

DC's Transit Future System Plan

FINAL REPORT

April 2010



DISTRICT OF COLUMBIA DEPARTMENT OF TRANSPORTATION



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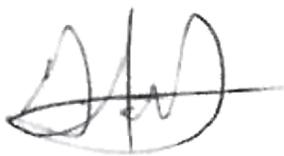
DC's Transit Future System Plan

The District of Columbia has entered an exciting new period of its history. The District has recovered from decades of declining population and is growing again. Neighborhoods across the city are reemerging and adding people, jobs and retail. Other neighborhoods are poised for growth and await the right catalyst. This rebirth has created challenges for the District's infrastructure, and we need to make the transportation investments that will support our recent growth and further strengthen our neighborhoods.

This plan is the culmination of a five-year effort to identify transit challenges and opportunities and recommend appropriate investment to meet these challenges and capitalize on opportunities. This plan lays out a series of investments in Metro Express limited-stop bus service and articulates a vision for a 37-mile streetcar system.

The *DC's Transit Future System Plan* has already made significant improvements to the mobility of District of Columbia residents and workers. New Metro Express limited-stop bus services, in coordination with local Metrobus routes, now provide faster and more convenient transit service along key transportation corridors within the District. The District has also started construction on its first streetcar lines. Continued transit improvements are in the works as the *DC's Transit Future System Plan* addresses both current and future challenges.

These new services will join our DC Circulator bus service and bike sharing program to form a new, local transit network. DDOT looks forward to continued engagement with the community as we bring these plans to fruition.



Gabe Klein, Director
District Department of Transportation



Executive Summary

The District of Columbia Department of Transportation (DDOT), in partnership with the Washington Metropolitan Area Transit Authority (WMATA), has developed the DC's Transit Future System Plan to establish a new, efficient, high-quality surface-transit network that supports community and economic development initiatives and connects residents and neighborhoods to employment centers, commercial areas, recreational facilities, and multimodal transportation hubs. The recommended plan includes a network of new streetcar lines operating in eight corridors, a transitway with reserved lanes for transit along K Street NW, as well as new Metro Express limited-stop bus service operating in 13 corridors across the city.

Purpose and Need for Transit Investments

The transportation system within DC will have to accommodate continued growth in population and employment over the next 20 years. In 2003 the District Government established a goal of adding 100,000 new residents to the city by 2014. Since that time, population has increased from 577,000 to nearly 600,000 residents and is expected to continue growing over the next 20 years. Currently there are about 700,000 employees working in the District, and that number is forecast to grow by more than 20 percent by 2030. Because of this growth, more people will be commuting to work and making more trips within the city. The number of total internal trips—one-way journeys using one mode of transportation in the District—is expected to increase 32 percent by 2030. In addition, many Metrobus routes are currently at or above capacity, and several Metrorail lines are expected to become highly congested by 2015 and exceed capacity by 2020. It is clear that the District faces a significant transportation challenge in the future.

A well-balanced and multi-modal transportation system is integral to the city's efforts to sustain and enhance the quality of life and is key to its future economic growth and role as the nation's capital. These efforts require integrating land use and transportation by implementing transportation projects that enhance intermodal connectivity, livability, and vitality. The District needs infrastructure investments that create or reinforce vibrant and stable neighborhoods, rebuild retail corridors, attract new jobs to the city, and promote sustainable development patterns. While economic conditions have improved in the District

over the past decade with a robust real estate market and resurgence in the city's residential population, the unemployment rate for DC residents remains substantially higher than that for the metropolitan region as whole. As such, transit investments are needed that will provide improved access to jobs and connect residential neighborhoods to the city's growing employment centers.

Recommended System Plan

In response to the transportation, economic, and community development needs facing the District, DDOT developed a transit system plan that establishes new high-quality transit services to connect DC residents to jobs, commercial businesses, recreational facilities, and regional transportation hubs. The plan includes:

- Re-establishment of streetcar service in the District of Columbia;
- Implementation of limited-stop bus service along major corridors; and
- Creation of a dedicated transitway on K Street NW.

Streetcar

The streetcar system will consist of modern low-floor vehicles operating on surface tracks that are embedded in the street pavement. Figure ES-1 shows the proposed streetcar element of the system plan. The vehicles will mostly operate in travel lanes that are shared with automobile traffic, although in some instances the streetcar may take advantage of available right-of-way and operate in exclusive transit-only lanes. The streetcar vehicles for the initial projects will be electrically powered via overhead



DC Streetcar Vehicle



Metro Express Bus

wires. Vehicles used in subsequent segments will have the ability to travel for limited distances without overhead wires to protect historical viewsheds. The streetcar stops will be generally located every $\frac{1}{4}$ to $\frac{1}{2}$ mile along the routes. The stops will include a small shelter and information regarding fares, route, and schedule. They may also have an off-vehicle fare collection system.

The new streetcar services are forecast to accommodate more than 147,000 daily trips by 2030, improve travel times by up to 38%, and reduce crowding on existing Metrobus lines by 27% in the corridors served by the new system. The streetcar component of the system also has the potential to stimulate more intense mixed-use development consistent with the city's Comprehensive Plan and zoning designations for the streetcar corridors. The system will serve as a catalyst for encouraging a pattern of high-quality, transit-oriented development and strengthening neighborhoods across the city.

Metro Express Limited-Stop Bus Service

The recommended plan also includes a network of new limited-stop bus services, referred to as "Metro Express," as shown in Figure ES-2. Four Metro Express routes have already been implemented in the District and operate along portions of Georgia Avenue, 16th Street NW, Wisconsin Avenue, and Pennsylvania Avenue. These services, operated by WMATA, consist of high-frequency bus services using specially marked vehicles with stop spacing of $\frac{1}{4}$ to $\frac{1}{2}$ mile along the routes. The Metro Express bus services will also include signal priority at key intersections for transit to facilitate the flow of buses and real-time Next Bus arrival displays at shelters served by the route.

K Street NW Transitway

The planned K Street NW Transitway is a critical component of the priority bus network because of the street's regional importance as a major transit corridor, connecting workers to the District's (and the region's) largest employment center and circulating people within the downtown core. The street currently carries over 20 Metrobus and commuter bus routes as well as the DC Circulator. The transitway project will reconstruct and reconfigure K Street NW between 9th Street NW and 20th Street NW to create dedicated lanes for transit. The preferred alternative includes a two-way, two-lane median transitway to accommodate bus services, two 10-foot wide general travel lanes in each direction, and one 12-foot travel/off peak parking lane in each direction. Raised medians would separate the general-purpose travel lanes from the bus-only lanes and provide width for passenger platforms and landscaping. The Transitway will also accommodate streetcar services along the corridor in the future to provide additional capacity; (pending additional study). The Federal Highway Administration (FHWA), in conjunction with the DDOT prepared an Environmental Assessment (EA) for the project and issued a Finding of No Significant Impact (FONSI) in December 2009.

Planning Process

This recommended system plan builds upon several earlier studies that were commissioned to identify potential solutions to the current transportation challenges that face the District of Columbia. The Transportation Vision, Strategy, and Action Plan (1997), developed by the DC Department of Public Works (DPW), identified several District corridors that would benefit from increased transit investment. Transit alternatives were selected to advance into more detailed project development in WMATA's District of Columbia Transit Development Study (2002), which was conducted as a follow-up to the 1997 plan.

Figure ES-1: System Plan - Streetcar Element

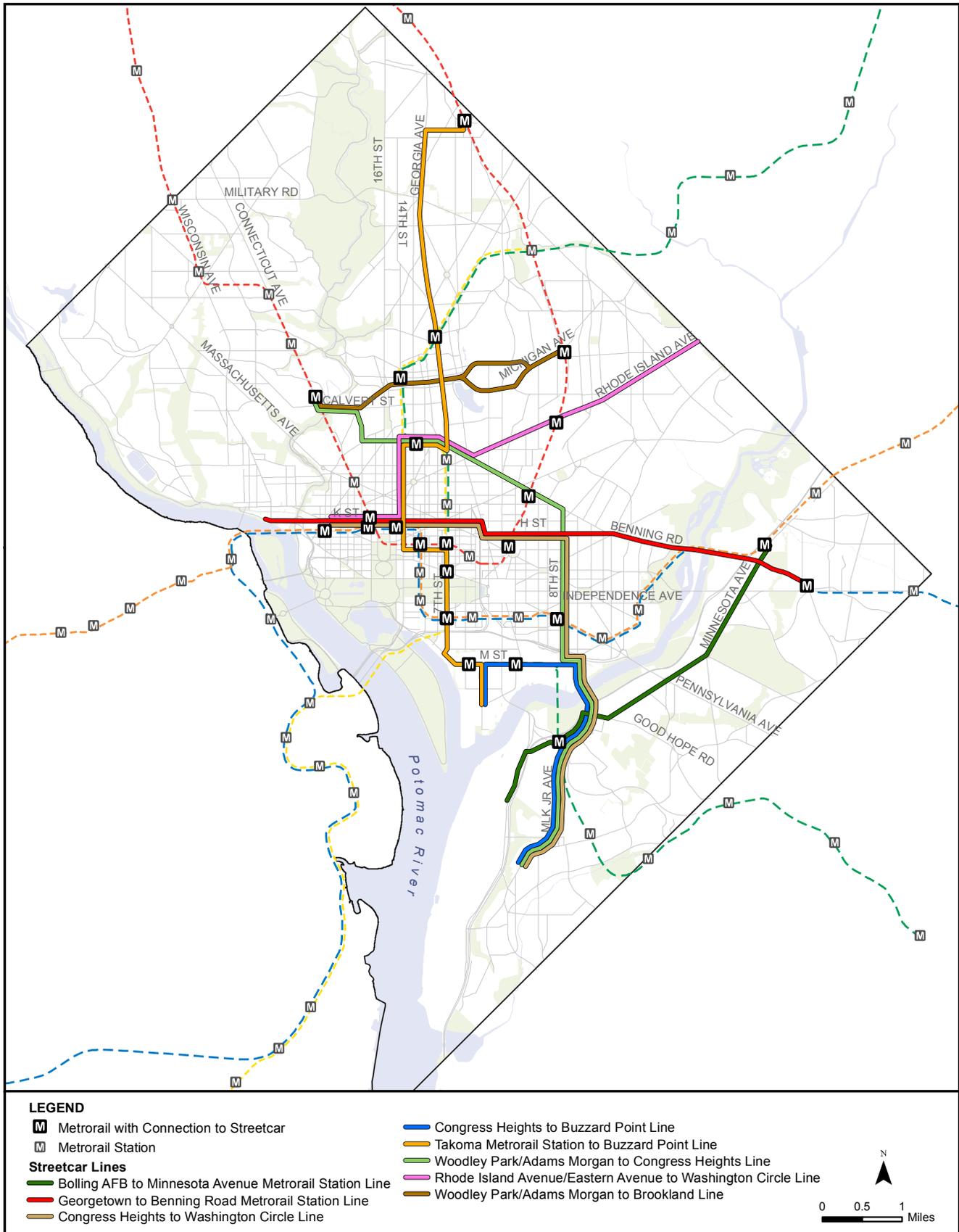
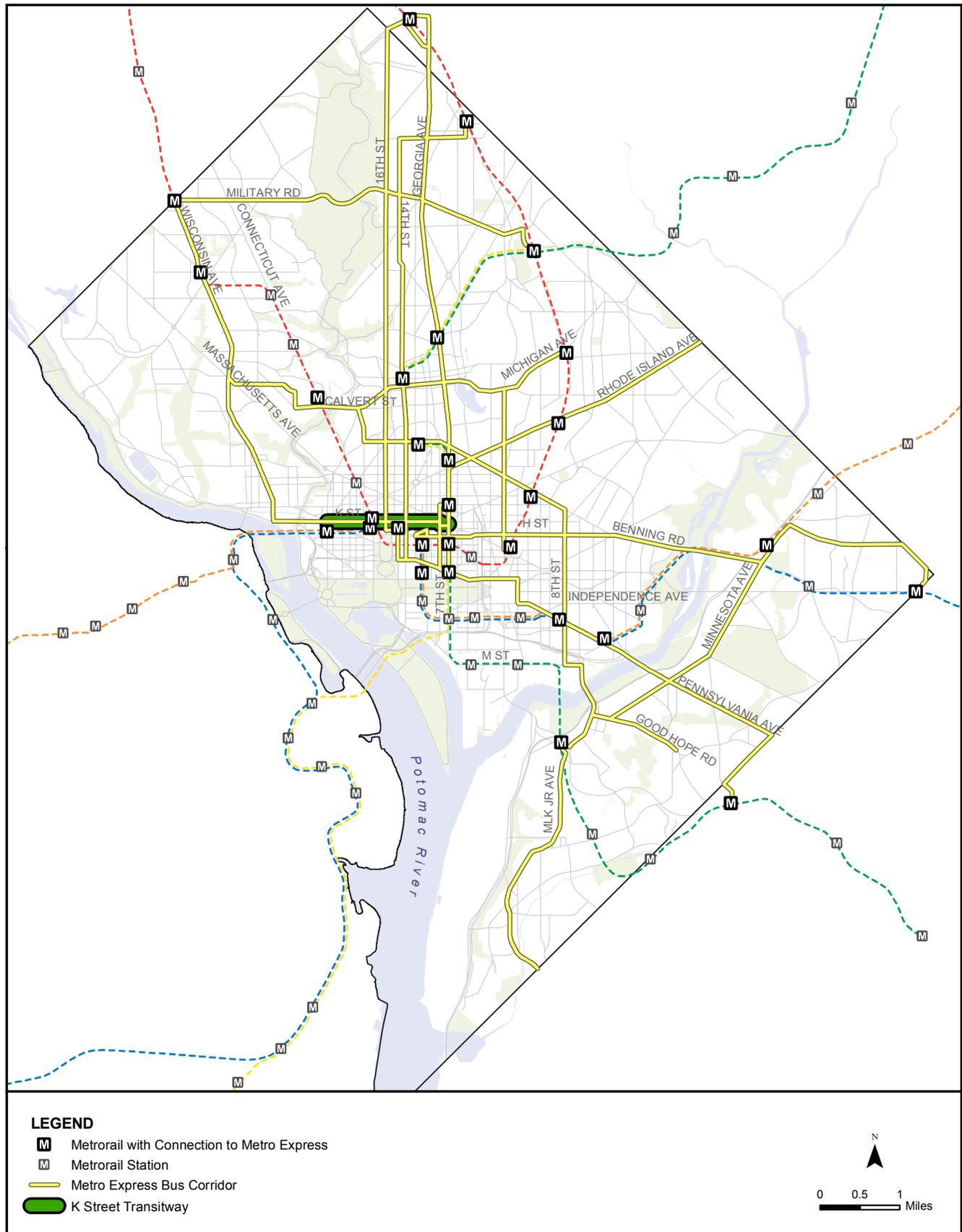


Figure ES-2: System Plan - Metro Express Bus Element



The DC Alternatives Analysis and System Plan, completed in 2005, evaluated specific streetcar and enhanced bus service options for corridors that were identified in the 2002 Transit Development Study and included an extensive public, agency, and stakeholder review process. The evaluation consisted of a three-step screening process designed to select the best mix of transit investments in each of the corridors by measuring performance of alternatives relative to the following four goals:

- Improve Access and Mobility;
- Encourage Community and Economic Development;
- Enhance Transit System Performance; and
- Promote Environmental Quality.

A total of 24 evaluation measures related to these goals were used to identify the best performing transit investment options to serve study area needs. Governmental agencies, neighborhood groups, businesses, community organizations and the public were actively involved in developing the recommended plan. Outreach efforts involved focus groups, presentations, briefings, community workshops, and public meetings.

DDOT initiated an update of the transit system plan in 2008 based on a re-evaluation of potential streetcar segments, taking into consideration the impact of substantial growth in the District since 2005. The 2008 system plan update incorporated:

- Additional streetcar segments along Florida Avenue NW/NE, 8th Street NE, and U Street NW to respond to rapid growth in the U Street Corridor and “NoMa” area by the New York Avenue Metro Station;
- Implementation of system phasing with a greater emphasis on maximizing ridership potential in the early phases of system development;
- Updated project costs and financial plan to reflect the changes in project phasing;
- Incorporation of WMATA’s Priority Bus Corridor Network (based on their 2005 study) into the system plan; and
- Additional transit services along 16th Street NW, 14th Street NW, North Capitol Street, and Rhode Island Avenue NE.

In 2010 DDOT completed a review and major update of the system plan to address recent transportation and development initiatives. DDOT had implemented several new limited-stop bus services and initiated construction on several key streetcar segments. Based on these factors, the 2010 Update process incorporated the following elements:

- Implementation of 2005/2008 recommendations; these include:
 - Anacostia Streetcar
 - H/Benning Streetcar
 - 11th Street Bridge Replacement
- New development and development plans;
- Current design/construction projects;
- Review of needs and opportunities; and
- Additional public and stakeholder input.

The 2010 Update includes an evaluation of five additional corridors for streetcar services and made several slight adjustments to streetcar connections based on the review of transportation needs and opportunities. It also includes a revised project phasing and financing plan that incorporates developments from 2005 to 2010. These components of the System Plan are summarized in the following sections.

Figure ES-3: Initial Projects

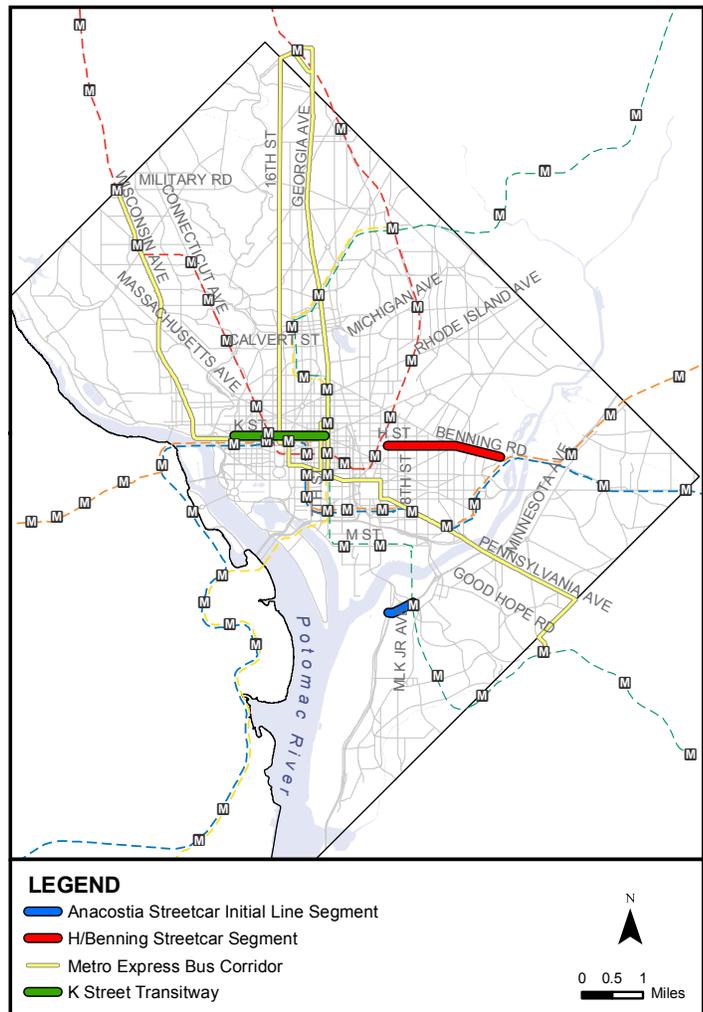
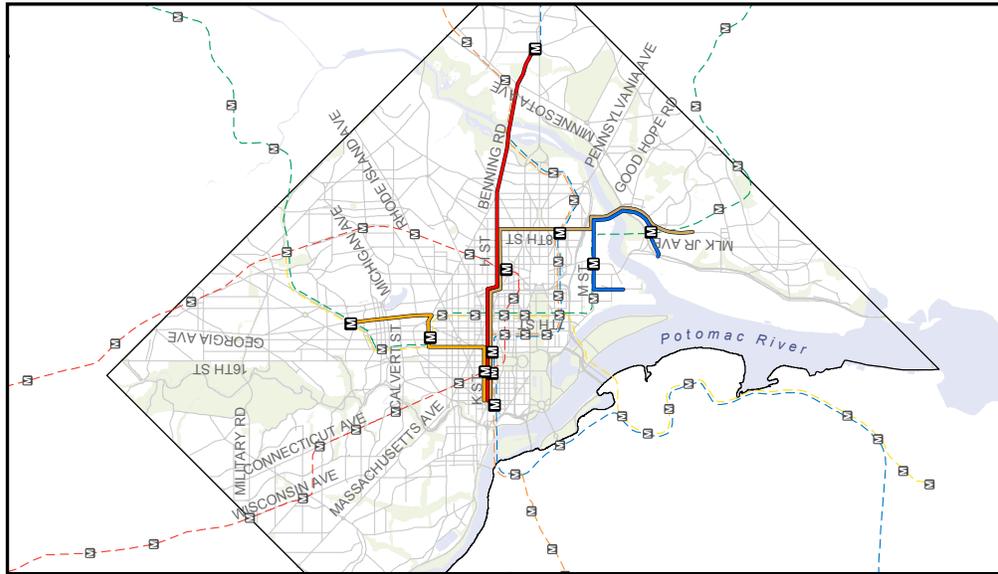


Figure ES-4:
Streetcar System - Phase 1



STREETCAR PHASE 1

- Washington Circle to Benning Road Metrorail Station Line
- Anacostia Initial Line Segment to Buzzard Point
- St. Elizabeth's Hospital Campus to Washington Circle Line
- Georgia Ave-Petworth Metrorail Station to Washington Circle Line

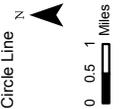
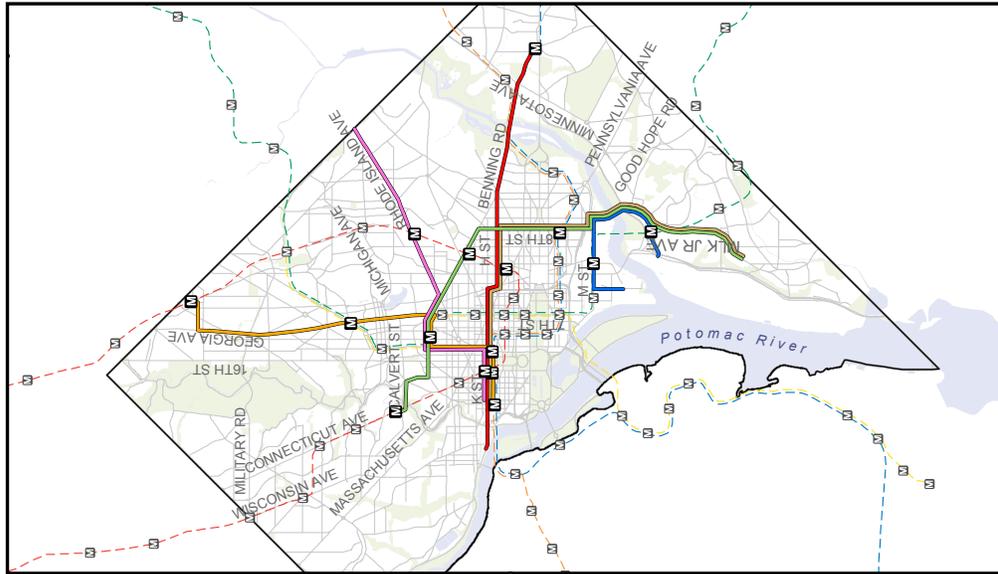


Figure ES-5:
Streetcar System - Phase 2



STREETCAR PHASE 2

- Georgetown to Benning Road Metrorail Station Line
- Anacostia Initial Line Segment to Buzzard Point
- Congress Heights to Washington Circle Line
- Takoma Metrorail Station to Washington Circle Line
- Woodley Park/Adams Morgan to Congress Heights Line
- Rhode Island Avenue/Eastern Avenue to Washington Circle Line

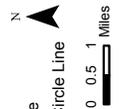
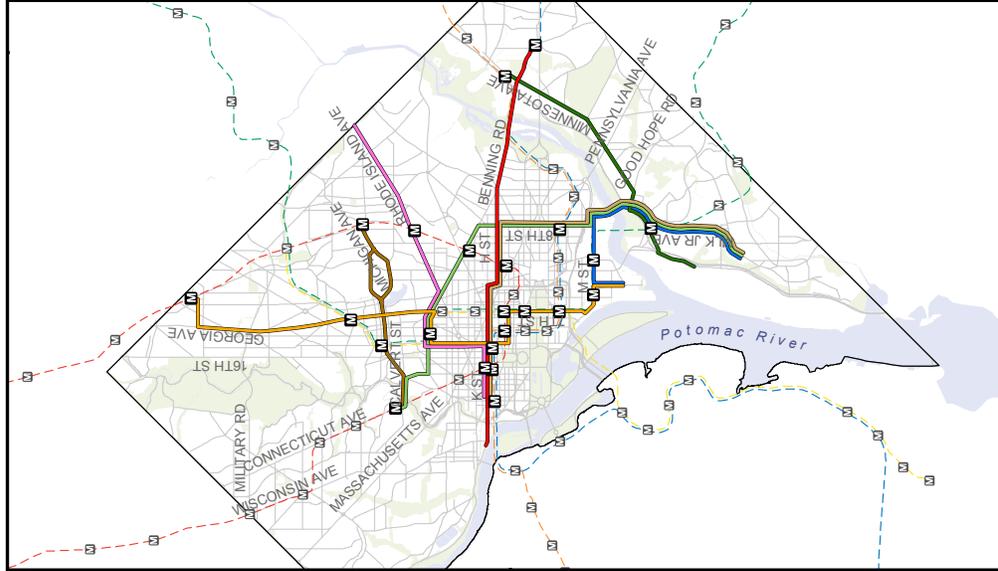
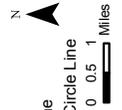


Figure ES-6:
Streetcar System - Phase 3



STREETCAR PHASE 3

- Bolling AFB to Minnesota Avenue Metrorail Station Line
- Georgetown to Benning Road Metrorail Station Line
- Congress Heights to Washington Circle Line
- Congress Heights to Buzzard Point Line
- Takoma Metrorail Station to Buzzard Point Line
- Woodley Park/Adams Morgan to Congress Heights Line
- Rhode Island Avenue/Eastern Avenue to Washington Circle Line
- Woodley Park/Adams Morgan to Brookland Line



Streetcar System Phasing

DDOT envisions implementing the streetcar system in phases, which include an initial phase of projects that are already under construction (see Figure ES-3) and three future phases of system development (see Figures ES-4 to ES-6). The streetcar project phasing strategy is based on the following criteria:

- **Ridership** – Early phases focus on the most productive high ridership segments of the proposed system.
- **Interconnection of Streetcar Lines** – The phasing strategy establishes an initial system of interconnected streetcar lines that expand outward to city neighborhoods in subsequent phases of system implementation. This strategy allows for greater flexibility for operations, vehicle fleet management, and maintenance and storage facility construction and utilization.
- **Coordination with Other Infrastructure Projects** – To the extent possible, the streetcar phasing has been designed to coordinate the construction of streetcar facilities with planned roadway, bridge reconstruction, and development projects located along the line.

Streetcar Performance

Ridership forecasts for the year 2030 were prepared for the recommended streetcar system using the regional travel demand forecasting model and Metropolitan Washington Council of Governments population and employment forecasts.

- The estimated average weekday ridership for the full streetcar system is about 147,000 or about 3,970 riders per mile for the 37-mile system.

- The DC Streetcar System's per-mile ridership forecast would exceed the average weekday per-mile ridership for the Portland Streetcar in Oregon (3,200 riders per mile), which has been in operation since 2001. It would also exceed the per-mile ridership of other existing streetcar lines, such as the Tacoma Streetcar (2,000 riders per mile), the South Lake Union Streetcar in Seattle (1,300 riders per mile), and the New Orleans Regional Transit Authority streetcars (500 riders per mile).

Streetcar System Costs and Funding

The capital and operating cost estimates and financing strategy for the recommended streetcar system plan are as follows:

- **Capital Costs** – \$1.5 billion in Year 2009 dollars or about \$1.9 billion in Year of Expenditure (YOE) dollars;
- **Annual Operating Costs (complete system)** – \$68 million per year in Year 2009 dollars or about \$127 million per year in Year 2030 dollars;
- **Federal, Local and Private Funding Sources** – Project capital funding assumes a split of 25% federal, 25% local and 50% corridor-specific (including Benefit Assessment District (BAD) and parking fees) funding. Project operating and maintenance costs not covered by fare box revenues are assumed to be covered by a local funding contribution.
- **Pay-As-You-Go Financing for Local Capital Funding** – The plan proposes providing the needed local capital funds on a cash basis. Under this approach, a local funding contribution would cover the non-federal share of project costs in the early years, and corridor specific benefit assessment districts and parking fee revenues would cover a greater share of the project cost in subsequent years.

1.0 Introduction

The District of Columbia Department of Transportation (DDOT) has developed the DC's Transit Future System Plan which establishes a vision of the future transit system for the District that includes the re-introduction of streetcar services and the continued expansion of Metro Express limited-stop bus services.

This document summarizes the results of an update of the system plan conducted in 2010, which is based on the original system plan completed in 2005 and a subsequent refinement of the plan completed in 2008. The 2010 update includes refinements to the streetcar component of the system plan that considers updated population and employment forecasts, development trends and planned development projects identified since 2005, opportunities to coordinate the expansion of streetcar with other planned infrastructure projects, a re-evaluation of streetcar projects based on updated data, and an extensive public and agency review process. A revised system plan has been developed based on the results of this process. The system plan identifies the general corridors to be served by the streetcar and limited-stop bus services. An updated phasing strategy and funding strategies have also been included.

This report is organized as follows:

- **Chapter 2: Purpose and Need** – Chapter 2 includes an outline of project goals and objectives and a discussion of how they served as the basis for identifying the plan's recommended improvements. The chapter also summarizes the results of a transit needs assessment that considers projected population and employment growth, mobility needs for District residents, core capacity constraints for the existing Metrorail and Metrobus system, and economic and community development initiatives in the city.
- **Chapter 3: Planning Process** – Chapter 3 briefly describes the process that was used to identify the recommended improvements included in the original system plan. It provides thorough documentation of the planning activities completed in 2010 that formed the basis for the plan update.
- **Chapter 4: Recommended System Plan** – Chapter 4 describes the recommended system plan that emerged from the planning process completed in 2010. This includes a description of the streetcar and bus elements of the plan and the phasing strategy for system construction and operation. A segment analysis per line was also conducted providing population, employment and ridership data; as well as, the key strengths of the area. The chapter also presents a strategy for establishing needed maintenance and storage facilities to support the proposed streetcar system. A financial plan that includes estimated capital and operating costs for the streetcar system and a proposed funding strategy are also presented in Chapter 4.
- **Chapter 5: Moving Forward** – Chapter 5 describes the required project development steps for individual streetcar projects seeking federal funding participation. These steps address the requirements of the National Environmental Policy Act (NEPA) process as well as the required review and approvals necessary to remain eligible for federal funding under the Section 5309 New Starts program. The chapter also discusses potential project delivery approaches.



2.0 Purpose and Need

This chapter describes the need for additional transit improvements generated by continuing population and employment growth in the District as well as local economic and community development objectives. The assessment addresses the effects of increased travel time, crowding on the existing bus and rail systems and inadequate access to transit.

2.1 Project Purpose

The purpose of the transit investments outlined in the system plan is to enhance mobility for city residents, accommodate continued growth in population and employment, improve access to jobs, connect neighborhoods and activity centers, and support sustainable economic growth for the District of Columbia. These results are based on the needs assessment conducted as part of the DC Alternatives Analysis completed in 2005 and updated in 2008 and 2010. The following section summarizes the needs assessment results.

2.2 Needs Assessment

The project needs assessment identified areas of the District of Columbia that require transit improvements to enhance access within and between neighborhoods, to key activity centers within the city, and to the regional Metrorail system. To identify these needed improvements, it measured five indicators of system performance:

1. Transit travel times to employment and other activity centers for District residents;
2. Overall travel and transit demand in different sections of the city;
3. Comparison of transit demand to transit capacity within key corridors in the city;
4. Development and redevelopment initiatives within the city that will require transit access; and
5. Public preferences for transit improvements.

Based on the analyses outlined above, a statement of transportation needs was developed for the District of Columbia. The needs statement provided the framework for the identification of corridors to receive detailed evaluation in subsequent steps of the system planning process. The key indicators of system performance from

the needs assessment were incorporated into some of the measures used to evaluate the transit improvement options. These measures included travel time savings to major trip destinations, ridership potential, change in transit capacity and vehicle loads, planning initiatives and development/redevelopment projects served, and community support. The evaluation of alternatives is summarized in Chapter 3.0 and Appendix B of this report.

The statement of needs addressed the following key issues:

- **Accommodate Population and Employment Growth** - The District has been actively engaged in community and economic development efforts to target areas that could be redeveloped to help accommodate 100,000 additional District residents. Over time, additional transit service will be required that offers more direct and higher-capacity access between areas with growing concentrations of population and employment within the city.
- **Provide Enhanced Mobility** - Current and future District residents need new transit services that extend to new activity centers within communities and for trip purposes that are currently underserved and require multiple transfers. There is a need for high-capacity transit service that can offer cross-town trip patterns and more direct connections across the Anacostia River without forcing a transfer. There is also a need to serve non-work trips made by neighborhood residents and visitors to destinations located in different parts of the City.
- **Support Continued Economic Development** - There are mutual benefits to be obtained by supporting community development initiatives with transit investments. The developing areas receive the advantage of convenient transportation to a variety of destinations. At the same time, the transit investment will benefit from the potential increased ridership base associated with the redevelopment areas.

- **Provide Metrorail Coverage and Core Capacity Relief** - The Metrorail system serves several parts of the City effectively, but there are still large gaps in service coverage within the District due to the regional nature of the service. In addition, both the Metrorail and Metrobus systems are approaching their maximum capacities.

2.3 Accommodate Population and Employment Growth

The transportation system within DC will have to accommodate continued growth in population and employment over the next 20 years not only within the city, but across the region. In 2000, 572,000 people lived within the city, with an average density of over 9,000 people per square mile. In 2003, District government set a goal of attracting 100,000 new residents to the District over the next ten years, which would represent an increase of almost 20 percent. Along with population growth, employment within the District is expected to grow by

approximately 22 percent by 2030. This section presents the results of population and employment growth forecasts in DC and identifies locations that will experience the greatest future transit demands and needs.

Population

Figure 2-1 shows the projected population densities across the city for the year 2030, and Figure 2-2 shows the areas in the District of Columbia that are expected to experience the greatest population increases between 2000 and 2030. High growth areas include:

- Mount Vernon Square/North of Massachusetts Avenue (NoMa) area near downtown DC;
- Brentwood area in Northeast DC;
- Soldiers' and Airmen's Home/McMillan Reservoir area in Northeast DC;
- Walter Reed Army Hospital site and adjacent area in Northwest DC;

Figure 2-1: Forecast Population Density (2030)

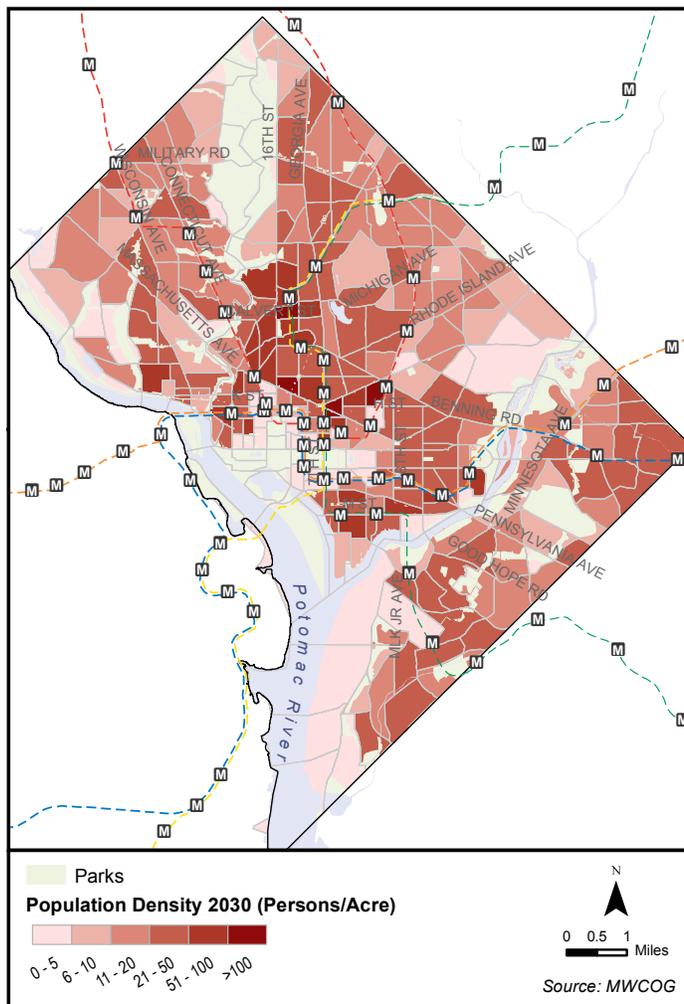
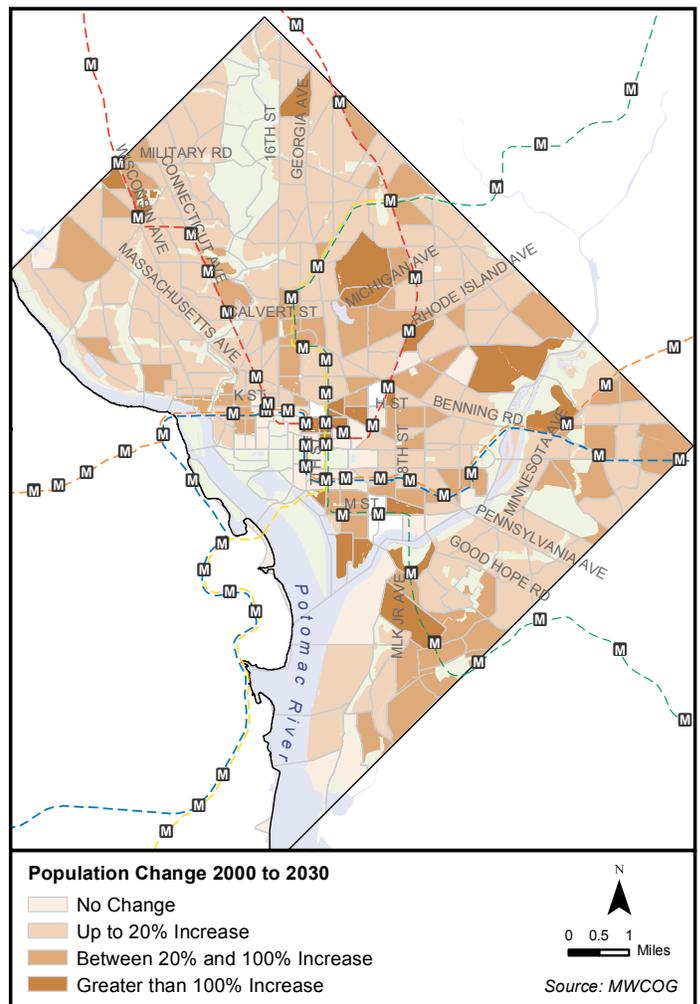


Figure 2-2: Population Change (2010-2030)



- East of New York Avenue NE and north of H Street NE/ Benning Road in the Trinidad and Carver/Langston neighborhoods in Northeast DC;
- Friendship Heights/Tenleytown area in Northwest DC; and
- Along the Anacostia River waterfront near the Navy Yard and Buzzard Point in Southeast DC.

Employment

District employment is not uniform across the city, but rather is concentrated in a few locations. The majority of employment in the year 2030 is clustered in downtown Washington, the St. Elizabeth’s Hospital campus, and universities. Large employers currently almost exclusively concentrate in the downtown core, with even greater concentrations around K Street NW. Appendix A shows the locations of major employers within the District in the year 2007. Although the existing Metrorail and Metrobus systems provide high-quality access to some of these employment concentrations (especially downtown), there

continues to be a need to maximize District residents’ ability to access both local and regional employment opportunities, especially in areas immediately north and east of the downtown core.

Although the majority of recent employment growth in the metropolitan area has occurred in the Maryland and Virginia suburbs, significant future employment growth is expected in several areas within the District. Figure 2-3 presents the projected employment densities within the District in 2030, and Figure 2-4 presents the percent change in employment between 2000 and 2030. Areas expected to experience the greatest employment growth are generally located east of 14th Street NW. Areas with projected employment growth of more than 100 percent include:

- Capitol Riverfront area near the Navy Yard and Buzzard Point extending from Southwest to Southeast DC;
- Benning Road/East Capitol Street area in Northeast DC;

Figure 2-3: Forecast Employment Density (2030)

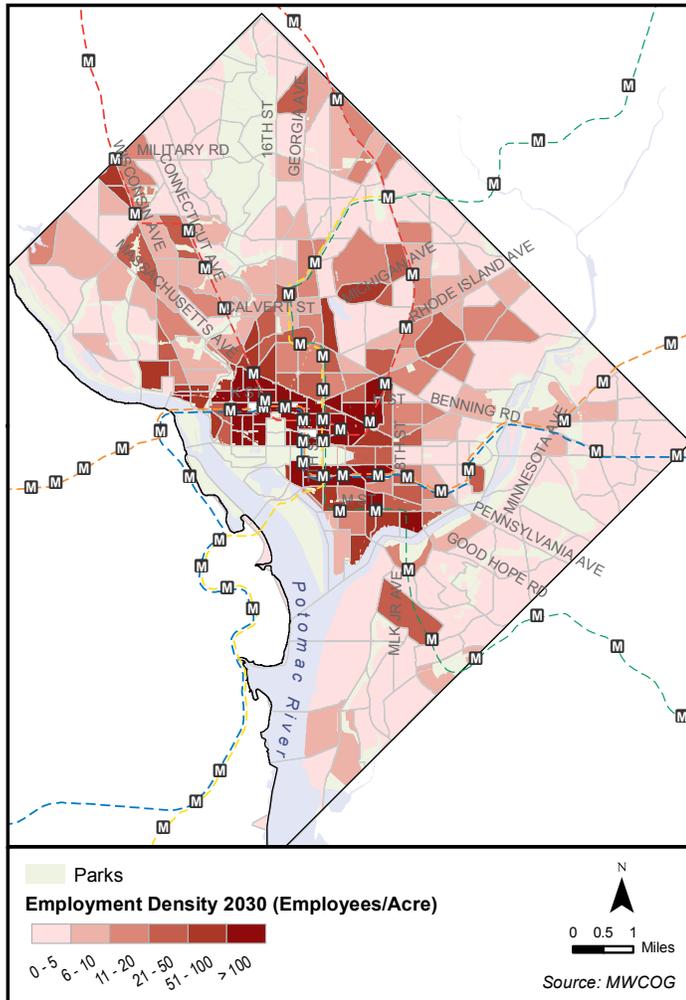
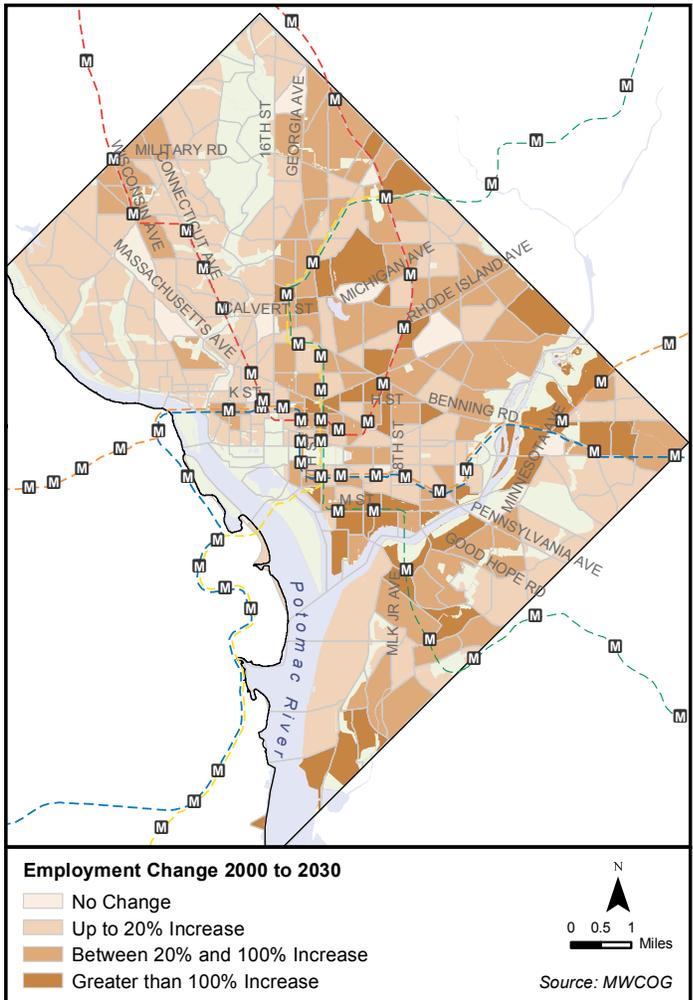


Figure 2-4: Employment Change (2010-2030)



- St Elizabeth’s Hospital campus in Southeast DC which is undergoing redevelopment as the new Homeland Security Administration headquarters;
- Southernmost portion of Southeast DC along South Capitol Street near National Harbor (which is located just over the border in Maryland);
- North of Massachusetts Avenue (NoMa) and Mount Vernon Square areas just north of downtown;
- Brentwood area along Rhode Island Avenue NE in Northeast DC;
- Columbia Heights area in Northwest DC;
- Soldiers’ and Airmen’s Home and Washington Hospital Center areas in Northeast and Northwest DC; and
- Fort Totten area in Northeast DC.

2.4 Provide Enhanced Mobility for District Residents

One of the primary purposes of the plan is to enhance mobility for DC residents. Mobility enhancements can benefit existing transit users through improved service and connections to new destinations. Enhanced transit mobility also benefits current non-users, by providing new travel options that are more competitive with the private automobile or other non-transit modes, thereby making it advantageous for them to use transit.

Mobility enhancements can address several key challenges facing the existing DC transit network, such as:

- Long travel times
- Transit service reliability
- Limited access to premium transit

Long Travel Times

Metrorail lines provide relatively rapid trips due to their separation from surface roadways; however, many areas of the city have limited access to Metrorail. Metrobus lines must mix with traffic and face delays associated with congestion, construction, incident delays, and traffic signals. In addition, many Metrobus routes are indirect between origins and destinations, resulting from a history of adding branches and circuitous routings into the bus system. Finally, Metrobus routes are often slower than automobile travel on comparable routes, because buses must stop frequently for passenger pick-up and drop-off and cannot divert from their assigned routes to avoid incidents or congestion.

The consequence of relatively slower travel times for Metrobus, as opposed to Metrorail, is that different parts of the city and region have varying levels of access to employment, services, and recreational and cultural destinations, depending on the availability of Metrorail service. The following figures show the accessibility of employment as measured by travel times:

- **Regional Employment** – Figure 2-5 illustrates, by Traffic Analysis Zone (TAZ), the percentage of regional employment that is accessible within 60 minutes of travel time by transit from that zone.
- **DC Employment** – Figure 2-6 depicts, by TAZ, the percentage of District employment that is accessible within 40 minutes of travel time by transit from that zone.

These travel times include walk times and wait times at transit stops.

The data in these figures show that in many parts of the city the existing transit network does not provide quick and easy access to employment centers, which make these areas logical candidates for transit improvements. In addition, slow transit travel times are a major factor leading to the choice to drive to work rather than take transit. This mode choice can lead to significant traffic congestion in areas with limited transit service.

The figures also indicate that the central city and areas adjacent to Metrorail have the highest levels of transit service. Central city neighborhood locations have two advantages:

- They are adjacent to the largest job concentrations in the city; thus, transit trips to these jobs are short distances; and
- They have access to the greatest concentration of transit in the city; thus, their transit options are much greater.

Locations along Metrorail lines have a similar advantage in their accessibility to employment centers. Metrorail lines run more frequently than other transit services and have shorter trip times because they do not run in mixed traffic.

Travel time data show that significant parts of the city outside of downtown are not well served by transit. For example, only 12 percent of District residents can reach Georgetown by transit in less than an hour using buses, rail or a combination of buses and rail. Similarly, over 95 percent of District residents must plan on spending more than an hour on transit to reach Walter Reed Hospital. By contrast, because it is located near a Metrorail station, over 60 percent of District residents can reach the Federal Center SW area near the National Mall in less than an hour of transit travel time.

Figure 2-5: Access to Regional Employment within 60 Minutes

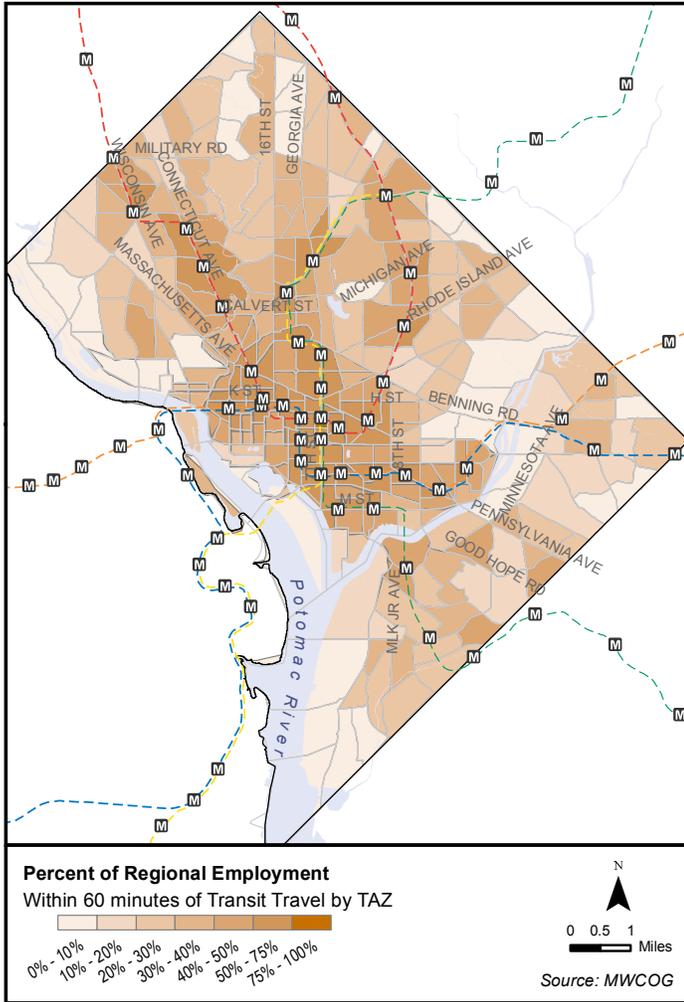
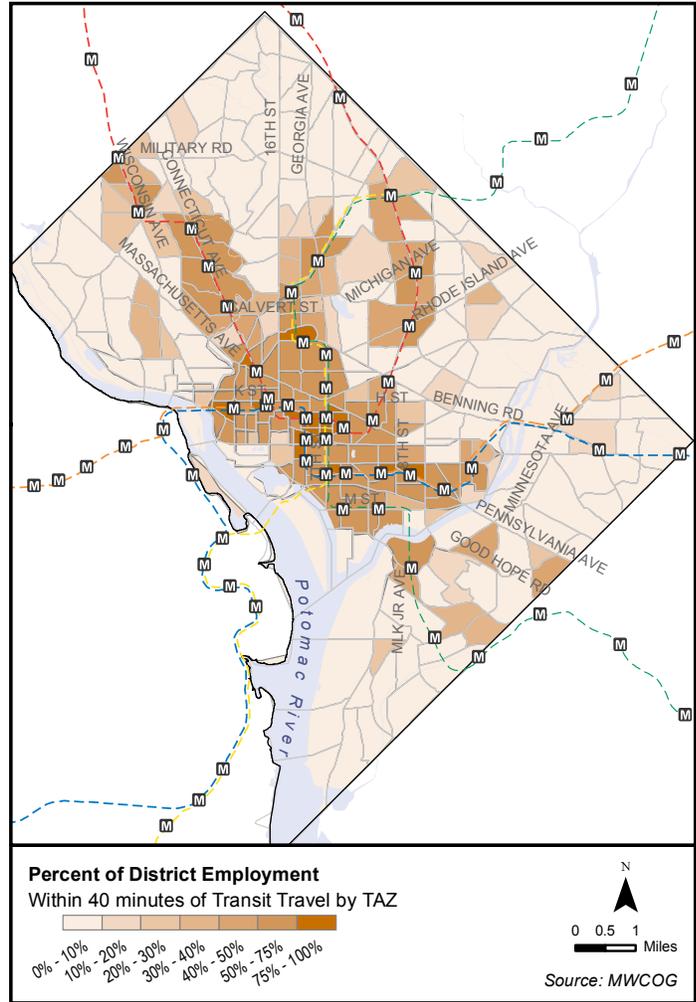


Figure 2-6: Access to District Employment within 40 Minutes



Reliability of Service

Poor reliability is a major challenge facing the District's transit services in general, and Metrobus service specifically. Even along Metrobus routes in which schedule adherence and reliability are high, the general perception may be that buses are not dependable. While Metrorail is generally able to maintain schedules and headways, except during mechanical problems, Metrobuses are much more likely to be impacted by heavy boardings, cycling wheelchair lifts, delays due to unexpected traffic congestion, and incidents such as accidents, special events, or road closings.

WMATA maintains on-time records for Metrobus routes that can serve as an indicator of service reliability. In general, a route with poor schedule adherence is one for which reliability may be a problem. Table 2-1 shows schedule adherence for selected high ridership bus routes that were evaluated as part of this study.

Almost 20 percent of trips on some of the busiest Metrobus routes are more than 5 minutes late; if trips between 2 and

5 minutes late are included, more than half of all trips are behind schedule. This statistic suggests a serious reliability problem with Metrobus service. Late buses or missed trips, especially for less-frequent routes, are serious disincentives to transit use, especially by choice riders.

Access to Premium Transit

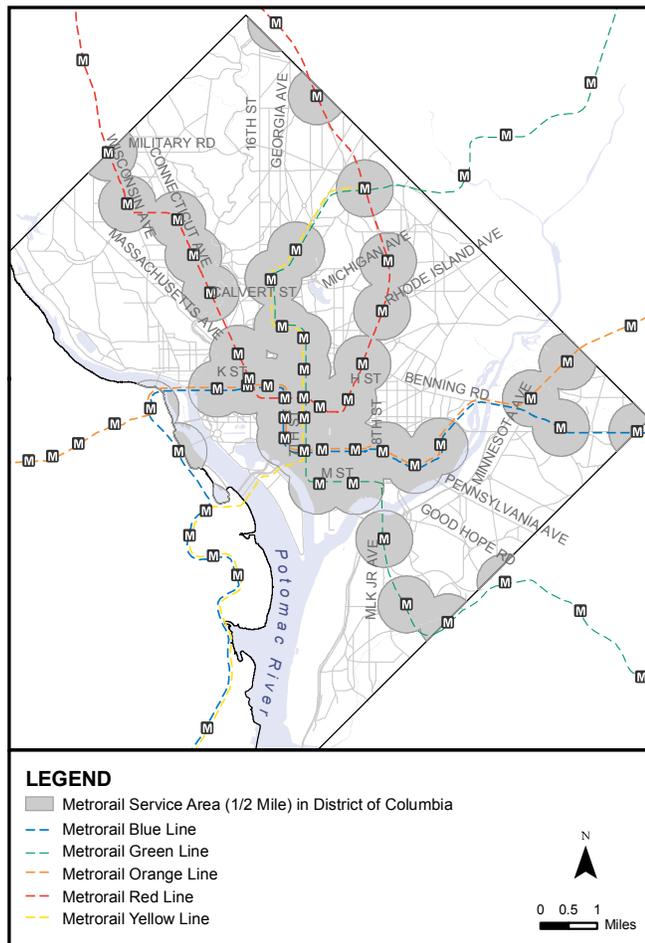
As noted in the section above, access to Metrorail service greatly expands the access to DC activity centers by transit in general. Figure 2-7 shows the areas within a half-mile radius of existing Metrorail stations. One-half mile is the approximate maximum distance that most transit patrons will walk to access a premium transit service. Premium transit service is defined as transit service that provides improved travel times, facilities and features compared to typical local bus service. Premium transit services would include limited-stop bus service, BRT, Streetcar, light rail and Metrorail services. The map shows that there are significant areas of the District that lack Metrorail access; these areas contain approximately 55 percent of District residents.

Table 2-1: Metrobus Schedule Adherence – Percent of Trips More than 5 Minutes late

Route	Northbound	Southbound	Eastbound	Westbound
A2-8, A42-48	11%	10%	-	-
A4-5	20%	4%	-	-
H1	71%	22%	-	-
70-71	16%	34%	-	-
79	16%	24%	-	-
90-92-93	16%	31%	-	-
H2-3-4	-	-	16%	8%
X1	-	-	48%	30%
X2	-	-	28%	24%
X3	-	-	68%	25%
32-36	-	-	70%	65%
34	-	-	66%	40%
37	-	-	44%	44%
39	-	-	67%	21%

Source: WMATA Metrobus Passenger and Time Reports through 2009, dates vary by line

Figure 2-7: Areas Served by Metrorail



2.5 Support Continued Economic Growth

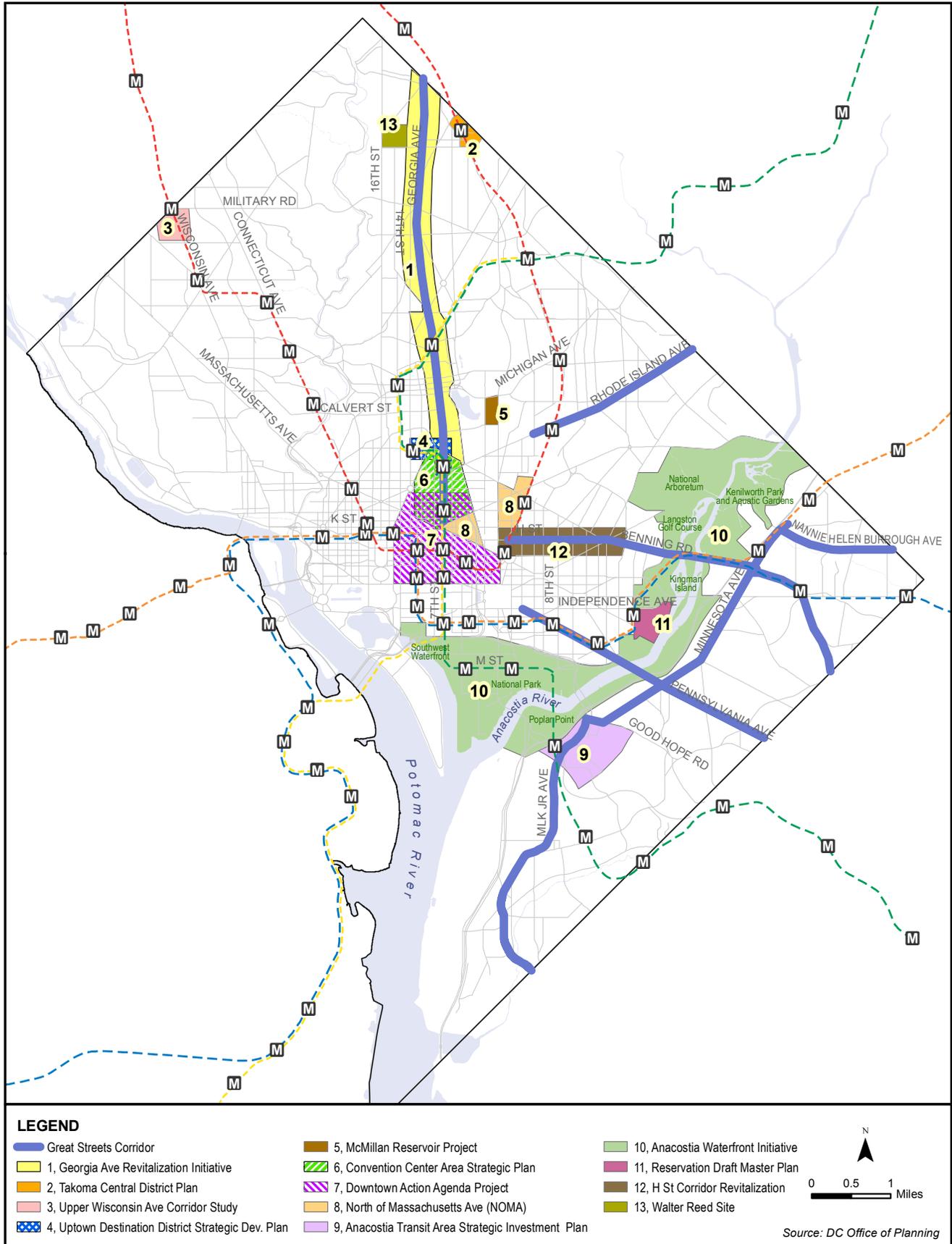
Major transit investments have the potential to support economic and community development initiatives by providing enhanced access, transportation capacity, and visibility to potential development and redevelopment sites located along the proposed new transit lines. The alternatives analysis and system plan development considered two factors in evaluating potential impacts of a transit investment on economic growth: service to city planning/economic initiatives and development potential along the route.

DC Planning Initiatives

Several major initiatives of the District government are currently in planning or implementation. The following describes some of the different types of initiatives underway in the city.

- Great Streets Initiative** – The Great Streets Initiative is a program of the Office of the Deputy Mayor for Planning and Economic Development and DDOT. The initiative targets public investment in roadway and streetscape improvements along strategic corridors, with the goal of encouraging private investment and enhancement in these areas.
- Revitalization Initiatives** – The District’s Office of Planning has identified revitalization initiatives to leverage federal and private sector investment in targeted neighborhoods and corridors, provide new job opportunities, increase retail sales and services, enhance

Figure 2-8: DC Planning Initiatives



LEGEND

- | | | | |
|--|---|--|-------------------------------|
| <ul style="list-style-type: none"> Great Streets Corridor 1, Georgia Ave Revitalization Initiative 2, Takoma Central District Plan 3, Upper Wisconsin Ave Corridor Study 4, Uptown Destination District Strategic Dev. Plan | <ul style="list-style-type: none"> 5, McMillan Reservoir Project 6, Convention Center Area Strategic Plan 7, Downtown Action Agenda Project 8, North of Massachusetts Ave (NOMA) 9, Anacostia Transit Area Strategic Investment Plan | <ul style="list-style-type: none"> 10, Anacostia Waterfront Initiative 11, Reservation Draft Master Plan 12, H St Corridor Revitalization 13, Walter Reed Site | <p>N</p> <p>0 0.5 1 Miles</p> |
|--|---|--|-------------------------------|

Source: DC Office of Planning

community image, and increase community pride. These strategies help existing businesses become more competitive and contribute to the growth of their neighborhoods.

- **Strategic Development Plans and Initiatives** – The Strategic Development Plans identified by the DC Office of Planning, provide clear policy direction for land use and development within their overall study areas and along major corridors. The plans designate future land uses and provide guidelines for development intensity and character.
- **District Plans** – District Plans define near- and mid-term strategies for revitalization and articulate broad development goals, urban design guidelines, and actions necessary to encourage and facilitate investment in the different areas of the city.
- **Area Master Plans** – Master plans address the locations of futures streets, blocks, and circulation patterns for major redevelopment sites. They also establish general land uses and address maximum build-out development intensities, building massing and heights, and public open space and parks.

Figure 2-8 shows the locations of these major planning initiatives relative to the corridors considered for major transit investments from previous studies (Chapter 3 describes these prior studies). As shown on the map most of these initiatives are located in the eastern portion of the city, generally east of 14th Street NW.

2.6 Provide Core Capacity Relief for Metrorail

Many DC Metrobus routes and all Metrorail lines face overcrowding during peak periods; in some cases, overcrowding continues into non-peak periods, including weekends. Overcrowding is a serious challenge facing Metro – it limits the number of potential patrons the system can serve, causes additional wear on transit infrastructure and vehicles, and reduces the quality of service.

Metrorail Congestion

One of the most significant issues in the Metrorail system is excess demand relative to available capacity. Table 2-2 shows current and future forecasted passenger loads on the Metrorail system in the peak hour by line, assuming use of the existing rail vehicles and operating plan.

The *Metro Matters* plan addresses Metrorail congestion through system upgrades to accommodate longer (8-car) trains. However, even with *Metro Matters* improvements, the Metrorail system will still experience highly-congested conditions by 2015 and will be overcapacity as early as 2020, as shown in Figure 2-9.

Metrobus Congestion

Many Metrobus lines in the District are also near or over capacity. Table 2-3 shows the load factors (the ratio of passenger volume to bus capacity) for crowded District bus lines. As the data show, a number of the primary bus corridors in the city have overcrowding, which in some cases is severe.

Another method of analyzing transit network capacity is to develop an estimate of transit demand for Metrobus trips from each sector of the city to each of the key activity centers and compare it to an estimate of transit capacity for direct trips (i.e., transit trips that do not require transfers) between the same origin/destination (O/D) pairs. This analysis takes into account the fact that there may be multiple methods of traveling between any two origins and destinations via direct transit trips. In transit corridors where overall trip demand outstrips service capacity, the result can be overcrowded transit vehicles or a shift of travel from transit to private automobile, which strains already congested roadways and parking capacity.

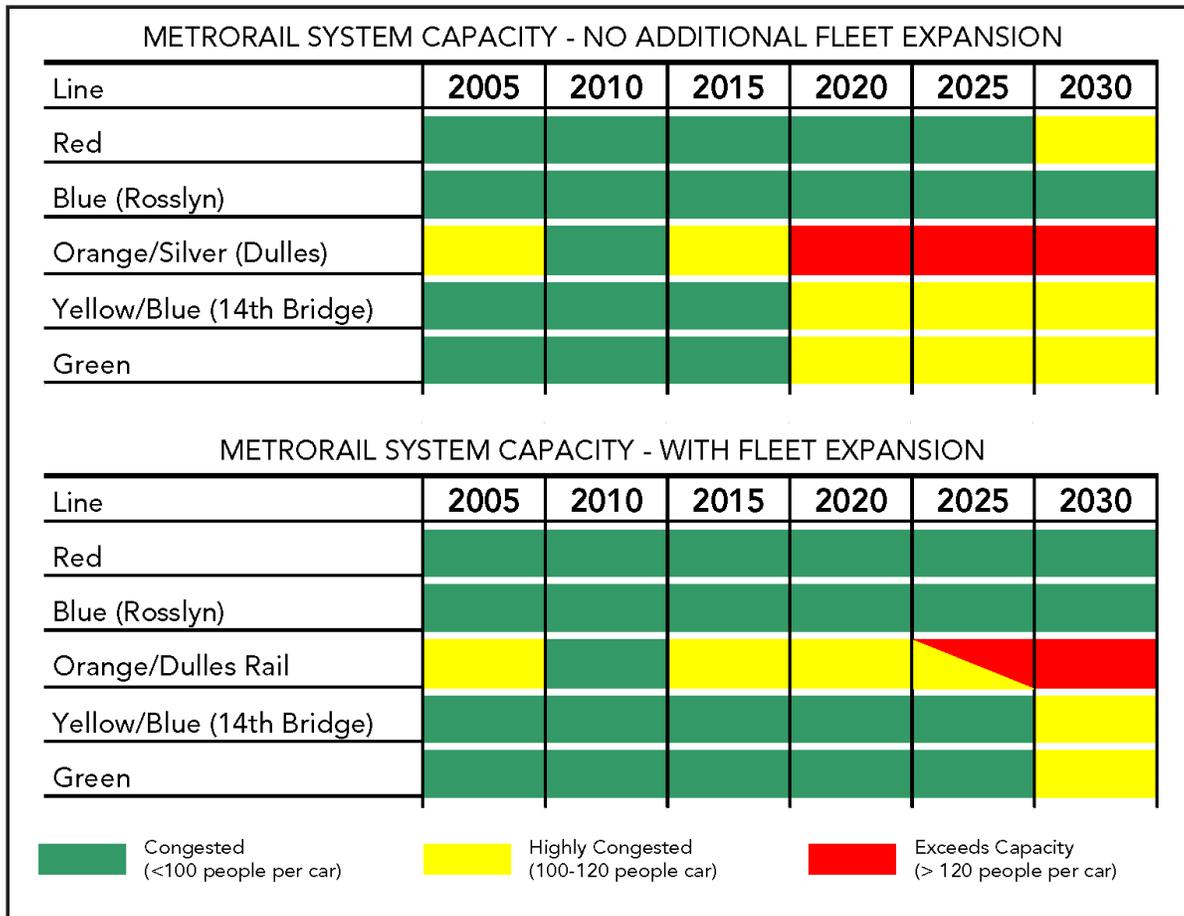
In this analysis, demand for transit trips to a number of the outlying activity centers exceeds service capacity, especially for crosstown trips that do not pass through downtown. These data do not necessarily imply high demand, as there may be extremely limited capacity for

Table 2-2: AM Peak Hour Metrorail Line Loads in DC, 2005-2030

Line	Location		Passenger Load		Type of Train	
	From	To	2005	2030	2005	2030
Red	Gallery Pl-Chinatown	Metro Center	13,300	17,400	6 cars	8 cars
Yellow/ Blue	Pentagon	L'Enfant Plaza	4,800 (Yellow)	11,300	4-6 cars	8 cars
Green	Waterfront - SEU	L'Enfant Plaza	7,400	9,700	6 cars	8 cars

Source: WMATA, Station Access and Capacity Study, 2008

Figure 2-9: Projected Metrorail Congestion with and without Metro Matters Fleet Expansion



Source: WMATA, 2005

Table 2-3: Bus Load Factors in Major Corridors

Route Numbers	Corridor	Load Factor*
H1, H2, H3, H4	Michigan Avenue/Crosstown	1.45 (all day)
42	Mount Pleasant Line	1.41 (all day)
S2, S4	16 th Street Line	1.41 (peak)
X1, X2, X3	H Street, Benning Road	1.34 (peak)
52, 53, 54	14 th Street	1.30 (peak) 1.45 (all day)
A2, A3, A6, A7, A8	Anacostia/Congress Heights	1.26 (all day)
30, 32, 34, 35, 36	Wisconsin Avenue, Pennsylvania Avenue	1.20 (peak)
70, 71	Georgia Avenue/7 th Street	1.07 (Saturday) 1.39 (Sunday)
90, 92	U Street, Florida Avenue	1.06 (all day)
D1, D3, D6	Sibley Hospital/Stadium Armory	1.06 (all day) 1.35 (Saturday)

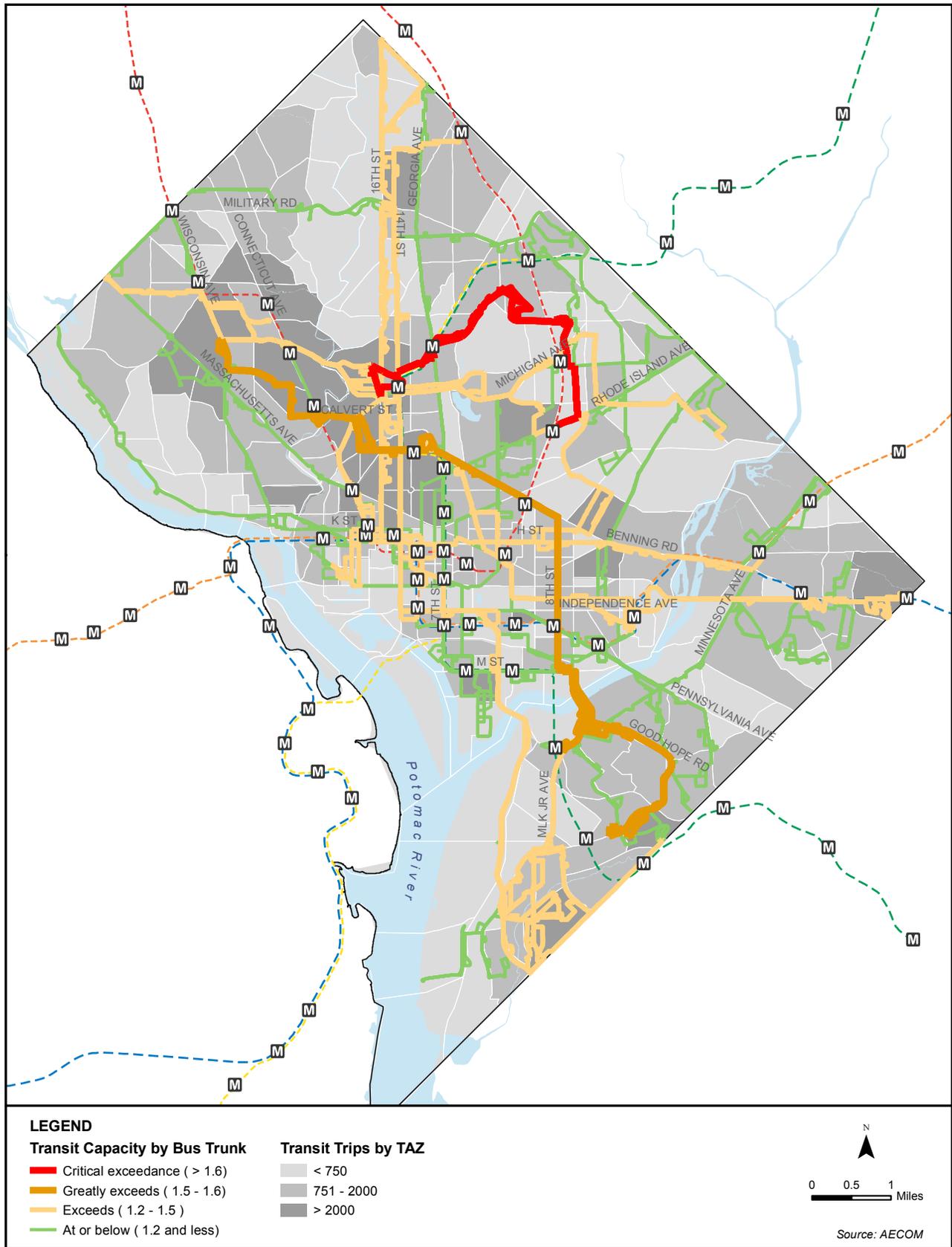
Source: Regional Bus Study Comprehensive Operations Analysis (WMATA, 2003)

*Load factor over 1.2 in peak periods or over 1.0 in off-peak periods/weekends exceeds acceptable load standards.

direct trips between two outlying points in the city. Figure 2-10 provides a general overview of transit trip origins and bus trunk line capacities. Additional crosstown transit capacity is needed in the following corridors:

- For some destinations, such as Adams Morgan and the Washington Hospital Center, direct trip transit capacity is inadequate to meet the demand: there is nine times greater demand than capacity for transit trips to Adams Morgan and over five times greater demand than capacity for transit trips to the Hospital Center. By City sub-area, capacity is especially lacking for transit trips from the Northwest to Adams Morgan and from both the northwest and central sub-areas to the Hospital Center.
- In Northwest DC, there is significant transit demand for destinations within the Northwest sub-area (Northwest to Adams Morgan, Northwest to Georgetown, and Northwest to American University (AU)). However, most of the transit services available are oriented to serve the downtown core.
- In the Northern part of DC, there is a need for greater transit capacity to serve Walter Reed Medical Center, but, more significantly, there is a need for a crosstown service to connect Walter Reed to District residents living anywhere other than the Northern sub-area and the Central core.
- Similarly, although Northeast DC is served by portions of the Red and Green lines, it could benefit from additional transit capacity from the Northwest and Central sub-areas, as well as from the introduction of direct service from the North to the Central area. The areas served by the existing H8 and H9 routes show a critical exceedance of capacity.
- The existing service configuration forces transfers for most trips starting in Southeast DC with destinations outside the Central core, but there are also additional capacity needs within the Southeast and Central sub-areas.
- Even trips from outlying sub-areas to the Central core vary in terms of service availability and capacity:
- There are significant transit capacity needs for residents in the Northwest and Southeast traveling to Metro Center.
- For trips to L'Enfant Plaza from within the Central sub-area, trip demand is three times greater than capacity.
- Trips to Capitol Hill from any sub-area other than the Central and Northwest sub-areas require transfers.
- Finally, even from the Central Core, which has the greatest number of converging transit services, demand for trips to the Hospital Center and to Walter Reed Medical Center are 11 times higher and three times higher, respectively, than the transit capacity to accommodate them.

Figure 2-10: Ratio of Demand to Capacity for Major Bus Connections



3.0 Planning Process

The DC's Transit Future System Plan is the result of a planning process focused on establishing a new, efficient, high-quality surface-transit network that supports community and economic development initiatives and connects residents and neighborhoods to employment centers, commercial areas, recreational facilities, and multimodal transportation hubs. The plan is the culmination of a process that has its roots in several earlier studies that were commissioned to identify potential solutions to the current transportation challenges that face the District of Columbia, as shown in Table 3-1.

3.1 Planning Process and Previous Studies

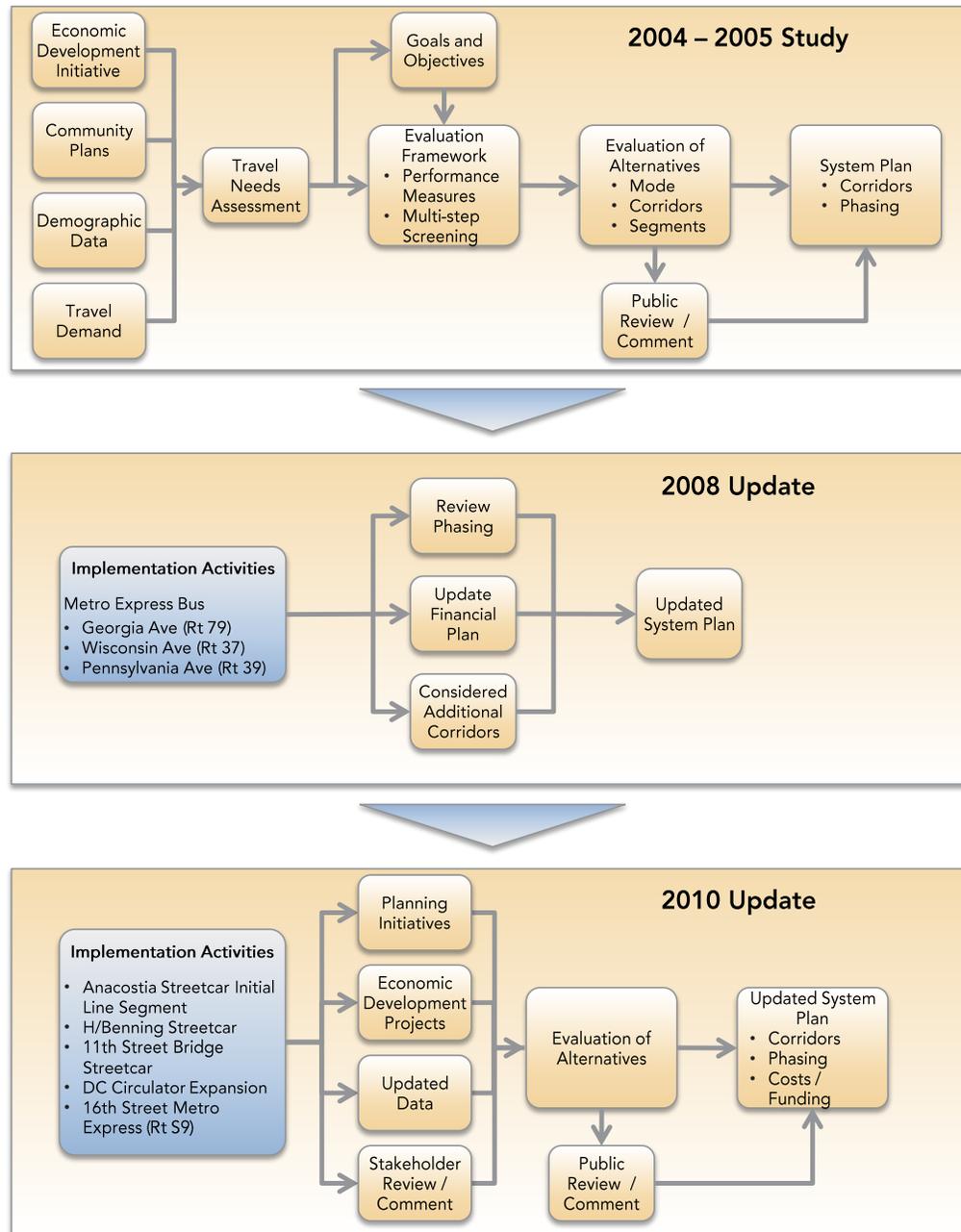
The DC's Transit Future System Plan has direct roots in the 2004-2005 DC's Transit Future Alternatives Analysis (DCAA). The methodology for this study and an update

completed in 2008 are described in detail in Appendix B. Figure 3-1 shows the process that was followed in developing the system plan from the initial system plan developed in 2005 through two subsequent updates in 2008 and 2010.

Table 3-1: Early Studies

Year	Study	Sponsor	Summary
1997	Vision, Strategy and Action Plan	DDOT	The plan recommended intra-city connections between the radial WMATA rail lines, designating ten corridors for transit improvements that would connect District neighborhoods and help support community economic development initiatives.
1999	Transit Service Expansion Plan	WMATA	The plan advanced five corridors for further study.
2001	Core Capacity Study	WMATA	The study identified system-wide Metrorail improvements to accommodate estimated future ridership.
2002	Transit Development Study	WMATA	The study considered each of the previously identified corridors for surface rail transit and recommended four priority corridors for implementation.
2003	Regional Bus Study	WMATA	The study identified bus improvements to serve inside previously designated corridors and to aid in District circulation and Metrorail system capacity relief.
2004 - 2010	DC's Transit Future Alternatives Analysis (DCAA)		
2004 - 2005	DC's Transit Future Alternatives Analysis (DCAA)	WMATA DDOT	The study refined a city-wide system plan of enhanced, multimodal surface transit on designated corridors.
2006	Georgia Avenue/7th Street Rapid Bus Service Plan	WMATA DDOT	The study resulted in the implementation of the Metro Express (Metro Extra at the time) limited-stop bus service, Route 79, in 2007.
2007	30s Line Study	WMATA DDOT	The study identified a restructuring of five bus routes, resulting in a combination of local, limited-stop and shuttle routes to serve Wisconsin and Pennsylvania Avenues. New Metro Express limited-stop bus services, Routes 37 and 39, were initiated in 2008.
2008	16 th Street Line Study	WMATA DDOT	The study resulted in the implementation of the Metro Express limited-stop bus service, Route S9, along 16th Street NW.
2009	Benning Road/H Street Study (Metrobus Routes X1, X2 and X3)	WMATA DDOT	The study identifies improved bus service levels and a planned Metro Express limited-stop service in the heavily travelled corridor
2009	DC Circulator New Routes	DDOT	Further expansion of DC Circulator to serve Adams Morgan, Woodley Park, Columbia Heights, Capitol Riverfront, Capitol Hill, and the Nationals Park Stadium area.
CURRENT	DC's Transit Future System Plan (DCAA) Update	DDOT	This updates the plan for a system of streetcars and limited stop bus services in the District.

Figure 3-1: System Planning Process



DC Alternatives Analysis and System Plan (2005)

In 2005, DDOT completed the DCAA, which evaluated specific streetcar and enhanced bus service options for corridors that were identified in the 2002 Transit Development Study and included an extensive public, agency, and stakeholder review process. The evaluation consisted of a three-step screening process designed to select the best mix of transit investments in each of the corridors by measuring performance of alternatives relative to the following four goals.

Goal 1: Enhance Access and Mobility

Objectives:

1. Increase neighborhood and activity center connectivity
2. Improve access to regional centers
3. Increase ridership demand

Goal 2: Support Community and Economic Development

Objectives:

1. Support community development initiatives
2. Enhance development benefits

Goal 3: Maximize System Performance

Objectives:

1. Increase capacity
2. Enhance efficiency and cost-effectiveness

Goal 4: Protect and Enhance Environmental Quality

Objectives:

1. Limit adverse impacts
2. Support environmental benefits

As shown in Appendix B, a total of 24 evaluation measures related to these goals were used to identify the best performing transit investment options to serve study area needs.

Governmental agencies, neighborhood groups, businesses, community organizations and the public were actively involved in developing the recommended plan. Outreach efforts included focus groups, presentations, briefings, community workshops, and public meetings. The planning process resulted in a recommended network of streetcar and enhanced bus services operating in 12 corridors across the city. Figure 3-3 at the end of this chapter shows the 2005 recommended System Plan. The plan also included a phasing strategy that emphasized the short term implementation of lower cost Metro Express bus services in several corridors throughout the city and an initial streetcar line segment in Southeast DC connecting the Anacostia Metrorail Station with the nearby Naval Annex. A 25-year financial plan to support the construction and operation of the recommended system was also developed as part of the 2005 study. The financial plan relied on a combination of federal capital grants, local government contributions, farebox revenues, value capture in the form of a Benefit Assessment District, and parking fee revenues to fund the construction and operation of the system.

Complementary Studies

Between 2005 and 2008, DDOT began implementing the short-term improvements included in the plan. In March 2007, new Metro Express bus services were launched in the Georgia Avenue/ 7th Street NW Corridor to be followed by similar services in the Wisconsin Avenue and

Pennsylvania Avenue SE Corridors in 2008. An Environmental Assessment for the Anacostia Light Rail Line (located along the CSX railroad) was completed.

2008 System Plan Update

In 2008 DDOT initiated an update of the transit system plan based on a re-evaluation of potential streetcar segments that considered the impact of substantial growth in development that had occurred in the District since 2005. The system plan update incorporated recommendations for additional streetcar segments along Florida Avenue NE, 8th Street NE, and U Street NW to respond to rapid growth in the NoMa area and the U Street Corridor. Since the opening of the New York Avenue Metrorail Station in the NoMa district in late 2004, the area added 5,000 new jobs and more than \$1 billion in new residential and commercial development.

The 2008 update also included refinements to the implementation phasing for the system with a greater emphasis on maximizing ridership potential in the early phases of system development. As a result, streetcar service in the K Street NW, H Street NE/Benning Road, and 8th Street NE Corridors were included in the first phase of system development to be completed by 2015. The project costs and financial plan were updated to reflect the changes in project phasing. The 2008 update also incorporated Washington Metropolitan Transit Authority's (WMATA's) Priority Bus Corridor Network into the system plan. The network consisted of a system of Metro Express limited stop bus services that was based in part on results of the DCAA and System Plan completed in 2005. The Priority Bus Corridor Network included many of the Metro Express bus corridors from the 2005 plan plus additional services along 16th Street NW, 14th Street NW, North Capitol Street, and Rhode Island Avenue NE. Table 3-4 at the end of this chapter includes a summary of the changes recommended in the 2008 update compared to the 2005 DCAA and System Plan. Figure 3-4 at the end of this chapter shows the 2008 recommended changes to the bus and streetcar network.

The bus improvements reflect comprehensive reviews of Metrobus priority corridors conducted by WMATA, in partnership with DDOT, during 2007-2010. For each corridor, the review analyzed existing service performance and developed an improvement strategy that included service, operations, and customer information enhancements. The first phases of service improvements and restructuring have been implemented by establishing Metro Express limited-bus services in several corridors, including Wisconsin Avenue NW, Pennsylvania Avenue SE, 16th Street NW, and Georgia Avenue/7th Street NW.

3.2 2010 System Plan Update

DDOT completed a major update of the System Plan in 2010 to validate the recommended network and to address the following key issues:

- **Construction of Initial Streetcar Segments** – DDOT initiated construction of two streetcar segments. The schedule and cost implications of these initial streetcar projects have been integrated into the updated system plan.
 - Anacostia – Construction of the 1.5-mile Anacostia Streetcar Initial Line Segment began in 2009 and will start revenue-service by the fall of 2012.
 - H/Benning – Construction of the streetcar tracks for a portion of the H/Benning Streetcar Line, between 3rd Street NE and Oklahoma Avenue NE, was initiated in 2009, concurrent with the roadway reconstruction of H Street NE and Benning Road NE Great Streets Project. Design-Build work has begun to extend the line to connect with Union Station. The line is scheduled to start revenue service in 2012.
- **Preliminary Design of the K Street Transitway Project** – An Environmental Assessment, preliminary design, and an updated capital cost estimate were completed in 2009 for the initial transitway along K Street NW.
- **11th Street Bridge Reconstruction Project** – The design for the reconstruction of the 11th Street Bridge includes the installation of tracks to accommodate the future extension of the Anacostia Initial Streetcar Line Segment across the Anacostia River. DDOT is using a Design-Build approach for project delivery so that construction can be completed by 2013.
- **New Redevelopment Projects** – Several new large-scale redevelopment projects have been planned for the District of Columbia. These projects include the redevelopment of the former St Elizabeths Hospital Site as the new headquarters for the Department of Homeland Security, which will bring over 14,000 new employees to Southeast DC and the Walter Reed Hospital Redevelopment. Other large mixed-use development plans have been announced for the Soldiers and Airmen's Home, McMillan Reservoir Sand Filtration Site, and the Poplar Point areas. These new projects significantly affected the distribution of forecast population and employment previously considered in the 2008 update.
- **Changes in the Mayoral Administration and DC Council** – A new administration was established for the District of Columbia with the election of Mayor Adrian

Fenty in 2006, and seven new DC Council members have taken office between 2005 and 2009. The 2010 system plan has been updated to better reflect the priorities of the new administration and current DC Council, with greater emphasis on infrastructure investment that spurs economic development and supports continued growth in District population and employment.

The 2010 update includes an extensive review of the results of the previous planning work and recommends changes in the proposed streetcar network and phasing strategy based on the following:

- Review of Transportation Needs and Opportunities;
- Updated Development Plans and Economic Development Projects;
- Re-evaluation of the Streetcar Corridors; and
- Public and Stakeholder Comment.

The results of each of these efforts are described as follows.

Review of Transportation Needs and Opportunities

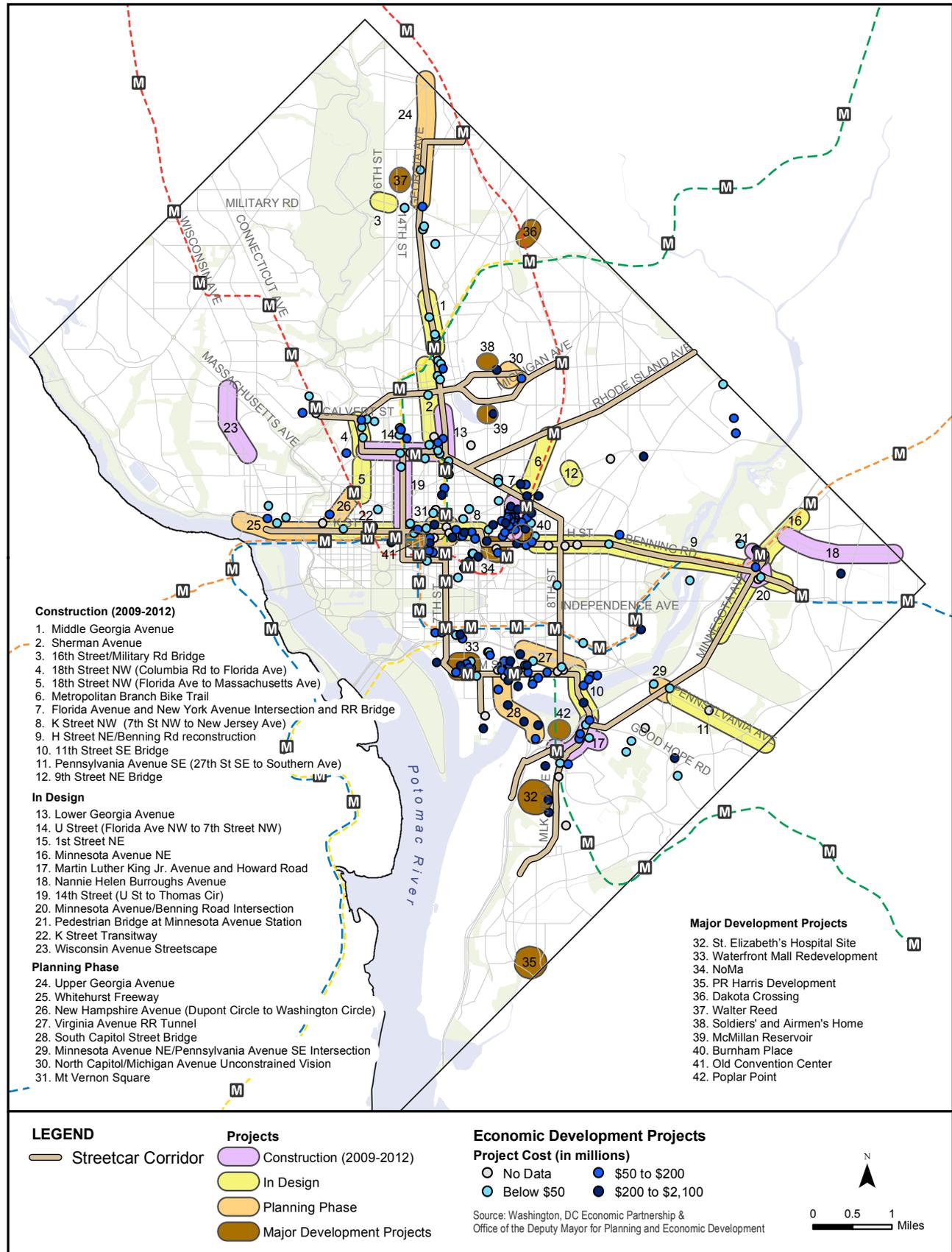
The results of previous plans and updates were reviewed across the DDOT administrations to identify opportunities and constraints associated with new transportation planning initiatives and upcoming construction projects that could affect the proposed streetcar system corridors and phasing. Figure 3-2 summarizes the roadway construction, planning, and development projects located along the streetcar corridors. The review included 19 projects that are currently in the planning and design phase and offered opportunities to potentially incorporate streetcar elements and supporting improvements into these on-going projects. It also included future projects located along:

- Georgia Avenue NW;
- 18th Street NW;
- Florida Avenue NE/NW;
- K Street NW;
- H Street NE;
- U Street NW;
- Minnesota Avenue NE;
- 14th Street NW; and
- Michigan Avenue NE.

The following key issues were also identified for consideration in refining the system plan:

- Need to emphasize better transit connections in Northeast DC which tends to be underserved by transit;

Figure 3-2: Roadway Construction, Planning, and Development Projects



- Streetcars need to connect neighborhoods to Metrorail, commuter rail, and regional bus services;
- Streetcar service ought to extend further east to the Benning Road Metrorail Station to accommodate transfer activity between the Metrorail Blue Line and the streetcar system;
- Transit service to the M Street SE corridor needs to be more than just a special events service;
- The Capitol Hill area and Good Hope Road SE have constrained street rights-of-way;
- Consideration for additional service to redevelopment occurring in the Buzzard Point area;
- The Mount Vernon Square area may present challenges for streetcar connections and traffic operations; and
- The Florida Avenue corridor serves many attractive transit destinations and is a major traffic carrier.

Economic Development Projects

Based on information provided by the DC Office of Planning, Office of the Deputy Mayor for Planning and Economic Development, and the Washington DC Economic Partnership, the locations of the major planned developments in the District were mapped for comparison to the planned streetcar system. Figure 3-2 presents the location of these developments and categorizes them based on their costs. As shown in the figure, the largest clusters of high value development are focused in the “NoMa” area located just northeast of the downtown core and in the Capitol Riverfront area near the new Nationals Park. The NoMa area contains 11 development projects that exceed \$200 million in project cost. The Capitol Riverfront area contains 14 planned developments that exceed \$200 million in project cost. Other clusters of planned development are located in the U Street NW, 7th Street NW, K Street NW, and Georgia Avenue NW Corridors.

The review of streetcar plans by the Office of Planning and the Office of the Deputy Mayor for Planning and Economic Development resulted in the following suggestions:

- Re-evaluate possible streetcar connections in the Michigan Avenue/Irving Street corridor, where the Soldiers and Airmen’s Home and McMillan Reservoir areas include major planned mixed-use developments that were not considered in the original 2005 Alternatives Analysis Study;
- Re-evaluate streetcar connections to the St Elizabeths Hospital campus, planned site of the new headquarters for the Department of Homeland Security, which will

bring more than 14,000 new jobs to the area of South-east DC served by Martin Luther King, Jr. Avenue; and

- Consider features to protect critical viewsheds along proposed streetcar lines in the District. The DC Office of Planning and the National Capital Planning Commission (NCPC) has identified viewsheds that could be impacted by the proposed lines.

Consistency with WMATA Priority Bus Corridor Network

The recommended Metro Express limited-stop bus network was updated in 2010 to be consistent with WMATA’s Priority Bus Corridor Network. The Priority Bus Corridor Network included all of the 10 recommended Metro Express limited stop corridors from the 2008 Update plus three additional corridors: H Street/Benning Road NE, Minnesota Avenue NE, and Florida Avenue/8th Street SE. These three corridors were added to the recommended plan from the 2010 Update increasing the number of Metro Express limited-stop bus corridors to 13.

Re-evaluation of the Streetcar Corridors

The re-evaluation follows the same three-step screening process utilized for the initial system planning effort. This process includes measuring the performance of potential streetcar corridor segments against the goals and objectives established for the project. Table 3-2 identifies the criteria considered in the evaluation and identifies those measures that were updated as part of the 2010 Update. The 2010 Update includes a re-evaluation of the transit options considered for the 2005 and 2008 plans based on updated population and employment projections, ridership forecasts, planned development and redevelopment projects, and cost estimates.

The re-evaluation also considers additional corridors that were not previously evaluated in response to requests received through the public and agency review process. The re-evaluation process also places a greater emphasis on economic and community development factors in determining the appropriate corridors for streetcar investment and the construction phasing of the streetcar system. This includes how the streetcar corridors support the DC Great Streets Initiative and other planning initiatives, serve planned development and redevelopment projects, connect neighborhoods and commercial areas that are not well-served by the existing Metrorail system, and provide improved access to economically distressed areas of the city.

Table 3-2: Evaluation Measures

Objective	Measure	Date
Goal 1: Access and Mobility		
Transit Travel	Change in mode share to regional centers	2005
Accessibility	Number of regional activity centers served	2005
	Population per route mile near proposed stops	2009 Update
	Employment per route mile near proposed stops	2009 Update
Ridership	Total daily boardings	2009 Update
	Daily boardings per route mile	2009 Update
Goal 2: Community and Economic Development		
Support of City Initiatives	Designated Great Street Corridors served	2009 Update
	Current development projects served	2009 Update
	Planning Initiatives Served	2009 Update
Zoning, Land Use, and Development	Zoning and land use compatibility	2009 Update
	Zoning potential/capacity of underutilized un-built land	2009 Update
Community Support	Level of community support for alternatives	2009 Update
Goal 3: System Performance		
Travel Time Savings	Average % Reduction in transit travel times	2005
	Average transit travel time savings to major trip destinations	2005
Person Through-Put	Change in transit capacity	2005
	Local bus peak load factors	2009 Update
	BRT and Streetcar peak load factors	2009 Update
Cost Savings	Operating cost per vehicle mile	2009 Update
	Annual operating cost per annual boarding	2009 Update
	Annualized capital cost per annual boarding	2009 Update
	Annualized capital cost per new annual boardings	2009 Update
Goal 4: Environmental Quality		
Community Fit	Visual compatibility of proposed stops within communities	2005
Environmental Impact	Potential to avoid adverse impacts	2005

The detailed evaluation methodology and results for each of the segments are included in Appendix B of this report. The re-evaluation revealed the following major results.

- Martin Luther King, Jr. Avenue – Updated ridership estimates for this segment exceed 15,000 daily boardings or over 7,000 daily boardings per mile which is substantially greater than projections from the 2005 study. This result is due in part to recent plans to locate the new headquarters for the US Department of Homeland Security in this area adding 14,000 new employees. The segment also performs well for supporting city economic development initiatives and cost-effectiveness criteria.
- Benning Road – This segment has projected ridership that is 42% higher than projections from the 2005 study. This result is due in part to the planned extension of the line further east to connect to the Benning Road Metrorail Station, included in the 2010 Update. The Benning Road segment also serves a designated “Great Streets” corridor and provides enhanced transit service to planned major redevelopment projects near its intersection with Minnesota Avenue.
- 14th Street NW (South of U Street NW) – This segment was not included in the original system plan from 2005. Ridership projections for the 2010 Update approach 14,000 riders per day. The segment is highly ranked for cost-effectiveness and it serves some of the highest population densities in the city, with more than 34,000 persons per route mile living within ¼ mile of the line.
- Rhode Island Avenue – This corridor was not included in the original system plan completed in 2005. The corridor performs well for cost-effectiveness measures, provides needed capacity, and relief for Metrobus crowding, and has transit-supportive land-use and high development potential.
- Columbia Road/Michigan Avenue – This corridor performs higher for the Community and Economic Development related measures than was the case in the 2005 study. This result is due in part to new major redevelopment projects planned for the Soldier’s and Airmen’s Home site and the McMillan Reservoir area.

Public Outreach and Agency Review and Comment

A series of eight open houses, one in each ward of the city, were held during October and November 2009 to provide information regarding the draft update of the system plan and to solicit public comment. These open houses attracted over 400 attendees. The open house included display boards and project staff arranged in a series of stations that addressed different aspects of the system plan. Appendix A includes the materials and information that were provided at the each of the open houses. The displays addressed the following key issues:

- Previous planning studies;
- Purpose and need for transit investments;
- Recommended streetcar system plan and phasing;
- Historical legacy of streetcars in DC;
- Community benefits associated with streetcar services; and
- Streetcar vehicle characteristics.

Comment cards were used to facilitate citizen feedback on the proposed streetcar system and to gather suggestions for improving the entirety of Washington's transportation network. Additionally, each station had a large tablet for documenting the meeting participants' verbal comments. Participants could also submit comments after the meetings via email or by calling the project "hotline". In total

418 separate comments were collected via these methods and summarized by type and by ward. While most of the comments were in favor of implementing the streetcar system, some expressed concerns about:

- Long lead times;
- Lack of proposed streetcar lines in their ward;
- Potential adverse impacts to traffic;
- Visual impacts of overhead wires;
- Potential impacts to the existing bus system; and
- Overall project costs.

Table 3-3 illustrates the number and types of the comments received by location.

The updated system plan also reflects the results of agency review process. This process included briefings, review and comment by staff from the National Capital Planning Commission, US Commission of Fine Arts, Federal Highway Administration (FHWA), Federal Transit Administration (FTA), WMATA, and the Downtown Business Improvement District.

Revised Streetcar Network Plan

Table 3-4 summarizes the key changes to the streetcar component of the system plan recommended in the 2010 update as well as the previous changes in the 2008 update. Figure 3-5 shows the recommended 2010 System Plan.

Table 3-3: Key Issues Raised at Public Meetings

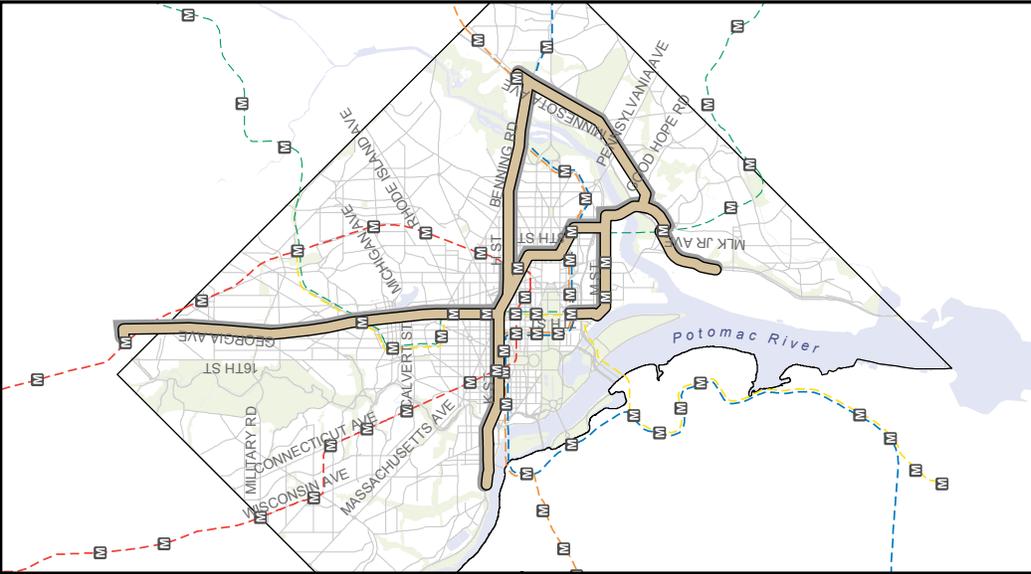
Key Issues	Wards							
	1	2	3	4	5	6	7	8
Positive Issues								
• Environmental Benefits						+		--
• Improved Mobility	+	+			+			
• Requested More Lines In Ward	+		++	+	+	+		
• Economic Development		O						
Neutral Issues								
• Traffic	-	-	±	+	±		+	--
• Timeline	O					O		-
• Routing	±±		±±	O		-		-
Negative Issues								
• Visual Impact (Wires)	OO	-	±	+	±	--	O	
• Impacts on Bus Service				-				-
• Noise	--		-					--
• Parking	±							
• Cost	-		OO	OO	O			

- + (<10 Comments) ++ (≥10 Comments) - Positive comments received
 - (<10 Comments) -- (≥10 Comments) - Negative comments received
 ± (<10 Comments) ±± (≥10 Comments) - Mixture of both positive and negative comments
 O (<10 Comments) OO (≥10 Comments) - General Comments (no positive or negative leaning)

Table 3-4: System Plan Changes for DC Streetcar Component

	Segment	Change	Reason
2008 Update Compared to the 2005 Alternatives Analysis and System Plan			
New Segments	Florida Avenue, U St NW, 18 th St NW, Calvert St	Added segment to recommended streetcar system	Serves rapidly growing NoMa area and U Street Corridor. Serves Gallaudet University and Adams Morgan activity center which are not directly served by Metrorail.
	Good Hope Road	Added segment to recommended streetcar system	Serves existing Skyland activity center and potential redevelopment in this area.
Minor Adjustments	Georgetown Connection	Shortened streetcar connection to terminate near Wisconsin Avenue	Concerns regarding right-of-way constraints and traffic patterns near Key Bridge.
	M Street SW	Shortened streetcar connection to terminate near South Capitol Street	Identified as a spur connection from the 8 th Street SE line for special events and terminated in the area of Nationals Park .
Eliminated Segments	Pennsylvania Avenue SE and 1 st /2 nd Streets SE	Identified for Metrobus service improvements rather than streetcar	Concerns regarding potential visual impacts to Capitol view shed and security constraints along 1 st /2 nd Sts SE.
2010 Update Compared to the 2008 Update			
New Segments	Martin Luther King, Jr. Avenue	Added segment to recommended streetcar system	Re-evaluated the segment with updated population, employment, and economic development related measures that consider redevelopment of St Elizabeth's Hospital Site as new Department of Homeland Security headquarters with 14,000 new employees.
	Rhode Island Avenue	Added segment to recommended streetcar system	Evaluated the segment based on request by project stakeholders and status as a one of DC's "Great Streets"; Re-evaluation considered updated population, employment, and economic development related measures.
	Columbia Road-Michigan Avenue	Added segment to recommended streetcar system	Re-evaluated the segment with updated population, employment, and economic development related measures that consider planned redevelopment of a portion of the Soldiers' and Airmen's Home and McMillan Reservoir areas.
	14 th Street NW (South of U Street)	Added segment to recommended streetcar system	Evaluated the segment based on updated population, employment, and economic development related measures that consider recent redevelopment projects.
	7 th Street SW	Added segment to recommended streetcar system	Re-evaluated the segment with updated population, employment, and economic development related measures; Re-evaluation considered possibility of vehicles operating without overhead wires for short segments including National Mall crossing.
Minor Adjustments	Benning Road	Extended streetcar corridor to terminate at Benning Road Metrorail Station rather than Minnesota Avenue Metrorail Station	This provides a direct connection between the streetcar system and the Metrorail Blue Line service to facilitate transfers.
	M Street SW	Extended streetcar corridor to serve Buzzard Point area	Line extended to serve potential redevelopment and possible maintenance/storage facility site.
	K Street NW/Mt Vernon Square	Modified streetcar connection from Mt Vernon Square to H Street NE by extending it further east on K Street to New Jersey Avenue	Modified to better serve potential transit oriented redevelopment east of Mt Vernon Square.
	Georgetown Connection	Modified connection to Georgetown from M Street NW to K Street NW	Modified to serve revitalized Georgetown Waterfront area.
	Georgia Avenue	Modified northern terminal point from Silver Spring to Takoma Park Metrorail Station	Modified northern terminus to remain within the District of Columbia, allowing for faster project delivery while preserving opportunities to extend to Silver Spring.
Eliminated Segments	Good Hope Road	Deferred streetcar connection to beyond Phase 3	Concerns regarding constrained right-of-way along this two lane roadway resulted in a recommendation to defer this link to beyond Phase 3.
	7 th Street NW	Eliminated from recommended streetcar system	This connection was replaced by 14 th Street streetcar connection since the 7 th Street NW connection in this area is already provided by the Metrorail Green and Yellow Line service.

Figure 3-3: 2005 Recommended Streetcar System Plan

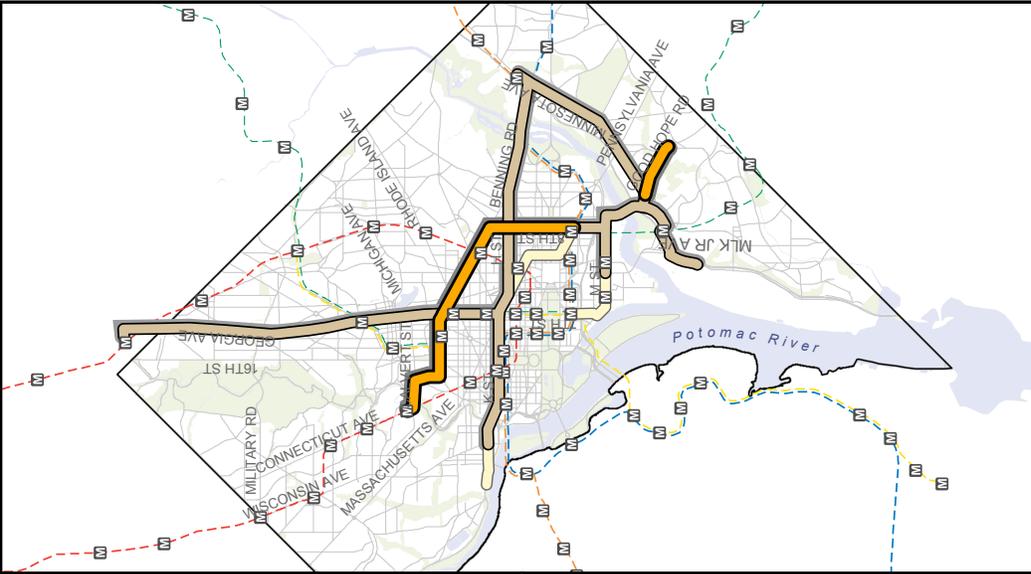


LEGEND

- Recommended 2005 streetcar corridors

0 0.5 1 Miles

Figure 3-4: Streetcar System Plan Changes For 2008 Update

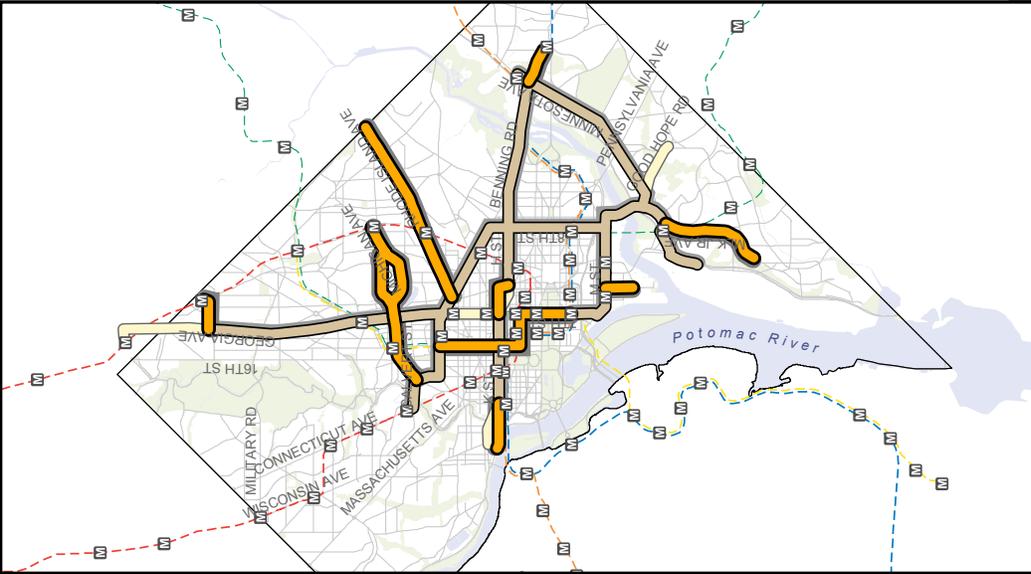


LEGEND

- Streetcar segments retained from 2005 Study
- New streetcar segments added in 2008 Update
- Streetcar segments eliminated

0 0.5 1 Miles

Figure 3-5: Streetcar System Plan Changes For 2010 Update



LEGEND

- Streetcar segments retained from 2008 Update
- New streetcar segments added in 2010 Update
- Streetcar segments eliminated

0 0.5 1 Miles

4.0 Recommended System Plan

Based on the results of the planning process described in the preceding chapter, the recommended System Plan consists of a network of eight new interconnected streetcar lines and thirteen Metro Express bus lines. The following sections describe each of these elements and their phased implementation. This chapter also describes the recommended maintenance facilities and funding strategies to support the proposed streetcar system.

4.1 Streetcar System

The recommended plan includes the addition of modern streetcar service to the multimodal transportation network serving the District of Columbia. Figure 4-1 shows examples of typical streetcar vehicles, tracks, and stops. The streetcar system will consist of small rail cars that operate along in-street tracks, at grade level, and mixed with automobile traffic. There may be some instances where the system utilizes exclusive right-of-way where it is available. The streetcar tracks will be located along the curbside travel lanes in some areas and along the centermost travel lanes, or possibly in a roadway median, in other areas. The streetcar system will use modern and sleek, low-floor vehicles with wide doors and large windows. The air-conditioned streetcar vehicles are typically about 8 feet wide and 66 feet long and can accommodate up to 168 seated and standing passengers. Each vehicle can be operated in either direction, eliminating the need for end-of-line turn around loops.

Streetcar stops will be located about every $\frac{1}{4}$ mile to $\frac{1}{2}$ mile along the routes. They will include a passenger waiting area, a shelter, and system information regarding fares, routes, and schedules. The stops may be located on a special platform that is about 75-feet long and 14-inches high, which enables level boarding, or they may simply utilize a portion of the sidewalk where possible. For areas with on-street parking, the streetcar stop may be located on a curb bulb-out that extends the sidewalk out to meet the streetcar vehicle operating in the roadway travel lane. Streetcar stops may also be located in a center median of the roadway in areas where center-running tracks are used. The streetcar system is planned to operate seven days per week with service frequencies of around 10 minutes throughout the day and evening, including late night service on weekends. For segments of the system that accommodate multiple lines, the services will be more frequent along these trunk lines.

As shown in Figure 4-2, the system includes the following eight streetcar lines that connect neighborhoods, employment centers, shopping, recreational facilities, and intermodal transportation hubs. The lines represent general corridors for service rather than specific alignments. More detailed environmental studies and alignment studies will need to be completed before specific routings can be determined.

- **Bolling AFB to Minnesota Avenue Metrorail Station Line** – This streetcar line will connect Bolling Air Force Base and the Naval Annex offices to the Anacostia Metrorail Station, running generally along portions of South Capitol Street, Howard Road and Firth Sterling Avenue. The line will also extend further to the northeast generally following a portion of Martin Luther King, Jr. Avenue, Good Hope Road and Minnesota Avenue to the Minnesota Avenue Metrorail Station. This line will connect neighborhoods to existing and planned pedestrian-friendly commercial and mixed-use development in the Historic Anacostia area and downtown Ward 7 at the Minnesota Avenue and Benning Road intersection, which includes the new District Department of Employment Services headquarters.
- **Georgetown to Benning Road Metrorail Station Line** – This line will connect the downtown Washington employment core to residential neighborhoods in Northeast DC, a revitalizing commercial district along H Street NE, established commercial retail businesses in Georgetown, and the Union Station Intermodal Transportation Center. The line also will connect to seven Metrorail Stations and serve planned mixed-use development located in downtown Ward 7 near the intersection of Benning Road and Minnesota Avenue.
- **Congress Heights to Washington Circle Line** – This line will extend streetcar service from the Historic Anacostia business district south to Savannah Street in the Congress Heights neighborhood in Southeast DC

Figure 4-1: Streetcar Features



Shelter with System Information



Raised Platform for Low Floor Boarding



Vehicle Interior



Streetcar Vehicle on Rails Embedded in the Pavement

Figure 4-2: System Plan-Streetcar Element

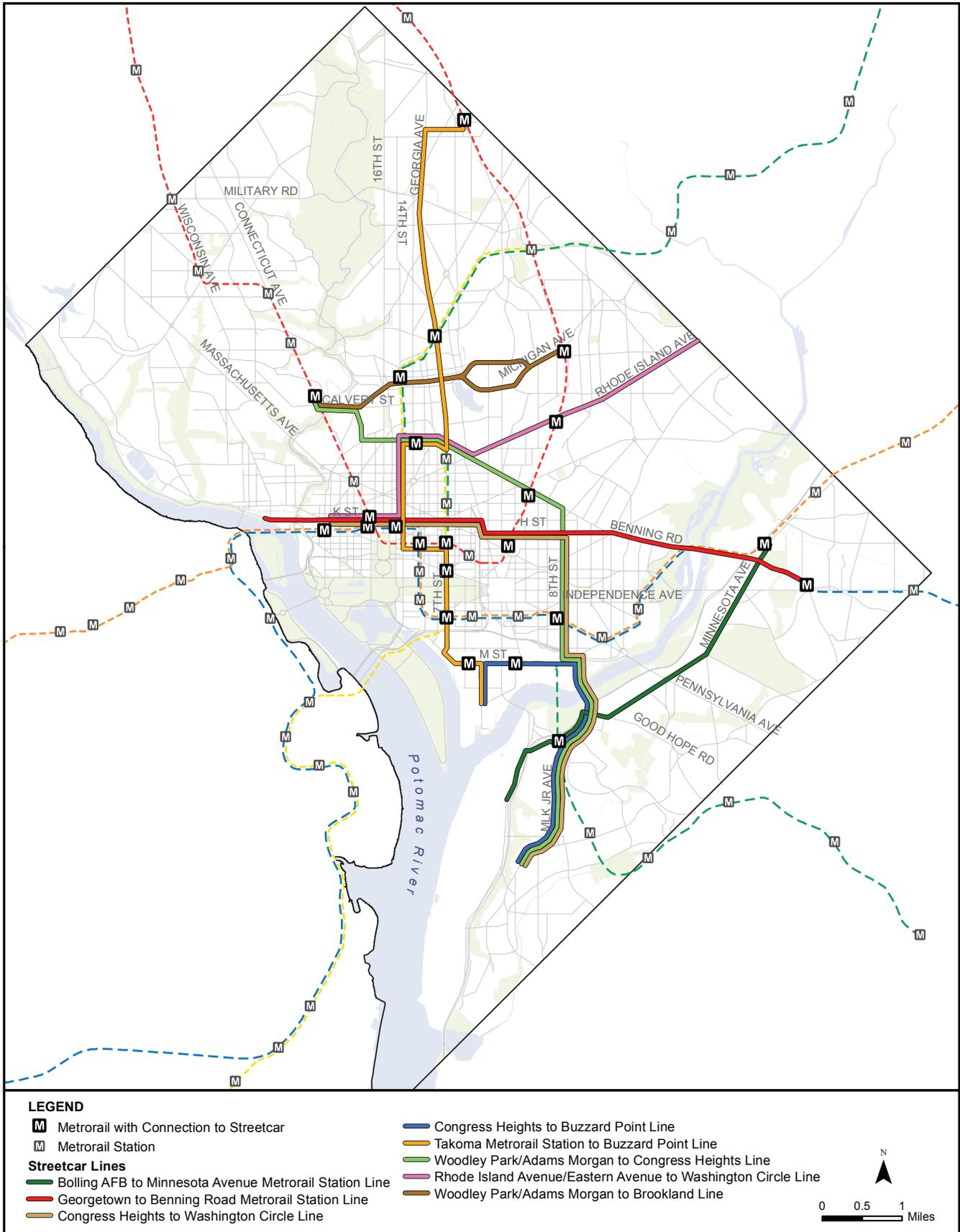
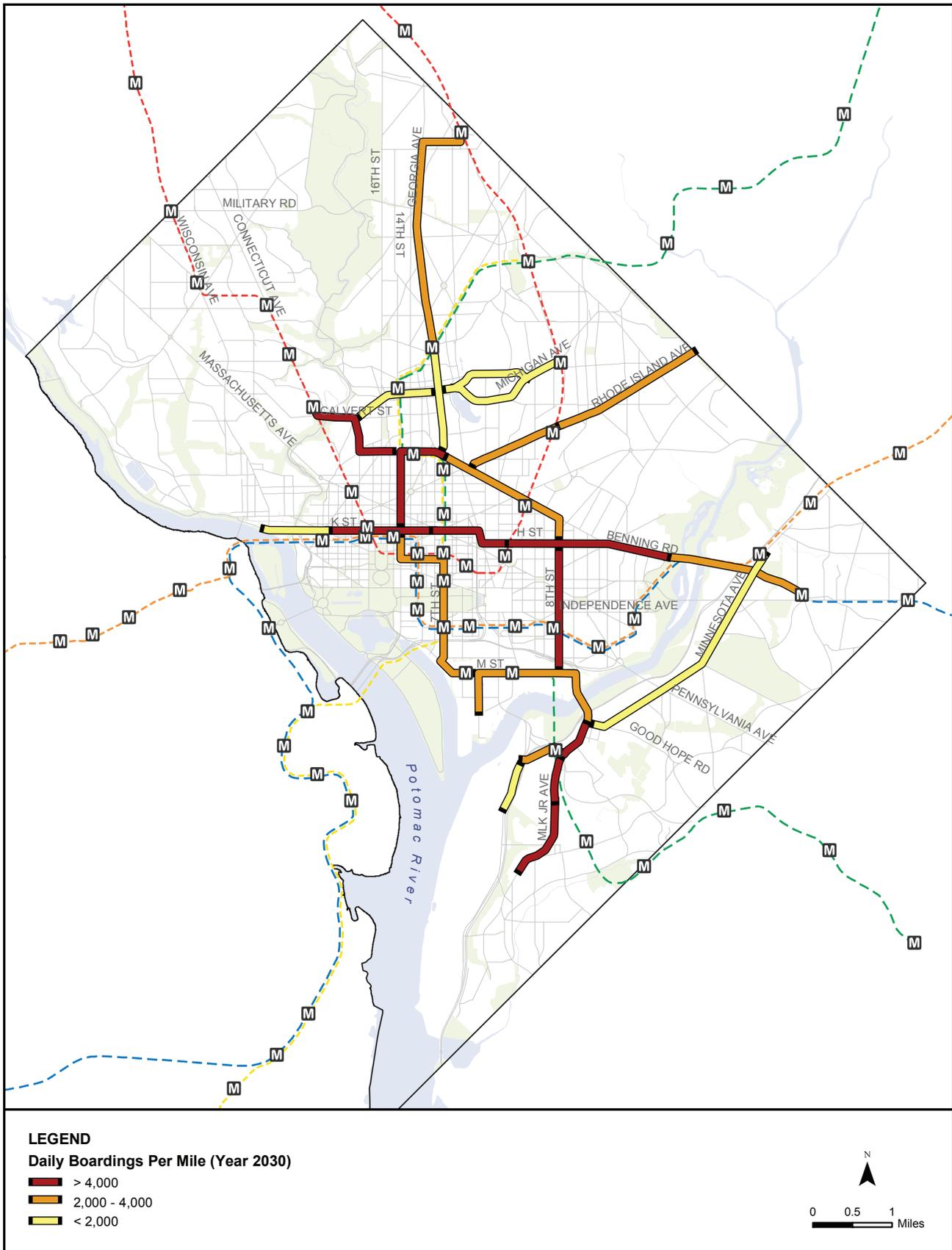


Figure 4-3: Streetcar Ridership Projections



and north across the Anacostia River to the Capitol Hill neighborhood, the H Street NE commercial district, and then to the downtown Washington employment core along K Street NW. Along the way the line will serve the future headquarters of the Department of Homeland Security at the former St. Elizabeths Hospital site, which will bring 14,000 new employees to the area. The line also will serve the Anacostia Waterfront, growing office and mixed-use development in the Near Southeast area, commercial businesses in the M Street SE/Barracks Row area, and connect to Union Station. This line will connect to all five Metrorail lines along the corridor.

- **Congress Heights to Buzzard Point Line** – This line will serve the Anacostia Waterfront area including the Nationals Park baseball stadium, Buzzard Point, and the growing commercial, office, and residential development along the route. The line will extend across the Anacostia River at the 11th Street Bridge and connect to residential neighborhoods east of the river. The line will link with the Metrorail Green Line at the Anacostia and Navy Yard Stations
- **Takoma Metrorail Station to Buzzard Point Line** – This line will connect the Georgia Avenue NW commercial corridor and adjacent neighborhoods with Howard University, the revitalized U Street NW commercial corridor, downtown Washington, the National Mall, and the Southwest Waterfront. This corridor will extend from the Takoma Park Metrorail Station west to the Georgia Avenue Corridor and then south to the U Street area. The line will also serve the 14th Street NW Corridor south of U Street and the 7th Street SW Corridor to the Buzzard Point area.
- **Woodley Park/Adams Morgan to Congress Heights Line** – This line will provide a connection between several commercial districts including Woodley Park, Adams Morgan, U Street NW, NoMa, H Street NE, Barracks Row, Anacostia Waterfront, and Historic Anacostia. The line also will have direct connections to all five Metrorail lines and serve Gallaudet University and the National Zoo.
- **Rhode Island Avenue/Eastern Avenue to Washington Circle Line** – This line will extend from Eastern Avenue in Northeast DC to the Washington Circle/Foggy Bottom area near downtown Washington and generally follow Rhode Island Avenue NE/NW, U Street NW, 14th Street NW and K Street NW. This line will connect the Brentwood area and neighborhoods along Rhode Island Avenue in Northeast DC, that are currently not well served by the existing Metrorail system, to employment centers and commercial districts in downtown Washington and adjacent areas.

- **Woodley Park/Adams Morgan to Brookland Line** – This line will extend from Woodley Park to the Brookland neighborhood in Northeast DC. The line will provide a needed east-west transit connection and serves the Adams Morgan and Columbia Heights commercial districts, Washington Hospital Center, Howard University, Catholic University, and planned large scale mixed-use developments located near the Soldiers' and Airmen's Home and McMillan Reservoir.

Forecasts of ridership for the streetcar system were prepared using the Metropolitan Washington Council of Governments Regional Travel Demand Forecasting Model. The Year 2030 forecast ridership for the entire streetcar system is about 147,000 riders on the average weekday. The total system ridership translates to an average daily ridership per mile of 3,900 for the system. As shown in Figure 4-3, the heaviest forecast ridership is likely to occur along the K Street NW, Martin Luther King, Jr. Avenue SE, 14th Street NW, and H Street NE segments of the planned system.

4.2 Metro Express Limited-Stop Bus System

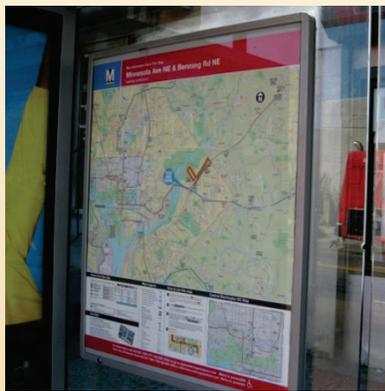
The Metro Express (originally called “Metro Extra”) bus service element implements new branded limited-stop bus service in several corridors. Metro Express service consists of limited-stop bus service that would only serve specially designated high-ridership stops that are ¼ to ½ mile or more apart. The routes use specially branded blue buses so riders can easily recognize them as limited-stop buses. The service is frequent and offers better travel times than the regular Metrobus local service, because it makes significantly fewer stops. The routes will also incorporate other features to help reduce travel times for passengers, including signal priority for transit at intersections and special lanes to bypass congested roadway segments where possible. Figure 4-4 shows some of the key features of the Metro Express bus service.

As shown in Figure 4-5, the Metro Express limited-stop bus element of the plan envisions the implementation of Metro Express limited-stop service in 13 corridors. These were identified based in part on the results of the evaluation of corridors described in Chapter 3.0. This element also includes some additional Metro Express limited-stop corridors that were identified as part of the 2008 WMATA Metrobus Priority Corridor Network Plan. Some of the initial Metro Express limited-stop bus corridors have been designated as future streetcar corridors. In these corridors the Metro Express limited-stop bus service would likely precede streetcar service in the short term.

Figure 4-4: Metro Express (Limited Stop) Bus Features



Bus Shelter with System Information

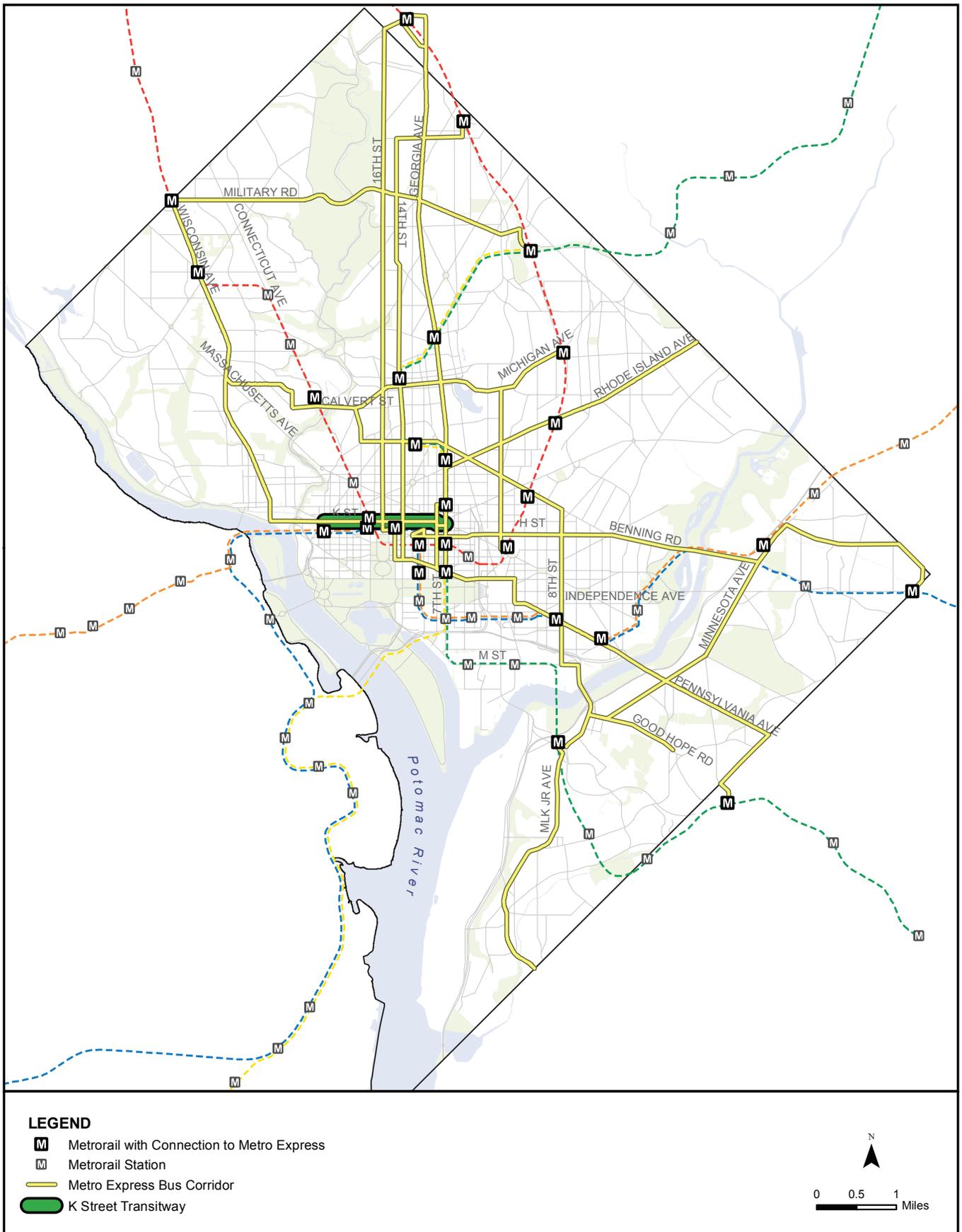


System Mapping and Real-time Information



Limited Stops, Low Floor Boarding and On-board Fare Collection

Figure 4-5: System Plan - Metro Express (Limited-Stop) Bus Element



As streetcar service is introduced in these particular corridors, the Metro Express limited-stop bus service will be optimized so that the bus and streetcar lines provide complementary services. Under this arrangement Metro Express will serve longer corridor trips than the streetcar service, with stops that are further spaced apart. This restructured service will further reduce travel times for passengers traveling relatively long distances via transit.

The Metro Express element of the long-term system plan includes service in the following corridors:

- **Georgia Avenue/7th Street NE Corridor** – Metro Express (Route 79) service was implemented in 2007 along this corridor. The service connects Silver Spring with the Gallery Pace/Chinatown area in downtown Washington. The route also serves Howard University and the Convention Center area.
- **Pennsylvania Avenue SE Corridor** – Metro Express (Route 39) service was implemented in 2008 along this corridor. It operates along Pennsylvania Avenue SE and connects downtown Washington to Capitol Hill, Barracks Row, and neighborhoods east of the Anacostia River.
- **Wisconsin Avenue/K Street NW Corridor** – Metro Express (Route 37) service was implemented in 2008 along Wisconsin Avenue NW and Massachusetts Avenue NW. The route connects Friendship Heights, Tenleytown, National Cathedral area, Dupont Circle, and downtown Washington. In the future this service would utilize the planned K Street Transitway, which will incorporate transit-only lanes into a reconstructed roadway. The K Street Transitway also will accommodate the DC Circulator Route, local Metrobus and streetcar service pending additional study.
- **16th Street NW Corridor** – Metro Express service (Route S9) was implemented in 2009 on 16th Street NW. The service connects residential neighborhoods in the northern part of the city with the McPherson Square area in downtown Washington.
- **14th Street NW Corridor** – This corridor will include new service along 14th Street NW from Pennsylvania Avenue NW to Aspen Street NW and a connection to the Takoma Park Metrorail Station. The route will serve the Columbia Heights and U Street commercial districts and residential areas to the north.
- **North Capitol Street/Michigan Avenue** – This corridor will include service along Michigan Avenue NE from the Brookland/Catholic University Metrorail Station to North Capitol Street and along North Capitol Street from Michigan Avenue NE to Massachusetts Avenue NW and Union Station.
- **Rhode Island Avenue NE Corridor** – This corridor will include service along Rhode Island Avenue NE/NW from Eastern Avenue to 7th Street NW. It will serve an area of the city that has traditionally been underserved by transit. The corridor is designated as a Great Streets corridor which will have comprehensive streetscape and pedestrian improvements.
- **Benning Road/H Street Corridor** – This corridor will include service along portions of Benning Road and H Street NE from Downtown Washington to East Capitol Street. The existing bus routes serving this corridor are some of the most heavily used and overcrowded in the city. The corridor will serve a revitalizing H Street NE commercial district and planned redevelopment east of the Anacostia River.
- **Florida Avenue/U Street NW/8th Street SE Corridor** – This corridor will connect the Anacostia Waterfront, Barracks Row, H Street NE, NoMa, U Street NW, Adams Morgan, and Woodley Park commercial districts.
- **South Capitol Street/Martin Luther King, Jr. Avenue/Minnesota Avenue Corridor** – This service will operate along portions of South Capitol Street, Martin Luther King, Jr. Avenue SE, and Minnesota Avenue SE. The route will serve the planned Department of Homeland Security headquarters campus, Historic Anacostia business district and planned redevelopment near the intersection of Minnesota Avenue and Benning Road.
- **Good Hope Road** – This corridor will include service along Good Hope Road SE and Martin Luther King, Jr. Avenue SE from the Anacostia Metrorail Station to the Skyland commercial area at Alabama Avenue SE.
- **Calvert St/Columbia Rd Corridor** – This corridor will provide needed east-west transit service connecting the National Cathedral area on Wisconsin Avenue to Woodley Park, Columbia Heights, Catholic University and the Brookland area. It also will serve planned mixed-use development near the Soldiers' and Airmen's Home and McMillan Reservoir.
- **Military Rd/Missouri Avenue Corridor** – This corridor will provide needed east-west transit service along Military Road and Missouri Avenue NW to the Fort Totten Metrorail Station, which is served by three Metrorail lines. The corridor also will serve redevelopment sites planned for the Fort Totten Area.

4.3 Project Phasing

This section describes the implementation phasing of projects included in the 2010 Update. Because the improvements cannot all be constructed and operated immediately, improvements will be gradually phased in over a period of years. For the implementation chronology, projects were divided into a set of initial phase of projects that were already under construction as of 2009 and three future phases of system development. The streetcar project phasing strategy considers the following key principals:

- **Focus on the Highest Ridership Segments for Early Implementation** – Ridership forecasts have been prepared for the recommended streetcar system using the regional travel demand forecasting model and Metropolitan Washington Council of Governments population and employment forecasts. The corridor segments with the highest ridership per mile include K Street NW, H Street NE, 14th Street NW, U Street NW, 8th Street NE, Martin Luther King Jr. Avenue SE, and Calvert Street NW.
- **Establish an Interconnected Streetcar Network** – This includes establishing an initial system of interconnected streetcar lines in Phase 1 that expands outward in subsequent phases of system implementation. This allows for greater flexibility for operations, vehicle fleet management, and maintenance and storage facility construction and utilization.
- **Coordinate Streetcar Construction with Other Infrastructure Projects** – To the extent possible, the streetcar phasing has been designed to coordinate the construction of streetcar facilities with planned roadway, bridge reconstruction, and development projects located along the line. For example, the streetcar projects in the H Street NE, Benning Road, Martin Luther King, Jr. Avenue, and 11th Street Bridge were identified for the earliest phases of implementation to be able to incorporate streetcar track construction into the road and bridge reconstruction projects that are currently underway.

Figures 4-6 through 4-9 show the recommended project phasing.

Initial Projects

This phase consists of projects that have already initiated design and construction activities by 2010 as well as implementation of new Metro Express services. The Initial Projects include the following:

- **Implementation of Initial Metro Express Bus Services** – Current implementation of the relatively low-cost Metro Express service has resulted in immediate improvement to several transit corridors. These initial corridors include some of those recommended in the WMATA Metrobus Priority Corridor Network Plan as well as the Transit System Plan. Service is being implemented along portions of 16th Street NW, Georgia Avenue NW/7th Street NW, Wisconsin Avenue NW, and Pennsylvania Avenue SE.
- **Anacostia Streetcar Initial Line Segment** – In 2004 DDOT and WMATA identified the Anacostia Initial Line Segment as the first phase of a future streetcar system for the District of Columbia. The segment connects the Anacostia Metrorail station with the Naval Annex in Southeast DC. Construction activities for this project began in 2009.
- **H/Benning Streetcar Segment** – DDOT also prioritized the H/Benning Streetcar line because of its high ridership potential and service to an area targeted for economic development. This phase includes streetcar construction along H Street NE and Benning Road between Union Station and Oklahoma Avenue. Track construction for this segment was initiated in 2009 as part of the reconstruction of these roadways.
- **K Street Transitway** – The project will construct a dedicated transitway to accommodate buses and eventually streetcars. It is currently in the environmental study and preliminary design phase of project development.

Phase 1

Phase 1 will connect the initial projects described above and expand the streetcar system to the north, east, and south. It includes the streetcar segments with the highest forecast ridership and establishes a single interconnected streetcar system. The Phase 1 system will be completed by 2015; activities consist of the following projects:

- **Extension of the Georgetown to H/Benning Streetcar Line to Ward 7 and Downtown** – After completion of the initial H/Benning Streetcar segment, expansion plans will focus on extending this line east from Oklahoma Avenue to the Benning Road Metrorail Station and extending it west from Union Station to K Street NW and Washington Circle (near the Foggy Bottom-GWU Metrorail station). Corridor analyses have indicated that the K Street NW segment has the highest ridership potential in the system. The streetcar alignment will utilize the dedicated transit lanes that will be established along K Street NW as part of the planned transitway project.

Figure 4-6: System Plan-Initial Projects

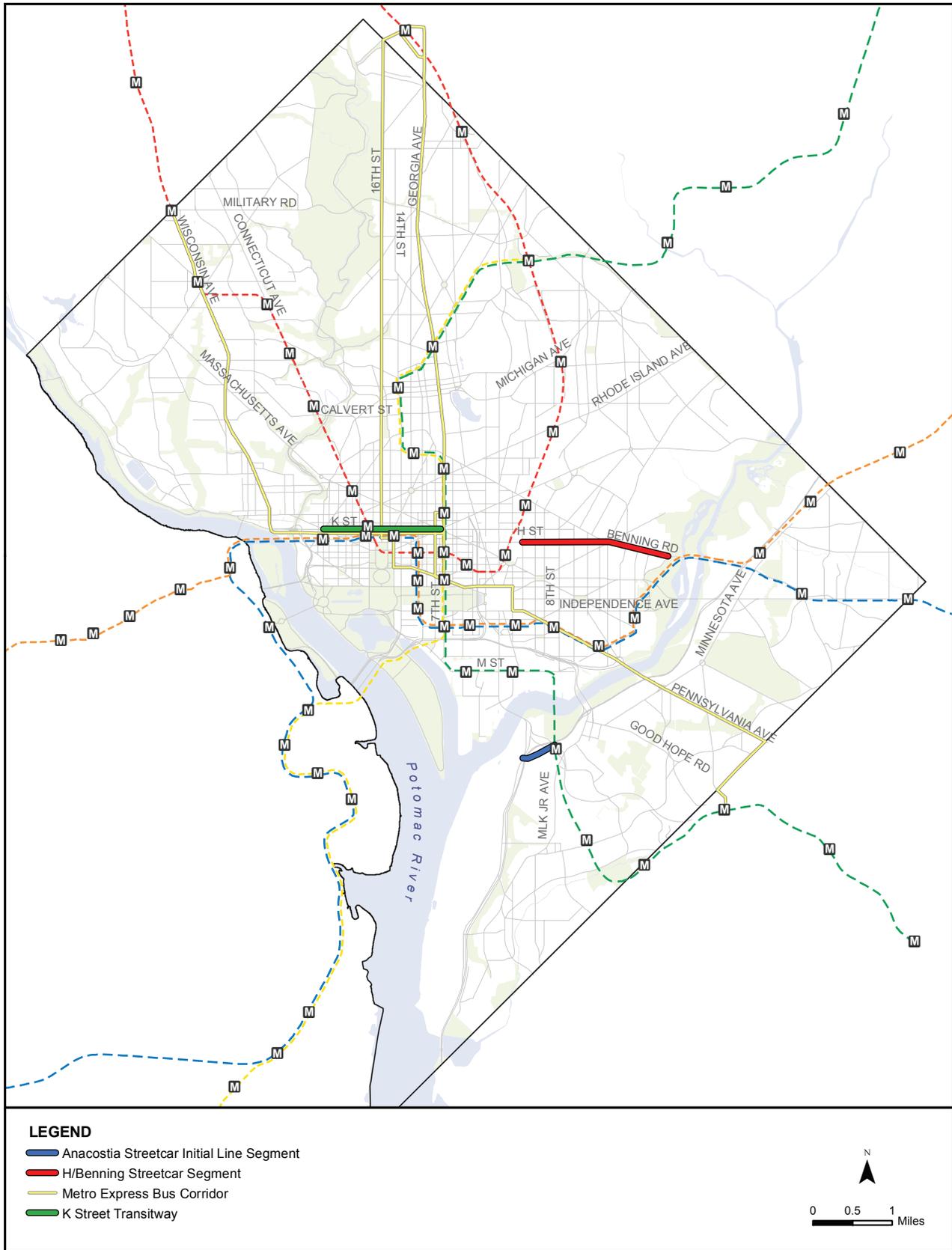


Figure 4-7: System Plan-Phase 1

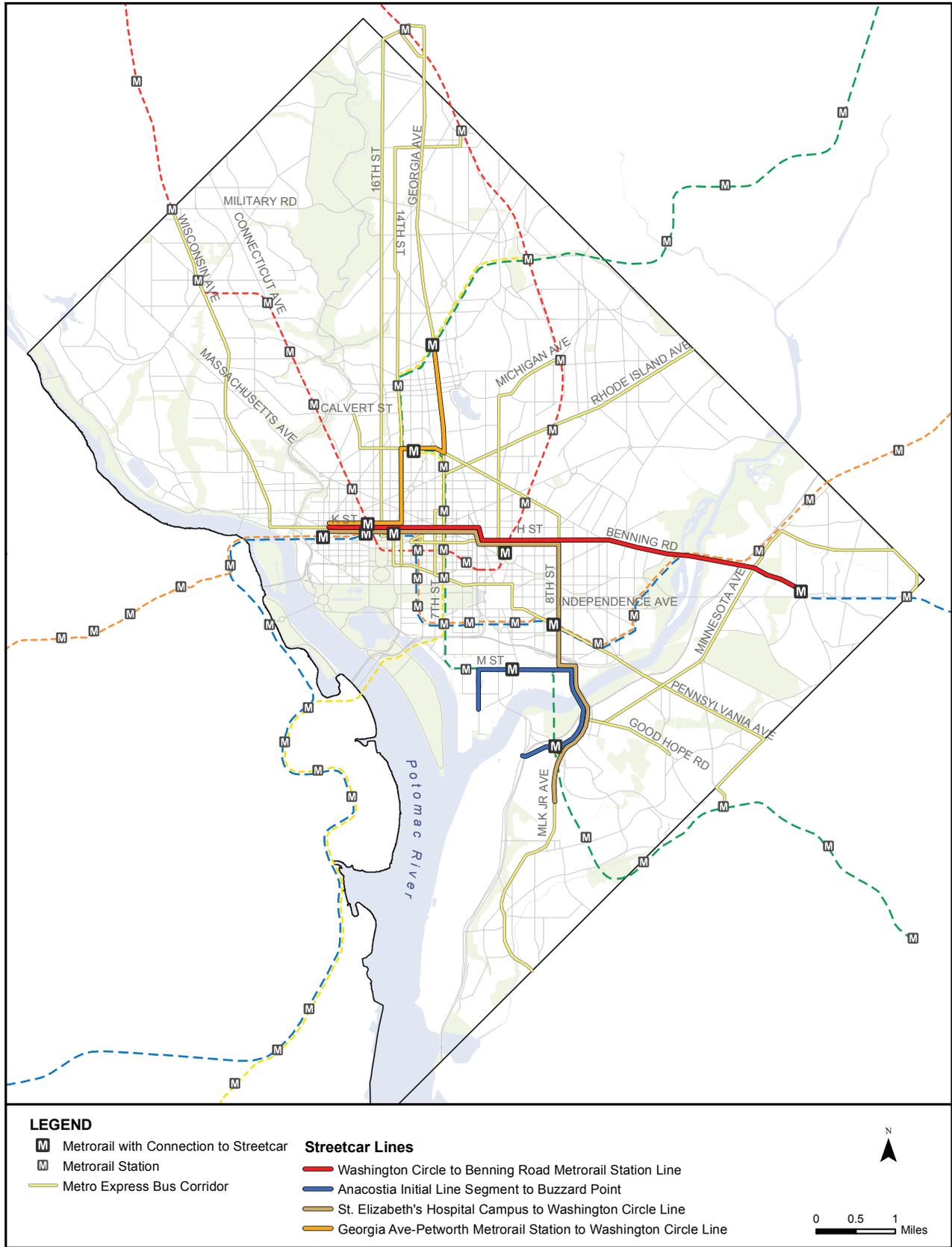


Figure 4-8: System Plan - Phase 2

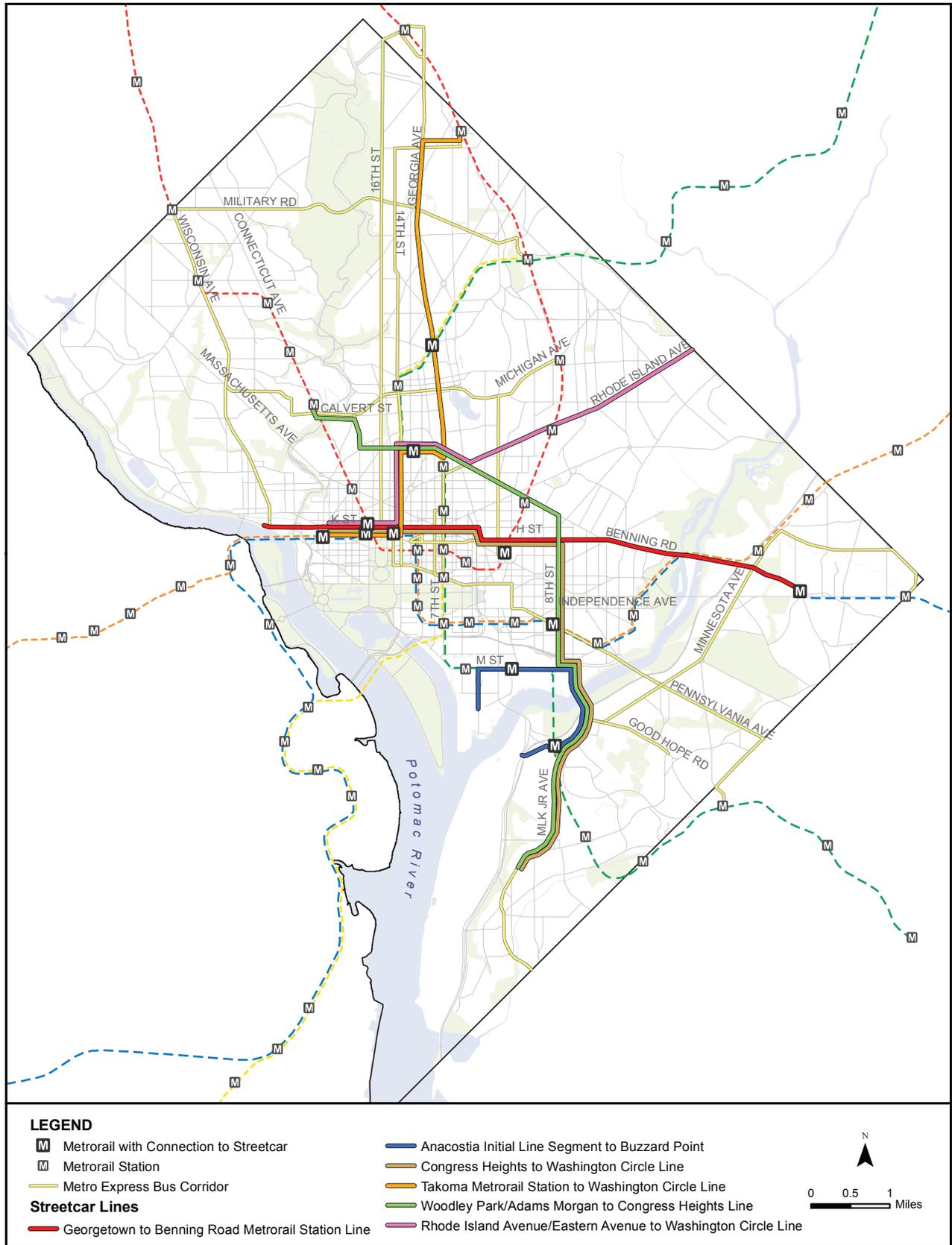
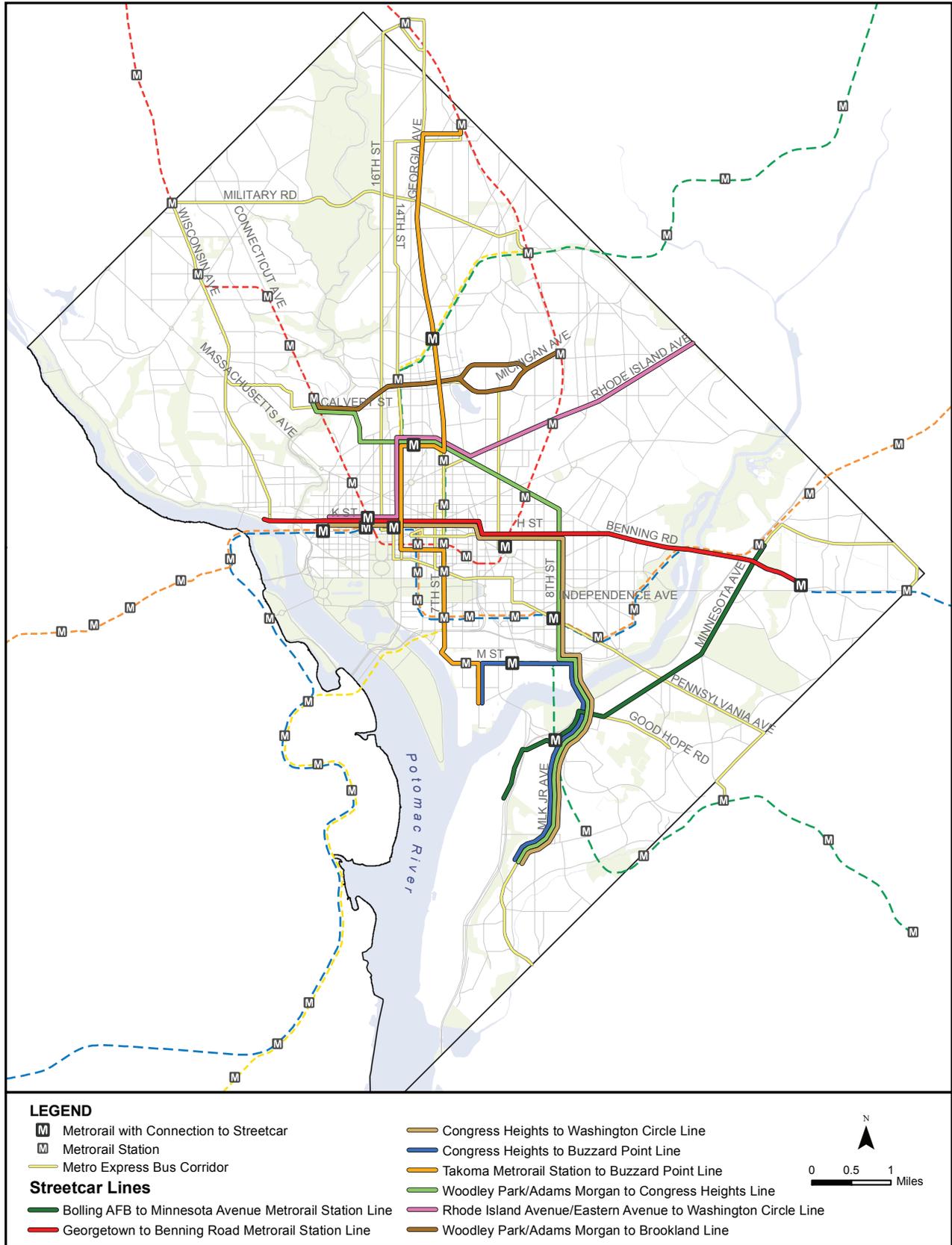


Figure 4-9: System Plan-Phase 3



- **Extension of the Anacostia Streetcar Initial Line Segment to Buzzard Point** – This phase will extend the Anacostia Initial Line Segment across the 11th Street Bridge to the M Street SE office and commercial corridor, Nationals Park stadium area, and terminus at Buzzard Point.
- **Construction of the Congress Heights to Downtown Streetcar Line to the St. Elizabeths Hospital Campus** – This line will provide a connection across the Anacostia River from Southeast to downtown Washington. The initial southern terminus of the line in Phase 1 will be the future Department of Homeland Security Headquarters at the St. Elizabeths Hospital campus. From this initial terminus, the line will run north to the Navy Yard area, Capitol Hill neighborhood, and downtown DC, terminating at Washington Circle. The line will also provide a streetcar linkage between the Anacostia Streetcar Initial Line Segment and H/Benning Streetcar line, creating a single connected streetcar system. The development of a single connected system will allow for easy movement of vehicles between streetcar lines and sharing of maintenance and storage yard facilities between the lines.
- **Construction of the northern segment of the Georgia Avenue to Buzzard Point Streetcar Line from Petworth to Downtown** – Ridership forecasts indicated strong ridership for streetcar service in the Georgia Avenue and 14th Street NW portions of the line as far north as the Georgia Avenue/Petworth Metrorail station. The Phase 1 portion of the line will extend service from Washington Circle, east along K Street NW to 14th Street NW, north on 14th Street NW, east on U Street NW, and north on Georgia Avenue NW to the Georgia Avenue/Petworth Metrorail station.
- **Expansion of Metro Express Bus Services** – Implementation of Metro Express services will continue in the following corridors: 14th Street NW, Michigan Avenue NW/North Capitol Street, Florida Avenue/U Street/8th Street SE, South Capitol Street/Martin Luther King, Jr. Avenue/Minnesota Avenue, and Rhode Island Avenue NE.

Phase 2

Phase 2 will expand the Phase 1 streetcar system further north to the Takoma Metro Station, further west to Georgetown, and further south to the Congress Heights area. This phase will also establish two new streetcar lines and continue implementation of Metro Express services. The Phase 2 system will be completed by 2018. Activities consist of the following projects:

- **Extension of the Georgia Avenue to Buzzard Point Streetcar Line further north to Takoma** – This phase will extend streetcar service further north along Georgia Avenue and connect to the Takoma Metrorail Station.
- **Completion of the Georgetown to H/Benning Streetcar Line west to Wisconsin Avenue** – This phase will extend the line further west to connect to the Georgetown waterfront on K Street NW, completing this line.
- **Construction of the Woodley Park/Adams Morgan to Congress Heights Streetcar Line** – This improvement will provide cross-town service connecting Northwest and Southeast DC. The northern terminus of the line is the Woodley Park-Zoo/Adams Morgan Metrorail station. At the south end, it will extend streetcar service south along Martin Luther King, Jr. Avenue SE to Congress Heights and the future Department of Homeland Security Headquarters.
- **Construction of the Rhode Island Avenue to Downtown Streetcar Line** – This project will initiate streetcar service for Northeast DC along Rhode Island Avenue NW/NE, including connections to the Brentwood area and Rhode Island Avenue Metrorail Station. It will extend from Washington Circle to Eastern Avenue and Fort Circle Park at the District boundary.
- **Implementation of the Remaining Metro Express Bus Services** – This phase will implement the remaining Metro Express corridors, such as the Military Road/Missouri Avenue Corridor, Good Hope Road SE and the Calvert Street NW/Columbia Road NW Corridor.

Phase 3

Phase 3 will include the expansion of the Phase 2 system to the Columbia Road/Michigan Avenue Corridor serving the Columbia Heights, Washington Hospital Center, and Brookland areas. This phase will also include the Minnesota Avenue corridor, connecting the Historic Anacostia area to Ward 7, and the 7th Street SW Corridor providing service to the monumental core and the Southwest Waterfront. The Phase 3 system will be completed by 2020. Activities consist of the following projects:

- **Construction of the Woodley Park/Adams Morgan to Brookland Line** – This phase will build and initiate service along a new line serving Columbia Heights, Washington Hospital Center, and Catholic University areas. The line will extend from the Woodley Park-Zoo/Adams Morgan Metrorail station to the Brookland-CUA Metrorail station.

- **Extension of the Anacostia Initial Line Segment to the Minnesota Avenue Metro Station** – This phase will extend the Anacostia Streetcar north along Minnesota Avenue to Benning Road and the Minnesota Avenue Metrorail Station.
- **Completion of the Georgia Avenue to Buzzard Point Streetcar Line** – This extension will complete the line, constructing the southern portion of the line from K Street NW to the Southwest Waterfront, M Street SW and Buzzard Point.

Future Extensions

Beyond Phase 3, the system plan envisions future expansions of the streetcar system in the Wisconsin Avenue corridor north of Georgetown, further north along Georgia Avenue to Silver Spring, further east to

the Skyland area, and further south along Martin Luther King, Jr. Avenue SE and South Capitol Street to National Harbor.

Potential Streetcar Projects by Phase

Based on the proposed streetcar system phasing, potential individual project segments have been identified to advance through the project planning and development process. Table 4-1 shows these proposed projects including the identification of logical operational termini for each project. The individual proposed streetcar segments are described in more detail in the segment profiles that follow the table. The profiles summarize key information about each of the segments including: length, ridership forecasts, capital cost estimates, population and employment along the route, performance relative to the evaluation criteria, key strengths, and segment termini.

Table 4-1: Potential Streetcar Projects by Phase

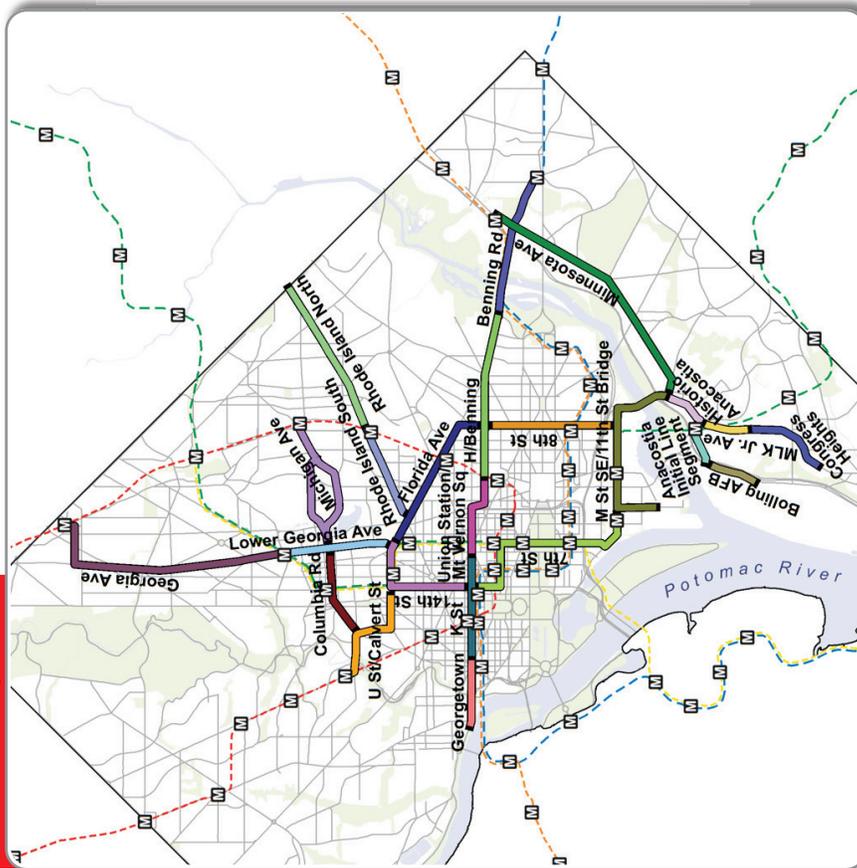
Project Segment	Operating Terminus 1	Operating Terminus 2	Rationale for Project Termini and Independent Utility
Initial Projects			
Anacostia Initial Line Segment	Naval Annex	Anacostia Metrorail Station	<ul style="list-style-type: none"> • Naval Annex is an employment center and trip destination point • Anacostia Metrorail station is a major multimodal passenger transfer point for SE Washington
H/Benning	Union Station	RFK Stadium Area (At Oklahoma Avenue)	<ul style="list-style-type: none"> • Union Station is a major intermodal passenger transfer location for the region • RFK Stadium is a destination for special events • Spingarn High School and the Spingarn-Langston Recreation Center are located adjacent to Terminus 2
Phase 1			
Benning Road	Union Station	Benning Road Metrorail Station	<ul style="list-style-type: none"> • Extends the H/Benning Project currently under construction west of Oklahoma Avenue NE • Benning Road Metrorail Station is a major passenger transfer point
Historic Anacostia	Naval Annex	Good Hope Road/11 th Street Bridge	<ul style="list-style-type: none"> • Naval Annex is an employment center and trip destination point • Connection to Good Hope Road serves Historic Anacostia business district
Union Station/Mount Vernon Square	Mount Vernon Square/ Convention Center	Benning Road Metrorail Station	<ul style="list-style-type: none"> • Extends the H/Benning Project currently under construction east of Union Station to the Downtown • Mount Vernon Square/Washington Convention Center is a destination point for special events
K Street	Washington Circle	Benning Road Metrorail Station	<ul style="list-style-type: none"> • Union Station is a major intermodal passenger transfer location for the region • Foggy Bottom-GWU Metrorail Station is a major passenger transfer point • George Washington University and Hospital at Washington Circle is a major employment, educational and medical trip destination point
M Street SE/11 th Street Bridge	Naval Annex	Buzzard Point (At V Street SW)	<ul style="list-style-type: none"> • Extends the Anacostia Initial Line Segment/Naval Annex to the M Street Corridor, connecting two major employment centers and trip destination points. • Serves Capitol Riverfront, Anacostia Waterfront, Southwest Waterfront and adjacent redevelopment at Buzzards Point
MLK Jr. Avenue	St. Elizabeth's Hospital Campus (Future DHS Headquarters Site)	Good Hope Road/11 th Street Bridge	<ul style="list-style-type: none"> • Future DHS Headquarters Site will become a major employment center and work trip destination point • Connection to Good Hope Road serves Historic Anacostia business district
8 th Street	St. Elizabeth's Hospital Campus (Future DHS Headquarters Site)	Washington Circle	<ul style="list-style-type: none"> • Future DHS Headquarters Site will become a major employment center and work trip destination point • Foggy Bottom-GWU Metrorail Station is a major passenger transfer location • George Washington University and Hospital at Washington Circle is a major employment, educational and medical trip destination point
14 th Street	Washington Circle	Georgia Avenue/ Florida Avenue	<ul style="list-style-type: none"> • Foggy Bottom-GWU Metrorail Station is a major passenger transfer location • George Washington University and Hospital at Washington Circle is a major employment, educational and medical trip destination point • Howard University and Hospital is a major employment, educational and medical trip destination point • U Street commercial activity center is a destination point
Lower Georgia Avenue	Washington Circle	Georgia Ave-Petworth Metrorail Station	<ul style="list-style-type: none"> • Foggy Bottom-GWU Metrorail Station is a major passenger transfer location • George Washington University and Hospital at Washington Circle is a major employment, educational and medical trip destination point • Georgia Ave-Petworth Metrorail Station and activity center is a major passenger transfer site

Table 4-1: Potential Streetcar Corridor Projects by Phase (continued)

Project Segment	Operating Terminus 1	Operating Terminus 2	Rationale for Project Termini and Independent Utility
Phase 2			
Georgia Avenue	Washington Circle	Takoma Metrorail Station	<ul style="list-style-type: none"> • Extends the Georgia Avenue Corridor constructed in Phase 1, connecting major destinations such as: U Street, Howard University and Hospital, Georgia Ave-Petworth Metrorail Station • Foggy Bottom-GWU Metrorail Station is a major passenger transfer location • George Washington University and Hospital at Washington Circle is a major employment, educational and medical trip destination point • Takoma Metrorail Station is a major passenger transfer location for the region
Congress Heights	Congress Heights commercial district (At Savannah St SE)	Washington Circle	<ul style="list-style-type: none"> • Congress Heights at Savannah Street and Martin Luther King Jr. Avenue is a neighborhood oriented activity center • Connection to Good Hope Road serves Historic Anacostia business district
Florida Avenue	Congress Heights commercial district (At Savannah St SE)	Georgia Avenue/ Florida Avenue	<ul style="list-style-type: none"> • Congress Heights at Savannah Street and Martin Luther King Jr. Avenue is a neighborhood oriented activity center • Howard University and Hospital is a major employment, educational and medical trip destination point
U Street/Calvert Street	Congress Heights commercial district (At Savannah St SE)	Woodley Park-Zoo/Adams Morgan Metrorail Station	<ul style="list-style-type: none"> • Congress Heights at Savannah Street and Martin Luther King Jr. Avenue a neighborhood oriented activity center • Woodley Park-Zoo/Adams Morgan Metrorail Station is a major passenger transfer location • Extension connects major destinations such as: Woodley Park/Adams Morgan, U Street, Howard University and Hospital, Gallaudet University, Capitol Hill, Anacostia.
Rhode Island Avenue South	Washington Circle	Rhode Island Ave-Brentwood Metrorail Station	<ul style="list-style-type: none"> • Foggy Bottom-GWU Metrorail Station is a major passenger transfer location • George Washington University and Hospital at Washington Circle is a major employment, educational and medical trip destination point • Downtown Washington via K Street major employment and work trip destination • Rhode Island Ave-Brentwood Metrorail Station is a major passenger transfer point
Rhode Island Avenue North	Washington Circle	Rhode Island Avenue/ Eastern Avenue	<ul style="list-style-type: none"> • Foggy Bottom-GWU Metrorail Station is a major passenger transfer location • George Washington University and Hospital at Washington Circle is a major employment, educational and medical trip destination point • Downtown Washington via K Street major employment and work trip destination • Residential neighborhoods and commercial center near Rhode Island Avenue and Eastern Avenue Intersection
Georgetown	K Street NW and Wisconsin Avenue	Benning Road Metrorail Station	<ul style="list-style-type: none"> • Georgetown Waterfront/Wisconsin Avenue is a major activity center and trip destination • Downtown Washington via K Street major employment and work trip destination • Extends the Washington Circle to Benning Road Metro Line constructed in Phase 1 • Union Station is a major intermodal passenger transfer location for the region. • Benning Road Metrorail Station is a major passenger transfer point
Phase 3			
Minnesota Avenue	Naval Annex	Minnesota Avenue Metrorail Station	<ul style="list-style-type: none"> • Extends Anacostia Initial Line Segment currently under construction • Naval Annex is an employment center and trip destination point • Minnesota Avenue Metrorail Station is a major passenger transfer point
Bolling AFB	Bolling Air Force Base	Minnesota Avenue Metrorail Station	<ul style="list-style-type: none"> • Extends Anacostia Initial Line Segment currently under construction • Connects to Bolling Air Force Base Access Point • Connects Bolling Air Force Base to Downtown Historic Anacostia • Minnesota Avenue Metrorail Station is a major passenger transfer point
Columbia Road	Woodley Park-Zoo/Adams Morgan Metrorail Station	Georgia Avenue/ Columbia Road	<ul style="list-style-type: none"> • Woodley Park-Zoo/Adams Morgan Metrorail Station is a major passenger transfer point • Columbia Heights Metrorail station is a major passenger destination and transfer point • Lower Georgia Avenue commercial district and connection to lower Georgia Avenue Streetcar
Michigan Avenue	Woodley Park-Zoo/Adams Morgan Metrorail Station	Brookland-CUA Metrorail Station	<ul style="list-style-type: none"> • Woodley Park-Zoo/Adams Morgan Metrorail Station is a major passenger transfer point • Washington Hospital Center is a major employment and work trip destination point • Brookland Avenue Metrorail Station is a major passenger transfer point • Catholic University near Brookland-CUA Metrorail Station is a major trip destination point
7 th Street	Takoma Metrorail Station	Buzzard Point (At V Street SW)	<ul style="list-style-type: none"> • Takoma Metrorail station is a major passenger transfer location for the region • Extends the Georgia Avenue Corridor constructed in Phase 2 • Serves stadium area activity center, Capitol Riverfront, Anacostia Waterfront, Southwest Waterfront and adjacent redevelopment

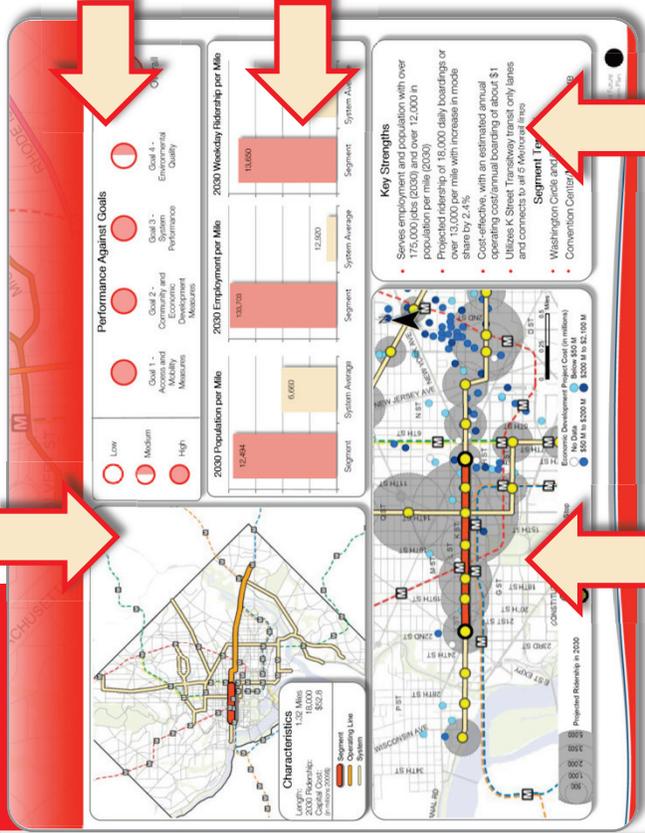
STREETCAR SEGMENT PROFILES

Streetcar Segments



Key map showing location of segment in DC Streetcar system, ridership from travel demand model, segment length and capital cost estimate (in 2009\$)

Profile Format



Map of segment showing stop locations, ridership from travel demand model and adjacent economic development projects identified by the Office of the Deputy Mayor of Planning and Economic Development and Washington, DC Economic Partnership

Key strengths of the segment and segment termini based on the results of the evaluations described in Appendix B

Segment performance against goals as described in Appendix B

Graphs showing population per mile, employment per mile, and ridership per mile within a quarter mile of segment station stops

Each graph compares segment performance to the average performance of the whole DC Streetcar system

Ridership, population and employment data were estimated using the MWCOG v.21D Rd 7.2 data and the travel demand model originally developed for the DC Alternatives Analysis based on the MWCOG model

Segment Index

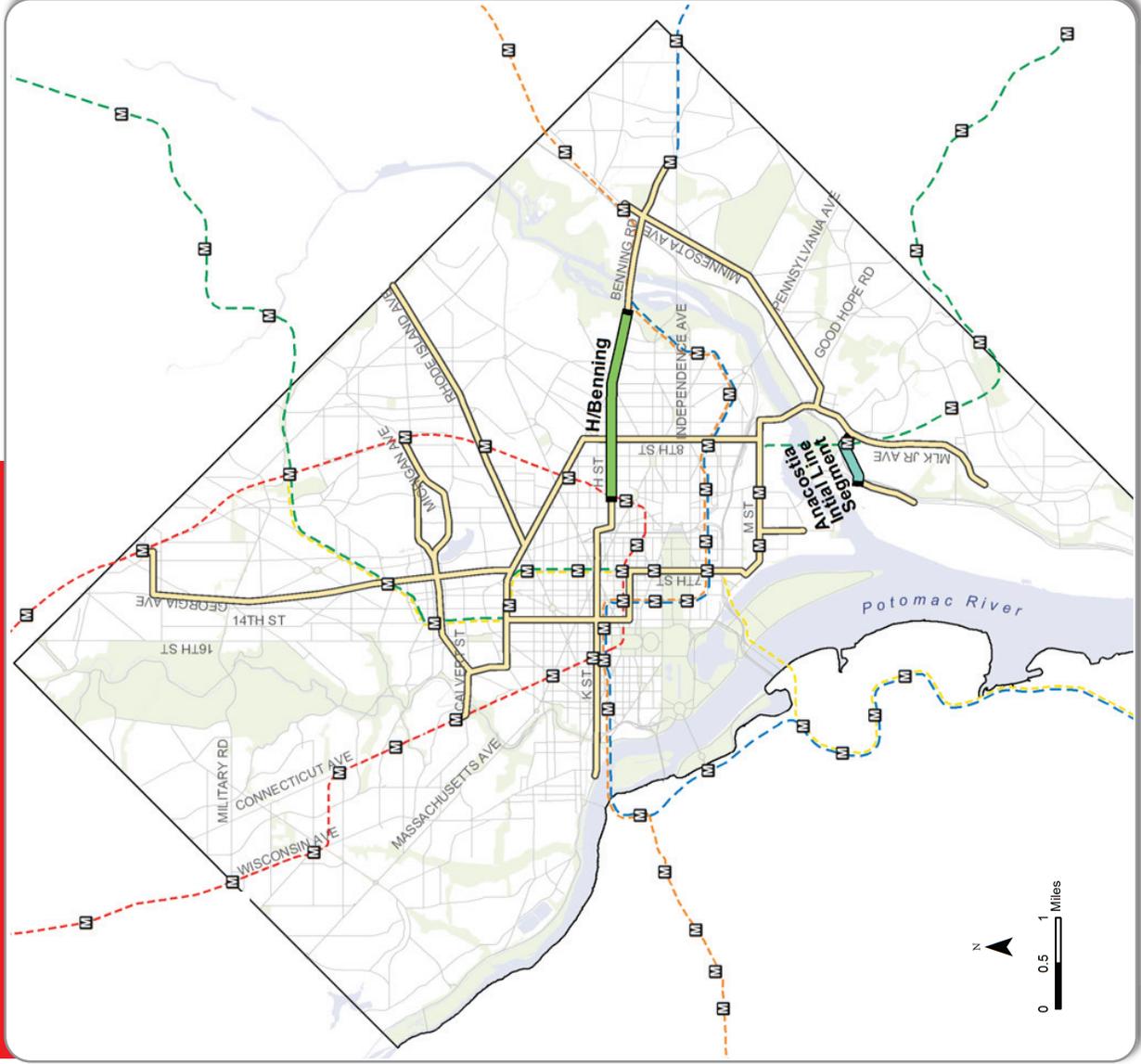
INITIAL PROJECTS	PAGE	PHASE	PAGE
Anacostia Initial Line Segment	4-19	Georgetown	4-38
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PHASE 1		Congress Heights	4-40
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		Rhode Island North	4-37
		K Street	4-25
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		Lower Georgia Avenue	4-30
		Minnesota Ave	4-32
		Bolling AFB	4-41
		Columbia Road	4-42
		Michigan Avenue	4-43
		7th Street	4-44

STREETCAR SEGMENT PROFILES - INITIAL PROJECTS

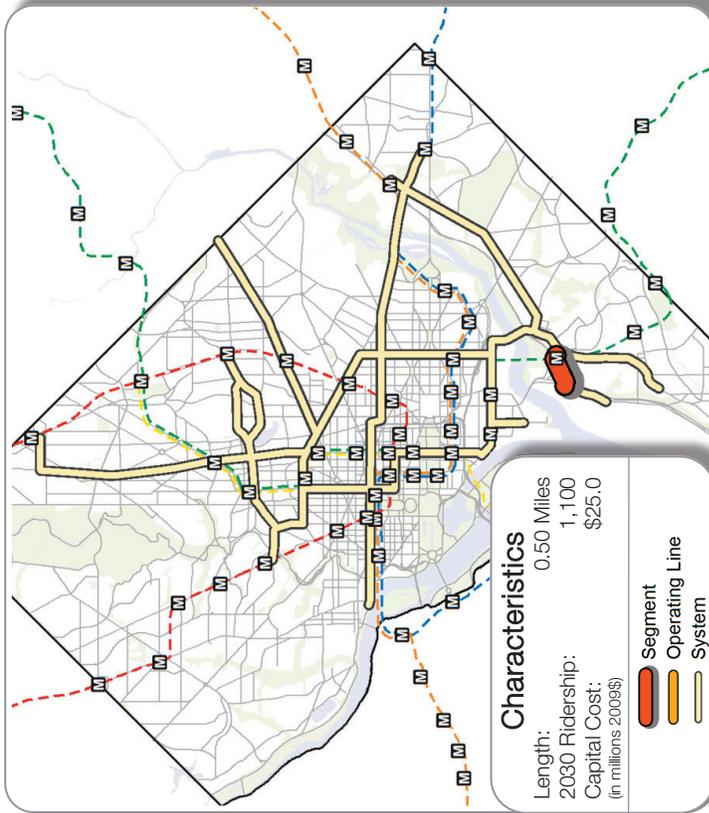
Segment Index

INITIAL PROJECTS	PAGE
Anacostia Initial Line Segment.....	4-19
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Initial Projects Streetcar Segments

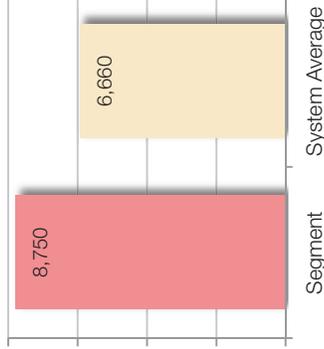


Anacostia Initial Line Segment

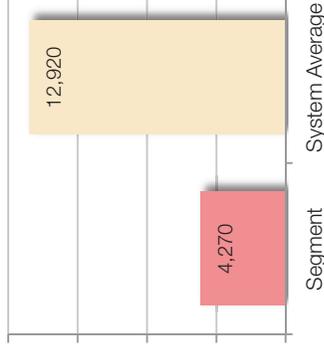


Note: The Anacostia segment was not rated for evaluation since it was already scheduled for construction at the time of the system studies.

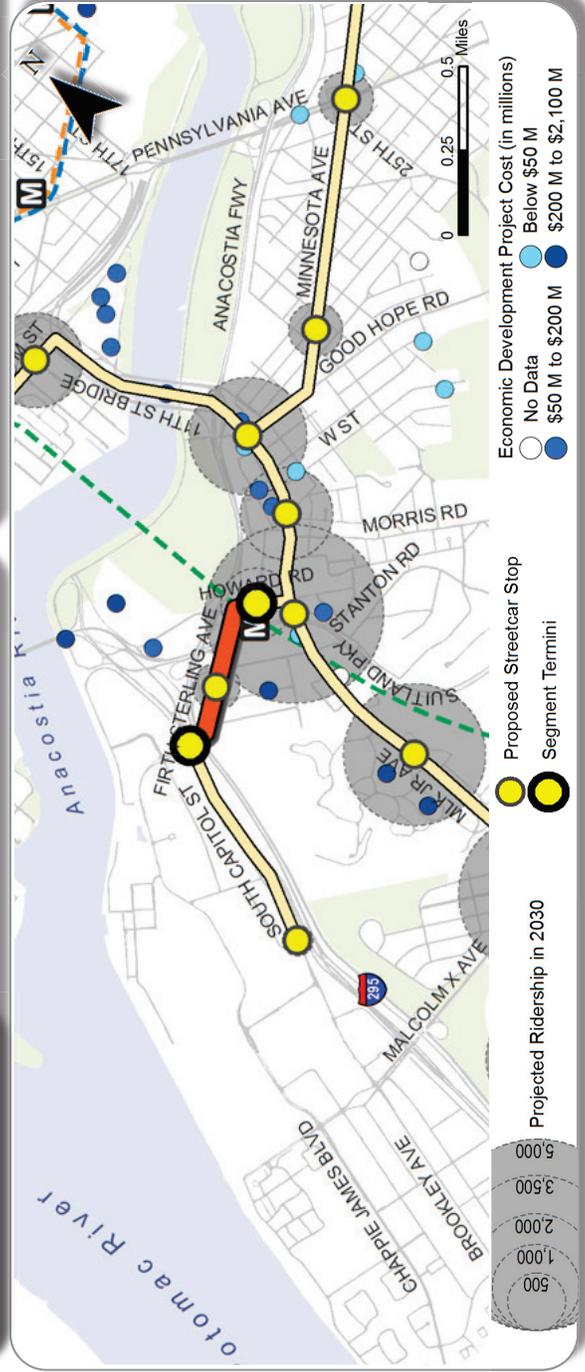
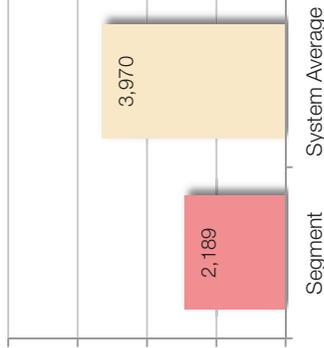
2030 Population per Mile



2030 Employment per Mile



2030 Weekday Ridership per Mile



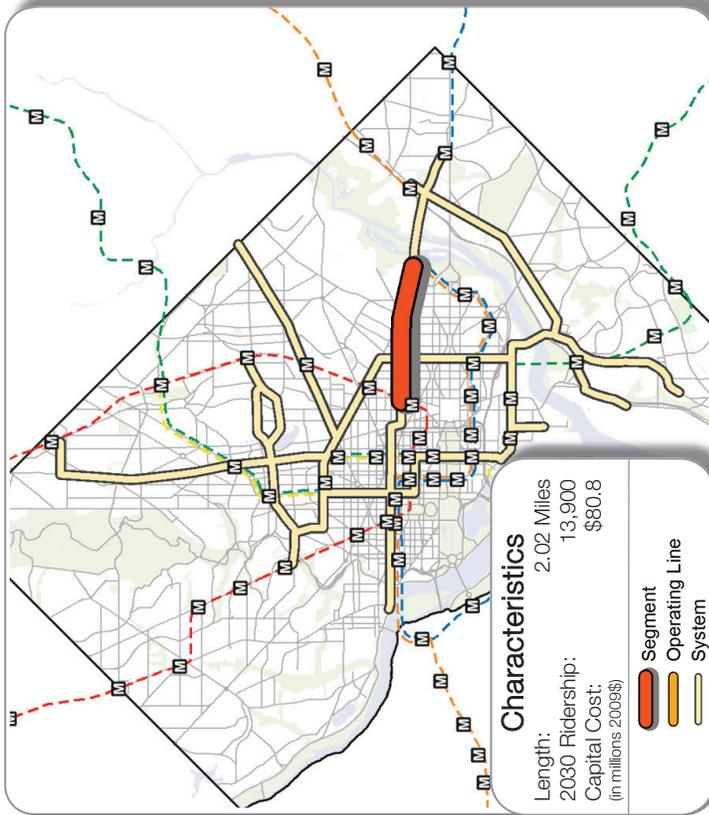
Key Strengths

- Connects Navy Annex and Barry Farms Residential Area to Anacostia Metro Station
- Will be the first streetcar segment for the system providing an opportunity for the public to see and experience streetcar vehicles in operation
- Connects to the first maintenance and storage facility for the system east of the river.

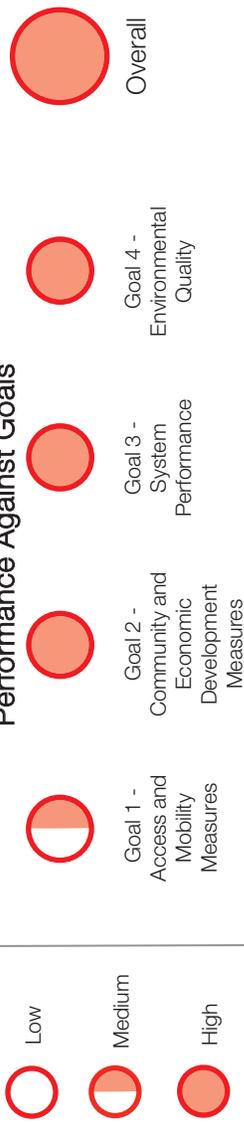
Segment Termini

- Access to Navy Annex
- Anacostia Metrorail Station and connection to Historic Anacostia and Martin Luther King Jr Ave Streetcar

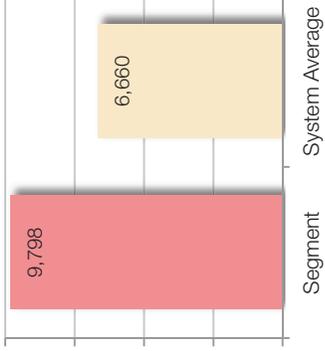
H/Benning



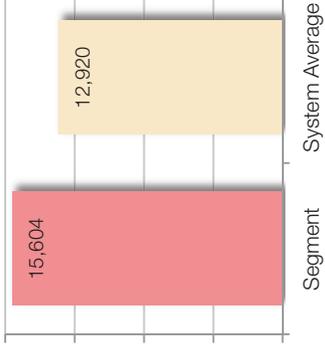
Performance Against Goals



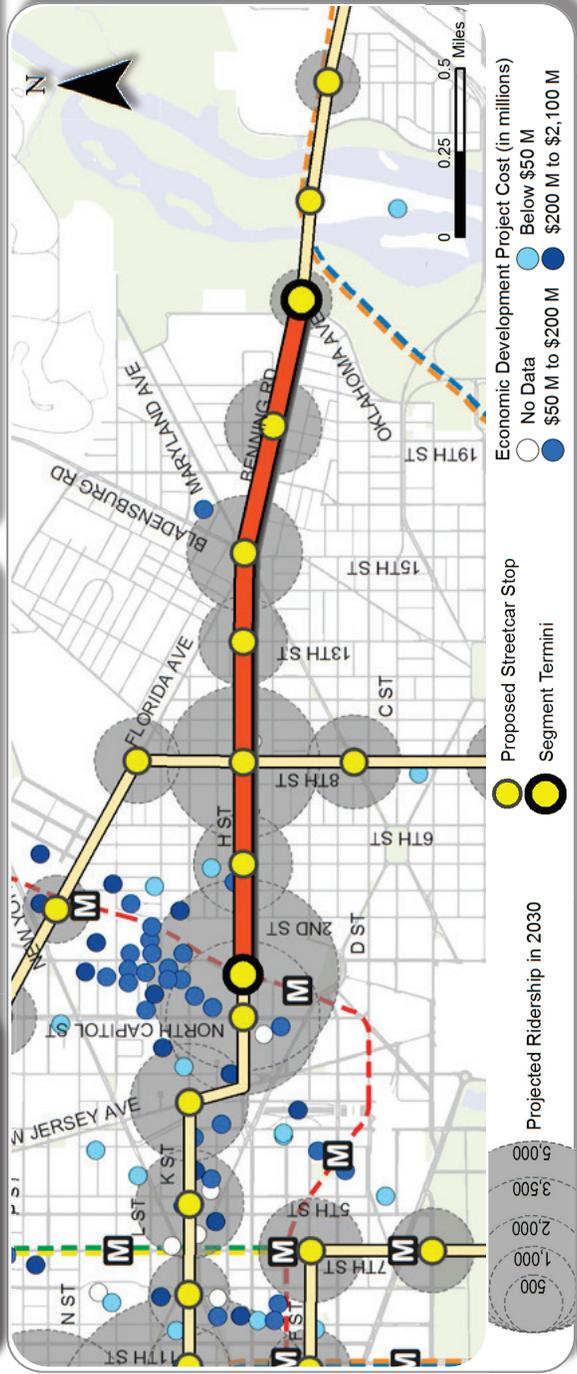
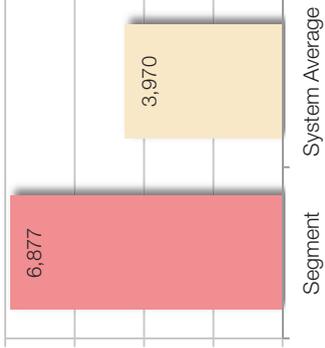
2030 Population per Mile



2030 Employment per Mile



2030 Weekday Ridership per Mile



Key Strengths

- Ridership of nearly 14,000 daily boardings or nearly 7,000 per mile with 2.2% increase in mode share
- Located along a Great Street corridor serving planning initiatives, redevelopment sites, and the H Street commercial district
- Significant travel time savings and increase in carrying capacity by nearly 85%
- Cost-effective, with annual operating cost per annual boarding of about \$1

Segment Termini

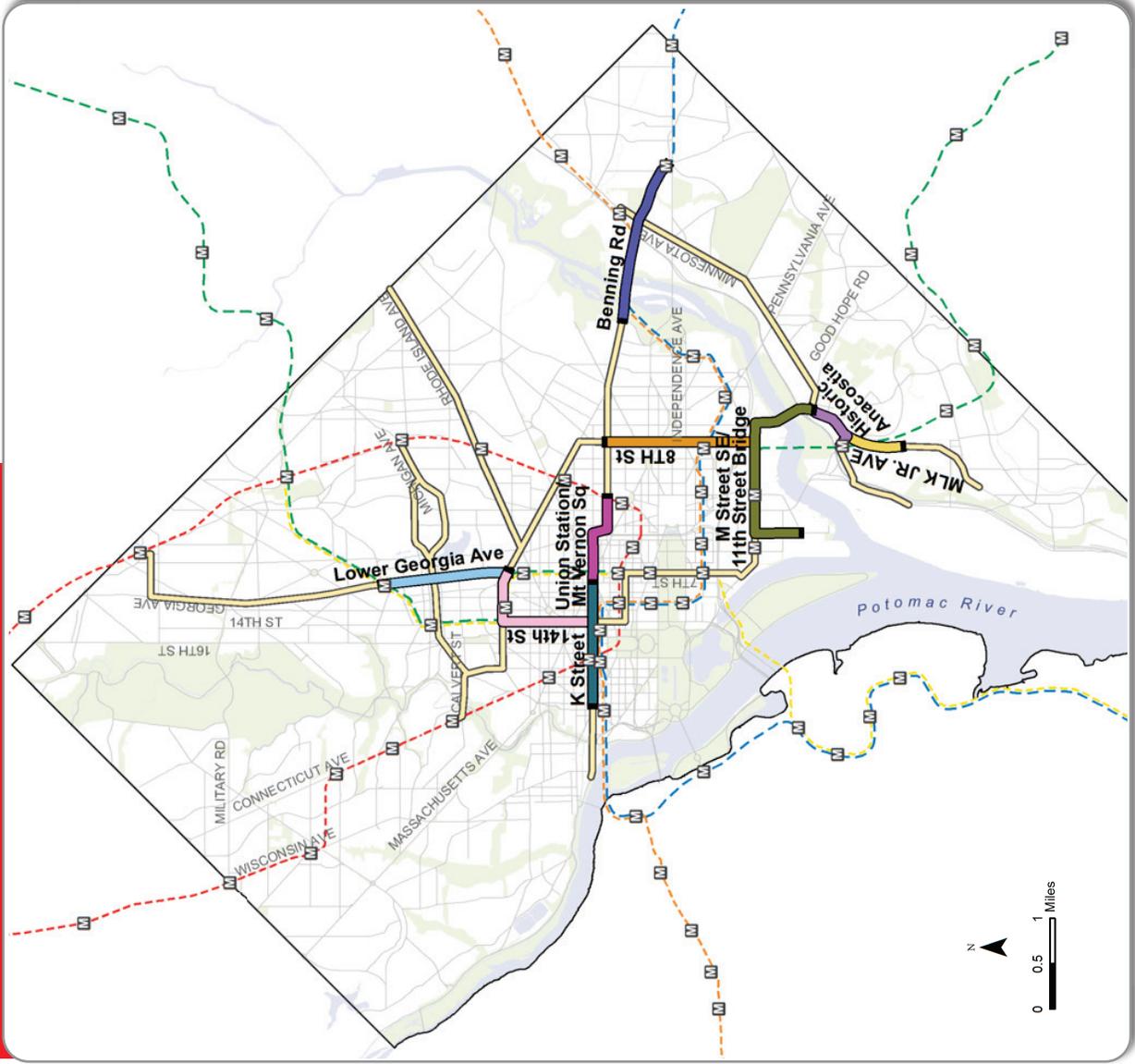
- Union Station/Mount Vernon Square
- RFK Stadium redevelopment area, Spingarn High School, and Spingarn-Langston Recreation Center

STREETCAR SEGMENT PROFILES – PHASE 1

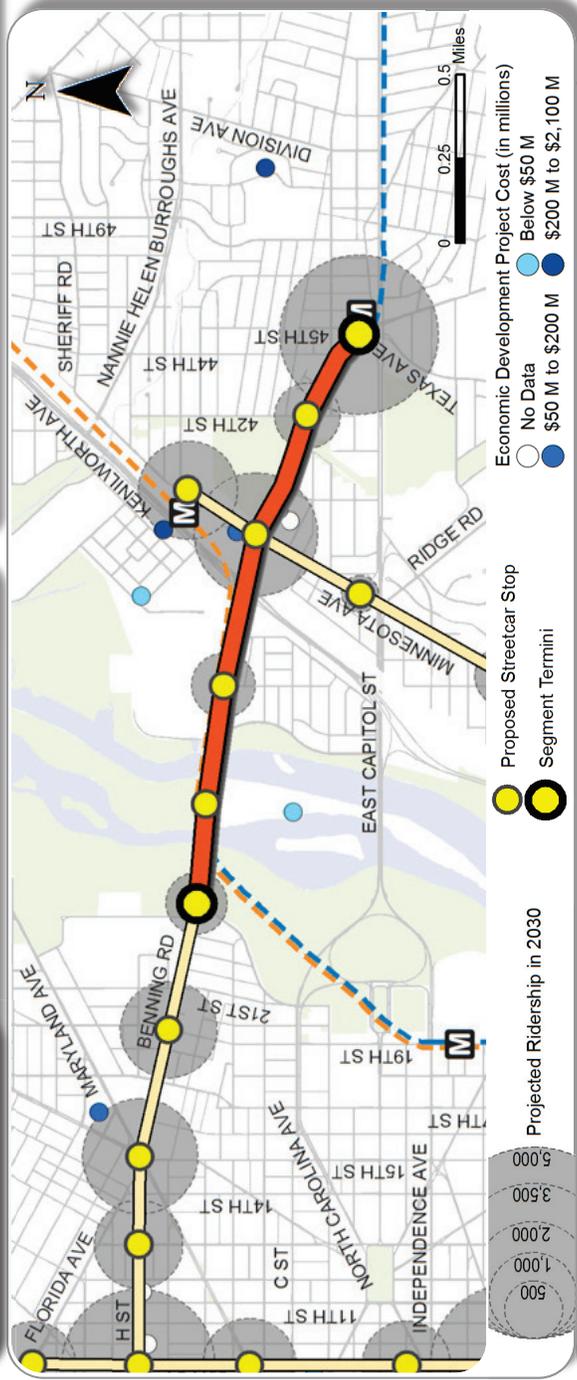
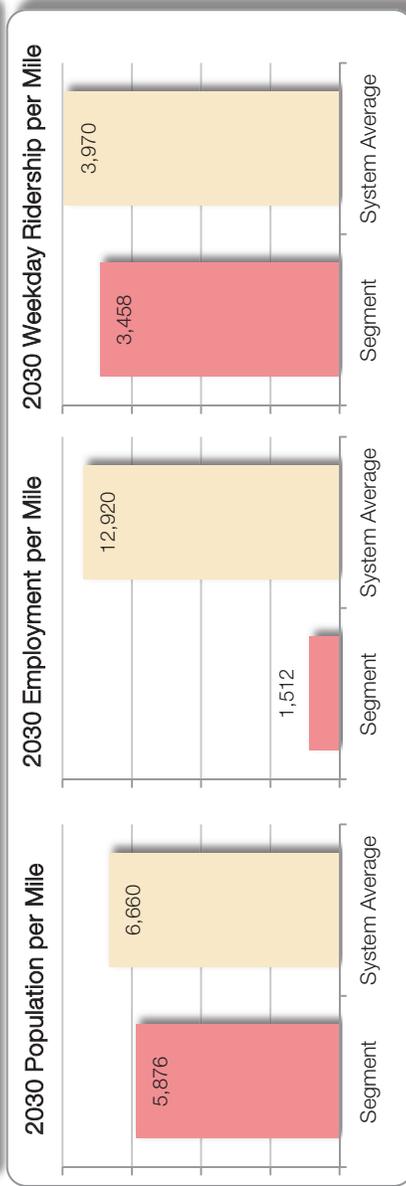
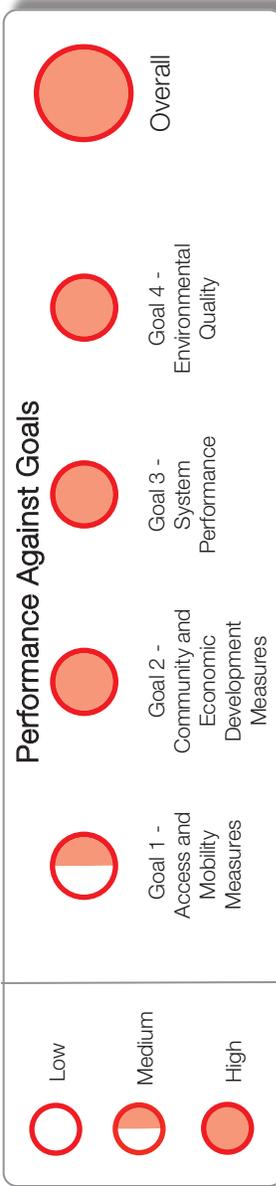
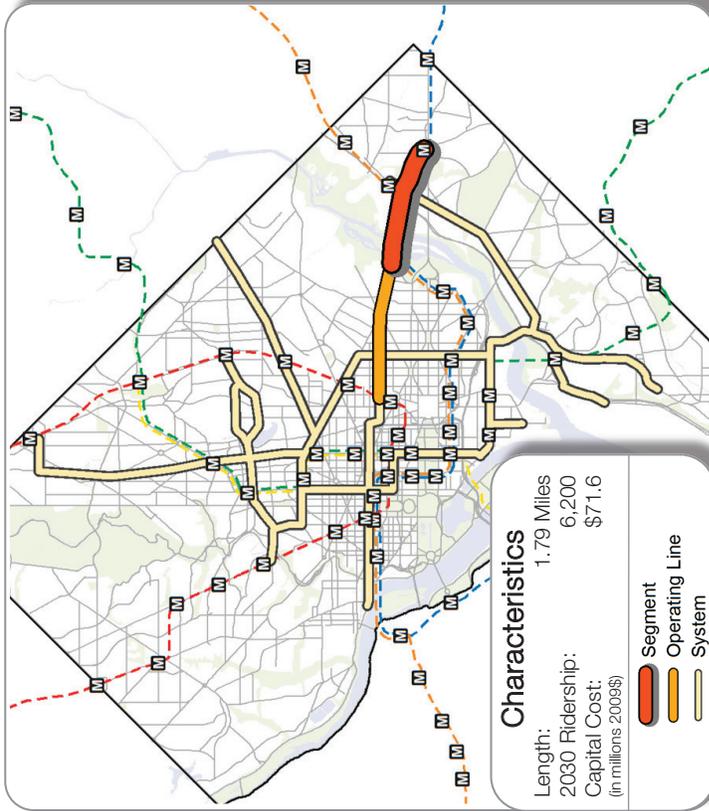
Segment Index

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K Street.....	4-25
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MLK Jr. Avenue.....	4-27
8th Street.....	4-28
14th Street.....	4-29
Lower Georgia Avenue.....	4-30

Phase 1 Streetcar Segments



Benning Road



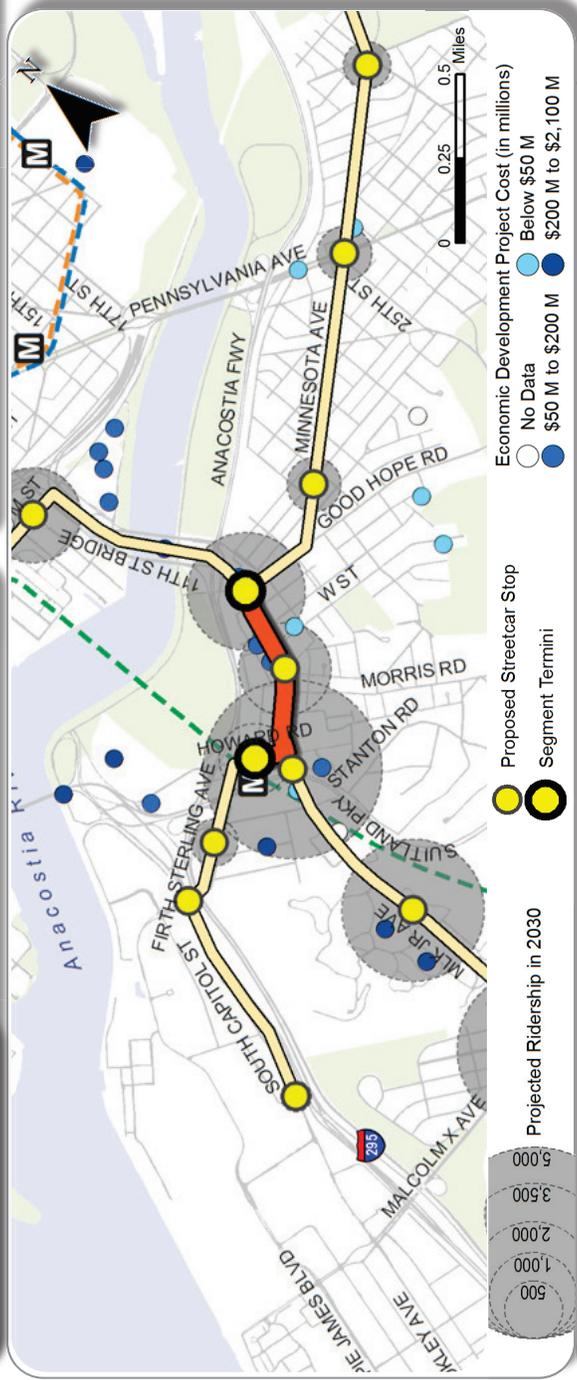
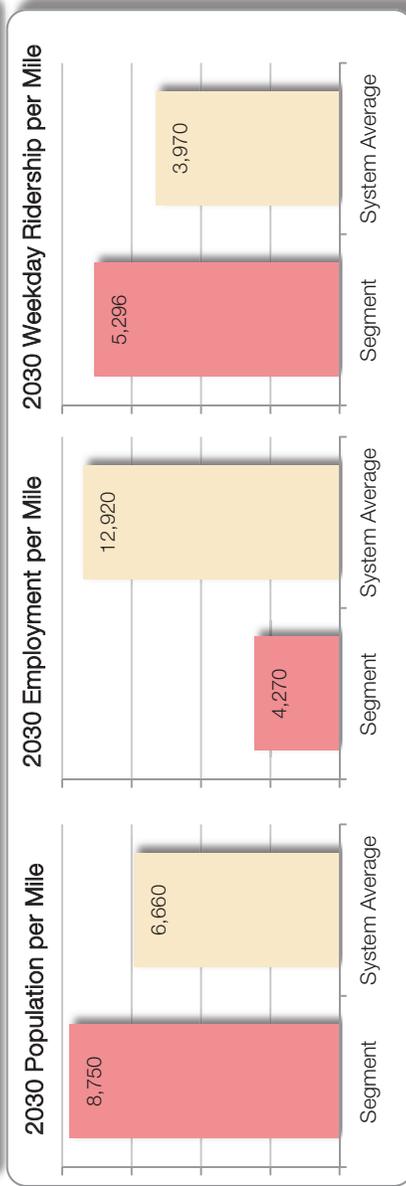
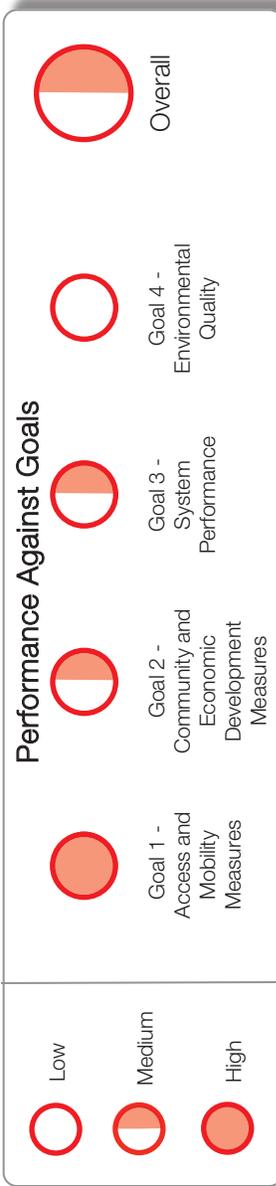
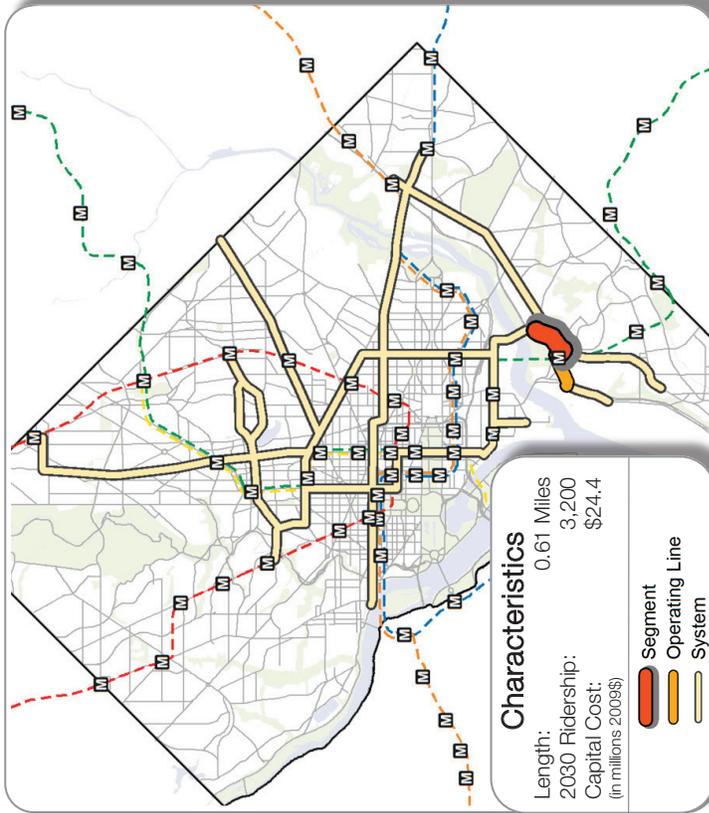
Key Strengths

- Projected ridership of over 6,000 daily boardings or 3,000 daily boardings per mile
- Located along a Great Street corridor and serves planning initiatives and redevelopment
- Connection to Metrorail at two locations
- Connects residential areas east of the Anacostia River to commercial centers and job opportunities west of the Anacostia River

Segment Termini

- RFK Stadium redevelopment area, Spingarn High School, Spingarn-Langston Recreation Center, and connects to H/Benning Streetcar
- Benning Road Metrorail Station and adjacent commercial center

Historic Anacostia



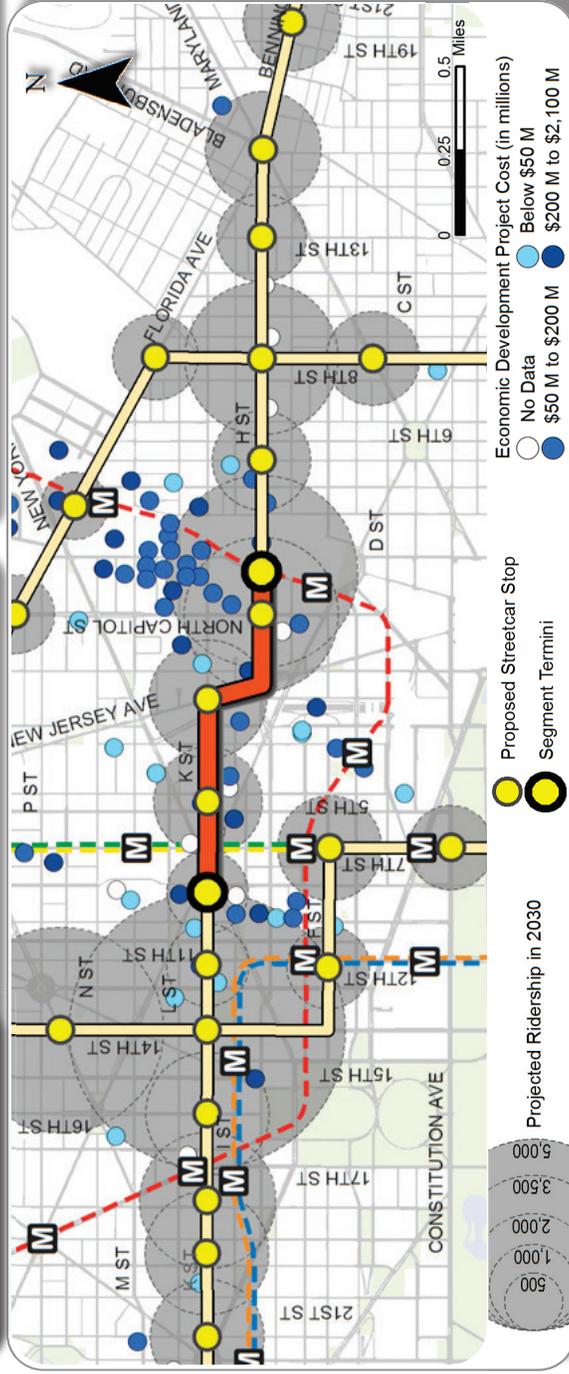
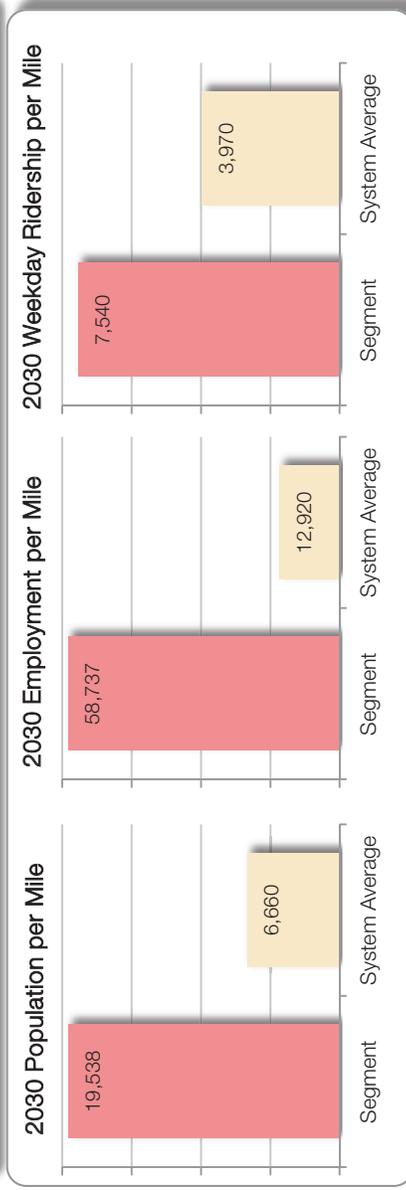
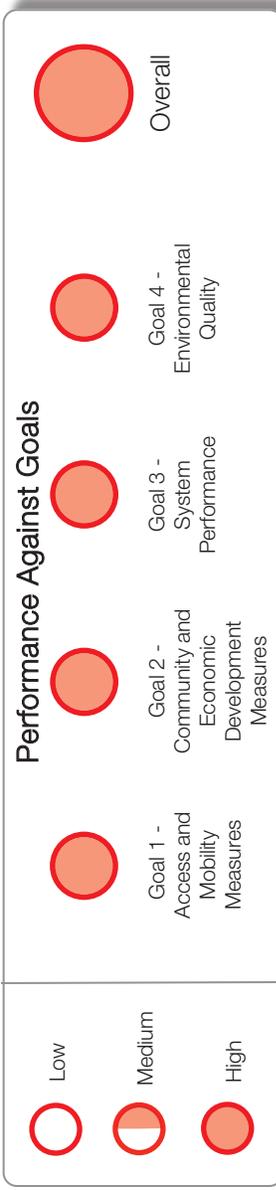
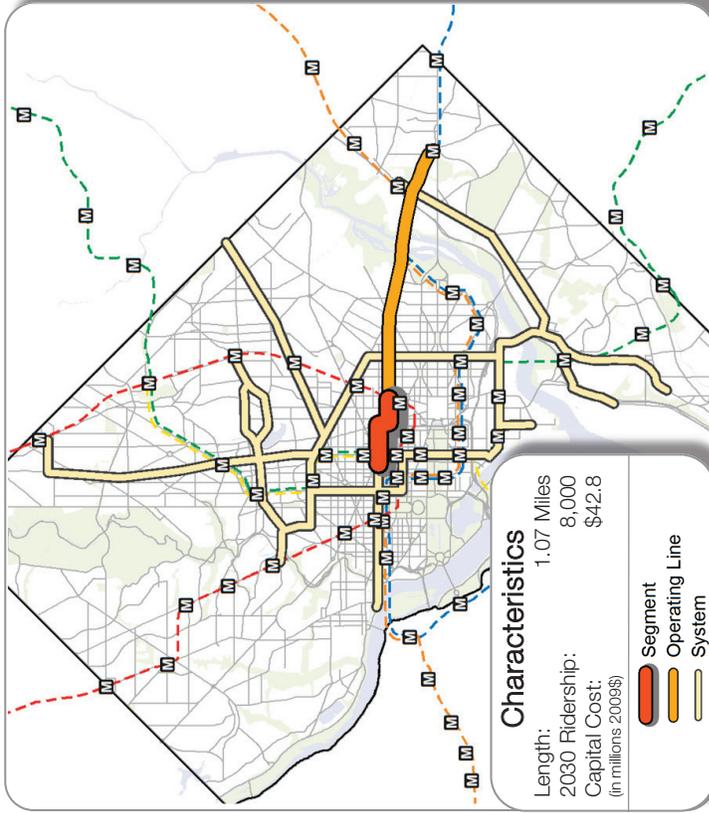
Key Strengths

- Ridership of 3,000 daily boardings or about 5,000 daily boardings per mile (in 2030)
- Connects Historic Anacostia commercial district to the Anacostia Metrorail Station
- Connects to Anacostia Initial Line Segment with connections to Navy Annex area

Segment Termini

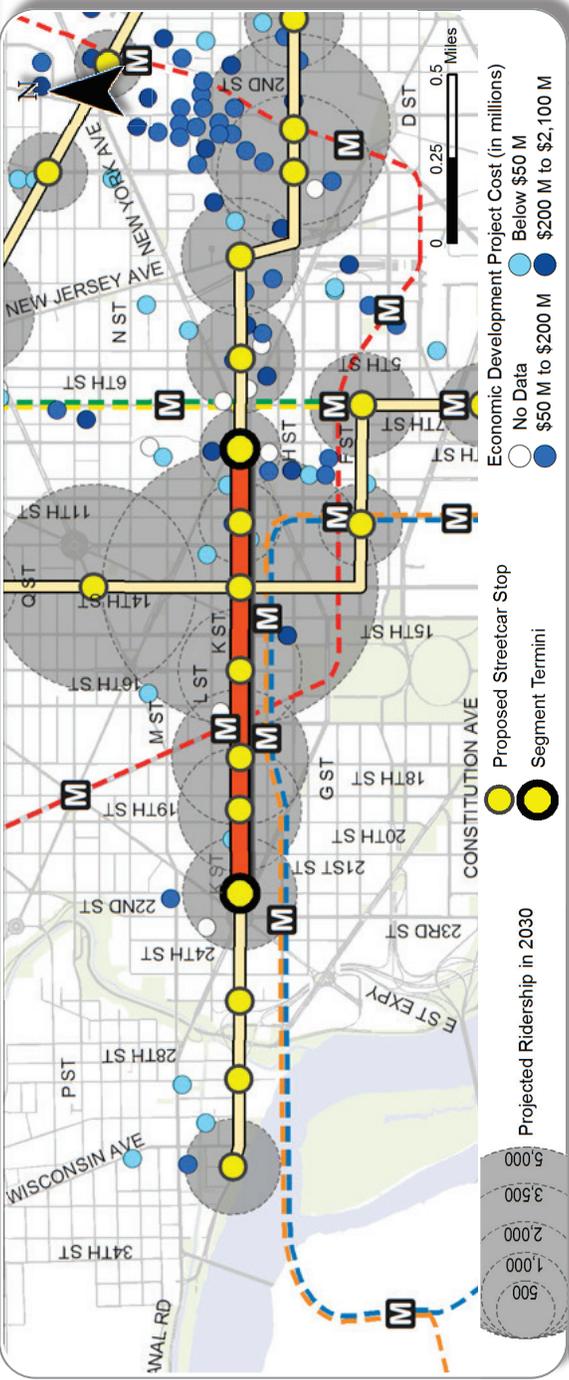
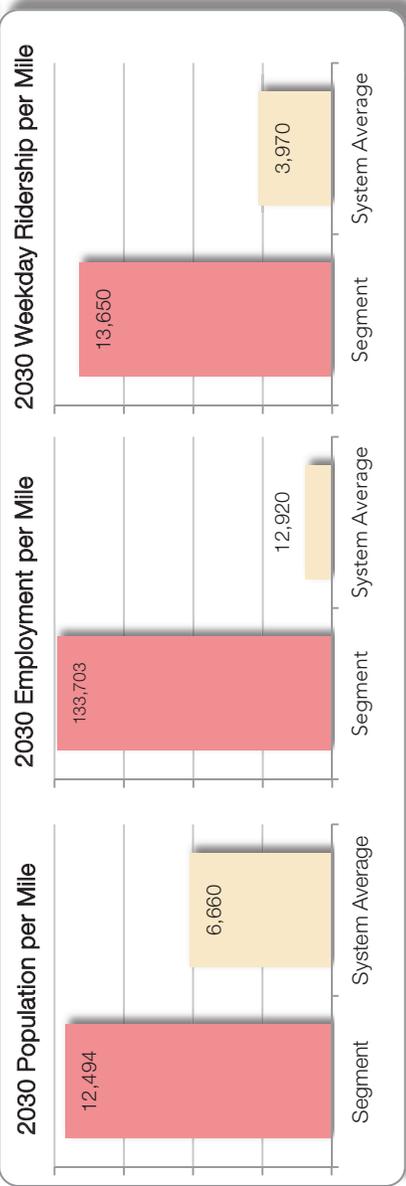
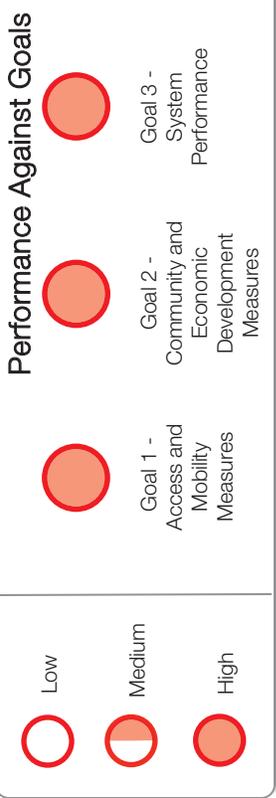
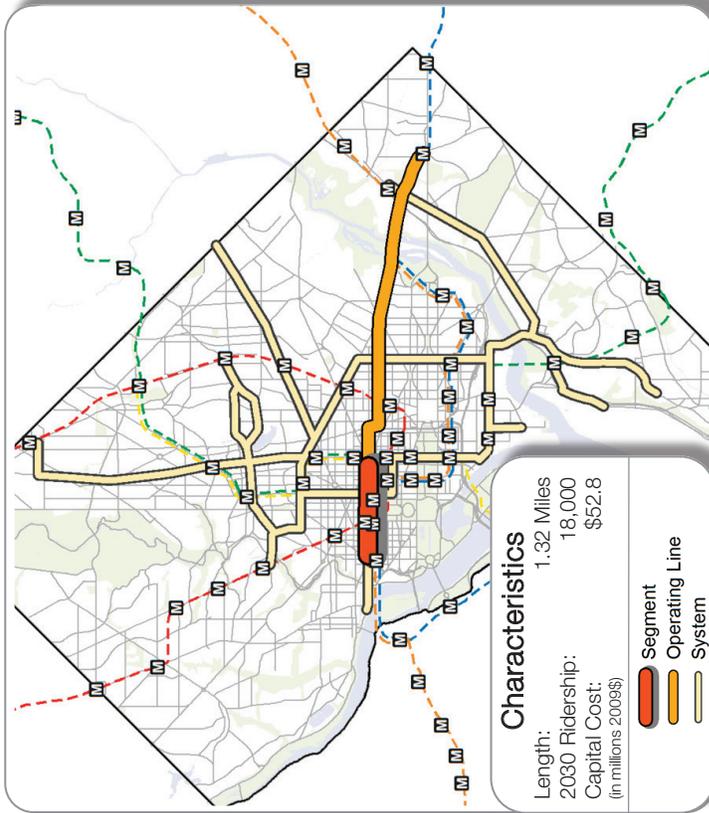
- Anacostia Metrorail Station and connects to Anacostia Initial Line Segment Streetcar
- Good Hope Road/11th Street Bridge and Historic Anacostia commercial business district

Union Station/Mount Vernon Square



- Key Strengths**
- Projected ridership of 8,000 daily boardings or over 7,000 per mile with increase in mode share by 2.4%
 - Cost-effective, with an estimated annual operating cost/annual boarding of about \$1
 - Connects Convention Center with Union Station intermodal center
- Segment Termini**
- Convention Center and Mount Vernon Square
 - Union Station Intermodal Transit Center and connects to H/Benning Streetcar

K Street



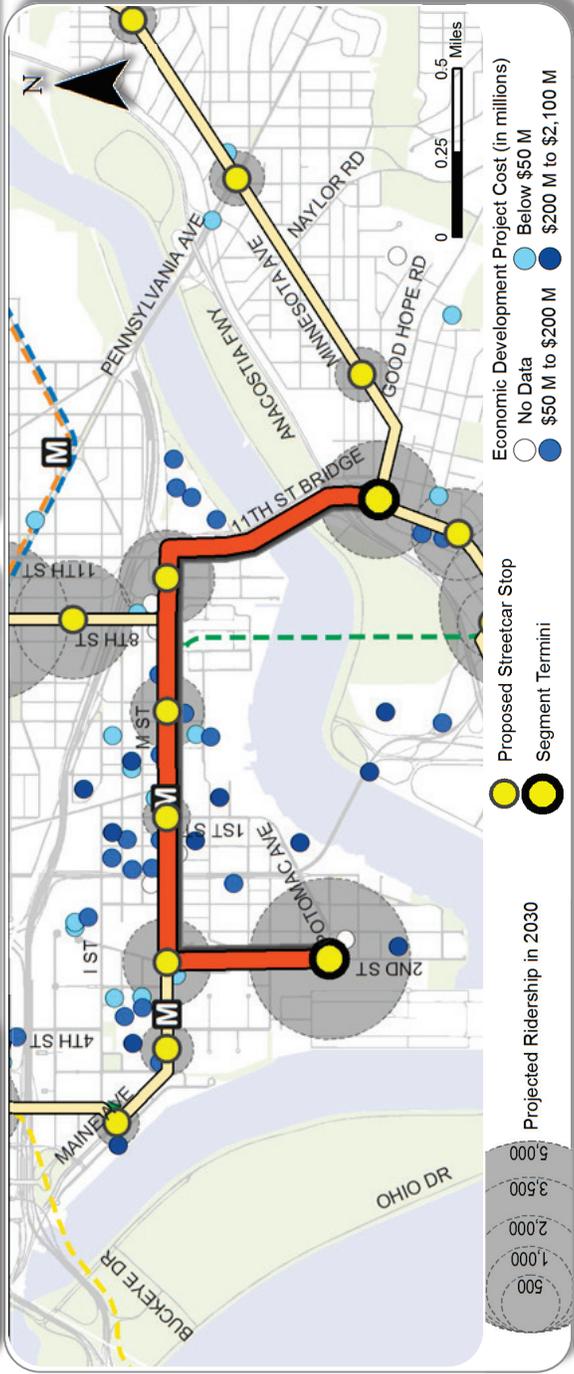
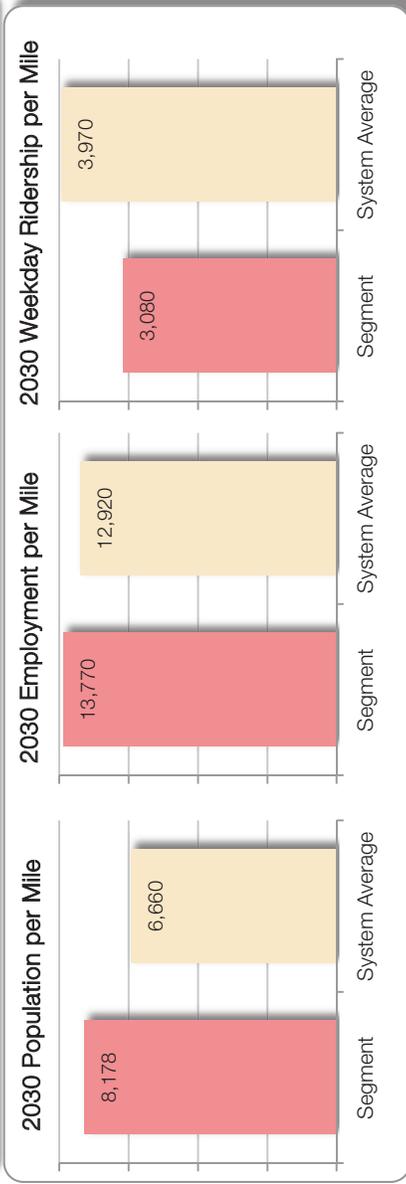
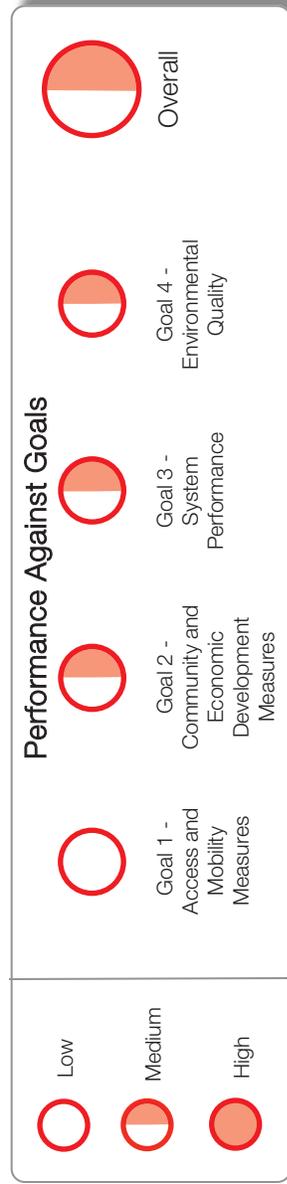
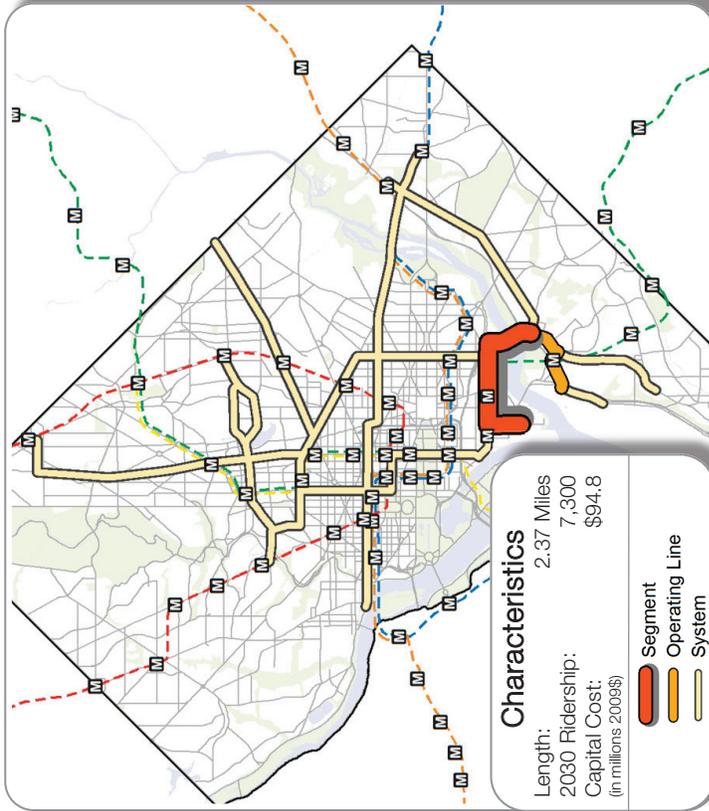
Key Strengths

- Serves employment and population with over 175,000 jobs (2030) and over 12,000 in population per mile (2030)
- Projected ridership of 18,000 daily boardings or over 13,000 per mile with increase in mode share by 2.4%
- Cost-effective, with an estimated annual operating cost/annual boarding of about \$1
- Utilizes K Street Transitway transit only lanes and connects to all 5 Metrorail lines

Segment Termini

- Washington Circle and GWU
- Convention Center/Mount Vernon Square

M Street SE/11th Street Bridge



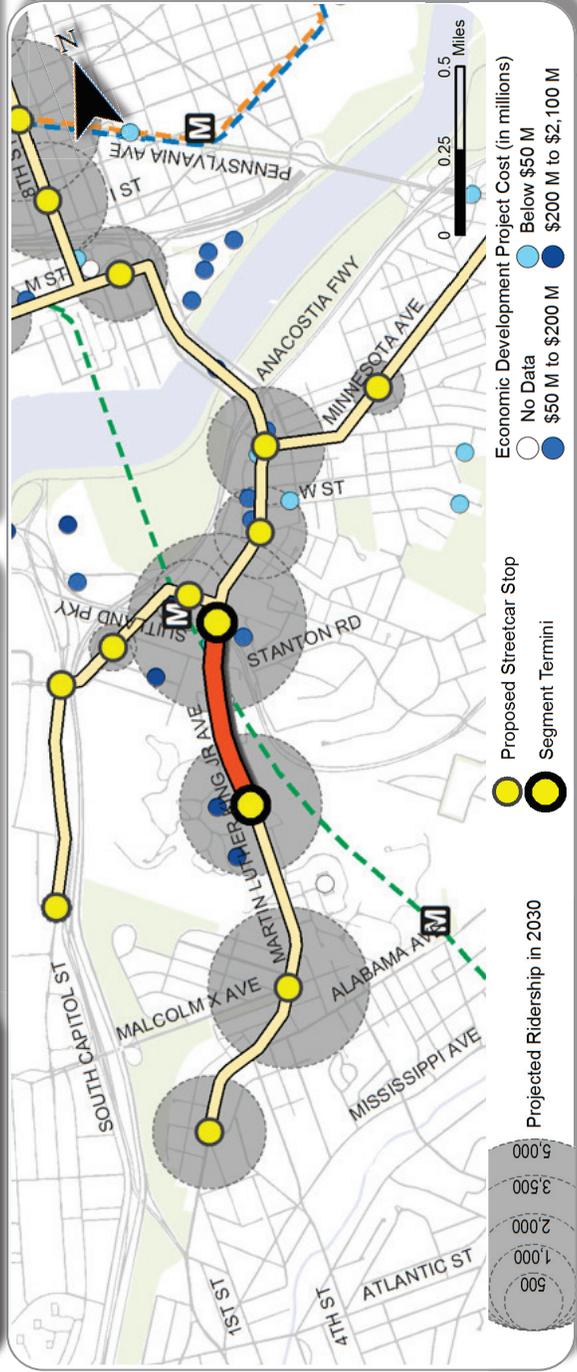
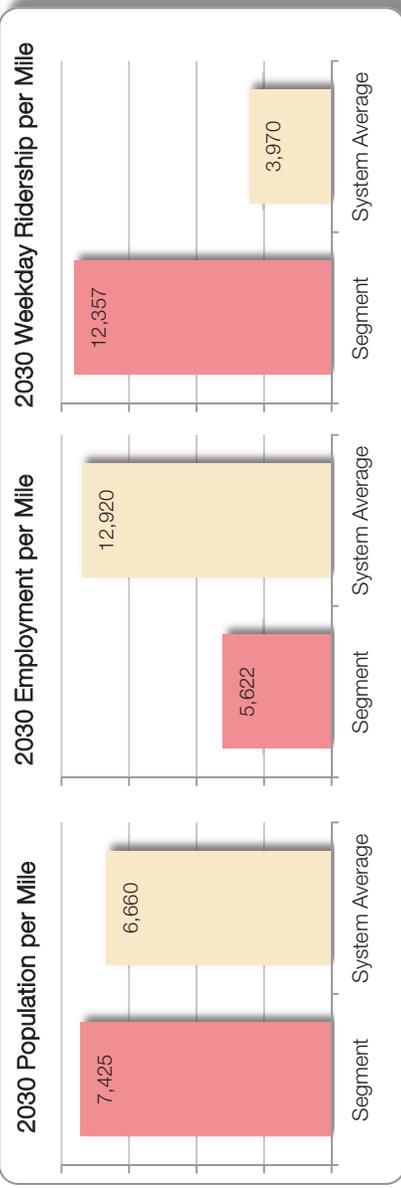
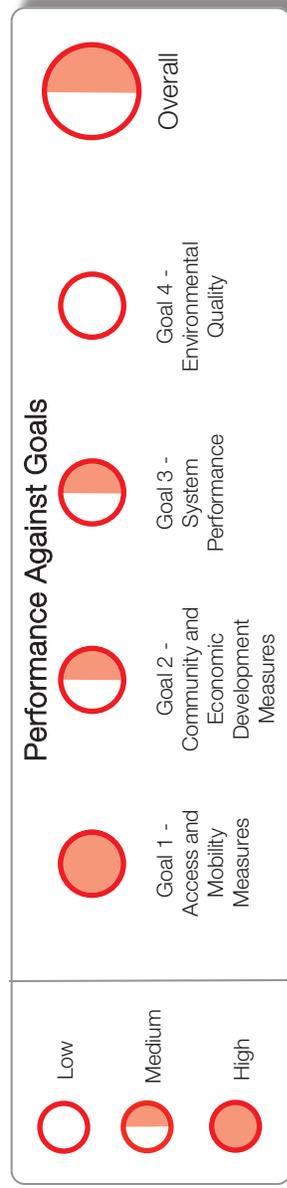
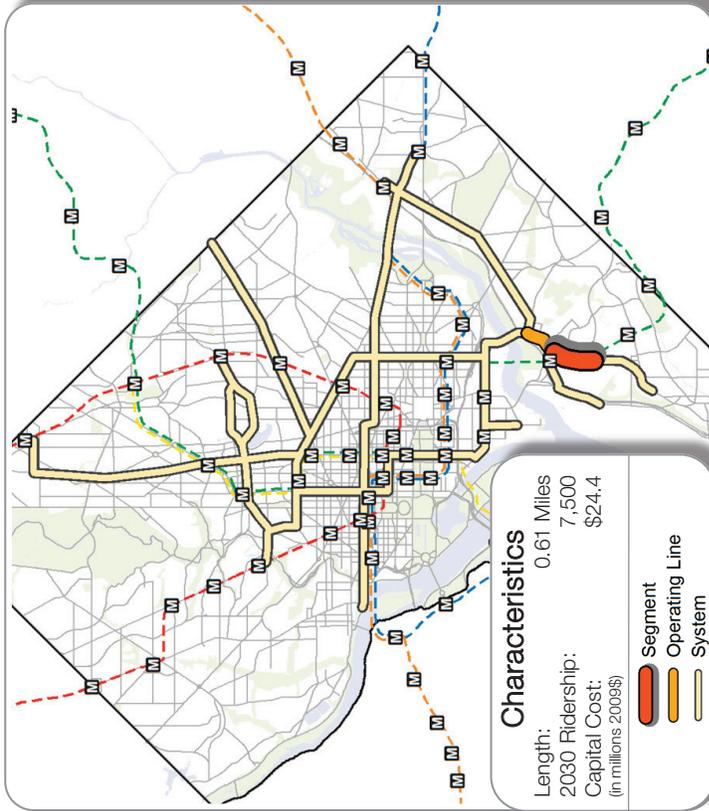
Key Strengths

- Serves an emerging Anacostia Waterfront and provides river crossing
- Provides transit travel time savings of over 40% and mode share increase of over 2.8%
- Cost-effective, with annualized capital cost per annual new boarding of about \$4
- Opportunity to coordinate Streetcar construction with 1st St Bridge reconstruction
- Serves stadium and adjacent redevelopment
- Provides access to Buzzard Point for redevelopment and/or vehicle storage

Segment Termini

- Historic Anacostia business district and connects to Historic Anacostia Streetcar
- Buzzard Point and Capital Riverfront redevelopment area

MLK Jr. Avenue



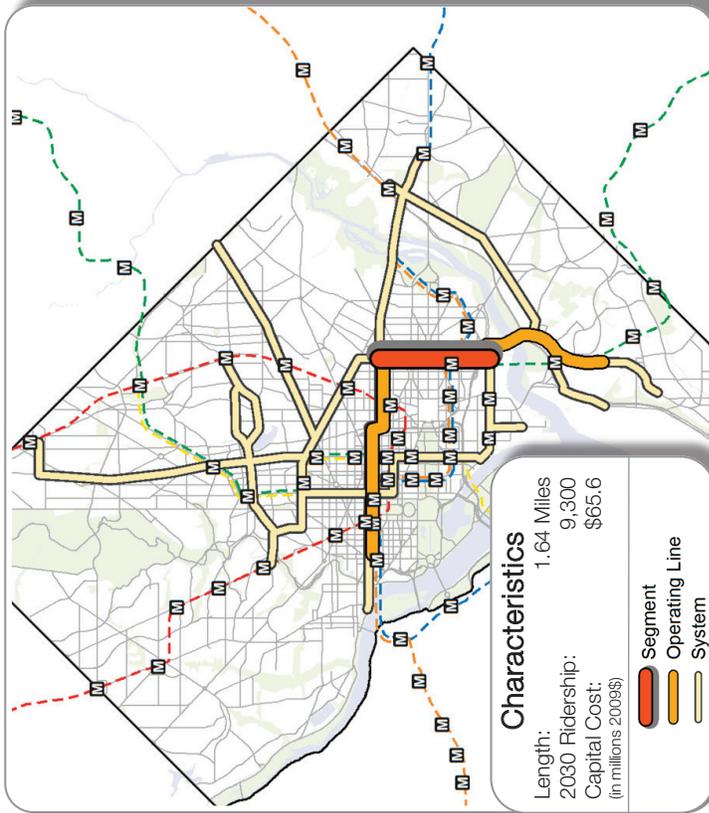
Key Strengths

- Projected ridership of over 7,000 daily boardings or over 12,000 daily boardings per mile with 2.2% increase in mode share
- Serves future Department of Homeland Security HQ site with 14,000 new employees
- Located along a Great Street corridor serving planning initiatives
- Cost-effective, with annual operating cost per annual boarding of < \$1 and annualized capital cost per annual new boarding of about \$5

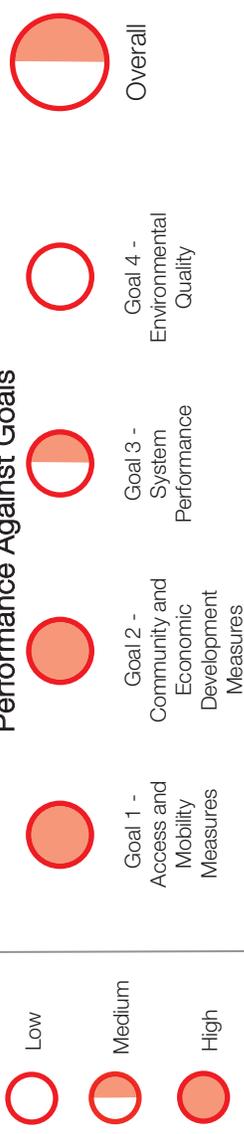
Segment Termini

- St. Elizabeths Hospital Campus and Future DHS Headquarters Site
- Anacostia Metrorail Station and connects to Historic Anacostia Streetcar

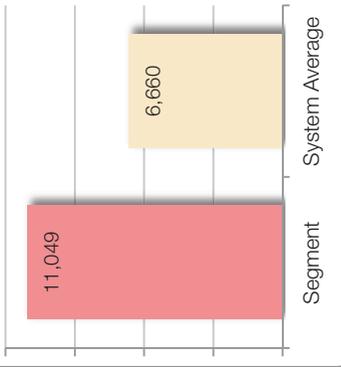
8th Street



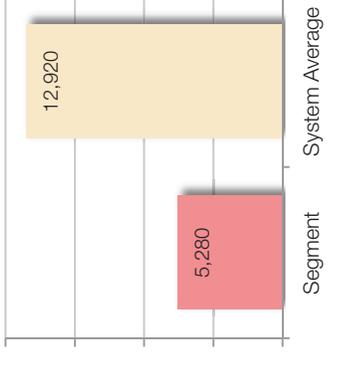
Performance Against Goals



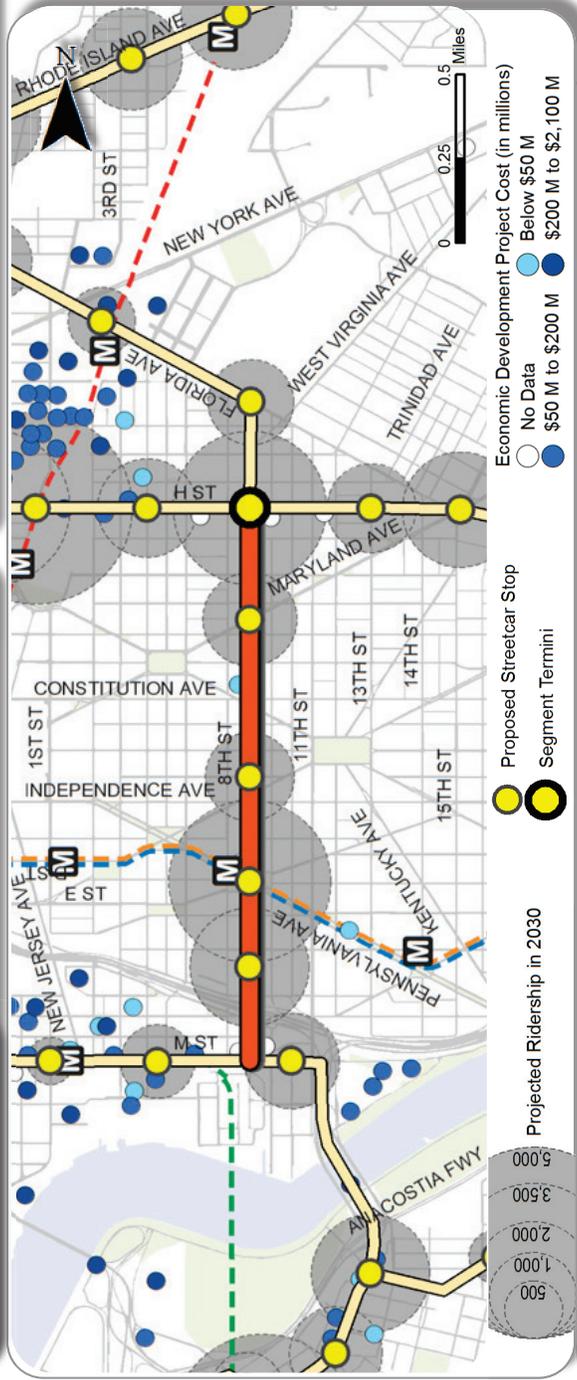
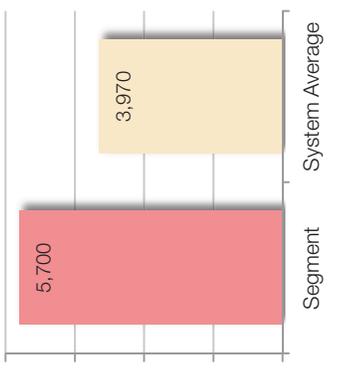
2030 Population per Mile



2030 Employment per Mile



2030 Weekday Ridership per Mile

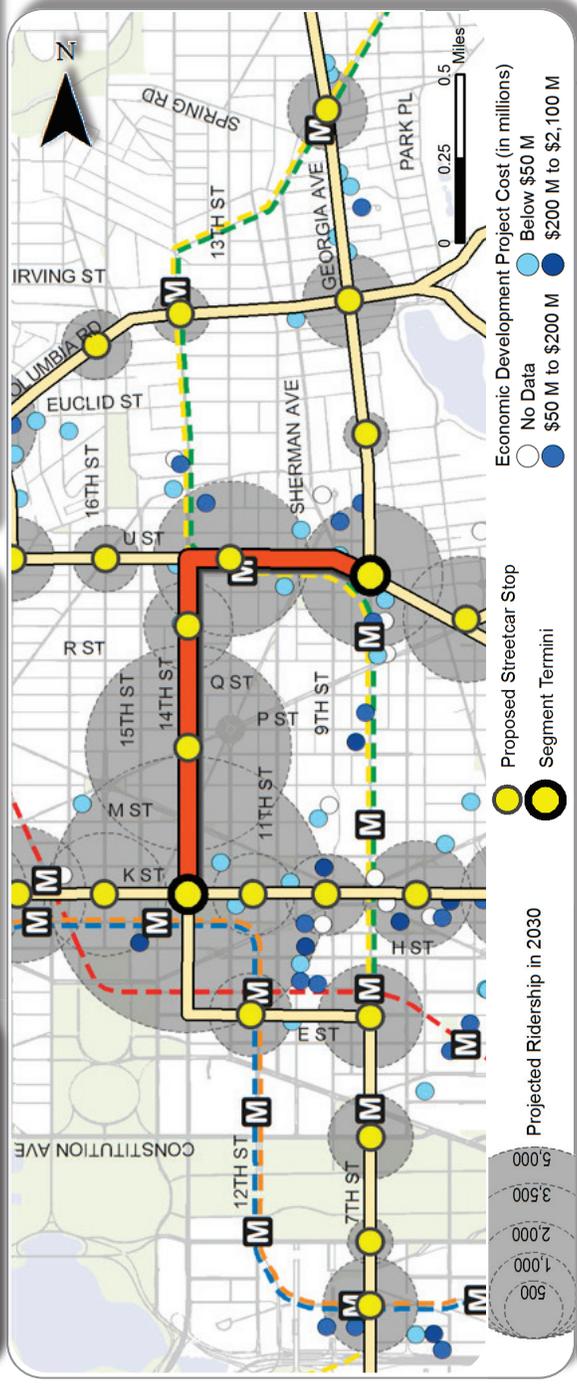
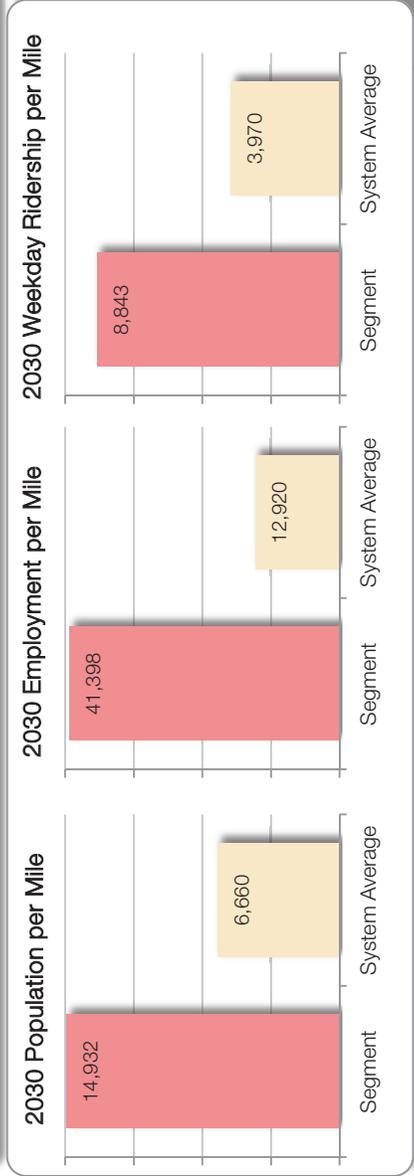
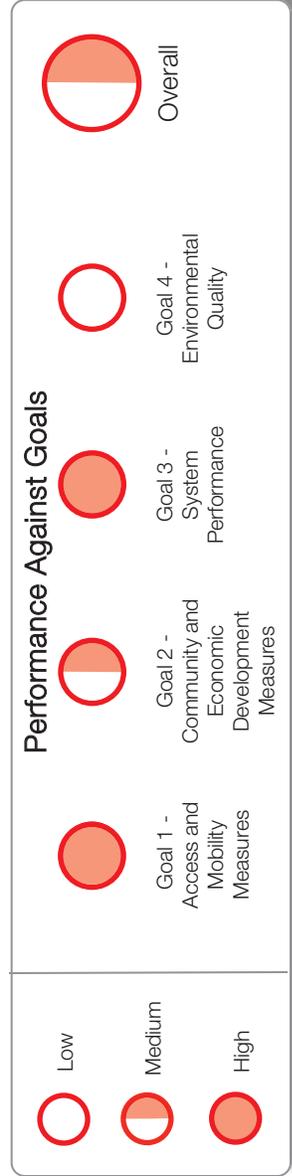
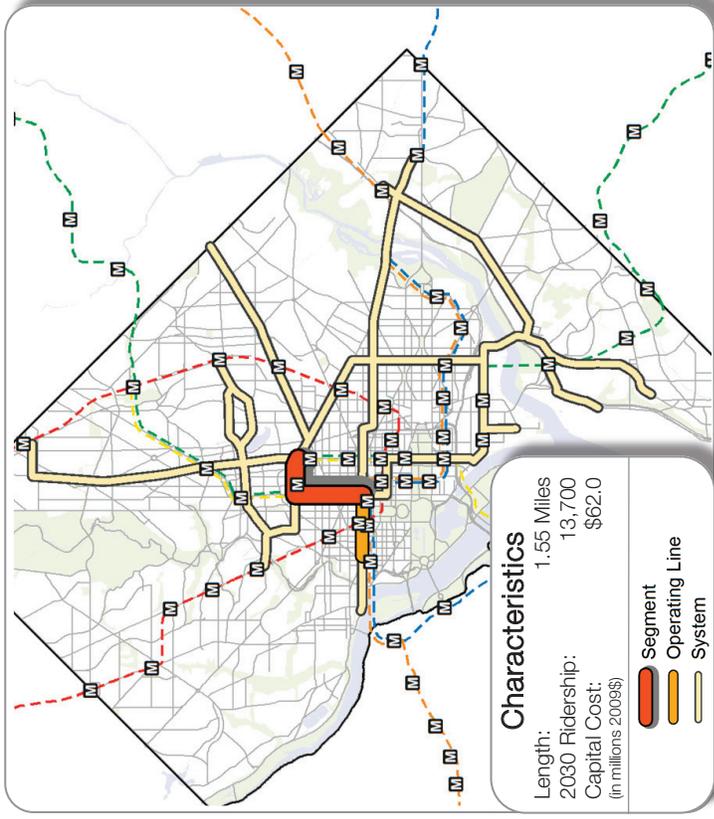


Key Strengths

- Projected ridership of over 9,000 daily boardings or nearly 6,000 daily boardings per mile
- Connects Barracks Row commercial area and the Navy Yard with the revitalizing H Street NE Commercial District and Eastern Market
- Serves redevelopment areas near the Anacostia waterfront.
- Provides north-south connectivity in Phase 1

Segment Termini

- Navy Yard/Barracks Row commercial area and connection to M Street/11th Street Bridge Streetcar
- H Street commercial area and connection to H/Benning Streetcar



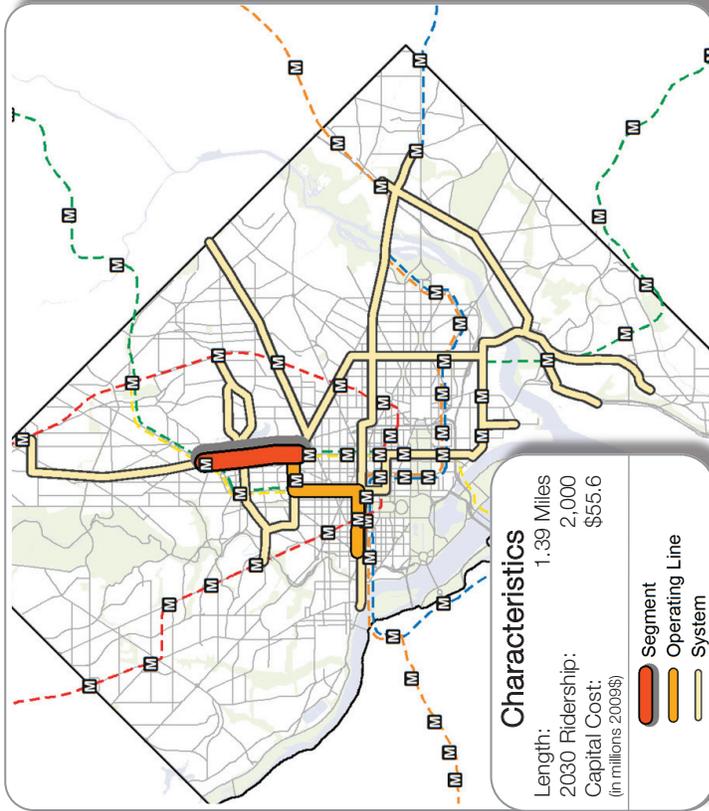
Key Strengths

- Serves nearly 15,000 in population per mile
- Projected ridership of over 13,000 daily boardings and increases mode share by 2.2%
- Serves strategic neighborhoods and planning initiatives
- Cost-effective, with annual operating cost per annual boarding of < \$1
- Increases corridor transit carrying capacity by approximately 107%

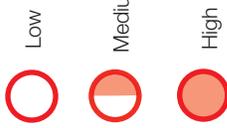
Segment Termini

- McPherson Square Metrorail Station and connection to K Street Transitway
- Georgia Avenue/Florida Avenue/Shaw-Howard University Metrorail Station

Lower Georgia Avenue



Performance Against Goals



Goal 1 - Access and Mobility Measures

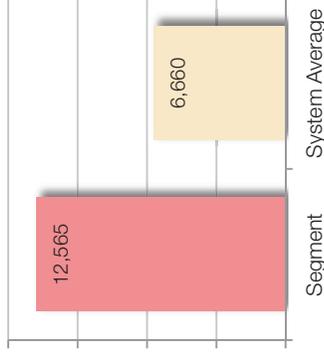
Goal 2 - Community and Economic Development Measures

Goal 3 - System Performance

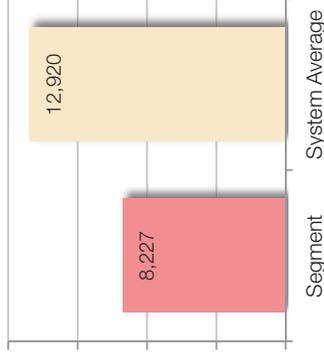
Goal 4 - Environmental Quality

Overall

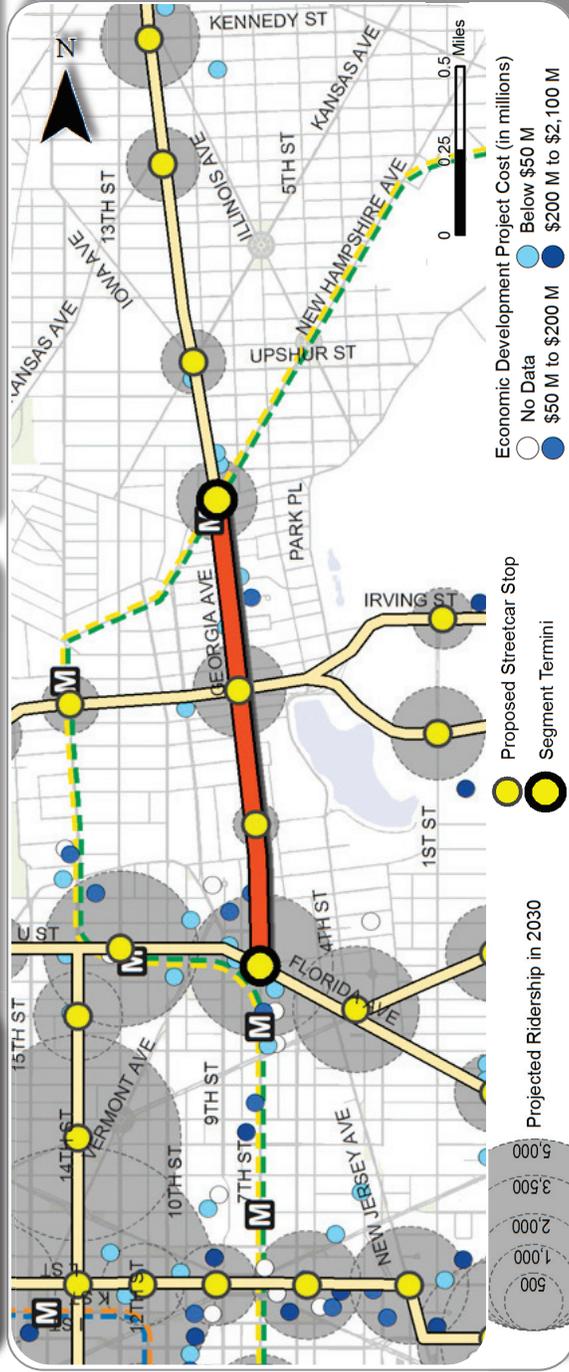
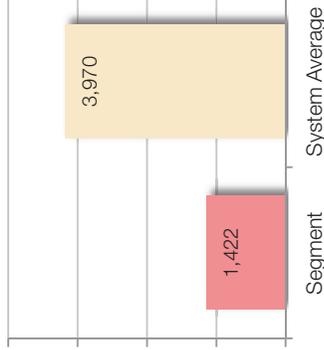
2030 Population per Mile



2030 Employment per Mile



2030 Weekday Ridership per Mile



Key Strengths

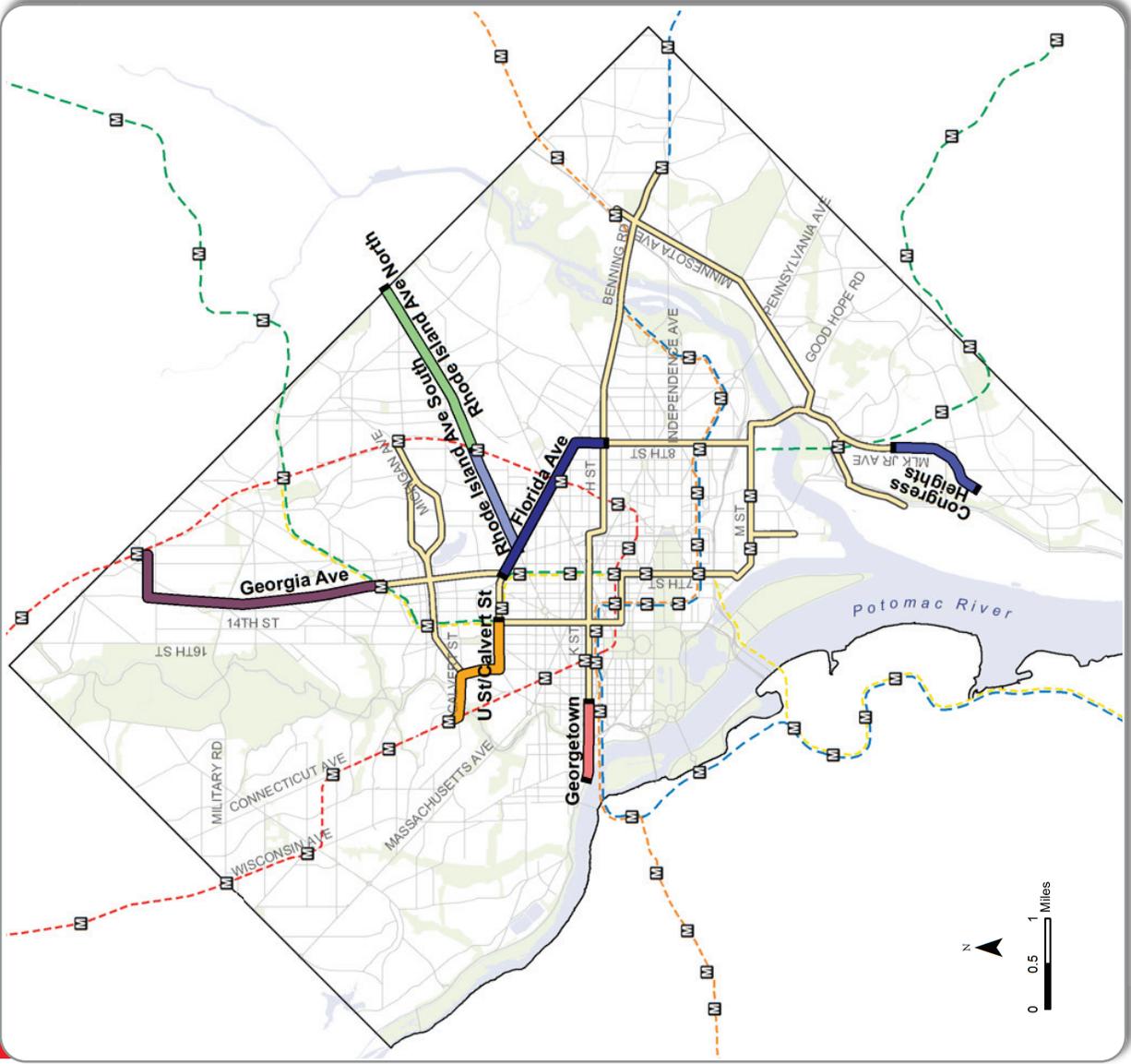
- Serves nearly 13,000 in population per mile (2030)
- Located along a Great Street corridor serving strategic neighborhoods and planning initiatives
- Increases corridor transit carrying capacity by up to 113%
- Serves Howard University and Howard University Hospital
- Segment Termini**
- Shaw/Howard University Metrorail Station and connects to U Street/Calvert Street Streetcar
- Georgia Ave-Petworth Metrorail Station

STREETCAR SEGMENT PROFILES – PHASE 2

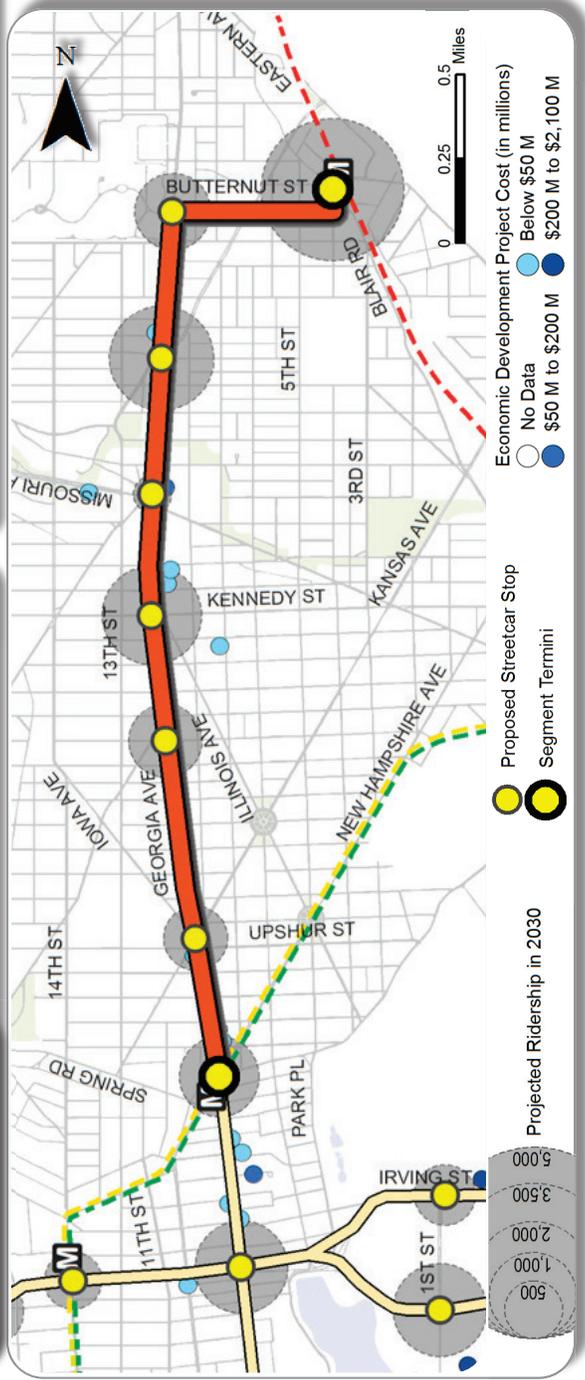
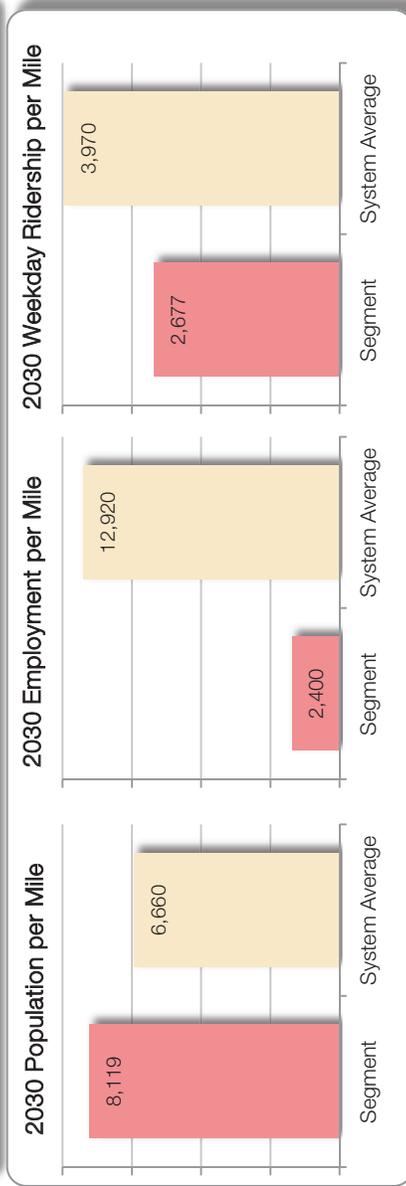
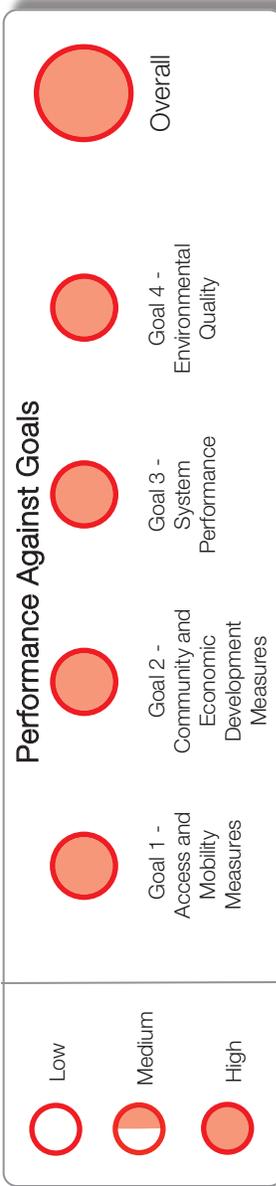
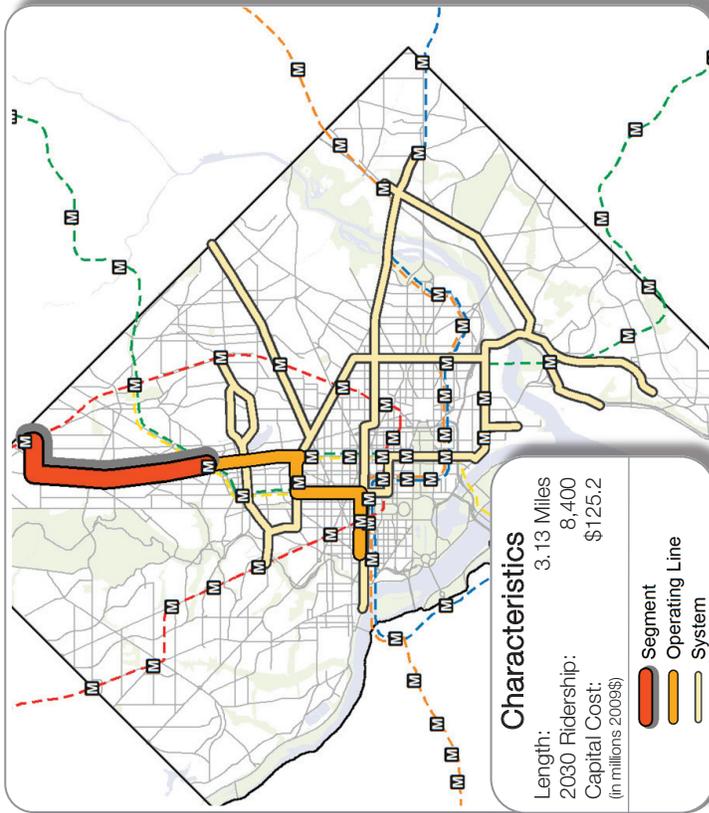
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Georgetown.....	4-38

Phase 2 Streetcar Segments



Georgia Avenue



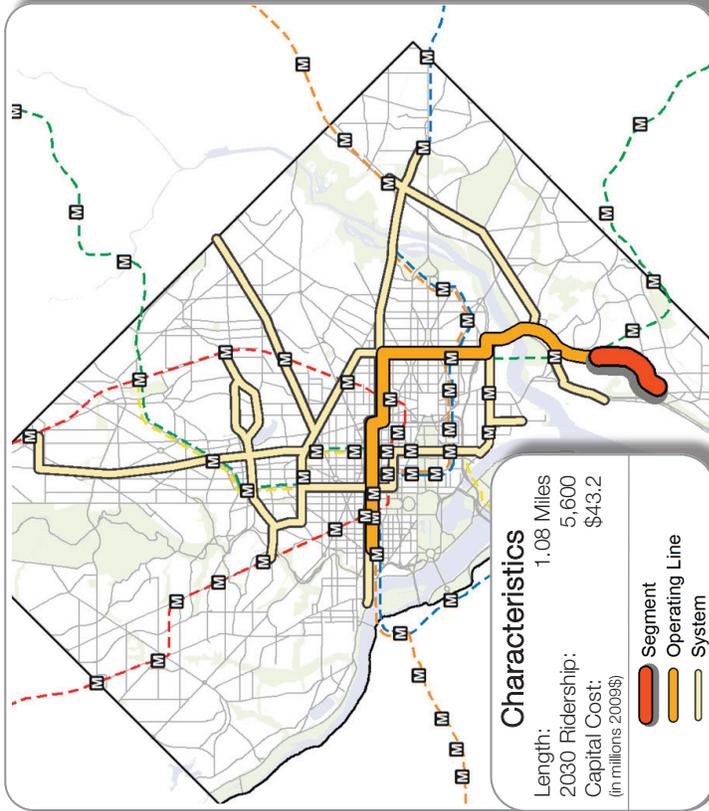
Key Strengths

- Projected ridership of 8,000 daily boardings or nearly 3,000 daily boardings per mile
- Serves high bus ridership corridor and increases corridor transit capacity by 113%
- Located along a Great Street corridor serving strategic neighborhoods, planning initiatives, and Walter Reed redevelopment
- Serves neighborhoods that are not well served by existing Metrorail system

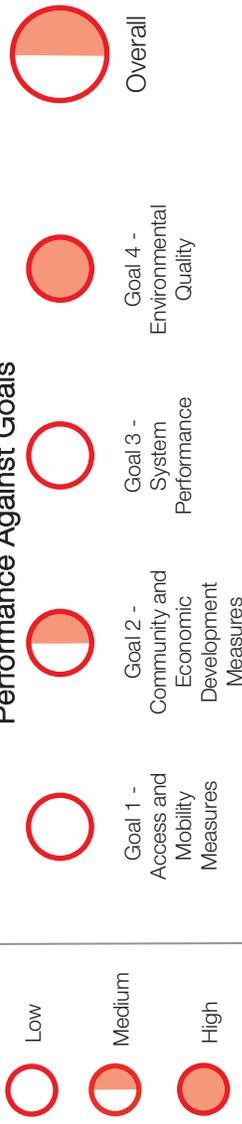
Segment Termini

- Georgia Ave-Petworth Metrorail Station and connection to Lower Georgia Ave Streetcar
- Takoma Metrorail Station

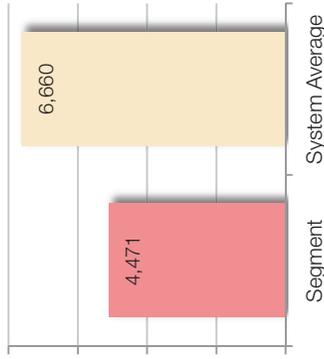
Congress Heights



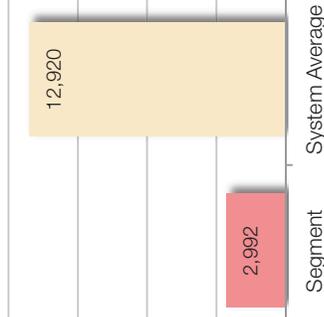
Performance Against Goals



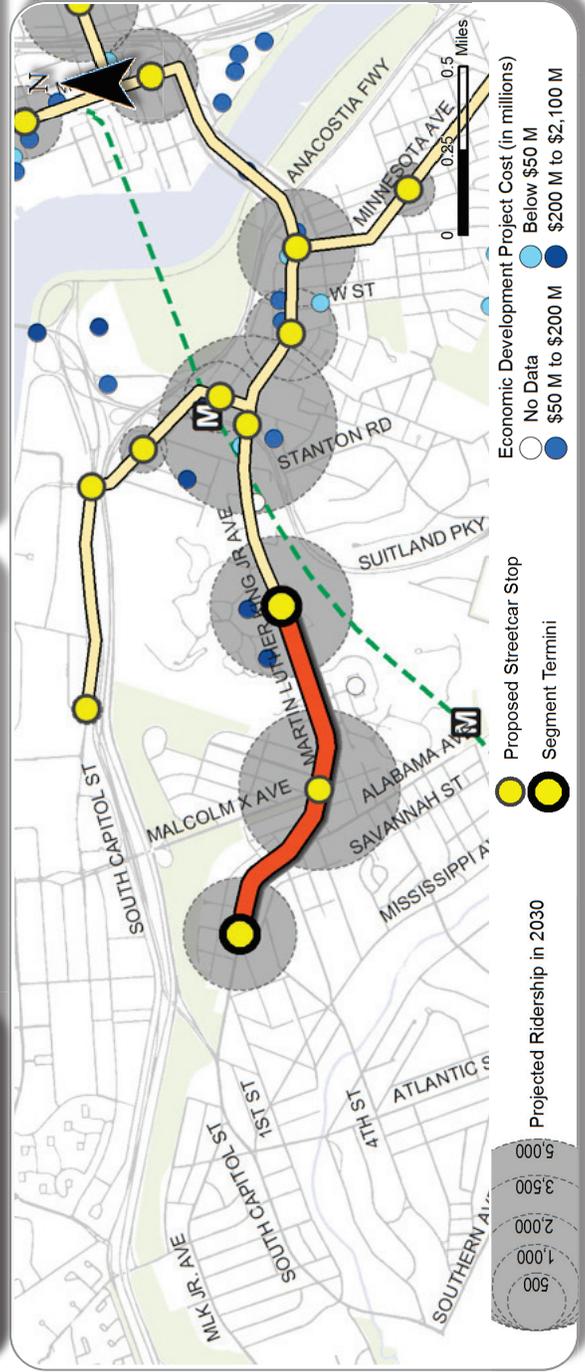
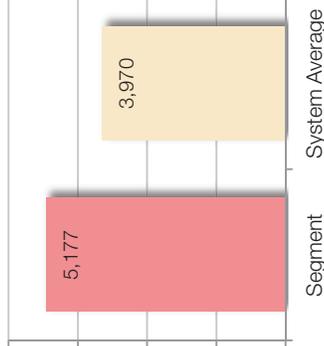
2030 Population per Mile



2030 Employment per Mile



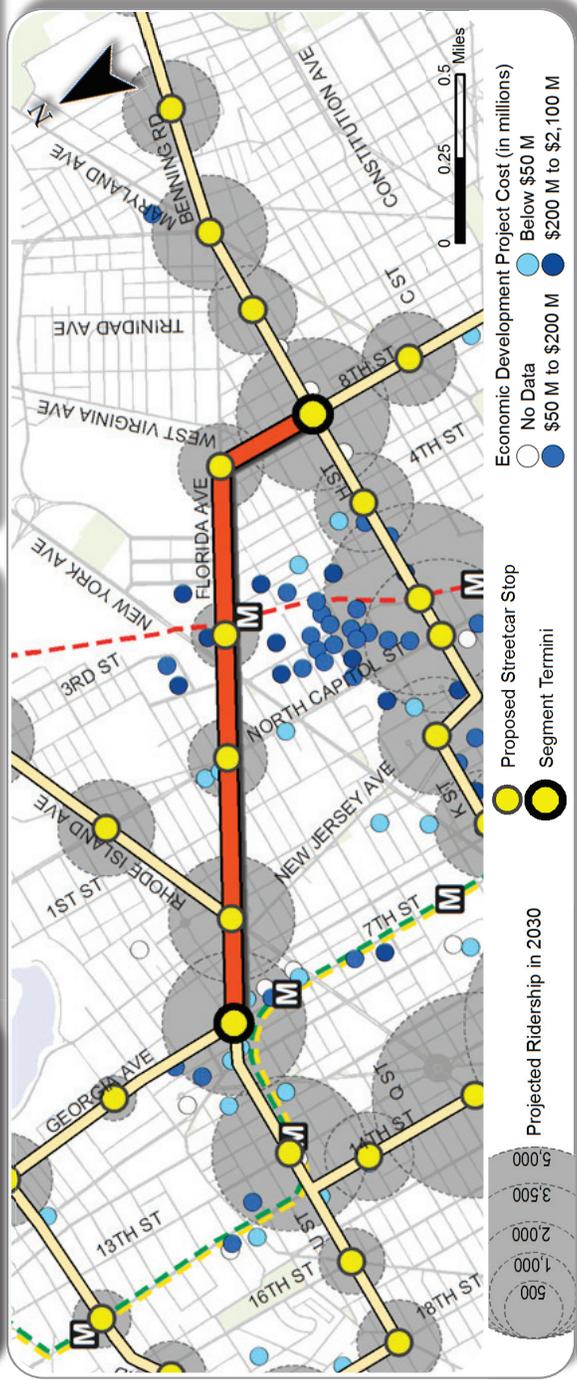
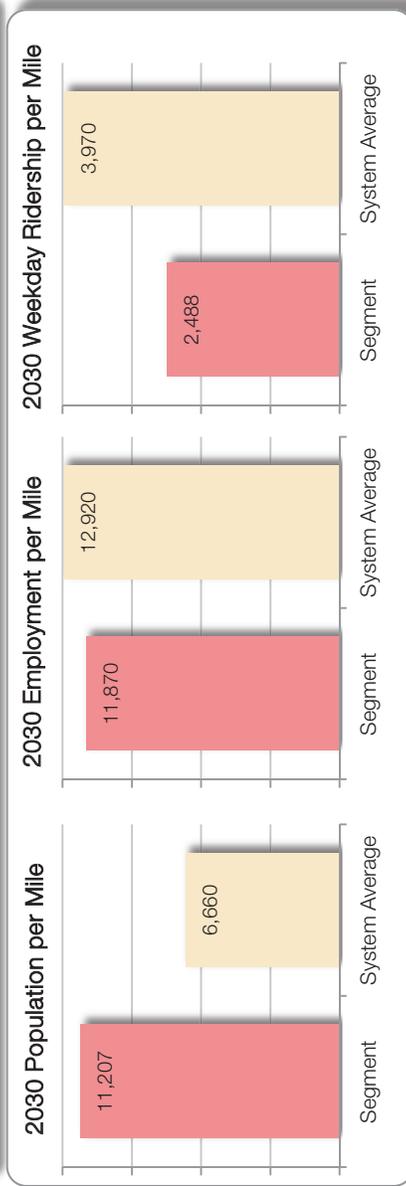
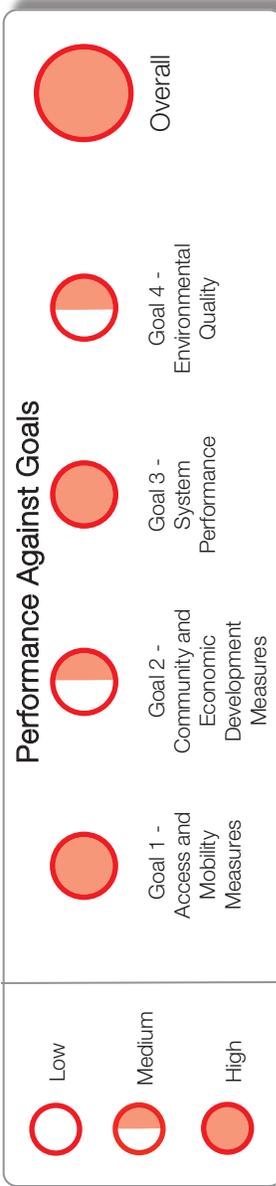
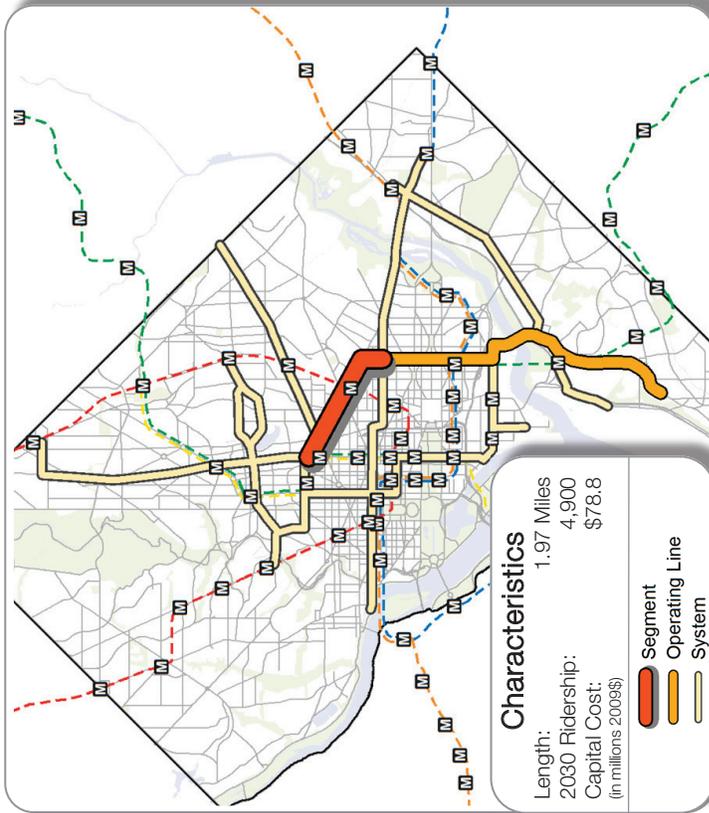
2030 Weekday Ridership per Mile



Key Strengths

- Serves Congress Heights neighborhood and commercial activity center
 - Serves St. Elizabeth Hospital site and Future DHS Headquarters Site with 14,000 new employees
 - High ridership of over 5,000 daily boardings per mile
 - Located along a Great Streets corridor serving planning initiatives
- ### Segment Termini
- St. Elizabeths Hospital Campus and Future DHS Headquarters Site
 - Congress Heights commercial center

Florida Avenue



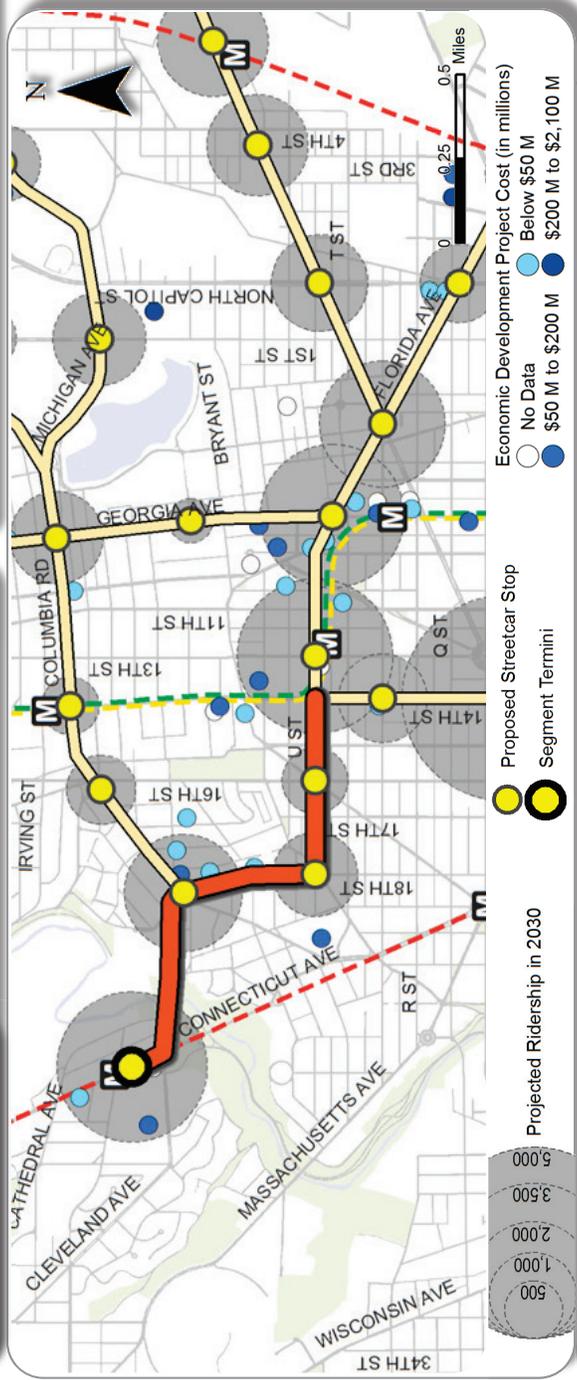
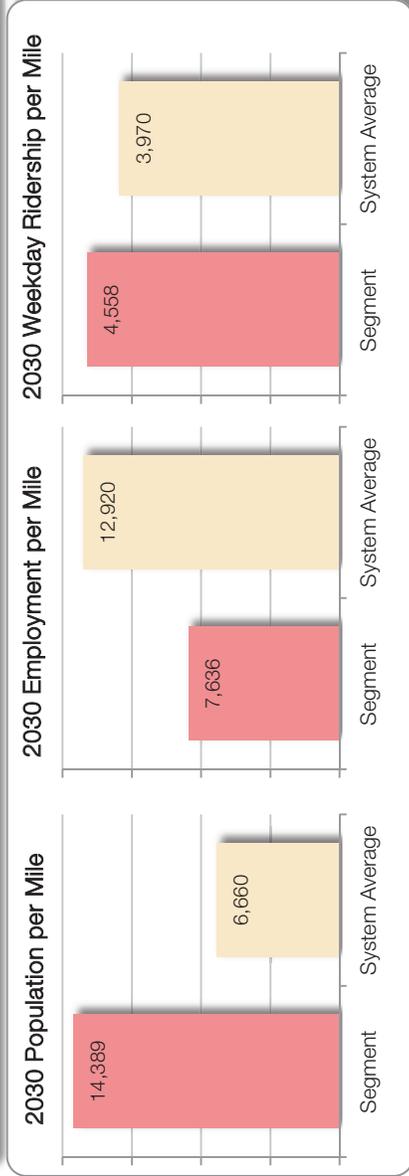
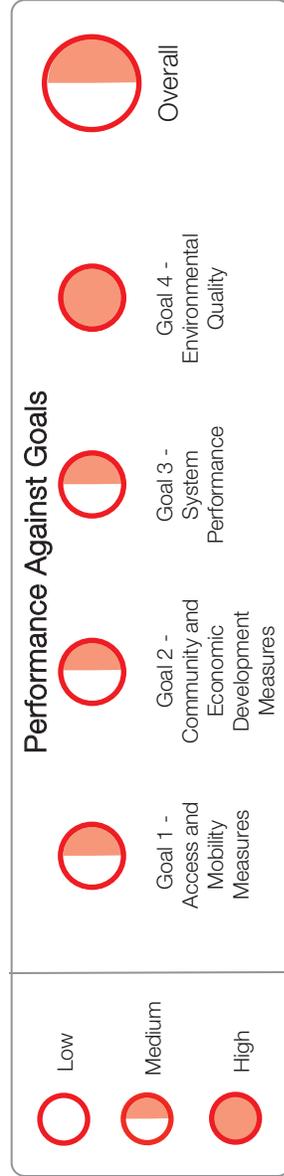
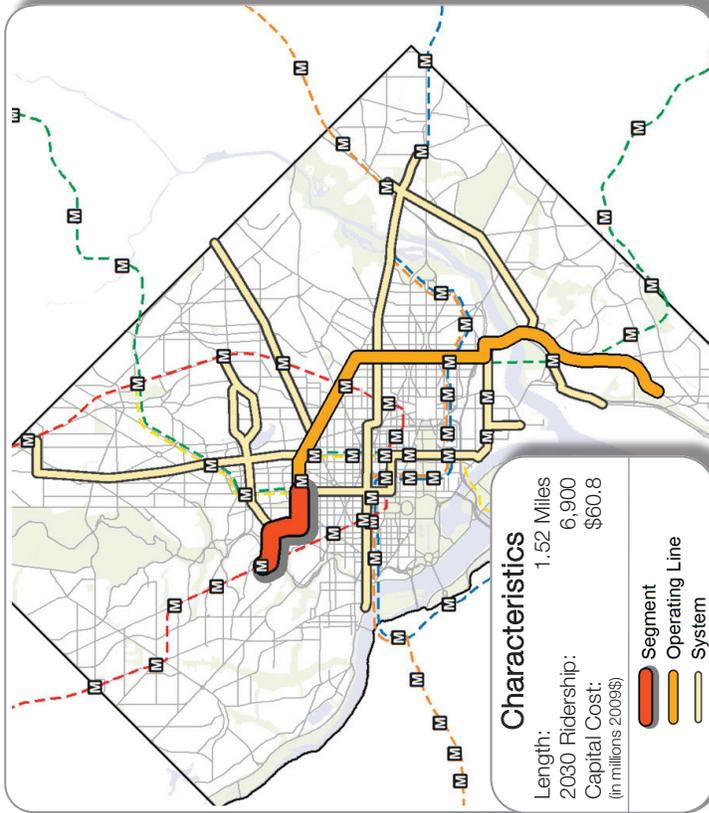
Key Strengths

- Serves strategic neighborhoods and planning initiatives
- Reduction in transit travel time of over 40%
- Serves densely populated neighborhoods and Gallaudet University
- Serves the rapidly growing NoMa district and the New York Avenue Metro rail Station area
- Connects to three Metro rail lines and provides core capacity relief

Segment Termini

- Georgia Avenue/ Florida Avenue/Shaw-Howard University Metro rail Station
- 8th Street/H Street commercial center

U Street/Calvert Street



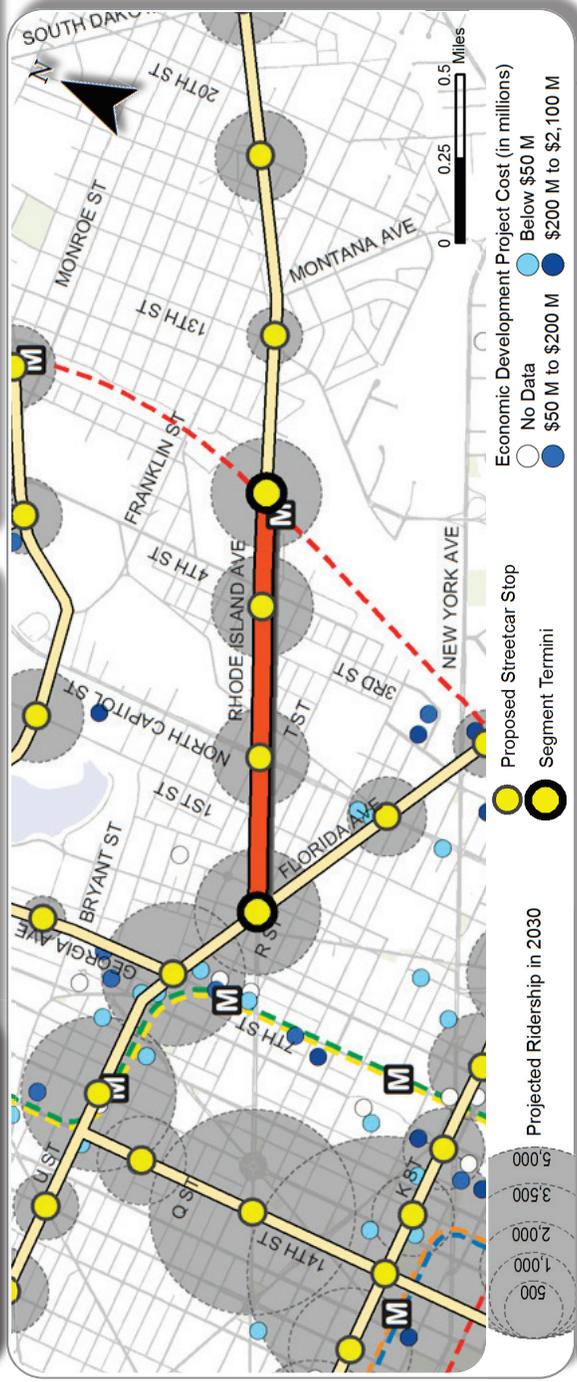
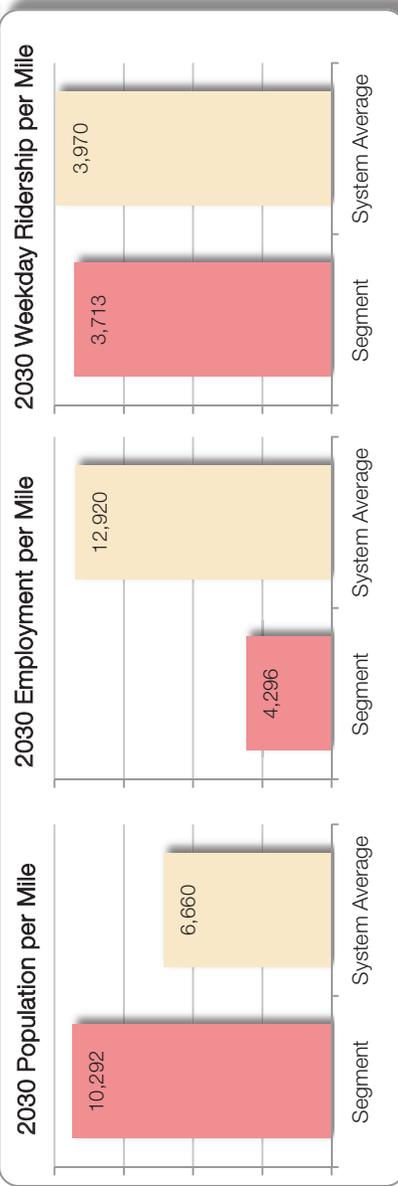
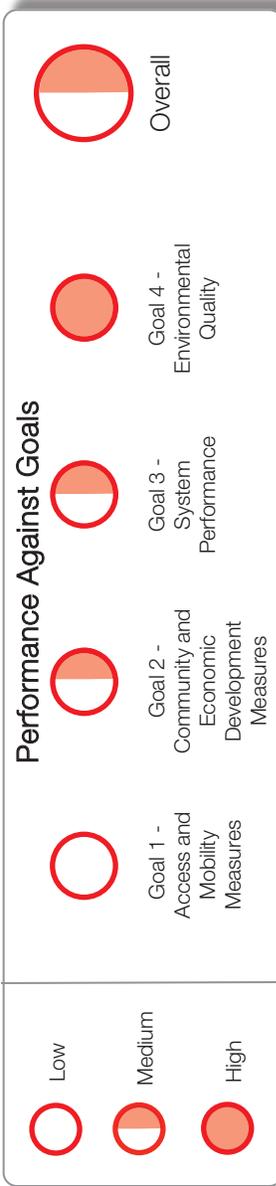
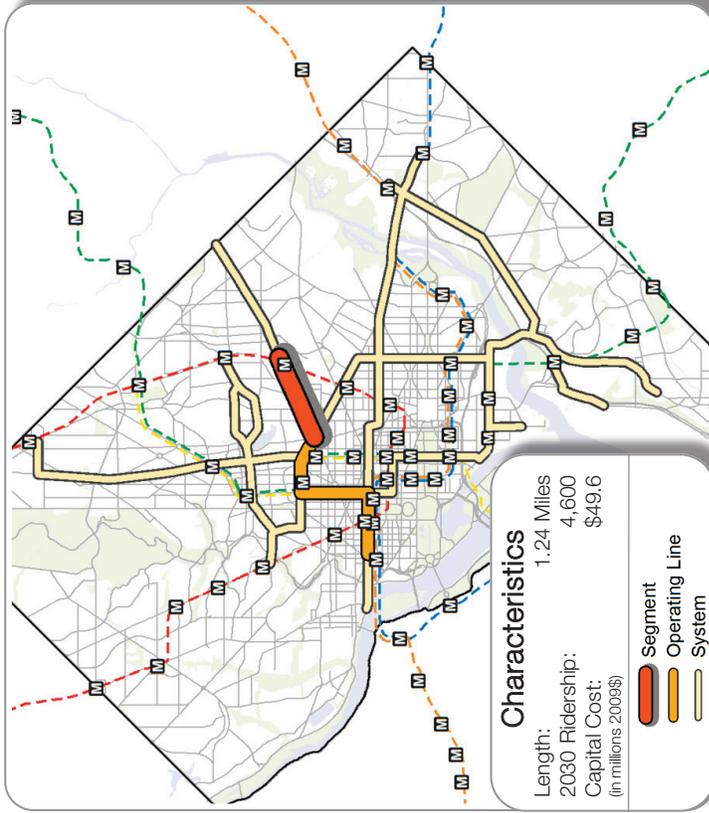
Key Strengths

- Serves a growing population of nearly 22,000 within walking distance (2030)
- Projected ridership of over 4,500 per mile
- Serves planning initiatives and east-west transit links
- Travel time savings of over 5 minutes to major destinations
- Serves major commercial activity centers of Adams Morgan and the U Street corridor

Segment Termini

- Woodley Park Metrorail Station
- U Street activity center and 14th Street Streetcar

Rhode Island South



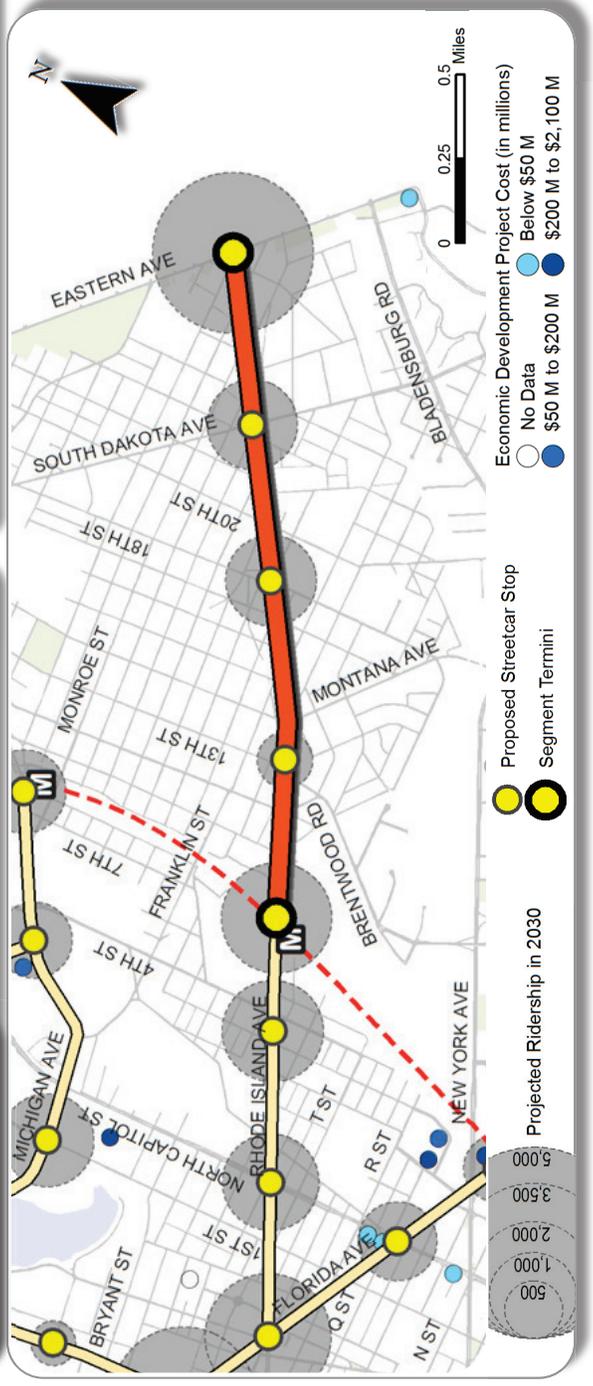
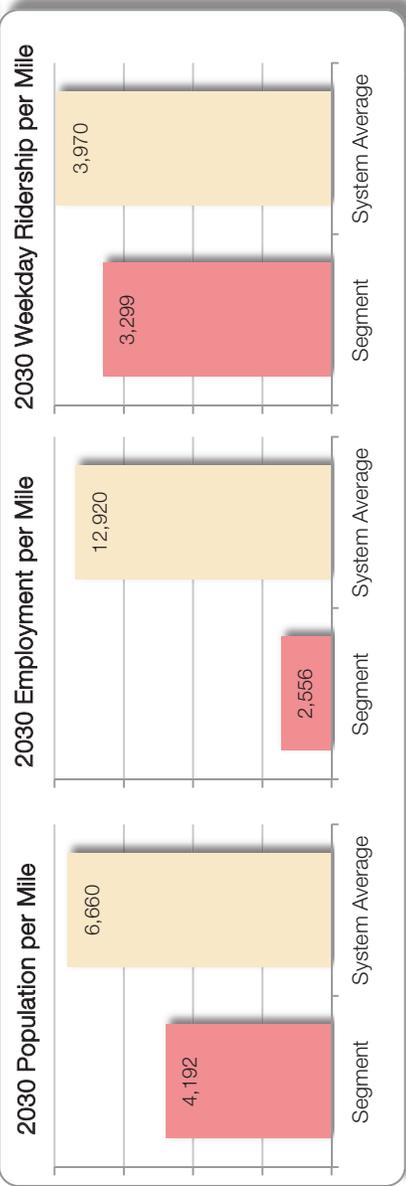
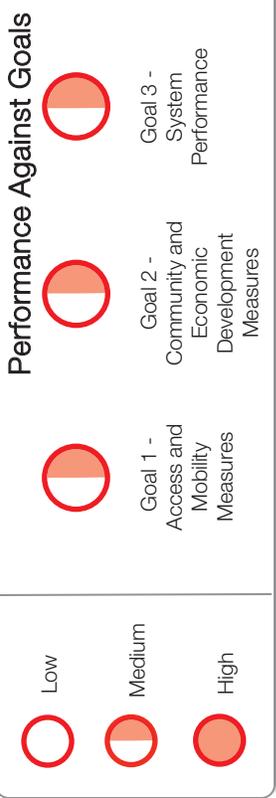
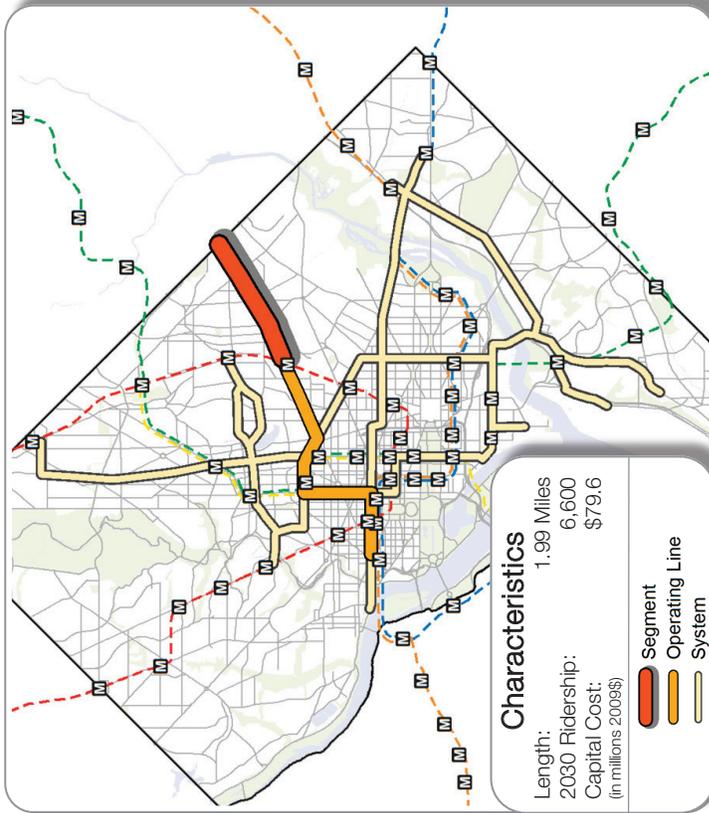
Key Strengths

- Located along a Great Street corridor serving strategic neighborhoods
- Cost-effective, with annual operating cost per annual boarding of < \$1.50
- Capacity for development/redevelopment along the route
- Connects neighborhoods not well served by Metrorail to the Metrorail Station at Brentwood

Segment Termini

- LeDroit Park area and connection to Florida Ave Streetcar
- Rhode Island Ave-Brentwood Metrorail Station

Rhode Island North



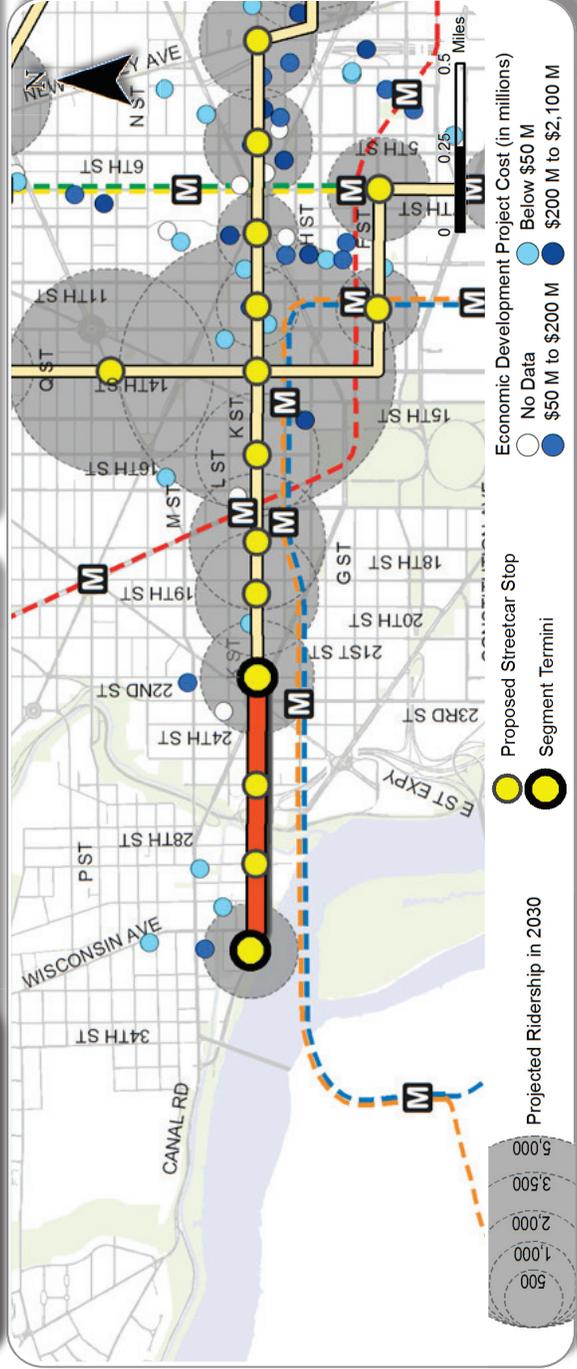
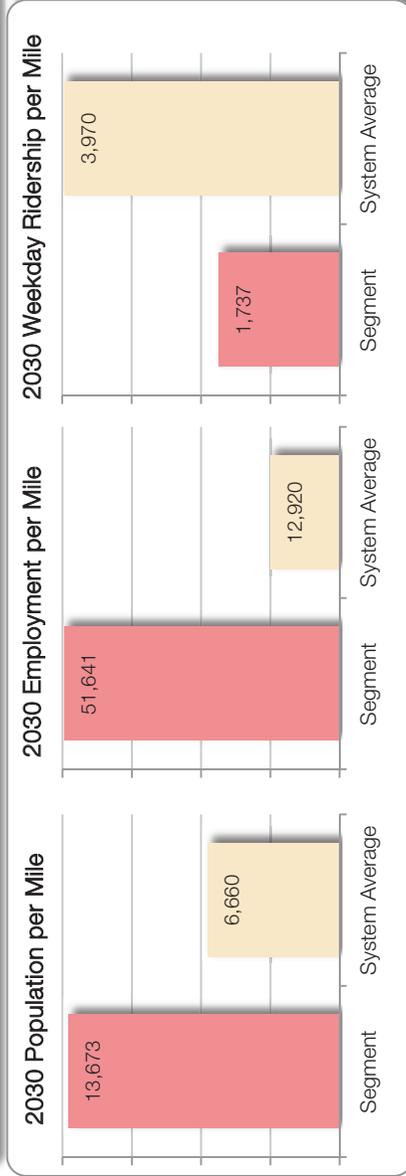
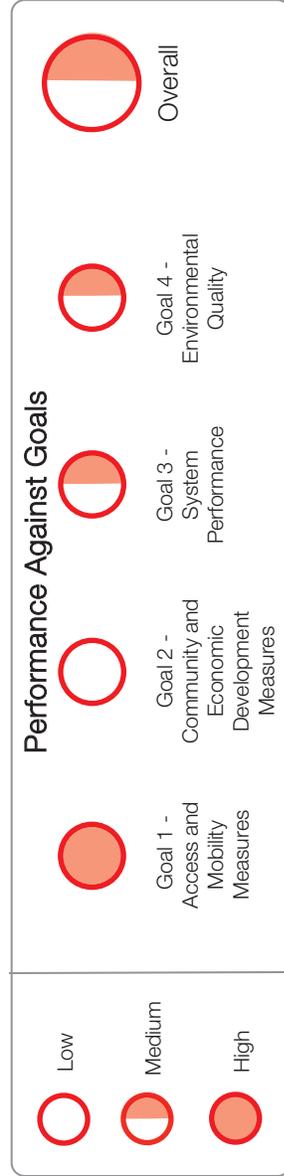
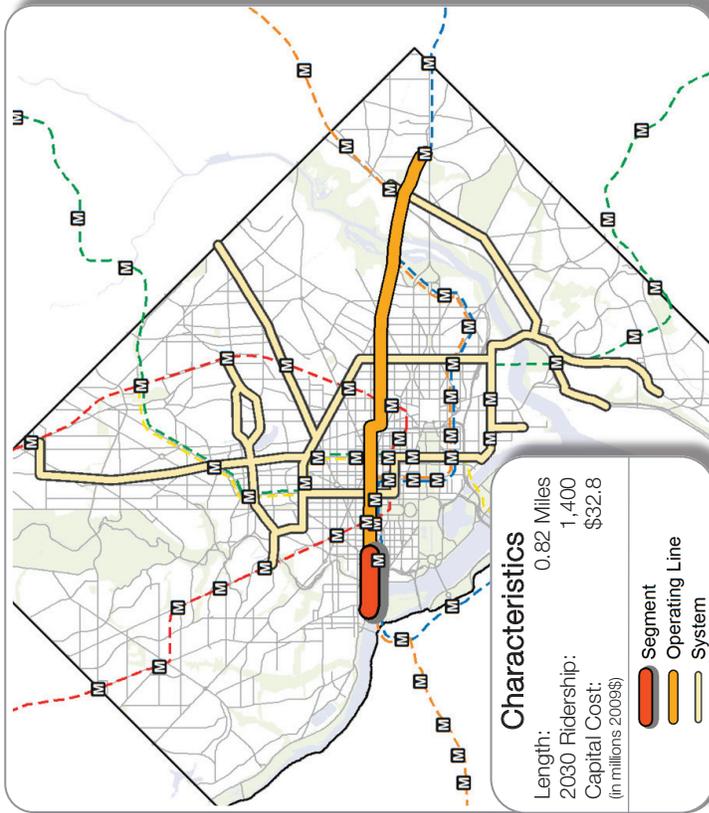
Key Strengths

- Located along a Great Street corridor serving strategic neighborhoods, and development/redevelopment along the route
- Cost-effective, with annual operating cost per annual boarding of < \$1.50
- Connects neighborhoods not well served by Metrorail to the Rhode Island Avenue Metrorail Station

Segment Termini

- Rhode Island Ave-Brentwood Metrorail Station
- Rhode Island Ave/Eastern Avenue neighborhood commercial district

Georgetown



Key Strengths

- Serves high population and employment with over 13,600 persons per mile and over 51,600 employees per mile
- Serves Georgetown Waterfront/Wisconsin Avenue commercial area and trip destination
- Connects Georgetown to Metrorail System via Foggy Bottom-GWU Metrorail Station

Segment Termini

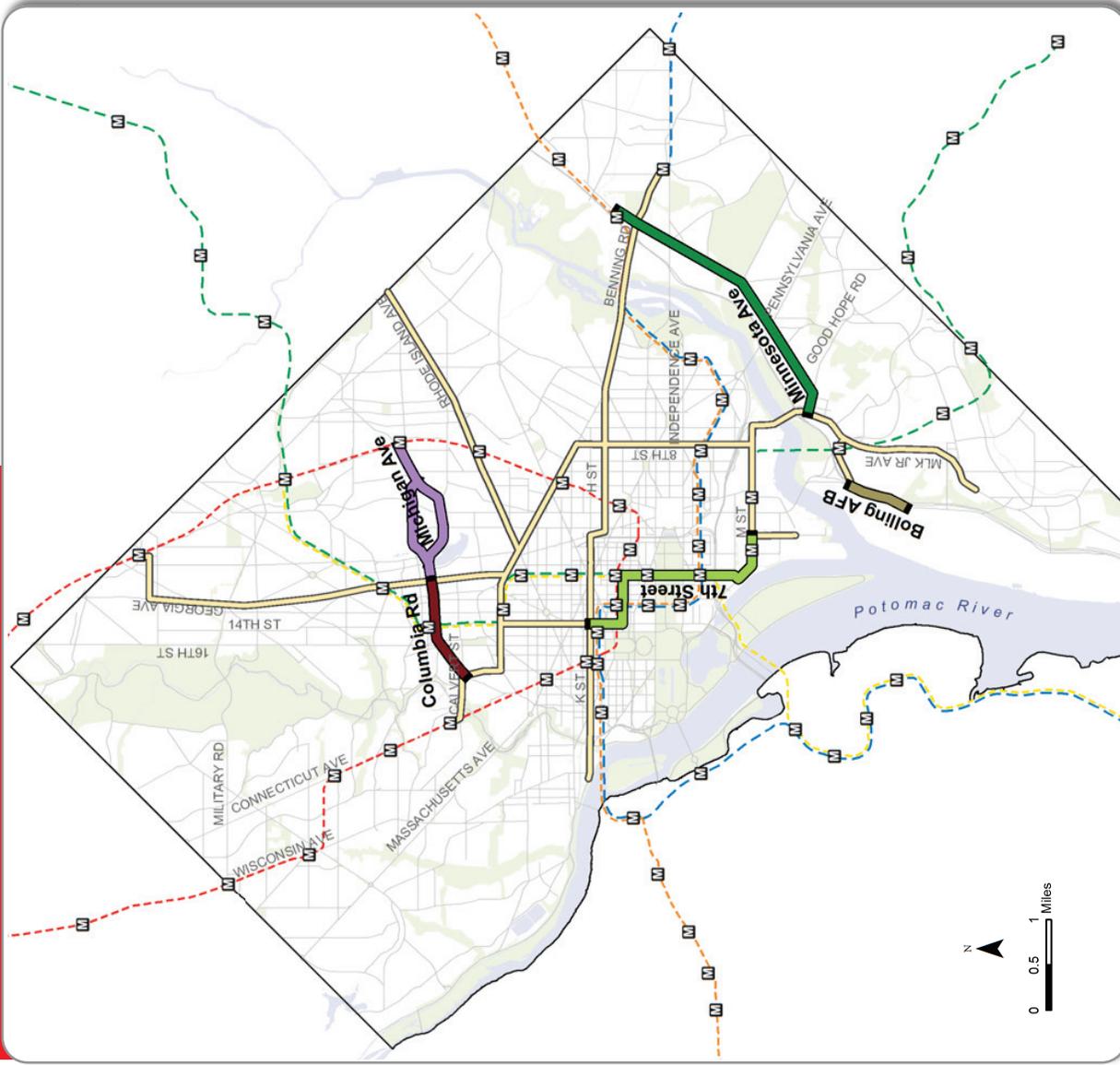
- Georgetown Waterfront/Wisconsin Avenue commercial area
- Washington Circle, GWU, and connection to K Street Streetcar

STREETCAR SEGMENT PROFILES – PHASE 3

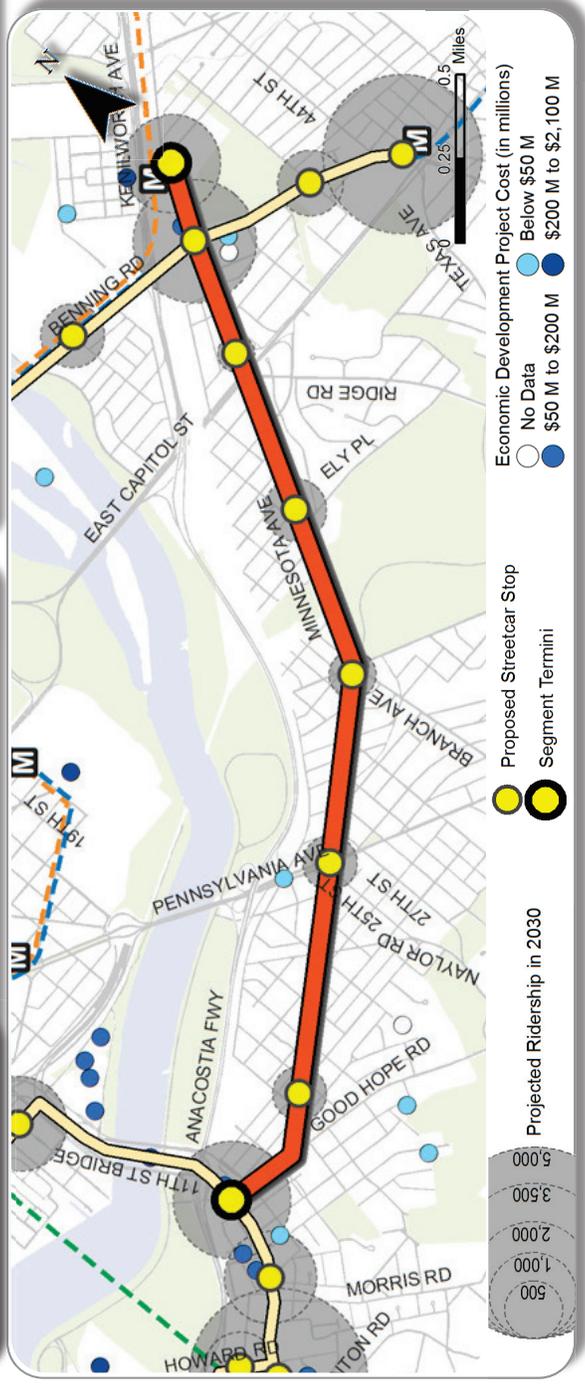
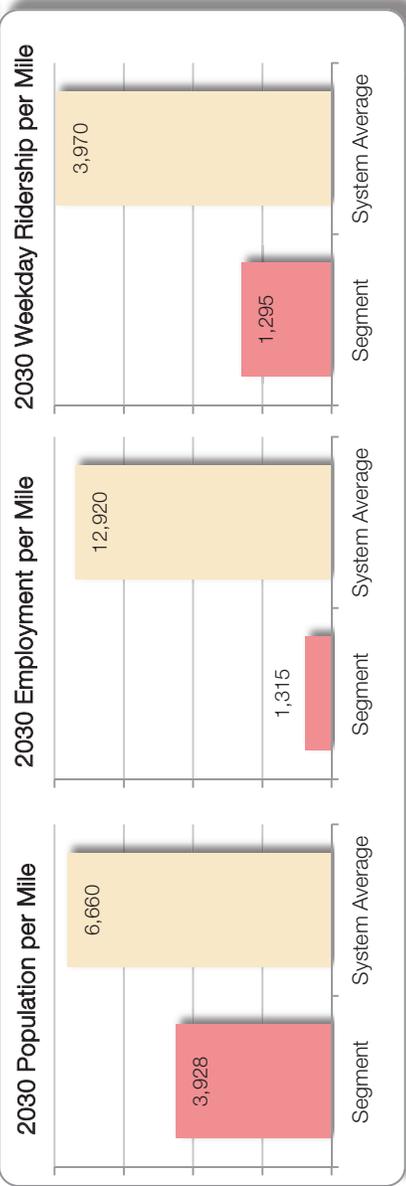
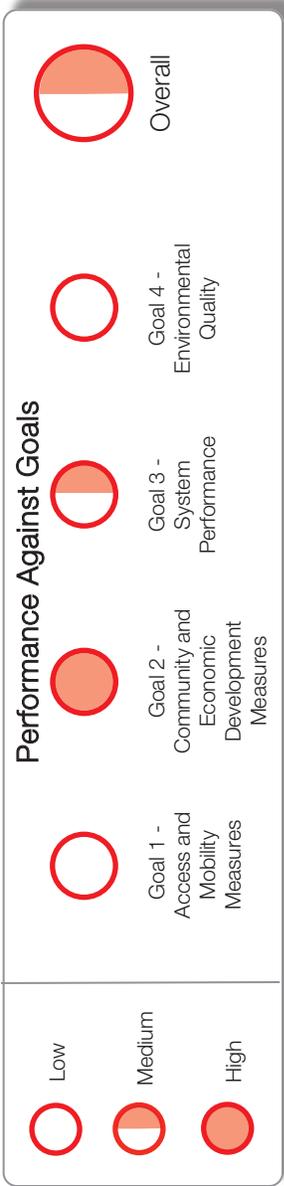
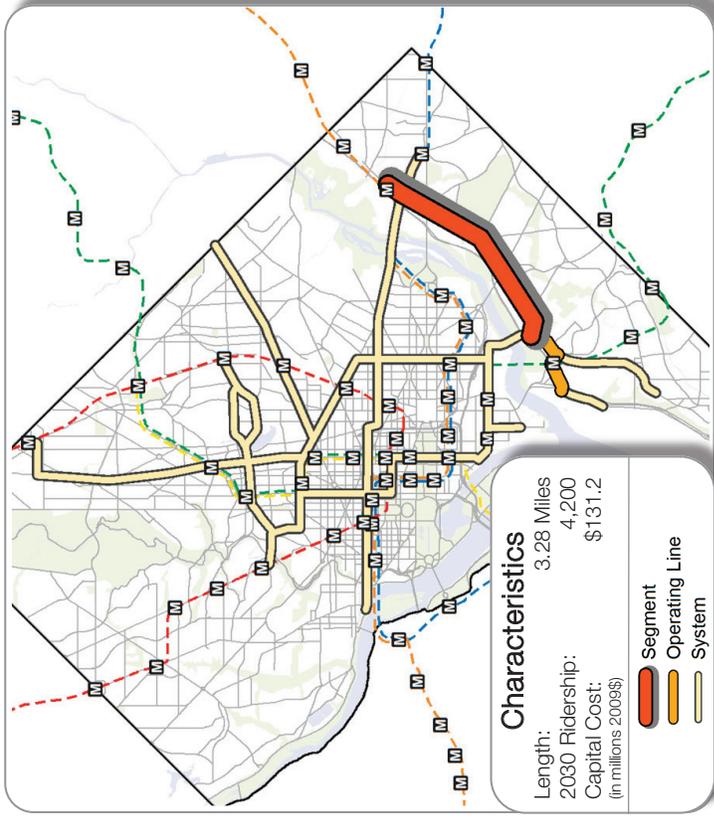
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Michigan Avenue.....	4-43
7th Street.....	4-44

Phase 3 Streetcar Segments



Minnesota Avenue



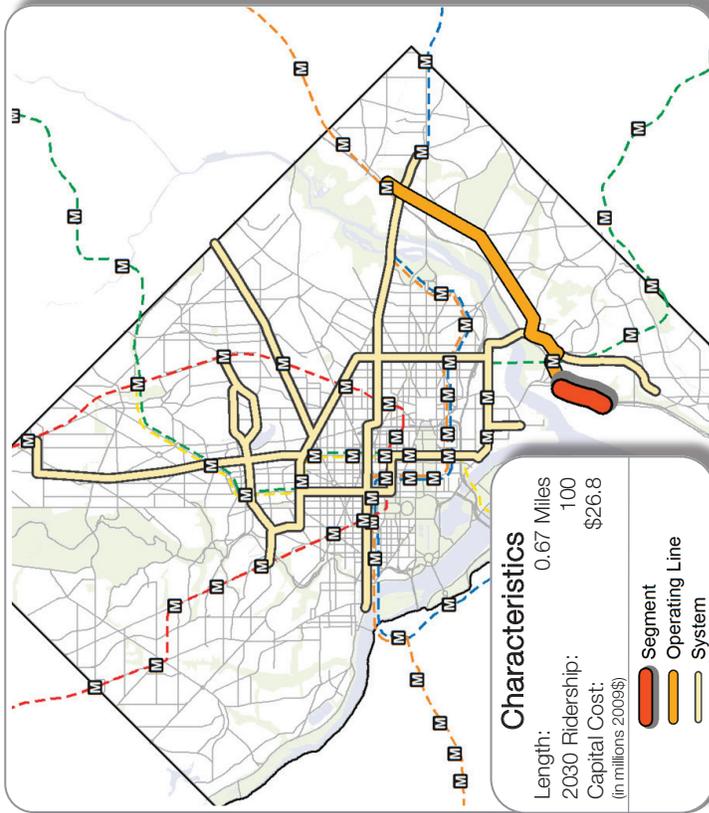
Key Strengths

- Connects neighborhoods to Minnesota/ Benning, L'Enfant Square, and Historic Anacostia commercial nodes
- Connects to Anacostia Waterfront Initiative redevelopment areas
- Connects economically distressed neighborhoods not well served by Metrorail to Minnesota Avenue Station

Segment Termini

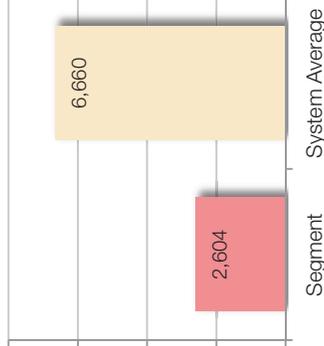
- Good Hope Road/11th Street Bridge, Historic Anacostia business district, and connections to Historic Anacostia Streetcar
- Minnesota Avenue Metrorail Station

Bolling AFB

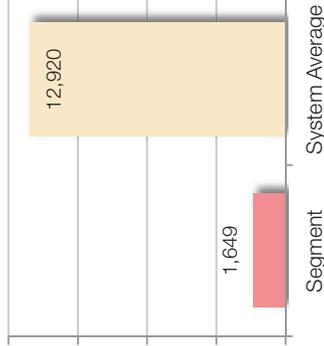


Note: The Bolling AFB segment was not rated for evaluation since it was part of the Anacostia Streetcar project which was scheduled for construction at the time of the system studies. This segment was subsequently deleted from the Anacostia Initial Line Segment.

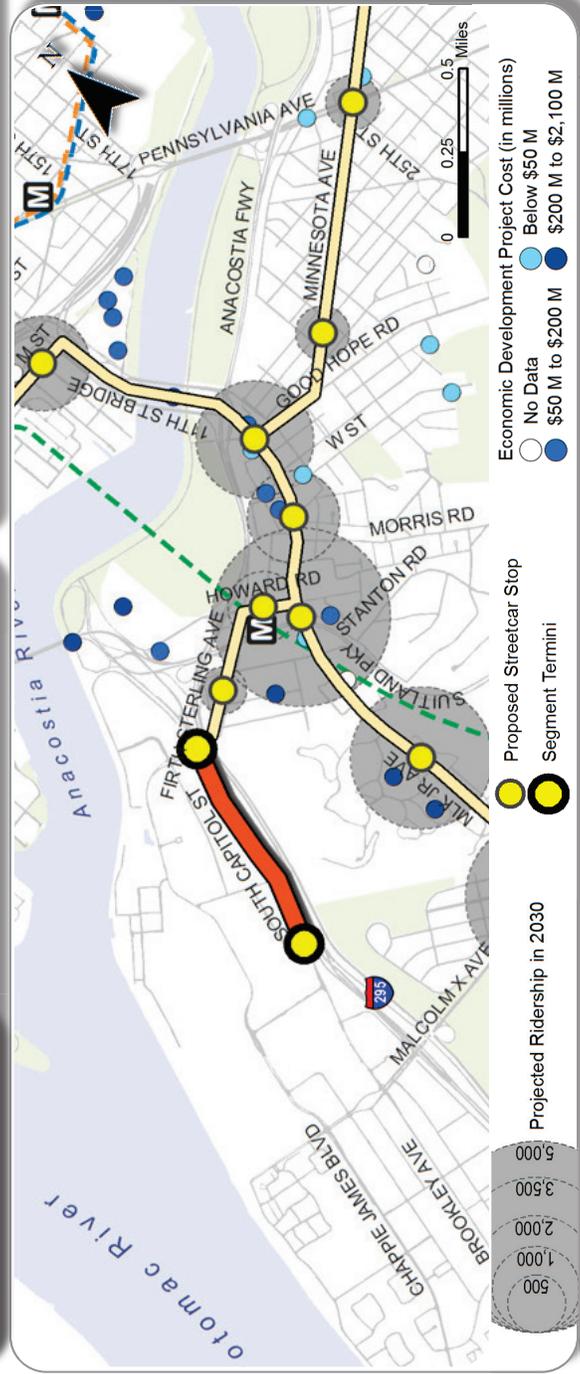
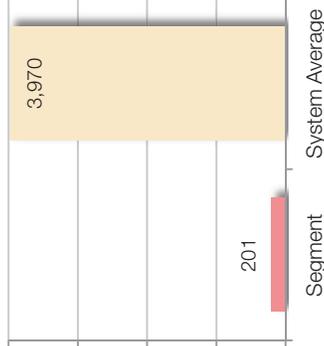
2030 Population per Mile



2030 Employment per Mile



2030 Weekday Ridership per Mile



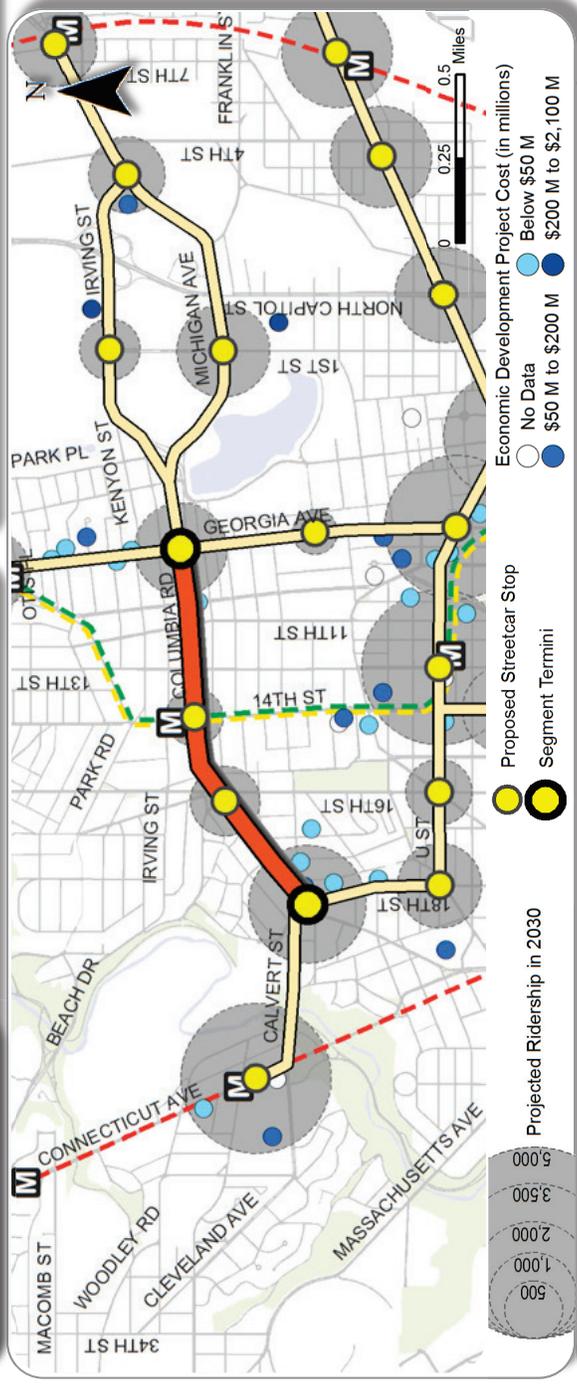
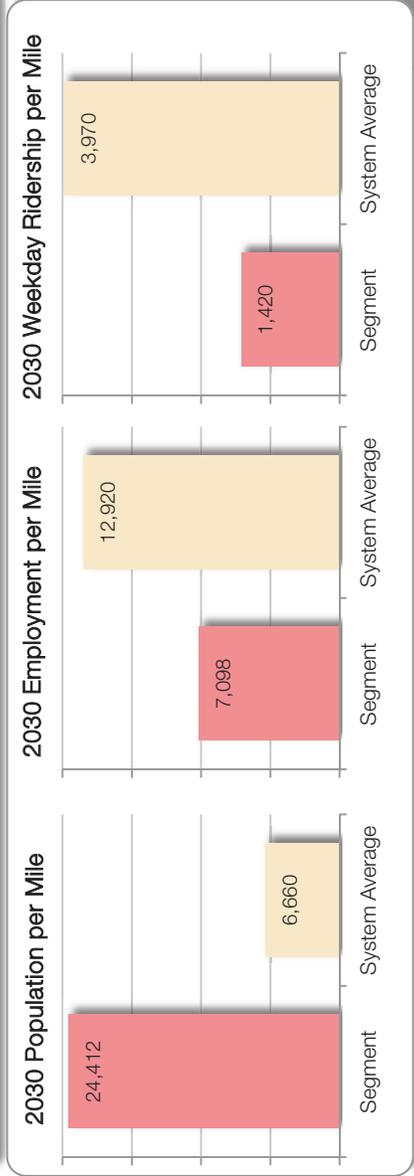
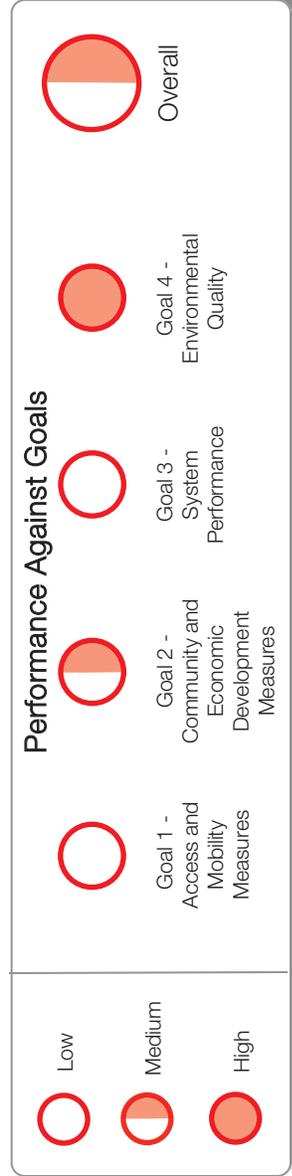
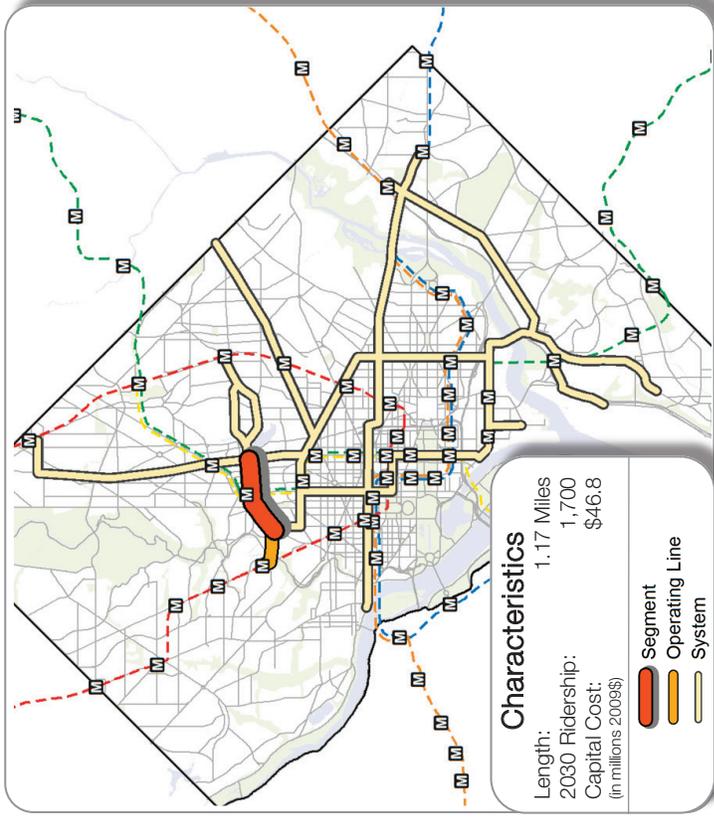
Key Strengths

- Provides connection between Bolling Air Force Base and Anacostia Metrorail Station
- Serves future expansion of employment at Bolling Air Force Base and Navy Annex

Segment Termini

- Access to Bolling Air Force Base
- Access to Navy Annex

Columbia Road



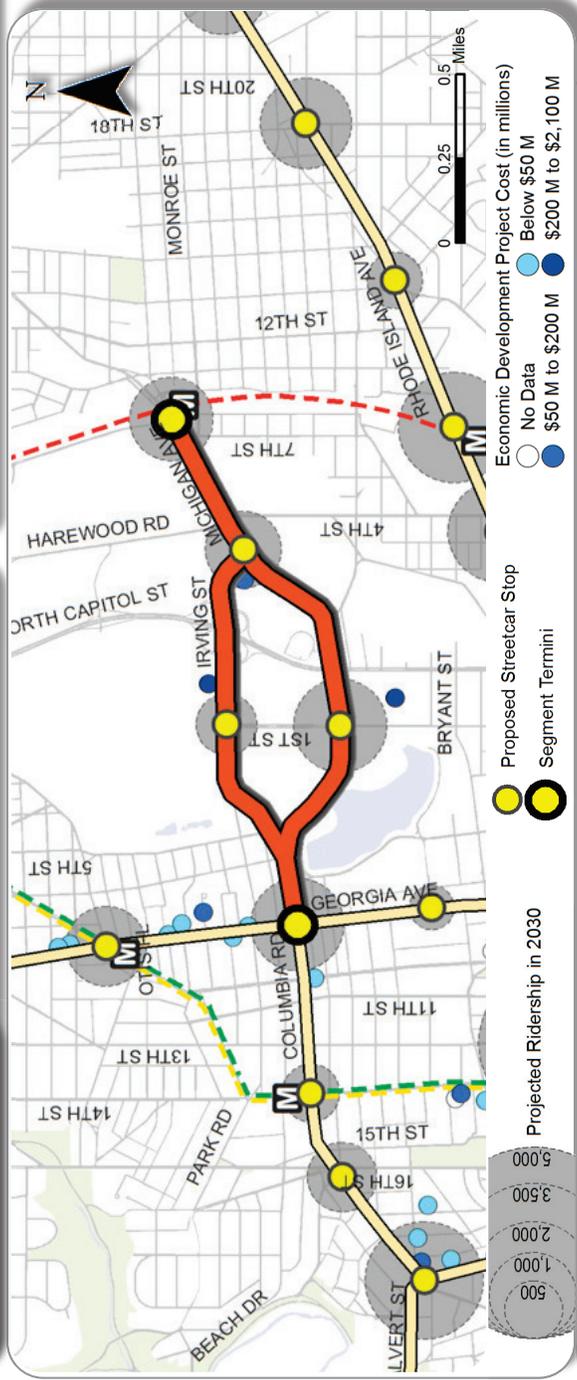
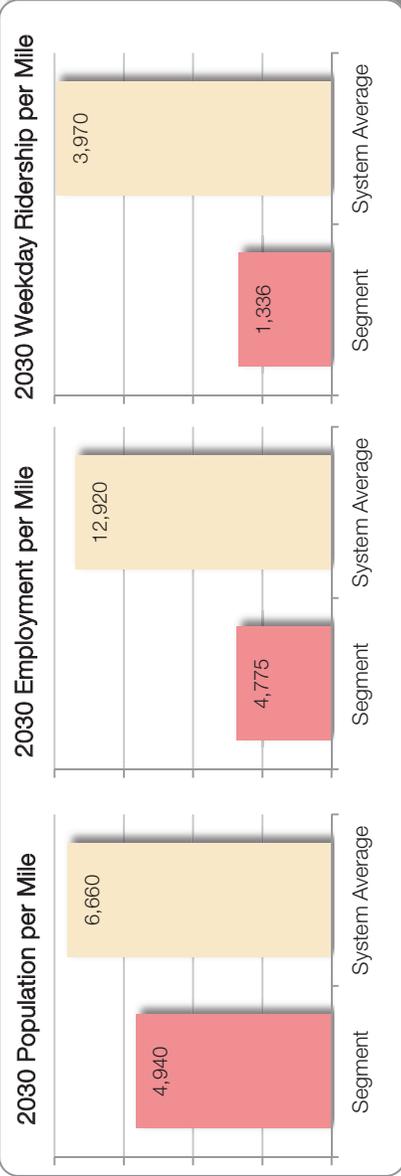
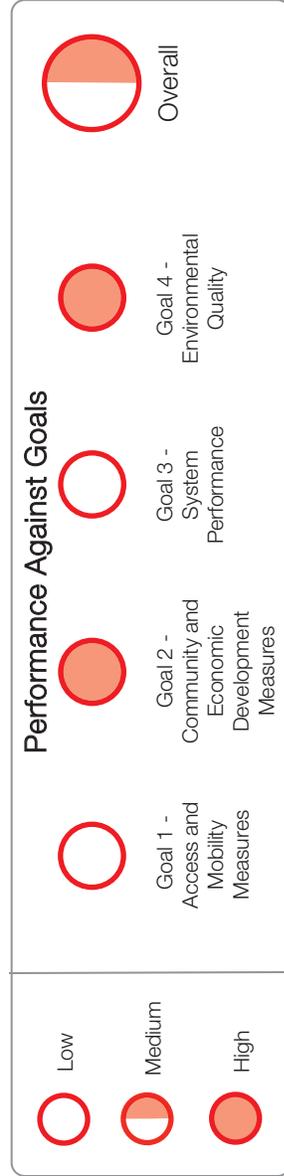
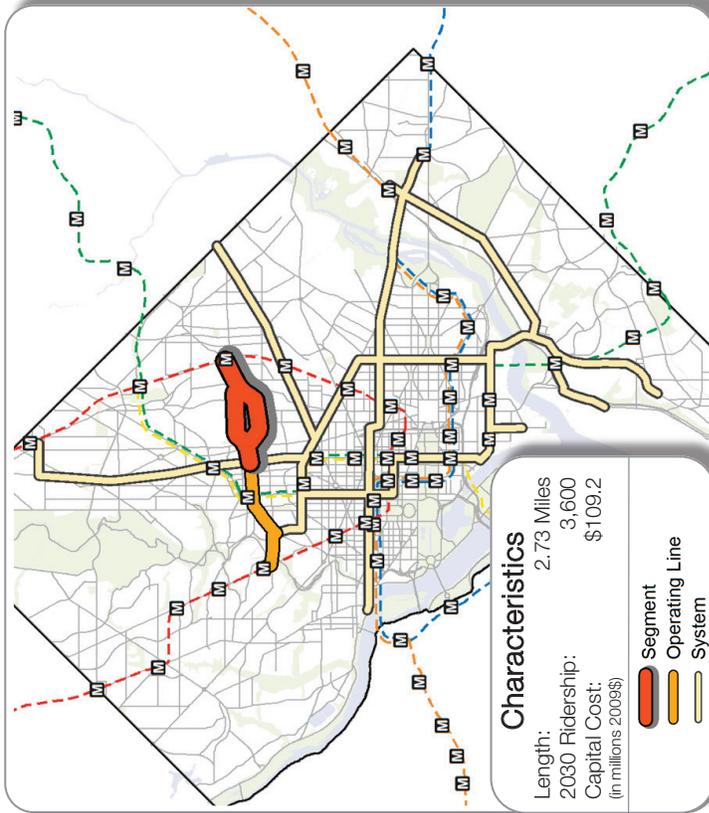
Key Strengths

- Serves Adams Morgan and Columbia Heights activity centers
- Provides east-west connection with the District's 2nd largest retail center outside downtown
- Serves one of the most densely populated parts of the District

Segment Termini

- Adams Morgan commercial area and connection to Calvert/U St Streetcar
- Lower Georgia Avenue commercial area and Lower Georgia Streetcar

Michigan Avenue



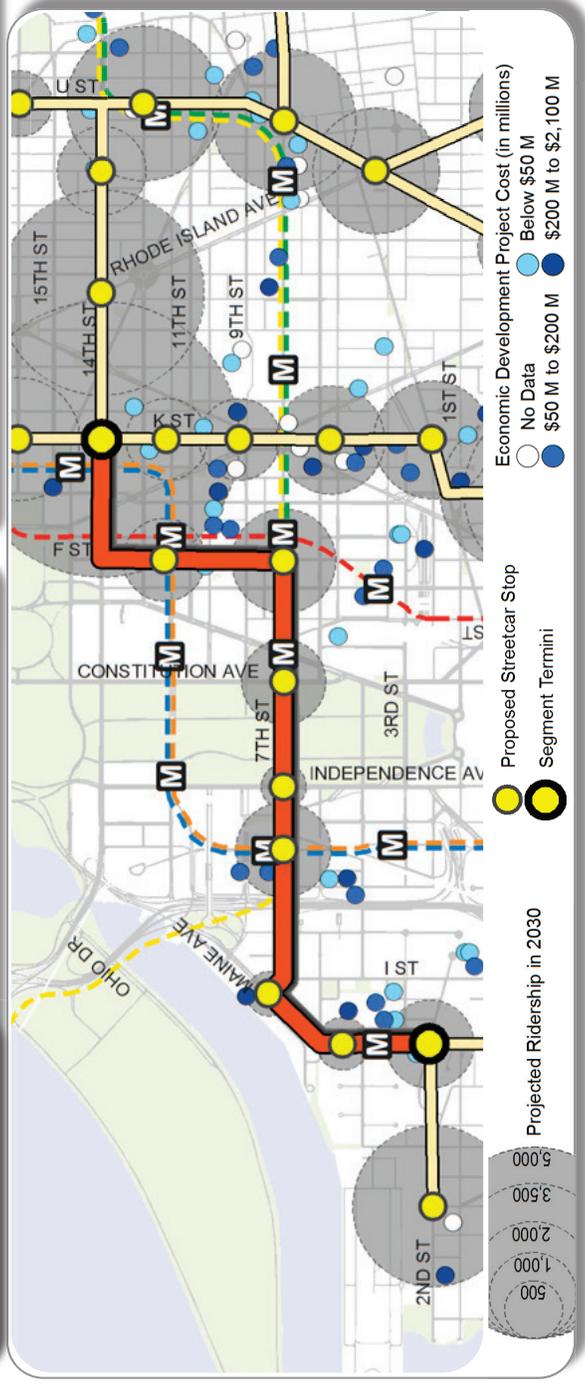
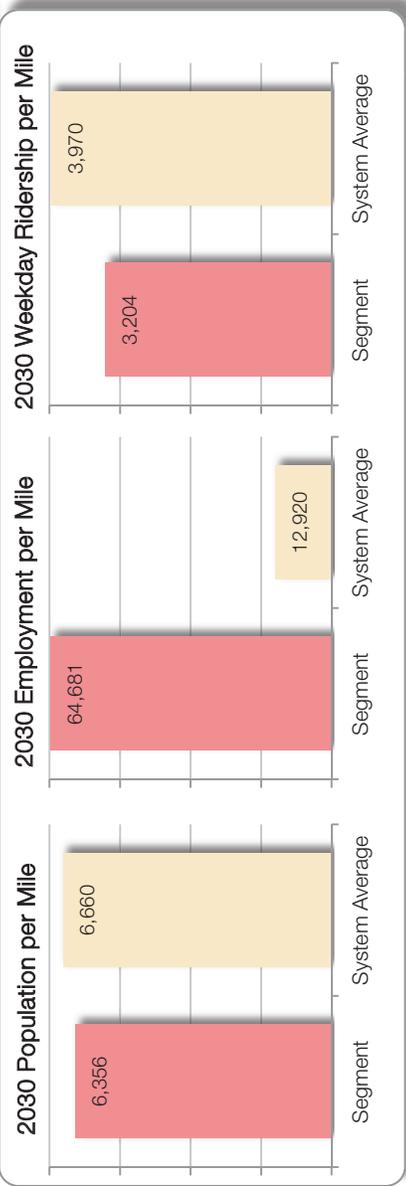
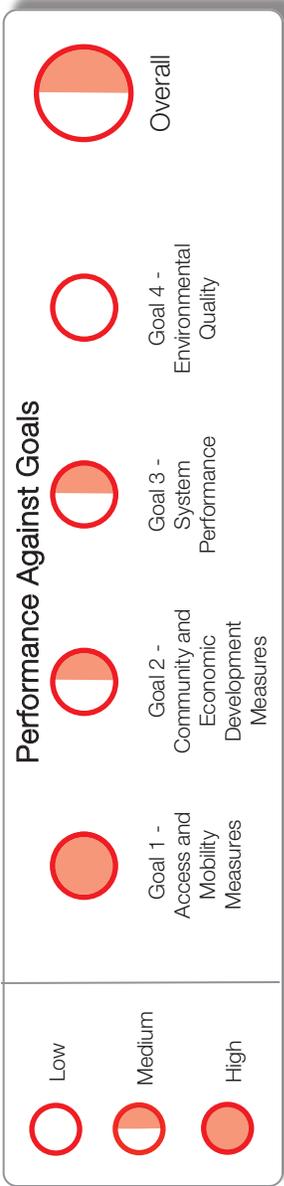
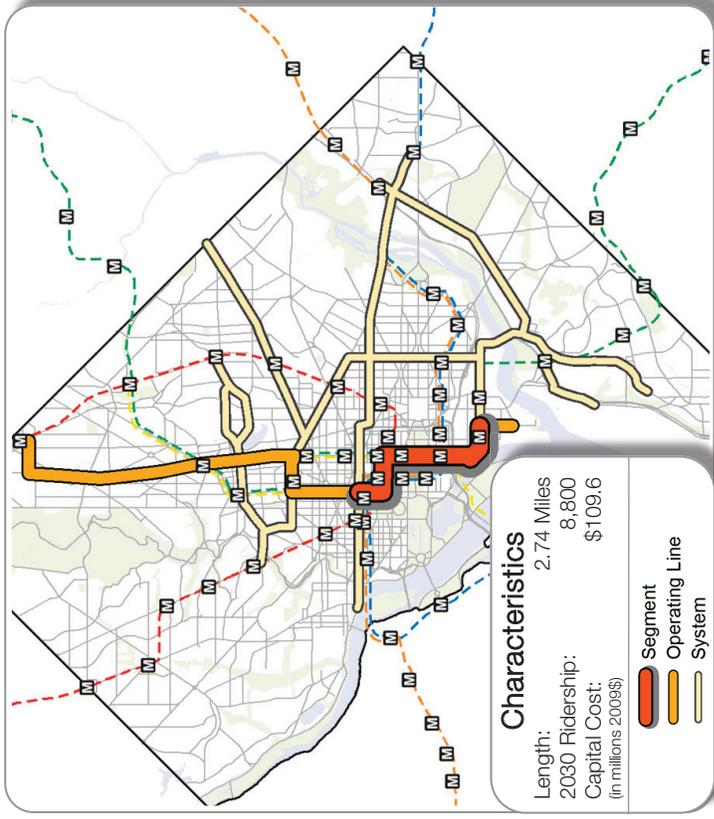
Key Strengths

- Serves strategic neighborhoods and planning initiatives, provides needed east-west transit links, and connects three Metrorail stations
- Serves planned redevelopment sites near Soldiers' and Airmen's Home and McMillan Reservoir
- Serves key destinations including Washington Hospital Center, Howard University, and Catholic University

Segment Termini

- Lower Georgia Avenue commercial area and connects to Lower Georgia Streetcar
- Brookland Metrorail Station and Catholic University

7th Street



Key Strengths

- Serves the National Mall and Southwest Waterfront areas and high employment and redevelopment areas
- Higher than average ridership of more than 3,000 riders per mile and connects to five Metrorail lines
- Carries tourists and their purchasing power off the Mall and into retail areas

Segment Termini

- Waterfront SEU Metrorail Station, stadium area and connection to M St SE Streetcar
- McPherson Sq Metrorail and connection to K St Streetcar

4.4 Streetcar Fleet and Maintenance and Storage Facilities

The system proposed in the 2010 Update requires establishing streetcar maintenance and storage yard facilities to accommodate the fleet of vehicles that will operate the streetcar lines. This section describes the streetcar support facility analysis which estimated the needs for the proposed system.

As part of the streetcar support facility analysis, it was critical to project the size of the future streetcar fleet. In addition to providing the minimum number of vehicles to meet service standards, the necessary capacity to meet projected vehicle loads was also considered. Industry standards call for a 20% spare ratio of vehicles to account for breakdowns and service interruptions. Table 4-2 shows the estimated number of streetcar vehicles necessary to operate the service for the set of projects in each phase and for the total system.

The initial streetcar projects currently being constructed and the Phase 1 expansion will require 42 streetcars with 9 spares, for a total of 51 vehicles. Each subsequent phase adds a number of vehicles and spares to bring the total fleet size to 137 vehicles at full build out. Industry standards call for sufficient capacity to provide one storage space per streetcar vehicle and one maintenance and service bay per nine (9) vehicles. Based on the size of the proposed fleet, the space program of the storage and maintenance facilities can be calculated using a ratio of 1:1 for storage spaces, and 1:9 for maintenance bays. Additional spaces may be added to optimize the operations of the system and eliminate the need to run non-revenue “deadhead” vehicles long distances to remote storage facilities. Up to six service bays will be required immediately in Phase 1, ten bays will be required for Phase 2, and a total of 16 bays will be needed at full build out. These are minimum requirements; it is recommended that added service capacity be built into the system to optimize operations, avoid delays in maintenance service to the streetcar fleet and permit more frequent service if ridership exceeds projections.

Table 4-2: Streetcar Fleet Size By Phase

Project Phase	Base Number Vehicles	20% Spare ratio	Streetcar Vehicles Needed	Total Fleet Size
Phase 1	42	9	51	51
Phase 2	32	7	39	90
Phase 3	39	8	47	137
Total System	113	24	137	137

Facility Types

Two prototypes are proposed for the needed support facilities: a smaller end-of-line storage site (Type 1) and a larger centrally located facility that provides both fleet storage and maintenance services (Type 2).

Type 1: This type (end-of-line or mid-line storage only) would provide the following features:

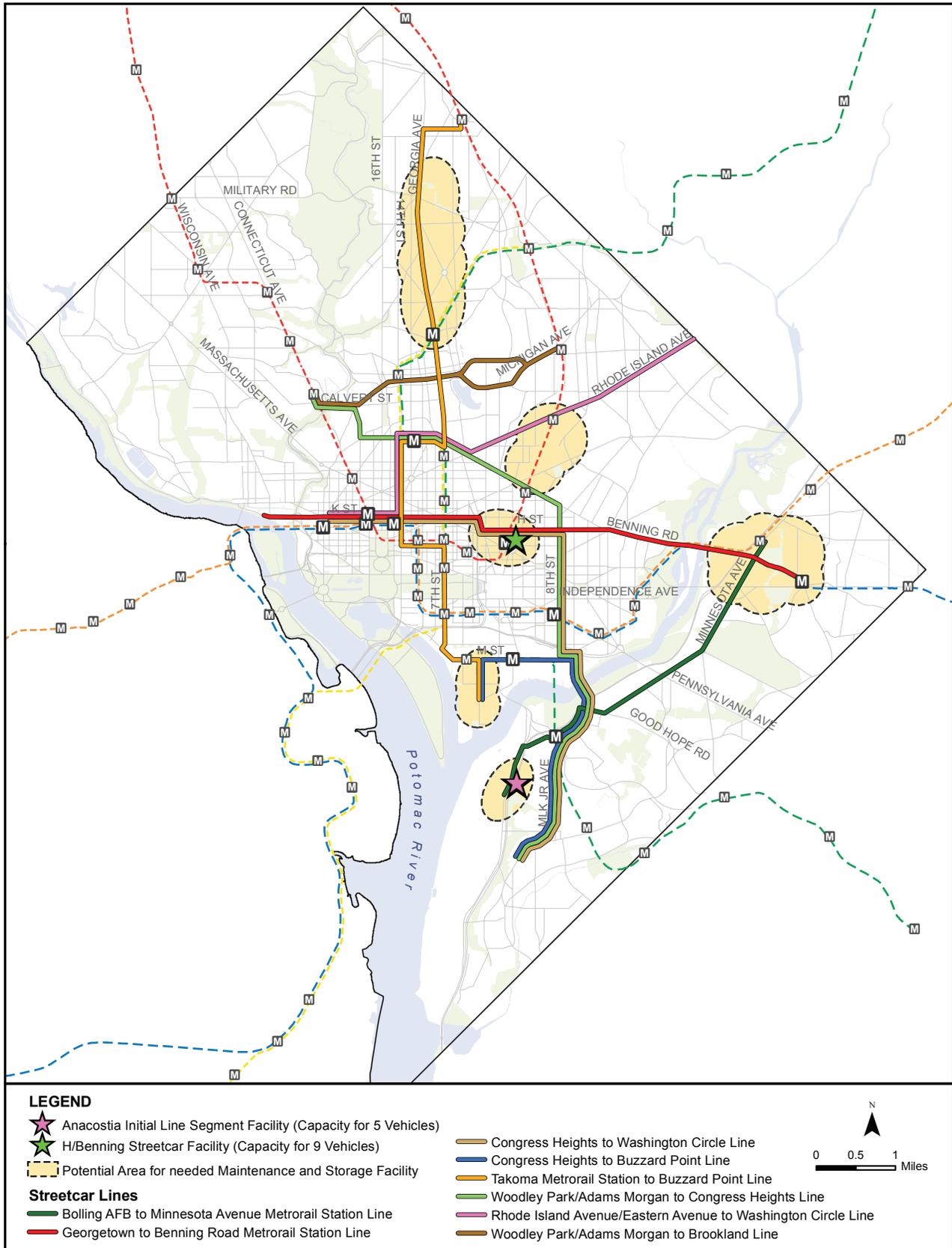
- Storage for up to 20 streetcars;
- Site security (fencing and lighting);
- Cleaning (interior and exterior);
- Inspections;
- Crew reporting;
- Employee service and welfare areas; and
- Employee parking.
- Building size of 100 feet by 44 feet (4,400 square feet), expandable to support added staff in future phases; and
- Total facility size of 47,600 square feet or approximately one acre for Phase 1, but expanding up to two acres for full build-out.

This type of facility would be designed to fit on smaller land parcels (approximately one acre) but could be expanded to provide additional storage for up to 20 vehicles if sited on a two-acre footprint.

Type 2: The second type of facility (larger size, service and storage) would provide the following services:

- Storage for up to 50 streetcars;
- Site security (fencing and lighting);
- Cleaning (interior and exterior);
- Inspections;
- Running repairs;
- Heavy repairs and service;
- Parts storage;
- Crew reporting and dispatching;
- Employee service and welfare areas; and
- Employee parking.
- Building size of 7,000 square feet, but expanding to support additional services in future phases; and

Figure 4-10: Potential Areas for Maintenance and Storage Facilities



- Total facility footprint of four acres initially, but expanding up to six acres for full build out.

This type of facility would be designed to fit on a larger land parcel (approximately four acres) but could be expanded to provide additional storage of up to 50 vehicles if sited on a six-acre footprint.

Potential Locations of Support Facilities by Phase

Based on the phased streetcar fleet size, it is estimated that the system will require a total of five maintenance and storage facilities. This estimate includes three Type 1 facilities and two Type 2 facilities. Table 4-3 lists the estimated number of facilities needed by phase.

The number of facilities required includes the facilities for the Anacostia Streetcar Initial Line Segment and the H/Benning Streetcar. It is assumed that the Anacostia Streetcar Initial Line Segment facility is expanded from its initial size that serves five vehicles to serve up to 20 vehicles for the Phase 1 system. It also assumes that the facility to serve the H/Benning Project is constructed to serve 9 vehicles, which is the maximum size that can be accommodated at the proposed site adjacent to Union Station and the H Street Bridge over the rail yard. It remains this size through all three phases of streetcar development. The third Type 1 facility constructed in Phase 3 will accommodate up to 8 vehicles. The first Type 2 facility would be constructed to accommodate up to 22 vehicles in Phase 1 and then be expanded to accommodate up to 50 vehicles for Phase 2. The second Type 2 facility would be constructed to accommodate up to 11 vehicles in Phase 2 and expanded to accommodate 50 vehicles in Phase 3.

Figure 4-10 depicts areas suitable for potential facility sites based on the location of streetcar corridors and project phasing. The exact locations of the proposed sites will be determined in a future phase of the project.

The conventional method to siting transit support facilities is to identify a suitable vacant industrial site, purchase the property and build the required facility. In an urbanized location with little existing industrial property such as the District of Columbia, this standard approach may be a challenge. Many vacant properties have been developed during the real estate boom of the past decade, and many potential sites identified in the 2005 study are no longer available.

Other approaches should be considered if vacant industrial sites are not available, including joint development opportunities, building in non-traditional locations, or combining streetcar facilities with existing public facilities.

Table 4-3: Estimated Number of Facilities Needed

Project Phase	Type 1 Facilities	Type 2 Facilities	Total
Phase 1	2	1	3
Phase 2	2	2	4
Phase 3	3	2	5

- Joint development opportunities would include the options of working with a private land developer to place a transit facility on the ground floor of a suitable proposed facility such as a parking deck and offering financial incentives that offset their loss of floor space. Another option for joint development would be to arrange for the transit facility to be built by the developer during overall construction of their site and provide compensation for the construction.
- A second approach would be to find non-traditional locations for the facilities such as under existing transportation infrastructure (e.g., highway overpasses, ramps, or under existing bridges). Several locations in the District may be suitable. This approach could also explore the use of WMATA bus facilities as combined bus/streetcar maintenance garages. These options are only feasible if the locations allow suitable site access, the grades are suitable for streetcar operations, and the cost of construction is comparable to other optimal locations.
- Finally, a third approach would be to combine the streetcar functions with other types of public facilities. For example, siting a maintenance/storage facility below grade level adjacent to a public school and constructing athletic fields above the garage building could provide benefits to both the school and DDOT. Combining the facility with a new public parking garage would allow the placement of the streetcars on the ground floor and placement of public parking on the upper decks. Several locations in the District have sites and grading conducive to this type of facility.

Consideration of all of these alternative approaches will likely be needed to site and construct the required streetcar support facilities within the District of Columbia.

Vehicle Power Source

The District of Columbia currently has a ban on overhead wires used to power streetcars within some of the streetcar corridor areas that are included in the historic L'Enfant Plan. DDOT envisions operating vehicle electrically powered via overhead wires and across certain viewsheds using onboard batteries to operate wirelessly. A number of vehicle manufacturers are developing this technology.

4.5 Streetcar Costs and Funding

This section summarizes the capital and operating cost estimates and potential funding sources for the streetcar component of the 2010 Update. This section does not include costs and funding for the Metro Express limited-stop bus components of the plan. The Metro Express limited-stop bus components are estimated to cost an additional \$82 million in capital expenses and \$37 million in annual operating and maintenance expenses in 2009 dollars. Financial planning for the Metro Express limited-stop bus improvements are to be completed as part of the on-going individual corridor studies for each of the Metro Express bus corridors jointly with WMATA.

Project costs for the proposed streetcar system plan are divided into two categories:

- **Capital costs** – one-time costs for infrastructure and vehicles required to provide service; and
- **Operating and maintenance costs** – recurring costs for each year a service is operating.

All costs for the various components of the three-phased implementation plan are in 2009 dollars except where noted. They were developed using existing unit costs from similar systems whenever possible. The Anacostia Initial Line Segment, H/Benning Streetcar initial segment, and 11th Street Bridge streetcar projects are considered part of the baseline condition, because construction activities are already underway for them. Maintenance facilities that are under construction for the Anacostia and H/Benning segments are also considered part of the baseline condition. Capital costs for these initial streetcar segments and facilities in the baseline condition are not included in the cost estimates. However, the costs associated with expanding the maintenance and storage facility for the Anacostia Initial Line Segment to accommodate the Phase 1 system is included in the capital cost estimates.

Streetcar Capital Costs

Based on recent experience constructing modern streetcar systems in other cities, it is estimated that capital costs for streetcar systems are typically about \$40 million per mile for double track facilities in 2009 dollars (not including maintenance and storage facilities), although some systems can well exceed those estimates. Capital costs include the physical elements required to operate the proposed transit system, including:

- Streetcar vehicles;
- Utility relocation and street reconstruction;
- Tracks, overhead catenary and power systems;

- Limited bridge reconstruction;
- Stations, including amenities;
- Off-vehicle fare payment;
- Signal priority systems;
- Minor environmental mitigation;
- Contractor soft costs;
- Planning and design; and
- Planning level contingency.

In addition to these elements, the streetcar system will require the construction of supporting maintenance and storage facilities. The cost of supporting maintenance facilities can vary widely between \$4 to \$40 million per site based on the size, functions and the costs of land acquisition. The costs for these facilities are in addition to the \$40 million per mile costs for streetcar track facilities. Two types of maintenance and storage facilities have been identified for the system. As described in the previous section, a Type 1 facility is a smaller end-of-line storage yard, while the Type 2 service facility is a larger, centrally-located yard with a streetcar maintenance garage. Estimated capital costs are approximately \$13 million for each full size Type 1 base facility and \$0.37 million for each vehicle storage space, in 2009 dollars. Type 2 base facility is estimated to be approximately \$29.4 million, with \$0.37 million for each vehicle storage space, in 2009 dollars. These estimates include land acquisition costs, and the District could save substantial capital costs by utilizing District-owned property for storage and maintenance facilities.

Table 4-4 lists the capital costs over the entire 20-year life of the implementation plan. These costs are shown in inflated dollars reflecting a three-percent per year inflation factor. The schedule of the plan assumes that Phase 1 is from 2011 to 2015, Phase 2 is from 2016 to 2018, and Phase 3 is from 2019 to 2020.

Streetcar Operating and Maintenance Costs

Unlike capital costs, operating and maintenance costs recur every year once a transit service begins operating. As a result, for services that begin early in the implementation phasing, the cumulative operating and maintenance costs over the life of the plan can be substantial, even if the annual costs are relatively low. Table 4-5 presents the estimated unit operating and maintenance costs per revenue hour for costs associated with vehicle operators, maintenance staff, and administrative support staff. The table also shows the estimated costs per vehicle revenue mile relative to the costs for track and station

maintenance and electricity to power the system. The unit operating costs are based on information from the National Transit Database for operating streetcar systems. These are conservative estimates of costs and may be higher than actual costs of the system depending on the costs for the entity designated to operate the system.

Operating and maintenance cost estimates are based on the annual revenue hours of service and the annual revenue miles of service provided by each streetcar line in the plan. The operating and maintenance costs by each phase of the project are shown in Table 4-6. The unit costs are calculated using labor costs and operating costs and are described in the notes of the table. It is assumed that the streetcar lines will operate with 10-minute headways during peak and off-peak time periods. The estimates assume that the service operates:

- Monday through Thursday from 6 am to 12 am
- Friday from 6 am to 2 am
- Saturday from 8 am to 2 am
- Sunday from 8 am to 10 pm

The streetcar corridors will be interlined so that some segments of the system will accommodate multiple lines. Therefore the operating miles will be greater than the length of the proposed system assumed in the capital improvements table. The table also does not show the impacts of changes that may be made to the underlying local bus service network.

Total Annual Costs

Table 4-7 summarizes the total estimated annual capital expenditures and operating and maintenance expenditures to construct and operate the streetcar system between 2011 and 2020.

Potential Funding Sources

There are a broad range of funding and financing approaches available for surface transit alternatives in the District of Columbia. These possible funding sources include:

- Federal Grants
 - Section 5309 Federal Transit Capital Program
 - Section 5307 Urbanized Area Formula Program
- Joint Development and Benefit Capture
 - Leasing/selling development rights
 - Leasing/selling land or facilities
 - Special benefit assessment districts
 - Cost sharing
 - Concession leases
 - Density bonuses
 - Tax increment financing
 - Connector fees
- Taxes and User Charges
 - Motor fuel tax
 - Extension of State retail sales tax to motor fuels

Table 4-4: Estimated Streetcar System Capital Costs (in millions)

Item	Capital Cost (2009 \$)	Capital Cost (YOE \$)	Notes
Phase 1*			
Vehicles, Track & Infrastructure	\$498.0		Assumes 12.45 miles of track & infrastructure at \$40M per mile in 2009\$
Expand Type 1 Maintenance and Storage Facility (Anacostia Initial Line Segment Facility)	\$5.6		Expand storage capacity from 5 vehicles to 20 vehicles
New Type 2 Maintenance and Storage Facility	\$37.5		New Type 2 Facility with 22 spaces
Subtotal Phase 1	\$541.1	\$617.2	
Phase 2			
Vehicles, Track & Infrastructure	\$464.0		Assumes 11.6 miles of track & infrastructure at \$40M per mile in 2009\$
Expand Type 2 Maintenance and Storage Facility	\$10.4		Expand storage capacity from 22 vehicles to 50 vehicles
New Type 2 Maintenance and Storage Facility	\$33.5		New Type 2 Facility with 11 spaces
Subtotal Phase 2	\$507.9	\$640.1	
Phase 3			
Vehicles, Track & Infrastructure	\$420.0		Assumes 10.5 miles of track & infrastructure at \$40M per mile in 2009\$
Expand Type 2 Maintenance and Storage Facility	\$14.4		Expand storage capacity from 11 vehicles to 50 vehicles
New Type 1 Maintenance and Storage Facility	\$15.1		New Type 1 Facility with 8 spaces
Subtotal Phase 3	\$450.1	\$614.0	
Total	\$1,499.1	\$1,871.3	

*Assumes two Type 1 Maintenance and Storage Facilities are already constructed prior to Phase 1 as part of the Anacostia Initial Line Segment to accommodate 5 vehicles and H/Benning Streetcar Project to accommodate 9 vehicles.

Table 4-5: Streetcar Operating and Maintenance Unit Costs*

Item	Unit	Unit Cost (2009 \$)
Vehicle Operators, Vehicle Maintenance Staff, and Administrative Support		
Wages	Vehicle Revenue Hour	55.03
Fringe Benefits	Vehicle Revenue Hour	73.02
Services and Parts	Vehicle Revenue Hour	88.76
Total	Vehicle Revenue Hour	216.81
Track and Facility Maintenance Staff and System Power		
Wages	Vehicle Revenue Mile	1.67
Fringe Benefits	Vehicle Revenue Mile	1.24
Services and Parts	Vehicle Revenue Mile	1.18
Total	Vehicle Revenue Mile	5.23

*Unit costs for existing streetcar and light rail transit systems vary widely. These estimates are from the middle of typical cost ranges.

Table 4-6: Operating and Maintenance Costs by Phase (in millions – 2009 dollars)

Streetcar Line (by phase)	Operating Length* (miles)	Revenue Miles	Unit Cost per Revenue Mile	Revenue Hours	Unit Cost per Revenue Hour	Cumulative Annual Operating Costs
Phase 1						
Georgetown to H/Benning	6.2	270,816	\$5.23	27,082	\$216.81	\$7.3
Georgia Avenue to Buzzard Point	3.8	165,984	\$5.23	16,598	\$216.81	\$4.5
Congress Heights to Downtown	6.7	292,656	\$5.23	29,266	\$216.81	\$7.9
Anacostia Streetcar to Nationals Park	3.4	148,512	\$5.23	14,851	\$216.81	\$4.0
PHASE 1 TOTAL	20.1	877,968		87,797		\$23.6
Phase 2						
Georgetown to H/Benning	7.0	305,760	\$5.23	30,576	\$216.81	\$8.2
Georgia Avenue to Buzzard Point	7.1	310,128	\$5.23	31,013	\$216.81	\$8.3
Congress Heights to Downtown	7.8	340,704	\$5.23	34,070	\$216.81	\$9.2
Woodley Park to Congress Heights	8.8	384,384	\$5.23	38,438	\$216.81	\$10.3
Anacostia Streetcar to Nationals Park	3.4	148,512	\$5.23	14,851	\$216.81	\$4.0
Rhode Island Avenue to Downtown	6.0	262,080	\$5.23	26,208	\$216.81	\$7.1
PHASE 2 TOTAL	31.3	1,367,184		136,718		\$47.1
Phase 3						
Georgetown to H/Benning	7.0	305,760	\$5.23	30,576	\$216.81	\$8.2
Georgia Avenue to Buzzard Point	9.4	410,592	\$5.23	41,059	\$216.81	\$11.0
Congress Heights to Downtown	7.8	340,704	\$5.23	34,070	\$216.81	\$9.2
Congress Heights to Nationals Park	4.5	196,560	\$5.23	19,656	\$216.81	\$5.3
Rhode Island Avenue to Downtown	6.0	262,080	\$5.23	26,208	\$216.81	\$7.1
Woodley Park to Congress Heights	8.8	384,384	\$5.23	38,438	\$216.81	\$10.3
Anacostia Streetcar to Minnesota Avenue	5.0	218,400	\$5.23	21,840	\$216.81	\$5.9
Woodley Park to Brookland "A Line" (follows Irving St between Warder St and 4 th St NE)	4.4	192,192	\$5.23	19,219	\$216.81	\$5.2
Woodley Park to Brookland "B Line" (follows Michigan Ave between Warder St and 4 th St NE)	4.5	196,560	\$5.23	19,656	\$216.81	\$5.3
PHASE 3 TOTAL	57.4	2,507,232		250,723		\$67.5

*Differs from track miles due to interlining

Table 4-7: Summary of Capital and Operating and Maintenance Costs by Year (in millions of Year of Expenditure \$)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Capital Costs	\$79.6	\$120.2	\$135.1	\$139.1	\$143.3	\$202.9	\$215.4	\$221.8	\$295.7	\$318.4	\$1,871.4
Operating and Maintenance Costs	-	\$4.4	\$11.3	\$18.5	\$32.2	\$40.6	\$50.7	\$61.3	\$76.6	\$94.1	\$389.7
Total	\$79.6	\$124.6	\$146.3	\$157.7	\$175.5	\$243.5	\$266.0	\$283.1	\$372.3	\$412.5	\$2,261.1

- Motor vehicle license fee
- Motor vehicle emissions fee
- Alcohol and cigarette tax
- Corporate income tax
- Business, Professional, and Occupational License (BPOL) tax
- Local option sales tax
- Personal income tax
- Utility tax
- Recordation tax
- Lodging tax
- Local restaurant/food tax
- Local property tax
- Parking receipt tax
- Vehicle Leasing
- Debt Financing
 - General obligation funds
 - Revenue bonds

With the exception of Benefit Assessment Districts and Tax Increment Financing, most of these approaches provide only a modest amount of revenue relative to projected operating and maintenance costs and capital costs for any given project. There are also innovative funding and financing approaches, which include the following:

- Deferred Local Match – Federal grant funding from the New Starts or Small Starts program is provided up-front, allowing deferral of locally funded project capital costs. The total local funding match for the project through completion remains the fixed amount negotiated with FTA.
- Revolving Loan Fund – Current federal surface transportation legislation permits states and the District of Columbia to apply a portion of their Federal Aid Highway Funding to capitalize a state infrastructure bank (SIB). The SIB then provides loans to transportation projects in the jurisdiction. Funds repaid to the SIB are lent to new transportation projects. This approach requires the District of Columbia to activate a SIB by capitalizing it with federal highway funds.
- Joint Development – Transportation agencies work directly with private developers in planning and executing a specific project involving the development on, above, or adjacent to land owned by a transit agency for a negotiated payment by the developer. Developer payments may include an annual ground or air-rights lease payment for a specific period of time as well as the construction cost of transit-related facilities, such as portals to transit facilities, parking facilities, and station

facility improvements.

- Use of Proceeds from Sale of Assets in Joint Development Projects – In lieu of lease payments for joint development parcels, a transportation agency may execute the outright sale of property for use by private developers. Often such arrangements involve the sale of construction staging areas or other surplus land no longer required following completion of a project.
- Transfer of Federal Ownership – Lands owned by the Federal government may be transferred to the District of Columbia for use in transportation projects. Lands may be transferred free of charge or in exchange for land owned by the District government elsewhere in the city.
- Incidental Non-Transit Use – Real estate acquired for projects that apply FTA funds must meet FTA requirements, including bona fide transportation use by the project for which the property is acquired. However, incidental non-transit use of property acquired for transportation projects is allowed. Such uses include joint development at station sites or the on-premise location of retail such as a coffee shop or newsstand. Incidental non-transit use may generate a small but stable revenue stream for a given project.
- Benefit Assessment District – The public sector owner/sponsor of a transit infrastructure project may partner with private sector property owners to create a sustainable funding source for transit improvements. Benefit Assessment Districts (BAD) assess properties within a defined distance of the fixed guideway and/or stations a higher property tax rate or special assessment commensurate with and in exchange for the benefits received from the property's enhanced accessibility due to the transit improvement.
- Tax Increment Financing – A portion of the property tax revenue collected on the incremental growth in the taxable value of real property within a defined boundary of the transportation project is dedicated to fund the transportation improvements. Thus, a portion of the increased taxable value of properties proximate to and benefiting from transportation improvements is applied to fund the cost of these improvements. Unlike BAD, the tax rate within the affected district remains unchanged. The portion of the tax revenue collected by the District of Columbia government within the defined district dedicated to the transportation project will not be available for other public uses.

Based on discussions regarding potential funding sources with DC government and the project participants, four major sources were identified for consideration. These included the following:

- Federal Grant Funding – The District of Columbia in coordination with WMATA may choose to pursue Section 5309 New Starts capital funding for portions of the streetcar system. However, these grants are discretionary and projects must compete for a limited pool of available funds.
- Local Government Contribution – DC general funds can also be used to fund a portion of the capital and operating and maintenance costs of the system.
- Value Capture – Interviews conducted with the development community as part of the system plan development revealed considerable enthusiasm for the corridor transit investments. This level of interest provided the basis for focusing funding and financing options on value-capture mechanisms, such as a BAD.
- User Fees – The two types of user fees considered were transit user fees and parking fees. Transit user fees are the fares that transit users will pay for the service. Parking fees could take many forms, but the most efficient are those associated with a parking tax. A parking fee generates substantial and stable revenue, is borne primarily by non-residents, and, arguably, may also be regarded as a Travel Demand Management (TDM) tool that mitigates congestion and contributes to improvement in air quality. Additionally, a parking tax has a logical nexus whereby revenue is raised from a transportation user charge and dedicated to transportation investment.

Streetcar System Funding

This section documents the recommended funding and financing options available to the District of Columbia to support the streetcar system plan. The funding strategy assumes that existing transit providers, primarily WMATA, will continue to receive funding for capital and operating costs of existing transit services in the District from existing revenue streams. This funding plan, therefore, addresses the incremental capital and operating costs and the marginal revenues required to provide premium streetcar services to the District. The funding plan does not include the capital costs for the Anacostia Initial Line Segment and the H /Benning Streetcar project, because these projects are already under construction.

Annualized Costs and Funding

From 2011 to 2030, capital expenses for the streetcar plan will total \$1,871 million in year-of-expenditure dollars, while operating expenses will total \$1,501 million. Funding for the system will come from the following sources:

- Federal Section 5309 Funding – assumes funding levels equal to 25% of the capital cost of the system;
- Local Government Contribution – assumes funding levels equal to 25% of the capital cost of the system, and 100% of the operating cost of the system, less fare revenues collected on the streetcar system;
- Value Capture Funding – based on property tax assessments within ¼ mile of streetcar lines, beginning in 2012 or five years prior to service in each segment (whichever is later), such as BAD dedicated taxes generated by an increase in property tax rates to fund transit capital improvements; and
- User Fee Funding – includes the revenue from the streetcar fare box and parking fees. Two types of annual per-parking space fees were evaluated, including rates for commercial and residential parking at medium- and high-density properties within ¼-mile of streetcar corridors as described below. This revenue source is assumed to begin in 2012 or five years prior to service in each segment (whichever is later).

The financial plan assumes a pay-as-you-go approach, funding the project on a cash basis, without debt financing. General Fund revenues are assumed to defray the non-federal share of project costs in FY11, with BAD and parking fee revenues covering a greater share of the project cost in subsequent years. Funds are structured to ensure that General Fund contributions cover no more than 25% of project capital costs by the conclusion of Phase 3 construction in 2020. BAD and parking fee revenue streams are assumed to sunset upon completion of Phase 3 of the program in 2020.

Table 4-8 shows the existing commercial and residential tax rates per \$100 of assessed value and can be used as a point of comparison to the additional amounts necessary to support the streetcar system construction.

Table 4-9 presents the rates required for BAD and parking fees to cover the projected capital expenses not covered by the Federal and Local Government funding. These rates assume that 25% of the capital costs for the system are funded by Federal capital grants and another 25% of the capital costs are covered by local government contributions. Note that many assumptions in the finance model were based on pre-2008 real estate market conditions reflecting the time when the original analysis was completed. Also note that the rates of taxation required under the BAD scenarios are reported in cents, not dollars. For example, the additional commercial property tax required is 2.0 cents, or \$0.02, which amounts to two additional pennies per \$100 assessed value. The District of Columbia has statutory limits on the level of debt that it can issue. The use of debt financing would depend on the legal and financial capacity of the District to issue debt.

Tables 4-10 and 4-11 depict the project costs and the source of funds for pay-as-you-go financing over the 20-year period. Figures 4-15 and 4-16 show the uses and

sources of funds graphically. As shown in the tables, project funds are sufficient from these identified sources to cover capital costs and operating and maintenance (O&M) costs.

Table 4-8: Existing Property Tax Rates

Class	Tax Rate per \$100 of Assessed Value	Description
1	\$0.85	Residential real property, including multifamily
2	\$1.65	Commercial and industrial real property, including hotels and motels, for the first \$3 million of assessed value
2	\$1.85	Commercial and industrial real property, including hotels and motels, for assessed value more than \$3 million
3	\$10.00	Vacant real property

Table 4-9: Dedicated Funding: Benefit Assessment District Plus Parking Fees

Source	Rates Required for Pay-as-you-go Financing
Benefit Assessment Districts 2 Years Prior to Service (Additional property tax)	2 cents per \$100 Commercial and 1 cent per \$100 Residential <i>From 2012 through 2020</i>
Parking Fee (Annual Fee)	\$220/space Commercial and \$110/space Residential High- and Medium-Density <i>From 2012 through 2020</i>

* Assumes federal grants cover 25% of capital costs and local government contribution covers another 25% of capital costs

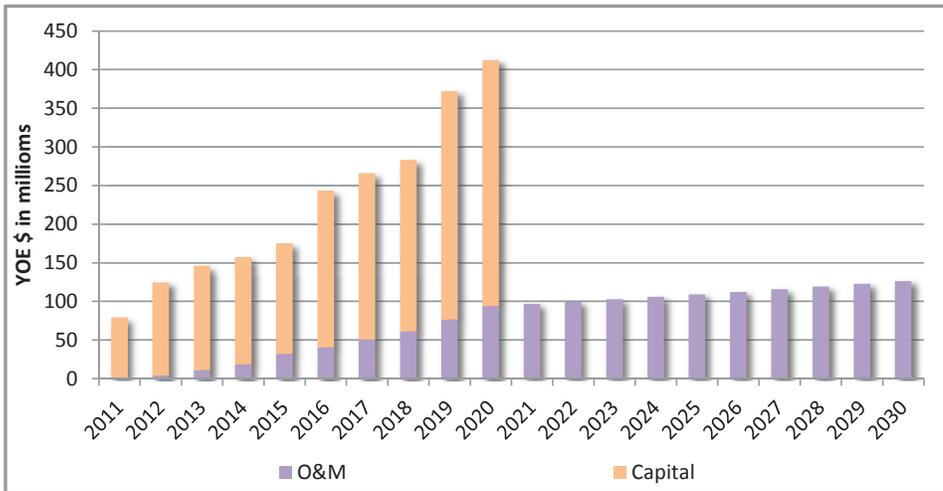
Table 4-10: Pay-as-you-go Financing: Annual Project Costs and Sources of Funds by Year 2011- 2020 (YOE \$ in millions)

	Phase 1					Phase 2			Phase 3		TOTAL
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Capital Uses of Funds:											
Capital Costs	\$79.6	\$120.2	\$135.1	\$139.1	\$143.3	\$202.9	\$215.4	\$221.8	\$295.7	\$318.4	\$1,871.4
Total Capital Uses (2011-2020)	\$79.6	\$120.2	\$135.1	\$139.1	\$143.3	\$202.9	\$215.4	\$221.8	\$295.7	\$318.4	\$1,871.4
Capital Sources of Funds:											
Local Funds (25% of Capital)	\$59.7	\$25.6	\$29.3	\$30.4	\$31.4	\$46.3	\$49.4	\$51.0	\$69.5	\$75.2	\$467.8
Federal Funds (25% of Capital)	\$19.9	\$30.0	\$33.8	\$34.8	\$35.8	\$50.7	\$53.8	\$55.5	\$73.9	\$79.6	\$467.8
Private Funds (Remainder of Capital)											
Value Capture (BAD)	\$-	\$24.6	\$25.5	\$37.5	\$38.8	\$40.2	\$41.6	\$43.1	\$44.6	\$46.2	\$341.9
Parking Fees	\$-	\$47.4	\$47.9	\$70.8	\$71.4	\$71.9	\$72.4	\$72.9	\$73.4	\$73.9	\$601.8
Total Capital Sources (2011-2020)	\$79.6	\$127.6	\$136.5	\$173.4	\$177.4	\$209.1	\$217.2	\$222.4	\$261.4	\$274.9	\$1,879.4
Net Capital Cash Flow	\$-	\$7.4	\$1.4	\$34.3	\$34.1	\$6.1	\$1.8	\$0.6	(\$34.3)	(\$43.5)	\$8.0
Operating Uses of Funds:											
Operating and Maintenance Costs	\$-	\$4.4	\$11.3	\$18.5	\$32.2	\$40.6	\$50.7	\$61.3	\$76.6	\$94.1	\$389.7
Total Operating Uses (2011-2020)	\$-	\$4.4	\$11.3	\$18.5	\$32.2	\$40.6	\$50.7	\$61.3	\$76.6	\$94.1	\$389.7
Operating Sources of Funds:											
Farebox Revenues	\$-	\$1.3	\$3.4	\$5.6	\$9.7	\$12.2	\$15.2	\$18.4	\$23.0	\$28.2	\$116.9
General Fund (100% of O&M less Fare Rev.)	\$-	\$3.1	\$7.9	\$13.0	\$22.6	\$28.4	\$35.5	\$42.9	\$53.6	\$65.9	\$272.8
Total Operating Sources (2011-2020)	\$-	\$4.4	\$11.3	\$18.5	\$32.2	\$40.6	\$50.7	\$61.3	\$76.6	\$94.1	\$389.7
Net Operating Cash Flow	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Annual Surplus (Shortfall)	\$-	\$7.4	\$1.4	\$34.3	\$34.1	\$6.1	\$1.8	\$0.6	(\$34.3)	(\$43.5)	\$8.0

Table 4-11: Pay-as-you-go Financing: Annual Project Costs and Sources of Funds by Year 2021- 2030 (YOE \$ in millions)

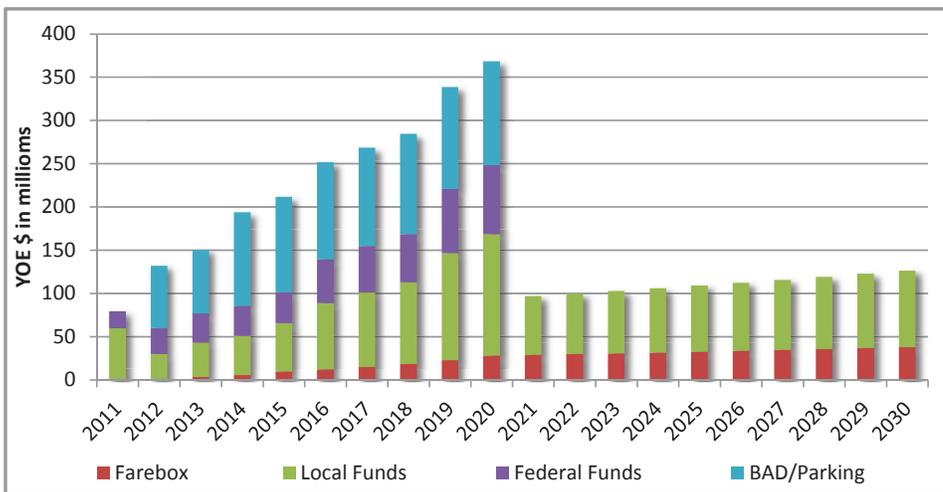
	Phase 3										TOTAL
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Operating Uses of Funds											
Operating and Maintenance Costs	\$97.0	\$99.9	\$102.9	\$105.9	\$109.1	\$112.4	\$115.8	\$119.2	\$122.8	\$126.5	\$1,111.4
Total Operating Uses (2021-2030)	\$97.0	\$99.9	\$102.9	\$105.9	\$109.1	\$112.4	\$115.8	\$119.2	\$122.8	\$126.5	\$1,111.4
Operating Sources of Funds											
Farebox Revenues	\$29.1	\$30.0	\$30.9	\$31.8	\$32.7	\$33.7	\$34.7	\$35.8	\$36.8	\$38.0	\$333.4
General Fund (100% of O&M less Fare Rev.)	\$67.9	\$69.9	\$72.0	\$74.2	\$76.4	\$78.7	\$81.0	\$83.5	\$86.0	\$88.6	\$778.0
Total Operating Sources (2021-2030)	\$97.0	\$99.9	\$102.9	\$105.9	\$109.1	\$112.4	\$115.8	\$119.2	\$122.8	\$126.5	\$1,111.4
Net Operating Cash Flow	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Annual Surplus (Shortfall)	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-

Figure 4-15: Pay-as-you-go Financing: Uses of Funds (YOE \$ in millions)



Source: AECOM Technical Services, Inc.

Figure 4-16: Pay-as-you-go Financing: Sources of Funds (YOE \$ in millions)



Source: AECOM Technical Services, Inc.

5.0 Moving Forward

This chapter describes the process for advancing large capital projects such as the streetcar through the project development process. The District of Columbia can fund projects with or without federal funding. The two approaches have different requirements for developing the project and completing the necessary environmental studies and review. Section 5.1 describes the project development approach for federally funded projects, and Section 5.2 describes the approach for non-federally funded projects. Section 5.3 describes project delivery methods, including alternative approaches for completing project design and construction activities.

5.1 Process for Federally Funded Projects **Project Development**

Constrained Long Range Transportation Plan (CLRP) and Transportation Improvement Program (TIP)

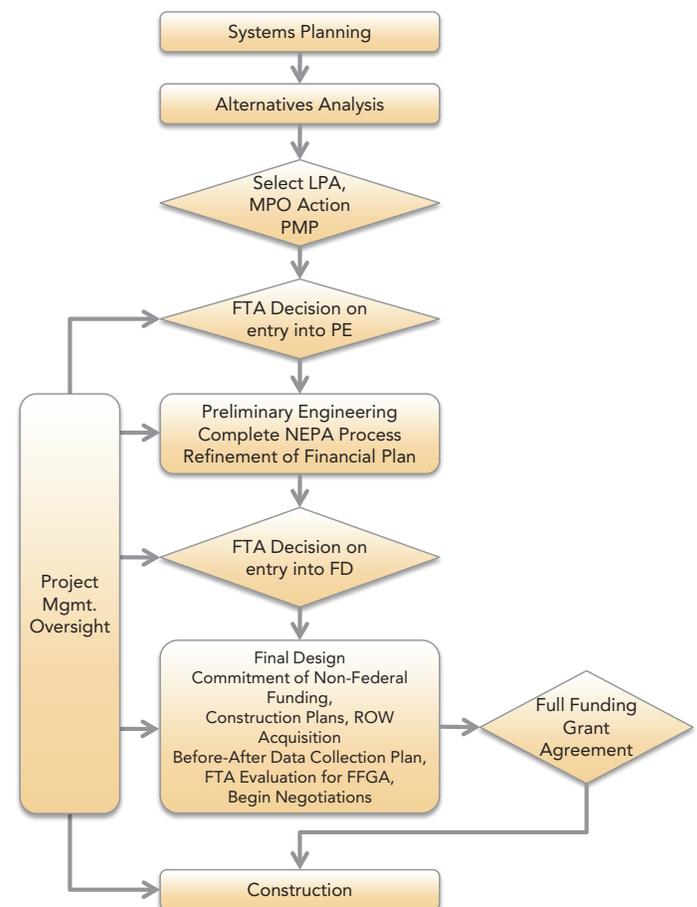
For projects to be considered for federal funding participation, they must be included in the CLRP. The CLRP identifies all regionally significant transportation projects and programs that are planned in the Washington metropolitan area over the next 20 years. The projects and programs that go into the CLRP are developed cooperatively by governmental bodies and agencies represented on the National Capital Region Transportation Planning Board (TPB). The CLRP and TIP are updated every year. Every four years the TPB is required to do a major plan update. The TIP is a 6-year financial program that describes the schedule for obligating federal funds to state and local projects. Major steps in the CLRP Update process include:

- TPB releases final call for projects;
- DDOT submits project;
- CLRP and TIP project submissions are released for public comment;
- TPB reviews public comment and is asked to approve submissions for inclusion in the Air Quality Conformity Analysis;
- Draft CLRP and TIP are released for public comment; and
- TPB reviews the public comments and responses and adopts the Draft Plan.

This process usually begins in December and ends in October of each year.

If an individual streetcar project is to remain eligible for federal funding participation under the FTA Section 5309 New Starts Program, then there is a specific federal project development process that candidate projects must follow.

Figure 5-1: FTA New Starts Project Development Process



This process is shown in Figure 5-1.

The process includes several key decision points that require FTA and possibly FHWA approval before entering the subsequent steps in the process. These key decision points include granting permission to enter Preliminary Engineering, granting permission to enter Final Design, and establishing a Full Funding Grant Agreement to fund the federal share of the capital costs of the project. Approvals are based in part on the ability of a project to meet minimum thresholds of cost effectiveness as well as other specific criteria related to local project funding and land use planning. The process includes meeting the requirements of NEPA.

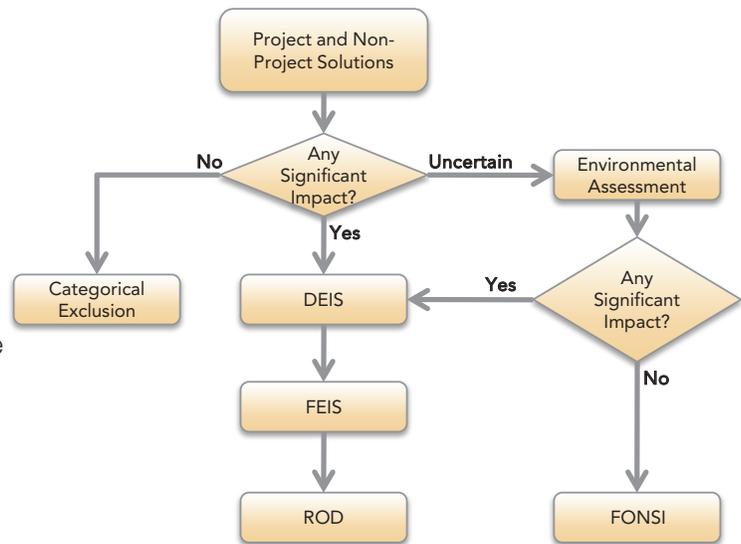
Corridor Level Alternatives Analysis

Individual streetcar corridor projects will need to advance through the Alternatives Analysis/NEPA process and then obtain permission from FTA to enter into Preliminary Engineering. Typically, corridor level Alternatives Analyses are conducted concurrently with the NEPA process. The corridor level Alternatives Analysis will need to consider a range of alternatives designed to address locally identified mobility and other problems in the specific transportation corridor.

NEPA Class of Action

Determination of the proper approach for addressing NEPA requirements will also need to be made through consultation with FTA. Figure 5-2 outlines the decision process in selecting the appropriate “class of action” under NEPA. The first decision point in determining the appropriate class of action is estimating the likelihood of a significant impact resulting from implementation of the project. If no significant impact is reasonably expected or the project meets the criteria established by the joint FHWA/FTA environmental regulations, a Categorical Exclusion can be documented and the project can proceed. If there is a potential for the existence of significant impacts, the project must proceed through more detailed documentation – either entering the Environmental Impact Statement (EIS) or Environmental Assessment (EA) process. Generally, a major investment has the potential to result in a significant impact – usually through the relocation of residences or businesses, requirement of significant property acquisition, or disturbance to sensitive aspects of the human or natural environment – and will require a draft and final EIS (DEIS and FEIS, respectively). If the potential exists that the project will not result in significant impacts, but the potential is not certain, an EA can be initiated to provide the necessary study and evaluation to determine the potential for significant impacts. If no

Figure 5-2: NEPA Class of Action Determination



significant impacts are discovered, the EA can proceed to documentation of the Finding of No Significant Impact (FONSI). If significant impacts are discovered, the EIS process must be initiated.

Traditional Approach to Meeting NEPA Requirements

The traditional NEPA approach looks at individual corridor projects separately and requires that each project establish its own class of action. The class of action for each project would depend on the types of potential impacts expected. This approach allows a single corridor project to advance through a single NEPA process and also allows for grouping multiple corridors together to be advanced as a single project. However, a disadvantage of this approach is that each NEPA document must discuss and validate alternatives, including revisiting the mode(s) selected for the project. This approach does not provide a cumulative look at the transit system as a whole and could result in difficulties in advancing a unified streetcar system.

Tiered Approach to NEPA

“Tiering” provides an alternate approach to satisfying NEPA requirements for major transportation actions. The first tier has a broad focus and explores issues such as “general location, mode choice, and area wide air quality and land use implications of the major alternatives”. The second tier of documents then focuses on site specific details of project impacts, costs and mitigation measures. A tiered approach is most often associated with projects where an EIS is the appropriate class of action.

An advantage of a tiered document is clearly stated in the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.20), which encourage the use of a tiered Environmental Impact Statement to “eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review.” This allows for the second tier documents to summarize only the issues presented and cleared in the first tier, thereby focusing on the specific action. A tiered approach for the DC’s Transit Future recommendations would have several benefits. During the first tier, project sponsors could resolve the issues of selecting the general project location and determining the final mode choice for the proposed system. In this manner, the tiered process would eliminate the need for re-evaluation of location and mode for each segment or corridor.

The first tier analysis and findings would allow the second tier of NEPA documentation to solely focus on corridor specific impacts and benefits. An additional benefit from the tiered approach is that the tiered document also lays the groundwork for determining the subsequent classes of action for the second tier documents. In essence, the first tier NEPA document provides the justification needed to help either FHWA or FTA make a determination on class of action for the second tier documents.

Hybrid Approach to NEPA

A hybrid approach would look at the streetcar system holistically while combining traditional and tiered approaches. It would use a first tier NEPA or DC Environmental Policy Act (DCEPA) document to review the system as a whole and to conduct an evaluation of mode choice and general alignment of proposed corridors. It would also allow second tier work on several projects already advancing through the planning and project development phase within the District, such as the Benning/H Street Corridor, Anacostia Corridor and the K Street Transitway Corridor improvements. DDOT prepared documentation to meet the requirements of the DCEPA for both the Benning/H Street Corridor and Anacostia Corridor; NEPA requirements were not completed because local funding for these projects was acquired. An Environmental Assessment was prepared under NEPA for K Street NW, which evaluated a K Street Transitway plan that did not include streetcar facilities. The hybrid approach would incorporate the findings of these previous efforts while allowing the broader system to be evaluated by a first tier document.

Typically, an EIS is prepared for the first tier documents. However, as specific projects advanced to the second tier documents, other classes of action might apply. Based on the findings of the first tier document, it may be determined

that a Categorical Exclusion (CE) or an Environmental Assessment (EA) is appropriate for the second tier class of action for the identified projects.

The hybrid approach can provide the most thorough, comprehensive and rational approach to NEPA by evaluating network effects and corridor impacts. However, at the time of this report’s printing, FTA (the likely lead federal agency for the project) requests that projects follow a traditional NEPA approach.

Preliminary Engineering and Final Design

A corridor project is advanced to the Preliminary Engineering (PE) stage when:

- the preferred alternative has been developed to the point where environmental impacts are known and mitigation measures are developed;
- the project scope is final and its cost estimates are relatively firm; and
- its financial plan is set, with the majority of local funding committed.

Final Design is the last phase of New Starts project development, during which the project sponsor prepares for construction. Final design is also the stage during which FTA may enter into a multi-year commitment to fund a proposed New Starts project; this commitment is called a Full Funding Grant Agreement (FFGA).

5.2 Process for Non-Federally Funded Projects

For major capital projects that will use all local or private funding, the District of Columbia Project Development Process should be used. This process, illustrating inputs for decision milestones and agency coordination, is shown in Figure 5-3.

DC Public Law 8-36, the Environmental Policy Act of 1989, requires that all District of Columbia agencies consider the environmental impact of all proposed major actions. The lead agency in the District for coordinating these reviews is the District of Columbia Department of Consumer and Regulatory Affairs (DCRA). In accordance with DC Public Law 8-36, all building permit applicants must submit an Environmental Intake Form (EIF) and Environmental Impact Screening Form (EISF) to determine whether or not the proposed project is likely to have a substantial negative impact on the community and whether or not an Environmental Impact Statement is required by the District. The District requirement to prepare an EISF is superseded by those

projects subject to review under NEPA. Transportation projects falling under the DC Environmental Policy Act or NEPA must be coordinated with DC Regulatory agencies, DDOT, and the DC City Council. Projects must also be included in the DDOT Capital Improvements Program (CIP). The CIP outlines the project costs and expected funding sources for transportation projects over the next six years. Those projects slated for construction within the first year of the CIP include the actual budget appropriations. The DC City Council approves a new CIP each year.

Once the environmental impact review process is complete and the project is included in the CIP, the project can advance to final design and construction.

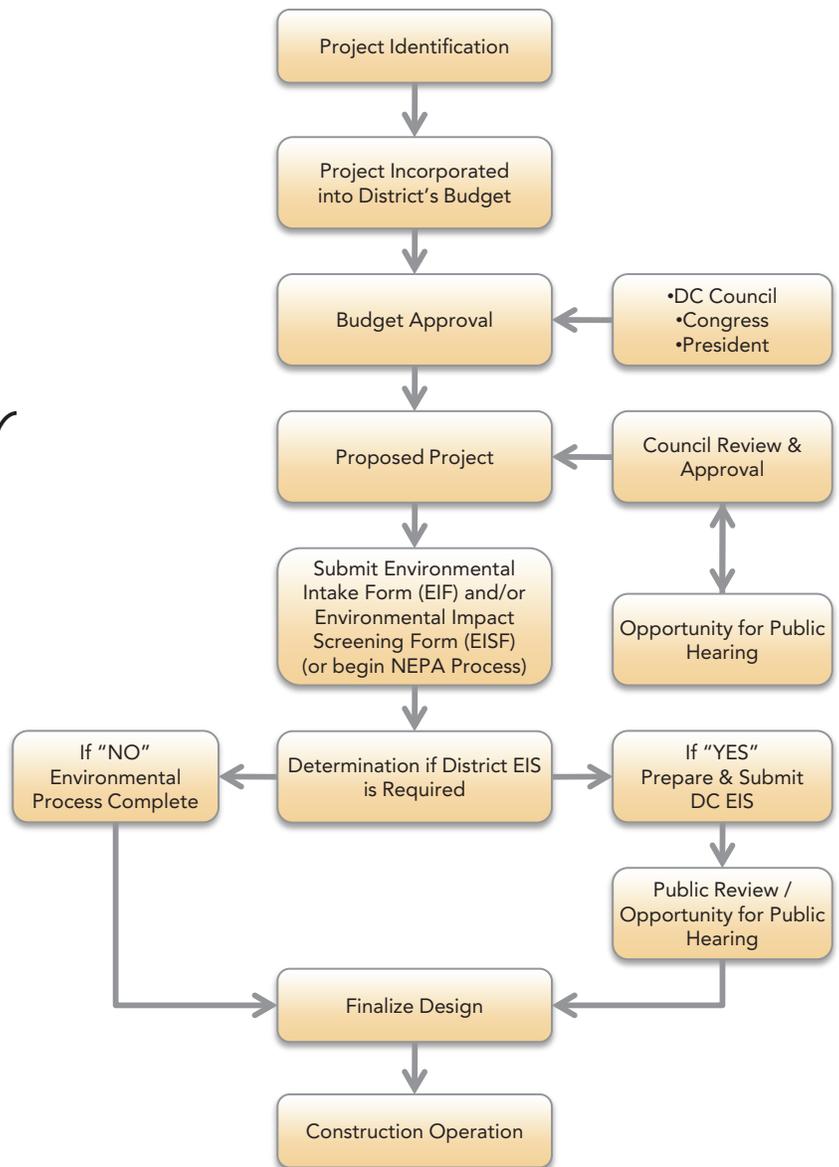
5.3 Project Delivery Methods

Another key decision that will need to be made to advance the streetcar system is to select a project delivery method for each of the projects as they move from the system planning phase into corridor planning and project design. The project delivery method chosen does not change the steps that must occur in the project development process as described in the previous section, but it does determine who has responsibility for various steps in the process. The three most common project delivery methods are described briefly below:

- **Design-Bid-Build** – Design-Bid-Build is the traditional project delivery method in which project design and construction services are contracted separately. In the past the Washington Metropolitan Area Transit Authority (WMATA) has used this approach to implement much of the Metrorail system that is currently operating throughout the region.
- **Design-Build** – Design-Build, also known as a turn-key method, is a project delivery method in which the project sponsor uses a single architectural/engineering entity for both design and construction services. Under this approach one entity performs both the engineering and construction services for the project. The agency owner does not need to be responsible for coordination between the design professional and the contractor. A Design-Build approach is currently being used by DDOT

Figure 5-3: DC Project Development Process (For Non-Federally Funded Projects)

Ongoing NCP&C & Commission of Fine Arts Review / Approvals



for the 11th Street Bridge Reconstruction as a means for encouraging creativity and flexibility in design and construction, along with fast-track project completion.

- **Design-Build-Operate-Maintain** – Design-Build-Operate-Maintain (DBOM) is similar to Design-Build, but the contract includes operations and maintenance of the system once it is constructed. For the Hudson-Bergen Light Rail project, New Jersey Transit used a DBOM approach for project delivery. The selected design and construction contractor delivered a fleet of vehicles, a guaranteed completion date, and 15 years of operation and maintenance of the system for a fixed price. The initial contract only covered the Initial Operating Segment, but it was later renegotiated for subsequent extensions.



Appendix A: Public Outreach

In Fall 2009, the District Department of Transportation (DDOT) coordinated a review of the proposed streetcar network plan with District of Columbia government agencies, key project stakeholders, and the general public. The agency and stakeholder reviews consisted of a series of briefings that provided an opportunity for participants to comment on the criteria used to develop the plan, proposed corridors, and the project phasing. DDOT also conducted a series of eight open houses, one in each Ward of the city, to provide an opportunity for participants to review the plan. Each open house included a short presentation and display boards that provided information on different aspects of the plan. At each open house, participants were encouraged to ask questions of the staff and provide comments and suggestions on the proposed streetcar network.

This appendix includes the materials and information that were provided at the each of the open houses in the order listed below:

1. Presentation (PowerPoint)
2. Display Boards
3. Overview Handout (English and Spanish)
4. Streetcar Vehicle Specification Handout
5. Ideas Form (English and Spanish)
6. Comment Form (English and Spanish)



DC's Transit Future



Public Open Houses

Fall 2009

Purpose of Tonight's Open House

- Overview of the *DC's Transit Future* System Plan
- Summary of Transit Investments Made to Date
- Streetcar Proposed System Plan
- Next Steps



DC's Transit Future System Plan

- The District's 1997 Vision, Strategy and Action Plan – recommended intra-city connections between the radial WMATA rail lines by designating ten corridors for transit improvements that would connect District neighborhoods and help support community economic development initiatives;
- WMATA's 1999 Transit Service Expansion Plan, advanced five corridors for further study;
- WMATA's 2001 Core Capacity Study – identified system-wide rail improvements that will allow the system to accommodate estimated future ridership;
- DC/WMATA's Transit Development Study – considered each of the previously-identified corridors for surface rail transit and recommended four priority corridors for implementation; and
- WMATA's 2003 Regional Bus Study – identified bus improvements to serve inside previously-designated corridor and to aid in District circulation and Metrorail system capacity relief.
- District of Columbia Alternatives Analysis, 2005 to 2009 – refined city-wide system plan of enhanced, multi-modal surface transit on designated corridors.

A Family of Services



Bike Sharing

- 1st in North America
- Expanding to 1,000 bikes in Spring 2010



Circulator

- 3 new routes
- Navy Yard, Woodley Park/Adams Morgan, and Smithsonian



Metrobus

- Restructure 30's route
- Studying restructuring of X routes.



Premium Bus

- Metro Extra 79
- Metro Express S9



BRT

- Submitting stimulus grant for K St. Transitway

What are Streetcars?

- The District has a 100-year history of streetcars
- Modern streetcars are smooth, quiet, and air-conditioned
- Streetcars mostly travel in the streets with cars
- Stations are spaced every ¼- to ½-mile



Why Streetcars?

- Streetcars provide added capacity to the District's transit network
- Streetcars stimulate economic development and retail growth in areas not served by Metrorail
- Streetcars improve the quality of transportation by connecting District neighborhoods



TRIO TYPE 12 COLOR SCHEME AND GRAPHICS APPLICATION - DC Streetcar



Why now?

- Population and job growth and congestion require new transit investments
- Metrorail crowding “unmanageable” by 2013



- The District is making once-in-a-generation infrastructure investments throughout the city
- Building streetcar projects in Anacostia and H St./Benning Rd.

Current Transit Improvements

H St./Benning Rd. NE

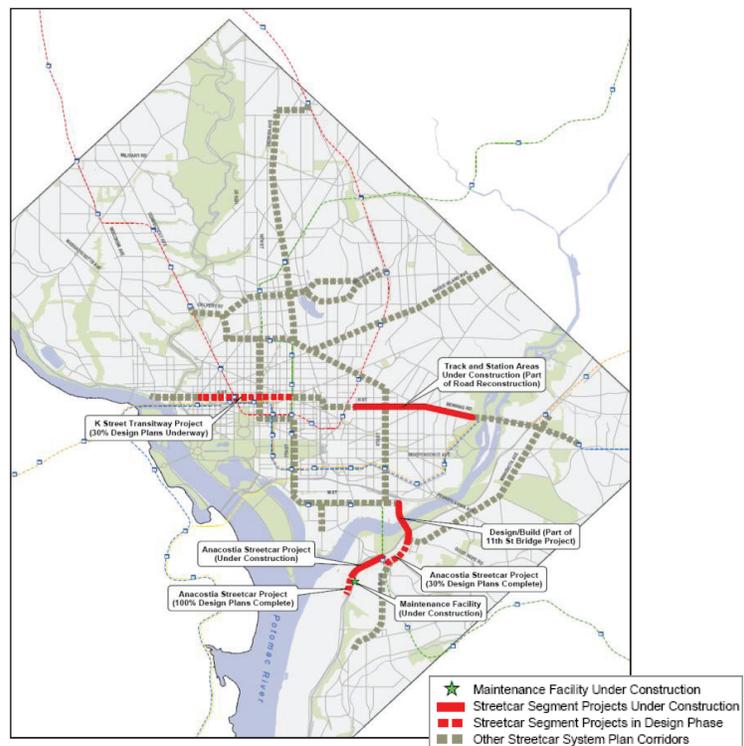
- Construction underway
- Estimated completion: Winter 2012

Anacostia Line

- Construction underway
- Estimated completion: Summer 2012

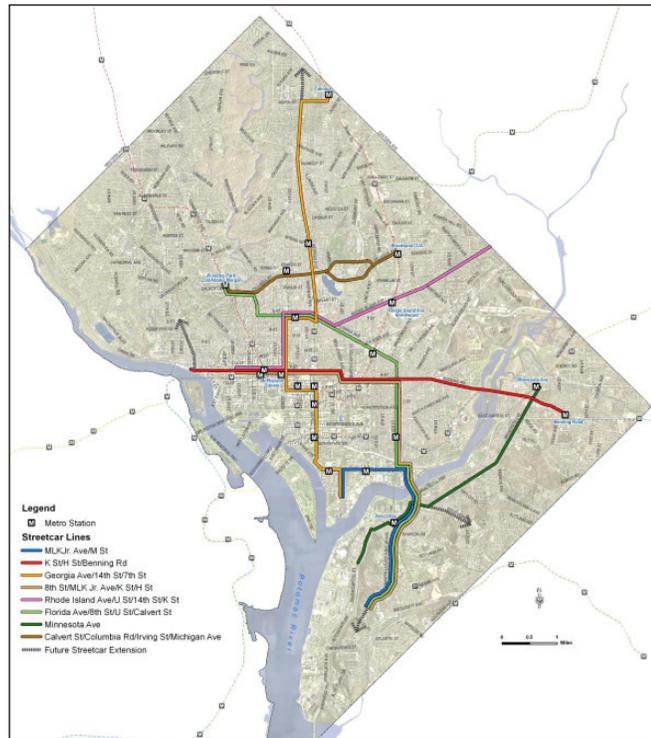
K Street Transitway

- Environmental Analysis, Fall 2009



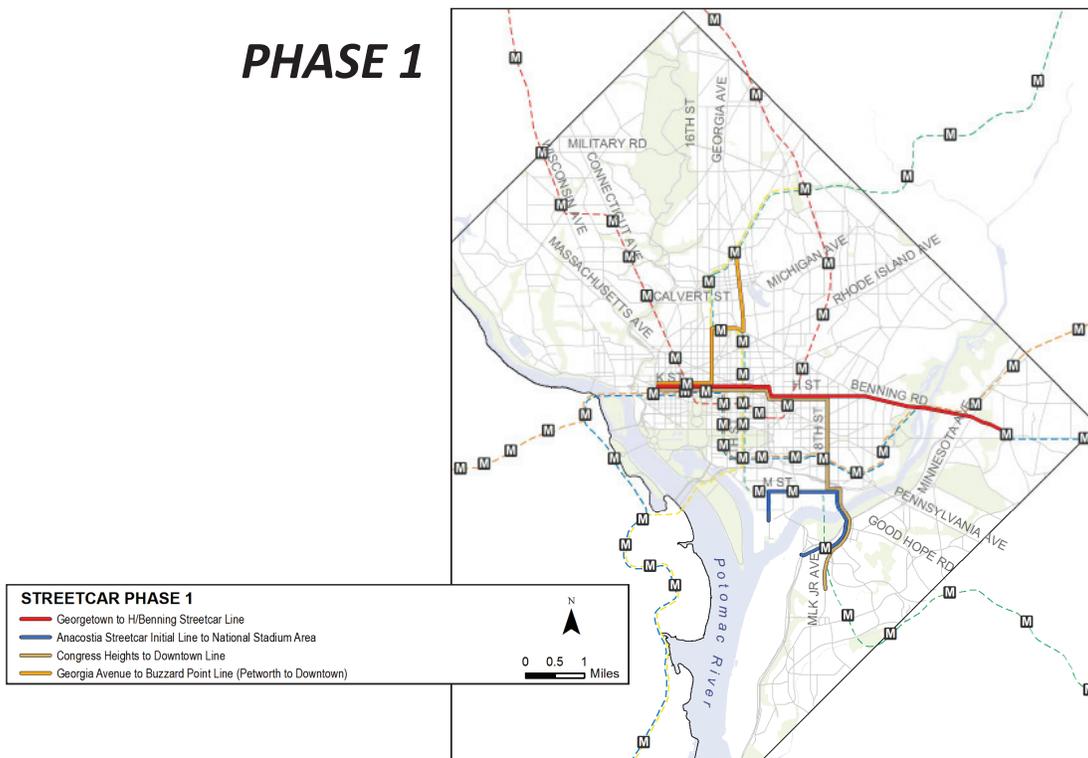
The Future Streetcar Network

- 37 miles of Streetcar lines
- Built in three phases
- Adds capacity to District's transit network
- Connects District neighborhoods and retail corridors
- Serve activity centers throughout the city



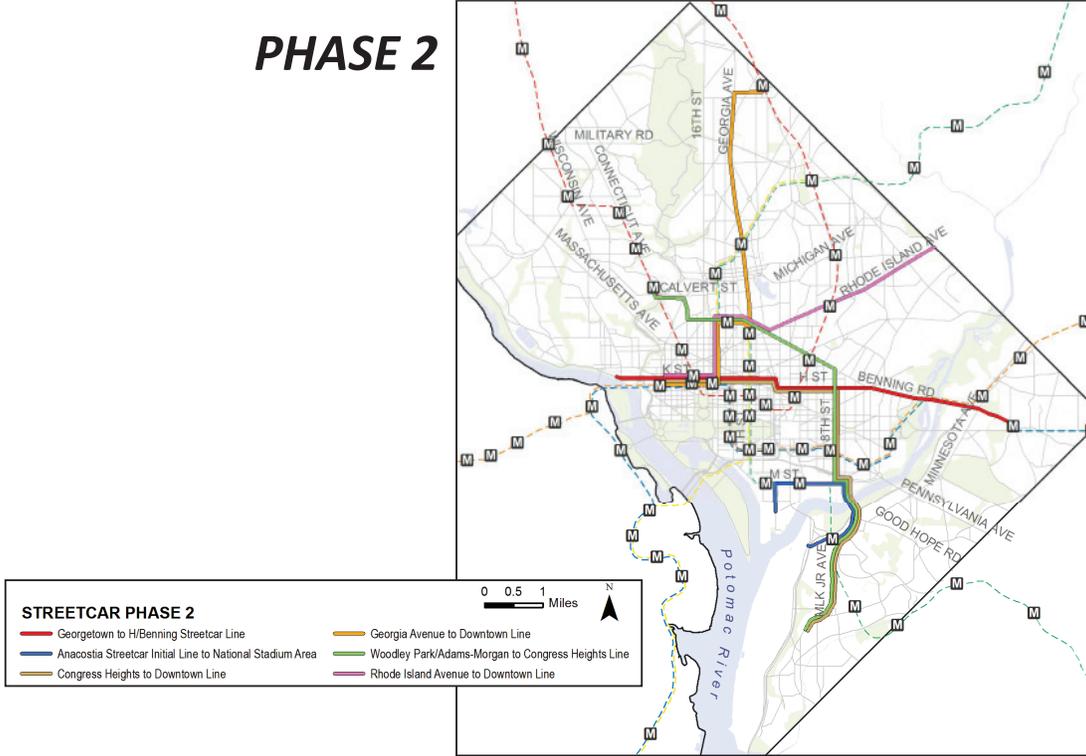
Streetcar Phasing...

PHASE 1



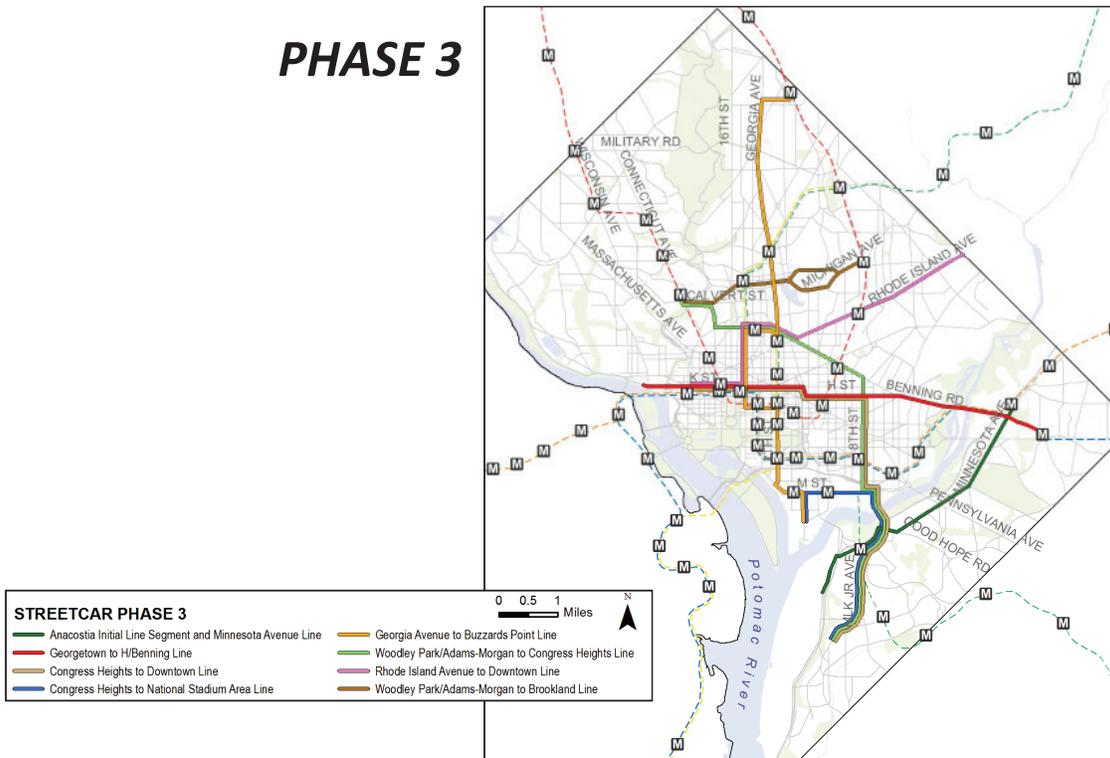
Streetcar Phasing...

PHASE 2

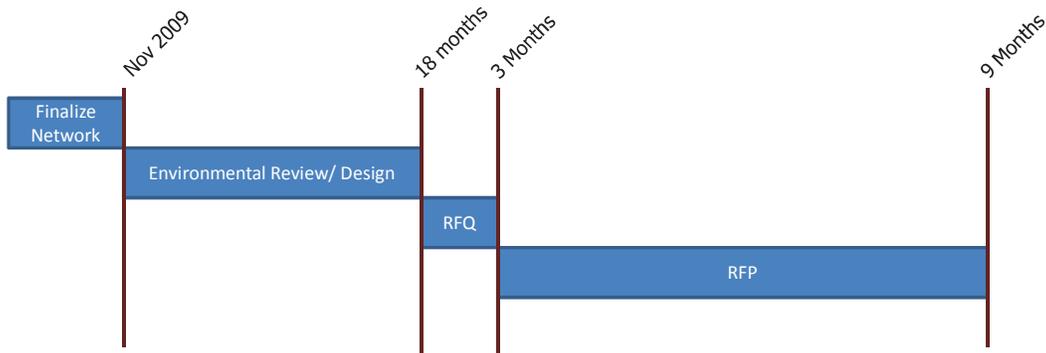


Streetcar Phasing...

PHASE 3



Next Steps



- **Public Open Houses**
- **Finalize Propose Draft Network Plan**
- **National Environmental Policy Act Process**
- **Procure firm to design, build, operate, and maintain streetcar system**

Staying Involved

- Individual Briefings
- Project website: www.ddot.dc.gov/dcstreetcar
- Contact: Scott Kubly- Project Manager
scott.kubly@dc.gov
Circe Torruellas- Outreach Coordination
circe.torruellas@dc.gov

DC's Transit Future



WELCOME

PLEASE SIGN IN



CHALLENGES FACING THE DISTRICT, STREETCARS AS A SOLUTION

Near- and Long-Term Transportation Challenges for DC:

- Population and job growth and congestion requires new transit investments
- Some Metrobus lines over 100 percent of capacity
- All Metrorail lines currently considered “highly congested”
- Metrorail crowding “unmanageable” by 2013



Why Streetcars?

- Streetcars provide added capacity to the District’s transit network
- Streetcars stimulate economic development and retail growth throughout the city
- Streetcars improve the quality of transportation by connecting District neighborhoods



Characteristics of Streetcars:

- Are air-conditioned and designed to run smoothly and quietly
- Share the road with other vehicles
- Stops are generally placed ¼-mile to ½-mile apart
- Vehicles: 66 feet long, 8 feet wide, and carry up to 168 passengers

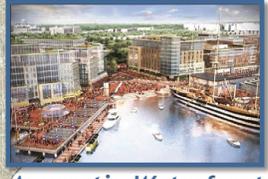
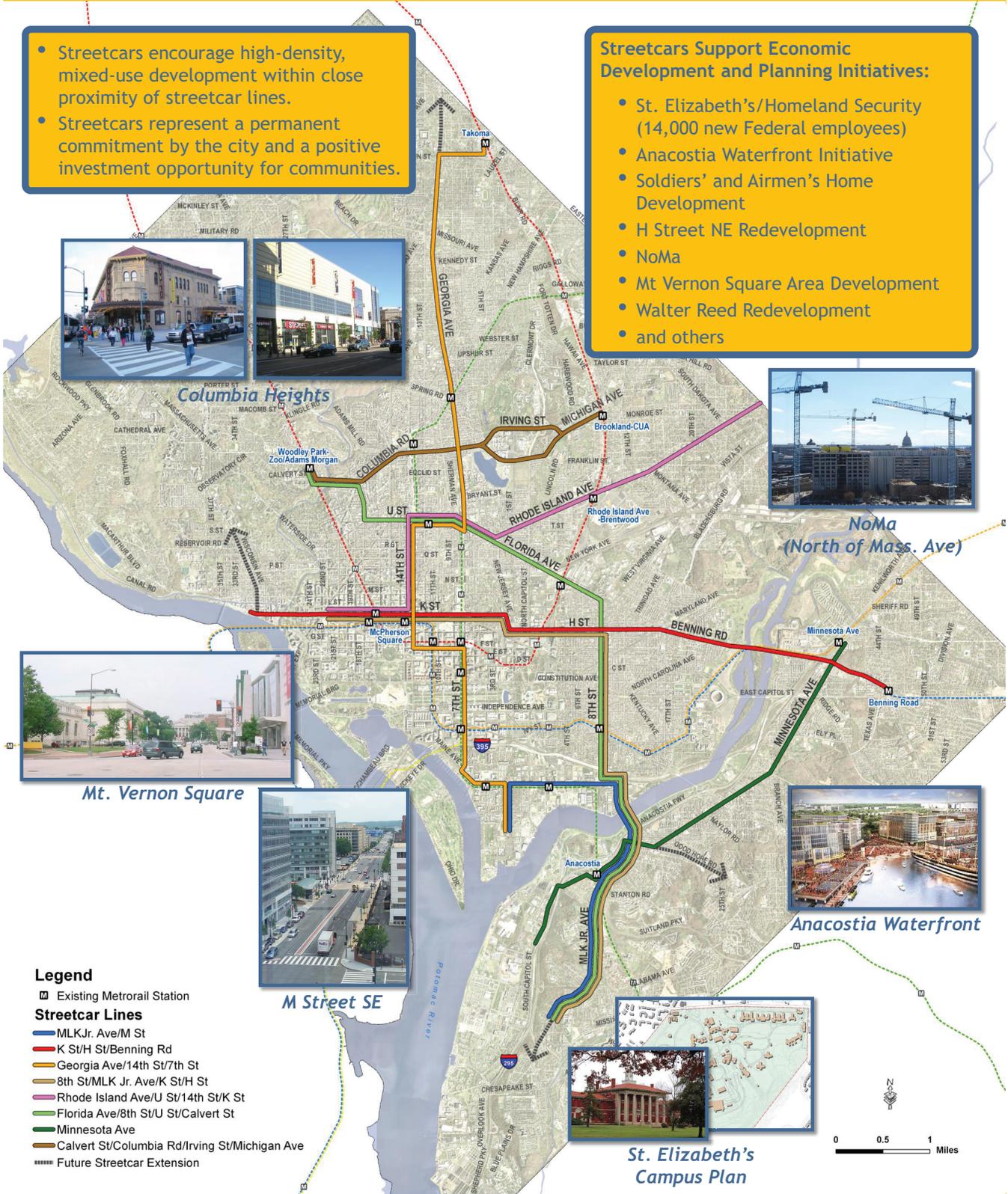
PROPOSED STREETCAR SYSTEM PLAN



BENEFITS OF STREETCARS

- Streetcars encourage high-density, mixed-use development within close proximity of streetcar lines.
- Streetcars represent a permanent commitment by the city and a positive investment opportunity for communities.

- Streetcars Support Economic Development and Planning Initiatives:**
- St. Elizabeth's/Homeland Security (14,000 new Federal employees)
 - Anacostia Waterfront Initiative
 - Soldiers' and Airmen's Home Development
 - H Street NE Redevelopment
 - NoMa
 - Mt Vernon Square Area Development
 - Walter Reed Redevelopment
 - and others



Legend

Existing Metrorail Station

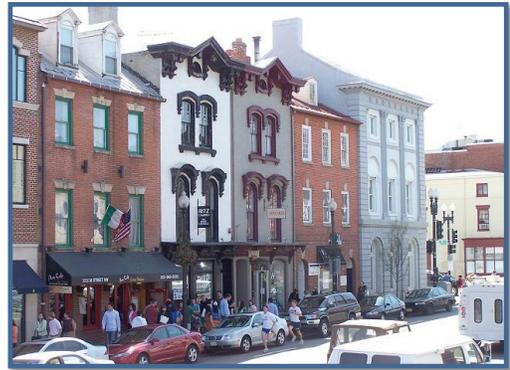
Streetcar Lines

- MLK Jr. Ave/M St
- K St/H St/Benning Rd
- Georgia Ave/14th St/7th St
- 8th St/MLK Jr. Ave/K St/H St
- Rhode Island Ave/U St/14th St/K St
- Florida Ave/8th St/U St/Calvert St
- Minnesota Ave
- Calvert St/Columbia Rd/Irving St/Michigan Ave
- Future Streetcar Extension

BENEFITS OF STREETCARS

Improves access and mobility of District residents and businesses

- Increases connections between neighborhoods and activity centers
- Accommodates population and employment growth
- Serves neighborhoods with limited or no Metrorail service: Historic Anacostia, H Street NE, Georgetown, Adams Morgan, Upper Georgia Avenue, and others



Georgetown



NoMa (North of Massachusetts Avenue)

Enhances Transit System Performance

- Increases capacity of the transit network and improves transit efficiency and cost-effectiveness
- Improves transit travel times
- Reduces crowding on Metrorail and Metrobus

Protects Environmental Quality

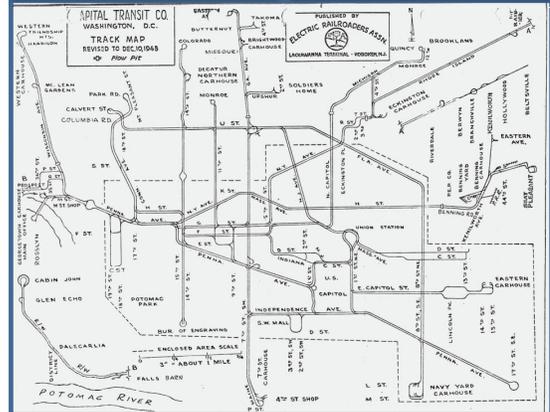
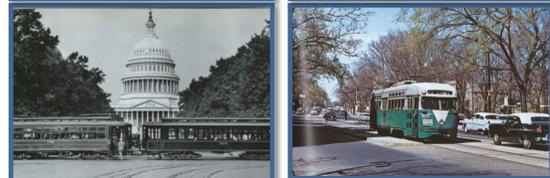
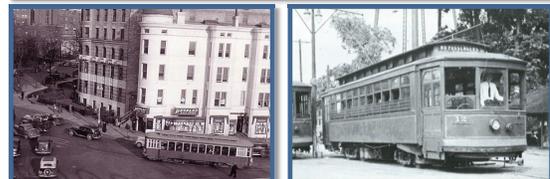
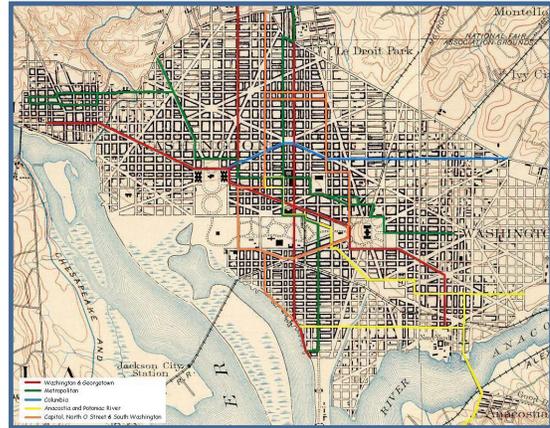
- Supports environmental benefits including reduced greenhouse gas emissions
- Provides an alternative to auto use



Anacostia River

TRANSFORMING A WASHINGTON TRADITION

- 1862 The first streetcar line begins operating in Washington under the Washington and Georgetown Railroad Company.
- 1875 Five companies run horse-drawn streetcars within the District.
- 1888 Expansion of Washington's city limits beyond Florida Avenue prompts the need for vehicles that can climb the hills above the original L'Enfant city. Electric streetcars can easily climb steep roads.
- 1888 The first electric streetcar line, The Eckington and Soldiers' Home Railway, begins operation.
- 1889 The District authorizes the switch to underground cable for all streetcar operators, eliminating the horse-drawn streetcar. Overhead wires are only allowed outside of the central city.
- 1895 Congress promotes consolidation as the most effective method to providing a seamless transit network in the city.
- 1916 The high point of streetcars in D.C. with a combined track length of over 200 miles in the city and its suburbs.
- 1921 The start of the first bus company in Washington.
- 1933 Washington Railway, Capital Traction, and Washington Rapid Transit merge to form the Capital Transit Company, marking the first time all streetcar lines in D.C. are managed by one company.
- 1941 World War II leads to an increase in government workers who depend on streetcars to commute.
- 1955 A seven-week strike leads to the transfer of the company to O. Roy Chalk in 1956. Capital Transit Company changes its name to DC Transit.
- 1956 As part of the transfer to Chalk, DC Transit is required to convert the entire system to buses by 1963.
- 1962 Streetcars in Washington put on hold for the next 45 years.
- 2009 The District begins laying tracks for modern Streetcars in Anacostia and the H Street/Benning Road corridor.



EXAMPLES OF STREETCARS

Systems with Modern Vehicles:

Portland, OR - Portland Streetcar

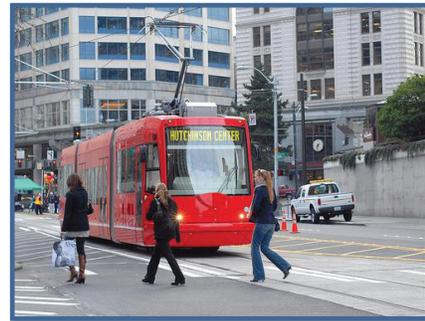
- Phase 1 opened in 2001, 3.9 miles, 1 Line
- Capital cost per mile: \$25 m
- Eastside Line to open in 2012 (additional 3.3 miles)
- Funding sources: Local agency, fares, city parking revenue, “Local Improvement Districts,” sponsorship of vehicles/stations, others



Portland Streetcar

Seattle - South Lake Union Streetcar

- Opened in 2007
- 1.3 miles, 1 line
- Capital cost per mile: \$40 m
- Funding sources: 50% from adjacent property owners, 50% from federal and state grants and the sale of surplus city land



South Lake Union Streetcar

Systems with Heritage Vehicles:

Successful examples include:

- Tampa, FL (2002)
- Kenosha, WI (2000)
- Charlotte, NC (1996)
- San Francisco, CA (1995)
- Tucson, AZ (1993)

Many other cities in North America are currently planning new modern streetcar lines as key parts of their transit systems, such as:

- Tucson, AZ
- Cincinnati, OH
- Los Angeles, CA
- Over a dozen other cities



Tampa/Ybor City - TECO Line



F Line - Market Street, San Francisco

DC'S MODERN STREETCARS



DC STREETCAR



DC STREETCAR

- Modern technology allows for quieter operation and higher reliability
- Air conditioned and heated cabins increase rider comfort
- Multiple boarding areas increases speed by reducing time spent loading and unloading passengers
- Modern control systems allow for smooth acceleration and braking, increasing rider comfort
- Adaptable car length allows for larger streetcars during peak periods and smaller ones during non-peak periods
- Streetcars are slightly longer than an articulated bus



PORTLAND



STREETCAR INTERIOR



SEATTLE



PASSENGERS BOARD THE PORTLAND STREETCAR

DC's Transit Future



STREETCARS IN OTHER CITIES

PORTLAND, OREGON



BARCELONA, SPAIN



STRASBOURG, FRANCE



DC PHOTO SIMULATIONS



DC's Transit Future

d.
District Department of Transportation

DC FAMILY OF TRANSPORTATION SERVICES

Bike Sharing



DC Circulator



Metrobus



Metro Extra/
Metro Express



Bus Rapid Transit



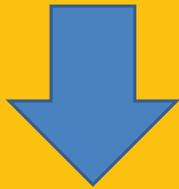
DC's Transit Future

d.
District Department of Transportation

REGIONAL AND LOCAL TRANSIT NETWORKS

REGIONAL NETWORK

Metrorail



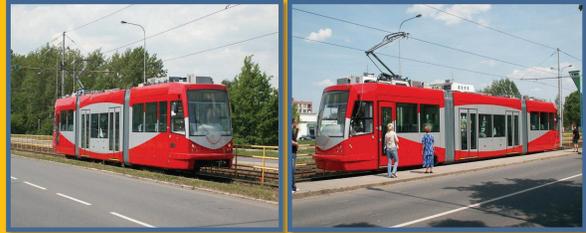
Metrobus



- Designed to serve Washington DC Metropolitan Area.
- Enhances regional mobility.
- Regional services designed for commuters.

LOCAL NETWORK

DC Streetcar



DC Circulator

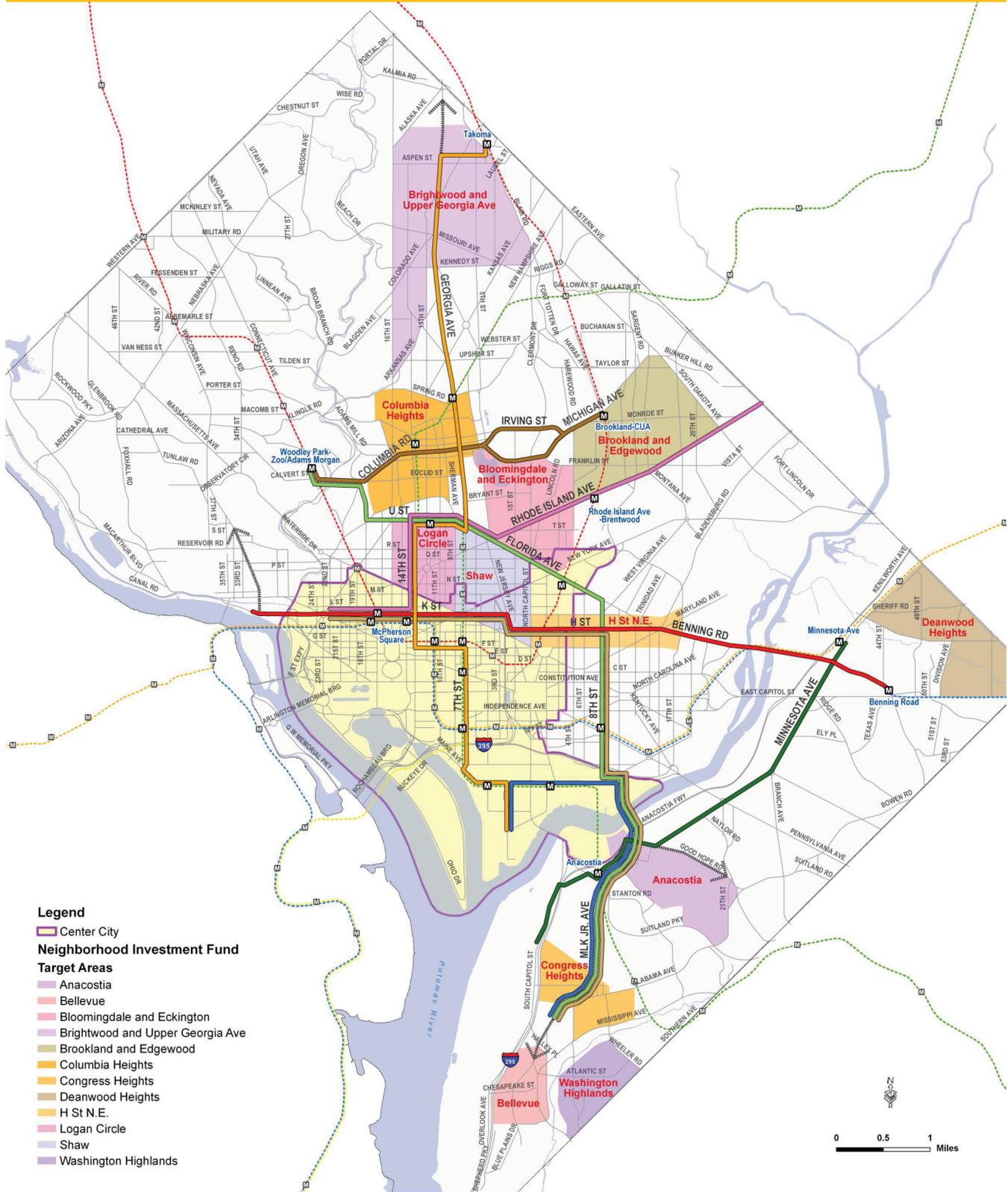


- Designed to serve District of Columbia neighborhoods and activity centers.
- Enhances mobility and neighborhood connections within the District.

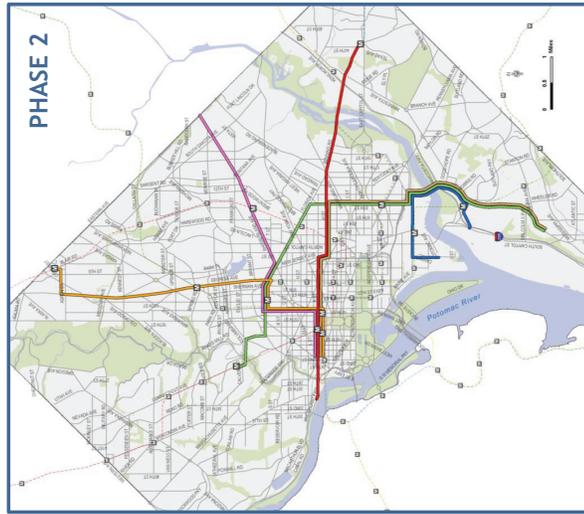
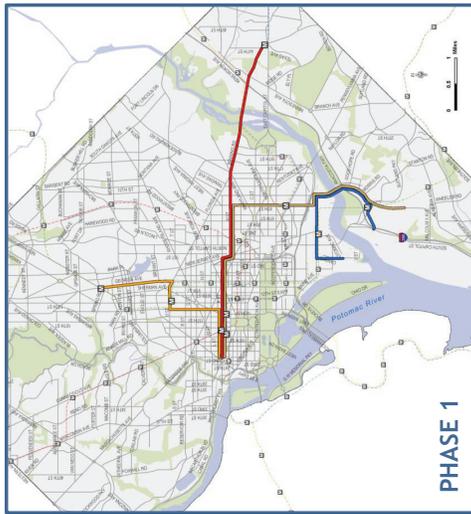
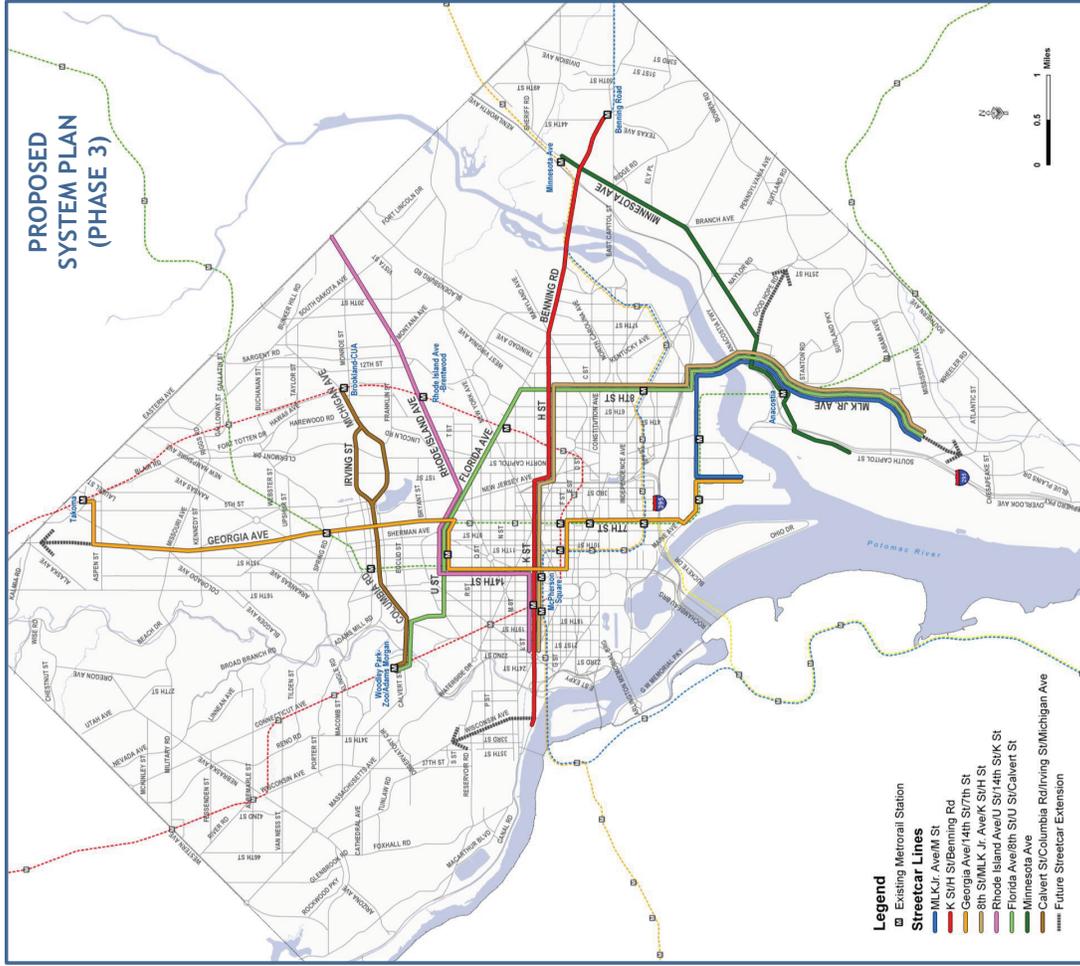
SMALL AREA PLANS



NEIGHBORHOOD INVESTMENT FUND TARGET AREAS



PROPOSED STREETCAR SYSTEM PLAN



DC's Transit Future

PLANNING PROCESS TIMELINE

DC's Transit Future (DCAA)						
1997	DC's Vision, Strategy & Action Plan					
1999	WMATA Transit Service Expansion Plan					
2001	WMATA Core Capacity Study					
2002	WMATA & DC, Transit Development Study					
2003	WMATA Regional Bus Study					
2004	WMATA & DDOT, DC Transit Alternatives Analysis					
2005		Georgia Avenue/7th St Rapid Bus Study				
2006			30s Line Study			
2007				16th Street Line Study		
2008					Benning Road/H Street Study	
2009						DC Circulat or New Routes
Current						DC Proposed Streetcar Plan

1997 The District's *Vision, Strategy, and Action Plan* recommended intra-city connections between the radial WMATA rail lines by designating ten corridors for transit improvements that would connect District neighborhoods and help support community economic development initiatives.

1999 WMATA's *Transit Service Expansion Plan* advanced five corridors for further study.

2001 WMATA's *Core Capacity Study* identified system-wide rail improvements that will allow the system to accommodate estimated future ridership.

2002 DC/WMATA's *Transit Development Study* considered each of the previously-identified corridors for surface rail transit and recommended four priority corridors for implementation.

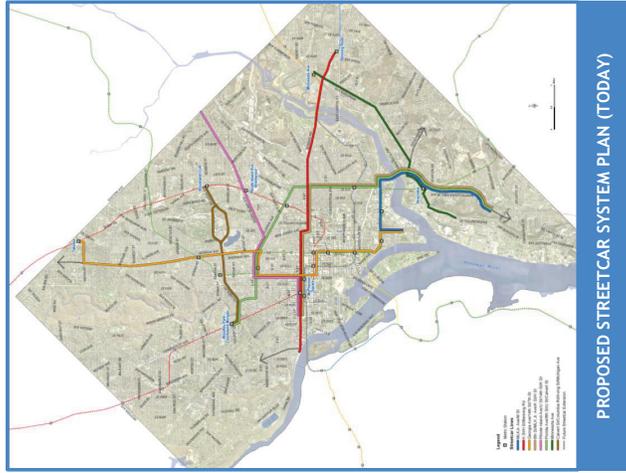
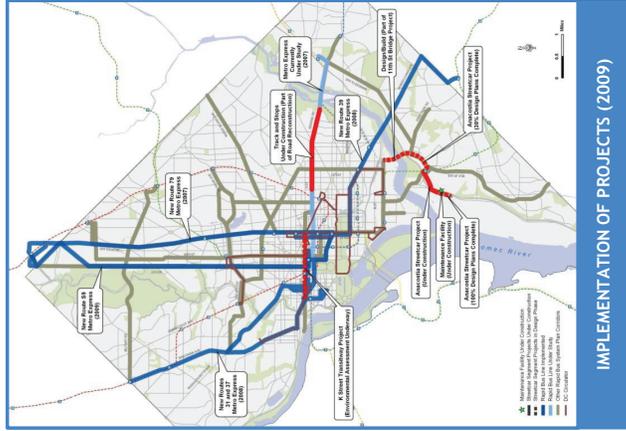
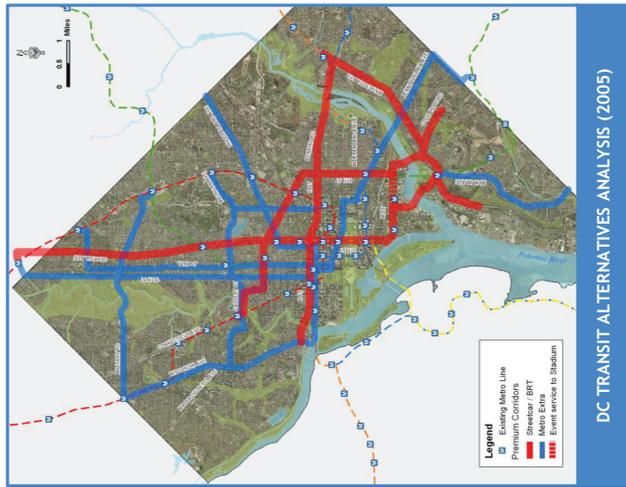
2003 WMATA's *Regional Bus Study* identified bus improvements to serve inside previously-designated corridor and to aid in District circulation and Metrorail system capacity relief.

2004-09 DC/WMATA's District of Columbia's Transit Future (DCAA) refined a city-wide system plan of enhanced, multi-modal surface transit on designated corridors.

DC's Transit Future



PLANNING PROCESS TIMELINE



Goals of the DC Transit Alternatives Analysis:

Improve access and mobility for District residents and businesses - Increase connections between neighborhoods and activity centers, and improve access to regional centers.

Encourage community and economic development - Support the city's initiatives for community development and enhance development benefits.

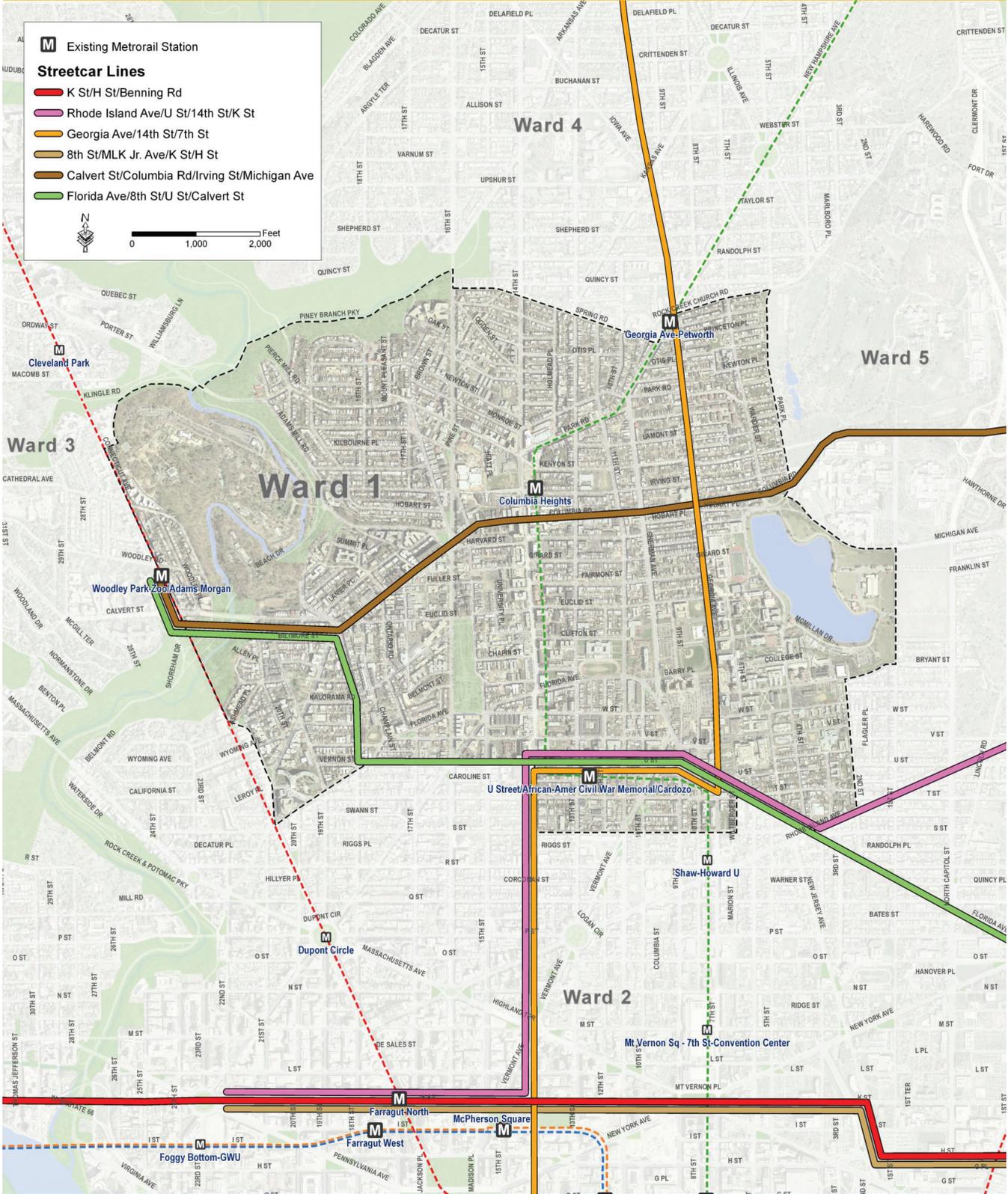
Enhance system performance - Increase the capacity of the transit network and improve transit efficiency and cost-effectiveness.

Promote environmental quality - Limit adverse impacts and support environmental benefits.

DC's Transit Future



PROPOSED STREETCAR SYSTEM - WARD 1



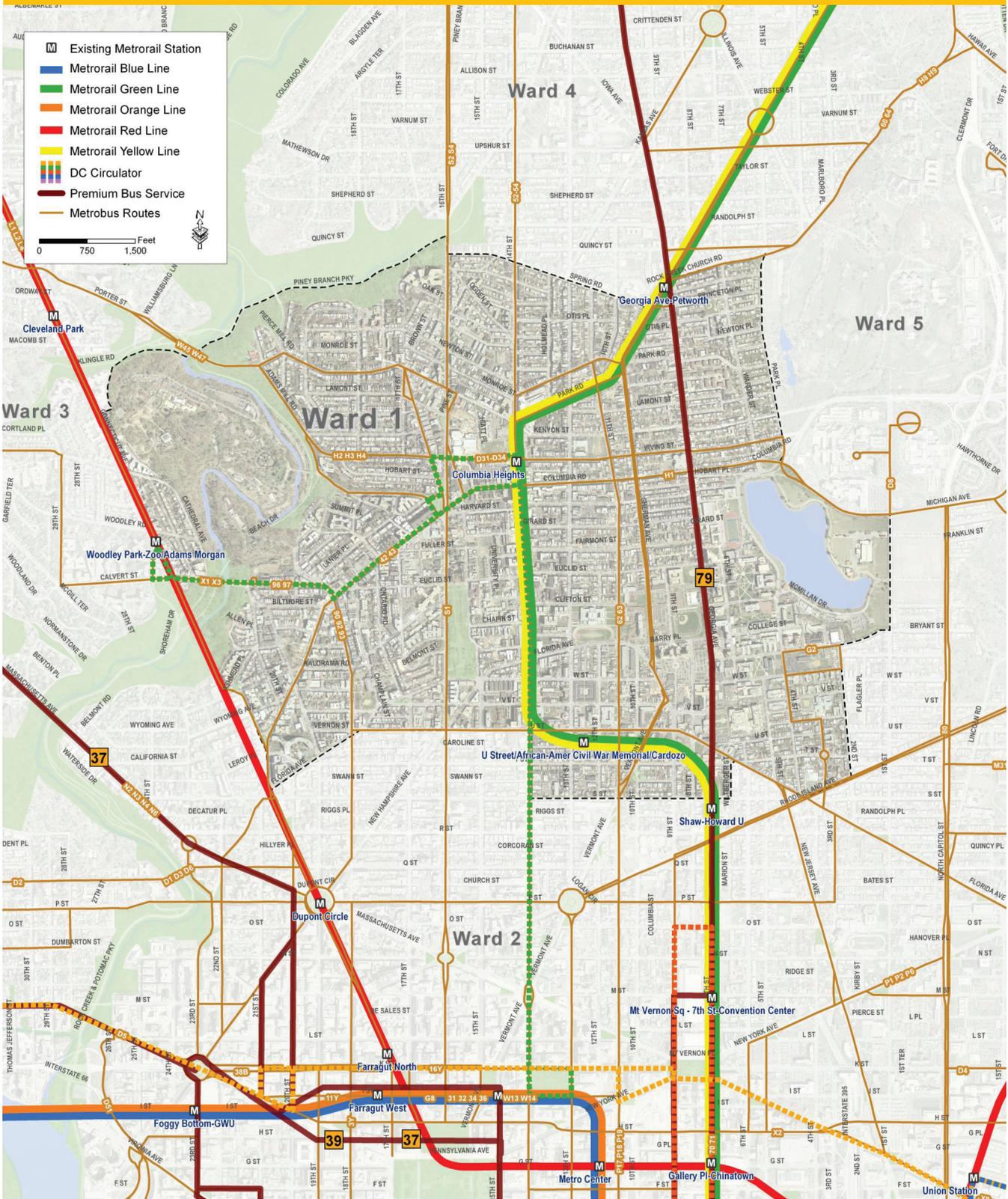
M Existing Metrorail Station

Streetcar Lines

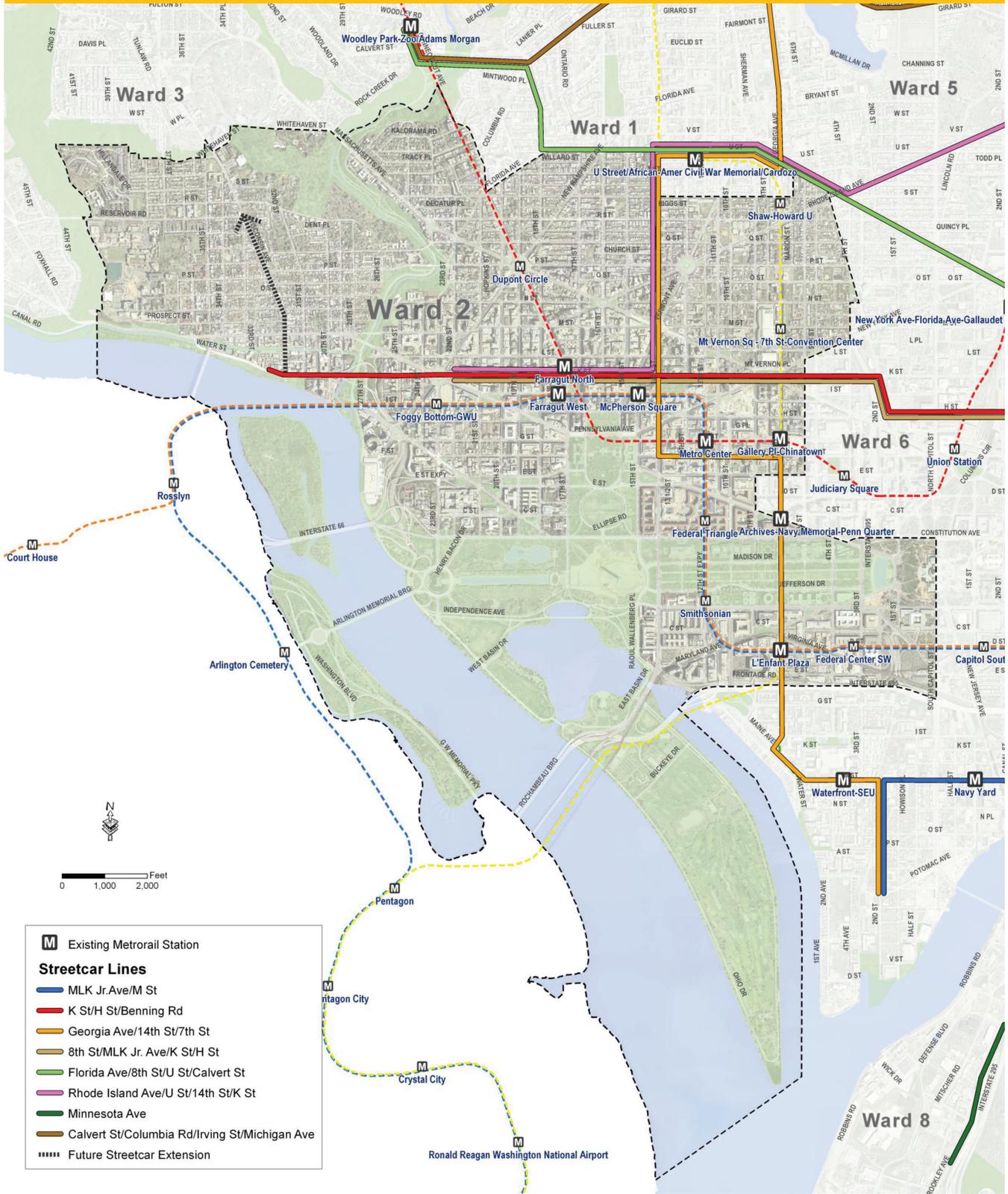
- K St/H St/Benning Rd
- Rhode Island Ave/U St/14th St/K St
- Georgia Ave/14th St/7th St
- 8th St/MLK Jr. Ave/K St/H St
- Calvert St/Columbia Rd/Irving St/Michigan Ave
- Florida Ave/8th St/U St/Calvert St

0 1,000 2,000 Feet

EXISTING TRANSIT SERVICES - WARD 1



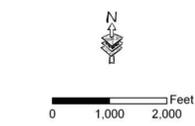
PROPOSED STREETCAR SYSTEM - WARD 2



EXISTING TRANSIT SERVICES - WARD 2

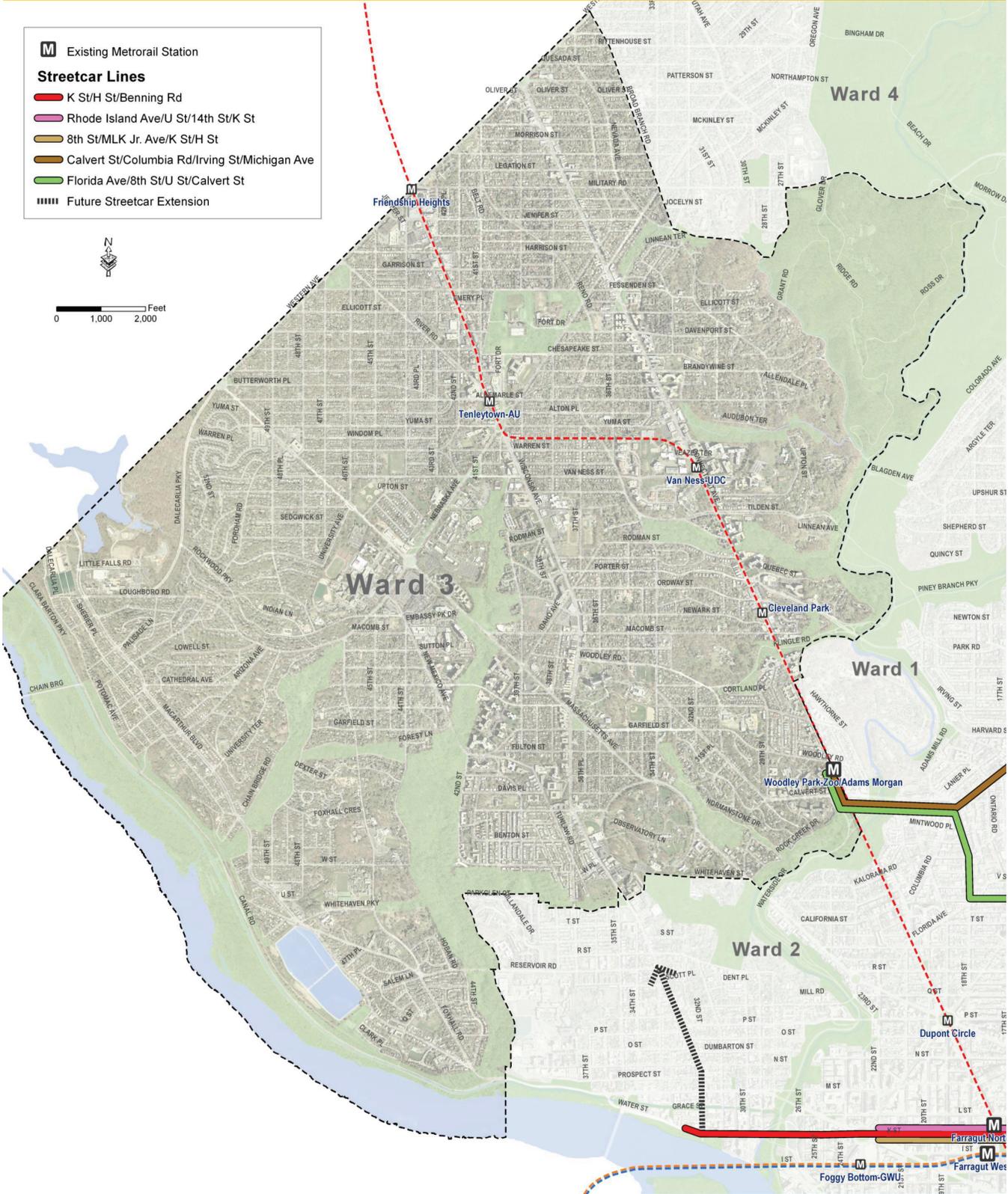
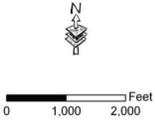


- Existing Metrorail Station
- Metrorail Blue Line
- Metrorail Green Line
- Metrorail Orange Line
- Metrorail Red Line
- Metrorail Yellow Line
- DC Circulator
- Premium Bus Service
- Metrobus Routes

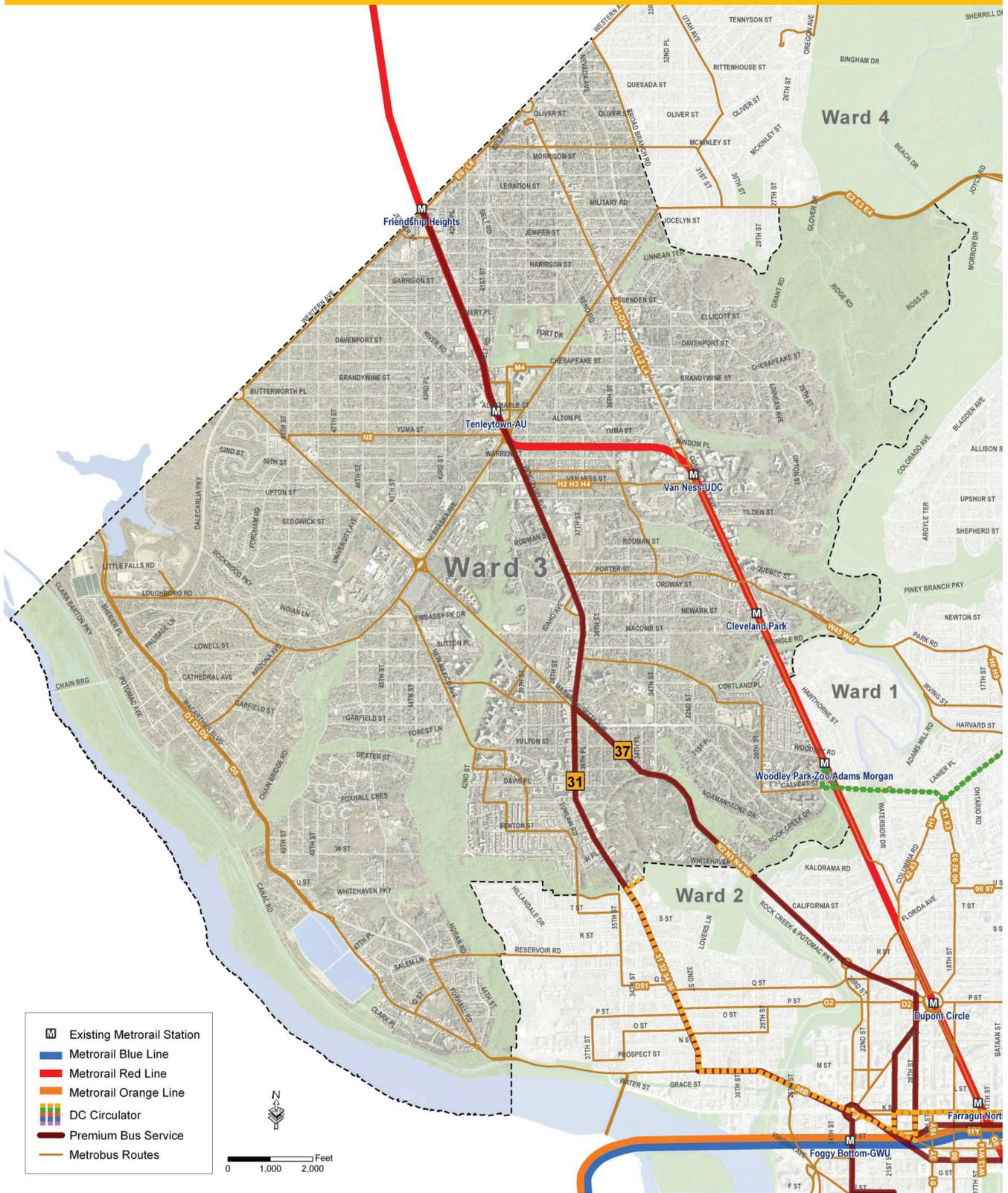


PROPOSED STREETCAR SYSTEM - WARD 3

- M** Existing Metrorail Station
- Streetcar Lines**
- K St/H St/Benning Rd
- Rhode Island Ave/U St/14th St/K St
- 8th St/MLK Jr. Ave/K St/H St
- Calvert St/Columbia Rd/Irving St/Michigan Ave
- Florida Ave/8th St/U St/Calvert St
- - - - Future Streetcar Extension



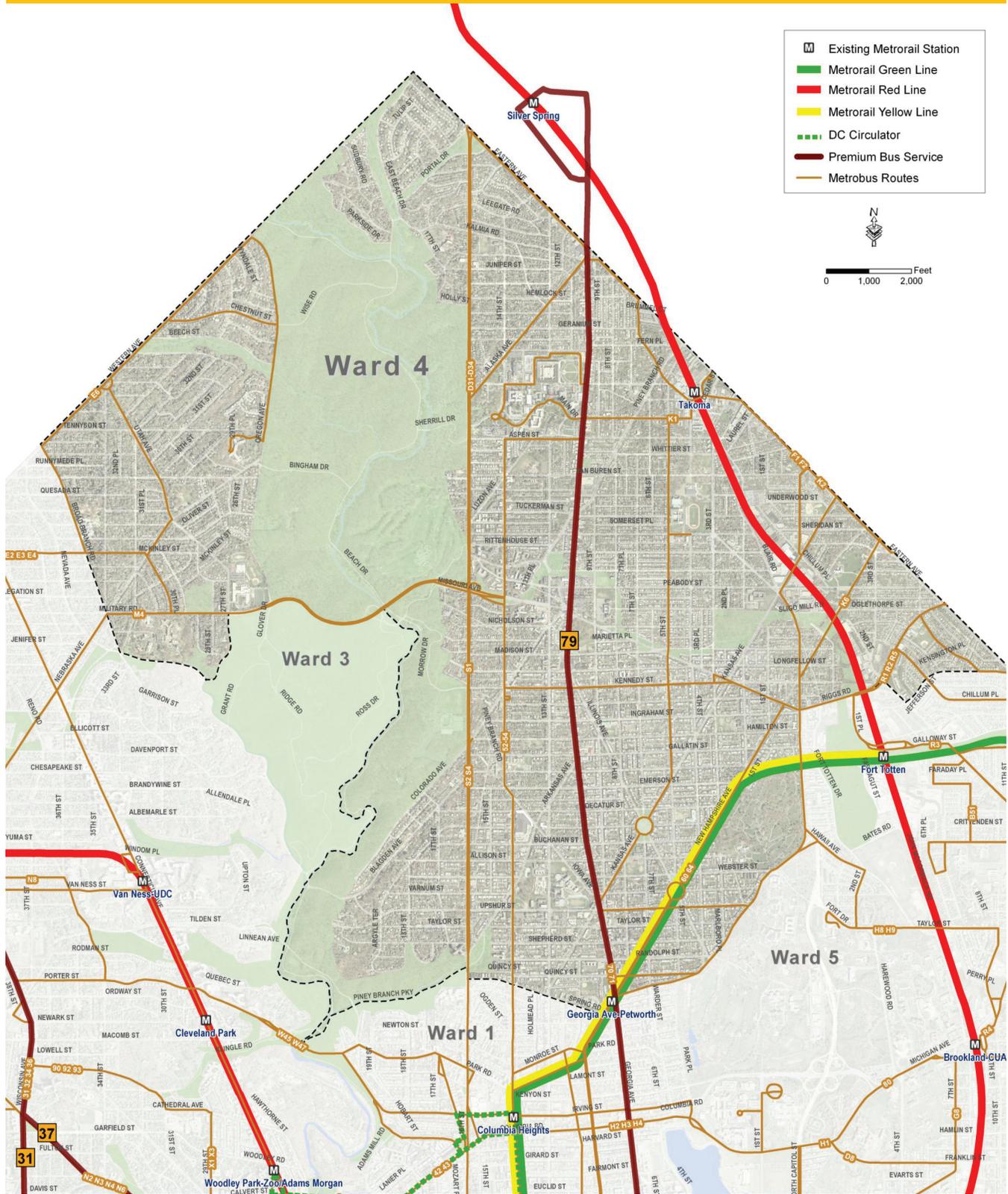
EXISTING TRANSIT SERVICES - WARD 3



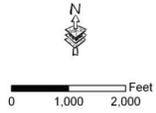
PROPOSED STREETCAR SYSTEM - WARD 4



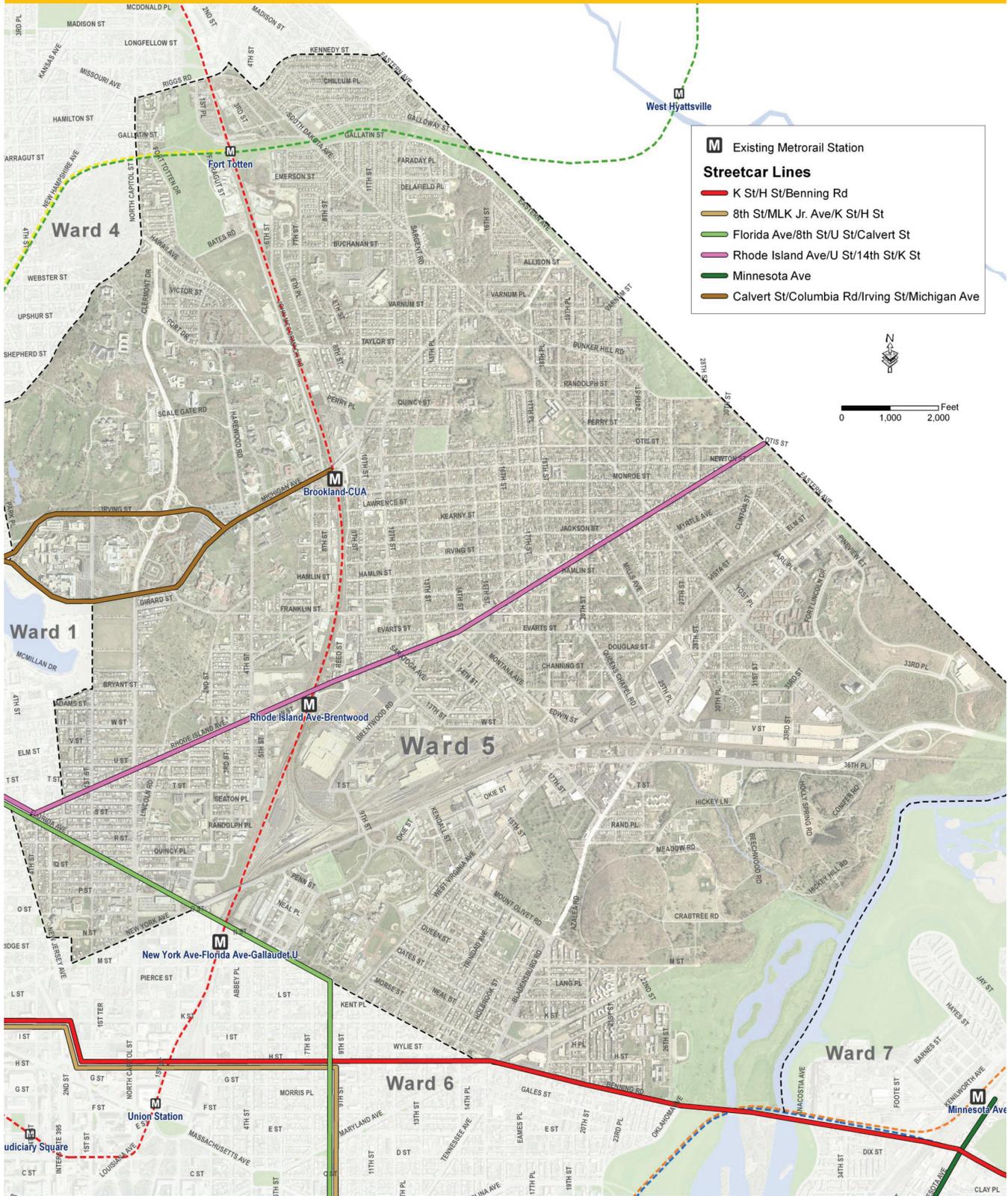
EXISTING TRANSIT SERVICES - WARD 4



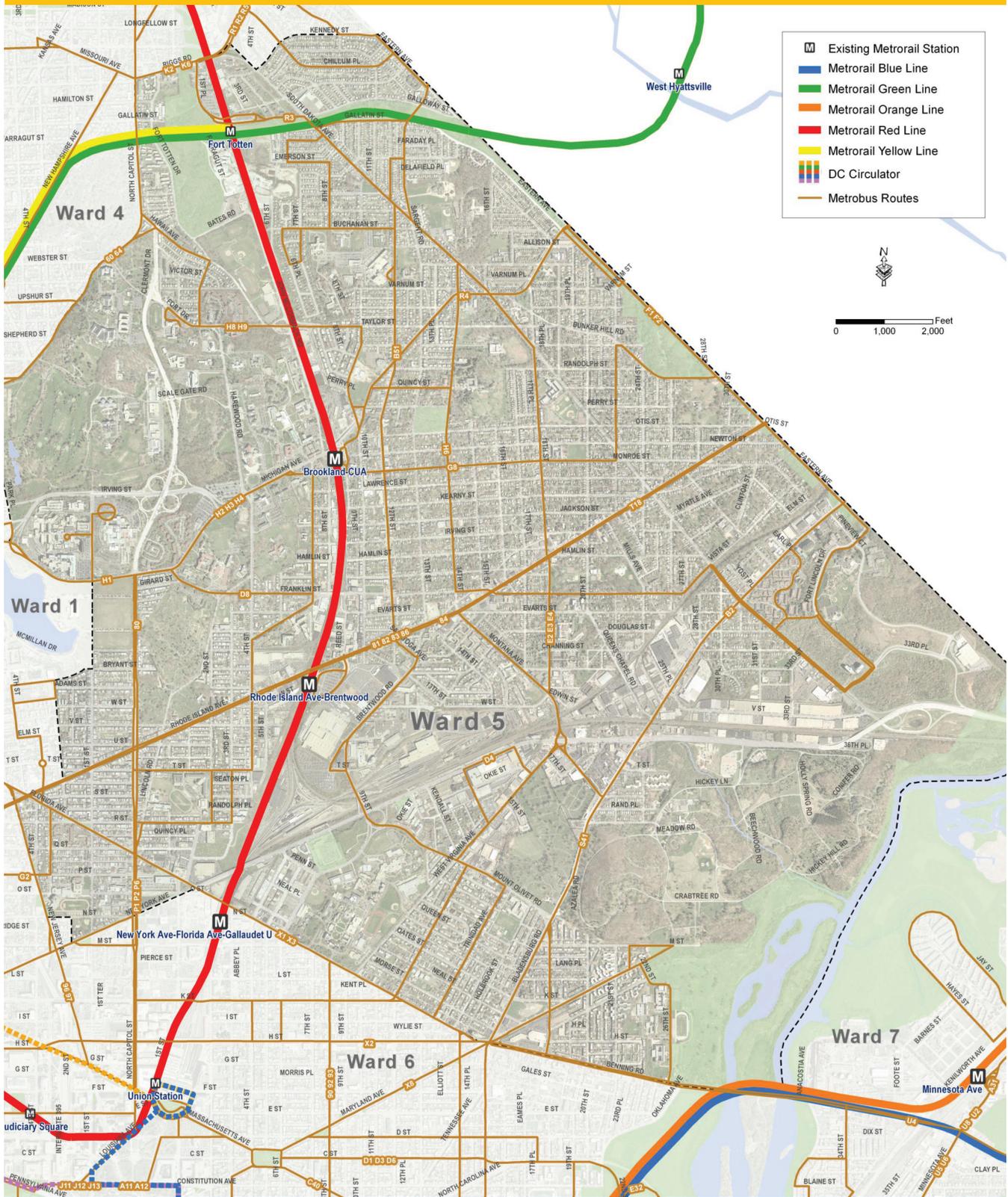
- M Existing Metrorail Station
- Metrorail Green Line
- Metrorail Red Line
- Metrorail Yellow Line
- DC Circulator
- Premium Bus Service
- Metrobus Routes



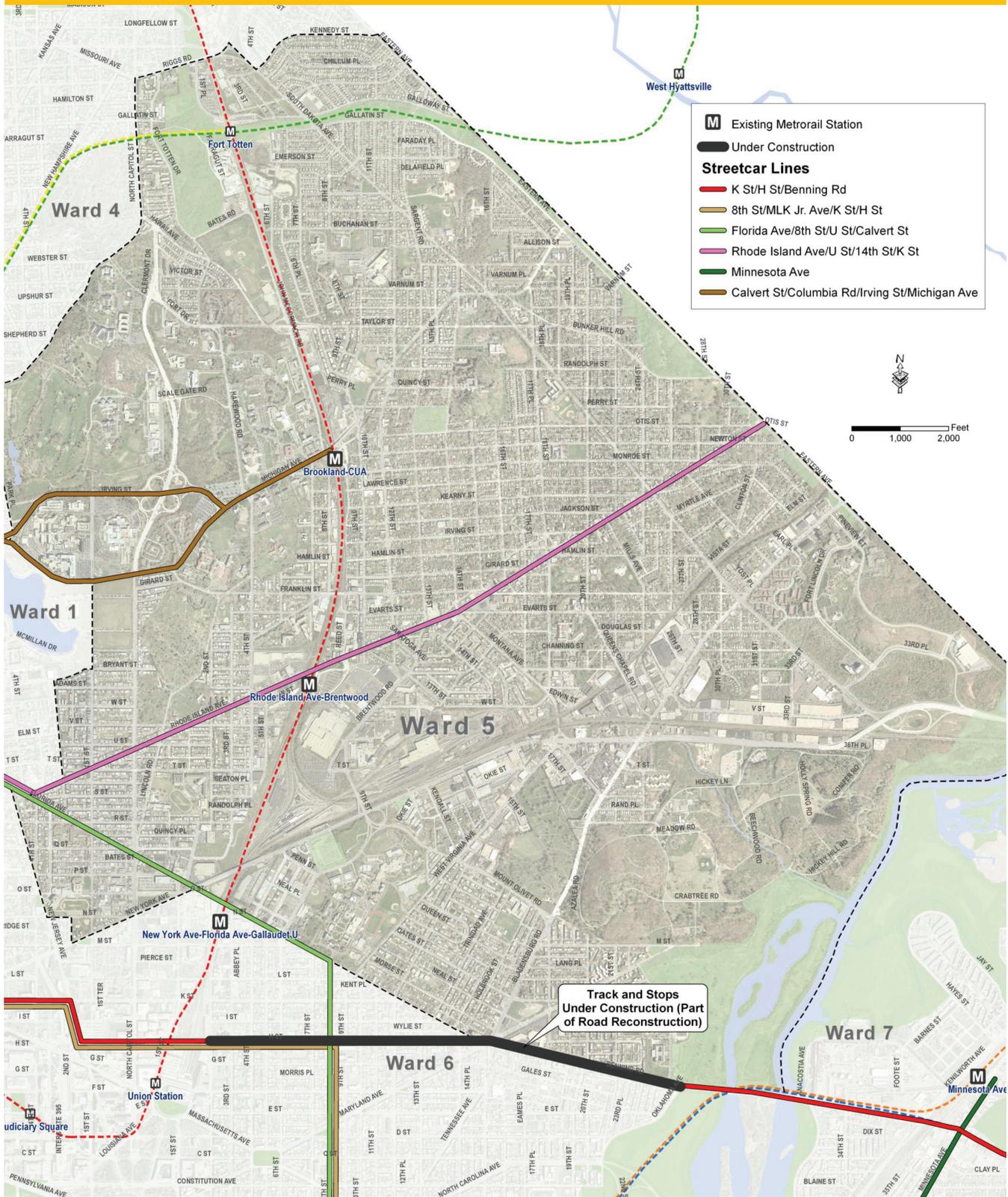
PROPOSED STREETCAR SYSTEM - WARD 5



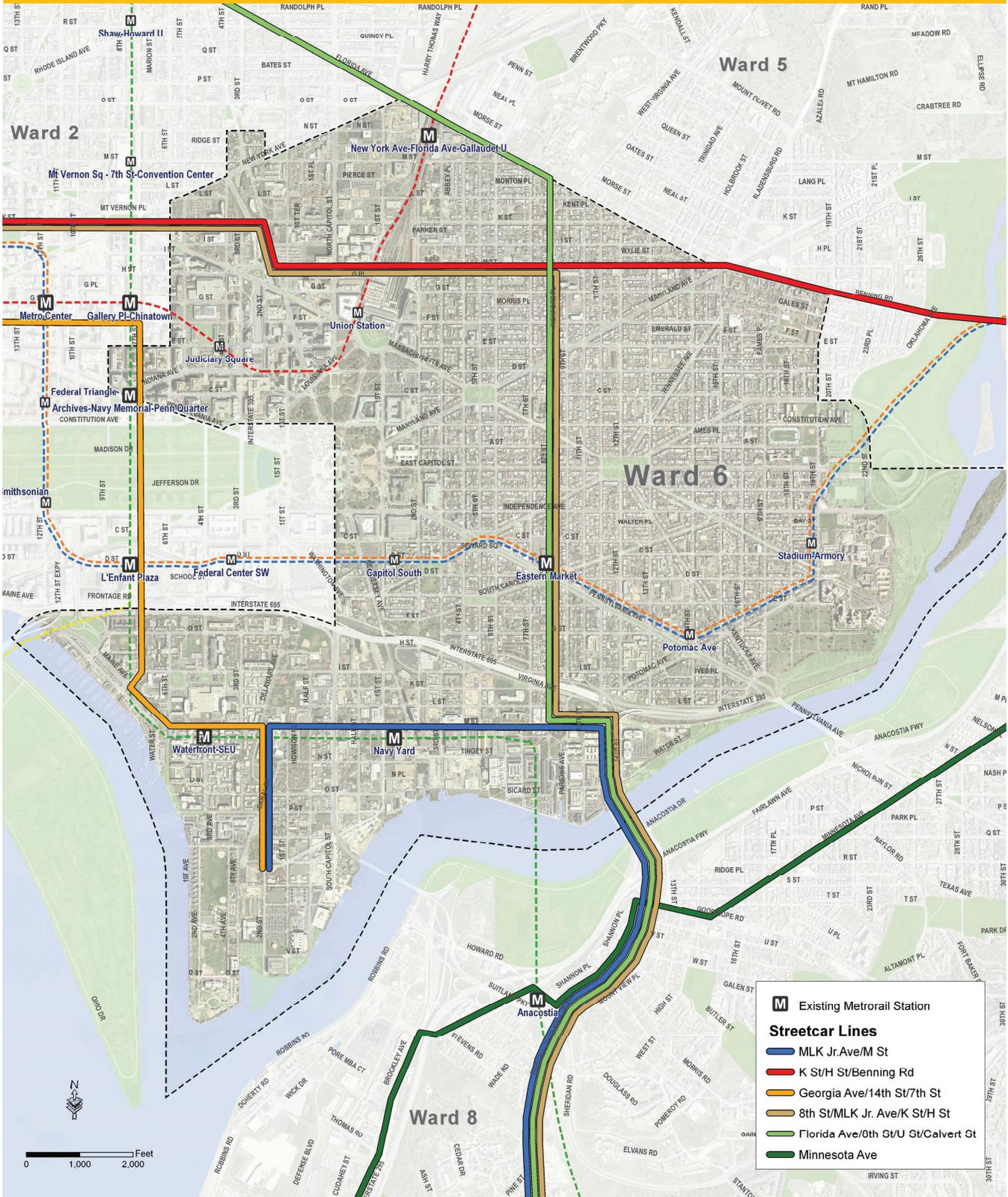
EXISTING TRANSIT SERVICES - WARD 5



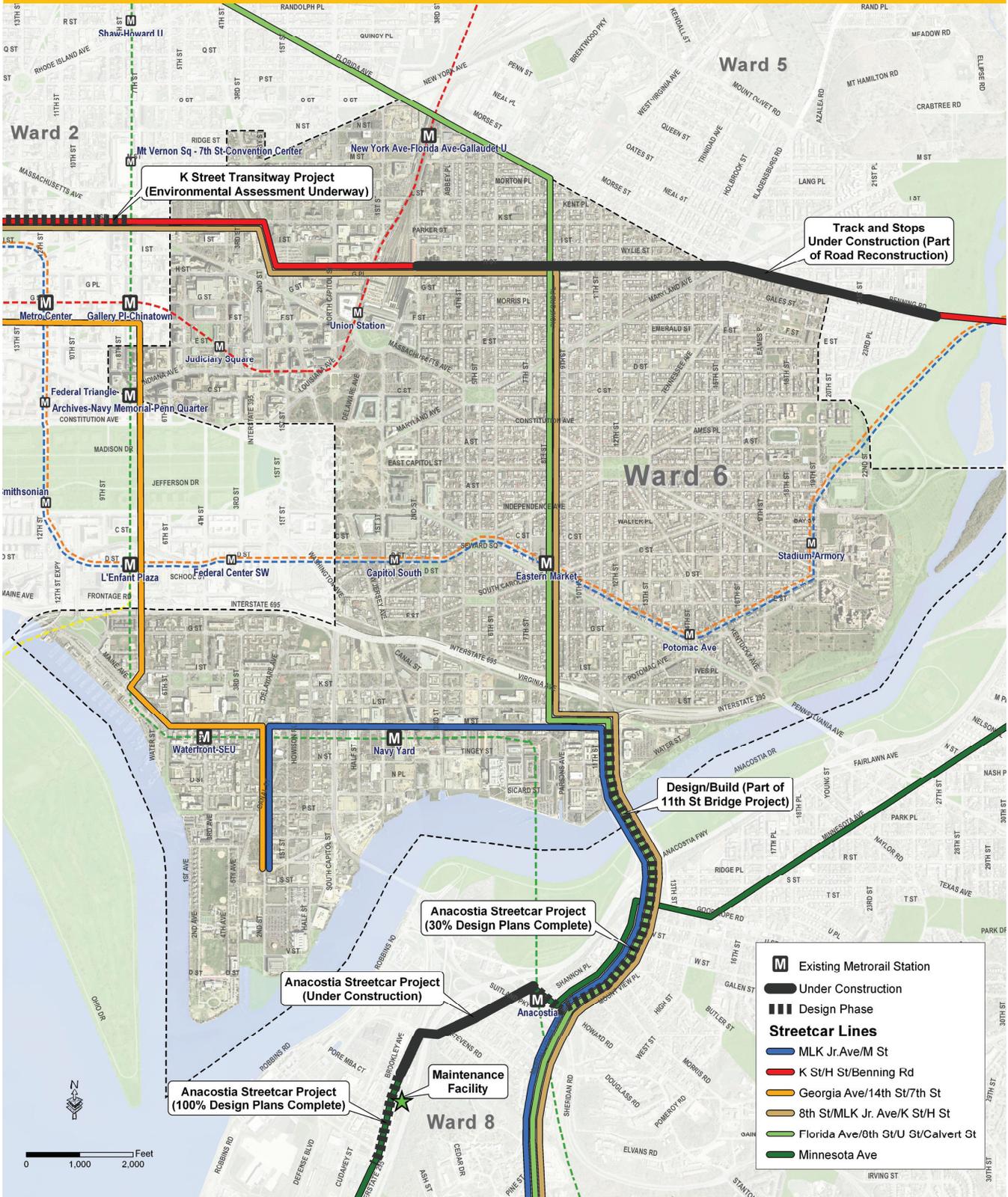
CONSTRUCTION CURRENTLY TAKING PLACE - WARD 5



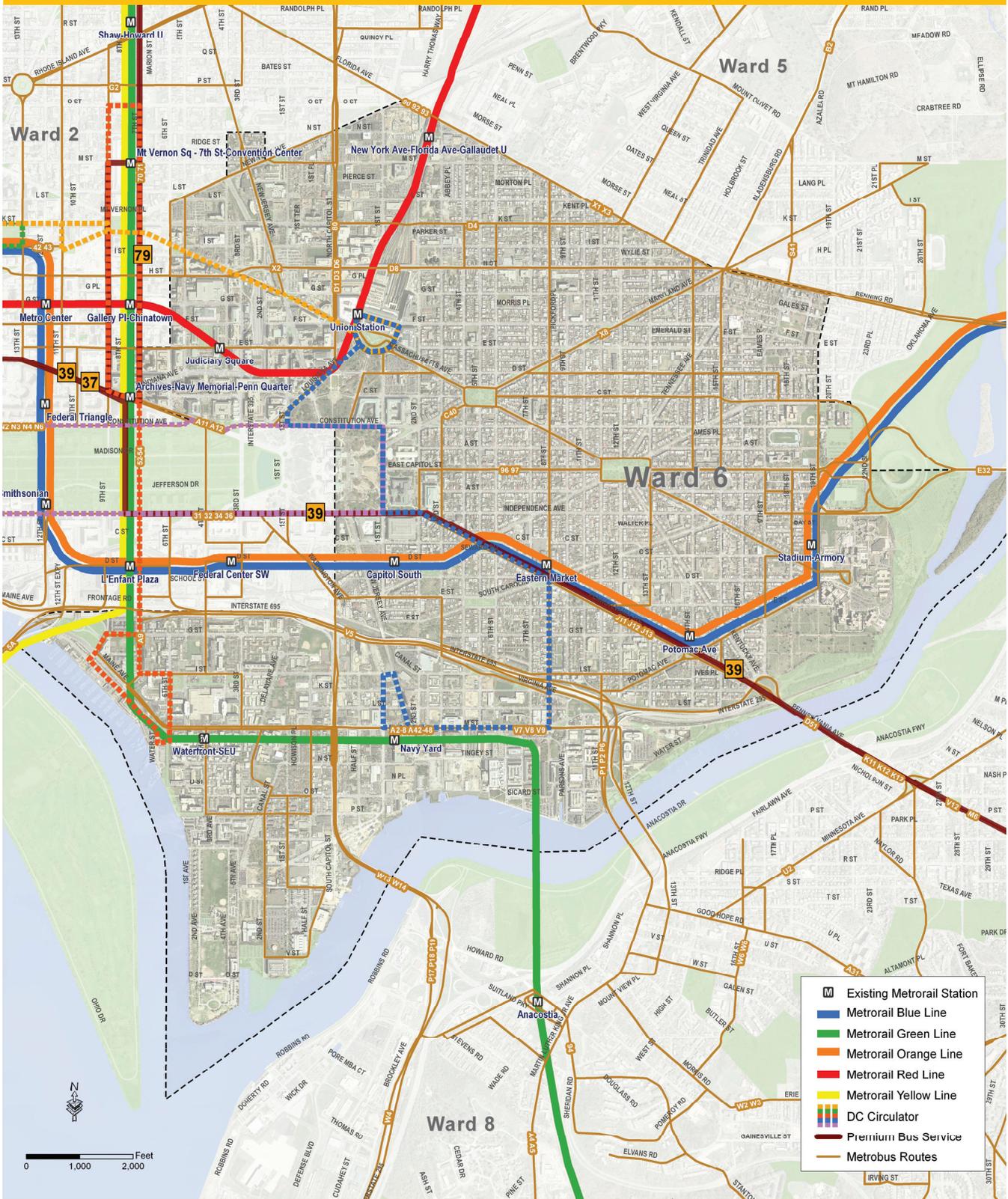
PROPOSED STREETCAR SYSTEM - WARD 6



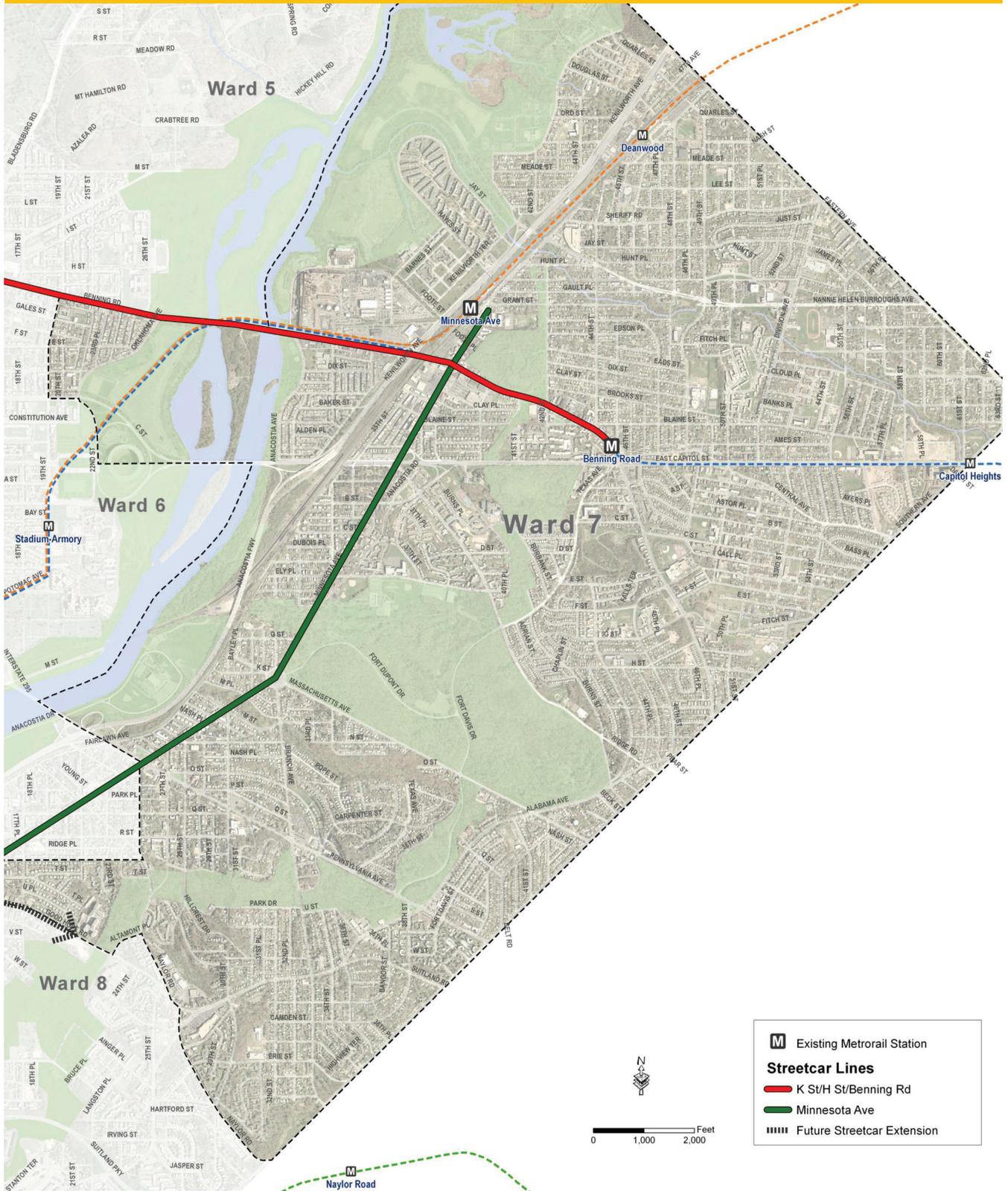
CONSTRUCTION CURRENTLY TAKING PLACE - WARD 6



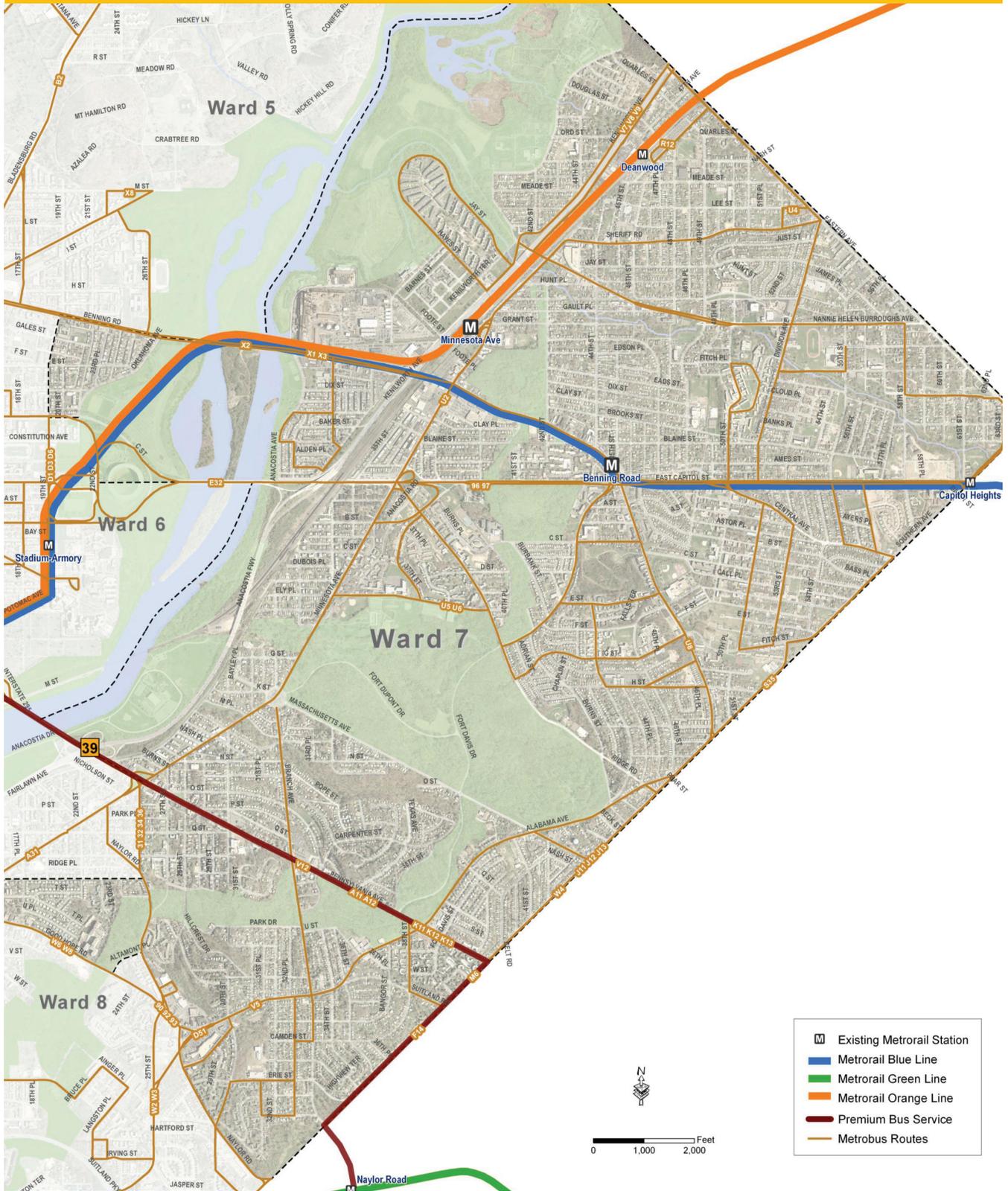
EXISTING TRANSIT SERVICES - WARD 6



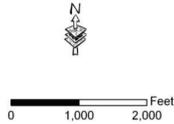
PROPOSED STREETCAR SYSTEM - WARD 7



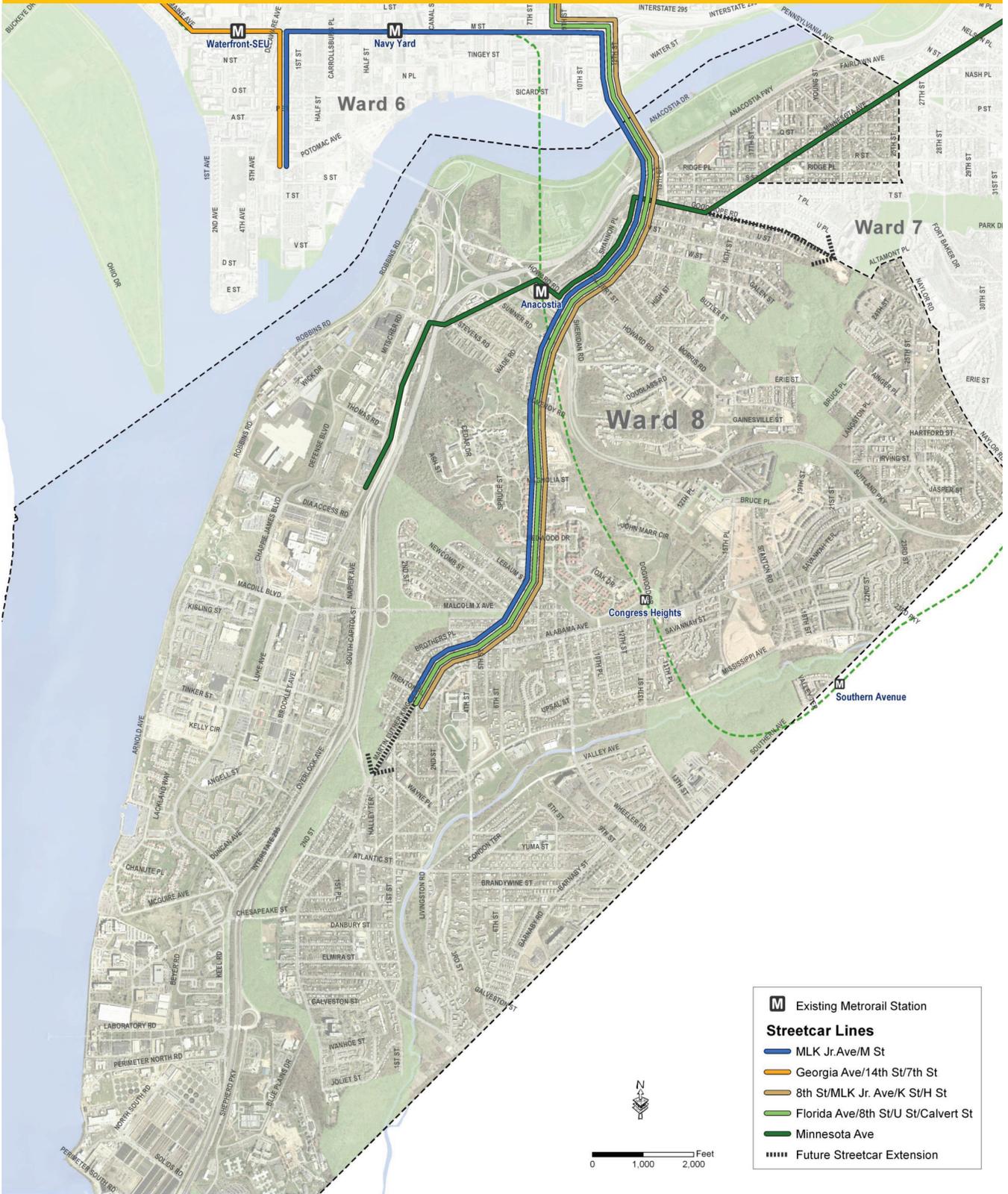
EXISTING TRANSIT SERVICES - WARD 7



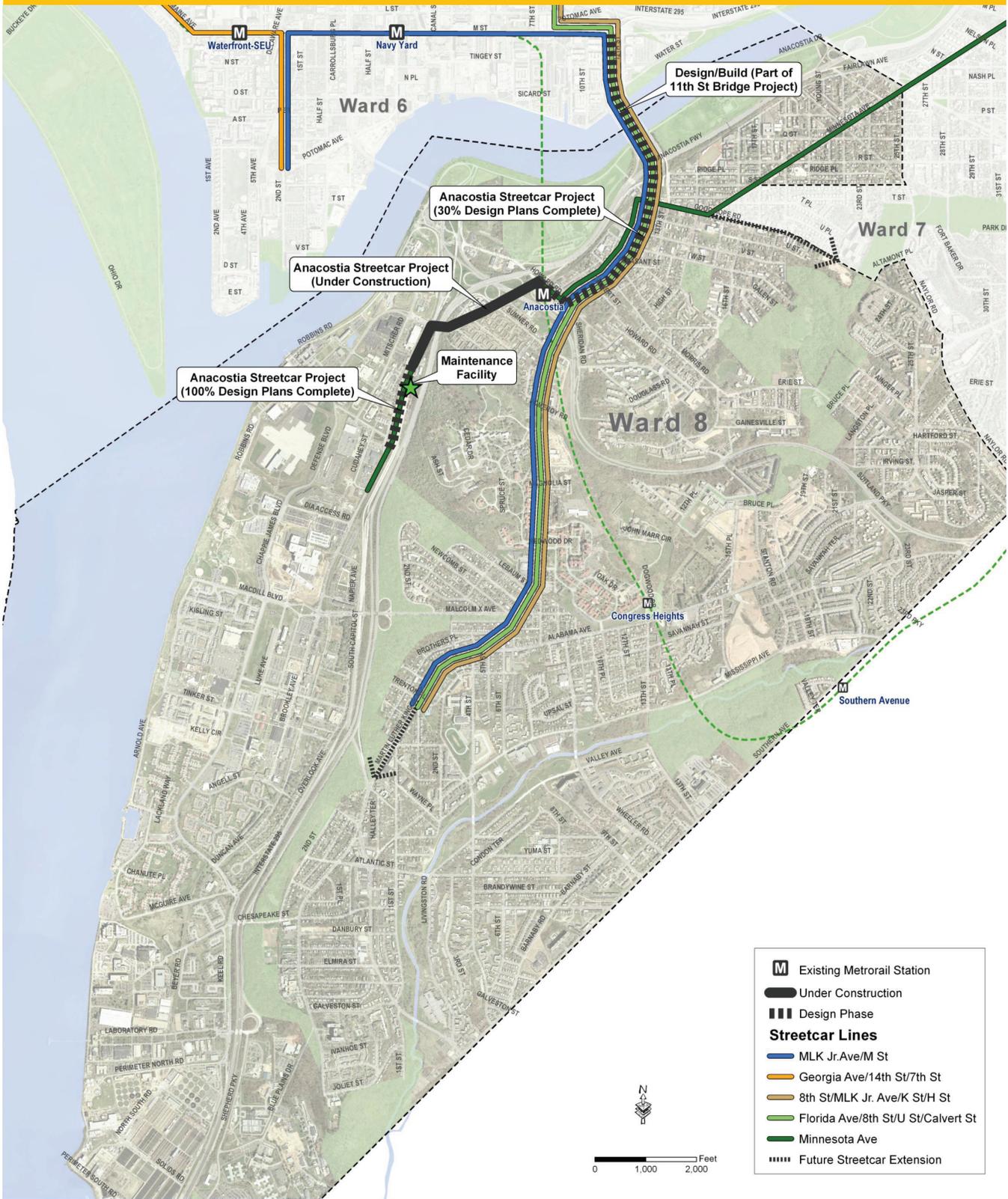
- Existing Metro rail Station
- Metro rail Blue Line
- Metro rail Green Line
- Metro rail Orange Line
- Premium Bus Service
- Metrobus Routes



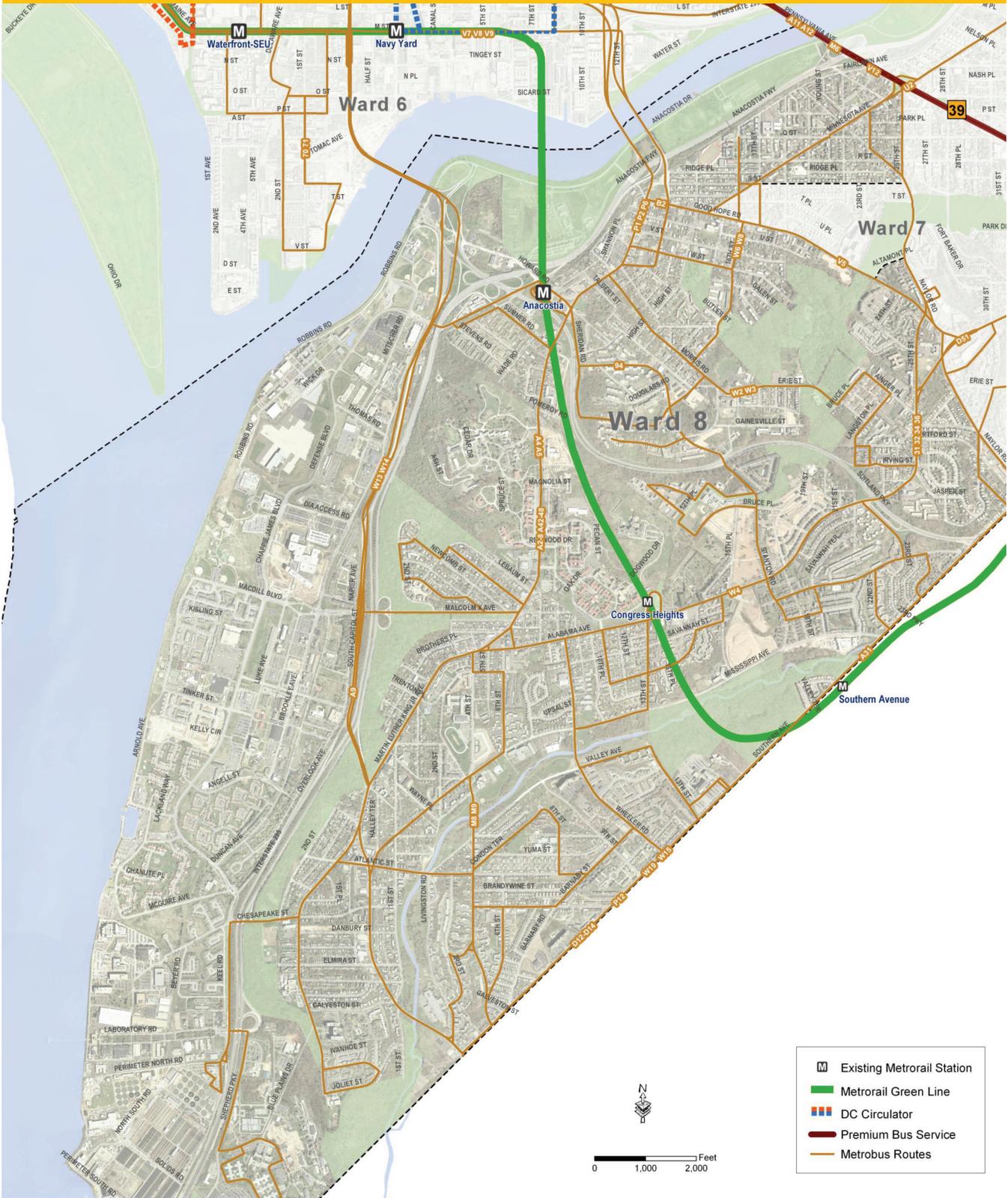
PROPOSED STREETCAR SYSTEM - WARD 8



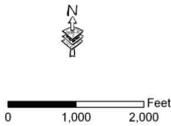
CONSTRUCTION CURRENTLY TAKING PLACE - WARD 8



EXISTING TRANSIT SERVICES - WARD 8



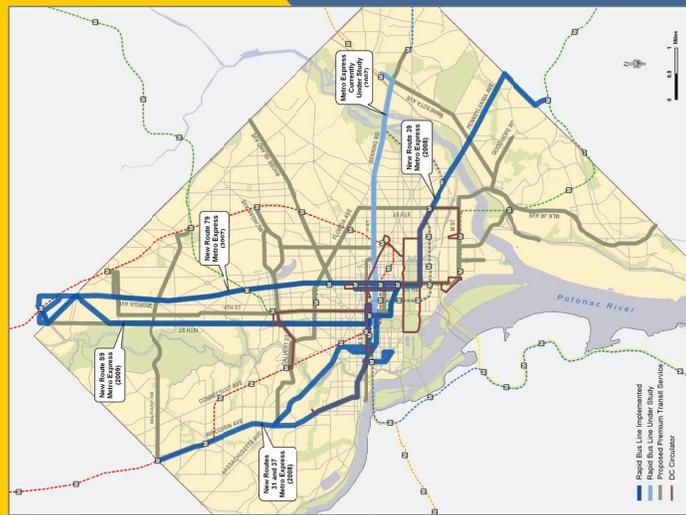
	Existing Metrorail Station
	Metrorail Green Line
	DC Circulator
	Premium Bus Service
	Metrobus Routes



Welcome to DC's Transit Future!

DC's *Transit Future* is a study of near-term and long-term transit improvements in the District of Columbia. The recommendations of the study include Streetcar, Bus Rapid Transit, and Rapid Bus services. Most of the recommendations will be implemented over the course of time, but some enhanced bus service has already begun, such as:

- Metrobus Express Route 79 – Georgia Avenue
- Metrobus 30s Line – Limited-Stop Routes 37 & 39
- Metrobus Express Route S9 – 16th Street
- DC Circulator – Convention Center to SW Waterfront, National Mall Loop, Union Station to Navy Yard, Georgetown to Union Station, and Woodley Park/Adams Morgan to McPherson Square



Next Steps

- Public open houses throughout the District
- Finalize proposed system plan
- Conduct environmental study (National Environmental Policy Act)
- Develop design standards



How to Stay Involved

- Website: <http://ddot.dc.gov/dcstreetcar>
- Email: dcstreetcar@dc.gov
- Mailing address:
DC's *Transit Future*
District Department of Transportation
2000 14th Street NW, 5th floor
Washington, DC 20009
- Project hotline: 703-682-5060

d. DISTRICT OF COLUMBIA DEPARTMENT OF TRANSPORTATION
www.ddot.dc.gov/dcstreetcar

in partnership with



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
www.wmata.com

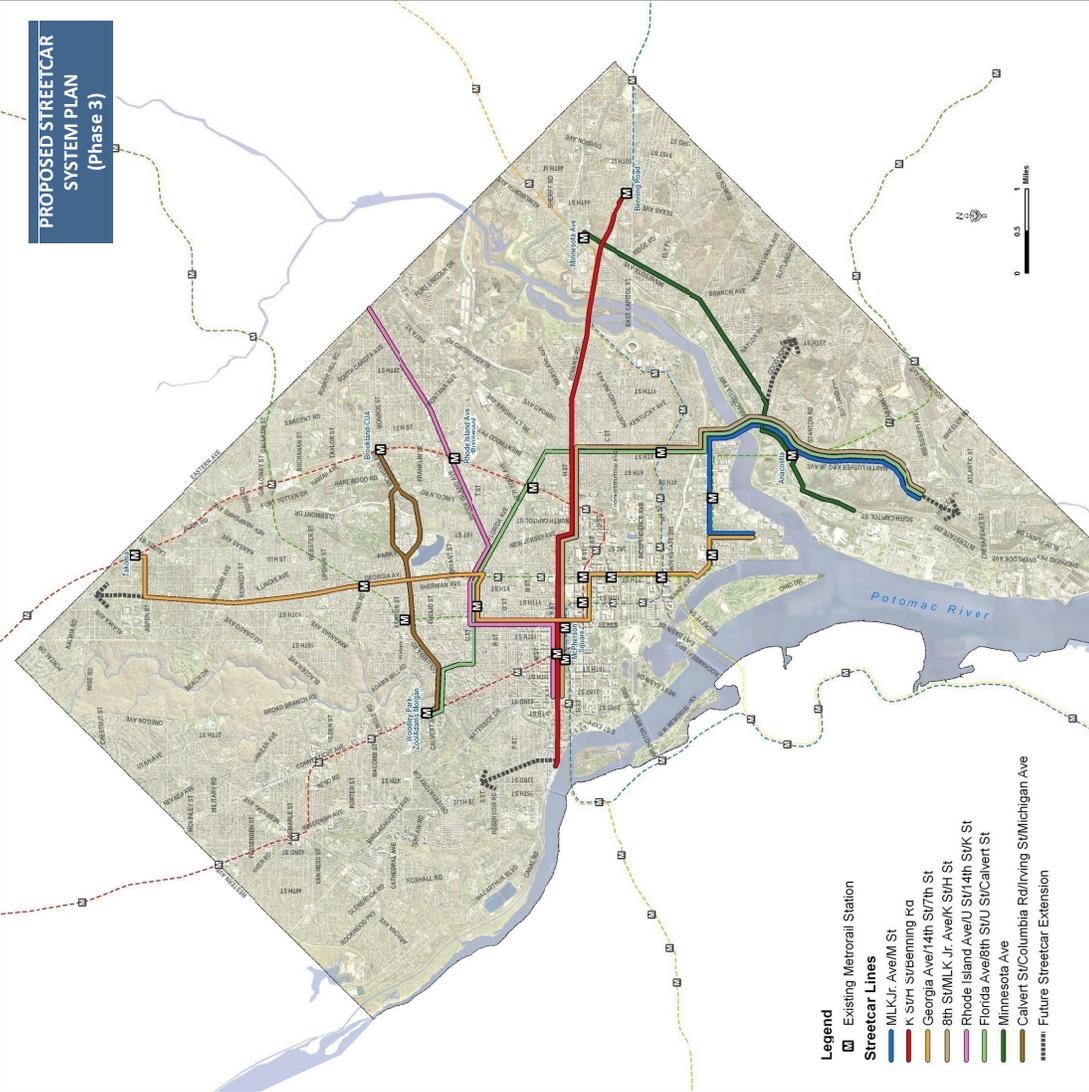
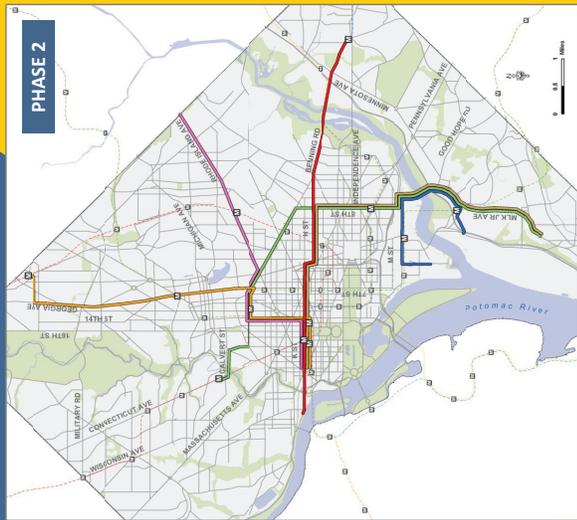
DC's *Transit Future*



PROPOSED STREETCAR SYSTEM PLAN

FALL 2009

The proposed streetcar system plan would be implemented in three phases as one of the long-term transit improvements recommended in the DC's *Transit Future* study.



- Legend**
- Existing Metrorail Station
 - Streetcar Lines**
 - MLK, Jr. Ave/M St
 - K St/1st S/Georgetown Rd
 - Georgia Ave/14th St/7th St
 - 8th St/MLK Jr. Ave/K St/4th St
 - Rhode Island Ave/U St/14th St
 - Florida Ave/8th St/U St/Calvert St
 - Minnesota Ave
 - Calvert St/Columbia Rd/Rivings St/Michigan Ave
 - Future Streetcar Extension



DC's Transit Future

PROPUESTA DE SISTEMA DE TRANVIAS

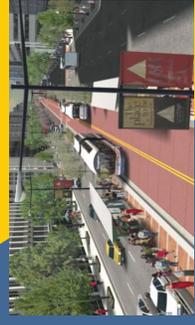
Pasos Siguietes

- Reuniones públicas en cada área del Distrito
- Finalizar el plan
- Realizar estudios de los impactos posibles al medio ambiente
- Preparar reglas de diseño del sistema

El Futuro de Transporte Público de DC

DC's *Transit Future* es un estudio de las mejoras de corto y largo plazo para el sistema de transporte público del Distrito de Columbia. Las propuestas incluyen Tranvías y Autobuses Rápidos. Se implementarán algunas de las propuestas en el futuro, pero hay algunas que ya se realizan actualmente – éstas son:

- Metrobus Express Ruta 79 – Georgia Avenue
- Metrobus Línea 30s – Rutas de paradas limitadas 37 & 39
- Metrobus Express Ruta S9 – 16th Street
- DC Circulator – Convention Center a SW Waterfront, National Mall, Union Station a Navy Yard, Georgetown a Union Station, y Woodley Park/Adams Morgan a McPherson Square



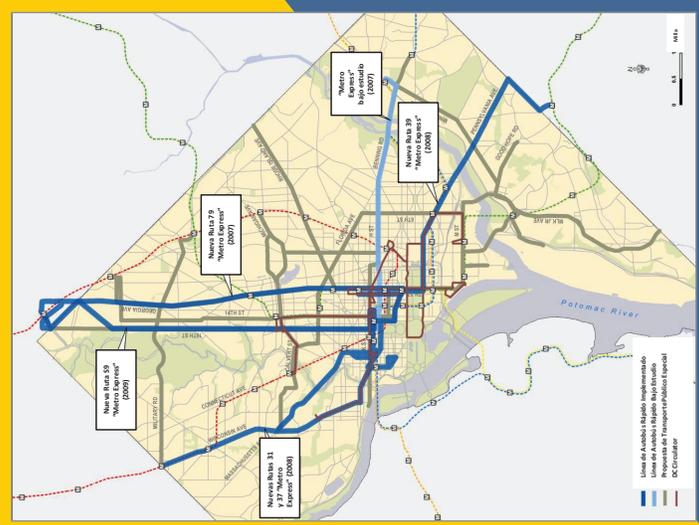
Cómo Involucrarse

- Sitio web: <http://ddot.dc.gov/dcstreetcar>
- Correo electrónico: dcstreetcar@dc.gov
- Dirección de correo: DC's *Transit Future*
District Department of Transportation
2000 14th Street NW, 5th floor
Washington, DC 20009
- Línea de teléfono: 703-682-5060

d. DEPARTAMENTO DE TRANSPORTE DEL DISTRITO DE COLUMBIA
www.ddot.dc.gov/dcstreetcar

En colaboración con:

LA AUTORIDAD DE TRANSITO DEL AREA METROPOLITANA DE WASHINGTON (WMATA)
www.wmata.com

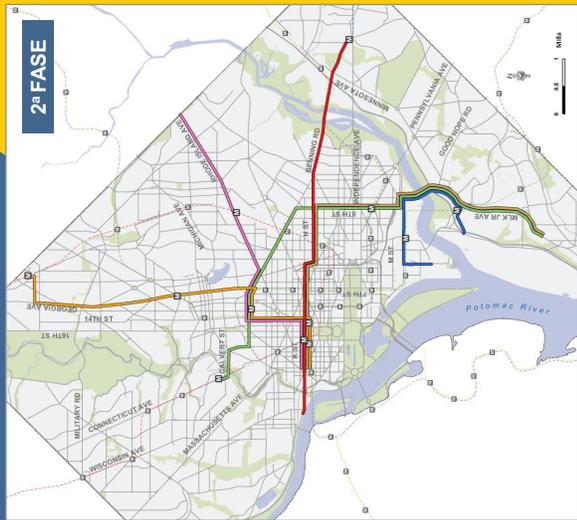


OTOÑO 2009

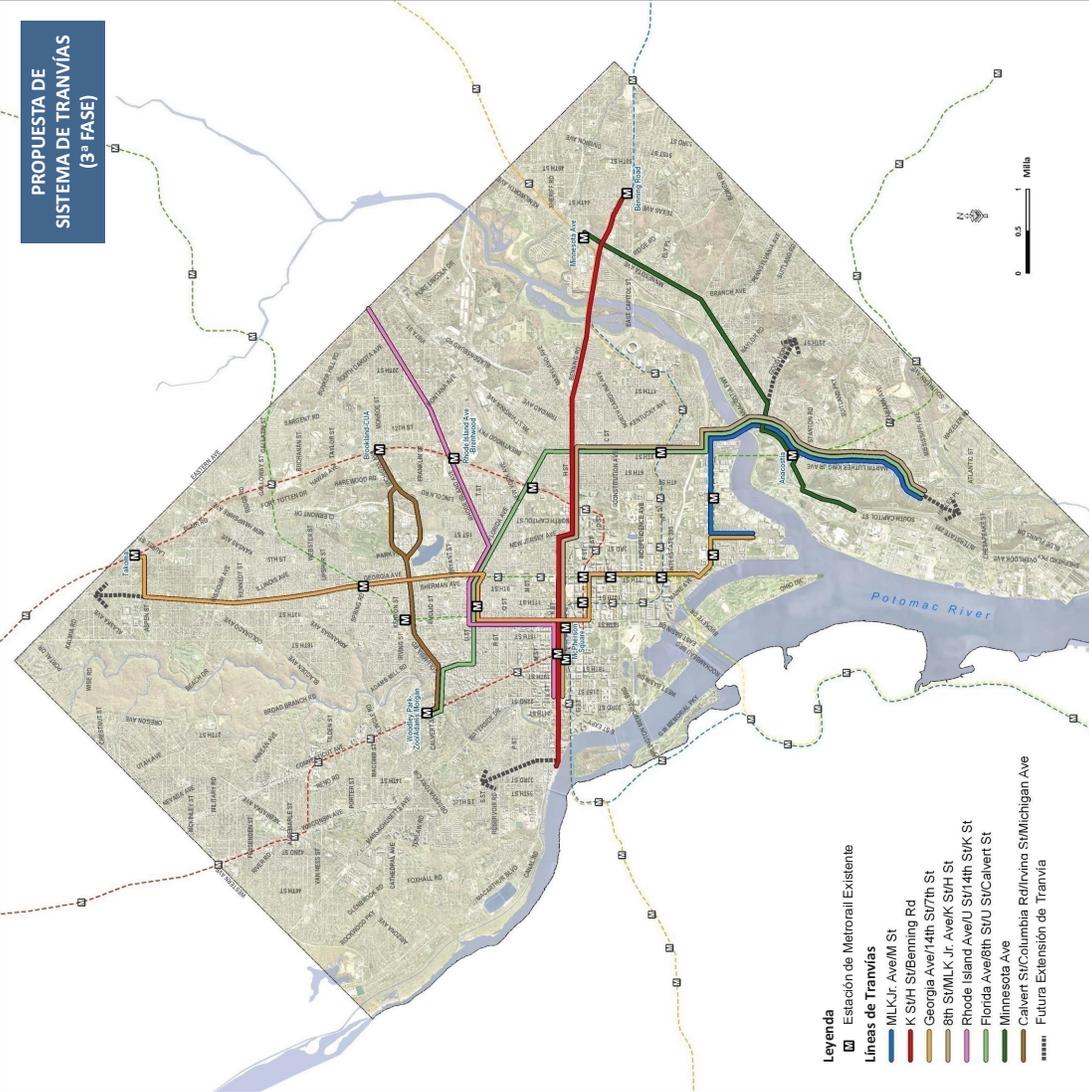
La propuesta de sistema de tranvías es un componente de las mejoras recomendadas por el estudio de *El Futuro de Transporte Público de DC*. Se implementará el plan de tranvías en tres fases.



1ª FASE



2ª FASE



PROPUESTA DE SISTEMA DE TRANVÍAS (3ª FASE)

- Leyenda**
- Estación de Metrorail Existente
 - Lineas de Tranvías**
 - MLK, Jr. Ave/M St
 - K St/H S/Benning Rd
 - Georgia Ave/14th St/7th St
 - 8th St/MLK Jr. Ave/K St/H St
 - Rhode Island Ave/J St/14th St/SK St
 - Florida Ave/8th St/U St/Calvert St
 - Minnesota Ave
 - Calvert St/Columbia Rd/Rivino St/Michigan Ave
 - Futura Extensión de Tranvía

DC Streetcar Vehicle Specifications

INEKON Bi-Directional TRIO 12



Vehicle Specifications

Track gauge	5 ft (1,435 mm)
Power system	600 V DC (750 V DC)
Maximum speed	45 mph (70 kph)
Traction motor output	4 by 90 kW
Gradient	Maximum 8%
Car length	66 ft (20,130 mm)
Wheel base	6 ft (1,880 mm)
Bogie distance	39 ft (11,800 mm)
Car width	8 ft (2,460 mm)
Car height with pantograph down	11 ft (3,460 mm)
Pantograph operating range above top of rail	13 ft – 20 ft (3,960 – 6,250 mm)
Car low-floor area	50 %
Floor height above the top of rail	1 ft – 2.5 ft (350-780 mm)
Wheel diameter max./min.	2.0/71.7 ft (610/530 mm)
Truck curve radius (minimum)	
Vertical plane	820 ft (250 m)
Horizontal plane	59 ft (18 m)
Handling curve	52 ft (16 m)
Vehicle dead weight	63,934 lbs (29,000 kg±5%)
Adhesion weight	100%
Occupancy	30 seated passengers and up to 138 additional standing passengers (total 168)

Vehicle Facts and Features:

- Produced specifically for Washington, D.C.
- Bi-directional service to be operated in both directions
- Fully air-conditioned
- GPS system
- Ticket vending machine and ticket designator
- CCTV system
- Hydro-pneumatic suspension providing constant floor height
- Double doors enabling fast and efficient passenger boarding and alighting
- Equipped with wheelchair ramp for disabled passengers
- Service life of forty years

DC's Transit Future

d.

District Department of Transportation

No idea is a crazy idea!

Thank you for participating in our DC Streetcar Open House!

Please take a moment to provide us with any comments or ideas you have on ways to improve transportation service in the District. Whether your ideas are about streetcars, buses, bike lanes, or some other transportation mode, we want to hear what you have to say!

Please keep me posted on DC's *Transit Future* developments:

Name: _____

Email: _____

Mailing Address (optional): _____



¡No hay ideas raras!

¡Gracias por participar en la reunión pública!

Por favor, tenga la bondad de ofrecer sus comentarios o ideas sobre la manera en que podemos mejorar el sistema de transporte del Distrito de Columbia. No importa si sus ideas se tratan de tranvías, autobuses, bicicletas, o cualquier otro modo de transporte – nosotros queremos escucharlas!

Por favor, infórmeme sobre *El Futuro de Transporte Público de DC*:

Nombre: _____

Email: _____

Dirección de Correo (opcional): _____



How Was the Meeting?

Thank you for participating in our DC Streetcar Open House!

The District Department of Transportation wants to make sure that your experience at this open house for *DC's Transit Future* was a good one. Was it at a convenient location? Was access easy? Were you able to participate to the extent that you had hoped? Would you encourage friends and members of your community to come to future open houses? Please give us your feedback on DDOT's public outreach!

Please keep me posted on *DC's Transit Future* developments:

Name: _____

Email: _____

Mailing Address (optional): _____



¿Cómo fue la reunión?

¡Gracias por participar en la reunión pública!

El Departamento de Transporte del Distrito de Columbia quiere que esta “casa abierta” sobre *El Futuro de Transporte Público del DC* le sirva bien. ¿Fue conveniente el sitio? ¿Fue fácil el acceso? ¿Pudo participar como quería? ¿Sugeriría usted a sus familiares y otros miembros de su comunidad que asistan reuniones como ésta en el futuro? ¡Por favor, dénos su comentario sobre las iniciativas de relaciones comunitarias del Departamento de Transporte!

Por favor, infórmeme sobre *El Futuro de Transporte Público de DC*:

Nombre: _____

Email: _____

Dirección de Correo (opcional): _____





Appendix B: Evaluation Screening Results

The 2005 DCAA and System plan included analysis and study identifying the best performing corridor segments. These corridors form the basis for the recommended streetcar system plan. As part of that process a three-step screening approach was used to review all of the potential high-capacity transit corridors that had emerged from previous studies or that were suggested through the public and agency review process and then identify the best performing segments relative to the goals and objectives established for the project. The process included three successive screenings of potential corridors and segments to narrow the list of the best performing segments. These segments were then considered in determining the recommended system and the phasing strategy for system implementation. For the System Plan (2010 Update), a re-evaluation of the corridors was conducted that reflected the most up to date population and employment estimates, ridership forecasts, development and redevelopment plans, economic development strategies, and public and stakeholder comments.

The screening process used for the evaluation included the following steps:

- **Screen 1:** Transit Modes – For Screen 1, a wide range of transit modes and technologies were evaluated based on their ability to provide “premium” transit service along the corridors considered for the study. The modes considered included Light Rail Transit, Streetcar, Diesel Multiple Units (DMU), Monorail, Automated Guideway Transit (AGT), and Heavy Rail. The modes were screened based on their ability to provide a surface running facility, engineering feasibility, and neighborhood compatibility. As a result of this process the Streetcar and Enhanced Bus options were identified for further consideration.
- **Screen 2:** Initial Corridors – For Screen 2, an initial set of corridors identified from previous studies were evaluated against performance measures that relate to each of the goals and objectives established for the project. This screening resulted in some corridors being advanced to more detailed study as part of the third screening as possible streetcar corridors with the other corridors recommended for potential enhanced bus services.
- **Screen 3:** Detailed Corridors and Segments – For Screen 3, more detailed criteria and measures were used to evaluate the potential streetcar corridors. The corridors considered included those corridors from the Screen 2 analysis and additional corridors suggested

through the public and community outreach activities. This included additional corridors suggested for the System Plan (2010 Update). Based on the results of the Screen 3 analysis the segments that form the basis of the recommended streetcar system were identified for further review and refinement based on feedback from the project stakeholders and general public.

The following sections provide a summary of each of the results of each of these successive screenings.

Screen 1: Transit Modes

The Screen 1 Evaluation was conducted in two steps with the purpose of identifying the modes to be evaluated further in later screening phases of the study. The purpose of Screen 1 was to:

- Identify a universe of modes to be considered for evaluation in the analysis;
- Complete a screening of the modes based on compatibility with project policies and general criteria related to overall feasibility; and
- Complete a final screening of surviving modes utilizing more detailed engineering analysis and an assessment of the compatibility of the mode with surrounding neighborhoods.

Screen 1 was completed in two steps. The first step focused on identifying appropriate modes, and the second step screened those down to the two modes, streetcar and enhanced bus services, to carry forward in the evaluation.

The first step in the study process was to identify a universe of modes to be considered for the project. A mode is a system for carrying transit passengers that can be described by specific features that include vertical and horizontal right of way requirements, turning radii requirements, vehicle technology, and operational elements such as service frequency and stop spacing. Seven potential modes were identified for this study: BRT, Light Rail Transit (LRT), Streetcar, light weight Diesel Multiple Unit (DMU), Automated Guideway Transit (AGT), Monorail, and Heavy Rail.

Each of the modes identified for this study was screened against an initial set of evaluation criteria. Modes that met these criteria were carried forward for further and more rigorous evaluation. Those modes that did not meet the criteria were eliminated from further consideration.

The criteria used in this first step of the mode screening included:

- **Surface-Running Transit System** - The selected mode(s) should be entirely surface running. DDOT and WMATA have stated a preference for a surface-running transit system to limit costs and to limit visual impacts and related issues associated with aerial alignments.
- **Engineering Feasibility** - The selected mode(s) and affiliated stop requirements must be able to fit within the existing corridor right of way, both vertically and horizontally and operate in existing transportation right of way.
- **Neighborhood Compatibility** - The selected mode(s) must be compatible with adjacent neighborhoods from the perspective of both horizontal and vertical scale.

Table B-1 summarizes the results of first step of the mode screening.

Based on this analysis, the modes remaining for further evaluation in the second step of the mode screening were Enhanced Bus, LRT, Lightweight DMU, and Streetcar. More extensive engineering analysis was completed to allow for this more detailed assessment of potential impacts within each corridor. The screening criteria used in this step of the mode screening process included:

- Traffic impacts
- Neighborhood scale and impacts to adjacent structures and properties
- Parking impacts
- Transit capacity issues
- Community support

As noted, the purpose of this process step was to complete a final screening of modes that are not feasible in the corridors selected for analysis. Findings of the mode screening include:

- No modes were screened out based on traffic impacts;
- LRT was eliminated based on potential impacts to adjacent structures or properties related to turning requirements;
- DMU was eliminated based on turning requirements and impacts to adjacent neighborhoods resulting from size and bulk of vehicle;
- No modes were screened out due to parking impacts;
- No modes were screened out due to lack of passenger carrying capacity; and
- No modes were screened out due to unusually strong community support or opposition.

Table B-1: Mode Screening

Criteria	Enhanced Bus	Streetcar	LRT	Lightweight DMU	AGT	Monorail	Heavy Rail
Surface-Running	Yes	Yes	Yes	Yes	No	No	No
Engineering Feasibility – Sufficient Cross Section							
Horizontal	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vertical	Yes	Yes	Yes	Yes	No	No	No
Sufficient Space for Passenger Facilities							
Horizontal	Yes	Yes	Yes	Yes	No	No	No
Vertical	Yes	Yes	Yes	Yes	No	No	No
Neighborhood Compatibility							
Scale	Yes	Yes	Somewhat	Somewhat	No	No	No
Visual/Aesthetic	Yes	Yes	Somewhat	Somewhat	No	No	No

Yes = Results in Acceptable Impacts

Based on the analyses outlined above, the second step of the mode screening process resulted in the elimination of two additional modes under consideration, DMU and LRT. While DMU and LRT both represent high-quality rail transit modes, the size of the vehicles and their large turning radii make them incompatible with the alignments under consideration. While DMU and LRT may have worked in one or two of the alignments, the system inter-operability requirement dictates that any mode found infeasible in one or more corridors would be eliminated from further consideration. Two modes that remained under consideration for further evaluation were Enhanced Bus and Streetcar. The Table B-2 shows the results of the screening evaluation.

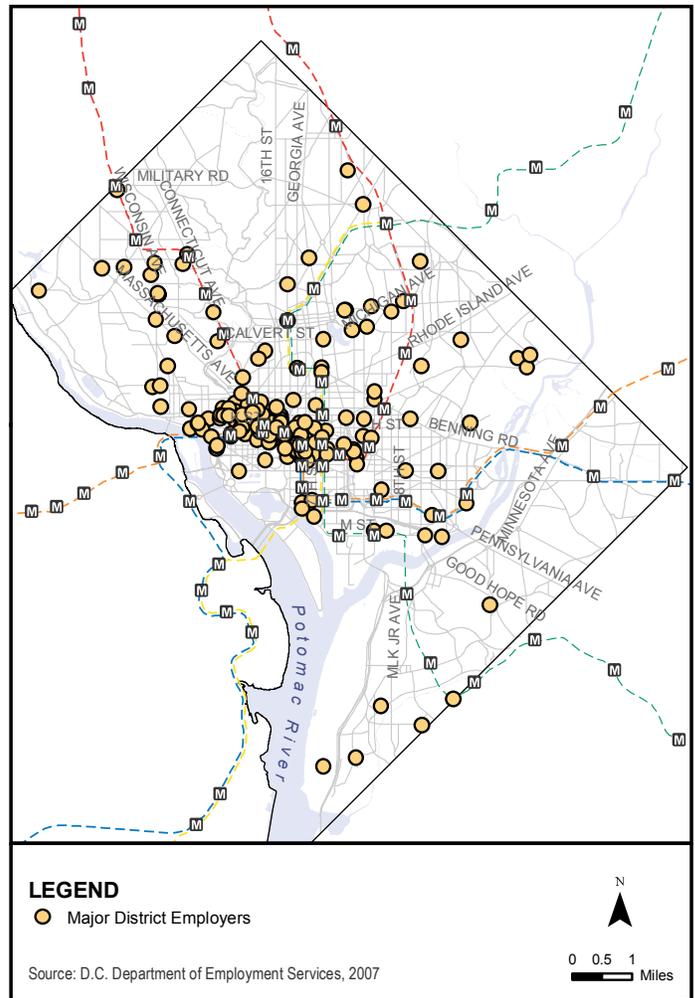
Screen 2: Initial Corridors

The purpose of Screen 2 was to identify an initial set of corridors for more detailed study that are appropriate for the implementation of premium transit services over the next 10 to 20-year time frame. The corridors that had been identified in previous studies were evaluated against criteria that addressed the project goals and objectives, corridor needs and issues, and operational considerations. Figure B-1 shows the locations of major employers, which were considered in defining corridors for study. Chapter 2 includes figures that show projected year 2030 employment density, change in employment between 2000 and 2030, and District planning initiatives. Chapter 3 includes a figure that shows economic development projects in the District.

As shown on Figure B-2, the Screen 2 analysis was conducted for an initial set of 11 corridors. As a result of the Screen 2 analysis, the number of corridors considered for premium transit investment was reduced to four, with an additional new one included on the direction of the Project Steering Committee. The corridors that were not advanced into the Screen 3 phase as premium transit corridors were identified for enhanced bus service improvements.

At the beginning of the Screen 2 evaluation process, a series of measures of effectiveness were developed to evaluate the performance of each corridor relative to spe-

Figure B-1: Major Employers



cific criteria and measures identified for each of the goals established for the project. These measures are shown in Table B-3. The results were then used to rate the corridor relative to its ability to address the identified project goals. Potential premium transit options were also evaluated based on their ability to address corridor level transit needs and key issues specific to each corridor (e.g., planning initiatives, core capacity constraints, transit demand, development patterns, etc.). The Screen 2 evaluation process is depicted graphically in Figure B-3.

Table B-2: Mode Screening Summary

Criterion	Enhanced Bus	LRT	DMU	Streetcar
Traffic Impacts	Yes	Yes	Yes	Yes
Neighborhood Scale/Impacts to Adjacent Structures	Yes	No	No	Yes
Parking Impacts	Yes	Yes	Yes	Yes
Capacity Issues	Yes	Yes	Yes	Yes
Community Support	Yes	Yes	Yes	Yes

Yes = Results in Acceptable Impacts

Figure B-2: Study Area and Priority Corridors Evaluated for Potential Premium Transit Services

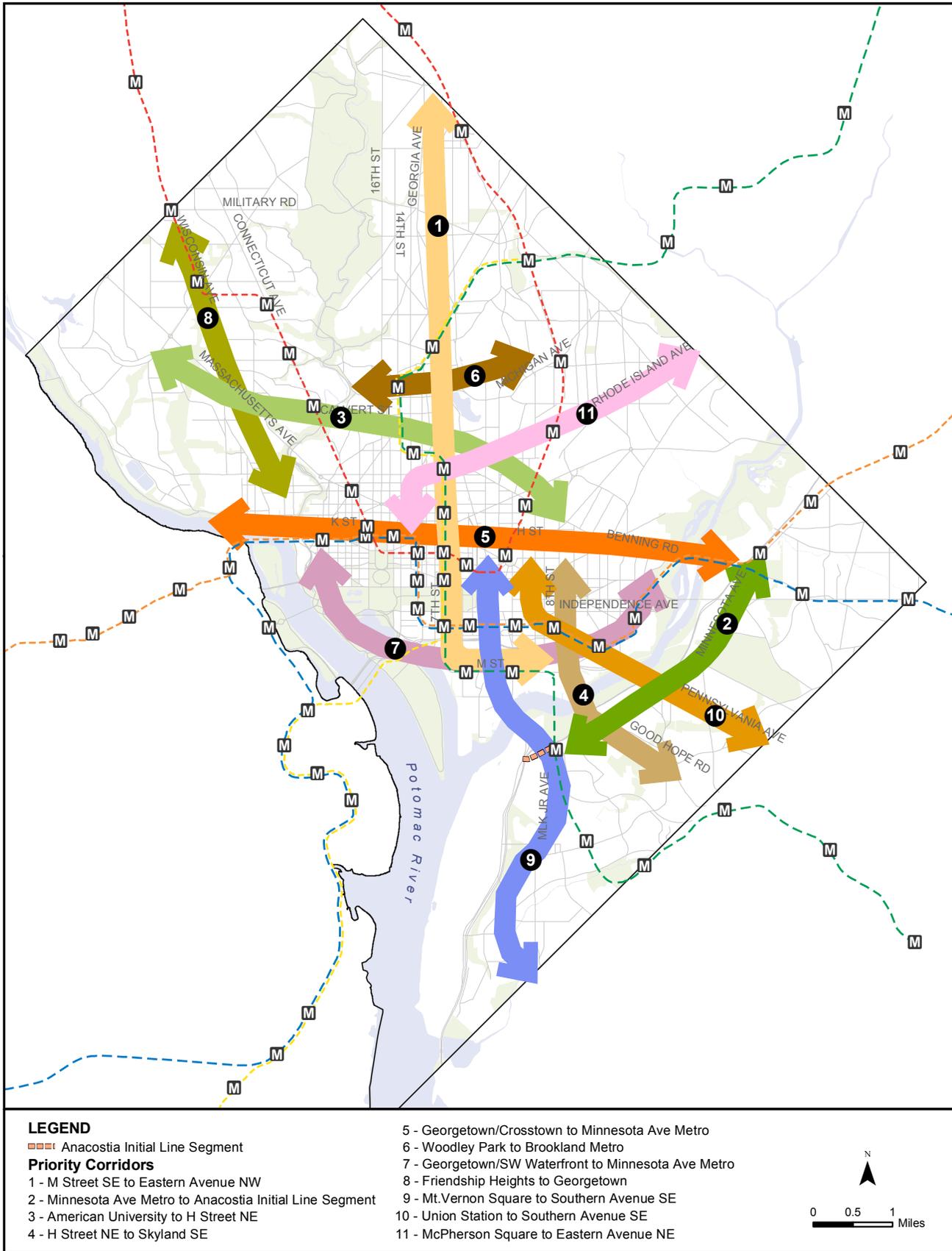


Figure B-3: Screen 2 Evaluation Process

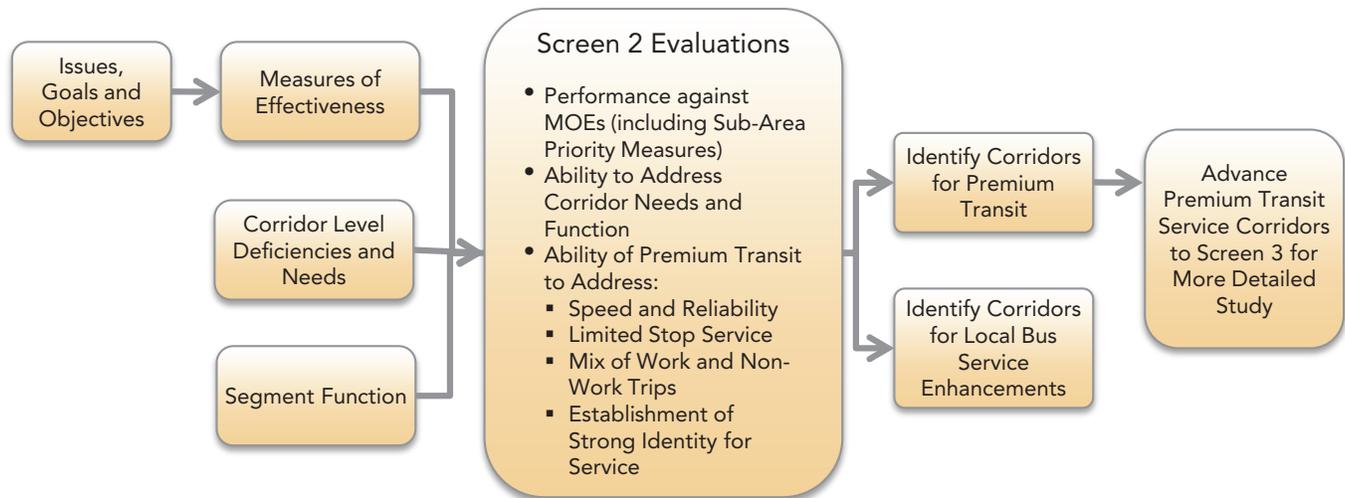


Table B-4 summarizes the results from the first stage of the Screen 2 process. The table shows the ratings by goal for each of the corridors. In order to rank the corridors relative to their performance against the project goals, a composite score for each corridor was determined. The composite score represents the sum of individual scores for each goal with a High rating given a score of 3, a Medium rating given a score of 2, and a Low rating given a score of 1.

The Georgetown/Crosstown to Minnesota Avenue Metro was the highest ranked alternative based on performance against the goals established for the project. Other high ranking corridors include the Friendship Heights to Georgetown, Silver Spring to M Street SE, H Street NE to Skyland SE, and AU to H Street NE Corridors. The lower ranked alternatives for performance against the project goals include: Georgetown/SW Waterfront to Minnesota Avenue Metro, Mount Vernon Square to National Harbor, Woodley Park to Brookland Metro, and Minnesota Avenue Metro to Anacostia Initial Line Segment Corridors. These results of the Screen 2 analysis are shown graphically in Figure B-4.

Although the Friendship Heights to Georgetown Corridor was highly ranked for many criteria, it did not perform well for the community and economic development related goal and measures. The area served by this corridor is already highly developed and does not include any city economic development initiatives. The Georgetown/SW Waterfront/Potomac Avenue Metro Corridor was a moderate performing corridor for Screen 2 but given the potential for environmental impacts and impacts to the monumental core area it was not recommended to advance to the Screen 3 Analysis.

The Mount Vernon Square to National Harbor, Woodley Park to Brookland Metro, and Minnesota Avenue Metro to Anacostia Initial Line Segment Corridors were not originally recommended to advance to the Screen 3 analysis in 2004-2005. However, based on requests from the stakeholder review process conducted in 2009, these corridors were evaluated for Screen 3 criteria given their proximity to major DC economic development initiatives that have emerged since 2005. These initiatives include:

- Development of the Department of Homeland Security Headquarters on the former St Elizabeths Hospital site served by the Mount Vernon Square to National Harbor Corridor;
- Redevelopment of the McMillan Reservoir and Soldiers' and Airmen's Home sites served by the Woodley Park to Brookland Metro Corridor; and
- Redevelopment near the Minnesota Avenue/Benning Road intersection served by the Minnesota Avenue Metro to Anacostia Initial Line Segment Corridor.

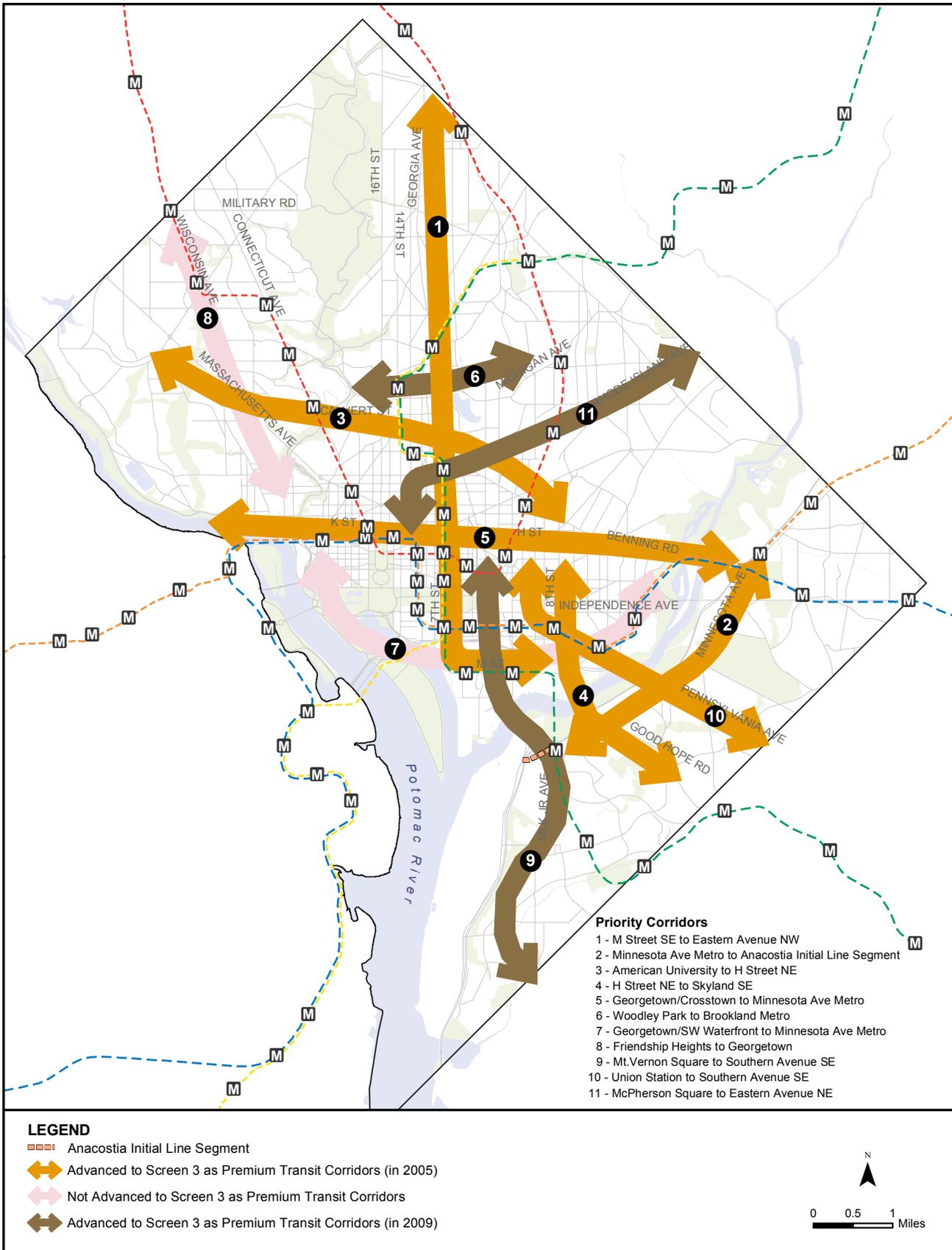
Table B-3: Screen 2 Measures

Goal/Criteria	Measure of Effectiveness
Goal 1: Access and Mobility	
Transit Travel	Change in existing travel time to access employment centers
Accessibility	Number of regional activity centers served
	Population per route mile near proposed stops
	Employment per route mile near proposed stops
Ridership	Projected daily boardings
	Projected daily boardings per route mile
Goal 2: Community and Economic Development	
Support of City Initiatives	Designated Main Street Corridors served
	Strategic Neighborhood Initiatives served
	Major planning initiatives
Zoning/Land Use/Development	Current development projects served
	Level of transit-supportive land use and zoning
Community Support	Level of community support for alternatives
Goal 3: System Performance	
Travel Time Savings	Change in transit travel times
	Change in transit travel times between select O/D pairs
Person Through-Put	Mode share
	Change in transit capacity
	Local bus peak load factors
Cost Savings	Number of TIP projects that could be coordinated with proposed project
Goal 4: Environmental Quality	
Community Fit	Visual compatibility of proposed stops within communities
Environmental Impact	Number of environmental resources potentially affected

Table B-4: Screen 2 Performance of Corridors for Project Goals

Corridor	Goal 1: Access and Mobility	Goal 2: Community and Economic Development	Goal 3: System Performance	Goal 4: Minimize Potential for Environ- mental Impact	Composite Score for Goals	Riders per Mile (from 2004- 2005 Analysis)	Rank
Corridors Advanced to Screen 3 from 2004-2005 Analysis							
Georgetown/Crosstown to Minnesota Avenue Metro	High	High	High	Low	10	4,000	1
Silver Spring to M Street SE	High	High	Medium	Low	9	3,000	3
H Street NE to Skyland SE	Medium	Medium	Medium	Medium	8	3,300	4
AU to H Street NE	Medium	High	Low	Medium	8	2,200	5
Union Station to Southern Ave	<i>New Corridor-Not Originally Analyzed as part of Screen 2</i>						
Additional Corridors Advanced to Screen 3 based on 2009 Public and Agency Review/Comment							
Mount Vernon Square to National Harbor	Low	High	Medium	Medium	8	1,100	8
Woodley Park to Brookland Metro	Low	Medium	Medium	High	8	1,100	9
Minnesota Avenue Metro to Anacostia Initial Line Segment	Low	Medium	Low	High	7	500	10
Rhode Island Avenue	<i>New Corridor-Not Originally Analyzed as part of Screen 2</i>						
Corridors Not Advanced to Screen 3							
Friendship Heights to Georgetown	High	Low	Medium	High	9	6,000	2
Georgetown/SW Waterfront to Potomac Avenue Metro	Medium	Medium	High	Low	8	2,000	7
Ridership based on regional travel demand model runs completed for initial system planning in 2004-2005							
Composite Score for Goals based on sum of ratings for Goals 1, 2, 3, and 4 with each High=3, Medium=2, and Low=1							
Higher Composite Score=Better Performance							

Figure B-4: Summary of Screen 2 Results



Recommended Corridors for Advancement to Screen 3 Evaluation

The rationale for recommending the premium transit corridors for advancement to the Screen 3 phase is summarized below.

Silver Spring to M Street SE Corridor

- Has the highest overall corridor ridership at 30,000 riders in 2030;
- Strongly supports access and mobility goal for the project by serving a large future population and employment, at 107,000 and 226,000, respectively;
- Strongly supports community and economic development goals for the project;
- Addresses potential transit capacity needs by providing a premium transit alternative to crowded Metrobus and Green and Yellow Metrorail lines;
- Serves neighborhoods without premium transit services;
- Has the potential to minimize walk distance and transfers to premium transit;
- Has the potential to improve transit reliability by improving travel times and schedule adherence; and
- Has the potential market for limited-stop service.

Minnesota Avenue Metro Station to Anacostia Initial Line Segment Corridor

- Provides needed north-south transit connectivity and connections to Metrorail;
- Provides connection to potential storage/maintenance facility site; and
- Connects Northeast DC, Poplar Point area, and planned Department of Homeland Security Headquarters (former St Elizabeths Hospital Site).

American University to H Street NE Corridor

- Connects areas with high population density with future employment growth areas;
- Serves areas without Metrorail service;
- Provides core capacity relief by offering a bypass alternative to the existing crowded core of the Metrorail system;
- Has a potential market for limited stop service;
- Has a high mix of work and non-work trips on existing transit with activity throughout the day; and
- Has a moderate ridership potential at a forecast rate of about 14,000 daily riders in 2030.

H Street NE to Skyland SE Corridor

- Has high ridership potential at 3,000 daily boardings per mile in 2030;
- Supports community and economic development project goal;
- Provides needed transit capacity in a corridor that is currently exceeding the maximum acceptable passenger loads (>80 percent) for existing bus routes;
- Provides transit time savings potential with premium transit; an improvement of as much as 32 percent with premium transit;
- Provides key connections to Metrorail service; and
- Premium transit could be more cost effective than running more local buses.

Georgetown/Crosstown to Minnesota Avenue Metro Corridor

- Has high ridership potential on premium transit at 29,000 in 2030;
- Strongly supports access and mobility goal for the project by serving a 2030 employment base of 24,000 and 2030 population of 73,000;
- Addresses potential transit capacity needs by providing a transit alternative to crowded Metrobus routes and Metrorail Lines in the corridor;
- Provides the potential for improved transit travel times;
- Provides premium transit service in areas not served by Metrorail;
- Provides possible cost savings;
- Provides potential for improvement in transit reliability by improving travel time and schedule adherence;
- Has the potential market for limited stop service;
- Provides a high mix of work and non-work transit trips with activity throughout the day; and
- Premium transit could be more cost-effective than running more Metrobuses.

Rhode Island Avenue Corridor

- Serves Brentwood area which is forecast to experience substantial growth in population and employment;
- High projected ridership of over 14,000 daily trips by 2030;
- Serves an area that is currently not served by Metrorail; and

- Potential to provide Metrorail Core Capacity relief between Union Station and Farragut North Stations on the Red Line and for Green Line/Red line transfers at Gallery Place Station.

Martin Luther King, Jr. Avenue SE/S. Capitol St Corridor

- Serves areas of projected high population and employment growth including the recently designated Homeland Security Administration Headquarters site resulting in 14,000 new jobs;
- Serves economic development initiatives including the Anacostia Waterfront initiative; and
- Provides connectivity to the Anacostia Initial Line Segment currently being constructed.

Woodley Park to Brookland Corridor

- Serves areas with substantial projected population and employment growth including the McMillan Reservoir and Soldiers' and Airmen's Home Developments;
- Provides needed cross-town transit service;
- Serves major activity centers at Washington Hospital Center, Howard University, Catholic University, and the recent development at Columbia Heights; and
- Potential to provide Metrorail Core capacity relief for Red and Green Lines

Recommended Corridors for Local Bus Service Enhancement

As a result of the Screen 2 Evaluation two corridors were not identified for premium transit investment. These corridors were recommended for limited stop and local bus service enhancements and low cost rapid bus service. These two corridors and the rationale for the recommendations are described as follows:

Friendship Heights to Georgetown Corridor

- Low performance for the community/economic development goal;
- Has the highest potential ridership per route mile in 2030, at 5,900 per route mile;
- Strongly supports the access and mobility goal for the project by serving a 2030 population and employment of 30,000 and 40,000, respectively; and
- Addresses potential transit capacity needs by providing a transit alternative to crowded Metrobus routes.

Georgetown/SW Waterfront to Potomac Avenue Metro Corridor

- The corridor segments with high population and employment densities are also served by other better-performing corridors;
- Performs well relative to the system performance goal, but many of the best-performing segments are also covered by other corridors;
- Provides core capacity relief by providing connections to and between four Metrorail radial corridors;
- Has moderate potential ridership per mile at 2,000 daily riders in 2030; and
- Running more local buses could be more cost-effective than premium transit for this corridor.

Screen 3: Detailed Corridor and Segment Evaluations

The Screen 3 analysis built on the Screen 2 findings, and provided a focused and detailed analysis of the proposed alternatives to determine which corridor segments should form the basis of the recommended streetcar network. The overall objective has been to use the results of Screen 3 to help define a vision of the long-range transit system, and a phasing strategy to achieve the vision.

During the Screen 3 analysis, additional measures were applied to the alternatives to differentiate the corridors further, thus helping to ascertain the technology that would function best under existing and future conditions. This included additional measures that addressed cost-effectiveness, travel time, accessibility, community fit, land use and redevelopment potential, and environmental effects. Table B-5 lists the measures used to evaluate each alternative and the data source used for analysis in the Screen 3 Phase.

Where the Screen 2 analysis was performed by corridor, the Screen 3 analysis was conducted for segments within each corridor. Once the best performing candidate streetcar segments were identified, they were connected together to form system elements that have logical endpoints, provide intermodal connections, connect activity centers with neighborhoods, and serve area travel patterns.

The Screen 3 Evaluation Process is illustrated in Figure B-5. The Screen 3 Evaluation process and results are summarized in the following sections.

The Anacostia Streetcar Initial Line Segment includes the establishment of streetcar service connecting the Naval Annex and the Metro Green Line Anacostia Station. The project is currently under construction and is included in the base network for all of the Screen 3 evaluations.

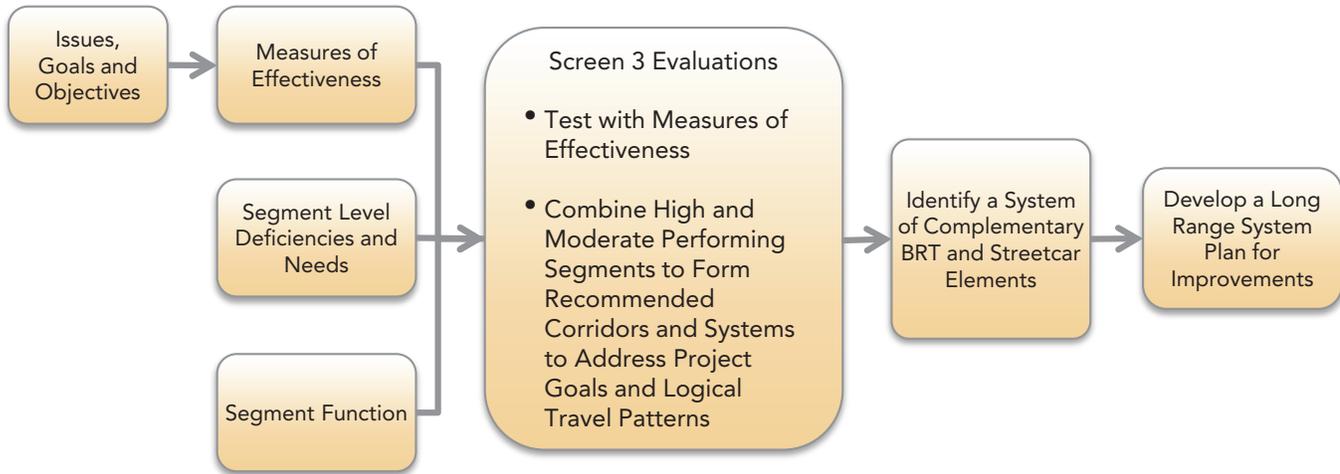
Table B-5: Screen 3 Evaluation Measures

Objective	Measure	Methodology	Date
Goal 1: Access and Mobility			
<i>Transit Travel</i>	Change in mode share to regional centers	This measure is based on the percentage of riders that have switched to transit from other modes with the implementation of premium transit. Estimates are based on the regional travel demand forecasting model.	2005
<i>Accessibility</i>	Number of regional activity centers served	This measure rates how well each segment serves a regional activity center, as defined by MWCOG's <i>Regional Activity Centers</i> report. If a segment touches the boundary of the activity center it is considered to Directly served by that segment. If it is within a 1/4 mile, it is considered to be Indirectly served by the segment.	2005
	Population per route mile near proposed stops	This measure was calculated based upon the MWCOG Model 7.1 2030 estimates for population and employment by TAZ. Employment was estimated using a 1/4 mile buffer at each stop along the segments. The total employment per segment was then divided by the length of the segment.	2010 Update
	Employment per route mile near proposed stops	This measure was calculated based upon the MWCOG Model 7.1 2030 estimates for population and employment by TAZ. Population was estimated using a 1/4 mile buffer at each stop along the segments. The total employment per segment was then divided by the length of the segment.	2010 Update
<i>Ridership</i>	Total daily boardings	This measure estimates the total number of riders accessing the premium transit service at stops along the corridor segment. Estimates are based on the regional travel demand forecasting model.	2010 Update
	Daily boardings per route mile	This measure divides the estimated total number of riders accessing the premium transit service at stops along the corridor segment by the length of the segment.	2010 Update
Goal 2: Community and Economic Development			
<i>Support of City Initiatives</i>	Designated Great Street Corridors served	Information on designated Great Street Corridors was obtained from the Office of the Deputy Mayor for Planning and Economic Development (DMPED). If a segment is located along the Great Street Corridor it is considered to be Directly served by that segment. If it is within a 1/4 mile, it is considered to be Indirectly served by the segment.	2010 Update
	Current development projects served	Information on development projects was obtained from Washington DC Economic Partnership & the Office of the Deputy Mayor on Planning and Economic Development. Development projects were selected per segment using a 1/4 mile buffer. Total Square Footage was calculated and rated "Low", "Medium", or "High" for each segment.	2010 Update
	Planning Initiatives Served	Information on District of Columbia planning initiatives was obtained from the District of Columbia Office of Planning. Segments with a "High" rating serve multiple initiatives, or serve the core of a single initiative. A "Medium" rating indicates that a segment indirectly serves on initiative, meaning it is within 1/4 mile of the periphery of the area covered by an initiative. If a segment does not serve any initiatives at all, it is given a "Low" rating.	2010 Update
<i>Zoning, Land Use, and Development</i>	Zoning and land use compatibility	This measure is based on a summary of the current and future land uses and their compatibility with a premium transit mode. Allowable densities of development were determined for each corridor segment. Segment with the highest allowable densities were rated as high for the Streetcar Mode with lower densities rated as medium or low.	2010 Update

Table B-5: Screen 3 Evaluation Measures (cont'd)

Objective	Measure	Methodology	Date
	Zoning potential/capacity of underutilized un-built land	Using information from the DC Office of Planning, the DC Office of Zoning, the DC Marketing Center, and MWCOG, the zoning, land use, population and employment density, and recent development activity within a 1/4 mile of the segments was mapped and analyzed. The "zoning envelope," meaning the difference between existing and potential development, was obtained by subtracting the existing population and employment from the potential population and employment. The ratings for this measure were based on the amount of new development possible under the current zoning envelope.	2010 Update
<i>Community Support</i>	Level of community support for alternatives	Public Comments were collected from attendees to the open houses. The list of comments was checked for those relating to each of the segments. The total number of positive, negative, or neutral comments was recorded for each segment (including previous comments from the 2004 AA) and a "High", "Medium", or "Low" rank was given to each segment dependant on the number of positive, neutral, or negative comments received.	2010 Update
Goal 3: System Performance			
<i>Travel Time Savings</i>	Average % Reduction in transit travel times	This estimates the percent change in travel times for the premium transit service compared to existing surface transit.	2005
	Average transit travel time savings to major trip destinations	This estimates the average change in transit travel times from traffic analysis zones served by the corridor segment to the nine key activity centers in the study area.	2005
	Change in transit capacity	This measure is based on the estimated percent change in the total seated and standing transit service capacity when the premium transit service is added to the corridor segment.	2005
	Local bus peak load factors	This measure is based on the resulting peak vehicle loads for the existing bus services that will continue to operate when the premium transit is introduced.	2010 Update
	BRT and Streetcar peak load factors	This measure the estimated vehicle loads for the premium transit service option.	2010 Update
	Operating cost per vehicle mile	This measure considers the estimated annual operating and maintenance costs divided by the estimated annual vehicle revenue miles for the premium transit service option	2010 Update
	Annual operating cost per annual boarding	This measure divides the estimated operating cost by the estimated number of boarding riders. The number of transit riders is estimated based on forecasts from the regional travel demand model.	2010 Update
	Annualized capital cost per annual boarding	This measure annualizes the capital cost to build the system assuming a 50 year life cycle and divides the annualized cost by the estimated annual transit rider boardings. Rider boarding estimates are based on the regional travel demand forecasting model	2010 Update
	Annualized capital cost per new annual boardings	This measure annualizes the capital cost to build the system assuming a 50 year life cycle and divides the annualized cost by the estimated number of boardings for new riders that are attracted to the system from other non-transit modes. The number of new transit riders is estimated based on forecasts from the regional travel demand model.	2010 Update
Goal 4: Environmental Quality			
	Visual compatibility of proposed stops within communities	A qualitative assessment of visual fit based on available rights-of-way, neighborhood character, roadway lanes and sidewalk widths was considered for this measure.	2005
	Potential to avoid adverse impacts	An assessment of the potential for environmental impacts was completed based on the number of potentially affected resources including parklands, historic resources, potential known hazardous materials sites, and water resources.	2005

Figure B-5: Screen 3 Evaluation Process



Screen 3 Evaluation Results

Each of the segments for each corridor was evaluated according to each of the 24 measures and the results were used to assign a rating as “High,” “Medium,” or “Low” for each measure. The individual ratings for each measure were used to determine ratings for each

segment by goal. The results are summarized in Table B-6. The results for each segment are listed in Tables B-7 through B-10 and are shown graphically in Figures B-6 through B-9.

Table B-6: Performance of Segments for Premium Transit*

Corridor	High Performing Segments	Moderate Performing Segments	Low Performing Segments
<i>Silver Spring to Skyland SE</i>	<ul style="list-style-type: none"> Georgia NW M Street SE 	<ul style="list-style-type: none"> Uptown 11th Street Bridge 7th Street North 	<ul style="list-style-type: none"> 7th Street South Good Hope Rd SE
<i>AU to L'Enfant Plaza</i>	<ul style="list-style-type: none"> U Street NW Florida NW/NE M Street SE 8th St NE/SE 		<ul style="list-style-type: none"> Massachusetts Ave NW Calvert West Calvert East 7th Street South
<i>Georgetown to Minnesota Avenue Metro</i>	<ul style="list-style-type: none"> Upper K Street NW H Street NW/NE Benning Road NE 	<ul style="list-style-type: none"> Lower K Street NW 	
<i>Minnesota Avenue Metro to Anacostia Initial Line Segment</i>			<ul style="list-style-type: none"> Minnesota Ave NE/SE
<i>Union Station to Southern Avenue</i>		<ul style="list-style-type: none"> Pennsylvania Ave W 	<ul style="list-style-type: none"> 1st/2nd Street SE Pennsylvania Ave E
<i>L'Enfant Plaza to Southern Avenue</i>	<ul style="list-style-type: none"> M Street SE 	<ul style="list-style-type: none"> 11th Street Bridge Martin Luther King, Jr. Ave SE South Capitol St SE 	<ul style="list-style-type: none"> 7th Street South
<i>Rhode Island Avenue</i>	<ul style="list-style-type: none"> 14th Street South NW 	<ul style="list-style-type: none"> Rhode Island South Rhode Island North 	
<i>Woodley Park to Brookland</i>		<ul style="list-style-type: none"> Michigan Ave NE 	<ul style="list-style-type: none"> Calvert East Columbia Rd NW

*Screenings for BRT are not included because no segments with BRT were advanced in the 2005 study except for the K Street NW corridor.

Table B-7: Screen 3 Results: Goal 1 – Access and Mobility Measures

Corridors and Segments	Transit Travel Time	Accessibility			Ridership		GOAL 1 RATINGS			
	Average Percent Change in Mode Share to Regional Centers	Number of Regional Activity Centers Served (Direct – Indirect)	Employment/Linear Mile (Year 2030)	Population/Linear Mile (Year 2030)	Projected Daily Boardings (2030)	Projected Daily Boardings Per Mile (2030)	Transit Travel Time	Accessibility	Ridership	GOAL 1 OVERALL
Silver Spring to Skyland SE										
Georgia	1.0%	0-1	1,905	6,162	14,298	2,960	Medium	Medium	High	High
Uptown	0.7%	0-1	8,279	10,810	3,115	3,799	Medium	Medium	Medium	Medium
7 th North	0.2%	1-0	20,659	12,866	4,839	4,938	Low	High	High	High
7 th South	0.2%	3-0	55,291	5,958	11,210	6,835	Low	High	High	High
M Street SE	2.8%	1-0	16,615	8,688	6,233	2,996	High	High	Medium	High
11 th Street Bridge	4.2%	0-1	6,159	2,822	527	555	High	Low	Low	Low
Good Hope Road	0.4%	0	1,138	6,578	4,705	4,127	Low	Low	High	Low
American University to L'Enfant Plaza										
Massachusetts	0.0%	0	2,964	5,339	2,834	3,080	Low	Low	Low	Low
Calvert West	0.0%	0	1,041	3,330	467	425	Low	Low	Low	Low
Calvert East	0.0%	0	4,413	11,982	1,866	2,248	Low	Low	Low	Low
U Street	1.4%	0-1	7,784	12,035	7,225	4,915	Medium	Medium	High	High
Florida	0.3%	0-2	11,156	9,462	2,792	1,417	Low	High	Low	Low
8 th Street	1.0%	0-1	3,512	7,678	8,559	5,219	Medium	Medium	High	High
M Street SE	2.8%	1-0	16,615	8,688	6,233	3,996	High	Medium	Medium	High
7 th South (Part of)	0.2%	3-0	94,218	7,493	1,550	3,444	Low	High	Low	Low
Georgetown to Minnesota Avenue Metro										
Lower K Street	2.4%	1-1	22,449	9,637	1,872	2,753	High	High	Low	High
Upper K Street	3.0%	1-1	111,410	11,299	15,364	9,912	High	High	High	High
H Street NE	2.2%	1-0	21,224	8,388	13,748	6,516	High	High	High	High
Benning Road	0.0%	0-1	1,106	5,082	11,046	4,315	Low	Medium	High	Medium
Minnesota Avenue Metro to Anacostia Streetcar										
Minnesota	0.0%	0	881	3,210	2,998	1,363	Low	Low	Low	Low
Union Station to Southern Avenue										
2nd Street	0.0%	1-0	42,069	5,240	1,676	1,510	Low	High	Low	Low
Pennsylvania West	1.0%	1-0	1,919	4,417	4,248	2,093	Medium	Medium	Low	Medium
Pennsylvania East	0.7%	0-1	657	2,195	1,242	857	Medium	Low	Low	Low
L'Enfant Plaza to Southern Ave Corridor										
7 th South (Part of)	0.2%	1-0	94,218	7,493	1,550	3,444	Low	High	Low	Low
M Street SE	2.8%	1-0	16,615	8,688	6,233	3,996	High	High	Medium	High
11 th St Bridge	4.2%	0-1	6,159	2,822	527	555	High	Low	Low	Low
MLK Jr. Ave	2.4%	0	2,346	5,205	15,838	7,232	High	Low	High	High
S Capitol St	2.4%	0	647	5,570	--	--	High	Low	Medium	Medium
Rhode Island Ave Corridor										
14th Street	2.2%	1-0	10,132	34,136	14,262	14,262	High	High	High	High
U Florida	1.4%	0-1	8,959	10,806	3,709	4,313	Medium	Medium	High	High
Rhode Island South	0.3%	0-1	4,132	9,971	2,653	2,057	Low	Medium	Low	Low
Rhode Island North	0.6%	0	1,985	3,101	5,452	2,825	Medium	Low	Medium	Medium
Woodley Park to Brookland Metro Corridor										
Calvert East	0.0%	0	4,413	11,982	1,866	2,248	Low	Low	Low	Low
Columbia	0.0%	0	3,926	14,599	1,393	1,191	Low	Low	Low	Low
Michigan	0.1%	0	4,835	3,921	1,449	842	Low	Low	Low	Low

Ratings Key						
High	>2%	Direct 1+, Indirect 2+	> 50,000	> 10,000	> 8,000	> 4,000
Medium	0.5%-2%	Indirect 1	10,000 – 50,000	5,000 – 10,000	3,000-8,000	2,500-4,000
Low	>0.5%	None	< 9,999	< 5,000	< 3,000	< 2,500

Table B-8: Screen 3 Results: Goal 2 – Community and Economic Development Measures

Corridors and Segments	Support of City Initiatives			Zoning/Land Use/Development			Community Support Public Comments (2005-2009)			Goal 2 Ratings			
	Designated Great Street Corridors Served (Direct – Indirect)	Development Projects Served (Based on square ft for projects identified by DCEP and DMPEP)	Planning Initiatives Served	Zoning and Land Use Compatibility	Zoning Potential/ Capacity of Underutilized/ Un-built Land	Positive	Neutral	Negative	Support of City Initiatives	Zoning/Land Use/ Development	Community Support	GOAL 2 OVERALL	
Silver Spring to Skyland SE													
Georgia	1-0	Medium	High	Medium	High	13	7	9	High	High	High	High	
Uptown	1-0	Medium	High	Medium	Medium	2	0	0	High	Medium	High	High	
7 th North	0-1	High	High	Medium	High	0	0	0	High	High	Medium	High	
7 th South	0	High	High	Medium	Medium	0	1	1	Medium	High	Low	Medium	
M Street SE	0	High	High	Medium	Medium	2	0	0	Medium	Medium	High	High	
11 th Street Bridge	0-1	Medium	High	Medium	Low	0	0	0	High	Low	Medium	Medium	
Good Hope Road	0-1	Medium	Medium	Medium	Medium	1	1	0	Medium	Medium	Medium	Medium	
American University to L'Enfant Plaza													
Massachusetts	0	Low	Low	Medium	Low	1	1	0	Low	Low	High	Low	
Calvert West	0	Low	Low	Low	Low	1	0	0	Low	Low	High	Low	
Calvert East	0	Low	Low	Medium	Low	0	0	0	Low	Low	Medium	Low	
U Street	0-1	Medium	High	Medium	Medium	1	0	0	High	Medium	High	High	
Florida	0-1	High	High	Medium	High	0	0	1	High	High	Low	High	
8 th Street	0-2	Medium	Medium	Medium	High	4	1	3	High	High	High	High	
M Street SE	0	High	High	Medium	Medium	2	0	0	Medium	Medium	High	High	
7 th South (Part of)	0	High	High	High	Low	0	0	0	Medium	Medium	Medium	Medium	
Georgetown to Minnesota Avenue Metro													
Lower K Street	0	Low	Low	Medium	Low	1	0	0	Low	Low	High	Low	
Upper K Street	0	High	High	High	Medium	6	4	2	Medium	High	High	High	
H Street NE	1-0	High	High	Medium	High	6	4	1	High	High	High	High	
Benning Road	1-2	Medium	High	Medium	High	1	3	0	High	Medium	Medium	High	
Minnesota Avenue Metro to Anacostia Streetcar													
Minnesota	1-4	Medium	Medium	Medium	Medium	3	0	1	High	Medium	High	High	
Union Station to Southern Avenue													
2nd Street	0-1	High	Medium	High	Low	0	1	0	High	Medium	Medium	High	
Pennsylvania West	1-1	Low	Medium	Medium	High	0	0	0	Medium	Medium	Medium	Medium	
Pennsylvania East	1-1	Low	Low	Low	Low	0	0	0	Low	Low	Medium	Low	
L'Enfant Plaza to Southern Ave Corridor													
7 th South (Part of)	0	High	High	High	Low	0	0	0	Medium	Medium	Medium	Medium	
M Street SE	0	High	High	Medium	Medium	2	0	0	Medium	Medium	High	High	
11 th St Bridge	0-1	Medium	High	Medium	Low	0	0	0	High	Low	Medium	Medium	
MLK Jr. Ave	1-0	High	High	High	High	2	2	4	High	Medium	Low	Medium	
S Capitol St	1-0	Low	Low	Low	High	0	0	0	Medium	Medium	Medium	Medium	
Rhode Island Ave Corridor													
14th Street	0	Medium	High	Medium	Medium	0	0	0	Medium	Medium	Medium	Medium	
U Florida	0-1	Medium	High	Medium	Medium	0	0	1	High	Medium	Low	Medium	
Rhode Island South	1-0	Low	Medium	Medium	High	1	0	3	Medium	High	Low	Medium	
Rhode Island North	1-0	Low	Low	Low	High	1	0	1	Low	Medium	Medium	Medium	
Woodley Park to Brookland Metro Corridor													
Calvert East	0	Low	Low	Medium	Low	0	0	0	Low	Low	Medium	Low	
Columbia	0	Low	Medium	Medium	High	1	0	4	Low	High	Low	Medium	
Michigan	0	Medium	High	High	High	1	1	0	Medium	High	High	High	

Table B-9: Screen 3 Results: Goal 3 – System Performance Measures

Corridors and Segments	Travel Time Savings		Transit Capacity			Operating Costs per Vehicle Mile	Annual Operating Cost per Annual Boarding	Cost Effectiveness		Goal 3 Ratings			
	Average Percent Reduction in Transit Travel Times	Average Travel Time Savings to Major Trip Destination (min)	Change in Transit Carrying Capacity	Local Bus Peak Load Factors	Peak Load Factors			Annualized Capital Cost per Annual Boarding (Annualized Capital Cost Based on 50 years)	Annualized Capital Cost per Annual New Boarding (Annualized capital cost based on 50 year life cycle)	Travel Time	Transit Capacity	Cost-Effectiveness	GOAL 3 OVERALL
Silver Spring to Skyland SE													
Georgia	31%	5.0	113%	0.81	0.32	\$11	\$1.28	\$0.90	\$20	Medium	High	Medium	High
Uptown	39%	4.8	113%	0.81	0.37	\$18	\$1.57	\$0.70	\$21	Medium	High	Low	Medium
7 th North	16%	4.8	113%	0.73	0.10	\$19	\$1.58	\$0.54	\$8	Medium	Medium	Medium	Medium
7 th South	47%	3.3	22%	0.65	0.21	\$16	\$0.80	\$0.39	\$13	Medium	Low	High	Medium
M Street SE	46%	6.0	61%	0.36	0.18	\$17	\$1.45	\$0.67	\$4	High	High	Medium	Medium
11 th Street Bridge	54%	6.4	63%	NA	0.08	\$12	\$10.37	\$4.81	\$8	High	Medium	Low	Medium
Good Hope Road	64%	4.6	100%	0.80	0.05	\$17	\$1.40	\$0.95	\$6	High	Low	Medium	Low
American University to L'Enfant Plaza													
Massachusetts	37%	5.5	127%	0.03	0.02	\$17	\$1.87	\$1.19	--	High	High	Medium	High
Calvert West	16%	5.5	29%	0.21	0.02	\$17	\$13.57	\$1.19	--	Medium	Low	Low	Low
Calvert East	31%	5.5	36%	0.32	0.02	\$17	\$3.19	\$1.19	--	High	Low	Low	Low
U Street	34%	5.3	24%	0.44	0.11	\$18	\$1.78	0.54	\$9	High	Medium	Medium	High
Florida	44%	3.4	35%	0.62	0.21	\$18	\$4.33	\$1.88	\$46	Medium	Medium	Low	Medium
8 th Street	34%	3.2	48%	0.80	0.13	\$17	\$1.39	\$0.51	\$17	Low	Medium	Medium	Medium
M Street SE	46%	6.0	61%	0.36	0.18	\$17	\$1.45	\$0.67	\$4	High	Low	Medium	Medium
7 th South (Part of)	47%	3.3	37%	0.65	0.19	\$17	\$1.62	\$0.39	\$3	Medium	Low	High	Medium
Georgetown to Minnesota Avenue Metro													
Lower K Street	36%	2.4	53%	0.54	0.11	\$18	\$2.22	\$0.39	\$6	Low	High	Medium	Medium
Upper K Street	43%	3.6	53%	0.37	0.75	\$21	\$1.07	\$0.27	\$3	Low	High	High	High
H Street NE	31%	7.3	85%	1.74	0.28	\$16	\$1.05	\$0.41	\$4	High	High	High	High
Benning Road	43%	9.8	69%	0.84	0.31	\$13	\$1.02	\$0.62	\$9	High	Medium	Medium	High
Minnesota Avenue Metro to Anacostia Streetcar													
Minnesota	37%	6.9	22%	0.26	0.02	\$23	--	\$1.96	\$11	High	High	Low	Medium
Union Station to Southern Avenue													
2nd Street	41%	3.1	65%	NA	0.27	\$17	\$3.82	--	--	Low	High	Medium	Medium
Pennsylvania W	41%	3.1	100%	0.50	0.27	\$17	\$2.75	--	--	Low	Medium	Medium	Medium
Pennsylvania E	38%	3.1	100%	0.50	0.27	\$17	\$6.73	--	--	Low	Medium	Medium	Medium
L'Enfant Plaza to Southern Ave Corridor													
7 th South (Part of)	47%	3.3	37%	0.65	0.19	\$17	\$1.62	\$0.77	\$3	Medium	Low	Medium	Medium
M Street SE	46%	6.0	61%	0.36	0.18	\$17	\$1.45	\$0.67	\$4	High	High	Medium	Medium
11 th St Bridge	54%	6.4	63%	NA	0.08	\$12	\$10.37	\$4.81	\$8	High	Medium	Medium	Medium
MLK Jr. Ave	32%	4.6	33%	0.19	0.07	\$14	\$0.99	\$0.37	\$5	Medium	Medium	High	Medium
S Capitol St	32%	4.6	33%	0.30	0.07	\$17	\$0.99	\$0.37	\$3	Medium	Low	High	Medium
Rhode Island Ave Corridor													
14th Street	13%	3.9	107%	0.43	0.20	\$23	\$0.81	\$0.19	\$14	Low	High	High	High
U Florida	34%	5.3	24%	0.44	0.11	\$16	\$1.86	\$0.62	\$5	High	Medium	Medium	High
Rhode Island S	30%	4.6	110%	0.17	0.22	\$15	\$2.51	\$1.30	\$65	Medium	High	Medium	Medium
Rhode Island N	15%	2.6	157%	0.35	0.17	\$12	\$1.48	\$0.94	\$39	Low	High	Medium	Medium
Woodley Park to Brookland Metro Corridor													
Calvert East	33%	5.5	36%	0.32	0.02	\$17	\$3.19	\$1.19	--	High	Low	Low	Low
Columbia	26%	2.4	73%	0.49	0.02	\$20	\$5.58	\$2.24	\$328	Low	Medium	Low	Low
Michigan	30%	2.9	50%	0.65	0.02	\$15	\$6.07	\$3.17	\$413	Low	Low	Low	Low

Ratings Key									
High	>40%	>6.0	>80%	<0.4	>0.25	<\$10	<\$1.25	<\$0.50	<\$7
Medium	20%-40%	5.0-6.0	45%-80%	0.4-0.6	0.10-0.25	\$10-\$18	\$1.25-\$3.00	\$0.50-\$1.00	\$7-\$15
Low	<20%	<5.0	<45%	>0.6	<0.10	>\$18	>\$3.00	>\$1.0	>\$15

Table B-10: Screen 3 Results: Goal 4 – Environmental Quality Measures

Corridors and Segments	Visual/ Community Fit of Stops	Potential to Avoid Adverse Impacts	GOAL 4 OVERALL
Silver Spring to Skyland SE			
Georgia	High	Medium	High
Uptown	Medium	Medium	Medium
7 th North	Low	Low	Low
7 th South	Low	Low	Low
M Street SE	High	Medium	High
11 th Street Bridge	Low	High	Medium
Good Hope Road	Medium	Medium	Medium
American University to L'Enfant Plaza			
Massachusetts	High	Low	Medium
Calvert West	Medium	Medium	Medium
Calvert East	Low	Medium	Low
U Street	Low	Low	Low
Florida	High	Medium	High
8 th Street	Low	Low	Low
M Street SE	High	Medium	High
7 th South (Part of)	Low	High	Medium
Georgetown to Minnesota Avenue Metro			
Lower K Street	Medium	Medium	Medium
Upper K Street	Medium	Medium	Medium
H Street NE	High	Medium	High
Benning Road	High	Medium	High
Minnesota Avenue Metro to Anacostia Streetcar			
Minnesota	Low	Medium	Low
Union Station to Southern Avenue			
2nd Street	Low	Medium	Low
Pennsylvania W	High	Medium	High
Pennsylvania E	Medium	Low	Low
L'Enfant Plaza to Southern Ave Corridor			
7 th South (Part of)	Low	High	Medium
M Street SE	High	Medium	High
11 th St Bridge	Low	High	Medium
MLK Jr. Ave	Medium	Low	Low
S Capitol St	High	Medium	High
Rhode Island Ave Corridor			
14th Street	Low	Low	Low
U Florida	Medium	Low	Medium
Rhode Island S	High	High	High
Rhode Island N	High	Medium	High
Woodley Park to Brookland Metro Corridor			
Calvert East	Low	Medium	Low
Columbia	High	Medium	High
Michigan	High	High	High

Figure B-6: Goal 1 - Access and Mobility Ratings

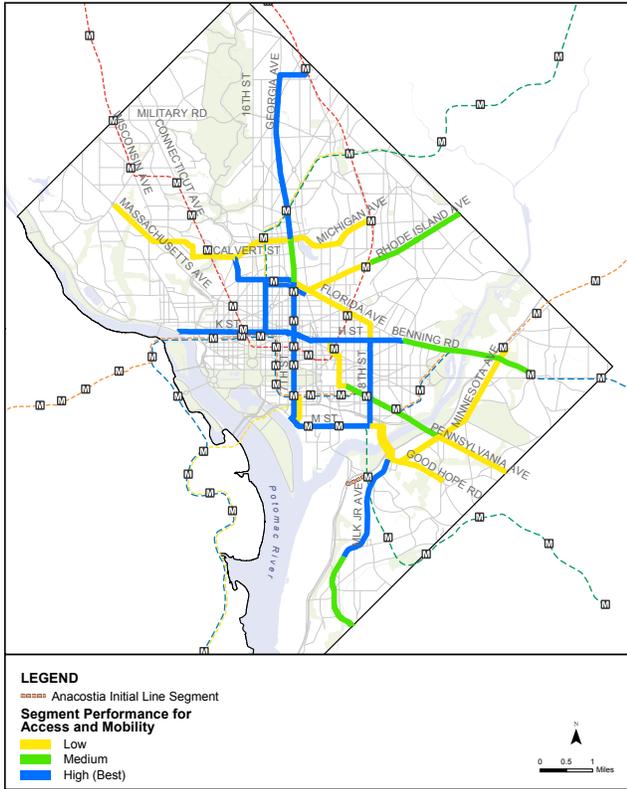


Figure B-7: Goal 2 - Community and Economic Development Ratings - Streetcar

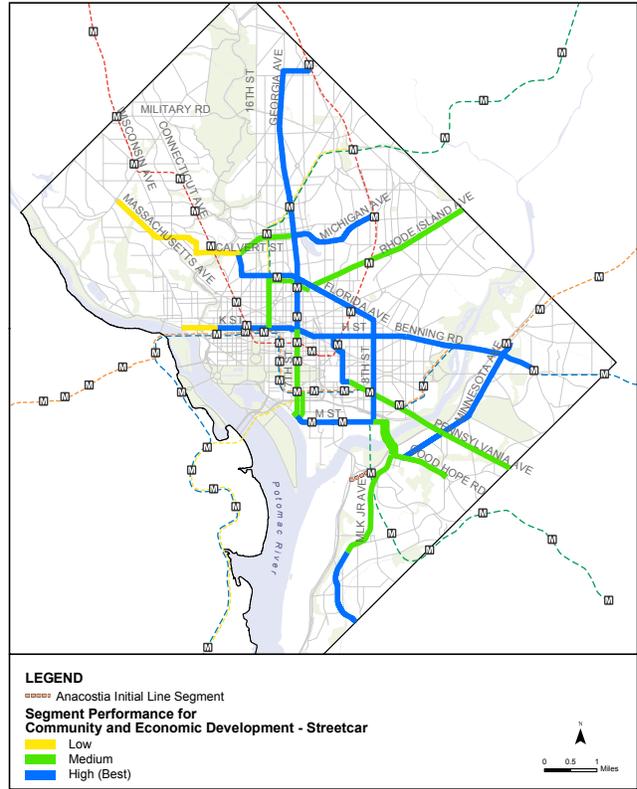


Figure B-8: Goal 3 - System Performance Ratings - Streetcar

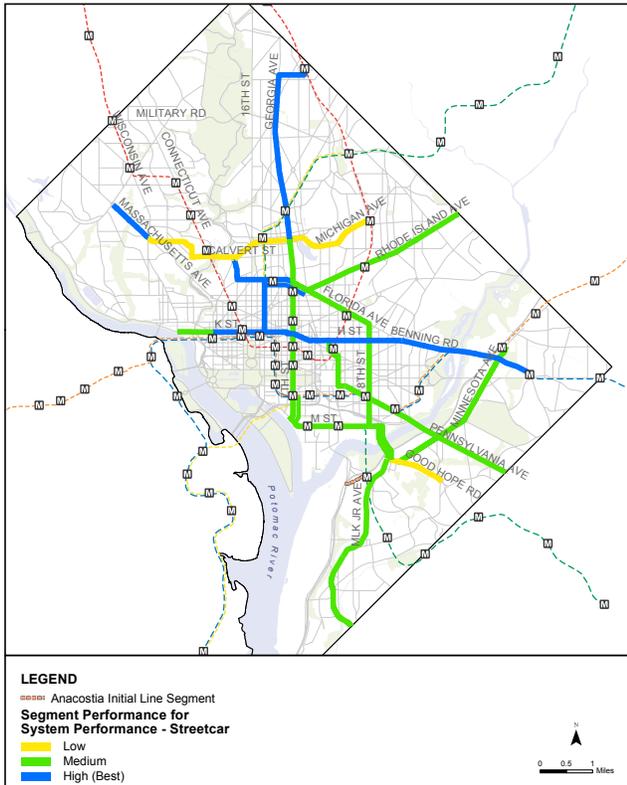
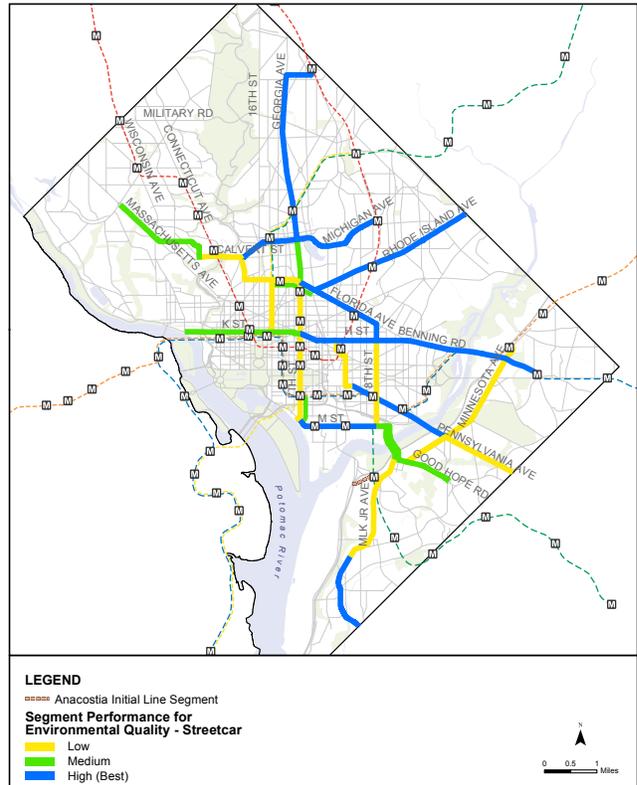


Figure B-9: Goal 4 - Environmental Quality Ratings - Streetcar



Best Performing Streetcar Segments

Upon completion of the screening process, specific segments were identified as suitable for specific levels of investment based on the screening results and agency and public participation. These high performing segments were identified as potential candidates for streetcar service, shown in Table B-11, given the goals and objectives established by the project participants. These segments represent the most attractive areas to expand streetcar services beyond the Anacostia Initial Line Segment service that is already under construction. Figure B-10 shows the projected ridership by segment for streetcar service.

In order to transform these high performing segments into the basis for a potential streetcar system, some additional short segments would be needed to connect these segments to each other, to logical terminal points, and to intermodal access points. The 11th Street Bridge connection across the Anacostia River provides a short connection between the Anacostia Initial Line Segment and the M Street SE segment. The creation of a unified streetcar system rather than unconnected corridors is highly desirable since it allows the flexibility of moving streetcar vehicles between all streetcar segments and provides access to a maintenance and storage facility (or facilities) from all streetcar segments.

Figure B-10: Streetcar Ridership Projections

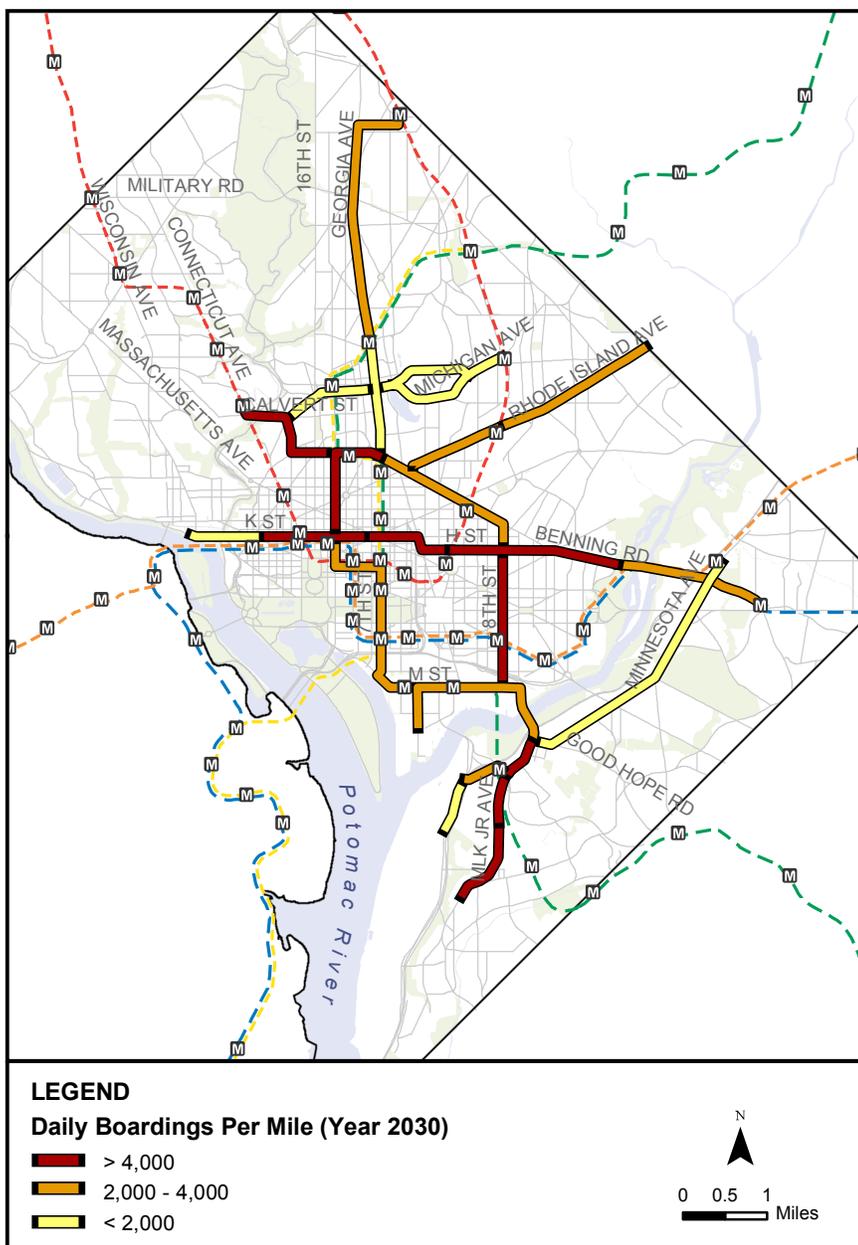


Table B-11: Best Performing Streetcar Segments

Segment	Key Strengths*
Upper K Street NW	Serves employment and population with over 111,000 jobs within walking distance and 11,000 population per mile
	Potential Increase in mode share of over 2.4%
	Projected ridership of over 15,000 daily boardings or nearly 10,000 per mile
	Cost-Effectiveness with annual operating cost/annual boarding of about \$1
Georgia Avenue	Projected ridership of 14,000 daily boardings or nearly 3,000 daily boardings per mile
	Increases corridor transit carrying capacity by up to 113%
	Located along a Great Street corridor serving strategic neighborhoods and planning initiatives
H Street NW/NE	Potential Increase in mode share of over 2.2%
	Ridership of over 13,000 daily boardings or over 6,500 per mile
	Located along a Great Street corridor serving strategic neighborhoods and planning initiatives
	Serves planned redevelopment sites and areas in the H Street Commercial District
	High levels of community support and interest
	Significant travel time savings and increase in carrying capacity by nearly 85%
	Cost-Effectiveness with annual operating cost/annual boarding of about \$1
Benning Rd NE	Projected ridership of 11,000 daily boardings or over 4,000 daily boardings per mile
	Located along a Great Street corridor serves planning initiatives
	Significant potential to support development/redevelopment
M Street SE	Potential Increase in mode share of over 2.8%
	Serves and emerging regional activity center and planning initiatives for Anacostia Waterfront
	Provides transit travel time savings of over 40%
	Cost-Effectiveness with annualized capital cost/annual new boarding of about \$4
14 th Street South NW	Potential Increase in mode share of over 2.2%
	Serves over 34,000 in population per mile
	Projected ridership of over 14,000 daily boardings
	Serves strategic neighborhoods and planning initiatives
	Cost-Effectiveness with annual operating cost/annual boarding of < \$1
	Increases corridor transit carrying capacity by up to 107%
U Street NW	Serves a growing population of over 12,000 within walking distance
	Projected ridership of nearly 5,000 per mile
	Serves strategic neighborhoods and planning initiatives
	Travel time savings of over 5 minutes to major destinations
Florida Ave NW/NE	Serves strategic neighborhoods and planning initiatives
	Reduction in transit travel time of over 40%
8 th Street NE/SE	Projected ridership of nearly 9,000 daily boardings or over 5,000 daily boardings per mile
Uptown	Serves over 10,000 in population per mile
	Located along a Great Street corridor serving strategic neighborhoods and planning initiatives
	Increases corridor transit carrying capacity by up to 113%
Martin Luther King, Jr. Ave SE	Projected ridership of over 15,000 daily boardings or over 7,000 daily boardings per mile
	Potential Increase in mode share of over 2.2%
	Serves an emerging regional activity center at future HSA Headquarters
	Located along a Great Street corridor serving strategic neighborhoods and planning initiatives
	Cost-Effectiveness with annual operating cost/annual boarding of < \$1 and annualized capital cost/annual new boarding of about \$5
Rhode Island Ave N/S	Located along a Great Street corridor serving strategic neighborhoods
	Cost-Effectiveness with annual operating cost/annual boarding of < \$1.50
	Capacity for development/redevelopment
Michigan Ave NE	Serves strategic neighborhoods and planning initiatives
	Serves planned redevelopment sites near Soldiers' and Airmen's Home and McMillan Reservoir

*Criteria where the segment performs best for Streetcar service

Appendix C: Ridership Forecasting Approach

The ridership forecasting effort was performed using the Metropolitan Washington Council of Governments/Transportation Planning Board (MWCOCG/TPB) Travel Forecasting Model Version 2.1D #50 and Round 7.2 Cooperative Land Use Forecasts. This model is an advanced four-step planning tool consisting of trip generation, trip distribution, mode choice, and traffic assignment procedures. At the end of the model application, total motorized person trips are apportioned among three different modes: auto driver, auto passenger and transit. Transit person trips, however, are not further divided among their different sub-modes (Bus, Metrorail, Commuter Rail, and other new fixed guideways). Consequently, it is not possible to forecast streetcar ridership by using the MWCOCG/TPB Model alone.

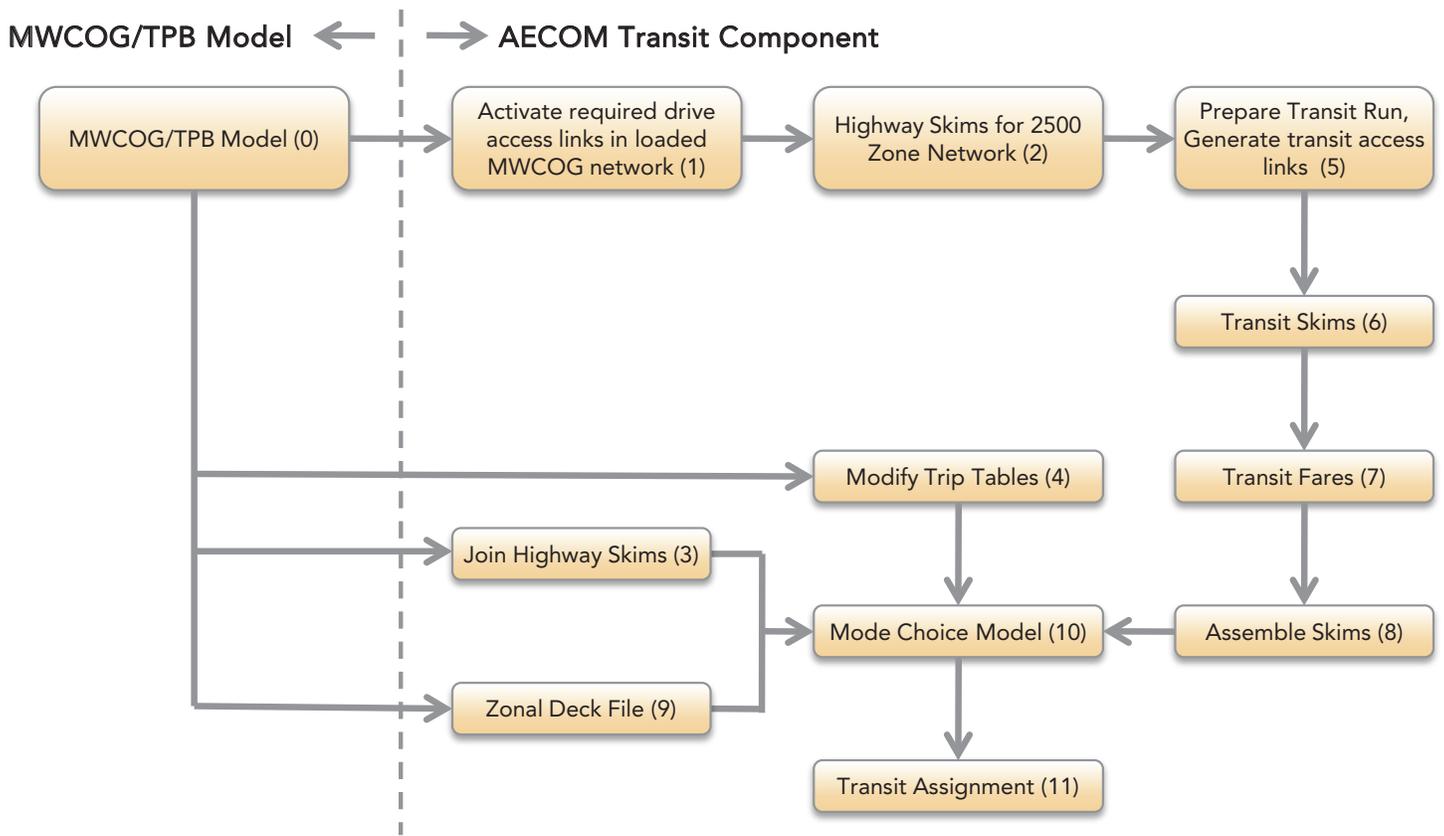
To that end, the Washington Regional Demand Forecasting Model, developed by AECOM as part of the District of Columbia Alternatives Analysis Study, was used to develop future-year ridership forecasts by transit sub-mode and access mode (walk, drive-and-park and kiss-and-ride). The starting point for this transit model was Round 50 of the 2.1D MWCOCG/TPB Model. This model retains the highway networks, trip generation, trip distribution, and highway assignment results from the MWCOCG/TPB Travel Forecasting Model. However, new transit paths by sub-mode are built and a more elaborate mode choice model – which apportion the total motorized person trips among the different auto and transit paths – is utilized. The mode choice model was calibrated using the 2000 Bus On-board Survey and 2002 Metrorail Survey.

The MWCOCG 2030 network was modified before it was used for the analysis. Particularly, the MWCOCG transportation analysis zone (TAZs) were split in many places along the build scenario alignments to allow for more thorough analysis and better understanding of the results. MWCOCG's highway network was then modified to add details along the split TAZs in order to provide proper access to transit stations. Detailed transit access coding was added around the rail stations to accurately represent various access modes – bus, park-and-ride, and kiss-and-ride. Transit line files were also “cleaned” and updated to reflect these highway modifications.

- **2030 Baseline Network** – According to the Federal Transit Administration New Starts project guidelines, the baseline network alternative serves as a starting point for developing project alternatives. For 2010 DC Streetcar System Plan analysis, the Baseline scenario consisted of the existing highway and transit networks, plus any committed service improvements except for major capital investments as defined in the 2004 regional Financially Constrained Long-Range Transportation Plan. Any transportation related improvements that were committed to be in place by year 2030, whether physical or operational, were assumed to be part of this baseline scenario. The MWCOCG/TPB model was run for the baseline scenario to produce base highway skims and person trip tables. The highway skims and person trip tables were fixed for the build alternative.
- **2030 Build Network** – For the 2010 DC Streetcar System Plan, the 2030 Build network consisted of approximately 37 miles of streetcar corridors in the District. The Streetcar System Plan is described in detail in Chapter 4 of this report. The background bus network was modified for the streetcar corridors to either remove duplicate and competitive bus service or to provide streamlined feeder bus service.

Figure C-1 graphically shows the structure of the transit component process.

Figure C-1: AECOM Transit Component Application Process



Note: The numbers in parenthesis are batch file step numbers

Appendix D: Estimation of Land Use-Driven Sources of Funding

Appendix D summarizes the methods by which the real estate tax base and parking space estimates used to calculate value capture and parking fee revenues were projected.

Residential and Commercial Development along Proposed Streetcar Transit Corridors in the District of Columbia

Projected residential and commercial development was analyzed along the proposed streetcar transit corridors in the District of Columbia. The methodology addressed three components of the projected development:

- **Baseline development value** – The value of the residential and commercial development projected to occur in the baseline scenario was estimated for each streetcar transit line. That value was used to determine the total revenue that could be generated from sources such as a benefit assessment tax.
- **Induced development value** – The value of the estimated increase in development that would be attributable to transit investment was estimated for each streetcar transit line. That value was used to determine the total revenue that could be generated from sources such as tax increment financing.
- **Numbers of parking spaces** – The number of parking spaces associated with development in the baseline scenario and with the increased development attributable to investment in streetcar transit is estimated. Those estimates were used to determine the revenue that would be generated from a parking tax.

It is important to note that the estimations listed above exclude low-density residential development. Because it is unlikely that any benefits assessment tax, tax increment financing, or parking tax would be applied to relatively low-density housing, it was decided to omit all low-density residential development from this analysis. Therefore, only residential development classified as medium- or high-density was considered when estimating development values and numbers of parking spaces. Low density residential development was defined as buildings with less

than 8 units. Medium density residential density includes buildings with 8-12 units on high density includes buildings with more than 12 units.

It is also important to note that all estimates reported in this memorandum include only the portions of each streetcar corridor (and associated buffer area) that are within the District of Columbia.

The analysis applied in this report is based on a prior analysis conducted for the October 2005 District of Columbia Transit Alternatives Analysis. This appendix first describes how the 2005 analysis was developed and what assumptions were made to apply the prior results to this study.

Proposed Streetcar Corridors

The streetcar element of the 2010 System Plan will be implemented in three phases. The phases and segments are mapped in Figure D-1. The premium transit alignments included in the 2005 DC Transit Alternatives Analysis study, which differ from the corridors included in this study, are summarized in Figure D-2.

Estimating the Value of Residential and Commercial Development in 2005 DC Transit Alternatives Analysis Baseline Scenario

In order to estimate the value of residential and commercial development in the baseline scenario, employment and household projections were obtained from the Metropolitan Washington Council of Governments (MWCOG).¹ Those forecasts were obtained for all transportation analysis zones (TAZs) along the premium transit alignments included in the October 2005 District of Columbia Transit Alternatives Analysis final report, which are summarized in Figure D-2. For each of these zones, data were obtained from 2000 to 2030 in five year increments and interim years were interpolated.

¹Data from MWCOG Round 6.3 Cooperative Forecasts were used in this analysis.

Figure D-1: DC Streetcar Corridors by Phase and Segment

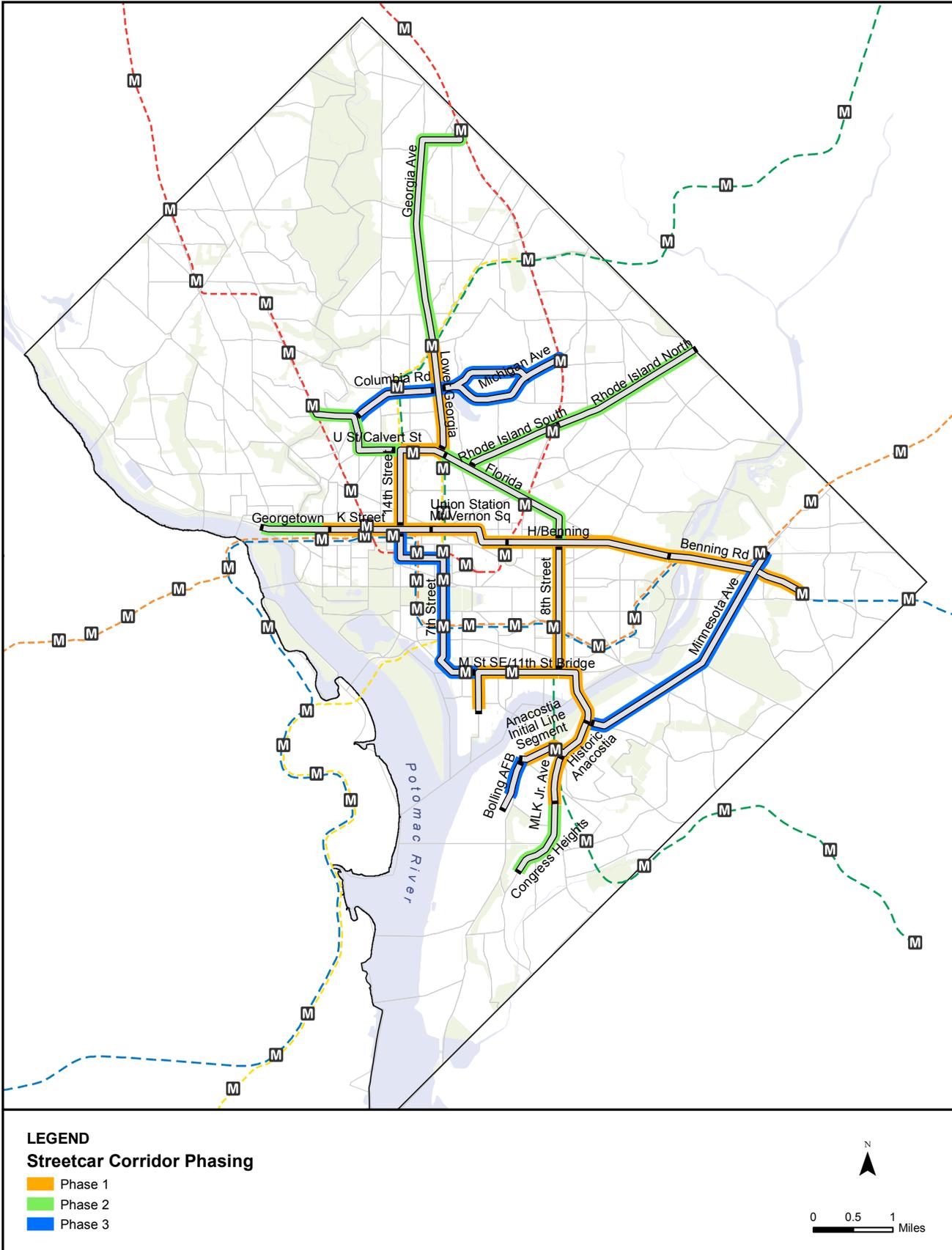
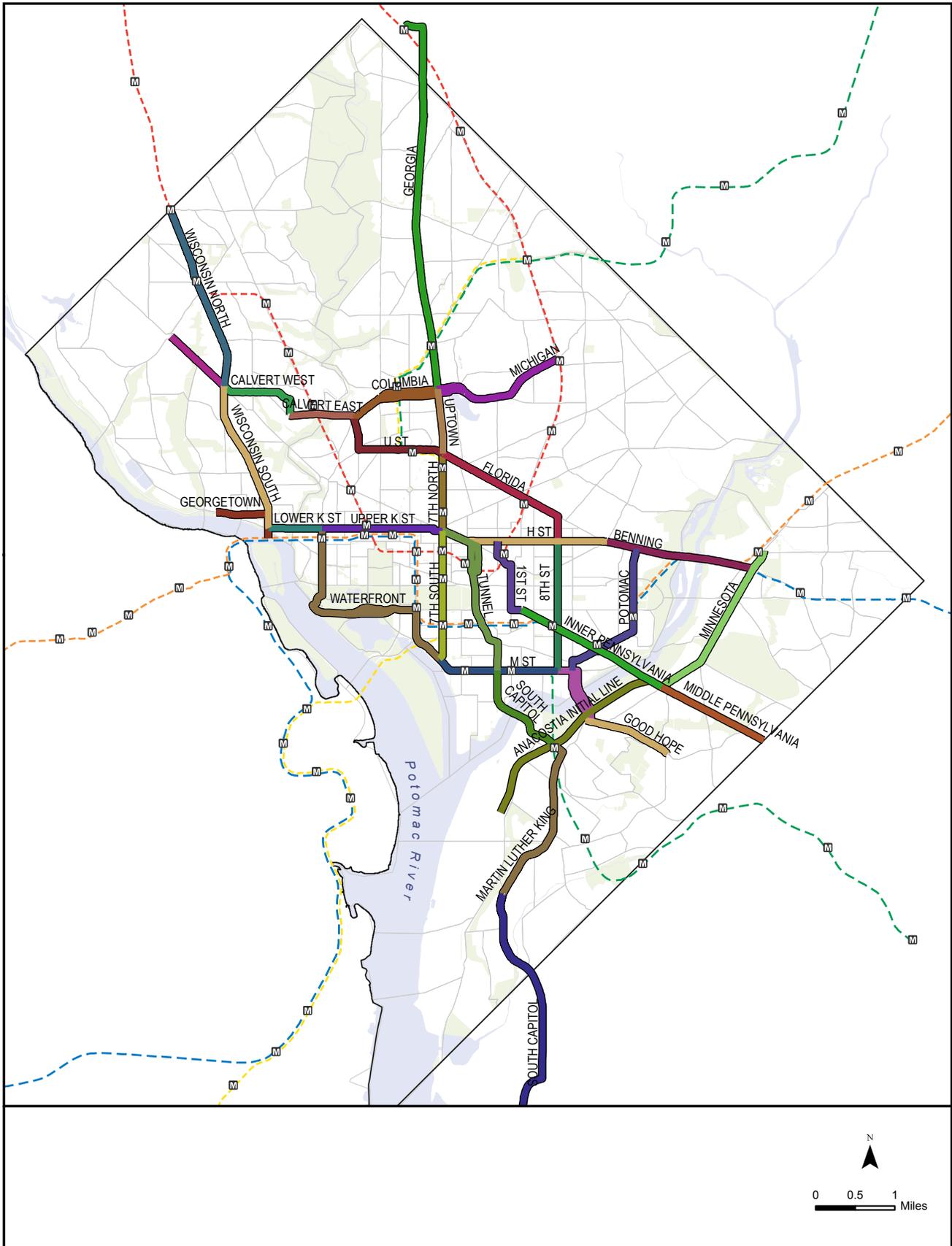


Figure D-2: 2005 DC Transit Alternatives Analysis Premium Transit Corridors by Segment



Because TAZs are irregularly shaped, TAZ-level data was adjusted to reflect households and employment that is within one quarter mile of a proposed streetcar line. That adjustment was conducted by calculating a unique factor for households and employment for each TAZ. For households, that factor was calculated by dividing the total area of land used for medium- and high-density housing within one quarter mile of a streetcar transit line by the total area of land used for residential purposes in the entire TAZ. For employment, that factor was calculated by dividing the total area of land used for commercial purposes within one quarter mile of a streetcar line by the total area of land used for commercial purposes in the entire TAZ².

After calculating factors for each TAZ for both residential and commercial development, housing units and employment for each TAZ from the MWCOG forecast were multiplied by those factors to arrive at an estimate of multi-unit households and employment in each TAZ that were within one quarter mile of a streetcar line. Residential and commercial development values were estimated based upon those adjusted household and employment figures.

To estimate the value of residential development, the number of households was multiplied by an assumed value per household. That value was calculated by determining the average housing unit value in the District of Columbia for each of the years between 2005 and 2030. The average housing unit value was estimated to be \$342,395 in 2005 and was assumed to increase at an inflation adjusted rate of 3.7 percent³. The average housing unit value for selected years is displayed in Table D-1.

Table D-1: Estimated Average Housing Unit and Commercial Development Value in the District of Columbia

Year	Average Housing Unit Value	Average Commercial Development Value Per Square Foot
2015	\$492,736	\$574.27
2025	\$591,095	\$688.08
2025	\$709,089	\$824.46
2030	\$850,637	\$987.86

Source: Delta Associates, Census Bureau, and AECOM

²Land use that was considered commercial in this analysis included the following classifications: low-, medium-, and high-density commercial, production and technical employment, institutional, federal, and local public facilities. Land use data were obtained from the DCDC Office of Planning.

³The average housing value in the District of Columbia, using Delta Associates sales data and Census Bureau housing stock distribution, was estimated to be \$342,395 in 2005. The compound annual growth rate in housing prices in the Washington, D.C. Metro Area was obtained by analyzing data from the Office of Federal Housing Enterprise Oversight. That rate, adjusted for inflation, was 3.7 percent for the 1975 to 2005 period.

⁴The area per employee for office, retail, and other employment was calculated by comparing the floor area of new development with employment growth that occurred in the Washington, DC region between 1990 and 2000. Those figures were obtained from MWCOG's Commercial Construction Indicators, 2003. Area per employee for industrial space was obtained from Metro-Seattle's 1999 Employment Density Study. Examples of other employment include workers in gymnasiums, churches, construction yards, and hospitals.

⁵The value of commercial development per square foot in 2005 was based on Delta Associates' recent transactions data. The inflation adjusted compound annual growth rate in Class A office building sales from 1997 to 2004 in the District of Columbia, which was 3.7%, was used as a proxy for appreciation rates of commercial property.

For commercial development, the employment projected to occur in the baseline scenario was first translated into floor area using the following assumptions regarding area per employee:

- Office employees: 300 square feet per employee
- Retail employees: 400 square feet per employee
- Industrial employees: 900 square feet per employee
- Other employees: 1,000 square feet per employee⁴

Then, the estimated commercial area was multiplied by development value per square foot to determine the total commercial development value in the baseline scenario. The commercial value per square foot was assumed to be \$400 in 2005 and was increased at a rate of 3.7 percent annually⁵. The average commercial development value per square foot for selected years is displayed in Table D-1.

Table D-2 illustrates the calculations used to determine the residential and commercial development by TAZ. The table uses TAZ 131 data from the Georgia Avenue segment as an example. TAZ 131 is located just west of the Petworth Metro Station.

The total value of residential and commercial development in the baseline scenario for each segment in the proposed 2005 transit network was calculated for each TAZ and aggregated by premium transit corridor. Table D-3 displays the estimated values for selected years.

Estimating the Value of Increased Development Attributable to Streetcar transit in the 2005 DC Transit Alternatives Analysis

For the 2005 study AECOM interviewed a number of real estate developers active in the District of Columbia. Recent projects by these developers included large-scale commercial development, mixed-use, and residential condominium and apartment complexes. Based on the interview findings, the study assumed that, in general,

residential and commercial development volumes would be 25 percent higher within one quarter mile of streetcar lines. However, the developers also indicated certain areas of the District that would not likely experience any increased development in response to investment in streetcar transit. Therefore, when calculating the value of increased development attributable to streetcar transit, the incremental increases in development volume of 25 percent for the streetcar alternative were only applied to selected TAZs.

Table D-2: An example of the Calculations to Determine Baseline Residential Development Value Using TAZ 131

Row Number	Household Calculations		Source/Formula
1	Total Households in 2015	1,702	MWCOG
Factor for Adjustment to 1/4 mile			
2	Total Residential Area within 1/4 Mile of Transit Line (Sq. Ft.)*	266,580	DC Office of Planning
3	Total Residential Area within Entire TAZ (Sq. Ft.)	3,022,014	DC Office of Planning
4	Household Factor	8.8%	Row 3 / Row 4
Adjusted Households			
5	Adjusted Households in 2015	150	Row 1 ¹ X Row 4
Housing Value			
6	Assumed Value per Unit	\$492,736	AECOM ²
Total Residential Development Value			
7	Total Residential Value in 2015	\$73,978,478	Row 5 ¹ X Row 6
Employment in 2015			
8	Industrial	140	MWCOG
9	Retail	187	MWCOG
10	Office	249	MWCOG
11	Other	239	MWCOG
12	Total	815	MWCOG
Factor for Adjustment to 1/4 mile			
13	Total Commercial Area within 1/4 Mile of Transit Line (Sq. Ft.)	1,438,172	DC Office of Planning
14	Total Commercial Area within Entire TAZ (Sq. Ft.)	1,488,430	DC Office of Planning
15	Employment Factor	96.6%	Row 13 / Row 14
Adjusted Employment in 2015			
16	Industrial	135	Row 8 ² X Row 15
17	Retail	181	Row 9 ² X Row 15
18	Office	241	Row 10 ² X Row 15
19	Other	231	Row 11 ² X Row 15
20	Total	788	Row 12 ² X Row 15
Assumed Area per Employee (Sq. Ft.)			
21	Industrial	900	AECOM ³
22	Retail	400	AECOM ⁴
23	Office	300	AECOM ⁴
24	Other	1,000	AECOM ⁴
Estimated Total Commercial Area (Sq. Ft.)			
25	Industrial	121,749	Row 16 ³ X Row 21
26	Retail	72,276	Row 17 ³ X Row 22
27	Office	72,180	Row 18 ³ X Row 23
28	Other	230,937	Row 19 ³ X Row 24
Assumed Commercial Value per Square Foot			
29	Commercial Value per Square foot in 2015	\$574.27	AECOM ⁵
Total Commercial Development Value			
30	Industrial	\$69,916,555	Row 25 ³ X Row 29
31	Retail	\$41,506,019	Row 26 ³ X Row 29
32	Office	\$41,450,529	Row 27 ³ X Row 29
33	Other	\$132,619,498	Row 28 ³ X Row 29
34	Total Commercial Development Value in 2015	\$285,492,602	Sum of Rows 30 to 34

Notes:

¹Area includes land use associated with high- and medium-density only.

²Sources also include Delta Associates and Census Bureau.

³Source also includes Metro-Seattle's 1999 Employment Density Study.

⁴Sources also include MWCOG's Commercial Construction Indicators, 2003.

⁵Sources also include MWCOG and Delta Associates.

Figure D-3 displays the areas that were considered eligible for increased development.

Using the information obtained from the survey, the total residential and commercial development attributable to investment in streetcar transit was calculated for each TAZ for the streetcar alternative. Those figures were calculated by first determining the residential and commercial development that was expected to occur from 2015 to 2030 in the baseline scenario and multiplying those figures by a 25 percent increment for streetcar alternatives in all TAZs considered eligible for increased development. That resulted in the total residential and commercial development that would be attributable to streetcar transit for the entire 2015 to 2030 period. Those figures were then multiplied by an assumed value to determine the total development value attributable to streetcar transit. Table D-4 displays the estimated cumulative value of residential and commercial development attributable to streetcar transit for the streetcar alternatives.

Estimating the Number of Parking Spaces in the Baseline Scenario and the Increase in Parking that is Attributable to Streetcar Transit in the 2005 DC Transit Alternatives Analysis

The baseline number of parking spaces was determined for both residential and commercial development, based on residential and commercial development volumes and District of Columbia municipal parking regulations. Table D-5 summarizes assumptions regarding the parking regulations that were applied in this analysis.

The total number of parking spaces associated with the residential and commercial development within one quarter mile of the streetcar lines was calculated by multiplying the assumed residential and commercial development in the baseline scenario by the appropriate parking assumptions reported in Table D-5. Those figures, which were calculated for each TAZ and aggregated by corridor, are displayed for selected years in Table D-6.

Calculating the increase in parking attributable to streetcar transit was similarly conducted by multiplying the assumed residential and commercial development attributable to streetcar transit by the parking assumptions displayed in Table D-5. Those figures were calculated for the streetcar alternative and are displayed in Table D-7.

Applying results of the 2005 DC Transit Alternatives Analysis

Some segments and corridors studied in the 2005 DC Transit Alternatives Analysis differ from the segments now proposed in the 2010 System Plan. In lieu of a new study of the projected residential and commercial development in the proposed streetcar corridors, the 2005 study findings were applied to the 2010 recommended network. Projected baseline and streetcar alternative real estate values and parking spaces were estimated for each segment of the proposed 2010 streetcar network by applying projected values for the equivalent 2005 segments, pro-rating to adjust for any changes in segment length. Segments that were not included in the 2005 study that have since been added to the proposed network applied the projected real estate values and parking spaces from a 2005 proxy segment deemed to be similar in nature and development

Table D-3: Residential and Commercial Development Value along Streetcar Corridors in the 2005 DC Transit Alternatives Analysis Baseline Scenario

Corridor	2015	2020	2025	2030
Baseline Residential Development Value				
Silver Spring to Skyland	\$7,252,236,663	\$8,791,804,072	\$10,658,804,987	\$12,786,506,698
Anacostia Streetcar Extension	\$179,791,467	\$219,765,015	\$268,714,682	\$322,355,281
American Univ. to L'Enfant Plaza	\$7,975,966,981	\$9,708,992,218	\$11,818,966,699	\$14,178,258,918
Georgetown to Minnesota Ave	\$5,701,431,294	\$6,917,722,817	\$8,395,215,822	\$10,071,061,763
Union Station to Forestville	\$125,049,779	\$152,482,586	\$185,884,669	\$222,990,811
Total*	\$12,717,419,261	\$16,162,939,973	\$19,649,984,938	\$23,635,281,952
Baseline Commercial Development Value				
Silver Spring to Skyland	\$49,806,036,051	\$63,553,297,770	\$81,525,748,659	\$97,683,638,798
Anacostia Streetcar Extension	\$1,609,726,859	\$1,977,549,707	\$2,369,487,610	\$2,839,105,137
American Univ. to L'Enfant Plaza	\$36,697,298,331	\$46,218,657,642	\$58,919,715,636	\$70,597,232,347
Georgetown to Minnesota Ave	\$74,453,909,487	\$92,365,825,220	\$113,694,939,259	\$136,228,560,455
Union Station to Forestville	\$9,054,867,690	\$11,321,207,911	\$13,895,689,020	\$16,649,727,103
Total*	\$128,967,161,292	\$161,123,996,379	\$200,471,457,804	\$241,983,629,978

* The total development value does not equal the sum of the values for the individual streetcar lines, because some development areas were included in more than one corridor where streetcar lines intersected. The total also assumes that the Georgetown to Minnesota Ave Metro Station line includes the Lower K Street alternative.

Source: MWCOG, Delta Associates, and AECOM.

Figure D-3: TAZs Expected to Experience Increased Development in the 2005 DC Transit Alternatives Analysis

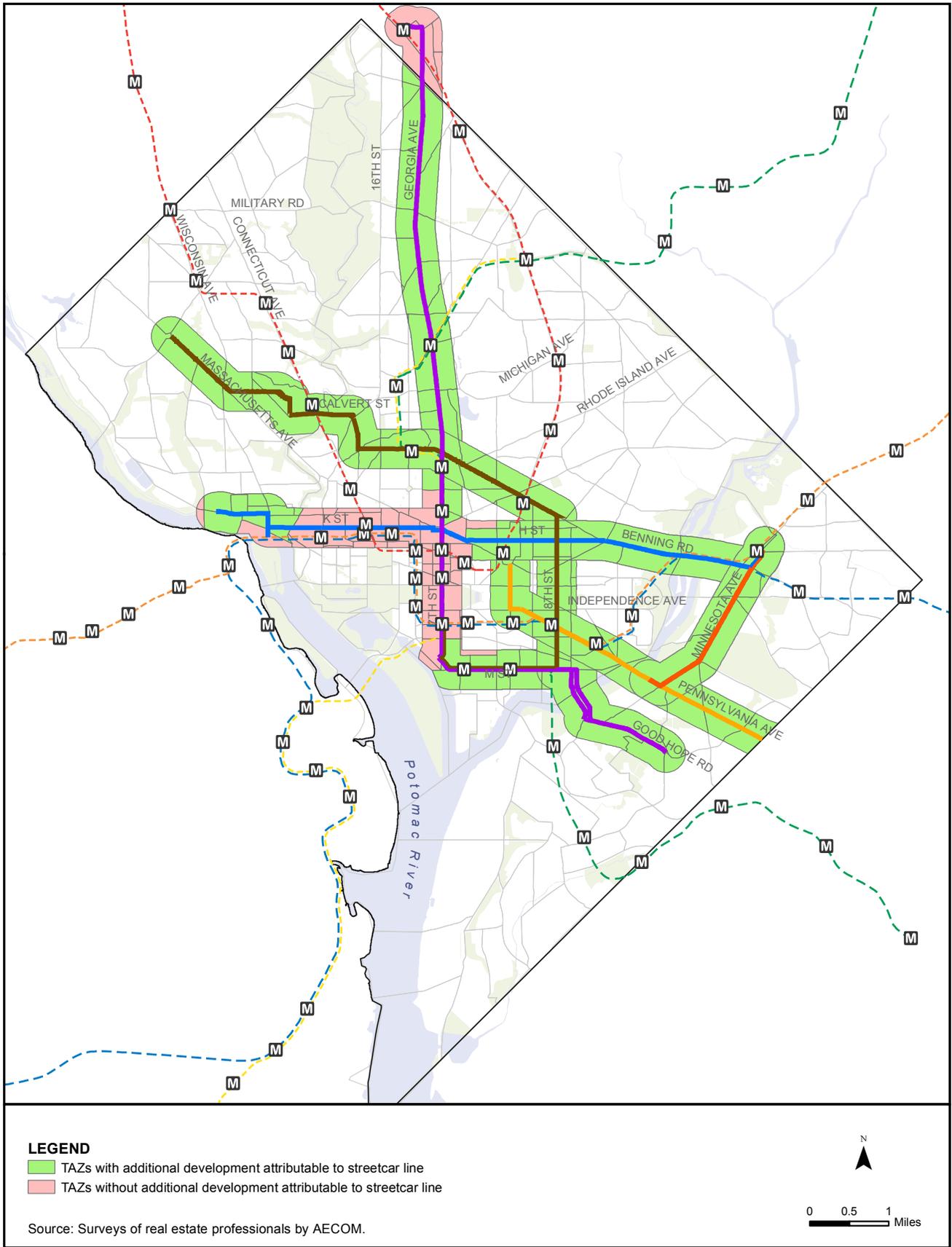


Table D-4: Cumulative Value of Development Attributable to Streetcar Investment in the 2005 DC Transit Alternatives Analysis Streetcar Alternative

	2015	2020	2025	2030
Value of Residential Development Attributable to Streetcar Transit				
Silver Spring to Skyland	\$76,360,153	\$110,490,485	\$155,510,082	\$186,552,874
Anacostia Streetcar Extension	\$753,759	\$1,888,661	\$3,490,363	\$4,187,106
American Univ. to L'Enfant Plaza	\$75,587,363	\$119,003,784	\$177,323,339	\$212,720,476
Georgetown to Minnesota Ave.	\$7,585,753	\$17,377,269	\$31,117,376	\$37,329,001
Union Station to Forestville	\$1,096,459	\$1,910,874	\$3,006,746	\$3,606,950
Total*	\$87,109,648	\$145,085,669	\$223,679,542	\$268,330,264
Value of Commercial Development Attributable to Streetcar Transit				
Silver Spring to Skyland	\$142,161,350	\$635,800,883	\$1,409,099,340	\$1,688,373,959
Anacostia Streetcar Extension	\$1,516,851	\$13,580,586	\$16,272,173	\$19,497,215
American Univ. to L'Enfant Plaza	\$140,640,431	\$710,598,747	\$1,705,197,986	\$2,043,157,492
Georgetown to Minnesota Ave.	\$69,640,343	\$470,072,339	\$802,495,721	\$961,545,321
Union Station to Forestville	\$13,220,736	\$133,338,917	\$244,080,033	\$292,455,159
Total*	\$245,087,720	\$1,435,729,714	\$2,975,250,246	\$3,564,926,114

* The total development value does not equal the sum of the values for the individual streetcar lines, because some development areas were included in more than one corridor where streetcar lines intersected. The total also assumes that the Georgetown to Minnesota Ave Metro Station line includes the Lower K Street alternative.
Source: MWCOG, Delta Associates, and AECOM.

Table D-5: Summary of Parking Assumptions Applied in Analysis

Development Type	Proxy Category in Parking Regulations	Assumed Parking Provision	Note
Residential	Average of 4 residential categories	1 space per 2.5 units	Required provision ranges from 1 space per unit to one space per 4 units. Analysis assumes 1 space per 2.5 units.
Industrial	Manufacturing, Industrial, and Wholesale	1 space per 1,000 sf.	Extracted directly from municipal parking regulations.
Retail	Retail or Service Except Gas	1 space per 750 sf.	Analysis assumes area was in C-1, C-2-A, C-3-A, C-M-1, or M district.
Office	General Office	1 space per 650 sf.	Analysis assumes area was in C-1, C-2-A, or C-3-A district.
Other	Warehouse	1 space per 3,000 sf.	Because "Other employment" includes a wide variety of employment, an appropriate proxy was unavailable. Warehouse regulations were selected as a conservative estimate.

Source: DC Office of Documents and Administrative Issuances and AECOM.

Table D-6: Residential and Commercial Parking Spaces along Streetcar transit Corridors in the 2005 DC Transit Alternatives Analysis Baseline Scenario

	2015	2020	2025	2030
Baseline Residential Parking Spaces				
Silver Spring to Skyland	5,887	5,949	6,013	6,013
Anacostia Streetcar Extension	146	149	152	152
American Univ. to L'Enfant Plaza	6,475	6,570	6,667	6,667
Georgetown to Minnesota Ave.	4,628	4,681	4,736	4,736
Union Station to Forestville	102	103	105	105
Total*	11,003	11,149	11,298	11,298
Baseline Commercial Parking Spaces				
Silver Spring to Skyland	88,853	94,927	102,096	102,096
Anacostia Streetcar Extension	1,774	1,807	1,807	1,807
American Univ. to L'Enfant Plaza	58,089	60,999	65,175	65,175
Georgetown to Minnesota Ave.	133,474	138,062	142,154	142,154
Union Station to Forestville	13,405	13,958	14,380	14,380
Total*	227,319	236,328	246,076	246,076

* The total development value does not equal the sum of the values for the individual streetcar lines, because some development areas were included in more than one corridor where streetcar lines intersected. The total also assumes that the Georgetown to Minnesota Ave Metro Station line includes the Lower K Street alternative.

Source: MWCOG, DC Office of Documents and Administrative Issuances, and AECOM.

potential to the additional corridor. For example, Rhode Island Avenue has been added to the proposed streetcar network since the 2005 study; the projected values from the 2005 Georgia segment were applied as a proxy.

Projected real estate values have not been adjusted from the 2005 study. As noted in Section 3 above, that study assumed that real estate would grow at an inflation adjusted rate of 3.7 percent, consistent with DC historical experience from 1975 to 2005. Despite the recent economic downturn, DC real estate values since 2005 have grown at an inflation adjusted average annual rate of 8.5 percent⁶,

which is greater than the 3.7 percent assumed in the previous study. However, as a conservative measure, the historical annual average growth rate of 3.7 percent is maintained from 2005 onward.

The total projected baseline and streetcar-induced commercial and residential real estate values and parking spaces applied in the updated analysis are summarized below.

These projections are multiplied by the real estate tax rates and parking fees summarized in the project finance chapter to calculate value capture and parking fee revenue.

Table D-7: Cumulative Increase in Parking Spaces Attributable to Streetcar Investment in the 2005 DC Transit Alternatives Analysis Streetcar Alternative

	2015	2020	2025	2030
Residential Parking Spaces Attributable to Streetcar Transit				
Silver Spring to Skyland	66	398	731	1,063
Anacostia Streetcar Extension	2	10	17	25
American Univ. to L'Enfant Plaza	71	429	786	1,143
Georgetown to Minnesota Ave.	51	309	566	824
Union Station to Forestville	1	7	12	18
Total*	78	470	862	1,254
Commercial Parking Spaces Attributable to Streetcar Transit				
Silver Spring to Skyland	349	2,096	3,842	5,589
Anacostia Streetcar Extension	3	20	37	54
American Univ. to L'Enfant Plaza	211	1,263	2,316	3,368
Georgetown to Minnesota Ave.	320	1,919	3,518	5,117
Union Station to Forestville	33	197	362	526
Total*	395	2,369	4,344	6,318

*The total development value does not equal the sum of the values for the individual streetcar lines, because some development areas were included in more than one corridor where streetcar lines intersected. The total also assumes that the Georgetown to Minnesota Ave Metro Station line includes the Lower K Street alternative.

Source: MWCOG, DC Office of Documents and Administrative Issuances, and AECOM.

Table D-8: Projected Real Estate Values and Parking Space Provision Applied in 2010 Analysis

	2015	2020	2025	2030
Real Estate Values (Millions of Dollars)				
Baseline Residential	\$19,665	\$23,677	\$29,008	\$35,849
Residential Attributable to Streetcar	\$0	\$60	\$72	\$89
Total Residential	\$19,665	\$23,737	\$29,080	\$35,938
Baseline Commercial	\$177,532	\$210,995	\$252,079	\$290,933
Commercial Attributable to Streetcar	\$0	\$205	\$232	\$266
Total Commercial	\$177,532	\$211,200	\$252,311	\$291,199
Total	\$197,197	\$234,937	\$281,392	\$327,136
Parking Space Provision (Number of Spaces)				
Baseline Residential	14,900	15,047	15,196	15,196
Residential Attributable to Streetcar	0	29	35	40
Total Residential	14,900	15,076	15,231	15,236
Baseline Commercial	314,480	325,680	338,222	338,222
Commercial Attributable to Streetcar	0	241	253	260
Total Commercial	314,480	325,921	338,475	338,482
Total	329,380	340,997	353,706	353,718

⁶ District of Columbia Office of Tax and Revenue, Real Property Tax Assessments, 2005 to 2010, adjusted for inflation by the U.S. Bureau of Labor Statistics Washington-Baltimore region 2005 to 2010 Consumer Price Index for All Urban Consumers.

Appendix E: Detailed Pay-as-you-go Financing Capital Cash Flow

Appendix E presents a detailed capital uses and sources of funds cash flow for Pay-as-you-go Financing presented in Section 4.5 of this report.

Table E-1 includes capital uses and sources funds for the H/Benning Streetcar project in FY10, and for the remainder of the program for FY11 onward. This cash flow includes specific detail on local capital funding sources, including a contribution from WMATA recapitalization in FY11 and FY12 and mixed local funding sources. Federal capital funds are described by funding program, including the Urban Circulator grant program, Small Starts, and American Recovery and Reinvestment Act (ARRA) programs, as well as by which project segment each federal grant program would support in each year. Uses of funds summarize the cost by project segment by year.

This analysis assumes that federal funding participation under the FTA Small Starts Program is pursued for the following four streetcar corridor projects.

- Washington Circle to Union Station (K Street and H Street) Corridor
- Washington Circle to Takoma Park (14th Street and Georgia Avenue) Corridor
- Congress Heights to Woodley Park (Martin Luther King Ave, 8th Street NE, Florida Avenue) Corridor
- Downtown to Buzzards Point (7th St SW) Corridor

The identification of these corridors considered the criteria used by FTA to evaluate projects seeking Small Starts funding. This includes identifying corridors that have the greatest potential for:

- Travel time savings for passengers
- Maximizing ridership
- Cost-effectiveness
- Promoting economic development
- Supporting transit friendly development patterns

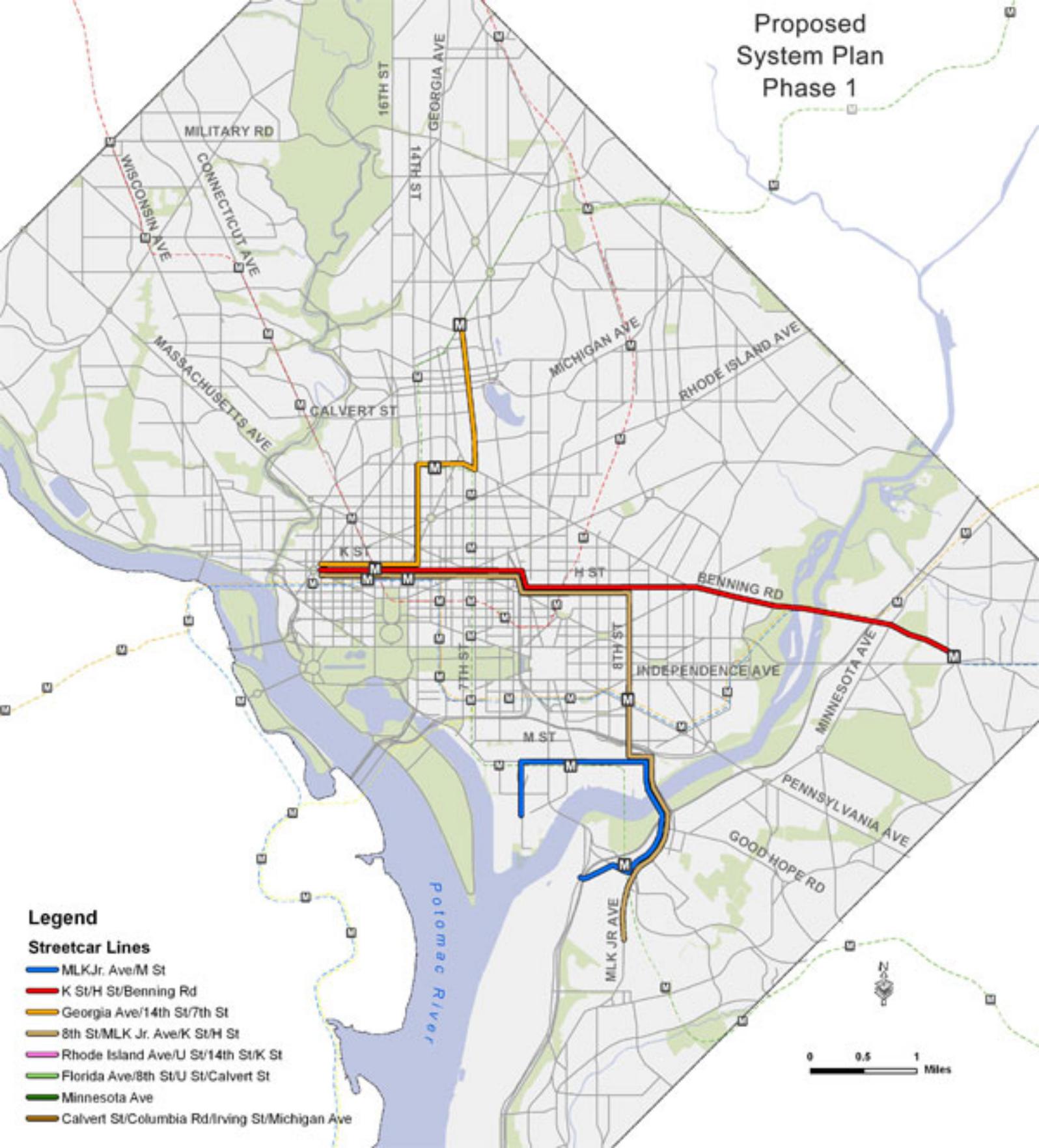
The potential sequencing of these projects was also considered so that the federally funded projects were spread evenly over each phase rather than focused on a single phase of system development.

Table E-1: Pay-as-you-go Financing Capital Cash Flow

	Phase 1						Phase 2			Phase 3		TOTAL
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Use of Funds												
H/Benning	\$63.0	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$63.0
Benning/OK to Benning Metro	\$-	\$39.0	\$39.1	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$78.1
Union Station to Washington Circle	\$-	\$-	\$-	\$56.5	\$52.2	\$-	\$-	\$-	\$-	\$-	\$-	\$108.7
Anacostia to Buzzards Point	\$-	\$40.6	\$81.1	\$7.6	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$129.3
14th St. to GA Petworth	\$-	\$-	\$-	\$17.6	\$2.8	\$65.7	\$-	\$-	\$-	\$-	\$-	\$151.6
St. E's/8th St/Washington Circle	\$-	\$-	\$-	\$53.3	\$44.2	\$34.4	\$-	\$-	\$-	\$-	\$-	\$131.9
RI Ave	\$-	\$-	\$-	\$-	\$-	\$43.2	\$66.6	\$81.1	\$-	\$-	\$-	\$190.9
Upper GA	\$-	\$-	\$-	\$-	\$-	\$-	\$92.1	\$86.0	\$-	\$-	\$-	\$178.1
Washington Circle to Georgetown	\$-	\$-	\$-	\$-	\$-	\$-	\$18.6	\$22.6	\$-	\$-	\$-	\$41.2
MLK/AB to Woodley	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$25.7	\$133.2	\$43.7	\$-	\$202.6
Anacostia to Minnesota	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$43.4	\$95.3	\$59.0	\$197.7
Crosstown	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$45.3	\$95.3	\$100.2	\$240.8
Mall	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$61.3	\$159.1	\$220.4
TOTAL USES	\$63.0	\$79.6	\$120.2	\$135.1	\$139.1	\$143.3	\$202.9	\$215.4	\$221.8	\$295.7	\$318.4	\$1,934.4
Sources of Funds												
Local												
WMATA Recapitalization												
WMATA FY11 Contribution	\$-	\$59.7	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$59.7
WMATA FY12 Contribution	\$-	\$-	\$25.6	\$14.4	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$40.0
Subtotal	\$-	\$59.7	\$25.6	\$14.4	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$99.70
Mixed Sources												
DDOT Funds	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Reprogramming WMATA Dedicated	\$28.6	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$28.6
DDOT Great Streets	\$20.0	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$20.0
Capital Funding (FY10/FY11)	\$10.0	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$10.0
6-Year Capital Program	\$-	\$-	\$-	\$14.9	\$30.4	\$31.4	\$46.3	\$49.4	\$51.0	\$69.5	\$75.2	\$368.1
Subtotal	\$58.6	\$-	\$-	\$14.9	\$30.4	\$31.4	\$46.3	\$49.4	\$51.0	\$69.5	\$75.2	\$426.7
WMATA Capital												
WMATA Closeout	\$4.4	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$4.4
Subtotal	\$4.4	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$4.4
Federal												
Urban Circulator	\$-	\$19.9	\$5.1	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$25.0
Small Starts (US to WC)	\$-	\$-	\$-	\$33.8	\$20.6	\$-	\$-	\$-	\$-	\$-	\$-	\$54.4
Small Starts (14th St. to GA Petworth)	\$-	\$-	\$-	\$-	\$14.2	\$35.8	\$25.6	\$-	\$-	\$-	\$-	\$75.6
Small Starts (Upper GA)	\$-	\$-	\$-	\$-	\$-	\$-	\$25.1	\$32.0	\$32.0	\$-	\$-	\$89.1
Small Starts (MLK/AB to Woodley)	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$21.8	\$23.5	\$56.0	\$-	\$101.3
Small Starts (Mall)	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$17.9	\$79.6	\$97.5
ARRA II	\$-	\$-	\$24.9	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$24.9
Subtotal	\$-	\$19.9	\$30.0	\$33.8	\$34.8	\$35.8	\$50.7	\$53.8	\$55.5	\$73.9	\$79.6	\$467.8
Private												
Value Capture	\$-	\$-	\$72.0	\$73.4	\$108.2	\$110.2	\$112.1	\$114.0	\$115.9	\$118.0	\$120.1	\$943.8
Subtotal	\$-	\$-	\$72.0	\$73.4	\$108.2	\$110.2	\$112.1	\$114.0	\$115.9	\$118.0	\$120.1	\$943.8
TOTAL SOURCES	\$63.0	\$79.6	\$127.6	\$136.5	\$173.4	\$177.4	\$209.1	\$217.2	\$222.4	\$261.4	\$274.9	\$1,942.4
DIFFERENCE BETWEEN USES AND SOURCES	\$-	\$-	\$7.42	\$1.42	\$34.30	\$34.12	\$6.13	\$1.85	\$0.58	\$(34.30)	\$(43.49)	\$8.0

Notes: WMATA Recapitalization: Assumes recapitalization prior to 1/1/2011 WMATA debt service payment. 30-year term at 6.5% and reprogramming of WMATA contribution to streetcar. Totals show a surplus of funds for 2010-2018 which are used to cover costs for year 2019 and 2020.

Proposed System Plan Phase 1



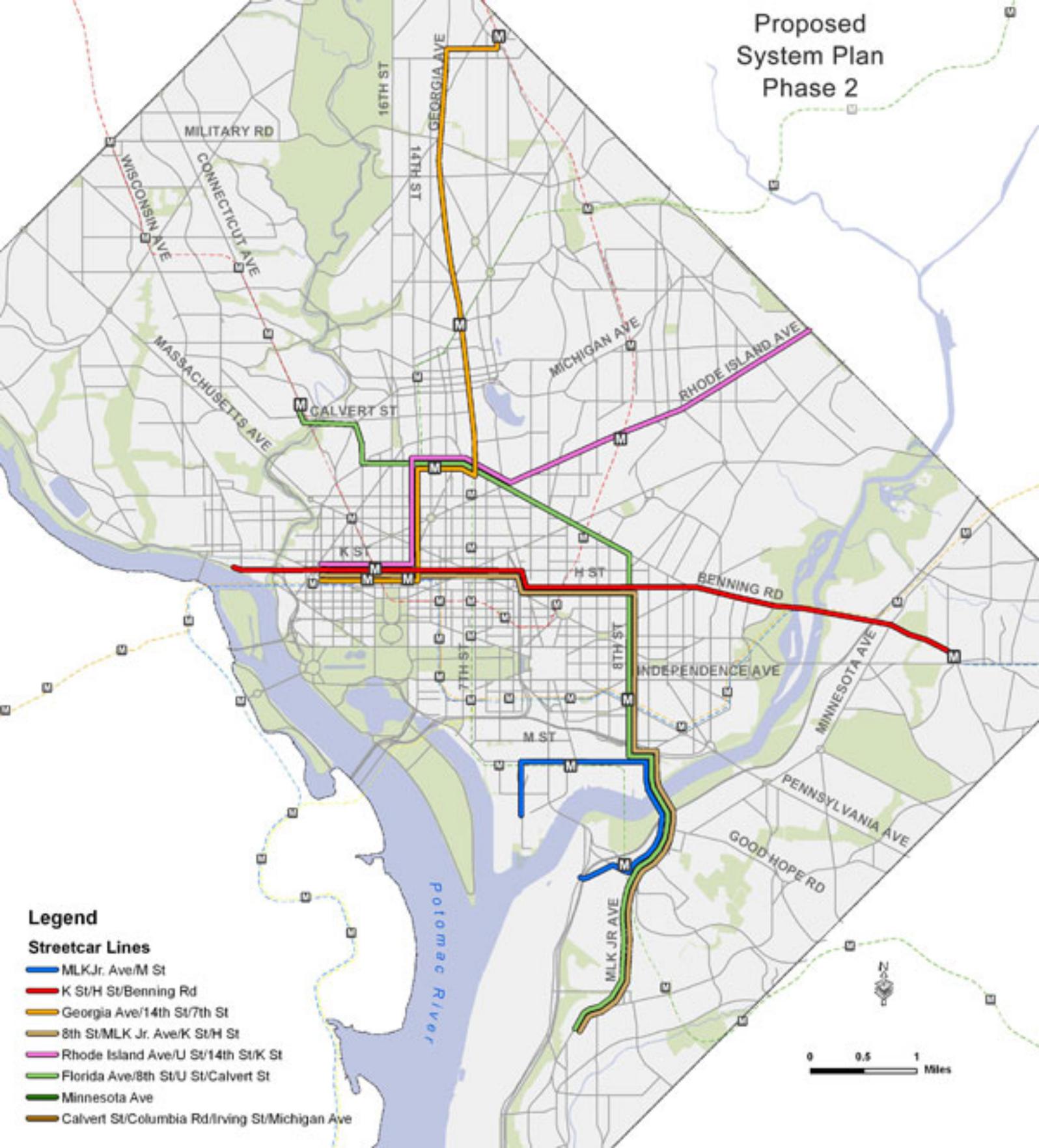
Legend

Streetcar Lines

- MLK Jr. Ave/M St
- K St/H St/Benning Rd
- Georgia Ave/14th St/7th St
- 8th St/MLK Jr. Ave/K St/H St
- Rhode Island Ave/U St/14th St/K St
- Florida Ave/8th St/U St/Calvert St
- Minnesota Ave
- Calvert St/Columbia Rd/Irving St/Michigan Ave



Proposed System Plan Phase 2



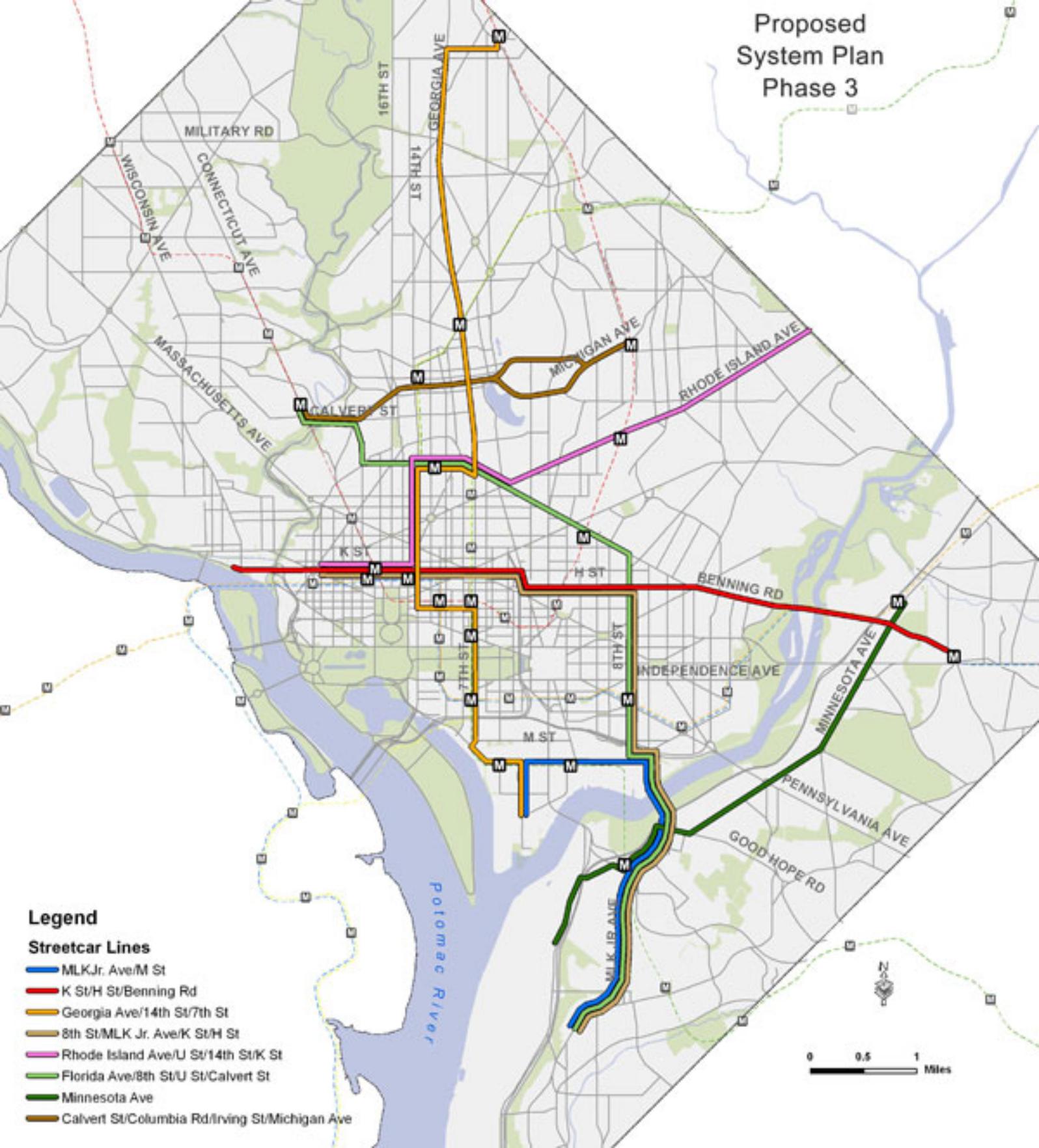
Legend

Streetcar Lines

- MLK Jr. Ave/M St
- K St/H St/Benning Rd
- Georgia Ave/14th St/7th St
- 8th St/MLK Jr. Ave/K St/H St
- Rhode Island Ave/U St/14th St/K St
- Florida Ave/8th St/U St/Calvert St
- Minnesota Ave
- Calvert St/Columbia Rd/Irving St/Michigan Ave



Proposed System Plan Phase 3



Legend

Streetcar Lines

- MLK Jr. Ave/M St
- K St/H St/Benning Rd
- Georgia Ave/14th St/7th St
- 8th St/MLK Jr. Ave/K St/H St
- Rhode Island Ave/U St/14th St/K St
- Florida Ave/8th St/U St/Calvert St
- Minnesota Ave
- Calvert St/Columbia Rd/Irving St/Michigan Ave

