BUS PRIORITY BEST PRACTICES IN THE NATIONAL CAPITAL REGION

Synthesis Briefing

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RPTS
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Agenda Item 3

National Capital Region
Transportation Planning Board

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INTRODUCTION AND PURPOSE

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Nine local bus operators in the National Capital Region (NCR) provide over 164 million trips annually. Eighty-one percent of the region's population, and 94 percent of the region's transit dependent population live within a quarter-mile of transit. However, bus speeds and reliability have declined over the past decade, limiting residents' access to jobs and opportunities. Metrobus speeds, for example, have decreased by 9% or 1 mph over the past 10 years.

The *Bus Priority Best Practices Synthesis* is a resource for the National Capital Region (NCR) highlighting local examples of bus priority and includes a comprehensive list of resources for planners and policymakers.

Photo Source: Floating Bus Stop (BeyondDC/Flickr), Data Source: National Transit Database

Investing in bus priority treatments has positive impacts

- Bus priority treatments can improve bus speed, reliability and efficiency
  - Increasing the region's residents' **access to jobs and opportunities**
  - Attracting **new transit riders** and improving the experience of existing riders

16th Street NW Buses (DDOT/https://www.16thstreetnwbus.com/)

Results of Bus Priority Projects in the Region

Bus priority treatments lead to increased speeds and increases in ridership

Priority Bus Corridors/Services	Results	Bus priority infrastructure
Metroway	83% ridership increase	Partial dedicated right-of-way, consolidated bus stops
H & I Streets NW Bus Lanes	1 mph increase in bus travel speeds	Dedicated right-of-way
US 29 FLASH	54%* ridership increase	Bus-on-shoulder lanes, TSP
16th Street NW Bus Improvements	2-5 minutes in travel time savings*	Queue jump lanes, TSP, dedicated right-of-way

*Expected results based on ridership and/or travel time improvement forecasts

Sources: Ethan Goffman, "Northern Virginia's Metroway Corridor Shows How Buses and Trains Can Complement Each Other," Mobility Lab, September 30, 2019, https://mobilitylab.org/2019/09/30/northern-virginias-metroway-corridor-shows-how-buses-and-trains-can-complement-each-other/.
US29 Bus Rapid Transit Project, https://www.ridetheflash.com/wp-content/uploads/2019/09/US29FLASH-Description-March2017.pdf
DDOT, "16th Street NW Bus Lanes Project Online Open House," https://www.16thstreetnwbus.com/wp-content/uploads/2018/07/16th-St-Online-Public-Meeting-072718.pdf
Christina Moscardi, "How well do DC's red-painted bus lanes work?", February 20, 2020, http://www.christianmoscardi.com/blog/2020/02/20/dc-bus-lanes.html

Bus Priority Treatment Impacts Include

REDUCED CONGESTION

IMPROVED AIR QUALITY

INCREASED REVENUE FROM INCREASED RIDERSHIP

REDUCED FUEL COST FROM REDUCED DELAY

For more information, see: https://www.transit.dot.gov/sites/fta.dot.gov/files/CBRT_2009_Update.pdf

Treatments Effectiveness Varies

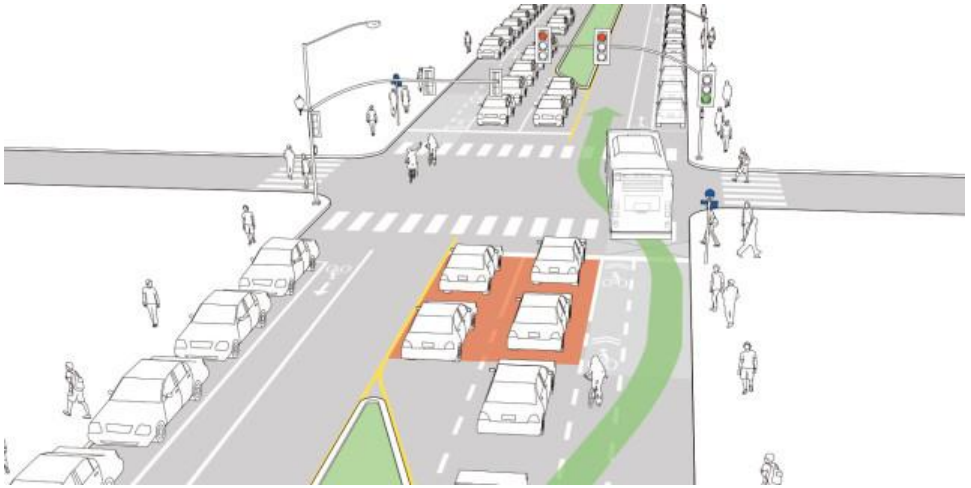
- Lower cost treatments can be easier to implement, but can be less impactful than higher cost treatments
    - An on-road painted bus lane is less expensive to implement, but may not be as effective as a dedicated busway
- Combining multiple treatments requires a larger investment, but usually results in greater improvements
- Difficulty of implementation is varied and site specific, but the level of effort increases as more treatments are combined together

Bus Priority Treatments

Dedicated Bus Lanes/Guideways	• Lanes are restricted to buses through signage or barriers • Lanes could be separate from traffic, concurrent with traffic, contraflow with traffic, or shoulder lanes
Transit Signal Priority	• Allows vehicles to communicate with traffic signals to adjust light timing • Typically either extends the green light or shortens the red
Queue Jumps	• Transit-only lanes at or before an intersection that allow buses to skip the queue of vehicles waiting a traffic light
Parking Limitations	• Reduces the ease of parking by increasing the parking fee or reducing the number of parking spaces to encourage more people to take the bus
Stop Consolidation	• Reduces the frequency of stops which increases the average speed of the buses
Off-Board Fare Payment	• Allows riders to pay in advance for their ticket, which saves time in the boarding process
All-Door Boarding	• Passengers that pay in advance can board from the rear doors, doubling the number of people that can board the bus at any given time

Queue Jumps and Bus Only Signals

- Queue jump lanes combine a short, dedicated transit facility with a leading bus interval or active signal priority
- Allows buses to enter traffic in a priority position
- Can reduce bus delay significantly as buses are able to the front of a queue of cars at traffic signals
    - Queue Jumps become increasingly effective as road congestion increases



Source: Queue Jump Lanes (NACTO/https://nacto.org/publication/transit-street-design-guide/intersections/intersection-design/queue-jump-lanes/)

Source: Queue Jump Lanes, *Transit Street Design Guide* (NACTO/https://nacto.org/publication/transit-street-design-guide/intersections/intersection-design/queue-jump-lanes/)

Components of Transit Signal Priority

- Operates with sensors imbedded on buses and road infrastructure
- Communication between buses, on-road infrastructure, and traffic management center via cellular network

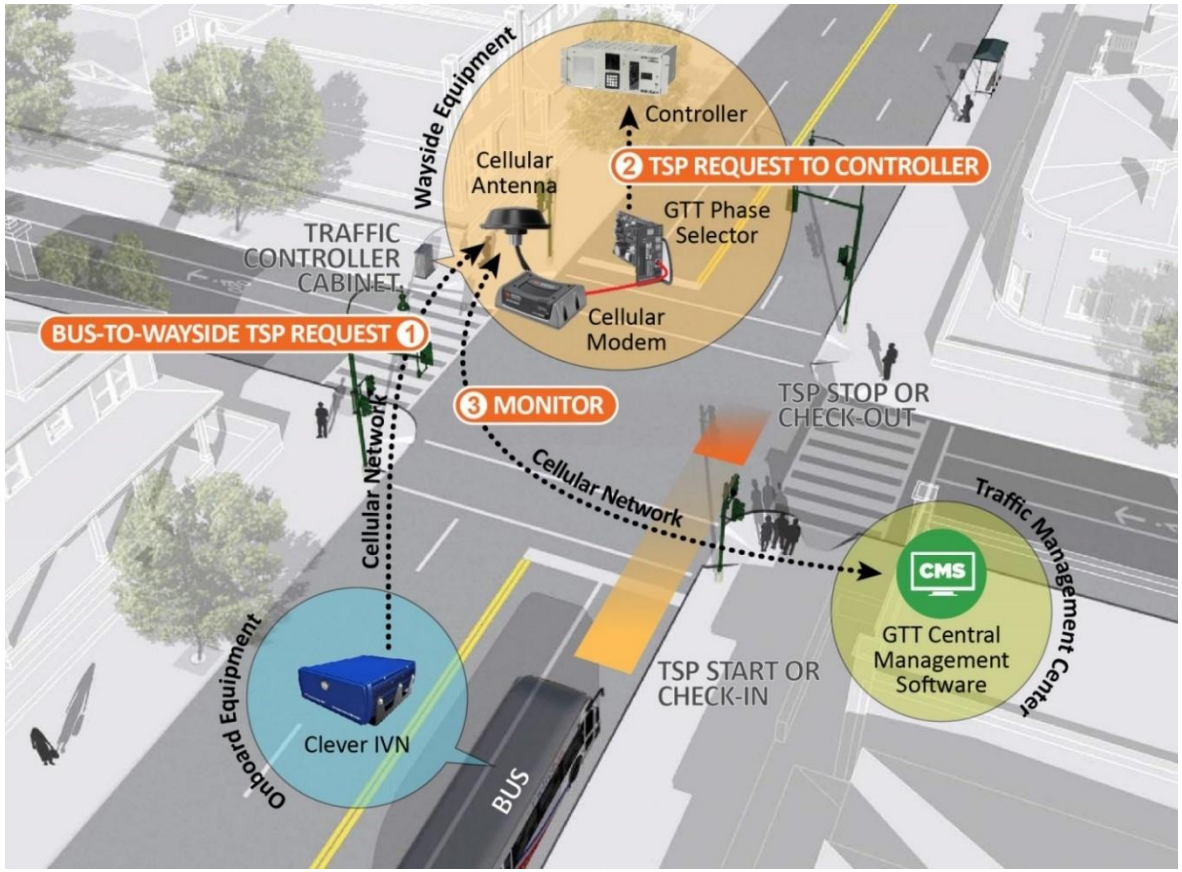


Photo Source: Components of TSP (Kittelson & Associates, Inc)

Bus Priority Costs and Impacts

Improvement	Improvement Description	Cost to Implement	Degree of Difficulty to Implement	Cost Savings/ Performance Improvements	Level of Anticipated Improvement
 **TSP** installed at some intersections, operated conditionally	Installed at some intersections, operated on a conditional basis	$0.3M to $9.0M per mile	Low to Moderate*	8% in travel time savings; $0.2M to $1.6M cost savings annually	Low
 **Dedicated lane** on existing road	Dedicated lane on existing road	$0.2M to $1M per mile	Low	$0.25M in savings per year; 10-14% travel time savings; up to 27% increase in reliability	Moderate
 Dense network of **TSP and queue jumps** at some intersections	Dense network of TSP and queue jumps at some intersections	$0.3M to $20M per mile	Low to Moderate*	1-10% in travel time savings; $0.3M to $1.7M cost savings annually	Low
 Dense network of **TSP, queue jumps at all intersections, dedicated lanes** on full route	Dense network of TSP, queue jumps at all intersections, dedicated lanes on the full route	$5.0M to $50M per mile	Moderate to High	18-54% in travel time savings; $0.55M to $1.95M in cost savings annually	Moderate to High
 Dense network of **TSP, exclusive bus right-of-way**	Dense network of TSP, exclusive bus right-of-way	$30M to $80M per mile	High	18-66% in travel time savings; $0.55M to $1.8M cost savings annually	High

*TSP implementation can be costly and time consuming due to variations in technology and hardware

Source: Washington Area Bus Transformation Project, https://bustransformationproject.com/; King County Metro, *Transit Speed and Reliability Guidelines and Strategies,* https://kingcounty.gov/~/media/depts/transportation/metro/about/planning/speed-reliability-toolbox.pdf

RESULTS OF TIGER BUS PRIORITY IN THE NCR

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TIGER Bus Priority in the NCR

The US Department of Transportation (USDOT) awarded a $58.8 million TIGER grant to the National Capital Region Transportation Planning Board (TPB) for Priority Bus Transit in the National Capital Region in 2010.

Photo Source: Bus queue jump signal, 16th St DC (BeyondDC/Flickr)

TIGER Bus Priority in the NCR

- Five local governments or transportation agencies were responsible for carrying out the 16 individual component projects of the larger regional TIGER project
- The improvements in technology and physical infrastructure aimed at making buses for reliable and convenient in the region
- TIGER-funded enhancements on eight key bus priority corridors included the following bus priority infrastructure:
  - Dedicated bus lanes/guideways
  - Transit Signal Priority (TSP)
  - Queue Jumps

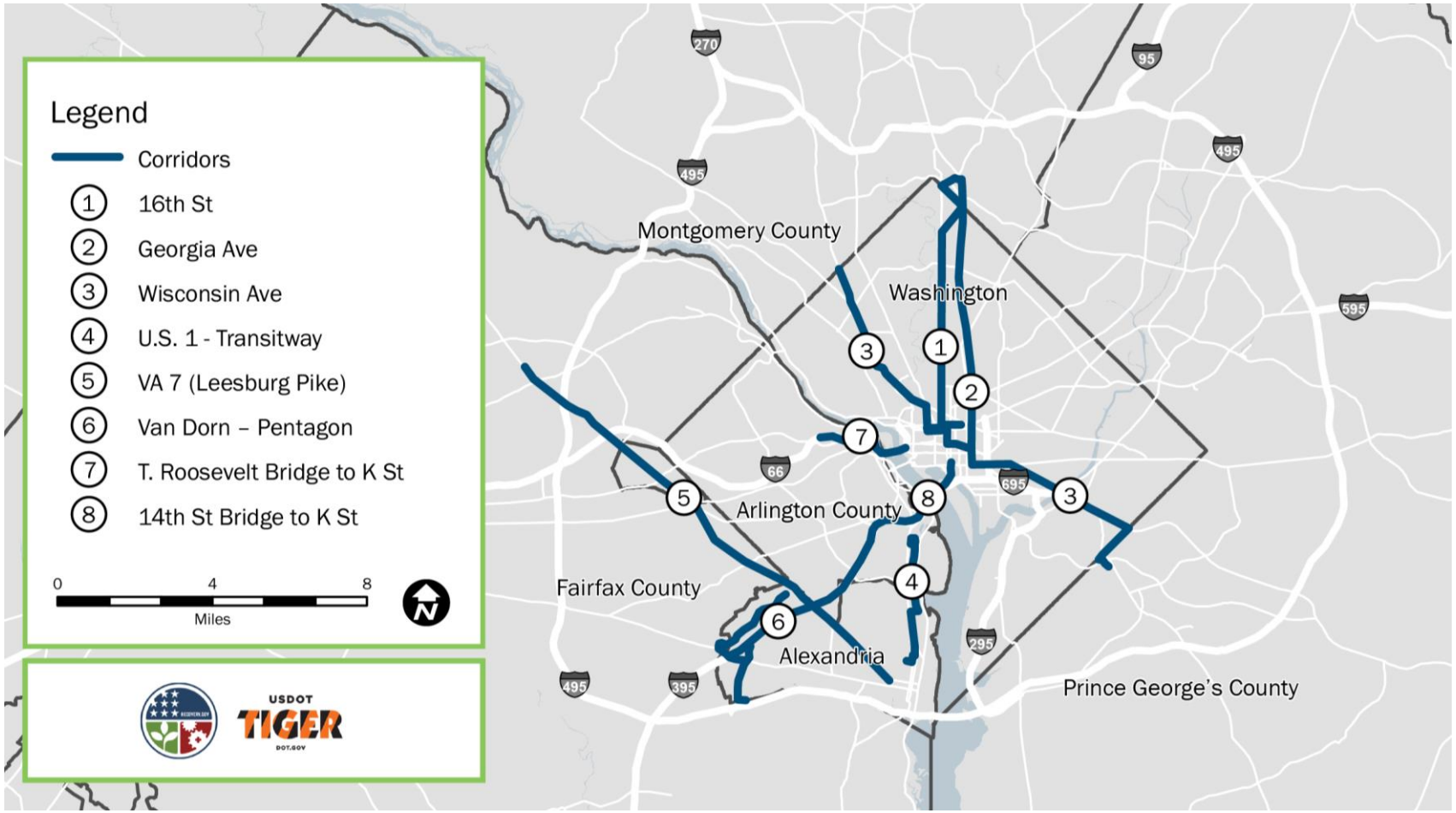
TIGER Corridors with Bus Priority Infrastructure

Corridor	Dedicated bus lanes/ guideways	Transit Signal Priority (TSP)	Queue Jumps
16th Street NW, DC	-	31	1
Georgia Avenue NW, DC	0.3 mi	57	3
Wisconsin Avenue, DC	-	39	-
US 1 - Transitway, VA	0.8 mi	-	-
VA 7 (Leesburg Pike), VA	-	25	-
Van Dorn – Pentagon, VA	-	9	2
T. Roosevelt Bridge to K St. NW, DC*	-	68**	-
14th Street Bridge to K St. NW, DC*			

**TR Bridge to K St and 14th St Bridge to K St corridors are treated as two separate corridors for performance monitoring and reporting, despite sharing the same bus priority enhancements in central Washington, DC.*

***In addition to TSP, these corridors counted with signal optimizations at 197 intersections and uninterruptible power supply (UPS) at 30 locations.*

TIGER


Legend
Corridors
1 16th St
2 Georgia Ave
3 Wisconsin Ave
4 U.S. 1 - Transitway
5 VA 7 (Leesburg Pike)
6 Van Dorn – Pentagon
7 T. Roosevelt Bridge to K St
8 14th St Bridge to K St
0
4
8
Miles
USDOT
TIGER
DOT.GOV
Montgomery County
Washington
Arlington County
Fairfax County
Alexandria
Prince George's County
270
95
495
595
66
695
295
395

TIGER Key Takeaways

Corridor	Bus Priority Treatments	On-time Performance		Ridership
		Peak	Off-Peak	
16th Street NW, DC		↓	↑	↓
Georgia Avenue NW, DC		↓	↑	↓
Wisconsin Avenue, DC		-	↑	↑
US 1 - Transitway, VA		↑	↑	↑
VA 7 (Leesburg Pike), VA		-	-	↓
Van Dorn – Pentagon, VA		↑	↑	↓
T. Roosevelt Bridge to K St. NW, DC*		-	-	↓
14th Street Bridge to K St. NW, DC*				

RESULTS OF OTHER BUS PRIORITY IN THE NCR

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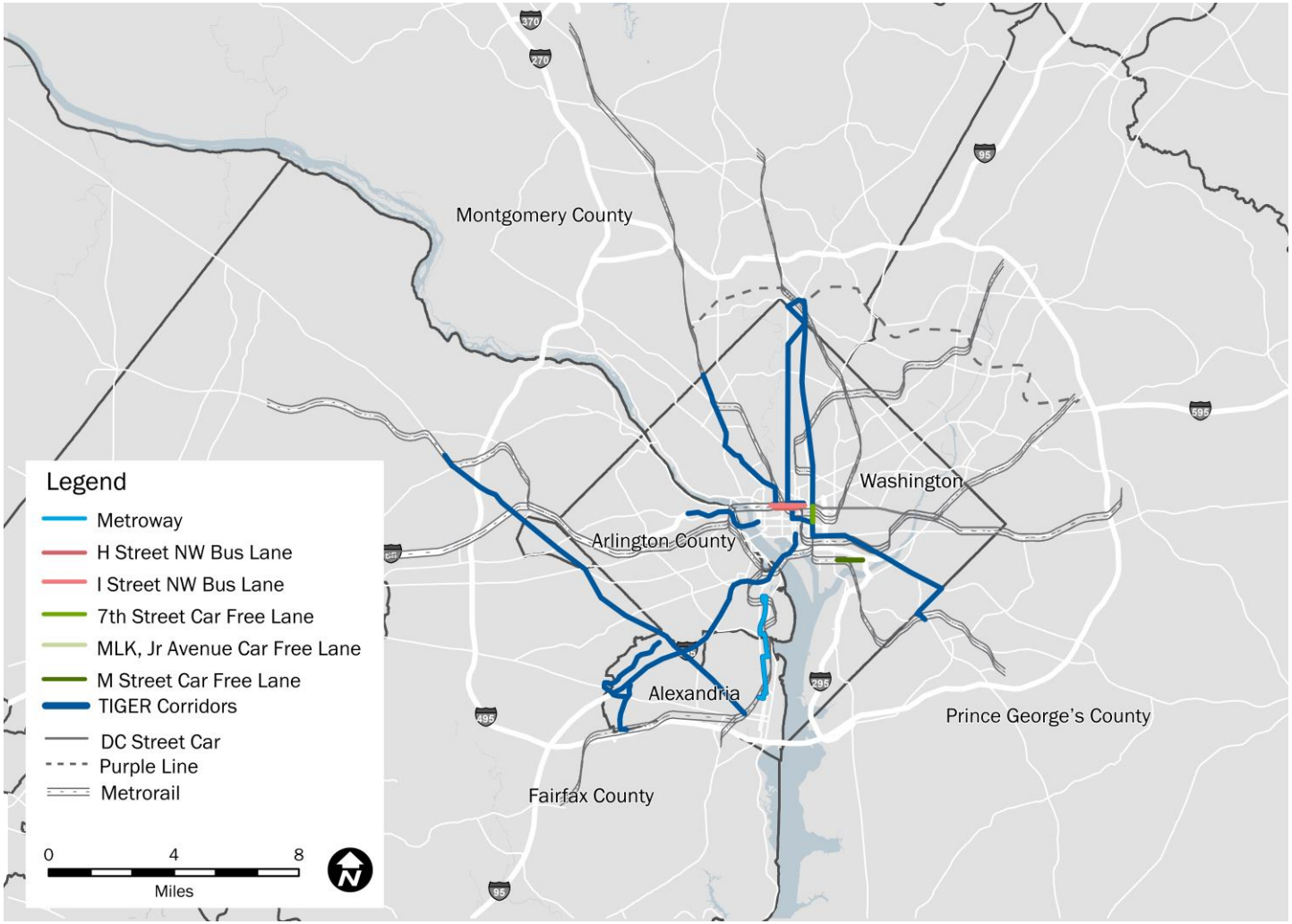
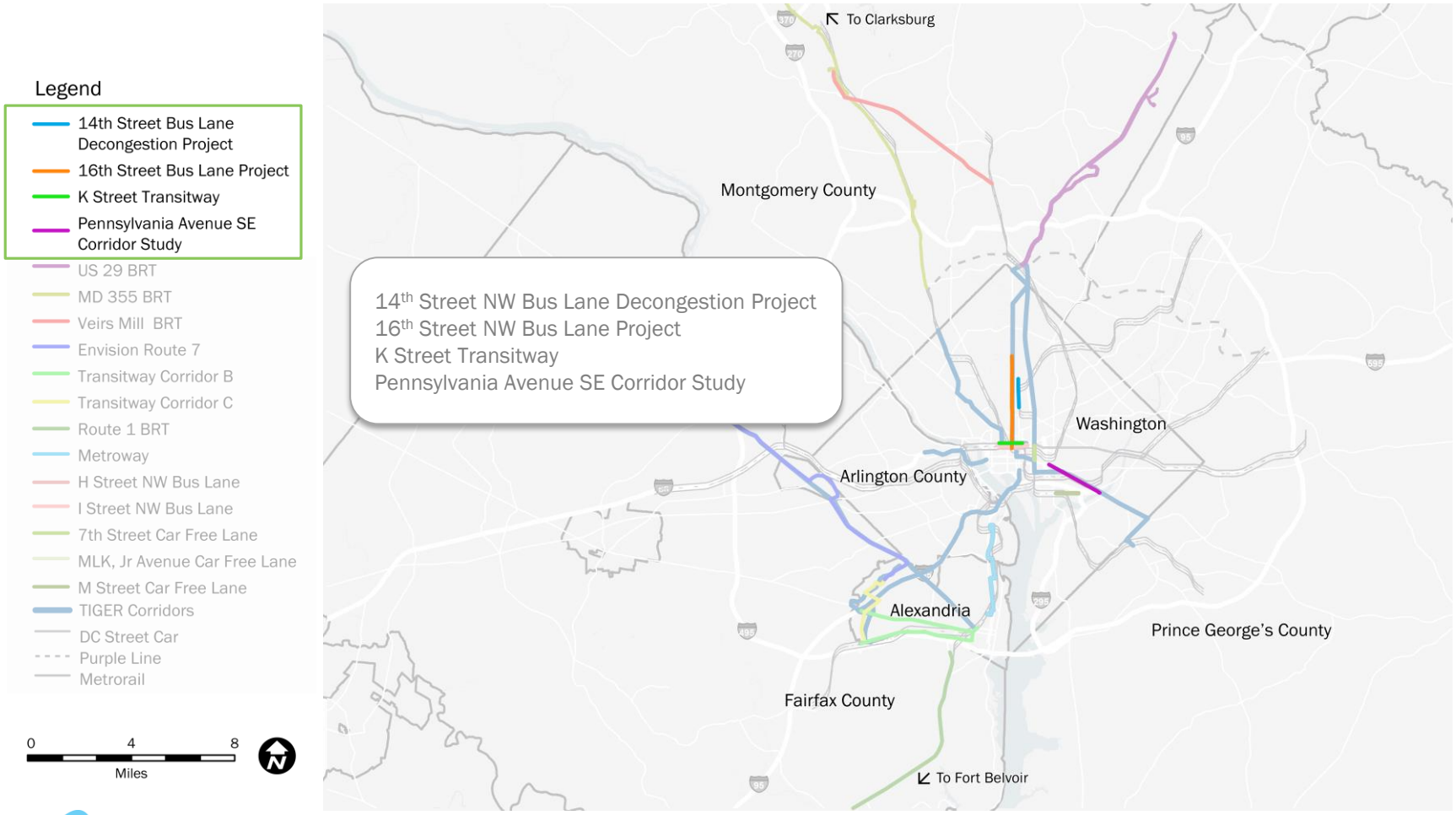
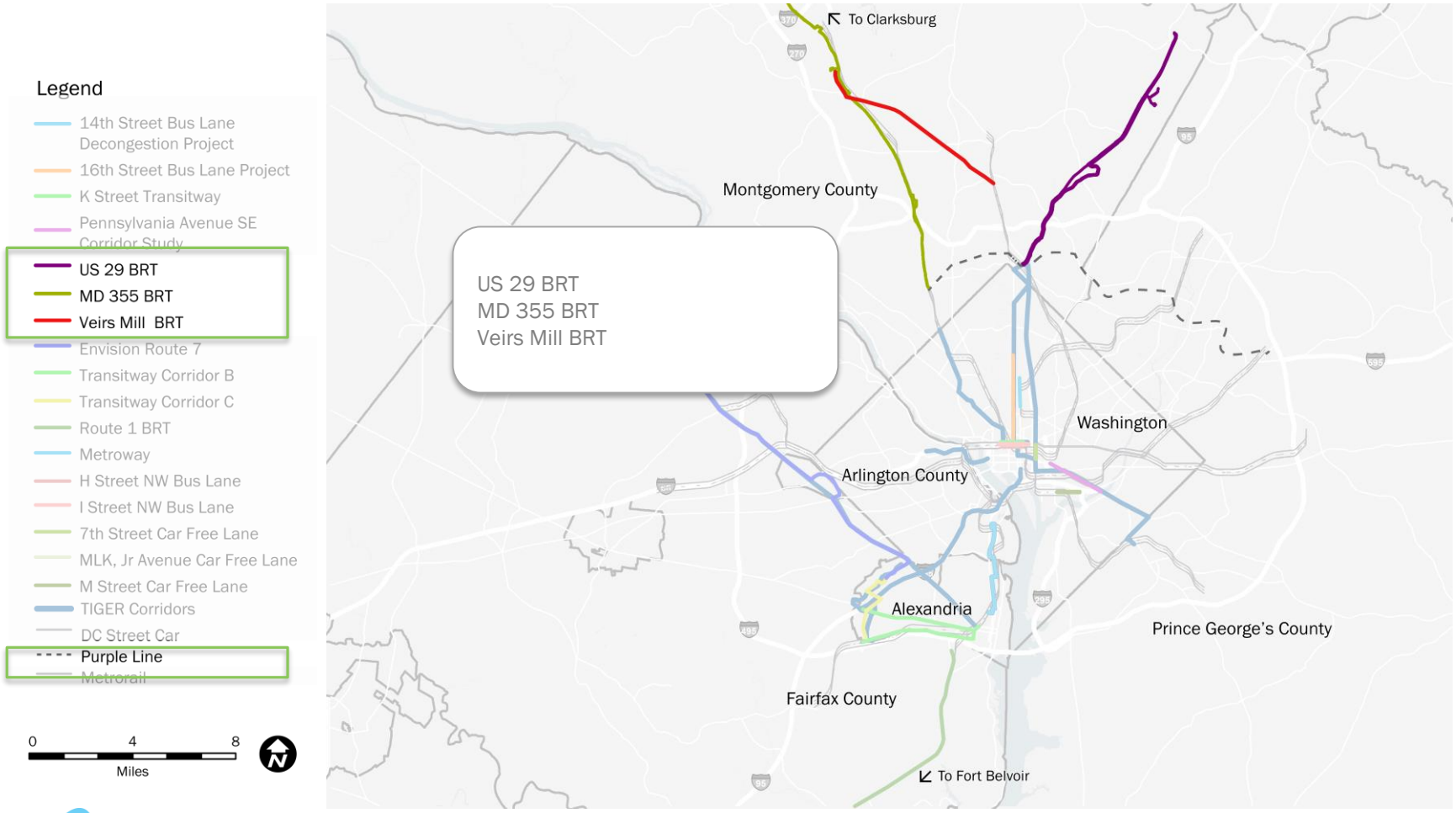
Existing Bus Priority Projects



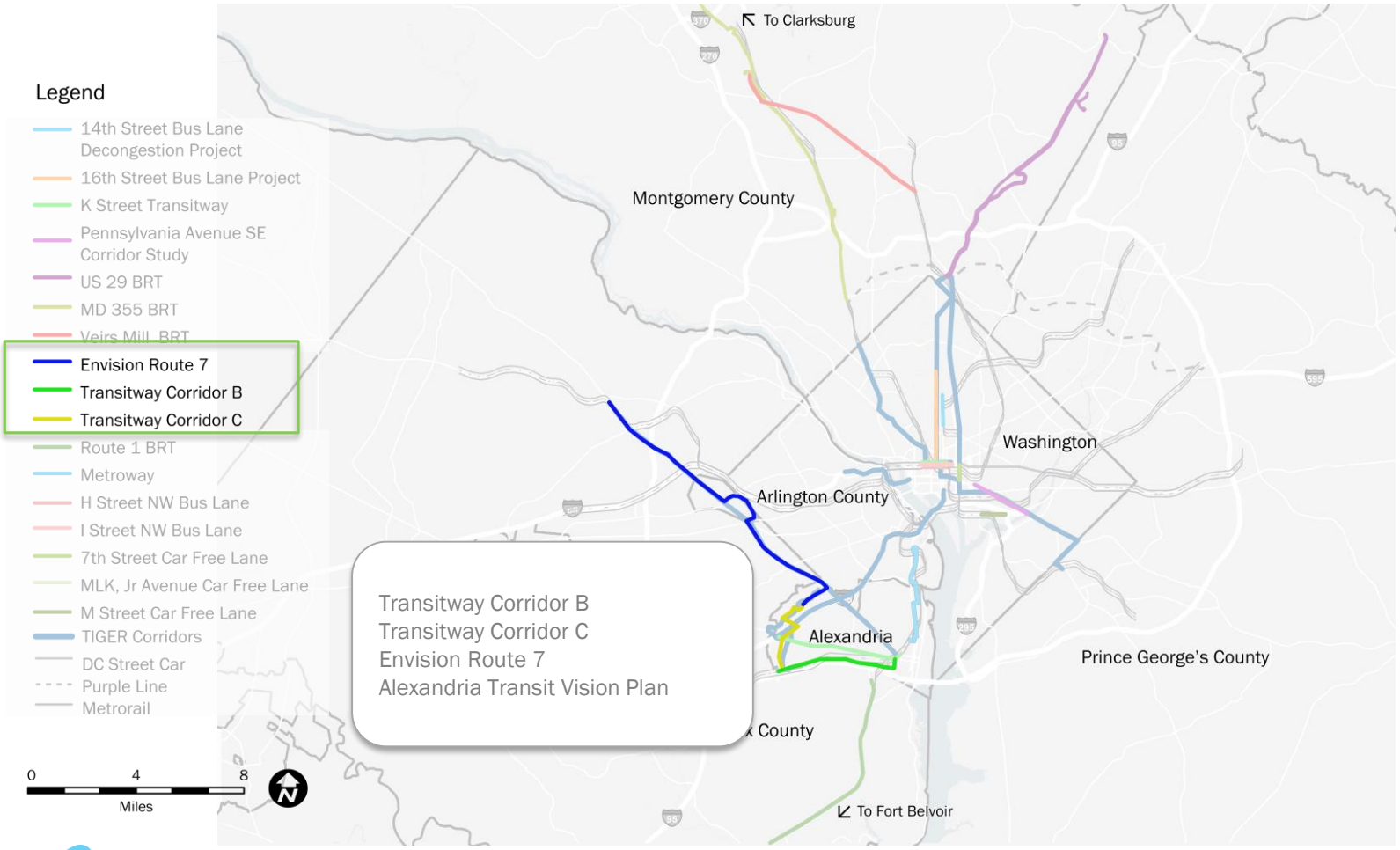
Bus Priority Planning Efforts: Washington DC



Bus Priority Planning Efforts: Montgomery County

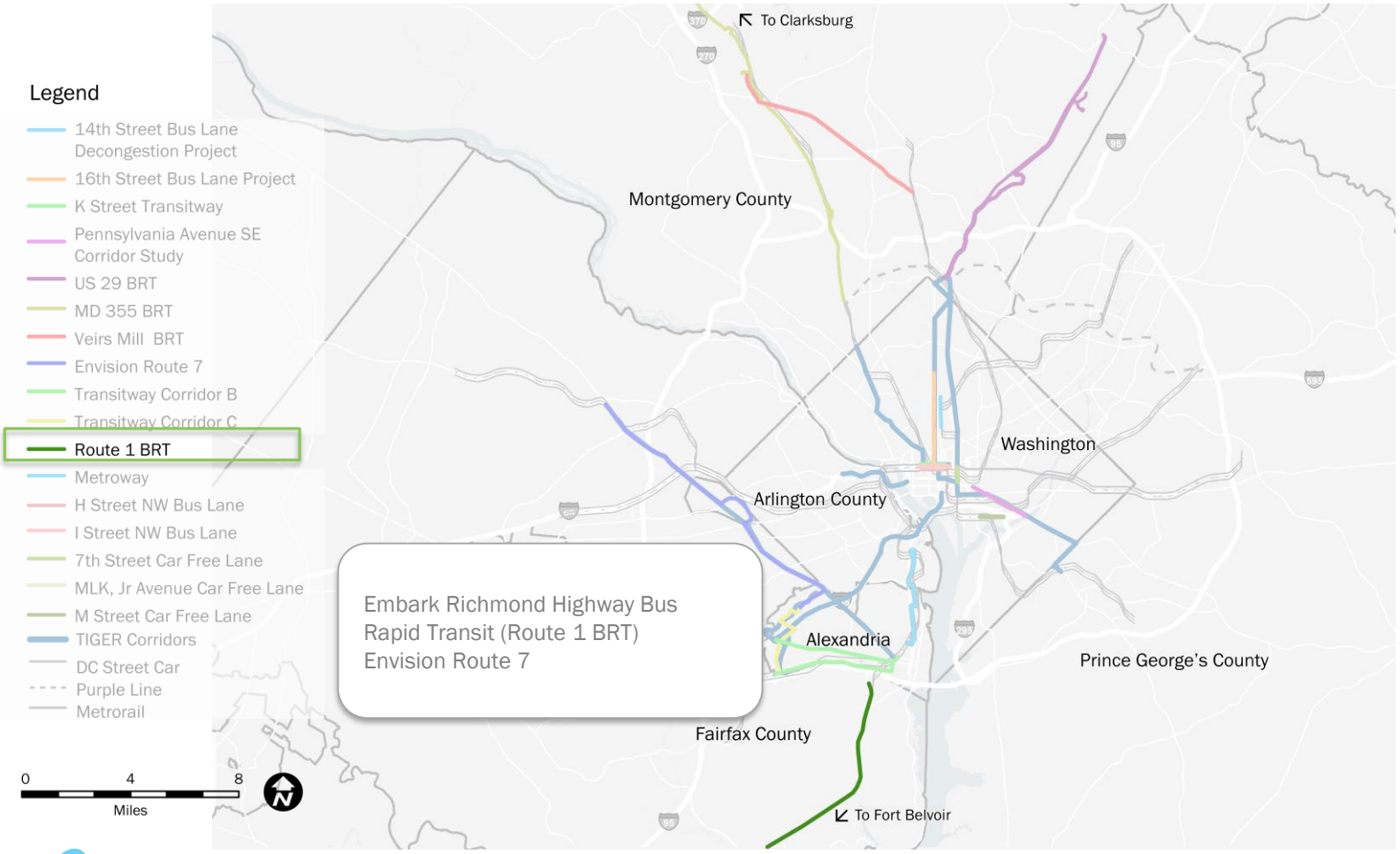


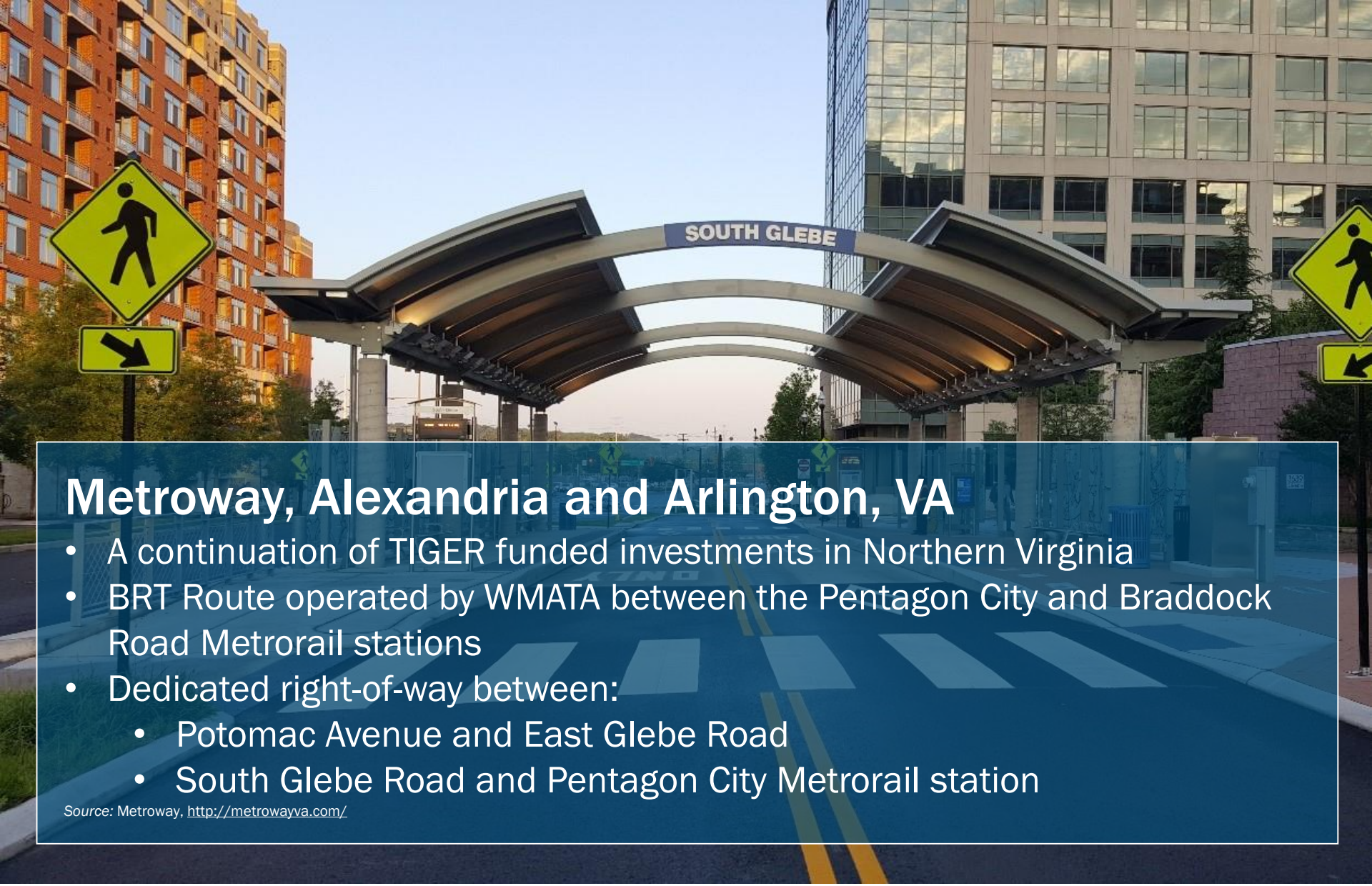
Bus Priority Planning Efforts: Alexandria



Bus Priority Planning Efforts: Arlington County

Bus Priority Planning Efforts: Fairfax County





Metroway, Alexandria and Arlington, VA

- A continuation of TIGER funded investments in Northern Virginia
- BRT Route operated by WMATA between the Pentagon City and Braddock Road Metrorail stations
- Dedicated right-of-way between:
  - Potomac Avenue and East Glebe Road
  - South Glebe Road and Pentagon City Metrorail station

Source: Metroway, http://metrowayva.com/

Metroway

- Between September 2014 and September 2019, monthly ridership increased from 30,000 trips to 55,000 trips
- Ridership on Metroway exceeds ridership on the route it replaced
- Metroway works in tandem with Metrorail service
  - Metroway ridership increased 60 percent in 2019 during Metrorail station construction along Metroway's route

Photo Source: Metroway Route (Metroway/http://metrowayva.com/)

Source: Ethan Goffman, "Northern Virginia's Metroway Corridor Shows How Buses and Trains Can Complement Each Other," Mobility Lab, September 30, 2019, https://mobilitylab.org/2019/09/30/northern-virginias-metroway-corridor-shows-how-buses-and-trains-can-complement-each-other/.

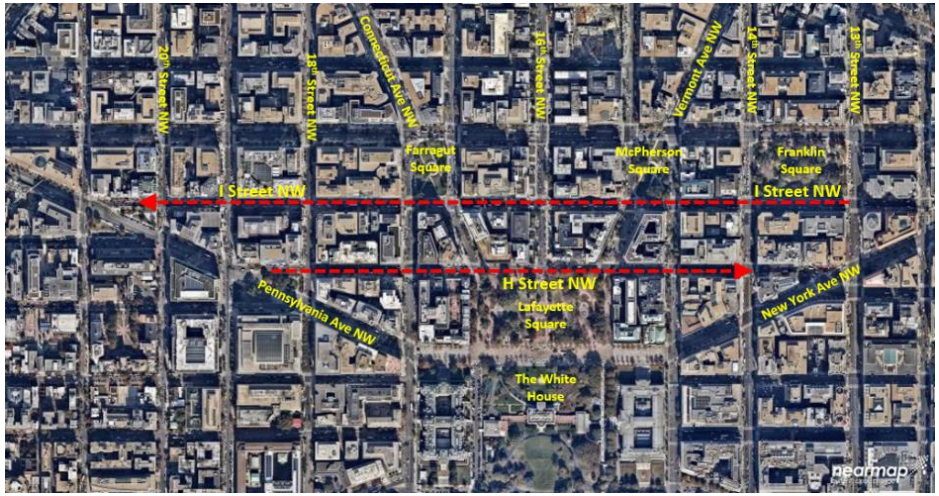
DDOT Bus Priority Plan and Program

- Development for DDOT's Bus Priority Plan began in 2020
- The plan will include:
  - Toolbox of improvements that address bus speeds and reliability
  - Identify a pipeline of bus priority projects in DC
- Numerous projects are underway through DDOT's initiative:
  - Three temporary Car Free Lanes or Streets
  - 14th Street NW Traffic Decongestion and Bus Improvements (under construction)
  - 16th Street NW Bus Lanes (under construction)
  - K Street Transitway (future project)
  - Pennsylvania Avenue SE Corridor Study (future project)

Photo Source: Bus Only Lane (BeyondDC/Flickr)

H and I Streets NW Bus Lanes

- Increases in bus speeds inconsistent during the pilot period
- Overall average bus speeds increased by approximately one mile per hour on both corridors
- Before and during the pilot period travel speeds in the AM peak were faster than the PM peak on both corridors

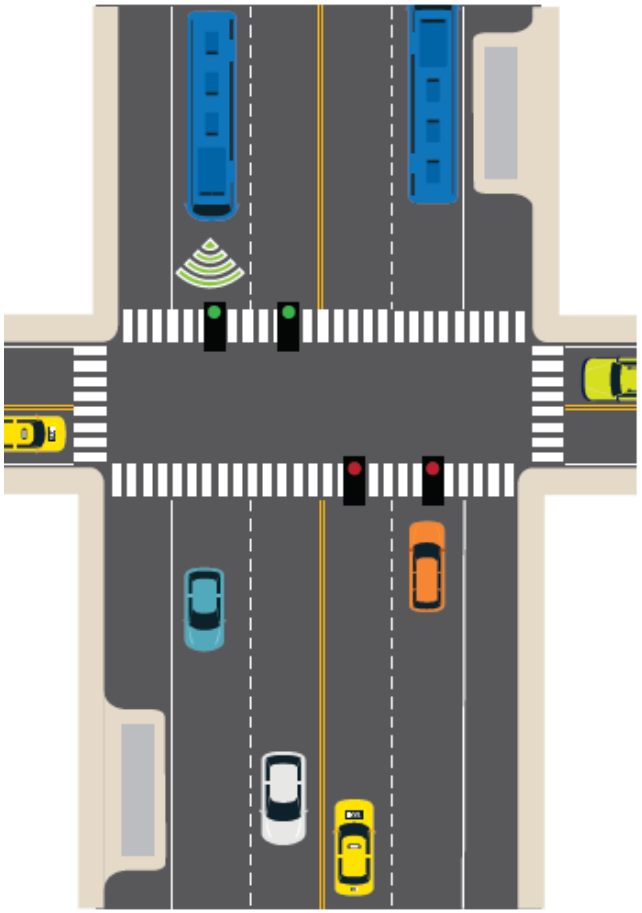


Source: H Street Bus Lane (BeyondDC/Flickr) (Top)
H and I Streets NW Bus Lane map ((DDOT/DDOT) (Bottom)

Christina Moscardi, "How well do DC's red-painted bus lanes work?", February 20, 2020, http://www.christianmoscardi.com/blog/2020/02/20/dc-bus-lanes.html

WMATA/DDOT TSP and Queue Jumps

- First implemented in 2016 through TIGER grant
- Operates in the District at 179 intersections and 11 Metrobus routes and in Alexandria on four corridors
- Improves schedule reliability and, in non-downtown corridors, reduces schedule runtime
- Less restrictive parameters to trigger extended red or green signals help increase the number of buses that can benefit from TSP
- TSP has not adversely impacted performance of other modes



Source: TSP (MDOT MTA/BaltimoreLink Transit Priority Toolkit)

BUS TRANSFORMATION PROJECT (BTP) RECOMMENDATIONS

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Bus Transformation Project

Developed and shaped by a broad range of stakeholders and the public from across the region, the Bus Transformation Project developed a regional Strategy and Action Plan that focus on **improving customer experience, connecting the region through better bus service, and fostering collaboration across transit and roadway agencies.**

Photo Source: https://bustransformationproject.com/wheaton-metrorail/

Recommendation #2 Priorities

To **give bus priority on roadways** to move people quickly and reliably:

- F Obtain commitments from state and local agencies (including roadway owners) to **adopt consistent guidelines**, bolster jurisdictional capital spending, and expedite coordinated implementation of bus priority
- G Implement enforcement policies that **establish bus priority** and result in reliable and fast service
- H Establish a capital program at WMATA that **supports accelerated implementation of bus priority projects**, including BRT
- I Support regional congestion mitigation efforts that bolster bus priority and **move more people more efficiently**

How BTP Aims to Transform Bus Service

from		to
Wondering when the bus will come	MAKE BUS THE EASY FIRST CHOICE	Frequent and predictable
Slow and stuck in traffic	PRIORITIZE BUSES ON MAJOR ROADWAYS	Fast trips where you want to go
Last resort	FOCUS ON THE CUSTOMER	Appealing and desirable
Region divided	STRENGTHEN REGIONAL COOPERATION TO TRANSFORM THE BUS SYSTEM	Stronger together

KEY INFORMATION FROM LITERATURE ON BENEFITS AND COSTS OF BUS PRIORITY

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Benefits of Bus Priority – Faster Speeds

Bus priority treatments increase the average speed of a bus by separating it from congestion and giving it an advantage at intersections

Dedicated right-of-way saves…

2 to 3 minutes per mile

Bus lanes on arterial streets save…

1 to 2 minutes per mile

The addition of a dedicated bus lane on a congested road can double or triple the average bus speed

Photo credit: Portland dedicated busway (J.Mause/Bikeportland.org)

For more information, see https://www.vtpi.org/blw.pdf & https://nacto.org/wp-content/uploads/2015/04/tcrp118brt_practitioners_kittleson.pdf

Benefits of Bus Priority – Higher Ridership

Increased speeds are associated with more efficient transit, which increases ridership

Priority Bus Corridors/Services	Approximate ridership increase	Bus priority infrastructure
Albuquerque Rapid Transit	67%	Dedicated right-of-way, TSP
Seattle RapidRide	87%	Dedicated right-of-way, queue jump, bus bulbs, TSP
Minneapolis METRO A and METRO C	33%	TSP, off-board ticketing
SFMTA Muni Forward	8%	Transit-only lanes in mixed traffic, bus-bulbs, TSP
NYC Bus Lanes	14%*	Transit-only lanes in mixed traffic

*Example ridership increase when dedicated bus lanes were added to 14th Street

For me information, see: https://www.transit.dot.gov/sites/fta.dot.gov/files/CBRT_2009_Update.pdf,
https://kinder.rice.edu/urbanedge/2020/02/06/how-brt-service-rapidly-improved-ridership-twin-cities
https://www.masstransitmag.com/management/press-release/12383795/abq-ride-art-system-receives-rare-gold-standard-from-itdp
https://www.sfmta.com/projects/16th-street-improvement-project-phase-1-and-phase-2
https://kingcounty.gov/depts/transportation/metro/travel-options/bus/rapidride.aspx
https://wcbs880.radio.com/articles/news/nyc-adding-20-new-miles-of-busways-bus-lanes

Benefits of Bus Priority – Development

- Bus prioritization is a catalyst for Transit Oriented Development (TOD)
- Prioritization corridors are associated with an **increase in property development** and **higher land values** at the corridor level and in the area directly surrounding the corridor

Source: https://www.fdot.gov/docs/default-source/transit/documents/FDOTCO_ANationalSynthesisofTransitinCompleteStreets_FinalReport_20180508.pdf

Photo Source: Cleveland's HealthLine (Center for Neighborhood Technology/Flickr)

Example Bus Priority System Costs

Richmond Pulse

Photo Credit: Richmond Pulse corridor
(Dan Malouff/Greater Greater Washington)

$8.7 million per mile

Three miles of dedicated bus lanes

7.6 miles in total

Albuquerque Rapid Transit

Photo Credit: Albuquerque Rapid Transit bus
(HDR)

$15.2 million per mile

97% of the alignment is dedicated

Approximately nine miles in length

CT*fastrak*

Photo Credit: CT*fastrak* Vehicle
(Sean Teehan/Hartford Business Journal)

$65.2 million per mile

9.4 miles of fully dedicated right-of-way

Challenges of Bus Priority – Bus Lane Management

One of the challenges of maintaining a bus priority system is enforcing the function of the dedicated lanes. This is particularly true when the bus lanes share the road with general traffic and the lane is reassigned from general traffic to dedicated bus lane.

The 2017 MWCOG Bus Lane Enforcement study reported five components of bus lane management:


Stakeholder Coordination


Enforcement


Legislation


Education


Monitoring

For more information, see: https://www.mwcog.org/assets/1/28/10062017_-_Item_12_-_DO_NOT_PRINT_-_Bus_Lane_Enforcement_Study_Final_Report.pdf

KEY INFORMATION FROM PEERS ON BENEFITS AND COSTS OF BUS PRIORITY

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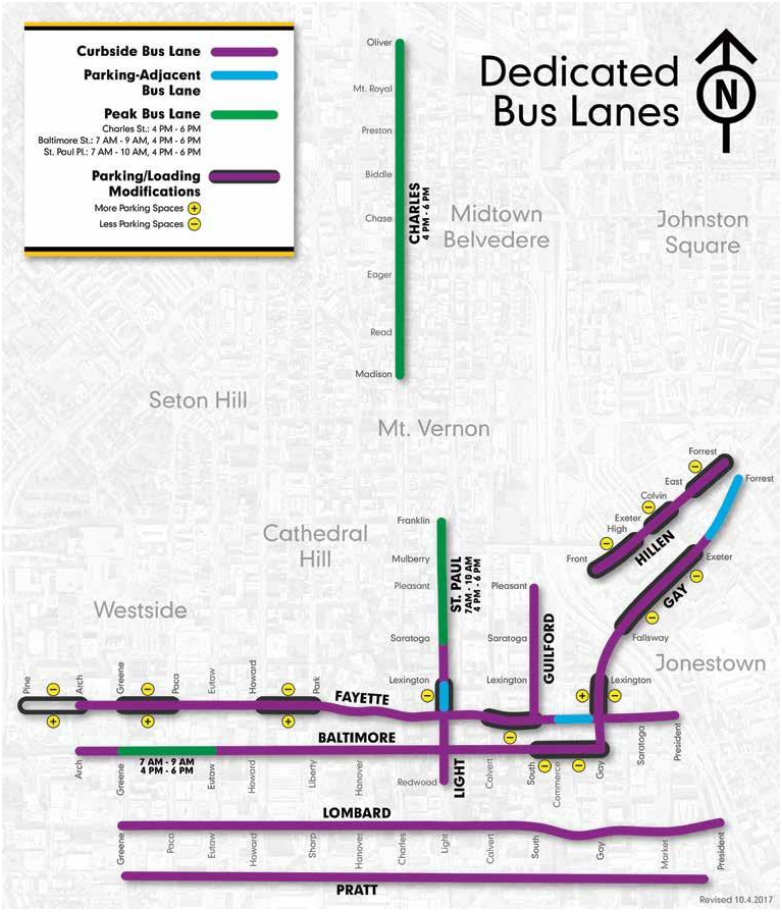
BaltimoreLink Transit Priority Initiative

- 5.5-mile network of dedicated bus lanes in Downtown Baltimore on nine streets
- Implemented in 2017 with BaltimoreLink network redesign
- Resulted in:
  - Average travel time savings of 9.3 percent per corridor
  - Average of less than one-minute increases to general traffic
  - Reduction of bus related safety incidents by 12 percent
- Enforcement issues limited initial effectiveness



Source: Dedicated Bus Lanes Before and After Study, MDOT MTA, February 2019, https://s3.amazonaws.com/mta-website-staging/mta-website-staging/files/System%20Information/DBL_Report_022019.pdf

Photo Source: BaltimoreLink Dedicated Bus Lanes (MDOT MTA, Before and After Study)

Chicago Loop Link

- Loop Link is a network of dedicated bus lanes within Chicago's downtown
- Features include
  - Dedicated lanes
  - Enhanced stations
  - Raised platform boarding
- Intended to improve travel flow on several key corridors
- Has had limited success since implementation due to lack of enforcement
- Loop Link cost over $30 million to implement.

Loop Link Station, (NACTO/Flickr)

Source: Blair Kamin, "Chicago's Loop Link not exactly rapid, but a step in the right direction," *Chicago Tribune*, January 9, 2016. https://www.chicagotribune.com/columns/ct-loop-link-review-kamin-met-0110-20160108-column.html

Minneapolis-St. Paul METRO A Line

- BRT-lite route connects Minneapolis and St-Paul
- Features include:
  - Enhanced stations
  - Transit Signal Priority
  - Off-board fare payment
  - Real-time trip information
- Corridor ridership grew 32 percent in first year of operation
- Average A Line speed is 19.7 miles per hour, compared to 13.4 miles per hour for local bus routes
- Implementation cost about $27 million

Source: METRO A Line Station, (Metro Transit/University of Minnesota Center for Transportation Studies)

Sources: "Metro Transit A Line 2017 Snap Shot," Metro Transit, https://www.metrotransit.org/Data/Sites/1/media/abrt/aline/11-002-01-18_aline_factsheet.pdf
Metropolitan Area Transit Finance Report, Metropolitan Council, October 2018, https://metrocouncil.org/Transportation/Publications-And-Resources/Finance/Metropolitan-Area-Transit-Finance-Report,-2018.aspx
"A Line Project FAQs," Metro Transit, https://www.metrotransit.org/a-line-project-faqs#:~:text=The%20total%20cost%20of%20the,technology%20and%20fare%20collection%20elements&text=%244%20million%20to%20design%20the%20stations%2C%20roadway%20improvements%20and%20technology

New York City Select Bus Service (SBS)

- MTA offers SBS on 16 routes on high ridership corridors.
- SBS routes feature BRT elements
  - Off-board fare payment
  - TSP
  - Consolidated stops
- On average, SBS is 27 percent faster than local/limited routes
- Implementing and operating SBS averages about $10 million per route
- The first four SBS routes improved travel time by an average of 19 percent

Source: Select Bus Services Launch M86 (NYC DOT/Flickr)

Source: Better Bus Action Plan. New York City Department of Transportation. 2019. https://www1.nyc.gov/html/brt/downloads/pdf/better-buses-action-plan-2019.pdf

New York City 14th Street Busway

- The 14th Street Busway bans private vehicles from making through trips on 14th Street between 6:00 A.M. and 10:00 P.M. daily
- Pilot began in October 2019 and was made permanent in June 2020
- Bus travel speeds increased by 24 percent on the corridor
- Ridership increased 30 percent on the corridor
- Shifting local traffic to adjacent roads has had limited impacts on travel speeds

Source: 14th Street Transitway (MTA/Flickr)

Sources: "14th Street Busway," NYC DOT, https://www1.nyc.gov/html/brt/html/routes/14th-street.shtml
"Banning Cars on 14th Street, No Problem," Inrix, https://inrix.com/blog/2019/10/nyc-busway/

Los Angeles Metro Rapid

- Metro Rapid is LA Metro's express bus service
- Operates in mixed traffic with distinctive branding
- TSP led to an estimated 25 percent reduction in bus travel times compared to travel without TSP
- Operating cost savings of $6.67 per bus per hour
  - $66.77 per bus per day
    $24k per bus per year
- Implementing TSP cost $13,500 per signalized intersection

Source: Metro Rapid, Los Angeles (NACTO/ Flickr)

Source: White Paper #2: Strategic Considerations, Bus Transformation Project, 2019, https://bustransformationproject.com/wp-content/uploads/2019/01/White-Paper-2_FINAL.pdf

Portland TriMet TSP Program

- TriMet implemented TSP capabilities at over 250 intersections in Portland
- TSP impacts:
  - Reduced bus travel time by 10 percent
  - Reduced travel time variability by 19 percent
- Improvements saved the agency over $13 million over eight years
- Equipping 250 intersections with TSP costs approximately $4.5 million

Source: Transit Priority Signal (TriMet/Flickr)

Source: White Paper #2: Strategic Considerations, Bus Transformation Project, 2019, https://bustransformationproject.com/wp-content/uploads/2019/01/White-Paper-2_FINAL.pdf

San Francisco MuniForward Transit Priority Projects

- MuniForward is SFMTA's initiative to create a safer, more reliable transit experience
- A transit lane on Church Street eliminated congestion-related delays for buses without significant impacts to drivers
- The red paint treatment reduced transit lane violations by 50 percent compared to non-colored transit-only lanes
- Restriping and repainting the Church Street corridor cost about $280,000 per mile

Source: Muni's Red Carpet (NACTO/Flickr)

Sources: Implementation Workbook, Muni Forward, San Francisco Municipal Transportation Agency, 2015, https://www.sfmta.com/sites/default/files/reports-and-documents/2018/04/muni_forward_implementation_workbook_v16.3_web.pdf
Church Street Transit Lanes Final Report, SFMTA, https://www.sfmta.com/sites/default/files/agendaitems/2015/6-2-15%20Item%2012%20%20Church%20St.%20Rapid%20Pilot%20-%20Final%20Report_1.pdf

Seattle RapidRide

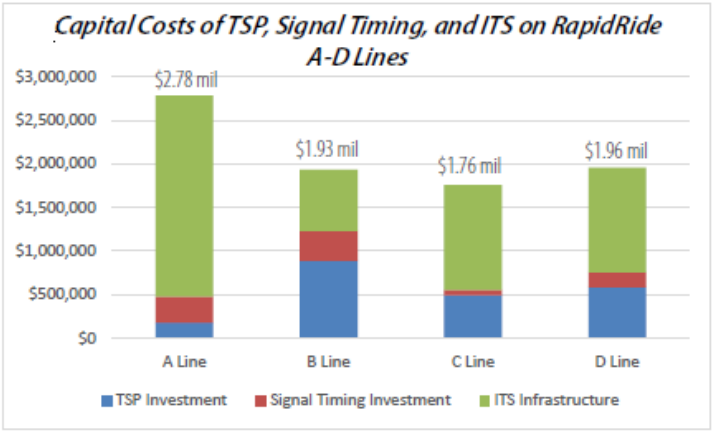
- Seattle RapidRide is King County Metro's BRT-lite network
- RapidRide serves 67,000 riders every weekday, a 70 percent increase compared to the previous service
- Peak hour travel is 20 percent faster than the previous service

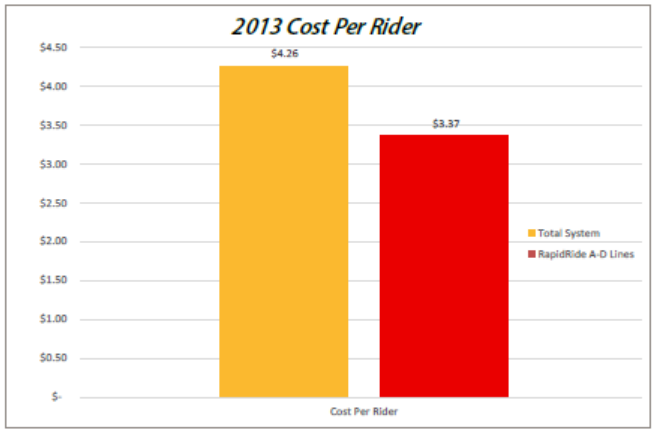
Top: RapidRide Station (SDOT/Flickr)
Bottom: Rapid Ride Station (King County Metro/King County Metro RapidRide Performance Evaluation Report)

Sources: RapidRide Expansion, King County Metro, https://kingcounty.gov/depts/transportation/metro/programs-projects/fares-routes-and-service/rapidride-expansion.aspx; *Transit Master Plan*, City of Seattle Department of Transportation, 2016, https://www.seattle.gov/Documents/Departments/SDOT/TransitProgram/TMPSupplmtALL2-16FINAL.pdf
King County Metro RapidRide Performance Evaluation Report, King County Metro, http://metro.kingcounty.gov/am/reports/2014/rapidride-performance-evaluation-report-2014.pdf

Seattle RapidRide

- RapidRide's cost per passenger was 21 percent less than King County Metro's local service in 2013
- TSP, signal timing, and ITS infrastructure investments combined cost between $1.76 million and $2.78 million per route to implement
- Implementing real-time infrastructure cost $400,000 to $1 million per route
- Investments in off-board fare readers cost between $95,000 to $300,000 per route





Source: Performance Metrics (King County Metro/ King County Metro RapidRide Performance Evaluation Report)

Toronto Viva BRT

- Viva, express bus service, opened in 2005 and construction of dedicated "rapidways" began in 2011
- York transit ridership increased by 26 percent between 2005 and 2013
- Key to Viva's success is its marketing campaign
  - Focus on selling a lifestyle
- The full network of transitways will cost approximately 1.7 billion Canadian dollars ($1.2 billion USD)

Source: Viva BRT Station (Ontario Municipal Housing and Affairs/Flickr)

YRT/Viva Bus Rapid Transit, Metrolinx, http://www.metrolinx.com/en/greaterregion/projects/york-viva-bus-rapid-transit.aspx
Jesse Thomas, "Suburban Toronto's Viva offers lessons for Montgomery BRT," *Greater Greater Washington*, August 27, 2013, https://ggwash.org/view/32171/suburban-torontos-viva-offers-lessons-for-montgomery-brt
YRT/Viva Bus Rapid Transit, Metrolinx, http://www.metrolinx.com/en/greaterregion/projects/york-viva-bus-rapid-transit.aspx

ONGOING AND FUTURE BUS PRIORITY PROJECTS IN THE NCR

Agenda Item 3

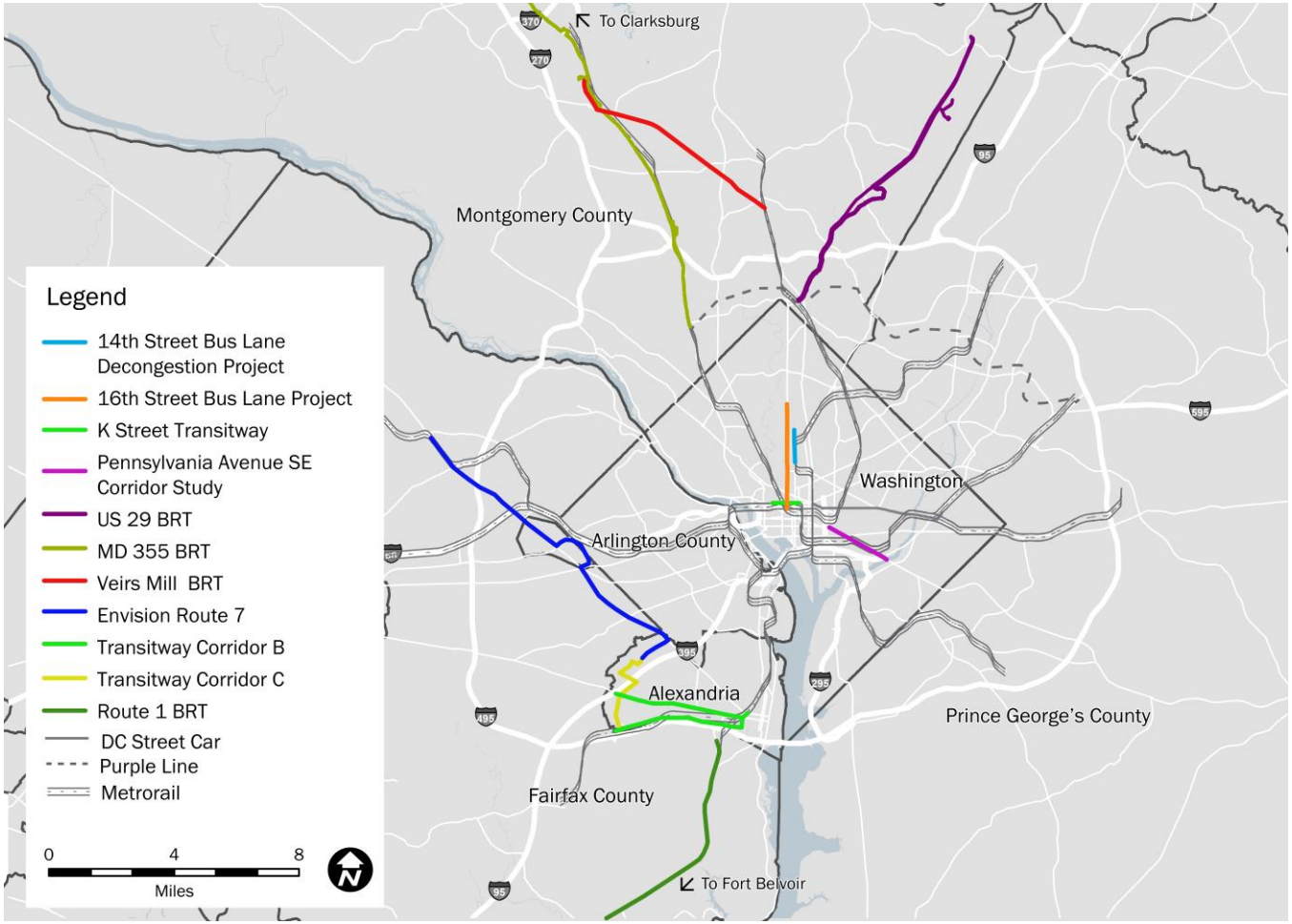
National Capital Region
Transportation Planning Board

The NCR is moving forward in improving bus reliability and efficiency

- The Bus Transformation Project (BTP) laid out strategies and action steps to transform the NCR's bus system to provide fast, frequent, reliable, and affordable bus system
- Numerous projects under construction and in early planning phases are helping push the region towards the BTP's vision

Metroway (BeoyondDC/Flickr)

Near Term and Planned Bus Priority Projects in the Region



Near Term Bus Priority Projects

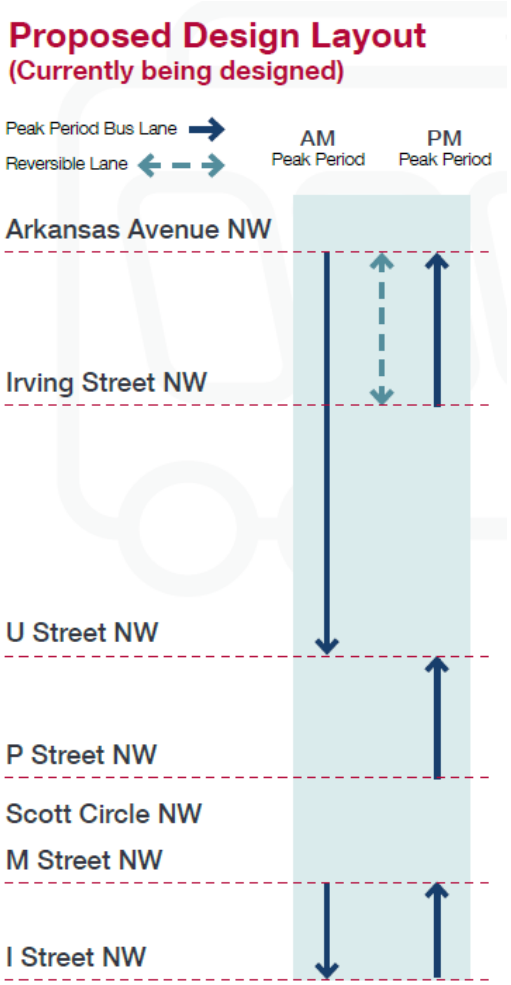
14th Street Bus Lane Decongestion Project

- The project includes:
  - Dedicated bus bike and bus lanes
  - Bus stop consolidation
  - Parking limitations
- Expected to improve performance of the DC Circulator and Metrobus Routes 52, 56, and 59, which combined carry over 15,500 travelers daily
- The demonstration project began construction in Summer 2020 and will be implemented for one year

Source: Sample Section on 14th Street NW (DDOT/https://ddot.dc.gov/node/1444606)

16th Street Bus Lane Project

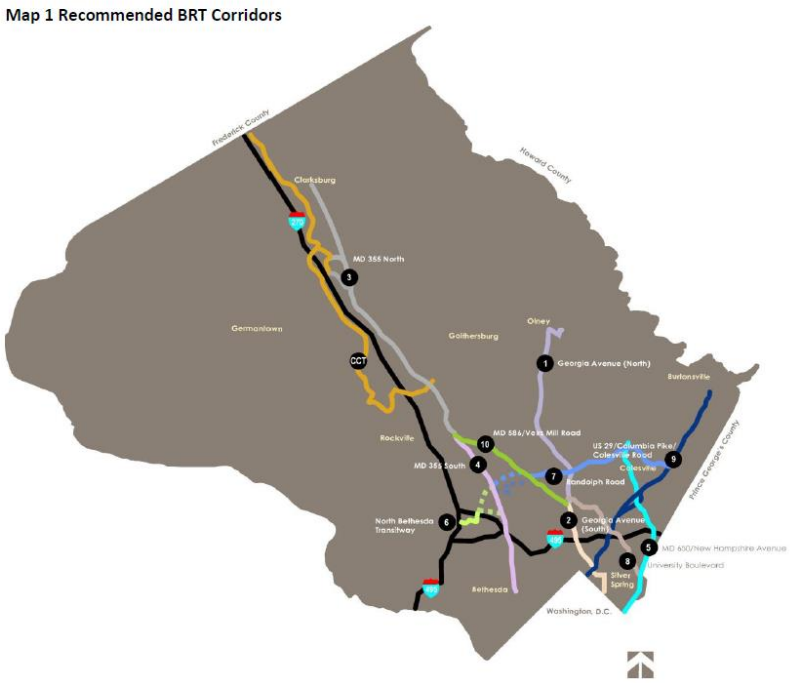
- The 2016 study recommended:
  - Queue jumps
  - All-door boarding
  - Off-board fare payment
  - Bus stop consolidation
  - Dedicated bus lanes
  - Parking limitations
- Improvements expected to reduce travel times in both directions by two to five minutes compared to the existing service
- Construction on the 16th Street corridor is expected to begin in Fall 2020



Source: 16th Street NW Bus Lanes Project, https://www.16thstreetnwbus.com/

Montgomery County Bus Rapid Transit

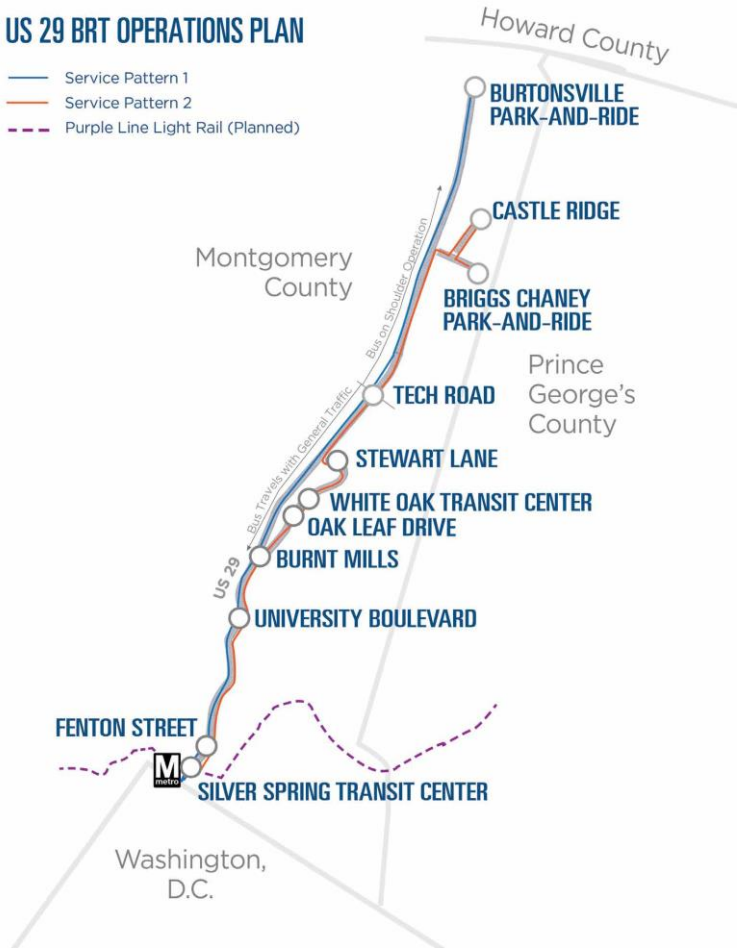
- Montgomery County the *Countywide Transit Corridors Functional Master Plan* recommended 11 BRT corridors
  - Georgia Avenue North (1)
  - Georgia Avenue South (2)
  - MD 355 North (3)
  - MD 355 South (4)
  - New Hampshire Avenue (5)
  - North Bethesda Transitway (6)
  - Randolph Road (7)
  - University Boulevard (8)
  - US 29 (9)
  - Veirs Mill Road (10)
  - Corridor City Transitway (CCT)



Source: Montgomery Planning, *Countywide Transit Corridors Functional Faster Plan*, Montgomery County, MD, https://montgomeryplanning.org/planning/transportation/transit-planning/countywide-transit-corridors-functional-master-plan/

Montgomery County Bus Rapid Transit

- US 29 FLASH is under construction and features:
  - Bus-on-shoulder lanes between Burtonsville and Tech Road
  - TSP installed at 15 intersections
- US 29 FLASH is expected to reduce travel time by 22 to 35 percent on the corridor compared to existing local bus service
- US 29 FLASH is also expected to result in over $250 million of economic net benefit



Source: FLASH, https://www.ridetheflash.com/us29/.
MCDOT US 29 BRT Project Summary, https://www.ridetheflash.com/wp-content/uploads/2018/04/US_29_March2018_Open_Houses_Boards.pdf

Planned Bus Priority Projects

K Street Transitway

- Busway designed to carry at least 13 bus routes with 55 buses per hour per direction during peak periods
- Construction expected to begin in 2022, with the Transitway opening in 2024
- Once complete, travel times on the Transitway are expected to improve by 30 percent compared to existing conditions

21st Street NW to 17th Street NW

Source: K Street Transitway (DDOT/https://ddot.dc.gov/page/k-street-transitway)

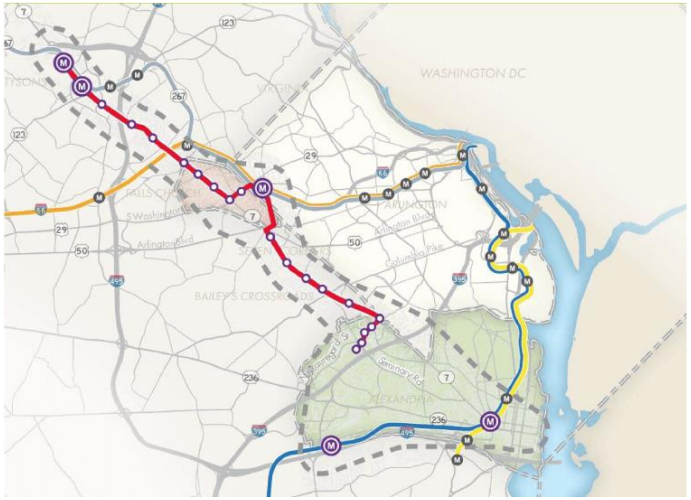
Pennsylvania Avenue Southeast Corridor Study

- Pennsylvania Avenue is a wide boulevard and major thoroughfare
- The 30S Metrobus operates on the Avenue, carrying over 11,000 passengers daily
- Up to 18 buses per hour operate in the AM peak on the corridor, and up to 24 buses operate in the PM Peak
- Bus reliability is poor; the Metrobus Report Card graded the corridor an "F" for scheduled adherence

Source: Pennsylvania Avenue Southeast Corridor Study, https://www.pennavese.com/

Envision Route 7

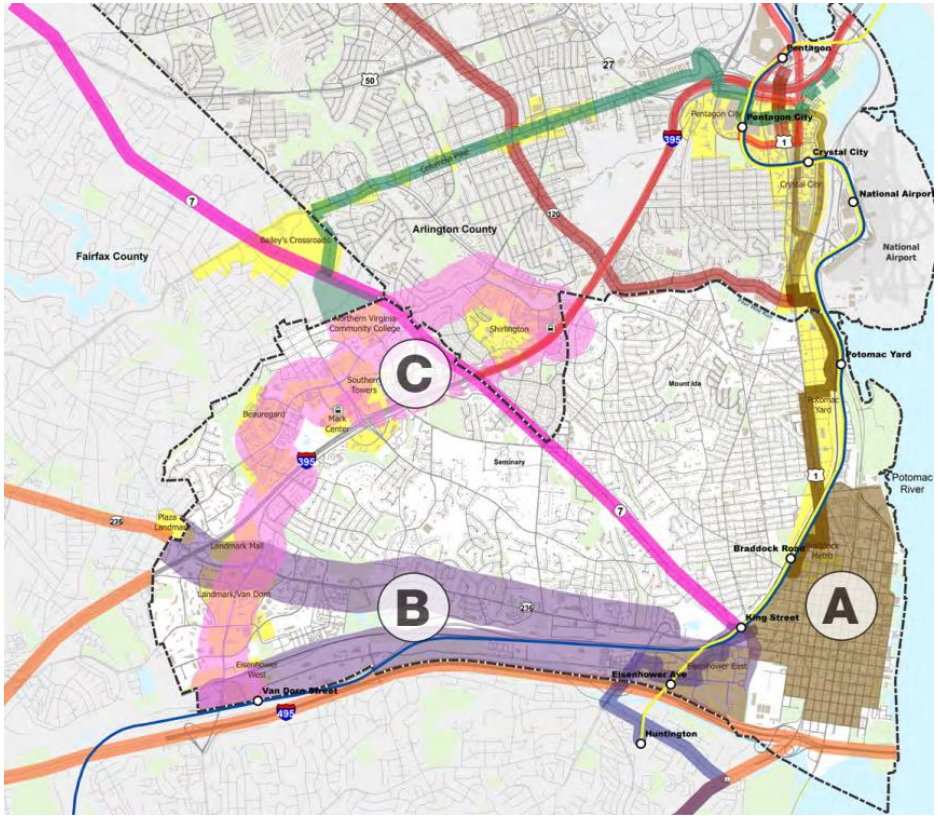
- Envision Route 7 is BRT project that connects the Mark Center in Alexandria to Tysons through Bailey's Crossroads, Seven Corners, and Falls Church
- The initial running way assumptions and station locations are currently being updated and right-of-way prioritization defined
- Future phases will focus on traffic impacts and benefits, and environmental and detailed design efforts



Source: NVTC, Envision Route 7, http://www.novatransit.org/programs/route7/

City of Alexandria Transitway Corridors

- Adding to Metroway, and completing a network of bus priority corridors, the City of Alexandria has planned Corridors B and C
- Corridor B, on Duke Street and Eisenhower Avenue, would connect Alexandria to Fairfax County to the west
- Corridor C, on Van Dorn/Beauregard Street has the potential to tie to Columbia Pike, Fairfax County, and the Pentagon area



Source: City of Alexandria Transitway Corridors Feasibility Study: https://www.alexandriava.gov/uploadedFiles/tes/info/Final_Transitways_Report_2012-10-19_forscreen(2).pdf

Embark Richmond Highway Bus Rapid Transit

- Proposed BRT line on Route 1 between Interstate 495 and Woodbridge
- Route would operate on an exclusive transitway with off-board fare payment and level boarding
- Preliminary studies estimate travel time savings of up to nine minutes on the corridor

Source: "Embark Richmond Highway – Plan Amendment 2015-IV-MV1; Adopted Amendment No. 2017-10 & No. 2017 P-02," Fairfax County, VA, https://www.fairfaxcounty.gov/planning-development/embark-richmond-highway "Richmond Highway Bus Rapid Transit (BRT)", Fairfax County, Virginia, https://www.fairfaxcounty.gov/transportation/richmond-hwy-brt. *Route 1 Multimodal Alternatives Analysis*. Virginia Department of Rail and Public Transportation and Virginia Department of Transportation, http://www.drpt.virginia.gov/media/1591/route-1-final-report-with-appendices-february-2015.pdf.

Additional Slides on TIGER Projects

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