicle travels 11,500 miles per year (including non-commuting travel) and emits 4.6 metric tons of CO_2 annually.[36] Using these metrics and the PMT for each investment package, the maximum potential daily GHG reduced (expressed in metric tons of CO_2) and the equivalent number of daily passenger vehicles was calculated. **Table 8-3** shows the maximum potential daily GHG reduced in each investment package, assuming that all riders of the transit service switch from using SOV. Transit service in the high investment package has the potential to reduce greenhouse gas emissions by up to 61.4 metric tons of daily CO_2 emissions, which is roughly equivalent to the daily use of 4,900 vehicles. This is a high-level assessment of potential reductions. More detail such as a mode-shift survey would be needed to provide a more accurate assessment of GHG emissions reductions associated with new transit service.

Table 8-3: Maximum Potential Daily GHG Reduction by Investment Package

Investment Package	Maximum Potential Daily GHG Reduction (2045 Metric Tons of CO_2 Emissions)	Equivalent Number of Vehicles (Total Daily Use)
Baseline	6.9	540
Medium	40.8	3200
High	61.4	4900

Notes/Assumptions:

- *Based on total forecast Passenger Miles Traveled (total distance per day in 2045 traveled by passengers including travel that does not pass over the Bridge)*
- *Maximum potential assumes that all riders of the transit service switch from using Single-Occupant-Vehicle (SOV)*
- *A typical passenger vehicle travels 11,500 miles per year (including non-commuting travel) and emits 4.6 metric tons of CO_2 annually. 95-99% of GHG emissions from vehicles are CO_2*

Sensitivity Analyses

Given the impact COVID-19 has had on commuting behavior and teleworking, future transportation trends are likely to be different than they were in early 2020. Other factors, such as concentrated population and employment growth are variables that can change the future transportation needs of the region. It is also important to note that the high-level assumptions for transit service in this Study are approximate and can vary from real-life behavior. Recognizing that certain elements in our future are unknown, the Study team ran sensitivity tests on the high investment package to provide a gauge of how the demand for transit service might change under different scenarios. The following four sensitivity tests were examined.

1. Increase service frequency by 10% to understand the impact of increased service on the proposed routes.
2. Reduced travel time on routes 10% to understand potential overall faster service on the proposed routes.
3. Reduce work trips (HBW trips) by 20% to reflect increased teleworking. This is based on survey responses indicating that people think they will be teleworking one day per week once the pandemic is complete.

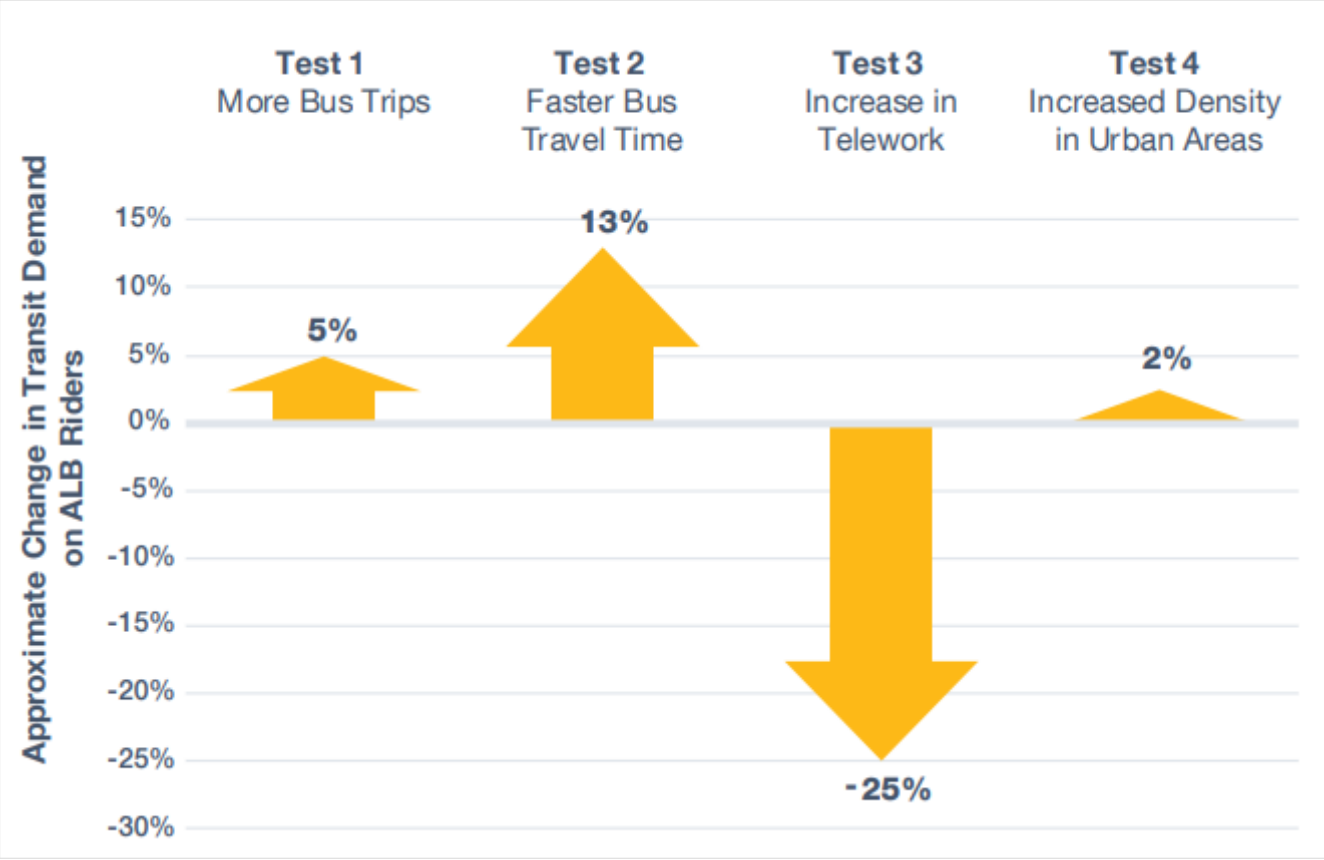
[36] (United States Environmental Protection Agency, 2018)

4. Increase population and employment growth in Bethesda, Tysons, Gaithersburg, and Silver Spring to reflect a higher population and employment densities than defined by regional cooperative land use growth.

The 2045 Model Daily Ridership across the American Legion Memorial Bridge for these sensitivity tests are presented in **Figure 8-6.** Often, changes in ridership demand to service characteristics are expressed in terms of elasticity. Elasticity is defined as the percent change in demand relative to the percent change of the service characteristic, such as time, frequency, and cost. The model results from Test 1 show that the increase in demand on the routes resulting from a 10% reduction in service frequency is an increase of 5% ridership demand, for an elasticity with respect to service frequency of -0.5, which is in line with expectations of service frequency. Test 2, which examined the reduction of route travel time by 10% resulted in a demand increase of 13%. The resulting elasticity to travel time is -1.3 which is at the high end of the observed ranges of transit demand elasticity to travel time.

Test 3 and Test 4 modified the demand on the services by changing the number of trips by reducing the number of work trips to account for future teleworking and by increasing the population and employment densities in Bethesda, Tysons, Gaithersburg, and Silver Spring. Test 3 resulted in a decrease of 25% of the transit demand. This result is understandable as the test reduces all work trips by 20% across the entire region. The reduction of the work trips, which are primarily made during the peak period results in improved highway operations and travel times, resulting in higher percentage of auto trips. Test 4 resulted in modest ridership increases because we increased both population and employment in the selected areas, causing more local trips as opposed to boosting the number of total trips between Bethesda, Gaithersburg, Silver Spring, and Tysons.

Figure 8-6: Transit Demand Sensitivity



9. CONCLUSIONS AND NEXT STEPS

This study identified a series of potential investment packages of recommendations that help meet the identified study needs of providing new mobility choices to service travel between Virginia and Maryland. Each package provides a combination of transit service elements, technology enhancements, Commuter Assistance Programs, and parking needs.

As the managed lanes studies in both Virginia and Maryland progress, these packages offer options to move more people over the Bridge in fewer vehicles. The levels of service that are able to be provided will be dependent on available funding levels and sources as well as determination of a transit operator.

As these potential transit services move closer to implementation, the following should be considered as next steps:

Transit Service

- Identify the potential to advance some transit service to near term before or during construction of managed lanes, potentially using a bus-on-shoulder approach based on the sequence and duration of construction of the managed/express lanes projects once that information is available.
- Determine potential operator(s) and associated maintenance facility considerations.
- Conduct more detailed analysis of specific transit operating assumptions such as frequency, stops, and run times.
- Identify bus bay capacity closer to the time of implementation based on the anticipated service levels at those locations.
- Work with local entities and transit providers to facilitate first-last mile connections and determine local service modifications.

Commuter Assistance Programs and Technology Enhancements

- Coordinate between states, localities, transit operators, and regional entities on implementation of programs.
- Monitor the Virginia RM3P Program for potential longer-term expansion to the I-495 corridor.
- Coordinate with private managed lanes operators about program promotion and real-time information regarding tolls.

Parking and Facility Needs

- Integrate the parking needs identified from the potential service in this Study with regional parking demand and other planned improvements.
- Coordination with transit providers and property owners at locations such as Metrorail and MARC stations to confirm the use of available parking for bus service

Additionally, the levels of investment and timing of the packages could be further refined pending more detailed information on funding availability and schedules for implementation of the managed/express lanes projects.

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11. APPENDICES

Appendix A: Existing Park-and-Ride Lots

Appendix B: Local Commuter Assistance Programs

Appendix C: Initial Screening Results

Appendix D: Off-Model Testing and Evaluation Results

Appendix E: CAPs Evaluation Assumptions

Appendix F: Technology Evaluation Assumptions

Appendix G: Parking Assessments

Appendix H: Stakeholder Meeting Summaries

Appendix I: Survey #1 Results

Appendix J: Survey #2 Results

Appendix K: I-495 American Legion Bridge Transit/TDM Study Summary Report

Appendix A: Existing Park-And-Ride Lots[37]

Name	Location	Main Corridor	Connecting Service	Type	Number of Spaces	Space Utilization Percentage[38, 39]
Arlington County						
Ballston Public Parking Garage	627 N Glebe Rd., Arlington, VA 22203	I-66	Metrobus, ART	Parking Deck	2800	68%
Four Mile Run	4800 Columbia Pike, Arlington, VA 22204	I-66	Metrobus	Surface Lot	19	0%
Metro-East Falls Church Station	2201 N Sycamore St., Arlington, VA 22205	I-66	Metrobus	Metrorail	439	92%
Washington-Liberty	4001 15th St., Arlington, VA 22207	I-66		Surface Lot	391	89%
Fairfax County						
AMF Centreville Lanes	13814 Lee Hwy., Centreville, VA 20120	I-66	Fairfax Connector	Surface Lot	21	0%
Autumn Willow Park	13090 Autumn Willow Dr., Centreville, VA 20120	I-66		Surface Lot	107	2%
Baron Cameron Park	11300 Baron Cameron Ave., Reston, VA, 20190	Route 267	Fairfax Connector	Surface Lot	253	4%
Centreville Park-and-Ride	14700 Lee Hwy., Centreville, VA 20120	I-66	Fairfax Connector	Surface Lot	372	73%
Fairfax County Government Center	12000 Government Center Pkwy., Fairfax, VA 22030	I-66	Fairfax Connector, Metrobus	Surface Lot	421	68%
Greenbriar Park	4600 Stringfellow Rd., Chantilly, VA 20151	I-66	Fairfax Connector	Surface Lot	143	3%
Herndon-Monroe Park-and-Ride	12530 Sunrise Valley Dr., Herndon, VA 20191	Route 267	Fairfax Connector, Metrobus	Parking Deck	1745	32%
Metro-Dunn Loring-Merrifield Station	2700 Gallows Rd., Vienna, VA 22180	I-66	Fairfax Connector, Metrobus, Metrorail	Metrorail	2083	52%
Metro-Vienna-Fairfax-GMU	2900 Nutley St., Fairfax, VA 22031	I-66	Fairfax Connector, Metrobus, Metrorail	Metrorail	4667	81%
Metro-West Falls Church	7040 Haycock Rd., Falls Church, VA 22043	I-66	Fairfax Connector, Metrobus, Metrorail, Loudoun County Transit	Metrorail	2058	57%
Poplar Tree Park	4721 Stringfellow Rd., Centreville, VA 20120	I-66	Fairfax Connector	Surface Lot	188	0%
Reston North	11300 Sunset Hills Rd., Reston, VA 20190	Route 267	Fairfax Connector	Surface Lot	340	99%
Reston South	2531 Reston Pkwy., Reston, VA 20191	Route 267	Fairfax Connector,	Surface Lot	299	28%
St. Paul Chung Catholic Church	4712 Rippling Pond Dr., Fairfax, VA 22033	I-66	Fairfax Connector	Surface Lot	100	6%
Stringfellow Park-and-Ride	4920 Stringfellow Rd., Centreville, VA 20120	I-66	Fairfax Connector	Surface Lot	698	46%
Sully Station Park-and-Ride	4900 Stonecroft Blvd., Centreville, VA 20151	I-66	Fairfax Connector	Surface Lot	39	18%
City of Fairfax						
Kutner Park	11010 Fairchester Dr., Fairfax, VA 22030	I-66	N/A	Surface Lot	39	21%
Loudoun County						
Our Lady of Hope Catholic Church	46639 Algonkian Pkwy., Sterling, VA 20165	Route 7	Loudoun County Transit	Surface Lot	150	18%
Ashburn North	45151 Russell Branch Pkwy., Ashburn, VA 20147	Route 7	Loudoun County Transit	Surface Lot	260	55%
Ashburn Village	43895 Grottoes Dr., Ashburn, VA 20147	Route 7/Route 267	N/A	Surface Lot	51	22%
Brambleton	42790 Creighton Rd., Ashburn, VA 20148	Route 267	Loudoun County Transit	Surface Lot	106	87%
Broad Run Farms	45425 Winding Rd., Sterling, VA 20165 (	Route 7	Loudoun County Transit	Surface Lot	48	8%
Broadlands	44610 Waxpool Rd., Ashburn, VA 20147	Route 267	N/A	Surface Lot	30	7%
Broadlands South (Broadlands-772)	43458 Old Ryan Rd., Ashburn, VA 20147	Route 267	Loudoun County Transit	Surface Lot	159	89%
Cascades	21014 Whitfield Pl., Potomac Falls, VA 20165	Route 7	Loudoun County Transit	Surface Lot	55	53%
Christian Fellowship Church	21673 Beaumeade Cir., Ashburn, VA 20147	Route 7/Route 267	Loudoun County Transit	Surface Lot	300	Not Available
Crossroads United Methodist Church	43465 Crossroads Dr., Ashburn, VA 20147	Route 267	N/A	Surface Lot	85	15%
Dulles North Transit Center	22599 Lockridge Rd., Sterling, VA 20166	Route 267	Loudoun County Transit	Surface Lot	781	102%
Dulles South (Village Center)	24499 Millstream Dr., Aldie, VA 20105 (Stone Ridge Village Center)	US 50	Loudoun County Transit	Surface Lot	100	88%
Goose Creek Village	20785 Century Corner Dr., Ashburn, VA 20147	Route 267	Loudoun County Transit	Surface Lot	87	87%
Harmony (Hamilton)	39464 E Colonial Hwy., Hamilton, VA 20158	Route 7	Loudoun County Transit	Surface Lot	250	66%
Leesburg Park-and-Ride Lot	42103 Claudia Dr., Leesburg, VA, 20175	Route 7/Route 267	Loudoun County Transit	Surface Lot	691	Not Available

[37] (Commuter Connections, 2020)
[38] Occupancy and number of space data for Maryland park-and-ride lots was obtained from the MDOT Transit Service Coordination Report (May 2020).
[39] Occupancy, number of spaces, and connecting service data for Virginia park-and-ride lots was obtained from VDOT on June 30, 2020.

Name	Location	Main Corridor	Connecting Service	Type	Number of Spaces	Space Utilization Percentage[38, 39]
Loudoun Station	43805 Central Station Dr., Ashburn, VA 20147	Route 267	Loudoun County Transit	Surface Lot	301	61%
Lowes Island Front Lot (Great Falls Plaza)	20789 Great Falls Plaza, Sterling, VA 20165	Route 7	Loudoun County Transit	Surface Lot	69	90%
Potomac Station (Harper Park)	18910 Potomac Station Dr., Leesburg, VA 20176	Route 7	N/A	Surface Lot	50	10%
Purcellville	412 Browning Ct., Purcellville, VA, 20132	Route 7	Loudoun County Transit	Surface Lot	221	76%
Dulles Town Center	21020 Atlantic Blvd., Sterling, VA, 20166	Route 7	Loudoun County Transit	Surface Lot	102	46%
East Gate	43664 Tall Cedars Pkwy., Chantilly, VA 20152	US 50	Loudoun County Transit	Surface Lot	218	69%
Telos	19886 Ashburn Rd., Ashburn, VA 20147	Route 7	Loudoun County Transit	Surface Lot	164	Not Available
Dulles South (Stone Ridge II)	24281 Millstream Dr., Aldie, VA, 20105	US 50	Loudoun County Transit	Surface Lot	299	75%
Montgomery County						
Briggs Chaney	Gateshead Manor Way, Silver Spring, MD 20904	US 29	Metrobus, Ride On	Surface Lot	253	60%
Burtonsville	National Drive and Sandy Spring Road, Burtonsville, MD 20866	US 29	Metrobus, MDOT MTA Commuter Bus	Surface Lot	532	50%
Colesville Commuter Lot	New Hampshire Ave., Colesville, MD 20904	US 29	Metrobus	Surface Lot	202	35%
Forcey Memorial Church	2130 E Randolph Rd., Silver Spring, MD 20904	US 29	Metrobus	Surface Lot	200	Not Available
Gaithersburg	124 S Quince Orchard Rd., Gaithersburg, MD 20878	I-270	Ride On, MDOT MTA Commuter Bus	Surface Lot	470	65%
Germantown Transit Center	19843 Crystal Rock Dr., Germantown, MD 20874	I-270	Ride On	Surface Lot	175	100%
Greencastle	Greencastle Road, Burtonsville, MD 20866	US 29	Metrobus	Surface Lot	155	25%
Kingsview	13520 Clopper Rd., Germantown, MD 20874	I-270	Ride On	Surface Lot	177	10%
Lakeforest Mall	262 Odendhal Ave., Gaithersburg, MD 20877	I-270	Metrobus, Ride On	Surface Lot	417	25%
MARC-Barnesville Station	Beallsville Road (MD 109) and Sellman Road	I-270	N/A	Commuter Rail	46	Not Available
MARC-Boyds Station	19940 White Ground Rd., Germantown, MD 20874	I-270	N/A	Commuter Rail	15	Not Available
MARC-Gaithersburg Station	5 S Summit Ave., Gaithersburg, MD 20877	I-270	Ride On	Commuter Rail	280	Not Available
MARC-Garrett Park Station	11015 Rokeby Ave., Kensington, MD 20895	I-495	N/A	Commuter Rail	22	Not Available
MARC-Germantown Station	19320 Mateny Hill Rd., Germantown, MD 20874	I-270	Ride On	Commuter Rail	657	100%
MARC-Kensington Station	3700 Howard Ave., Kensington, MD 20895	I-495	Ride On	Commuter Rail	45	Not Available
MARC-Metropolitan Grove Station	2 Metropolitan Ct., Gaithersburg, MD 20878	I-270	Ride On	Commuter Rail	352	70%
MARC-Rockville Station	307 S Stonestreet Ave., Rockville, MD 20850	I-270	Metrorail, Metrobus, Ride On	Commuter Rail	532	Not Available
MARC-Silver Spring Station	1170 Bonifant St., Silver Spring, MD 20910	I-495	Metrobus, Ride On	Commuter Rail	716	Not Available
MARC-Washington Grove Station	17070 Railroad St., Gaithersburg, MD 20877	I-270	Ride On	Commuter Rail	15	Not Available
Metro-Forest Glen	9730 Georgia Ave., Forest Glen, MD 20910	I-495	Metrobus, Ride On	Metrorail	596	Not Available
Metro-Glenmont Station	12501 Georgia Ave., Silver Spring, MD 20906	I-495	Metrobus, Ride On	Metrorail	1781	Not Available
Metro-Grosvenor-Strathmore Station	5301 Tuckerman Ln., North Bethesda, MD 20852	I-495	Metrobus, Ride On	Metrorail	1894	Not Available
Metro-Rockville Station	307-361 Stonestreet Ave., Rockville, MD 20850	I-270	Metrobus, Ride On	Metrorail	524	Not Available
Metro-Shady Grove Station	15903 Somerville Dr., Rockville, MD 20855	I-270	Metrobus, Ride On	Metrorail	5745	100%
Metro-Twinbrook Station	1600 Chapman Ave., Rockville, MD 20852	I-270	Metrobus	Metrorail	1098	Not Available
Metro-Wheaton Station	11171 Georgia Ave., Silver Spring, MD 20902	I-495	Metrobus	Metrorail	977	Not Available
Metro-White Flint Station	5500 Marinelli Rd., Rockville, MD 20852	I-270/I-495	Metrobus, Ride On	Metrorail	1270	100%
Milestone Shopping Center	Shakespeare Boulevard, Germantown, MD 20876 (Between Frederick Road and Observation Drive)	I-270	Ride On	Surface Lot	216	90%
Montrose Road	Southwest corner of Rockville Pike (MD 355) and Montrose Road	I-270	Ride On	Surface Lot	209	40%
Norbeck Road	3890 Norbeck Rd., Silver Spring, MD 20906	Route 97	Metrobus, Ride On	Surface Lot	248	2%
Tech Road	Old Columbia Pike, Silver Spring, MD 20904	US 29	Metrobus, Ride On	Surface Lot	161	10%
West Diamond Avenue	W Diamond Avenue, Gaithersburg, MD 20877	I-270	Ride On	Surface Lot	318	60%
Westfield Montgomery Mall	10451 Westlake Dr., Bethesda, MD 20817	I-495/I-270	Ride On, Metrobus	Surface Lot	200	50%
Georgia Avenue	15800 Georgia Ave., Rockville, MD, 20853	Route 97	MDOT MTA Commuter Bus, Ride On	Surface Lot	202	51%

Note: *Park-and-Ride lots in Prince George's County, MD and Washington, DC are not shown in this table.*

Appendix B: Local Commuter Assistance Programs

	Alexandria	Arlington	Fairfax	Loudoun	Prince William and Manassas	Montgomery	Frederick
Program Name	**GO Alex**	**ACCS**	**FCTSG**	**LCCS**	**PRTC OmniMatch**	**Montgomery County Commuter Services**	**TransIT**
Commute Pattern (Cross Border)	65% out (residents) 59% in (workers)	Substantial cross border: 78% out (residents) and 52% in (workers)	Substantial cross border: 48% out (residents) and 45% in (workers)	N/A	Substantial cross border: 66% out (residents) and 35% in (workers)	N/A	N/A
Driver Alone Share (Residents)[40]	59%	52%	71%	78%	76%	65.3%	80%
Average travel distance (One-Way Miles)	11 (residents) 15 (workers)	10 (residents) 15 (workers)	14 (residents) 16 (workers)	N/A	23 (residents) 13 (workers)	N/A	N/A
Mode Focus of TDM Program	Primary: Transit, carpool, bike/walk	Primary: Transit, carpool, bike/walk	Primary: Carpool, transit Secondary: Vanpool	Primary: Carpool/Vanpool, transit	Primary: Carpool/vanpool Secondary: Transit	Primary: Carpool/vanpool, bike/walk Secondary: Transit	Primary: Carpool/vanpool
Transit Access	Excellent: Metrorail/Metrobus, DASH bus, VRE	Excellent: Metrorail, Metro bus, ART bus, VRE	Medium: Metrorail/Metrobus, Fairfax Connector bus	Medium: Loudoun County Transit, Metrorail/Metrobus	Medium: OmniRide and OmniLink bus, Metro feeder to Metrorail, Commuter bus, VRE	Medium: Metrorail/Metrobus, MARC	Medium: TransIT bus and shuttle service, MDOT MTA bus, MARC
Casual Carpool Pick- Up (Slug Lines)	No	3 AM drop-off locations	6 AM pick-up locations	N/A	7 AM pick-up locations	N/A	N/A
High-Occupancy Vehicle (HOV)/Express Lanes	I-395, Arterial Streets	I-395	I-95, I-395, I-495, I-66	None	I-95, I-66	I-270	None
Park-and-Ride Lots	2	4	42	22	44	36	14
Bikeshare[41]	Capital Bikeshare	Capital Bikeshare	No	No	No	BikeMatch	No
Website	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Marketing/Promotion	Medium: Targeted residential	Substantial: Residential, ART bus market, “Car-Free Diet”	Medium: Residential, Multifamily building	N/A	Medium: Residential	N/A	N/A
Events	Substantial: BTW Day, Try Transit, Local events, Commuter Challenge	Substantial: BTW Day, Car-Free Day, Earth Day, Try Transit, Local events	Medium: BTW Day, Car-Free Day, Earth Day, Try Transit	Medium: BTW Day, Car-Free Day, Try Transit, Earth Day	Minimal: BTW Day, Try Transit	Substantial: BTW Day, Car-Free day, Earth Day,	Medium: BTW Day, Try Transit, Car-Free Day, Earth Day
Ride matching	Commuter Connections	Commuter Connections	Commuter Connections	Commuter Connections	Commuter Connections	Commuter Connections	Commuter Connections
Vanpool Support	Minimal	Minimal	Minimal	Minimal	Minimal	Minimal	Average
Commuter Store/Transit Store	1 mobile store	4 stationary stores 1 mobile store	5 stationary stores	None	1 stationary	1 mobile store	None
Employer Outreach	Substantial: 300+ employers	Substantial:600+ employers	Substantial: 650+ employers	N/A	Medium:40+ employers	N/A	N/A
Bicycle/Walk	Planning support	BikeArlington, WalkArlington, Planning Support	Bike commute assistance	No	No	N/A	N/A
Other	Site plan TDM review	Site plan TDM review, Commuter Direct, Transit media sales	Smart Benefit “Plus 50”			Traffic Mitigation Plans for large employers	

[40] (United States Census Bureau, 2018)
[41] (Montgomery County Department of Transportation, 2020)

Appendix C: Initial Screening Results

Potential Options ID	Type	Potential Options for Evaluation	Commuter Bus Travel Time (40 mph)	Existing Transit Travel Time (min)	Travel Time Difference (min)	Approximate Daily Travel Demand MD>VA	Approximate Daily Travel Demand VA>MD
1	Transit	Tysons - Bethesda (Route 14A)	42	65	-23	1,233	801
3	Transit	Tysons - Germantown	55	116	-61	1,343	105
4	Transit	Tysons - White Flint BRT Service	38	72	-34	1,676	618
6	Transit	Tysons - Frederick	71	142	-71	1,397	89
2a	Transit	Tysons - Bethesda	42	65	-23	1,233	801
2b	Transit	Tysons - Friendship Heights	56	61	-5	1,705	933
5a	Transit	Tysons - Silver Spring	39	61	-22	1,085	283
5b	Transit	Tysons - White Oak via Silver Spring	68	92	-24	1,847	394
7a	Transit	Reston - Frederick	91	157	-66	2,253	152
7b	Transit	Reston - Germantown	66	129	-63	1,756	169
7c	Transit	Reston - Gaithersburg	60	89	-29	2,207	721
7d	Transit	Reston - Rockville	52	86	-34	1,067	795
7e	Transit	Reston - Silver Spring	57	78	-21	1,370	426
7f	Transit	Reston - White Oak	86	108	-22	2,351	625
7g	Transit	Reston - Bethesda	55	79	-24	1,528	1,470
8a	Transit	Dunn Loring - Frederick	99	147	-48	1,859	123
8b	Transit	Dunn Loring - Germantown	71	99	-28	1,759	151
8c	Transit	Dunn Loring - Gaithersburg	68	78	-10	2,228	627
8d	Transit	Dunn Loring - Rockville	59	75	-16	1,090	687
8e	Transit	Dunn Loring - Silver Spring	66	57	9	1,379	426
8f	Transit	Dunn Loring - White Oak	88	93	-5	2,362	589
8g	Transit	Dunn Loring - Bethesda	64	52	12	1,579	2,411
9a	Transit	Arlington - Frederick	115	131	-16	1,866	81
9b	Transit	Arlington - Germantown	84	86	-2	2,071	101
9c	Transit	Arlington - Gaithersburg	72	57	15	2,451	402
9d	Transit	Arlington - Rockville	60	54	6	1,129	439
9e	Transit	Arlington - Bethesda	58	46	12	1,815	964
9f	Transit	Arlington - Silver Spring	64	42	22	2,025	426
9g	Transit	Arlington - White Oak	77	74	3	3,244	548

Appendix D: Off-Model Testing and Evaluation Results

Option ID	2a	3	5a	5c	6	7g	8g	9a
Options for Evaluation	Bethesda - Tysons West	German-town - Tysons West	Silver Spring - Tysons West	Gaithersburg - Tysons West	Frederick - Tysons West	Bethesda - Reston	Bethesda - Dunn Loring	Frederick - L'Enfant
Description	Bi-directional	Peak Direction Only	Peak Direction Only	Peak Direction Only	Peak Direction Only	Bi-directional	Bi-directional	Peak Direction Only
Weekday Trips (One Direction)	24	12	6	12	4	2	24	12
Frequency	0:30	0:30	1:00	0:30	1:30	3:00	0:30	0:30
Cycle Time (Minutes)	85	92	80	106	146	90	99	174
Distance (mi.) Northbound	15	25	21	28	46	22	17	55
Distance (mi.) Southbound	15	27	20	28	45	23	18	56
Travel Time (mins.) Northbound	44	57	45	71	84	74	50	104
Travel Time (mins.) Southbound	42	50	41	71	86	48	50	98
Weekday Ridership	298	246	136	264	65	77	347	487
Estimated Daily Revenue Hours	24	24	12	30	12	6	24	42
Boardings per Revenue Hour	**12**	**10**	**11**	**9**	**5**	**13**	**14**	**12**
Total Jobs	156,535	94,346	94,346	94,346	94,346	110,092	174,125	132,206
Total Pop	44,569	26,605	34,330	61,074	32,284	35,073	49,880	47,115
Low Income	6%	12%	18%	12%	16%	8%	8%	13%
Minority	34%	58%	65%	55%	40%	37%	38%	54%
Scheduled Trips on Connecting Transit Service	2,739	2,182	4,007	3,836	1,922	1,601	2,330	2,131
Peak Vehicles	4	4	2	5	2	1	4	7
Vehicle Costs per Daily Boarding	$8,048	$9,756	$8,851	$11,348	$18,423	$7,792	$6,908	$8,623
Daily Operating Cost	**$3,648**	**$3,648**	**$1,824**	**$4,560**	**$1,824**	**$912**	**$3,648**	**$6,384**
Operating Cost per Trip	$12	$15	$13	$17	$28	$12	$10	$13
Pax/Hr Score	**0.86**	**0.71**	**0.78**	**0.61**	**0.37**	**0.89**	**1.00**	**0.80**
Cost/Trip Score	*0.90*	*0.75*	*0.83*	*0.61*	*0.00*	*0.92*	*1.00*	*0.85*
Trips Score	*1.84*	*1.52*	*0.84*	*1.63*	*0.40*	*0.32*	*2.14*	*3.00*
Capital Costs/Pax Score	*0.90*	*0.75*	*0.83*	*0.61*	*0.00*	*0.92*	*1.00*	*0.85*
Minority Score	*0.52*	*0.89*	*1.00*	*0.85*	*0.62*	*0.57*	*0.58*	*0.83*
Low-Income Score	*0.33*	*0.67*	*1.00*	*0.67*	*0.89*	*0.45*	*0.44*	*0.73*
Total Jobs Score	*0.90*	*0.54*	*0.54*	*0.54*	*0.54*	*0.63*	*1.00*	*0.76*
Total Pop Score	*0.73*	*0.44*	*0.56*	*1.00*	*0.53*	*0.57*	*0.82*	*0.77*
Connectivity Score	*0.68*	*0.54*	*1.00*	*0.96*	*0.48*	*0.40*	*0.58*	*0.53*
Final Score	*7.66*	*6.81*	*7.38*	*7.48*	*3.83*	*5.67*	*8.56*	*9.12*
Final Rank	***#3***	***#6***	***#5***	***#4***	***#8***	***#7***	***#2***	***#1***

Appendix E: CAPs Evaluation Assumptions

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[1]	General Marketing	Regional/area-wide informational mass marketing/advertising campaigns about commuting/TDM services	Commuters in program area who are targeted with messaging	187,000	Based on trip flows in MWCOG Model going from TAZs in one state to activity centers in the other for the design year 2045.	Signs for Stations and Bus Wraps	$100,000	This is a one-time capital cost. Expected program life for capital cost is 3 years.
						Print Media	$10,000	Annual Cost
	Commuter Express Bus	Promotion and/or operation of commuter express bus service typically operating between residential areas and work areas	Total weekday boardings	96,200[2] 145,600[3]	Annual ridership increase from marketing campaign (assumes 10 percent increase from forecasted total).	Radio/TV	$50,000	Annual Cost
						Targeted Digital Campaign	$90,000	Annual Cost
Targeted Residential Outreach	Targeted Residential Marketing	Direct mail/other mass marketing targeted to residents/employees in specific geographic areas	Commuters in program area who are targeted with messaging	121,550	The percentage (65 percent) of dwelling units in Washington DC Metropolitan Statistical Area that are non-single-family detached units (according to the 2014–2018,5-year American Community Survey) applied to the trip flows in MWCOG Model going from TAZs in one state to activity centers in the other for the design year 2045.	Staff	$150,000	Two full time positions (one focused on NOVA outreach and one focused on Bethesda/I-270 outreach)
						Materials and Travel	$10,000	Annual Cost
Targeted Employer Outreach	Employer Services (Low/Moderate)	Assistance to employers that offer commute information and other low/moderate level commute support (GRH, flextime, and preferential parking)	Employees at Low/Moderate program Worksites (on last day of evaluation period) * does not include employees at High program worksites	44,900	50 percent of commuters have access to low/moderate employer services in program area and 80 percent of businesses in the area have more than 25 employees according to the State of the Commute Survey*. These percentages were applied to the number of trip flows in MWCOG Model going from TAZs in one state to activity centers in the other for the design year 2045. It was assumed **40 percent** of targeted employees will not be reached.	Staff	$150,000	Two full time positions (one focused on NOVA outreach and one focused on Bethesda/I-270 outreach)
	Employer Services (High)	Assistance to employers that offer high level commute support services (financial incentives, company vanpool assistance, parking charges, and shuttles to transit stops)	Employees at High program worksites (on last day of evaluation period)	4,500	5 percent of commuters have access to high employer services in program area and 80 percent of businesses in the area have more than 25 employees according to the State of the Commute Survey*. These percentages were applied to the number of trip flows in MWCOG Model going from TAZs in one state to activity centers in the other for the design year, 2045. It was assumed **40 percent** of targeted employees will not be reached.			
	Telework	Assistance to employers that offer telework programs at worksite	Employees at sites that offer TW option	4,500	According to the State of the Commute Survey*, 5 percent of commuters in 2019 teleworked three or more days a week. That percentage was applied to the 80 percent of businesses in the area have more than 25 employees. It was assumed **40 percent** of targeted employees will not be reached.	Materials and Travel	$10,000	Annual Cost
Vanpool Formation and Expansion Program	Vanpool Formation	Outreach and assistance to commuters to start/maintain commute vanpools; typically, residence-based vanpool outreach	Total Riders in Program Supported Vans	210	Assumed that the number of vanpools will increase by **25 percent** because of Express Lanes (62 new vanpools). The program will support 20 percent of existing vans. Assumed nine riders per van according to 2018 MWCOG vanpool survey.	Participating Vans	$132,000	$400 per van for 6 months each
						Administration	$26,400	20 percent of operation cost
Corridor-Specific HOV Incentive	Alternative Mode "try-it" Incentive	Short-term/temporary financial benefit to drivers' alone commuters to try non-drive alone modes	Registered Participants (on last day of program)	300	Assume 25 participants will try the program each month	Financial Benefits	$137,500	$250 per participant each month — trial lasts for 2 months
						Administration	$27,500	Annual Cost

[1] Corridor Specific Mobility Options Marketing Campaigns is included the medium and high investment packages.
[2] Annual Ridership with the Medium Investment Package
[3] Annual Ridership in the High Investment Package

Appendix F: Technology Evaluation Assumptions

Commuter Parking Information Systems

Options 10a (Virginia Commuter Parking Information System) and 10b (Maryland Commuter Parking Information System) are commuter parking information systems that would provide commuters with reliable and expected parking space availability for park-and-ride lots served by transit services, carpools, and vanpools crossing the Bridge.

The following assumptions were used to develop capital costs for the commuter parking information systems:

- Per-lot cost range for detection equipment, installation, and testing — $99,000 to $220,000
- Per-lot operator cost range for management software including an application programming interface (API) that would allow the data feed to be integrated into third-party apps — $60,000 to $120,000 (including installation and testing)
- Project and construction management costs — Estimated at 15 percent
- Contingency — Estimated at 20 percent
- Annual operating and maintenance — Twenty percent of the detection and software/API capital costs.
- Number of parking lots – Assumes two typical lots in Virginia with two operators and eight typical lots in Maryland with three traffic signal system operators.

Real-Time Traveler Information

Options 11a (Real-Time Toll and Transit Information), 11b (Real-Time Transit Arrival Information), and 11c (Real Time Passenger Load Information) would provide travelers with information to support real-time decision making.

Assumptions used to develop capital and operating costs for 11a (Real-Time Toll and Transit Information) include the following:

- Development of multiple APIs and coordination with third-party vendors to provide integrated data — $130,000 to $245,000
- Project and construction management costs — Estimated at 15 percent
- Contingency — Estimated at 20 percent
- Annual operating and maintenance — Ten percent of the cost for developing APIs plus continued coordination time with app providers.

Assumptions used to develop capital and operating costs for 11b (Real-Time Transit Arrival) include the following:

- Per-bus cost range for hardware, installation, and testing — $5,500 to $11,000
- Per-operator cost range for software to develop the real-time data feed, installation, testing, and coordination with third-party applications — $75,000 to $142,000
- Project and construction management costs — Estimated at 15 percent
- Contingency — Estimated at 20 percent
- Annual operating maintenance costs – Five percent of the cost for developing the real-time data feed plus continued coordination time with app providers.

Costs for overall backend software to support automated vehicle location (AVL) is not included because it is assumed new buses would leverage systems already in use by potential transit operators.

Assumptions used to develop capital and operating costs for 11c (Real-Time Passenger Load Information) include the following:

- Per-bus cost range for hardware, installation, and testing — $3,500 to $6,000

- Per-operator cost range for software to develop the real-time data feed, installation, testing, and coordination with third-party applications — $93,000 to $196,000
- Project and construction management costs — Estimated at 15 percent
- Contingency — Estimated at 20 percent
- Annual O and M — Ten percent of the hardware capital costs, 20 percent for the software capital costs, plus time for continued coordination with third party application providers.

Transit Signal Priority

Option 12 (Transit Signal Priority) would provide priority treatment of buses approaching traffic signals to improve travel time reliability.

The following assumptions were used to develop capital costs for the transit signal priority system:

- Per-bus cost range for hardware, installation, and testing — $4,500 to $7,000
- Per-intersection cost range — $15,000 to $26,000
- Per-signal system operator cost range for hardware, installation, testing, and monitoring software — $50,000 to $100,000
- Project and construction management costs — Estimated at 15 percent
- Contingency — Estimated at 20 percent
- Annual O and M — Ten percent of bus and intersection hardware capital costs and 20 percent of the software capital costs.
- Cost estimates were based on the assumption that the technology would be implemented for 32 intersections and three traffic signal system operators. Transit signal priority could be tailored to which transit routes are implemented in each investment package to maximize the benefits of transit signal priority.

Option	Name	Capital Cost Estimate (2020 $)	Annual O&M Costs (2020 $)
10a	Virginia Commuter Parking Information System	$350,000 –$760,000	$28,000 – $60,000
10b	Maryland Commuter Parking Information System	$1,160,000 – $2,540,000	$111,000 – $240,000
11a	Real-Time Toll and Transit Information	$180,000 – $330,000	$22,000 –$44,000
11b	Real-Time Transit Arrival Information	$500,000 – $980,000	$36,000 – $75,000
11c	Real-Time Passenger Load Information	$440,000 – $850,000	$74,000 – $174,000
12	Transit Signal Priority	$1,090,000 – $1,910,000	$74,000 – $144,000

Appendix G: Parking Assessments

Baseline Investment Package							
Parking and Facilities Location	**Existing Capacity**	**Available Parking Spaces**	**Growth in HOV**	**Future Transit Parking Demand**	**Total Future Parking Demand (Includes HOV Growth and Transit Demand)**	**Net Demand (Existing Available Spaces - Future Parking Demand**	**Parking Assessment**
Tysons	0	0	0	11	11	-11	Additional Spaces Required Potential Solution: Shared use Agreements
Dunn Loring	No routes servicing this parking location						
Reston	No routes servicing this parking location						
Bethesda	0	0	0	12	12	-12	Additional Spaces Required Potential Solution: Shared use Agreements
Silver Spring	No routes servicing this parking location						
Rock Spring – Westfield Montgomery Mall Transit Center	161	61	6	140	146	-85	Additional Spaces Required Potential Solution: New Parking Structure
Gaithersburg	6912	757*	57	63	120	637	Existing Capacity Exceeds Demand From New Services No Solution Needed
Germantown	No routes servicing this parking location						
Urbana	No routes servicing this parking location						
Monocacy	No routes servicing this parking location						
Frederick	No routes servicing this parking location						

Medium Investment Package							
Parking and Facilities Location	**Existing Capacity**	**Available Parking Spaces**	**Growth in HOV**	**Future Transit Parking Demand**	**Total Future Parking Demand (Includes HOV Growth and Transit Demand)**	**Net Demand (Existing Available Spaces - Future Parking Demand**	**Parking Assessment**
Tysons	0	0	0	12	12	-12	Additional Spaces Required Potential Solution: Shared use Agreements
Dunn Loring	No routes servicing this parking location						
Reston	No routes servicing this parking location						
Bethesda	0	0	0	12	12	-12	Additional Spaces Required Potential Solution: Shared use Agreements
Silver Spring	0	0	0	18	18	-18	Additional Spaces Required Potential Solution: Shared use Agreements

Rock Spring – Westfield Montgomery Mall Transit Center	161	61	6	404	410	-349	Additional Spaces Required Potential Solution: New Parking Structure
Gaithersburg	6912	757*	57	104	161	596	Existing Capacity Exceeds Demand From New Services No Solution Needed
Germantown	175	0	25	140	164	-164	Additional Spaces Required Potential Solution: Expansion of Existing Surface Lot
Urbana	511	194	44	175	219	-25	Additional Spaces Required Potential Solution: Expansion of Existing Surface Lot
Monocacy	800	120	95	96	191	-71	Additional Spaces Required Potential Solution: Expansion of Existing Surface Lot
Frederick	100	91	2	25	47	44	Existing Capacity Exceeds Demand From New Services No Solution Needed

High Investment Package

Parking and Facilities Location	Existing Capacity	Available Parking Spaces	Growth in HOV	Future Transit Parking Demand	Total Future Parking Demand (Includes HOV Growth and Transit Demand)	Net Demand (Existing Available Spaces - Future Parking Demand	Parking Assessment
Tysons	0	0	0	11	11	-11	Additional Spaces Required Potential Solution: Shared use Agreements
Dunn Loring	2083	1000	0	10	10	990	Existing Capacity Exceeds Demand From New Services No Solution Needed
Reston	0	0	0	13	13	-13	Additional Spaces Required Potential Solution: Shared use Agreements
Bethesda	0	0	0	24	24	-20	Additional Spaces Required Potential Solution: Shared use Agreements
Silver Spring	0	0	0	27	27	-27	Additional Spaces Required Potential Solution: Shared use Agreements

Rock Spring – Westfield Montgomery Mall Transit Center	161	61	6	489	495	-434	Additional Spaces Required Potential Solution: New Parking Structure
Gaithersburg	6912	757*	57	92	150	608	Existing Capacity Exceeds Demand From New Services No Solution Needed
Germantown	175	0	25	199	224	-224	Additional Spaces Required Potential Solution: Expansion of Existing Surface Lot
Urbana	511	194	44	258	302	-108	Additional Spaces Required Potential Solution: Expansion of Existing Surface Lot
Monocacy	800	120	95	141	237	-117	Additional Spaces Required Potential Solution: Expansion of Existing Surface Lot
Frederick	100	91	2	67	69	22	Existing Capacity Exceeds Demand From New Services No Solution Needed

Note: *Parking occupancy numbers for Gaithersburg MARC Station not available*

Appendix H: Stakeholder Meeting Summaries

Meeting #1 Summary

Participants

Project Team

DRPT:
- Jennifer Debruhl
- Grant Sparks
- Todd Horsley
- Ciara Williams

MDOT/MTA:
- Zachary Chissell
- Elizabeth Kreider
- James Ritchey

Consultant Team:
- Melissa DuMond
- Paul Elman
- Erin Murphy
- Lucas Muller
- Grace Daigle
- Amanda Bahrij
- Andrew Wainwright
- David Miller

Project Stakeholders

Arlington County, VA:
- Jim Larsen
- Kirk Dand
- Pierre Holloman

Arlington Transportation Partners:
- Wendy Duren

Bethesda Transportation Solutions:
- Kristen Blackmon

City of Alexandria:
- Jennifer Slesinger

Dulles Area Transportation Association:
- Doug Pickford

Fairfax County, VA:
- Elizabeth Mann
- Malcolm Watson
- Martha Coello
- Michael Felschow
- Zach Khromal
- Stuart Boggs
- Walter Daniel
- Yuqing Xiong
- Marcus Moore

Frederick County, MD:
- Mark Mishler
- Ron Burns

Loudoun County, VA:
- Penny Newquist

MDOT:
- Heather Murphy
- Michelle Martin
- Gladys Hurwitz
- Kari Snyder

Montgomery County, MD:
- Chris Conklin
- Dan Hibberd
- Gary Erenrich
- Sandra Brecher

MWCOG:
- Eric Randall
- Nicholas Ramfos

NVTA:
- Keith Jasper
- Ria Kulkarni

NVTC:
- Dan Goldfarb
- Dinah Girma
- Jae Watkins

OmniRide:
- Holly Morello
- Perrin Palistrant

Tysons Partnership:
- Ronit Dancis

Vanpool Alliance:
- Joe Stainsby

VDOT:
- Abraham Lerner
- Fatemeh Allahdoust

WMATA:
- Charlie Scott
- Jonathan Parker

Date/Time: July 16, 2020, 9:30 AM – 12:00 PM

Subject: Stakeholder Meeting #1

Key Takeaways

The meeting began with a round of introductions followed by a description of the project and an update on ongoing corridor efforts from MDOT SHA's consultant and VDOT. Stakeholders were then given an opportunity to

respond with current/ongoing initiatives relating to travel over the Bridge. After a quick break, the project team presented the needs assessment and gaps analysis that was conducted as a part of Tech Memo I. Breakout groups (two transit and a TDM group) were assigned to stakeholders for discussion on potential routes and services. The groups reconvened to discuss takeaways and project next steps.

Stakeholder Input: Current/Ongoing Initiatives relating to travel over the American Legion Bridge

Each stakeholder group was given space to provide initial input. The stakeholders that commented during this time are summarized below:

- Bethesda Transportation Solutions stated that their reduced carpool parking program in downtown Bethesda is popular.
- Fairfax County, VA commented on the different funding structures of transit providers and how that could affect potential improvements.
- Frederick County, MD stated that there is Leesburg and Reston travel from Frederick County that utilizes the Bridge. They also mentioned the importance of express (rapid) bus service from Frederick along the I-270 corridor.
- Montgomery County, MD stated the need for park-and-ride facilities in both Virginia and Maryland. They commented that there is an opportunity to incorporate the BRT plans in Montgomery County with this effort. They also mentioned looking at ways to connect/integrate with existing local transit services such as the BRT and Purple Line and stressed the importance of connections to bikeways on the Maryland side of the bridge. Additionally, they stated that Montgomery Mall is a key location as it was envisioned to support transit service into Virginia over the Bridge.
- MWCOG stated that commuter incentives programs are already in place and they are expanding the program to include employer-based module in app (over the next 3 years). The program includes ride matching, carpool and vanpool incentives, flextime incentive program.
- NVTA is looking to incorporate this project into its Long-Range Multimodal Transportation Plan to make it eligible for funding.
- NVTC has a two-year commuter choice ongoing program that can be extended. Their ride matching assistance for Prince William County receives request for service across the bridge.
- Omni Ride stated that they have existing services that go to Tysons and could utilize transit/TDM improvements across the bridge.
- Vanpool Alliance already has vanpool routes that travel across the bridge. This project will incentivize more vanpools.
- VDOT commented that they are developing a TMP for I-495 NEXT, and the I-66 TMP is ongoing.
- WMATA brought up the SmartMover service that was discontinued in 2003 because of congestion over the bridge.

Breakout Group Session Summaries

Transit Group A

Stakeholders stressed that parking in Virginia near Tysons is a major challenge and will require creative solutions. There was a recommendation to extend routes beyond Tysons to the Dulles Corridor. There is also a demand inside the beltway toward DCA. It was also commented that access to the Pentagon is critical. A route was recommended from Montgomery Mall to the Pentagon. NVTA is currently investing in BRT connecting Ft. Belvoir to Alexandria. If this BRT comes to fruition would allow for Alexandria-Tysons (with Route 7 BRT) and into MD. A suggestion was made to extend a route from Maryland to the Vienna Metrorail station with the improved Express Lane access at Vaden Dr by the on-going I-66 outside the Beltway project.

On the Maryland side, it was stated that Germantown has express services to Shady Grove which could be incorporated into service across the Bridge. Lake Forest Mall has a transit center (which as it redevelops, would be good to incorporate). New Cut/Seneca Parkway may be an opportunity to serve Frederick County. There is a need for more park-and-rides and commuter bus routes in Frederick. Silver Spring Transit center is a big hub and connection there is important. Extension of the Purple Line into Virginia is a long-range goal. It was also stated that if Montgomery County was to operate services across the bridge, that bus maintenance facilities in Montgomery County would need to be considered.

Regarding equity, connection to Gaithersburg and Silver Spring/along Route 29 are diverse areas that should be prioritized. Additionally, accommodating for shift workers and mid-day travel is a component of equity.

Transit Group B

Multimodal connections for first and last mile were stressed - not only parking facilities, but also bike facilities and pedestrian accommodations. It is important to coordinate with local bus routes and regional rapid bus connections. Maximizing route frequency, diversifying span of services, identifying optimal access points and considering bi-directional service were features of the potential routes/services that were discussed.

Regarding equity, utilizing toll revenue to fund transit fare policies to benefit low-income riders was discussed. A sustainable funding source is important given the bi-state nature of the potential services. The difference in how tolled facilities are treated between the states (HOV-3) could produce equity issues. Access to technology is also a point of inequality and should be considered in creating new services. Bethesda and Tysons are two high-income areas. Ensuring connection services are provided to lower income areas is important as well.

Added potential connection points discussed were to Reston and Rockville, utilizing the express lanes networks there. Use of the underutilized Park and Ride at Montgomery Mall was discussed as well as incorporating potential service with the US 29 BRT route. Short-term potential routes might have lower frequency and build over time to something more frequent (e.g., 30-minute headway now, 20-minute headway in X years, 15 mins in X years).

TDM Group

Discussion began with a question about how the managed lanes projects could affect carpools and vanpools. The lack of available parking at park-and-ride locations in exurban areas, such as Clarksburg in Maryland, was identified as a key constraint for getting more people to use vanpools. It was recognized that there are generally more park-and-rides in Virginia, but also that park-and-rides should be located near and adjacent to access points to the managed lanes to make carpool and vanpooling more attractive to users. The Westfield Montgomery Mall park-and-ride was identified as a good example of a private agreement park and ride lot that would provide access to managed lanes on I-270 in both directions.

There was also discussion about how COVID-19 and teleworking will affect carpools and vanpools going forward. Several participants noted that employers will not be going back to physical work locations until January and that teleworking will remain in some capacity in the long term. Participants agreed that casual carpooling and vanpools in general will take a long time to recover since commuters are less likely to get in a car with strangers or a group of people who might be infected. Since the managed lanes will be fully constructed in roughly a decade, participants considered how to get commuters to carpool and vanpool in the future as the threat of COVID wanes. There was agreement that strong relationships with employers and residential contacts and robust marketing campaigns are the most effective methods to get people to vanpool and carpool.

Participants discussed the importance of linking TDM improvements to Metrorail Stations and other multimodal connections. There was agreement that parking should not be a focal point in activity centers like Tysons, and that innovative strategies technologies should be utilized at origin and destination points to provide first and last mile connections, such as autonomous shuttles, on-demand microtransit, and ride-hailing services.

Meeting #2 Summary

Participants

Project Team

DRPT:
- Jennifer Debruhl
- Ciara Williams
- Todd Horsley

MDOT/MTA:
- Zachary Chissell
- Elizabeth Kreider
- Jim Ritchey

Consultant Team:
- Melissa DuMond
- Lucas Muller
- Grace Daigle
- David Miller
- Andrew Zalewski
- Andrew Wainwright
- Tyler Beduhn

Project Stakeholders[42]

Arlington County, VA:
- Jim Larsen

Bethesda Transportation Solutions:
- Kristen Blackmon

DRPT
- Chris Arabia

Fairfax County, VA:
- Elizabeth Mann
- Malcolm Watson
- Michael Felschow
- Zach Khromal
- Stuart Boggs
- Anna Nissinen
- Yuqing Xiong
- Marcus Moore

Frederick County, MD:
- Mark Mishler
- Ron Burns

Loudoun County, VA:
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- Bob Brown

MDOT:
- Heather Murphy
- Michelle Martin
- Gladys Hurwitz
- Kari Snyder

Montgomery County, MD:
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- Dan Hibbert
- Gary Erenrich
- Sandra Brecher

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- Carol Rubin

NVTA:
- Keith Jasper
- Ria Kulkarni

NVTC:
- Dan Goldfarb
- Dinah Girma
- Jae Watkins
- Allan Fye
- Kate Mattice
- Ben Owen

OmniRide:
- Holly Morello

Prince George's County:
- Courtney Glass

Prince William County
- Paolo Belita

Vanpool Alliance:
- Joe Stainsby

VDOT:
- Abraham Lerner
- Fatemeh Allahdoust

WMATA:
- Charlie Scott
- Melissa Kim

Date/Time: August 28, 2020, 9:30 AM – 12:00 PM

Subject: Stakeholder Meeting #2

Key Takeaways

The meeting began with a recap of the topics covered in the first stakeholder meeting and progress made in the last month. The project team then presented the Preliminary Potential Recommendations being evaluated in the next phase of the study using a data-driven methodology and screening process. The project team solicited feedback on each Preliminary Potential Recommendation from the stakeholders through polling questions and discussion. The Preliminary Potential Recommendations were split into four categories: transit, technology,

commuter assistance programs (CAPs), and parking and facilities improvements. A refined list of recommendations will be presented to stakeholders at the third stakeholder meeting scheduled on Friday, October 16.

Polling Results and Feedback

Feedback from stakeholders on the Preliminary Potential Recommendations was captured through polling. Results from the poll questions can be found in the accompanying presentation PDF attached in the email dated September 4.

The Project Team asked participants to rate their experience with the polling questions and using the polling platform on a scale of 1-5 with 5 being the highest. The majority of participants rated their experience with a 4 or 5, but some rated the experience much lower with a 1. Some participants also stated that the polling platform worked but could have been better if participants had more time to respond to questions and had more background context and data to make more informed responses. Additional information on project background and data related to each transit recommendation will also be presented at Stakeholder Meeting #3 to provide participants with more context to provide more meaningful feedback on specific recommendations. The Project Team is committed to using this feedback to improve upon the virtual experience at the next Stakeholder Group Meeting to foster a robust dialogue and meaningful discussion.

Meeting #3 Summary

Participants

Project Team

DRPT:
- Jennifer DeBruhl
- Todd Horsley
- Ciara Williams
- Christopher Arabia

MDOT/MTA:
- Zachary Chissell
- Elizabeth Kreider
- James Ritchey

Consultant Team:
- Melissa DuMond
- Paul Elman
- Erin Murphy
- Lucas Muller
- Steve Weller
- Amanda Bahrij
- Grace Daigle
- Andrew Wainwright
- Andrew Zalewski

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City of Alexandria:
- Jennifer Slesinger

Fairfax County, VA:
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- Malcolm Watson
- Zach Khromal
- Yuqing Xiong
- Marcus Moore
- Malcolm Watson

MDOT:
- Gladys Hurwitz
- Heather Murphy
- Michelle Martin

Montgomery County, MD:
- Dan Hibbert
- Gary Erenrich
- Sandra Brecher

M-NCPPC:
- Patrick Reed

MWCOG:
- Eric Randall
- Nicholas Ramfos

North Bethesda Transportation Management District:
- Peggy Schwartz

NVTA:
- Ria Kulkarni

NVTC:
- Allan Fye
- Ben Owen
- Dan Goldfarb
- Dinah Girma

OmniRide:
- Holly Morello

Prince William County:
- Courtney Glass

Vanpool Alliance:
- Joe Stainsby

VDOT:
- Abraham Lerner
- Fatemeh Allahdoust

WMATA:
- Charlie Scott
- Jonathan Parker

Date/Time: October 16, 2020, 9:30 AM – 12:00 PM

Subject: Stakeholder Meeting #3

Key Takeaways

The third stakeholder meeting began with introductions in which stakeholders were asked to share organization successes during this season. Many stakeholders were proud of the way transit has been able to serve the metro DC region during COVID-19. The project team gave updates on I-495 NEXT and I-270 Managed Lanes studies and stakeholders presented recent work that might influence travel across the Bridge. The project team then presented the preliminary study recommendations regarding transit, technology, and commuter assistance programs that passed initial screening of the study and breakout sessions were held to discuss the presented material.

Study Updates from Stakeholders

Montgomery Planning updated participants on the Corridor Forward Plan which is a master plan for transit options in the Maryland, metro-DC region. Six scenarios will advance preliminary analysis and will undergo robust scenario planning. A key project assumption is that all routes to Virginia will travel across the American Legion Bridge. Website link was posted in the meeting chat and can be found here.

NVTC presented the impact of teleworking in the northern Virginia area based on a recent study. Before the COVID-19 pandemic, 10% of the region teleworked according to MWCOG. The peak of teleworking during spring of 2020 was 40-50%. Modeling telework behavior in the future, the study found that mode share increases at high teleworking rates because of the low-income workers still traveling to on-site jobs. As such, single occupancy vehicle trips had the most volatility, and bus as a mode became more prominent.

MWCOG gave an update on the 2019 State of the Commute General Public Report, which has commuter information pre-pandemic. The next report is planned for 2022. According to other work they are doing, there is a high percentage of employers interested in continuing telework after pandemic restrictions are lifted. They are modifying some of their survey questions to learn more about this topic.

VDOT mentioned they have a commuter survey that has been developed. The website was also posted in meeting chat. And Montgomery County commented that there has been extensive internal effort toward planning BRT.

Refinement Process Results

The project team presented all preliminary recommendations and explained the initial screening process and why recommendations were screened out based on a variety of different factors. Clarification was given during the call that travel demands were based on a blend of existing and future land use projections. For the off-model analysis, it was discussed that the transit mode share was set at 5% based on assumptions in previous studies. Sensitivity testing will be done in the model to more accurately predict the percentage of transit use as a mode share.

Breakout Group Session Summaries

Group 1

Group 1 began their breakout group discussion with conversation about the potential transit route recommendations presented. Participants gave several examples of how the strategy for implementation could evolve over time based available infrastructure, changes in land use, increased route popularity, and other factors. Participants were surprised by lack of demand from White Flint. Montgomery County is focused on centering growth in the White Flint and White Oak areas, so they would expect demand to rise over time. They suggested infill stops with future services. Several questions were raised related to consideration of equity in planning the routes. Participants indicated Montgomery County is very focused on equity in transit and suggested looking at other studies in the region to determine if something other than the federal poverty line should be used as the low-income threshold due to high cost of living in DC metro. The example was given that WMATA uses $30,000 as its low-income threshold. Participants also noted that frequencies for the services seemed really low. They suggest looking at Omni-ride, MTA, and others for guidelines on minimum frequencies. The project team indicated that adjustments to frequencies were being considered as part of the modeling efforts currently underway.

Vanpool Alliance representatives expressed concern that new transit service over the Bridge would pull users from existing vanpool routes. There was discussion as to how to focus on capturing SOV trips rather than moving passengers from vanpool to bus, including the possibility of introducing incentives for vanpool routes that show a reduction in riders due to the new transit services.

Participants indicated that they were surprised by polling results from Stakeholder Meeting #2 showing a preference for real-time parking information over transit signal priority to improve travel times. They indicated that real-time parking information is valuable in more suburban areas, but less useful in urban areas with limited parking. Participants would like to see implementation of variable messaging signs and apps that provide information such SOV and transit travel times and next bus arrival time to allow commuters to make informed choices about their travel mode before leaving the house.

Group 2

In regard to future regional change, some stakeholders in Group 2 stressed that the growth in Tysons will increase in its draw of commuters over the Bridge. Maryland representatives stressed that there are plans in development that will cause more job growth in Maryland. Two factors that will affect future travel is the rate of teleworking and the use of autonomous vehicles. It was discussed how these factors may decrease the cost of travel and decrease congestion over the bridge.

Concerning the potential transit route recommendations, there was an emphasis on Montgomery Mall being an important stop on routes. The route from Fredrick to Arlington was brought up and stakeholders commented that it would also be beneficial to connect Frederick to DC via commuter bus. If this route was developed, travel should stay on managed lanes as much as possible. Routing should be connected through I-66 which would also open up additional funding opportunities.

Regarding commuter assistance programs, stakeholders agreed that technology will provide more flexibility for commuters which might increase participation. Another benefit is that both Virginia and Maryland have strong existing CAP programs which makes coordination for new incentives across the Bridge more doable and effective.

Group 3

Discussion in Group 3 began with an evaluation of evolving regional travel trends in the future. There was consensus among participants that COVID-19 and the ensuing stay-at-home measures have dramatically changed the commuting patterns of workers in Virginia and Maryland in two specific ways. First, teleworking is likely going to continue even after the threat of COVID-19 has diminished, even if at a limited capacity where employees telework one or two days per week. Second, an increasing proportion of travel is moving to the off-peak time and the distribution of travel through the day is changing. However, whereas the number of people driving, and total miles traveled decreased dramatically in the early stages of the pandemic, vehicle miles traveled (VMT) is coming close to pre-COVID-19 levels again, and transit and carpool/vanpool usage has decreased.

In regard to potential transit route recommendations discussed during the presentation, participants outlined a few recommendations for the Project Team to consider in future analysis. First, more frequent service and shorter headway times would help make the service more attractive and competitive. Second, some routes operate as peak direction only and do not stop at highly travelled to destinations, such as White Oak, MD. Third, transit mode share assumption (currently 5%) could potentially be improved by looking at the mode share split for transit on similar facilities in the region, such as I-95.

Participants also highlighted the administrative challenges of coordinating interstate transit services and multi-jurisdictional commuter assistance programs (CAPs). Participants agreed that CAPs at the local level have worked well with each other and MWCOG has been instrumental in pulling the region together to coordinate on transportation demand management (TDM) strategies. The challenge going forward is how these transit and CAPs can be coordinated and implemented as part of the traffic mitigation plan during the construction of the Managed Lanes in MD and Express Lanes in Virginia.

Meeting Follow Up Questions

After the meeting, stakeholders reached out to the project team with some follow up questions. The responses to those questions are summarized below.

One question was asked for clarification on how the transit recommendation vehicle cost per passenger was calculated and exactly what it represents. The project team responded that the vehicle cost per passenger was assumed to be a vehicle cost per average daily boarding. For example, recommendation 2a, East Bethesda – Tysons East, requires two vehicles daily x $600,000 for each vehicle which equals $1,200,000. Daily boarding was estimated at 256 riders (using forecasted zone to zone travel demand from MWCOG travel demand model). The vehiclel cost per passenger then was calculated to be $4,682 which is $1,200,000 divided by 256. In everyday terms, the lower the vehicle cost per passenger is, the higher the return is on capital dollars.

Another question was regarding Dulles Airport as a destination. The project team explained that it was brought up in the last meeting for consideration but did not pass initial screening. It was screened out due to insufficient travel demand as documented on slide 15.

Additionally, a question was asked about the goal for the study and what will be its result. Specifically, if the recommendations will be given to DRPT for guidance in future funding or if there is designated funding associated with the potential recommendations. The project team responded that, to generalize, the study will provide Virginia and Maryland concepts that may be operationalized in the future. These recommendations are for transit that may be pursued in the context of the managed lanes improvements going on in both states. Currently no specific funding sources have been identified by the study sponsors, DRPT and MTA, to support the potential recommendations.

Meeting #4 Summary

Participants

Project Team

DRPT:
- Jennifer DeBruhl
- Todd Horsley
- Ciara Williams
- Christopher Arabia

MDOT/MTA:
- Zachary Chissell
- Elizabeth Kreider
- James Ritchey

Consultant Team:
- Melissa DuMond
- Paul Elman
- Erin Murphy
- Lucas Muller
- Steve Weller
- Amanda Bahrij
- Grace Daigle
- Andrew Wainwright
- Andrew Zalewski
- David Miller

Project Stakeholders

Arlington County, VA:
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Fairfax County, VA:
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- Malcolm Watson
- Marwan Mahmoud
- Michael Felschow
- Stuart Boggs
- Yuqing Xiong

Loudon County, VA:
- Bob Brown
- Penny Newquist

MDOT:
- Gladys Hurwitz
- Heather Murphy
- Kari Snyder

Montgomery County, MD:
- Chris Conklin
- Dan Hibbert
- Gary Erenrich
- Patrick Reed
- Sandra Brecher

M-NCPPC:
- Carol Rubin

MWCOG:
- Antonio Castaneda
- Eric Randall
- Nicholas Ramfos

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- Allan Fye
- Ben Owen
- Dan Goldfarb
- Dinah Girma
- Jae Watkins
- James Davenport
- Kate Mattice

OmniRide:
- Holly Morello

Vanpool Alliance:
- Joe Stainsby

VDOT:
- Fatemeh Allahdoust
- David Metcalf

WMATA:
- Jonathan Parker

Date/Time: December 11, 2020, 9:30 AM – 12:00 PM

Subject: Stakeholder Meeting #4

Key Takeaways

The fourth stakeholder meeting began with introductions in which stakeholders from each organization were asked to share updates on progress their agency has made on any efforts related to the I-495 ALB Transit/TDM Study. The project team then provided a brief update on the progress made on the Study since the last stakeholder meeting. The project team also recounted general themes of input received from the stakeholders throughout the process, and questions asked by the stakeholders in previous meetings that will be addressed during the stakeholder meeting. The project team then presented the proposed baseline, medium, and high investment packages, and provided a high-level overview of the transit, technology enhancement, commuter assistance program (CAP), and parking components within each package. The potential benefits of the packages were also outlined, as well as the effect that changes in key factors, such as travel time and frequency, would have on transit demand. The final component of the meeting were the breakout sessions and discussion of next steps following the completion of this study.

Investment Packages

Stakeholders had received preview handouts outlining the proposed investment packages prior to the meeting. During the meeting the project team further explained the implementation framework and process that defined the investment packages and their associated improvements. Specifically, each investment package was built around level of transit service and varied by number of markets served, route frequency, and span (time of day). Moreover, potential transit routes within each package are supported technology enhancements, CAPs, and parking needs. Transit service and the other package elements are also influenced by the implementation timeframes, which are heavily dependent on the construction of the managed lanes and express lanes in MD and VA, respectively.

Brief defining characteristics of the investment packages are outlined below:

- **Baseline** – Foundational peak-period service connecting three markets identified in previous planning efforts
- **Medium** – Robust network of primarily peak-period service connecting five key markets in Maryland with Tysons and Arlington in Virginia
- **High** – Comprehensive all-day bus service that maximizes potential ridership and serves additional destinations

Investment Package Benefits

Having outlined the proposed investment packages, the project team outlined the anticipated benefits of the High package, which includes the most robust level of transit service. Specifically, the high package will provide for over 180 bus trips per day and moving 5,600 new transit riders. 66% of the bus trips during the peak period will provide service to origins within ½ mile of MWCOG Equity Emphasis Areas and allow for connections at both origins and destinations to several Metrorail, MARC, and local transit routes. The project team also presented the results of the four sensitivity analysis tests conducted. The results showed that increasing the frequency of transit service and reducing travel time had moderate increase in transit demand whereas accounting for an increase in telework had the most potential decrease. An increase in growth in some of the urban areas had a relatively neutral effect on transit demand.

Breakout Group Session Summaries

Stakeholders were broken into breakout rooms to discuss next steps following completion of this study. Summaries and key takeaways from each of the breakout room sessions are outlined below

Group 1

Discussion in Group 1 began with agreement from attendees that messaging is a critical component for promoting future transit service and CAPs. Messaging should be formulated to garner public support while also tying transit service into the Virginia I-495 NEXT and Maryland Managed Lanes projects. Attendees pointed out that based on the I-495 NEXT public meetings, there is the sense that the express lanes are only for single-occupancy vehicles, and that the branding of the express and managed lanes projects should emphasize transit and carpool/vanpool.

To get people to take these commuter bus routes and use carpool/vanpool on the new managed lanes, the travel times savings should be emphasized in the branding and marketing. Working with employers has worked well for TDM entities in the study area, and attendees emphasized that working with employers to promote new transit service over the Bridge (and other non-SOV modes of travel) should be a key component of any marketing campaign. Fairfax County has had success running the 699 commuter bus on I-66 HOT lanes, so that service and their marketing strategy could serve as a model for implementing commuter bus service across the Bridge. The importance of outreach to disadvantaged communities and ensuring the proposed service is servicing equity emphasis areas was also emphasized. Discussions with community groups would be an effective strategy for reaching these groups and marketing the service.

Attendees also agreed that before gaining public support and formulating a message for the public, more details about the transit service must be determined, including the operator, level of service, route alignment, and maintenance facilities. Knowing these details about transit service will also allow the implementing agency to begin finding funding sources to implement the new service, which will require coordination with regional and state entities. The potential for implementing some service during construction of the express and managed lanes was brought up. While it might not be a congestion-free ride as it would be in the managed lanes, it would help at least get the service started sooner and moving people across the Bridge.

Group 2

Discussion in Group 2 began with attendees sharing any remaining comments regarding the presented material. The challenge of park-and-ride availability in Tysons was discussed as well as the increasing job growth in the area. Discussion then shifted to the guiding questions for next steps beyond this project.

What can your agency do to advance the transit market over the Bridge?

- Arlington County and Montgomery County both mentioned their well-established commuter assistance programs and the importance of continuing outreach to employers and residents (particularly in multi-family areas).

What materials or messaging would be helpful to garner public support?

- Arlington County emphasized messaging a complete vision for the Bridge. M-NCPPC agreed and stated that tying in the Transit and TDM study with the managed/express lanes efforts in both Maryland and Virginia might help alleviate local objections to the Bridge expansion. Additionally, adding structural support to the bridge with the potential for rail in the future will help with public perception of the ongoing projects. DRPT stated that another key message is the reliability that the managed/express lanes provide for transit service.

What follow-on efforts would be of value for transit and TDM on the Bridge corridor?

- M-NCPPC recommended technology investments that help users experience their ride as a uniform trip – even if there were multiple connections involved. This could include having a universal transit fair payment system and/or well-coordinated departure times to minimize delays between connections. Anything that can add convenience to the user and brand the route as a holistic service will increase ridership. DRPT added that uniform messaging about the service from all the different agencies is another key to the success of the new service.

How can future plans incorporate input from disadvantaged populations?

- M-NCPPC recommended inviting members from the community to share ideas, solutions and direct input. The cost of transit in the region is increasing and is a barrier to serving disadvantaged populations.

Group 3

Discussion in Group 3 began with conversation around the need to coordinate transit options introduced during construction with future transit routes to capitalize on the new ridership that may be gained during construction. Stakeholders also suggested looking at the parking needs to support transit options implemented during construction and how they could be used with future post-construction transit routes. VDOT indicated that the TMP coordination for the I-495 NEXT program has not yet begun. However, VDOT does not expect that shoulders would be available for bus use during construction, so busses would be running in traffic.

Fairfax County representatives suggested that bus bay capacity and layover space would need to be considered in future efforts for service in Tysons. The Westpark Transit Center was suggested as an alternate terminus location to Spring Hill because of the availability of layover spaces for the busses. A redevelopment of the Westpark Transit Center is currently being planned, and potential service that would use the transit center should be considered in those planning efforts.

Stakeholders discussed the need for thoughtful public messaging around how any proposed transit service would improve their lives and a need to clearly message why new transit service is needed when traffic is down due to COVID. Stakeholders noted that while total volumes are moving closer to pre-COVID levels, the morning and afternoon peak periods have shifted to reflect more of a mid-day perk period. It was also suggested that increased telework, increased car trips due to avoiding air travel, and increased delivery and freight service might change the Bridge from a commuter corridor to more of an inter-state shipping and travel corridor.

Finally, Stakeholders also discussed the logistics of interjurisdictional bus operations. Fairfax County and Montgomery County representatives stated that it would be possible to run busses from one jurisdiction to another with proper licensing of the drives and funding and operations agreements in place. WMATA has overseen this type of service in the past, but the option to have the service run by other entities exists and is already being done in some limited cases between Maryland and Washington, D.C.

Appendix I: Survey #1 Results

Survey #1 Results

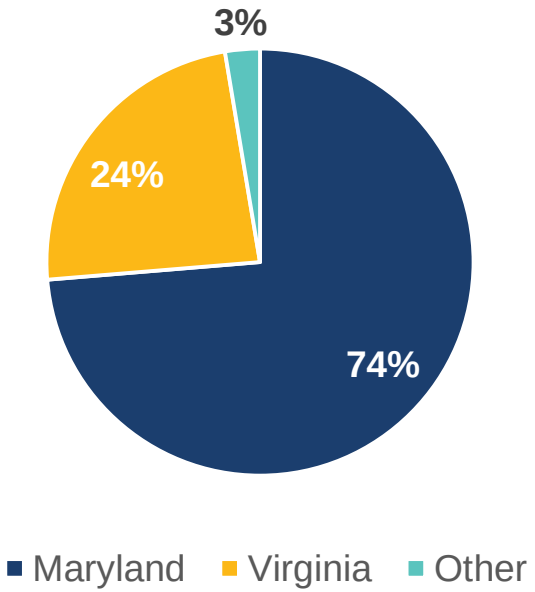
Survey #1 Purpose

- Who is using the American Legion Bridge (ALB)?
- For what purpose are the respondents using the ALB?
- What are respondents' perceptions of travel conditions over the ALB?
- What are the multimodal preferences, if any, of the respondents?

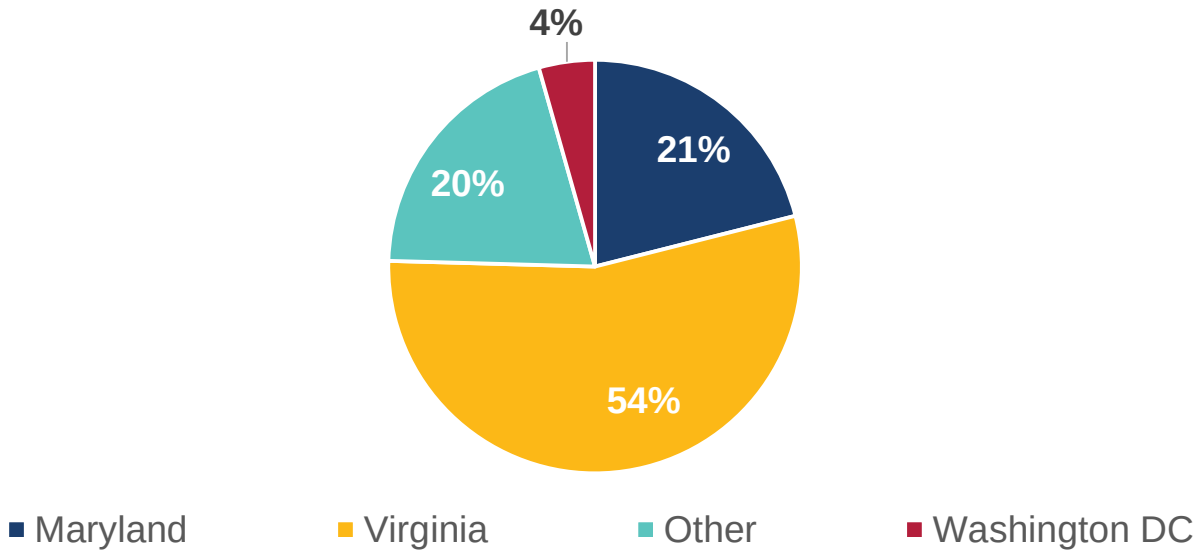
Survey #1 Results Summary

- Survey Live from July 21, 2020 to August 28, 2020
- Total Number of Respondents: **114**

What is your home zip code?

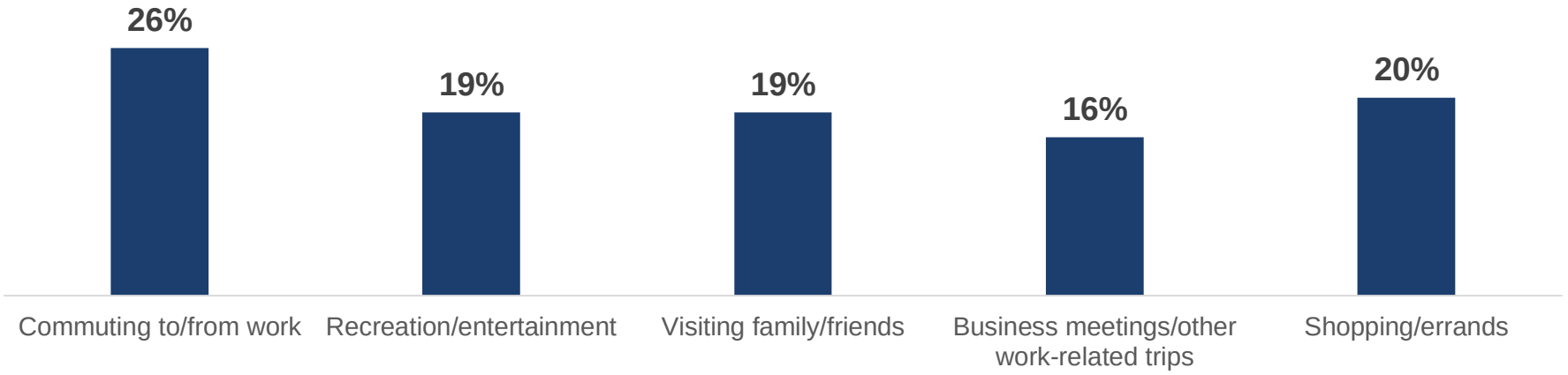


When using the I-495 American Legion Bridge, what is the zip code of the place you most frequently travel (e.g. work, school)?

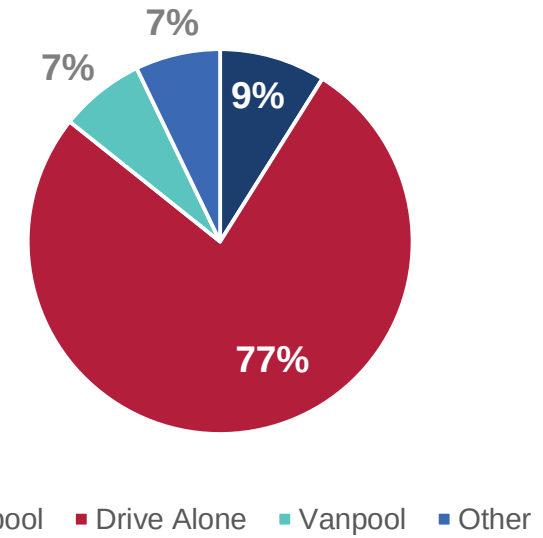


Percentages rounded to the nearest whole number

What are the most typical reasons you travel across the I-495 American Legion Bridge?

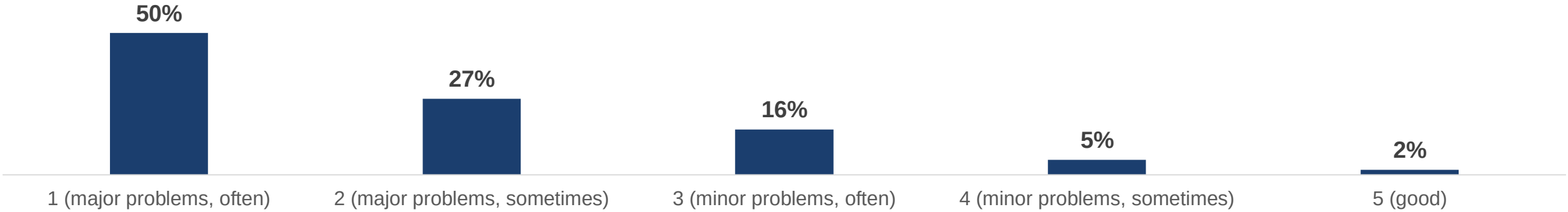


How do you most frequently travel on the I-495 American Legion Bridge?

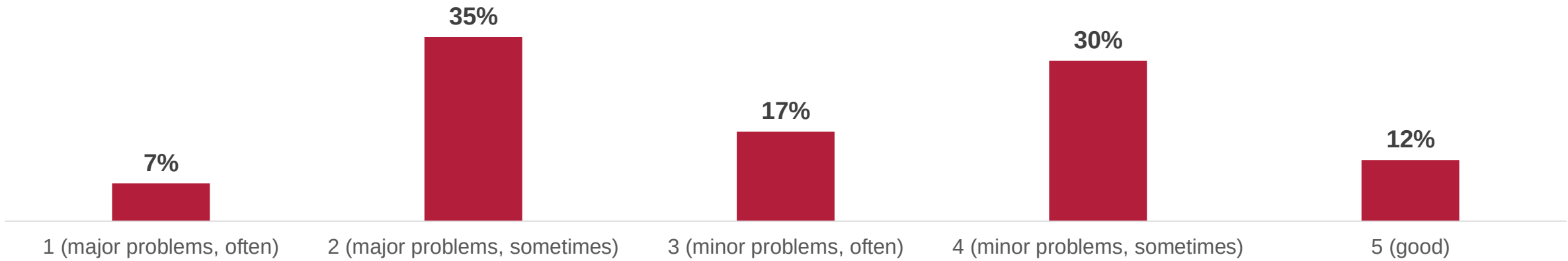


Percentages rounded to the nearest whole number

On a scale of 1 to 5, how would you rate your travel experience along I-495 using the American Legion Bridge during ***peak*** periods (Weekdays 7:00-9:00 a.m. and 4:00-7:00 p.m.)?

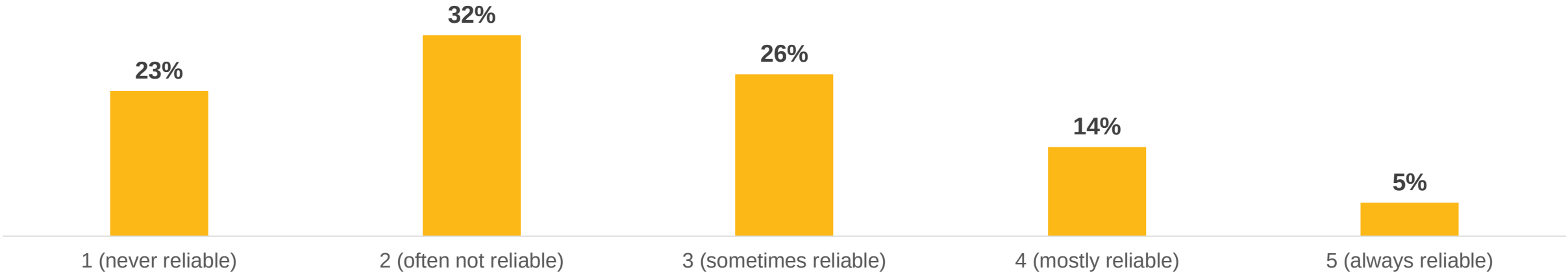


On a scale of 1 to 5, how would you rate your travel experience along I-495 using the American Legion Bridge during ***off peak*** periods?

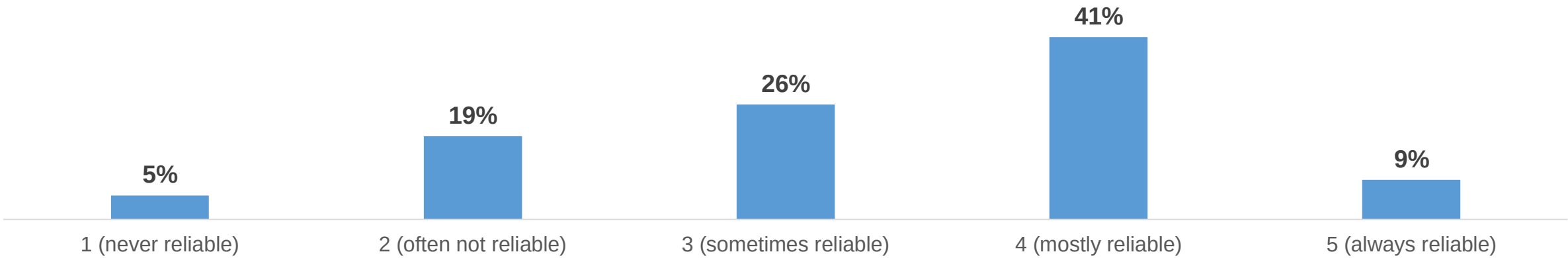


Percentages rounded to the nearest whole number

How reliable is your typical trip crossing the American Legion Bridge during ***peak*** periods (Weekdays 7:00-9:00 a.m. and 4:00-7:00 p.m.)?

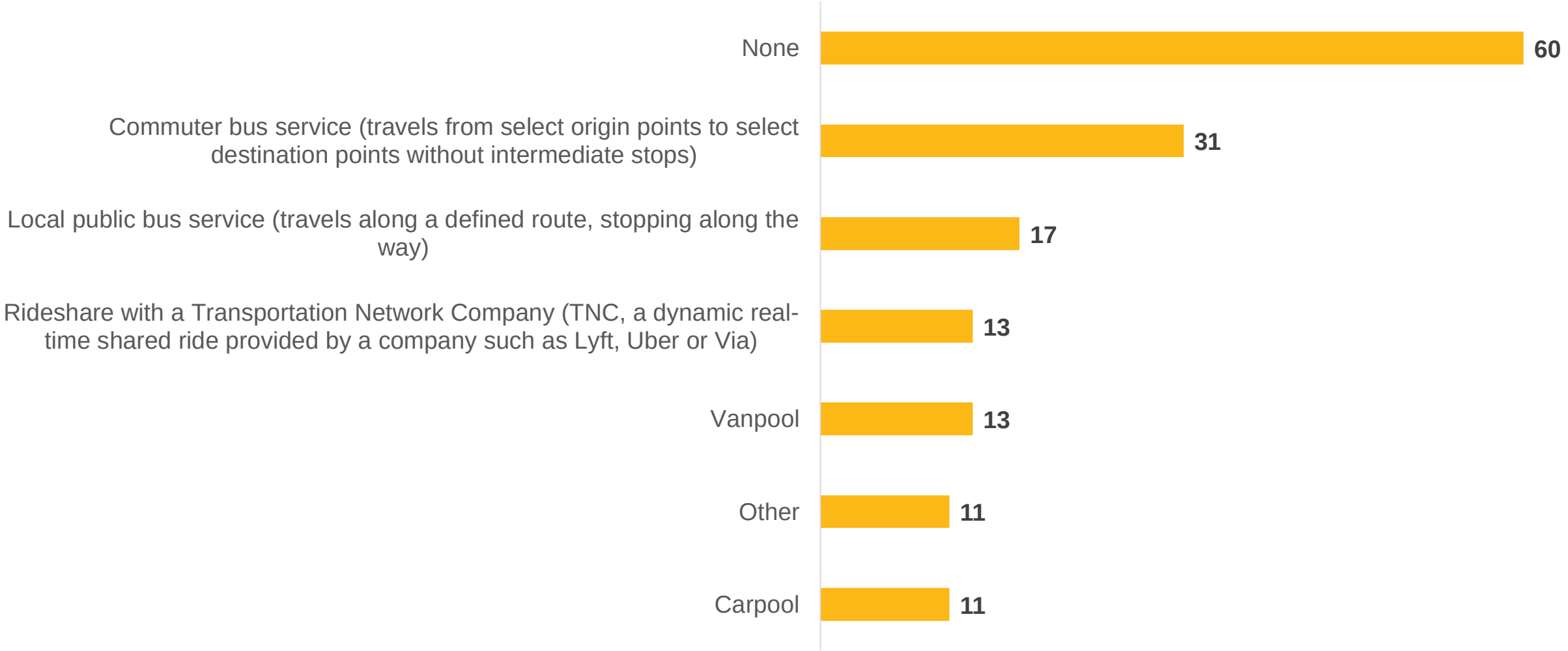


How reliable is your typical trip crossing the American Legion Bridge during ***off peak*** periods?

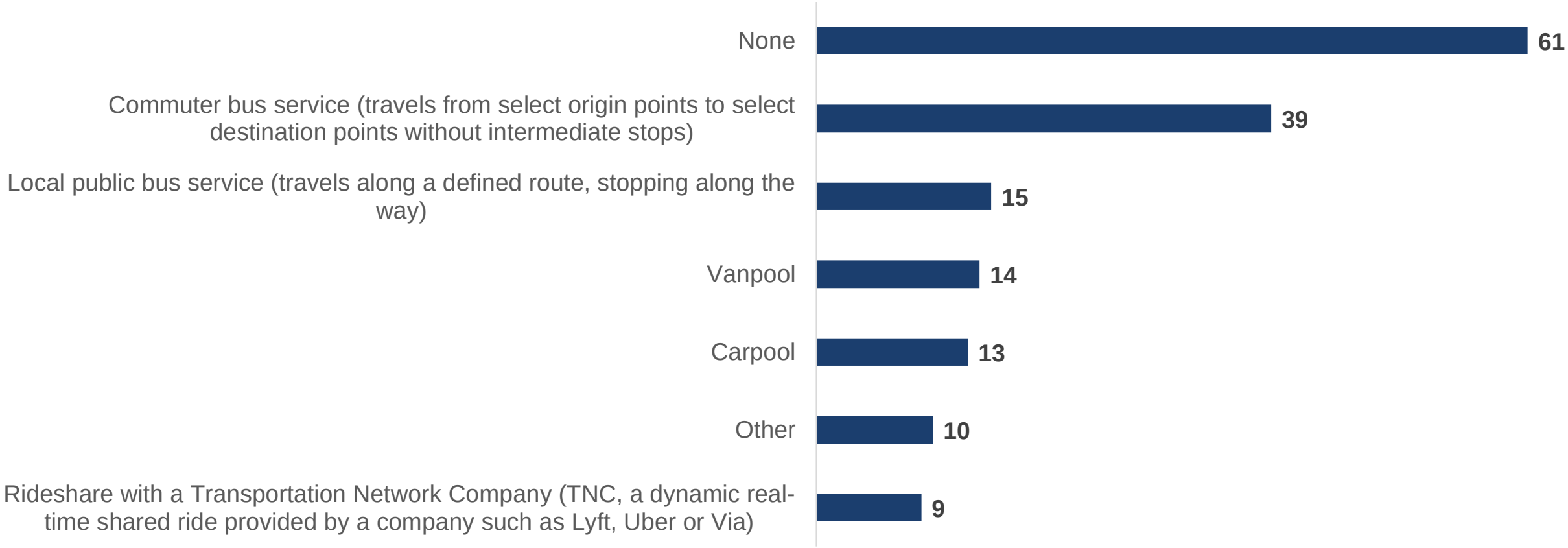


Percentages rounded to the nearest whole number

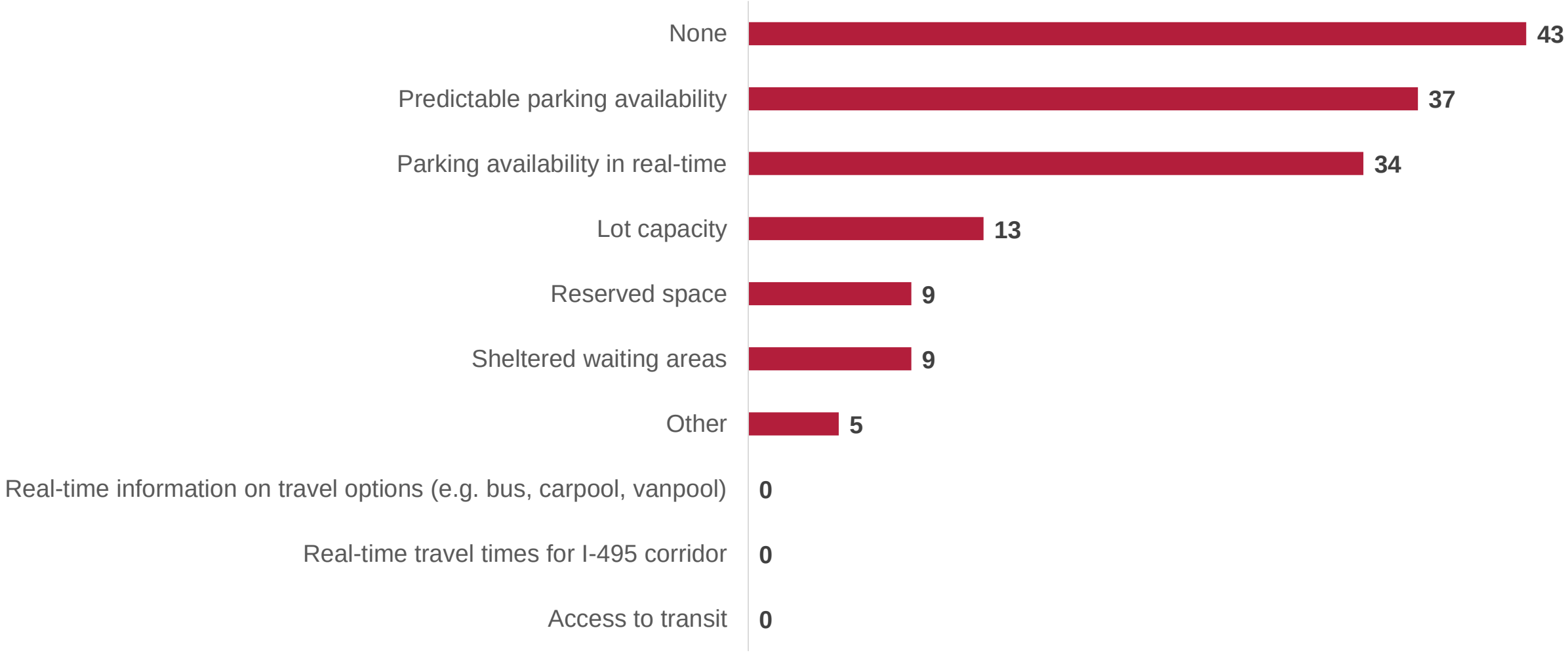
What ways would you use to cross the I-495 American Legion Bridge if they were available to you?



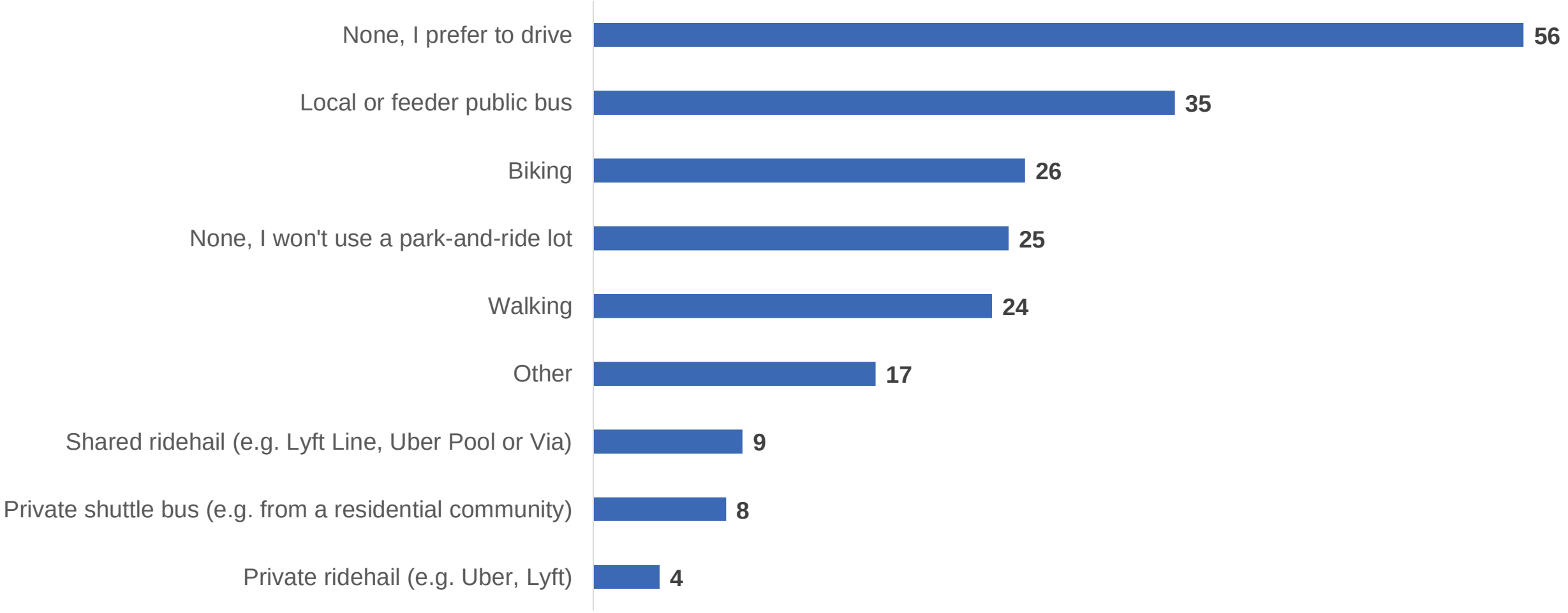
What ways would you use to cross the I-495 American Legion Bridge if a park-and-ride were available near your home or along your route to I-495?



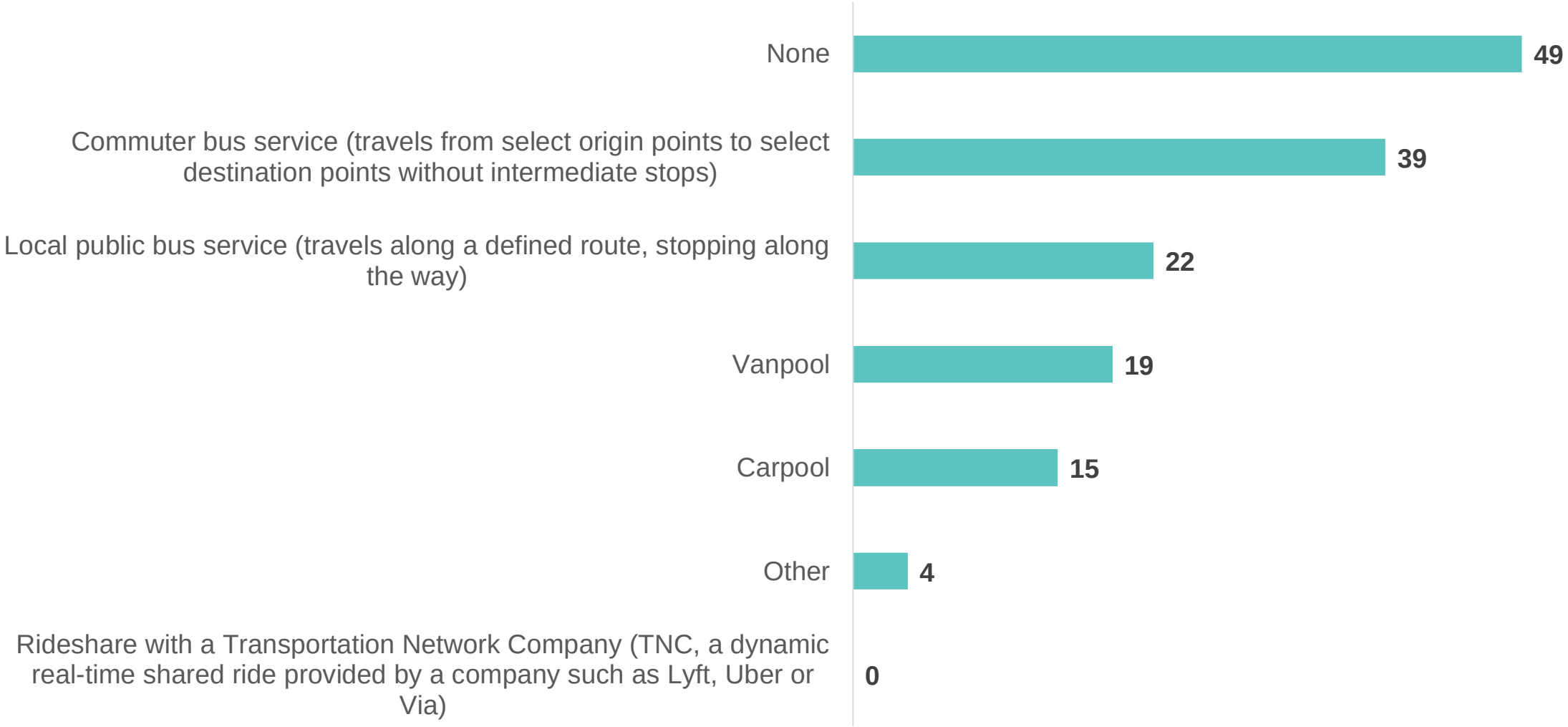
What information would be most useful for deciding which park-and-ride lot to use? (select up to three)



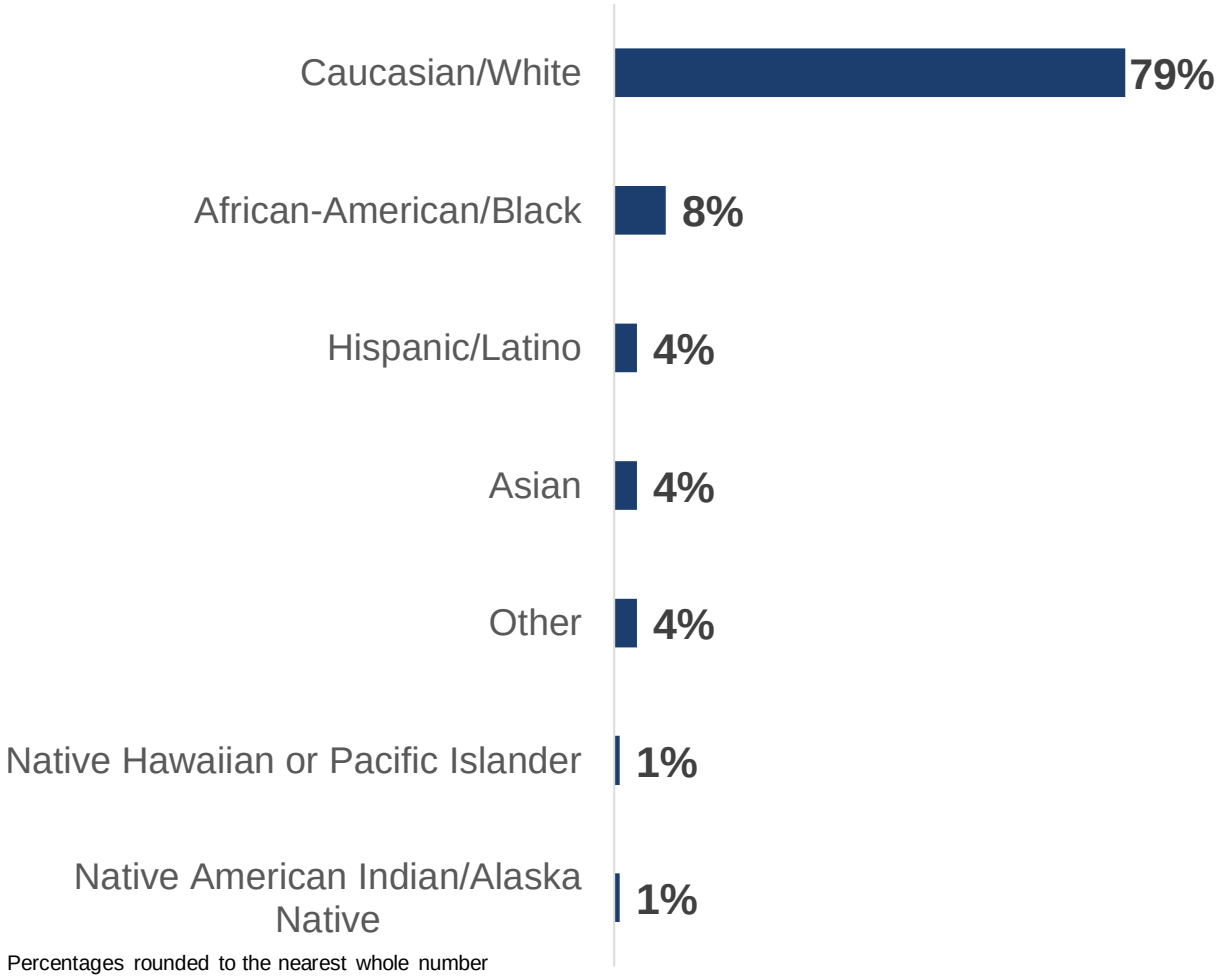
Interstate transit and rideshare trips most often originate at a park-and-ride-lot, station or common point. Other than driving, what ways would you consider traveling to these points? (select up to three)



What ways would you use to cross the I-495 American Legion Bridge if a monetary incentive was available to try the service for 90 days? (select up to three)

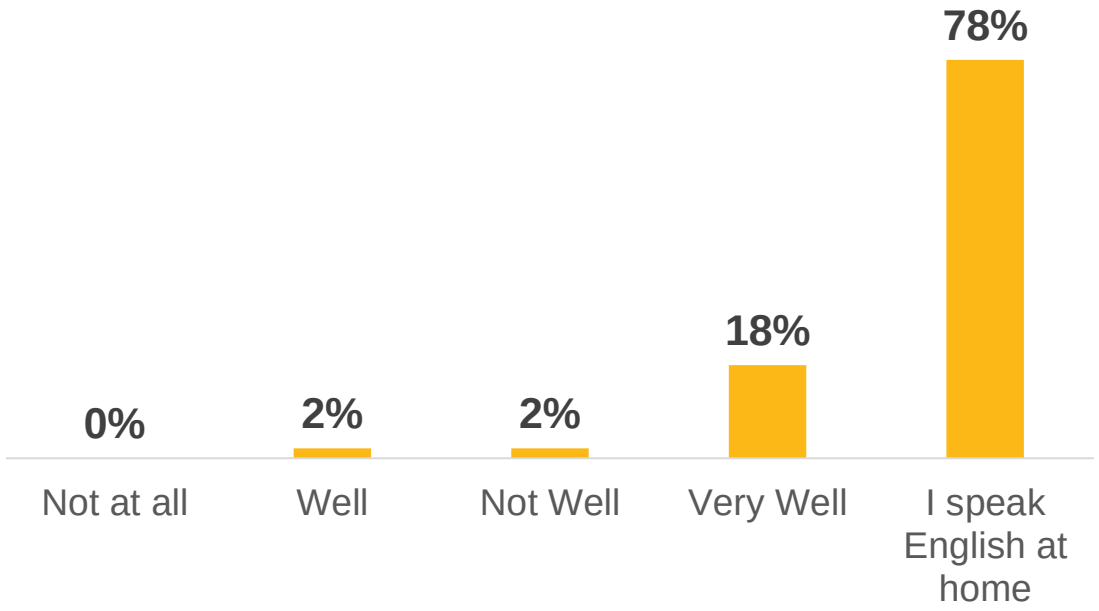


Which do you consider yourself? (Check all that apply)

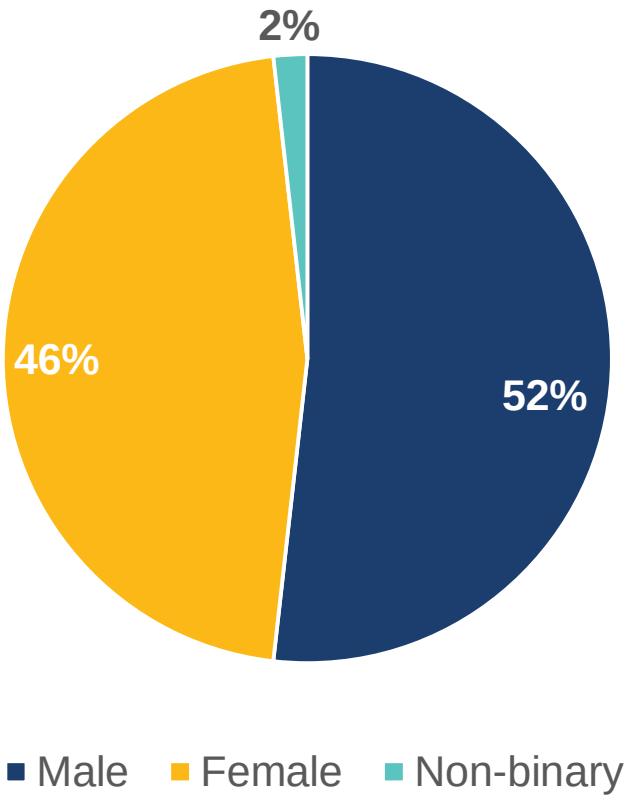


Percentages rounded to the nearest whole number

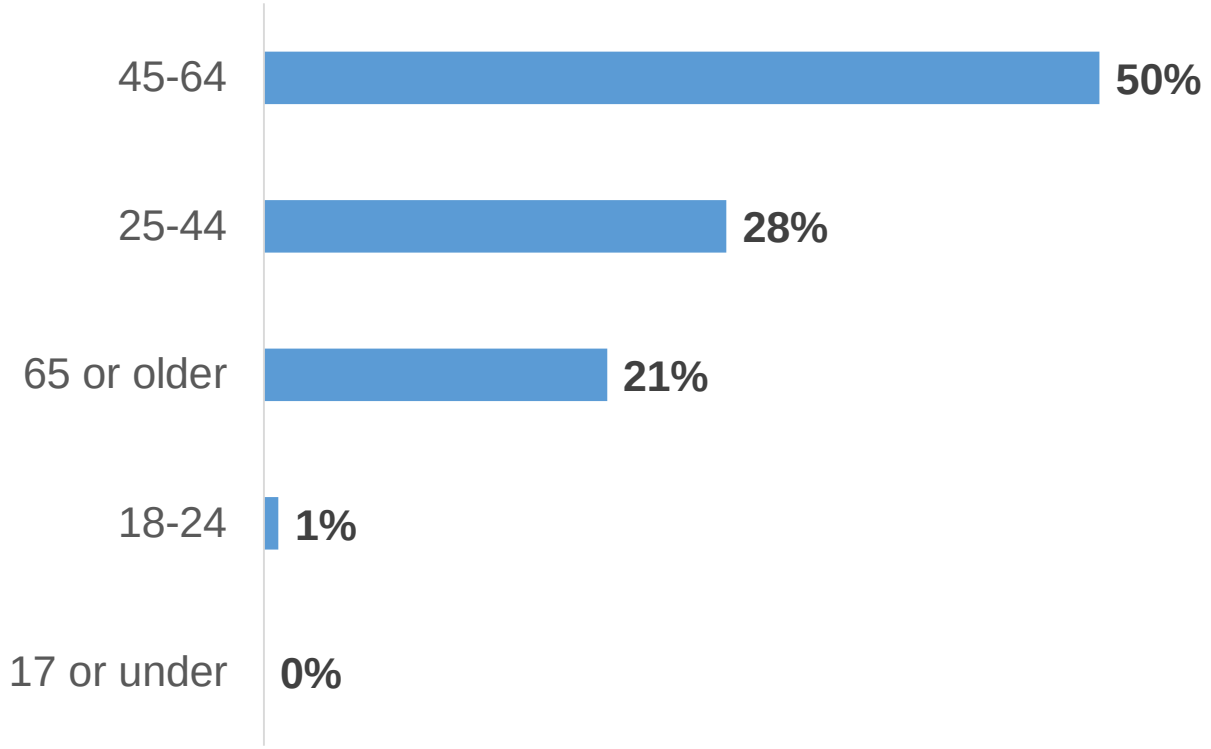
If you speak another language at home, how well do you speak English?



What is your gender?

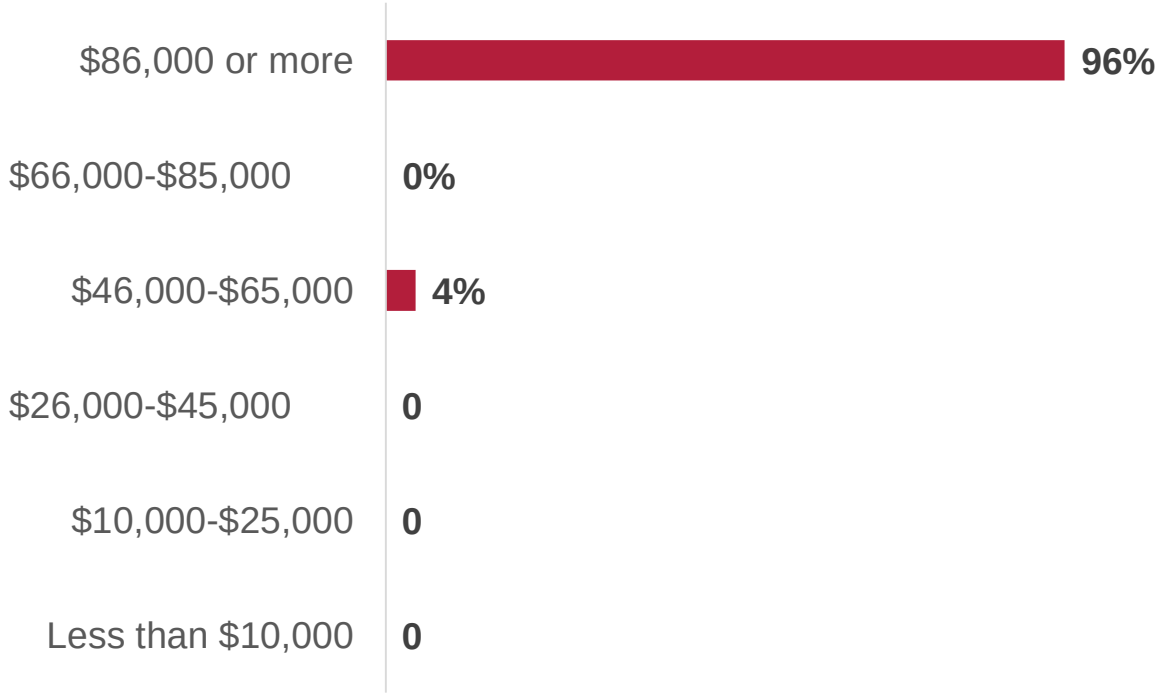


What is your age?

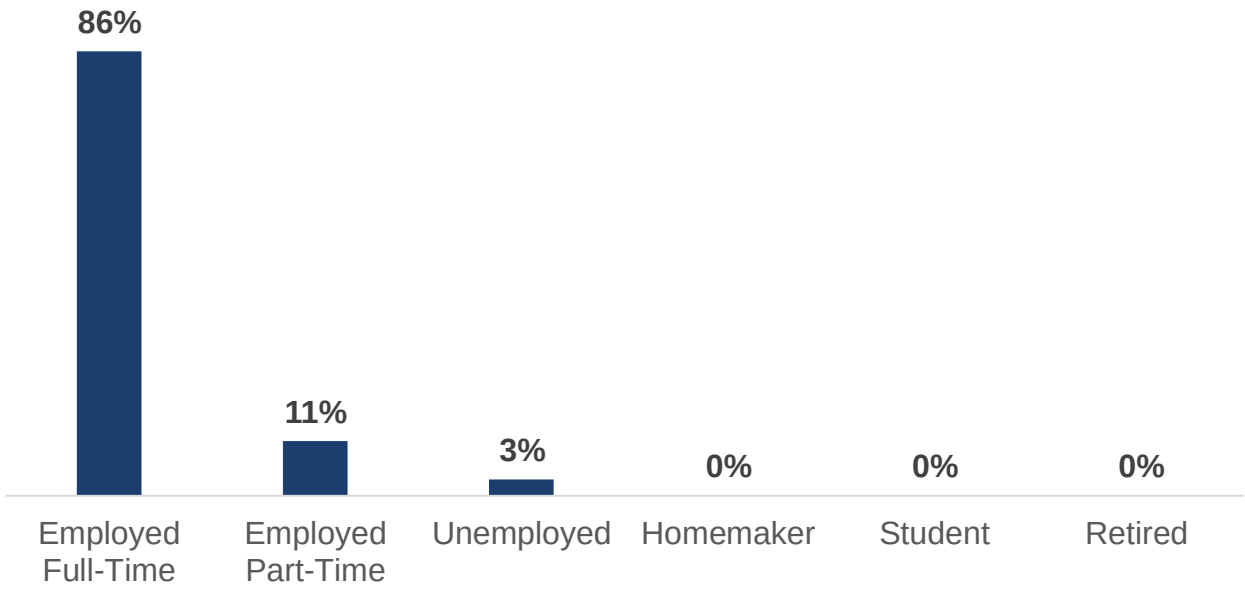


Percentages rounded to the nearest whole number

What is your total annual household income?



What is your employment status?



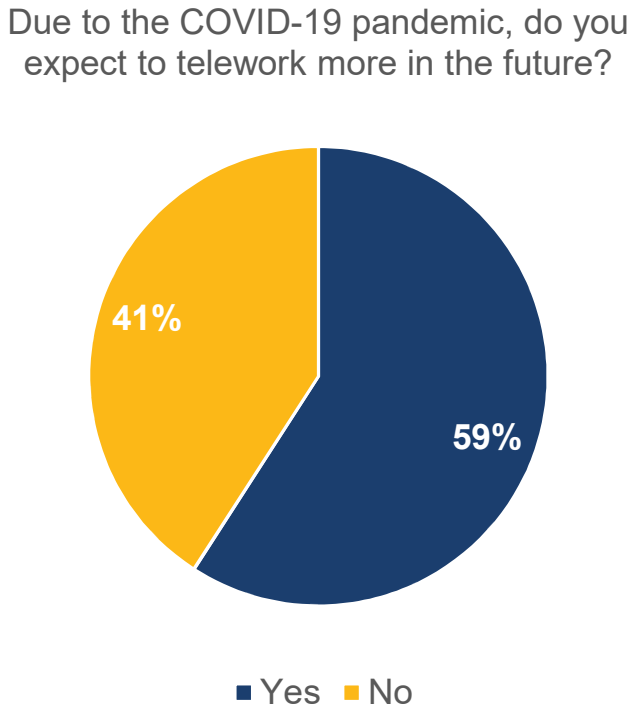
Percentages rounded to the nearest whole number

Appendix J: Survey #2 Results

Survey #2 Results

Survey #2 Purpose

- Who is using the Bridge?
- What preliminary potential routes service frequent travel patterns of respondents?
- What factors would influence travel via bus, carpool or vanpool across the Bridge?
- How would respondents invest transit funding for improvement over the bridge?
- How will telework effect travel in the future?

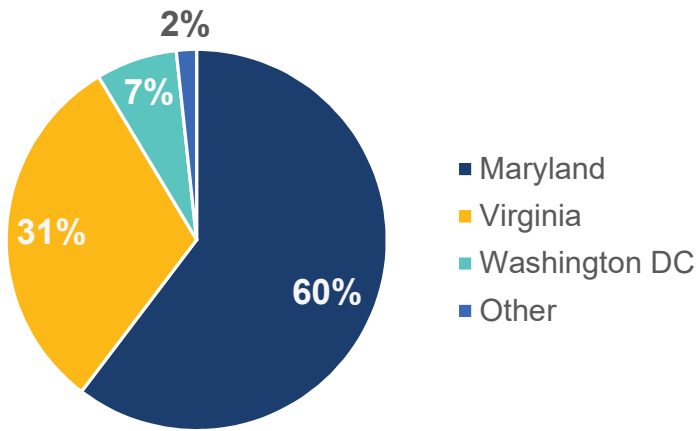


Survey #2 Results Summary

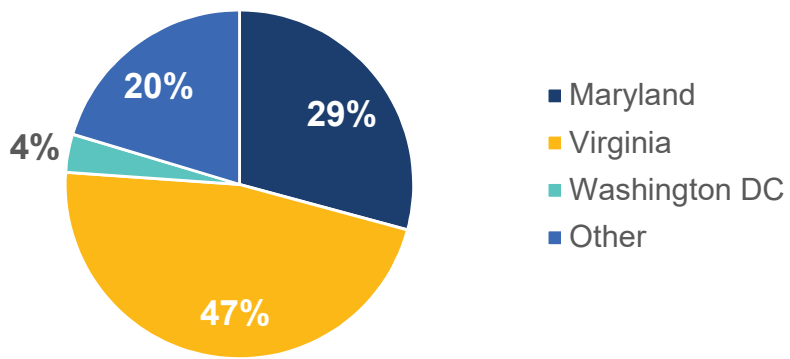
Survey Live from November 12, 2020 to December 15, 2020

Total Number of Respondents: **117**

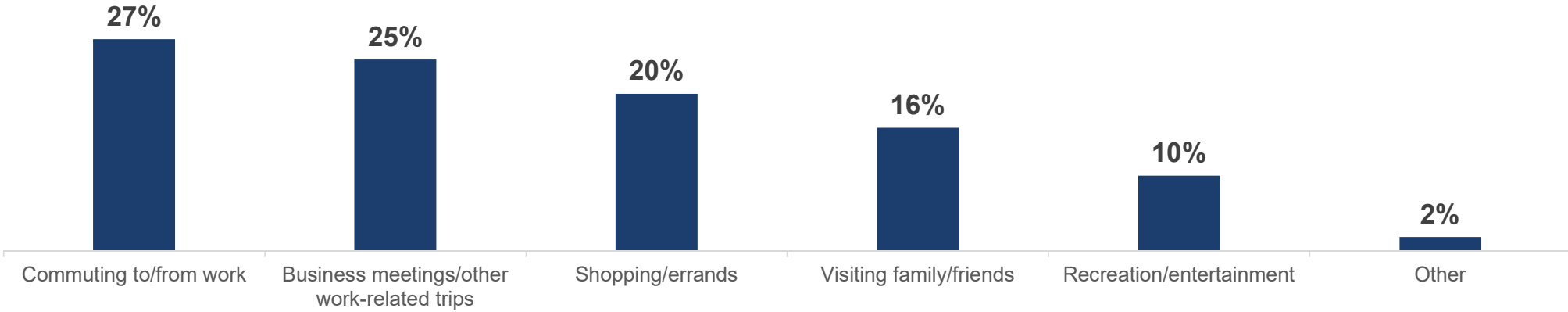
What is your home zip code?



When using the I-495 American Legion Bridge, what is the zip code of the place you most frequently travel to (e.g. work, school)?

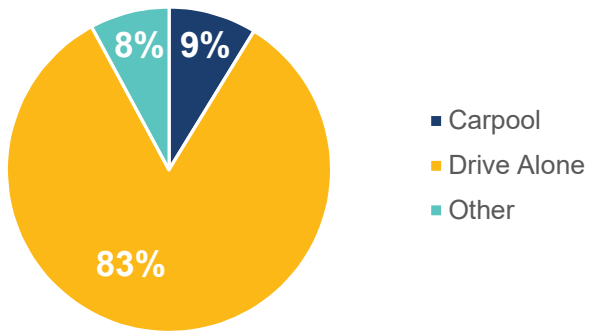


What are the most typical reasons you travel across the I-495 American Legion Bridge?

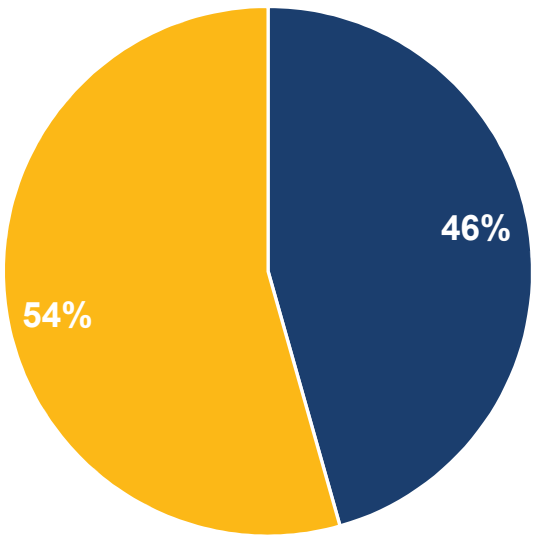


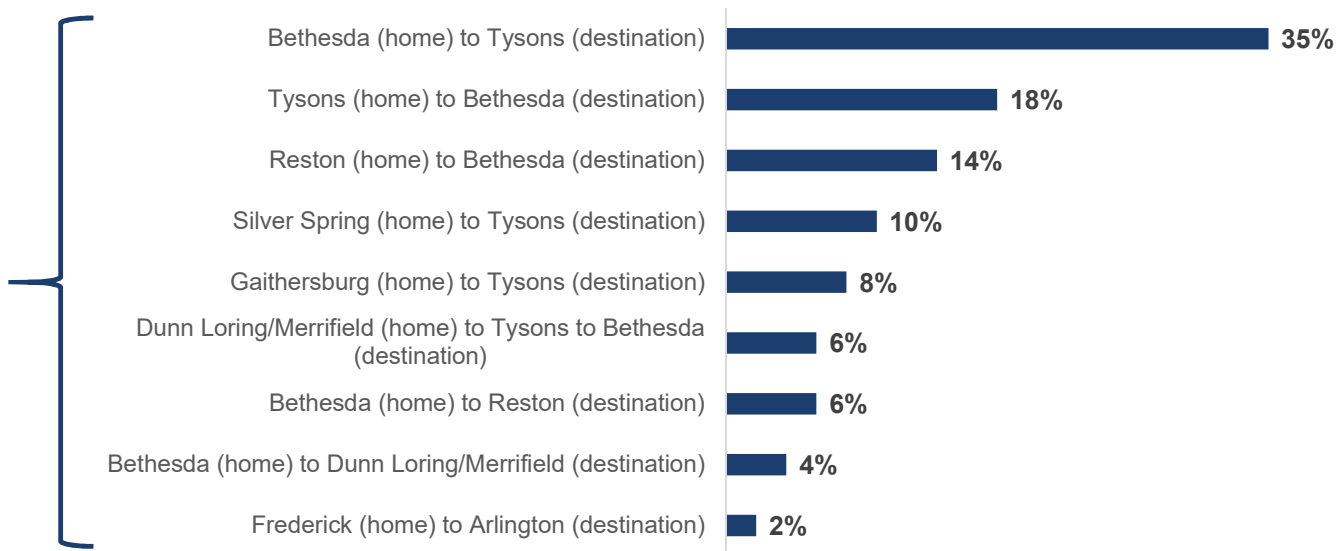
52% Of respondents travel across the I-495 American Legion Bridge for **work related** purposes.

How do you most frequently travel on the I-495 American Legion Bridge?

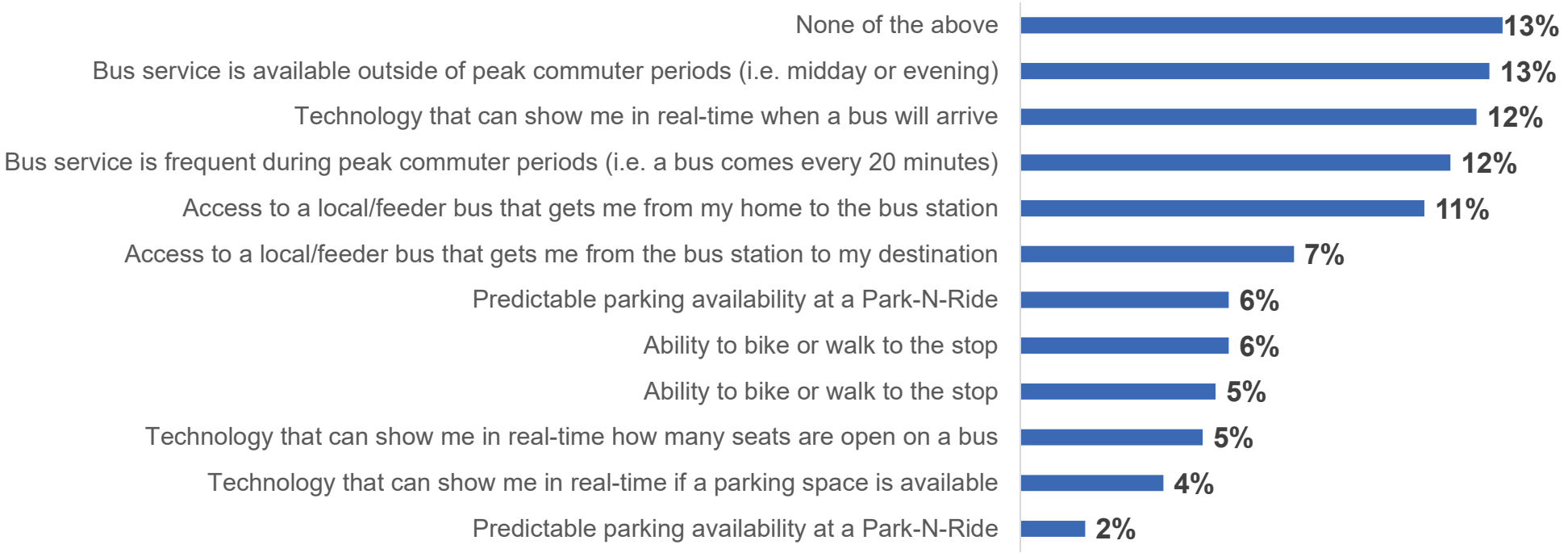


Which of the potential bus routes serve your most frequent travel pattern? Assume pre-COVID conditions.

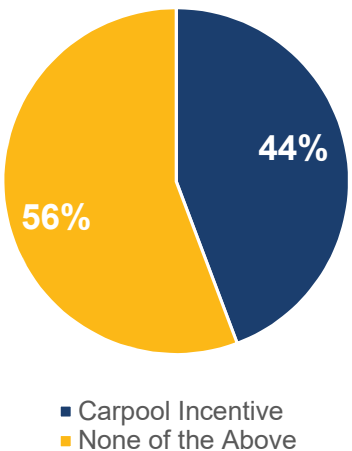


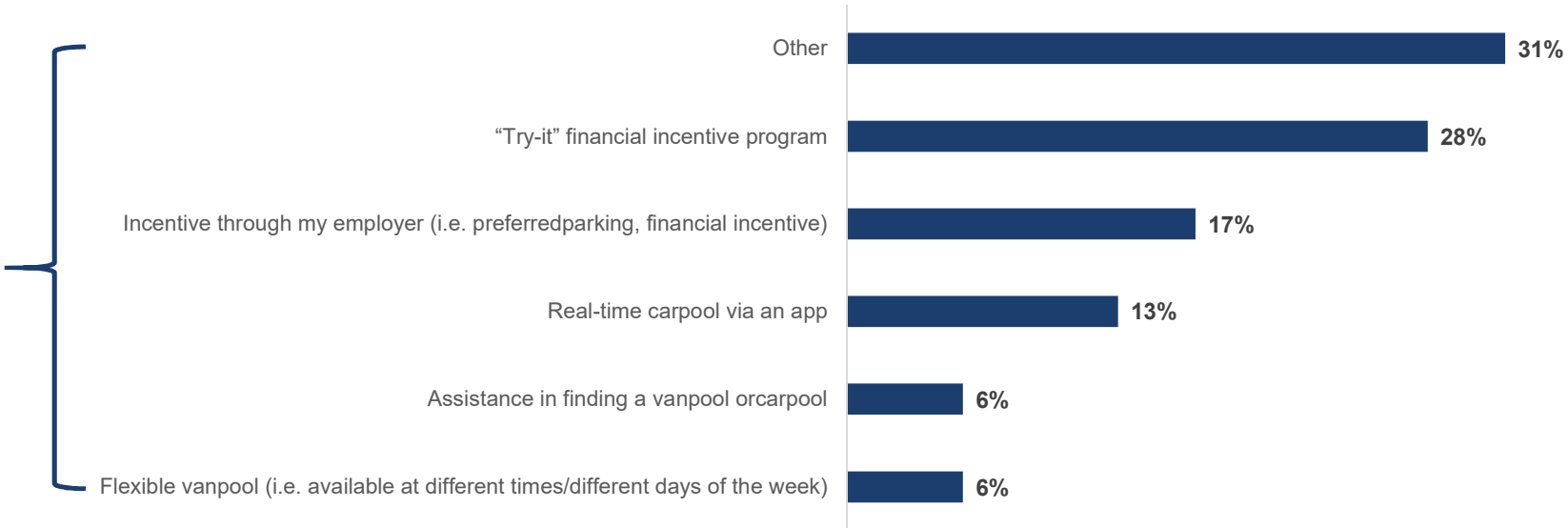


If one of the potential bus routes listed above meets your most frequent travel pattern, rank the factors that would encourage you to travel **by bus** across the bridge. Assume pre-COVID conditions. Check all that apply.



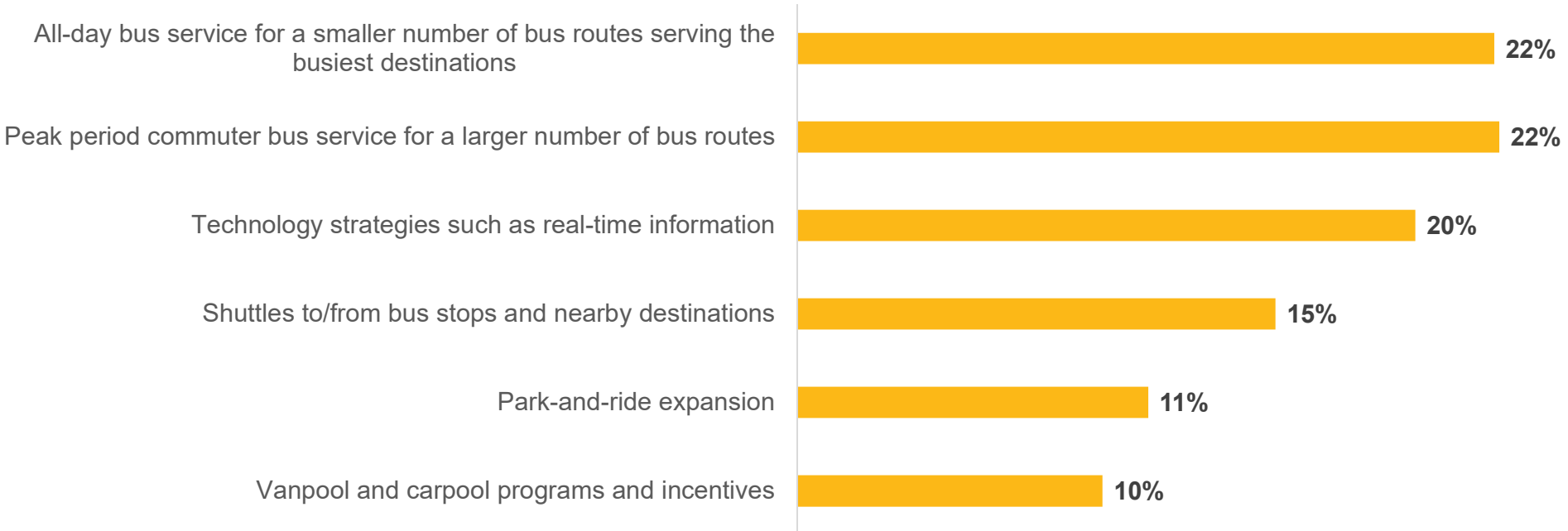
If one of the potential bus routes listed above meets your most frequent travel pattern, rank the factors that would encourage you to travel by **carpool or vanpool** across the bridge. Assume pre-COVID conditions. Check all that apply.



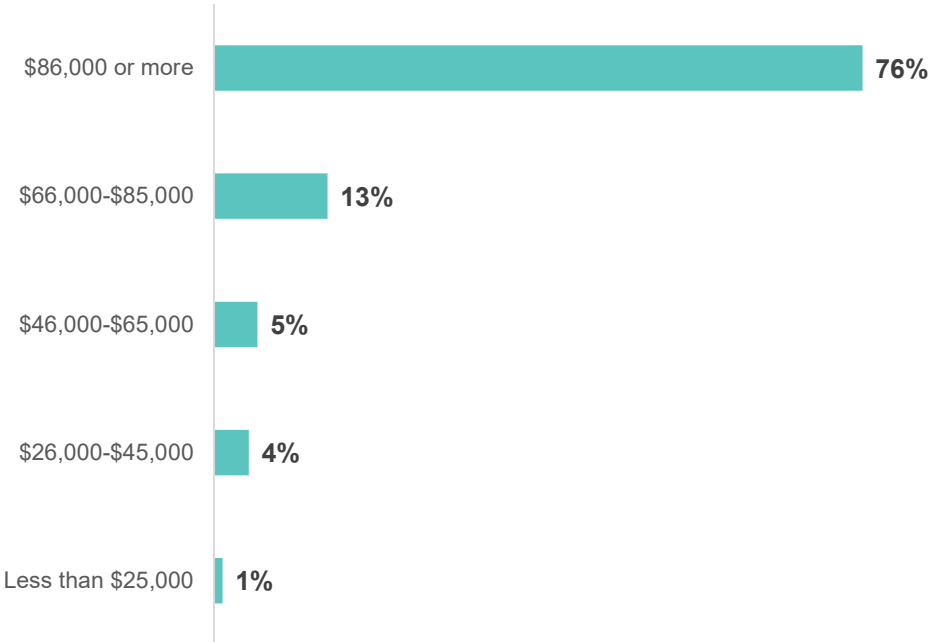


How would you invest transportation resources in multimodal strategies to encourage alternatives to driving alone across the I-495 American Legion Bridge?

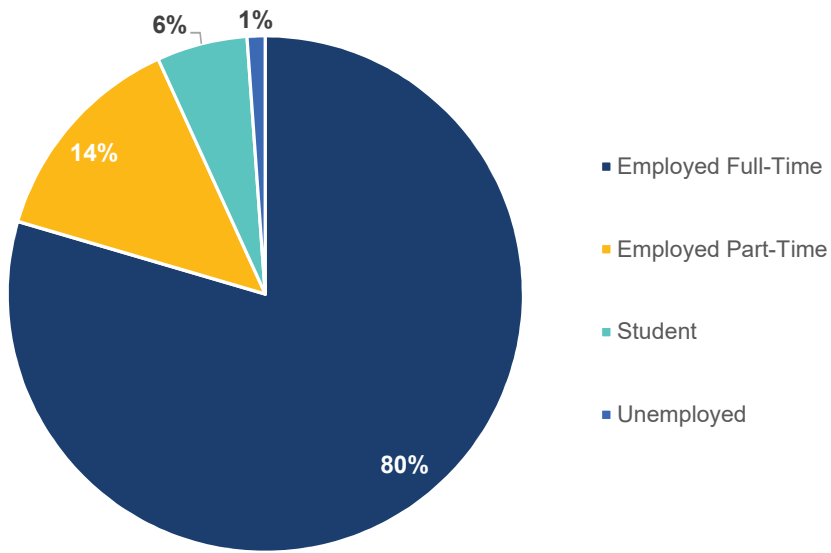
Indicate the amount of resources from 0 (low) to 5 (high) that you would allocate to each category. You may allocate a total of 10 units.

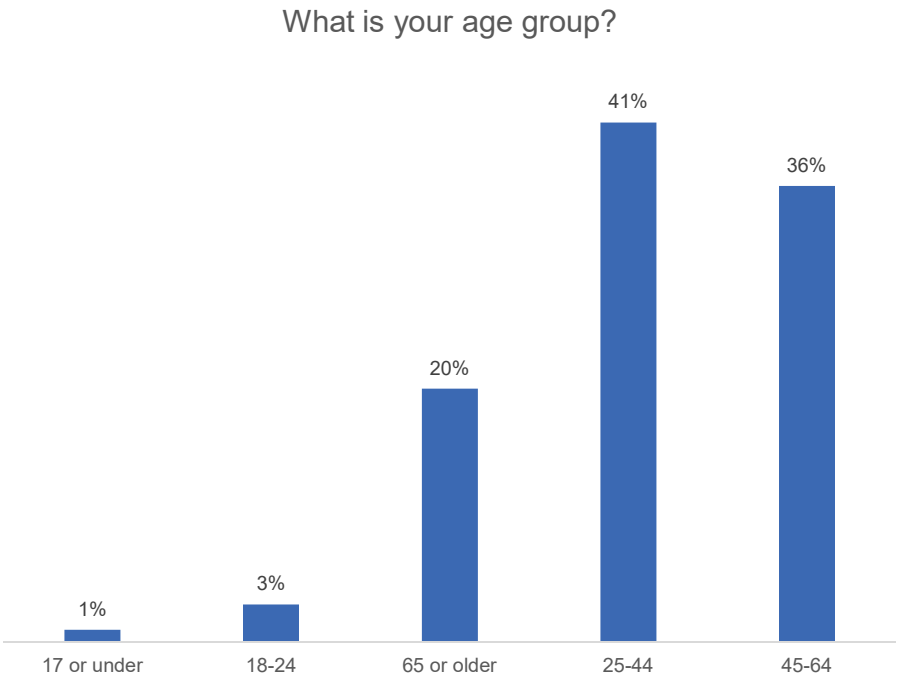


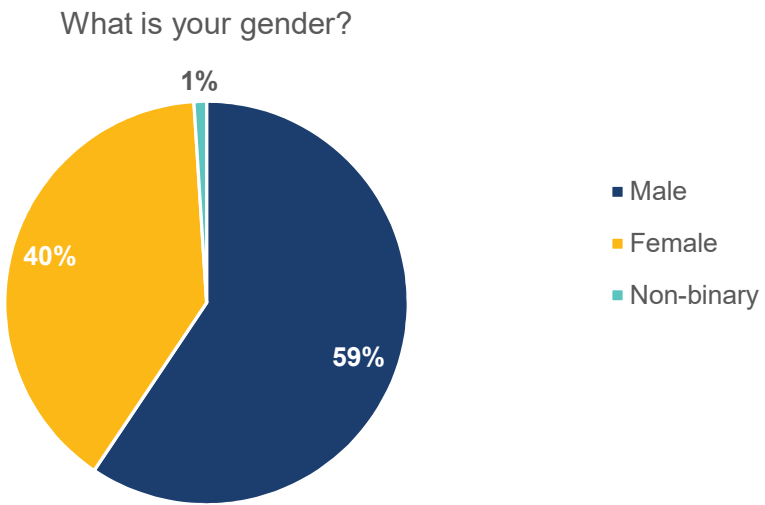
What is your total annual household income?



What is your employment?

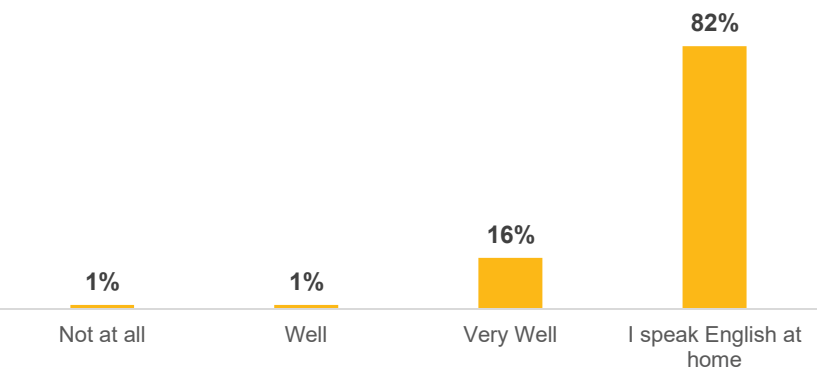



What is your age group?
41%
36%
20%
3%
1%
17 or under
18-24
65 or older
25-44
45-64

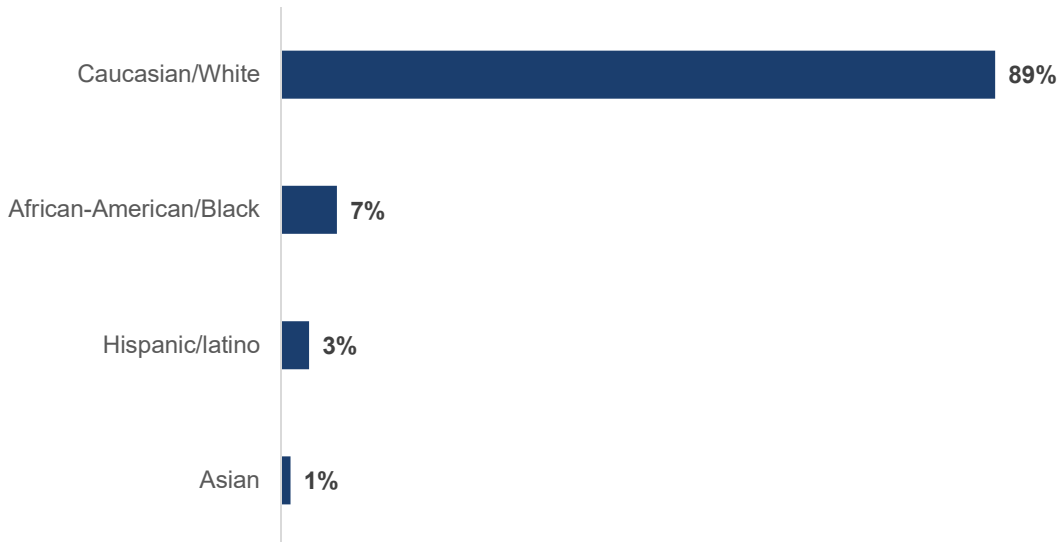

What is your gender?
1%
40%
59%
Male
Female
Non-binary

If you speak another language at home, what language do you speak?
• Spanish • Polish • Korean • Hindi • German • French • Hebrew • Chinese Mandarin • Arabic • Italian

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



Which do you consider yourself?



Appendix K: I-495 American Legion Bridge Transit/TDM Study Summary Report

I-495 American Legion Bridge Transit/TDM Study

Summary Report

February 2021

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND TRANSIT ADMINISTRATION

DRPT
Virginia Department of Rail and Public Transportation

Table of Contents

Special thanks to the Project Stakeholder Group

I-495 American Legion Bridge Transit/TDM Study

Summary Report

Project Overview and Purpose

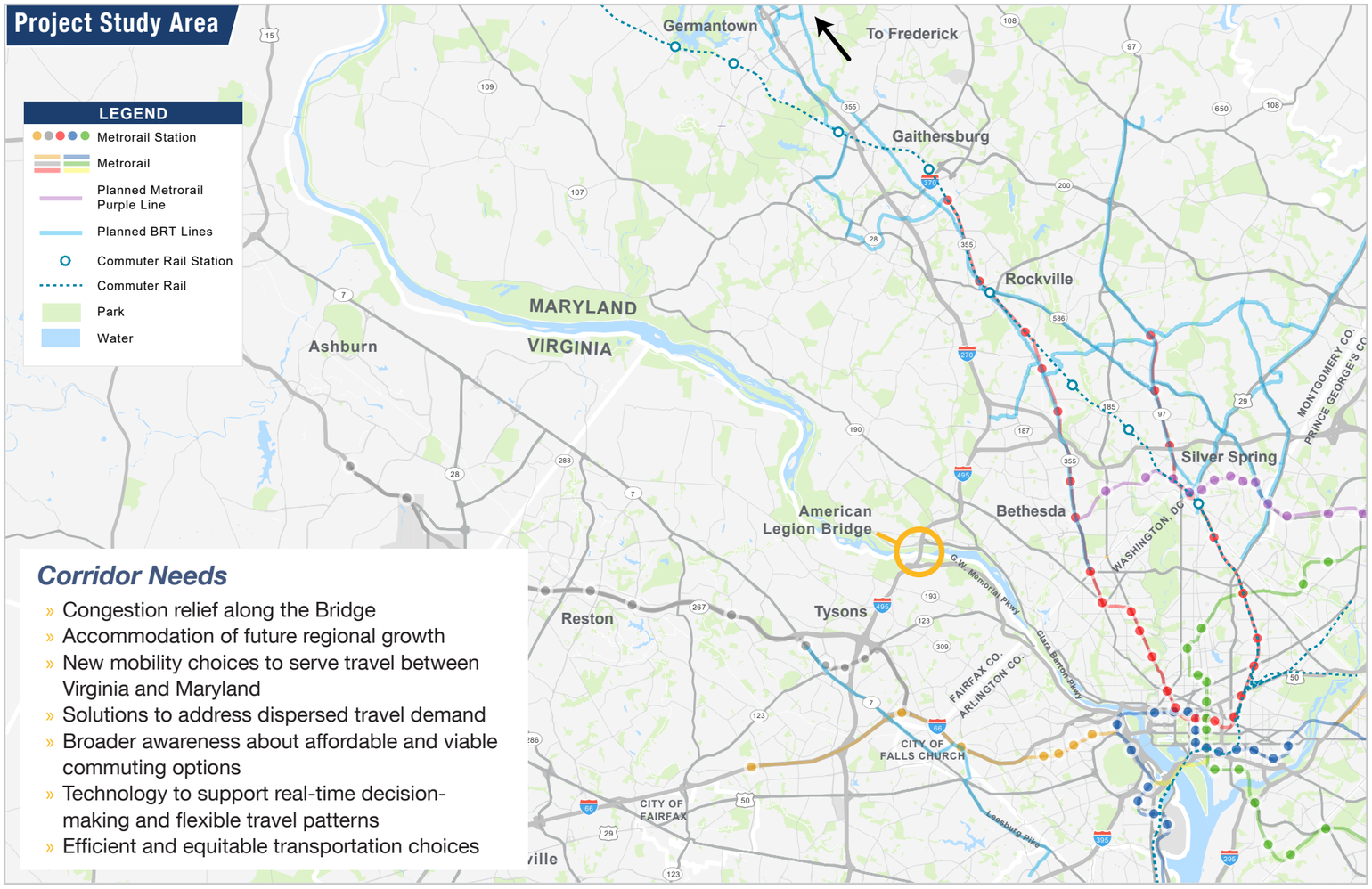
Introduction

The purpose of the I-495/American Legion Bridge Transit/Transportation Demand Management Study (the Study) is to identify a range of current and future potential multimodal solutions that could be implemented to reduce congestion, improve trip reliability and regional connections, and enhance existing and planned multimodal mobility and connectivity for bi-state travel across the American Legion Bridge (the Bridge).

The Study is a joint effort between Maryland and Virginia and was announced shortly after the announcement of the Capital Beltway Accord to Rebuild American Legion Bridge and connect the Interstate Highway System by Governors Hogan and Northam in Fall 2019. The Study complements Virginia's I-495 NEXT project and Maryland's Managed Lanes Study and their efforts to develop a region-wide seamless network of reliable travel options around the Capital Beltway, I-270, I-95, I-395 and I-66. **The potential construction of managed lanes in both states represents an opportunity to implement new transit service options that take advantage of this infrastructure and provide riders with congestion-free service.**

Study Area

The Study area focuses on the American Legion Bridge (the Bridge) and I-495 west and south of the MD Route 97 interchange in Maryland and north of the I-495/I-95/I-395 interchange in Virginia. The Bridge is the only crossing point between Virginia and Maryland connecting the employment hubs in Montgomery, Fairfax, and Loudoun counties besides US 15 that is roughly 30 miles west of I-495. Given that the Bridge is the main crossing point between Virginia and Maryland for commuters in both states, major corridors intersecting I-495 are being considered in the Study, including I-270 to Germantown and VA Route 267 to Dulles International Airport. Other major intersecting routes within one mile of I-495 are also being evaluated in the Study area. The complete Study area is shown in map (right).



Corridor Needs

- Congestion relief along the Bridge
- Accommodation of future regional growth
- New mobility choices to serve travel between Virginia and Maryland
- Solutions to address dispersed travel demand
- Broader awareness about affordable and viable commuting options
- Technology to support real-time decision-making and flexible travel patterns
- Efficient and equitable transportation choices

Background

Previous Transit Service across the Bridge

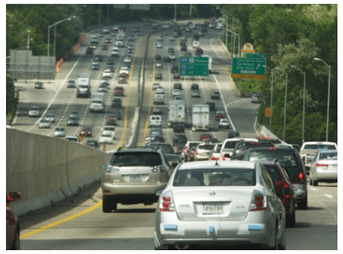
A Metrobus route (Route 14) operated between Tysons and Bethesda from 1998 to 2003. In Maryland, the bus was permitted to operate on the shoulders of I-495 to avoid congestion but could not use the shoulder in Virginia due to of Virginia Department of Transportation (VDOT) safety concerns.[1] According to the Fairfax County Transit Development Plans (TDP), this constraint and the bottleneck of the Bridge caused the bus to experience long delays on the interstate. Additionally, the high number of stops added to the length of a trip. Because of these challenges, the Metrobus route was discontinued in 2003.

[1] *(National Capital Region Transportation Planning Board, 2013)*

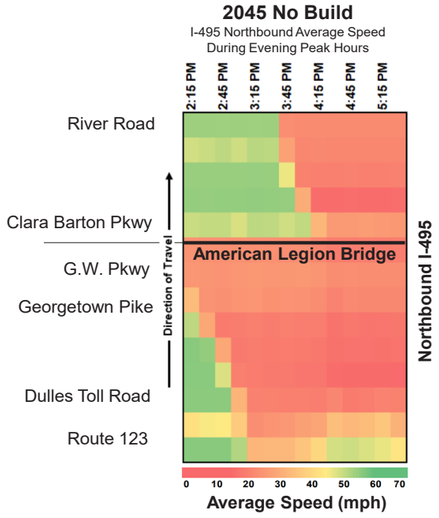
Existing and Planned Services

Existing Conditions and Services

I-495 is one of the most congested roadways in all of Maryland and Virginia. Traffic is forecasted to increase in the future. In conjunction with the planned managed/express lanes, there is an opportunity to efficiently and effectively provide transit across the Bridge.



Source: I-495 NEXT, Virginia Department of Transportation, 2019
(Right: Northbound I-495 Chart)



Rail

Existing rail service is oriented for travel to Washington, DC, from the surrounding counties in Virginia and Maryland. The Metrorail Red Line and MARC commuter service run parallel to the I-270 corridor and the Metrorail Silver Line serves the Dulles Corridor but only connects with the Orange and Blue Lines in Arlington, VA before continuing to Washington, DC to connect with the Red Line. MTA's planned Purple Line will connect key activity centers in Montgomery and Prince George's County in Maryland when constructed.

Local and Commuter Bus Service

Within the Study area, there is an abundance of local bus services operating between jurisdictions in each state. **However, there is currently no service between Virginia and Maryland across the Bridge.** The current congested conditions on the bridge offer no time savings for potential transit service.

Park-and-Ride Lots

There are several park-and-ride facilities located along the I-270 corridor in Maryland that provide parking for existing commuter bus routes operating within Maryland. There are limited park-and-ride opportunities for areas along the I-495 loop, including high-demand origin and destinations such as Tysons, Bethesda, and the Westfield Montgomery Mall Transit Center.

Commuter Assistance Programs (CAPs)

There are a variety of programs provided by Commuter Connections, the Metropolitan Washington Council of Governments' (MWCOG) regional network of TDM organizations, that promote alternative travel options and incentives to commuters in the region. Each of the Study area jurisdictions also has programs that coordinates with Commuter Connections to provide information about available travel options. However, there is no coordinated effort or programming that specifically targets travel between Virginia and Maryland.

Operations and Maintenance Facilities

Operators for the potential transit routes have not been identified at this point. Except for MDOT MTA, each of the transit providers in the Study Area have maintenance facilities. Once operators have been identified for transit routes, a capacity and needs analysis should be conducted to determine any constraints on their operations.

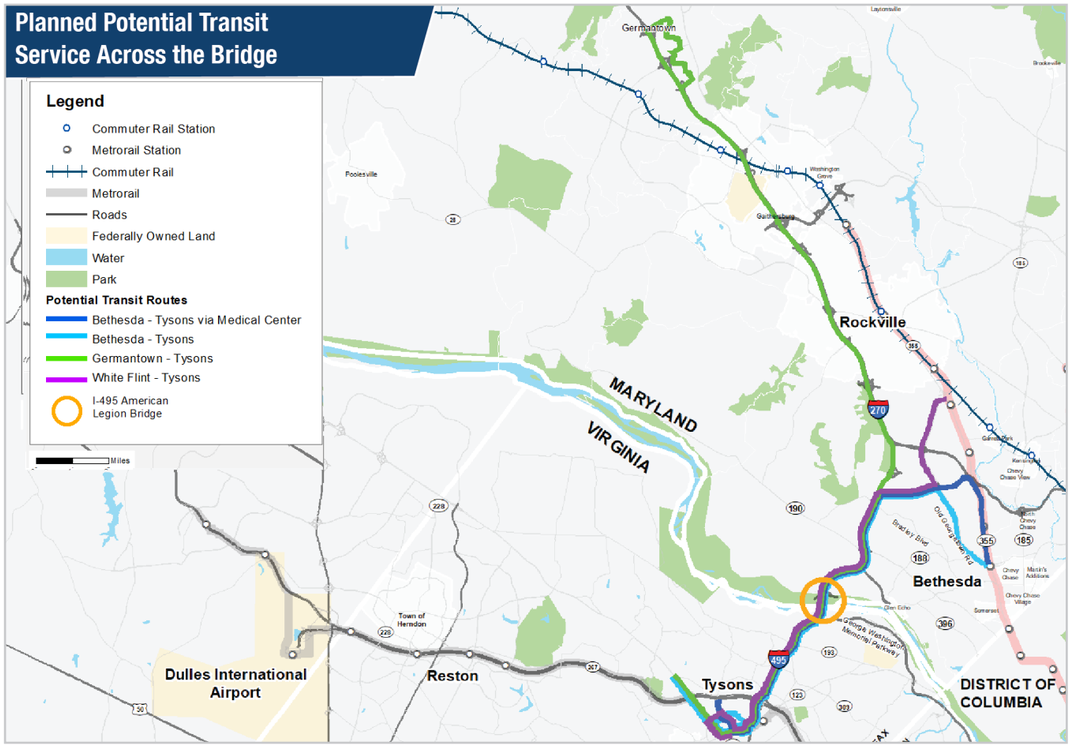
Planned Potential Services

Relevant and available data was collected and reviewed from a variety of sources to provide a comprehensive inventory of planned services in the corridor. Of the information reviewed, three sources contained planned potential transit routes across the Bridge:

- Fairfax County Transit Development Plan (TDP)[2]
- Maryland Transit Service Coordination Report[3]
- Northern Virginia Transportation Authority (NVTA) Transaction Plan[4]

The planned potential services are shown in the table and map below

Service Type (e.g., commuter bus/ express bus, etc.)	Maryland Destination(s)	Virginia Destination(s)
Metrobus	Bethesda Metrorail, Medical Center Metrorail	Tysons
WMATA Express Bus Transit	Bethesda Metrorail	Tysons, McLean
WMATA Express Bus Transit	Germantown, Gaithersburg, North Bethesda	Tysons, McLean
Bus Rapid Transit (BRT)	White Flint Metrorail	Tysons



[2] (Fairfax County, 2020) *[3]* (Maryland Department of Transportation State Highway Administration, 2020) *[4]* (Northern Virginia Transportation Authority, 2018)

Potential Transit Recommendations Development Process

To develop potential recommendations for transit, a five-step process was followed. The process began by developing a list of possible route connections based on travel demand and culminated in a set of building blocks of transit routes that could be used in a series of investment packages. Throughout the process, the Study team met with a group of stakeholders and solicited feedback through two public surveys. Additionally, public feedback was gathered at ongoing I-495 Virginia and Maryland projects.

1. Develop List of Evaluation Options
The Study team began its transit evaluation by identifying the markets in Maryland and Northern Virginia with the greatest demand for cross-Potomac travel. This resulted in 31 route options.

Stakeholder meeting #1

Public Survey #1

2. Initial Screening
Potential route options were screened down to eight options based on comparison with existing transit service, travel demand along the corridor and potential access to managed lanes.

Stakeholder meeting #2

3. Off-Model Testing and Evaluation
The eight remaining routes were evaluated comparatively against each other based on scores of equity (high concentrations of low-income and minority individuals), connectivity to jobs and residents and productivity (maximizing ridership for the lowest cost).

Stakeholder meeting #3

Public Meeting

Public Survey #2

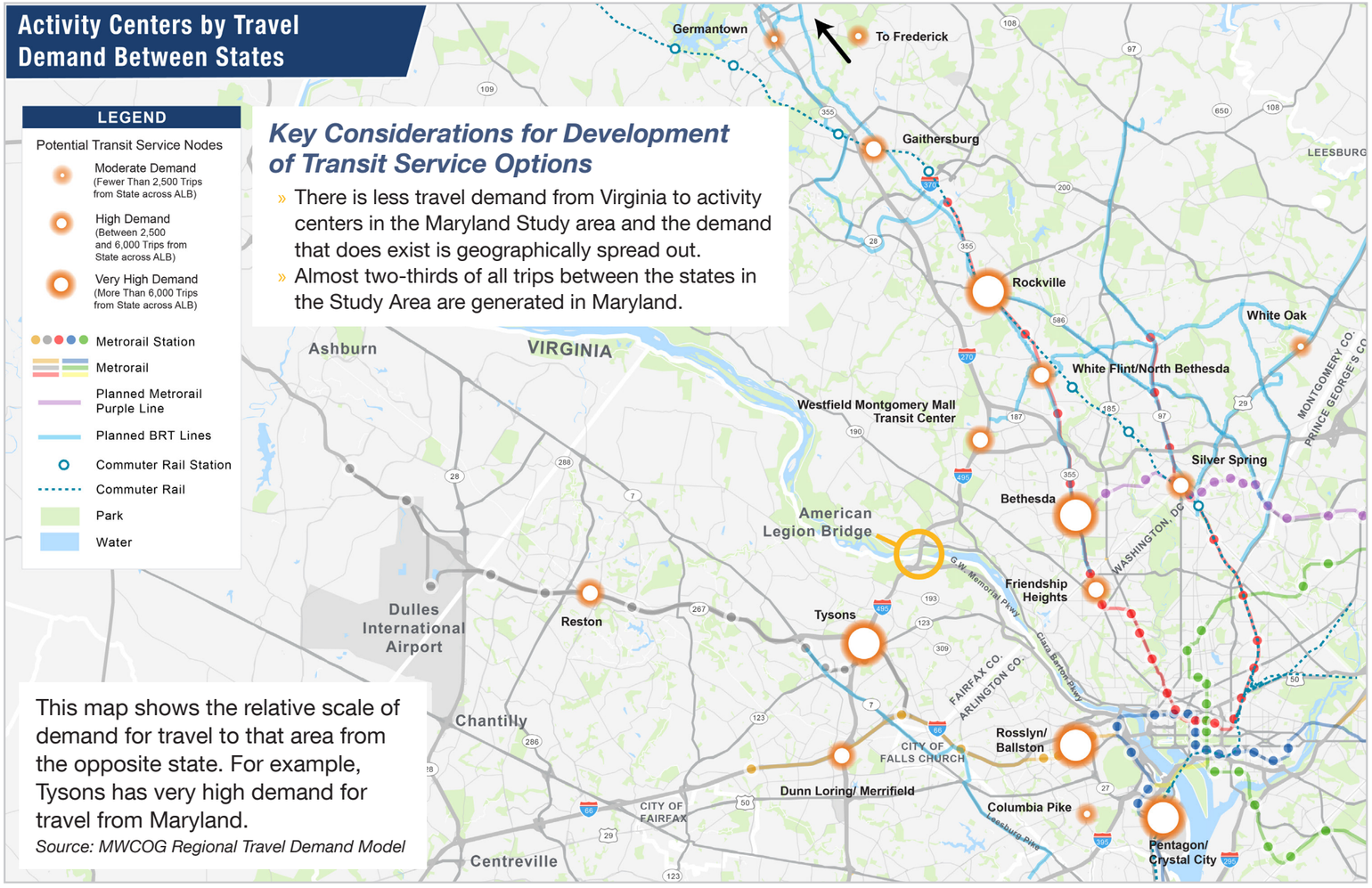
4. Modeling
The full group of eight routes was modeled to refine different combinations of routes, as well as how often and when each route should run.

Stakeholder meeting #4

5. Develop and Refine Investment Packages
Tiered groupings of routes were developed based on the number of markets served and how much service was provided (see following page for more information).

Public Meeting

Activity Centers by Travel Demand Between States



Key Considerations for Development of Transit Service Options

- There is less travel demand from Virginia to activity centers in the Maryland Study area and the demand that does exist is geographically spread out.
- Almost two-thirds of all trips between the states in the Study Area are generated in Maryland.

This map shows the relative scale of demand for travel to that area from the opposite state. For example, Tysons has very high demand for travel from Maryland.

Source: MWCOG Regional Travel Demand Model

Eight Transit Routes Retained

- Bethesda to Tysons
- Germantown to Tysons
- Silver Spring to Tysons
- Gaithersburg to Tysons
- Frederick to Tysons
- Bethesda to Reston
- Bethesda to Dunn Loring via Tysons
- Frederick to L'Enfant via Arlington

Public and Stakeholder Input Related to Multimodal Travel

Themes

- Support for analyzing multimodal solutions
- Importance of air quality and emissions goals
- Provide affordable and equitable choices
- Request for dedicated funding to expand transit
- Consider the effect of COVID-19 and potential increase in teleworking

Sources of Input

- Public comment on ongoing I-495 Virginia and Maryland projects
- Transit/TDM Public Survey #1
- Transit/TDM Public Survey #2
- Stakeholder coordination meetings

Potential Investment Packages

Investment Package Development Approach

Potential transit and TDM recommendations are grouped into three investment level packages: baseline, medium, and high. Each investment package is built around the level of transit service supported by complementary technology enhancements, CAPs, and parking facilities (described on the following page). Packages were developed to provide three varying levels of service in terms of frequency, markets served, and span (time of day).

- The baseline package includes two main route connections providing peak service, consistent with locations identified in previous planning efforts.
- The medium package includes additional routes, increased frequency, and the introduction of off-peak service.
- The high package includes additional route connections, further increased frequencies, and expands off-peak service.

Identification of complementary technology enhancements, CAPs, and parking needs within each investment package reflect consistency in terms of their implementation timeframe and their supportive role to the bus services.

Implementation Framework

The framework provides guidance for development of implementation timeframes in which complementary projects can be grouped together for delivery at the same time. The following considerations were taken into account when determining the timeframes of projects in each investment package:

- **Infrastructure Assumptions** — The anticipated status of the construction of the managed lanes network in Virginia and Maryland
- **Implementation Effort** — Length of time or amount of effort involved in implementing the service
- **Demand Served** — Whether the Study is serving an existing demand or one that is forecast to grow over time
- **Complementary Service** — Grouping of projects that supplement or enhance the use of new infrastructure or transit service

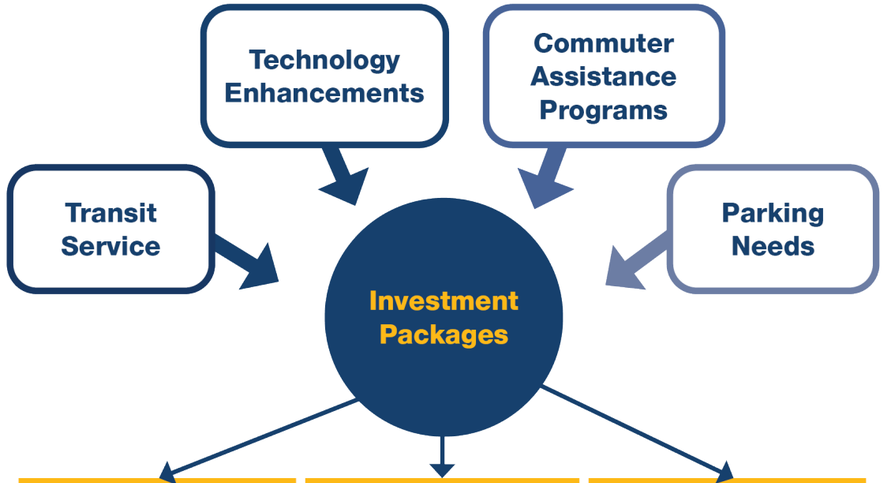
For the purpose of this Study, given the uncertainty in timing of potential managed lanes, timeframes have been assigned as follows:

- **Near-Term** — Prior to the opening of the managed lanes up to and over the Bridge in both Maryland and Virginia
- **Mid-Term** — In conjunction with the opening of the managed lanes up to and over the Bridge in both Maryland and Virginia
- **Long-Term** — Following opening of the managed lanes in Maryland and Virginia

Assumptions

- Potential operators for transit service have been identified.
- Storage and maintenance facility locations, needs, and associated costs have not been identified.
- Parking needs are based on demand generated by transit service evaluated in this Study and growth in HOV travel on I-270 and I-495.
- Ridership and person-trips are based on 2045 MWCOG Model runs and represent daily riders (AM and PM peak periods plus off-peak) over the American Legion Bridge. Forecasts developed using the MWCOG Travel Demand Model are based on future regional cooperative land use forecasts and existing regional travel behaviors.
- Stop locations and routing within a general area were identified to show feasibility and should be refined closer to implementation.
- Although the various investment packages lend themselves to an incremental and cumulative implementation approach, it is important to note that each investment package can stand on its own as an overall bundle of Transit/TDM recommendations.

Developing Investment Packages



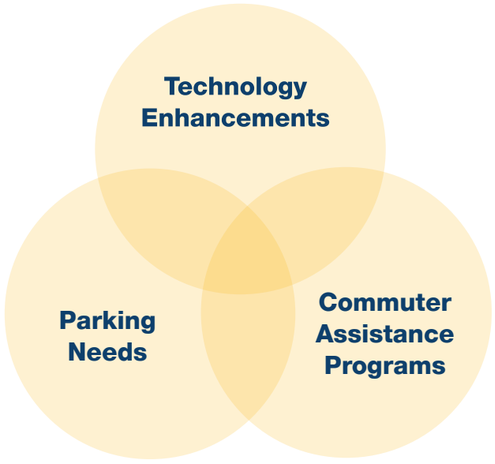
Additional Package Elements

Additional elements were assigned to packages and timeframes based on levels of transit service. Including commuter assistance programs, technology enhancements, and parking needs. They serve a complementary or supportive role to those transit services. Factors that describe the implementation effort of each of the supportive elements are defined in order to convey the amount of effort needed to implement those programs as proposed. Each of these elements are preliminary in nature and would require close coordination with entities throughout the region for more detailed planning and analysis. Performance over time should be monitored and adjusted.

Implementation Effort

The more factors identified for each transit/TDM enhancement, the more effort and complexity is assumed to be required to implement the projects proposed for each investment package. Implementation factors include the following:

- Multi-entity Coordination
- Multiple Locations
- Technology/Software Integration
- Major Capital Infrastructure



Parking Needs

The following parking assessments are included in each investment package for routes associated with their respective stops. Each assessment reflects a cost-effective approach for meeting the demand generated by the transit services and growth in HOV travel in each investment package.

- Demand can be served by existing parking capacity
- Potential expansion of existing parking facilities by negotiating new or by leveraging existing parking agreements for more spaces
- Potential capital expansion by constructing new surface or structural parking facilities

Technology

The following technology enhancements were included based on input from stakeholders as important for supporting transit service and carpool/vanpool travel across the Bridge.

Virginia and Maryland Commuter Parking Information System	Provides commuters with reliable expected parking space availability for parking lots serving rail, bus, and carpool/vanpool commuters, potentially leveraging Virginia's Regional Multi-Modal Mobility Program (RM3P).
Real-Time Toll and Transit Information	Work with private partners to incorporate real-time toll, congestion, and transit data into commonly used apps like Google Maps and Waze.
Real-Time Arrival Information	Work with transit agencies to make real-time arrival data available for public use. Once available, transit agencies can work with private partners to incorporate real-time transit arrival time information in commonly used apps such as Google Maps Transit and Transit App.
Real-Time Passenger Load Information	Work with private partners to incorporate real-time passenger load information for transit services in commonly used apps such as Google Maps Transit and Transit App using automated passenger counters (APCs).
Transit Signal Priority	Install transit signal priority and/or queue jumps at high-priority, bottleneck intersections on new transit routes to improve transit travel time reliability. This would need to be coordinated with local roadway and traffic signal operators. This Study does not propose any specific locations for transit signal priority.

Commuter Assistance Programs (CAPs)

The following list of potential CAPs was included based on input from stakeholders and assessment of potential return on investment. CAPs encourage people to use alternative modes of transportation besides single-occupancy vehicles(SOV), such as transit, carpool, and vanpool, among others. CAPs in the list below are a corridor-specific program that will supplement ongoing regional programs.

Vanpool Formation and Expansion Program	Financial incentives to start new vanpools and retain existing ones that travel over the Bridge.
Corridor-Specific Mobility Marketing Campaign	Public-facing media coverage (e.g., print, radio/TV, and digital) and advertisement via radio, news sites, and social media regarding transit service across the Bridge.
Targeted Residential Outreach	Target outreach to commuters in the Study area advertising and promoting the new transit routes and vanpool/carpool incentives as they become available.
Targeted Employer Outreach	Target employers located in and around key activity centers in the Study area with promoting the new transit routes and vanpool/carpool incentives as they are available.
Corridor-Specific HOV Incentive	Short-term financial benefit to try a new mode (e.g., car/vanpool or transit) that travels across the Bridge. This could be implementing using an existing or planned mobile platform.

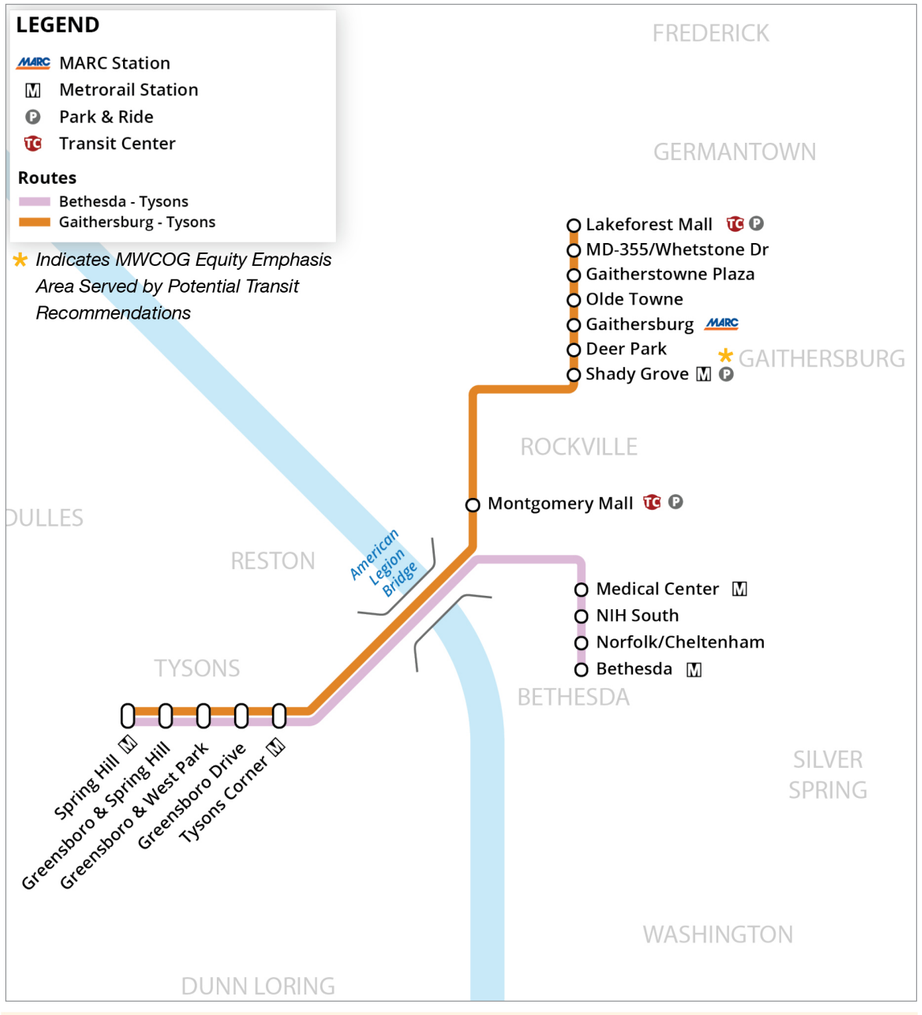
I-495 American Legion Bridge Transit/TDM Study

Summary Report

- **Alignment** - Start and end points of the route
- **Direction** - Indicates whether the service operates in both directions or just MD to VA in the AM and VA to MD in the PM
- **Peak Frequency** - How often the bus would come during peak period
- **Daily ALB Riders (2045)** - Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service

Baseline Package

Potential Transit Recommendations



Summary of Benefits

Total Forecasted Daily Riders (Over ALB)[1]: 1,000

Total Passenger Miles[2]: 17,000

1: *Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service (Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors)*

2: *Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)*

Summary of Potential Transit Recommendations

Alignment	Direction	Peak Frequency (min)	Daily ALB Riders (2045)	Time Frame
Bethesda - Tysons	Bi-Directional	30	400	Mid-Term
Gaithersburg - Tysons	Peak Direction Only	30	600	Mid-Term

- *Maintenance facility or expansion may be needed to advance potential recommendations and is dependent on operator.*
- *The Bethesda - Tysons Transit Route could be advanced as part of the Near-Term timeframe.*

Key Implementation Effort:
= Low
= Medium
= High

	Implementation Effort
Technology Enhancements	
Near-Term • VA and Maryland Commuter Parking Information	
Commuter Assistance Programs	

Near-Term
• Corridor-Specific Commuter Assistance Program
  • Targeted Residential Outreach
  • Targeted Employer Outreach
  • Vanpool Formation and Expansion Program
  • Corridor-Specific HOV Incentive Program
Continual
• Ongoing Regional and Statewide Programs	

Capital Parking Expansion Needs	
Mid-Term • Westfield Montgomery Mall	

Overview

- The baseline investment package focuses on low-cost traffic mitigation strategies with high rates of ROI that do not rely heavily on construction of the managed lanes for implementation.
- Transit service in the baseline package is consistent with markets that have been identified in previous studies.

Near-Term
Prior to the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Mid-Term
In conjunction with the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Long-Term
Following opening of the Managed Lanes

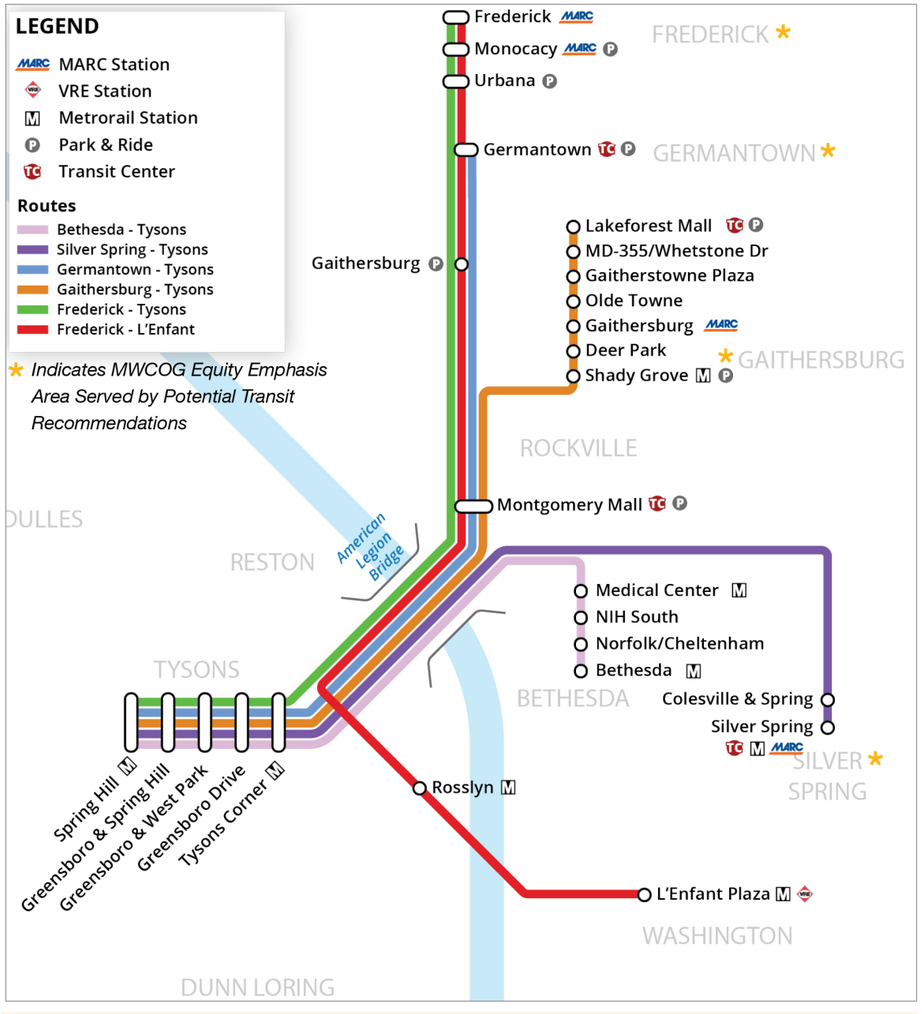
I-495 American Legion Bridge Transit/TDM Study

Summary Report

- **Alignment** - Start and end points of the route
- **Direction** - Indicates whether the service operates in both directions or just MD to VA in the AM and VA to MD in the PM
- **Peak Frequency** - How often the bus would come during peak period
- **Daily ALB Riders (2045)** - Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service

Medium Package

Potential Transit Recommendations



Summary of Benefits

Total Forecasted Daily Riders (Over ALB)[1]: 3,700
Peak: 3,500 Off-Peak: 200

Total Passenger Miles[2]: 101,000

1: Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service (Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors)

2: Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)

Summary of Potential Transit Recommendations

Alignment	Direction	Peak Frequency(min)	Off-Peak Service	Daily ALB Riders (2045)	Time Frame
Bethesda - Tysons	Bi-Directional	30	✓	600	Mid-Term
Silver Spring - Tysons	Peak Direction Only	30		600	Mid-Term
Germantown - Tysons	Peak Direction Only	30		600	Mid-Term
Gaithersburg - Tysons	Peak Direction Only	20		800	Mid-Term
Frederick - Tysons	Peak Direction Only	30		600	Long-Term
Frederick - L'Enfant via Arlington	Peak Direction Only	40		500	Long-Term

- *Maintenance facility or expansion may be needed to advance potential recommendations and is dependent on operator.*
- *The Bethesda - Tysons Transit Route could be advanced as part of the Near-Term timeframe.*

Key Implementation Effort:
🔧 = Low
🔧🔧 = Medium
🔧🔧🔧 = High

	Implementation Effort
Technology Enhancements	
Near-Term • VA and Maryland Commuter Parking Information	🔧🔧
Mid-Term • Maintain or Adjust Near-Term Program • Technology Enhancements to Existing Efforts (Levels Based on Proposed Service) • Real-Time Toll and Transit Information • Real-Time Passenger Load Information • Real-Time Transit Arrival Information • Transit-Signal Priority	🔧🔧🔧
Commuter Assistance Programs	
Near-Term • Corridor-Specific Commuter Assistance Program • Targeted Residential Outreach • Vanpool Formation and Expansion Program • Targeted Employer Outreach • Corridor-Specific HOV Incentive Program	🔧🔧
Mid-Term • Maintain or Adjust Near-Term Programs based on Performance • **New Addition to Program:** Corridor-Specific Mobility Marketing Campaign	🔧
Long-Term • Maintain or Adjust Mid-Term Program based on Performance **Continual** • Ongoing Regional and Statewide Programs	N/A
Capital Parking Expansion Needs	
Mid-Term • Westfield Montgomery Mall • Germantown	🔧🔧🔧
Long-Term • Urbana • Monocacy	🔧🔧🔧

Overview

- A key characteristic of the medium investment package is a significant increase in commuter bus services and supporting technologies that enhance the commuter experience.
- The medium package also introduces off-peak midday service for one high-ranking route.

Near-Term
Prior to the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Mid-Term
In conjunction with the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Long-Term
Following opening of the Managed Lanes

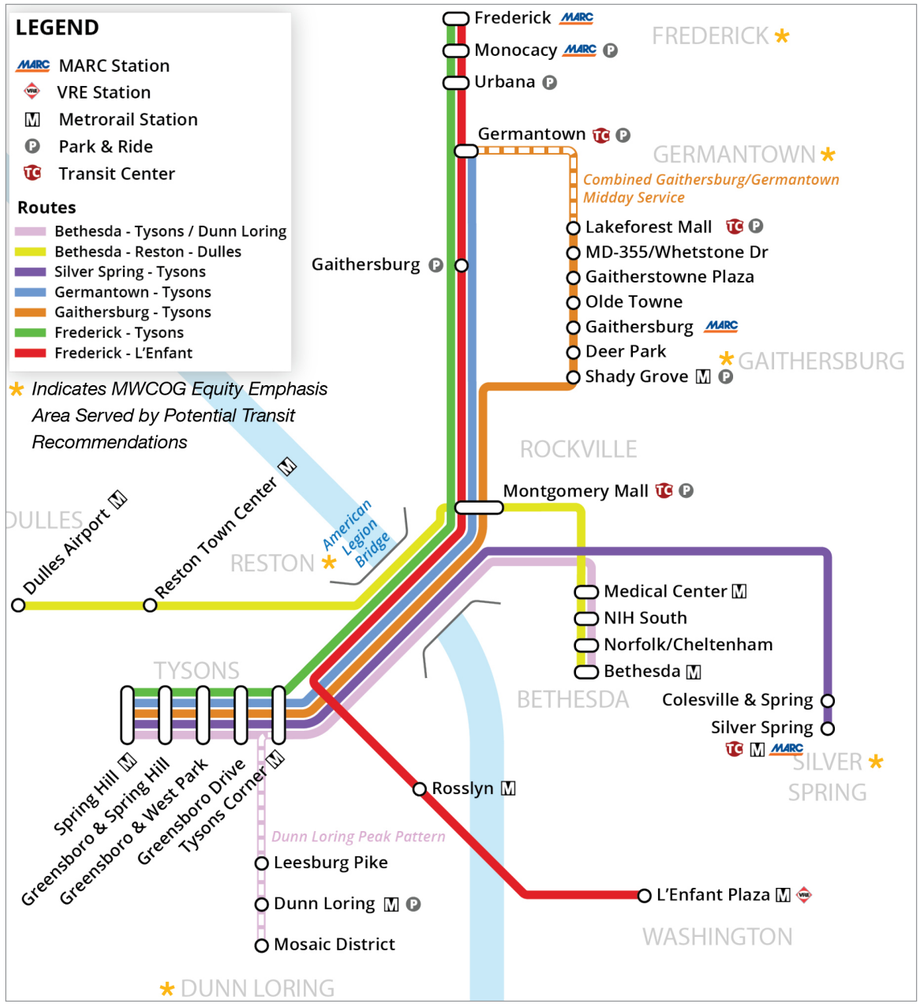
I-495 American Legion Bridge Transit/TDM Study

Summary Report

- **Alignment** - Start and end points of the route
- **Direction** - Indicates whether the service operates in both directions or just MD to VA in the AM and VA to MD in the PM
- **Peak Frequency** - How often the bus would come during peak period
- **Daily ALB Riders (2045)** - Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service

High Package

Potential Transit Recommendations



Summary of Benefits

Total Forecasted Daily Riders (Over ALB)[1]: 5,600
Peak: 4,500 Off-Peak: 1,100

Total Passenger Miles[2]: 152,000

1: Number of people per day in 2045 forecast to cross the American Legion Bridge on the transit service (Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors)

2: Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)

Summary of Potential Transit Recommendations

Alignment	Direction	Peak Frequency (min)	Off Peak Service	Daily ALB Riders (2045)	Time Frame
Bethesda - Tysons/Dunn Loring	Bi-Directional	12*	✓	800	Mid-Term
Bethesda - Reston/Dulles	Bi-Directional	30		300	Mid-Term
Silver Spring - Tysons	Peak Direction Only	20	✓	1000	Mid-Term
Germantown - Tysons	Peak Direction Only	20	✓	1000	Mid-Term
Gaithersburg - Tysons	Peak Direction Only	15	✓	700	Mid-Term
Frederick - Tysons	Peak Direction Only	20		900	Long-Term
Frederick - L'Enfant via Arlington	Peak Direction Only	30	✓	900	Long-Term

**Combined frequency; 2 buses per hour extend to Dunn Loring during the peak period*

- *Maintenance facility or expansion may be needed to advance potential recommendations and is dependent on operator.*
- *The Bethesda - Tysons Transit Route could be advanced as part of the Near-Term timeframe.*

Key Implementation Effort:
🔧 = Low
🔧🔧 = Medium
🔧🔧🔧 = High

	Implementation Effort
Technology Enhancements	
Near-Term • VA and Maryland Commuter Parking Information	🔧🔧
Mid-Term • Maintain or Adjust Near-Term Program • Technology Enhancements to Existing Efforts (Levels Based on Proposed Service) • Real-Time Toll and Transit Information • Real-Time Passenger Load Information • Real-Time Transit Arrival Information • Transit-Signal Priority	🔧🔧🔧
Commuter Assistance Programs	
Near-Term • Corridor-Specific Program • Targeted Residential Outreach • Vanpool Formation and Expansion Program • Targeted Employer Outreach • Corridor-Specific HOV Incentive Program	🔧🔧
Mid-Term • Maintain or Adjust Near-Term Programs based on Performance • **New Addition to Program:** Corridor-Specific Mobility Marketing Campaign	🔧
Long-Term • Maintain or Adjust Mid-Term Program based on Performance **Continual** • Ongoing Regional and Statewide Programs	N/A
Capital Parking Expansion Needs	
Mid-Term • Westfield Montgomery Mall • Germantown	🔧🔧🔧
Long-Term • Urbana • Monocacy	🔧🔧🔧

Overview

- The high investment package reflects the most robust level of service for the proposed commuter bus routes, with connections and service route extensions to all major destinations for users of the Bridge.
- Frequencies are consistent with those outlined in the Constrained Long-Range Transportation Plan (CLRP) for planned routes.
- Includes significant off-peak midday service for five of the seven commuter bus service options. The mid-day off peak service is added, mostly in the form of bi-directional service.

Near-Term
Prior to the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Mid-Term
In conjunction with the opening of the Managed Lanes up to and over the Bridge in both Maryland and Virginia

Long-Term
Following opening of the Managed Lanes

Package Comparisons

Transit Service

Because transit service is the main component of the investment packages and the other improvements support and promote transit usage, it is important to recognize the effect that level of service (i.e. route frequency) has on transit ridership. The table shows the routes included in each investment package, the level of service at which the routes would operate, the resulting number of riders across the Bridge taking each route, and the estimated total number of daily riders and passenger miles across the Bridge associated with each investment package.

Alignment	Direction	Base Package			Medium Package			High Package		
		Peak Frequency (min)	Off-Peak Frequency (min)	Daily ALB Riders (2045)	Peak Frequency (min)	Off-Peak Frequency (min)	Daily ALB Riders (2045)	Peak Frequency (min)	Off-Peak Frequency (min)	Daily ALB Riders (2045)
Bethesda – Tysons*	Bi-Directional	30		400	20	60	600	12*	30	800
Bethesda - Reston/ Dulles	Bi-Directional							30		300
Silver Spring - Tysons	Peak Direction Only				30		600	20	60	1,000
Germantown - Tysons	Peak Direction Only				30		600	20	60	1,000
Gaithersburg - Tysons	Peak Direction Only	30		600	20		800	15	60	700
Frederick - Tysons	Peak Direction Only				30		600	20		900
Frederick - L'Enfant via Arlington	Peak Direction Only				40		500	30	60	900
Total Forecast Daily ALB Riders				**1,000**			**3,700**			**5,600**
Total Forecast Passenger Miles Traveled				**17,000**			**101,000**			**151,000**

**In high package, 2 buses per hour during peak extend to Dunn Loring. Frequency shown is a combined frequency for Bethesda-Tysons*

Note:

- *Ridership and person-trips based on 2045 MWCOG Model runs and represents daily riders (AM and PM peak periods plus off-peak) over the American Legion Bridge; Forecasts developed using the MWCOG Travel Forecast Model are based on future regional cooperative land use forecast and existing regional travel behaviors.*
- *Peak Periods assumed 3 hours in AM and 3 in PM; Off-peak - 8 hours*
- *Passenger Miles Traveled: Measure of total distance per day in 2045 traveled by passengers on the route (includes travel that does not pass over the American Legion Bridge)*

Base Package

The base investment package focuses on providing service on the two corridors identified in previous plans: Bethesda to Tysons and Gaithersburg to Tysons. These services would operate every 30 minutes during the peak period only. The Bethesda to Tysons service would run in both directions, while Gaithersburg to Tysons would operate to Tysons in the morning and from Tysons in the afternoon/ evening.

Medium Package

The medium-investment package focuses on introducing peak-period commuter service between the key transit markets identified in this Study's demand analysis. All but one route would connect Maryland to Tysons with a minimum headway of 30 minutes. The Bethesda to Tysons and Gaithersburg to Tysons options feature an increase in service frequency over the baseline-investment package, with the Bethesda to Tysons route including off-peak service. Frederick to L'Enfant service would provide a peak-period service to Arlington (Rosslyn) and L'Enfant Plaza, complementing existing MARC service, which has limited capacity to operate additional trips into Washington, DC from Frederick.

High Package

The high investment package envisions all-day transit service across the Bridge. For routes that operate only in one direction, off-peak service would be bi-directional. The Germantown and Gaithersburg to Tysons route would be combined during the off-peak period. The Bethesda to Tysons service would be complemented by an alternative service pattern that would operate to Dunn Loring via the Tysons Corner Metrorail station during the peak period. A new peak period service would operate between Bethesda and Dulles International Airport via the Westfield Montgomery Mall Transit Center and Reston Town Center.

Additional Package Benefits

Transit Connections

In addition to providing efficient service to key activity centers, effective transit service should also connect with other transit modes to increase regional connectivity and provide first and last mile connections. Connectivity with other transit service will increase ridership and has the potential to decrease the amount of driving and parking needed to support the routes. Below is a comparison of the connectivity of each investment package with other existing and planned transit service.

Metro

Tysons ●●○
Reston ○
Dulles ○
Dunn Loring ○
Bethesda ●●○
Silver Spring ●○
Shady Grove ●●○
Rosslyn ●○
L'Enfant Plaza ●○

MARC

Silver Spring ●○
Gaithersburg ●●○
Monocacy ●○
Frederick ●○

Purple Line

Silver Spring ●○
Bethesda ●●○

County BRT

Tysons ●●○
Bethesda ●●○
Silver Spring ●○
Westfield Montgomery Mall Transit Center ●●○
Gaithersburg ●●○
Germantown ●○

Local Bus

All stops ●●○

Notes:
Italicized stops are serviced by planned transit connections

- ● Denotes stops on routes included in the baseline package
- ● Denotes stops on routes included in the medium package
- ○ Denotes stops on routes included in the high package

Greenhouse Gas Emissions Reduction

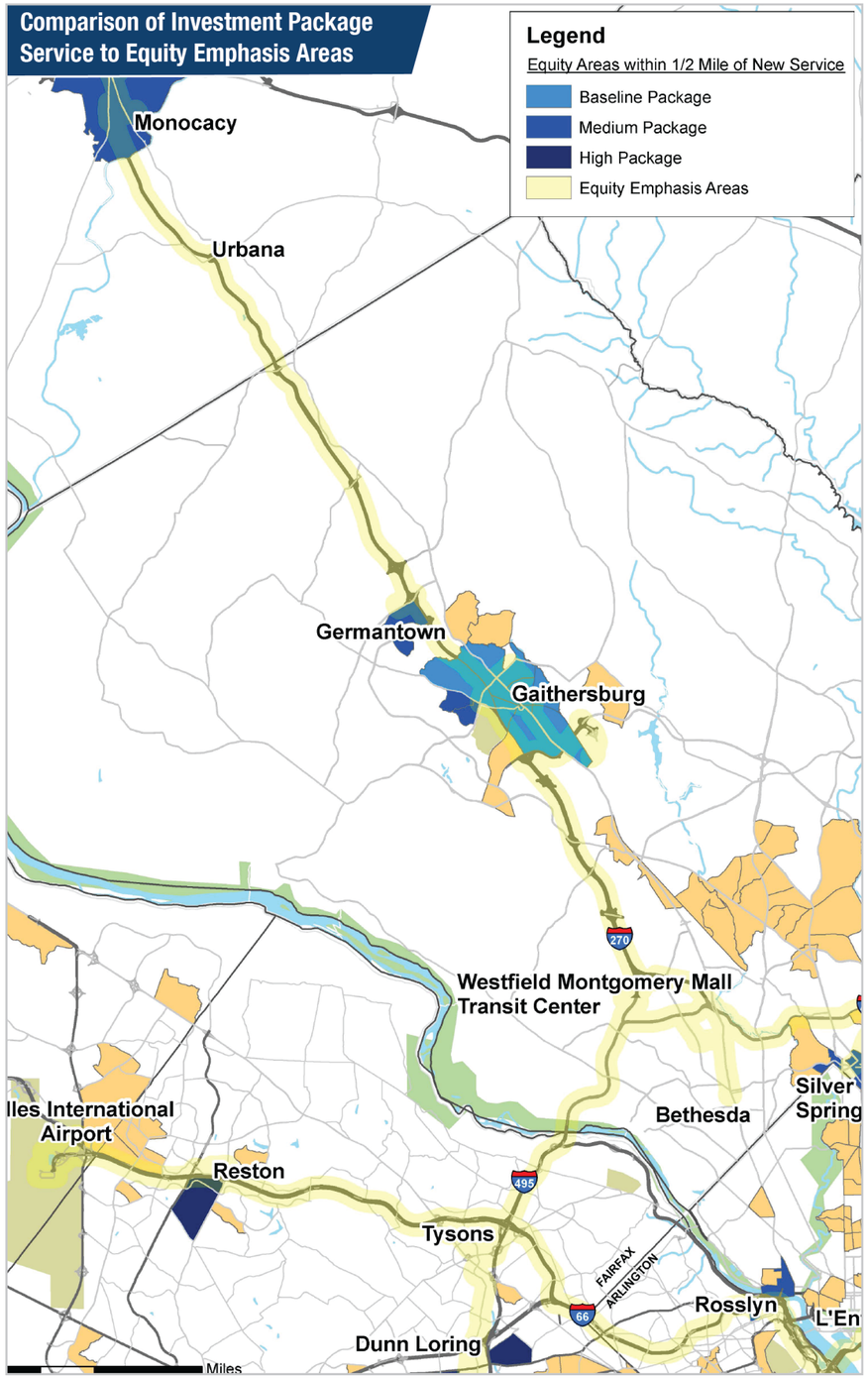
The transit service in the high package has the potential to reduce greenhouse gas (GHG) emissions by up to 61.4 metric tons of daily CO_2 emissions. That's the equivalent to the total daily use of approximately 4,900 vehicles.

	Maximum Potential Daily GHG Reduction (2045 Metric Tons of CO_2 Emissions)	Equivalent Vehicles (Total Daily Use)
Baseline	6.9	540
Medium	40.8	3200
High	61.4	4900

Notes/Assumptions
- *Based on total forecast Passenger Miles Traveled (total distance per day in 2045 traveled by passengers including travel that does not pass over the Bridge)*
- *Maximum potential assumes that all riders of the transit service switch from using Single-Occupant-Vehicle (SOV)*
- *A typical passenger vehicle travels 11,500 miles per year (including non-commuting travel) and emits 4.6 metric tons of CO_2 annually. 95-99% of GHG emissions from vehicles are CO_2* [5]

Serving Equity Emphasis Areas

Transit should also provide service to those who need it most, such as low-income populations who rely on transit as their main mode of transportation. Equity Emphasis Areas are small geographic areas identified by MWCOG that have significant concentrations of low-income, minority populations, or both.[6] The map shows the MWCOG Equity Emphasis Areas and highlights the areas that are within ½ mile of each investment package's new transit routes. It's worth noting that the medium package includes the baseline package's Equity Emphasis Areas, and the high package includes the medium and baseline package Equity Emphasis Areas.



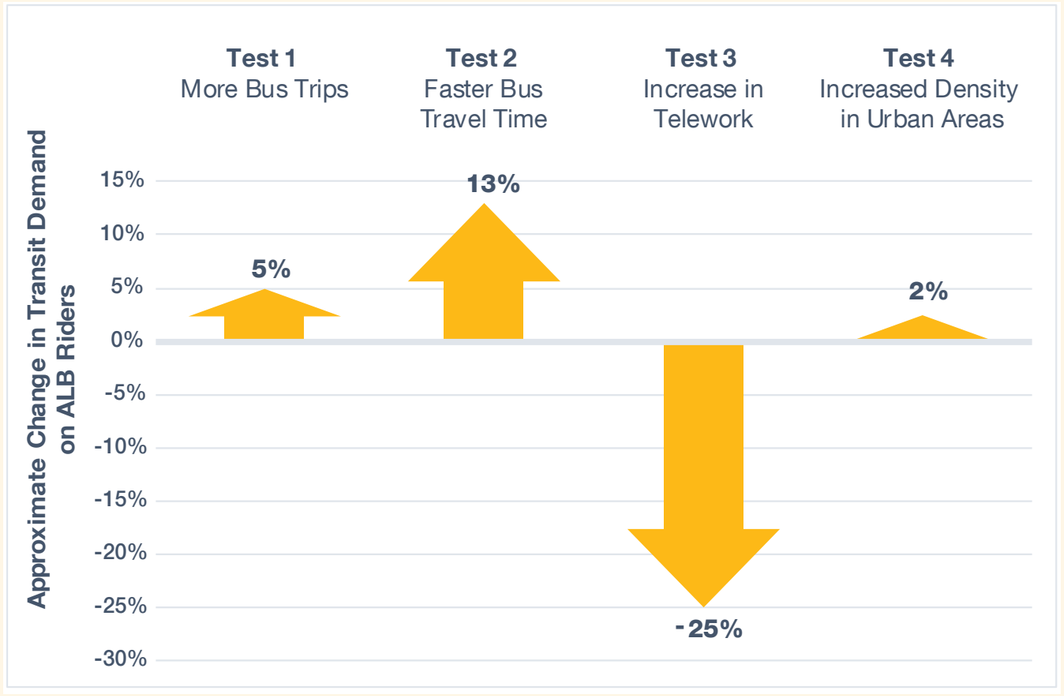
[5] (US EPA, 2018) [6] (Metropolitan Washington Council of Governments (MWCOG), 2020)

Modeling Potential Effects of Changes in Assumptions

Given the impact COVID-19 has had on commuting behavior and teleworking, future transportation trends are likely to be different than they were in early 2020. Other factors, such as concentrated population and employment growth are variables that can change the future transportation needs of the region. It is also important to note that the high-level assumptions for transit service in this Study are approximate and can vary from real-life behavior. Recognizing that certain elements in our future are unknown, the Study team ran modeling tests to provide a gauge of how the demand for transit service might change under different scenarios.

- What would happen if 10% more bus trips on the routes proposed were offered?
- What if the travel time for proposed buses was 10% faster?
- What if 20% more people teleworked in the future?
- What if urban areas like Bethesda, Tysons, Gaithersburg and Silver Spring grew at a rate 20% higher than currently projected?

The graph below shows an approximation of the potential change in demand for transit service over the Bridge for each of the four scenarios tested.



Next Steps

This Study identified a series of potential investment packages of recommendations that help meet the identified Study needs of providing new mobility choices to service travel between Virginia and Maryland. Each investment package provides a combination of transit service elements, technology enhancements, Commuter Assistance Programs, and parking needs. As the managed lanes studies in both Virginia and Maryland progress, these investment packages offer options to move more people over the Bridge in fewer vehicles. As these potential transit services move closer to implementation, the items below should be considered as next steps.

Additionally, the levels of investment and timing of the packages could be further refined pending more detailed information on funding availability and schedules for implementation of the managed/express lanes projects.

Transit Service

- Identify the potential to advance some transit service to near term before or during construction of managed lanes, potentially using a bus-on-shoulder approach based on the sequence and duration of construction of the managed/express lanes projects.
- Determine potential operator(s) and associated maintenance facility considerations.
- Conduct more detailed analysis of specific transit operating assumptions such as frequency, stops, and run times.
- Identify available bus bay capacity closer to the time of implementation based on the anticipated service levels at those locations.
- Work with local entities and transit providers to facilitate first-last mile connections and determine local service modifications.

Commuter Assistance Programs and Technology Enhancements

- Coordinate between states, localities, transit operators, and regional entities on implementation of programs.
- Monitor the Virginia RM3P Program for potential longer-term expansion to the I-495 corridor.
- Coordinate with private managed lanes operators about program promotion and real-time information regarding tolls.

Parking and Facility Needs

- Integrate the parking needs identified from the potential service in this Study with regional parking demand and other planned improvements.
- Coordinate with transit providers and property owners at locations such as Metrorail and MARC stations to confirm the use of available parking for bus service.

Appendix

February 2021

MARYLAND DEPARTMENT OF TRANSPORTATION

MARYLAND TRANSIT ADMINISTRATION

DRPT

Virginia Department of Rail and Public Transportation

Summary of Public and Stakeholder Comments

A draft of this Summary Report was made available for public comment between December 21, 2020 and February 1, 2021. In addition to comments received from the public, a few organizations provided input on the Study including the Sierra Club, Southern Environmental Law Center, and Fairfax County Board of Supervisors. Responses to the comments received are outlined below.

TOPIC: I-495 NEXT and Maryland Managed Lanes Project

Comment Theme	Response
Concern that a second bridge further west of the American Legion Bridge is needed	The possibility of building a second bridge was not included in the scope of this Study. Since both Maryland and Virginia governments have committed to expanding the Bridge, this Study identified transit routes to utilize the managed/express lanes based on assumptions related to completion stages of the network (see page 4), that provide congestion-free service between activity centers in each state.
Request that more analysis be conducted to determine the effects of the COVID-19 pandemic on travel flows	Sensitivity analyses using available modeling tools were conducted to understand how changing future conditions could alter demand for transit service, including an increase in telework. Maryland and Virginia will continue to monitor travel trends and forecasting tools will be updated as more data is available.
Request that the managed/express lanes projects should focus on reducing congestion and promoting alternative modes of transportation	The goal of this Study was to identify potential opportunities between key activities centers in Maryland and Virginia and leverage the future construction of the managed/express lanes to provide fast, efficient, and reliable congestion-free transit service between the two states. Running high-frequency transit buses in the managed/express lanes will ensure that the service is competitive and attracts interstate travelers who would otherwise drive in their vehicles.
Concern that rail has not been considered as a viable alternative	Rail was not considered in this Study since both states have agreed to the Capital Beltway Accord, and each state has plans to construct managed/express lanes on I-495. The managed/express lanes represent an opportunity to implement high-frequency bus service between Maryland and Virginia separated from general traffic.
Concern over the environmental impacts of reconstructing the Bridge	This Study only examines transit and TDM options that would utilize infrastructure built under the separate managed/express lanes projects. Both Maryland and Virginia are in the process of completing environmental analyses for each state's respective managed/express lanes projects to disclose the impacts of these improvements in accordance with the National Environmental Policy Act.
Request that there be more coordination between the states	Maryland and Virginia have been closely coordinating the expansion of the Bridge and the managed/express lanes projects, which resulted in both states actively developing this Study looking at tranist and TDM options across the Bridge.
Request that separated and protected facilities for pedestrians, cyclists, and other non-motorized road users are included in managed/express lanes and bridge reconstruction projects	Noted. Multimodal connectivity with transit service options was evaluated but the scope of this Study did not include the design of specific facilities.

TOPIC: Potential Transit Recommendations

Comment Theme	Response
Request that Dulles be considered as a potential bus stop	Bi-directional, 30-minute frequency service during the peak period to Dulles Airport from Bethesda via Tysons and Reston is proposed in the high investment package in the mid-term.
Request that transit service be provided to Tysons, VA and Merrifield, VA, as well as Herndon, VA, Reston, VA, and Potomac, MD	Transit service to Tysons is recommended at various frequencies in the baseline, medium, and high Investment packages. Transit service to Dunn Loring/Merrifield and Reston/Herndon are proposed in the high investment package as well. Transit service to Potomac is achieved by multiple routes servicing the Westfield Montgomery Mall Transit Center in the baseline, medium, and high investment packages.
Request to provide all-day service to key activity centers like Tysons and Bethesda	Bi-directional transit service between Tysons and Bethesda is proposed at varying frequencies in the baseline, medium, and high investment packages. Results from the travel demand modeling completed as part of this Study did not indicate enough demand for bi-directional all-day service between Tysons and Bethesda.
Request that some routes should be implemented immediately to help alleviate congestion during construction	All of these routes would greatly benefit from the construction of the managed /express lanes to provide congestion-free service between Maryland and Virginia. However, in each of the investment packages the Bethesda-Tysons route has been identified as a potential candidate in the near-term prior to the managed lanes opening.
Concern that the proposed transit service is not enough to meet future demand	Noted. This Study evaluates initial transit service and TDM options across the Bridge that can be implemented and integrated as part of the broader regional transit network in both states. Currently there is no interstate transit service across the Bridge. The potential investment packages of this Study are a starting point and provide decision makers at the local and state level with the data and context needed to prioritize transit routes for implementation. Future studies will monitor performance and have the potential to increase service based on performance and available funding.
Request that recommendations be embedded in final procurement documents for Public Private Partnership (P3) projects in both states	This Study provides a framework for implementing transit service across the Bridge between Maryland and Virginia. This Study is intended to be the catalyst for discussions between Maryland and Virginia state and local governments to begin coordinating interstate transit service across the Bridge.
Request that driverless on-demand service be considered in the future	The transit service and TDM options identified in the Study allow for technology advancements to be integrated prior to implementation. Implementing agencies should continue to monitor emerging technology and consider partnerships in the future as automation becomes more prevalent.

Potential Transit Connections (Continued)

Comment Theme	Response
Concern that bus service across the Bridge must be high-frequency to decrease the number of vehicles traveling on I-495 and I-270	The potential investment packages in this Study include variations of high-frequency bus service across the Bridge. The goal of this Study was to identify potential opportunities between key activities centers in Virginia and Maryland and leverage the future construction of the Managed/Express Lanes to provide fast, efficient, and reliable congestion-free transit service between the two states. Running high-frequency transit buses in the managed/express lanes will ensure that the service is competitive and attracts interstate travelers who would otherwise drive in their vehicles.
Concern that the Study did not adequately analyze activity centers in Northern Virginia adjacent to I-495	As part of the travel demand analysis we looked at current and future population and employment data along the I-495 corridor in both Virginia and Maryland. The analysis showed that in Virginia, areas that would benefit most from high-frequency bus service between Maryland and Virginia were dense activity centers, including Tysons, Dunn Loring, Reston, and Rosslyn. Moreover, the travel demand analysis indicated that the majority of trips between the two states, almost two thirds, were from Maryland to Virginia.
Concern that the costs and potential funding sources for the proposed investment packages has not been studied thoroughly enough	The investment packages proposed as part of this Study represent high-level estimate strategies for implementing transit across the Bridge. There are many variables for estimating the cost for operating individual transit routes, including service run time, number of trips, and farebox recovery. Operating costs are also largely dependent on the agency operating the service. This Study also does not identify service operators but instead provides decision makers at the state and local level with the data and context need to make more informed decisions about where transit is needed in their jurisdictions.
Concern that the proposed transit routes does not serve the areas with populations that need it most	Two thirds of bus trips during peak period in the high investment package serve origins within 1/2 mile of Metropolitan Washington Council of Governments Equity Emphasis Areas. Equity Emphasis Areas are small geographic areas with high concentrations of low-income, minority populations, or both. Providing high-frequency transit service to these areas was a key priority for this Study.
Request that transit-oriented development will be encouraged along with new transit service	Noted. The potential transit services outlined in this report can be enhanced by leveraging transit-oriented development.
Questions about how the potential transit service recommendations will interact with existing local services	Evaluating the impacts to existing local transit service was not included in the scope of this Study. Impacts to local transit service will need to be evaluated as transit operating plans for new intestate routes are refined.
Request that additional planning and analysis be conducted to further refine transit routes and level of service	This Study was a first step for implementing transit service across the Bridge between Maryland and Virginia and generated transit alignment and TDM program concepts that can help facilitate discussion between local and state implementing agencies about which routes and stop locations should be prioritized for service. Virginia and Maryland are committed to working with local jurisdictions to advance planning and coordinate on operating and cost assumptions.

Potential Transit Connections (Continued)

Comment Theme	Response
Noting the importance of identifying a service operator	This Study did not identify potential operators for specific routes. Implementing agencies at the state and local level will need to coordinate which agencies will operate the routes.
Concern that there will be increased demand for transit and parking facilities	Noted. As transit service plans and route alignments are refined, discussions about parking demand and bus bay capacity at express bus stops should be considered in addition to other regionally planned improvements to provide adequate parking for riders and space for buses.
Request that the connections to the planned Purple line be shown on the investment package maps	Connection to the planned Purple Line is included in the Transit Connections section.
Request that the Bethesda - Reston/Dulles Airport service be advanced from the high to medium investment package	Noted. Results from the travel demand analysis completed as part of this Study indicated that the demand for travel between Dulles and Maryland was not as strong as other activity centers in Virginia. However, operating agencies may choose to implement the Bethesda-Reston/Dulles route sooner depending on available funding and service priorities.
Question of how much travel time savings will the buses provide compared to single-occupant vehicle travel	The bus trips are assumed to use proposed managed lanes for much of the alignments and offer a reliable travel time based on the free-flow speed as well as other benefits such as not having to pay for parking or tolls to use the managed lanes. Specific travel time savings by route was not included in this Study.
Request for more detail regarding the scale of implementation effort provided in the investment package summaries	Noted. Each of the recommendations included in the investment packages has a corresponding implementation effort required (low, medium, or high) that is based on a few factors, including multi-entity coordination, deployment at multiple locations, and technology/software integration requirements. The implementation effort for each recommendation is a subjective assessment based on existing practices in the region and current technological capabilities.
Clarification on the projected Greenhouse Gas (GHG) emissions calculations	The maximum potential daily GHG reductions are based on gross savings assuming that all riders of the transit service switch from using Single-Occupant-Vehicles. This is a high-level assessment of potential reductions. More detail such as a mode-shift survey would be needed to provide a more accurate assessment.

Potential Transit Connections (Continued)

Comment Theme	Response
Clarification on how the potential for increased teleworking was modeled as part of the Study	To model for increase in telework, the percentage of people working from home (and not commuting to work) was increased by 20% in the MWCOG travel demand model. Faster bus service could be a result of increased teleworking and less driving to work, but the tests completed as part of this Study were conducted independently from each other.
Request that new interstate transit routes not be implemented until after managed/express lanes have been constructed to provide congestion-free service	Noted. When to implement and begin operation of these routes will need to be decided by the local and state agencies will who be operating the service. Stakeholders and members of the public also voiced support for implementing routes in the near-term to help alleviate congestion during construction of the managed/express lanes.
Concern that the timeline for construction of the managed lanes is uncertain	Noted. As transit service plans and route alignments are refined and the managed lanes projects in each state progress, factors such as the purchase time for buses as well as the flow of funding will need to be considered.
Concern that future residential growth in Virginia will necessitate more Virginia to employment centers in Maryland	Results from the travel demand modeling completed as part of this Study indicated that the majority of trips between the two states today, almost two thirds, were from Maryland to Virginia. This trend also continued into the future as well as employment growth in key activity centers in Virginia, namely Tysons, outpaced job growth in activity centers in Maryland. Should these patterns change, there is flexibility for bus service to be operated in both directions.