



# TRANSIT ALTERNATIVES ANALYSIS OF THE ROUTE 7 CORRIDOR

## Definition of Alternatives

December 2013

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Northern Virginia Transportation Commission

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## **INTRODUCTION**

This report describes the high-level definition of the alternatives considered in the Transit Alternatives Analysis (AA) of the Route 7 Corridor (Route 7 Study) Phase I. This information lays the foundation for Phase II of the study that will develop a Locally Preferred Alternative (LPA). Each alternative includes a summary of the transit mode, routing, expected travel time, and service characteristics, as well as a description of infrastructure required for a potential operations and maintenance (O&M) facility and turnaround loop. Further details of each alternative will be developed during Phase II of the Route 7 Study.

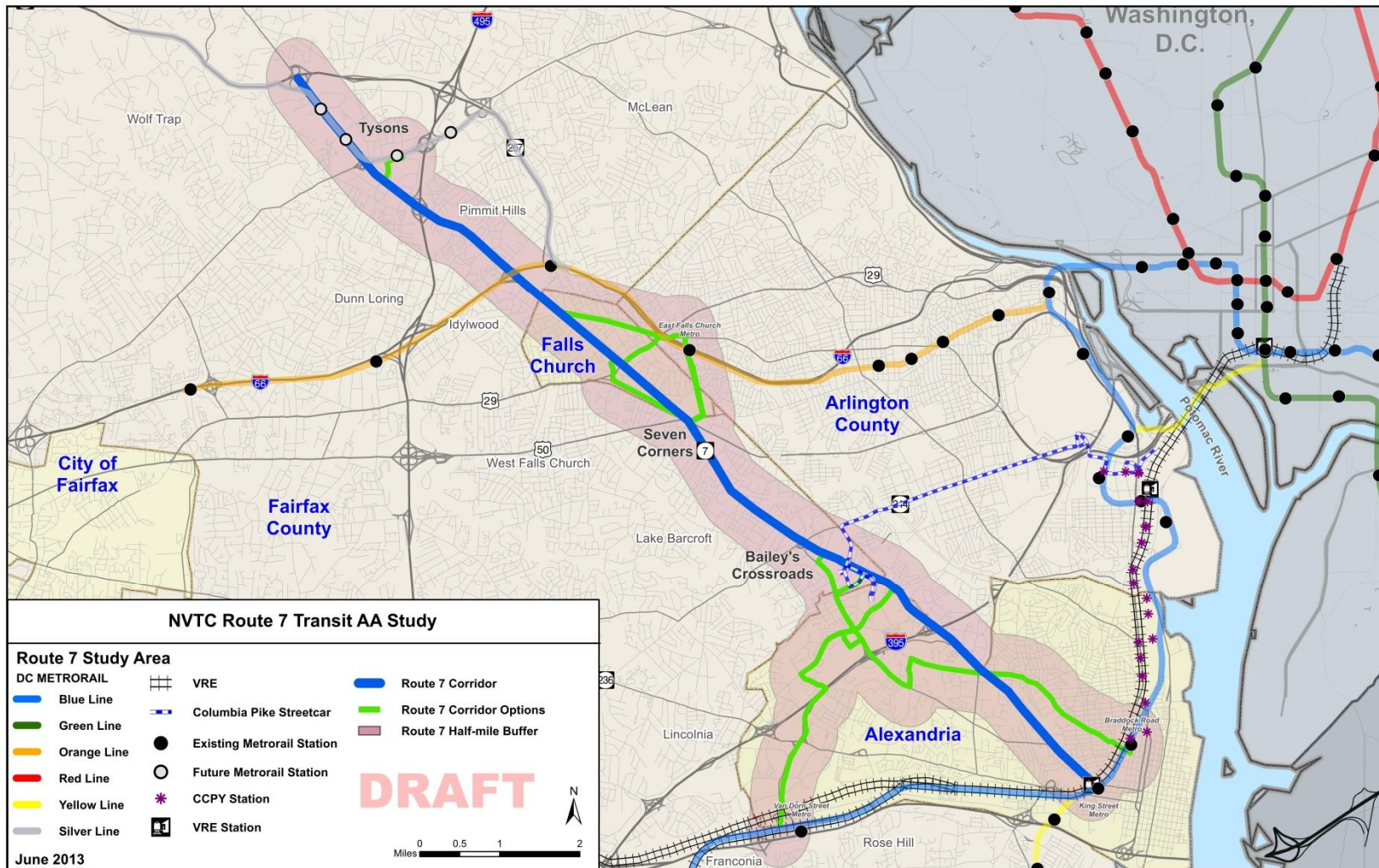
## **GENERAL OPERATING CONCEPTS – TRANSIT**

Four agencies—Arlington County Bus (ART), City of Alexandria (DASH), Fairfax Connector, and WMATA—provide local and express bus service along Route 7 and traversing the study area. Route 7 is directly served by end-to-end service along Metrobus’s 28 Line, while many other bus routes operate along Route 7 for short segments.

The proposed alignment alternatives for premium transit within the Route 7 study area are shown in Figure 1. Route 7 alternative alignments provide opportunities to for regional connections to the Silver Line Metrorail extension as well as the existing Orange, Blue and Yellow Lines and the southwestern end of the planned Columbia Pike Streetcar.

The following sections describe the regular and express fare structures for existing transit services, as well as the potential regular fare structure for premium transit service within the Route 7 study area. Information on existing fares were gathered for each agency’s web site and validated with its technical advisory committee (TAC) representative.

Figure 1: Route 7 Study Area



Source: Arlington County, City of Alexandria, ESRI, MWCOG, Parsons Brinckerhoff

## Fares

### Existing Transit Service

#### ART

ART uses a flat fare structure for its bus service and is shown in Table 1. Regular one-way service is \$1.50. Transfers using the regional SmarTrip card within a two-hour window are provided for riders to other ART buses for free, or to other transit services at a discount. Transfers for regular bus service without a SmarTrip card require payment of the full one-way fare.

**Table 1: ART Local Bus Fares**

Service Type	One-Way Fare (Cash or SmarTrip)	7-Day Pass	Transfers*
Regular	\$1.50	\$16.25**	<ul style="list-style-type: none"> <li>- Metrobus or ART to ART: Free**</li> <li>- Metrorail to ART, ART to Metrorail: \$0.50 discount**</li> <li>- ART to Metrobus: \$0.10**</li> <li>- Without SmarTrip card: Full fare</li> </ul>

#### Notes

\* Transfers to and from ART buses are valid within a two-hour window.

\*\* With use of SmarTrip card

#### DASH

DASH uses a flat fare structure for its bus service and as described in Table 2. Regular one-way service is \$1.60. Weekly and monthly passes are also available for \$16 and \$40, respectively. Transfers using the regional SmarTrip card within a four-hour window are provided for riders to other DASH and regional buses for free, or to Metrorail at a discount.

**Table 2: DASH Local Bus Fares**

Service Type	One-Way Fare (Cash or SmarTrip)	7-Day Regional Pass	Monthly DASH Pass	Transfers*
Regular	\$1.60	\$16.00	\$40.00	<ul style="list-style-type: none"> <li>- Bus to bus: Free</li> <li>- Metrorail to DASH, DASH to Metrorail: \$0.50 discount</li> </ul>

#### Notes

\* Only issued with use of SmarTrip card. DASH-to-DASH bus transfers are valid within a four-hour window; DASH-to-other bus transfers are valid within a two-hour window. Additional charges may apply to services priced higher than DASH service. If transferring without use of SmarTrip card, must pay full fare.

Fairfax Connector

Fairfax Connector uses a flat fare structure for its local and express<sup>1</sup> bus service as described in Table 3. Regular one-way service is \$1.60 with use of a SmarTrip card and \$1.80 without use of a SmarTrip card. Weekly and monthly passes are also available for \$16 and \$40<sup>2</sup>, respectively. Transfers using the regional SmarTrip card within a two-hour window are provided for riders to other Fairfax Connector and regional buses for free, or to express buses and Metrorail at a discount.

**Table 3: Fairfax Connector Local and Express Bus Fares**

Service Type	One-Way Cash Fare	One-Way SmarTrip Fare	7-Day Regional Bus Pass	Transfers *
Regular	\$1.80	\$1.60	See Metrobus pass fares	<ul style="list-style-type: none"> <li>- Bus to bus: Free **</li> <li>- Metrorail to Fairfax Connector, Fairfax Connector to Metrorail: \$0.50 discount</li> <li>- Without SmarTrip card: Full fare</li> </ul>
Route 395 Express	\$4.00	\$3.65	N/A	<ul style="list-style-type: none"> <li>- With SmarTrip card: \$2.05</li> <li>- Without SmarTrip card: Full fare</li> </ul>
Route 595 Express	\$7.50	\$7.50	N/A	<ul style="list-style-type: none"> <li>- With or without SmarTrip card: Full fare</li> </ul>
Route 597 Express	\$7.50	\$7.50	N/A	<ul style="list-style-type: none"> <li>- With or without SmarTrip card: Full fare</li> </ul>

Notes

\* Transfers to and from Fairfax Connector local buses are valid within a two-hour window.

\*\* With use of SmarTrip card

WMATAMetrobus

Metrobus uses a flat fare structure for its local and express bus service as described in Table 4. Regular one-way service is \$1.60 with use of a SmarTrip card and \$1.80 without use of a SmarTrip card. Express one-way service is \$3.65 with use of a SmarTrip card and \$4.00 without use of a SmarTrip card. Riders can also purchase a 7-Day Regional Bus Pass loaded onto SmarTrip cards for \$16. Bus-to-bus transfers using the regional SmarTrip card within a two-hour window are provided for free; transfers to and from Metrorail are provided at a discount.

<sup>1</sup> Discussion on Fairfax Connector's express bus service applies only to those services within the Route 7 study area.

<sup>2</sup> Fairfax Connector accepts \$40 DASH monthly pass.



Table 4: Metrobus Local and Express Bus Fares

Service Type	One-Way Cash Fare	One-Way SmarTrip Fare	7-Day Regional Pass	Transfers *
Regular	\$1.80	\$1.60	\$16.00	- Bus to bus: Free ** - Metrorail to Metrobus, Metrobus to Metrorail: \$0.50 discount
Express	\$3.65	\$4.00	N/A	- Bus to bus: Free ** - Metrorail to Metrobus, Metrobus to Metrorail: \$0.50 discount

Notes

\* Transfers to and from Metrobuses are valid within a two-hour window.

\*\* With use of SmarTrip card

*Metrorail*

Metrorail uses a distance-based fare structure. During the peak period, a flat fare of \$2.10 is charged for the first three miles of travel. WMATA then applies two different tiers of incremental fares. The first tier charges riders \$0.316/mile for trips greater than three miles in length and up to six miles in length. The second tier charges riders \$0.28/mile for trips greater than six miles in length. The maximum fare is \$5.75. Off-peak fares are charged similarly, but at about a 25% discount. The mileage on which the fare is based is a composite mileage between each station pair and is the average of the track miles between station pairs and the straight-line distance. Table 5 describes Metrorail's fare structure.

Table 5: Metrorail Fare Structure, FY13

	Peak	Off-Peak
Flat fare for first 3 miles of travel	\$2.10	\$1.70
Incremental fare for additional miles above 3 and up to 6	\$0.316/mile	\$0.237/mile
Incremental fare for additional miles above 6	\$0.280/mile	\$0.210/mile
Maximum fare cap, regardless of distance	\$5.75	\$3.50

Source: <http://planitmetro.com/2012/11/15/how-are-metrorail-fares-calculated/> (accessed October 24, 2013)

The fare matrices for the first 10 stations at each of the five Metrorail stations within the Route 7 study area are shown in Table 6 through Table 10.

**Table 6: Metrorail Station-to-Station Fares from West Falls Church**

Heading to	One-Way Peak Period Fare	One-Way Off-Peak Period Fare
Dunn Loring-Merrifield	\$2.10	\$1.70
East Falls Church	\$2.10	\$1.70
Ballston-MU	\$2.55	\$2.05
Vienna/Fairfax-GMU	\$2.70	\$2.05
Virginia Square-GMU	\$2.70	\$2.05
Clarendon	\$2.85	\$2.05
Court House	\$3.00	\$2.05
Rosslyn	\$3.25	\$2.05
Arlington Cemetery	\$3.45	\$2.75
Foggy Bottom-GWU	\$3.60	\$2.75
All Other Stations	\$3.75-\$5.75	\$2.75-\$3.50

**Table 7: Metrorail Station-to-Station Fares from King Street**

Heading to	One-Way Peak Period Fare	One-Way Off-Peak Period Fare
Braddock Road	\$2.10	\$1.70
Eisenhower Avenue	\$2.10	\$1.70
Huntington	\$2.10	\$1.70
Ronald Reagan Washington National Airport	\$2.25	\$1.85
Van Dorn Street	\$2.35	\$1.90
Crystal City	\$2.40	\$1.90
Pentagon City	\$2.55	\$2.05
Pentagon	\$2.70	\$2.05
Arlington Cemetery	\$3.10	\$2.05
Franconia-Springfield	\$3.30	\$2.05
All Other Stations	\$3.30-\$5.75	\$2.05-\$3.50

**Table 8: Metrorail Station-to-Station Fares from East Falls Church**

Heading to	One-Way Peak Period Fare	One-Way Off-Peak Period Fare
Ballston-MU	\$2.10	\$1.70
Virginia Square-GMU	\$2.10	\$1.70
West Falls Church-VT/UVA	\$2.10	\$1.70
Clarendon	\$2.25	\$1.80
Court House	\$2.40	\$1.90
Dunn Loring-Merrifield	\$2.45	\$1.95
Rosslyn	\$2.70	\$2.05
Arlington Cemetery	\$2.90	\$2.05
Foggy Bottom-GWU	\$3.10	\$2.05
Pentagon	\$3.20	\$2.05
All Other Stations	\$3.20-\$5.75	\$2.05-\$3.50

**Table 9: Metrorail Station-to-Station Fares from Braddock Road**

Heading to	One-Way Peak Period Fare	One-Way Off-Peak Period Fare
Eisenhower Avenue	\$2.10	\$1.70
Huntington	\$2.10	\$1.70
King St-Old Town	\$2.10	\$1.70
Ronald Reagan Washington National Airport	\$2.10	\$1.70
Crystal City	\$2.20	\$1.75
Pentagon City	\$2.35	\$1.90
Van Dorn Street	\$2.50	\$2.00
Pentagon	\$2.55	\$2.00
Arlington Cemetery	\$2.90	\$2.05
L'Enfant Plaza	\$3.10	\$2.05
All Other Stations	\$3.15-\$5.75	\$2.05-\$3.50

**Table 10: Metrorail Station-to-Station Fares from Van Dorn Street**

Heading to	One-Way Peak Period Fare	One-Way Off-Peak Period Fare
Franconia-Springfield	\$2.20	\$1.75
Eisenhower Avenue	\$2.35	\$1.90
King St-Old Town	\$2.35	\$1.90
Huntington	\$2.40	\$1.95
Braddock Road	\$2.50	\$2.00
Ronald Reagan Washington National Airport	\$3.25	\$2.05
Crystal City	\$3.30	\$2.05
Pentagon City	\$3.40	\$2.70
Pentagon	\$3.55	\$2.75
Arlington Cemetery	\$3.85	\$2.75
All Other Stations	\$4.05-\$5.75	\$2.75-\$3.50

### Potential Fare Structure for Route 7 Transit Service

The fare structure for LRT and BRT are assumed to be flat fare rate of \$1.60. Passengers would use all doors for boarding and alighting and use off-board fare collection through vending machines purchased either at stations or transit stores. Fare inspectors could be employed to verify fare payments and discourage fare evasion in this proof-of-payment system.

### Hours of Service

The Route 7 alignment alternatives assume 17-22 hours of service. A feeder bus network that supports a Route 7 alignment alternative will be determined during Phase 2 of this study.

### Route 7 Station and Park-and-Ride Facilities

Table 11 lists the station facilities and park-and-ride assumptions for transit services at 18 identified station locations along the Route 7 alignment alternatives. The next phase of the study will adjust parking assumptions at station locations.

**Table 11: Station and Park-and-Ride Facilities for Route 7 Transit Service**

Station Location	Park & Ride	Markets Served	Feeder Bus Service
Spring Hill Metrorail Station	No	Mixed-use urban center	– Fairfax Connector <sup>**</sup> : 424, 432, 574, 724 – Metrobus: 2T, 28T – Metrorail: Silver Line

Station Location	Park & Ride	Markets Served	Feeder Bus Service
Greensboro Metrorail Station	No	Mixed-use urban center	– Fairfax Connector <sup>**</sup> : 422 – Metrorail: Silver Line
Gallows Road and Route 7	Yes <sup>*</sup>	Mixed-use urban center	– Fairfax Connector: 401, 402 – Metrobus: 2T, 3T, 15K, 15L, 23A
Patterson Road and Route 7	Yes <sup>*</sup>	Local residential and business	– Metrobus: 28A, 28T
West Street and Route 7	Yes <sup>*</sup>	Local residential and business	– Metrobus: 3B, 28A
Washington Street (US 29) and Route 7	Yes <sup>*</sup>	Falls Church CBD	– Metrobus: 2A, 2B, 2C, 2G, 3A, 28A, 28X
East Falls Church Metrorail Station	Yes	Transfer to Metrorail	– ART: 52, 53A, 53B, 53W – Metrobus: 2A, 2B, 2C, 2G, 3A, 3B, 3E, 24T – Metrorail: Orange Line, Silver Line
Arlington Boulevard (US 50) and Route 7	Yes <sup>*</sup>	Seven Corners	– Metrobus: 1A, 1B, 1E, 1F, 4A, 4B, 4H, 28A, 28X
Glen Carlyn Road and Route 7	Yes <sup>*</sup>	Local residential and business	– Metrobus: 4A, 16B, 16E, 16J, 16P, 16X, 28A, 28X
Jefferson Street and Route 7	No	Bailey’s Crossroads/ Skyline	– Metrobus: 16H, 25A, 25B, 25E, 28G, 28X – Columbia Pike Streetcar
Park Center (4390 King Street)	Yes <sup>*</sup>	High-density residential; educational; federal employment	– Metrobus: 7B, 7C
Quaker Lane and Route 7	Yes <sup>*</sup>	Community businesses; Bradlee Shopping Center; mid-rise residential	– ART: 5, 6
King Street Metrorail Station	No	Transfer to Metrorail; Old Town Alexandria	– ART: 2, 5, 6, 7, 8, 10, King Street Trolley – Metrobus: 28A, 29K, 29N, REX
Braddock Road and Beauregard Street	Yes <sup>*</sup>	Northern Virginia Community College	– ART: 6 – Metrobus: 7A, 7B, 7F, 7Y, 25A, 25C, 25E – Columbia Pike Streetcar
Mark Center Drive and Beauregard Street	Yes <sup>*</sup>	BRAC – Mark Center	– ART: 1, 2 – Metrobus: 7A, 7F, 7M, 7W, 7X, 8W
Bradford Court and Sanger Avenue	Yes <sup>*</sup>	Mid-rise residential	N/A
Duke Street and Van Dorn Street/Landmark Mall	Yes <sup>*</sup>	Landmark Mall; Mid- to high-rise residential	– ART: 1, 5, 7, 8 – Metrobus: 7A, 25B, 29K, 29N

Station Location	Park & Ride	Markets Served	Feeder Bus Service
Van Dorn Street Metrorail Station	Yes	Transfer to Metrorail	– ART: 1, 5, 7, 8 – Fairfax Connector: 109, 231, 232, 321, 322 – Metrobus: 25B

Table 11 Notes

\* Assuming the presence of a park-and-ride facility with a high number of spaces at station location tested potential ridership that could be expected through demand modeling efforts

\*\* Reflects changes to Fairfax Connector service to serve future Silver Line Metrorail stations

## DEFINITION OF ALTERNATIVES

In Phase 1 of the Route 7 Study, two build alternatives were tested using the FTA-approved MDAAII model. The next phase of the study will assess the reduced set of alternatives defined in this section.

### No-Build Alternative

The no-build is the alternative against which other alternatives are compared. The alternative consists of planned and programmed transit and highway improvements for the Washington Metropolitan Area as identified in the MWCOG's 2012 constrained long-range plan (CLRP). Figure 2 shows the major transit improvements and Figure 3 shows the major highway improvements within the MWCOG region. Each figure lists projects specific to the state of Virginia.

### Future No-Build Feeder Bus Service

The future no-build feeder bus network reflects changes that were made in anticipation of the Silver Line extension, with Phase 1 to be operational by 2014. The following service changes are assumed:

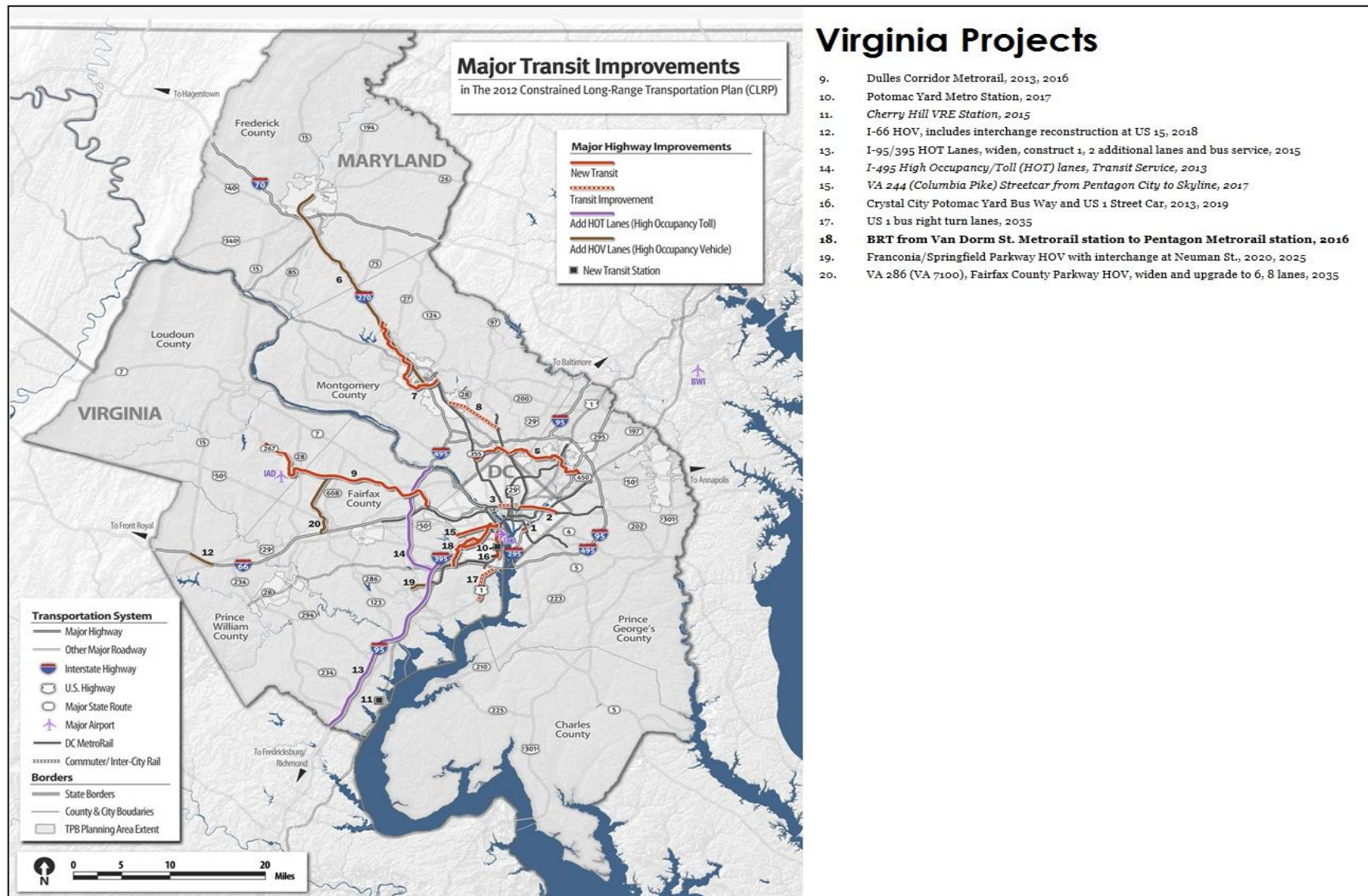
- Metrobus will modify 11 routes. Many will serve the Tysons Corner area. Restructuring of 3A-E, 3T, 15K, 15L for service to East Falls Church Metrorail station; eliminate the 24T and 28T<sup>3</sup>
- A circulator bus system will serve the Tysons area, including the new Silver Line stations in Tysons<sup>4</sup>
- Fairfax Connector will implement 12 new routes serving Tysons Corner, McLean, and Reston while eliminating six other routes.
- Many Fairfax Connector buses connecting Reston and Herndon to West Falls Church station will now serve the Wiehle Avenue

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<sup>3</sup>[http://www.wmata.com/about\\_metro/board\\_of\\_directors/board\\_docs/011013\\_3BSilverLineBusSvc.pdf](http://www.wmata.com/about_metro/board_of_directors/board_docs/011013_3BSilverLineBusSvc.pdf) (accessed on October 22, 2013)

<sup>4</sup><http://www.fairfaxcounty.gov/connector/routes/silverline/> (accessed on October 22, 2013)

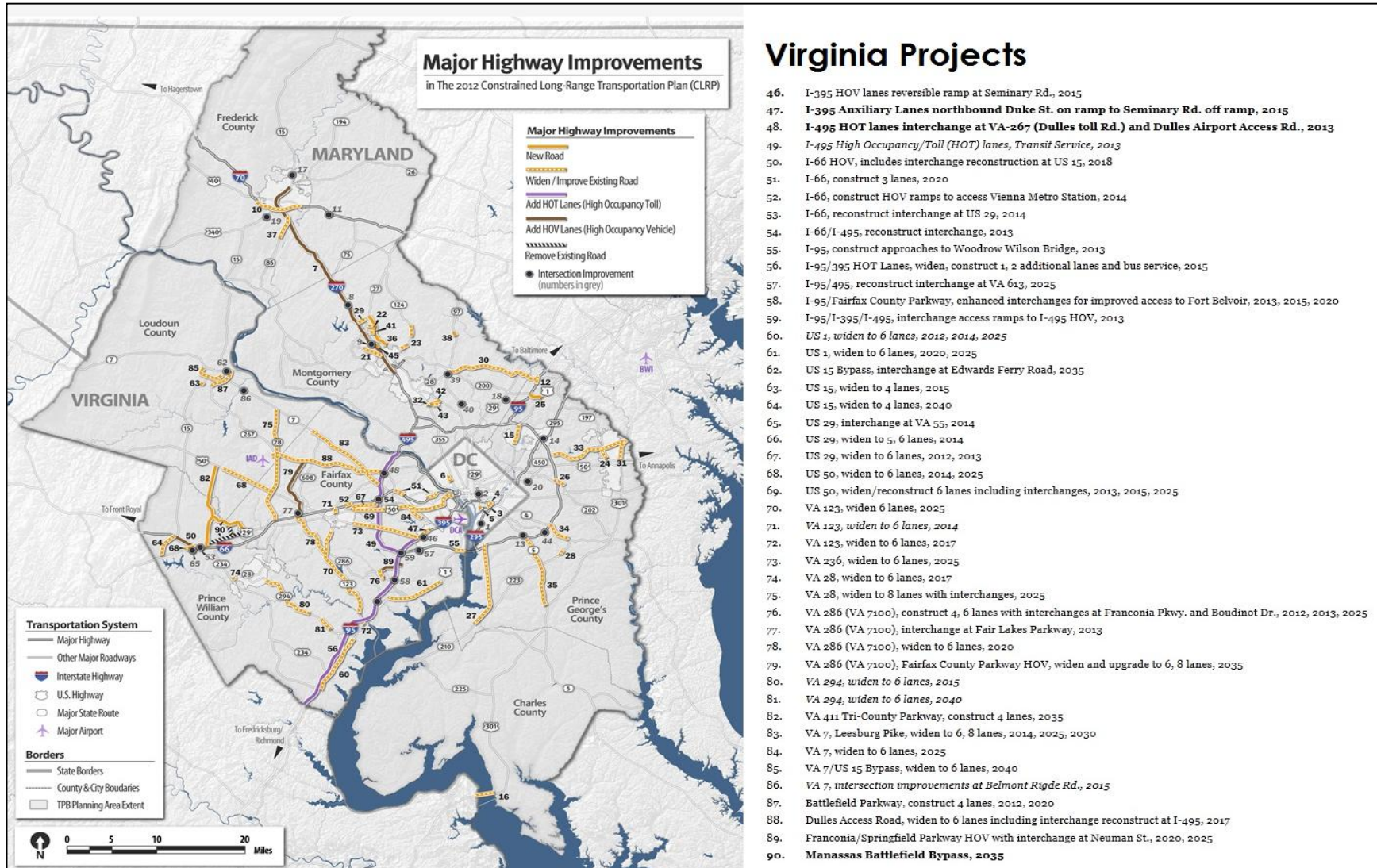
Figure 2: Planned and Programmed Transit Improvements for No-Build Alternative



Source: MWCOC 2012 Constrained Long-Range Transportation Plan



Figure 3: Planned and Programmed Highway Improvements for No-Build Alternative



Source: MWCOG 2012 Constrained Long-Range Transportation Plan

## **Alternative 1-A-B: Bus Rapid Transit from Tysons to King Street Metrorail Station via East Falls Church**

Alternative 1-A-B is a Bus Rapid Transit (BRT) alternative from the future Spring Hill Metrorail Station in Tysons Corner to the King Street-Old Town Metrorail Station in Alexandria. Alternative 1-A-B is shown in Figure 4 and includes a direct connection with the East Falls Church Metrorail station.

### **Route**

The route for Alternative 1-A-B would originate in the north at the Spring Hill Metrorail station on the Silver Line and Route 7, south toward North Washington Street. At North Washington Street, the route would turn eastward and follow the roadway toward Fairfax Drive where would turn south along Fairfax Drive and follow the roadway over I-66 and the Orange Line Metrorail right-of-way to join Washington Boulevard. From Washington Boulevard, the route would turn south onto North Sycamore Street where it would connect directly with the East Falls Church Metrorail station. The route would continue along North Sycamore Street before turning west onto Wilson Boulevard. The route would follow the roadway for less than one mile before re-joining the Route 7 Corridor, turning south to follow the roadway, continuing onto King Street to its terminus at the King Street Metrorail station in Alexandria.

### **End-to-end Transit Travel Time**

The estimated end-to-end transit travel time is 68.5 minutes, with an average speed of 12.3 mph. This would provide a travel time savings of approximately five minutes when compared to existing Metrobus 28A, although they are not directly comparable because the 28A does not operate as far north as the Spring Hill Metrorail station. The individual travel times between stations are shown in Figure 4. Intersection priority treatments that could provide additional travel time savings at key intersections will be evaluated in further detail during Phase 2 of the Route 7 study.

Figure 4: Alternative 1-A-B: Bus Rapid Transit

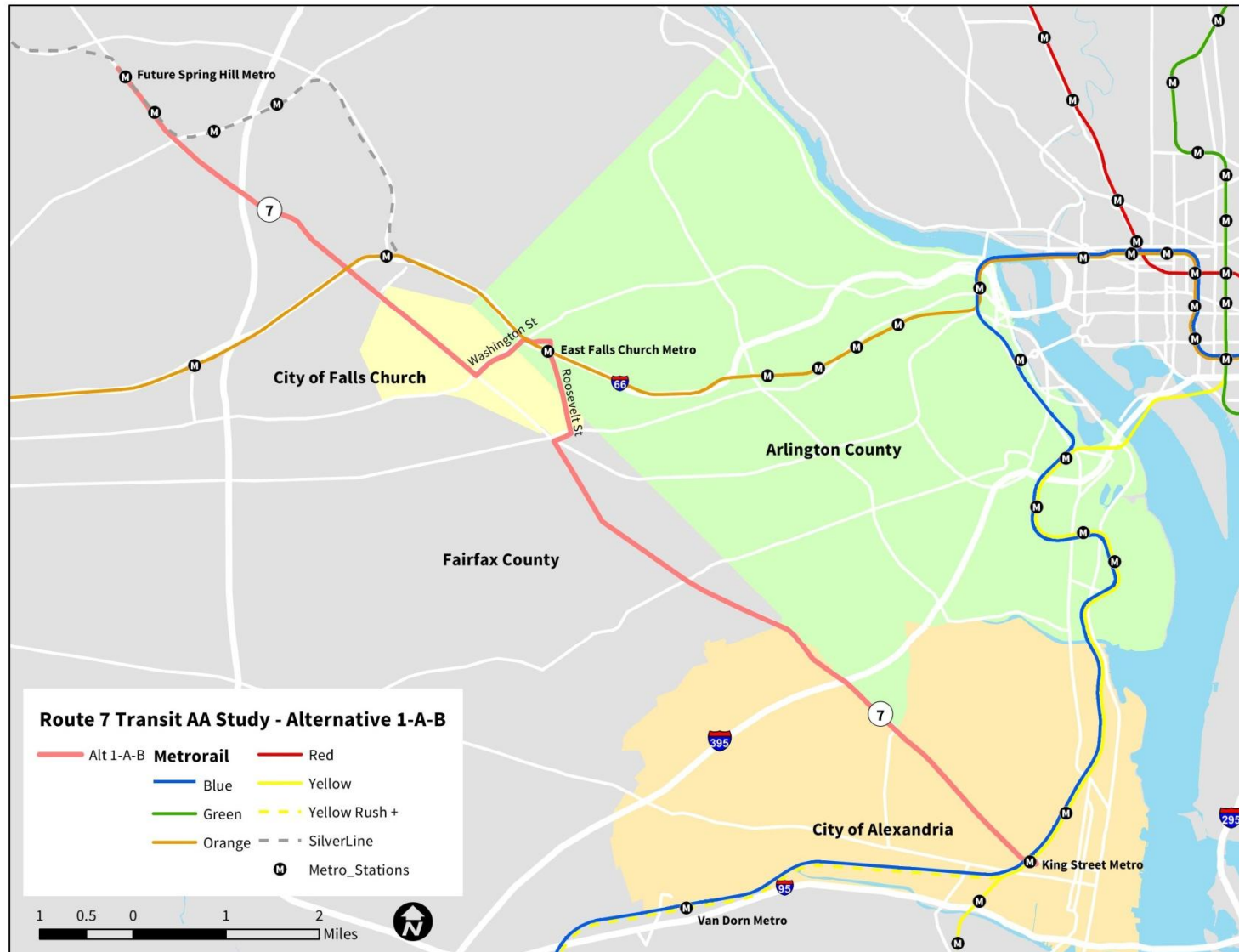


Table 12: Alternative 1-A-B Transit Travel Time

Roadway	From	To	Station-to-Station Time (minutes)	Distance (miles)
Route 7	Spring Hill Metrorail Station	Greensboro Metrorail Station	2.4	0.7
Route 7	Greensboro Metrorail Station	Gallows Road and Route 7	3.8	0.6
Route 7	Gallows Road and Route 7	Patterson Road and Route 7	5.7	1.3
Route 7	Patterson Road and Route 7	West Street and Route 7	7.3	1.5
Route 7	West Street and Route 7	Washington Street (US 29) and Route 7	5.8	0.9
Washington Street / Fairfax Drive	Washington Street (US 29) and Route 7	East Falls Church Metrorail Station	6.0	1.0
N Sycamore St / Roosevelt Blvd / Wilson Blvd	East Falls Church Metrorail Station	Arlington Boulevard (US 50) and Route 7	6.9	1.2
Route 7	Arlington Boulevard (US 50) and Route 7	Glen Carlyn Road and Route 7	4.8	1.4
Route 7	Glen Carlyn Road and Route 7	Jefferson Street and Route 7	6.6	1.3
Route 7	Jefferson Street and Route 7	Park Center (4390 King Street)	6.6	1.0
Route 7	Park Center (4390 King Street)	Quaker Lane and Route 7	5.5	1.3
Route 7	Quaker Lane and Route 7	King Street Metrorail Station	7.0	1.9
TOTAL UNDER NORMAL CONDITIONS			68.5 minutes	14.1 miles
OPERATING SPEED (mph)			12.3 mph	

### Service Characteristics

The service characteristics for Alternative 1-A-B are shown in Table 13. It is assumed that this alternative would include all of the typical characteristics associated with BRT systems in the United States today. BRT has been defined by the FTA as a “rapid mode of transportation that can provide the quality of rail transit and the flexibility of buses.” TCRP Report 90 expands this definition to “a rubber-tired form of rapid transit that combines stations, vehicles, services, running ways, and ITS elements into an integrated system with a strong image and identity.” In brief, BRT is an integrated system of facilities, equipment, services, and amenities that improves the speed, reliability, and identity of bus transit.<sup>5</sup>

<sup>5</sup> TCRP Report 118, Bus Rapid Transit Practitioner's Guide, page S-1.

The weekday peak and off-peak frequency for this phase of screening (pending analysis of ridership volumes) is recommended to be 10 minutes peak and 15 minutes off-peak. A total of 22 weekday service hours are recommended, which would allow the BRT service to meet passengers from the last Metrorail trains at the King Street-Old Town, East Falls Church, or Spring Hill stations. During Phase 2, the detailed definition of alternatives would explore the potential for using local bus to provide late night or “owl” service along Alternative 1-A-B.

### Mainline Fleet Requirement

An estimated cycle time of 151 minutes is estimated for Alternative 1-A-B. This estimate assumes a 68.5 minute one-way travel time and a 10% recovery/layover time for the line (or 14 minutes for one cycle). As a result, a requirement of 16 peak vehicles is required to maintain a 10 minute frequency on the line. A total fleet of 20 vehicles is estimated assuming a 20% spare ratio.

**Table 13: Alternative 1-A-B Service Characteristics**

	Peak Frequency	Off-Peak Frequency	Daily service hours	One-way travel time	Cycle time	Peak Trains	Total Fleet Size
Alternative 1-A-B: BRT from Tysons to King Street Metrorail station via East Falls Church Metrorail station	10 min.	15 min.	22 hours	68.5 min.	151 min.	16	20

### Local/Feeder Bus Strategy

Several bus networks would expect to be adjusted with the implementation of Alternative 1-A-B.

- WMATA Metrobus:** WMATA operates routes throughout the length of the Alternative 1-A-B alignment, including the mainline 28A. The mainline route is recommended to maintain existing service and to provide supplemental local bus service along the corridor at a lower service frequency to provide service to bus stops located between BRT stations. In addition, minor Metrobus routes may be recommended to be extended and/or increase frequency in order to meet BRT service at stations along the corridor. WMATA service along route: 1B, 1Z, 2T, 3 Line, 4 Line, 7 Line, 16 Line, 25 Line, and 28 Line.
- Fairfax Connector:** Local bus routes in the Tysons area are operated by Fairfax Connector. Since Alternative 1-A-B will serve two Silver Line stations, it is likely that Fairfax Connector routes will be adjusted to feed BRT service. Fairfax Connector service along route: 401, 402, 427, 493, 494, 495, and 574.
- Arlington Transit (ART):** Arlington Transit serves the Alternative 1-A-B route at the East Falls Church Metrorail station and along Columbia Pike. Routes at the East Falls Church station would naturally connect to Alternative 1-A-B, but there may be a need for increased frequency. ART routes along Columbia Pike may be extended to meet

Alternative 1-A-B at the proposed Jefferson Street station. ART service along routes: 41, 45, 52, 53, and 75.

- **Alexandria Transit (DASH):** DASH routes are located in the southern end of Alternative 1-A-B, at Duke Street and the King Street-Old Town Metrorail station. No realignments are necessary, but it is possible that service frequencies on DASH routes in this area could increase in order to better deliver riders to the BRT service. DASH service along routes: 1, 2, 5, 6, 7, 8, 10.

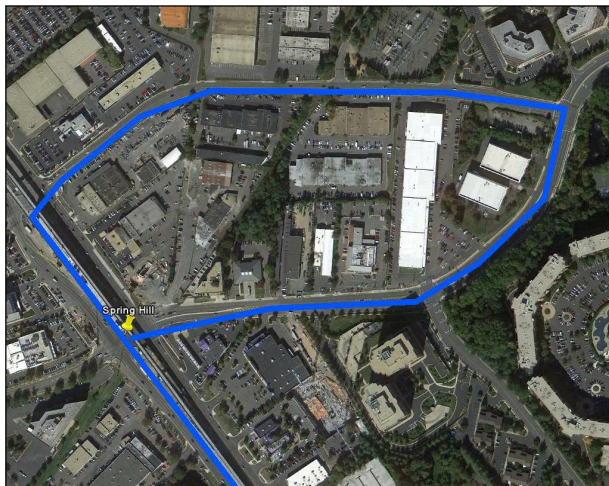
## Turnaround Locations

Turnaround locations for BRT vehicles would be necessary at both the northern and southern ends of the Alternative 1-A-B route.

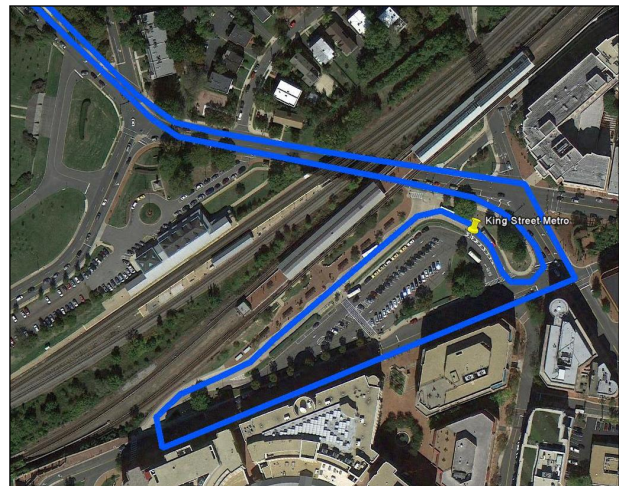
At the northern end, BRT vehicles could use an on-street turnaround alignment consisting of Tyco Road and Spring Hill Road in order to return to Route 7 for the southbound trip. A bus bay or off-street layover location for the BRT vehicles would need to be secured at this end of the alignment. At the southern end, BRT vehicles could use the turnaround loop in front of the King Street Metrorail station.

Figure shows these turnaround loops. Autoturn bus templates would be used to determine whether the selected vehicle can make the movements diagrammed.

**Figure 5: Proposed Station Turnaround Loops for Alternative 1-A-B**



(a) At Spring Hill Metrorail Station



(b) At King Street Metrorail Station

## Operations and Maintenance Facility

The O&M facility for Alternative 1-A-B, with room for at least 20 BRT vehicles, is expected to be similar in size and elements provided to that identified for Alternative 3-A-L. There are few locations along Route 7 that are large enough and appropriately zoned to accommodate such a

facility. It is possible that instead, the Alternative 1-A-B O&M facility could be co-located with another bus garage in Northern Virginia, depending on the proposed operator of the service, the location of other facilities, the ability to accommodate the selected BRT vehicle, whether the facility has sufficient capacity to accept the 20 additional vehicles, and an operating agreement that allows for this co-use of the facility. This decision would be made at a later point in the Route 7 Study.

### Alternative 1-B-TSM: Transit TSM

The TSM alternative represents the low-cost alternative for enhancing mobility on the Route 7 corridor. The alternative is shown in Figure 6 and proposes a number of enhancements to the existing roadway and transit network.

The TSM alternative would enhance existing bus transit service along Route 7 by improving the 28A Metrobus from all-day, 30-minute headways to all-day, 15-minute headways. The 28X Metrobus would continue to operate as it does today. In addition, a bus route would be overlaid on existing service that would feature transit priority elements to improve schedule adherence, service reliability, and reduced travel time. The proposed TSM route would provide direct transit service between the primary destinations along Route 7 and increase access to the Metrorail system along Route 7 between Tysons and King Street Metrorail station.

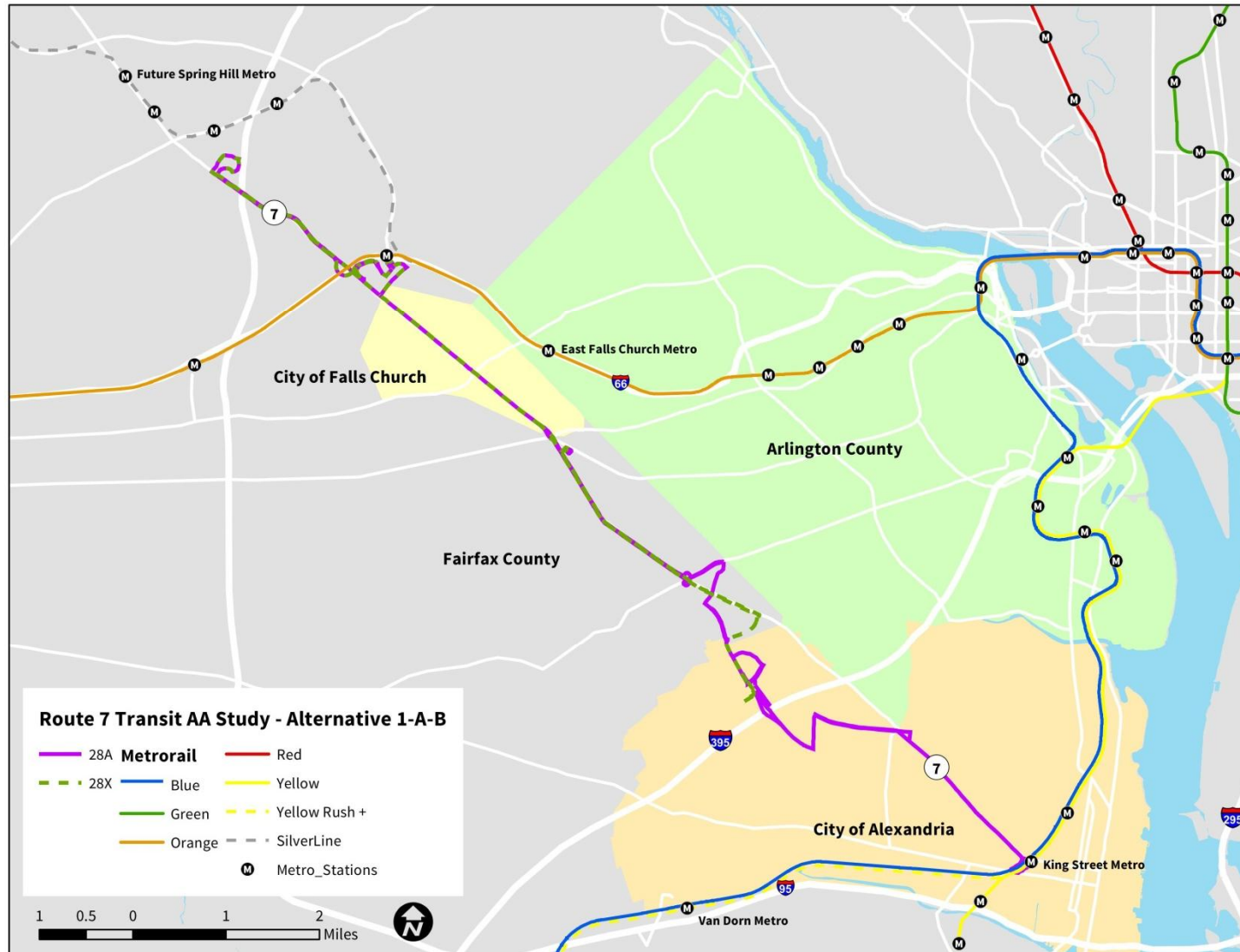
The service would operate at 10-minute peak and 15-minutes off-peak headways on weekdays. The service would operate 15-minute headways on Saturday and Sunday. The span of service for the northern route would mirror that of the 28A’s service span: 5AM to 1AM on weekdays and 6AM to midnight on weekends. The span of service for the southern route would be from 5AM to midnight on weekdays and from 6AM to 11PM on weekends.

**Table 14: Alternative 1-B-TSM Service Characteristics**

	Peak Frequency	Off-Peak Frequency	Daily Service Hours
Alternative 1-B-TSM	10 minutes	15 Minutes	20 hours – weekdays 18 hours – weekends



Figure 6: Alternative 1-B-TSM



## **Alternative 3-A-B: Bus Rapid Transit from Tysons to Van Dorn Metrorail Station via East Falls Church Metrorail Station**

Alternative 3-A-B is a Bus Rapid Transit (BRT) alternative from the Spring Hill Metrorail station in Tysons to the Van Dorn Street Metrorail Station in Alexandria. Alternative 3-A-B is shown in Figure 7 and includes a direct connection with the East Falls Church Metrorail station.

### **Route**

The route for Alternative 3-A-B would originate in the north at the Spring Hill Metrorail station and follows Route 7 south toward North Washington Street. At North Washington Street, the route would turn eastward and follow the roadway toward Fairfax Drive where would turn south along Fairfax Drive and follow the roadway over I-66 and the Orange Line Metrorail right-of-way to join Washington Boulevard. From Washington Boulevard, the route would turn south onto North Sycamore Street where it would connect directly with the East Falls Church Metrorail station. The route would continue along North Sycamore Street before turning west onto Wilson Boulevard. The route would follow the roadway for less than one mile before re-joining the Route 7 corridor, turning south to follow the roadway.

The route would continue to follow Route 7, continuing onto King Street. As it approaches North Beauregard Street, the route would turn west and follows Beauregard Street before turning south onto Sanger Avenue. The route would follow Sanger Avenue and crosses I-395/Henry G Shirley Highway before turning west onto North Van Dorn Street. At Eisenhower Avenue, the route would turn east to follow Eisenhower Avenue to its terminus at the Van Dorn Street Metrorail station in Alexandria.

### **End to end transit travel time**

The estimated end to end transit travel time is 76.2 minutes, with an average speed of 11.6 mph. This would provide a travel time savings of approximately 14 minutes when compared to existing local bus service (combination of Metrobus 28A and DASH AT5). The individual travel times between stations are shown in Figure 7.. Intersection priority treatments that could provide additional travel time savings at key intersections will be evaluated in further detail during Phase 2 of the Route 7 study.

Figure 7: Alternative 3-A-B: Bus Rapid Transit

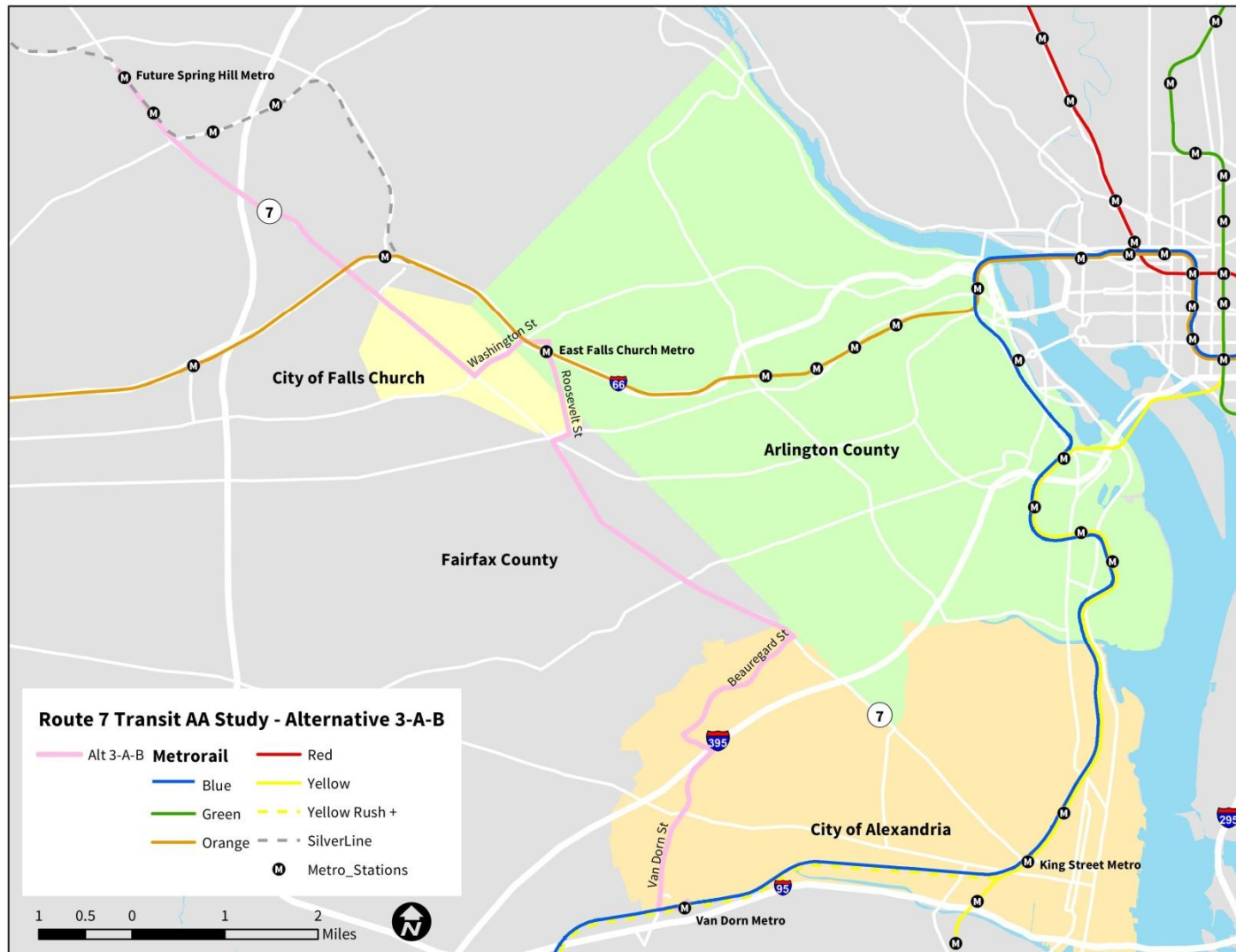


Table 15: Alternative 3-A-B Transit Travel Time

Roadway	From	To	Station-to-Station Time (minutes)	Distance (miles)
Route 7	Spring Hill Metrorail Station	Greensboro Metrorail Station	2.4	0.7
Route 7	Greensboro Metrorail Station	Gallows Road and Route 7	3.8	0.6
Route 7	Gallows Road and Route 7	Patterson Road and Route 7	5.7	1.3
Route 7	Patterson Road and Route 7	West Street and Route 7	7.3	1.5
Route 7	West Street and Route 7	Washington Street (US 29) and Route 7	5.8	0.9
Washington Street / Fairfax Drive	Washington Street (US 29) and Route 7	East Falls Church Metrorail Station	6.0	1.0
N Sycamore St / Roosevelt Blvd / Wilson Blvd	East Falls Church Metrorail Station	Arlington Boulevard (US 50) and Route 7	6.9	1.2
Route 7	Arlington Boulevard (US 50) and Route 7	Glen Carlyn Road and Route 7	4.8	1.4
Route 7	Glen Carlyn Road and Route 7	Jefferson Street and Route 7	6.6	1.3
Route 7	Jefferson Street and Route 7	Braddock Road and Bearegard Street	6.1	0.9
Bearegard Street	Braddock Road and Bearegard Street	Mark Center Drive and Bearegard Street	3.3	0.6
Bearegard Street	Mark Center Drive and Bearegard Street	Bradford Court and Sanger Avenue	4.7	1.0
Sanger Avenue	Bradford Court and Sanger Avenue	Duke Street and Van Dorn Street/Landmark Mall	5.1	0.9
Van Dorn Street	Duke Street and Van Dorn Street/Landmark Mall	Van Dorn Street Metrorail Station	7.6	1.4
TOTAL UNDER NORMAL CONDITIONS			<b>76.2 minutes</b>	<b>14.7 miles</b>
OPERATING SPEED (mph)			<b>11.6 mph</b>	

### Service Characteristics

The service characteristics for Alternative 3-A-B are shown in Table 16. It is assumed that this alternative would include all of the typical characteristics associated with BRT systems in the United States today. The weekday peak and off-peak frequency for this phase of screening is recommended to be 10 minutes peak and 15 minutes off-peak. A total of 22 weekday service

hours are recommended, which would allow the light rail service to meet passengers using the last Metrorail trains at the Van Dorn or Spring Hill stations. During Phase 2, the detailed definition of alternatives would explore the potential for using local bus to provide late night or “owl” service along Alternative 3-A-B.

**Mainline Fleet Requirement**

An estimated cycle time of 168 minutes is estimated for Alternative 3-A-B. This estimate assumes a 76.2 minute one-way travel time and a 10% recovery/layover time for the line (or 15 minutes for one cycle). As a result, a requirement of 17 peak vehicles is required in order to maintain a 10 minute frequency on the line. The total fleet is estimated at 21 vehicles assuming a 20% spare ratio.

**Table 16: Alternative 3-A-B Service Characteristics**

	Peak Frequency	Off-Peak Frequency	Daily service hours	One-way travel time	Cycle time	Peak Trains	Total Fleet Size
Alternative 3-A-B: BRT from Tysons to Van Dorn Street Metrorail station via East Falls Church Metrorail station	10 min.	15 min.	22 hours	76.2 min.	168 min.	17	21

**Local/Feeder Bus Strategy**

Several bus networks are expected to be adjusted with the implementation of Alternative 3-A-B.

- **WMATA Metrobus:** WMATA operates routes throughout the length of the Alternative 3-A-B alignment, including the mainline 28A. The mainline route is recommended to maintain existing service to provide supplemental local bus service along the corridor at a lower service frequency to provide service to bus stops located between BRT stations. In addition, minor Metrobus routes may be recommended to be extended or increase frequency in order to meet BRT service at stations along the corridor. WMATA service along route: 1B, 1Z, 2T, 3 Line, 4 Line, 7 Line, 16 Line, 25 Line, and 28 Line.
- **Fairfax Connector:** Local bus routes in the Tysons Corner area are operated by Fairfax Connector. Since Alternative 3-A-B will serve two Silver Line stations, it is likely that the routing of Fairfax Connector service will be adjusted to feed Alternative 3-A-B BRT service. Fairfax Connector service along route: 401, 402, 427, 493, 494, 495, and 574.
- **Arlington Transit (ART):** Arlington Transit serves the Alternative 3-A-B service at the East Falls Church Metrorail station and along Columbia Pike. Routes at the East Falls Church station would naturally connect to Alternative 3-A-B, but there may be a need for increased frequency. ART routes along Columbia Pike may be extended to meet Alternative 3-A-B at the proposed Jefferson Street station. ART service along route: 41, 45, 52, 53, and 75.

- **Alexandria Transit (DASH):** DASH routes are located in the southern end of Alternative 3-A-B, at Duke Street and the Van Dorn Metrorail station. No reroutings are necessary, but it is possible that service frequencies on DASH routes in this area could increase in order to better deliver riders to the BRT service.

### Turnaround Locations

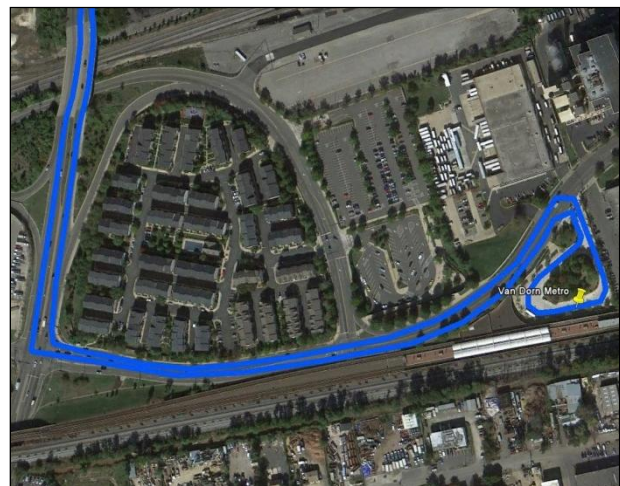
Turnaround locations for BRT vehicles will be necessary at both the northern and southern ends of the Alternative 3-A-B route. At the northern end, BRT vehicles could use an on-street turnaround alignment consisting of Tyco Road and Spring Hill Road in order to return to Route 7 for the southbound trip. A bus bay or off-street layover location for the BRT vehicles would need to be secured at this end of the route. At the southern end, BRT vehicles could use the turnaround loop in front of the Van Dorn Metrorail station.

Figure shows this potential turnaround loops. Autoturn bus templates will be used to determine whether the selected vehicle can make the movements diagrammed.

**Figure 8: Proposed Station Turnaround Loops for Alternative 3-A-B**



(a) At Spring Hill Metrorail Station



(b) At Van Dorn Street Metrorail Station

### Operations and Maintenance Facility

The O&M facility for Alternative 3-A-B, with room for at least 21 BRT vehicles, is expected to be similar in size and elements provided to that identified for Alternative 3-A-L. There are few locations along Route 7 that are large enough and appropriately zoned to accommodate such a facility. It is possible that instead, the Alternative 3-A-B O&M facility could be co-located with another bus garage in Northern Virginia reflecting the flexibility of wheeled transit.

Recommendations on the final location would be dependent on the proposed operator of the service, the location of other available facilities, the ability to accommodate the selected BRT vehicle in the service location, whether the facility has sufficient capacity to accept the 20

additional vehicles required for this service, and whether an operating agreement that allows for this co-use of the facility may need to be negotiated. This decision will be made at a later point in the study.

### **Potential for Shared O&M Facilities**

Land within the Route 7 study is largely built out and opportunities primarily existing for redeveloping sites. This, combined with existing and planned O&M facilities for other transit services close to the study area leave few opportunities for an additional stand-alone O&M facility. Therefore, refined analyses under Phase 2 of this study should explore opportunities for shared O&M facilities close to alternative alignments.

## **Alternative 3-A-L: Light Rail Transit from Tysons to Van Dorn Street Metrorail Station via East Falls Church Metrorail Station**

Alternative 3-A-L would be a light rail alternative operating between the future Spring Hill Metrorail Station in Tysons on the Silver Line and the Van Dorn Street Metrorail Station on the Blue Line in Alexandria. Alternative 3-A-L is shown in Figure 9 and would include a direct connection with the East Falls Church Metrorail station on the Orange and Silver Lines.

### **Routing**

The route for Alternative 3-A-L would originate in the north at the Spring Hill Metrorail station and follow Route 7 south toward North Washington Street. At North Washington Street, the route would head eastward and follow the roadway toward Fairfax Drive where would turn south along Fairfax Drive. It would then follow the roadway over I-66 and the Orange Line Metrorail right-of-way to join Washington Boulevard. From Washington Boulevard, the route would turn south onto North Sycamore Street where it would connect directly with the East Falls Church Metrorail station. The route would then continue along North Sycamore Street before turning west onto Wilson Boulevard. The route would follow the roadway for less than one mile before re-joining Route 7, turning south to follow the roadway.

The route would continue to follow Route 7, continuing onto King Street. As it approaches North Beauregard Street, the route would turn west and follow Beauregard Street before turning south onto Sanger Avenue. The route would follow Sanger Avenue and cross I-395/Henry G Shirley Highway before turning west onto North Van Dorn Street. At Eisenhower Avenue, the route would turn east to follow Eisenhower Avenue and then arrive at its terminus at the Van Dorn Street Metrorail Station.

### **End-to-end Transit Travel Time**

The estimated end-to-end transit travel time is 70 minutes, with an average speed of 12.6 mph. This would provide a travel time savings of approximately 20 minutes when compared to existing local bus service (combination of Metrobus 28A and DASH AT5). The individual travel times between stations are shown in Figure 9. . Intersection priority treatments that could provide additional travel time savings at key intersections will be evaluated in further detail during Phase 2 of the Route 7 study.



Figure 9: Alternative 3-A-L: Light Rail Transit

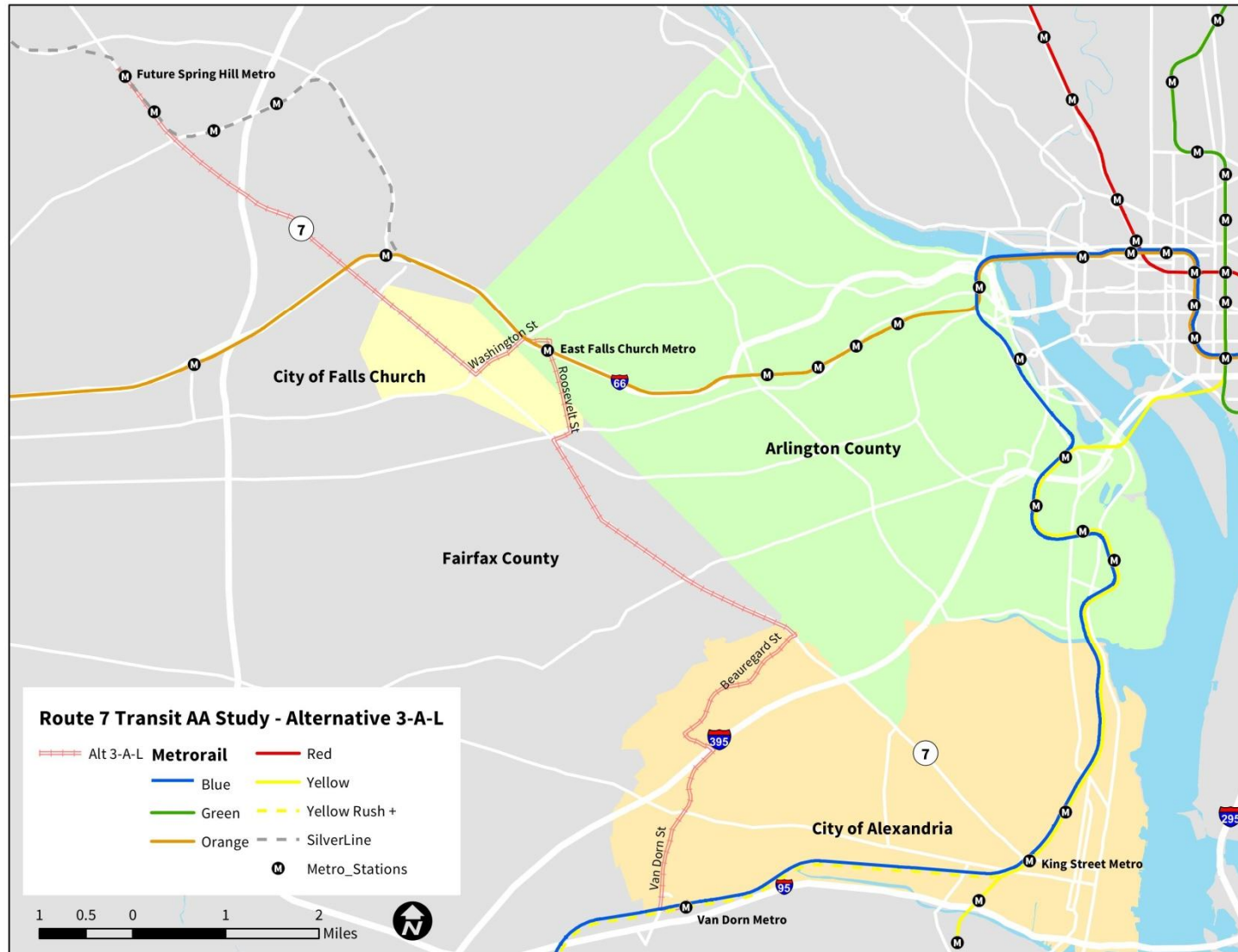


Table 17: Alternative 3-A-L Transit Travel Time

Roadway	From	To	Station-to-Station Time (minutes)	Distance (miles)
Route 7	Spring Hill Metrorail Station	Greensboro Metrorail Station	2.1	0.7
Route 7	Greensboro Metrorail Station	Gallows Road and Route 7	3.4	0.6
Route 7	Gallows Road and Route 7	Patterson Road and Route 7	5.3	1.3
Route 7	Patterson Road and Route 7	West Street and Route 7	6.7	1.5
Route 7	West Street and Route 7	Washington Street (US 29) and Route 7	5.8	0.9
Washington Street / Fairfax Drive	Washington Street (US 29) and Route 7	East Falls Church Metrorail Station	5.5	1.0
N Sycamore St / Roosevelt Blvd / Wilson Blvd	East Falls Church Metrorail Station	Arlington Boulevard (US 50) and Route 7	6.3	1.2
Route 7	Arlington Boulevard (US 50) and Route 7	Glen Carlyn Road and Route 7	4.4	1.4
Route 7	Glen Carlyn Road and Route 7	Jefferson Street and Route 7	6.0	1.3
Route 7	Jefferson Street and Route 7	Braddock Road and Bearegard Street	5.5	0.9
Bearegard Street	Braddock Road and Bearegard Street	Mark Center Drive and Bearegard Street	3.0	0.6
Bearegard Street	Mark Center Drive and Bearegard Street	Bradford Court and Sanger Avenue	4.3	1.0
Sanger Avenue	Bradford Court and Sanger Avenue	Duke Street and Van Dorn Street/Landmark Mall	4.6	0.9
Van Dorn Street	Duke Street and Van Dorn Street/Landmark Mall	Van Dorn Street Metrorail Station	7.0	1.4
<b>TOTAL UNDER NORMAL CONDITIONS</b>			<b>70.0 minutes</b>	<b>14.7 miles</b>
<b>OPERATING SPEED (mph)</b>			<b>12.6 mph</b>	

### Service Characteristics

The service characteristics for Alternative 3-A-L are shown in Table 18. The weekday peak and off-peak frequency for this phase of screening is recommended to be 10 minutes peak and 15 minutes off-peak. A total of 22 weekday service hours are recommended, which would allow the light rail service to meet passengers using the last Metrorail trains at the Van Dorn Street, East Falls Church, or Spring Hill stations. During Phase 2, the detailed definition of alternatives would

explore the potential for using local bus to provide late night or “owl” service along Alternative 3-A-L.

**Mainline Fleet Requirement**

An estimated cycle time of 154 minutes is estimated for Alternative 3-A-L. This estimate assumes a 70.0 minute one-way travel time and a 10% recovery/layover time for the line (or 14 minutes for one cycle). As a result, a requirement of 16 peak trains is required to maintain a 10-minute frequency on the line. A total fleet of 20 vehicles is also estimated. The total fleet size was calculated based on an assumed 20% spare ratio and one light rail vehicle per train. If either of these assumptions changes in the future, then the total fleet size would need to be recalculated.

**Table 18: Alternative 3-A-L Service Characteristics and Total Fleet Size**

	Peak Frequency	Off-Peak Frequency	Daily service hours	One-way travel time	Cycle time	Peak Trains	Total Fleet Size
Alternative 3-A-L: LRT from Tysons to Van Dorn Street Metrorail station via East Falls Church Metrorail station	10 min.	15 min.	22 hours	70 min.	154 min.	16	20

**Local/Feeder Bus Strategy**

Several bus networks are expected to be adjusted with the implementation of Alternative 3-A-L.

- **WMATA Metrobus:** WMATA operates routes throughout the length of the Alternative 3-A-L route, including the mainline 28A. The mainline route is recommended to reduce service since it will be replaced with the light rail service. Instead, the 28A would provide supplemental local bus service along the corridor at a lower service frequency to provide service to bus stops located between rail stations. In addition, minor Metrobus routes may be recommended to be extended or increase frequency in order to meet light rail service at stations along the corridor. WMATA routes along route: 1B, 1Z, 2T, 3 Line, 4 Line, 7 Line, 16 Line, 25 Line, and 28 Line.
- **Fairfax Connector:** Local bus routes in the Tysons Corner area are operated by Fairfax Connector. Since Alternative 3-A-L would serve two Silver Line stations, it is likely that the alignments of Fairfax Connector routes would be adjusted to feed Alternative 3-A-L light rail service. Fairfax Connector routes along route: 401, 402, 427, 493, 494, 495, and 574.
- **Arlington Transit (ART):** Arlington Transit serves the Alternative 3-A-L route at the East Falls Church Metrorail station and along Columbia Pike. Routes at the East Falls Church station would naturally connect to Alternative 3-A-L, but there may be a need for increased frequency. ART routes along Columbia Pike may be extended to meet

Alternative 3-A-L at the proposed Jefferson Street station. ART routes along route: 41, 45, 52, 53, and 75.

- **Alexandria Transit (DASH):** DASH routes are located in the southern end of Alternative 3-A-L, at Duke Street and the Van Dom Metrorail station. No re-routings would be necessary, but it is possible that service frequencies on DASH routes in this area could increase in order to better deliver riders to the light rail service. DASH routes along the following routes: 1, 2, 5, 6, 7, 8, 10.

### **Turnaround Locations**

This light rail alternative would not require a turnaround loop. The driver of each train would switch ends at the terminal in order to operate the train in the opposite direction. If the light rail vehicle selected has only a single cab, then this assumption would need to be revisited.

### **Operations and Maintenance Facility**

The operations and maintenance (O&M) facility for Alternative 3-A-L, with storage and repair facilities room for at least 20 light rail vehicles, is expected to be 82,800 square feet. This stand-alone facility would include the following elements:

- Four (4) repair bays (two pits, one lift, and one flat bay)
- One (1) tire/brake bay
- One (1) body/prep bay
- One (1) paint bay
- Support shops (tire storage, tire shop, common work/brake shop)
- Support areas (lube compressor room, portable equipment storage, maintenance offices/lockers, restroom, break room, custodial)
- Parts storage
- Administration/operations offices (including drivers' areas)
- Separate fuel, bus wash and chassis wash
- Agency vehicle parking (includes site circulation)
- Employee parking (includes site circulation)

There are few locations along Route 7 that are large enough and appropriately zoned to accommodate such a facility. It is possible that instead of developing a new O&M facility, the Alternative 3-A-L O&M facility could be co-located with another light rail service (or even shared with a bus garage) in Northern Virginia, depending on the location of the other facility, the type of LRT vehicle selected, and an operating agreement that allows for this co-use of the facility. This decision would be made in a subsequent study.

## **Alternative 3-B-B: Bus Rapid Transit from Tysons to Van Dorn Street Metrorail Station**

Alternative 3-B-B is a Bus Rapid Transit (BRT) alternative from the Spring Hill Metrorail station in Tysons to the Van Dorn Street Metrorail station in Alexandria, shown in Figure 10.

### **Route**

The route would originate in the north at the Spring Hill Metrorail station and follows Route 7, continuing along Route 7 toward North Beauregard Street.

At North Beauregard Street, the route would turn west and follow Beauregard Street before turning south onto Sanger Avenue. The route would follow Sanger Avenue and cross I-395/Henry G Shirley Highway before turning west onto North Van Dorn Street. At Eisenhower Avenue, the alignment would turn east to follow Eisenhower Avenue to its terminus at the Van Dorn Street Metrorail Station in Alexandria.

### **End-to-end Transit Travel Time**

The estimated end to end transit travel time is 67.2 minutes, with an average speed of 12.2 mph. This would provide a travel time savings of approximately 23 minutes when compared to existing local bus service (combination of Metrobus 28A and DASH AT5). The individual travel times between stations are shown in Table 19. Intersection priority treatments that could provide additional travel time savings at key intersections will be evaluated in further detail during Phase 2 of the Route 7 study.

Figure 10: Alternative 3-B-B: Bus Rapid Transit

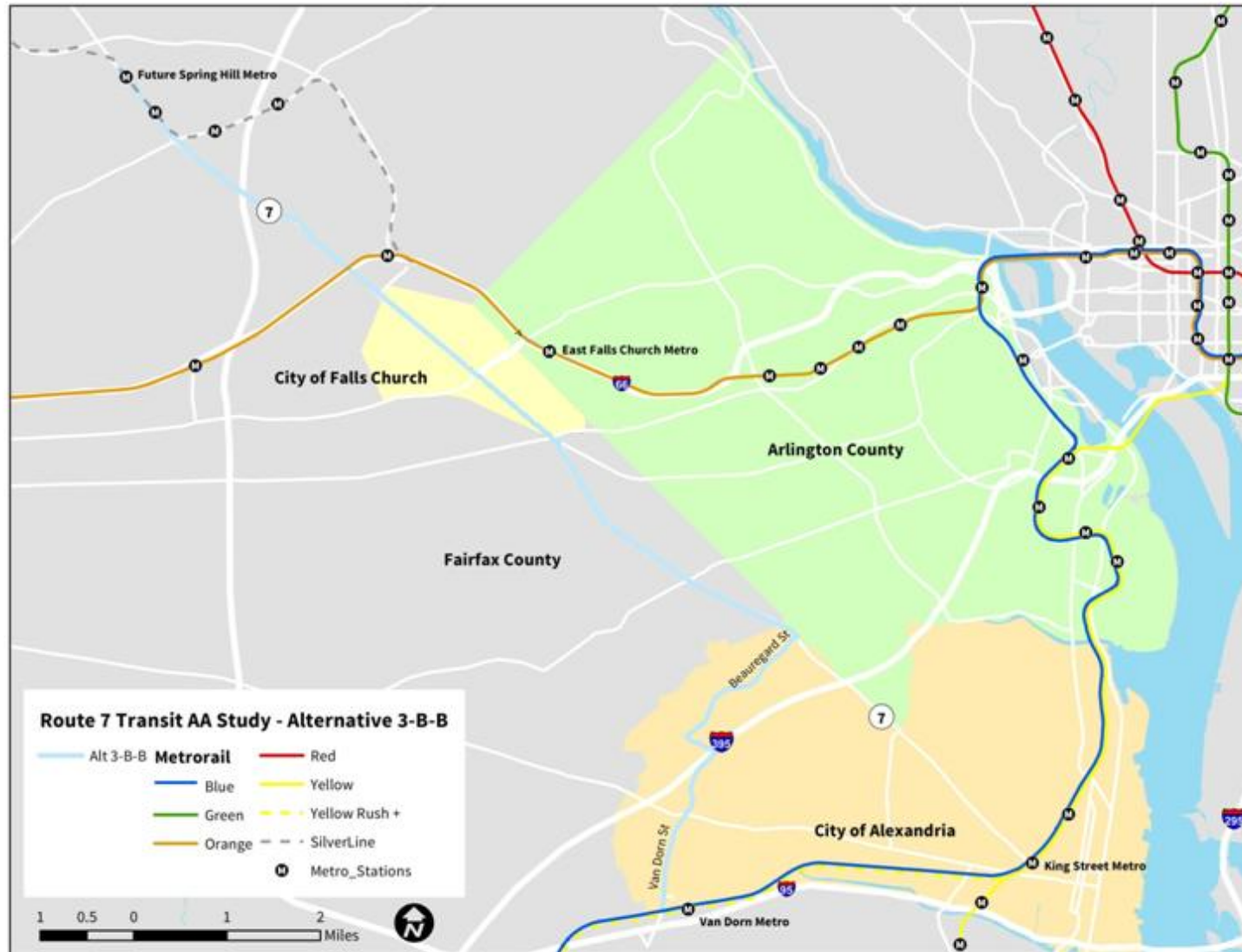


Table 19: Alternative 3-B-B Transit Travel Time

From	To	Station-to-Station Time (minutes)	Distance (miles)
Spring Hill Metrorail Station	Greensboro Metrorail Station	2.4	0.7
Greensboro Metrorail Station	Gallows Road and Route 7	3.8	0.6
Gallows Road and Route 7	Patterson Road and Route 7	5.7	1.3
Patterson Road and Route 7	West Street and Route 7	7.3	1.5
West Street and Route 7	Washington Street (US 29) and Route 7	5.8	0.9
Washington Street (US 29) and Route 7	Arlington Boulevard (US 50) and Route 7	4.0	1.1
Arlington Boulevard (US 50) and Route 7	Glen Carlyn Road and Route 7	4.8	1.4
Glen Carlyn Road and Route 7	Jefferson Street and Route 7	6.6	1.3
Jefferson Street and Route 7	Braddock Road and Beauregard Street	6.1	0.9
Braddock Road and Beauregard Street	Mark Center Drive and Beauregard Street	3.3	0.6
Mark Center Drive and Beauregard Street	Bradford Court and Sanger Avenue	4.7	1.0
Bradford Court and Sanger Avenue	Duke Street and Van Dorn Street/Landmark Mall	5.1	0.9
Duke Street and Van Dorn Street/Landmark Mall	Van Dorn Street Metrorail Station	7.6	1.4
TOTAL UNDER NORMAL CONDITIONS		67.2 minutes	13.7 miles
OPERATING SPEED (mph)		12.2 mph	

### Service Characteristics

The service characteristics for Alternative 3-B-B are shown in Table 20. It is assumed that this alternative would include all of the typical characteristics associated with BRT systems in the United States today. The weekday peak and off-peak frequency for this phase of screening (pending analysis of ridership volumes) is recommended to be 10 minutes peak and 15 minutes off-peak. A total of 22 weekday service hours are recommended, which would allow the light rail service to meet passengers from the last Metrorail trains at the Van Dorn or Spring Hill stations. During Phase 2, the detailed definition of alternatives would explore the potential for using local bus to provide late night or “owl” service along Alternative 3-B-B.

### Mainline Fleet Requirement

An estimated cycle time of 148 minutes is estimated for Alternative 3-B-B. This estimate assumes a 67.2 minute one-way travel time and a 10% recovery/layover time for the line (or 14 minutes for one cycle). As a result, a requirement of 15 peak vehicles is required to maintain a

10 minute frequency on the line. The total fleet is estimated at 18 vehicles assuming a 20% spare ratio.

Table 20: Alternative 3-B-B Service Characteristics

	Peak Frequency	Off-Peak Frequency	Daily service hours	One-way travel time	Cycle time	Peak Trains	Total Fleet Size
Alternative 3-B-B: BRT from Tysons to Van Dorn Street Metrorail station	10 min.	15 min.	22 hours	67.2 min.	148 min.	15	18

Local/Feeder Bus Strategy

Several bus networks are expected to be adjusted with the implementation of Alternative 3-B-B.

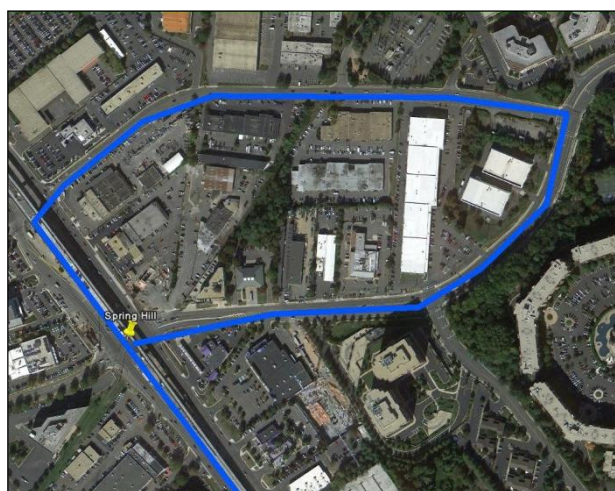
- **WMATA Metrobus:** WMATA operates routes throughout the length of the Alternative 3-B-B alignment, including the mainline 28A. The mainline route is recommended to maintain existing service to provide supplemental local bus service along the corridor at a lower service frequency to provide service to bus stops located between BRT stations. In addition, minor Metrobus routes may be recommended to be extended or increase frequency in order to meet light rail service at stations along the corridor. WMATA service along route: 1B, 1Z, 2T, 3 Line, 4 Line, 7 Line, 16 Line, 25 Line, and 28 Line.
- **Fairfax Connector:** Local bus routes in the Tysons Corner area are operated by Fairfax Connector. Since Alternative 1-A-B will serve two Silver Line stations, it is likely that the routing of Fairfax Connector service will be adjusted to feed Alternative 3-B-B BRT service. Fairfax Connector service along route: 401, 402, 427, 493, 494, 495, and 574.
- **Arlington Transit (ART):** Arlington Transit serves the Alternative 3-B-B alignment along Columbia Pike. ART routes along Columbia Pike may be extended to meet Alternative 1-A-B at the proposed Jefferson Street station. ART routes along route: 41, 45, and 75.
- **Alexandria Transit (DASH):** DASH routes are located in the southern end of Alternative 3-B-B, at Duke Street and the Van Dorn Metrorail station. No reroutings are necessary, but it is possible that service frequencies on DASH routes in this area could increase in order to better deliver riders to the BRT service.

Turnaround Locations

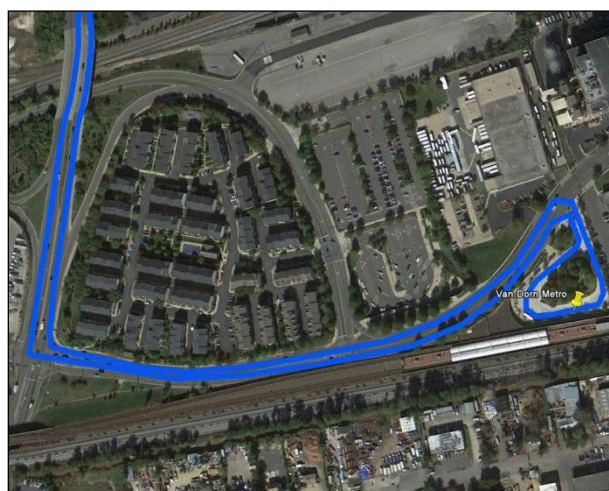
Turnaround locations for BRT vehicles will be necessary at both the northern and southern ends of the Alternative 3-B-B route. At the northern end, BRT vehicles could use an on-street turnaround alignment consisting of Tyco Road and Spring Hill Road in order to return to Route 7 for the southbound trip. A bus bay or off-street layover location for the BRT vehicles would need to be secured at this end of the route. At the southern end, BRT vehicles could use the turnaround loop in front of the Van Dorn Metrorail station.

Figure shows these potential turnaround loops. Autoturn bus templates will be used to determine whether the selected vehicle can make the movements diagrammed.



**Figure 11: Proposed Station Turnaround Loops for Alternative 3-B-B**

(a) At Spring Hill Metrorail Station



(b) At Van Dorn Street Metrorail Station

### Operations and Maintenance Facility

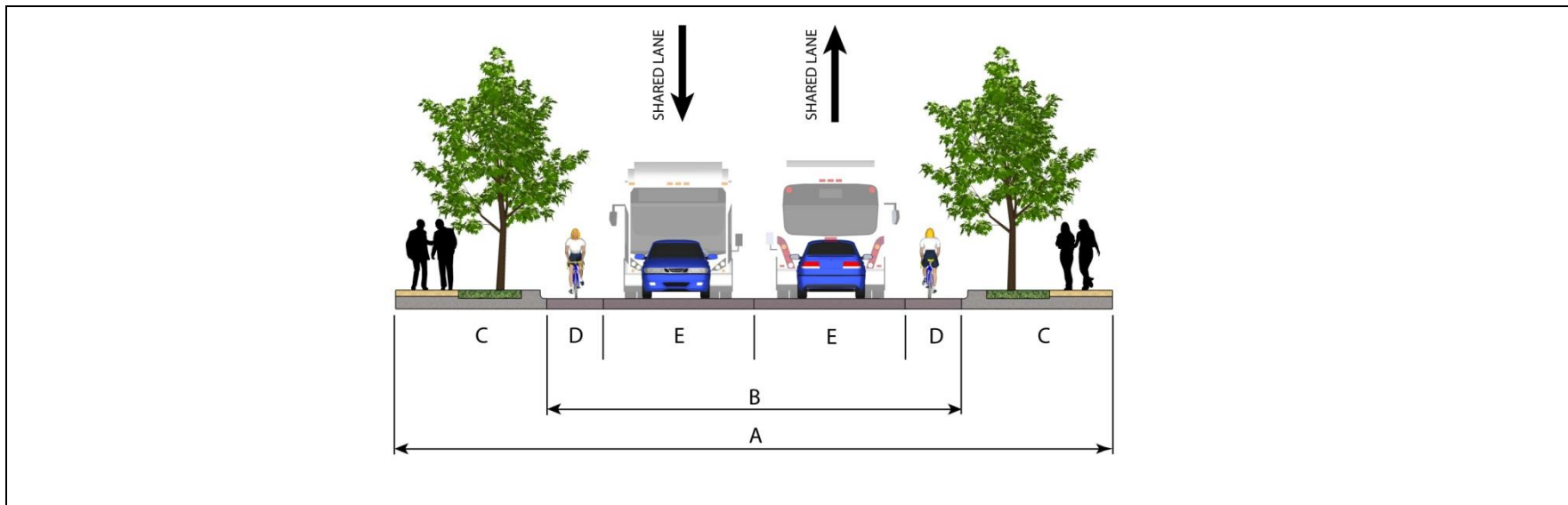
The O&M facility for Alternative 3-B-B, with room for at least 18 BRT vehicles, is expected to be similar in size and elements provided to that identified for Alternative 3-A-L. There are few locations along Route 7 that are large enough and appropriately zoned to accommodate such a facility. It is possible that instead, the Alternative 3-B-B O&M facility could be co-located with another bus garage in Northern Virginia, proposed operator of the service, the location of other facilities, the ability to accommodate the selected BRT vehicle, whether the facility has sufficient capacity to accept the 20 additional vehicles, and an operating agreement that allows for this co-use of the facility. This decision will be made at a later point in the study.

### Typical Sections and Pavement Widths

Using GIS, sample measurements were taken of representative right of way widths along the Route 7 alignment alternatives to capture the minimum and maximum widths. This information provides a cursory range of pavement widths with respect to existing roadway cross sections (i.e., six-lane divided roadway, two-lane undivided roadway, etc.) and provides insights into how BRT or LRT could be configured along each roadway segment.

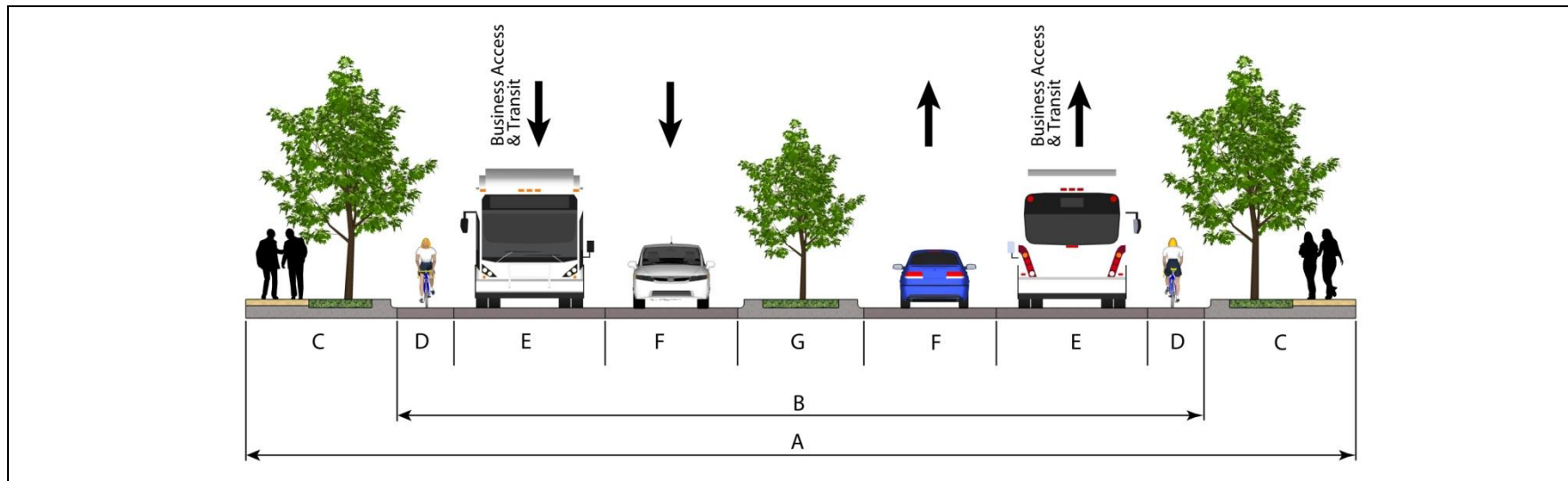
Figure 12 through Figure 15 provide example typical sections for implementing BRT or LRT along an alignment alternative, while Table 21 shows the possible pavement width ranges within which a BRT or LRT transitway could be constructed. During Phase 2, refined right-of-way (ROW) assessment will aid in developing typical sections reflective of the various corridor segments and identifying the ROW impacts on adjacent land uses.

Figure 12: Typical Section for Two-Lane Roadway with BRT in Mixed Traffic at Midblock (Option 2L-Mixed)



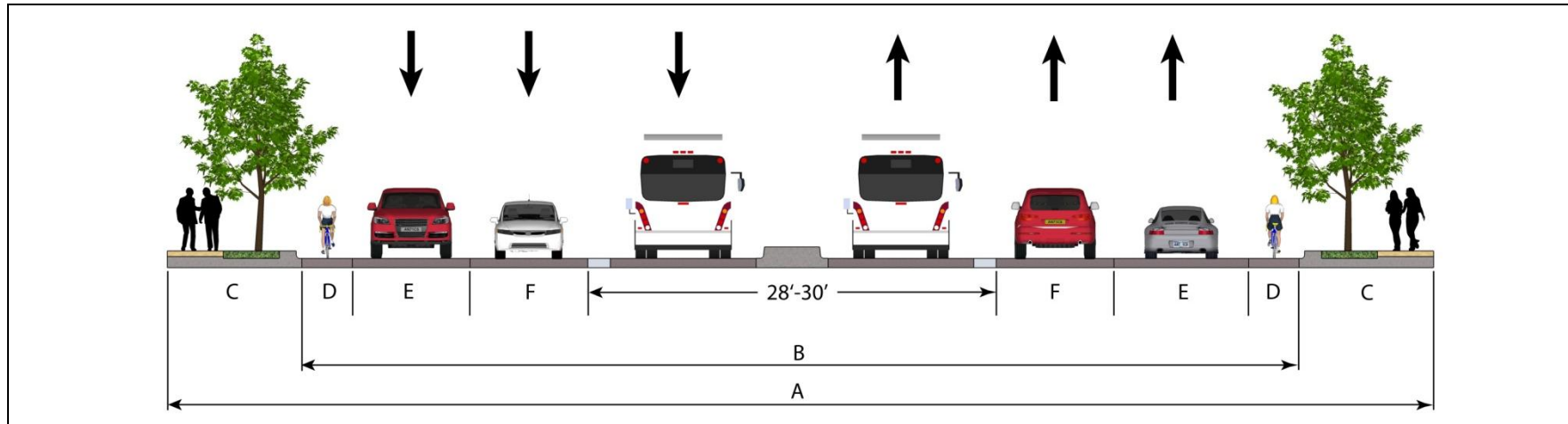
Designation	Description	Notes
A	Overall Right-of-Way	
B	Curb-to-Curb Pavement Width	
C	Streetscape and Curb	<ul style="list-style-type: none"> <li>Streetscape includes sidewalk and planting strip</li> <li>Planting strip could incorporate stormwater treatment, as needed, for reconstructed sections of corridor</li> </ul>
D	Bicycle Lane	
E	BRT/Outside Travel Lane	<ul style="list-style-type: none"> <li>Wider outside lane could be shared with bicycles in constrained areas</li> </ul>

Figure 13: Typical Section for Four-Lane Roadway with BRT in Dedicated Curb Lane at Midblock (Option 4L-BAT)



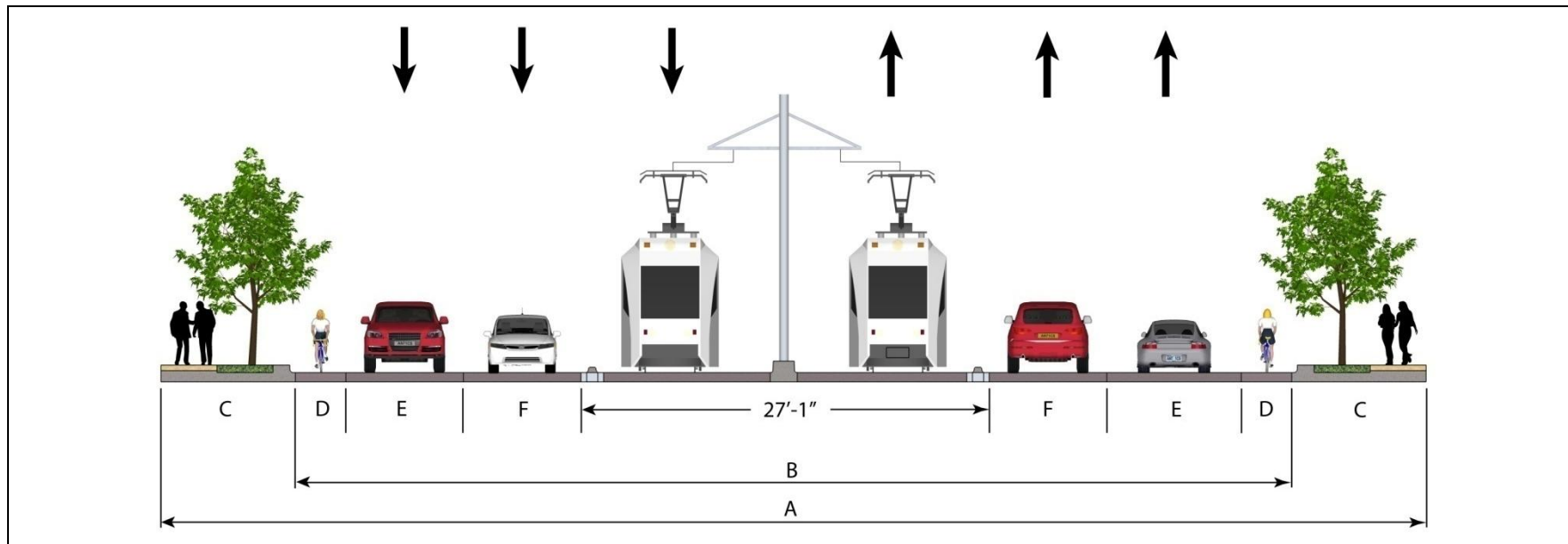
Designation	Description	Notes
A	Overall Right-of-Way	
B	Curb-to-Curb Pavement Width	
C	Streetscape and Curb	<ul style="list-style-type: none"> <li>Streetscape includes sidewalk and planting strip</li> <li>Planting strip could incorporate stormwater treatment, as needed, for reconstructed sections of corridor</li> </ul>
D	Bicycle Lane	
E	Transit/Outside Travel Lane	<ul style="list-style-type: none"> <li>BRT or LRT could operate in outside travel lane</li> <li>Near intersections, right-turning vehicles may enter lane</li> <li>Wider outside lane could be shared with bicycles in constrained areas</li> </ul>
F	Inside Travel Lane	
G	Raised Median or Two-Way Left Turn Lane	

Figure 14: Typical Section for Six-Lane Roadway with BRT in Median Transitway at Midblock (Option 6L-Median)



Designation	Description	Notes
A	Overall Right-of-Way	
B	Curb-to-Curb Pavement Width	
C	Streetscape and Curb	<ul style="list-style-type: none"> <li>Streetscape includes sidewalk and planting strip</li> <li>Planting strip could incorporate stormwater treatment, as needed, for reconstructed sections of corridor</li> </ul>
D	Bicycle Lane	
E	Outside Travel Lane	<ul style="list-style-type: none"> <li>Wider outside lane could be shared with bicycles in constrained areas</li> </ul>
F	Inside Travel Lane	
G	BRT Median Transitway	<ul style="list-style-type: none"> <li>Includes lateral clearance between transitway and inside travel lane, as well as bus lane separator</li> <li>Bus lane separator could be widened to serve as pedestrian refuge (requires increase to overall width of transitway)</li> </ul>

Figure 15: Typical Section for Six-Lane Roadway with LRT in Median Transitway at Midblock



Designation	Description	Notes
A	Overall Right-of-Way	
B	Curb-to-Curb Pavement Width	
C	Streetscape and Curb	<ul style="list-style-type: none"> <li>Streetscape includes sidewalk and planting strip</li> <li>Planting strip could incorporate stormwater treatment, as needed, for reconstructed sections of corridor</li> </ul>
D	Bicycle Lane	
E	Outside Travel Lane	<ul style="list-style-type: none"> <li>Wider outside lane could be shared with bicycles in constrained areas</li> </ul>
F	Inside Travel Lane	
G	LRT Median Transitway	<ul style="list-style-type: none"> <li>Includes raised curb to provide physical separation between transitway and inside travel lane</li> </ul>

Table 21: Estimated Pavement Widths and Possible Typical Sections

<b>Route 7</b>						
<i>From</i>	<i>To</i>	<i>Roadway Type</i>	<i>Pavement Width (Estimated)</i>		<i>Possible Typical Section Options</i>	
			<i>Min</i>	<i>Max</i>		
Spring Hill Rd	Ramada Rd	6D	180	225	6L-Median	
Ramada Rd	Pimmit Dr	4D	105	180	4L-BAT, 6L-Median	
Pimmit Dr	Idylwood Rd	5U	150	150	4L-BAT	
Idylwood Rd	Arlington Blvd	4U	60	130	4L-BAT	
Arlington Blvd	Patrick Henry Dr	6U	120	135	6L-Median	
Patrick Henry Dr	Crossroads Center Wy	4U	115	165	4L-BAT	
Crossroads Center Wy	Dawes Ave	6D	115	140	6L-Median	
Dawes Ave	Park Center Dr	4U	85	115	4L-BAT	
Park Center Dr	Menokin Dr	6D	100	105	6L-Median	
Menokin Dr	Chinquapin Dr	4D	75	160	4L-BAT	
Chinquapin Dr	Janneys La	4U	65	70	4L-BAT	
Janneys La	Sunset Dr	2U	55	70	2L-Mixed	
Sunset Dr	King Street Metro	3U	60	60	2L-Mixed	
<b>Beauregard St</b>						
King Street	Braddock Rd	4D	110	110	4L-BAT	
Braddock Rd	Shopping center entrance	2D	120	155	2L-Mixed, 4L-BAT	
Shopping center entrance	Sanger Ave	4D	90	90	4L-BAT	
<b>Sanger Ave</b>						
Beauregard St	Van Dorn St	4U	60	60	4L-BAT	
<b>Van Dorn St</b>						
Sanger Ave	Holmes Run Pkwy	4U	80	145	4L-BAT	
Holmes Run Pkwy	Eisenhower Ave	4D	95	115	4L-BAT	