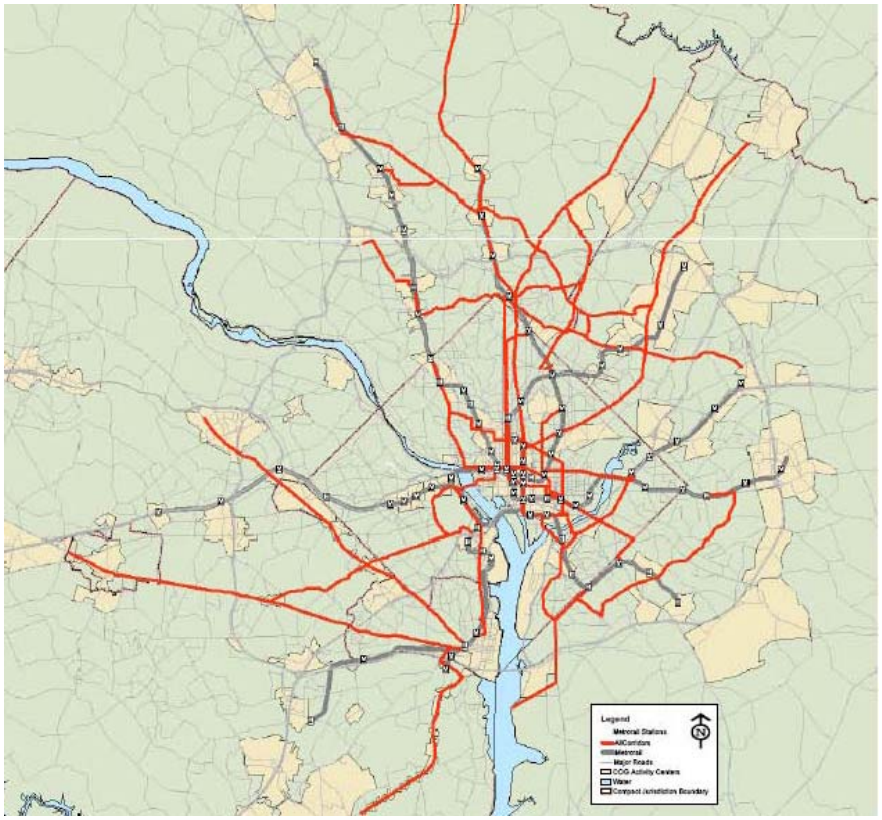
January 29, 2010 **Contract No. 09-049**

An Evaluation of the Metrobus Priority Corridor Networks

Draft Final Report



Submitted to

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Contents

Figures

Tables

Overview of Priority Corridor Network (PCN) Concept

PCN Concept

The Priority Corridor Network (PCN) consists of 23 corridors within the Washington Metropolitan Area Transit Authority (WMATA) compact area having the most heavily used Metrobus routes in the system. Together, the primary Metrobus routes in these corridors carry more than half of Metrobus' daily ridership. These corridors have been designated as candidates for improvements to bus operating conditions and service parameters.

The PCN was developed by WMATA with the participation of the compact area jurisdictions. There are nine corridors that are primarily in the District of Columbia, five corridors that are primarily in Virginia, and nine corridors that are primarily in Maryland. In total, the 23 corridors include approximately 235 miles of roadway that WMATA and its partners have identified as candidates for bus service improvements. These improvements would include high frequency bus service and could include the addition or conversion of a lane to bus-only operations, transit signal priority (TSP), queue jumps, off-board fare collection, and branding. Some improvements have already been implemented in a few of these corridors and have yielded operational benefits for bus service, including along Richmond Highway (US 1) in Virginia and Sixteenth Street in the District. The PCN is illustrated in Figure 1 and details of the corridors are shown in Table 1.

WMATA has three goals for its Priority Corridor Network:

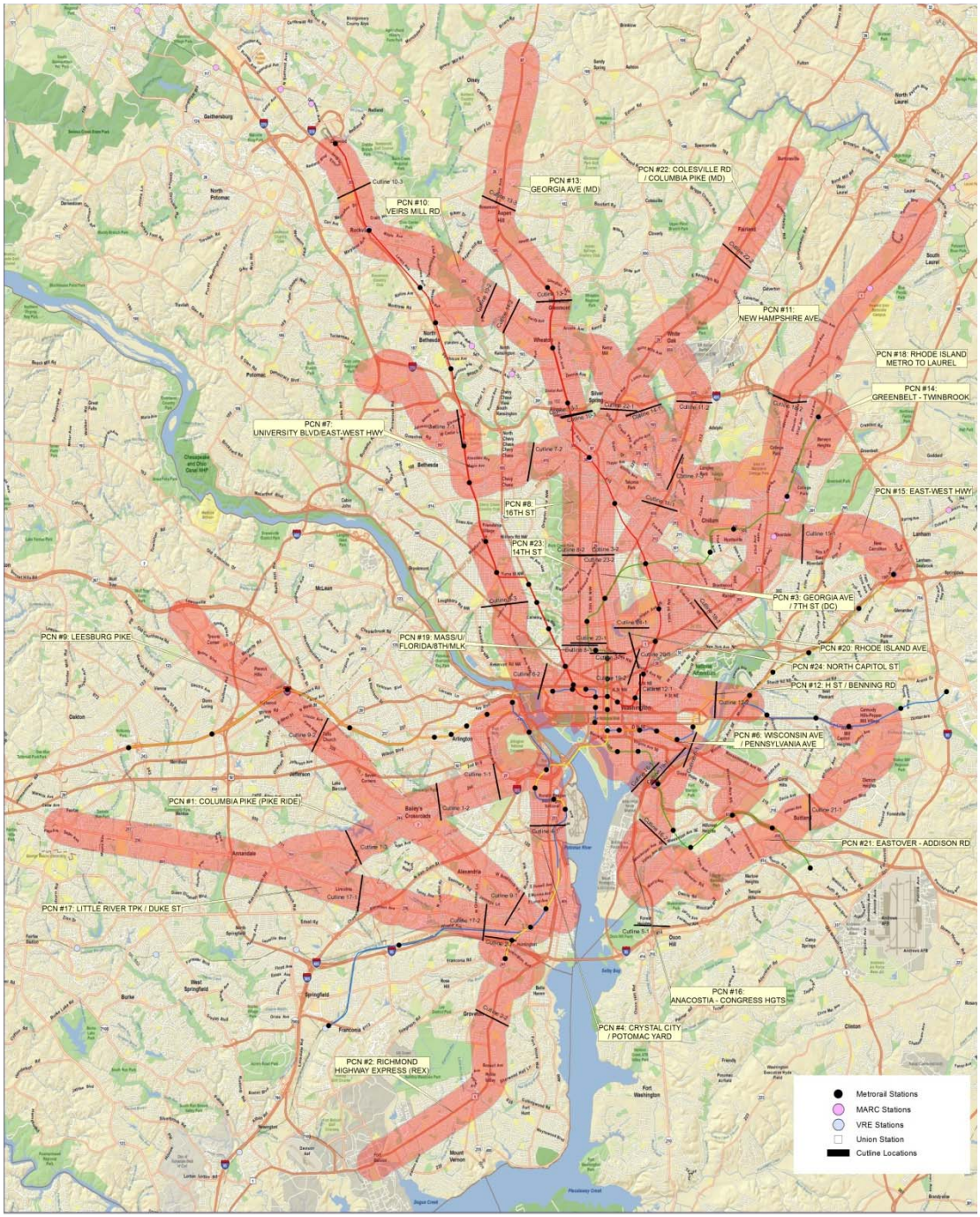
1. Improve competitiveness of bus transit;
2. Support existing and planned land use and economic development; and
3. Improve efficiency of the transportation system.

The PCN Evaluation Project described in this document provides quantitative information about the extent to which the PCN will help WMATA meet the goals envisioned.

Current PCN Status

WMATA has already implemented service improvements along some of the corridors that were analyzed as part of the PCN evaluation. For example, there is existing express service along Columbia Pike (16F) and Richmond Highway (REX) in Virginia, Sixteenth Street (S9) in the District, and University Boulevard/East-West Highway (J4) in Maryland. In addition, express service along Leesburg Pike (28X) in Virginia between Bailey's Crossroads and Tysons Corner began in December 2009.

Figure 1: PCN Corridor Network



While the primary feature of those routes already implemented is limited stop service, the PCN evaluation project, as well as other concurrent planning studies along some of these corridors, looks beyond limited stops to add more features. The studies consider what additional benefits can be gained by adding runningway and operational improvements. These additional improvements beyond express/skip-stop service are critical to the success of the PCN concept. As indicated above, runningway

improvements that were evaluated as part of the PCN project included Transit Signal Priority (TSP), queue jumps, and exclusive lanes. In addition, the PCN evaluation assessed the benefits that would be provided by off-board fare collection, branded service, and improved information.

Table 1: PCN Corridor Listing

Corridor	Corridor Bus Routes*	Corridor Limits	
Columbia Pike (Pike Ride)	16ABDEF*J 16GHKW 16L 16Y	McPherson Square Metro & Pentagon Metro	Columbia Pike & Little River Turnpike
Richmond Highway Express	REX*	Eisenhower Metro	Fort Belvoir
Georgia Ave./7th Street	70 71 79*	P St & Half St SW (S of Navy Yard & Waterfront Metros)	Silver Spring Metro
Crystal City-Potomac Yard	9A 9E 9S	Pentagon Metro	Braddock Rd Metro
Wisconsin Ave./Pennsylvania Ave.	31 32 34 36 37* 39*	Naylor Road Metro Station	Friendship Heights Metro
University Blvd / East-West Highway	J1 J2 J3 J4*	Montgomery Mall Transit Center (Westlake Drive)	College Park Metro
Sixteenth Street (DC)	S1 S2 S4 S9*	McPherson Square Metro	Silver Spring Metro
Leesburg Pike	28AB 28FG 28T 28X*	King St Metro	Tysons West*Park
Veirs Mill Road	Q2	Silver Spring Metro	Shady Grove Metro
New Hampshire Avenue	K6	Fort Totten Metro	White Oak (Columbia Pike & Stewart Lane)
H Street / Benning Road	X2	Minnesota Ave Metro	McPherson Square Metro
Georgia Ave. (MD)	Y5 Y7 Y8 Y9	Silver Spring Metro	Montgomery General Hospital
Greenbelt-Twinbrook	C2 C4	Prince George's Plaza Metro	Twinbrook Metro
East-West Highway (Prince George's)	F4 F6	Silver Spring Metro	New Carrollton Metro
Anacostia-Congress Heights	A2-8, A42-48	L'Enfant Plaza Metro	S Capitol St & Southern Avenue SE
Little River Turnpike/Duke Street	29KN 29CEGHX	King St. Metro	Route 123
Rhode Island Ave. Metro to Laurel	81 82 83 86 87 88 89 89M	Rhode Island Avenue Metro	Cherry Lane (Laurel)
Mass Ave/ U St./ Florida Ave./ 8th St./ MLK Ave.	90 92 93	Anacostia Metro	Woodley Park Metro
Rhode Island Avenue	G8	Shaw Howard University Metro	Eastern Ave & Michigan Avenue NE
Eastover - Addison Road	P12	Southern Avene & Indian	Addison Road Metro

		Head Highway	
Colesville Rd./ Columbia Pike (MD) - US 29	Z2 Z6 Z8 Z9,29 Z11,13	Silver Spring Metro	Columbia Pike & Silver Spring Road
Fourteenth Street	52 53 54	L'Enfant Plaza Metro	Takoma Park Metro
North Capitol Street	80	19th & K (Farragut N & W)	Fort Totten Metro

* Existing express route.

PCN Evaluation Project

To investigate the degree to which the PCN will meet its goals and to continue to implement the PCN, Vanasse Hangen Brustlin, Inc. (VHB) was engaged to lead a team to analyze the potential benefits that could be realized at a network level. While the analysis was conducted by looking at improvements to the PCN on a corridor level, the results are most accurate at a system-wide level. The PCN evaluation project provides an analytic framework with which to evaluate the PCN concept as a whole and provides results that reflect the synergy of implementing an entire network as opposed to just isolated corridors. This evaluation of the regional priority bus network helps establish the regional benefits and impacts and provides recommendations for input to the Metropolitan Washington Council of Governments (MWCOG) Transportation Planning Board's (TPB) Constrained Long-Range Transportation Plan (CLRP).

The purpose of this project was twofold:

- Quantify regional benefits and impacts resulting from implementation of the proposed WMATA Bus Priority Corridor Network (PCN), and
- Identify and prioritize the most effective runningway improvement strategies for implementation along study corridors.

The PCN corridors are those where actions would be taken to provide priority to buses and where improvements to bus priority would yield the most benefits. The improvements evaluated by this study go beyond just exclusive lanes and should be further explored by future studies and, ultimately implemented. The actions include express service, bus priority treatments, TSP, queue jumps, and other improvements such as branding and off-board fare collection.

The PCN Evaluation reviewed two build alternatives, the Service and Operational Improvements Alternative (SOIA) and the Exclusive Lanes Investment Alternative (ELIA). The SOIA is focused on providing limited stop, high-frequency service on the entire priority corridor network. The SOIA does not include runningway improvements other than queue jumps and TSP. The ELIA includes the improvements in the SOIA with the addition of exclusive bus lanes on the portions of the PCN where it could provide the most benefit.

PCN Evaluation Overall Findings

The PCN analysis showed that the PCN concept is an effective way to transport more people through these priority corridors. The analysis indicated that the PCN could provide a significant increase in transit system capacity by providing an alternative to other transit services. This includes local bus service, existing express service and even Metrorail, which is approaching its capacity limit in some locations.

Overall Results of PCN Alternatives

No-Build (CLRP System) Alternative

The No-Build alternative, as defined in the validated model of the 2008 CLRP transportation network, yields a baseline from which to measure how the two alternative build scenarios help meet the objectives for the PCN.

Service and Operational Improvements Alternative (SOIA)

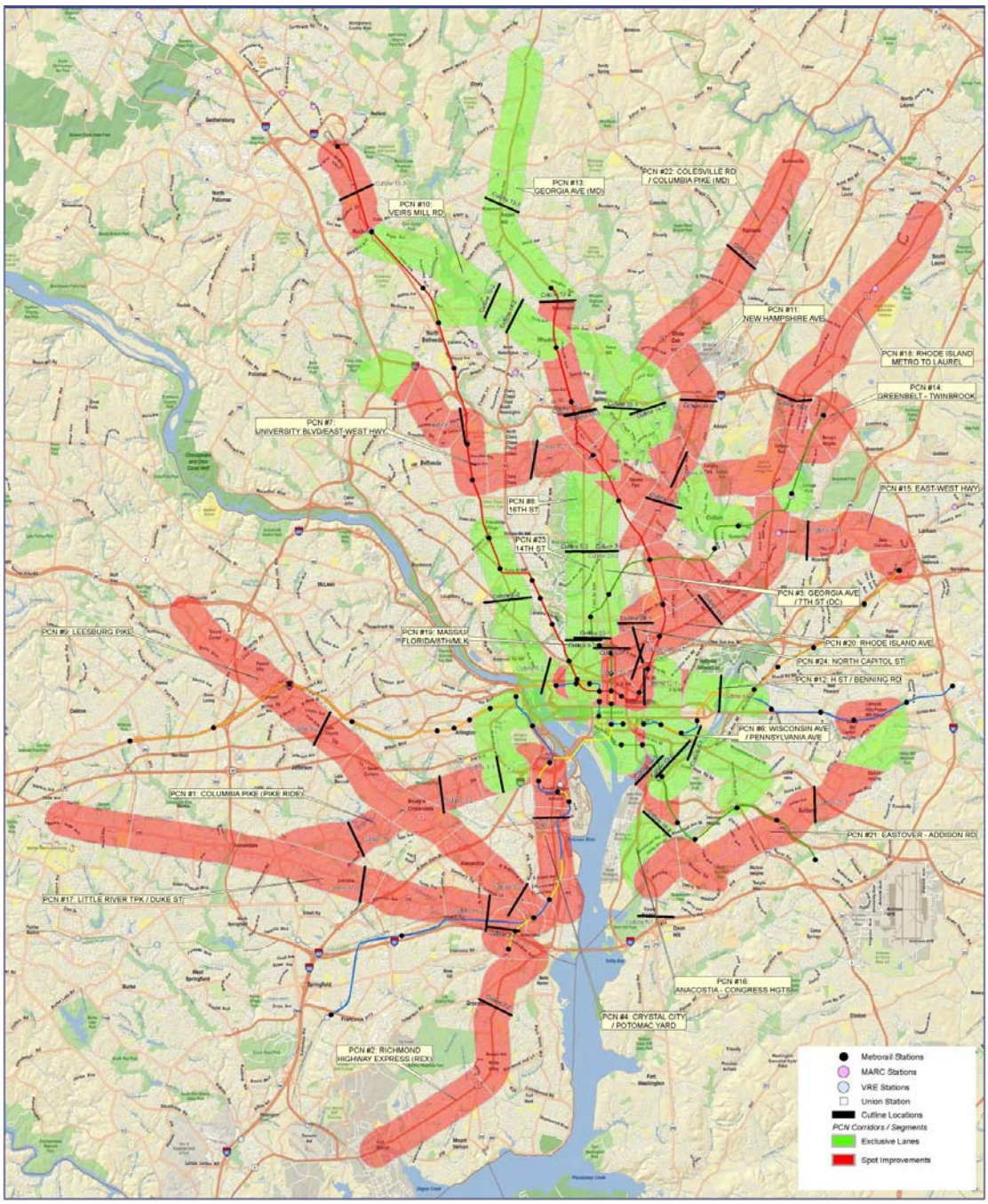
The Service and Operational Improvements Alternative (SOIA) decreases transit travel time, increases accessibility to jobs and households by transit, makes transit times more competitive to the auto in the PCN corridors, and yields a net travel time benefit to both auto and transit travelers in the PCN corridors. However, all of these benefits are to a lesser degree as compared to the Exclusive Lane Improvements Alternative.

Exclusive Lane Improvements Alternative (ELIA)

At a network level, which is the main focus of the PCN Evaluation project, the Exclusive Lane Improvements Alternative (ELIA), with its nearly 84 miles of exclusive bus lanes, contributes substantially to the PCN system performance. The analysis conducted showed that the portions of the network in this alternative that do not have exclusive lanes have achieved speeds comparable to exclusive lanes without the need to dedicate a lane. Figure 2 shows which areas had exclusive lanes and which had simply spot improvements under the ELIA.

It should be noted that in corridors where the 2008 CLRP indicated plans for guideway transit projects, the benefits of overlaying the new PCN service were significantly less because those projects were already being modeled with those projects and, therefore, already are modeled as attracting new riders. This includes the following projects on PCN corridors: Potomac Yard Transitway/Crystal City Potomac Yard Busway, Veirs Mill Road Bus Enhancements, Columbia Pike Transit, and the Purple Line (University Boulevard/East-West Highway Corridor).

Figure 2: Level of Investment for ELIA



Results of Key Measures of Effectiveness in PCN Corridors

Transit Ridership Increases

Both PCN build alternatives show a significant increase in transit ridership over the No-Build alternative. As shown in Table 2 below, PCN corridor ridership would nearly double over the No-Build for the SOIA and more than double over the No-Build for the ELIA. Both alternatives create more than 200,000 additional daily transit boardings. Furthermore, the total number of transit passengers using the PCN corridors increases by more than 20% over the No-Build under both alternatives.

Table 2: Results of PCN Corridor Utilization Measures

Utilization Measure	Current (2009)	2030 NB	2030 SOIA	% chg from 2030 NB	2030 ELIA	% chg from 2030 NB
Express Bus Daily Boardings	166,500	210,800	416,400	98%	478,500	127%
Daily transit passengers in PCN Corridors		480,100	592,600	23%	600,900	25%

Improved Transit Travel Time

Transit users in the PCN corridors would save a significant amount of travel time under either of the alternatives. Passengers of the PCN express routes would save about three to four minutes of travel time per trip under ELIA and about two minutes of travel time per trip under the SOIA and would save wait time due to the increased bus frequency. Finally, the perception of time saving would also increase due to the faster bus speed along the corridors due to fewer stops to drop off and pick up passengers, fewer red signals due to TSP, and, in the case of the Exclusive Lanes Investment Alternative, lower impact of traffic congestion.

Table 3: Results of PCN Corridor Time Measures

Time Measures	2030 NB	2030 SOIA	% chg from 2030 NB	2030 ELIA	% chg from 2030 NB
Daily Average Bus Speed in PCN Corridors	12.4	12.6	2%	14.3	15%
Daily transit passenger-hours in PCN Corridors	326,800	386,800	18%	372,500	14%
Hours per PCN passenger	0.68	0.65	(5%)	0.62	(10%)

Increased Accessibility by Transit

Both PCN alternatives show an increase in the number of jobs and households that are accessible within 45 minutes by transit. The increase in accessibility to households by transit is more pronounced than to jobs, likely because the PCN allows high quality transit service to serve many more residential areas than can be reached by the existing rail network. However, the accessibility to both uses increases, by about 3% to jobs and 75% to households in the AM peak period for the ELIA, and about 0.5% to jobs and 1.5% to households in the AM peak period for the SOIA.

Increased Number of Households and Jobs within ½ Mile of Express Transit Service

The number of households and jobs within a half mile of express transit service is limited by existing transit infrastructure. A half mile, about a ten-minute walk, is typically considered reasonable for a walk to a high-quality transit service. As shown in Implementation of the PCN would add a significant number of express transit stops to the regional network, thereby increasing twofold the number of households and jobs within that distance of express transit.

Table 4: Number of Households and Jobs within ½ Mile of Express Bus Stop

Accessibility Measures	Current (2009)	2030 NB	2030 SOIA	% chg from 2030 NB	2030 ELIA	% chg from 2030 NB
Households within ½ mile of a PCN Bus Stop	212,600	212,600	660,200	211%	660,200	211%
Jobs within ½ mile of a PCN Bus Stop	611,500	611,500	1,612,800	164%	1,612,800	164%

Overall Net Person Travel Time Savings

Table 5 shows that there is an overall net savings in person travel time within the PCN corridors, where increases in auto travel times in some areas are offset by larger decreases in transit travel times in other areas. Figure 3 shows while the ratio of transit time to auto time over the entire PCN system favors transit, results vary along individual corridors. Figure 4 shows the broad geographic distribution of changes in auto times with the PCN: the greatest increases occur in the District of Columbia, and auto times decrease in Virginia compared to the no build.

Table 5: Overall Net Person-Travel Time Savings

	Current (2009)	2030 NB	2030 SOIA	% chg from 2030 NB	2030 ELIA	% chg from 2030 NB
Number of Transit Passengers on Corridors		480,100	592,600	23	600,900	25
Change in Time (minutes)		n/a	(1.8)		(3.6)	
Total Transit Time Change (minutes)		n/a	(1,066,620)		(2,163,240)	
Number of Auto Trips on Corridors		34,496,000	34,639,600	<1	32,258,200	<1
Average Auto Occupancy		1.26	1.26	-	1.26	-
Change in Time (minutes)		n/a	1.18		1.30	
Total Auto Time Change (minutes)		n/a	310,900		1,281,200	
Total Travel Time Change Transit + Auto (mins)		n/a	(0.62)		(2.4)	

Figure 3: Ratio of Transit Time to Auto Time by PCN Corridor (AM Peak)

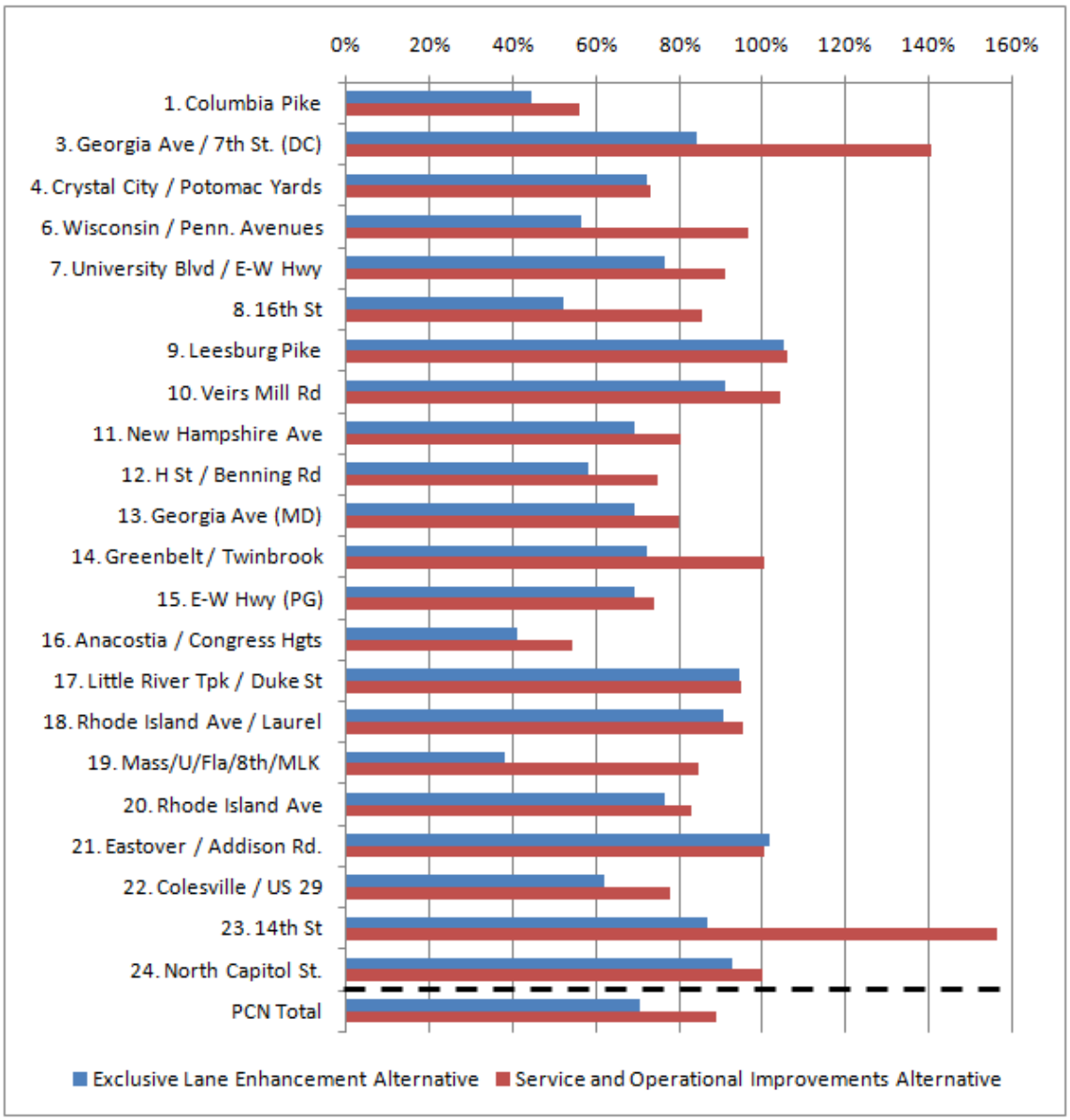
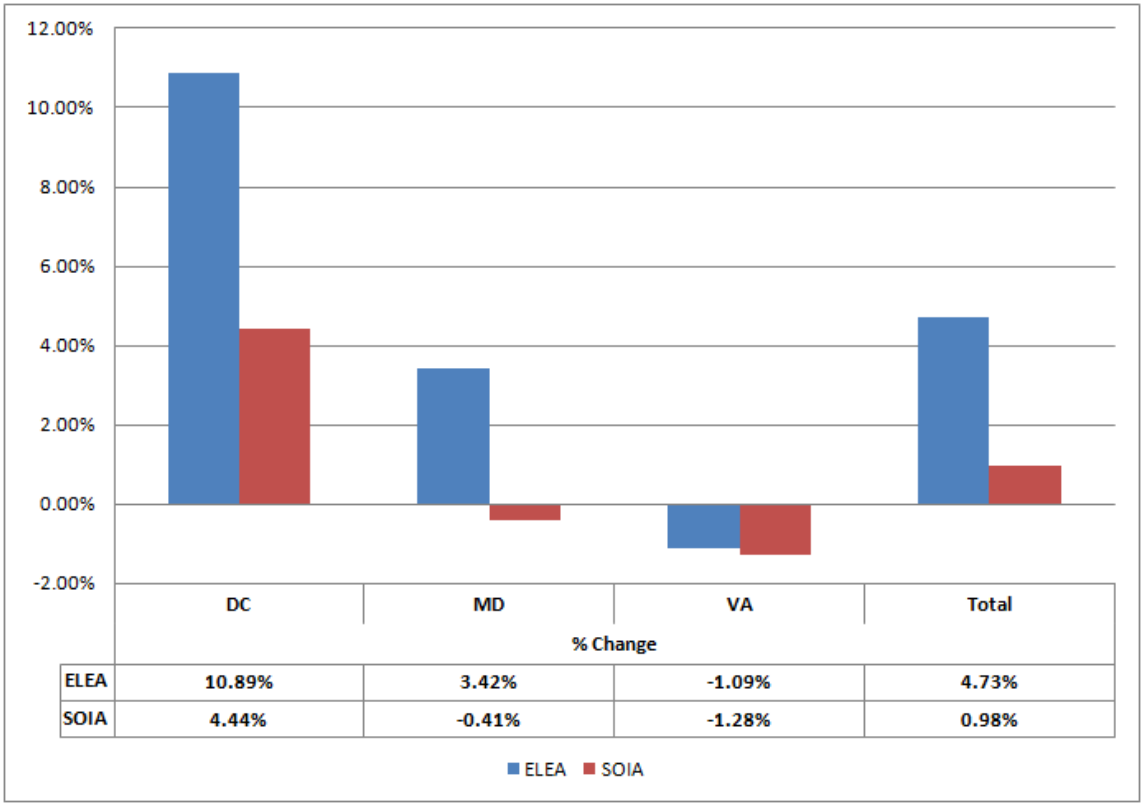


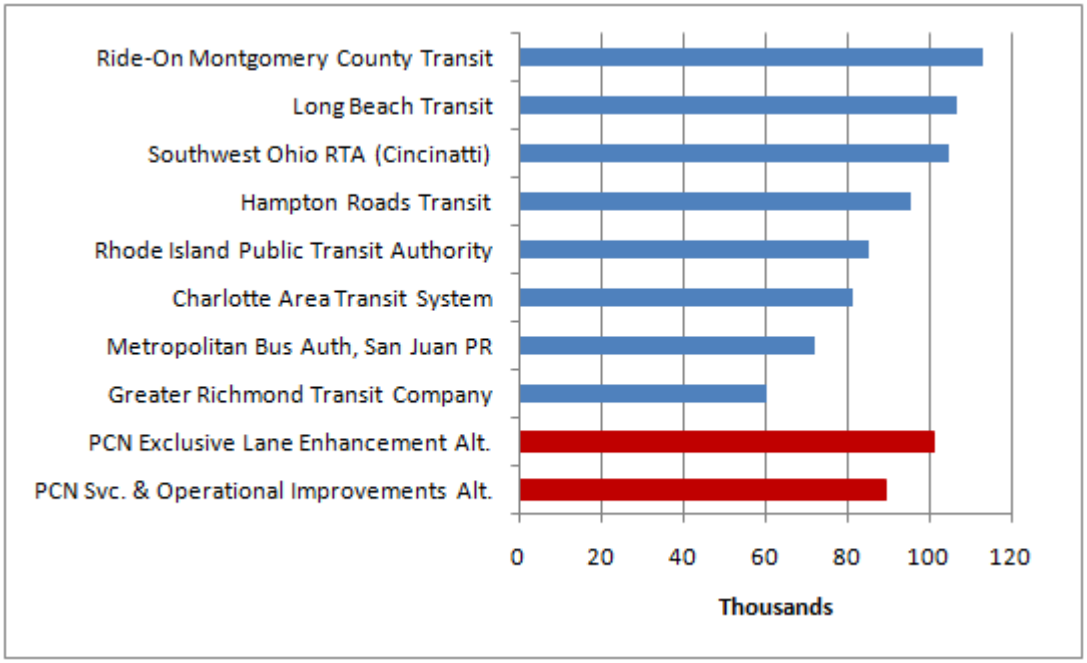
Figure 4: Auto Travel Time Changes from 2030 No Build by Major Jurisdiction (AM Peak)



	DC	MD	VA	Total
	% Change			
ELEA	10.89%	3.42%	-1.09%	4.73%
SOIA	4.44%	-0.41%	-1.28%	0.98%

As shown in Figure 5, the number of boardings from the PCN is an increase over the No-Build alternative roughly equal to the total ridership of some other U.S. transit systems.

Figure 5: Total Daily Transit Boardings[1]



Potential Cost Savings

While detailed cost estimates were not conducted as part of the PCN Evaluation, opportunities exist to decrease local bus services by replacing them with express services, thereby saving the operational costs of the local services.

Auto Travel Benefits

The largest remaining question from this analysis was whether dedicating exclusive lanes for bus operations could be done without negatively impacting auto travel times and speeds. Some impacts were identified from lane takings, but it should be noted that this evaluation did not provide the level of corridor specific analysis necessary to assess potential traffic impacts on a roadway or intersection level. Therefore, the correct conclusion from this evaluation is that dedicating lanes, while significantly beneficial for transit users, was not positive for auto users. Given the substantial transit rider benefits of exclusive lanes, they should be considered on a corridor specific basis. Some exclusive lanes will be possible with little or no traffic impact (e.g. in wide medians or

[1] Total daily transit boardings for other cities based on 2007 National Transit Database data, annual boardings divided by 250. Total daily boardings for the PCN alternatives are the increase above the No-Build for 2030.

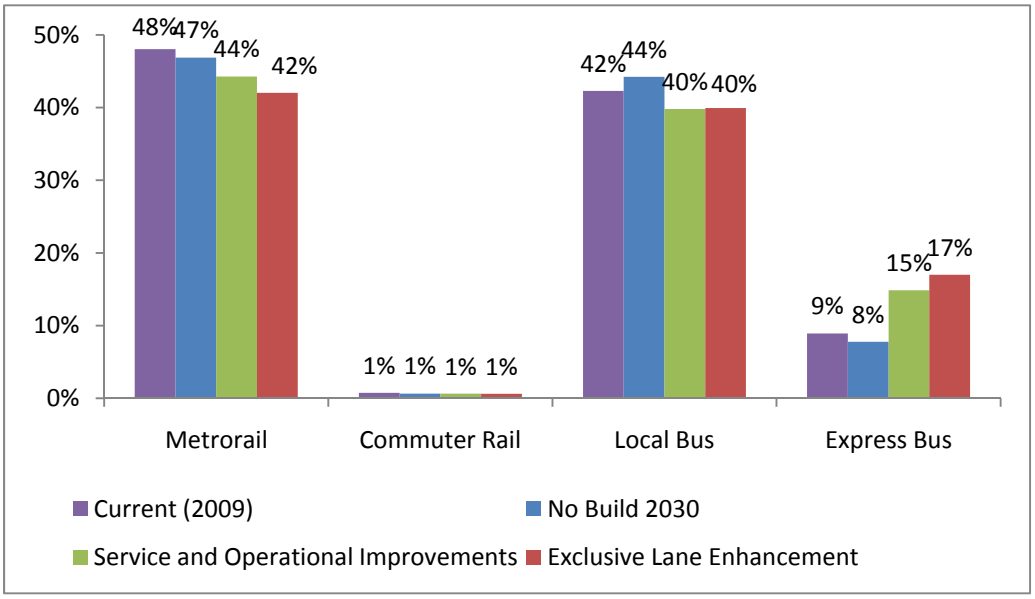
on streets with on-street parking), while others may necessitate roadway adjustments to mitigate congestion effects. Therefore, creating of an exclusive transit lane should be a corridor level decision.

The PCN system should be tailored to fit the needs and characteristics of each corridor, with the level of investment adjusted for the cost and impacts of each PCN measure considered.

PCN Impact on Regional Transit Ridership

Regional transit boardings would increase by 3% in the SOIA and by 4% in the ELIA (see Table A-3). As seen in Figure 6 below, regional transit mode shares would shift from Metrorail to express bus due to the impact of the PCN alternatives.

Figure 6: PCN Regional Transit Mode Share



PCN Relationship with Larger Regional Priority Bus Network

The PCN is a subset of the corridors in the region that have been classified as priority corridors. Many of the jurisdictions in the Washington region have identified additional corridors, or extensions of the WMATA corridors, that are under consideration for priority transit service. The PCN corridors, as indicated earlier, were identified to serve the corridors having the highest ridership Metrobus routes. The PCN designation did not take into account ridership on the local bus systems, levels of traffic congestion, or key auto travel routes-- selection criteria for other priority corridors throughout the region.

For example, in late 2009 the MWCOG Transportation Planning Board submitted an application, on behalf of the region, for funding from the Transportation Investments Generating Economic Recovery (TIGER) grant program administered by the U.S. Department of Transportation (USDOT). That application contained a request for funding for fourteen priority bus corridors throughout the region, as shown in Figure 7. Nine of the corridors in that application are the same as those in the PCN, but it also included five corridors not part of the PCN:

1. Van Dorn to the Pentagon via Shirlington in Virginia
2. US-1 Transitway from King Street to the Pentagon in Virginia
3. Theodore Roosevelt Bridge to K Street NW in the District of Columbia
4. The Fourteenth Street Bridge from I-395 to K Street in the District of Columbia
5. Express bus on freeways, specifically I-66 and I-95/I-395.

The TIGER grant application seeks to implement similar measures to those in the PCN project: exclusive bus lanes, queue jump lanes, TSP, enhanced transit stops, and improved customer information.

Figure 7: Priority Corridors from Regional TIGER Grant Application

Source: Application for Funding from the TIGER Competitive Grant Program Administered by the U.S. Department of Transportation, MWCOG TPB, September 2009

Appendices

A : Detailed PCN Analysis Methodology and Results

PCN Evaluation Project Introduction

In 2008, the Washington Metropolitan Area Transit Authority (WMATA) developed a bus Priority Corridor Network (PCN) plan to improve, over a six-year period, bus service travel times, reliability, capacity, productivity, and system access on 23 corridors in the region. The PCN plan includes 23 routes operating over 235 miles of roadways in the metropolitan Washington, D.C. area. To support this effort, Vanasse Hangen Brustlin, Inc. (VHB) led a team to develop and implement an analytical framework for evaluating the proposed bus improvements and for identifying the corridor segments where runningway improvements will have the greatest benefit. An evaluation of the regional priority bus network will help establish the regional benefits and impacts and provide recommendations for input to the TPB Constrained Long-Range Transportation Plan (CLRP).

This analysis applied an incremental (pivot point) mode choice model in combination with the TPB regional travel demand model to forecast network-level travel impacts of the PCN evaluated the recommended strategies and expected benefits. This project was specifically designed as a network level analysis as opposed to a more detailed, corridor level analysis. Each of the PCN corridors has been or should be analyzed in detail as jurisdictions conduct individual corridor planning studies prior to implementing improvements.

In summary, the PCN analysis showed that the PCN concept is an effective way to transport more people through these priority corridors. The improvements that will be evaluated further, and hopefully implemented, go beyond than just exclusive lanes and include express service, bus priority treatments, transit signal priority (TSP), queue jumps, and other improvements such as branding and off-board fare collection. While the analysis indicated that there are some negative impacts of implementing the PCN, they are small and are negated by the large positive impacts on increased transit ridership and travel time savings for transit riders.

Assumptions

Travel Demand Model Version 2.2

The PCN study used MWCOG's Version 2.2 Travel Demand Model to estimate all modes of travel on the corridors being studied for the various alternatives and scenarios tested. The model was augmented by bus passenger counts and a pivot point model using coefficients relevant to the Washington region and the nature of the PCN strategies being evaluated.

2008 CLRP

The PCN study began in the spring of 2009, at which time the most recently adopted regional long-range transportation plan was the 2008 CLRP. That version of the CLRP was used as the

basis upon which the PCN was evaluated. Figure 4 shows and Table 2 lists the transit projects assumed during the PCN evaluation.

Figure A-1: 2008 CLRP Transit and HOV Improvements[2]

Source: MWCOG

[2] The Purple Line in Maryland was added for the 2009 CLRP but was not included in the PCN analysis, which was based on the 2008 CLRP.

Table A-1 Transit Projects in 2008 CLRP

District of Columbia	Maryland	Virginia
• **Anacostia Streetcar** • **K Street Busway**	• Corridor Cities Transitway • University Blvd Bus Enhancements • Veirs Mill Rd Bus Enhancements	• Crystal City Potomac Yard Busway • Potomac Yard Transitway • Dulles Rail • US-1 Bus Right Turn Lanes • Columbia Pike Streetcar

Source:http://www.mwcog.org/clrp/projects/new/added_2008.asp, http://www.mwcog.org/clrp/projects/transithov.asp, January 2010.

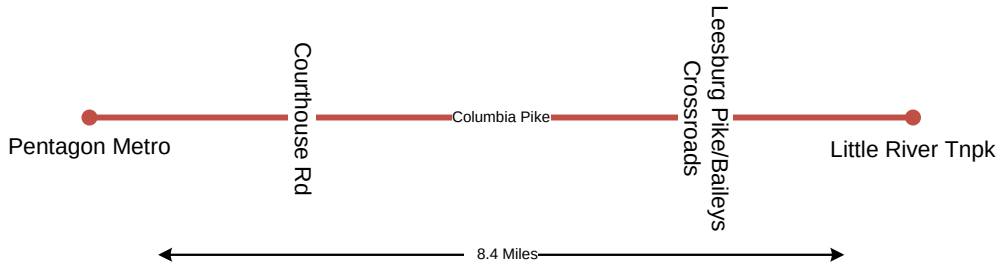
Corridors Analyzed and Modeled

This section provides an overview of each corridor in the PCN, including information on existing express bus service and the status of any other planning efforts that have been completed or are in process on the corridor. Also discussed for each corridor are the following four characteristics:

1. Area type. The area type of the corridor is important to understanding the surrounding land use density and therefore the likely ridership.
2. Roadway functional classification. The roadway functional classification gives an idea of the type of roadways that the buses would be operating on, to gain a better understanding of the types of runningway improvements that might be practical.
3. Miles of the corridor with at least three lanes in each direction. Sections of the corridors with at least three lanes in each direction were considered more viable candidates for bus-only lanes in the alternative that included exclusive bus lanes.
4. Miles of the corridor with median and/or parking lanes. Existing medians and parking lanes along sections of the corridors were considered for possible conversion to exclusive bus lanes in the alternative that included exclusive bus lanes.

More detailed information on each corridor is also provided in Appendix F.

Corridor 1: Columbia Pike (VA-244)



The Columbia Pike PCN corridor is divided into two sections. The main portion has one end at the Pentagon Metrorail Station in Arlington County and the other at Columbia Pike and Little River Turnpike in Annandale, Fairfax County, about four miles west of Bailey's Crossroads. The second portion of the Columbia Pike corridor is an extension into the District of Columbia based on the Metrobus 16Y. This portion of the corridor extends between the McPherson Square Metrorail Station in DC and Courthouse Road and Columbia Pike in Arlington.

The 13.6 mile Columbia Pike corridor is split about evenly between urban and inner-suburban land use densities. Most of the corridor is a major arterial. Only about 20% of the corridor has three lanes in each direction, but the vast majority of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

Pike Ride express and branded service operated by WMATA already operates as the 16 Line for the full length of this PCN corridor. All of the 16 Line buses are branded as Pike Ride, though the 16F route is the only one with limited stops; the remaining routes make local stops. Arlington County, Fairfax County and WMATA recently completed the Columbia Pike Transit Alternatives Analysis, from which a modified streetcar alternative was selected as the locally preferred alternative. Environmental work is now beginning on this corridor with the ultimate goal being to implement a streetcar operating in mixed traffic along with additional express, priority, and local bus routes.

The Pike Ride express service was included in the transit network that was modeled as part of the baseline network for the PCN evaluation. It was replaced by a new "PCN service" overlay on all subsequently modeled alternatives.

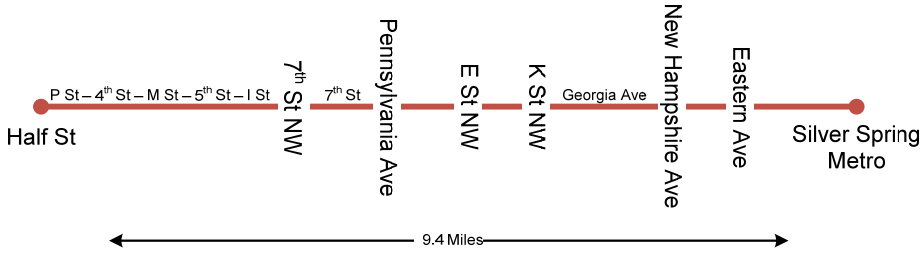
Corridor 2: Richmond Highway (US-1)

The Richmond Highway PCN corridor has one end at the Eisenhower Avenue Metrorail Station in Alexandria and the other at the main gate at Fort Belvoir in southern Fairfax County. Richmond Highway is already served by a priority route, the Richmond Highway Express (REX). REX is a limited stop, branded service that runs from Fort Belvoir to the King Street Metrorail Station, although the PCN analysis only goes as far as the Eisenhower Avenue Metrorail Station. TSP is in place along the corridor to give green signals to buses.

The 9 mile Richmond Highway corridor is split about evenly between inner-suburban and outer-suburban land use densities, with the northernmost mile of the corridor exhibiting urban densities. The entire corridor is a major arterial, which eases the implementation of a certain level of priority service, as has already been done. About 40% of the corridor has three lanes in each direction, plus the entire length of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

The REX service is included in the transit network modeled as part of the baseline network for the PCN evaluation. It was replaced by a new "PCN service" overlay on all subsequently modeled alternatives.

Corridor 3: Georgia Avenue/Seventh Street



The Georgia Avenue/Seventh Street corridor has one end in Southwest Washington, just south of the Navy Yard and Waterfront Metrorail Stations, and extends through downtown DC to the Silver Spring Metrorail Station in Montgomery County. It is served by Metrobus routes 70, 71, and 79, a limited stop route operating weekdays (peak periods and mid-day) on the portion of

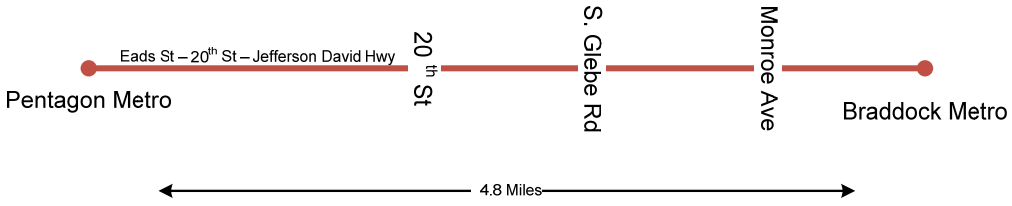
the corridor from Archives Metrorail Station to Silver Spring Metrorail Station. The 79 is branded as the "Georgia Avenue Metro Extra" line.

The 9.4 mile Georgia Avenue/Seventh Street corridor is split roughly 60%/40% between urban and inner-suburban land use densities. The corridor is mostly a major arterial with some parts considered to be collector roads. About half of the corridor has three lanes in each direction, plus the entire length of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

A study commissioned by WMATA in November 2006 addressed continuing challenges on the corridor, including long delays, poor schedule adherence, and insufficient capacity. The study supported continuation of the Route 79, but also recommended runningway improvements to help address some of the issues along the corridor. For example, it suggested bulb-outs at certain stop locations to make boarding easier and safer; removal of curb parking near certain stops; and also the implementation of the necessary equipment to take advantage of the Georgia Avenue signal priority project. Finally, the study advocated for improved bus shelters.

The Georgia Avenue Metro Extra express service is included in the transit network that was modeled as part of the baseline network for the PCN evaluation. It was replaced by a new "PCN service" overlay on all subsequently modeled alternatives.

Corridor 4: Crystal City-Potomac Yard

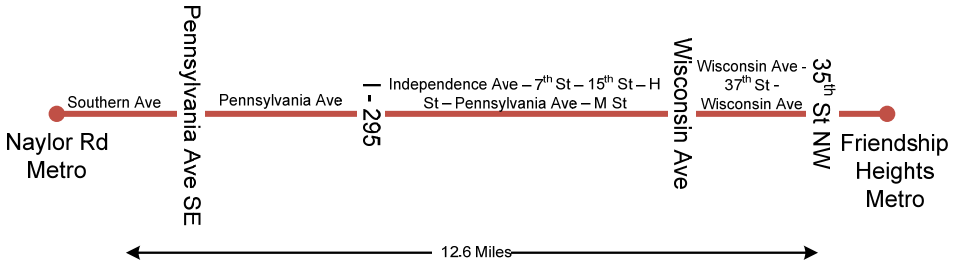


The Crystal City-Potomac Yard corridor lies between the Pentagon Metrorail Station in Arlington County and the Braddock Road Metrorail Station in Alexandria. It mostly follows Jefferson Davis Highway (US-1), and is served primarily by the 9A, 9E, and 9S Metrobus routes.

The 4.8 mile Crystal City-Potomac Yard corridor is mostly surrounded by inner-suburban land use densities, with urban form surrounding the mile of the corridor going southbound from the Pentagon Metrorail station. The corridor is mostly a major arterial with some parts considered to be collector roads. A very small portion of the corridor has three lanes in each direction, but the entire length of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

The transit network that was modeled as part of the PCN evaluation includes a busway in this corridor that does not currently exist, but was modeled to be built by 2013, as specified in the 2008 CLRP.

Corridor 6:[3] Wisconsin Avenue/Pennsylvania Avenue



The Wisconsin Avenue/Pennsylvania Avenue PCN corridor stretches from the Naylor Road Metrorail Station in Prince George's County, through the District of Columbia, to the Friendship Heights Metrorail Station at the northwest border between the District of Columbia and Montgomery County. The primary routes on the corridor are the Metrobus 30s Line (Routes 31, 32, 34, 36, 37, and 39). The 37 and 39, begun in 2008, provide overlapping limited stop peak-period service from Friendship Heights Metrorail Station to Archives Metrorail Station (37) and from the State Department, past Archives Metrorail Station, to Naylor Road Metrorail Station (39).

About 75% of the 12.6 mile Wisconsin Avenue/Pennsylvania Avenue corridor goes through inner-suburban land use densities, with the remaining 25% in a more urban environment. The entire corridor is a major arterial, which eases the implementation of a certain level of priority service, as has already been done. About 8.5 miles of the corridor has three lanes in each direction and the entire length of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

The corridor was the subject of a joint WMATA and District of Columbia Department of Transportation (DDOT) study completed in February 2008. The 37 and 39 limited stop services resulted from that study. In addition, the study recommended two additional local routes along this corridor that have also been implemented. The study also suggested some measures yet to be implemented, including runningway improvements such as additional green time at certain intersections; traffic control officers at certain intersections; and bus-only lanes using curb lanes during the peak period, peak direction in the following locations:

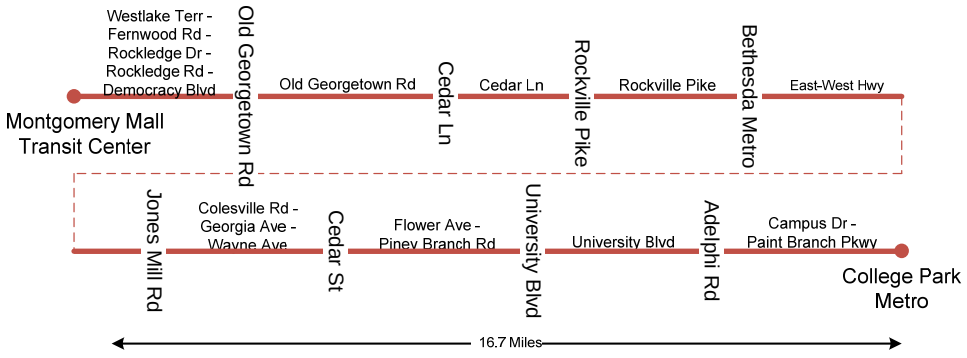
[3] There is no Corridor 5, as it was removed from the analysis and the remaining corridor numbers were retained as-is for simplicity.

- At the Barney Circle eastbound slip ramp;
- Pennsylvania Avenue SE between Branch Avenue SE and Minnesota Avenue SE;
- Pennsylvania Avenue SE between Barney Circle and 2nd Street SE;
- H Street NW and I Street NW between 15th Street NW and 19th Street NW (temporary lanes until the K Street Transitway is constructed); and
- Wisconsin Avenue NW between Calvert Street NW and Western Avenue NW.

Finally, the study recommended enabling multi-door boarding and adding improved bus shelters and providing improved information.

Express service on Routes 37 and 39 were included in the transit network modeled as part of the PCN evaluation.

Corridor 7: University Boulevard/East-West Highway (MD-193/MD-410)



This corridor's west end is the Montgomery Mall Transit Center, extends through Bethesda and its east end is the College Park Metrorail Station in Prince George's County. It is anchored by several major trip generators/employers, including Montgomery Mall, the National Institutes of Health and the National Naval Medical Center in Bethesda, downtown Bethesda, and the University of Maryland's flagship campus in College Park. The corridor is served primarily by Metrobus routes J1, J2, J3 and J4. The J4 serves only selected stops and operates between the Bethesda Metrorail Station and the College Park Metrorail Station.

The entire 16.7 mile University Boulevard/East-West Highway corridor goes through areas with inner-suburban land use densities. The corridor is mostly a major arterial with some parts considered to be collector roads. Almost half of the corridor has three lanes in each direction and most of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

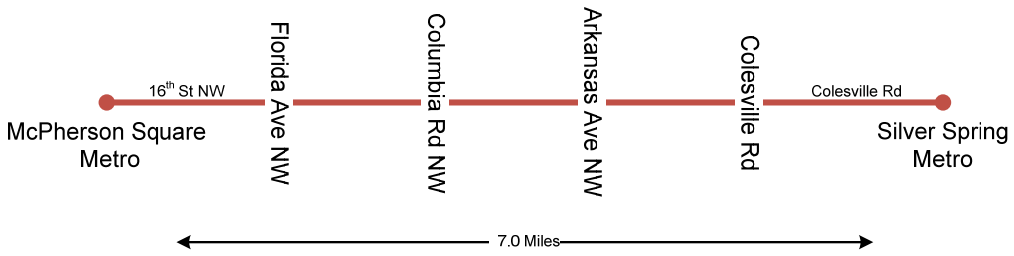
WMATA and the Maryland Transit Administration (MTA) commissioned a study, completed in April 2007, that identified potential improvements along the corridor prior to the implementation of the Purple Line, which will operate on the Bethesda to College Park portion

of the PCN corridor. The study recommended re-branding the J4 as a Metro Extra limited-stop service, increasing the frequency of the route in phases, and reducing the number of stops further. It also recommended some changes to the J1, J2 and J3. The study also recommends runningway improvements, twenty intersections of TSP and five queue jumps or queue bypasses. Finally, the study recommended better public information and bus stop improvements along the entire corridor.

Finally, the study recommended better public information and bus stop improvements along the entire corridor.

The J4 limited stop service and University Boulevard bus improvements were included in the transit network that was modeled as part of the baseline network for the PCN evaluation. They were replaced by a new "PCN service" overlay on all subsequently modeled alternatives

Corridor 8: Sixteenth Street (DC)



The Sixteenth Street PCN corridor runs between the McPherson Square Metrorail Station in the District of Columbia and the Silver Spring Metrorail Station in Montgomery County, operating primarily on 16th Street NW. It is served by the S1, S2, S4 and S9 buses. Metrobus S9, begun in March 2009, provides express service along the full length of this corridor, providing frequent, limited stop service during weekday peak periods.

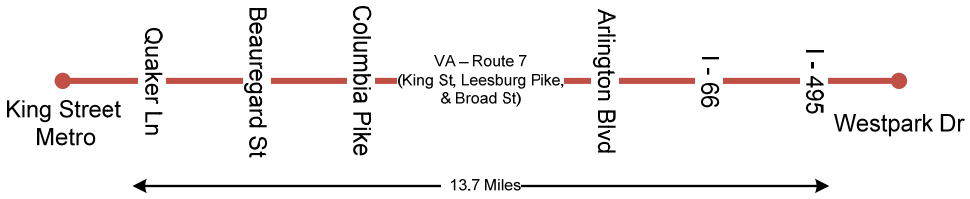
The 7 mile Sixteenth Street corridor is split about evenly between urban and inner-suburban land use densities. The entire corridor is a major arterial. The vast majority of the corridor has three lanes in each direction and contains medians and/or parking lanes that could potentially be used as bus lanes.

This corridor comprised a portion of the subject of a joint WMATA/DDOT study completed in February 2009. That study recommended retaining a high-frequency "trunk" service along 16th Street NW, but also adding new service types and retaining some all-stops local service. The study recommended expanding the S9 service into the midday and evening, as well as implementing a short–turn service to provide more peak period service to the busiest part of the

corridor, from Federal Triangle[4] to 16th Street and Colorado Avenue NW. It also suggested runningway improvements to the corridor, including the conversion of a parking lane into a bus-only lane (between Irving Street and Spring Road NW), addition of TSP or a fully coordinated signal system (between U Street NW and Alaska Avenue NW), and queue jumps at the intersections with U Street NW and Colesville Road. Finally, the study recommended enabling multi-door boarding as well as adding branding and easier to understand passenger information.

The S9 express service is included in the transit network modeled as part of the baseline transit network for the PCN evaluation. It was replaced by a new "PCN service" overlay on all subsequently modeled alternatives.

Corridor 9: Leesburg Pike (VA-7)



The King Street Metrorail Station in Alexandria defines one end of this PCN corridor and the Tysons West*Park transit station in Tysons Corner, Fairfax County, defines the other. The corridor is primarily served by the Metrobus 28 line, including the 28AB, 28FG, and 28T. As of December 2009, a limited stop overlay service, the 28X, will operate between Bailey's Crossroads and Tysons Corner.

The 13.7 mile Leesburg Pike corridor is split about 40%/60% between urban and inner-suburban land use densities. The entire corridor is a major arterial. About four miles of the corridor have three lanes in each direction, but the entire corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

The Leesburg Pike corridor is the subject of a study conducted by WMATA that was completed in the fall of 2009. In addition to some stopgap measures to make minor improvements, the study recommended the 28X service (that would eventually go all the way to King Street) as well as implementing intersection improvements and bus lanes in the longer term. Intersection improvements specifically recommended include six queue jumps and consideration of TSP,

[4] Note that the portion of the corridor from Federal Triangle to McPherson Square that was part of the WMATA/DDOT study is not part of the corridor as defined by the PCN.

given the fifty traffic signals along the corridor. Finally, the study recommends branding the express service and making bus stop improvements.

The 28X limited stop service was not included in the transit network that was modeled as part of the PCN evaluation.

Corridor 10: Veirs Mill Road (MD-586)

The Veirs Mill Road corridor runs between the Silver Spring Metrorail Station in southeastern Montgomery County and the Shady Grove Metrorail Station in the northwestern part of the County, passing the Forest Glen, Wheaton, and Rockville Metrorail Stations in between. The corridor is primarily served by the Metrobus Q2.

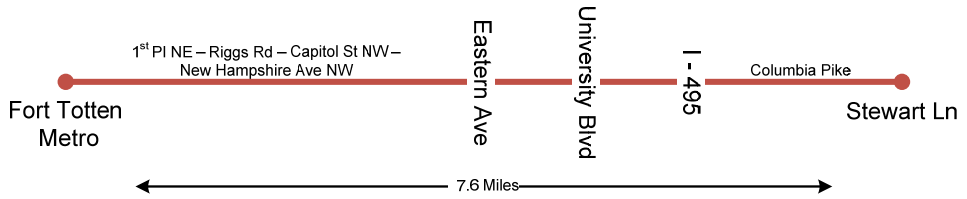
The 12.1 mile Veirs Mill Road corridor runs almost exclusively through inner-suburban land use densities. The entire corridor is a major arterial. About 60% of the corridor has three lanes in each direction, but the entire corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

The Montgomery County Department of Transportation (MCDOT) and WMATA completed a joint study of this corridor in July 2009. The study recommendations have been followed, including implementing in phases a limited stop bus service starting in December 2009. In the first phase, the Q2 route was split into two new overlapping north-south routes, Q4 and Q6, during the day (the full-length Q2 will continue to operate in the evenings). Two additional routes, Q1 from Shady Grove to Silver Spring and Q5 from Shady Grove to Wheaton, designed to bypass Montgomery College were also added.

Pending approval by the WMATA Board, the second phase of improvements will commence in 2010. These improvements include the introduction of a limited stop "Metro Extra" branded bus line, provisionally labeled the Q9. This line will operate between Shady Grove and Wheaton during weekday peak periods in both directions, with headways of 12 minutes. Included among the operational improvements recommended for the corridor are signal prioritization, queue jump lanes at major intersections, and the implementation of "NextBus" style electronic information displays at major bus stops along the route.

Veirs Mill road bus enhancements were included in the transit network modeled as part of the baseline transit network for the PCN evaluation. It was replaced by a new "PCN service" overlay on all subsequently modeled alternatives.

Corridor 11: New Hampshire Avenue (MD-650)

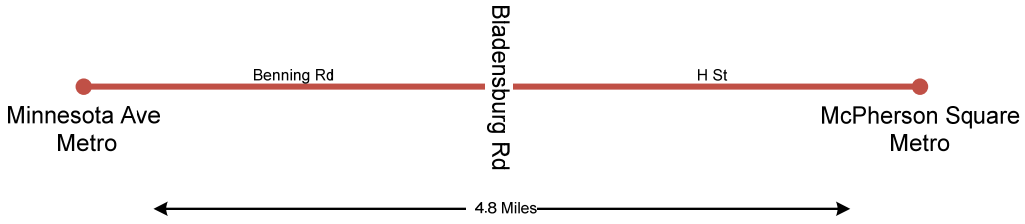


The New Hampshire Avenue corridor runs between the Fort Totten Metrorail Station in Northeast Washington and White Oak in northeastern Montgomery County. White Oak is the location of a new consolidated campus for the U.S. Food and Drug Administration (FDA). The Metrobus K6 is the primary bus route on this corridor.

About 70% of the 7.6 mile New Hampshire Avenue corridor runs through areas with inner-suburban land use densities, while the remainder goes through areas that have more outer-suburban form. The entire corridor is a major arterial. 6.2 miles of the corridor has three lanes in each direction and also contains medians and/or parking lanes that could potentially be used as bus lanes.

No existing express or limited stop service on New Hampshire Avenue was included in the transit network modeled as part of the PCN evaluation.

Corridor 12: H Street/Benning Road



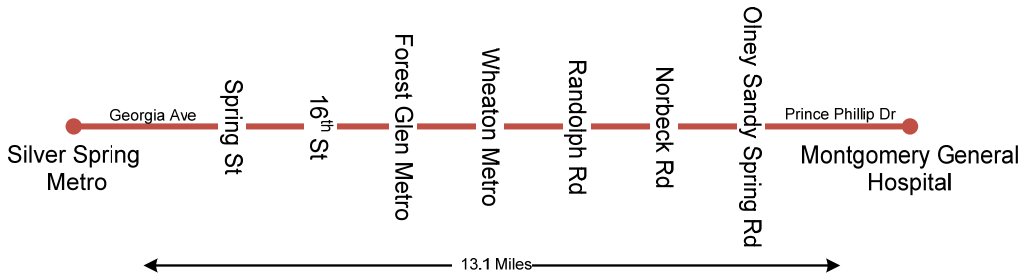
The H Street/Benning Road corridor stretches between the Minnesota Avenue Metrorail Station and the McPherson Square Metrorail Station. It is served primarily by the X2 bus.

The 4.8 mile H Street/Benning Road corridor is split roughly 60/40 between areas of urban and inner-suburban land use densities. The corridor is mostly a major arterial, but also operates on

some minor arterials. The entire corridor has three lanes in each direction and also contains medians and/or parking lanes that could potentially be used as bus lanes.

While DDOT plans to implement streetcar on this corridor, the transit network modeled as part of the PCN evaluation did not include this improvement, as it was not part of the 2008 CLRP.

Corridor 13: Georgia Avenue (MD-97)



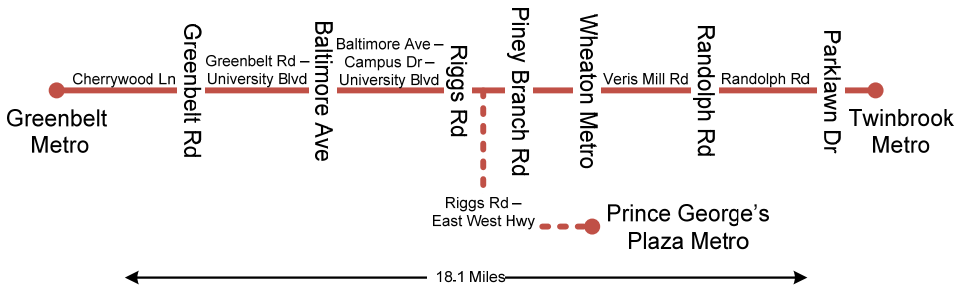
The Georgia Avenue corridor in Maryland lies between the Silver Spring Metrorail Station and Montgomery General Hospital in Olney, passing the Forest Glen, Wheaton, and Glenmont Metrorail Stations in between. It is primarily served by the Y5, Y7, Y8 and Y9 Metrobus routes. The portion of the corridor from Norbeck Road north (about three miles) contains a wide grassy median that Montgomery County has set aside as a future busway.

The 13.1 mile Georgia Avenue corridor has a brief urban section near the Silver Spring Metrorail station, but then travels through about four miles of inner-suburban land use density followed by eight miles of outer-suburban form. The entire corridor is a major arterial. About 70% of the corridor has three lanes in each direction, and most of the corridor also contains medians and/or parking lanes that could potentially be used as bus lanes, including the median set aside by the county for a future busway.

A 1999 Montgomery County Planning Department study recommended a Georgia Avenue median busway to connect Olney and the Glenmont Metrorail Station. The report recommended that the busway be bi-directional and accommodate both local and express service buses. A follow-up 2002 WMATA study on the potential Georgia Avenue Busway recommended it be an express service route with just five stops: the Olney Town Center, the Norbeck Park and Ride, Connecticut Avenue, and the Glenmont Metrorail Station. Although the Georgia Avenue Busway is ranked second in the Montgomery County Council's ten-year transportation program, no further planning or studies have since been undertaken.

No express bus service on Georgia Avenue in Maryland was modeled as part of the baseline bus network for the PCN evaluation.

Corridor 14: Greenbelt-Twinbrook



The Greenbelt-Twinbrook corridor is between the Greenbelt Metrorail Station in Prince George's County and the Twinbrook Metrorail Station in Montgomery County, passing the Prince George's Plaza and Wheaton Metrorail Stations. The corridor mainly follows University Boulevard (MD-193), Veirs Mill Road (MD-586) and Randolph Road, and is primarily served by the C2 and C4 Metrobus Routes.

The entire 18.1 mile Greenbelt-Twinbrook corridor runs through areas of inner-suburban land use density. The corridor is mostly a major arterial with some parts considered to be collector roads. About half of the corridor has three lanes in each direction, and about 60% contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled as part of the baseline bus network for the PCN evaluation.

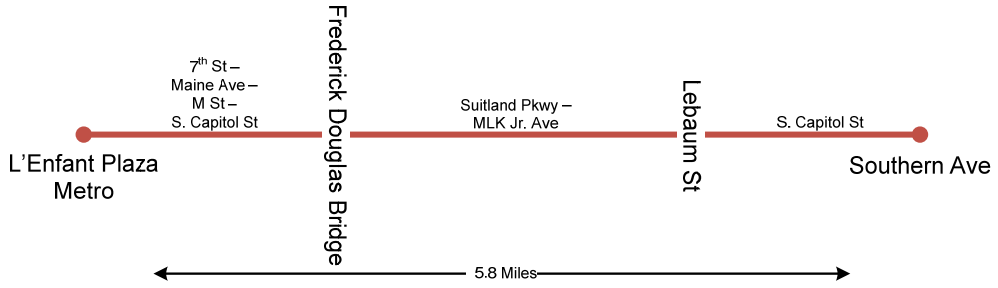
Corridor 15: East-West Highway, Prince George's (MD-410)

The East-West Highway corridor has one end at the Silver Spring Metrorail Station and the other at the New Carrollton Metrorail Station, passing the Prince George's Plaza Metrorail Station. Bus service is primarily provided by the F4 and F6 Metrobus routes.

The entire 10.6 mile East-West Highway corridor runs through areas of inner-suburban land use density. The corridor is mostly a major arterial with some parts considered to be collector roads. No parts of the corridor have three lanes in each direction, but about 70% contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on East-West Highway as part of the baseline bus network for the PCN evaluation.

Corridor 16: Anacostia-Congress Heights



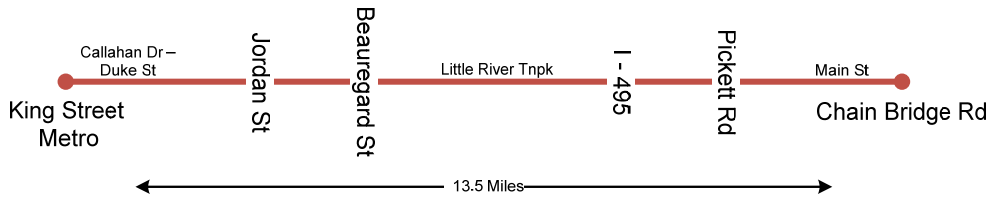
The Anacostia-Congress Heights corridor is between the L'Enfant Plaza Metrorail Station and the intersection South Capitol Street and Southern Avenue SE. The corridor also serves the Waterfront, Navy Yard, and Anacostia Metro stations. The corridor runs mainly along 7th Street SW, M Street SE, Martin Luther King Jr. Avenue SE, and South Capitol Street SE. Bus service on the corridor is provided by a number of Metrobus routes, specifically A2-8 and A42-48.

The entire 5.8 mile Anacostia-Congress Heights corridor runs through areas of urban land use density. The whole corridor is on a major arterial. The entire length of the corridor has three lanes in each direction and also contains medians and/or parking lanes that could potentially be used as bus lanes.

The DC Streetcar Anacostia Line will provide additional transit service to this corridor in the near future. As a part of Phase 1 of the DC Streetcar project, the Anacostia Line is currently under construction and projected to be operational in 2012. It will connect the Anacostia Metrorail Station with the Navy Annex and Bolling Air Force Base via South Capitol Street. A second streetcar line originating at the Anacostia Metrorail Station will travel down 8th Street SE, Martin Luther King Jr. Avenue SE, K Street SE, and H Street SE, overlapping on Martin Luther King Jr. Avenue with Metrobus routes A2-8 and A42-48. Phases 2 and 3 of the DC Streetcar system implementation are expected to add two additional streetcar lines in this corridor.

The DC Streetcar service was included in the baseline model, so a portion of this PCN corridor had streetcar service modeled in the baseline network.

Corridor 17: Little River Turnpike/Duke Street (VA-236)

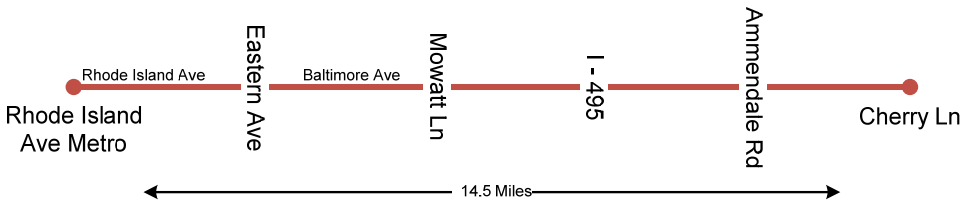


King Street Metrorail Station in Alexandria and Route 123 in the City of Fairfax bound this PCN corridor. It is served by the WMATA 29 Line.

The 13.5 mile Little River Turnpike/Duke Street corridor is split relatively evenly between areas of inner-suburban and outer-suburban land use density. The whole corridor is on a major arterial. Less than one third of the length of the corridor has three lanes in each direction, but the entire corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on Little River Turnpike/Duke Street as part of the baseline bus network for the PCN evaluation.

Corridor 18: Rhode Island Avenue Metro to Laurel (US-1)

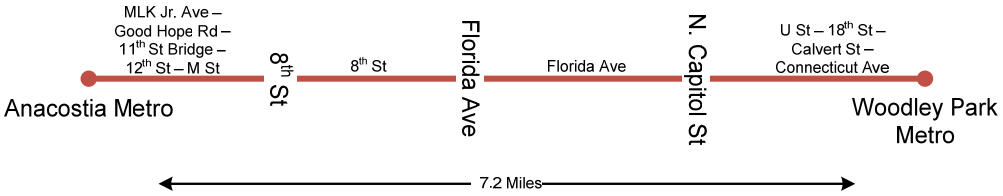


The Rhode Island Avenue-Brentwood Metrorail Station in Washington defines one end of this corridor and Laurel the other. The corridor extends along Rhode Island Avenue, Baltimore Avenue and Ammendale Road. It is served by the Metrobus 80s Line (Routes 81-89).

The 14.5 mile Rhode Island Avenue Metro to Laurel corridor is split 15%/65%/20% between urban, inner-suburban, and outer-suburban land use densities, making it a very diverse corridor from that perspective. The whole corridor is on a major arterial. Only two miles of the corridor have three lanes in each direction, but about 60% of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on this corridor as part of the baseline bus network for the PCN evaluation.

Corridor 19: Mass Avenue/ U Street/ Florida Avenue/ 8th St./ MLK Avenue

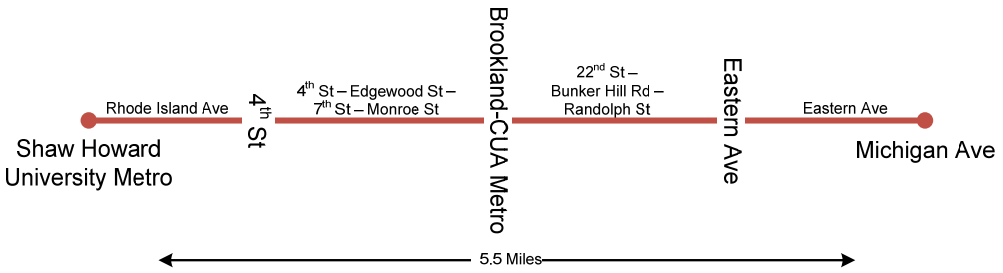


This corridor is between the Anacostia Metrorail Station and the Woodley Park Metrorail Station, with stops at the Eastern Market, New York Avenue-Florida Avenue-Gallaudet University, and U Street/African American Civil War Memorial/Cardozo Metrorail Stations. It is served by Metrobus routes 90, 92 and 93.

About 80% of the 7.2 mile Mass Ave/ U St./ Florida Ave./ 8th St./ MLK Ave. corridor goes through inner-suburban type land use densities, with the remainder in more urban land use. The corridor consists of roadways that are a mix of freeways, major arterials and collectors. Five miles of the corridor have three lanes in each direction, and six miles of the corridor contain medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on this corridor as part of the baseline bus network for the PCN evaluation.

Corridor 20: Rhode Island Avenue (US-29/US-1)



This corridor is entirely within the District of Columbia and spans Rhode Island Avenue from the Shaw-Howard University Metrorail Station to Eastern Avenue and Michigan Avenue, passing the Brookland and Rhode Island Avenue Metrorail Stations.

About 70% of the 5.5 mile Rhode Island Avenue corridor goes through inner-suburban type land use densities, with the remainder in more urban land use. The corridor consists of roadways that are mainly minor arterials, with some collectors and some major arterials. About 30% of the corridor has three lanes in each direction, and a little more than half of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on the Rhode Island Avenue corridor as part of the baseline bus network for the PCN evaluation.

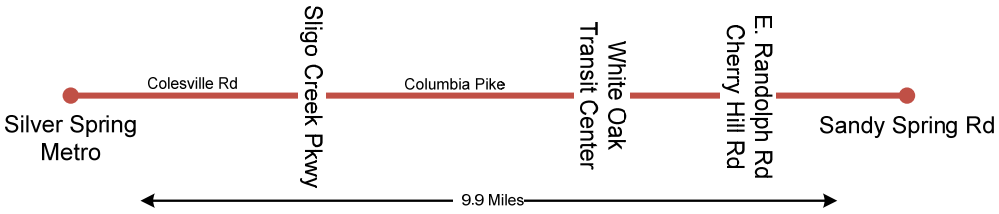
Corridor 21: Eastover-Addison Road

This corridor is between Southern Avenue SE at Indian Head Highway at the District of Columbia / Prince George's County border and the Addison Road Metrorail Station, passing the Southern Avenue and Suitland Metrorail Stations. It primarily runs along Southern Avenue, Iverson Street, Silver Hill Road, and Walker Mill Road, and is served by Metrobus P12.

The 11 mile Eastover-Addison Road corridor is split 10%/65%/25% between urban, inner-suburban, and outer-suburban land use densities, making it a very diverse corridor from that perspective. The corridor consists of roadways that are mainly major arterials, with some collectors and some minor arterials. About five miles of the corridor have three lanes in each direction, and most of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on the Eastover-Addison Road corridor as part of the baseline bus network for the PCN evaluation.

Corridor 22: Colesville Road/ Columbia Pike Maryland (US-29)

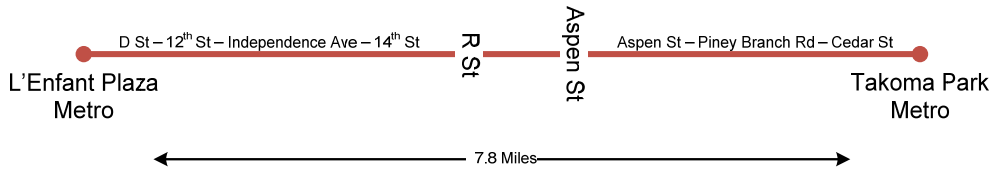


This corridor lies between the Silver Spring Metrorail Station and the interchange of Columbia Pike and Sandy Spring Road in Burtonsville in northwest Montgomery County. The portion of the corridor north of New Hampshire Avenue is being converted to a grade-separated expressway. The primary bus service along the corridor is provided by numerous routes, namely the Metrobus Z2; Z6; Z8; Z9, 29; and Z11, 13.

The 9.9 mile Colesville Road/Columbia Pike corridor is split 10%/50%/40% between urban, inner-suburban, and outer-suburban land use densities, making it a very diverse corridor from that perspective. The corridor consists of roadways that are mainly expressway and major arterial, with some collector sections. The entire corridor has three lanes in each direction and contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on the Colesville Road/Columbia Pike-US 29 corridor as part of the baseline bus network for the PCN evaluation.

Corridor 23: Fourteenth Street

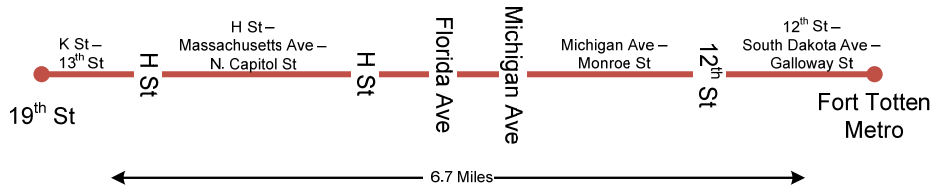


The Fourteenth Street PCN corridor lies primarily on 14th Street NW between the L'Enfant Plaza and (via local streets) the Takoma Metrorail Stations. It is served by the 52, 53, 54 Fourteenth Street Line. The corridor also includes the Smithsonian and McPherson Square Metrorail Stations in downtown Washington and the Columbia Heights Metrorail Station further north.

The 7.8 mile Fourteenth Street corridor goes mostly through areas with urban land use densities, with about a mile through inner-suburban density at its northern end near the Takoma Metrorail station. The corridor is mostly on collector roadway, with parts classified as major arterial. 2.5 miles of the corridor have three lanes in each direction, and the entire length of the corridor contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on the Fourteenth Street corridor as part of the baseline bus network for the PCN evaluation.

Corridor 24: North Capitol Street



The North Capitol Street Corridor operates between Farragut Square at the Farragut North and Farragut West Metrorail Stations (19th and K Streets NW) and the Fort Totten Metrorail Station, passing by the McPherson Square and Union Station Metrorail Stations along the corridor. Bus service is provided primarily by the Route 80.

The 6.7 mile North Capitol Street corridor is about evenly split between operating in areas with urban and inner-suburban land use densities. The corridor is mostly on a major arterial, with some portions classified as minor arterial. Most of the corridor has three lanes in each direction or contains medians and/or parking lanes that could potentially be used as bus lanes.

No express bus service was modeled on the North Capitol Street corridor as part of the baseline bus network for the PCN evaluation.

Impact of Existing and Modeled Projects on PCN Evaluation

2008 CLRP

The additional transit facilities that were modeled as part of the PCN analysis that had the biggest impact on the results were the Crystal City Potomac Yard Transitway, the Veirs Mill Road Bus Enhancements, and the Columbia Pike Streetcar. The PCN analysis essentially overlaid additional high frequency, high quality transit service on top of improvements that were already modeled in the baseline 2008 CLRP network. Therefore, certain corridors that already had high frequency transit service modeled on them in the baseline network did not show much of an incremental improvement by adding the "PCN transit service" on top. This did not indicate that the corridors do not warrant high quality service. Rather, it shows that the amount of service already planned in the baseline model, which in many cases, is not yet implemented but is modeled as part of the CLRP network, may be sufficient.

In addition to the impact shown by future projects, a number of already existing express services also had an impact on the model results for the PCN system. In particular, because the REX service along Richmond Highway in Fairfax County is already modeled as part of the baseline transit network, additional improvements modeled as part of the PCN analysis do not show as much of an incremental improvement.

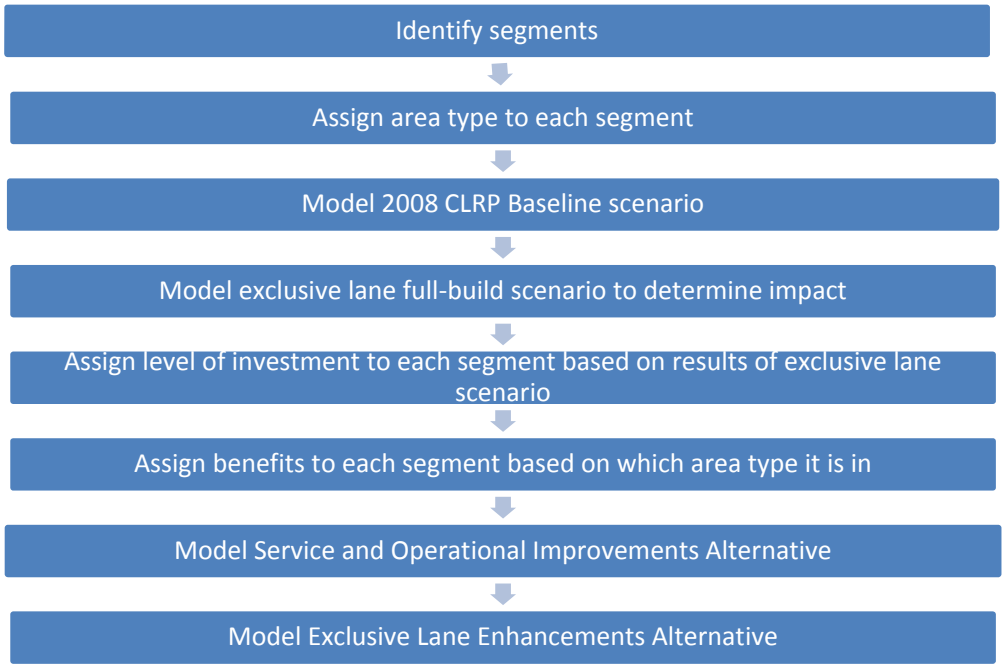
Round 7.1 Cooperative Land Use Forecasts

At the time that the PCN evaluation study began in the spring of 2009, the most recently adopted regional land use forecasts were the MWCOG Round 7.1 Cooperative Land Use Forecasts. It is important to remember that while several jurisdictions have since adopted more aggressive policies toward transit-oriented development and denser development along some of these priority corridors, these policies were not reflected in the modeled land use. This absence could have an impact on the PCN evaluation, particularly on projected ridership in certain corridors.

Alternatives Development

The evaluation of the PCN began by first running the regional travel demand model augmented by the incremental logit model with a "full-build" scenario, in which an exclusive bus lane was modeled on all parts of the PCN network. Because this level of investment is not realistic, the "full-build" test should not be considered a true alternative but rather a sensitivity tool from which to base decisions on which improvements should be included in the alternatives to be tested against the project objectives. Once the results of the "full-build" scenario analysis were complete, the outcomes, along with information from industry research on bus priority treatments, were used to define two more realistic alternatives, consisting of a combination of runningway and operational improvements, for each corridor in the PCN. The process that was followed is outlined in Figure A-2. Except for a base year (2008) model application to determine the factors necessary to adjust model projections to match observed transit ridership at 47 selected locations (cut lines) along the corridors, all analysis of the PCN, whether for the scenario test, the No-Build alternative, or either of the two build alternatives, was done for the target year 2030.

Figure A-2: Process for Developing Alternatives



Corridor Segmentation and Cut-Lines

To manage what improvements should be considered for such a large network, each corridor of the network was divided into segments based on several factors, including the number of through lanes and household and employment density. The 23 corridors were divided into 123 segments, to which specific packages of improvements could then be assigned. The segments enabled a given set of improvements to be assigned to parts of each corridor, and 47 cut-lines were used to measure the expected transit ridership and traffic flow at the 47 given points.

Exclusive Lane Full-Build Scenario Tool

Once ridership and auto travel were measured on the baseline network, as defined by the 2008 CLRP, the entire PCN was modeled with a full set of priority bus features: exclusive lanes, frequent service, and time benefits to reflect the impact of runningway improvements such as queue jumps and transit signal priority. Depending on the physical characteristics of the roadway, the exclusive lane was modeled in some cases as a "lane taking" from a general purpose lane and in some cases as a new lane, which was assumed to have been created from existing median and/or parking lanes.

The results from this model run were used as a tool to determine the segments the network for which it made sense to include exclusive lanes as part of an alternative. It was not the intention that the PCN would ever be built with a full network of exclusive lanes; rather, this exercise was conducted to determine where such a change would have the most beneficial and/or adverse impacts on transit ridership and auto congestion.

The four factors that were used to develop more focused and realistic alternatives, and how they were rated, are shown in Table A-2. The three columns, "Probably Appropriate," "Possibly Appropriate," and "Not Appropriate," indicate whether the scenario tool analysis suggested that an exclusive bus lane would be appropriate based on the factor being considered. Detailed results for each corridor are shown in Appendix G.

Table A-2 Factors used to select exclusive bus lane segments

	Probably Appropriate	Possibly Appropriate	Not Appropriate
Projected bus ridership for 2030 – Total	≥5,000	≥3,000	<3,000
Projected bus ridership for 2030 – Change	≥3,000	<3,000	n/a
Vehicle volume/capacity (v/c) ratio	New V/C<0.8	V/C New < V/C Old OR Change in V/C<0.1	New V/C >0.9 AND Old V/C >0.9
Change in number of auto trips, i.e., new transit trips and diversion of auto trips off the corridor.	≥3,600	1,800 < Change <3,600	≤1,800

Some of the system-level results for the full-build scenario tool are displayed in the following tables and figures. Table A-3 shows the transit ridership attributable to PCN routes and other transit modes. It shows that if the entire network of exclusive lanes were built, an additional 117,000 daily transit boardings would result, roughly equivalent to the daily ridership of Montgomery County Ride-On or the Sacramento, California, Regional Transit District, which operates both bus and light rail.[5]

Table A-3 2030 Full-Build Scenario Daily Transit Boardings

Mode	No Build	Full-Build PCN	Full-Build PCN - No Build	% Change PCN/NB
Local Bus	1,201,000	1,120,000	(81,000)	-7%
PCN Routes		291,000	291,000	
Other WMATA Express*	67,000	72,000	5,000	7%
Rail	1,272,000	1,169,000	(103,000)	-8%
Commuter Rail	17,000	17,000	0	0%
Light Rail	13,000	12,000	(1,000)	-8%
Non-WMATA Express	144,000	150,000	6,000	4%
Total	2,714,000	2,831,000	117,000	4%

[5] Based on 2007 Annual Unlinked Passenger Trips, National Transit Database.

Figure A-3 shows the ridership throughout the system resulting from the full-build exclusive lane scenario tool, and Figure A-4 shows the transit ridership by mode. Overall, the WMATA/PCN Express Routes achieve a ridership increase by about six times greater than the No-Build in this scenario, and WMATA Metrorail ridership drops by 7%, a decrease that might be welcome to help reduce some of the capacity constraints on the Metrorail system that are likely to be an issue again by the model year of 2030.

Figure A-3 Daily Transit Ridership for Full-Build Exclusive Lane Scenario

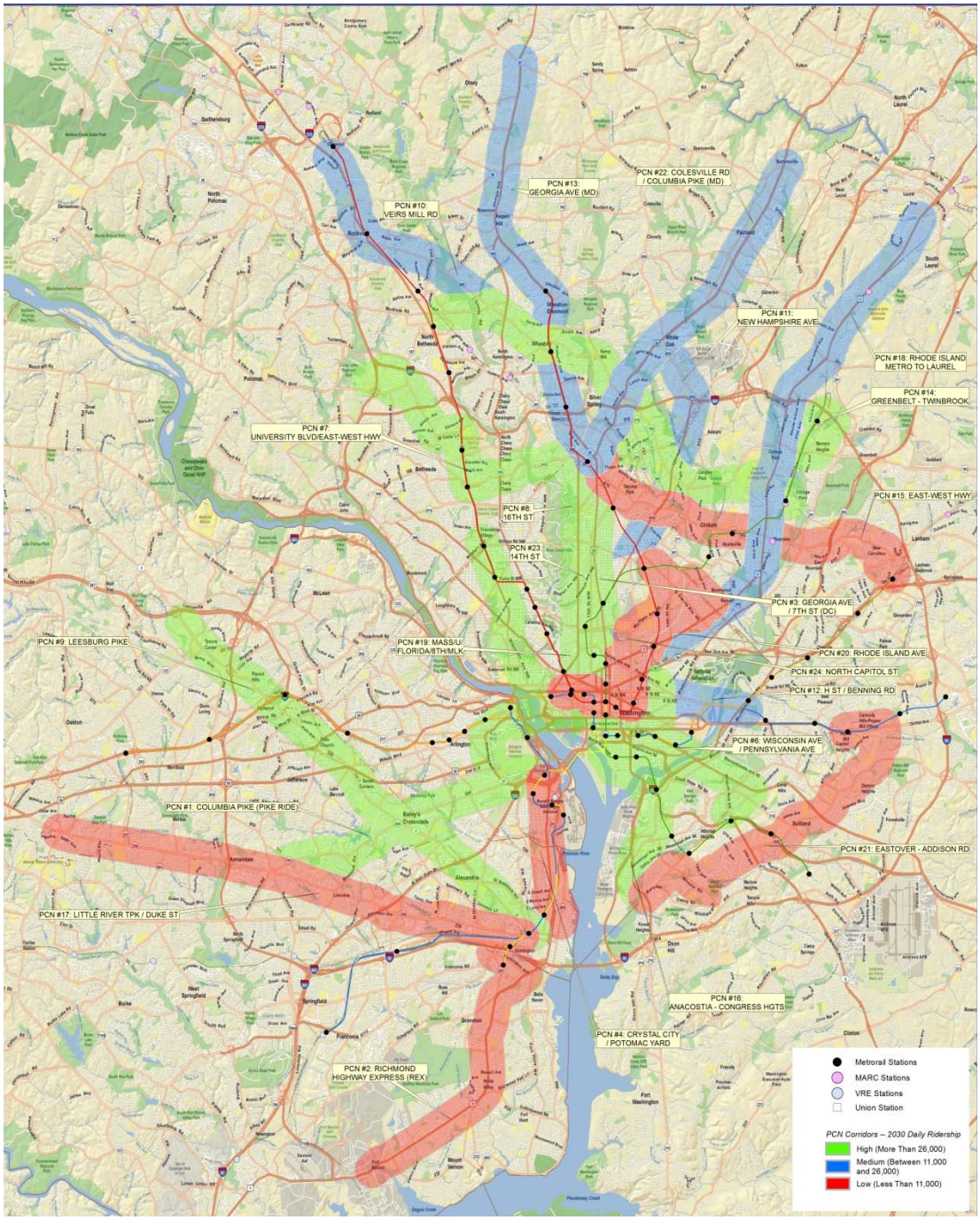
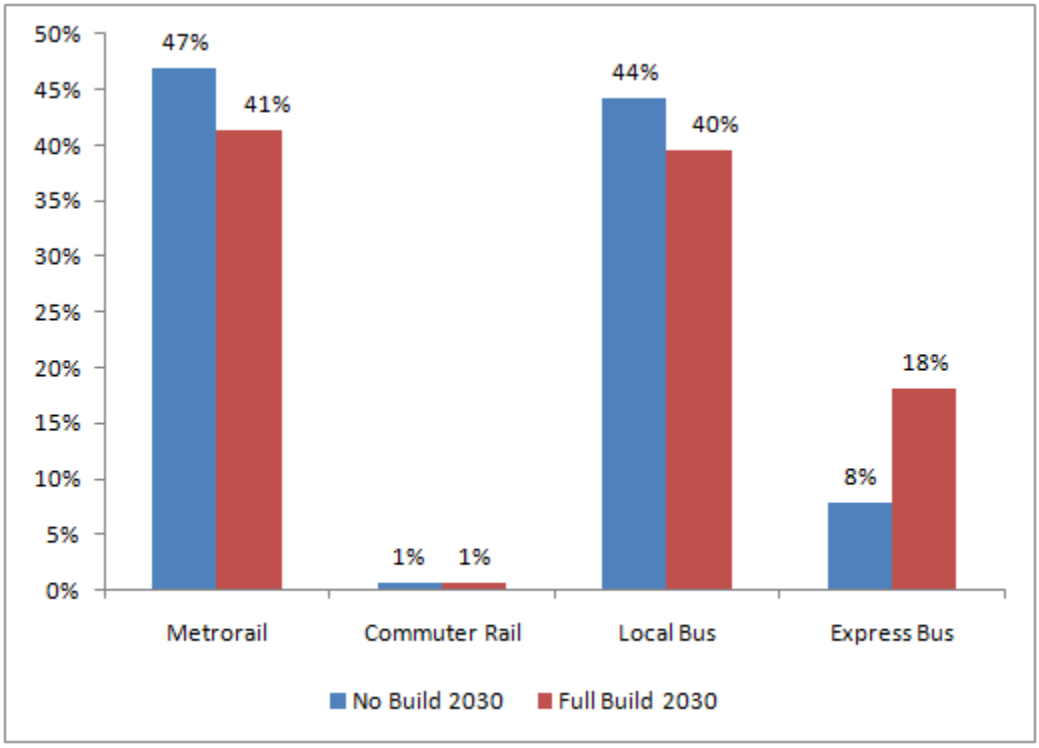


Figure A-4 Transit Riders by Mode for Full-Build Exclusive Lane Scenario



Defined Alternatives

No-Build (CLRP System) Alternative

As described above, the 2008 Constrained Long Range Plan (CLRP) was used as the baseline transportation network for the PCN Evaluation. The baseline option was further developed by validating the travel demand model to match existing bus ridership, as provided by WMATA and local transit operators, on the corridors being studied. The results of the No-Build alternative were reviewed as part of the alternative evaluation presented below.

Service and Operational Improvements Alternative (SOIA)

This alternative is based on continuing to implement improvements to the PCN along the lines of the improvements that have already been implemented on certain corridors, namely limited stop, high-frequency service on the entire priority corridor network. This alternative does include runningway improvements other than exclusive lanes, including queue jumps and TSP.

For this alternative, high-frequency express bus service was modeled on all PCN corridors. This is also included in the Exclusive Lane Improvements Alternative. To accurately model the level of bus service that would be reasonable to provide, corridors where the 2008 CLRP already reflected PCN-type operations were identified. The PCN replaces the routes on those corridors – at least in terms of this analysis – to identify the full benefits of the PCN concept. The corridors where the PCN model replaced other PCN-type service were: Columbia Pike (16F);

Richmond Highway (REX); Veirs Mill Road (Bus Enhancements in CLRP); Georgia Avenue/7th Street (Route 79); University Boulevard/East-West Highway (J4); and Sixteenth Street (S9).[6]

Exclusive Lane Improvements Alternative (ELIA)

This alternative was developed using the information gleaned from the full-build exclusive lanes scenario, as well as jurisdictional consultation. As discussed, the full-build scenario was modeled to determine the impacts that an exclusive lane would have on bus ridership, auto trips, and auto congestion (volume/capacity ratio). By knowing the impact that an exclusive lane would have on the corridor and by using the characteristics of each segment of each corridor, a judgment could be made as to the appropriate level of investment for each segment.

A matrix was developed to streamline the analysis of the level of improvements that should be modeled for each segment of the network. The matrix identified a set level of improvements to be modeled for each segment, depending on the area type that the segment served (urban, inner-suburban, outer-suburban) and the level of investment for that segment (high, medium, low). The level of investment was determined by reviewing the results of the full-build scenario with the appropriate jurisdictions. Figure A-5 shows the types of improvements that were used for each of the nine segment characterizations. Further detail about what each of these treatments entails can be found in Appendix G.

[6] Note that while the Wisconsin Avenue/Pennsylvania Avenue corridor (Route 37) and Leesburg Pike corridor (28X) also currently have express service, these were not part of the Travel Demand Model baseline transit network because they are recently added services that had not been included in the version of the model available for this analysis.

Figure A-5 PCN Treatments for Exclusive Lanes Investment Alternative

PCN TREATMENT		Urban			Inner Suburban			Outer Suburban		
		H	M	L	H	M	L	H	M	L
Runningway	Exclusive Lane	●			●					
	Queue Jumps		●			●		●		
	General Purpose Lanes			●			●		●	●
	TSP	●	●		●	●		●	●	
Shelters	Unique shelters with seating	●	●		●					
	Standard shelters			●		●	●		●	●
	3 per mile	●	●	●	●	●	●			
	2 per mile							●	●	●
Passenger Information	Real time schedule info	●	●	●						
	Standard				●	●	●	●	●	●

Figure A-6 shows which segments of the PCN were modeled with exclusive lanes as part of this alternative and which were assumed to have "spot improvements" only. Details on the individual segment categorization of the PCN can be found in Appendix F. In addition to the physical improvements, the ELE Alternative, like the SOI alternative discussed above, includes high-frequency bus service on all corridors, modified to reflect existing express type operations that were already reflected in the 2008 CLRP.

The tables that follow the map indicate the levels of investment that were assigned as part of the Exclusive Lanes Investment Alternative. Table A-4 shows the mileage (and percentage of mileage) by level of investment by jurisdiction, and Table A-5 shows the mileage that has been defined by investment level, by corridor.

Figure A-6 Exclusive Lanes and Spot Improvements for Exclusive Lane Improvements Alternative

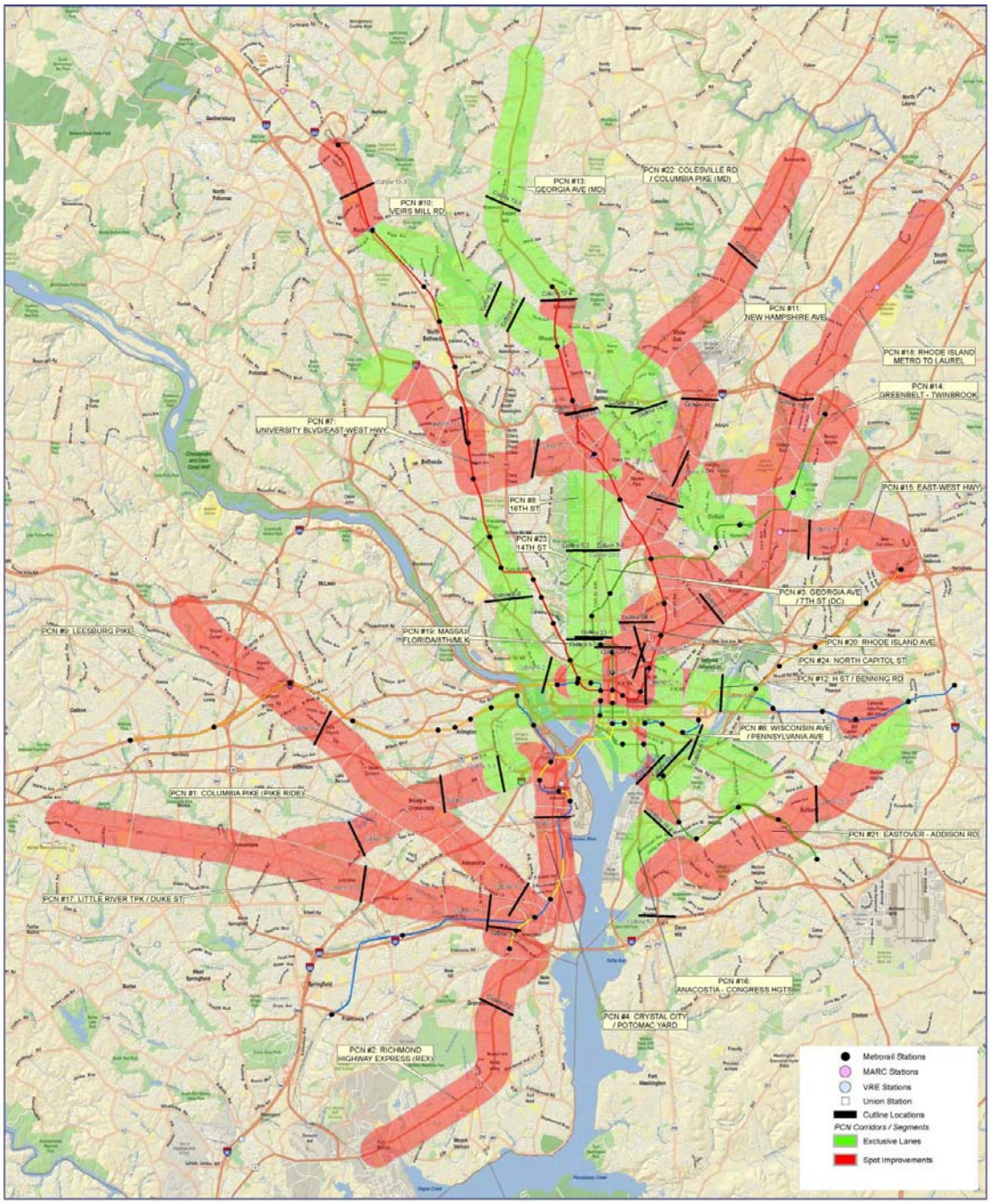


Table A-4 Mileage of Segments by Jurisdiction and Level of Investment for Exclusive Lanes Investment Alternative

	High	Medium	Low	Total
VA	3.2 (6%)	22.1 (42%)	27.3 (52%)	52.6 (100%)
MD	32.9 (30%)	36.0 (32%)	42.5 (38%)	111.4 (100%)
DC	47.8 (67%)	15.8 (22%)	7.4 (10%)	71.0 (100%)
Total	83.9	73.9	77.2	235.0
TOTAL EXCLUSIVE LANES	83.9 (36%)			

Table A-5 Mileage by Level of Investment by Corridor for Exclusive Lanes Investment Alternative[7]

	CORRIDOR	H	M	L	Total
1	Columbia Pike (Pike Ride)	5.2	8.4		13.6
2	Richmond Highway Express (REX)			9.0	9.0
3	Georgia Ave./7th Street	9.4			9.4
4	Crystal City-Potomac Yard			4.8	4.8
6	Wisconsin Ave./Pennsylvania Ave.	12.6			12.6
7	University Blvd / East-West Highway	4.6	8.6	3.5	16.7
8	Sixteenth Street (DC)	7.0			7
9	Leesburg Pike		13.7		13.7
10	Veirs Mill Road	6.4		5.7	12.1
11	New Hampshire Avenue		3.3	4.3	7.6

[7] All corridors in the Service and Operational Improvements Alternative are considered to be at a medium level of investment.

	CORRIDOR	H	M	L	Total
12	H Street / Benning Road	1.9	2.9		4.8
13	Georgia Ave. (MD)	7.3		5.8	13.1
14	Greenbelt-Twinbrook	10.5	7.6		18.1
15	East-West Highway (Prince George's)			10.6	10.6
16	Anacostia-Congress Heights	2.1	3.7	0	5.8
17	Little River Turnpike/Duke Street			13.5	13.5
18	Rhode Island Ave Metro to Laurel			14.5	14.5
19	Mass Ave/ U St./ Florida Ave./ 8th St./ MLK Ave.	7.2			7.2
20	Rhode Island Avenue			5.5	5.5
21	Eastover - Addison Road		11.0		11.0
22	Colesville Rd./ Columbia Pike - MD US 29	3.0	6.9		9.9
23	Fourteenth Street (DC)	6.7	1.1		7.8
24	North Capitol Street		6.7		6.7
	Total	**83.9**	**73.9**	**77.2**	**235**

Goals, Objectives and Measures of Effectiveness

As a foundation for this study, goals, objectives, and measures of effectiveness (MOEs) were developed. This section identifies those goals, objectives, and MOEs and indicates the context in which they were used to conduct an evaluation of the corridors at a system level. While 'goal' and 'objective' are often used interchangeably in colloquial speech, they have distinct definitions in the context of project planning. Goals are broad statements of a desired state. Their purpose is to articulate a vision. An effective goal is general and brief, describing a condition that can be improved upon, but not necessarily fully achieved. Three goals were established for the PCN study:

Goal 1: Improve the competitiveness of bus transit

Goal 2: Support existing and planned land use and economic development

Goal 3: Improve the efficiency of the transportation system

Objectives are specific statements describing the desired outcome. They are quantifiable measures. Achieving an objective should lead to the advancement of its associated goal. Objectives should be quantifiable, time-specific, and measurable. They are often developed in response to specific issues or obstacles, but they can also be used to advance a vision or to define the characteristics of a transportation system. However, objectives should not prejudge one transportation improvement over another.

MOEs are used to quantify objectives. Their purpose is to understand the transportation need by measuring the extent to which the corresponding objective is achieved. They also serve as a baseline for evaluating the effectiveness of alternative improvements. MOEs were established for each of the study objectives.

Objectives were established for each of the study goals, and MOEs were established to help measure whether the alternatives being evaluated met the study goals and objectives. The objectives and MOES associated with each goal are outlined in Table A-6. It was determined that some of the MOEs could not be reasonably computed, so not all of the MOEs initially chosen are reported here.

Table A-6 Goals, Objectives, and Measures of Effectiveness

Objectives	Measures of Effectiveness
Goal 1: Improve the competitiveness of bus transit	
1.1: Increase average bus speed **1.2: Increase bus ridership** **1.3: Increase the number of jobs that are accessible by a 45 minute transit trip.** **1.4: Increase the number of households that are accessible by a 45 minute transit trip.** **1.5: Improve travel time of transit relative to auto**	1. Percent increase in average bus speed 2. Percent change in average travel time per passenger 3. Annual passenger travel time saved 4. Percent increase in corridor bus ridership 5. Percent change in regional bus ridership 6. Percent of jobs within 45 minutes by transit to households 7. Percent of households within 45 minutes by transit to jobs 8. The ratio of transit travel time to auto travel time
Goal 2: Support existing and planned land use and economic development	
2.1: Provide transit service within walking distance of existing and planned households and jobs.	1. Increase the number of households within ½ mile of express bus stops 2. Percent of households within 45 minutes by bus 3. Increase the number of jobs within ½ mile of express bus stops 4. Percent of jobs within 45 minutes by bus
Goal 3: Improve the efficiency of the transportation system	
3.1: Decrease travel time for bus passengers in corridors **3.2: Maintain average auto travel time within corridors** **3.3: Improve travel time for all passenger trips in corridors** **3.4: Reduce vehicle-miles traveled (VMT)**	1. % change in bus passenger times for trips through and within all corridors 2. Percent change in auto passenger times for trips through and within all corridors 3. Percent change in times for all (auto and bus) trips through and corridors 4. Percent change in bus VMT 5. Percent change in auto VMT

Results of Alternatives

No-Build (CLRP System) Alternative

The No-Build alternative, simply the validated model of the 2008 CLRP transportation network, yields a baseline from which to measure how the two alternative build scenarios help meet the objectives for the PCN.

Service and Operational Improvements Alternative (SOIA)

The Service and Operational Improvements Alternative (SOIA) decreases transit travel time, increases accessibility to jobs and households by transit, makes transit times more competitive to the auto in the PCN corridors, and yields a net travel time benefit to both auto and transit travelers in the PCN corridors. However, all of these benefits confer to a lesser degree than compared to the Exclusive Lane Improvements Alternative.

Exclusive Lane Improvements Alternative (ELIA)

At a network level, which is the main focus of the PCN Evaluation project, the Exclusive Lane Improvements Alternative (ELIA), with its nearly 84 miles of exclusive bus lanes, contributes substantially to the PCN system performance. The analysis conducted showed that the portions of the network in this alternative that do not have exclusive lanes have achieved speeds comparable to exclusive lanes without the need to dedicate a lane.

It should be noted, as discussed earlier, that in corridors where the 2008 CLRP indicated plans for guideway transit projects, the benefits of overlaying the new PCN service were significantly less because those projects were already being modeled as attracting new riders. This includes the following projects on PCN corridors: Potomac Yard Transitway/Crystal City Potomac Yard Busway, Veirs Mill Road Bus Enhancements, Columbia Pike Transit, and the Purple Line (University Boulevard/East-West Highway Corridor).

Overall Review of Objectives for PCN System

Table A-7 reviews the outcomes of the two alternatives tested vis-à-vis the objectives of the PCN system. The Service and Operational Alternative meets some of the objectives of the PCN system. The Exclusive Lane Enhancement alternative meets many of the objectives of the PCN system – enough to classify the alternative as a likely successful implementation scheme for the PCN system, although a few objectives are not quite met using this alternative.

Table A-7 Objectives Met by Alternatives Tested

Objective		Alternative: Service and Operational	Alternative: Exclusive Lane Enhancement
Goal 1: Improve Competitiveness of Bus Transit			
1.1	Increase average bus speed	◯	●
1.2	Increase bus ridership	●	●
1.3	Increase number of jobs accessible by a 45 minute transit trip	◯	●
1.4	Increase number of households accessible by a 45 minute transit trip	◯	●
1.5	Improve travel time of transit relative to auto	●	●
Goal 2: Support Land Use and Economic Development			
2.1	Provide transit service within walking distance of existing and planned households and jobs	●	●
Goal 3: Improve Efficiency of System			
3.1	Reduce travel time for bus passengers in corridors	●	●
3.2	Maintain auto passenger speed within corridors	●	◯
3.3	Improve speed for all passenger trips in corridors	◯	■
3.4	Reduce vehicle miles traveled (VMT)	●	●
● **Strongly Supports** ◯ **Partially Supports** ■ **Does Not Support**			

Objective 1.1: Increase Average Bus Speed

Table A-8 shows that the SOI alternative would improve bus speeds on the PCN corridors by 2%, while the ELE alternative would improve bus speeds on those corridors by 15% over the no build alternative.

Table A-8 Average Daily Bus Speed (mph) for PCN Alternatives (2030)

	2008 CLRP No Build	Service and Operational	% Increase Over No Build	Exclusive Lane Enhancements	% Increase Over No Build
Local Bus	14.9	15.0	1%	15.3	3%
PCN Corridors	12.4	12.6	2%	14.3	15%

Objective 1.2: Increase Bus Ridership

The PCN Evaluation indicated that transit ridership, specifically bus ridership, would increase with the implementation of the PCN alternatives. The regional transit boardings, as shown inTable A-9, would increase by 3% in the SOI alternative and by 4% in the ELE alternative. These increases, while relatively small, are on a regional level. When only the PCN corridors are considered, the SOIA results in a 23% increase over the No-Build alternative and the ELIA a full 25% increase in transit ridership. The just over 100,000 daily transit boardings that the ELE alternative results in is roughly the same number of daily boardings experienced by Hampton Roads Transit (HRT) in Virginia or the Southwest Ohio Regional Transit Authority, which serves the greater Cincinnati area.[8] Table A-9 shows the regional transit ridership numbers for each alternative, and Figure A-7 graphically depicts the mode share for transit in the region that is expected to result from the implementation of each alternative. Table A-10 shows the regional transit trip results by trip purpose and illustrates that the PCN alternatives actually increase regional transit trips in addition to boardings – changes in boardings alone could be the result of inducing more transit transfers.

Table A-9 Daily Transit Boardings for PCN Alternatives

	2009	2030						
Mode	2008 CLRP No Build	2008 CLRP No Build	SOIA	SOIA Minus NB	Percent Change	ELIA	ELIA Minus No Build	Percent Change
Local Bus	789,000	1,200,500	1,115,800	(84,700)	(7%)	1,124,200	(76,300)	(6%)
Express Bus	166,500	210,800	416,400	205,600	98%	478,500	267,700	127%
Metrorail	896,200	1,272,200	1,241,000	(31,200)	(2%)	1,183,000	(89,200)	(7%)
Commuter Rail	14,100	17,500	17,700	300	2%	17,400	(100)	(1%)
Light Rail	0	12,800	12,100	(700)	(5%)	12,000	(800)	(6%)
Total Transit	1,865,800	2,713,800	2,803,000	89,300	3%	2,815,100	101,300	4%

Note: For comparison with other recent regional transit projects, 2030 daily ridership for the Columbia Pike streetcar is 23,100[9]; year 2030 daily ridership for the full Purple Line is 64,800.[10]

[8] Based on 2007 Annual Unlinked Passenger Trips, National Transit Database.

[9] March 2006 AA Final Report. http://www.piketransit.com/downloads/PTI-Final-Rpt-Chp5.pdf

[10] LPA document. URL:
http://www.purplelinemd.com/images/stories/purpleline_documents/lpa/Purple%20Line%20LPA%20Document%2020090804.pdf

Figure A-7 Mode Split for Daily Transit Riders for Alternatives

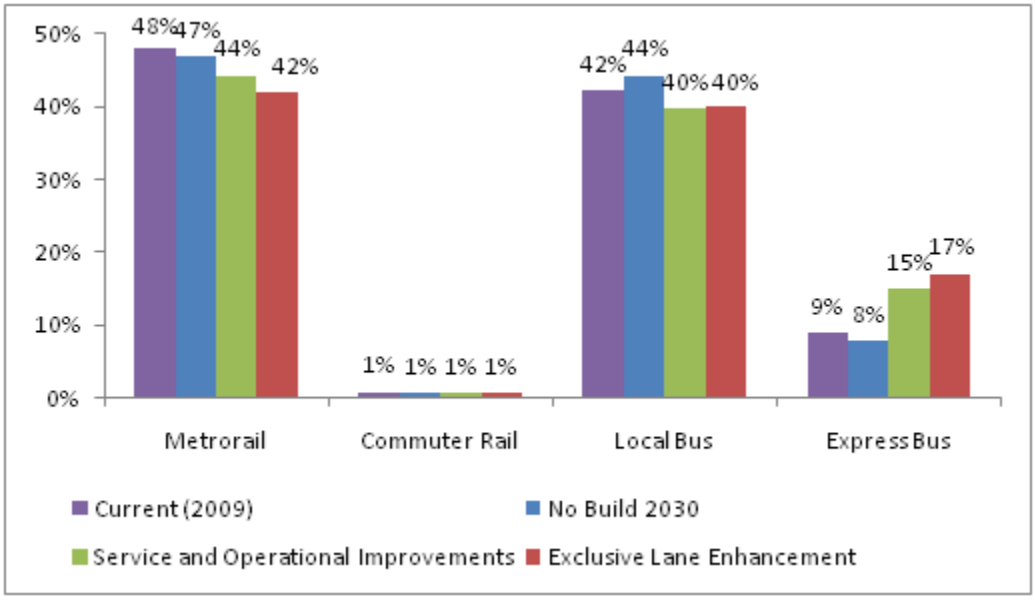


Table A-10: Regional Transit Trips by Purpose and Mode-of-Access

		2009	2030 NB	2030 PCN Full Build		2030 PCN ELIA		2030 PCN SOIA	
					% chg NB		% chg NB		% chg NB
HBW	Walk-Access	389,162	537,090	566,852	1.0554	565,633	1.0531	560,260	1.0431
	Drive Access	244,816	365,307	373,381	1.0221	372,385	1.0194	368,406	1.0085
	All	633,978	902,397	940,233	1.0419	938,018	1.0395	928,666	1.0291
	Change from NB			37,836		35,621		26,269	
HBS	Walk-Access	32,930	50,559	52,582	1.0400	52,022	1.0289	51,950	1.0275
	Drive Access	31,997	51,403	52,148	1.0145	51,613	1.0041	51,600	1.0038
	All	64,927	101,962	104,730	1.0271	103,635	1.0164	103,550	1.0156
	Change from NB			2,768		1,673		1,588	
HBO	Walk-Access	238,126	368,514	389,185	1.0561	386,088	1.0477	385,012	1.0448
	Drive Access	40,656	69,181	70,248	1.0154	69,599	1.0060	69,569	1.0056
	All	278,782	437,695	459,433	1.0497	455,687	1.0411	454,581	1.0386
	Change from NB			21,738		17,992		16,886	
NHB	Walk-Access	166,807	237,622	248,338	1.0451	246,988	1.0394	246,181	1.0360
	Drive Access	13,524	24,634	25,008	1.0152	24,760	1.0051	24,744	1.0045
	All	180,331	262,256	273,346	1.0423	271,748	1.0362	270,925	1.0331
	Change from NB			11,090		9,492		8,669	
Total	Walk-Access	827,025	1,193,785	1,256,957	1.0529	1,250,731	1.0477	1,243,403	1.0416
	Drive Access	330,993	510,525	520,785	1.0201	518,357	1.0153	514,319	1.0074
	All	1,158,018	1,704,310	1,777,742	1.0431	1,769,088	1.0380	1,757,722	1.0313
	Change from NB			73,432		64,778		53,412	
Change from 2030 No-build				4.31%		3.80%		3.13%	

Objective 1.3: Increase accessibility to jobs by transit

Both alternatives tested show that accessibility to jobs via transit is increased in many parts of the region if the PCN system were to be implemented. Looking at the increase in jobs accessible within 45 minutes by transit during the AM peak period, many locations showed significant improvement, with the locations that were already quite accessible, i.e., by Metrorail, showing the least amount of improvement. The accessibility improvements were most pronounced in the AM peak, as would be expected, due to the greater relative benefit achieved by PCN speeds

over the congested roadways during peak travel time. The average increase in accessibility to jobs for all Traffic Analysis Zones (TAZs) in the MWCOG model area was 3% in the AM and 2% in the off-peak for the ELE alternative, and 0.6% and 0.7% for the SOIA.

Objective 1.4: Increase accessibility to households by transit

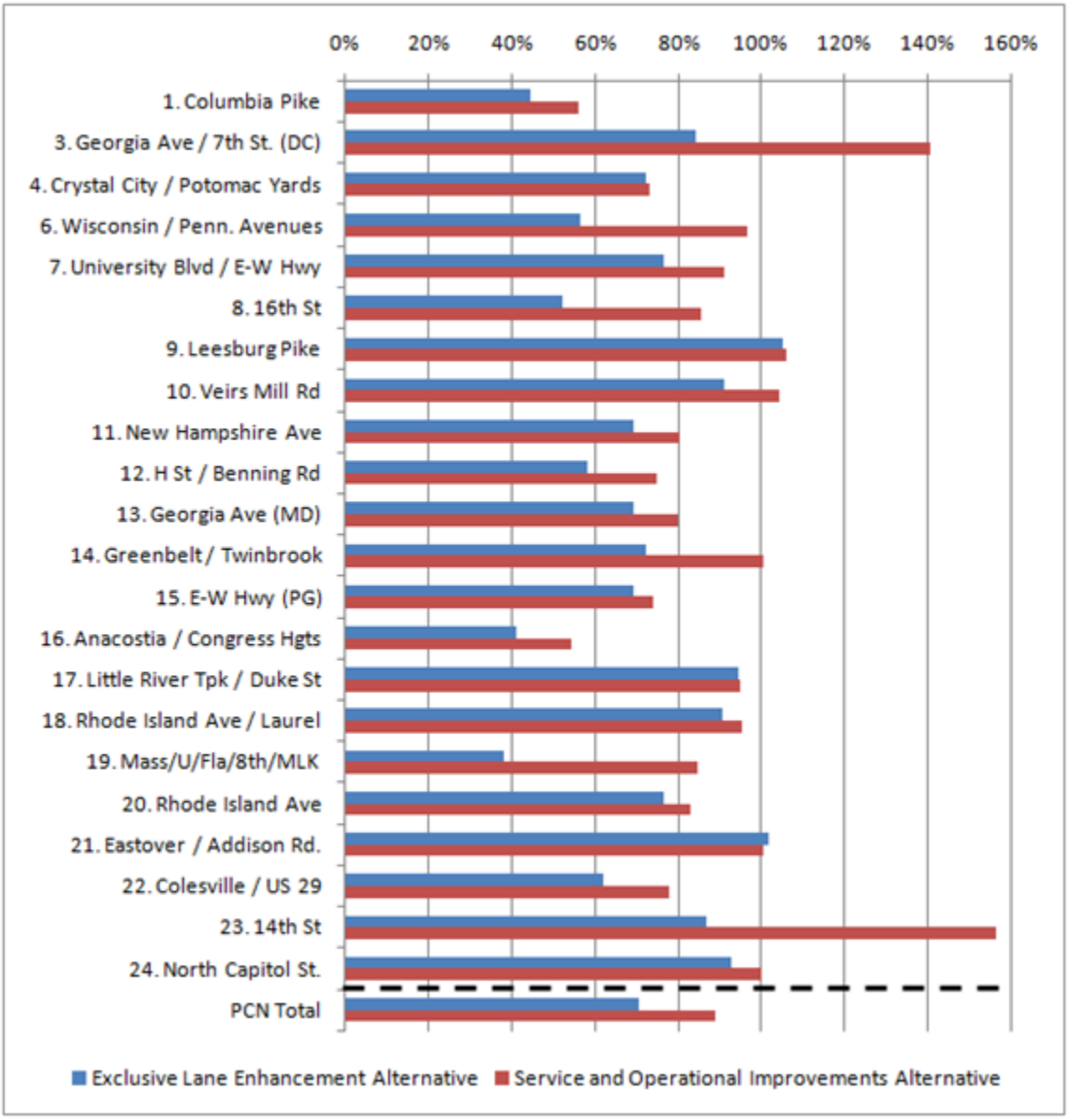
Accessibility to households within 45 minutes, a key indicator of the potential of employees, to get to work on transit showed a significantly higher level of improvement than did the jobs measure, likely because the PCN allows high quality transit service to serve many more residential areas than can be reached by the existing rail network. As with the jobs measure, peak period improvements were more pronounced, and the already most accessible locations showed the least improvement. The average increase in accessibility to households for all TAZs in the MWCOG model area was 77% in the AM and 30% in the off-peak for the ELE alternative, and 1.5% and 2.3% for the SOIA.

Objective 1.5: Improve transit travel time relative to auto

Figure A-8 shows how transit time relates to auto trip time on the PCN corridors for which this data was available. In the ELE alternative, two corridors did not show a significant speed/time advantage for the PCN transit over auto traffic in the same corridor, specifically Leesburg Pike and Eastover-Addison Road. Neither of these corridors was modeled with exclusive lanes, so in those two cases it does not appear that the other PCN improvements have a significant impact in making transit a quicker trip. However, in all other cases, the same trip would be quicker to make by transit once the PCN improvements are implemented. The benefits are most pronounced on the following corridors: Mass Ave/ U St./ Florida Ave./ 8th St./ MLK Ave.; Anacostia-Congress Heights; Sixteenth Street; Wisconsin Ave/Pennsylvania Ave; and Columbia Pike, where it is predicted to be around twice as fast to take transit than to drive. All of these corridors are modeled as all or partly exclusive lanes (high level of investment), and any portions without exclusive lanes are modeled with other runningway improvements.

In general, the ratio of transit time to auto time in the PCN corridors for the SOI alternative follows a similar pattern to the results for the ELE alternative, although in most cases the speed and time advantage is not as significant due to the absence of an exclusive lane. In the Georgia Ave / 7th Street corridor and 14th Street corridor in the District, the impacts of adding significantly more service in already heavily congested corridors without providing an exclusive lane are very negative for transit users, resulting in transit travel times that are much longer than those for automobiles.

Figure A-8 Percent of PCN Transit to Auto Trip Time



Objective 2.1: Provide Transit Service within Walking Distance of Existing and Planned Households and Jobs

With the 450 express bus stops on 235 miles of regional roadways, it is no surprise that implementation of either of the PCN alternatives would result in great gains in the number of jobs and households within ½ mile, or about a ten minute walk, from express bus service (Table A-11).

Table A-11 Jobs and Households within ½ Mile of a PCN Express Bus Stop

	2008 CLRP No Build	Service and Operational	Exclusive Lane Enhancements
Households	212,600	660,200 (211%)	660,200 (211%)
Jobs	611,500	1,612,800 (164%)	1,612,800 (164%)

Objective 3.1: Decrease travel time for bus passengers in corridors

Bus speed increases translate directly into time savings for the riders. Speed for bus passengers would increase by 15% for the express buses in PCN corridors and 3% for local buses in the ELIA. Passengers of the PCN express buses are predicted to save 3.6 minutes per trip in the Exclusive Lane Improvements Alternative over the No Build alternative. For the Service and Operational Improvements Alternative, speed for bus passengers would increase by 2% for the express buses in PCN corridors and 3% for local buses. Passengers of the PCN express buses are predicted to save 1.8 minutes per trip in the Service and Operational Improvements Alternative.

Table A-12 shows that both alternatives analyzed result in fewer hours per passenger spent riding transit. The benefits are more pronounced on the PCN corridors, but also extend region-wide.

Table A-12 Hours per Passenger Spent on Transit

	2008 CLRP No Build	Service and Operational	% Change	Exclusive Lane Enhancements	% Change
Regional Transit Passengers					
Transit Passengers	1,704,300	1,757,700	3%	1,769,100	4%
Transit Passenger Hours	1,006,800	1,035,000	3%	1,017,100	1%
Hours per Passenger	0.59	0.59	zero	0.57	(3%)
PCN Corridors Transit Passengers					
Transit Passengers	480,100	592,600	23%	600,900	25%
Transit Passenger Hours	326,800	386,800	18%	372,500	14%
Hours per Passenger	0.68	0.65	(5%)	0.62	(10%)

Objective 3.2: Maintain average auto travel time within corridors

Figure A-9 shows the auto travel time changes anticipated to result from each alternative. The SOI alternative results in an overall slight increase in auto travel time during the AM peak, mainly in the District; auto travelers on PCN corridors in Maryland and Virginia experience a small decrease in travel time. Because the Exclusive Lane Enhancements alternative would add an exclusive lane on 36% (83.9 miles) of the corridors, the auto passenger speed does decrease slightly in this alternative. It is important to note that not all of the exclusive lanes would require a lane to be removed from the general purpose lanes – in fact only 55.2 miles would require a lane taking, whereas the remaining 28.7 miles of roadway would make use of existing median or parking lanes. On average, auto trips on the PCN corridors would take an average of 1.17 minutes longer with the implementation of the ELE alternative.

Table A-13 shows the change in automobile vehicle-hours traveled for each of the two alternatives, further showing the impact of the alternatives on the time spent for auto travel.

Figure A-9 PCN Corridor Auto Travel Time Changes for Alternatives (AM Peak)

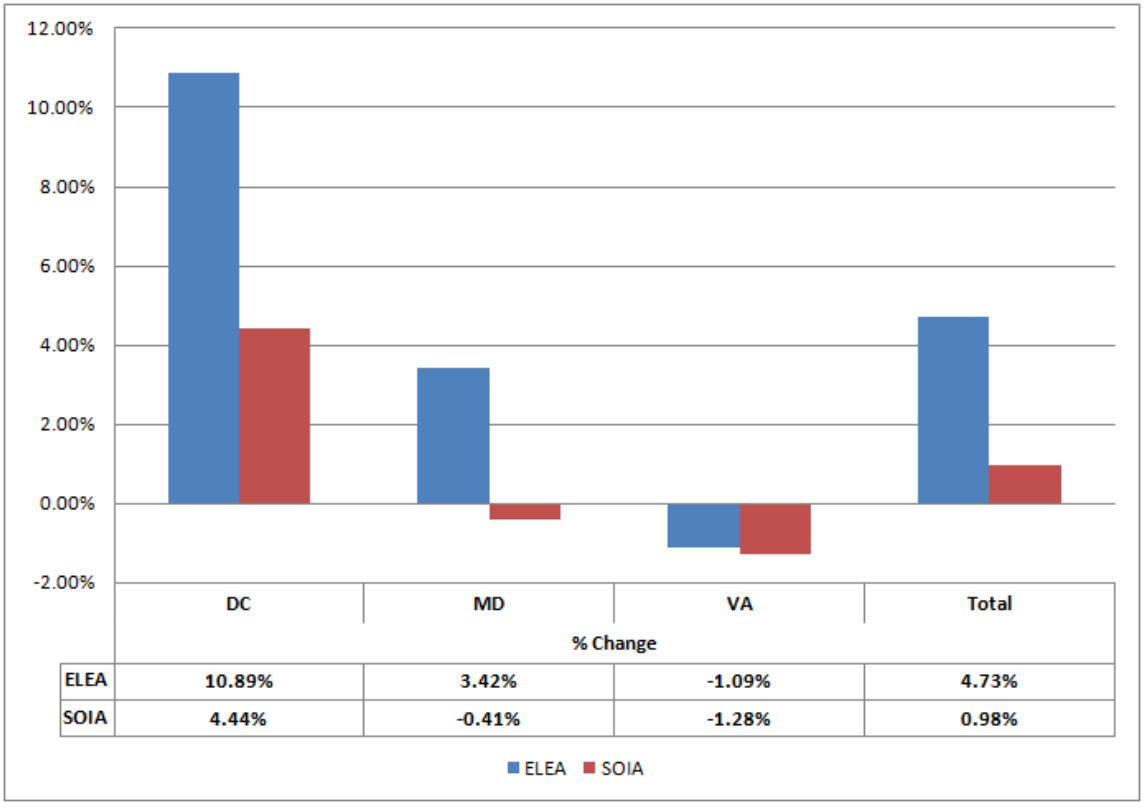


Table A-13 Daily Auto Vehicle Hours Traveled for Alternatives Reviewed (2030)

	VHT	Percent Change in VHT
2008 CLRP No-Build	10,500,700	-
Service and Operational	10,543,200	0.4%
Exclusive Lane Enhancement	10,686,900	1.8%

Objective 3.3: Improve travel time for all passenger trips in corridors

The previous two objectives looked individually at changes to travel time for transit riders and auto users that would result from implementing the two build alternatives for the PCN. Table A-14 shows the overall travel time change for all travelers regardless of mode. It shows that, despite the slight loss in travel time for auto users in the ELE alternative, the time savings for transit users makes up for that loss to result in an overall time savings on a per-person basis.

Table A-14 Transit Travel Time Change

	2008 CLRP No Build	Service and Operational	Exclusive Lane Enhancements
Number of Transit Passengers on Corridors	480,100	592,600	600,900
Change in Time (minutes)	n/a	(1.8)	(3.6)
Total Transit Time Change (minutes)	n/a	(1,066,620)	(2,163,240)
Number of Auto Trips on Corridors	34,496,000	34,639,600	32,258,200
Average Auto Occupancy	1.26	1.26	1.26
Change in Time (minutes)	n/a	1.18	1.30
Total Auto Time Change (minutes)	n/a	310,900	1,281,200
Total Travel Time Change Transit + Auto (mins)	n/a	(0.62)	(2.4)

Objective 3.4: Reduce vehicle-miles traveled (VMT)

Both the SOIA and ELIA result in a slight increase in auto VMT as well as bus VMT. The auto VMT increase is likely a result of auto trips diverting from the PCN corridors to alternative

routes that move faster but require a slightly longer trip. The bus VMT increase is merely a result of the significant increase in bus service frequency that is assumed for both PCN build alternatives.

Table A-15 Daily Auto Vehicle Miles Traveled for Alternatives Reviewed (2030)

	VMT	Percent Change in VMT
2008 CLRP No-Build	198,489,700	n/a
Service and Operational	198,718,800	0.14%
Exclusive Lane Enhancement	198,820,800	0.17%

Table A-16 Bus Weekday VMT for Alternatives Reviewed (2030)

Bus Vehicle Miles Traveled (VMT)	2008 CLRP No Build	Service and Operational	VMT Change	Exclusive Lane Enhancement	VMT Change
Local Bus AM	111,400	111,400	zero	110,600	(800)
Local Bus Off-Peak	80,900	80,900	zero	80,700	(200)
PCN Bus AM	n/a	9,000	n/a	9,000	n/a
PCN Bus Off-Peak	n/a	10,000	n/a	10,000	n/a
Total (Including PM*)	303,800	331,700	27,900	329,900	26,100

*PM equals AM

Conclusions

Some of the key benefits of implementing the Priority Corridor Network include:

- Increased transit ridership,
- Increased accessibility by transit,
- Improved travel time for transit riders in PCN corridors,
- Increased number of households and jobs within a short walk to express transit service,
- Time savings for travel, and
- Potential operational efficiencies by decreasing the need for local bus service and increasing corridor bus speeds.

It is important to remember that the results presented as part of the PCN Evaluation are limited to the alternatives analyzed. Any number of variations of PCN type improvements could be implemented.

As has already been done in a number of cases, corridor level detailed planning must be done on each corridor to identify which improvements should be made. The analysis of the PCN as a whole presented here is intended to assess the potential benefits of the PCN concept on a system wide basis. It has demonstrated that a Priority Corridor Network could provide substantial benefits that could enhance ridership, improve system efficiency and improve the transit user experience.

References

Metrobus 16th Street Line Study Final Summary Report, February 2009, WMATA and DDOT

Metrobus 30s Line Study Draft Final Summary Report, February 2008, WMATA and DDOT

Metro Extra Service Plan, Georgia Avenue-7th Street Corridor, November 2006, DMJM Harris/AECOM

Bethesda-College Park Corridor Enhanced Bus Improvements, Final Report, April 2007, WMATA and Maryland MTA

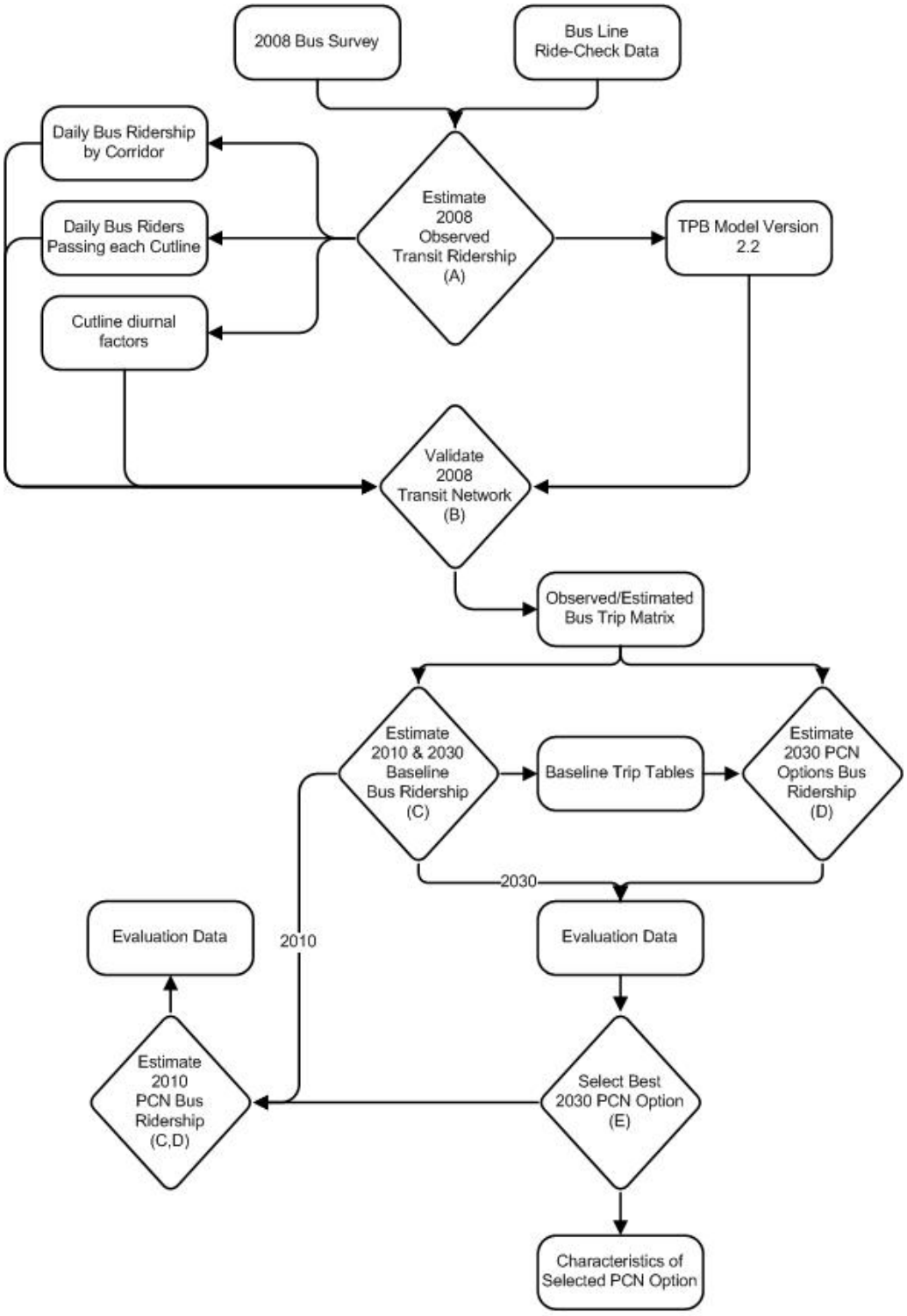
Powerpoint Presentation, Project Management Team Meeting, Updated Technical Memorandum Review, May 1, 2009, WMATA

B : PCN Travel Demand Forecasting Methodology

It is very important that the travel demand model used for analysis of the PCN options reasonably estimate corridor level ridership on bus lines. MWCOG does not assign transit trips as part of its modeling process for a number of reasons including the difficulty of accurately assigning trips to bus lines. Furthermore, while the nested logit post-processor developed for WMATA and MWCOG has been successfully applied for individual corridor studies, it has not been successfully applied by MWCOG for the entire region.

For these reasons, a different approach was used to evaluate the effect of bus improvements on the PCN corridors. This approach used the MWCOG Version 2.2 model set, as applied by MWCOG for the 2008 Constrained Long Range Plan (CLRP) and the aspiration study, augmented by bus counts and a pivot point model using coefficients derived from reliable sources relevant to the Washington region and the nature of the PCN strategies being evaluated. A high-level flowchart of the approach is shown in Figure B-1.

Figure B-1: Analysis Approach



(A) Detailed flowchart

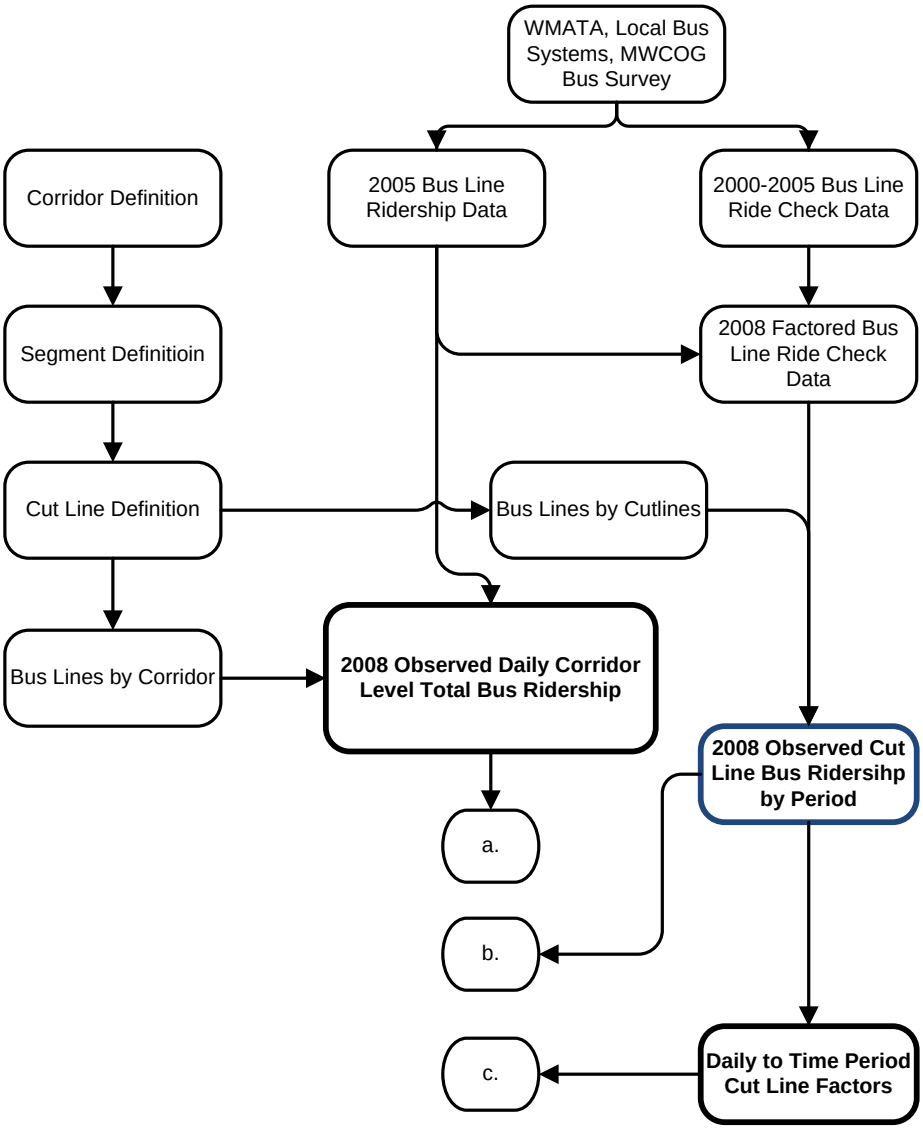
Step 1 – Estimate Existing Bus Ridership

As shown in Figure B-1, the approach included multiple components. The first component was the gathering of available bus patronage data to estimate existing ridership that was compared to model results for 2008. A detailed representation of this first step is shown in Figure B-2. Ride-check and other data were obtained for most of WMATA and local provider bus lines that travel in the 23 PCN corridors. Ride-check data, which are counts of passengers boarding and alighting at each bus stop, provided estimates of total daily riders on each bus line, by time of day. They also provided the number of riders passing selected locations (i.e., cutlines) along the PCN corridors to estimate the number of bus passengers on PCN routes at different points along the corridor. [11]A map identifying each of the cutlines used for the validation is shown in Figure B-2. The ride check data was normalized to reflect May 2008 bus ridership by line using data provided from the 2008 WMATA bus survey conducted by MWCOG. The results of the first step included:

- Observed daily ridership of bus routes associated with each PCN corridor;
- Daily bus riders passing each cutline; and
- Factors to estimate AM peak period, PM peak period, and midday ridership from daily ridership.

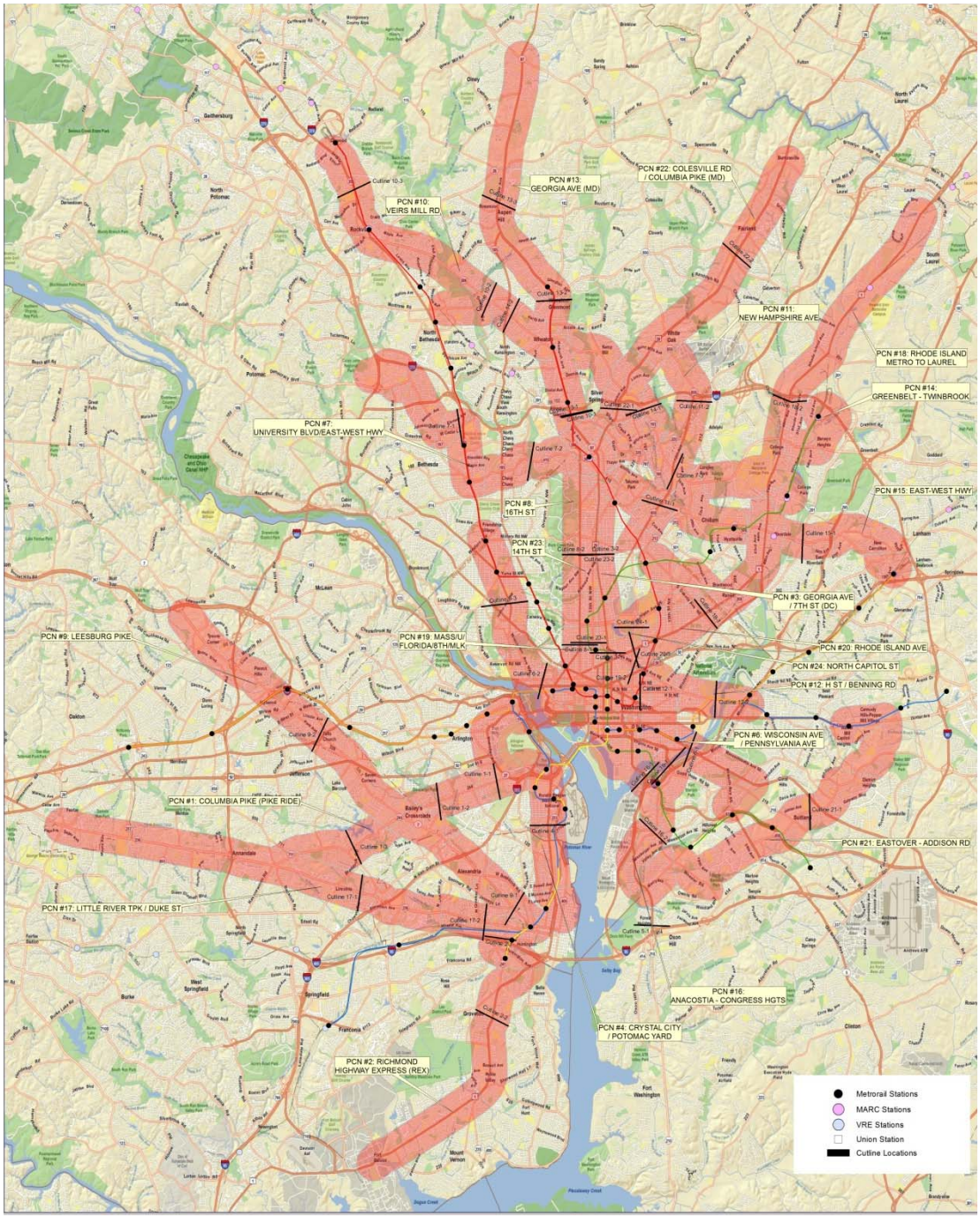
[11] Cutlines are imaginary lines perpendicular to a corridor crossing parallel roads that captures major flows through a corridor.

Figure B-2 Estimating Existing Ridership



a. Observed daily ridership of bus routes associated to each corridor
b. Daily total bus riders passing each cut line
c. Factors splitting total bus riders to different time periods by direction for each cut line

Figure B-3 Cutline Map



Step 2 – 2008 Model Adjustment

The second component of the process, shown in Figure B-4, was to validate the transit network and factor the model results for 2008 to match 2008 observed data. The first provided a validation of the transit network used by the model, and the second provided corridor-by-corridor assignments for 2008 conditions.

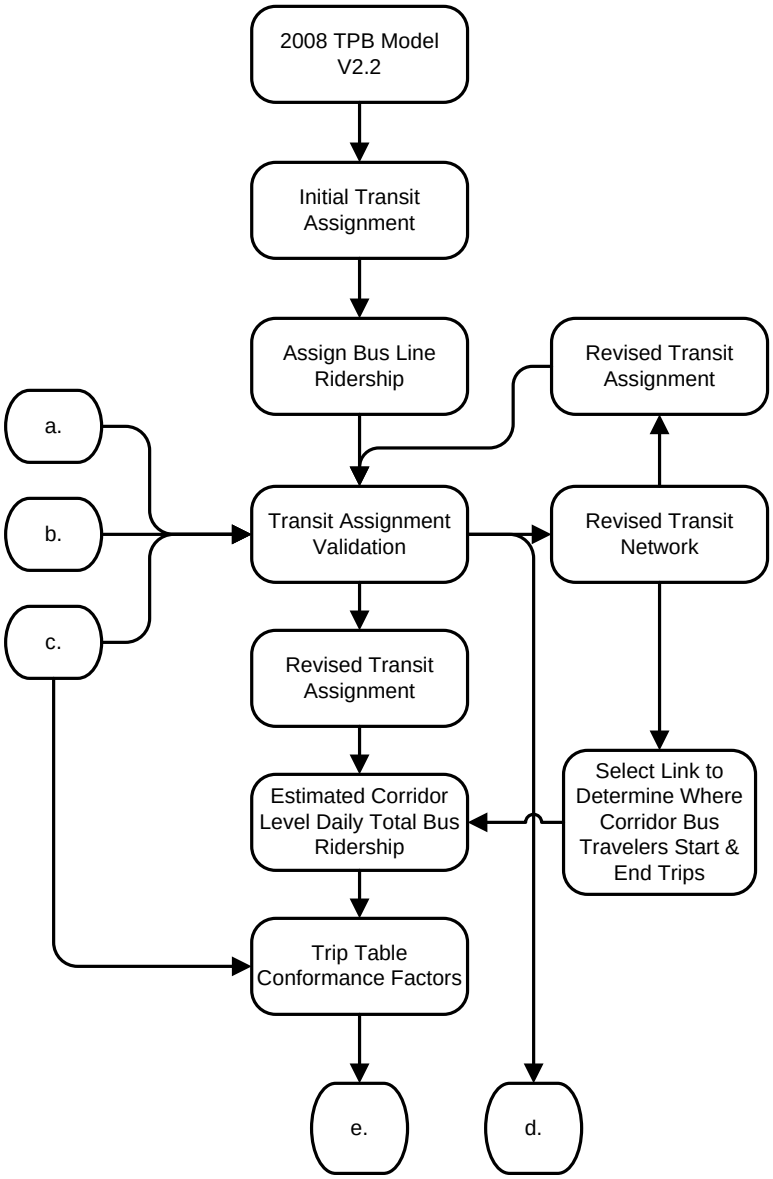
The 2008 model results were examined to determine how well the model forecasts transit ridership in each of the 23 corridors. Based on the results of that analysis, a revised network was run using adjustments to centroid connectors and network modifications to improve the performance of the model. Even with these adjustments, the model results did not match observed data within an acceptable error range (e.g., 25%) in every corridor. Therefore, the count data were then used to develop a correction factor for each corridor, and in a few cases sub-corridors, that were applied to all future year forecasts. This factor was developed based on the percentage difference and absolute difference between assignments and passenger counts. The passenger counts were also used to create a set of factors to adjust future-year bus trips by origin-destination (O-D) pair.

The validation was based on comparing how well the model replicated the passenger counts of the number of riders crossing cutlines along the corridors. Cutlines Table B-1 provides a comparison between the number of riders estimated by the model for 2008 compared to data from transit passenger counts.

The products of this step included:

- An acceptable model that provided corridor-wide volumes for each of the 23 PCN corridors
- Comparison of 2008 observed and modeled estimated daily bus ridership for:
    - Corridor level total bus ridership
    - Total bus ridership at individual cutlines
    - Ratio of observed and estimated daily bus ridership by origin and destination pair for bus trips in the 23 PCN corridors

Figure B-4 Validation Process



d. Comparison of observed and model estimated daily bus ridership with regard to:

1. Corridor bus lines
2. Corridor level total bus ridership
3. Total bus ridership at individual cut lines

e. Ratio of observed and estimated daily bus ridership per origin and destination pair bus trips in 23 corridors

Table B-1 Comparison of model forecasts and ridership counts at cutlines

ID	Corridor Description	Cutline Number	Cutline Location	Daily			Model Result	Percent Difference
				Corridor	Parallel Roads	Total		Difference
1	Columbia Pike (Pike Ride)	1-1	South Courthouse Rd.	7,051	1,245	8,296	9,411	13%
		1-2	W of South Four Mile Run Dr.	4,985	1,073	6,058	4,980	-18%
		1-3	Between Braddock Rd. and Lincolnia Rd	1,269	NA	1,269	1369	8%
2	Richmond Highway Express (REX)	2-1	Capital Beltway	1,126	NA	1,126	1136	1%
		2-2	Near Lowe's (Lockheed Blvd?)	4,970	529	5,499	7,179	31%
3	Georgia Ave./7th Street	3-1	Florida Ave NW (MWCOG Metro Core Cordon Line)	7,968	16,104	24,071	25,694	7%
		3-2	South of Kennedy St NW	7,729	8,873	16,603	13,307	-20%
4	Crystal City-Potomac Yard	4-1	Between South Glebe Rd and VA 233 (S. 27th St?)	647	2,267	2,913	3,210	10%
6	Wisconsin Ave./Penn Ave.	6-1	Anacostia River	7,473	NA	7,473	5528	-26%
		6-2	MWCOG Ring 1 Cordon / Rock Creek Pkwy	6,049	1,498	7,547	11,321	50%
		6-3	Porter St NW	3,953	4,216	8,169	9,177	12%
7	Univ. Blvd / East-West Hiway	7-1	W of MD 355	2,382	NA	2,382	2754	16%
		7-2	Rock Creek	6,557	NA	6,557	10933	67%
		7-3	New Hampshire Ave	5,752	0	5,752	4,905	-15%
8	Sixteenth Street (DC)	8-1	Florida Ave NW (MWCOG Metro Core Cordon Line)	9,216	8,350	17,566	21,897	25%
		8-2	South of Kennedy St NW	6,147	10,456	16,603	13,307	-20%
9	Leesburg Pike	9-1	E of Janneys Ln	3,272	2,449	5,721	5,525	-3%
		9-2	W of Washington St (City of Falls Church)	2,777	NA	2,777	2172	-22%
10	Veirs Mill Road	10-1	North of Capital Beltway (MWCOG Cordon)	5,599	NA	5,599	5604	0%
		10-2	North of Randolph Rd	5,473	NA	5,473	5621	3%
		10-3	MD 355 at North Campus Dr	4,862	1,189	6,051	5,151	-15%

ID	Corridor Description	Cutline Number	Cutline Location	Daily			Model Result	Percent Difference
11	New Hampshire Avenue	11-1	South of MD 410	2,976	4,025	7,001	11,853	69%
		11-2	Capital Beltway	3,069	1,028	4,097	4,194	2%
12	H Street / Benning Road	12-1	Amtrak NEC Tracks	5,710	0	5,710	6,001	5%
		12-2	Anacostia River	5,911	0	5,911	3,968	-33%
13	Georgia Ave. (MD)	13-1	North of Capital Beltway (MWCOG Cordon)	5,599	1,616	7,215	6,905	-4%
		13-2	Randolph Rd	3,726	1,117	4,842	2,801	-42%
		13-3	North of Bel Pre Rd	1,581	NA	1,581	1928	22%
14	Greenbelt-Twinbrook	14-1	Capital Beltway	5,634	1,350	6,984	5,160	-26%
		14-2	Connecticut Ave	8,066	1,596	9,662	8,082	-16%
15	East-West Hiway (PG)	15-1	Kenilworth Ave	1,949	NA	1,949	1721	-12%
16	Anacostia-Congress Heights	16-1	Anacostia River	4,458	0	4,458	4,775	7%
		16-2	South of Malcolm X Ave SE	6,486	2,522	9,008	12,139	35%
17	Little River Turnpike/Duke Street	17-1	Between Braddock Rd and I-395	2,118	NA	2,118	2505	18%
		17-2	East of Quaker Ln	1,985	1,175	3,160	2,676	-15%
18	Rhode Island Ave Metro to Laurel	18-1	South Dakota Ave NE	4,363	2,514	6,877	8,997	31%
		18-2	Capital Beltway	609	0	609	605	-1%
19	MA / U / FL/ 8th / MLK	19-1	Anacostia River	3,901	11,531	15,432	18,824	22%
		19-2	East of North Capitol St NE	4,354	5,710	10,063	10,279	2%
20	Rhode Island Avenue	20-1	East of North Capitol St NE	1,757	0	1,757	1,708	-3%
21	Eastover - Addison Road	21-1	South of Pennsylvania Ave?	1,736	NA	1,736	1664	-4%
22	Colesville Rd./Columbia Pike - MD US 29	22-1	Capital Beltway	7,281	NA	7,281	8980	23%
		22-2	Fairland Rd	2,746	55	2,801	2,941	5%

ID	Corridor Description	Cutline Number	Cutline Location	Daily			Model Result	Percent Difference
23	Fourteenth Street (DC)	23-1	Florida Ave NW (MWCOG Metro Core Cordon Line)	6,888	18,646	25,534	31,983	25%
		23-2	South of Kennedy St NW	2,726	13,876	16,603	13,307	-20%
24	North Capitol Street	24-1	South of Michgan Ave NE	2,554	NA	2,554	1731	-32%

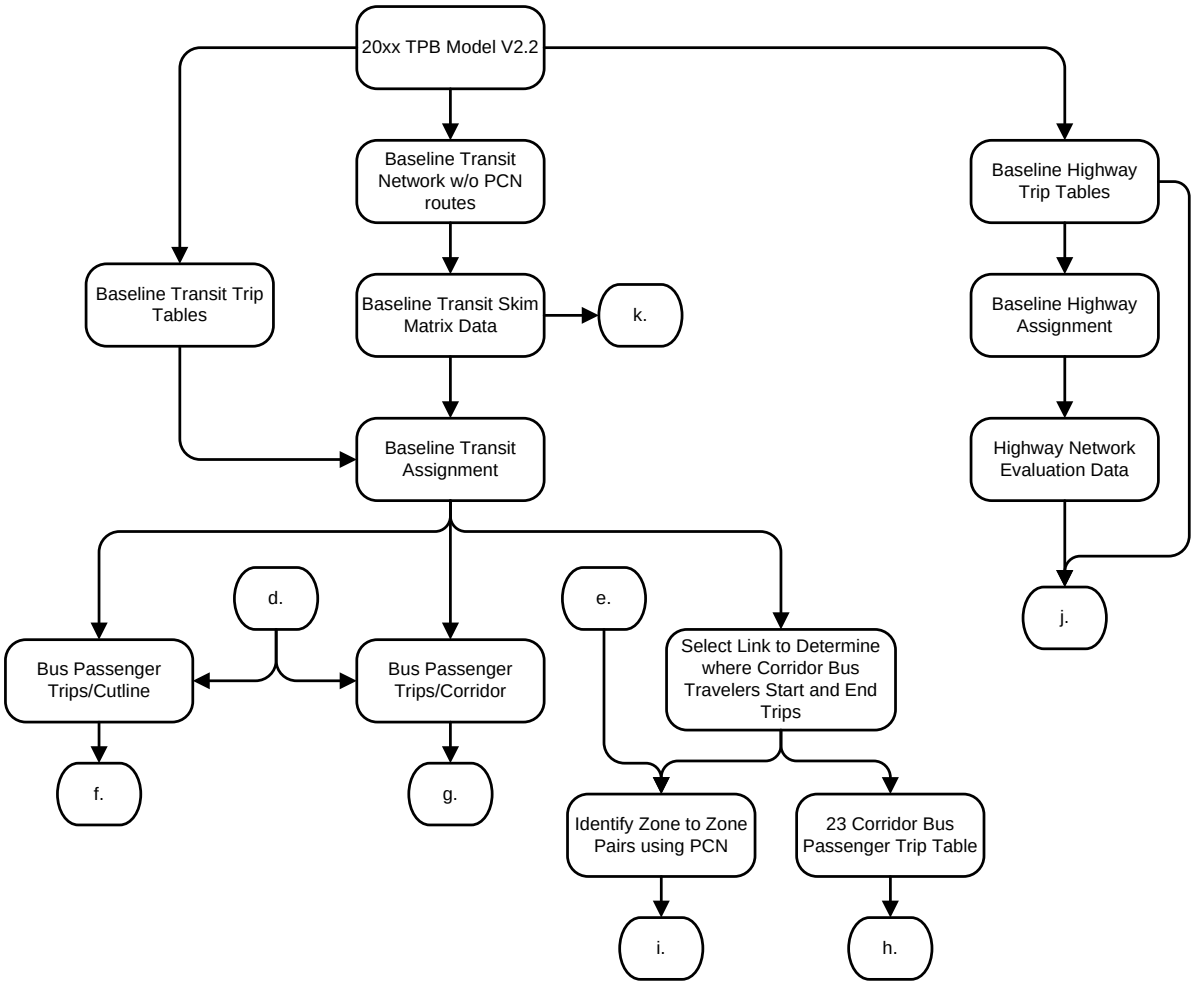
Step 3 - Develop Baseline 2030 Conditions

The third component of the analysis process, shown in Figure B-5, was to develop baseline 2010 and 2030 forecasts of transportation conditions. This was accomplished using the CLRP networks for 2010 and 2030, and socioeconomic data (MWCOG Round 7.1 Cooperative Forecasts) within the Version 2.2 model. This forecast formed the basis of most of the required analysis of 2030 conditions. It provided baseline bus patronage without the PCN improvements for each of the 23 corridors, and a baseline highway assignment. A select link analysis was used to identify the O-D zones that use bus in all of the corridors. The trips for these O-D zones were adjusted to reflect the revised trips resulting from the factored corridor and cutline volumes. The resulting trip tables served as the basis for the next step, pivot point modeling. They also provided information about estimated baseline 2030 conditions that was compared to the situation with the enhanced PCN network for that year.

The products of this step included:

- Daily bus passenger trips crossing each cutline without PCN enhancements for 2010 and 2030
- Daily bus passenger trips in each corridor without PCN enhancements for 2010 and 2030
- Trip table of bus passenger trips using all PCN corridors prior to enhancements for 2010 and 2030
- Trips (i,j pairs) that would use buses in PCN corridors before enhancements in 2010 and 2030
- Baseline automobile data without PCN enhancements for 2010 and 2030
- Auto Trip Table
- Regional Vehicle-Miles Traveled (VMT) ,Vehicle-Hours Traveled (VHT), and Person-Hours Traveled (PHT) for auto users
- Daily automobile vehicle trips crossing each cutline
- Peak hour capacity of each cutline
- Zone to zone out-of-vehicle and in-vehicle times prior to enhancements
- Baseline transit supply and demand data for 2010 and 2030 to compare with results of PCN evaluation

Figure B-5 Process to Estimate 2030 Baseline Ridership



f. Daily bus passenger trips crossing each cutline without PCN enhancement for 2010 and 2030
g. Daily bus passenger trips in each corridor without PCN enhancements for 2010 and 2030
h. Trip table of bus passenger trips using all PCN corridor prior to enhancements for 2010 and 2030
i. Trips (i,j pairs) that use buses in PCN corridor before enhancements in 2010 and 2030
j. Baseline automobile data without PCN enhancements for 2010 and 2030
   1. Auto Trip Table
   2. Regional VMT, VHT and PHT for auto users
   3. Daily automobile vehicle trips crossing each cutline
   4. Peak hour capacity of each cutline
k. Zone-to-zone out-of-vehicle and in-vehicle times prior to enhancements

Step 4 – 2030 PCN Bus Ridership Forecasts and Resulting Changes in Highway Conditions

The fourth component of the forecasting process, shown in Figure B-6, was the forecast of 2030 transit demand with the PCN improvements, and to estimate the effect that the PCN improvements will have on auto travel. This forecast used the adjusted base year trip tables developed in step 3 and a pivot point model (i.e., incremental logit model). For this component, the highway and transit networks were recoded to include the appropriate highway and transit network changes for each of the PCN options. These PCN option networks were used to determine the in-vehicle and out-of-vehicle changes in travel time for both bus trips and auto trips within the PCN network. The difference in time related to PCN improvements was evaluated to estimate the resulting change in bus passengers and auto drivers. This process captured the impact that increased bus ridership and reduced auto trips would have on highway speeds.

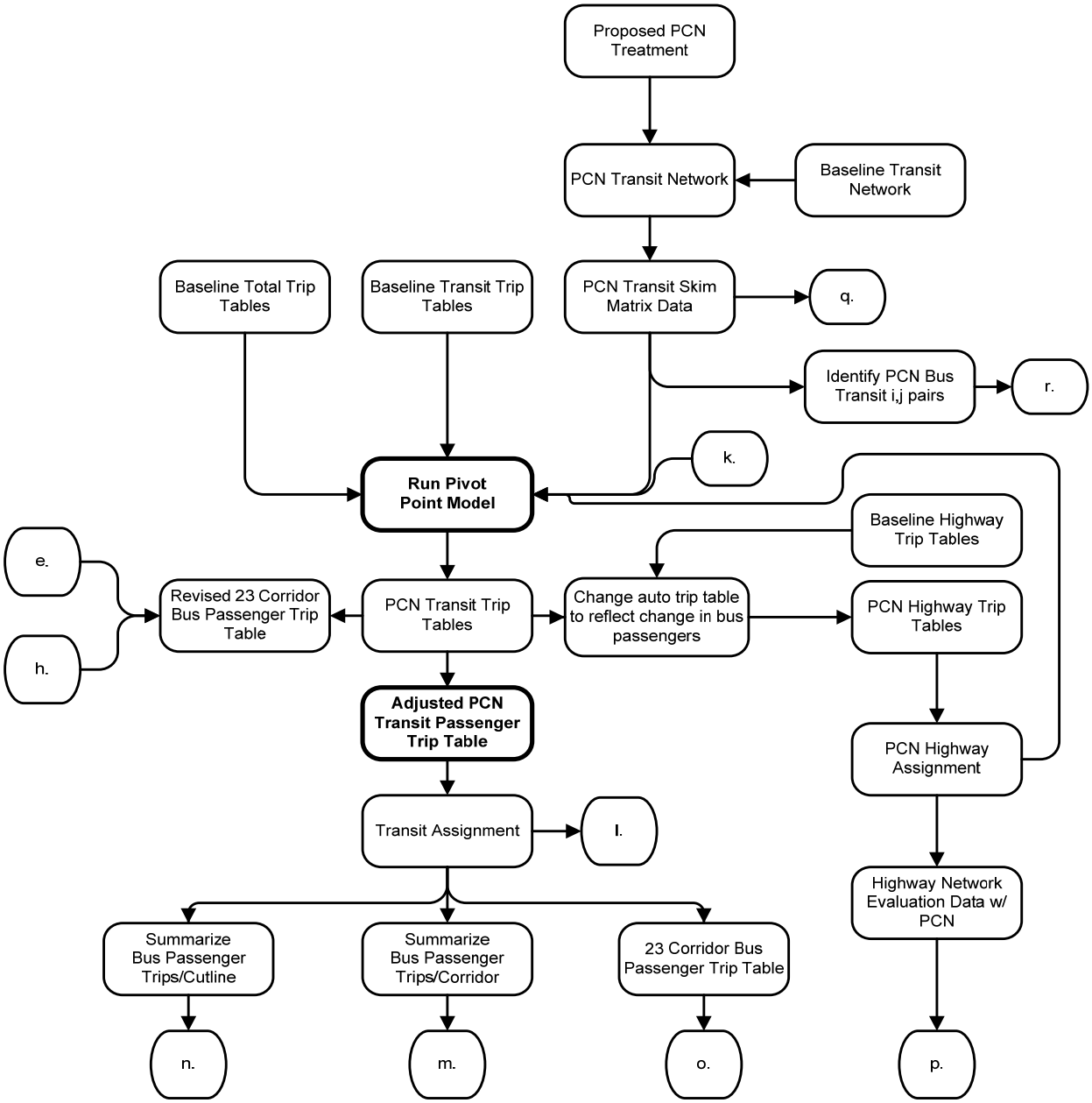
The resulting transit trip tables were adjusted to reflect the differences found between 2008 observed and modeled trips in step 2. Adjustments were made to those trips between O-D pairs determined to use buses serving the PCN corridors in the 2008 baseline. New trips between O-D pairs not served in the baseline were not adjusted.

The adjusted transit trip table was used to modify the highway trip table to reflect the impact of the PCN options. The modified trip tables were then assigned to the highway and transit networks to determine utilization of bus service and the impact on the highway network. Most, if not all performance attributes, were determined using the results of these assignments. The products of this step included:

- Assignment of all transit trips to bus and rail routes
- Daily bus passenger trips in each corridor
- Adjusted trip table of bus passenger trips using all corridors after PCN enhancements for each alternative for 2030
- 2030 automobile network data for after PCN enhancements for each alternative
- Regional VMT , VHT, and PHT for auto users
- Daily automobile vehicle trips crossing each cutline
- Peak hour capacity of each cutline
- Zone to zone out-of-vehicle and in-vehicle times with PCN attributes

- Highway and transit supply and demand data to evaluate PCN attributes

Figure B-6 Process to Forecast 2030 Ridership with PCN Treatments



l. Assignment of all transit trips to rail and bus routes
m. Daily bus passenger trips in each corridor
n. Bus passenger trips/cutline
o. Adjusted trip table of bus passenger trips using all corridors after PCN enhancements for each alternative for 2030w
p. Automobile network data for after each PCN enhancements for each alternative for 2030
    1. Regional VMT, VHT, and PHT for auto users
    2. Daily automobile vehicle trips crossing each cutline
    3. Peak hour capacity of each cutline
q. Zone to zone out-of-vehicle and in-vehicle times
r. Zone to zone pairs using PCN

Step 5 Evaluation of 2030 PCN options

The fifth component of the analysis process was to evaluate the impacts of the PCN network on the highway and transit systems. This step used data derived in the previous steps to quantify the MOEs. MOE values for full build PCN attributes (e.g., dedicated bus lanes, signal priority, 10 minutes or better headways in during the peak period, etc.) were analyzed to determine in which corridors they were effective without dramatically degrading the highway system, and where they made the most sense. A second network, the so-called Exclusive Lane Improvements Alternative (ELIA), was developed and analyzed. This alternative included exclusive lanes, where warranted, and improved headways, queue jumpers, signal preemption, off-board fare collection, reduced stops, etc. in all corridors. Segments from the full build option that had a low level of ridership and/or high impact on roadway capacity due to reserving a lane in each direction for bus only operations were identified and unwarranted transit-exclusive segments were removed from the network. A third PCN network (Service and Operational Improvements network) was developed keeping the full attributes where appropriate, and where they were not appropriate included less obtrusive attributes. The results of the analysis of the modified network were then compared to MOEs for the full build, the ELIA scenarios, and the baseline to estimate the relative regional benefits of the PCN system.

This evaluation resulted in a final PCN network derived from the modified network for which a new set of MOEs were estimated and benefits predicted. The products of this step were:

- MOEs for each alternative
- An evaluation matrix that demonstrated the pros and cons of each alternative

C : Travel Time Savings attributable to PCN Attributes

Existing Research Basis

Projects establishing various forms of bus priority, both in the Washington metropolitan area and across the nation, are not new. The bus lanes on I-395 in Northern Virginia date from about 1974. Bus (and right-turn) only lanes on Arlington Boulevard in Arlington were operated in peak-hours prior to the opening of I-66. Contra-flow bus lanes were operated in cities ranging from San Juan, Puerto Rico to Madison, Wisconsin and bus only transit malls were developed in many cities. In the past decade, there has been greater interest in providing enhanced bus operations as part of an entire package of improvements that include not only priority rights-of-way but also other features to improve both the performance and the visibility of the bus services. These other features include priority for transit vehicles at traffic signals, off-board fare collection, queue-jump lanes at key intersections or congestion points, greater spacing between stops, and branding of the service to enhance visibility and customer recognition. The broader package incorporating all of the priority and marketing elements is often identified as Bus Rapid Transit, but projects incorporating several of the priority elements have been implemented in many metropolitan areas across the nation. Most of these projects have been implemented in only the past few years, but selected information documenting the effects achieved by these projects is beginning to appear in the literature.

A summary of the benefits that had been demonstrated by implementation of various forms of bus priority treatment through 2006 can be found in the Bus Rapid Transit Practitioner's Guide.[12] While a full BRT may be the goal for many agencies, experience has shown that the implementation of selected key elements of the overall package can result in significant improvement in bus operations, increased ridership and customer satisfaction.

The body of the PCN Evaluation report identifies goals, objectives and measures of effectiveness used in evaluating the effectiveness of bus priority actions in the designated corridors. Twelve of those measures relate directly or indirectly to the reduction in bus travel time that can be achieved. Factors that affect the bus travel time include:

- The extent of transit exclusive roadway space available
- The use of transit signal priority to reduce bus delays at traffic signals

[12] Bus Rapid Transit Practitioner's Guide, Transit Cooperative Research Program Report 118, Transportation Research Board, Washington DC, 2007

- The use of off-board fare collection to reduce boarding times
- The spacing of bus stops or stations

Understanding the time devoted to various activities (e.g. in-motion, picking-up or discharging passengers, stopping at a traffic signal, etc.) provides insights into how each of the factors contributes to the overall travel time for a bus trip and the gains that can be made by implementing the various priority strategies. The data for such analyses are obtained from speed and delay studies on specific routes or corridors. Figure C-1 illustrates the components of bus travel time as reported by Metropolitan Transit Authority (MTA), New York City, in its study of the Fordham Road bus Priority implementation. Figure C-2 illustrates the components of bus travel time as observed on Washington Metropolitan Area Transit Authority (WMATA) Route 9A in Fairfax County in 2000, while Table C-1 presents the data on which the charts are based.

For the Fordham Road corridor in New York with substantial boarding and alighting activity and heavy traffic, the bus is in motion just over half the time (54%) For the Fairfax County studies with less on and off activity, the bus was in motion over three-quarters of the time (77%) on a light traffic summer day and 65% of the time on a fall day with greater traffic. Note that in the Fairfax County study, the actual time in motion for the surveyed trip was essentially the same (43.6 vs. 43.9 minutes) in both observations. The greater passenger activity in the fall added just under a minute to the overall trip time. The greater roadway congestion, with concomitant signal delay, in September compared to August accounted for almost all the additional time (11.8 vs. 3.9 minutes). Direct comparisons between the effect of signal delay on Fordham Road in New York and Route 1 in Fairfax County are not possible without greater knowledge of the number and spacing of traffic signals in the two locations. Furthermore, in the Fairfax studies delay was considered "signal delay" if the bus was stopped in a queue that resulted from traffic backed up at a traffic signal.

Figure C-1: Components of bus running time (New York MTA)

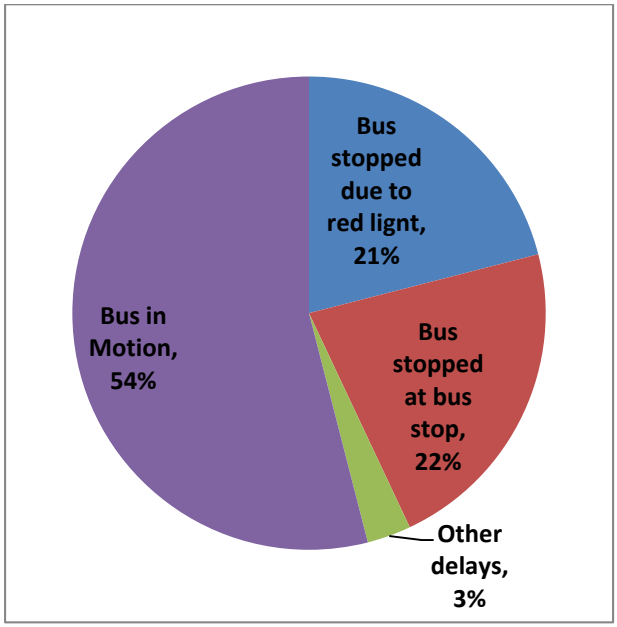


Figure C-2: Components of Bus Travel Time, Fairfax County VA

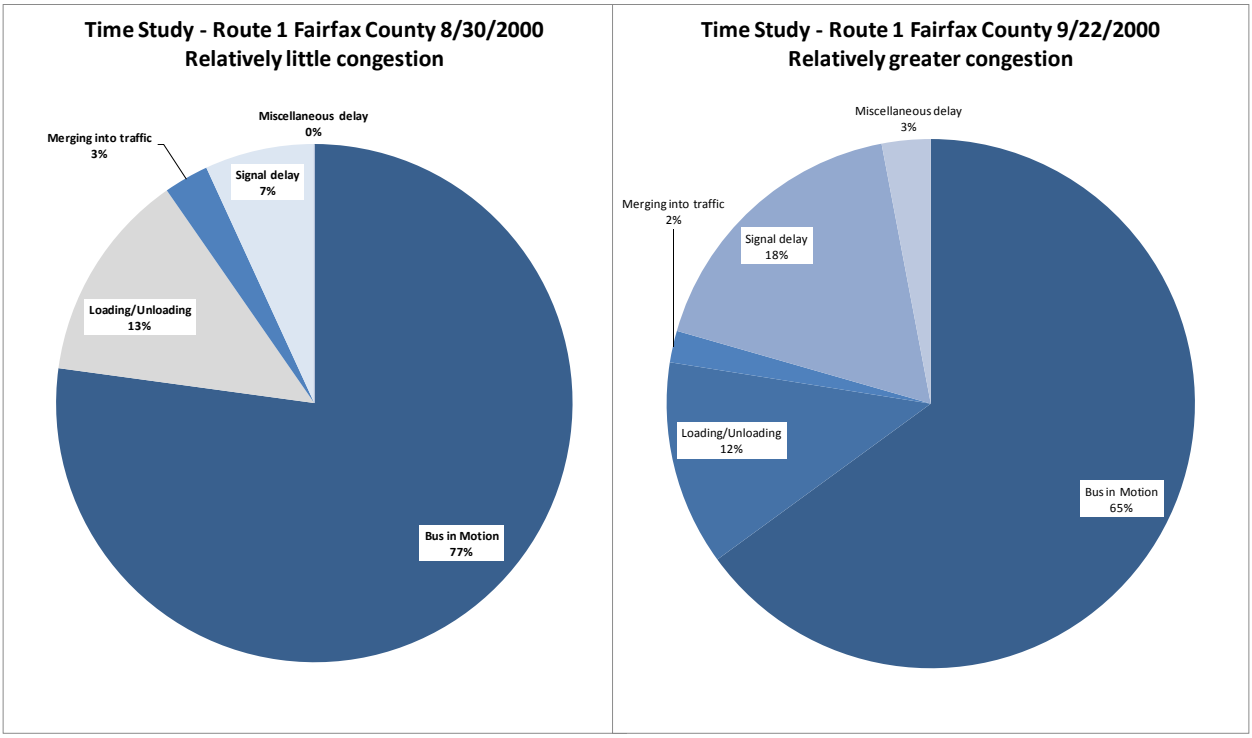


Table C-1: Fairfax County Bus Travel Time Study Data

Northbound trips from Lorton VRE Station to Huntington Metrorail Station		
Morning Peak Hour		
	August 30, 2000	September 22, 2000
	(Wednesday)	(Friday)
	Lv. 7:22 AM	Lv. 7:29 AM
Activity	**Minutes**	**Minutes**
Bus in Motion	43.9	43.6
Loading/Unloading	7.5	8.4
Merging into traffic	1.6	1.3
Signal delay	3.9	11.8
Miscellaneous delay	0	2
Total	**56.9**	**67.1**

For a bus operating on an arterial roadway with adjacent traffic, the gain in maximum operating speed to be achieved by use of an exclusive lane is not likely to be large. The speed, while in motion, will be governed by the roadway conditions, roadside friction, posted speed limits and similar factors. The data from Fairfax County suggest that the reductions in travel time that can be attributed to an exclusive or semi-exclusive bus lane arise not from increased maximum operating speed, but rather primarily from the queue-jump opportunities afforded by the bus priority lane.

Effect of Exclusive Use of Roadway Space

Many of the bus priority systems in North America use the curb lane on an existing roadway by restricting it to use by transit vehicles (either all day or during peak hours). Often, these lanes are also used by other vehicles that are turning right at the next intersection. The change in bus speed or travel time that will result from the use by buses of such an exclusive lane depends in large measure on the overall capacity of the roadway, the number of vehicles using the lane to make right turns, the number of intersections at which right turns are permitted, and the

spacing of bus stops. Table C-2 illustrates how average bus speeds vary with stop spacing and dwell time for a range of typical conditions. For conditions that would be typical for a priority bus operation (e.g., bus stop spacing of 0.25 to 0.50 miles and 30 second dwell times), the change in travel time that may be expected from the use of a dedicated bus lane is 3 minutes per mile. The overall time saving in a segment or corridor can be estimated by determining the length (in miles) for which the restricted lane is to be provided and multiplying by this factor.

Table C-2: Estimated Arterial Bus Speeds With and Without Dedicated Bus Lanes

Estimated Average Bus Speeds on General Purpose Traffic Lanes						
Average Stop Spacing (miles)	*Average Dwell Time Per Stop (seconds)*					
	10	*20*	*30*	*40*	*50*	*60*
0.10	6	5	5	4	4	3
0.20	9	8	7	6	6	5
0.25	10	9	8	7	7	6
0.50	11	10	10	9	9	8
Estimated Average Bus Speeds on Dedicated Arterial Street Bus Lanes						
Average Stop Spacing (miles)	*Average Dwell Time Per Stop (seconds)*					
	10	*20*	*30*	*40*	*50*	*60*
0.10	9	7	6	5	4	4
0.20	16	13	11	10	9	8
0.25	18	15	13	11	10	9
0.50	25	22	20	18	16	15

Source: Source for data: Characteristics of Bus Rapid Transit for Decision Makers, FTA, Feb. 2009, Page 3-5

Use of Transit Signal Preemption to Reduce Bus Delays at Traffic Signals

Many of the bus priority projects implemented have had priority for buses at transit signals as one element. Transit Signal Priority (TSP) has been part of the transit priority package used in cites ranging in size from Springfield, Massachusetts to Los Angeles, California. The effectiveness of signal priority in reducing bus running times will, of course, vary with the degree of existing congestion and the number of signals. This is illustrated, in part by the experience in Las Vegas (Table C-3) which shows the most significant time savings in the peak directions (southbound in the morning and northbound in the afternoon). For this 7.6-mile project involving both mixed lanes and exclusive lanes, the savings are approximately 2 minutes per mile in the peak hour peak directions and 1.3 minutes per mile in the peak hour off-peak directions. The proportion of the savings due to TSP, as opposed to the other priority elements (e.g., fewer stops) is not reported but the experience from the Metro Rapid in Los Angeles is that about one-third of the savings (0.40 to 0.66 min/mile) result from TSP.

Table C-3: Average Weekday Travel Times (min) on Route 113 and MAX by Time of Day

	Route 113 (pre-MAX)		MAX		Percentage Reduction	
	NB	SB	NB	SB	NB	SB
AM	38	49	28	31	26%	43%
Midday	44	49	28	31	36%	37%
PM	37	39	23	28	38%	28%

Use of Off-Board Fare Collection to Reduce Boarding Times

Table C-4 illustrates the time required to serve boarding passengers under a range of fare policies.

Table C-4: Bus passenger Service times (Seconds/passenger)

Fare Payment Method	Observed Range	Default (Single-Door Boarding)
BOARDING		
Pre-payment (e.g., passes, no fare, free transfer, pay on exit)	2.25–2.75	2.5
Smart card	3.0–3.7	3.7
Single ticket or token	3.4–3.6	3.7
Exact change	3.6–4.3	4.2
Swipe or dip card	4.2	4.4
ALIGHTING		
Rear door	1.4–2.7	2.3
Front door	2.6–3.7	3.5

Sources: Transit Capacity and Quality of Service Manual, 2nd Edition, p. 4-5; "BRT Implementation Guidelines," Table 8-7.

When exact change is required, the reported time per boarding is over 4 seconds, although fares requiring odd combinations of change (e.g., $1.40, with no bills accepted) could result in substantially longer times. At stops with more than one or two boarding passengers, the time at a bus stop can easily approach a minute. Over the length of a heavily used bus route with many stops, the time to board passengers and collect fares can easily exceed the 12% of trip time observed in Fairfax County. In such conditions, the 22% of trip time devoted to serving passengers at bus stops reported in New York may be more typical.

Off-board fare collection not only reduces the time per transaction required to serve a passenger from about 4 seconds to 2.5 seconds, it also permits the use of all doors for boarding. At a stop with 30 boarding passengers, the time savings that would be required for on-board fare payment would be about 30 x 4 = 120 seconds. With off-board fare payment, this time would

drop to 30 x 2.5 = 75 seconds. Use of both the front and rear doors for boarding would reduce this still further to about 40 seconds – one-third of the time for boarding with cash fare payment – and a savings of over a minute per stop.

For a priority bus route with two to three stops per mile, the time saving attributable to off-board fare collection would be about three minutes per mile.

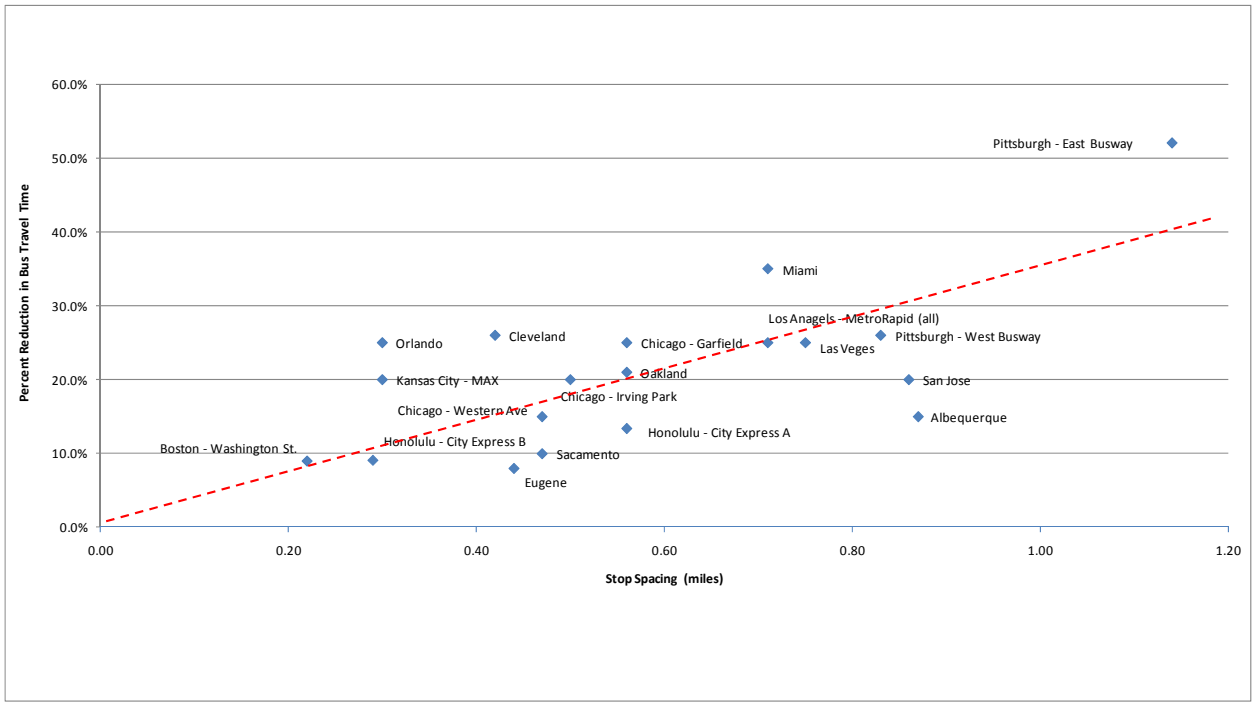
Spacing of Bus Stops or Stations

The number of bus stops can have a significant effect of bus running times. At a stop with no boarding or alighting passengers, the effects may be small, but even at these stops the driver must reduce speed and be prepared stop in the anticipation of a request for service. When a passenger is waiting to board or there is a request for a stop, the driver must decelerate, maneuver to the stop location, operate the doors, check to be sure that boarding and alighting passengers have cleared the vehicle, and maneuver back into traffic. All of these steps are required and are independent of the number of passengers boarding or alighting. Reducing the number of bus stops has been a major factor in reducing the travel time for most of the priority bus projects reported in the United States. The degree of time savings depends on multiple factors including the number of stops per mile in both the before and after conditions and the boarding and alighting volumes. Unfortunately, from the data reported it is not always possible to isolate the effects of reducing the number of bus stops from the effects of off-board fare collection or establishment of bus priority lanes.

Figure C-3 illustrates the relationship between the spacing of bus stops on the priority bus services implemented in eighteen cities and the percentage reduction in travel time. A linear regression on these data suggests that for every additional tenth of a mile between stops there is a 3.5% reduction in travel time compared to the non-priority bus service.

The time saving attributable only to fewer stops per mile is directly related to the average operating speed of the bus, and the prior stop spacing. For a prior stop spacing of 0.167 miles (six stops per mile), the time savings expected would range from 0.9 minutes per mile for buses operating at an average speed of 8 miles per hour to 0.5 minutes per mile for buses operating at an average speed on 20 miles per hour.

Figure C-3: Percent Reduction in Travel Time vs. Stop Spacing



Source for data: Characteristics of Bus Rapid Transit for Decision Makers, FTA, Feb. 2009, Pages 3-9 ff

Summary

Based on the observations reported from previous studies, the savings in bus travel time that might be expected were estimated to be as shown inTable C-5.

Table C-5: Time Savings for Bus Priority Treatments

Factors that affect the bus travel time	Time saving (minutes per mile)
Exclusive use of roadway	3
Transit signal priority	0.40 to 0.66
Off-board fare collection	3
Spacing of bus stops or stations	0.5 to 0.9

However, when use of these factors for the PCN network was attempted it was found that in many cases the resulting travel times were not plausible. In some cases, the estimated time saved would have exceeded the reported running time. Therefore, an alternative approach was

developed. This alternative approach recognized the factors from which travel time savings would be derived, as discussed above, but tailored the application to the specific conditions in the WMATA service area.

The first step was to identify all local bus routes operating over each segment of the PCN and to determine the travel time for traversing the segment as it appeared in the MWCOG network. Due to the procedure used by MWCOG in network building, while bus route end-to-end times agree with those shown on WMATA schedules, the times over specific segments may be different. The mean travel time for local bus routes traversing each segment was determined and tabulated.

The base conditions for each segment for the MWCOG 2030 transit network were identified. These included segment length, time to traverse the segment, the resulting speed and the resulting minutes per mile.

For each segment, the following attributes were estimated based on roadway type and location in the metropolitan area:

- Number of stops per mile
- Running speed (i.e. bus average speed while in-motion; generally the same as the auto running speed

The travel time over the segment was defined as being made up of three components:

- In-motion time - estimated as the segment length divided by the running speed
- Time at stops, including boarding, alighting and fare collection - estimated based on 0.2 minutes per stop
- Time while delayed in congestion at intersections – estimated as the difference between the "observed" average segment travel time as reported in the MWCOG networks less the time spent at stops.

Having established the base travel time and the components of the travel time, it was then possible to assess the amount of reduction in travel time that could be achieved by implementation of various elements of the PCN.

Time savings resulting from each of these attributes was as estimated as follows:

- Fewer stops per mile – 0.2 minute saving for each stop eliminated
- Off-board fare collection – 0.3 x time devoted to stops

- Transit signal priority – 0.3 x time attributable to intersection congestion
- Exclusive use lane – difference between the average segment travel time as coded in the MWCOG network and the segment travel time that could be achieved traversing the segment at the average uncongested speed.

The time required for PCN and local bus routes to traverse a segment was then computed as the travel time as coded in the MWCOG 2030 transit network less the time savings achievable through application of the features referenced above.

For each alternative, the attributes or features associated with each segment were defined. The change in bus travel time resulting from these features was then computed using a specially developed spreadsheet. For PCN routes the time on each segment was coded as computed. For local buses travel time savings were assumed only for routes that traveled more than one-half mile on the PCN corridor. For those routes the time saving was computed based on the length of route operation on the PCN corridor. The computed time saving was then subtracted from the route end-to-end travel time coded in the MWCOG network, as adjusted using the MWCOG process to account for added congestions between 2008 and 2030. The MWCOG network coding process was then used to determine local bus link travel times.

D : PCN Accounting for Non-travel Time Related Factors

Bus operations on the PCN network will improve service quality and reduce travel times for travelers choosing to use transit. The effects on the transit share of the total travel market related to increased service frequency and reduced travel times are captured directly in the MWCOG mode choice model and the incremental application of that model as applied in the PCN studies. However, there are other attributes of a PCN network and the related bus services that will also enhance the attractiveness of the bus services and, hence, the share of the travel markets capture by transit. These effects on market share of these non-quantifiable attributes are represented in mode choice models in the form of modal bias constants.

It has long been asserted that rail transit attracts greater ridership than would be attributable solely to savings in travel time. Recent Before-and-After studies of projects funded under the FTA New Starts Program have provided information to validate this assertion. Many of the attributes of rail services that contribute to this positive customer response are also found in enhanced bus services such as those that would make up the PCN network. The Bus Rapid Transit Practitioners Guide[13] presents a recommended methodology for accounting for the increased customer response for bus services that "…operates as a premium mode and offers riders the following:

- A clearly identifiable running way, with a sense of permanence and minimum traffic interferences
- Safe, secure, and convenient access to attractive yet functional stations
- Clean, comfortable, climate-controlled vehicles that are easy to board and exit
- Passenger information systems at stations and on vehicles, which give "next station" announcements and vehicle arrival times
- A long service span, with frequent service throughout the day
- A simple, understandable service pattern
- A clear system image and identity

The above attributes were associated with PCN operations.

[13] Bus Rapid Transit Practitioners Guide, Transit Cooperative Research Program Report 118, Transportation Research Board, National Academies, Washington DC, 2007

To represent in the effects of these attributes in the market share analysis function, the Guide suggests that, based on observed operations of premium bus services, a modal bias constant of up to ten minutes may be attributed to enhance bus services. The actual amount was determined using a method in which the proportion of maximum benefits associated with any specific service is determined based on the allocation shown in Table D-1.

For each segment of each corridor included in the PCN network an assessment was made whether or not each of the attributes above would be present in each of the alternatives considered. Some attributes were associated with all PCN operations (e.g., all-day service; clear, simple service pattern, branding, unique vehicles) while others were specific to the configuration in a specific segment in a specific alternative (e.g., all-day bus lanes).

In the application of the incremental mode choice analysis, each zone-to-zone transit path was examined to determine which PCN segments (if any) were traversed. Next, the appropriate modal bias constant to be allocated to the transit utility for those paths was determined. The proper amount was then added in the utility functions.

Table D-1: Proportion of Enhanced Bus Modal Bias Constant Attributable to Specific Factors

Component	Points	Percent
Running Ways (one only)	20	
Grade-separated busway		20
At-grade busway		15
Median arterial bus lanes		10
All-day bus lanes (delineated)		5
Peak-Hour bus lanes		0
Mixed Traffic		0
Stations	15	
Conventional Shelter		0
Unique/Attractive/ Special shelter		2
Illumination		2
Telephones		3
Climate controlled waiting area		3
Passenger amenities		3
Passenger services		2
Vehicles	15	
Conventional vehicles		0
Uniquely designed vehicles		5
Air conditioning		0
Wide multi-door configuration		5

Level boarding (low floor or high platform)		5
Service Patterns	15	
All-day service		4
High-frequency service (<=10 min)		4
Clear, simple service pattern		4
Off-vehicle fare collection		3
ITS applications	10	
Passenger information at stops		7
Passenger information on vehicles		3
BRT Branding	10	
Vehicle and Stations		7
Brochures/schedules		3
Subtotal (Maximum = 85)		
Synergy credit (If subtotal > 60)		15
Total		100

E : Research from Existing Studies for PCN Corridors

Metrobus 16th Street Line Study

PCN Corridor: 16th Street Corridor: McPherson Square Metro to Silver Spring Metro

February 2009

WMATA and DDOT

Principles of Service

- There should be a basic level of service to anywhere in the corridor that transit service is provided.
- Retain a high-frequency "trunk" service along 16th Street NW.
- New service types should be in addition to retaining some all-stops local service.
- Match service type, frequency, and capacity to demand based on route segment; trip purposes, time of day; travel direction; day of week; and origins and destinations to preserve effectiveness and efficiency.

New Services (in addition to existing bus services):

- Planned Improvements in three phases:
- Immediate: March 2009
- Intermediate: Late 2009/Early 2010
- Long-Term: After 2010

Immediate– already implemented in March 2009:

- Implement S9 Express Service
- From McPherson Square Metro to Silver Spring Metro
- Limited Stops at:

- Silver Spring Metro (Colesville Rd & East-West Highway)
- Eastern Avenue
- Kalmia Road
- Sheridan Street (SB) and Somerset Place (NB)
- Missouri Avenue
- Colorado Avenue
- Buchanan Street
- 3636 16th Street (SB) and Spring Road (NB)
- Park Road
- Irving Street/Columbia Road
- Euclid Street
- U Street
- P Street
- M Street
- K Street
- McPherson Square (I Street between 13th and 14th)

- Headway: 10 minutes peak
- Span: 6:30 – 10:00 AM and 3:00 – 7:00 PM

Intermediate:

- Expand S9 into evenings and middays
- Headway: 10 minutes peak, 20 minutes late evenings and middays.
- Span: 6:30 AM – 12:30 AM

- Implement S3 Short-Turn Service: Provide more peak period service to busiest part of corridor.
- From Federal Triangle to Colorado Avenue (terminus TBS, likely Colorado, or between Kansas and Colorado).
- Same stops as S2 and S4 (local routes).
- Headway: 10 minutes peak, 15 minutes off-peak
- Span: 6:00 – 9:00 AM and 3:30 – 6:30 PM
- Use articulated buses on S2 and S4 in late-evening hours to address crowding

Long-Term:

- Increase Frequency of S3 Service
- Headway: 5 minutes peaks, 10 minutes midday, 15 minutes evenings

Other Improvements:

Runningway

- Bus Lane: Existing reversible lane in peak direction between Spring Road and Irving Street. Not bus only, and DDOT considering turning it into a grassy median. This study proposes an option to retain that travel lane and turn the curbside parking lanes into bus only lanes- during peak hours and peak direction only.
- Intersection Improvements: Recommends queue jumps for buses at the following intersections: 16th and Colesville and 16th and U.
- TSP or fully coordinated signal system (instead of pre-timed): recommended between U and Alaska

Fare Collection

- Additional SmarTrip reader at back doors.

Other

- Branding for express services
- Updated information in easier to use format

- NextBus
- Marketing Campaign

Metrobus 30s Line Study

PCN Corridor: Wisconsin Avenue/Pennsylvania Avenue: Naylor Road Metro to Friendship Heights Metro

February 2008

WMATA and DDOT

Principles of Service

- There should be a basic level of service to anywhere in the corridor that transit service is provided.
- Preserve connectivity between the SE and NW quadrants of the District.
- Retain a high frequency "trunk" service along the 30s Line.
- New service types should be in addition to retaining some all-stops local service.
- Avoid transfers; but where necessary, provide coordination and accommodation to minimize inconvenience and travel time.
- Match service type, frequency and capacity to demand based on route segment, trip purposes, travel markets time of day, direction of travel, day of week and origins and destinations to preserve effectiveness and efficiency.

New Services (in addition to existing bus services):

- Retain existing 32 and 36 routes from Naylor Road to Friendship Heights
- Retain existing M6 from Southern Ave to Potomac Avenue Station
- Remove existing 34 and 35 (that was the plan; 30 and 35 were actually removed and 34 remained)
- New Route 37 (already implemented):
    - Friendship Heights to Archives station

- Stops 2/3 mile apart:
- Friendship Heights
- WI and Fessenden
- Tenleytown Metro
- WI and Van Ness Street
- WI and Porter
- WI and Woodley
- WI and Garfield
- Dupont Circle
- 20th and NH
- 20th and PA
- Farragut West Station
- McPherson Square Station
- Federal Triangle Station
- Archives Station
- Headway: 15 minutes peak, no service off-peak

- New Route 39 (already implemented):
  - Washington Circle to Naylor Road
  - Stops 2/3 mile apart:
  - 22nd and VA
  - Foggy Bottom Station
  - 22nd and PA
  - 19th and PA

  - 17th and I
  - McPherson Square Station
  - Federal Triangle Station
  - Archives Station
  - 7th and Independence
  - 3rd and Independence
  - 1st and Independence
  - Eastern Market Station
  - Potomac Avenue Station
  - PA and MN
  - PA and 30th
  - PA and Branch
  - PA and AL
  - Southern and Suitland
  - Southern and Branch
  - Naylor Road Station
- Headway: 15 minutes peak, no service off-peak
- New Route 31 (already implemented):
  - Friendship Heights to Washington Circle/Potomac Park/State Dept.
  - Headway: 15 minutes peak, 30 minutes off peak
  - Local stops
- New Route M5:
  - Naylor Road Station to Eastern Market Station

- Headway: 15 minutes peak, 30 minutes off peak
- Local Stops

Other Improvements:

- Runningway
- Additional green time:
  - Alabama and Branch
  - PA and Branch (for NB left turn)
  - PA and Anacostia Fwy (for EB left turn)
  - Traffic Control Officers:
  - PA and Potomac
  - 7th St NW and PA
  - PA and 14th NW
  - I and 17th NW
  - I and 18th NW
  - WI and M NW
- Bus-Only Lanes by using curb lane in peak hours, peak direction:
  - Barney Circle eastbound slip ramp
  - Pennsylvania Avenue SE between Branch Avenue SE and Minnesota Avenue SE and between
  - Barney Circle and 2nd Street SE
  - H Street NW and I Street NW between 15th Street NW and 19th Street NW (temporary lanes until the K Street Transitway is constructed)
  - Wisconsin Avenue NW between Calvert Street NW and Western Avenue NW.

Fare Collection

- Additional SmarTrip reader at back doors.

Other

- New shelters
- Improved information
- Marketing campaign

MetroExtra Service Plan and District of Columbia Rapid Bus Study

PCN Corridor: Georgia Avenue/7th Street: Navy Yard/Waterfront Metro to Silver Spring Metro

November 2006

DMJM-AECOM

Corridor in study identified as 7th Street between PA and FL Avenues NW to Eastern Ave, with a possible extension to the Silver Spring Metro.

Existing

- 70 and 71 local routes operate from south of Waterfront Metro to Silver Spring Metro.
- 79 is a limited stop route that operates from Archives Metro to Silver Spring station.

Challenges to Address

- Long travel times due to slow travel speeds and intersection signal delay
- The roadway operates at level of service F south of Florida Avenue and north of Piney Branch Road
- Between Petworth and Irving, transit speeds are below 8 mph all day
- The total trip average speed is below 10mph for all southbound midday and PM peak trips, and all northbound AM peak, midday, PM peak and evening trips
- Poor schedule adherence (reliability)
- 22% of southbound trips are more than 5 minutes late

- 33% of northbound trips are more than 5 minutes late
- Insufficient capacity
- Peak period, peak direction load factors exceed 0.8 in both directions
- The most crowded point is Irving Street, with a load factor of 0.89
- Imbalance of service between the northern and southern ends of the existing 70 and 71 routes
- There are too many trips to Buzzard's Point for the service demand in the area
- Limited passenger amenities at stops
- Most stops lack shelters and benches; no stops have real time bus arrival information

<u>New Services (in addition to existing bus services):</u>

New Route 79 (already implemented)

- Archives station to Silver Spring Station (7.4 miles)
- Stops 1/2 mile apart:
    - Archives Metro
    - Gallery Place Metro
    - Mt. Vernon Square Metro/Convention Center
    - Shaw Metro
    - GA and FL
    - Howard University
    - GA and Columbia/Irving Street
    - Petworth Metro
    - GA and Decatur Street
    - GA and Kennedy Street
    - Brightwood

  - Piney Branch
  - Walter Reed
  - Shepherd Park (Alaska Ave)
  - Silver Spring Metro
- Headway: 10 minutes peak and midday, no evening service
- Plan calls for eventually adding 15 minute headway evening service

Other Improvements:

Runningway

- Bulb-outs suggested at some stop locations to make boarding easier and safer and preventing the bus from having to pull out of and back into traffic:
  - Gallery Place
  - Mt. Vernon Square
  - Howard University
  - Irving Street
  - Kennedy Street
- Removal of curb parking has been suggested at the following stops
  - Florida Avenue
  - Decatur Street
- Signal Priority

The Georgia Avenue/7th Street Metro *EXTRA* Rapid service is designed to take advantage of the ongoing Georgia Avenue signal priority project. This project should increase travel speeds and reliability by providing transit vehicles with extended green signals (either starting the green cycle early or extending a cycle). The system is based on *conditional priority*, which means signals can be set to extend greens only when buses are running behind schedule. The signal priority system requires special controllers and software to be located within the intersection signal control cases. Controllers are already proposed for all signalized intersections between

Rhode Island Avenue and Eastern Avenue except for Rhode Island Avenue and Kansas Avenue. The Georgia Avenue / 7th Street Metro *EXTRA* Rapid plan calls for the signal priority system to be extended south to N Street NW.

Other

- Improved shelters
- Better/real-time information

Bethesda-College Park Corridor Study

PCN Corridor: University Boulevard/East-West Highway: Montgomery Mall to College Park Metro

April 2007

WMATA and Maryland MTA

Prepared by: P2D: PTG, PB, Delon Hampton, Kittelson and Associates, TranSystems

- Corridor studied runs from Medical Center Metro to College Park Metro.

Existing Service

- J1, J2, J3, J4
- J4 serves limited stops between College Park Metro and Bethesda

Challenges to Address

- Intended to identify potential improvements along the corridor prior to the implementation of the purple line.
- Improvements to the transportation system in the corridor would address the following transportation challenges:
    - Increasing congestion
    - Slow transit travel times
    - Limited alternative travel options for suburban east-west markets
    - Poor mobility and accessibility between key activity centers and employment hubs

- Slow and unreliable connections to radial Metrorail lines and to other rail and bus services.

The circumferential route just inside the Capital Beltway is also home to dense suburban apartment complexes, compact neighborhoods of single family homes, and a significant number of smaller neighborhood shopping venues. The major employers anchoring the corridor include the University of Maryland's flagship campus in College Park and the National Institute of Health and the National Naval Medical Center in Bethesda. A survey of corridor passengers found that ridership is 78 percent transit dependent, 87 percent minority, and with low household incomes. MTA and WMATA are collaborating to achieve a coordinated set of physical improvements with service and running way enhancements that will meet WMATA's new MetroExtra brand criteria.

New Services (in addition to existing bus services):

Phase 1 (implemented in August 2007, according to the study- however, none of the items have actually been done as of July 2009):

- Re-branding of route J4 as a MetroExtra limited-stop service, increasing peak period frequencies to 5 buses per hour per direction, and adding base (midday and early evening) service at 2 buses per hour per direction. No weekend service.
- Combining J2 and J3 into one route (referred to as J3 from here on) and reducing frequency to a 15 minute headway.
- Terminating J1 at Medical Center
- Eliminating Shuttle-UM's Silver Spring route.

Headways would be as shown in Table E-1:

Table E-1: Proposed Headways for University Boulevard/East-West Highway Corridor

	Route	Peak Headway	Off-Peak Headway
J1	Medical Center-Silver Spring	20	-
J3	Montgomery Mall-Bethesda-Silver Spring	12	20
J4	Bethesda-College Park	12	30

Stops recommended in the study are different than the actual limited stops on the J4:

- Study has 15 stops (including the 3 Metro stations) in 12 miles
- Current J4 has 17 from Bethesda to Campus Drive/Adelphi Road and then serves all stops beyond that.
- Phase 2 (to be implemented as demand warrants):
- Increase J4 frequency to 10 peak, 20 midday
- Add J4 Saturday service (30 minute headway)

Phase 3 (to be implemented as demand warrants):

- Second variation of J4 (J4B) limited stops, between Medical Center and Riggs Road (Langley Park, between Silver Spring and College Park)
- Can't tell from study how many/which stops are served.
- Effective Headway between Bethesda and Riggs Road on J4A and J4B would be 5 minutes peak, 10 minutes off-peak

Other Improvements:

- Runningway

Table E-2: Locations/Delay Reduction for WMATA J Routes

		TSP Travel Time Savings					Queue time savings per bus average	
Segment	Intersections to add TSP	AM Peak Hour E/B	AM Peak Hour W/B	PM Peak Hour E/B	PM Peak Hour W/B	Queue Bypass/Jump	AM Peak Hr	PM Peak Hr
Paint Branch Parkway-Campus Drive (from College Park Metro to University Boulevard)	3	0%	1%	7%	3%	1 Bypass on Rte 193 @ Campus Dr/Adelphi Rd W/B	55 sec	35 sec

		TSP Travel Time Savings					Queue time savings per bus average	
University Boulevard (from Campus Drive to Piney Branch Road)	4	5%	3%	4%	3%	1 Bypass on Rte 193 @ West Park Dr E/B	nominal	nominal
						1 Bypass or Jump on Rte 193 @ Riggs Rd E/B	1 sec	4 sec
Piney Branch Road (from University Boulevard to Flower Avenue)	5	2%	3%	16%	20%	None		
Wayne Avenue (from Flower Avenue to Silver Spring Metro)	8	10%	18%	14%	16%	1 Bypass on Wayne Ave @ Fenton E/B	5 sec	1 sec
						1 Bypass on Wayne Ave @ Fenton W/B	2 sec	2 sec

TSP is defined as follows:

- *Green Extension* – only occurs if the bus arrives while the traffic signal is green on its approach.
- The green time is then extended, by a predetermined amount, to allow the bus to progress through the intersection without having to wait for the next signal cycle's green.
- *Red Truncation (Early Green)* – only occurs if the bus arrives while the traffic signal is not green on its approach. The green time on the other phase(s) at the intersection is reduced to return the traffic signal to green earlier than normal, thus shortening or truncating the amount of red time/delay the bus experiences at the intersection.

- *Queue Bypass* – Lane for buses to advance to head of queue.
- *Queue Jump* - Bypass plus TSP at the signal.

Other

- Branding: As MetroExtra route
- Phase 1:
    - Better public information at bus stops
    - Real time information at all J4 bus stops
- AVL
- All Phases:
- Bus stop improvements, i.e. shelters, lighting, etc.- different stops listed for improvements by phase.

Leesburg Pike Updated Technical Memorandum Review

PCN Corridor: Leesburg Pike

PowerPoint Presentation:

Project Management Team Meeting

May 1, 2009

WMATA

(Also referred to the following documents provided to me separately: Leesburg Pike Technical Memos 2, 3, 4, and 5 DRAFTS)

Existing Service

- 28AB, 28FG, 28T

Challenges to Address

- Service Goals:
- Improve Reliability: Buses remain on schedule
- Increase Frequency: Shorter time between buses
- Shorten Travel Time: Buses operate faster
- Increase Span of Service: More early morning and late evening service

New Services (in addition to existing bus services):

- Near-term improvements include:
    - Increased supervision
    - Trippers and increase service span
    - Reroutings
    - Consolidate / eliminate stops
    - SmarTrip availability and streamlined boarding
- Medium-term improvements include:
    - Cease 28A (WMATA): DASH takes over 28A

- Add 28Xpress (Tysons to King St or Southern Twrs)
- Improve shelters
- Revised SmarTrip discount and fee policies
- Longer-term improvements include:
- Intersection improvements
- Bus lanes

Proposes adding the following limited stop service in addition to the existing service:

- Phase 1: Limited-Stop - Peak Only: Replace 28A and 28B with 40 min headway peak (same as current) plus limited stop between Tysons and King Street at 40 min headway peak/no limited stop service off-peak
- Phase 2: Limited-Stop - Peak Only and Longer Hours: Replace 28A and 28B with 30 min headway peak plus limited stop between Tysons and King Street at 30 min headway peak/no limited stop service off-peak plus add 2 peak trippers and 4 off-peak trippers plus increase service span with 11 additional trips
- Phase 3: Limited-Stop - All Day and Longer Hours: Same as Phase 2 but limited stop service operates 6:00AM-8:30PM

Limited Stops: 17 for Tysons to King Street, 15 for Tysons to Southern Towers. 15 mile route, so about 1 mile stop spacing.

- King Street Metro
- Seminary Road at Kenmore Avenue
- Southern Towers
- Fillmore Avenue at West Campus Drive (NVCC)
- South George Mason Drive
- Leesburg Pike (Route 7) at South Jefferson Street
- Columbia Pike at Spring Lane

- Leesburg Pike (Route 7) at Payne Street
- Leesburg Pike (Route 7) at Glen Carlyn Road
- Leesburg Pike (Route 7) at Patrick Henry Drive
- Seven Corners Transit Center
- Broad Street at Lee Highway (Route 29)/Washington Street
- Broad Street between West Street and Virginia Avenue
- West Falls Church Metro
- Leesburg Pike (Route 7) at Pimmit Drive
- Leesburg Pike (Route 7) at Lisle Avenue/Ramada Road
- Tysons Corner

Table E-3 shows the proposed headways for all three phases. Two routing options are shown, with the same level of service for both options.

Table E-3: Proposed Headways for Leesburg Pike Priority Service

		Headway			
		Existing	Phase 1	Phase 2	Phase 3
28A	Peak	40	Replaced by DASH		
	Off-Peak	60			
28B	Peak	40	40	30	30
	Off-Peak	60	30	30	45
28 Express (28X)	Peak		40	30	30
	Off-Peak				45
Local Stops Effective Hdwy	Peak	20	40	30	30
	Off-Peak	30	30	30	45
Express Stops Effective Hdwy	Peak	20	20	15	15
	Off-Peak	30	30	30	23
Span		6am-12am	6am-12am	5am-1am	5am-1am

Other Improvements

- Runningway
- Queue Jumps that could be added with little or no construction:
    - Leesburg Pike/Patterson Road W/B
    - Leesburg Pike/Pimmit Drive W/B
    - Leesburg Pike/Patrick Henry Drive E/B
    - Leesburg Pike/Glen Carlyn Road E/B
    - King Street/Hampton Drive W/B

  - King Street/Janneys Lane E/B

- Re-evaluation and adjustments to signal timing is recommended.
- TSP: should be considered. 50 signals along corridor, none currently TSP-ready.

Fare

- Potentially make the express service SmarTrip only routes.

Other

- Recommend improved pedestrian crossings.
- Branding the express routes.
- Bus stop improvements at all express stops: shelters, seating, lighting, better information, etc.

F : PCN Corridor Segmentation

Background and Purpose of Segmentation

To manage what improvements should be considered for such a large network, the PCN was divided into segments based on the number of through lanes and household and employment density. The evaluation of the PCN first ran the regional travel demand model with a "full-build" scenario, where an exclusive bus lane was assumed on all parts of the network. Once that analysis was completed, the outcomes, along with information from industry research on bus priority treatments, were utilized to assign a "modified" set of priority treatments to model for each segment of the network.

Segmentation Methodology

To determine where to break the segments, a few basic premises were assumed. First, segments would always begin and end at an intersection. In addition, some of the key components of segment determination were the number of lanes and roadway functional classification. While a change from one lane to two did not necessarily drive a decision to break a segment, a change from two through lanes to three did, as conversion of an existing lane into an exclusive bus lane is more realistic when there are three or more through lanes. In addition to the number of lanes, the biggest drivers for determining the start and endpoints of a segment were the household and employment densities on either side of the corridor. Additionally, in many cases, segments were cut at jurisdictional boundaries in order to allow the two jurisdictions to decide on different levels of investment to be modeled on the corridor. Finally, any Metrorail stations that were served mid-corridor generally served as a segment cut point.

To make informed decisions on the segmentation, a geographic information system (GIS) was developed that included all of the information that would be needed as the corridors were reviewed. Data in the GIS that were used to determine the segmentation included:

- PCN Corridors
- Metrorail lines and stations
- WMATA bus network
- Effective bus headway layer (including WMATA and local service)
- MARC and VRE stations
- Roadway network from travel model
- Number of through lanes (including any peak period changes)

- Functional classification
- Area type (combination of household and employment densities)
- Aerial photography
- Household and employment densities from Round 7.1 Cooperative Forecasts (2005 and 2030)

The original intent was to keep segments at least two miles long, but as the process progressed, it became clear that was not possible, especially in places where the number of lanes changed from three to fewer.

Once the segments were developed, each one was assigned an area type based on the household and employment density: Urban, Inner Suburban, or Outer Suburban. The area types were not tied to the regional location of the segment, but rather to the density of the surrounding land use. For example, parts of corridors running through Tysons Corner were considered "urban," while parts of corridors in the District of Columbia were considered "inner suburban." Using these area type definitions along with the level of investment that was later identified for each segment resulted in a list of improvements that were modeled as part of the "modified" network.

In addition to the characteristics used to determine where the segments should be cut, the following information was included for each corridor or segment:

- Corridor Level Information
- Other WMATA bus routes operating on corridor (aside from main ones identified by WMATA)
- Local and commuter bus routes operating on the corridors
- Transit ridership
- Segment Level Information
- Available median and/or parking lanes
- Effective bus headway
- Availability of existing park and ride locations (including at Metrorail stations and park-and-ride facilities)

Segmentation Results

Upon completion of the segmentation analysis, the length of the corridors totaled approximately 233 miles as roughly measured in GIS. This number was solidified at 235 miles as part of the modeling process and quality assurance / quality checking. The 23 corridors contain 120 segments with an average segment length of 1.95 miles; the shortest segment is 0.2 miles and the longest is 5.9 miles. While the original plan was to keep the segments no shorter than two miles, the realities of the changes in roadway cross-sections and adjacent urban form resulted in many segments shorter than that.

It is also important to note that some portions of the corridors are actually not on the main corridor itself but are "access roads" to the corridor, i.e. between the Metrorail station and the corridor. While the access portions of the corridors are included in the segmentation, it is likely that there will not be much, if any, improvements modeled for these portions of the corridors.

Segment Characteristics

Table F-1: Segmentation for PCN Corridor #1 – Columbia Pike

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/ Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
1A	16ABDEFJ 16GHKW 16L 16Y	ART 41, 42, 73, 74, 75	VA	8.4	Pentagon Metro	Columbia Pike and Little River Tpk							
1a				2.1	Pentagon Metro	Columbia Pike and Courthouse Rd	Arterial Ramp, Major Arterial	2	M - from Pentagon Parking Lot to Columbia Pike @ Navy Annex	U	21 to 60	12.2	3,496
1b				2.2	Columbia Pike and Courthouse Rd	Columbia Pike at Leesburg Pike/Baileys Crossroads	Major Arterial	2	M - S Glebe to S Lincoln; P - WB S Oakland to S Randolph; M - Midblock S Columbus to S Frederick; M - S Jefferson to Leesburg Pike; P - WB S Highland to S Glebe	IS	7 to 20	9.5	1,083
1c				4.1	Leesburg Pike/Baileys Crossroads	Columbia Pike and Little River Tpk	Major Arterial	2	M - Leesburg Pike to Evergreen Ln	IS	1 to 6	14.3	359

Table F-2: Segmentation for PCN Corridor #1 – Columbia Pike (Section to D.C.)

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/ Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
1B	16Y	ART 41, 42, 73, 74, 75	DC/VA	5.2	McPherson Square Metro	Columbia Pike and Courthouse Rd							
1d				1.4	McPherson Square Metro	18th St and E St Expwy NW (including stops at Farragut North and West)	Major Arterial and Collector	2	P - both sides to 17th & Pennsylvania Ave; P - both sides NY Ave from 17th to E St Expwy	U	7 to 20	4.0	3,496
1e				0.6	18th St and E St Expwy NW	E St Expwy and TR Memorial Bridge NW	Freeway	2		U	1 to 6	2.6	3,496
1f				0.7	E St Expwy and TR Memorial Bridge NW	US50 (after ramp from I-66)	Freeway and Freeway ramp	3 (except on ramp from I-66 to US50)		U	1 to 6	4.5	3,496
1g				1.9	US-50 (after ramp from I-66)	Washington Blvd Exit of Arlington Blvd	Expressway	3	M	U	7 to 20	9.9	3,496
1h				0.6	Washington Blvd Exit of Arlington Blvd	Courthouse Rd and Columbia Pike	Major Arterial	2	M	IS	7 to 20	4.4	3,496

Table F-3: Segmentation for PCN Corridor #2 – Richmond Highway Express

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
2	**REX**	MB 9A; FC 151, 152, 161, 162, 171; AT 1, 6, 7	VA	9.0	Eisenhower Metro	Ft. Belvoir							
2a				1.6	Eisenhower Metro	Huntington Ave and Richmond Hwy (including stop at Huntington Metro)	Arterial Ramp until Huntington Ave, then Major Arterial	2	M	U	7 to 20	7.1	653
2b				3.9	Huntington Ave and Richmond Hwy	Route 235/Old Mt. Vernon Rd	Major Arterial	3	M	IS	7 to 20	14.2	2,387
2c				3.5	Route 235/Old Mt. Vernon Rd	Ft. Belvoir	Major Arterial	2	M - Woodlawn Rd to Ft Belvoir	OS	7 to 20	15.5	2,387

Table F-4: Segmentation for PCN Corridor #3 – Georgia Avenue / 7th Street

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
3	70 71 **79**	MB A9, V7, V8, V9, Circ-NS, 13B, 13F, A42, A46, A48, P17, P19, W13, K1, 32, 34, 36, 39, 60, 62, 63; MTA 901, 904, 905, 915, 929	DC	9.4	P St and Half St SW (S of Navy Yard and Waterfront Metros)	Silver Spring Metro							
3a				1.1	P St and Half St SW (including stop at Waterfront Metro)	7th and I SW	Major Arterial and Collector	1, 2, 3	P - WB side P St; P - both side 4th St; B - M St to Maine Ave; M - Maine Ave to 7th and I	U	7 to 20	1.1	8,134

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
3b				1.0	7th and I SW	7th and Pennsylvania SN (including stop at L'Enfant Plaza Metro)	Major Arterial	3	B - I St to SW Fwy Bridge; M - E St to D St; B - D St to Virginia; P - Maryland to Pennsylvania	U	7 to 20	5.9	8,134
3c				0.2	7th and Pennsylvania NW	7th and E NW	Major Arterial	1	P	U	7 to 20	1.1	8,134
3d				0.5	7th and E NW	7th and K NW (including stop at Gallery Place Metro)	Major Arterial	1 plus 1 bus only	P	U	7 to 20	3.1	8,134

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
3e				2.6	7th and K NW	Georgia and New Hampshire Ave NW (GA Ave-Petworth Metro, plus stops at Mt. Vernon Square Metro and Shaw-Howard Metro)	Major Arterial	2 then 1	P	U	1 to 6	22.7	8,134
3f				3.3	Georgia and New Hampshire Ave NW (GA Ave-Petworth Metro)	Georgia and Eastern Ave NW	Major Arterial	3	P	IS	7 to 20	21.4	3,595
3g				0.7	Georgia and Eastern Ave NW	Silver Spring Metro	Major Arterial	3	P - Eastern to Wayne; M - Blair Mill to	IS	7 to 20	5.3	3,595

Table F-5: Segmentation for PCN Corridor #4 – Crystal City / Potomac Yard

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/ Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
4	9A 9E 9S	MB 5A, 23A, 23C; ART 90; FC 595, 597	VA	4.8	Pentagon Metro	Braddock Rd Metro							
4a				1.0	Pentagon Metro (Eads St)	JD Hwy and 20th St (Includes stop at Crystal City Metro)	Collector	2	P - both sides	U	1 to 6	5.3	775
4b				0.9	JD Hwy and 20th St	JD Hwy at S Glebe	Major Arterial	3	M	IS	1 to 6	6.1	775
4c				1.5	JD Hwy at S Glebe	JD Hwy at Monroe Ave	Major Arterial	2 (it appears to be 3 in some parts in S/B direction only)	M	IS	1 to 6	8.7	775

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/ Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
4d				1.4	Monroe Ave	Braddock Rd Metro	Major Arterial, Collector	2 to Pendleton St. then 1	M - Monroe Ave to First St; P - both sides of First St	IS	1 to 6	5.9	775

Table F-6: Segmentation for PCN Corridor #6 – Wisconsin Avenue / Pennsylvania Avenue[14]

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
6	**30** 32 34 **35** 36	MB F14, M2, 39, M6, B2, K11, **37**, **39**, 38B, D5, CIRC-EW, **31**, N22, P17, P19, W13, 70, 71, V8, 13A 13G, 13B, 13F, A42, A46, A48, 54, 38B, 11Y, G8, 43, X2, N2, H4, X3, S2, S4; MTA 902, 903, 904, 905, 909, 922	DC	12.6	Naylor Road Metro Station	Friendship Heights Metro							
6a				1.2	Naylor Road Metro Station	Southern Ave and Pennsylvania Ave SE	Major Arterial (Branch Ave), Minor Arterial (Southern Ave)	2	P - Branch Ave to Pennsylvania Ave	IS	1 to 6	4.0	1,595

[14] PCN Corridor #5 was deleted by WMATA.

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
6b				2.0	Southern Ave and Pennsylvania Ave SE	Pennsylvania Ave and I-295 SE (including stops at Potomac Ave and Eastern Mkt Metros)	Major Arterial	2	P - Southern Ave to Alabama Ave; M - Minnesota Ave to Barney Cir SE; B - Barney Cir SE to 2nd St SE	IS	7 to 20	24.9	1,595
6c				5.6	Pennsylvania Ave and I-295 SE	Wisconsin and M St NW (including stops at Archives, Fedaral Triangle, McPherson and Farragust West Metros)	Major Arterial	3	P - 3rd St SE to 7th St SW; P (7th st) National Mall to Pennsylvania Ave; M - @ xwalks 7th St to 15th St; P (15th St) - Pennsylvannia to I St; P (I St) - 15th St to Pennsylvania Ave; P - I St to Wisconsin & M	IS	7 to 20	21.8	2,737

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
6d				0.9	Wisconsin and M St NW	Wisconsin and 35th St. NW (including stop at Foggy Bottom Metro)	Major Arterial	2	P	IS	7 to 20	8.4	2,737
6e				2.9	Wisconsin and 35th St. NW	Friendship Heights Metro at Western Ave (including a stop at Tenleytown Metro)	Major Arterial	3	P	U	1 to 6	22.7	2,545

Table F-7: Segmentation for PCN Corridor #7 – University Boulevard / East-West Highway

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
7	J1 J2 J3 **J4**	MB C2, C4, F8; RO 47, 70, 1, 2, 11, 28, 12, 15, 19, 16, 20, 24	MD	16.7	Montgomery Mall Transit Center (Westlake Drive)	College Park Metro							
7a				1.9	Montgomery Mall Transit Center (Westlake Drive)	Democracy Blvd and Old Georgetown	Major Arterial	3	M	IS	21 to 60	2.3	1,225
7b				1.6	Democracy Blvd and Old Georgetown	Old Georgetown and Cedar Lane	Major Arterial	3	M	IS	1 to 6	6.9	1,225
7c				0.7	Old Georgetown and Cedar Lane	Cedar Lane and 355	Minor Arterial	2		IS	7 to 20	3.7	3,607

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
7d				1.5	Cedar Lane and 355	Bethesda Metro (including stop at Medical Center Metro)	Major Arterial	3	M; P - Rosedale to Bethesda Metro	IS	7 to 20	8.9	3,607
7e				1.8	Bethesda Metro	E-W Hwy at Jones Mill Rd (Including stop at Silver Spring Transit Center)	Major Arterial	2		IS	1 to 6	8.6	3,607
7f				2.4	E-W Hwy at Jones Mill Rd	Wayne and Cedar	Major Arterial until Wayne, then Collector	2	M - Meadowbrook Ln to Sundale; M - 16th St to Fenton St	IS	21 to 60	9.2	3,607
7g				1.9	Wayne and Cedar	Piney Branch and University	Collector and Major Arterial	2	M - Barron to University	IS	7 to 20	6.9	905

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
7h				2.7	Piney Branch and University Blvd	University Blvd and Adelphi Rd	Major Arterial	3	M	IS	7 to 20	11.6	905
7i				2.2	University Blvd and Adelphi Rd	College Park Metro	Mostly Collector	1		IS	7 to 20	12.0	905

Table F-8: Segmentation for PCN Corridor #8 – Sixteenth Street (D.C.)

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
8	S1 S2 S4	**MB S9**; MTA 915	DC	7.0	McPherson Square Metro	Silver Spring Metro							
8a				1.6	McPherson Square	16th St and Florida Ave NW	Major Arterial	3	P	U	7 to 20	8.3	6,855
8b				0.5	16th St and Florida Ave NW	16th St and Columbia Rd NW	Major Arterial	2 AM, 3 PM	P	U	1 to 6	4.4	6,855
8c				0.9	16th St and Columbia Rd NW	16th St and Arkansas Ave NW	Major Arterial	3 AM, 2 PM	P	U	7 to 20	7.0	6,855
8d				3.6	16th St and Arkansas Ave NW	16th St and Colesville Road	Major Arterial	3	M	IS	7 to 20	19.7	3,595
8e				0.4	16th St and Colesville Road NW	Silver Spring Metro	Major Arterial	2 until E-W Hwy, then 3	B	U	7 to 20	1.2	3,595

Table F-9: Segmentation for PCN Corridor #9 – Leesburg Pike

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
9	28AB 28FG 28T	MB: 4A, 26A, 26B, 26E, 26W, 3B, 25A, 25C, 16H, 16P, 16J, 16E, 16F, 16B, 3B, 2T; AT5, AT6; FC574	VA	13.7	King St Metro	Tysons Westpark							
9a				2.1	King St Metro	Leesburg Pike and Quaker Lane	Major Arterial	1 to Janneys Lane then 2	P - Btw Highland Pl and W View Ter; M - at Quaker	IS	1 to 6	10.1	1,225
9b				1.5	King Street and Quaker Lane	King Street and Beauregard St	Major Arterial	2	M - Quaker to S 28th St	U	7 to 20	7.3	1,225
9c				1.4	King Street and Beauregard St	Leesburg Pike and Columbia Pike	Major Arterial	3	M - Dawes Ave to Columbia Pike	U	1 to 6	5.0	1,225

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
9d				2.1	Leesburg Pike and Columbia Pike	Arlington Blvd/7 Corners at New 7 Corners Transit Center	Major Arterial	2 until Patrick Hentry Drive, then 3	M - Columbia Pike to Payne St; M - Patrick Henry to 7 Corners	IS	1 to 6	9.5	1,225
9e				2.8	Arlington Blvd/7 Corners at New 7 Corners Transit Center	I-66 with possible stop at West Falls Church Metro	Major Arterial	2	M - @ N West St; M - Gordon Rd to I66	IS	1 to 6	17.8	707
9f				1.4	I-66	I-495	Major Arterial	2	M	IS	1 to 6	8.7	707
9g				2.4	I-495	Tysons Westpark	Major Arterial	3	M	U	1 to 6	4.8	707

Table F-10: Segmentation for PCN Corridor #10 – Veirs Mill Road

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
10	Q2	MB Y5, Y7, Y8, Y9, J5, C4; RO 7, 34, 38, 48, 26, 45, 46, 55	MD	12.1	Silver Spring Metro	Shady Grove Metro							
10a				0.4	Silver Spring Metro	Spring Street	Major Arterial	3	B	U	7 to 20	1.5	985
10b				0.7	Georgia Ave and Spring Street	Georgia Ave and 16th St	Major Arterial	3	M	IS	1 to 6	3.5	985
10c				0.5	Georgia Ave and 16th St	Georgia Ave and I-495 (Forest Glen Metro)	Major Arterial	4 (peak direction), o/w 3	M - 495 to Forest Glenn	IS	1 to 6	4.9	985

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
10d				1.7	Georgia Ave and I-495 (Forest Glen Metro)	Georgia and Veirs Mills Rd (Wheaton Metro)	Major Arterial	3	M	IS	7 to 20	9.8	985
10e				1.7	Georgia and Veirs Mills Rd (Wheaton Metro)	Veirs Mill Rd and Connecticut	Major Arterial	3	M	IS	7 to 20	11.9	1,868
10f				2.5	Veirs Mill Rd and Connecticut	Veirs Mill Rd and Twinbrook Pkwy	Major Arterial	2	M	IS	1 to 6	10.0	1,868
10g				2.2	Veirs Mill Rd and Twinbrook Pkwy	Rockville Metro	Major Arterial	2	M	IS	1 to 6	9.6	1,868
10h				2.4	Rockville Metro	Shady Grove Metro	Major Arterial	3	M	IS	7 to 20	17.4	1,942

Table F-11: Segmentation for PCN Corridor #11 – New Hampshire Avenue

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
11	K6	MB C8; RO 16, 20, 24, 10, 22	MD	7.6	Fort Totten Metro	White Oak (Columbia Pike and Stewart Lane)							
11a				1.4	Fort Totten Metro	New Hampshire Ave and Eastern Ave	Major Arterial	2		IS	1 to 6	3.1	4,396
11b				1.9	New Hampshire Ave and Eastern Ave NE	New Hampshire and University Blvd	Major Arterial	3	M	IS	7 to 20	8.8	4,396
11c				2.1	New Hampshire and University Blvd	New Hampshire and I-495	Major Arterial	3	M	IS	7 to 20	7.9	473
11d				2.2	New Hampshire and I-495	White Oak (Columbia Pike and Stewart Lane)- with a stop at the new White Oak Transit Center	Major Arterial	3	M	OS	7 to 20	8.6	473

Table F-12: Segmentation for PCN Corridor #12 – H Street / Benning Road

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
12	X2	MB X1, X3, 80, P6, S2, S4, S9, U4, D8, G8, 42, 43; MTA 950	DC	5.1	Minnesota Ave Metro	McPherson Square Metro							
12a				1.9	Minnesota Ave Metro	Benning Rd and Bladensburg Rd NE	Major Arterial	4	M	IS	7 to 20	13.1	979
12b				2.9	Benning Rd and Bladensburg Rd NE	McPherson Square Metro (including stops at Union Station, Gallery Place and Metro Center Metros)	Major Arterial until 3rd St, then Minor Arterial	3	P	U	7 to 20	21.3	1,401

Table F-13: Segmentation for PCN Corridor #13 – Georgia Avenue (MD)

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
13	Y5 Y7 Y8 Y9	MB J5, Q2; RO 7, 33, 41, 51, 52, 53	MD	13.1	Silver Spring Metro	Montgomery General Hospital							
13a				0.4	Silver Spring Metro	Spring Street	Major Arterial	3	B	U	7 to 20	1.5	1,196
13b				0.7	Georgia Ave and Spring Street	Georgia Ave and 16th St	Major Arterial	3	M	IS	1 to 6	3.5	1,196
13c				0.4	Georgia Ave and 16th St	Georgia Ave and I-495 (Forest Glen Metro)	Major Arterial	4 (peak direction), o/w 3		IS	1 to 6	4.9	1,196
13d				1.7	Georgia Ave and I-495 (Forest Glen Metro)	Georgia and Veirs Mills Rd (Wheaton Metro)	Major Arterial	3	M	IS	7 to 20	9.8	1,196

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
13e				1.5	Georgia and Veirs Mills Rd (Wheaton Metro)	Georgia Ave and Randolph Road	Major Arterial	3	M	IS	7 to 20	12.7	375
13f				4.2	Georgia Ave and Randolph Road	Georgia Ave and Norbeck Road (including stop at Glenmont Metro)	Major Arterial	3	Wide median Rippling Brooke to Norbeck	OS	21 to 60	18.3	154
13g				3.1	Georgia Ave and Norbeck Road	Georgia Ave and Olney-Sandy Spring Rd	Major Arterial	2	Wide median Norbeck to 0.25 miles south of Olney-Sandy Spring Road	OS	7 to 20	10.5	154

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
13h				1.1	Georgia Ave and Olney-Sandy Spring Rd	Montgomery General Hospital			M - Olney-Sandy Spring to Spartan	OS		1.3	154

Table F-14: Segmentation for PCN Corridor #14 – Greenbelt-Twinbrook

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
14	C2 C4	MB F4, R2, R3, R1, R5, 15, J4, Q2, C8, J5; RO 7, 8, 9, 10, 19, 34, 38, 48; TB 14	MD	18.1	Greenbelt Metro	Twinbrook Metro							
14a				1.3	Greenbelt Metro	Cherrywood Lane and Greenbelt Road	Collector	2		IS	1 to 6	6.0	905
14b				1.1	Cherrywood Lane and Greenbelt Road	Greenbelt Road and US-1	Major Arterial	3		IS	7 to 20	4.0	905
14c				3.2	Greenbelt Road and US 1	Riggs Rd and University Blvd (via UMD / Campus Drive)	Major Arterial / Collector	2/1		IS	7 to 20	11.0	905
14d				2.1	Prince George's Plaza Metro	Riggs Rd and University Blvd	Major Arterial	2	M	IS	7 to 20	4.4	905

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
14e				1.4	Riggs Rd and University Blvd	East University Blvd and Piney Branch Rd	Major Arterial	3	M	IS	7 to 20	7.2	905
14f				4.6	East University Blvd and Piney Branch Rd	Wheaton Metro Station	Major Arterial	3	M	IS	7 to 20	24.0	832
14g				2.1	Wheaton Metro Station	Veirs Mills Road and Randolph Road	Major Arterial	3	M	IS	7 to 20	7.7	2,455
14h				1.3	Veirs Mills Road and Randolph Road	Randolph Road and Parklawn Dr	Major Arterial	2	M - Viers Mill to Rocking Horse	IS	7 to 20	7.1	2,455
14i				1.0	Randolph Road and Parklawn Dr	Twinbrook Metro	Collector	2		IS	7 to 20	8.5	2,455

Table F-15: Segmentation for PCN Corridor #15 – East-West Highway (Prince George's)

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
15	F4 F6	MB C4, R2, R3, 84; RO 16,17; TB 13, 14, 16	MD	10.6	Silver Spring Metro	New Carrollton Metro							
15a				1.3	Silver Spring Metro	Philadelphia Ave and Piney Branch Road	Collector and Major Arterial	2	P - Fenton to Philadelphia;	IS	7 to 20	7.0	942
15b				2.2	Philadelphia Ave and Piney Branch Road	Ethan Allen and Riggs Rd	Major Arterial	mix of 1 and 2	P - New Hampshire to Fairview	IS	7 to 20	8.8	942
15c				2.3	Ethan Allen and Riggs Rd	East-West Hwy and Baltimore Ave (including stop at Prince George's Plaza Metro)	Major Arterial	2	M	IS	7 to 20	5.3	942
15d				1.9	East-West Hwy and Baltimore Ave	E-W Hwy at B-W Pkwy	Major Arterial	2	M - Baltimore Ave to 61st Pl; P - 61st Pl to 64th Ave	IS	7 to 20	9.2	942

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
15e				2.9	E-W Hwy at B-W Pkwy	New Carrollton Metro	Major Arterial and Collector	2 on Major, 1 on Collectors		IS	7 to 20	10.6	942

Table F-16: Segmentation for PCN Corridor #16 – Anacostia / Congress Heights

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
16	A2-8, A42-48	MB A9, P1, P2, V5, 52, 54, V7, V8, V9, P17, P18, P19, W13, W14, W4	DC	5.8	L'Enfant Plaza Metro	S Capitol St and Southern Ave SE							
16a				2.0	7th and D St SW (L'Enfant Plaza Metro)	Beginning of Fred Douglass Bridge SW (including stop at Waterfront Metro and potentially Navy Yard Metro)	Major Arterial	3 (small portion 2 along N Capitol)	M	U	7 to 20	4.3	1,580
16b				1.7	Beginning of Fred Douglass Bridge SW	MLK Ave SE and Lebaum St SE (including stop at Anacostia Metro)	Major and Minor Arterial (except expressway on Suitland Pkwy)	3 until Anacosti a Fwy then 2	M - S Capitol St to 11th St SE; P - MLK to Howard Rd; P - Sumner to Pomeroy;	U	7 to 20	4.4	1,580
16c				2.1	MLK Ave SE and Lebaum St SE	S Capitol St and Southern Ave SE at Park and Ride Lot on Southern Ave	Major and Minor Arterial	3 until MLK and S Capitol, then 2	P - Milwaukee to S Capitol; P - Elmira to 1st St SE	U	1 to 6	3.5	5,801

Table F-17: Segmentation for PCN Corridor #17: Little River Turnpike / Duke Street

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
17	29KN 29CEGHX	MB 8X, 8Z, 16A, 16B, 16D, 16E, 16L, 17A, 17B, 17M, 7A, 7F, 7X, 7H, 3A; AT 1, 2, 8; FC 306, 401; CUE Green	VA	13.5	King St. Metro	Route 123							
17a				2.4	King St Metro (Duke and Callahan)	Duke St and Jordan St.	Major Arterial	3 until Quaker then 2	M - Callahan to Roth; M - S Quaker to Wheeler Ave;	IS	1 to 6	12.0	951
17b				2.0	Duke St and Jordan St.	Duke St and Beauregard St	Major Arterial	3 until Ripley, then 2	M	IS	1 to 6	9.7	951
17c				4.2	Duke St and Beauregard St	I-495	Major Arterial	2	M - Beauregard to Jon Marr Dr; M - Backlick to Annandale; M - Markham to 495	OS	1 to 6	14.8	1,127
17d				3.0	I-495	Pickett Rd	Major Arterial	2	M	OS	1 to 6	15.1	1,127

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
17e				1.9	Pickett Rd	Route 123	Major Arterial	2	M - Pickett to Old Lee Hwy	IS	1 to 6	12.7	1,127

Table F-18: Segmentation for PCN Corridor #18 – Rhode Island Avenue Metrorail Station to Laurel

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
18	81 82 83 86 87 88 89 89M	MB B8, B9, T18, 84, C2; TB 13, 17	MD	14.5	Rhode Island Ave Metro	Cherry Lane (Laurel)							
18a				1.9	Rhode Island Ave Metro	Eastern Ave	Major Arterial	3	B	U	1 to 6	9.2	2,541
18b				3.5	Eastern Ave	Baltimore Ave and Mowatt Lane	Major Arterial	2	B - Eastern Ave to 38th Ave; M - 38th to 43rd; P - Farragut to Gallatin	IS	1 to 6	19.0	2,541
18c				2.9	Baltimore Ave and Mowatt Lane	I-495	Major Arterial	2	M - Mowatt to Lakeland; M - Cherry Hill to 495	IS	1 to 6	18.3	263
18d				2.8	I-495	Ammendale Road	Major Arterial	2	M - 495 to Sunnyside; M - Quimby to Ammendale	OS	1 to 6	9.3	263

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
18e				3.4	Ammendale Road	Cherry Lane	Major Arterial	2 until Contee, then 1	M - Virginia Manor; M @ Cherry Lane	IS	1 to 6	11.9	263

Table F-19: Segmentation for PCN Corridor #19 – Massachusetts Avenue / U Street / Florida Avenue / 8th Street / MLK Avenue

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/ Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
19	90 92 93	MB A42, A46, A48, P1, P2, P6, V5, X3, 96, 98, U2, N22, L2; MTA 903	DC	7.2	Anacostia Metro	Woodley Park Metro							
19a				1.5	Anacostia Metro	M St and 8th St. SE	Freeway and Major Arterial	3	M - 12th St to 8th St	U	7 to 20	10.1	9,030
19b				2	M St and 8th St. SE	8th St. and FL Ave NE (including stop at Eastern Mkt Metro)	Collector	1	P	IS	7 to 20	19.5	9,030
19c				0.9	8th St. and FL Ave NE	FL and N Capitol St NE (including stop at NY Ave Metro)	Major Arterial	3		IS	1 to 6	4.4	2,240
19d				2.8	FL and N Capitol St NE	Woodley Park Metro (including stop at U Street Metro)	Major Arterial and Collector	3 and 2	P - U St to Woodley Park Metro	IS	1 to 6	15.1	2,240

Table F-20: Segmentation for PCN Corridor #20 – Rhode Island Avenue

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/ Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
20	G8	MB D8, B8, B9, T18, 81, 82, 83, 86, 84, R4	DC	5.5	Shaw Howard Univ Metro	Eastern Ave and Michigan Ave NE							
20a				1.6	Shaw Howard Univ Metro	RI and 4th St NE	Major Arterial	3	B	U	1 to 6	11.1	586
20b				1.1	RI and 4th St NE	Brookland Metro (including potential stop at Rhode Island Ave Metro)	Collector	1	P	IS	7 to 20	10.6	586
20c				2	Brookland Metro	Randolph St and Eastern Ave NE	Minor Arterial/Collector	1	P	IS	1 to 6	10.6	586
20d				0.8	Randolph St and Eastern Ave NE	Eastern Ave and Michigan Ave NE	Connector	2		IS	1 to 6	4.5	586

Table F-21: Segmentation for PCN Corridor #21 – Eastover-Addison Road

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
21	P12	MB W19, W15, D12, D13, D14, K11, K12, K13; TB 20, 24	MD	11.0	Southern Ave and Indian Head Hwy SE	Addison Rd Metro							
21a				1.2	Southern Ave and Indian Head Hwy SE	13th Street at United Medical Center (with potential stop at Southern Ave Metro)	Collector then Minor Arterial	2	M - Indian Head to Deal; P - Deal to Iverson; P - Iverson to 13th St	U	1 to 6	7.4	735
21b				3.1	13th Street at United Medical Center	Iverson St and Branch Ave	Major Arterial except Iverson Pl and St btwn Wheeler and 23rd is Minor Arterial	1	P - Wheeler Hills to Wheeler Hills; B - 19th Ave to Branch	IS	1 to 6	13.4	735

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
21c				3.8	Iverson St and Branch Ave	Walker Mill Road and Addison Rd (with potential stop at Suitland Metro)	Major Arterial	3	M - Branch to Rochelle	IS	1 to 6	17.6	735
21d				1.8	Walker Mill Road and Addison Rd	Shady Glen Drive and Central Avenue	Minor Arterial and Collector	1		OS	1 to 6	10.4	735
21e				1.1	Shady Glen Drive and Central Avenue	Addison Rd Metro	Major Arterial	3	M	OS	7 to 20	3.3	735

Table F-22: Segmentation for PCN Corridor #22 --- Colesville Road / Columbia Pike (US 29)

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
22	Z2 Z6 Z8 Z9,29 Z11,13	RO 8, 9, 10, 12, 13, 14, 22; MTA 915, 929	MD	9.9	Silver Spring Metro	Columbia Pike and Sandy Spring Rd							
22a				1.0	Silver Spring Metro	Colesville Rd and Sligo Creek Pkwy	Collector, Major Arterial	3	P - Silver Spring Metro to Fenton;	U	7 to 20	8.2	4,032
22b				2.0	Colesville Rd and Sligo Creek Pkwy	Columbia Pike and Lockwood Drive (at new White Oak Transit Center)	Major Arterial	3	M	IS	21 to 60	9.7	4,032
22c				3.0	Columbia Pike and Lockwood Drive	Columbia Pike and E Randolph/Cherry Hill Rd	Major Arterial to NH Ave, then Expressway	3	M	IS	21 to 60	8.3	1,877
22d				3.9	Columbia Pike and E Randolph/Cherry Hill Rd	Columbia Pike and Sandy Spring Rd	Expressway	3	M	OS	21 to 60	9.9	1,877

Table F-23: Segmentation for PCN Corridor #23 – Fourteenth Street

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
23	52 53 54	MB 11Y, 13A, 13B, 13G, 13F, V7, V9; MTA 909, 902, 907, 922	DC	7.8	L'Enfant Plaza Metro	Takoma Park Metro							
23a				2.5	L'Enfant Plaza Metro	14th and R St NW (including stops at Smithsonian Metro and McPherson Metro)	Major Arterial (14th St) and Minor Arterial and Collector	3 on 14th St, mixed before	P	U	21 to 60	16.9	7,755
23b				4.2	14th and R St NW	14th and Aspen NW (including stop at Columbia Heights Metro)	Collector	1	P	U	1 to 6	30.2	3,595
23c				1.1	14th and Aspen NW	Takoma Park Metro	Collector	1	P	IS			3,595

Table F-24: Segmentation for PCN Corridor #24 – North Capitol Street

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
24	80	MB X2, 3Y, 16Y, S1, S2, S4, S9, D1, D3, D5, D6, P6, 9P, H1, H2, H3, H4, 96, G8, CIRC-EW, N2, N4, N6; MTA 903, 922, 915	DC	6.7	19th and K NW (Farragut N and W)	Fort Totten Metro							
24a				0.9	19th and K NW (Farragut N and W)	13th and H NW (including stop at McPherson Square Metro)	Major Arterial	3	Street Parking separated by medians on both sides of K St; P - 13th St to H St	U	21 to 60	1.1	1,023

Number	Line/Routes	Other Bus Routes on Corridor	State	One Way Length (miles)	Corridor Limits		Functional Classification	Through Lanes	Median/Parking Lanes? (M,P,B)	Area Type: U (urban); IS (inner suburban); OS (outer suburban)	No Build: Effective Bus Service 2030 AM Peak (buses / hour) from MWCOG	No Build: 2030 Bus Travel Times (minutes)	No Build: 2030 Bus Ridership (Daily)
24b				1.4	13th and H NW	H and North Capitol (including stop at Union Station Metro)	Major Arterial	3	P - 13th St to N Capitol	U	7 to 20	6.0	1,023
24c				0.8	H and North Capitol NW	North Capitol and Florida NW	Major Arterial	3	B	U	1 to 6	6.5	1,023
24d				1.1	North Capitol and Florida NW	North Capitol and Michigan NE	Major Arterial	2	B	IS	7 to 20	11.6	1,023
24e				1	North Capitol and Michigan NE	Monroe and 12th St	Major Arterial	3	P	IS	7 to 20	4.6	1,023
24f				1.5	Monroe and 12th St NE	Fort Totten Metro	Major and Minor Arterial	1 and 2	P - 12th St to S Dakota;	IS	1 to 6	10.8	1,023

Segment Maps

Figure F-1: Map of PCN Corridor #1-- Columbia Pike (Mainline)

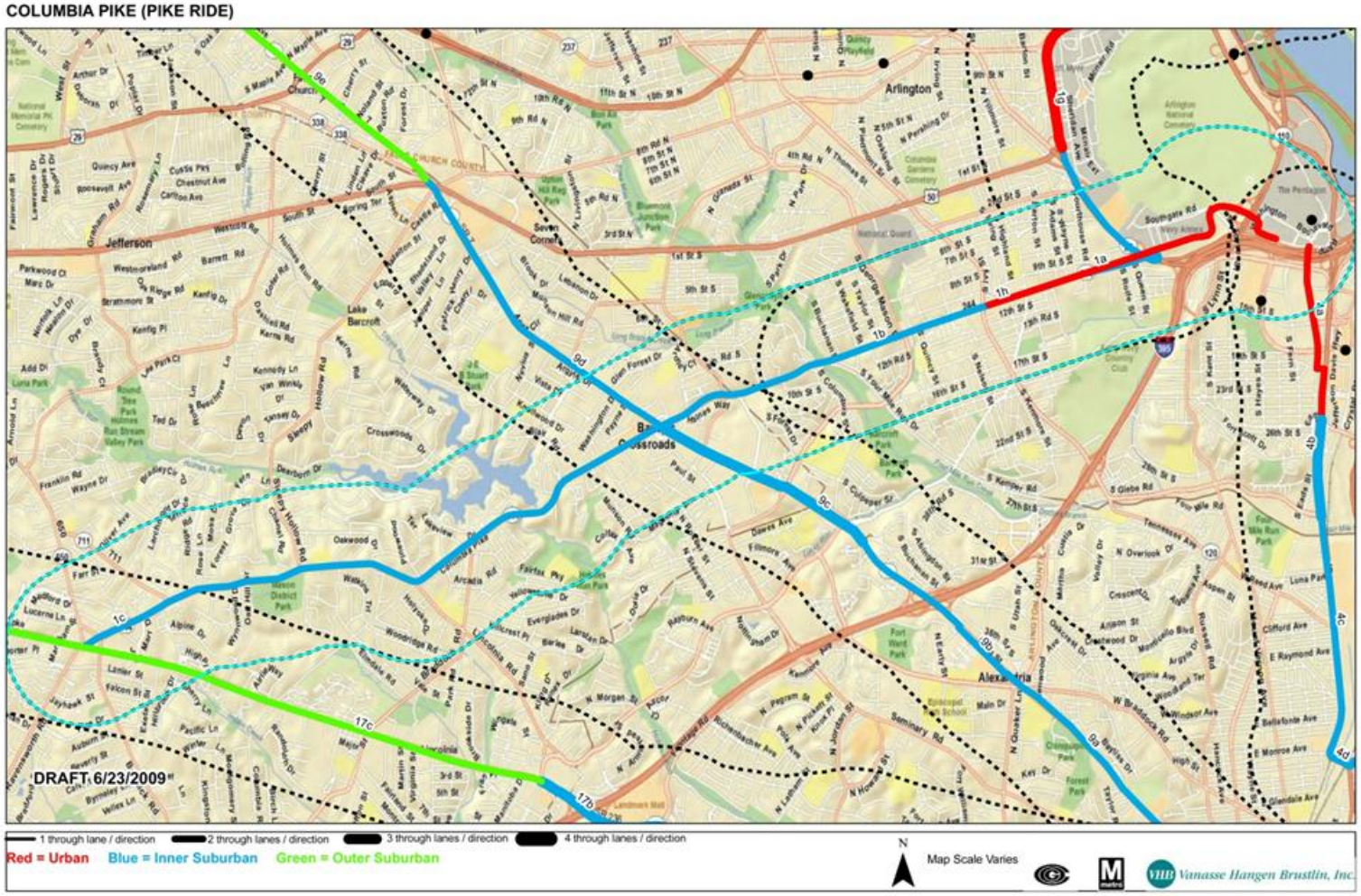


Figure F-2: Map of PCN Corridor #1-- Columbia Pike (section to downtown Washington)

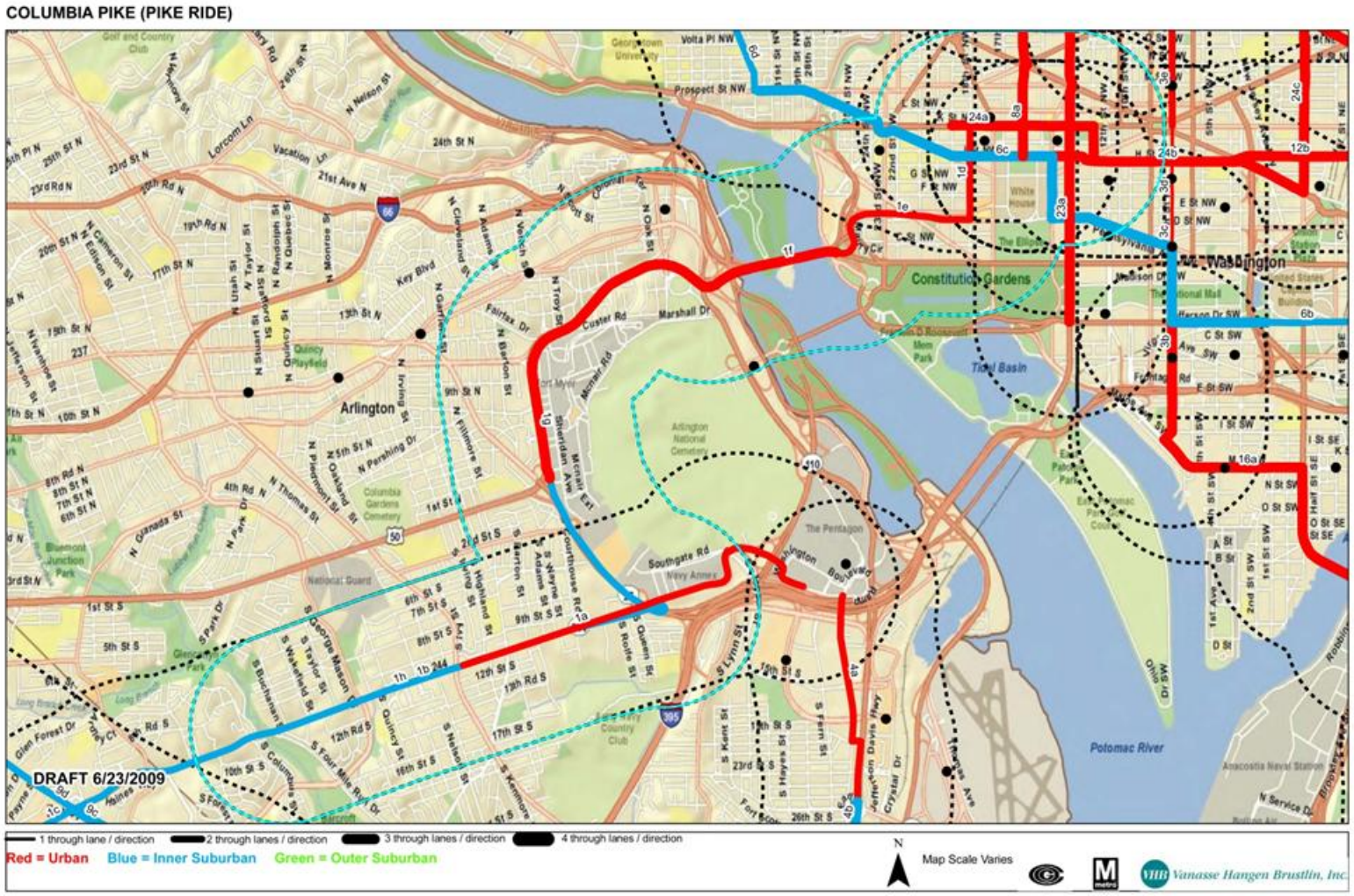


Figure F-3: Map of PCN Corridor #2 – Richmond Highway Express

Figure F-4: Map of PCN Corridor #3 – Georgia Avenue / 7th Street (D.C.)

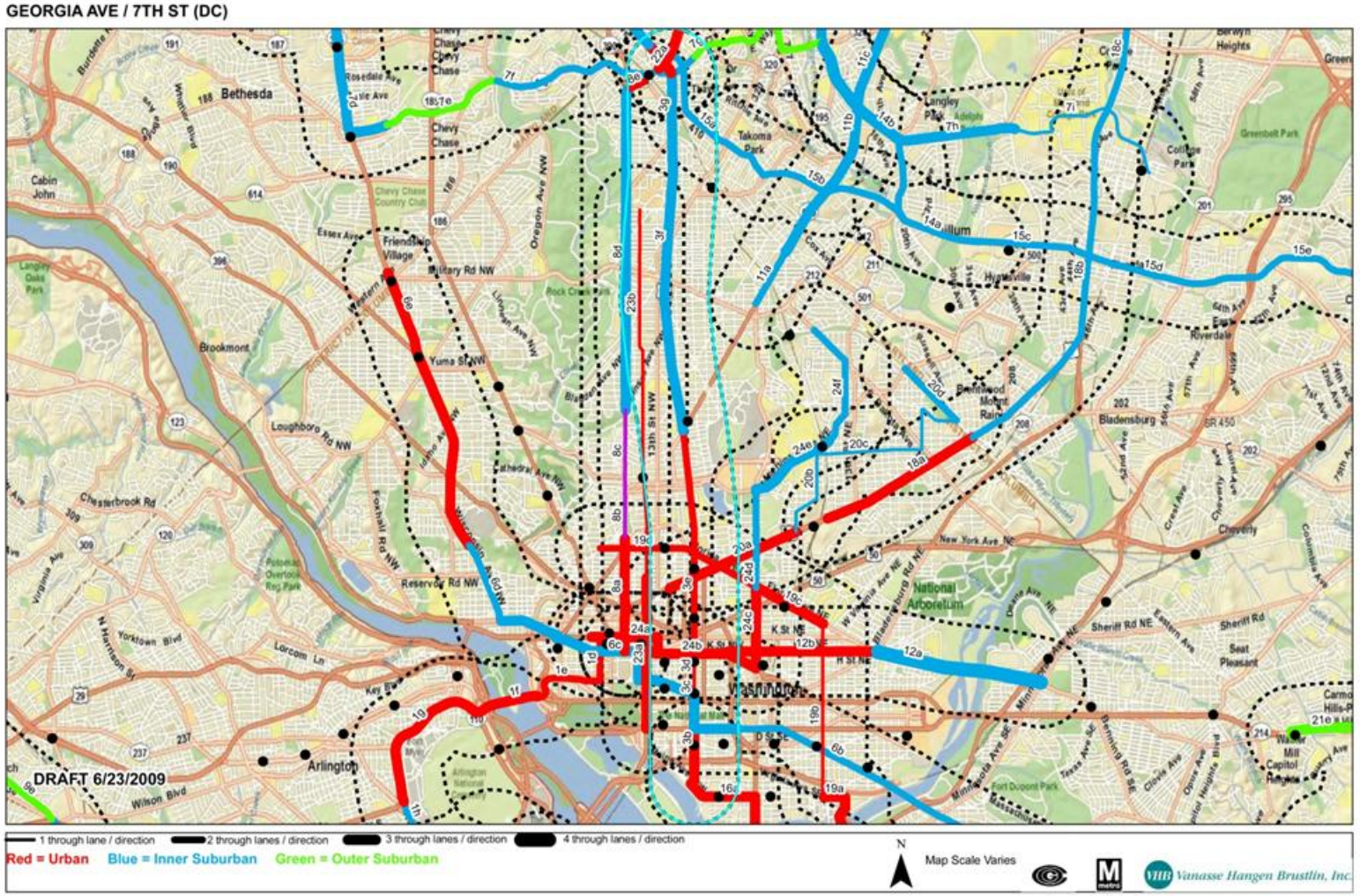


Figure F-5: Map of PCN Corridor #4 – Crystal City / Potomac Yard

1.

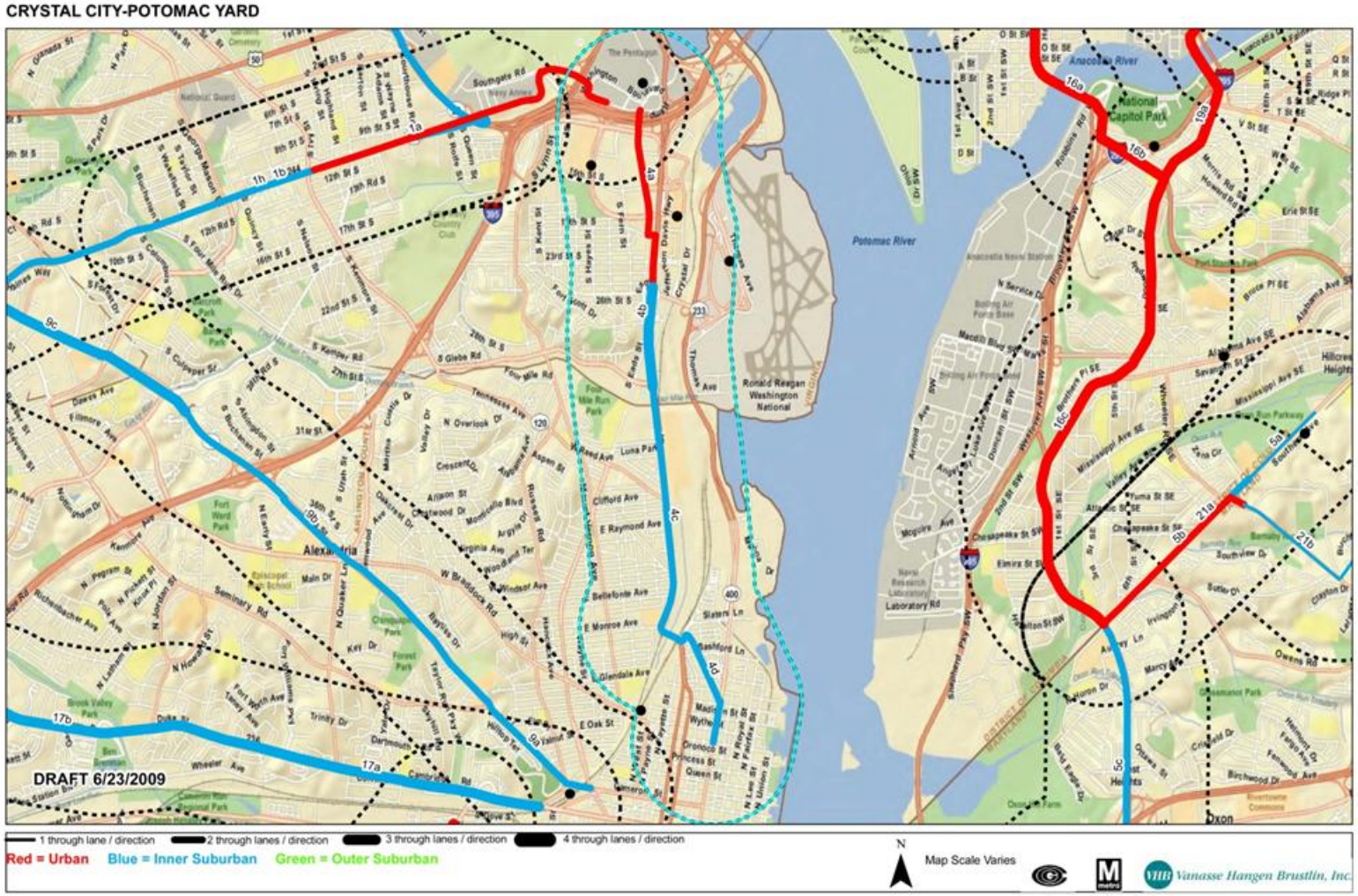
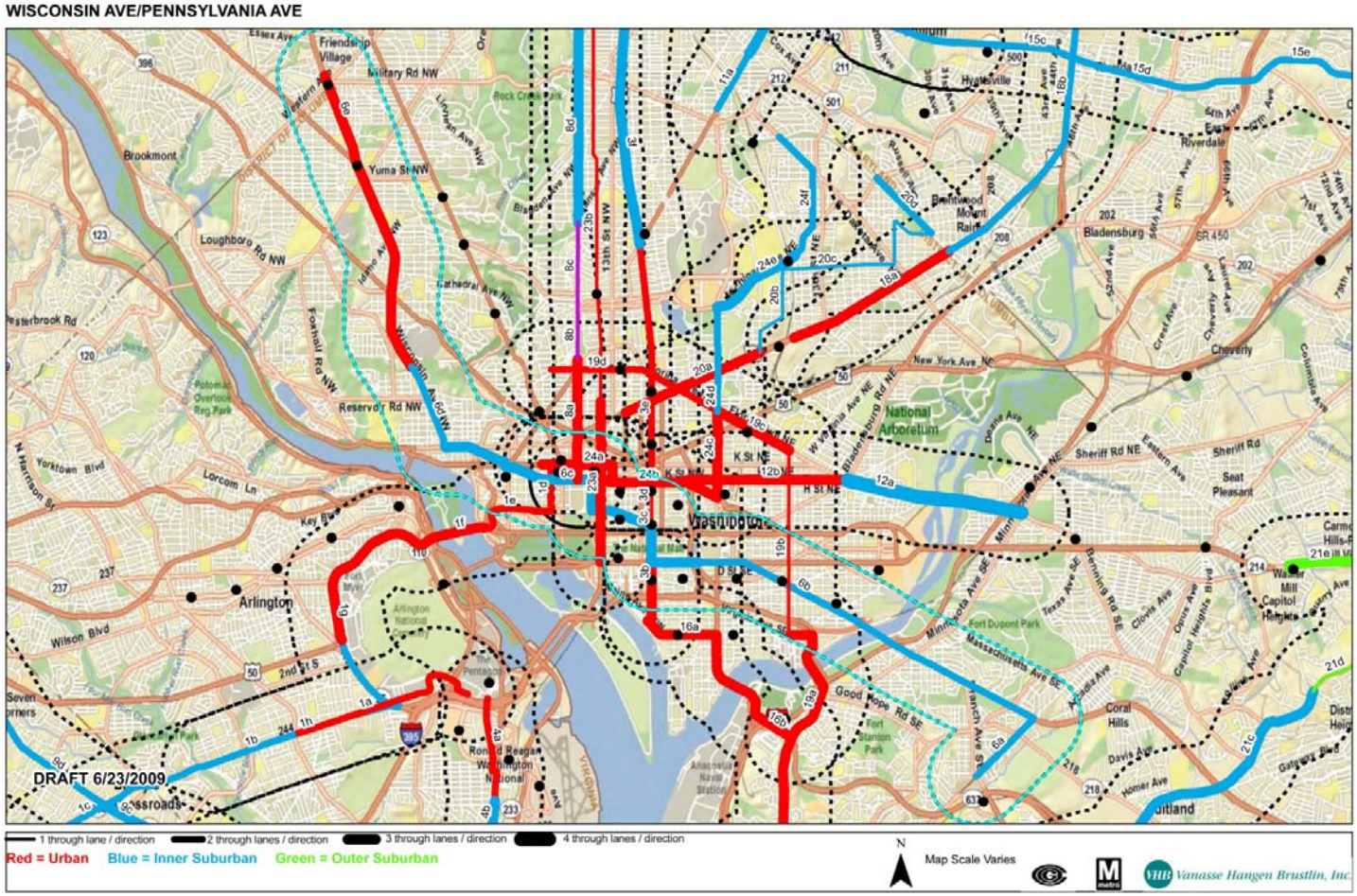


Figure F-6: Map of PCN Corridor #6 – Wisconsin Avenue / Pennsylvania Avenue[15]



[15] As noted earlier, PCN Corridor #5 was dropped from the study by WMATA.

Figure F-7: Map of PCN Corridor #7 – University Boulevard / East-West Highway

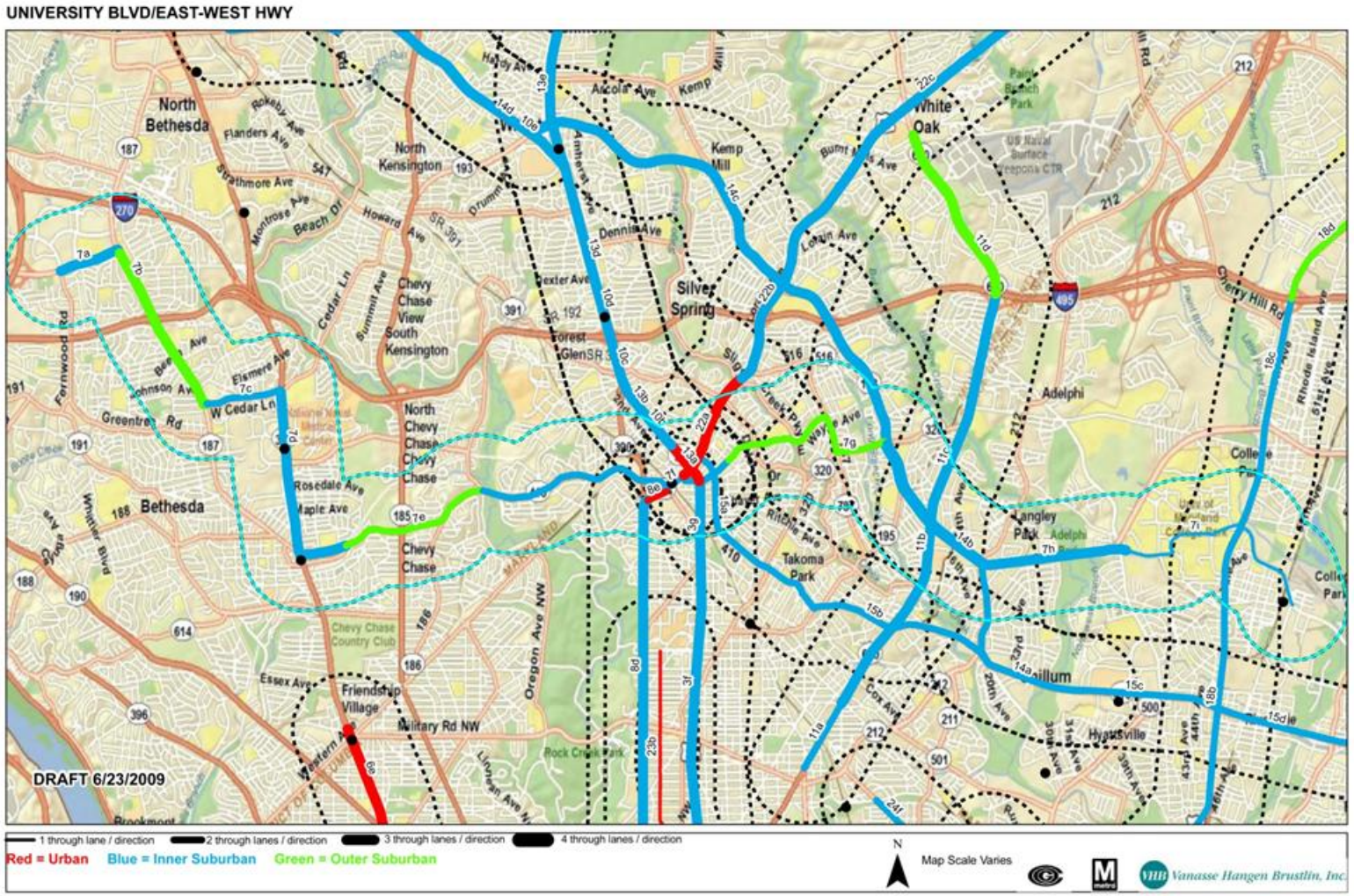


Figure F-8: Map of PCN Corridor #8 – Sixteenth Street (D.C.)

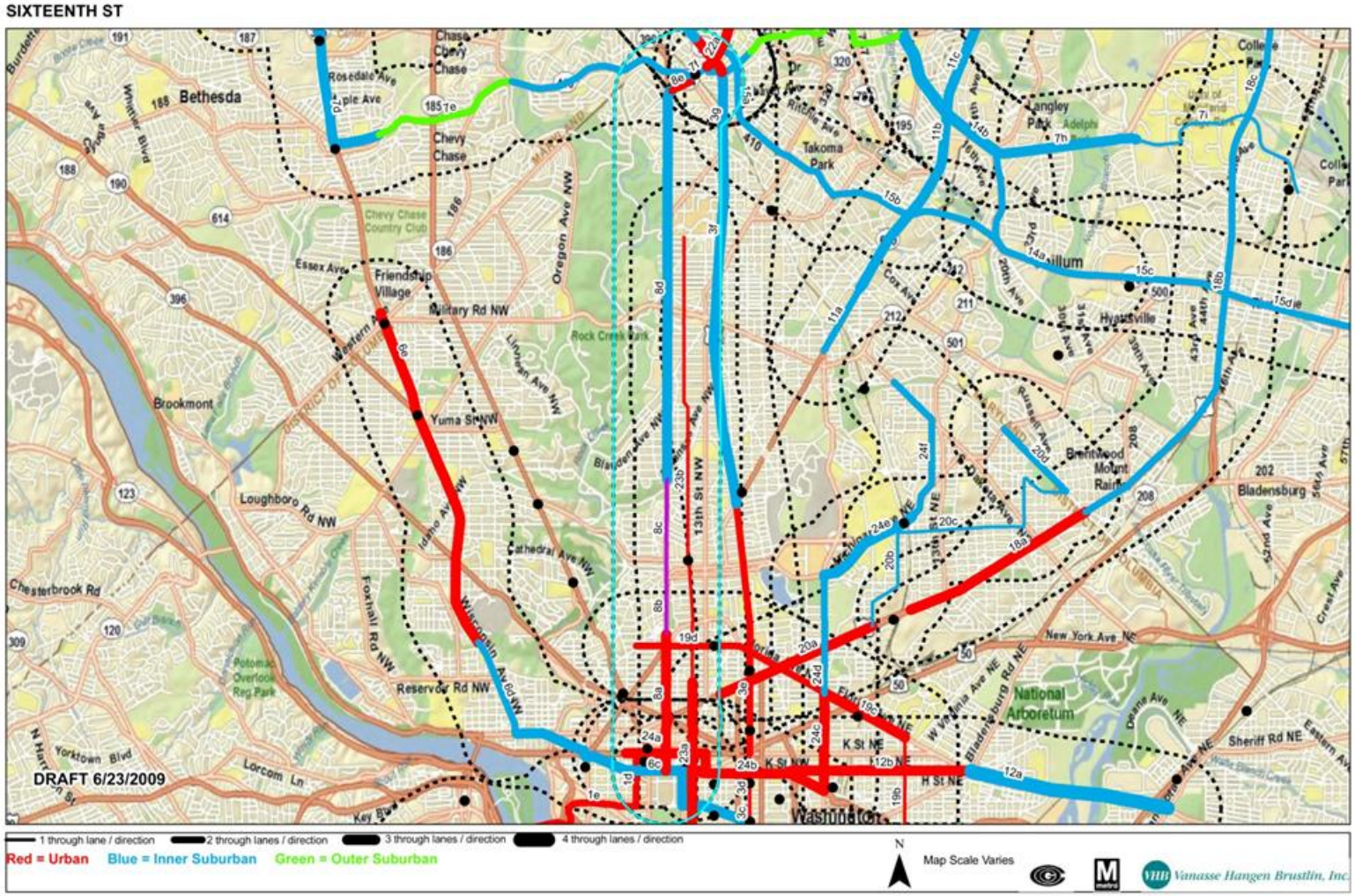


Figure F-9: Map of PCN Corridor #9 – Leesburg Pike

Figure F-10: Map of PCN Corridor #10 – Veirs Mill Road

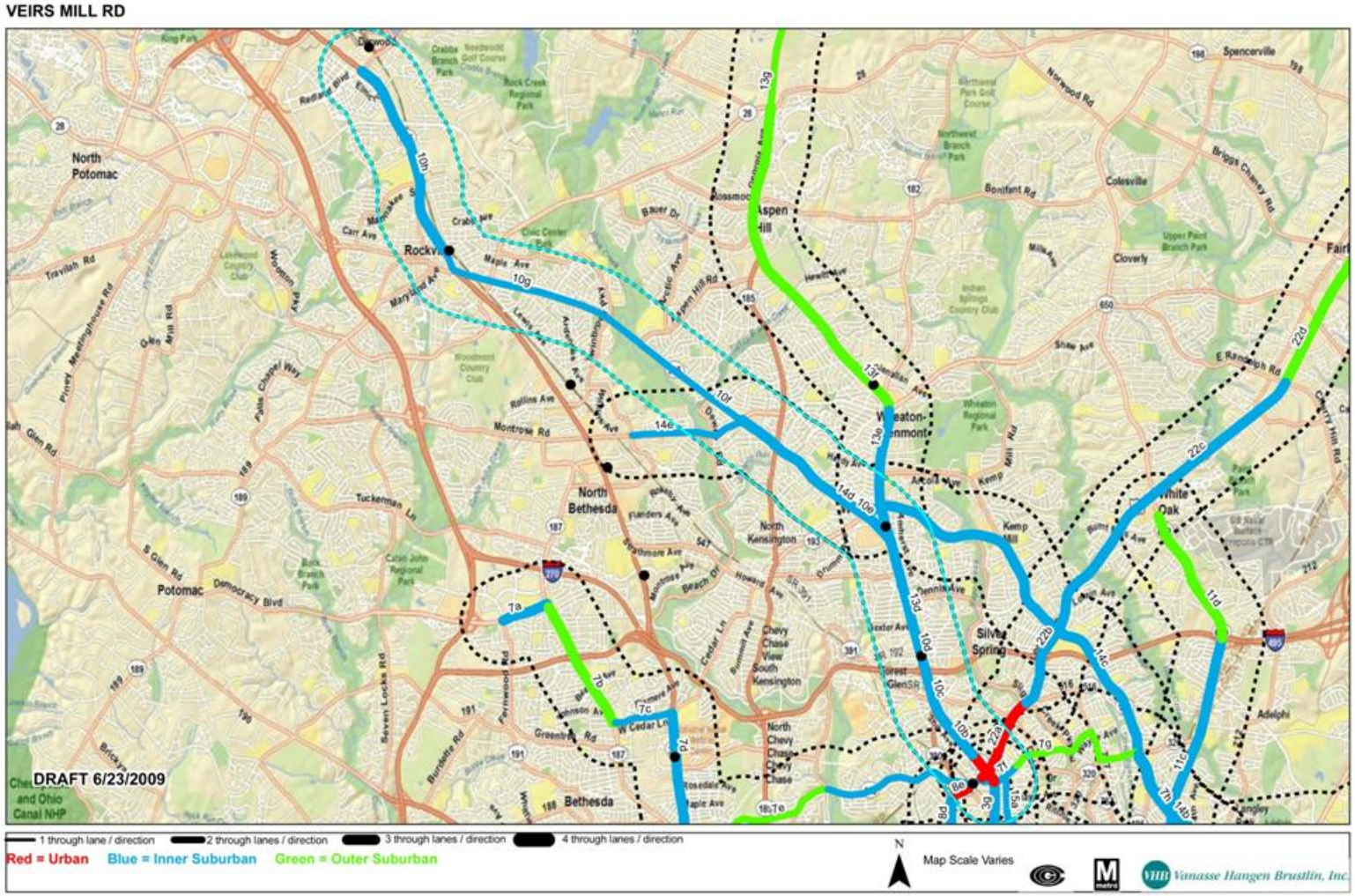


Figure F-11: Map of PCN Corridor #11 – New Hampshire Avenue

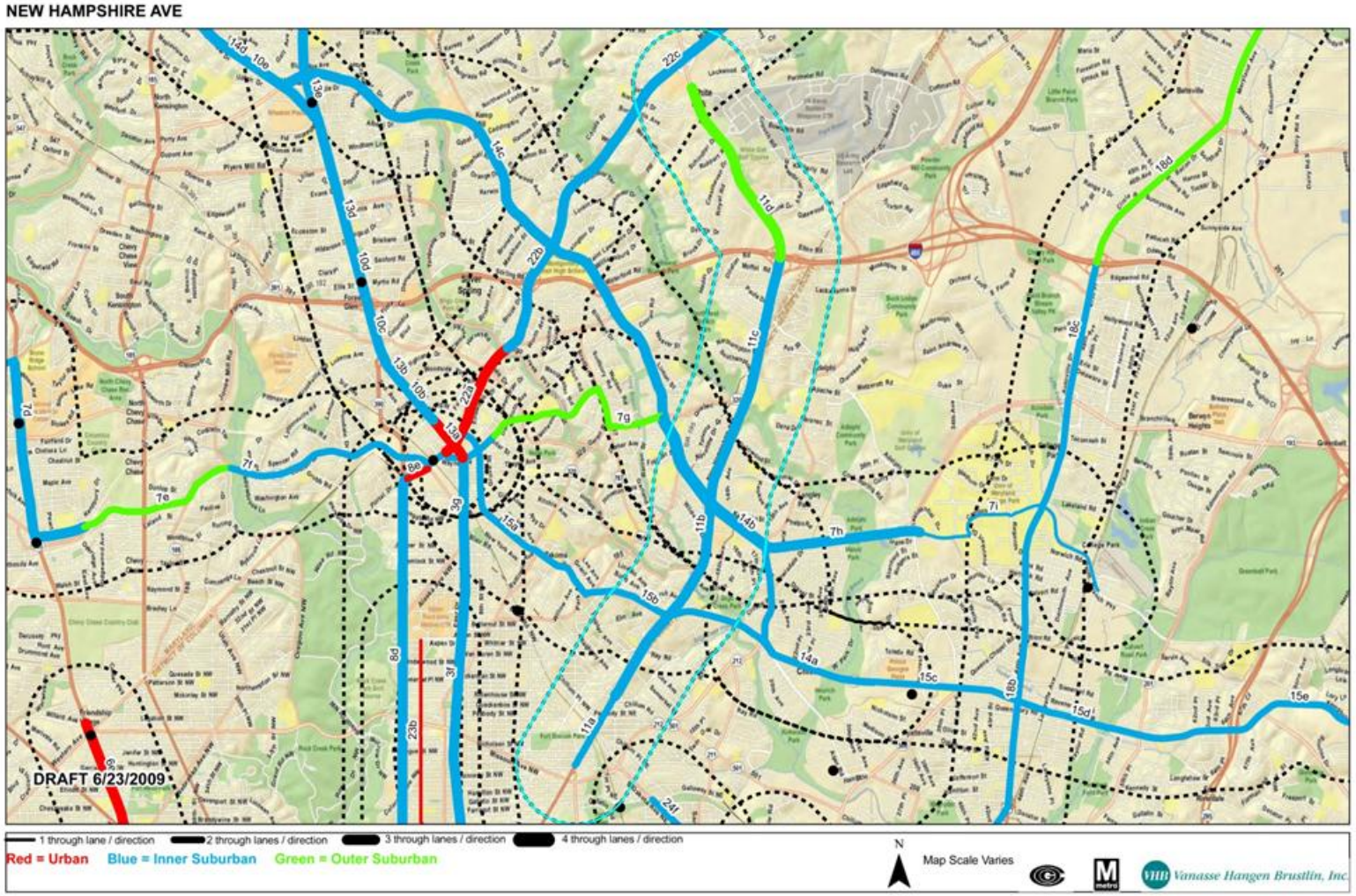


Figure F-12: Map of PCN Corridor #12 – H Street / Benning Road

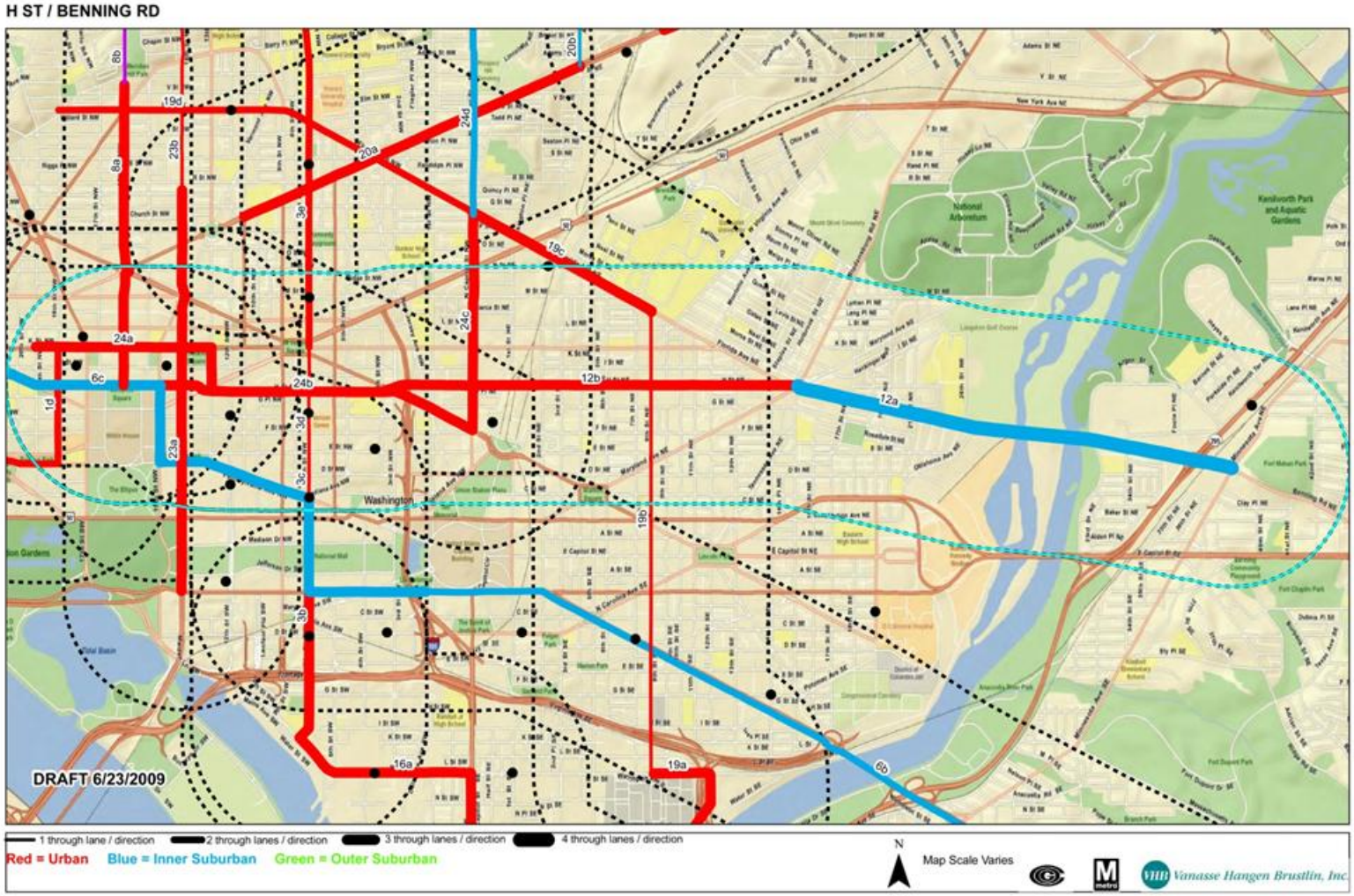


Figure F-13: Map of PCN Corridor #13 – Georgia Ave

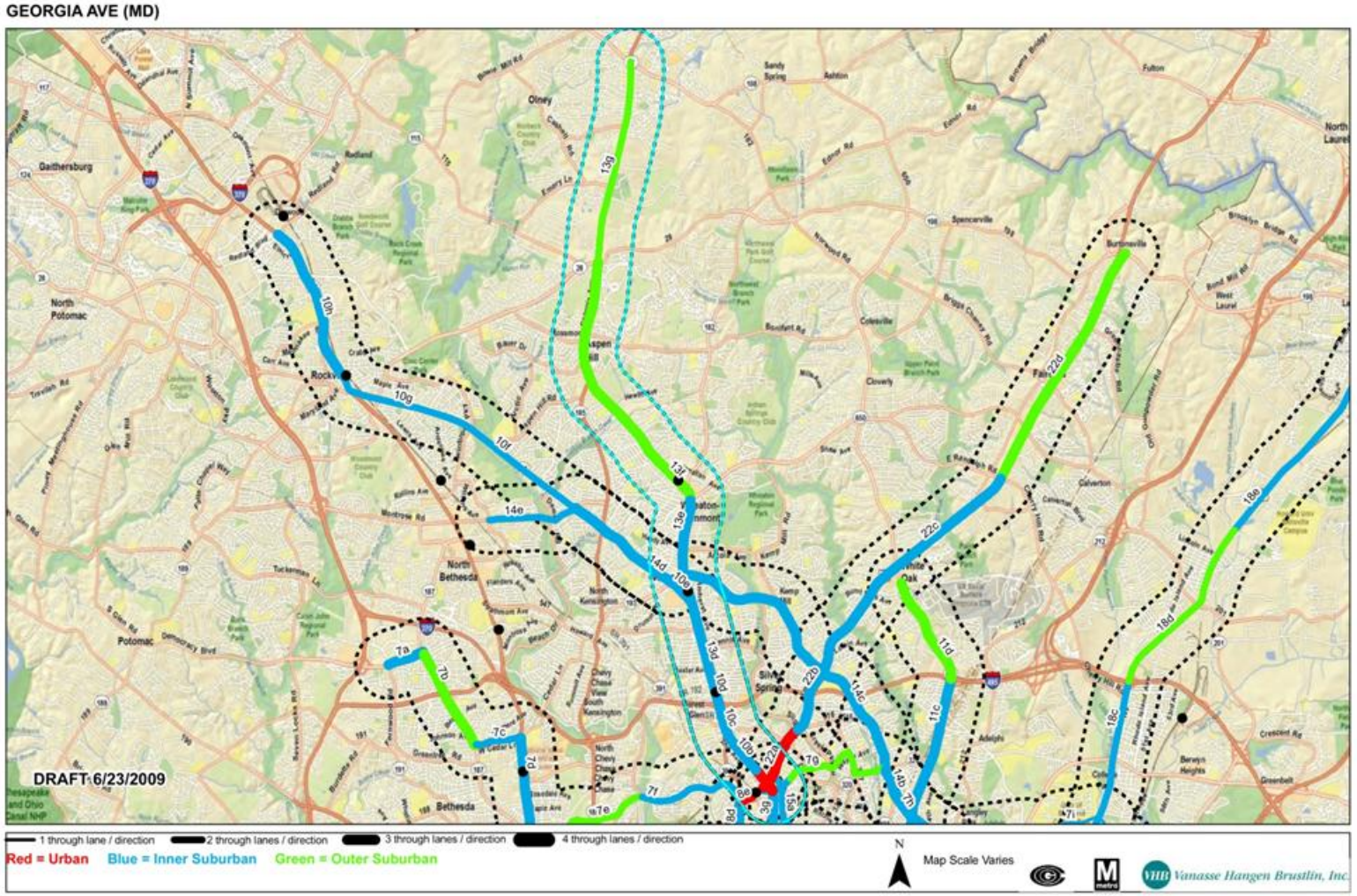


Figure F-14: Map of PCN Corridor #14 – Greenbelt / Twinbrook

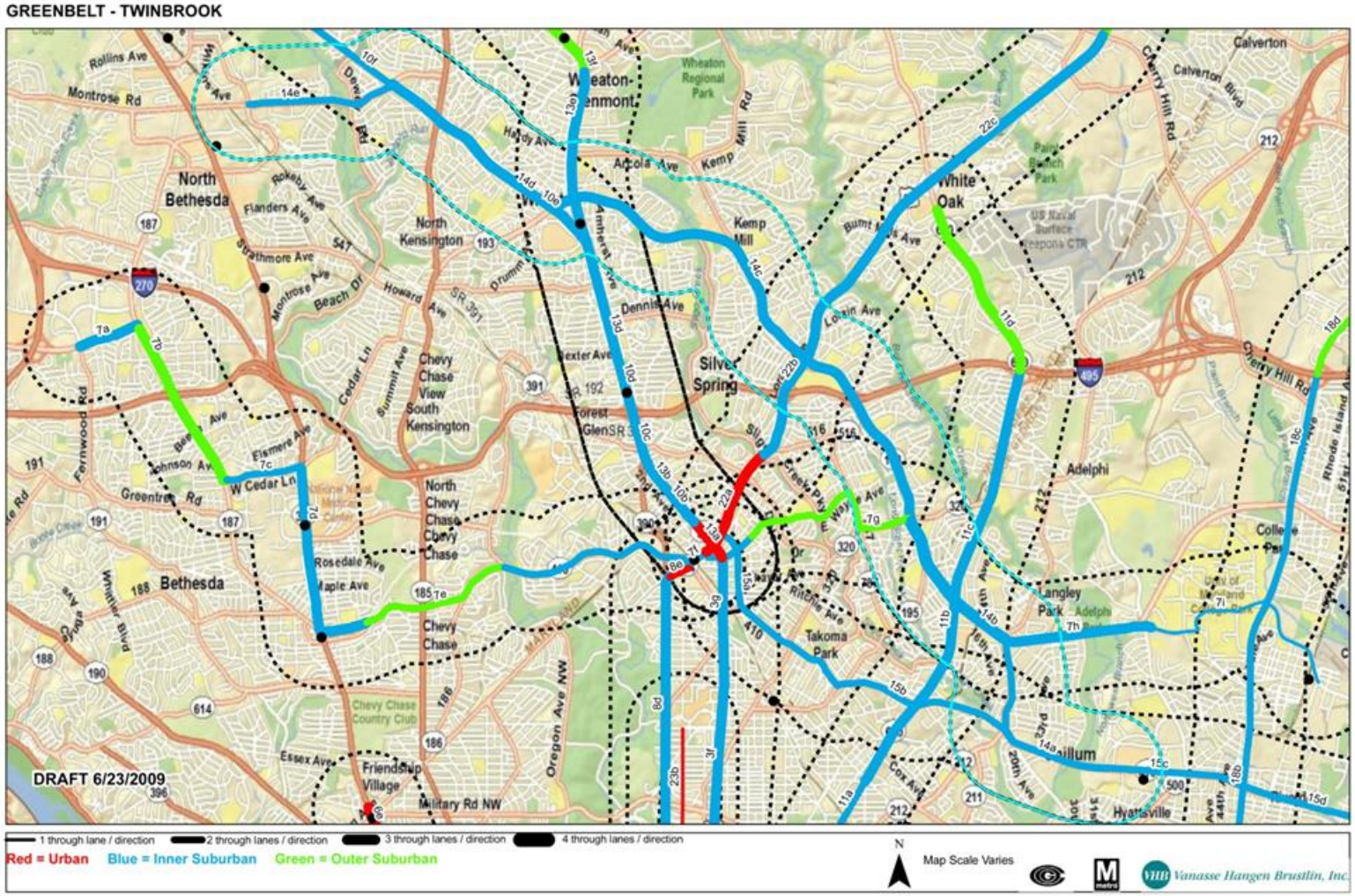


Figure F-15: Map of PCN Corridor #15: East-West Highway (Prince George's)

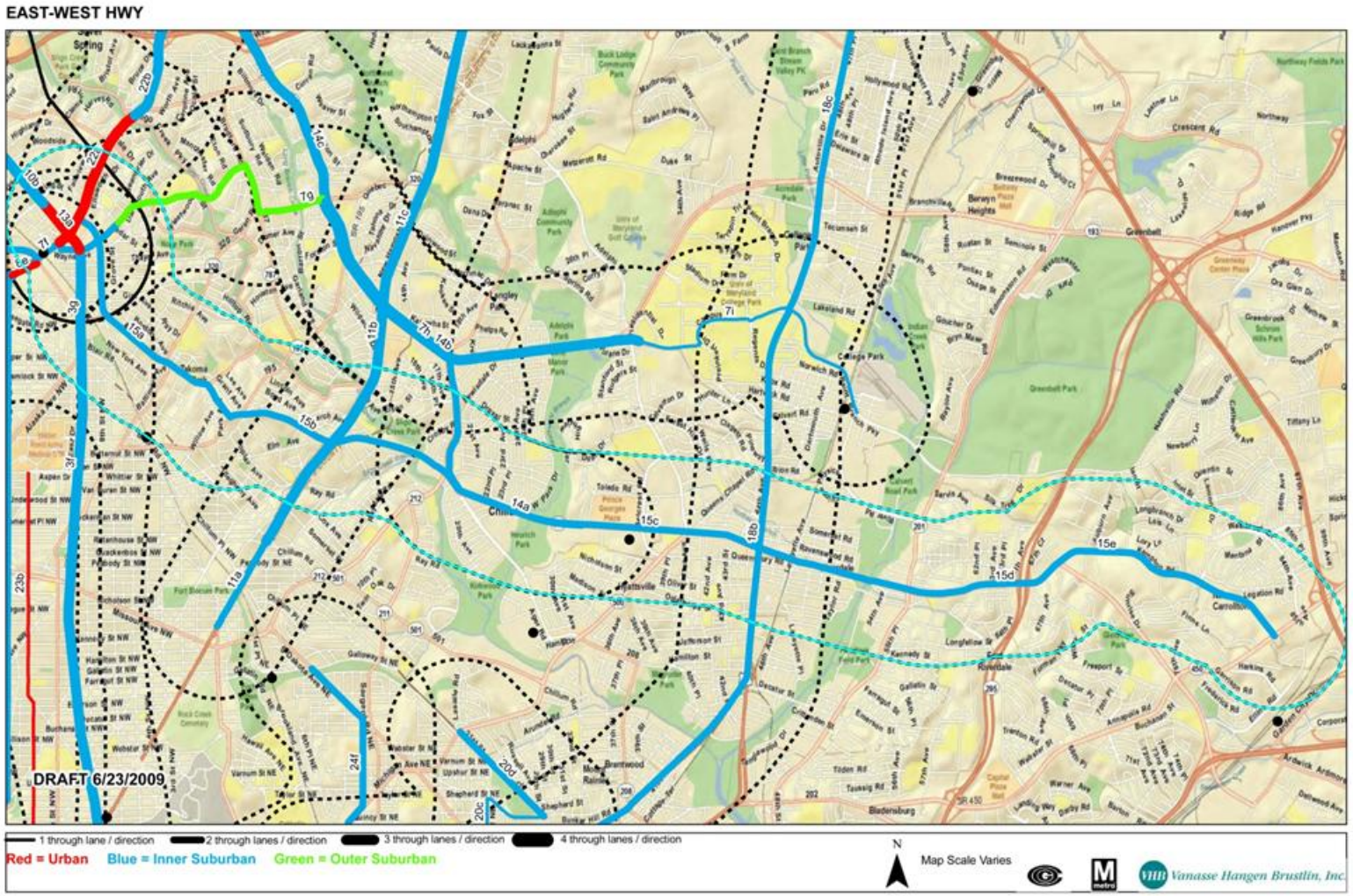


Figure F-16: Map of PCN Corridor #16 – Anacostia – Congress Heights

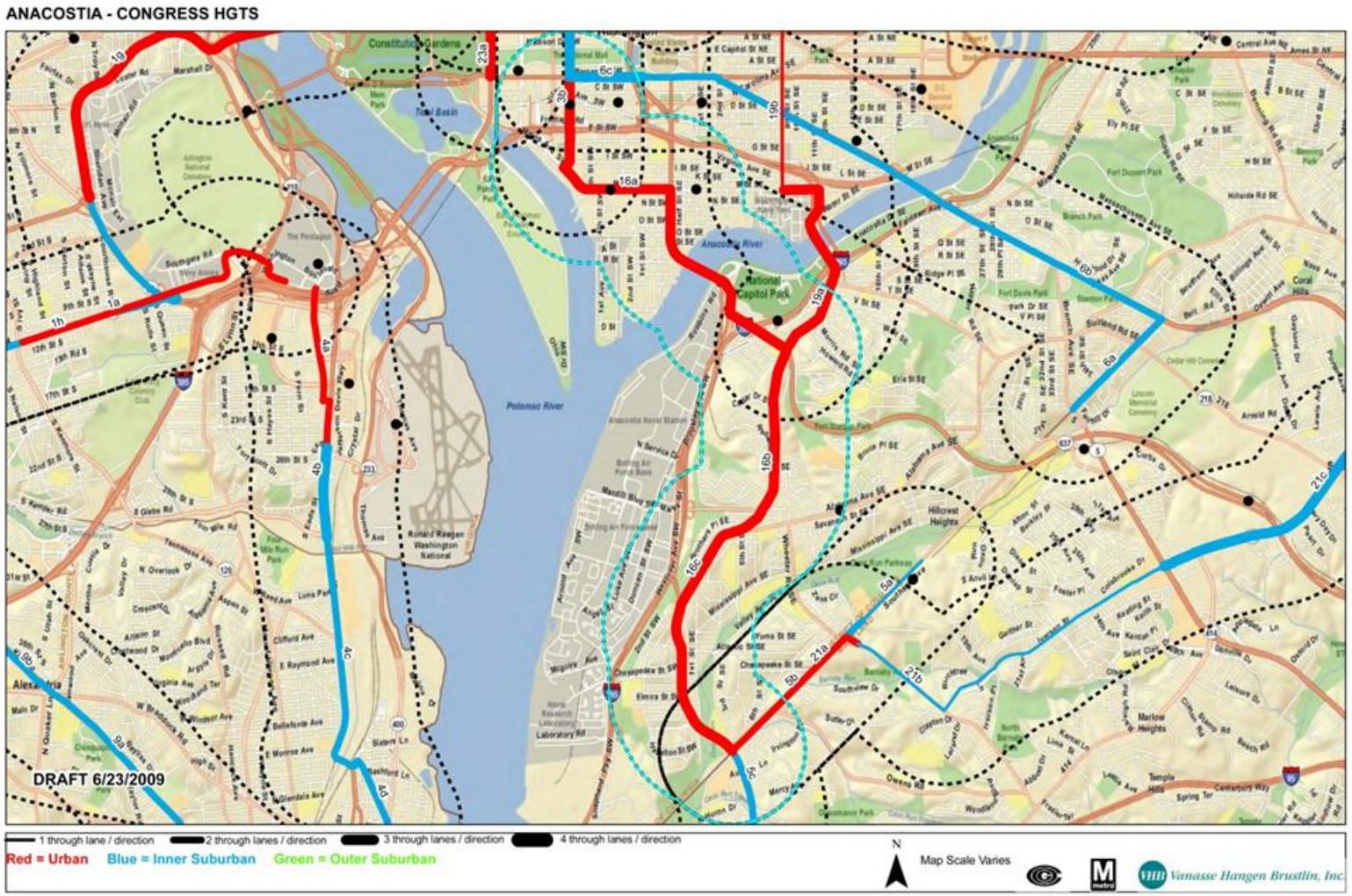


Figure F-17: Map of PCN Corridor #17 – Little River Turnpike / Duke Street

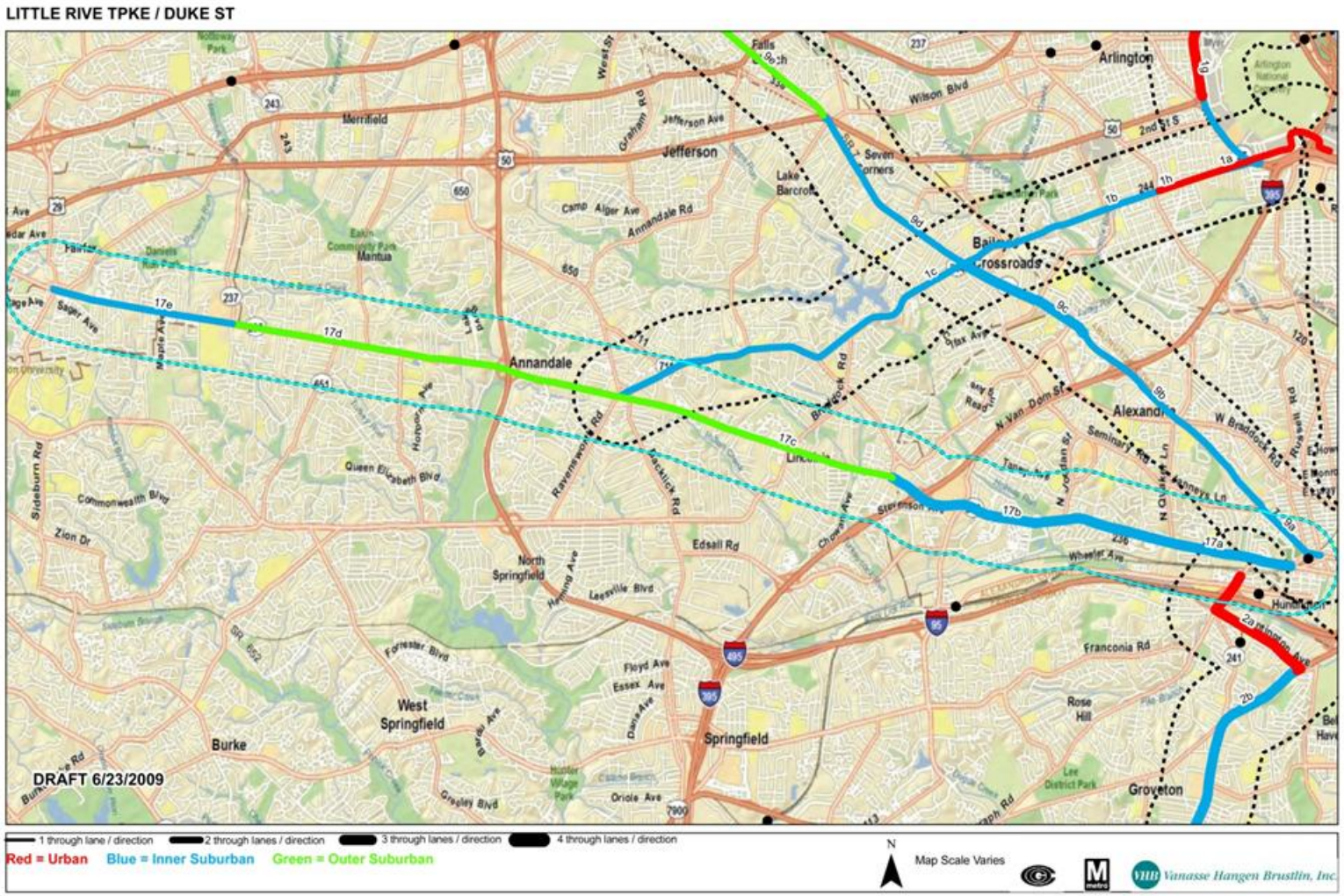


Figure F-18: Map of PCN Corridor #18 – Rhode Island Avenue Metro to Laurel

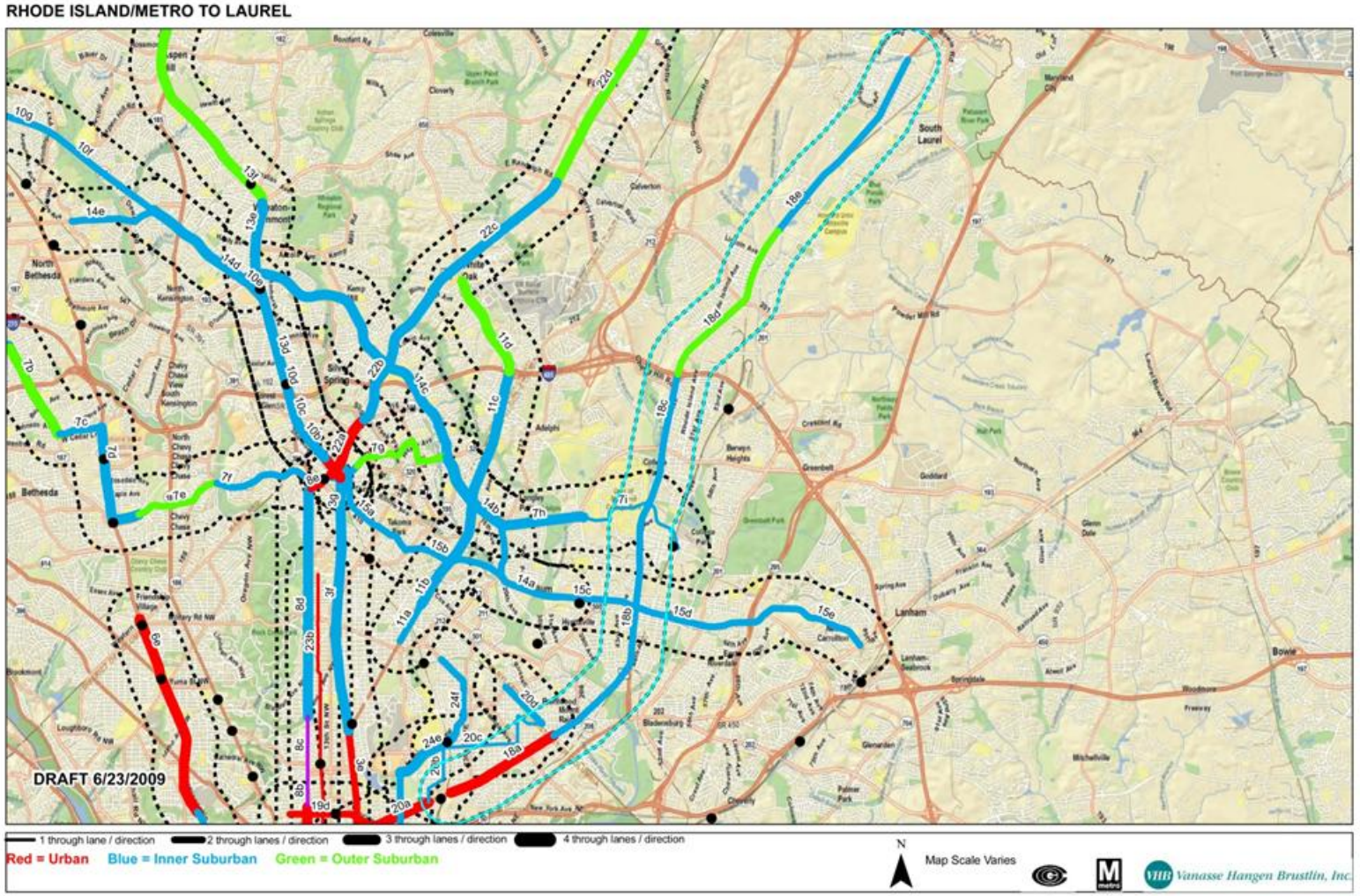


Figure F-19: Map of PCN Corridor #19 – Massachusetts Avenue / U Street / Florida Avenue / 8th Street / MLK Avenue

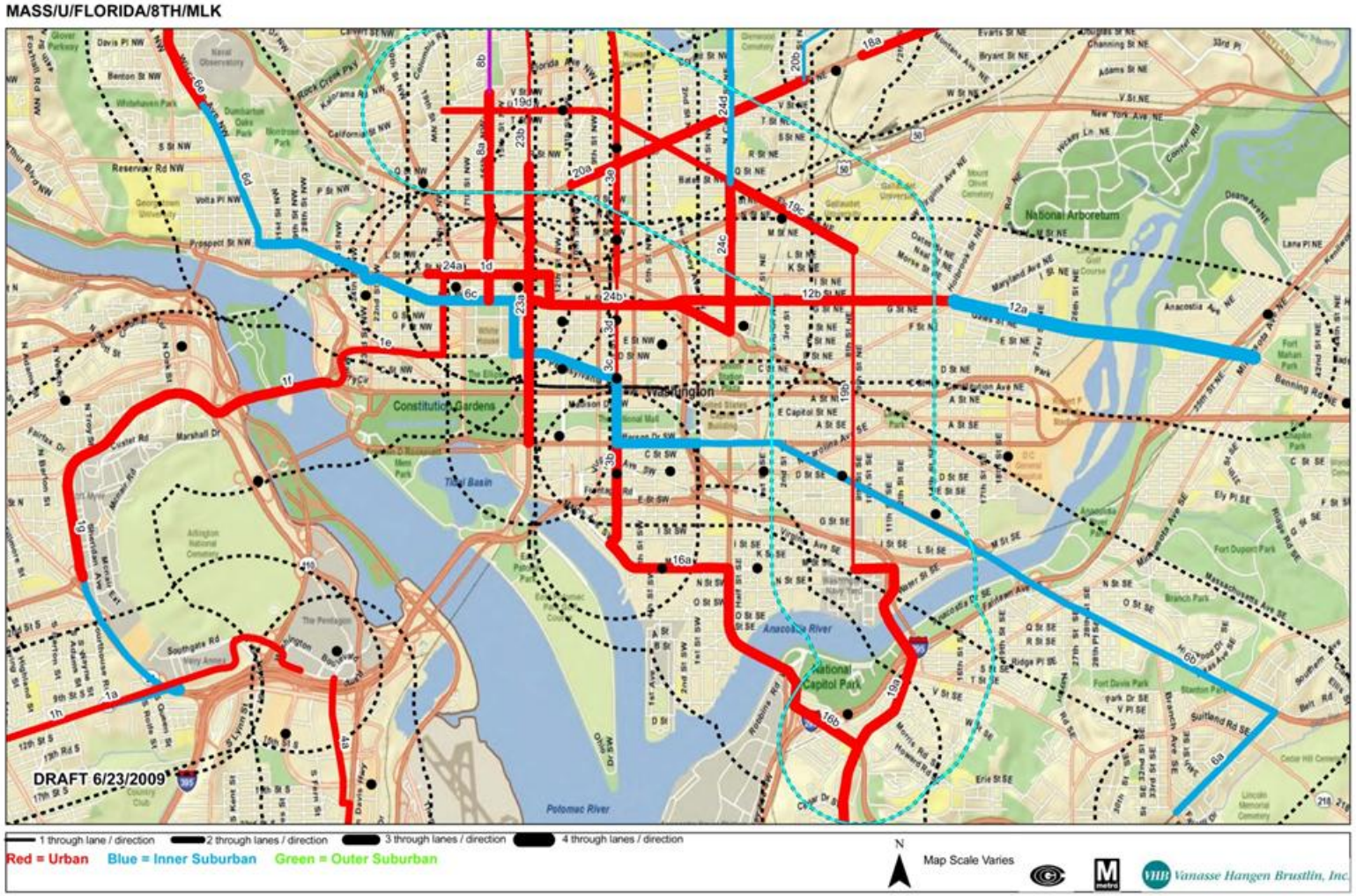


Figure F-20: Map of PCN Corridor #20 – Rhode Island Avenue

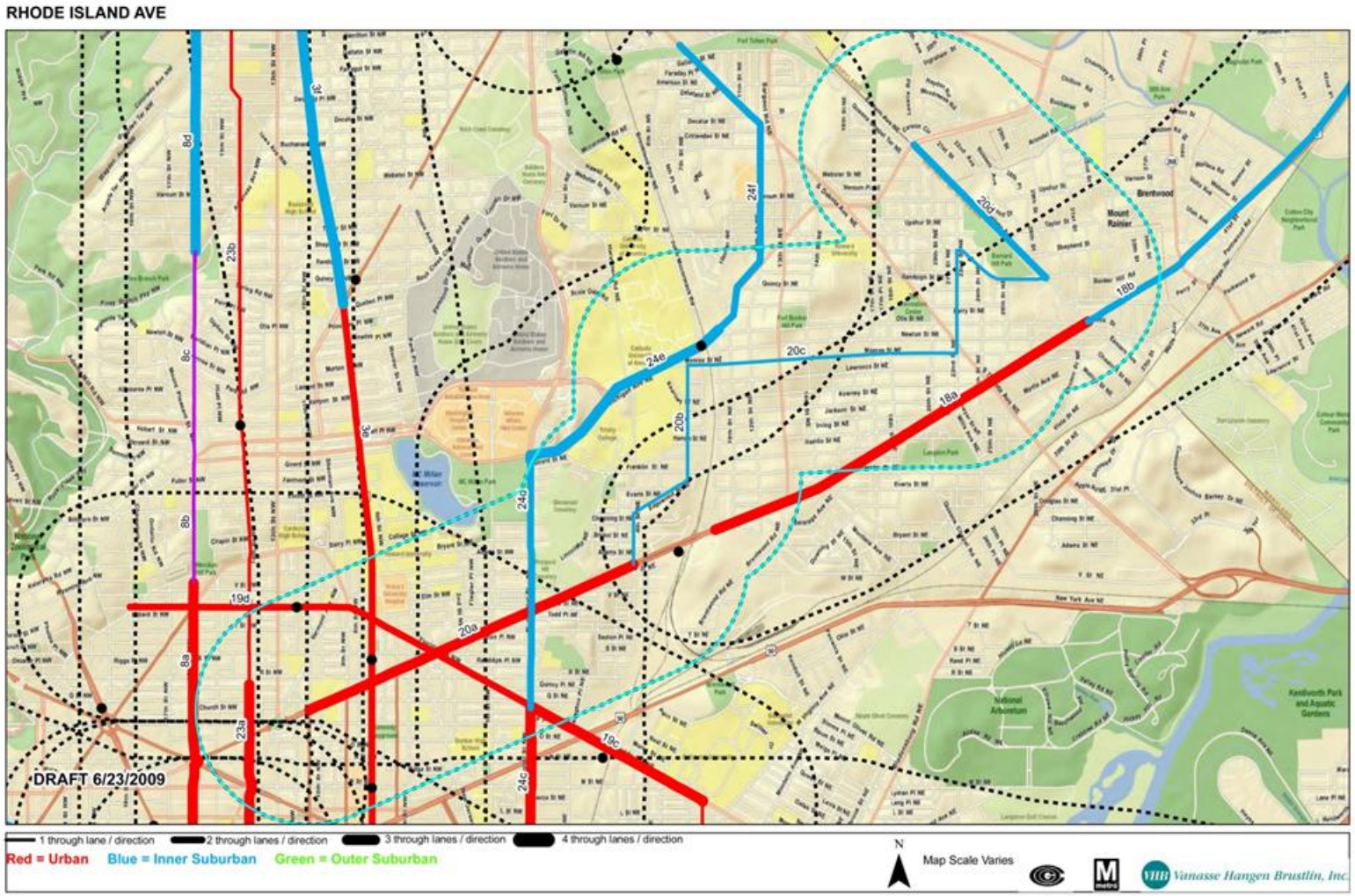


Figure F-21: Map of PCN Corridor #21 – Eastover-Addison Road

Figure F-22: Map of PCN Corridor #22 – Colesville Road / Columbia Pike (US 29)

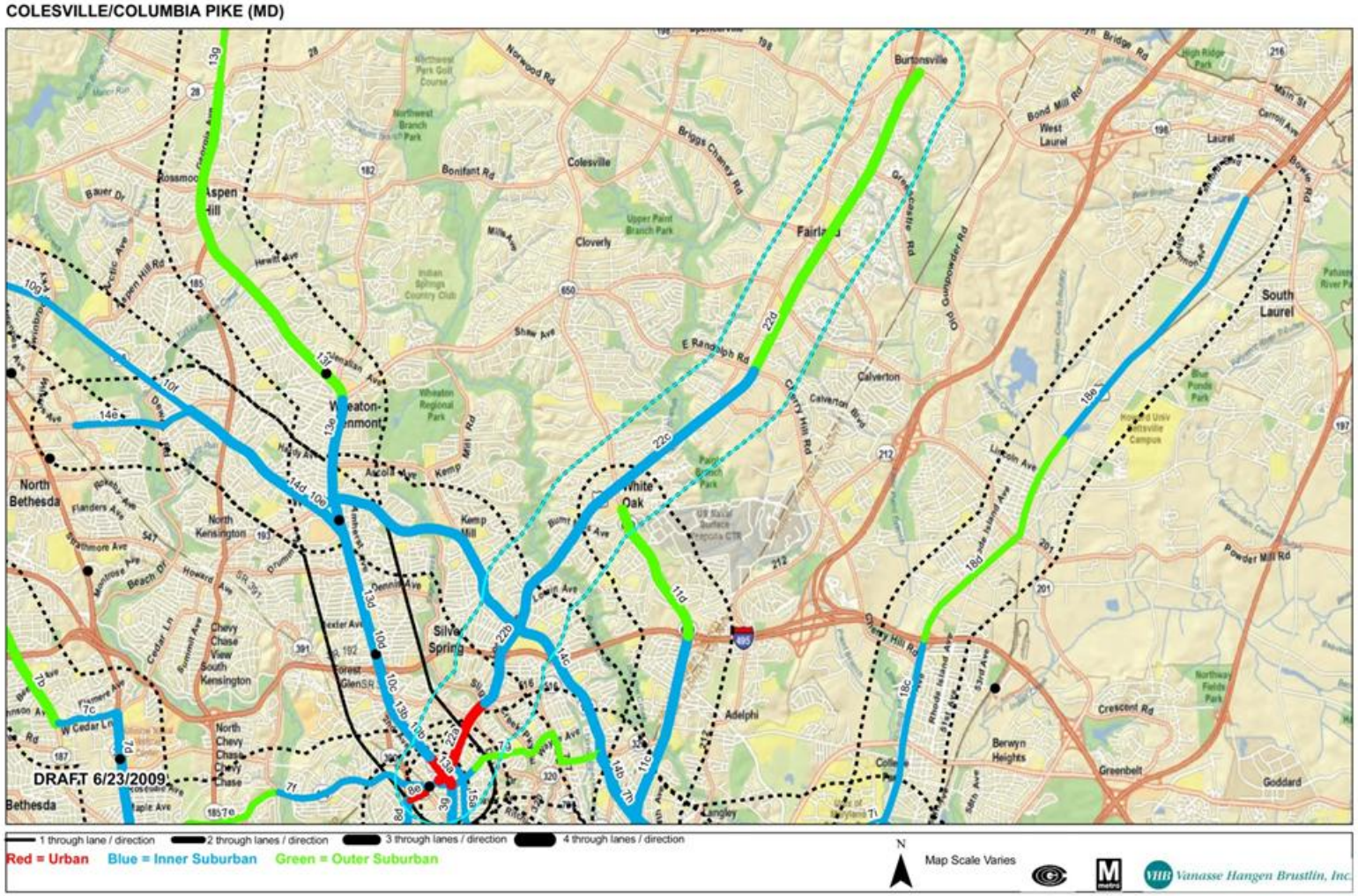


Figure F-23: Map of PCN Corridor #23 – Fourteenth Street

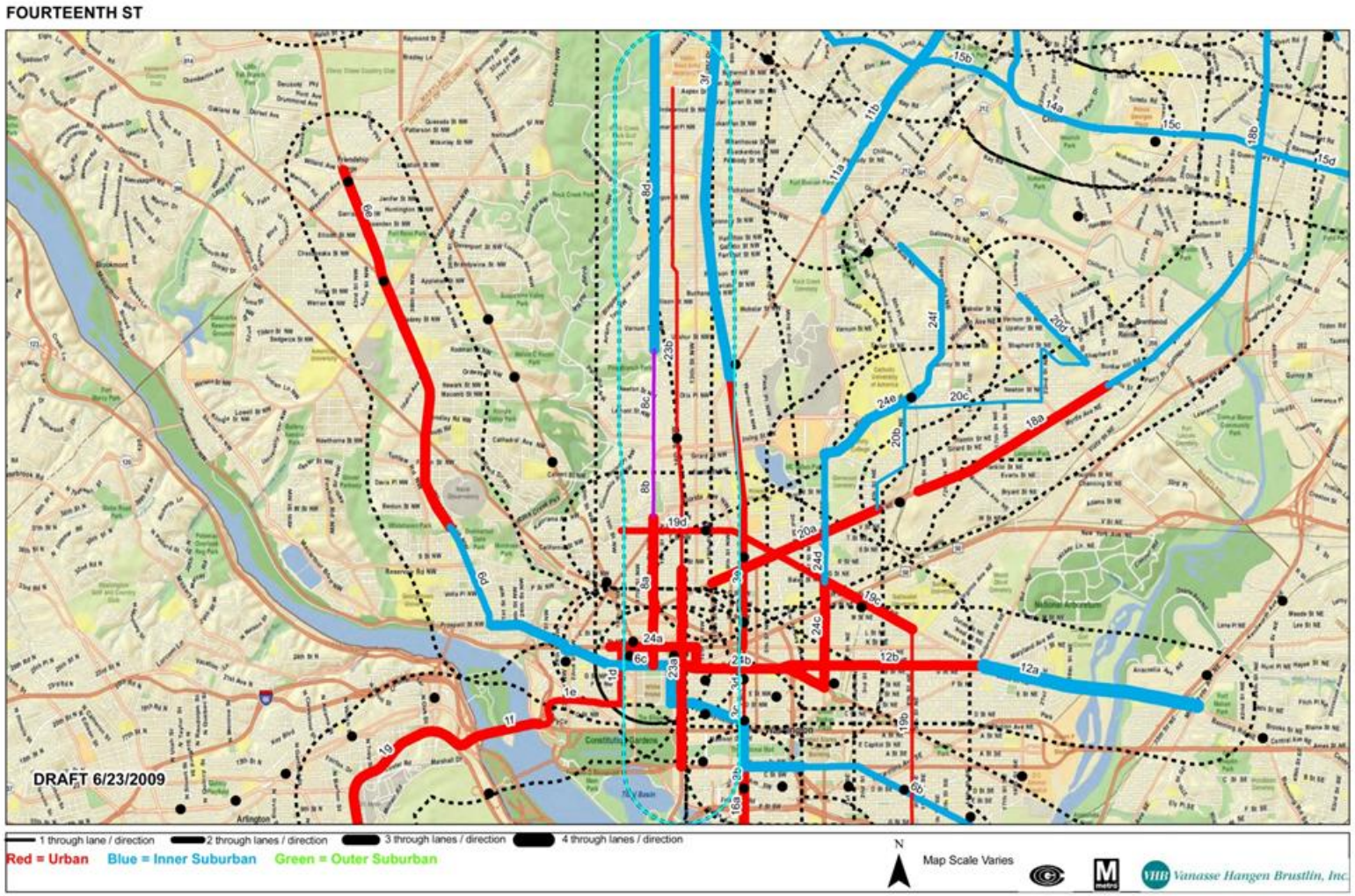
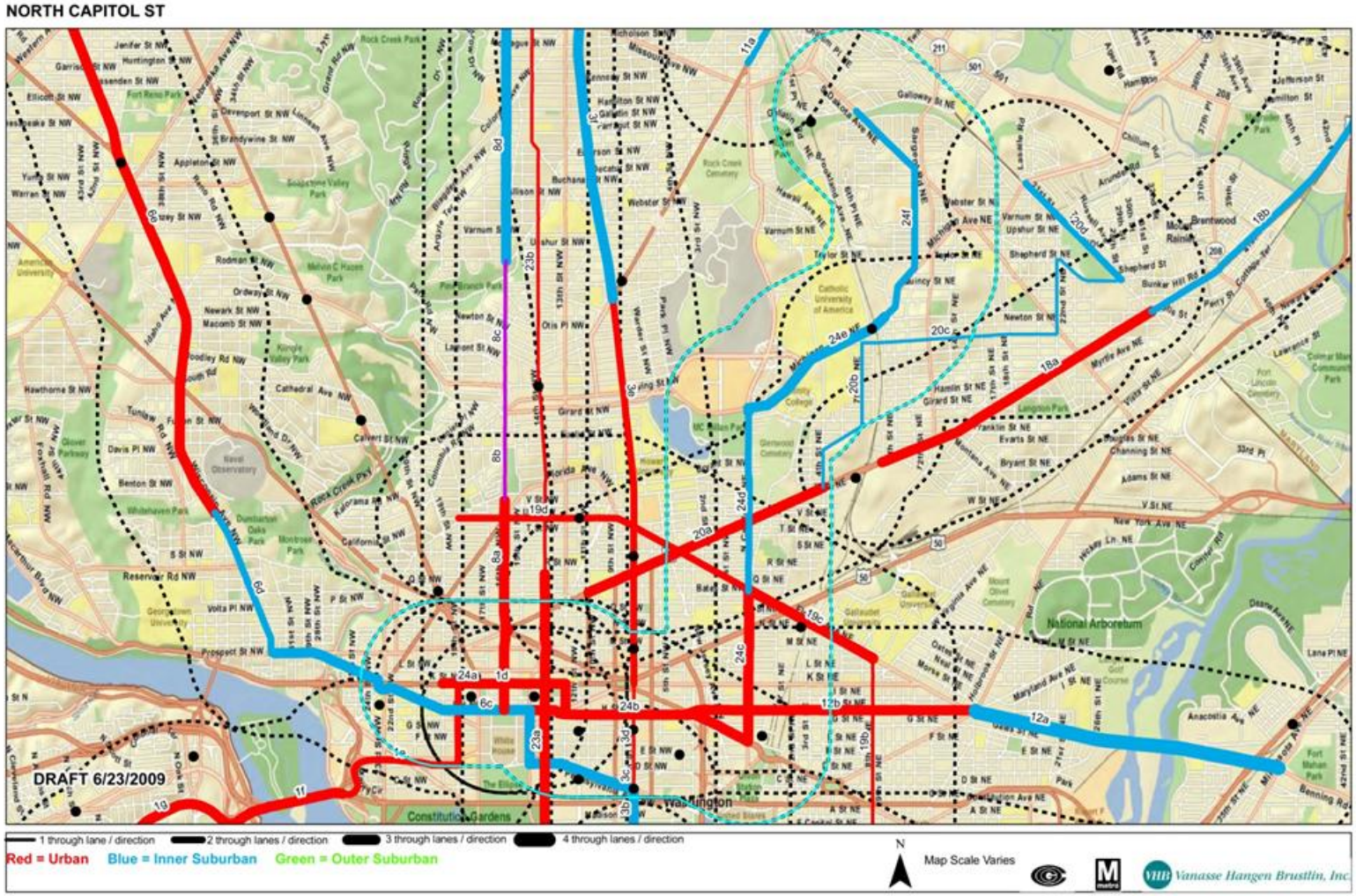


Figure F-24: Map of PCN Corridor #24 – North Capitol Street



G : Exclusive Lane Improvements Alternative Level of Investment Methodology

Table G-1: Investment Matrix

	High	Medium	Low
Urban	**Runningway:** Exclusive Lane **TSP:** Yes **Stations/Stops:** Unique Shelters with seating. ≤ 3 stops per mile and at transfer points. **Passenger Info:** Real-time schedule info at stops	**Runningway:** Queue jumps; 1/4 mile worth for every mile traveled **TSP:** Yes **Stations/Stops:** Unique Shelters with seating. ≤ 3 stops per mile and at transfer points. **Passenger Info:** Standard	**Runningway:** General Purpose Lanes **TSP:** No **Stations/Stops:** Standard. ≤ 3 stops per mile and at transfer points. **Passenger Info:** Standard
Inner-Suburban	**Runningway:** Exclusive Lane **TSP:** Yes **Stations/Stops:** Unique Shelters with seating. ≤ 3 stops per mile and at transfer points. **Passenger Info:** Real-time schedule info at stops	**Runningway:** Queue jumps; 1/4 mile worth for every mile traveled **TSP:** Yes **Stations/Stops:** Standard. ≤ 3 stops per mile and at transfer points. **Passenger Info:** Standard	**Runningway:** General Purpose Lanes **TSP:** No **Stations/Stops:** Standard. ≤ 3 stops per mile and at transfer points. **Passenger Info:** Standard
Outer-Suburban	**Runningway:** Queue jumps; 1/5[16] mile worth for every mile traveled **TSP:** Yes **Stations/Stops:** Unique Shelters with seating. ≈2 stops per mile and at transfer points. **Passenger Info:** Real-time schedule info at stops	**Runningway:** General Purpose Lanes **TSP:** Yes **Stations/Stops:** Standard. ≈2 stops per mile and at transfer points. **Passenger Info:** Standard	**Runningway:** General Purpose Lanes **TSP:** No **Stations/Stops:** Standard. ≈2 stops per mile and at transfer points. **Passenger Info:** Standard

[16] Less than for urban and inner suburban since more queues per mile in inner suburban and urban areas.

Levels of Investment Recommended

Table G-1 shows the type of improvements that were modeled for the Exclusive Lanes Investment Alternative, depending on the level of investment recommended. Different improvements were assigned to the segments based on the recommended level of investment (i.e., high, medium, low) and the area type (i.e., urban, inner-suburban, outer-suburban).

Table G-2 represents the level of investment recommended for each segment, using the parameters identified the main report. Other methodology used for defining level of investment included:

- Plans for corridors that have been studied and planned for by the jurisdictions were utilized as a starting point.
- Guidelines for assigning level of investment:
- High: All green, 1 or 2 green and others at least yellow, or % green
- Medium: two or more yellow or better
- Low: two or more red
- Note that in order to be assigned a High Level of Investment for Urban and Inner-Suburban areas, the segment must have either 3+ lanes, median, or parking lanes in order to accommodate the new exclusive lane.

Table G-2: Level of Investment Modeled by Segment for Exclusive Lanes Investment Alternative

	Cutline Number	Segments	2030 Full Build Bus Ridership	Change in Bus Ridership 2030 NB to Full Build	V/C	Reduction in Auto Trips	Level of Investment Recommendation
Columbia Pike (Pike Ride)	1-1	1a	≥5,000	<3,000	New V/C<0.8	1,800 < Δ <3,600	M
	1-1	1d-h	≥5,000	<3,000	New V/C<0.8	1,800 < Δ <3,600	H
	1-2	1b	≥3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	1,800 < Δ <3,600	M
	1-3	1c	<3,000	<3,000	V/C New < V/C Old OR Δ V/C<0.1	1,800 < Δ <3,600	M
Richmond Highway Express (REX)	21-	2a	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
	2-2	2b, 2c	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
Georgia Ave./7th Street	3-1	3a-e	≥5,000	≥3,000	New V/C<0.8	≤1,800	H
	3-2	3f-g	≥5,000	≥3,000	V/C New < V/C Old OR Δ V/C<0.1	1,800 < Δ <3,600	H

	Cutline Number	Segments	2030 Full Build Bus Ridership	Change in Bus Ridership 2030 NB to Full Build	V/C	Reduction in Auto Trips	Level of Investment Recommendation
Crystal City-Potomac Yard	4-1	4a-d	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
Wisconsin Ave./Pennsylvania Ave.	6-1	6a-b	≥5,000	≥3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	H
	6-2	6c-d	≥5,000	≥3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	H
	6-3	6e	≥5,000	≥3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	H
University Blvd /East-West Highway	7-1	7a-b	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
	7-2	7c-f	≥3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	M
	7-3	7g-h, 14a-e	≥5,000	≥3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	H
	7-3	7i	≥5,000	≥3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	M

	Cutline Number	Segments	2030 Full Build Bus Ridership	Change in Bus Ridership 2030 NB to Full Build	V/C	Reduction in Auto Trips	Level of Investment Recommendation
Sixteenth Street (DC)	8-1	8a-c	≥5,000	≥3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	H
	8-2	8d-e	≥5,000	≥3,000	V/C New < V/C Old OR Δ V/C<0.1	1,800 < Δ <3,600	H
Leesburg Pike	8-1	9a-d	<3,000	<3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	M
	9-2	9e-g	≥3,000	<3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	M
Veirs Mill Road	10-1	10a-d	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
	10-2	10e-g	≥3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	1,800 < Δ <3,600	H
	10-3	10h	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
New Hampshire Avenue	11-1	11a-b	≥3,000	<3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	M
	11-2	11c-d	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L

	Cutline Number	Segments	2030 Full Build Bus Ridership	Change in Bus Ridership 2030 NB to Full Build	V/C	Reduction in Auto Trips	Level of Investment Recommendation
H Street / Benning Road	12-1	12b	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	M
	12-2	12a	<3,000	<3,000	New V/C<0.8	≤1,800	H
Georgia Ave. (MD)	13-1	13a-d	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
	13-2	13e	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
	13-3	13f, g	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	1,800 < Δ <3,600	H
	13-3	13h	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	1,800 < Δ <3,600	L
Greenbelt-Twinbrook	14-1	14f	≥5,000	≥3,000	New V/C >0.9 AND Old V/C >0.9	1,800 < Δ <3,600	H
	14-2	14g-i	≥3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	M
East-West Highway (Prince George's)	15-1	15a-e	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
Anacostia-Congress Heights	16-1	16a-b	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≥3,600	M

	Cutline Number	Segments	2030 Full Build Bus Ridership	Change in Bus Ridership 2030 NB to Full Build	V/C	Reduction in Auto Trips	Level of Investment Recommendation
	16-2	16c	≥5,000	<3,000	New V/C<0.8	≤1,800	H
Little River Turnpike/Duke Street	17-1	17c-e	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
	17-2	17a-b	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
Rhode Island Ave Metro to Laurel	18-1	18a-b	<3,000	<3,000	New V/C<0.8	≤1,800	L
	18-2	18c-e	<3,000	<3,000	New V/C<0.8	≤1,800	L
Mass Ave/ U St./ Florida Ave./ 8th St./ MLK Ave.	19-1	19a-b	≥5,000	≥3,000	New V/C >0.9 AND Old V/C >0.9	≥3,600	H
	19-2	19c-d	≥3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	H
Rhode Island Avenue	20-1	20a-d	<3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	L
Eastover - Addison Road	21-1	21a-e	<3,000	<3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	M
Colesville Rd./ Columbia Pike - MD US 29	22-1	22a-b	≥3,000	<3,000	New V/C >0.9 AND Old V/C >0.9	≤1,800	H
	22-2	22c-d	<3,000	<3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	M

	Cutline Number	Segments	2030 Full Build Bus Ridership	Change in Bus Ridership 2030 NB to Full Build	V/C	Reduction in Auto Trips	Level of Investment Recommendation
Fourteenth Street (DC)	23-1	23a	≥5,000	≥3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	H
	23-2	23b					H
	23-2	23c	≥5,000	≥3,000	V/C New < V/C Old OR Δ V/C<0.1	1,800 < Δ <3,600	M
North Capitol Street	24-1	24a-f	<3,000	<3,000	V/C New < V/C Old OR Δ V/C<0.1	≤1,800	M