



CONNECT GREATER WASHINGTON

The Region's Transit System Plan



DRAFT REPORT

OCTOBER 2014

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TABLE OF CONTENTS

1.0 BACKGROUND AND METHODOLOGY.....	1
Purpose of the Plan—Addressing Critical Future Transit Needs to Create a Livable, Prosperous, Accessible Region	1
Supporting Other Major Regional Initiatives.....	2
Other Local and Regional Planning Context	5
Development of <i>ConnectGreaterWashington</i>	11
Stakeholder Engagement	15
2.0 REGIONAL TRENDS AND 2040 FORECASTS	21
Recent Trends	21
2040 Forecasts and Projections	22
Increased Demand for Transit	25
Paratransit Trends and Forecast.....	32
3.0 CHALLENGES AND OPPORTUNITIES FOR TRANSIT	35
Key Goals	35
Supporting Broader Regional Goals.....	35
Opportunities for the Region's Transit System	38
4.0 HIGH-CAPACITY TRANSIT.....	43
What is High-Capacity Transit?	43
Developing a High-Capacity Transit System for 2040 and Beyond	47
5.0 THE PLAN	53
Improved Access to Leverage Transit Investments	56
A Network Of Regionally Significant High-Capacity Surface Transit Corridors.....	58
Increased Service For Commuter Rail And Commuter Bus.....	62
New Metrorail Lines for the Region's Core.....	64
Overall 2040 Recommended Network Performance.....	68
6.0 COSTS AND BENEFITS.....	73
Costs of the System Plan	73
Regional Benefits of the 2040 Planned Network	74
7.0 MOVING FORWARD.....	79
Regional Paratransit Coordination.....	79



LIST OF FIGURES

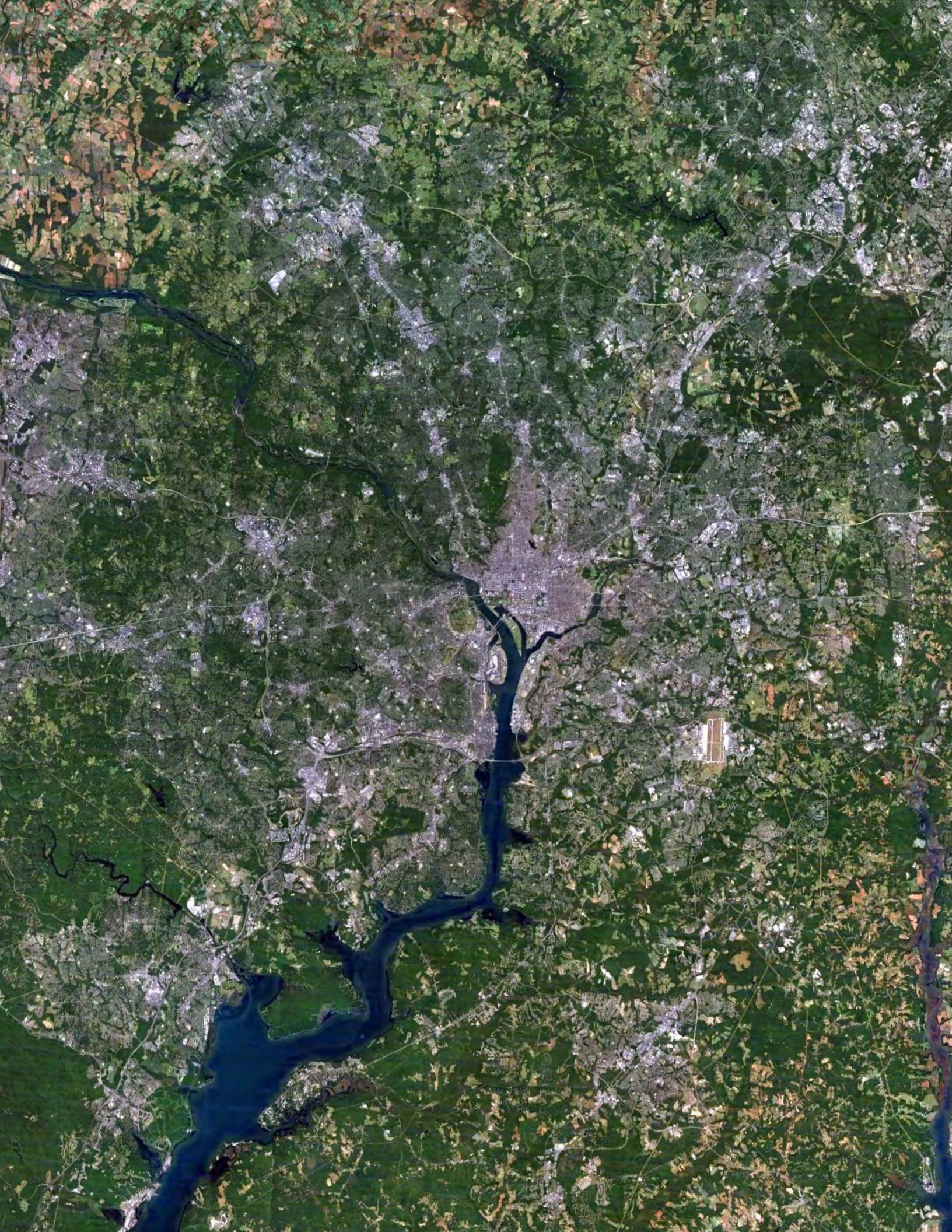
FIGURE 1-1	MWCOG 2013 Regional Activity Centers and 2040 CLRP Transit Projects.....	3
FIGURE 1-2	Metro's Concurrent Long-Range Planning Initiatives.....	4
FIGURE 1-3	<i>ConnectGreaterWashington</i> Study Area.....	10
FIGURE 1-4	Planning Process.....	11
FIGURE 1-5	Transit Improvements and 2040 Baseline Network.....	13
FIGURE 1-6	<i>Momentum</i> Public Engagement Website.....	16
FIGURE 1-7	Public Outreach Online Poll Results	16
FIGURE 1-8	Future Transit Investment Scenarios for Participant Feedback at Deliberative Forums.....	17
FIGURE 2-1	Total Population and Employment,	22
FIGURE 2-2	Washington DC MSA and	22
FIGURE 2-3	WMATA Compact Area, 2004 - 2012	22
FIGURE 2-4	Total Regional Population and Employment and Percent Change, 2010 - 2040	23
FIGURE 2-5	Total Population and Employment by MWCOG Jurisdiction, 2010 - 2040	23
FIGURE 2-6	Total Population and Employment Change by Jurisdiction, 2010 - 2040.....	24
FIGURE 2-7	2040 Regional Forecasts - Overall Travel Demand	25
FIGURE 2-8	2040 Regional Forecasts - Transit Demand.....	27
FIGURE 2-9	Peak Period Passenger Hours on Crowded Rail and Bus Vehicles, 2007 - 2040.....	28
FIGURE 2-10	2010 Metrorail Passenger Loads.....	29
FIGURE 2-11	2040 Baseline Metrorail Passenger Loads.....	29
FIGURE 2-12	2040 Baseline Metrorail Passenger Loads -.....	30
FIGURE 2-13	Aspirations Land Use Scenario	30
FIGURE 2-14	2040 Regional Forecasts - High-Quality Transit Accessibility	31
FIGURE 2-15	Paratransit Demand and Service Trends	32
FIGURE 3-1	2040 Baseline Transit Network and Regional Activity Centers	38
FIGURE 3-2	Core Capacity Deficiencies	38
FIGURE 3-3	Transit Projects and Strategies Evaluated	47
FIGURE 5-1	2040 Recommended High-Capacity Transit Network	54
FIGURE 5-2	Improving Station Walkability - Tysons Corner Example.....	56
FIGURE 5-3	2040 Tier 2 New High-Capacity Transit Corridors.....	59
FIGURE 5-4	Connections among Regional Activity Centers.....	60
FIGURE 5-5	Recommended Commuter Rail Enhancements.....	62
FIGURE 5-6	New Core Metrorail Loop and Orange/Silver Express Line	65
FIGURE 5-7	2040 Baseline Metrorail Passenger Loads	66
FIGURE 5-8	2040 CGW Metrorail Passenger Loads	66
FIGURE 5-9	Central Jurisdiction Circulation.....	67



FIGURE 5-10	2040 Overall Travel Demand	68
FIGURE 5-11	2040 Transit Demand.....	69
FIGURE 5-12	Daily Transit Trips to/from RACs and High-Frequency/Higher-Speed Transit Proximity	70
FIGURE 5-13	Daily Person Hours of Transit Travel on Congested Vehicles	71
FIGURE 5-14	Metrorail Transfer Capacity - Average Weekday Metrorail Transfers at Core Stations	71
FIGURE 6-1	2040 CGW Network Benefit-Cost Analysis	75

LIST OF TABLES

TABLE 1-1	Major Regional Plans	7
TABLE 1-2	Local Transit and Multimodal Plans	8
TABLE 1-3	Technical Advisory Group Members.....	15
TABLE 3-1	Goals, Objectives, and Measures of Effectiveness	36
TABLE 4-1	Types of High-Capacity Transit	44
TABLE 4-2	High-Capacity Transit Station/Stop Amenities	46
TABLE 4-3	Projects by Tier to be Included in the 2040 Network	50
TABLE 5-1	2040 Tier 2 New High-Capacity Transit Corridors	58
TABLE 5-2	Recommended Commuter Rail Enhancements.....	62
TABLE 5-3	Commuter Bus Peak Period Service Enhancements.....	63
TABLE 5-4	Improvements to Metrorail Line Capacity in Key Corridors.....	67
TABLE 6-1	2040 CGW Network Order-of-Magnitude Capital Costs.....	73
TABLE 6-2	2040 CGW Network Annual Operating Costs (Additional above Baseline)	74



1.0 BACKGROUND AND METHODOLOGY

Transit to Support the Region's Long-Range Goals



ConnectGreaterWashington: the Region's Transit System Plan ("the plan") identifies the future high-capacity transit service network that will be needed to support continued growth in population, employment, and economic activity across the Washington, DC Metropolitan Area through 2040.

is forecast to continue its recent growth in population and employment, adding 1.0 million residents and 1.1 million workers by 2040. The broader Washington metropolitan region is expected to add 2.0 million residents and 1.6 million workers during the same time period. This growth, combined with changes in travel patterns and the general trend of increased demand for transit, presents new challenges for the region.

To anticipate the resulting mobility and accessibility needs, Metro, in coordination with its jurisdictional partners, developed *ConnectGreaterWashington: the Region's Transit System Plan* ("the plan"), which sets forth a regional transit network for 2040 and addresses the following goals:



Enhance environmental quality, improve energy efficiency, and protect human health and safety



Facilitate transit-oriented, mixed-use communities that capture employment and household growth, providing choices in where to live, work, and play



Maximize availability of and convenient access to integrated transit choices

Purpose of the Plan—Addressing Critical Future Transit Needs to Create a Livable, Prosperous, Accessible Region

As called for in Article VI of WMATA's compact agreement, Metro is responsible for planning to address long-range transit needs throughout its service area, in coordination with local member jurisdictions and their comprehensive plans. Over the next several decades, the WMATA Compact Area, the geographic area of Metro's member jurisdictions,



Provide a high-quality transit system that accommodates and encourages future ridership and growth



Provide a financially viable and sustainable transit system that is efficient and effective for the region

Addressing these broad regional goals presents Metro with opportunities to enhance the region's transit system. The plan achieves the following:

- **Reduces congestion in the core of the region's transit system** — Without significant improvements to the region's transit capacity in downtown DC and Arlington, the total hours spent on crowded transit vehicles will more than triple by 2040.
- **Improves connections among suburban activity centers** — The region's high-capacity transit largely serves travel to downtown DC in the peak direction. However, 80 percent of future job growth is projected to occur in the suburbs, mostly in the Regional Activity Centers identified by the Metropolitan Washington Council of Governments (MWCOC). Serving these new and expanding employment centers outside of the region's core will require new and improved transit connections.
- **Creates cross-jurisdictional links in the region's transit network** — The region continues to lack any direct transit service between Maryland and Virginia. Commuters traveling from Montgomery County to Tysons Corner or to Prince George's County from Alexandria, for example, must first travel into downtown DC and then transfer to reach their destinations.
- **Enhances circulation within the inner jurisdictions** — Continued crowding on Metrorail and Metrobus lines combined with forecast population and employment growth in DC, Arlington and Alexandria demonstrate the need for new high-quality transit options like bus rapid transit, light rail

transit, and modern streetcar lines.

- **Improves access to the regional transit system** — Walking access to Metrorail increased 15 percent between 2007 and 2012 alone. This increase was concentrated in short walks under ½ mile to central jurisdiction stations. However, many stations in the system continue to lack convenient walking access, either requiring better transit access, improved walking and biking connections to surrounding land uses, or increased Park & Ride capacity. Park & Ride demand is already exceeding the capacity of existing facilities along several lines.

Supporting Other Major Regional Initiatives

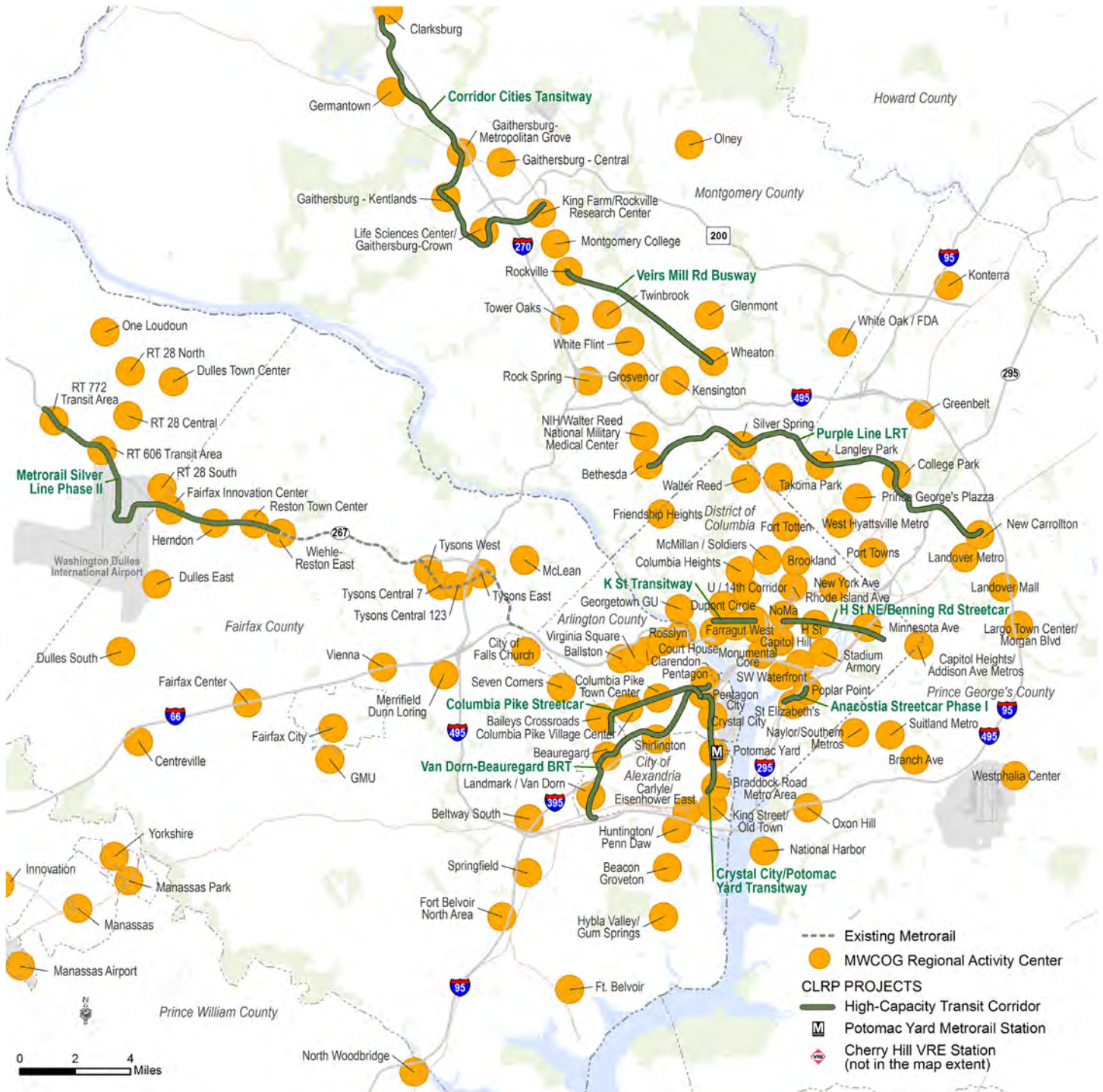
The Plan and Concurrent Planning Initiatives

The plan builds on both the Constrained Long-Range Plan (CLRP) and *Momentum*, Metro's strategic plan. The CLRP, developed and adopted by the National Capital Region Transportation Planning Board (TPB), identifies all regionally significant transportation projects and programs that are planned with reasonable expectations of funding between 2013 and 2040. The CLRP projects, shown in **Figure 1-1** with the regional activity centers, will increase transit use in the region, but will also increase transfers to Metrorail and Metrobus, which are approaching capacity. *Momentum* seeks to maximize Metro's existing system and enable the region's other transit investments to perform as expected. But the CLRP and *Momentum* are not enough to meet future demand and continue our region's economic successes.





FIGURE 1-1
MWCOG 2013 Regional Activity Centers and 2040 CLRP Transit Projects



The plan includes Metro 2025 and CLRP projects plus additional capital investments needed to meet transit demand

As such, the plan is an extension of *Momentum's* goal, to "Improve regional mobility and connect communities". **Figure 1-2**, which illustrates the relationship between concurrent planning initiatives and the CGW 2040 plan.

Regional trends of increased transit ridership but dispersed overall travel patterns have continued since the 1999 adoption of Metro's previous long-range regional plan, the Transit System Expansion Plan (TSEP). Changes since the TSEP was adopted, point to the need to update the regional long-range transit plan. This update, provided by the *ConnectGreaterWashington* plan, will incorporate regional issues with consideration of the regional transit system, the customers it serves, and the metropolitan community at large.

ConnectGreaterWashington and Region Forward - The Vision for Metropolitan Washington

ConnectGreaterWashington is also intended to support the broader regional planning principles established for the metropolitan area in the 2010 *Region Forward* plan prepared by the Greater Washington 2050 Coalition and MWCOC and endorsed by local jurisdictions.

Region Forward defines itself as:

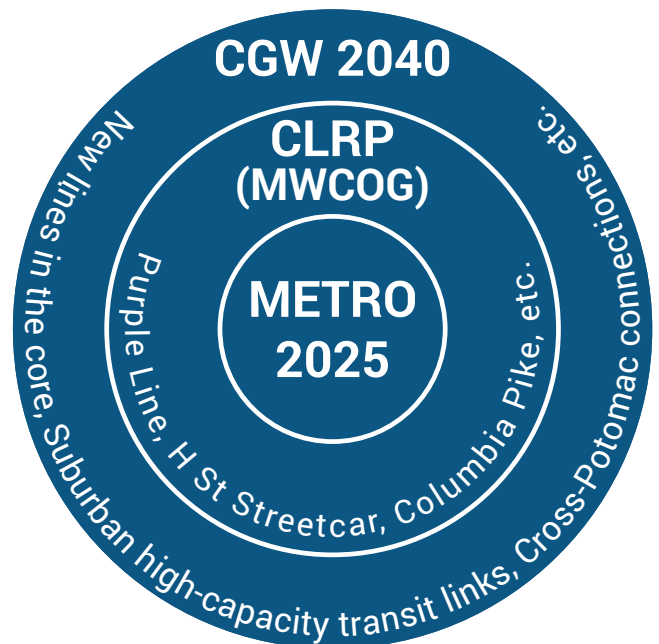
"A vision for a more accessible, sustainable, prosperous, and livable metropolitan Washington."

This vision required an expansion of the high-quality transit in the region to achieve its transportation and land use goals, which include the following:

- A broad range of public and private transportation choices for our region which maximizes accessibility and affordability to everyone and minimizes reliance upon single occupancy use of the automobile

FIGURE 1-2

Metro's Concurrent Long-Range Planning Initiatives



- A transportation system that maximizes community connectivity and walkability, and minimizes ecological harm to the Region and world beyond
- Transit-oriented and mixed-use communities emerging in Regional Activity Centers (see sidebar on page 6) that will capture new employment and household growth
- Climate and energy objectives that emphasize the reduction of greenhouse gas emissions from the transportation sector and increased reliance on public transit





Momentum: The Next Generation of Metro



A key goal of *Momentum* is to "Improve Regional Mobility and Connect Communities" through the following strategies:

- Be the region's transit leader
- Maximize what we have
- Enhance access
- Expand for the future
- Support the region's economic competitiveness

The plan supports each of these strategies in its approach and incorporates *Momentum's* Metro 2025 capital projects into its future baseline transit network.

Metro 2025

Momentum identified seven initiatives, together referred to as Metro 2025, to maximize the current transit network and prepare it for projects included in the CLRP and *ConnectGreaterWashington*. These initiatives include:

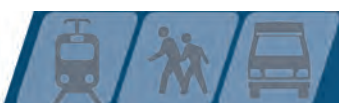
- Operate all eight-car trains during rush hour
- Expand or enhance high-volume rail transfer stations in the Metro system core to ease congestion for existing and future customers and riders
- Complete the Metrobus Priority Corridor Network (PCN)
- Seek to restore peak period Blue Line service between the Pentagon and Rosslyn
- Become a one-stop shop for all regional transit trip planning and payment for the region's 15 transit systems
- Expand the bus fleet and storage/maintenance facilities
- Build new rail infrastructure such as pocket tracks and crossovers to improve service

Other Local and Regional Planning Context

The plan is guided by other Metro studies as well as plans by regional agencies and state and local jurisdictions. These additional plans further document the mobility and accessibility challenges facing the region, outline general livability and sustainability goals, and identify potential transit and land use strategies.

Table 1-1 summarizes the main regional plans and their major components. **Table 1-2** summarizes the local plans from which *ConnectGreaterWashington* evaluated specific transit projects of potential regional significance.

Overall, the studies and plans by Metro and the region's jurisdictions identify significant unmet transportation needs and recommend new capital programs. The CLRP comprises only projects anticipated to have funding from existing sources, and only includes a small share of the transit projects that the region's jurisdictions have



Supporting Regional Activity Centers – Why Transit is an Important Element for Achieving the *Region Forward* Vision



The Metropolitan Washington Council of Governments (MWCOC) defines Regional Activity Centers (RACs) as the places that will accommodate much of the region's growth in coming decades. RACs are largely based on employment concentrations, and to a lesser extent on residential, transit, and cultural activities. In the 2013 update of *Region Forward*, MWCOC identified 141 RACs across the metropolitan area. *ConnectGreaterWashington* will strengthen the linkages between these RACs by building on the existing and planned high-quality transit services and corridors shown in **Figure 1-1**.

Region Forward established a broad-based consensus that walkable, mixed-use activity centers are priority locations for public and private investment, important centers of community activities, and must be accessible by a range of transportation alternatives to the automobile. Thus, improved accessibility via transit plays a key role.

identified to meet projected mobility needs through 2040. In this context, the plan seeks to prioritize the regionally significant transit projects that can address core capacity and regional mobility needs.

The timing of these complementary planning efforts is critical — even with 100 percent eight-car train

- Recent analysis by the regional Transportation Planning Board (TPB) found that 60% of the growth in households and 75% of the growth in jobs between now and 2040 will occur within RACs.
- TPB also found that 88% of new transit trips by 2040 will have destinations in RACs by 2040, with 67% of new transit trips originating in RACs.
- Trips by all travel modes originating from or ending at an RAC grow at significantly faster rates than those outside of RACs, according to TPB. The growth in auto trips to/from RACs will increase roadway congestion and could adversely affect existing surface transit performance without transit priority upgrades.
- 70% of RACs will have rail transit service by 2040, and an additional 14% of the RACs will be served by the Metrobus PCN lines. However, some of these rail transit services and most of the PCN lines will operate in mixed traffic conditions, susceptible to growing traffic congestion.

Extending high-quality transit service to the remaining unserved RACs, providing suburb-to-suburb transit connections between RACs, and upgrading existing surface transit capacity and facilities to bypass increasing auto congestion are provided by *ConnectGreaterWashington*.

operations and planned Metrobus Priority Corridor (PCN) improvements, the Metrorail and Metrobus systems will have crowding in 2040. Large capital projects that may be needed in the future, such as construction of new Metrorail lines or development of a bus rapid transit (BRT) system, often take over a decade to design and construct. In this context, the next several years are important for





TABLE 1-1
Major Regional Plans

Plan	Key Elements
Metro Plans	
Momentum (2013) Horizon Year: 2025 Not Fiscally Constrained	Relevant Metro 2025 Capital Initiatives Include: • Eight-Car Trains During Peak Periods and Bus Fleet Expansion • Core Station Improvements • Metrobus Priority Corridor Network (PCN) • New Blue Line Connections Other shorter-term safety, maintenance, and agency goals
Priority Corridor Network (2009, updated 2011) Horizon Year: 2015, with additional long-term improvements Not Fiscally Constrained	24 high-ridership bus corridors to receive priority treatments – both service adjustments and roadway and facility improvements. Included in <i>Momentum</i> as Metro 2025 strategy.
Core Capacity Study (2002) Horizon Year: 2030 Not Fiscally Constrained	Analyzed projected Metrorail ridership growth and identified operating strategies and capital investments to expand core capacity, including: • Eight-car train operations • Metrorail line connections • Station capacity and access enhancements
Transit System Expansion Plan (1999) Horizon Year: 2025 Not Fiscally Constrained	25-year vision for expansion of the Metro system. Elements since implemented include the Largo extension, New York Ave station, Silver Line Phase I, and rail fleet expansion.
MWCOG and TPB Plans	
Regional Transportation Priorities Plan (2013) Horizon Year: 2040 Not Fiscally Constrained	Sets regional transportation priorities and identifies strategies for each to guide the 2014 major update of the CLRP. The three regional priorities are: • Meet our existing obligations: maintain the transportation system we already have • Strengthen public confidence and ensure fairness • Move more people more efficiently
National Capital Region's Financially Constrained Long Range Transportation Plan (CLRP) (2013 Update) Horizon Year: 2040 Fiscally Constrained	Identifies regionally significant transportation projects planned and funded in cooperation with local governments. Major transit projects include: • MTA Purple Line Light Rail Transit • Columbia Pike Streetcar • Corridor Cities Transitway • New infill stations and other transitway and streetcar projects
Region Forward (2010) Horizon Year: 2040 Regional Vision Plan	Transportation and land use goals emphasize transit and walkability, mixed-use activity centers, and sustainability. Other goals address climate, energy, housing, public safety, education, and the regional economy.
Aspirations Land Use Scenario (2010, updated 2013) Horizon Year: 2040 Land Use Policy Scenario	Alternative land use scenario that establishes a denser, transit-oriented development pattern focused on the Core and RACs. Updated with regional land use forecasts.



INTRODUCTION

TABLE 1-2

Local Transit and Multimodal Plans

Jurisdiction	Key Plans	Key Transit Elements
District of Columbia		
District Department of Transportation	• moveDC (ongoing) • DC's Transit Future System Plan (2010)	Establishes the DC Streetcar System Plan and identifies other key surface transit corridors; currently being assessed in the ongoing <i>moveDC</i> multimodal study
Maryland		
Maryland Transit Administration	• South Maryland Transit Corridor Preservation Study (2010)	Examines the feasibility of dedicated transit right-of-way connecting Charles County and Prince George's County
Montgomery County	• Transit Corridors Functional Master Plan (2013) • Countywide Bus Rapid Transit Study Final Report (2011)	Plans for a BRT and enhanced bus corridor network
Prince George's County	• Countywide Master Plan of Transportation (2009)	Transit improvements that feed Metrorail stations and the planned Purple Line
Virginia		
Virginia Department of Rail and Public Transportation	• SuperNOVA Vision Plan (2012) • I-95/I-395 Transit/TDM Study (2008)	Address the primary travel corridors in Northern Virginia
Virginia Department of Transportation	• I-66 Multimodal Study (2012)	Addresses the primary east-west travel corridor in the region
Arlington County	• Arlington Master Transit Plan (2009)	Plans for new high-quality surface transit corridors and improves connections to Metrorail stations
City of Alexandria	• Comprehensive Transportation Master Plan (2008)	Plans for new high-quality surface transit corridors and infill Metro station
Fairfax County	• Countywide Transit Network Study (ongoing) • Transit Development Plan (2009)	Developing a high-quality transit network through the year 2050; enhances connections to the Metrorail Silver Line extension and VRE lines
Loudoun County	• Revised Countywide Transportation Plan (Amended May 2012)	Expands transit accessibility and connections, particularly with connections to the Metrorail Silver Line extension and existing VRE lines
Prince William County	• Comprehensive Plan, Transportation Chapter 2010 Update (2010)	Addresses countywide transit accessibility and enhances connections to VRE and Metrorail terminal stations





developing consensus at the regional level among local jurisdictions and residents, setting the stage to later address implementation and funding issues.

ConnectGreaterWashington Study Area

Geographically, the plan covers Metro's member jurisdictions, referred to as the "WMATA Compact Area," as well as several neighboring counties, which play an important role in the broader regional transit network of which the Metrorail and Metrobus systems are components (see **Figure 1-3**). This study area for the plan also aligns with the federally defined planning area for regional transportation investments, coordinated by the TPB, which is affiliated with MWCOG and is the federally-designated metropolitan planning organization (MPO) for the region.

ConnectGreaterWashington reflects goals, policies, land use patterns, and transit strategies expressed in existing plans for local and regional jurisdictions



Metro's Key Role in the Region

The Value of Accessibility

- Two million jobs, which account for 54% of all jobs in the region, are within a half-mile radius of all Metrorail stations and Metrobus stops.
- \$235 billion of property value is within a half-mile of Metrorail stations. This land generates \$3.1 billion annually in property tax revenues and represents 28% of the jurisdictions' property tax base, but only 4% of their land.

Without Metro:

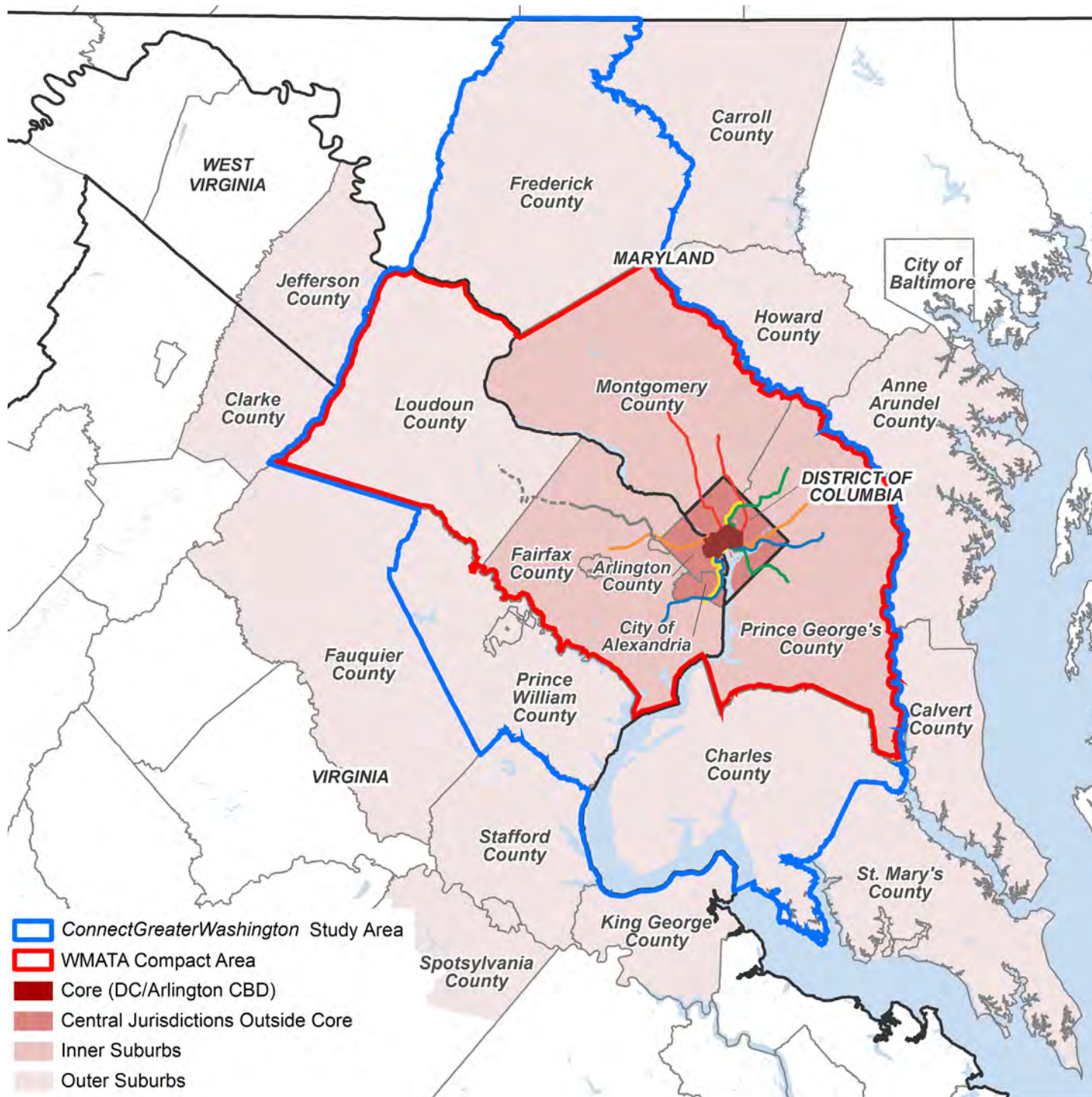
- Congestion would increase 25%, costing over \$1.5 billion annually in wasted time and fuel. The region would fragment into several smaller economies resulting in the loss of regional economic competitiveness.
- Employers would have access to a much smaller pool of employees, and residents would have fewer jobs within an acceptable commuting distance.
- More than 1,000 lane-miles of new pavement on highways and arterials would be needed, which is the equivalent of two new Beltways.
- All river crossings would need 4-6 additional lanes.
- 1 million more auto trips per day would be made.
- 200,000 more parking spaces in the core would be needed, which would be the equivalent of 166 blocks of five-story garages.

Source: WMATA, *Making the Case for Transit: WMATA Regional Benefits of Transit*, 2011



FIGURE 1-3

ConnectGreaterWashington Study Area





Development of *Connect-GreaterWashington* – The Planning Process

To develop a future transit network that addresses the regional needs and goals outlined above, the plan assesses both Metrorail core capacity needs and regional mobility approaches. The planning process identified, evaluated and prioritized new high-capacity transit projects, including Metrorail and surface transit corridors, as well as service enhancements to the existing transit network (see **Figure 1-4**).

The plan was developed based on a three-step process that included the evaluation of different combinations of high-capacity transit to support projected growth

Step 1: Identification of 2040 Needs

MWCOG forecasts future population and employment trends for the greater Washington metropolitan area based on local land use plans, development trends and economic data. The MWCOG Round 8.2 Cooperative Forecasts for the year 2040 were used by Metro to understand how travel patterns will change as different parts of the region grow in terms of households and jobs. Metro uses the MWCOG regional travel demand model to forecast trips by transit and other modes on the region's transportation network, including existing facilities and those already planned and funded.

Step 2: Development and Evaluation of Strategies

A full range of major transit capital investments was identified to meet Year 2040 transit needs including potential new Metrorail lines, new and expanded surface transit options, enhance bus services, and access enhancements. These were evaluated both individually and as part of coordinated networks of improvements. A baseline network was established to use as a point of comparison in the evaluation of these networks of

FIGURE 1-4
Planning Process



Measures of Effectiveness

ConnectGreaterWashington employed 21 individual unique measures of effectiveness (MOEs) that reflect the plan's goals and objectives. Of the 21 MOEs proposed, 10 proved to be non-differentiating (the results among the scenarios presented were identical and offered no useful comparison). These non-differentiating MOEs were excluded from further analysis:

- Number of Households that can be Reached by Transit and Auto Within 45 Minutes from Employment
- Incidents per 1 million Passenger Miles
- Congested Person Miles of Travel
- Number of Households Within ½ Mile of Any Transit
- Number Of Jobs Within ½ Mile of Any Transit
- Transit Mode Share by Subregion
- Evenness of Distribution of User Benefits
- Households and Jobs Within ½ Mile of High-Frequency/Higher-Speed Transit Stops
- Metrorail Parking Availability

The following 11 differentiating MOEs were used to compare and contrast the results of the different scenarios analyzed as part of the *ConnectGreaterWashington* planning process:

- Total Transit Linked Trips
- Transit Mode Share to/from Regional Activity Centers (RACs)
- Transit Mode Share Outside RACs
- Reduction in Vehicle Miles Traveled (VMT)
- User Benefits Within and Between RACs
- User Benefits Outside RACs
- Number of RACs Served by High-Frequency/Higher-Speed Transit
- Transit Link Capacity and Congested Person Hours of Travel
- Metrorail Transfer Capacity
- Transit Peak Orientation Factor
- Capital and Operating Costs/Passenger Mile

transit improvements. The 2040 baseline transit network consists of the transit system as it exists today plus baseline regional priority improvements already identified in previous regional plans, which consist of the following:

- Transit improvements identified and funded in the current CLRP for the Washington Metropolitan Region
- Metro 2025 facility and service enhancements planned for the Metrorail and Metrobus systems, including the PCN

Figure 1-5 shows the baseline transit improvements. The baseline network features new transit modes to the Washington region, such as light rail transit (LRT),

bus rapid transit (BRT), and the return of streetcars. In addition, the baseline network evaluated includes new facilities on existing transit lines, such as infill transit stations that make efficient use of existing infrastructure.

Step 3: Recommend 2040 Network

Previous analyses have shown that although the 2040 Baseline Transit Network makes improvements to transit capacity and service, it does not meet the mobility and accessibility challenges of a growing region. To build upon the Baseline Network, the plan identified additional potential projects, comprising core capacity improvements, new transit corridors and service enhancements. Candidate projects were selected from local and regional transit plans, including their proposed

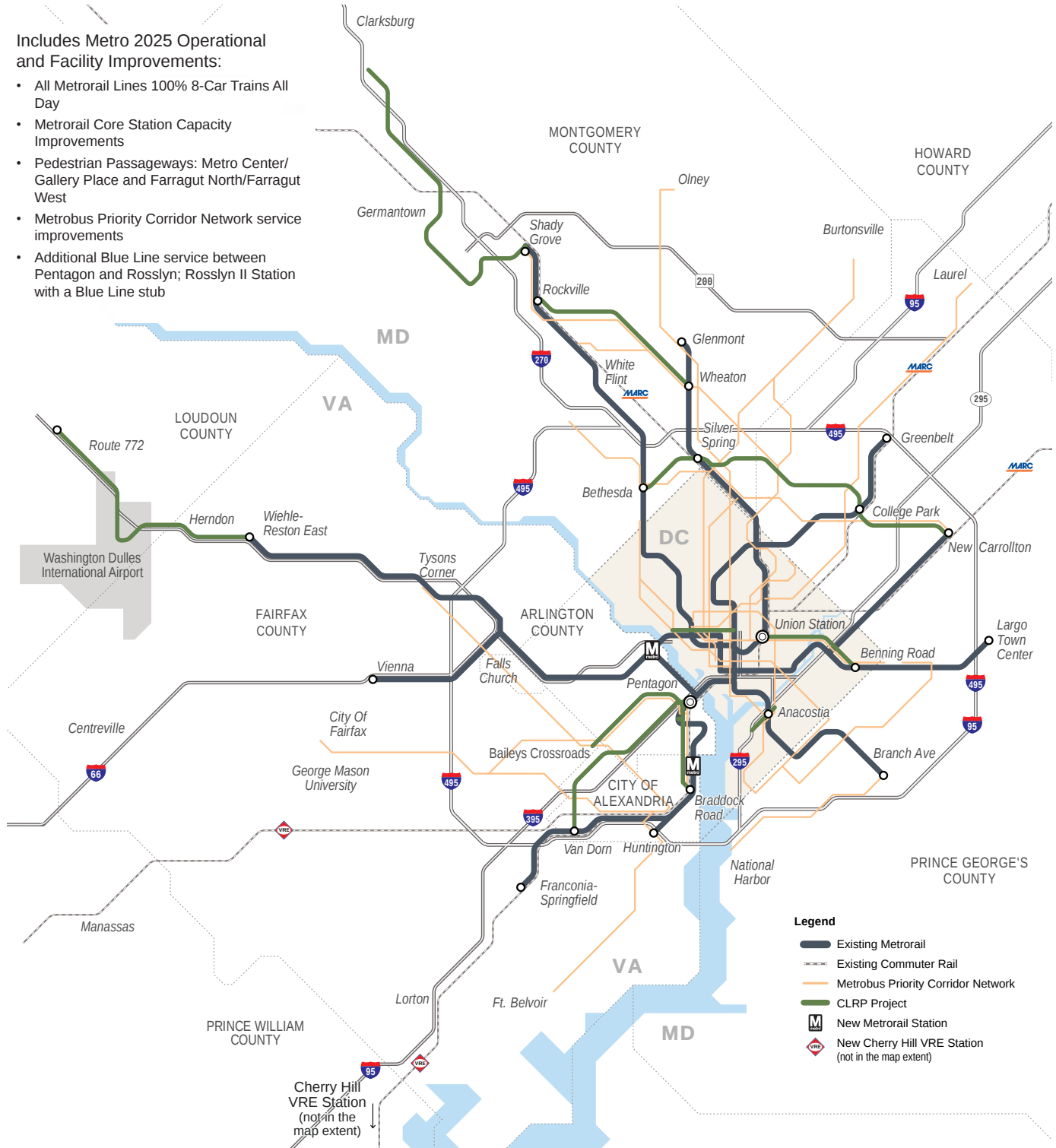




FIGURE 1-5
Transit Improvements and 2040 Baseline Network

Includes Metro 2025 Operational and Facility Improvements:

- All Metrorail Lines 100% 8-Car Trains All Day
- Metrorail Core Station Capacity Improvements
- Pedestrian Passageways: Metro Center/ Gallery Place and Farragut North/Farragut West
- Metrobus Priority Corridor Network service improvements
- Additional Blue Line service between Pentagon and Rosslyn; Rosslyn II Station with a Blue Line stub



INTRODUCTION

projects as well as identifying opportunities for additional cross-jurisdictional links. Goals, objectives, and measures of effectiveness (MOEs) were developed with which to assess the candidate projects.

The transit projects were grouped into mutually supportive networks, or “scenarios.” Different scenarios were developed to test different approaches to addressing the plan goals and objectives using the MWCOC regional travel model. All scenarios included projects related to both Metrorail core capacity and regional transit mobility.

From the top performing scenarios, individual transit projects were prioritized based on modeling results, using factors such as ridership, population, and employment density, and the number of Regional Activity Centers (RACs) connected by the project corridor. The highest ranking projects were compiled to form the recommended regional transit network. The 2040 network is comprised of Metrorail core improvements to reduce congestion and enable future development, as well as surface transit improvements that connect RACs, creating a network of high-capacity, high-frequency transit along regionally significant corridors.





Stakeholder Engagement

Development of the plan was guided by technical representatives of the region's transportation agencies and local jurisdictions, direct outreach to members of the public conducted in conjunction with the *Momentum* strategic planning process, and meetings with individual jurisdictions and regional agencies.

Technical Advisory Group (TAG)

A Technical Advisory Group (TAG) was convened to guide study technical tasks throughout the planning process, by reviewing draft work products and providing feedback to the study team on subsequent steps. The TAG met 10 times during the course of the study from Fall 2009. TAG members in turn briefed their respective organizations and informed Metro of their ongoing transit planning initiatives to be considered in the plan process. **Table 1-3** outlines the current members of the *ConnectGreaterWashington* TAG.

Metro also met individually with transportation and land use staff from the TAG member jurisdictions and agencies over the course of the plan's development to coordinate transit corridor identification and provide study updates.

Momentum Public Outreach

In the fall of 2012, Metro undertook an extensive outreach effort for *Momentum*, the Authority's strategic plan. Though much of the outreach focused on short-term measures, some long-range scenarios and questions that incorporate elements of the plan were proposed on MindMixer, an interactive online community engagement and dialogue tool (see **Figure 1-6**) and in four deliberative forums held in each jurisdiction, including one conducted in Spanish.

Feedback

Over 650 people contributed more than 5,200 votes, comments, and ideas in response to Metro's questions and proposals on the project's MindMixer public engagement site.

TABLE 1-3

Technical Advisory Group Members

Technical Advisory Group	
Local Jurisdictions	
• District of Columbia - Department of Transportation and Office of Planning • Prince George's County - Department of Public Works and Transportation • Montgomery County - Department of Transportation • Maryland-National Capital Region Park and Planning Commission (M-NCPPC) • Arlington County - Department of Environmental Services • City of Alexandria - Department of Transportation and Environmental Services • City of Falls Church • City of Fairfax • Fairfax County - Department of Transportation • Prince William County - Department of Transportation • Frederick County • Loudoun County	
Regional Agencies and Transit Providers	
• Metropolitan Washington Council of Governments (MWCOC) and the National Capital Region Transportation Planning Board (TPB) • Northern Virginia Transportation Commission (NVTC) • Virginia Railway Express (VRE)	
State Agencies and Transit Providers	
• Maryland Transit Administration / MARC • Maryland Department of Transportation • Virginia Department of Rail and Public Transportation • Virginia Department of Transportation	
Federal Agencies	
• Federal Transit Administration (Region 3/DC Metro) • National Capital Planning Commission	

Overall, participants indicated that Metro should focus on:

1. Addressing core capacity issues, such as relieving crowding on trains and in stations; and
2. Implementing new high-quality transit, especially between suburbs and regional activity centers. Underserved travel corridors mentioned included Dunn Loring/Tysons Corner to North Bethesda (I-495 corridor), Branch Avenue Station to Waldorf (MD Route 5/US 301 Corridor) and others.

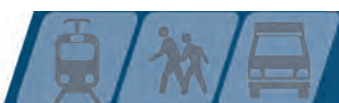
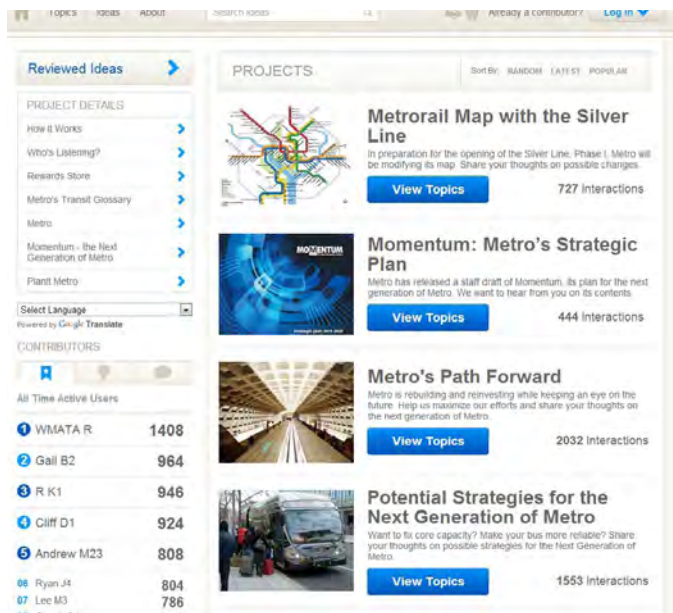


FIGURE 1-6

Momentum Public Engagement Website



Public participants in the planning process expressed an interest in more high-quality transit between suburbs and Regional Activity Centers

FIGURE 1-7

Public Outreach Online Poll Results

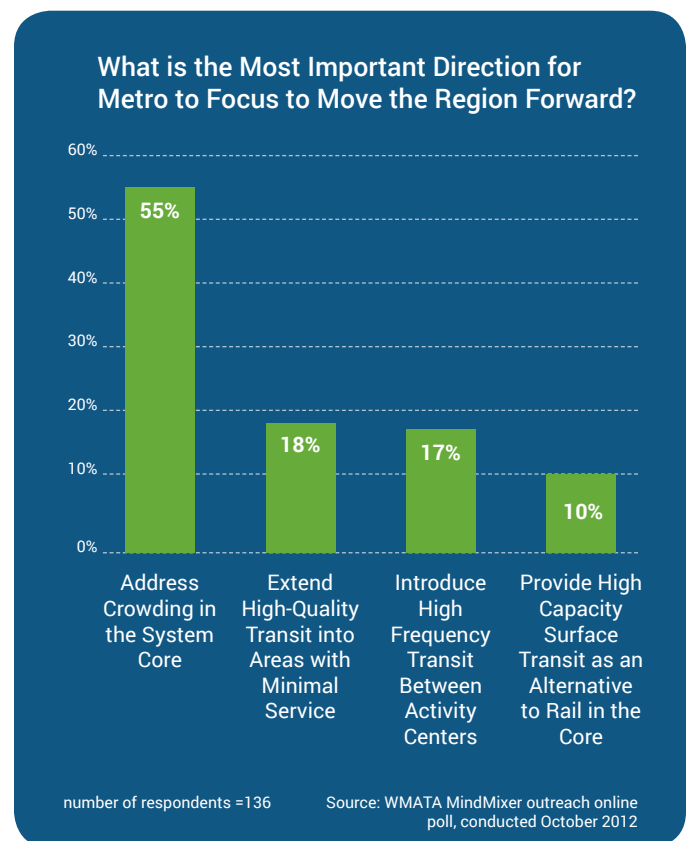


Figure 1-7 summarizes the future transit priorities of the participants in the online poll.

Deliberative Forums

A representative sample of 136 Metro riders was selected to participate in a series of interactive forums that enabled participants to learn more about issues affecting Metro, discuss the issues in groups, and vote on or prioritize issues. In terms of the strategies being considered by *ConnectGreaterWashington*, Metro received feedback on three future investment/development scenarios that built upon one another.

Figure 1-8 summarizes those three scenarios and participant feedback.



FIGURE 1-8

Future Transit Investment Scenarios for Participant Feedback at Deliberative Forums



Scenario A

BRT Strategy



Utilizes bus transit on bus-only lanes throughout the region

Feedback

Cost-effective, easy to implement, and helps travel time and reliability, but too limited to adequately address core capacity, congestion or regional needs. Additionally:

1. 52% of participants felt that Scenario A was desirable or very desirable to meet the region's future transportation needs.
2. Only 16% of participants felt that Scenario A would alleviate congestion problems in the region.
3. 68% of participants felt that Scenario A would increase transit ridership some or a lot.



Scenario B

BRT + Rail Strategy



Adds to Scenario A by building new Metrorail line downtown and increasing streetcar and commuter rail connections across the Potomac

Feedback

Addresses both core needs and suburban connections, but costs too high, ignores some outlying areas, and construction would cause major interruptions. Additionally:

1. 60% of participants felt that Scenario B was desirable or very desirable to meet the region's future transportation needs.
2. 60% of participants felt that Scenario B would alleviate congestion problems in the region.
3. 79% of participants felt that Scenario B would increase transit ridership some or a lot.



Scenario C

High Investment



Adds to Scenario B by building a second new Metrorail line downtown, express Metrorail line in Virginia, extending existing Metrorail lines, and extending light rail across the Wilson and American Legion bridges

Feedback

Very comprehensive in meeting regional needs, but too expensive and visionary to be accomplished, and construction too disruptive. Additionally:

1. 86% of participants felt that Scenario C was desirable or very desirable to meet the region's future transportation needs.
2. 84% of participants felt that Scenario C would alleviate congestion problems in the region.
3. 96% of participants felt that Scenario C would increase transit ridership some or a lot.



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2.0 REGIONAL TRENDS AND 2040 FORECASTS

ConnectGreaterWashington anticipates changing travel patterns projected for the region resulting from increasing interjurisdictional travel demand, especially along key corridors and between regional activity centers. Without investment in additional transit system capacity, Metrorail lines through the region's core and major Metrobus lines will experience extreme passenger crowding by 2040 and bus service will be choked by traffic congestion.

The Washington metropolitan region faces mobility challenges in both its core and suburbs due to growing population and employment and travel patterns becoming more dispersed. At the same time, the region has set broad goals to make its communities more accessible, sustainable, prosperous, and livable as part of the *Region Forward* vision.

From 2010 to 2040, the greater Washington region is projected to have 31 percent growth in population and 41 percent growth in employment

The regional trends and forecasts on the following pages provide snapshots of demographic and travel changes in the region. MWCOG's Aspirations Land Use Scenario (a projection that intensifies land uses near transit and brings more households and employment into the urbanized metropolitan area) is shown for comparison purposes, illustrating how changes in regional land use policies could significantly affect travel patterns and



further increase transit demand – providing a “stress test” of the region's transit system.

Recent Trends

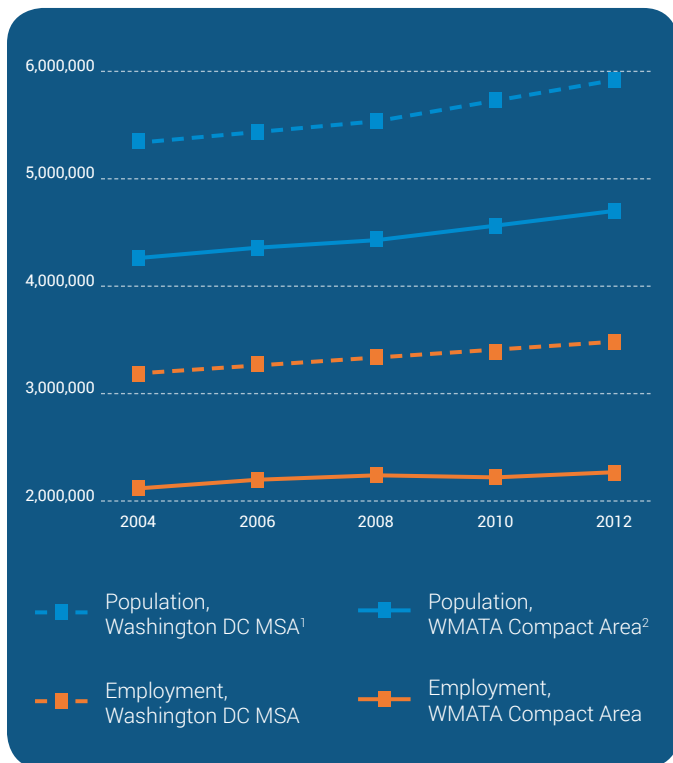
U.S. Census data shows that recent population growth in the Washington metropolitan area has been concentrated in the region's central jurisdictions and inner suburbs. The WMATA Compact Area, comprising Metro's service area for rail and bus, contains 75 percent of the region's population and employment. In recent years, growth has continued to be concentrated in areas served by transit. From 2010 to 2012, 60 percent of new households in the region located within ½ mile of Metrorail stations or within ¼ mile of Metrobus corridors.

The recent trends in the Washington metropolitan area, both in terms of demographic and travel patterns, reflect a national trend that is seeing fewer urban commuters traveling by car, opting instead to complete their journey to work using public transit, biking, or walking. Furthermore, the modernization of transit options and services, added mobility of workers and employers, and an increasingly favorable outlook towards transit are adding to demand for high-quality transit investments in the region.



FIGURE 2-1

Total Population and Employment,
Washington DC MSA and
WMATA Compact Area, 2004 - 2012



¹The Washington DC Metropolitan Statistical Area (MSA), as defined by the U.S. Census Bureau, comprises Washington, DC; Calvert, Charles, Frederick, Montgomery, and Prince George's Counties, MD; Arlington, Clarke, Culpeper, Fairfax, Fauquier, Loudoun, Prince William, Rappahannock, Spotsylvania, Stafford, and Warren Counties, VA; the Cities of Alexandria, Fairfax, Falls Church, Manassas, Manassas Park, and Fredericksburg, VA; and Jefferson County, WV.

²The WMATA Compact Area, a subset of the Washington DC MSA as defined by WMATA, comprises Washington, DC; Montgomery and Prince George's Counties, MD; Arlington, Fairfax, and Loudoun Counties, VA; and the Cities of Alexandria, Fairfax, and Falls Church, VA.

2040 Forecasts and Projections

Figure 2-2 shows forecast population and employment growth across the region; **Figure 2-3** shows growth by sub-areas of the region. The forecast growth displays elements of concentration in central areas and inner suburbs served by transit as well as continued dispersion throughout the region:

- Core and central jurisdictions show relatively high population growth rates (35 percent and 27 percent respectively);
- Traditional transit markets in the core and central jurisdictions account for 20 percent of all job growth;
- Over one-quarter of the region's population growth and 40 percent of the region's employment growth occur in the inner suburbs, with concentrations in key travel corridors and activity centers; and
- Outer suburbs continue to grow, but most of the population and employment growth occurs within the WMATA Compact Area.

Figure 2-4 on page 24 maps population and employment growth by jurisdiction.





FIGURE 2-2

Total Regional Population and Employment and Percent Change, 2010 - 2040

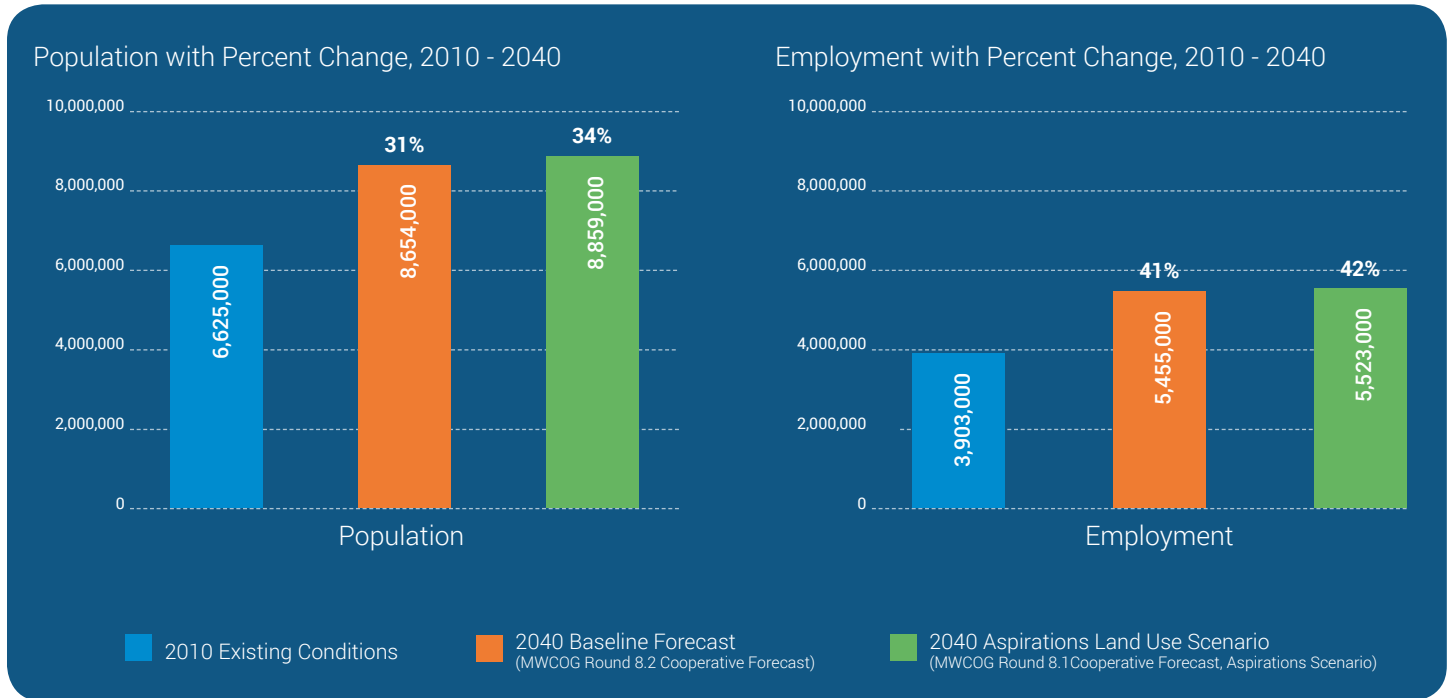


FIGURE 2-3

Total Population and Employment by MWCOC Jurisdiction, 2010 - 2040

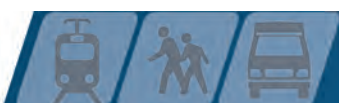
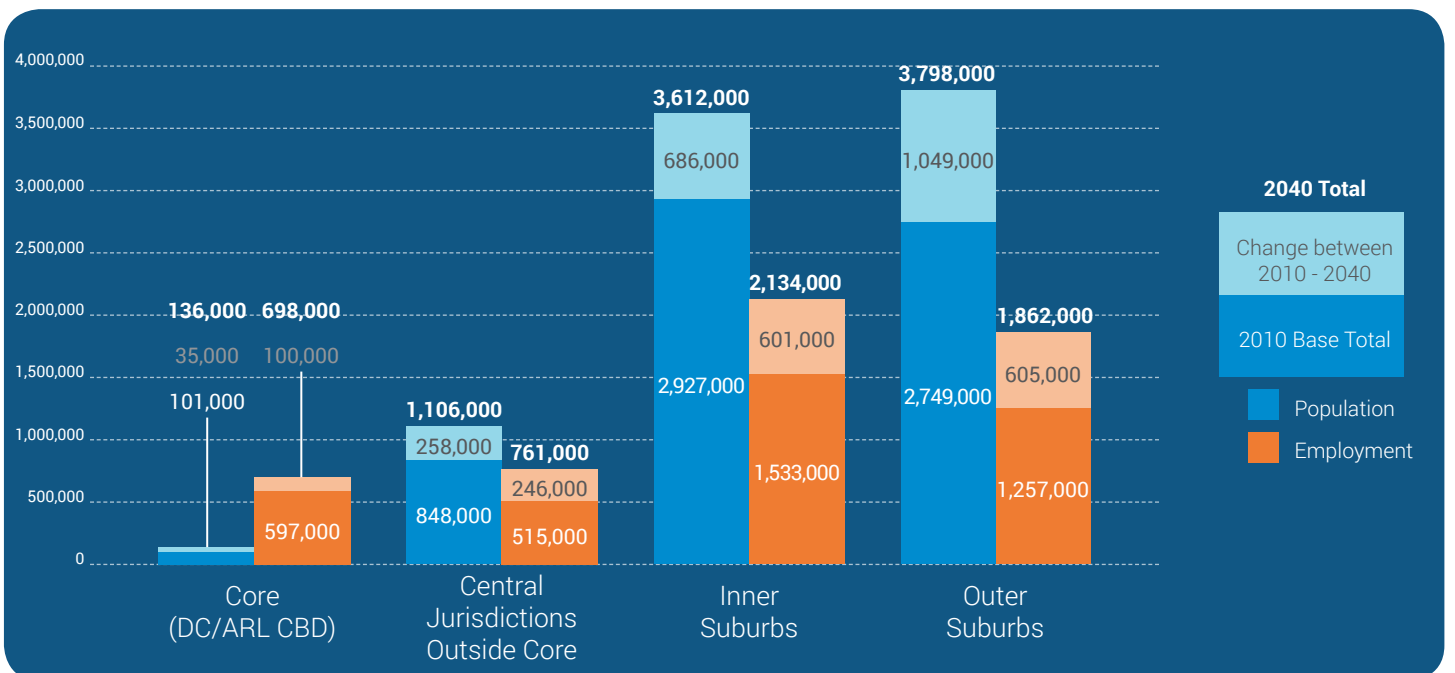
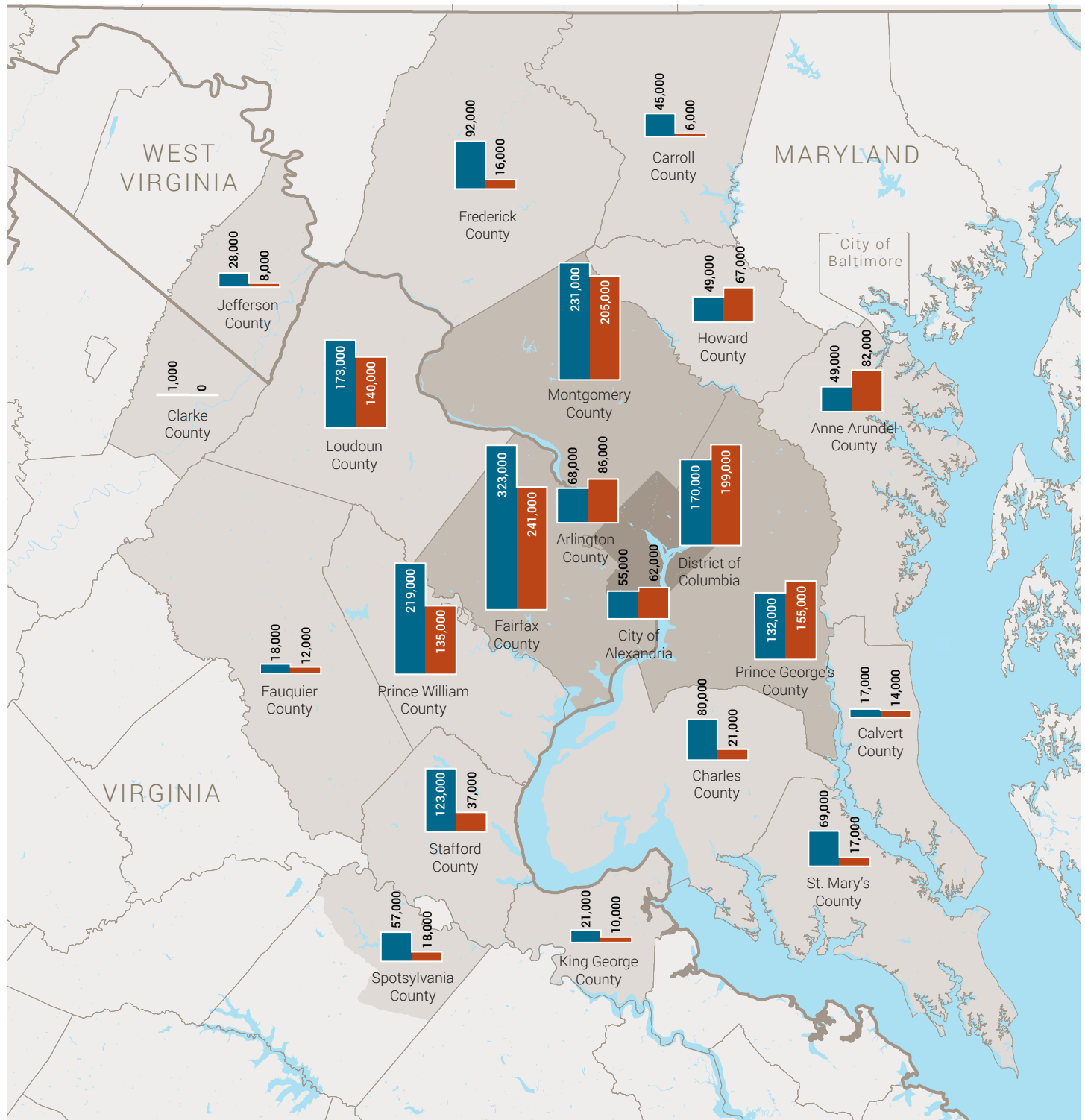


FIGURE 2-4

Total Population and Employment Change by Jurisdiction, 2010 - 2040





Increased Demand for Transit

How do transit and auto travel demand change?

The anticipated population and employment growth will have significant direct impacts on regional travel, increasing overall transit demand and also changing travel patterns due to the spatial distribution of the household and employment growth in the central jurisdictions and regional activity centers (**Figure 2-5**). If this population and employment growth occurs in patterns similar to the Aspirations Land Use Scenario, transit demand will increase even further.

Changing travel preferences and increased recognition of the value of walkable communities (see sidebar on following page) are also pushing the growth rate in transit demand over the growth rate in driving by 2040.

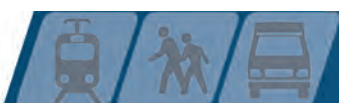
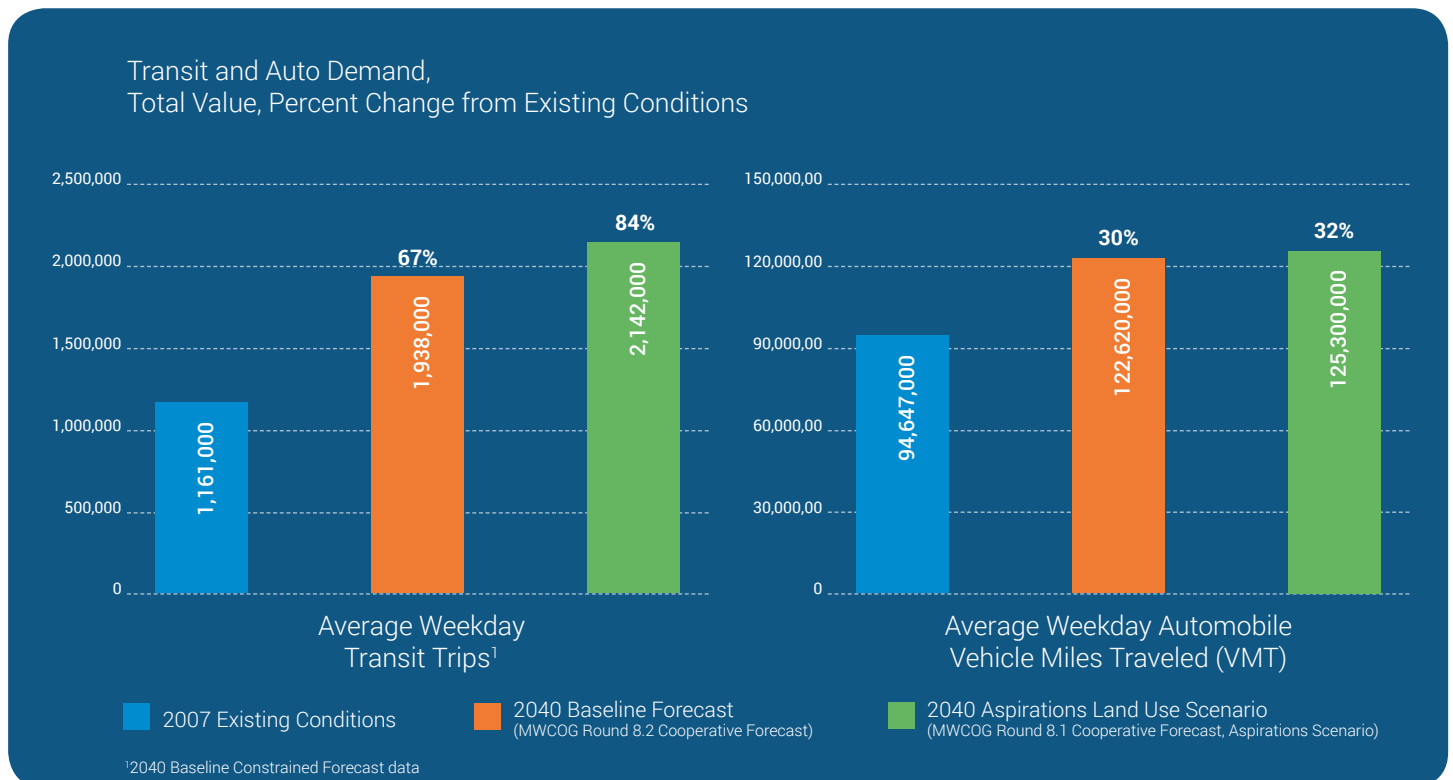
Key Travel Trends

Key trends from 2007 - 2040 include the following:

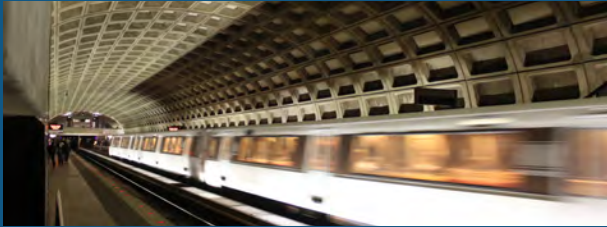
- Transit ridership increases 71% across the region
- Transit ridership under the Aspirations land use scenario would increase 85% across the region
- Increased travel among job and activity centers outside the core – suburb-to-suburb commutes increase 35% while commutes to the core increase 11%

FIGURE 2-5

2040 Regional Forecasts - Overall Travel Demand



Fewer Cars, More Transit, and Walkable Communities



As America has moved into the 21st Century, smaller percentages of urban commuters are traveling by car, opting instead to take transit, bike, or walk to work. A 2013 report by the U.S. Public Interest Research Group (USPIRG) and the Frontier Group found that between 2005 and 2011 for home to work travel:

- The Washington metropolitan area had the second largest decrease in private car commuters in the U.S. (a reduction of 4.7% between 2000 to 2011).
- Washington's passenger miles traveled on public transit increased 7.0% from 2005 - 2011.

The development model for communities in the Washington region has also shifted from a car-dependent suburban model to a walkable urban model, according to a 2012 George Washington University School of Business report, "DC: WalkUP

Wake Up Call". The study found that the Walkable Urban Place model, or "WalkUP", is increasingly where the majority of the region's economic growth is taking place, and these WalkUPs are not just in the core.

- Although the 43 regionally significant WalkUPs in the Washington region occupy only 1% of its land area, they contain 34% of the region's jobs.
- Development in the regionally significant WalkUPs is 15 times denser than the rest of the region.
- 77% of these activity centers have rail transit or are implementing it.
- 58% of WalkUPs are found outside of the District of Columbia, and 21% are outside of the Beltway.

WalkUPs, like the broader set of MWCOC Regional Activity Centers, are mixed-use drivers of economic growth that depend on transit due to their density. Combined with the general shift in the Washington region's travel preferences toward mass transit, the trend toward walkable urban development further demonstrates the importance of expanding high-quality transit services over the next couple decades.

Figure 2-6 shows the forecast increase in Metrorail demand, by daily boardings, transfers, and peak-period/peak-direction ridership, as well as the forecast demand increase for bus and MetroAccess. The sheer increase in ridership among all transit modes will more than triple the cumulative time that transit passengers spend in crowded transit vehicles, even with new capacity provided by Metro 2025 and CLRP improvements (see **Figure 2-7**).

Most of the region's growth is to be focused in the Regional Activity Centers but nearly 62% of these centers will continue to lack any high-capacity transit services in 2040

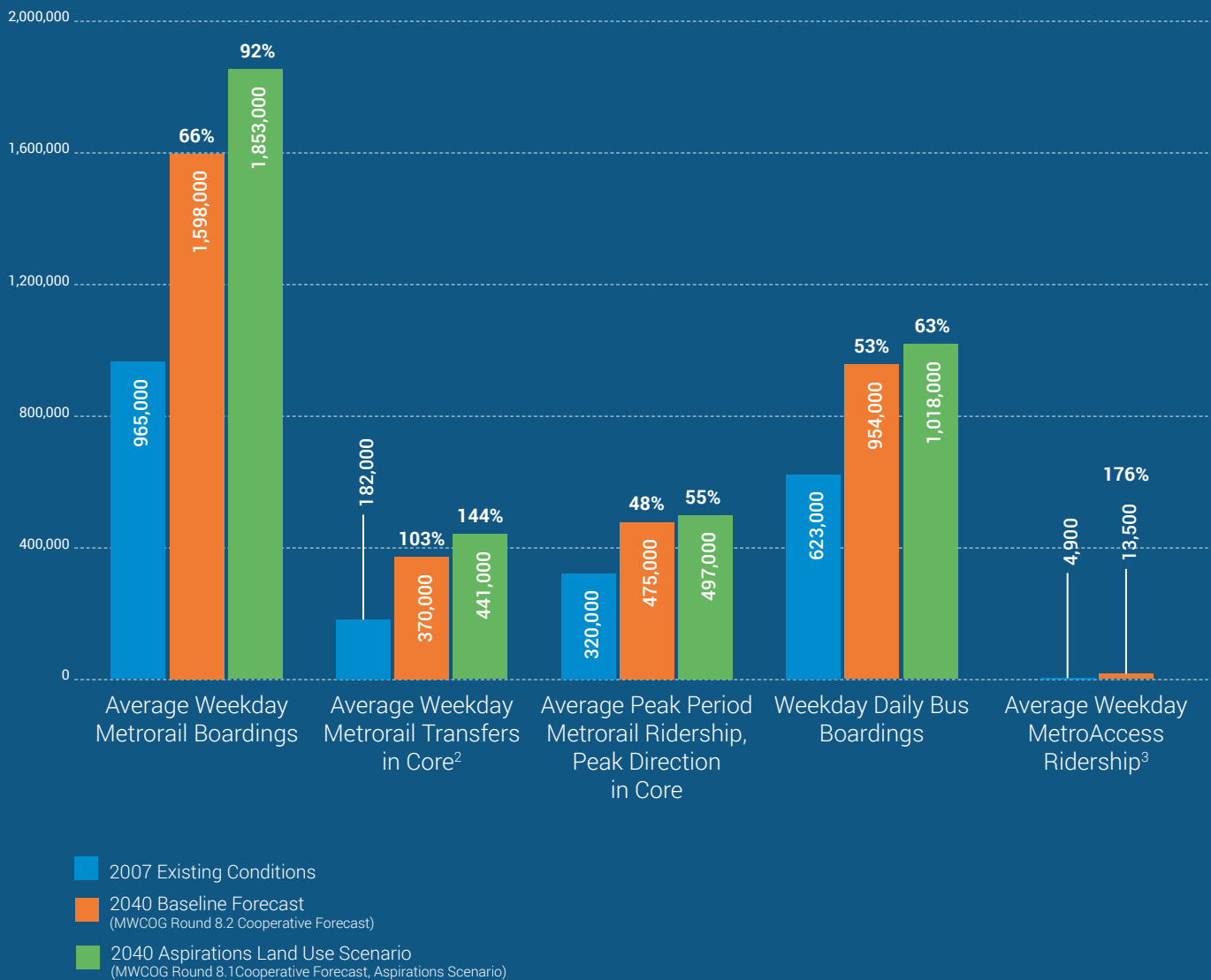




FIGURE 2-6

2040 Regional Forecasts - Transit Demand

Metrorail, Bus, and MetroAccess Demand
Total Value, Percent Change from Existing Conditions



²2040 Baseline Constrained Forecast data

³2040 Baseline Forecast based on MWCOG Round 8.1 Cooperative Forecast data

How well does the Metrorail system respond to further regional growth?

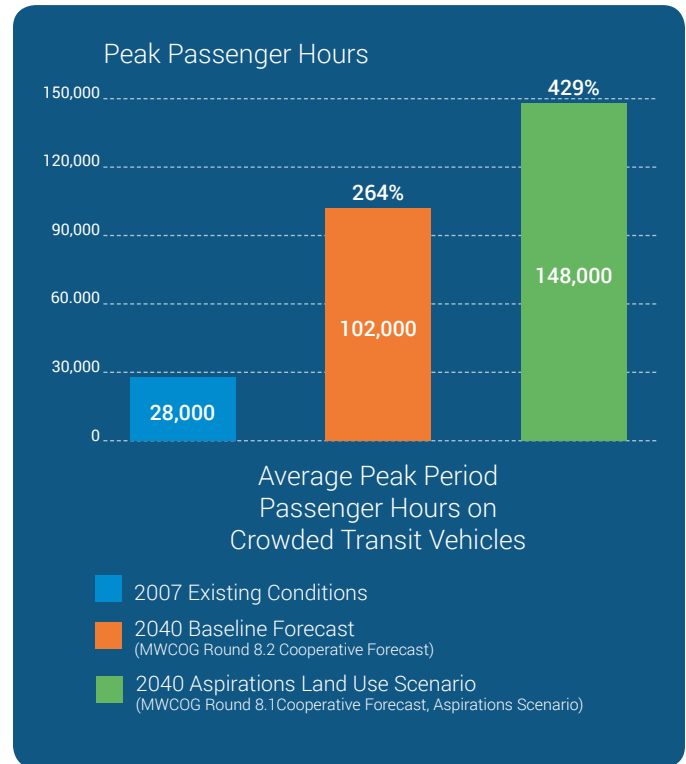
Metrorail ridership will grow 74 percent by 2040, putting significant pressure on the capacity of core lines and stations, especially at the key transfer stations (Metro Center, L'Enfant Plaza, Gallery Place, and Rosslyn). The Aspirations land use scenario would result in even higher ridership growth of 89 percent. Even with all eight-car trains, total passenger hours on crowded Metrorail cars are forecast to increase five-fold by 2040.

Figure 2-8 through **Figure 2-10** show Metrorail train car passenger loads along segments of the system in 2010, 2040 under the baseline land use forecast, and 2040 under the Aspirations land use scenario.

- 2010 Existing Conditions** – Already in 2010, extreme crowding is evident on the Orange Line between the West Falls Church and Farragut West Stations. Crowding is also shown on short segments of the Red, Blue, and Green Lines in the core area.
- 2040 Baseline Forecast** – The conversion to all eight-car trains in the peak hours included in the Metro 2025 plan results in some relief but extreme crowding is still projected for the Orange Line and the Green Line between Anacostia and L'Enfant Plaza by 2040. Other portions of the Silver, Orange, Yellow, and Green Lines are also projected to experience crowded conditions.
- 2040 Aspirations Land Use Scenario** – Additional extreme crowding along portions of the Silver, Orange, Blue, and Green Lines results by 2040. Additional Metrorail capacity in the core will be needed beyond the enhancements in the Metro 2025 Plan to accommodate transit travel demand by 2040.

FIGURE 2-7

Peak Period Passenger Hours on Crowded Rail and Bus Vehicles, 2007 - 2040

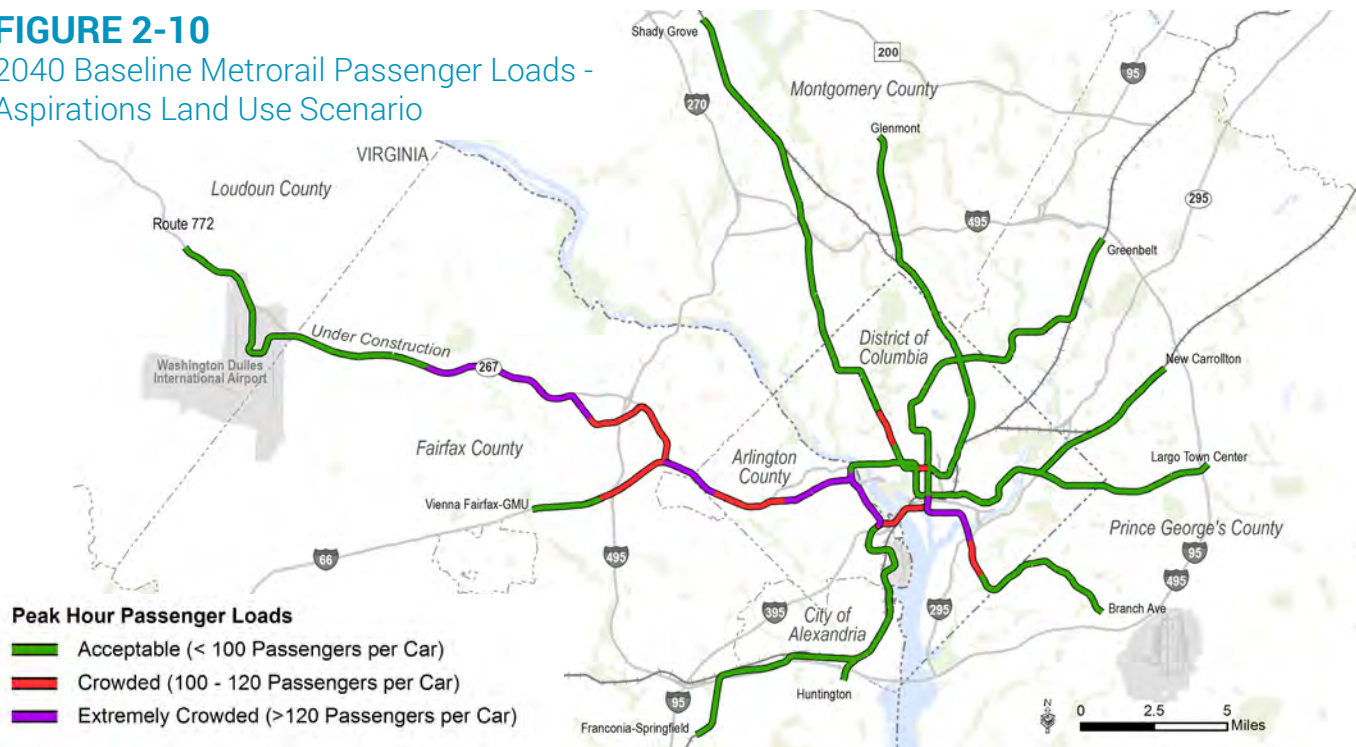


Without additional investment in Metrorail capacity, extreme passenger crowding in the peak hours will occur in the core area and along portions of the Orange and Silver Lines west of the core area



FIGURE 2-10

2040 Baseline Metrorail Passenger Loads - Aspirations Land Use Scenario



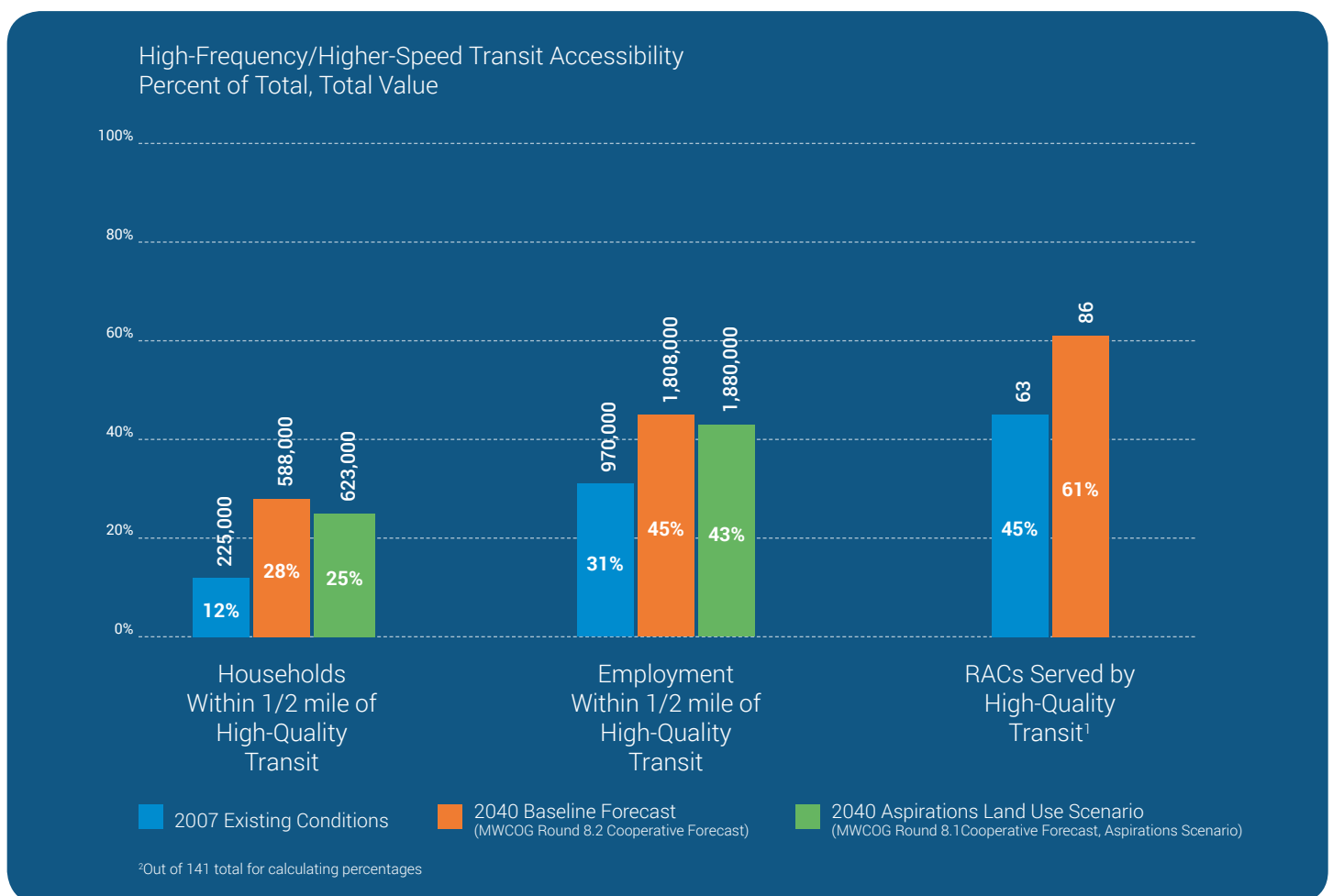


How accessible is the existing and planned regional transit system?

Local and express bus services operating in mixed traffic conditions will be subject to the region's generally increasing traffic volumes, resulting in longer travel times and less reliable service for their passengers. Thus, frequent transit services that have right-of-way priority to enable higher speeds will be increasingly necessary to expand access to the transit system and support Regional Activity Centers (RACs). These high-quality transit options will also need sufficient vehicle capacities to handle increased passenger volumes (described further in Section 4, "High-Capacity Transit").

By 2040, new high-quality surface transit lines, such as the Purple Line, providing circumferential travel among activity centers in the central jurisdictions and the core will help augment the existing hub and spoke system of Metrorail and commuter rail lines. However, 39 percent of RACs will continue to lack high-quality transit service, especially in the suburbs. Most of the region's population and employment will still be outside of a half mile from high-quality transit (see **Figure 2-11**), showing the need to expand high-frequency and higher-speed surface transit options beyond those currently planned, with a priority to serve RACs.

FIGURE 2-11
2040 Regional Forecasts - High-Quality Transit Accessibility



Paratransit Trends and Forecast

The Americans with Disabilities Act (ADA) requires Metro to provide accessible public transit to everyone, including those who are unable to use accessible “fixed-route” services, such as Metrobus and Metrorail. Metro does so by providing MetroAccess, a complementary, shared-ride, door-to-door paratransit service. The ADA also mandates that Metro meet all ADA paratransit demand within its service area. Metro has agreements with the region’s local bus services to provide ADA paratransit coverage in their service areas, which increases Metro’s overall paratransit service area. As *ConnectGreaterWashington* seeks to expand the region’s overall fixed-route transit network, the MetroAccess service area will expand with it.

Service Trends

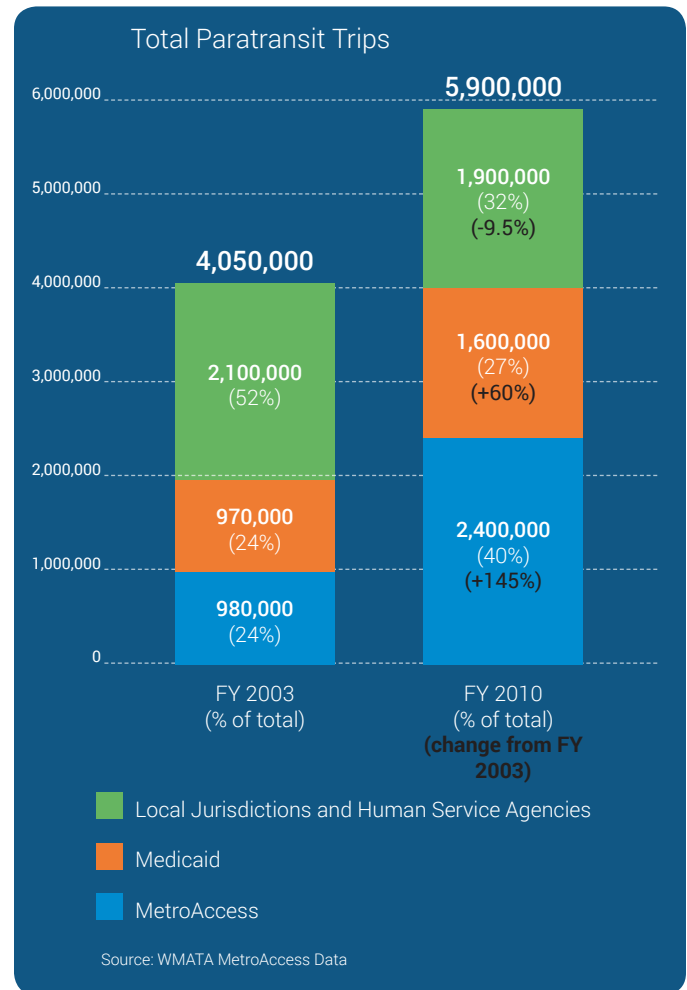
In 1994, MetroAccess began service and provided a few thousand trips. By 2003, there had been a massive increase in regional paratransit demand. As shown in **Figure 2-12**, MetroAccess provided about 1 million trips in 2003, while Medicaid provided another 1 million and local jurisdictions and human service agencies provided the remaining 2.1 million trips.

By 2010, the region’s demand for specialized transportation increased to 5.9 million, while trips provided by the local jurisdictions and human service agencies had dropped by about 10%. The result was that MetroAccess demand exploded by 145%, while Medicaid grew by 60% from 2003 to 2010. Overall, MetroAccess’ share of trips expanded from 24% in 2003 to 40% in 2010, while Medicaid’s share stayed relatively consistent, and local jurisdictions and human service agencies’ share dropped.

In response to this unsustainable growth trend, Metro initiated strong outreach, eligibility and travel training programs to encourage the use of Metro’s ADA-accessible Metrobus and Metrorail services. As a result, 1.2 million MetroAccess customer trips were shifted to fixed-route bus and rail in 2013, which has avoided \$60 million annually in paratransit expenses to the region. Metro’s Reduced

FIGURE 2-12

Paratransit Demand and Service Trends



Fare Programs (RFP) enabled people with disabilities and seniors to take 16 million trips on fixed-route bus and rail. These approaches resulted in a decline of MetroAccess trips from 2.4 million in 2010 to 2.0 million trips in 2013, or an average of 8,200 trips per weekday in 2013, for an annual expense of \$104 million.

Future Demand Projections

As the country’s fourth largest ADA paratransit service with 600 vehicles, MetroAccess ridership is beginning to grow again. In the last 18 months, enrollment has increased from 27,000 to 32,000 registered customers. As a result, FY2014 second quarter ridership has increased





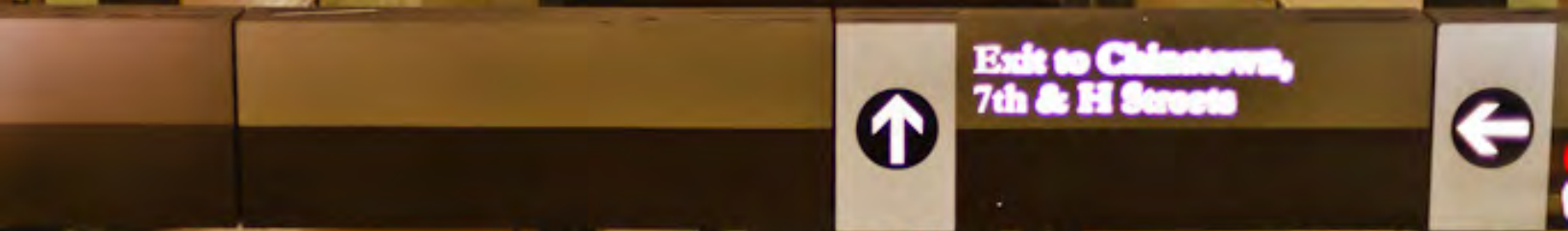
ability to fund current fixed-route transit service, much less advance *ConnectGreaterWashington's* proposed service expansion over the long term.

by 7 percent over the same period last year. This trend signifies the start of the “age wave” where the region’s population of seniors and people with disabilities is expected to double by 2040. Currently, almost half of MetroAccess customers are age 65 or older, so not only do MetroAccess customers have a disability, they are also much older than the general population.

Due to this expected doubling of the MetroAccess eligible population, service demand can also be expected to double by 2040. At a conservative growth rate in demand of 2.6 percent per year, far less than the current growth rate, MetroAccess is forecast to provide 3.6 million trips per year by 2040, which will require a fleet of 1,200 vehicles and annual operating and maintenance expenses of \$208 million (2013\$).

This growth cannot be handled by MetroAccess alone. The trend of local jurisdictions and social service agencies to reduce their specialized transportation programs and rely on Metro to serve their customers is a major challenge and needs a regional solution. If not addressed, this trend could add 1 million additional annual trips to MetroAccess by 2040. This projected service increase is a realistic scenario but is financially unsustainable, because MetroAccess is the most expensive paratransit option. In the near term, Metro’s cost of providing unconstrained ADA paratransit service will strongly impair the region’s





3.0 CHALLENGES AND OPPORTUNITIES FOR TRANSIT

Key Goals

The future challenges for the region's transit system described in Section 2 are also opportunities for addressing ongoing transportation and land use issues and achieving the *Region Forward* vision. The regional trends of increased transit ridership but with dispersed overall travel patterns have continued since the 1999 adoption of Metro's previous long-range regional plan, the *Transit System Expansion Plan* (TSEP) – and these trends are forecast to continue in the following decades. An update of the long-range plan, provided by *ConnectGreaterWashington*, will address broad regional issues with consideration of the regional transit system, the customers it serves, and the metropolitan community at large.

Supporting Broader Regional Goals

To support broader regional goals, Metro reviewed applicable goals and objectives from previous regional transportation and strategic planning efforts by MWCOG and the National Capital Region Transportation Planning Board (TPB), as well as Metro's own strategic plans. Common themes of the plans include: improving individual mobility and accessibility, strengthening community activity centers, and fostering regional sustainability. Based on these key themes and the anticipated transit needs of the region through 2040, Metro developed the five goals for the *ConnectGreaterWashington* plan.

A set of corresponding objectives was defined for each goal. Each objective represented a more specific aspect of the associated goal. Objectives are specific, achievable, measurable statements of what needs to be done to achieve the theme. Measures of effectiveness to evaluate the strategies were identified for each objective. The objectives and measures of effectiveness

ConnectGreaterWashington Goals:

-  Enhance environmental quality, improve energy efficiency, and protect human health and safety
-  Facilitate transit-oriented, mixed-use communities that capture employment and household growth, providing choices in where to live, work and play
-  Maximize availability of and convenient access to integrated transit choices
-  Provide a financially viable and sustainable transit system that is efficient and effective for the region
-  Provide a financially viable and sustainable transit system that is efficient and effective for the region

defined for each goal are listed in **Table 3-1**.

CHALLENGES AND OPPORTUNITIES

TABLE 3-1

Goals, Objectives, and Measures of Effectiveness

Goal	Objective	Measures of Effectiveness
Goal 1: Enhance environmental quality, improve energy efficiency, protect human health and safety	Objective 1.1 Maximize safety	Passenger miles between incidents by mode – auto, Metrorail, streetcar, light rail, BRT, local bus, commuter bus, commuter rail
	Objective 1.2 Minimize transportation-related emissions and energy use	Congested person-miles of travel – miles of person travel in autos and buses on streets with travel times greater than twice the free flow travel time
		Vehicle-miles traveled – additional/reduced VMT
Goal 2: Facilitate transit-oriented, mixed-use communities that capture employment and household growth, providing choices in where to live, work, and play	Objective 2.1 Provide highly desirable transit choices that support household and employment growth in Regional Activity Centers (RACs) and mixed-use corridors	High-frequency/higher-speed transit service to RACs by mode – number of RACs served; and number of connections between RACs
		Transit mode share – linked transit trips that begin or end in RACs
		User benefits (cumulative travel time savings) for trips with one or both ends in RACs
	Objective 2.2 Continue to provide attractive transit options to support existing and planned development outside of RACs	Transit mode share – linked transit trips that begin and end outside RACs
		User benefits (cumulative travel time savings) for trips with both ends outside RACs
Goal 3: Maximize availability of and convenient access to integrated transit choices	Objective 3.1 Maximize transit network coverage and improve mobility throughout the region for residents, employees and visitors	Households within 1/2 mile of any transit
		Jobs within 1/2 mile of any transit
		Total transit ridership (linked trips)
	Objective 3.2 Improve availability of and multimodal access to transit stations and stops served by high-frequency, higher-speed service	Households within 1/2 mile of high-frequency/higher-speed transit stops
		Jobs within 1/2 mile of high-frequency/higher-speed transit stops
		Metrorail parking availability – number of stations at which parking does not exceed 95% of capacity
	Objective 3.3 Ensure that the travel time benefits of transit service are distributed widely to residents throughout the region	Evenness of distribution of user benefits to residents of four quadrants of the region





TABLE 3-1 (cont'd)

Goals, Objectives, and Measures of Effectiveness

Goal	Objective	Measures of Effectiveness
Goal 4: Provide a high-quality transit system that accommodates and encourages future ridership growth	Objective 4.1 Provide sufficient capacity to serve future demand	Transit link capacity – transit passenger hours on links with congested passenger loads: • Metrorail - passengers per car (ppc) ≥ 100 • Light Rail - ppc ≥ 140 • Streetcar - ppc ≥ 115 • Bus - passengers per bus (ppb) ≥ 45
		Metrorail parking availability – number of stations at which parking does not exceed 95% of capacity
		Metrorail transfer capacity – number of passengers at major transfer stations (Metro Center, Gallery Place, L'Enfant Plaza, Rosslyn)
	Objective 4.2 Maximize transit's competitiveness versus the automobile	Total transit ridership (linked trips)
		Households that can be reached by transit within 45 minutes from employment for transit and auto
		Transit mode share – linked transit trips for the region
Goal 5: Provide a financially viable and sustainable transit system that is efficient and effective for the region	Objective 5.1 Provide transit service that is the best value to the region	Transit utilization – passenger miles per seat mile in revenue service
		Transit peak orientation factor – ratio of transit riders crossing cordon in peak hour and peak direction to total peak Metrorail ridership
		Total annualized transit capital and operating costs /passenger mile
		Congested person-miles of travel – miles of person travel on streets with travel times greater than twice the free flow travel time



Opportunities for the Region's Transit System

By achieving the goals described above, the plan provides the following opportunities:

- Reduce Congestion in the Region's Transit System Core
- Improve Connections Between Regional Activity Centers
- Operate Efficient Region-wide Transit Service
- Improve Central Jurisdiction Circulation
- Improve Access to the Regional Transit System

These opportunities are described below and shown in **Figure 3-2** through **Figure 3-6**.

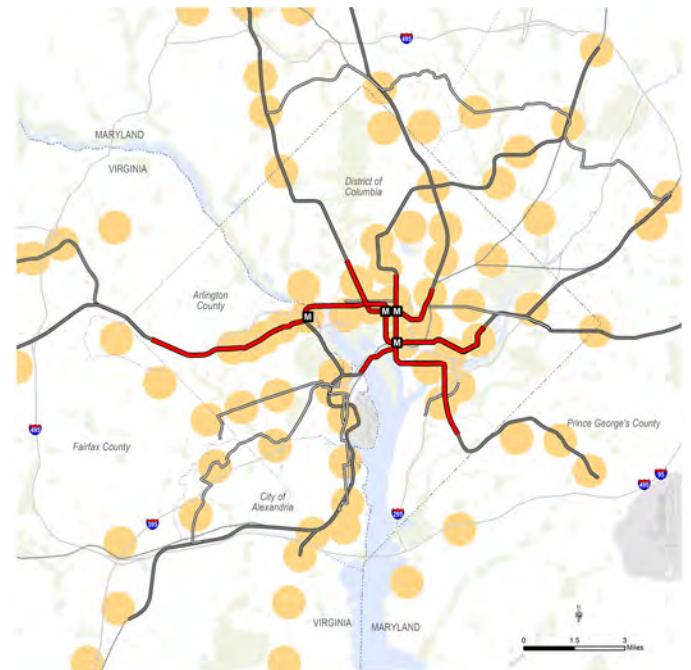
Reduce Congestion in the Region's Transit System Core

Without additional Metrorail core capacity improvements beyond Metro 2025, passenger crowding on Metrorail trains will persist even with eight-car train operations on all lines. Relieving crowding is necessary to ensure safe and reliable travel for Metrorail customers, provide adequate system capacity for future ridership growth, and improve passenger comfort.

FIGURE 3-1
2040 Baseline Transit Network and Regional Activity Centers



FIGURE 3-2
Core Capacity Deficiencies

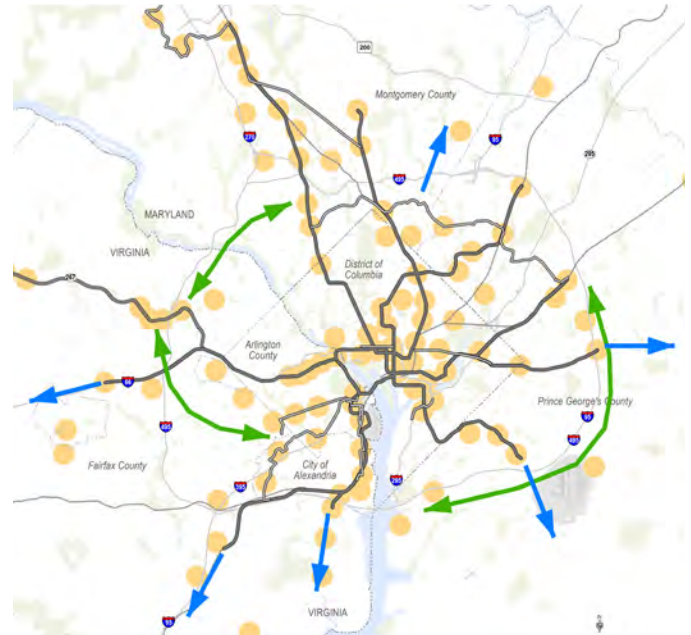




Improve Connections Between Regional Activity Centers

Growth in households and employment in urbanizing areas of the inner suburbs and central jurisdictions requires better suburb-to-suburb transit connections. Focusing transportation investments on connections among Regional Activity Centers is consistent with regional plans and local land use policies, and allows high-quality transit to efficiently expand beyond serving traditional commutes to the core.

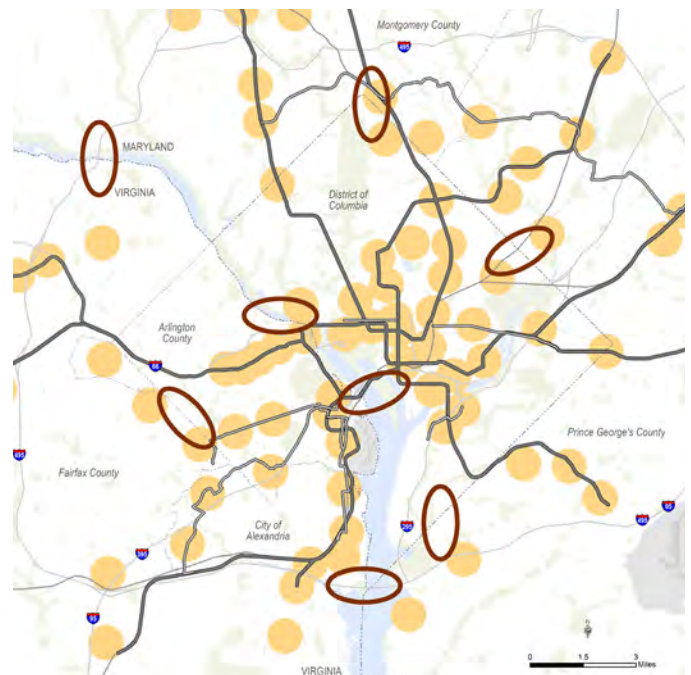
FIGURE 3-3
Improved Connections between RACs



Operate Efficient Region-wide Transit Service

Opportunities to provide more efficient transit service are available through simple measures like increasing cross-jurisdictional transit connections and links among different modes. The planned 2040 base transit network of Metro 2025 and CLRP projects still lacks direct transit service between Virginia and Maryland. In addition, addressing sometimes redundant local services through regional transit planning can better serve the region's trips.

FIGURE 3-4
Missing Cross-Jurisdictional Links

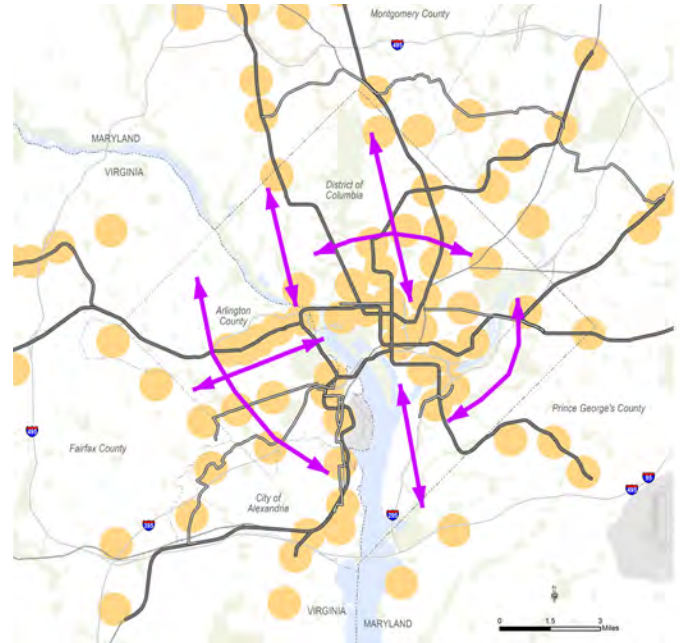


Improve Central Jurisdiction Circulation

Continued crowding on Metrorail and Metrobus lines combined with residential and commercial growth in the central jurisdictions raise the need for more comprehensive high-capacity surface transit options in DC, Alexandria, Arlington, and adjacent portions of the inner suburbs.

FIGURE 3-5

Expanded Central Jurisdiction Surface Transit

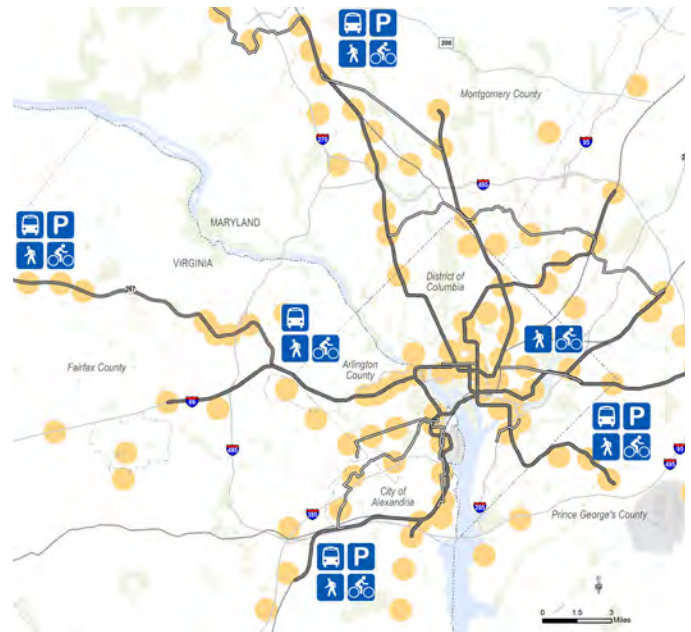


Improve Access to the Regional Transit System

Walking access to Metrorail increased 15 percent just between 2007 and 2012. However, many stations in the system continue to lack convenient walking access, either requiring better transit access, improved land use connectivity, or increased Park & Ride capacity, as parking demand at suburban Metrorail stations is forecast to exceed capacity along several lines. Improving access to existing and planned high-capacity transit is a low-cost way to help people get on transit.

FIGURE 3-6

Improved Access to the Regional Transit System



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4.0 HIGH-CAPACITY TRANSIT

ConnectGreaterWashington considered how potential expanded Metrorail and Commuter Rail lines combined with new surface modes such as Light Rail, Streetcar, and Bus Rapid Transit can best meet future travel demand and support key goals for transit service in the region.

What is High-Capacity Transit?

High-capacity transit serves high volumes of passengers along important travel corridors and provides frequent service and faster travel times than local bus services. High-capacity transit services can compete with the automobile, rather than being subject to the same levels of congestion and delay as peak period auto travel. These transit services also aim to provide higher levels of amenities, such as station facilities, customer information, and enhanced vehicles that can provide comfortable and convenient transportation options while also serving large numbers of travelers – they are critical to attract and conveniently serve high volumes of travelers.

Table 4-1 and **Table 4-2** on the following pages list the types and characteristics of high-capacity transit modes.

Current high-capacity transit in the region consists of the following:

- **Metrorail** – provides the bulk of high-capacity transit services in the Washington metropolitan region
- **HOV Lane Bus Services** – I-95, I-395 and I-66 accommodate high-volumes of express bus and



longer-distance commuter bus service, and new Express Lanes on I-495 and I-95 will also become important facilities for bus transit

- **VRE and MARC Commuter Rail Lines** – provide dedicated right-of-way for reliable longer-distance commute trips into downtown Washington and central jurisdiction employment centers
- **Metrobus Priority Corridor Network (PCN) Bus Lines** – service improvements have already been implemented on key PCN lines and additional investments to improve travel times and increase capacity of all 24 lines are being phased in over the next ten years

As described in the previous section, the Metrorail system will maintain its regional importance and grow in ridership; however, due to the emergence of new employment centers throughout the region and the high demand placed on Metrorail, new high-capacity surface transit is becoming increasingly important. Relatively new modes to the region such as Bus Rapid Transit (BRT), Light Rail Transit (LRT) and modern streetcar, as well as existing modes described above, will play larger roles in supplementing the Metrorail system.



HIGH-CAPACITY TRANSIT

TABLE 4-1

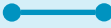
Types of High-Capacity Transit

Mode Local Examples	Right-of-Way	Corridor/Station Area Land Use Intensity ¹					
		Households per Acre			Employees per Acre		
		Local Min-Max Examples	Suburbs	Central Jurisdictions/ Core	Existing Local Min-Max	Suburbs	Central Jurisdictions/ Core
 Commuter Rail VRE MARC	 Dedicated	<1 - Stafford County 13 - Silver Spring	 2-4	  >4	<1 - Stafford County 140 - L'Enfant Plaza	N/A (Typically residential or Park-and-Ride)	N/A (Varies by corridor and terminal stations)
 Heavy Rail Metrorail	 Dedicated	1 - Branch Ave Metro 27 - Columbia Heights Metro	  12-18	   >18	1 - Addison Rd Metro 350 - Farragut West Metro	  25-35	  >35
 Light Rail Purple Line (Planned)	  Dedicated Shared	6 - Purple Line Corridor	 3-7	  >7	12 - Purple Line Corridor	  8-18	  >18
 Modern Streetcar Columbia Pike Streetcar (planned) DC Streetcar (under construction)	  Dedicated Shared	13 - Columbia Pike 19 - H St NE	 3-6	  >6	30 - Columbia Pike 50 - H St NE	  5-15	  >15
 Commuter Bus MTA Commuter Bus PRTC OmniRide Loudoun County Transit Private Operators	  Dedicated Shared	N/A (Long distance point-to-point service)					
 Bus Rapid Transit Corridor Cities Transitway (planned) CCPY Transitway (under construction)	 Dedicated	2 - Corridor Cities Transitway 11 - CCPY Transitway	 3-6	  >6	8 - Corridor Cities Transitway 44 - CCPY Transitway	  8-18	  >18
 Enhanced Bus Metrobus MetroExtra Priority Corridor Network (planned)	 Shared	3 - various suburban PCN lines 26 - 16th St NW line	 3-6	  >6	3 - various suburban PCN lines 108 - 16th St NW line	  8-18	  >18

¹Land Use Intensity as measured within 1/2 mile of Metrorail stations or transit corridors
N/A = Not Applicable





Capacity ²		Distance		Cost ³	
Passengers per Vehicle	Corridor (passengers per hour per direction)	Station/Stop Spacing (average)	Passenger Trip Length (average)	Capital Cost	Operating Cost (per passenger mile)
 90-190 seated	 2,500 - 40,000	 2 - 10 miles	 24 miles	\$ - \$\$\$ • \$5 - \$100 million per mile • \$33 million per 8-car train with locomotive	¢ \$0.30 - \$0.50
 65 - 75 seated 100 - 120 total (Metrorail)	 25,000 (Metrorail)	 0.5 - 1 mile	 5 miles	\$\$ - \$\$\$ • \$100 - \$600 million per mile • \$80 - \$300 million per station • \$22 million per 8-car train	¢ \$0.30 - \$0.50
 40-80 seated 180 total	 3,600	 0.75 - 1.5 miles	 5 miles	\$\$ - \$\$\$ • \$50 - \$150 million per mile (includes vehicles)	¢ \$0.40 - \$0.80
 30-50 seated 120 total	 1,200	 0.5 mile	 4 miles	\$\$ • \$30 - \$80 million per mile (includes vehicles)	¢ \$0.50 - \$0.85
 45 - 65 seated	 100 - 1,000	Varied; Stops Clustered at Route Start and End	 20 - 60 miles	\$ • \$500K - \$600K per vehicle	¢ Dependent on operator
 60 seated 90 total	 1,900 - 2,100	 0.5 mile	 5 miles	\$\$ • \$5 - \$30 million per mile • \$500K - \$800K per vehicle	¢ \$0.40 - \$0.60
 40 - 45 seated 60 - 70 total	 1,200 - 1,400	 0.25 - 0.5 mile	 4 miles	\$ • \$250K - \$2 million per mile • \$400K - \$750K per vehicle	¢ \$0.40 - \$0.65

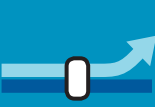
²Vehicle and Corridor Capacity based on recent WMATA and other industry experience, APTA National Transit Database, and VDRPT Transit Service Design Guidelines
³Capital and Operating Costs based on recent WMATA and other industry experience, APTA National Transit Database, and VDRPT Transit Service Design Guidelines



HIGH-CAPACITY TRANSIT

TABLE 4-2

High-Capacity Transit Station/Stop Amenities

Mode	Transit Connections		Stations/Stops			Park and Ride Facilities	
	 Local	 Regional	 Enclosed Stations	 Elevated Platforms	 Shelters and Seating	 Systemwide	 Suburbs Only
 Commuter Rail	•	• ⁵	•	•		•	
 Heavy Rail	•	•	•				•
 Light Rail	•	•	•	•			•
 Modern Streetcar	•			•	•		
 Commuter Bus	• ⁴				•		•
 Bus Rapid Transit	•	•	•	•			•
 Enhanced Bus	•			• ⁶	•		

⁴Local connections available at core stations only
⁵Regional connections available at Core and Central Jurisdictions stations only
⁶Elevated platforms along high-investment lines only



HIGH-CAPACITY TRANSIT

Ultimately, four general categories of strategies emerged as necessary for the 2040 transit network:

- Improved Access to Leverage Transit Investments
- A Network of Regionally Significant High-Capacity Surface Transit Corridors
- Increased Service for Commuter Rail and Commuter Bus
- New Metrorail Lines for the Region's core

Individual high-capacity transit projects or strategies were grouped together into alternative networks and evaluated based on their performance relative to the Measures of Effectiveness identified for the plan development.



Improved Access to Leverage Transit Investments

Packages of transit access improvements were developed based on previous planning efforts, covering land use, pedestrian and bicycle access, infill Metrorail stations and new Metrorail station entrances, feeder bus services, and park-and-ride facilities. Access improvement strategies were tested individually, and then the well performing



strategies and projects were included as underlying strategies in the various high-capacity transit scenarios and recommended network.



A Network of Regionally Significant High Capacity Surface Transit Corridors

Important regional travel corridors may connect widely separated activity centers or other important regional destinations, serving work commutes and other travel, and may also provide access to concentrations of living, employment, and commercial uses and other attractions along the length of a corridor.



Approximately 70 corridors were identified from:

- The region's CLRP
- Metro's own Priority Corridor Network
- Local jurisdictions' long-range plans
- Extensions from end-of-line Metrorail stations
- New connections that Metro's planners felt were not included in the above





Depending on the corridor, high-capacity surface transit can be provided more efficiently and effectively by modes other than Metrorail. As such, most corridors were modeled using various surface transit modes, such as BRT, LRT, streetcar, and enhanced bus. Metrorail was tested along potential line extensions and new lines in the central jurisdictions, such as a Beltway Line; testing of new Metrorail lines in the region's core is described on page 51 ("New Metrorail for the Region's Core").

Potential transit corridors that performed well in the scenario modeling of packages of transit strategies were further evaluated based on land use, ridership and service to Regional Activity Centers (see **Table 4-3**). For each metric Low, Medium and High thresholds were then developed for each mode. A combination of national data, local data and national standards were used as sources for establishing the thresholds. The three metrics were weighted equally to determine an overall performance score which was used to screen corridors for inclusion in the recommended 2040 network.



and helping relieve their crowded Park & Ride lot. Both commuter bus and commuter rail can relieve Metrorail passenger loads by providing more direct long-distance travel into the central jurisdictions and core. The following types of enhancements were developed and tested:

- Improving frequencies and non-peak service along existing commuter rail and bus lines, which can generally be accomplished without major capital investments, especially during off-peak periods and in the reverse peak-direction
- Extending VRE service in Virginia and MARC service across the Potomac River
- Extending and creating new commuter bus lines to take advantage of new I-495 highway express lanes and access to Metrorail provided by the Silver Line



Increased Service for Commuter Rail and Commuter Bus

To better accommodate longer-distance commuting and non-peak travel, enhancements to commuter rail and commuter bus services were developed and assessed. Commuter bus can extend the reach of Metrorail, by providing feeder service to end-of-line Metrorail stations

High-capacity transit strategies considered included new Metrorail Lines in the core area, a new express Orange and Silver Metrorail Line, pedestrian tunnels linking Metrorail Stations, Metrorail Extensions and new high-capacity surface transit connecting activity centers

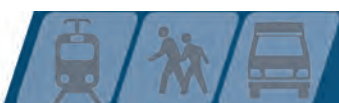


TABLE 4-3

Projects by Tier to be Included in the 2040 Network

Project Tier	Description	Performance Criteria	Inclusion in 2040 Network
Tier 1 – 2025 Priority Network	Projects already planned in the CLRP and Metro 2025 program	Previously evaluated by project sponsors in planning and project development. Included in major regional plans as priority projects based on performance and stakeholder input	Included in CGW 2040 recommended high-capacity transit network as key elements of the plan and that would receive priority in further planning
Tier 2 – 2040 Priority Network	High performing, regionally significant travel corridors	Perform well on at least two of the three metrics: • 2040 land use suitability – meet minimum household and employment densities along the corridors • 2040 forecast ridership – demonstrate strong average weekday passenger boardings per mile • Service to Regional Activity Centers – connect RACs at various points (as measured per corridor mile)	
Tier 3 – Additional Corridors for Future Consideration	Potential high-capacity transit corridors evaluated in the CGW process	Do not perform well on two or more three basic metrics: • 2040 land use suitability – low household and employment densities • 2040 forecast ridership – low average weekday passenger boardings per mile • Service to Regional Activity Centers – connect no or few activity centers relative to corridor distance	Not included at this time; existing local bus or commuter bus services in corridors will continue; as local jurisdictions adopt transit-supportive land use plans and as regional development patterns evolve, the corridors would merit re-evaluation in future plan updates





New Metrorail Lines for the Region's Core

Various potential new Metrorail lines and linkages between existing lines and stations in the core were tested to assess how well these resolved Metrorail core capacity deficiencies. These project concepts included the following:

- Interline Connection to bypass Pentagon
- Relocated Yellow Line via 10th St SW/NW to Thomas Circle
- Relocated Yellow Line via 2nd St SE/NE to Union Station
- New Blue Line under M St NW to Thomas Circle
- New Blue Line under M St NW, New Jersey Ave, and H St NW/NE to Union Station
- New Express Orange/Silver Line from East Falls Church to Rosslyn and DC
- Pedestrian Tunnels along relocated Blue/Yellow Lines to connect new and existing stations

These projects and others were tested separately and in combination as core capacity scenarios to assess their performance in reducing Metrorail vehicle crowding and transfer volumes at existing core stations. From the top performing scenarios, individual core capacity Metrorail projects were selected for the recommended 2040 regional transit network.





5.0 THE PLAN

The 2040 recommended transit network is an integrated package of Metrorail core capacity improvements, new high-capacity transit corridors, and service and access enhancements to the existing and planned transit system.

CGW pairs the new high-capacity transit corridors of regional significance with the critical Metrorail core capacity improvements to create the recommended network for 2040 and beyond. The plan includes additional transit service and access enhancements for the proposed new facilities as well as the existing system, maximizing benefits for riders and the region as a whole.

The recommended 2040 network is shown on the following pages (**Figure 5-1**). It comprises the Tier 1 and Tier 2 corridors, the Metrorail Core Capacity improvements, and other supportive strategies. Key elements of the recommended network are described in the following sections:



Improved Access to Leverage Transit Investments – strategies to facilitate access to transit stations, which is an extremely cost-effective way to serve existing transit customers, utilize existing transit infrastructure, and accommodate growth in ridership.



A Network of Regionally Significant High-Capacity Surface Transit Corridors – new corridors to connect suburban activity centers, bridge missing links across the Potomac River and among jurisdictions, and provide needed high-capacity surface transit within the central jurisdictions.



Increased Service for Commuter Rail and Commuter Bus – strategy to serve longer-distance trips by efficiently using existing infrastructure and right-of-way that give priority to transit



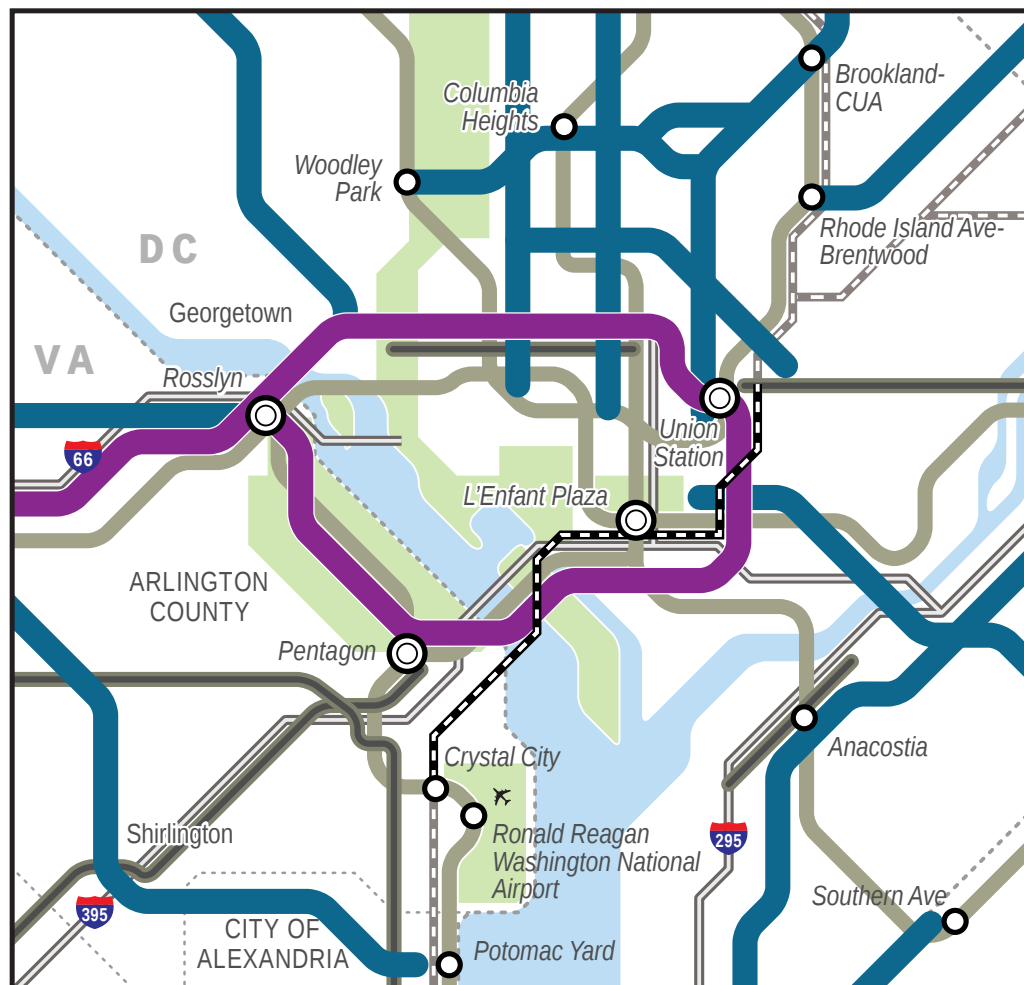
New Metrorail Lines for the Region's Core – needed relief for the Metrorail Core, consisting of a new Metrorail loop line with connections between existing and new stations and an Orange/Silver Express Line in Virginia.



Overall 2040 Recommended Network Performance – summary of how the four groups of strategies listed above work together to meet the goals and provide the opportunities of CGW.



FIGURE 5-1
2040 Recommended High-Capacity Transit Network



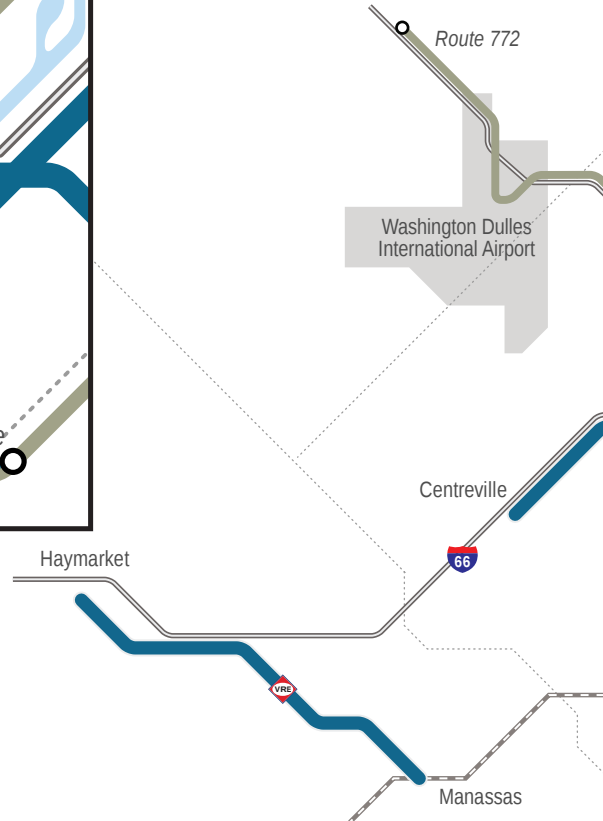
Legend

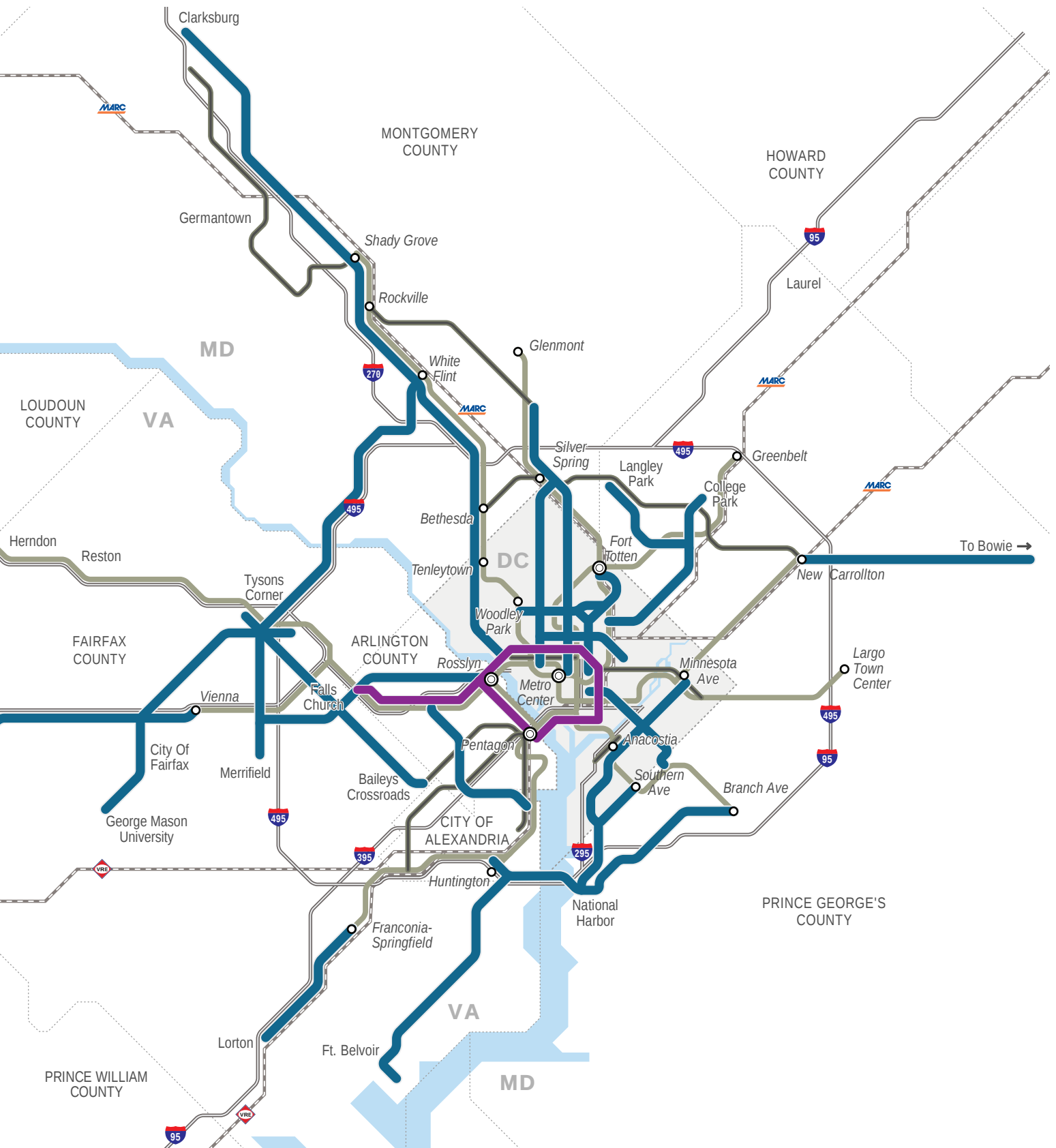
2025 Existing & Currently Planned Projects

-  Metrorail
-  Commuter Rail
-  CLRP High-Capacity Surface Transit Corridor

2040 CGW Projects

-  New Metrorail Lines
-  New High-Capacity Surface Transit Corridor
-  MARC Service Extension to Crystal City







Improved Access to Leverage Transit Investments

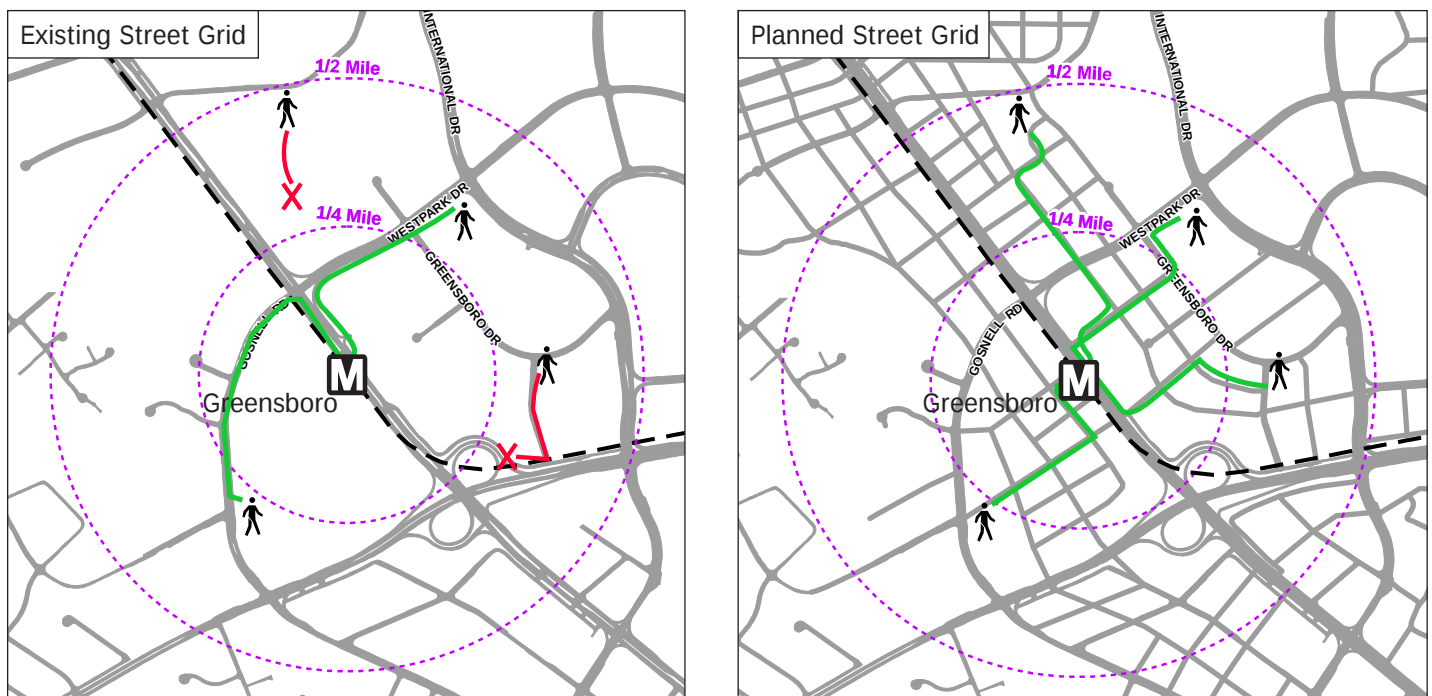
Summary

Facilitating access to transit stations is an extremely cost-effective way to serve existing transit customers, utilize existing transit infrastructure, and accommodate growth in ridership.

- **Pedestrian and Bicycle Access** – updating station area pedestrian accommodations, expanding bicycle parking facilities, improving station wayfinding, providing better connections to nearby trails and on-road bicycle lanes, and providing safety improvements such as lighting and canopies throughout the system. Establishing pedestrian-friendly street and development patterns within the approximately ½-mile walking distance of stations will be encouraged and coordinated with local jurisdictions (see example in **Figure 5-2**).

- **Local Feeder Buses** – integrating existing local bus services with the new regional high-capacity transit lines and establishing new or redesigned local circulator buses focused in activity centers, in coordination with Metro's jurisdictional partners.
- **Park & Ride Facilities** – providing park-and-ride facilities for new suburban high-capacity transit extensions and remote park-and-ride lots with shuttle services to nearby Metrorail stations. For existing Metrorail system Park & Ride facilities, enhanced pedestrian, bicycle and feeder bus access is expected to help free up capacity by diverting short car trips to these other modes.

FIGURE 5-2
Improving Station Walkability - Tysons Corner Example





Goals Addressed

-  Enhance environmental quality, improve energy efficiency, and protect human health and safety
-  Facilitate transit-oriented, mixed-use communities that capture employment and household growth, providing choices in where to live, work, and play
-  Maximize availability of and convenient access to integrated transit choices
-  Provide a financially viable and sustainable transit system that is efficient and effective for the region

Opportunities Provided

- Improves access to the region's transit system
- Operates efficient region-wide transit service

Planning Background

- **Needs Identified** – many Metrorail stations continue to lack convenient walking and biking access, requiring better transit access, improved land use connectivity, or increased Park & Ride capacity, as parking demand at suburban Metrorail stations is forecast to exceed capacity along several lines.
- **Strategy Modeling** – showed that improved street grid connectivity in Metrorail station areas can significantly increase Metrorail ridership (especially in suburbs), increase overall regional transit ridership, better utilize reverse peak-direction Metrorail capacity, and reduce Park & Ride overflow at Metrorail stations.
- **Strategy Refinement** – due to their significant benefits and relatively low costs, various access strategies were included in the transit improvement scenarios modeled.
- **Future Considerations** – requires continuing to actively plan for station area enhancements and transit-oriented development in coordination with local member jurisdictions.

Key Results

- Improving Metrorail station area walkability can increase forecast regional transit ridership (across all transit modes) by as much as 11 percent.
- The impact of walkable, fine-grained street grids is especially significant in suburban areas. If all suburban Metrorail station areas have street grids similar to Silver Spring or Greenbelt Town Center increases inner suburban transit ridership by 30 percent.
- Walkable Metrorail station areas benefit other transit modes, increasing regional bus boardings by 18 percent and light rail boardings by 11 percent.
- The 2040 CGW improvements to the surface transit system increase bus access to a number of Metrorail stations, and, as a result, help relieve excess Park & Ride demand in those commuting markets – the number of Park & Ride stations with spare capacity increases from 15 to 20.

Order-of-Magnitude Cost Estimate

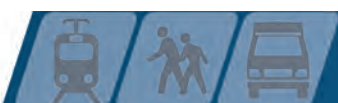
Capital and operating costs were not estimated for access strategies, as these depend largely on local jurisdiction policies for station area land use and redevelopment, in coordination with Metro, as well as relatively low-cost pedestrian and bicycle infrastructure improvements.

Benefits

Focused and targeted pedestrian and bicycle infrastructure and program improvements will improve safety for all riders, facilitate the sustainability benefits of Transit-Oriented Development (TOD), and potentially reduce



costs required to provide parking for motor vehicles.





A Network Of Regionally Significant High-Capacity Surface Transit Corridors

Summary

The recommended new high-capacity surface transit lines provide connections among suburban activity centers, bridge missing links across the Potomac River and among jurisdictions, and provide needed high-capacity surface transit in central jurisdictions. The new transit lines consist of either enhancements to existing transit modes in those

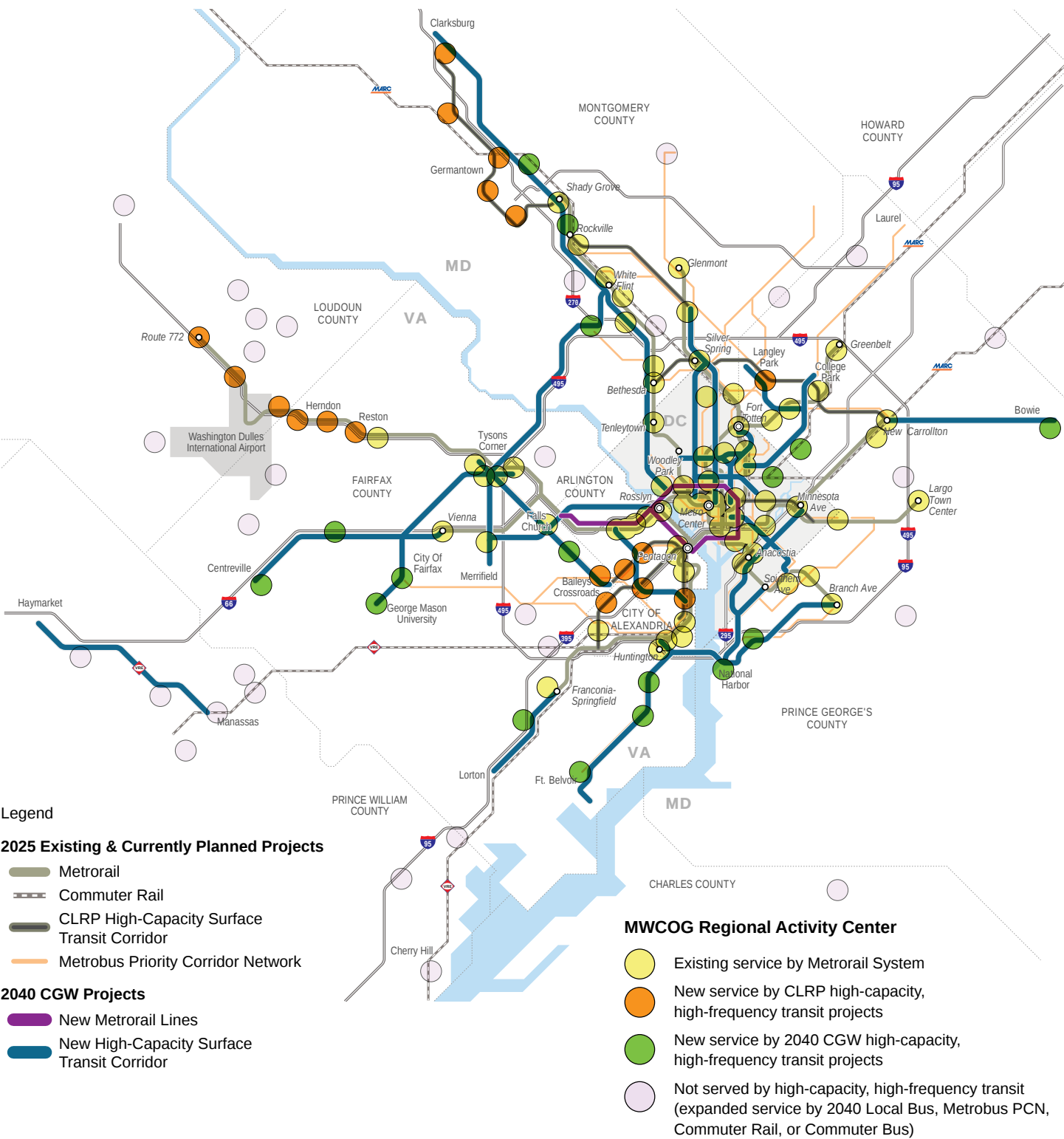
corridors or new modes. These “Tier 2” surface transit corridors build on the Tier 1 corridors already planned in the CLRP (see **Table 5-1** and **Figure 5-3**). The strategy also incorporates frequency enhancements to local bus routes in additional corridors targeted by local jurisdiction planning efforts.

TABLE 5-1
2040 Tier 2 New High-Capacity Transit Corridors

Ref No.	Corridor	Termini	Description
1	Georgia Avenue	Silver Spring to Downtown DC (Chinatown)	PCN trunk line with additional transit facility and service investments
2	16th Street NW	Silver Spring to Downtown DC (White House)	PCN trunk line with additional transit facility and service investments
3	North Capitol Street	Union Station to Fort Totten	PCN trunk line with additional transit facility and service investments
4	U Street NW, Florida Ave NW/NE	16th Street NW to 8th Street NE	PCN trunk line with additional transit facility and service investments
5	Columbia Road, Irving Street NW	Woodley Park to Brookland	New high-capacity transit corridor; long-term corridor in DC Streetcar System Plan
6	Wisconsin Avenue NW	Georgetown to Tenleytown	PCN trunk line with additional transit facility and service investments
7	Pennsylvania Avenue SE	Capitol Hill to Fairfax Village	PCN trunk line with additional transit facility and service investments
8	Minnesota Avenue SE/NE	Anacostia to Minnesota Avenue Metro	New high-capacity transit corridor; long-term corridor in DC Streetcar System Plan
9	Martin Luther King, Jr. Avenue, South Capitol Street	Anacostia Metro to Eastover	PCN trunk line with additional transit facility and service investments
10	Southern Avenue, MD Route 210	Southern Avenue Metro to National Harbor	New high-capacity transit corridor
11	U.S. Route 1 (DC, MD)	Rhode Island Avenue Metro to College Park	PCN trunk line with additional transit facility and service investments
12	Glebe Road	Ballston to Potomac Yard	New high-capacity transit corridor
13	Lee Highway, U.S. Route 29	Rosslyn to Dunn Loring Metro	New high-capacity transit corridor
14	U.S. Route 1 (VA)	Huntington to Fort Belvoir	PCN trunk line with additional transit facility and service investments
15	I-95	Franconia-Springfield to Lorton	Metrorail Blue Line feeder corridor
16	VA Route 7	Baileys Crossroads to Tysons Corner	PCN trunk line with additional transit facility and service investments
17	I-66	Vienna Metro to Centreville	Metrorail Orange Line feeder corridor
18	Gallows Road	Fairfax Inova Hospital, Merrifield to Tysons	New high-capacity transit corridor
19	VA Route 123	George Mason University to Tysons Corner	New high-capacity transit corridor
20	VA Route 123 Segment	Tysons Corner to McLean	New high-capacity transit corridor
21	Haymarket VRE Extension	Manassas to Haymarket	VRE Manassas Line extension corridor
22	I-495 (Alexandria to Prince George's Co.)	Eisenhower Metro to Branch Avenue Metro via Woodrow Wilson Bridge	New high-capacity transit corridor
23	I-495 (Montgomery Co. to Fairfax Co.)	Montgomery Mall to Dunn Loring via American Legion Bridge	New high-capacity transit corridor
24	MD Route 187, Old Georgetown Road	White Flint to Montgomery Mall	New high-capacity transit corridor
25	Georgia Avenue (MD)	Silver Spring to Wheaton	PCN trunk line with additional transit facility and service investments
26	MD Route 355 (South)	Tenleytown to Rockville	New high-capacity transit corridor
27	MD Route 355 (North)	Rockville to Clarksburg	New high-capacity transit corridor
28	MD Route 212/410	Bladensburg to Takoma-Langley Park	PCN trunk line with additional transit facility and service investments
29	U.S. Route 50	New Carrollton to Bowie (Crain Highway)	Metrorail Orange Line feeder corridor



FIGURE 5-4
Connections among Regional Activity Centers





Planning Background

- **Needs Identified** – urbanizing areas of the inner suburbs and central jurisdictions require better suburb-to-suburb transit connections, upgrades to surface transit services operating in congested mixed-traffic environments and expanded capacity along high-ridership lines.
- **Strategy Modeling** – early modeling of additional enhancements to the Metrobus PCN showed significant benefits in early modeling, by improving regional transit coverage and access to RACs and increasing overall transit mode share. Other packages of streetcar and light rail transit were also tested.
- **Strategy Refinement** – the surface transit strategy assumed the baseline Metro 2025 PCN and incorporated additional corridors and enhancements to select PCN lines based on their ridership, density, and connections to RACs.
- **Future Considerations** – Additional corridor development through a typical alternatives analysis or other planning process must occur for individual corridors to determine the locally preferred mode, specific alignment, and extents of the corridor.

Key Results

Compared to the 2040 Baseline Transit network, the Tier 2 high-capacity surface corridors:

- Increase the number of RACs served by high-capacity, high-frequency transit from 86 to 103, out of the 141 total in the region (see **Figure 5-4**);
- Increase the percentage of WMATA Compact Area households within ½-mile of high-capacity, high-frequency transit from 28 percent to 52 percent;
- Increase the percentage of WMATA Compact Area jobs within ½-mile of high-capacity, high-frequency transit from 47 percent to 68 percent;

- Increase surface transit boardings by almost 30 percent; and
- Decrease total passenger hours spent on crowded buses by over 40 percent.

Order-of-Magnitude Cost Estimate (2013 \$)

Capital Cost:

Unfunded Tier 1 Projects: \$240 million

Tier 2 Projects: \$5.57 billion

Local Bus Enhancements: \$300 million

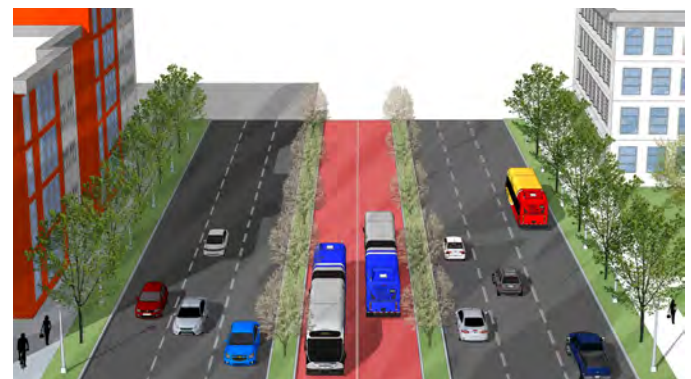
Annual Operating Cost:

\$217 million

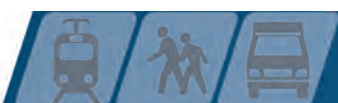
(All costs in 2013 dollars)

Benefits

The new surface transit corridors provide significant benefits to the region's economy by supporting its main locations of growth – the RACs – serving suburb-to-suburb connections among RACs, as well as connections between suburbs and central jurisdictions. The expanded high-capacity, high-frequency surface transit network also helps relieve crowded areas of the Metrorail system, while also facilitating access to suburban stations.



Example of potential new high-capacity transit corridor: Bus Rapid Transit alternative for U.S. Route 1 corridor in Fairfax County, Route 1 Multimodal Alternatives Analysis, Virginia Department of Rail and Public Transportation





Increased Service For Commuter Rail And Commuter Bus

Summary

Commuter rail and commuter bus serve longer-distance travel. They efficiently use existing infrastructure and take advantage of right-of-way that gives priority to transit – rail

lines and HOV lanes – bypassing congestion and provide more reliable travel times. Expanding service during off-peak periods and in the reverse peak-direction can be

TABLE 5-2
Recommended Commuter Rail Enhancements

Enhancements	Description
Extension of VRE service along the Manassas Line to Haymarket, Virginia (Tier 2 Corridor)	• New two-way service operating on the current VRE tracks from Union Station, DC to Manassas City station and continuing to Haymarket • Provides new commuter rail stations and track improvements along the existing freight rail corridor between Manassas and Haymarket
Extension of MARC service to Crystal City, Virginia	• New two-way MARC commuter rail services from Union Station south across the Potomac River to Crystal City Station in Virginia • Requires new platform and track facilities and depends on the planned reconstruction and expansion of the Long Bridge river crossing that serves freight, passenger, and commuter rail lines
More frequent peak-period service	• VRE Manassas Line – increased service, both directions • VRE Fredericksburg Line – reverse peak service • MARC Brunswick Line – increased peak-direction service
Expanded off-peak period service	• VRE Manassas and Fredericksburg Lines – bi-directional, all-day • MARC Brunswick and Camden Lines

FIGURE 5-5
Recommended Commuter Rail Enhancements

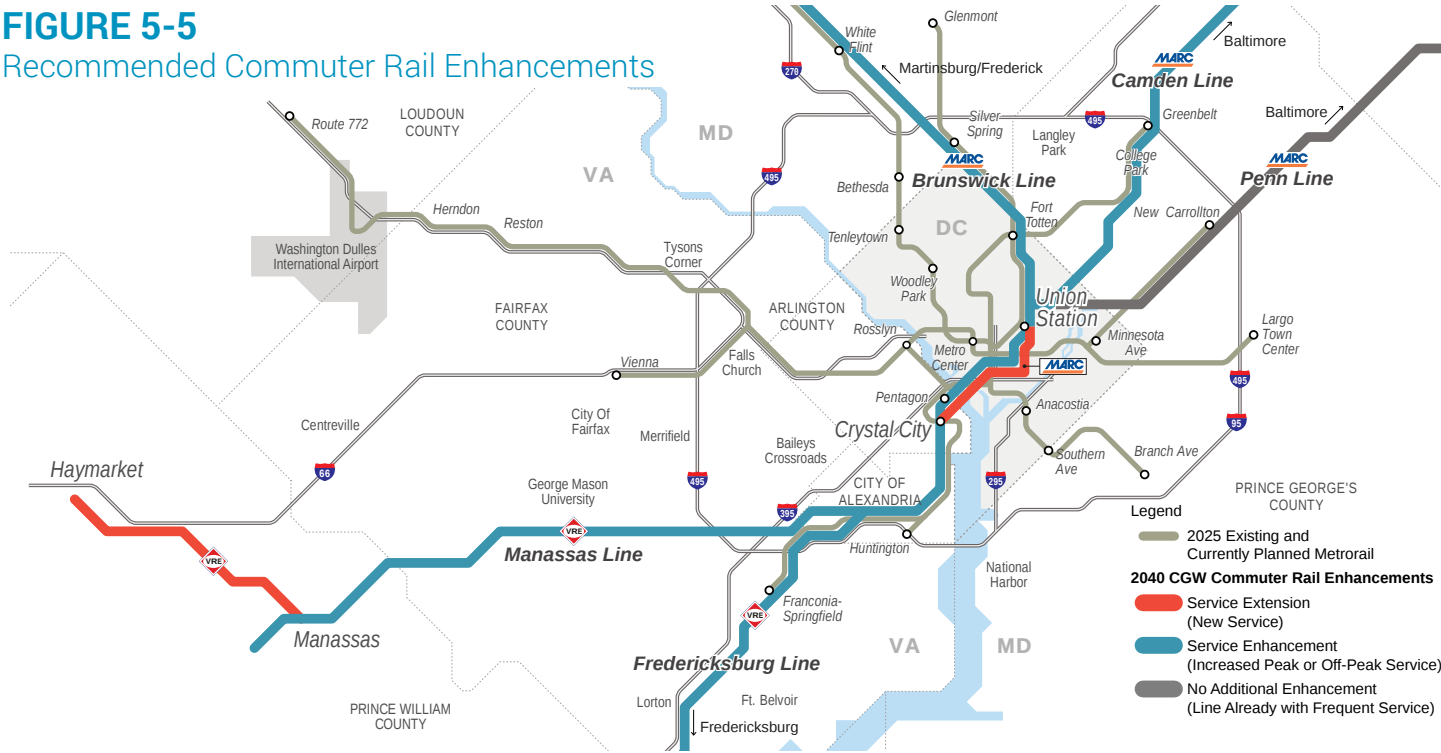




TABLE 5-3

Commuter Bus Peak Period
Service Enhancements

2040 Baseline Frequency	2040 Recommended Frequency
60 min	40 min
40 min	30 min
30 min	20 min
20 min	15 min
15 min	12 min

accomplished with less capital investments than needed for Metrorail. The recommended 2040 transit network includes enhancements to existing services as well as extensions of service (see **Table 5-2**, **Figure 5-5**, and **Table 5-3**).

Goals Addressed

-  Enhance environmental quality, improve energy efficiency, and protect human health and safety
-  Provide a high-quality transit system that accommodates and encourages future ridership growth
-  Provide a financially viable and sustainable transit system that is efficient and effective for the region

Opportunities Provided

- Improves connections between Regional Activity Centers
- Operates efficient region-wide transit service

Planning Background

- Needs Identified** – Commuter bus can extend the reach of Metrorail, by providing feeder service to end-of-line Metrorail stations and helping relieve their crowded Park & Rides. Both commuter bus and commuter rail can relieve Metrorail passenger loads by providing more direct long-distance travel into the central jurisdictions and core. Outlying RACs with commuter rail stations lack reverse-peak and off-peak

service that could significantly broaden their transit accessibility.

- Strategy Modeling** – Commuter bus and commuter rail enhancements were included as common strategies in most scenario modeling
- Strategy Refinement** – Various refinements were made to optimize service frequencies, directions, and hours during the process of scenario testing
- Future Considerations** – Although many commuter rail frequency improvements, especially new reverse peak direction and off-peak service, can utilize existing right-of-way and vehicles, some improvements would require significant capital improvements and inter-agency coordination, such as extending MARC into Virginia. Commuter bus service improvements should also be coordinated with private operators, which are a significant share of the market.

Key Results

The commuter rail and bus service enhancements significantly increase 2040 boardings:

- Commuter rail: 61% increase
- Commuter bus: 24% increase

Order-of-Magnitude Cost Estimate

Capital Cost:

Commuter Rail: \$2.74 billion

Commuter Bus: \$100 million

Annual Operating Cost:

Commuter Rail: \$36 million

Commuter Bus: \$59 million

(All costs in 2013 dollars)

Benefits

The service enhancements efficiently use existing right-of-way to extend the reach of high-quality transit, saving time, energy, and costs for long-distance commutes.





New Metrorail Lines for the Region's Core

Summary

To provide the necessary relief for the Metrorail Core, a new Metrorail loop line with connections between existing and new stations and a new Orange/Silver Express Line in Virginia are recommended:

- **New Core Metrorail Loop** – extending two-way Blue/Yellow Metrorail Service through Rosslyn, Georgetown, northern downtown DC generally along M Street NW, to Union Station, Capitol Hill and the Capitol Riverfront to Pentagon, with regularly spaced stations along the route.
- **Pedestrian Tunnel Connections** – providing multiple opportunities for transferring between lines rather than focusing transfers on just one or two locations. New pedestrian tunnels will link stations on the new Metrorail loop with stations on existing core lines.
- **Orange/Silver Express Line** – building a new separate two-way express line, between East Falls Church and Rosslyn via a new station at Ballston, to provide express service and relieve projected congestion and delay along the local Orange and Silver Metrorail Line in this area; the new line connects to the Core Loop's second tunnel under the Potomac River near Rosslyn for express service directly into the District of Columbia.

Goals Addressed



Facilitate transit-oriented, mixed-use communities that capture employment and household growth, providing choices in where to live, work, and play



Provide a high-quality transit system that accommodates and encourages future ridership growth

Opportunities Provided

- Reduces congestion in the region's transit system core
- Improves central jurisdiction circulation

Planning Background

- **Needs Identified** – Metrorail core congestion is becoming significant, and Metro recognized the need to separate Green/Yellow Lines at L'Enfant Plaza and Blue/Orange/Silver Lines at Rosslyn and to provide additional service to Union Station.
- **Strategy Modeling** – The planning process tested a new Blue Line along M Street NW to Union Station and out H Street NE to Benning Road and a new Yellow Line through Southwest and Southeast DC to Union Station, and up North Capitol Street.
- **Strategy Refinement** – Metro noted that ridership and corridor density dropped north and east of Union Station. As a result, a new core Metrorail loop was created that resolves core congestion and addresses the identified 2040 service needs.
- **Future Considerations** – The core loop should not preclude future Metrorail extensions as corridor land use evolves to become supportive of transit-oriented development and station access.





FIGURE 5-6
New Core Metrorail Loop and Orange/Silver Express Line

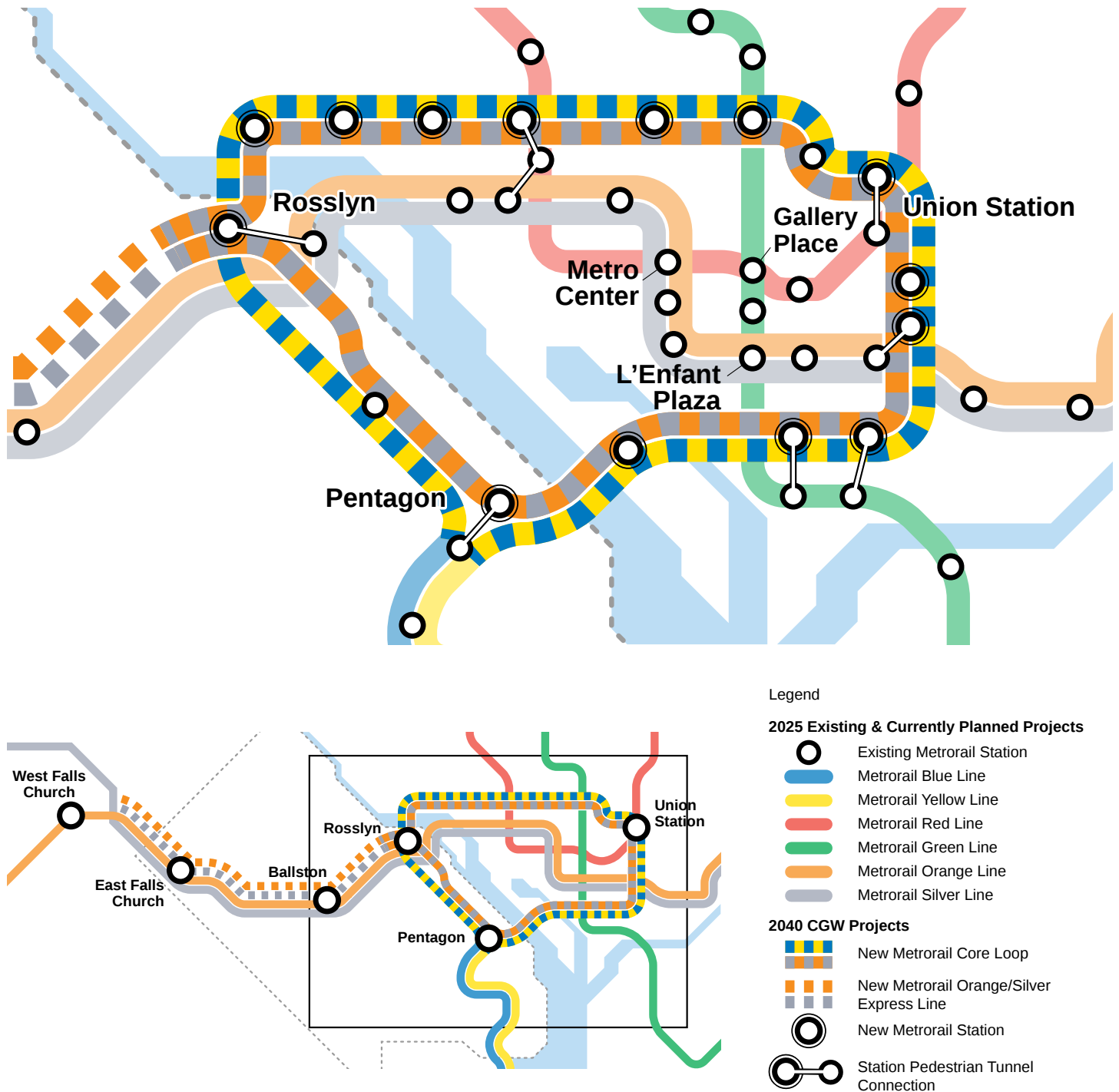


FIGURE 5-7
2040 Baseline Metrorail Passenger Loads

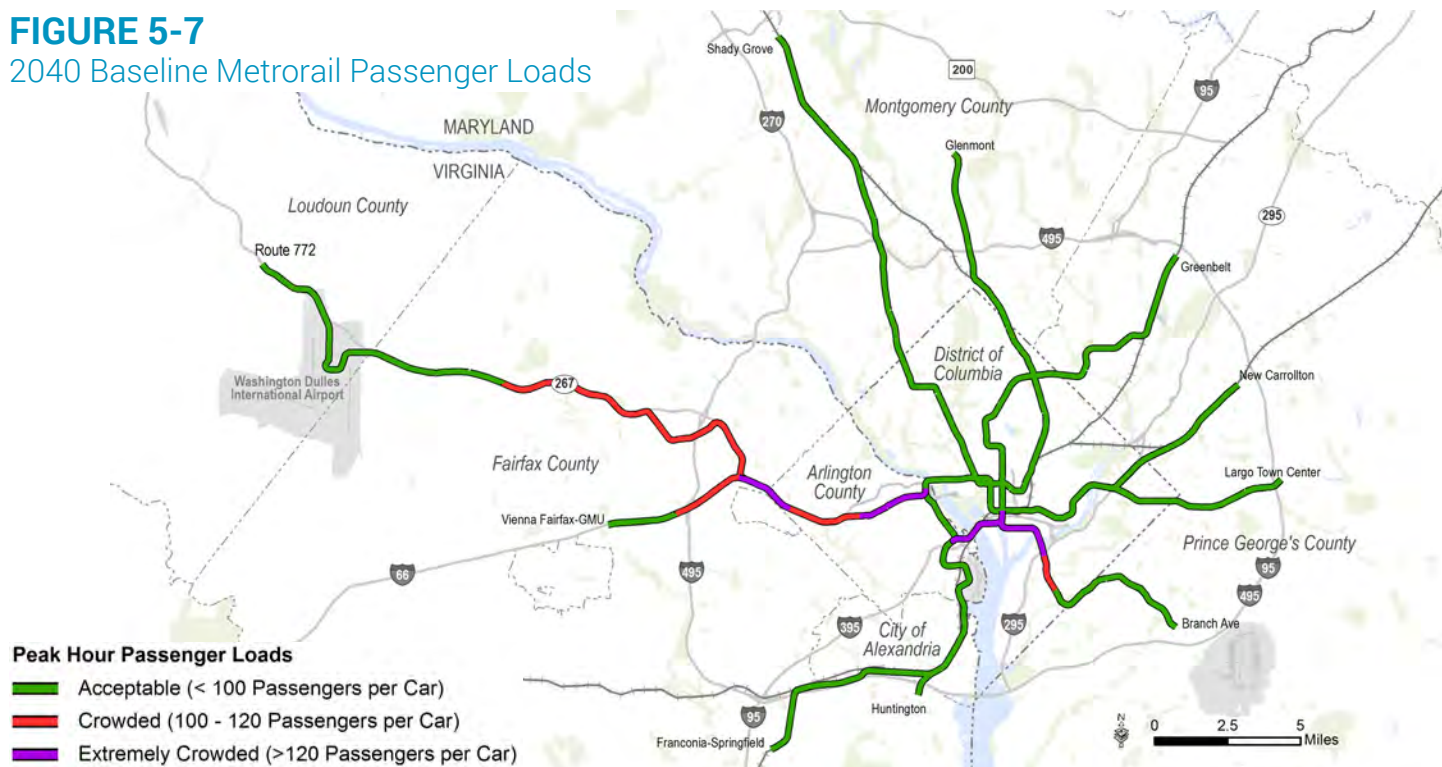
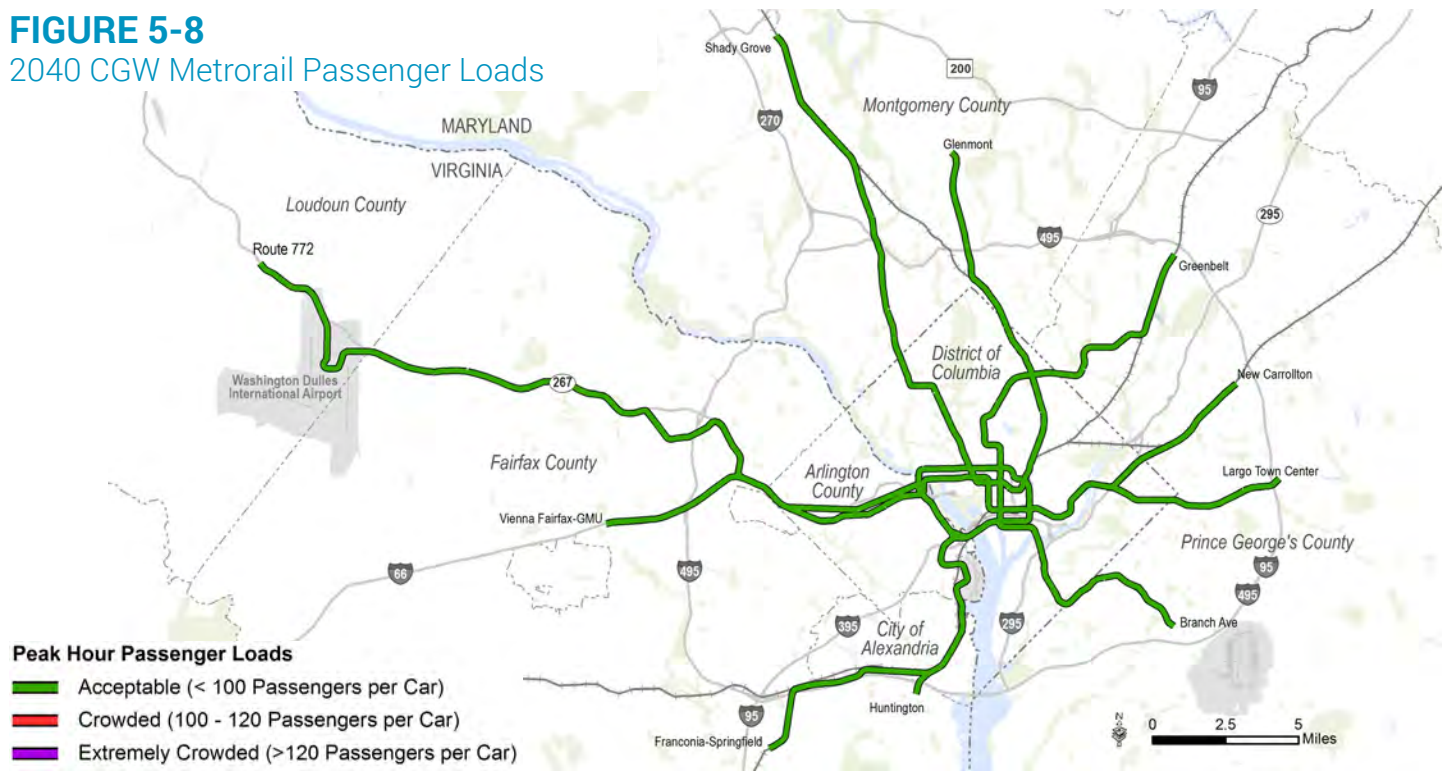


FIGURE 5-8
2040 CGW Metrorail Passenger Loads





Key Results

Compared to the 2040 Baseline Network, the CGW Network with new Metrorail Lines:

- Increases the number of peak period trains per hour entering the region's core from 149 to 164 per hour. **Table 5-4** lists the corridors with capacity improvements.
- Reduces total person hours of travel on crowded Metrorail vehicles from 49,000 per day to 1,600 per day. **Figures 5-7** and **5-8** show the 2040 Base and 2040 CGW network reduction in crowded passenger loads by Metrorail line segment.
- Relieves the system's key transfer stations by reducing transfers in the core by 31 percent.

TABLE 5-4

Improvements to Metrorail Line Capacity in Key Corridors

Line Segment/Station	Trains per Hour Peak Period, Each Direction	
	2040 Baseline	2040 CGW
Northern Virginia Orange/Silver Line (East Falls Church to Rosslyn)	20	40
Northern Virginia Blue/Yellow Line (King Street to Pentagon)	20	26
Maryland/DC Green Line (Greenbelt to Branch Ave)	10	15
New Core Loop (Rosslyn to DC to Pentagon)	-	20-26

Order-of-Magnitude Cost Estimate

Capital Cost: \$23.54 billion

Annual Operating Cost: \$37 million

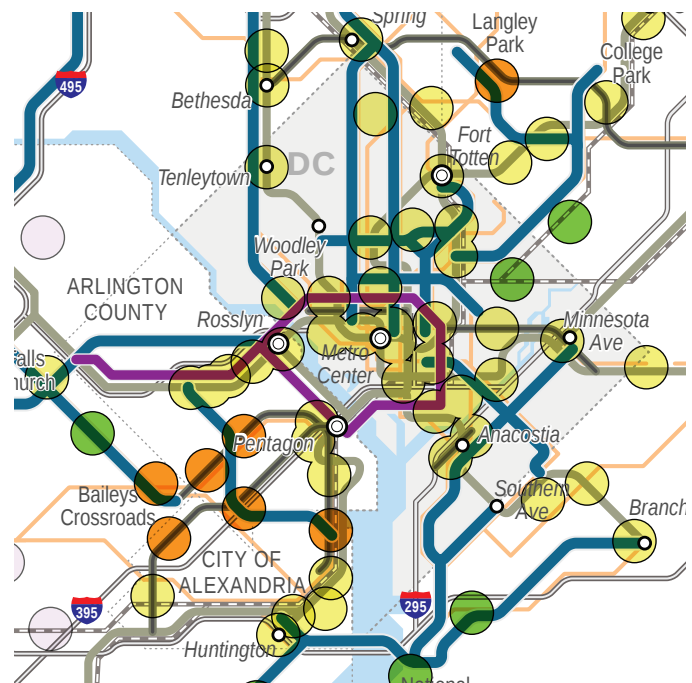
(All costs in 2013 dollars)

Benefits

The new Metrorail lines resolve the future system crowding, both on train cars and at crowded transfer stations. In addition, the new lines bring Metrorail service to new areas, supporting underserved areas of the region's core and facilitating economic development in areas adjacent to the core (see **Figure 5-9**). The new lines also foster system redundancy, providing a new river crossing and interline connections that make the system more flexible and better able to respond to service disruptions.

FIGURE 5-9

Central Jurisdiction Circulation



MWCOG Regional Activity Center

- Existing service by Metrorail System
- New service by CLRP high-capacity, high-frequency transit projects
- New service by 2040 CGW high-capacity, high-frequency transit projects
- Not served by high-capacity, high-frequency transit (expanded service by 2040 Local Bus, Metrobus PCN, Commuter Rail, or Commuter Bus)





Overall 2040 Recommended Network Performance

Summary

Overall, the 2040 Recommended CGW Network achieves the following when tested against the baseline transit network:

- Significantly relieves Metrorail core capacity, eliminating overcrowded Metrorail segments, and also significantly reduces bus vehicle crowding;
- Substantially expands the reach of high-capacity, high-frequency transit in the region, bringing service to additional regional activity centers (RACs) and within ½ mile of significantly more households and jobs;

- Creates significant regional transit travel time savings for trips to/from RACs; and
- Increases daily transit trips and service, especially to RACs and within central jurisdictions.

Figure 5-10 through **Figure 5-14** on these and the following pages show the significant modeling results of the plan compared to the 2040 Baseline and existing conditions (using base year of 2007).

FIGURE 5-10

2040 Overall Travel Demand

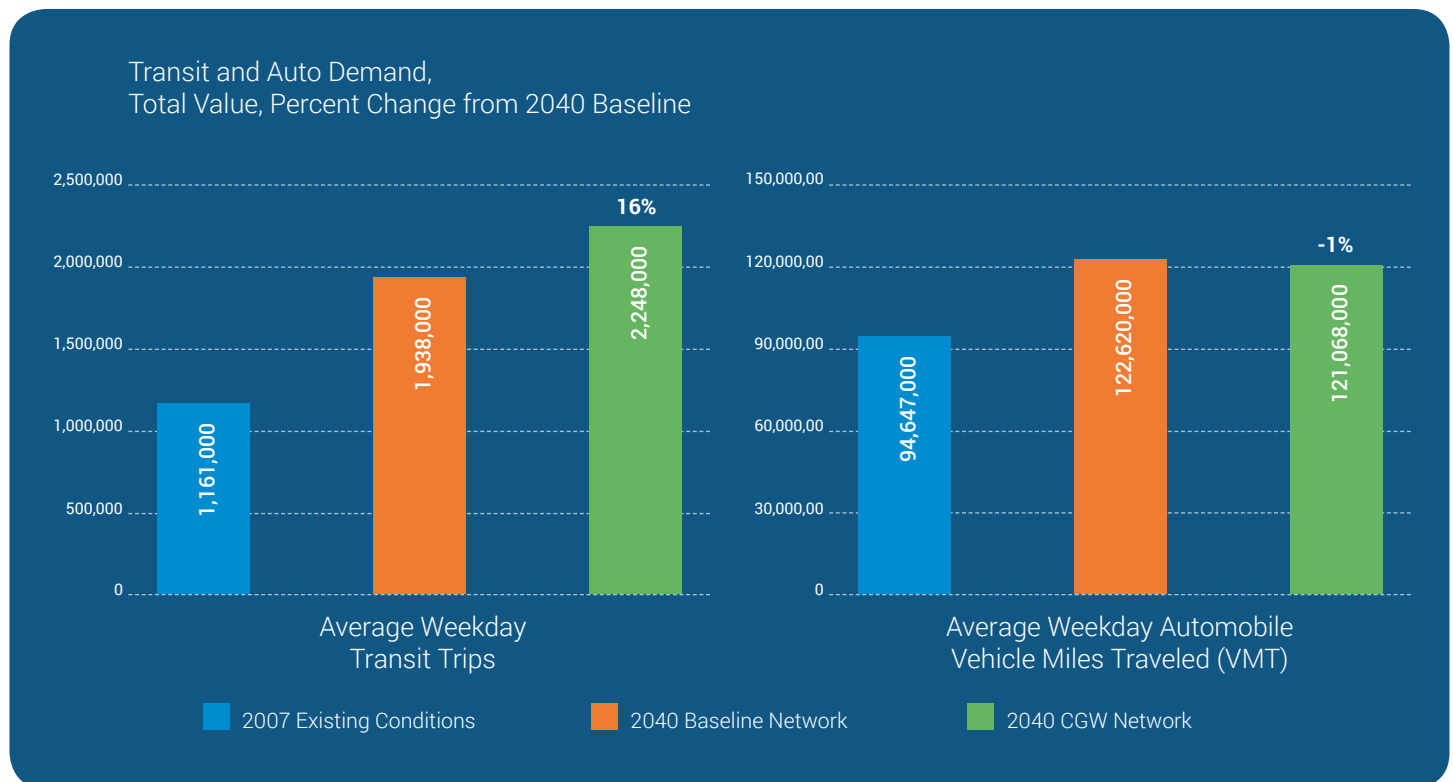
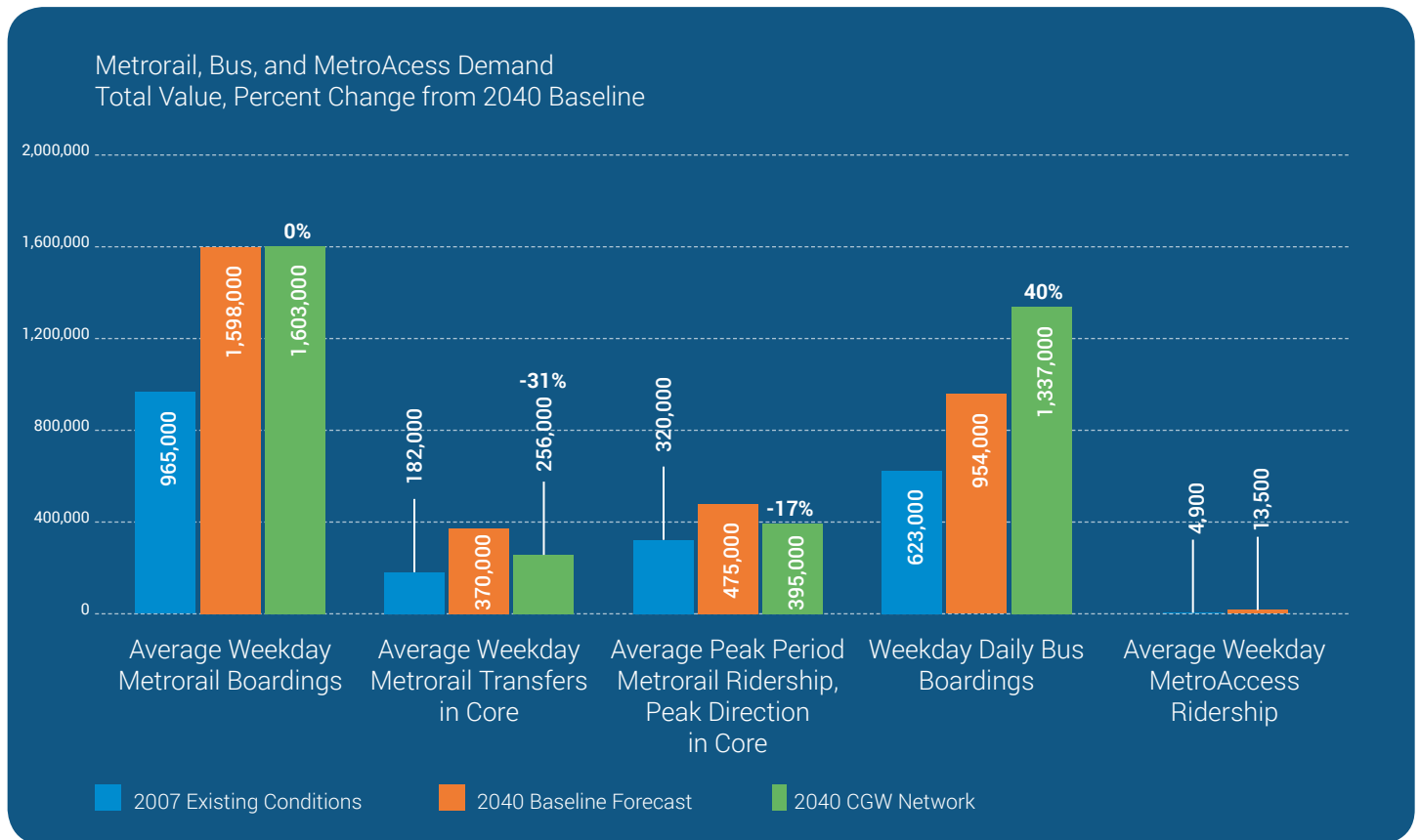




FIGURE 5-11
2040 Transit Demand



Goals Addressed

Enhance environmental quality, improve energy efficiency, and protect human health and safety

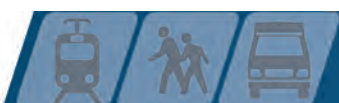
The CGW Network results in measurable benefits, even at the broader regional level:

- Lowers per capita VMT, from 14.2 to 14.0; and
- Decreases the Congested Person Miles of Travel in autos and buses by 2 percent.



Facilitate transit-oriented, mixed-use communities that capture employment and household growth, providing choices in where to live, work, and play

- Increases the number of RACs served by high-capacity transit in 2040 from 86 to 103 out of 141 total;
- Increases the number of daily transit trips both to/from RACs (13 percent) and outside of RACs (19 percent); and
- Creates significant regional transit travel time savings for trips to/from RACs (129,000 hours saved out of approximately 850,000 total hours of daily transit travel).





Maximize availability of and convenient access to integrated transit choices

- Increases the number of total regional daily transit trips by 16 percent;
- Increases the numbers of households (85 percent increase) and jobs (46 percent increase) within ½ mile of high-capacity, high-frequency transit;
- Relieves Metrorail Park & Ride capacity by increasing the number of stations with available parking from 15 to 20; and
- Provides travel time savings for both the eastern and western sides of the region.

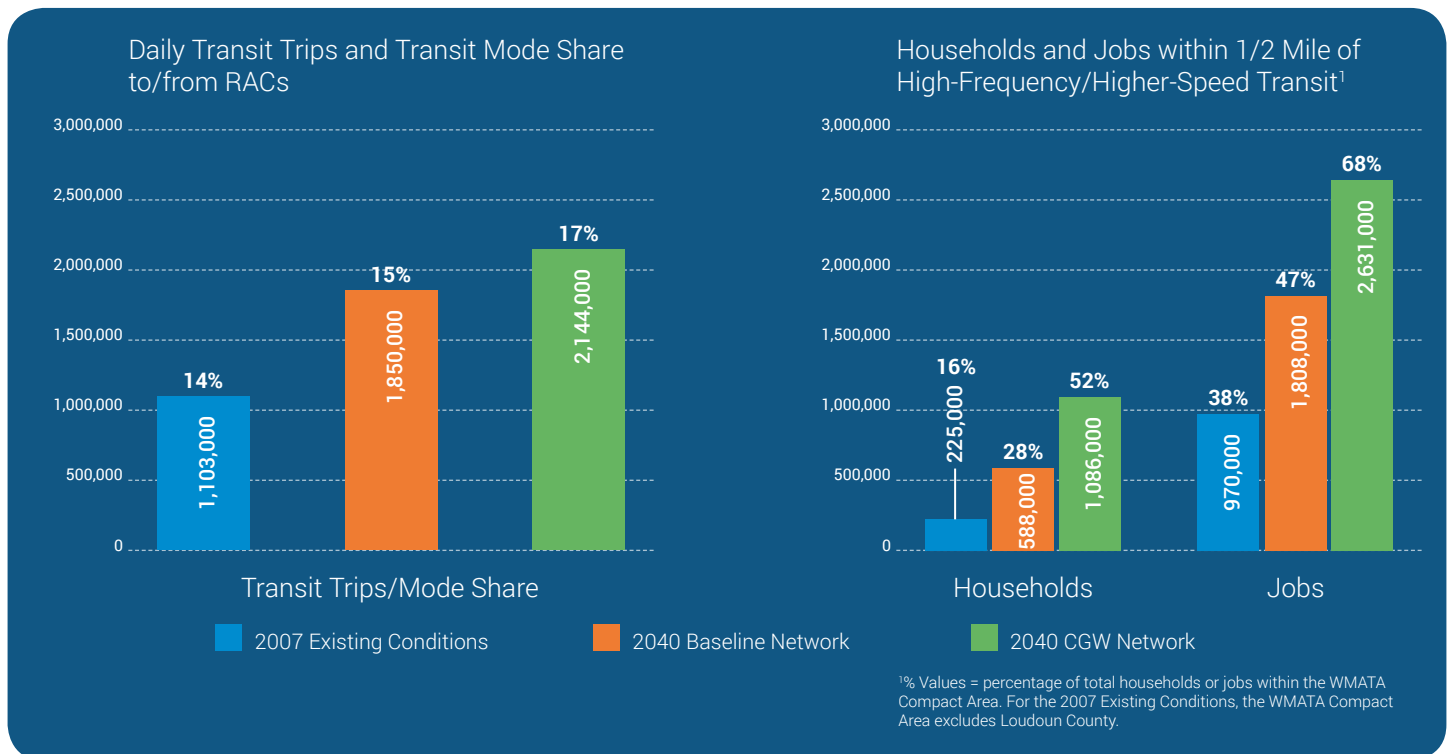


Provide a high-quality transit system that accommodates and encourages future ridership growth

- Relieves transit passenger crowding by reducing the number of passenger hours on crowded vehicles by 74 percent;
- Relieves Metrorail transfer stations by reducing total transfers by 31 percent;
- Reduces the congested peak-period/peak-direction volume of Metrorail passengers traveling into the congested core by 17 percent;
- Improves overall regional accessibility by increasing the numbers of jobs available within 45 minutes both by transit (9 percent increase) and by auto (4 percent increase); and

FIGURE 5-12

Daily Transit Trips to/from RACs and High-Frequency/Higher-Speed Transit Proximity





- Increases transit mode share of trips produced in the core (from 41 to 45 percent), central jurisdictions (from 27 to 30 percent), and inner suburbs (from 8 to 9 percent).

\$ Provide a financially viable and sustainable transit system that is efficient and effective for the region

- Increases transit service, as measured by revenue vehicle miles, by 11 percent in peak periods and 18 percent in the off-peak;
- Maintains same average daily transit capacity utilization of the overall network as the baseline (44 percent), while reducing passenger crowding; and
- Results in operating costs per passenger mile slightly higher than the 2040 Base network (\$0.25 per mile versus \$0.21).

FIGURE 5-13

Daily Person Hours of Transit Travel on Congested Vehicles²

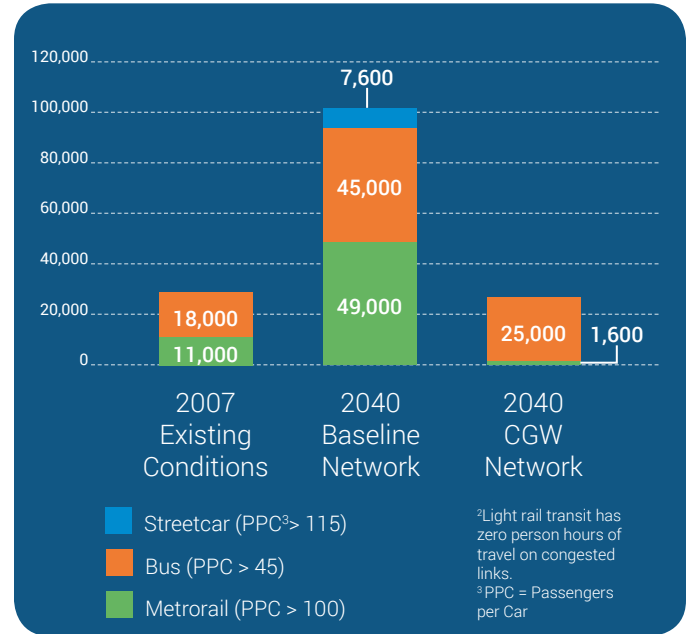
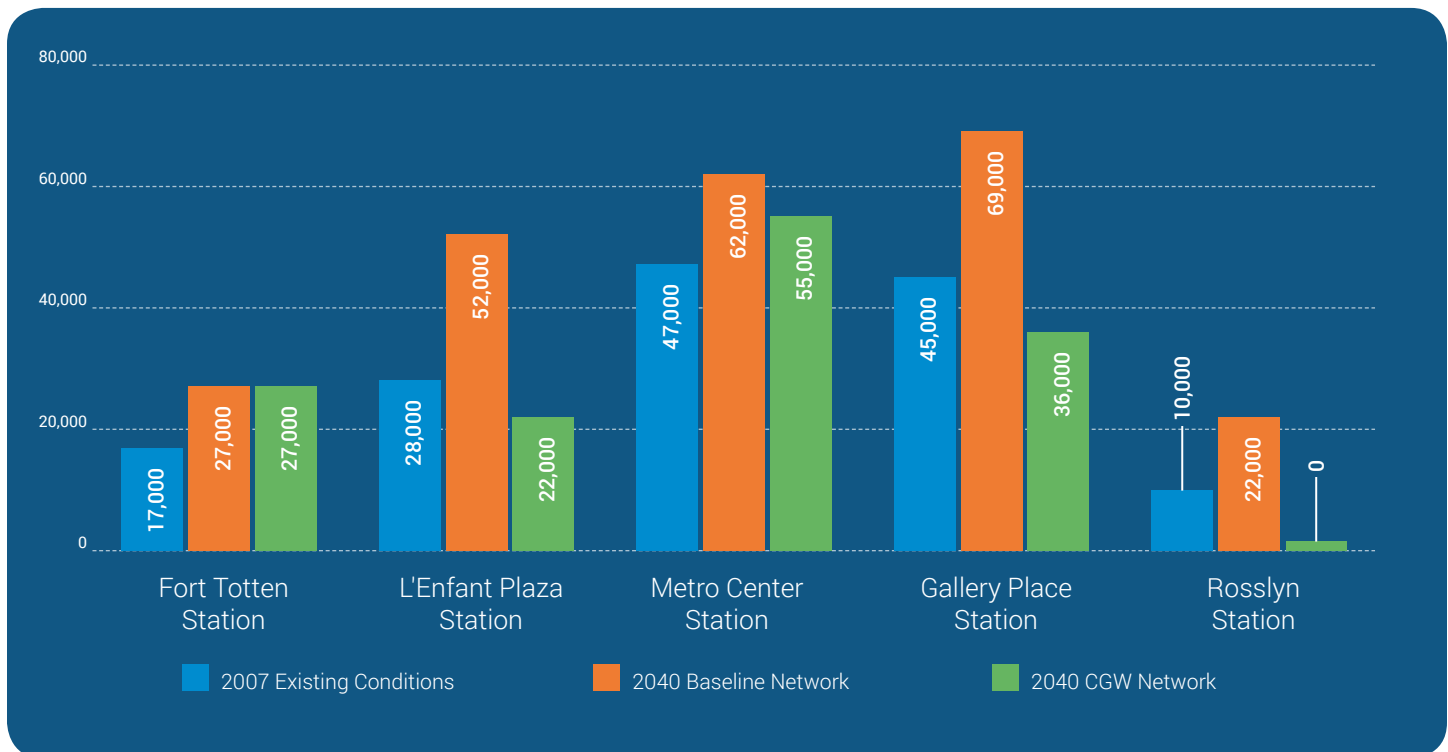


FIGURE 5-14

Metrorail Transfer Capacity - Average Weekday Metrorail Transfers at Core Stations





6.0 COSTS AND BENEFITS

Every dollar of capital invested in *ConnectGreaterWashington* transit improvements will return 1.17 to 1.24 dollars of benefits to the region.

This section summarizes the costs and benefits of the *ConnectGreaterWashington* plan. Order-of-magnitude capital and operating costs are estimated for the *ConnectGreaterWashington* transit strategies. The diverse types of economic benefits of the transit strategies for the region are estimated and compared with the capital costs.

Costs of the System Plan

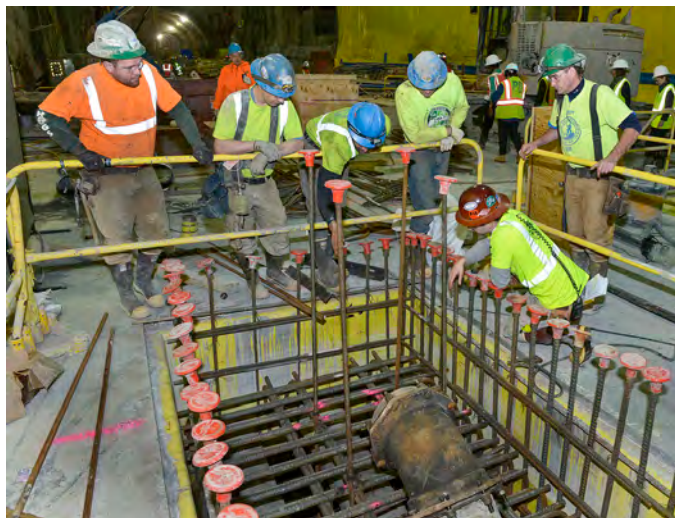
Order-of-magnitude capital and operating costs for the plan are summarized below. Detailed conceptual costs and assumptions are included in Appendix I.

Capital Costs

Table 6-1 shows the estimated incremental order-of-magnitude capital costs (in Year 2013 dollars) for the full system plan. The cost estimates are based on unit costs per mile or per vehicle from similar projects in the Washington Metropolitan Area where possible or similar projects from other areas when necessary.

TABLE 6-1
2040 CGW Network Order-of-Magnitude Capital Costs

Strategy	Costs (in Millions, Year 2013 \$)
Tier 1 High-Capacity Transit Corridors (unfunded portion)	\$241 M
Tier 2 High-Capacity Transit Corridors	\$5,571 M
Vehicles for Additional Local Bus Service Enhancements	\$303 M
Commuter Rail Service Enhancements	\$1,756 M
Commuter Bus Service Enhancements	\$98 M
New Metrorail Lines in the Core	\$23,541 M
Total Capital Costs	\$31,510 M



Incremental Operating Costs

Table 6-2 shows the estimated annual operating costs (in Year 2013 dollars) for the additional transit service provided by the CGW network above the 2040 Baseline transit service. The cost estimates are based on unit costs per vehicle hour by mode from Metrorail, Metrobus, and the FTA National Transit Database.

TABLE 6-2
2040 CGW Network Annual Operating Costs
(Additional above Baseline)

Strategy	Annual Costs (in Millions, Year 2013 \$)
Tier 2 High-Capacity Surface Transit and Local Bus Enhancements	\$271 M
Commuter Rail Service Enhancements	\$36 M
Commuter Bus Service Enhancements	\$59 M
New Metrorail Lines in the Core	\$37 M
Total Annual Operating Costs	\$348 M

Regional Benefits of the 2040 Planned Network

The 2040 recommended system plan directly addresses the transit system's core capacity constraints and provides important enhancements in system mobility and connectivity. These improvements will yield a diverse set of benefits to the region, beyond enhanced mobility. Beneficiaries include transit riders, auto travelers, Metro member jurisdictions, and the broader regional community. This is a plan that fulfills a long-term vision for the region—the package of projects described in this plan support the economy of this generation and the

next—well beyond 2040. Benefits generated by the 2040 *ConnectGreaterWashington* plan are summarized below.

Travel Time, Reliability, and Cost

Travel time savings – more transit riders are accommodated by Metro's additional capacity, and as a result, the remaining auto travelers experience less congested roadways. The annual travel time savings associated with CGW (for both transit and auto modes combined) in 2040 are:

- 24.6 million total hours for personal/commute trips
- 1.2 million total hours for business trips

Greater reliability – transit passengers no longer need to wait as long for the next train or plan as much extra time into their trips to accommodate surprise delays. The annual reduced transit passenger delay savings associated with CGW in 2040 are:

- 2.2 million total hours for commutes and other personal trips
- 0.1 million hours for business trips

Travel cost savings – additional travelers throughout the region can be accommodated on transit rather than driving, paying a fare for the full transit trip that is often less than the cost of parking alone. Their total annual savings in 2040 are:

- \$128 million (2013 \$) in travel costs, including auto operating cost savings, parking cost savings, and toll cost savings, less transit travel costs

Safety and Environmental Quality

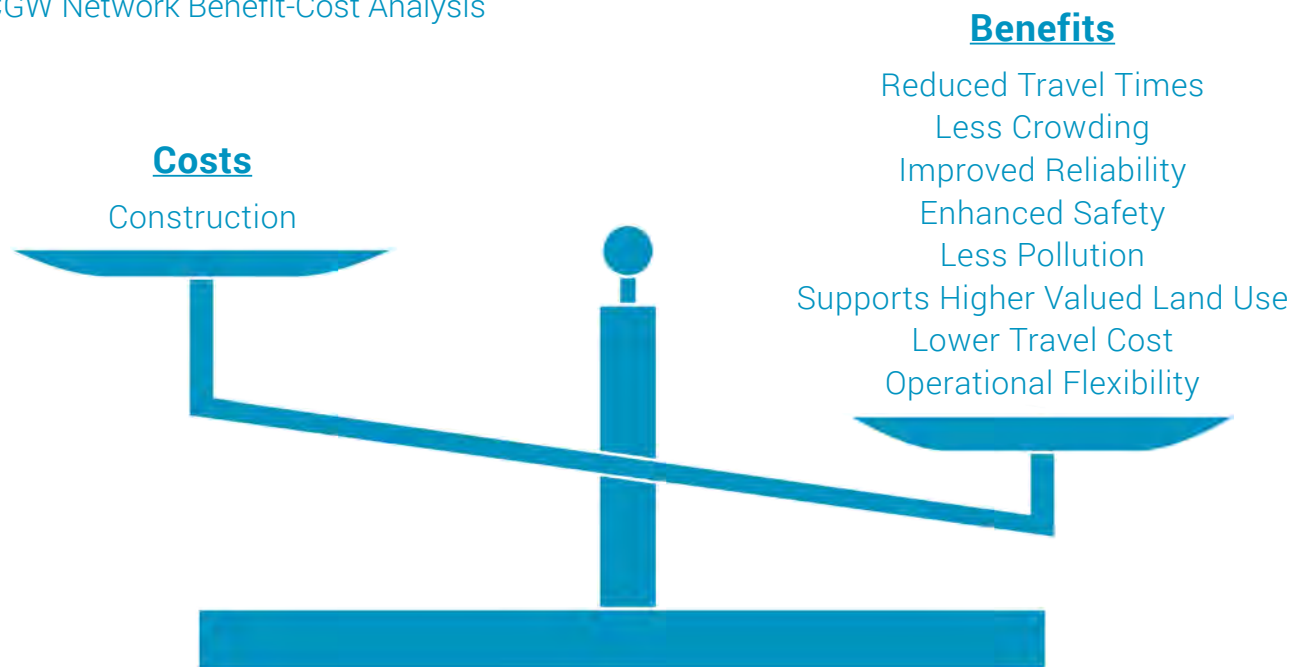
Fewer injuries and fatalities – a greater number of travelers can make their trips on mass transit, which is a safer travel mode than personal automobiles. As a result of the reduced auto vehicle miles traveled (VMT) associated with the CGW network, the likelihood of accidents is reduced in 2040, potentially avoiding each year:





FIGURE 6-1

2040 CGW Network Benefit-Cost Analysis



- 480 fatalities and injuries
- 1,200 crashes (with no injuries)

Reduced crowding – a safer and more pleasant transit travel experience results from less passenger crowding on Metrorail trains. The annual benefits from reduced crowding due to CGW's Metrorail core capacity improvements in 2040 are:

- 167 million Metrorail riders experiencing reduced crowding
- \$17 million (2013 \$) in value, estimated using a “willingness to pay” methodology, based on higher fares passengers would be willing to pay for a more comfortable, less crowded transit trip

Avoidance of pollutant and greenhouse gas emissions – contributing to a healthier, more pleasant and sustainable community. Overall annual reductions in pollutants associated with CGW in 2040 include:

- 80 short tons of Nitrogen Oxides
- 150 short tons of Volatile Organic Compounds
- 4 short tons of Particulate Matter-2.5
- 207,700 metric tons of Greenhouse Gases

Regional Infrastructure and Economic Development

Avoidance of highway and parking infrastructure costs – without the CGW improvements, significant highway improvements and new parking facilities would be needed to maintain our region's current (and already congested) roadway traffic level of service. The smaller footprint of transit facilities frees up land that otherwise would be required to widen roads and bridges and build parking facilities, allowing the land to be used for more valuable uses. The infrastructure, and associated loss of land for housing, businesses and other uses, saved as a result of CGW improvements are:



COSTS AND BENEFITS



- 96.4 miles of new roadway lanes and 1.7 miles of new bridge lanes across the region
- 33,800 additional parking spaces that would have been needed to accommodate demand in downtown DC and Arlington — or the equivalent of approximately 28 city blocks with five-story parking garages

Improved worker productivity – reduced freeway congestion as a result of CGW lessens the economic drag on the region's economy caused by traffic jams. As a result of the improved freeway operations provided by CGW, the region in 2040 has the potential to retain annually:

- \$86 million (2013 \$) in additional gross domestic product (GDP), or the equivalent of approximately 610 recurring jobs

Greater system operational flexibility – more efficient planning for weekend maintenance activities is enabled through multiple tracks, new rail service, and alternate routes available as a result of CGW investments. This flexibility will divert some travelers back to transit, particularly on weekends, reducing personal travel costs, as well as avoiding the higher pollutant emissions and accidents associated with driving. These annual benefits total \$4 million (2013 \$) in 2040.

Higher land values around new transit stations – the increase in value for taxable properties within ½ mile of new transit stations associated with CGW improves the tax base of member jurisdictions by approximately \$2

billion (2013 \$). This amount reflects the positive impact of the personal travel time savings described above on Metro's member jurisdictions.

Total Benefits

Taken together, the value of these diverse transportation benefits, along with the residual value of CGW investments beyond 2040, exceeds the capital costs of the *ConnectGreaterWashington* projects and strategies by a ratio of 1.17 to 1. If the retained regional productivity associated with reduced freeway congestion is included, the value of these benefits exceeds the capital costs by a ratio of 1.24 to 1. That means for every dollar of capital invested, the program returns 1.17 to 1.24 dollars of benefits to the region.



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7.0 MOVING FORWARD

Next steps involve coordination between other ongoing planning initiatives and *ConnectGreaterWashington* along with further project development and parallel corridor land use planning by local jurisdictions

ConnectGreaterWashington is one step in a regional effort to expand the Washington metropolitan area's high-capacity transit network for 2040 and beyond. As described in the planning context, there are parallel initiatives among the region's jurisdictions to envision their future local transit networks and regional connections. Efforts such as the next major update of the CLRP in 2014 and the ongoing *moveDC* multimodal transportation plan will be coordinated with the recommendations of *ConnectGreaterWashington*.

In addition, many projects proposed in the plan, such as streetcar and LRT, would likely be built and operated by Metro's member jurisdictions and partnering transit service providers, necessitating a higher level of coordination than projects involving Metro's existing assets. Stakeholder involvement throughout the *ConnectGreaterWashington* planning process sets the stage for this next step in project development and parallel corridor land use planning by local jurisdictions.

New planning initiatives could affect regional assumptions for future land use and development. Given the inevitable evolution in the region's social and economic environment over the next 25 years, periodic reviews of the plan will help guide adjustments in planning for new high-capacity transit as needed.

Regional Paratransit Coordination

As recent trends and future forecasts show, demand for MetroAccess is expected to grow dramatically and this growth would be financially unsustainable for the region. Although MetroAccess is the region's largest ADA paratransit provider, state and local jurisdictions support a wide array of alternative paratransit programs that are run by social service agencies, non-profit organizations, Medicaid and local government paratransit providers. Without the need to meet especially robust ADA requirements, these alternative services often cost substantially less than MetroAccess and should be leveraged.

