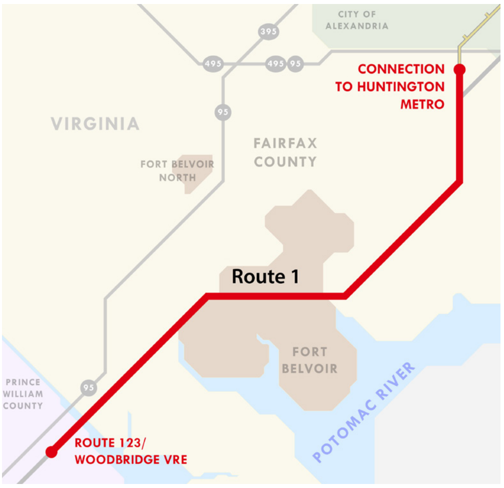
Route 1
Multimodal Alternatives Analysis

EXECUTIVE SUMMARY
February 2015

DRPT Virginia Department of Rail and Public Transportation
Office of INTERMODAL Planning and Investment
VDOT

INTRODUCTION

The Route 1 Multimodal Alternatives Analysis addresses the mobility needs of Richmond Highway in Northern Virginia. The study evaluated the benefits, costs, and impacts of implementing multimodal improvements along a 15-mile stretch of Richmond Highway, extending from the I-95/I-495 Beltway area, through Fairfax County, to the VRE Station at Woodbridge in Prince William County. The study was initiated to identify a program of multi-modal improvements that best meets both the community needs and the needs of travelers to and through the corridor.



Study Corridor

Through stakeholder participation and technical analysis, the study resulted in a recommended program of transportation improvements for adoption by Fairfax County and Prince William County. Solutions included combinations of transit, roadway, pedestrian, and bicycle improvements.

PROJECT PROCESS AND PUBLIC INVOLVEMENT

Led by the Virginia Department of Rail and Public Transportation (DRPT), the study was an 18-month collaborative effort among Fairfax County, Prince William County, the Virginia Department of Transportation (VDOT), and the Virginia Office of Intermodal Planning and Investment (OIPI). An Executive Steering Committee, comprised of elected officials and senior staff from the key stakeholder groups, provided guidance throughout the study. The process also included frequent public outreach and events to ensure that the community and stakeholders played an active role in guiding the outcomes of the study.

PROJECT PURPOSE AND GOALS

The purpose of the study is to provide improved transit, bicycle and pedestrian, and vehicular conditions and facilities along the Route 1 corridor that support long-term growth and economic development. The study developed and evaluated a range of multi-modal solutions to address the transportation needs of the corridor.

LOCALLY PREFERRED ALTERNATIVE RECOMMENDATION

After reviewing the technical results and listening to feedback from the project committees and the community, the project's Executive Steering Committee endorsed a phased implementation of the multimodal (roadway, bicycle/pedestrian, and transit) improvements of "Alternative 4 BRT/Metrorail Hybrid", including:

- **Roadway Widening** – Widen roadway from four lanes to six through lanes where necessary to create a consistent, six-lane cross section (three lanes in each direction)
- **Bicycle and Pedestrian Facilities** – Create a continuous facility for pedestrians and bicyclists along the 15 mile corridor; the configuration will vary depending upon urban design, right-of-way availability, and other local considerations
- **Transit** – Contingent upon increased land use density and project funding, implement a median-running Bus Rapid Transit (BRT) system from Huntington to Route 123 in Woodbridge (curb-running BRT in mixed traffic within the Prince William County portion) and a 3-mile Metrorail Yellow Line extension from Huntington to Hybla Valley as expeditiously as possible

Goals

Expand attractive multimodal travel options to improve local and regional mobility	Improve safety and increase accessibility	Increase economic viability and vitality of the corridor	Support community health and minimize impacts on community resources

CORRIDOR PLANNING INITIATIVES

Numerous past studies and plans completed for the corridor consistently identified four key findings:

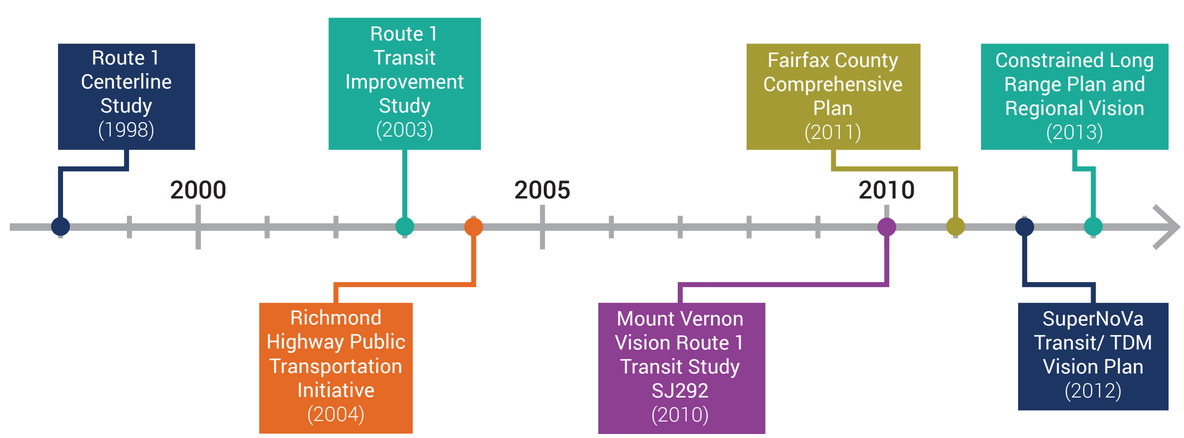
- Growth in regional population and employment, as well as changes in job concentrations, have driven greater demand for travel in the constrained corridor.
- Safety for users of all types (drivers, walkers, bicyclists, and transit riders) remains a concern.
- Land use and economic plans anticipate further growth and redevelopment.
- Maintaining housing affordability and diversity is an increasing challenge.

The two foundational studies for this effort are the VDOT Route 1 Centerline Study (1998) and the DRPT Route 1 Transit Study (2010). The VDOT study recommended widening the roadway and improving pedestrian and bicycle facilities, as well as preserving right-of-way for transit.

The DRPT study recommended a further detailed assessment to examine the feasibility of dedicated transit running way and evaluation of modes to address congestion, capacity, and pedestrian safety issues along the corridor.

The Fairfax County Comprehensive Plan incorporates the findings of the Centerline Study, but stipulates that there should be no more than six general purpose travel lanes on Route 1 through the study area. The Prince William County Plan also calls for Route 1 to be a six-lane facility within the study area. These recommendations are already being carried out through Route 1 widening projects around Fort Belvoir in Fairfax County and at the Route 1/Route 123 interchange in Prince William County.

Previous Plans and Studies



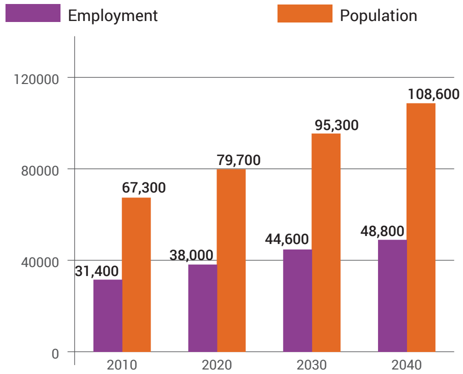
CORRIDOR TRANSPORTATION CHALLENGES

The need for the project stems from existing and anticipated transportation problems along the corridor related to limited transit service, poor bicycle and pedestrian facilities, and high traffic volumes. These deficiencies limit accessibility and multimodal connectivity and are not supportive of the desired economic development and growth along the corridor.

The existing person carrying capacity of the corridor is constrained. Integrated multimodal improvements are needed to support the anticipated high levels of employment and residential growth. Without transportation capacity improvements that encourage pedestrian and transit travel, it is unlikely that the projected growth can be accommodated within the corridor, and the associated economic opportunity of additional jobs and residents will be limited.

Attractive multimodal options are needed to help serve the large transit-dependent population who rely on bicycling, walking, and/or transit to meet the needs of daily life. According to the American Community Survey (2008-2012), within ½-mile of the study corridor, there are over 2,000 households that do not own a car. Of the existing transit riders, nearly three-quarters have no access to an automobile as a travel alternative. Over half of corridor transit riders have household incomes of less than $30,000. Preserving affordability and mobility on the corridor over the long term requires improved transit and other transportation options.

Projected Employment and Population for the Study Area



By 2040, the Route 1 Corridor expects approximately:

45,000 new residents; and

18,000 new jobs

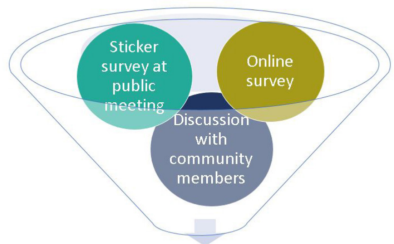
	Challenges	Needs
Transit	• Transit travel time is not competitive with auto travel time • Peak and off-peak transit service is infrequent • Delays caused by transit dwell time at stops and peak period congestion	• Attractive and competitive transit service
Pedestrian/ Bicycle	• Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness of single occupancy vehicle travel • Pedestrian crossings of Route 1 are infrequent, long, and disconnected from existing transit stops • Bicycle access is difficult with few dedicated paths	• Safe and accessible pedestrian and bicycle access
Vehicular	• Significant congestion along Route 1 during peak periods • Travel times are highly variable and unpredictable	• An appropriate level of vehicle accommodation • Additional attractive travel choices in the corridor to minimize auto use
Land Use/ Economic Dev.	• Current development patterns fail to optimize development potential at designated activity centers • The street network is limited, offering few alternatives to Route 1 travel	• Support for more robust land development to support anticipated population and employment growth

ADDRESSING TRANSPORTATION CHALLENGES

The project team developed and evaluated three types of alternatives: (1) Bicycle and Pedestrian, (2) Number of Vehicle Travel Lanes, and (3) Transit Technologies. From the broad range of possible options, a set of initial alternatives emerged based on their applicability in the Route 1 Corridor.

Early analyses focusing on traffic operations and right of way requirements determined that a consistent six-lane roadway and continuous bicycle and pedestrian facilities would be a way to simultaneously address the current and future congestion and bicycle/pedestrian access and safety issues along the corridor.

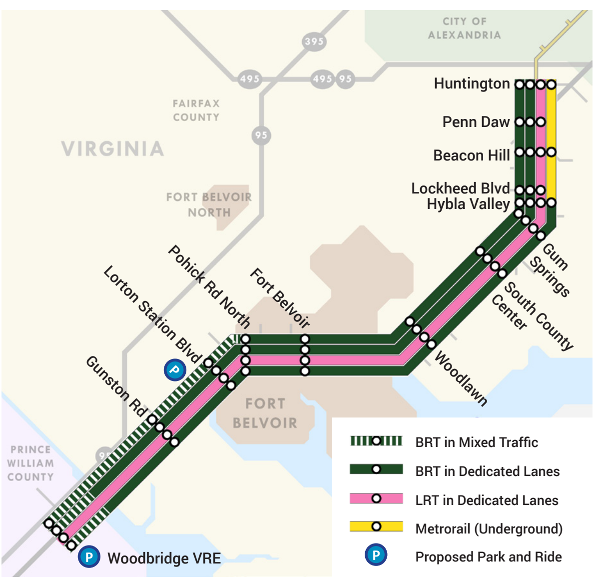
What We Learned From Corridor Residents



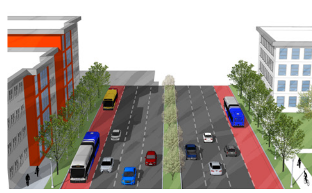
- **Purpose and Need**
- **Weighting of Evaluation Measures**
- **Recommendations and Action Plan**

Four detailed alternatives examined bus rapid transit, light rail, and Metrorail options for the corridor. Each assumed a consistent six vehicular travel lanes along the entire corridor, as well as a 10-foot shared path for bicycles and pedestrians on each side of the roadway.

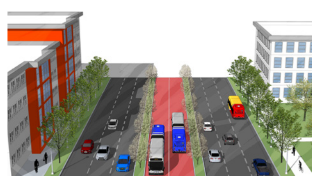
MULTIMODAL ALTERNATIVES



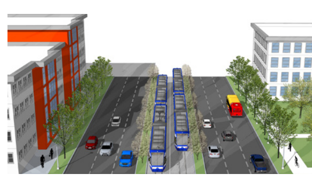
Note: Each alternative includes six vehicular travel lanes and a shared bicycle/pedestrian path on each side of the roadway.



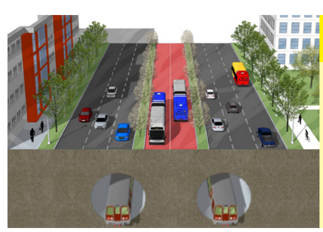
Alternative 1
Bus Rapid Transit - Curb
Bus operates in curb, dedicated transit lanes from Huntington to Pohick Road North, and in mixed traffic south of Pohick Road to Woodbridge.



Alternative 2
Bus Rapid Transit - Median
Bus operates in median in dedicated lanes for the entire length of the corridor and in mixed traffic in Prince William County.



Alternative 3
Light Rail Transit
Light rail operates in the median dedicated lanes for the entire length of the corridor.



Alternative 4
Metrorail/BRT Hybrid
In the short term, BRT operates in dedicated lanes and transitions into mixed-traffic in Prince William County. In the long term, Metrorail is added underground from Huntington to Hybla Valley.

LAND USE IMPLICATIONS

Land use and transportation planning are interconnected. To maximize the quality of public transit service, development patterns must support higher density populations, a mix of uses, and pedestrian access to stations. This study included an analysis of land use potential as one way to evaluate the multimodal alternatives.

The study identified 13 potential transit stations on the corridor. The half-mile radius around each station was used for the land use analysis because it represents a typical walking distance for transit riders, and therefore a generally appropriate location for transit-oriented development. It is also the area of analysis for Federal Transit Administration (FTA) funding criteria relating to land use and economic development.

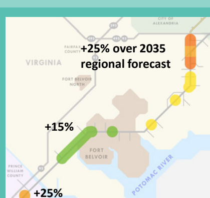
The land use analysis was carried out for three growth scenarios, which informed the evaluation of alternatives. Several key principles of transit-oriented development are reflected in illustrative land use and urban design plans for the station areas:

- Compact, higher-density, mixed-use development patterns, including office, retail, and residential to allow residents to live, work, and shop within the Route 1 Corridor.
- Focused growth that “steps down” as a transition from station areas to existing neighborhoods
- Street designs that allow for wide sidewalks, street trees, street furniture, well-defined crosswalks, and on-street parking, all of which promote pedestrian activity
- A street grid within the station area and to adjacent neighborhoods that allows multimodal travel within the study area, but off Route 1
- High quality parks and public spaces

Population and Employment Growth Scenarios

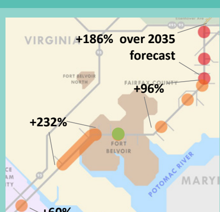
Scenario 1

“Base Land Use Scenario” 2035 MWCOG regional forecast



Scenario 2

Reasonable growth expectation for a corridor that invests in high-quality BRT or LRT.



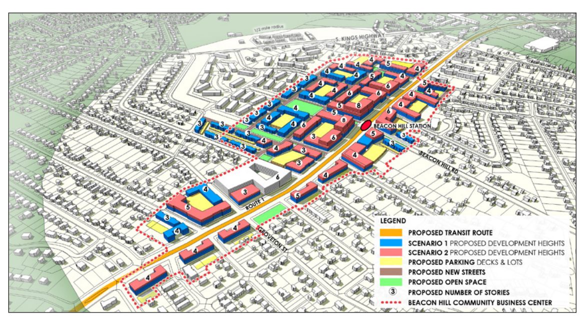
Scenario 3

Increase in population and employment needed to achieve density levels typically supportive of Metrorail (Huntington to Hybla Valley) and BRT (Gum Springs to Woodbridge).

- Urban Core (Rail)
- Urban Center (BRT/LRT)
- Large Town/Suburban Center (Express Bus)
- Medium Town/Suburban Center (Fixed Route Bus)

Source: DRPT Multimodal Design Guidelines (2013)

Proposed Beacon Hill Station Area Today



Beacon Hill Potential Development Pattern

EVALUATION OF TRANSIT ALTERNATIVES

The evaluation process assessed how well each transit alternative and cross section addressed the project goals and objectives. It also assessed the feasibility of the alternatives.

The evaluation assessed each alternative's ability to meet the project goals and objectives by using evaluation measures that provided either quantitative or qualitative data on how well each alternative met the goals. Based on feedback from community members and other stakeholders (including Technical Advisory Committee, Executive Steering Committee, and Community Involvement Committee members), certain measures were weighted double or triple to reflect their importance.

The evaluation also included a qualitative assessment of how well each alternative supported key objectives for successful and timely implementation. Implementation factors, based on stakeholder input, reflect the likely physical/operational and financial feasibility of the project, likelihood of development levels appropriate to the type of transportation investment, and ability to secure funding for recommended improvements.

Alternatives 2 and 4 performed best overall. The full-corridor BRT service, combined with the recommended program of street and pedestrian/bicycle improvements, would provide strong mobility benefits in a cost-effective way. A long-term Metrorail extension at the north end of the corridor would provide additional mobility and support economic development.

Goals	Evaluation Measures	Alt. 1: BRT-Curb	Alt. 2: BRT-Median	Alt. 3: LRT	Alt. 4: Metrorail-BRT (Hybrid)
Goal 1: Local and regional mobility	• Project ridership* • Number of transit dependent riders* • Transit travel time savings* • Provides connection to existing transit network* • New transit riders • Person throughput • Number of riders who walked to access transit • Provides improved bicycle and pedestrian facilities	0.7	0.8	0.8	1.00
Goal 2: Safety and accessibility	• Auto Network Delay* • Pedestrian access to stops* • Pedestrian crossing time* • Auto travel time • Impacts due to turns • Preserves flexibility for bike lane	0.7	0.8	0.8	0.8
Goal 3A: Economic Development	• Potential to begin transit within 10 years** • Tendency to encourage additional development* • Jobs within 60 minutes* • Per passenger O&M cost savings with growth • Tendency to accelerate development	0.6	0.6	0.6	0.7
Goal 3B: Cost Effectiveness	• Cost per rider** • Estimated Capital Cost* • Estimated Annual O&M cost*	1.0	0.9	0.7	0.5
Goal 4: Community health and resources	• Change in VMT* • Total Right of Way* • Trips diverted from I-95 • Temporary construction impacts • Environmental benefits	0.7	0.7	0.7	0.8
Ability to Meet Project Goals - Average Score		**0.7**	**0.8**	**0.7**	**0.8**

* measure weight doubled. ** measure weight tripled.

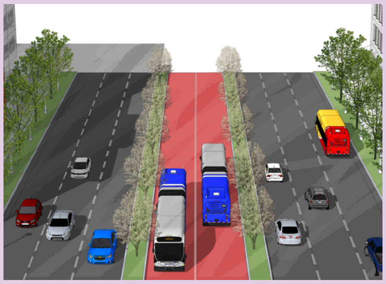
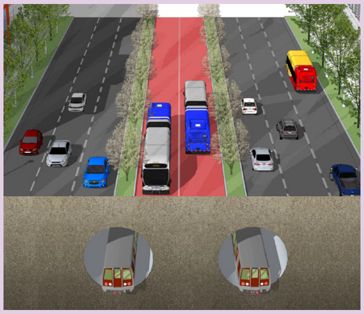
Key Indicators	Alt. 1: BRT-Curb	Alt. 2: BRT-Median	Alt. 3: LRT	Alt. 4: Metrorail-BRT (Hybrid)
Average Weekday Ridership (2035)	15,200	16,600	18,400	26,500* (BRT 10,600; Metrorail 22,900)
Conceptual Capital Cost	$832 M	$1.01 B	$1.56 M	$2.46 B (BRT $1 B, Metrorail $1.46B)
Annual O&M Cost**	$18 M	$17 M	$24 M	$31 M (BRT $8M, Metrorail $17M)
Cost Effectiveness***	$19	$20	$27	$28 (BRT $29; Metrorail $28)

* Corridor ridership, excluding transfers between Metrorail and BRT Portions
** Each Alternative includes $5 M annual cost for Ft. Belvoir shuttle service
*** Annualized capital + operating cost per rider

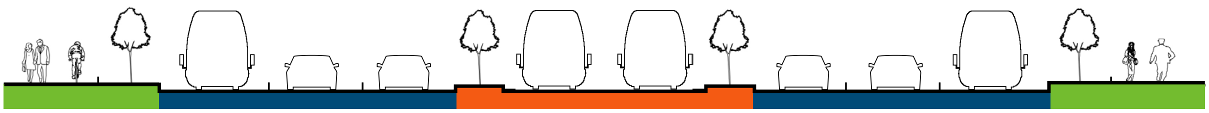
RECOMMENDED MULTIMODAL ALTERNATIVE

The recommended transit alternative is a phased implementation of **Alternative 4 (Hybrid BRT-Metrorail)**, contingent upon increased future land use density:

- **Near-term: Median-running Bus Rapid Transit** would provide a cost effective transportation solution to support economic development plans.
- **Long-term: A Metrorail extension to Hybla Valley** (in addition to the BRT system) has potential to provide a higher level of local and regional mobility and support long-term corridor development.

Recommendations	Near-Term Vision	Long-Term Vision
Transit – Median-running Bus Rapid Transit System in the near-term, with a Metrorail extension to Hybla Valley in the long-term. BRT would be configured in dedicated median transitway through Fairfax County and in curb-running general purpose lanes in Prince William County.		
Pedestrian/Bicycle – 10-foot shared use path on both sides of street (may transition to on-street bicycle lanes in higher density areas).		
Vehicular – Route 1 to include consistent 3 lanes in either direction.		

Recommended Cross-Section



Notes:
[1]The multiuse path may transition to on-street bicycle lanes in higher density areas.

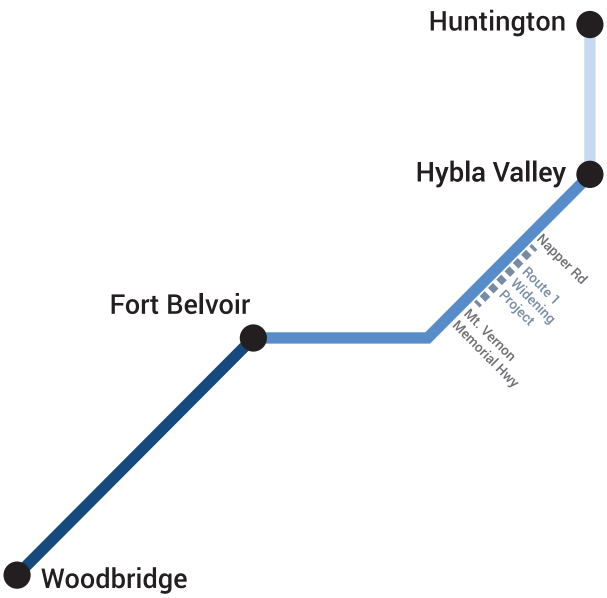
[2]Curb-running BRT within the Prince William County portion.

POTENTIAL TIMELINE AND ESTIMATED COSTS

The recommendation calls for a four-phase approach to implementation. The BRT system, roadway widening, and pedestrian/bicycle facilities will be implemented during the first three phases (through 2032), with the Metrorail extension in the 2040 timeframe.

The recommended projects would require funding from a range of sources, including local, regional, state, and federal funds. These transit project elements are potentially competitive for federal funding through the FTA Capital Investment Program, which historically funded transit projects at 50 percent of project capital costs. Local, regional, and state contributions would also be necessary. The funding mix for roadway/vehicular improvements may include state, federal formula, regional and local funds.

Phasing Timeline



BRT Phase I (2026)
Huntington to Hybla Valley

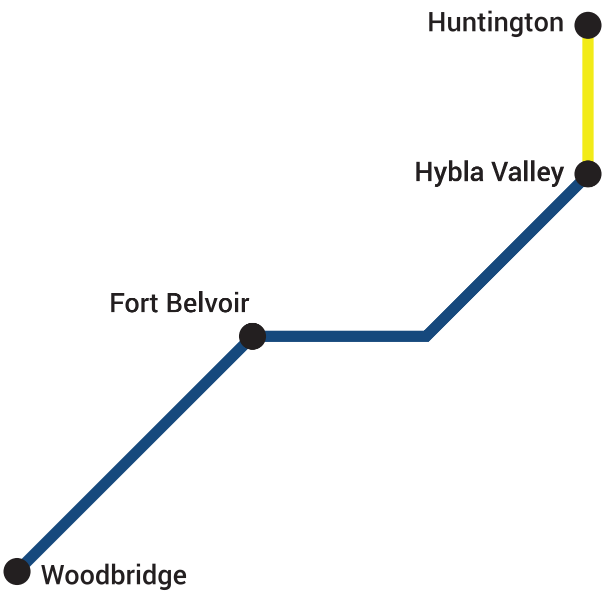
$306M, 3.1 miles

BRT Phase II (2028)
Hybla Valley to Fort Belvoir

$224M, 7.3 miles

BRT Phase III (2032)
Fort Belvoir to Woodbridge

$472M, 4.6 miles



Metrorail Phase IV (2040)
Metrorail Yellow Line Extension to Hybla Valley

$1.46B, 3.1 miles

Note: The recommendation calls for implementation of the vehicular, bicycle, and pedestrian improvements at the same time, if not before, the phased transit improvements.

Woodlawn Vision (Artist's Rendering)

RECOMMENDATIONS FOR SUCCESSFUL IMPLEMENTATION

Study findings include several supporting recommendations that would be necessary for successful implementation. One key finding is that a Metrorail Yellow Line extension to Woodbridge along Route 1 (a 15-mile extension) would not be feasible. In keeping with the Prince William County Comprehensive Plan, a potential Metrorail Blue Line extension could be considered in a subsequent study.

Successful implementation for all phases will require sustained and coordinated effort in three key areas: land use and economic development, transportation investment, and financial planning.

LAND USE AND ECONOMIC DEVELOPMENT ACTIONS

Every transportation action affects land use, and all land use actions have transportation implications.

An integrated vision for the Route 1 corridor will guide actions to maximize economic development potential by creating a range of housing and commercial opportunities within the corridor. These recommendations build on the principles laid out in the Fairfax County and Prince William County Comprehensive Plans.

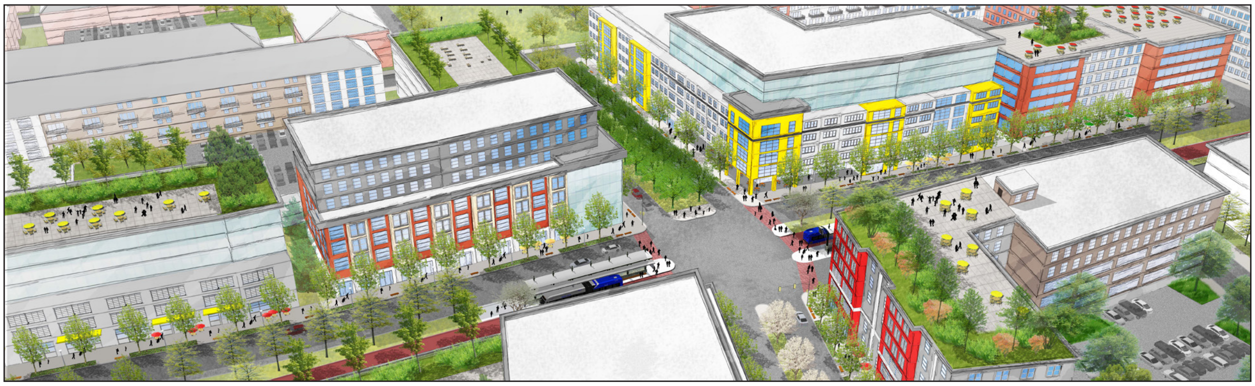
Market Absorption Study – Identify future land use and development scenarios that are desirable from a TOD and Smart Growth standpoint and feasible from a development standpoint.

Comprehensive Plan Updates – Revisit Plan documents in light of the Locally Preferred Alternative for transit and transportation. Develop policies to implement the Plan in the Route 1 corridor. Key elements include:

- Station locations and specific station area plans
- Infrastructure requirements (schools, public safety, parks, and other critical public investments)
- Urban design regulations and parking policies
- Future Local Street Network

Economic Development Activity – Implement incentives and guidance to encourage denser, mixed-use development around proposed transit stations. The Inova Mount Vernon Hospital and the expansions at Fort Belvoir provide an initial economic attraction in the corridor. Additional focused investment would define centers of economic and community activity.

Affordable Housing – Preserve and increase affordable housing. In a growing region, the corridor will continue to attract a new generation of residents and businesses. With the complementary goals of equity and economic development, both jurisdictions should ensure that affordable housing is included as part of market-rate development.



Beacon Hill Vision (Artist's Rendering)

TRANSPORTATION ACTIONS

Travel along and within the current Route 1 corridor relies heavily on the Route 1 right-of-way. These recommendations outline changes along Route 1 that will safely and efficiently accommodate all modes of transportation.

Transit Investment – Advance the next stage of transit project development, and continue to coordinate actively across agencies. Phased construction/reconstruction of Route 1 will include a systematic effort to preserve right-of-way and remove utility conflicts for median-running BRT.

Bicycle and Pedestrian Improvements – Continue near-term County programs to improve sidewalks and bicycle facilities, prioritizing immediate small-scale connections to improve safety and access. Phase construction of continuous sidewalks and multiuse paths along Route 1 in step with transit and roadway projects.

Supporting Street Grid – Expand the local street network to provide better connections to local destinations. Route 1 traffic congestion is the combination of local and through travel. A more connected system of walkable streets provides alternatives for local trips and supports access to transit stations.

Right-of-Way Preservation – Establish the future right-of-way limits for the proposed Route 1 multimodal needs. As land values continue to rise in this area, protective buying will secure the corridor for future investment and create a specific framework for private development and redevelopment activity.

Roadway Widening – Advance roadway widening projects to achieve the vision for a consistent six-lane vehicular cross-section, providing three travel lanes in each direction. Coordinate with transit, bicycle, and pedestrian facility improvements.

PROJECT FUNDING ACTIONS

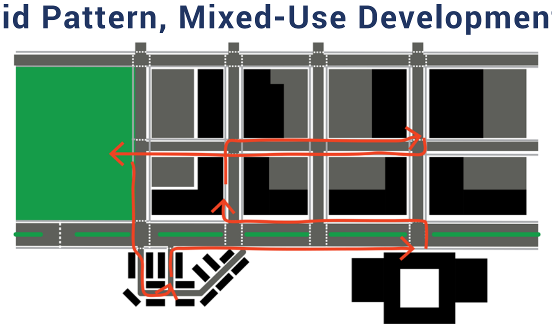
An initial funding analysis shows that implementation of the recommended transportation projects will require funding from a range of sources.

For typical County-sponsored transportation improvements, funds from local, regional, state, and federal sources are combined, incorporated into the County Capital Improvement Programs, and applied to the projects. The Route 1 corridor improvements are also expected to rely on regional funding through the Northern Virginia Transportation Authority (NVTA), state funding through DRPT and VDOT, and federal funding through the FTA Capital Investment (New Starts/Small Starts) program, the National Highway Performance Program, and other Federal sources.

Next steps are to identify funding for the environmental documentation and conceptual engineering phase of the project, and during that phase, to continue refining the assumed sources and amounts of capital and operating funding.

Conventional Development

Grid Pattern, Mixed-Use Development



NEXT STEPS

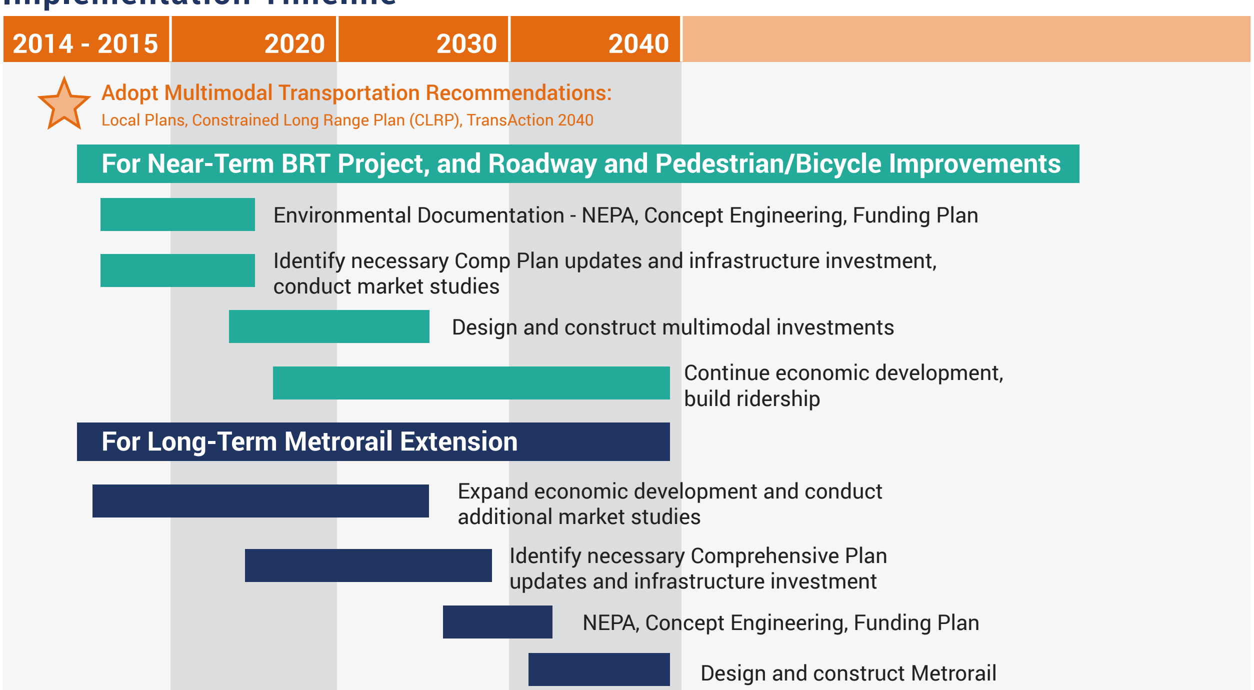
The timeline below illustrates a framework of implementation steps for the near-term BRT project, the long-term Metrorail extension, and the roadway and bicycle/pedestrian improvements. The immediate next phases of project development are accompanied by the recommended market absorption study and Comprehensive Plan updates.

The recommendations of this study recognize that many related corridor improvements are already underway. Roadway widening, a robust program of pedestrian and bicycle improvements, intersection upgrades, and transit service refinements are examples of the ongoing improvements being carried out by County and State agencies.

The next steps towards project implementation include:

- Forward study recommendations to local governments for endorsement and implementation
- Begin to incorporate recommendations in local, regional, and state plans
- Coordinate environmental documentation "Class of Action" with responsible federal agencies: FTA and FHWA
- Initiate environmental documentation for Phases I and II (Huntington to Fort Belvoir)
- Conduct corridor-wide market absorption study
- Initiate Comprehensive Plan updates
- Conduct a right-of-way survey to define potential impacts and create structure for public corridor preservation and private parcel consolidation

Implementation Timeline



Route 1

Multimodal Alternatives Analysis

Route 1 Multimodal Alternatives Analysis

Final Report

January 2015

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Supporting Appendices

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1.0 Introduction

The Virginia Department of Rail and Public Transportation (DRPT) has undertaken a Multimodal Alternatives Analysis in coordination with Fairfax County, Prince William County, the Virginia Department of Transportation (VDOT), and the Virginia Office of Intermodal Planning and Investment (OIPI). The purpose of the project is to provide improved performance for transit, bicycle and pedestrian, and vehicular conditions and facilities along the Route 1 corridor that support long-term growth and economic development.

The study corridor consists of a 15-mile segment of U.S. Route 1 ("Route 1"), extending from Route 123 in Woodbridge in Prince William County to the I-95/I-495 Beltway in Fairfax County near its border with the City of Alexandria. The corridor is known more familiarly in this segment as Richmond Highway. **Figure 1-1** shows a map of the study corridor.

The study defines key transportation issues for local and through travelers, and considers a range of transportation solutions to address the needs. These solutions include a combination of transit, roadway, and pedestrian and bicycle improvements. Solutions also consider the future of land use and development on the corridor. Through stakeholder participation and technical analysis, the study results in a recommended program of transportation improvements for adoption by Fairfax County and Prince William County.

This report discusses the process of developing and evaluating the multimodal alternatives. It provides detail on performance measures and associated analysis methodologies used to screen and recommend a multimodal solution that best meets the needs of the corridor.

An important part of the alternatives evaluation is an assessment of potential funding and implementation steps for the recommended alternative. Implementation considerations are the levels of anticipated population and employment, the need for additional transportation infrastructure, and general viability of the preliminary funding plan including competitiveness for federal transit funding.

Figure 1-1: Study Corridor

The document is organized as follows:

Section 1.0: Introduction: *Describes the study corridor, purpose of the project, and the evaluation process.*

Section 2.0: Project Overview: *Provides an overview of the purpose of the project, key stakeholders, and study process.*

Section 3.0: Relationship to Previous Studies: Describes the previous plans and studies associated with the corridor.

Section 4.0: Purpose and Need: *Describes the purpose of the project and the transportation challenges present along the corridor that this project seeks to address.*

Section 5.0: Evaluation Overview: *Defines the range of preliminary alternatives that were initially considered. Preliminary alternatives are screened based on basic project requirements.*

Section 6.0: Initial Alternatives: *Defines the initial vehicular lane configurations, bicycle and pedestrian, and transit alternatives. It also describes the evaluation measures and screening results of the initial alternatives.*

Section 7.0: Refined Multimodal Alternatives: *Defines the refined multimodal alternatives that are evaluated in detail. The refined multimodal alternatives assume the same vehicular and bicycle and* *pedestrian facility with varying transit modes and operations. The alternatives are evaluated using a robust screening methodology.*

Section 8.0: Evaluation of Multimodal Alternatives: *Evaluates the alternatives based on goals and objectives and project implementation factors. It describes the measures, evaluation findings and results, and the technical recommendation.*

Section 9.0: Recommendations - Action Plan for Implementation: *Lays out an action plan for implementing the technical recommendation.*

Six technical reports were developed and support the findings in this report. The following memoranda are appended to this report:

- *Purpose and Need Report*
- *Outreach Summary Report*
- *Traffic and Transportation Report*
- *Land Use and Economic Development Report*
- *Additional Transportation Analysis Report*
- *Detailed Evaluation of Alternatives Report*
- *Environmental Scan Report*
- *Preliminary Funding Analysis Report*

2.0 Project Overview

An Alternatives Analysis (AA) is a transportation planning process for evaluating all reasonable modal and multimodal alternatives and general alignment options for identified transportation needs in a corridor. The alternatives analysis process studies a transportation problem in detail and considers a range of options, along with an analysis of benefits and costs to ensure that potential solutions are feasible and meet the project goals and objectives. At the conclusion of this alternatives analysis, the local jurisdictions and implementing agencies can adopt the technical recommendation as the Locally Preferred Alternative (LPA), which will allow the project to initiate the process of seeking local, regional, and federal funding.

Both Fairfax County and Prince William County would most likely require federal funding assistance to construct a major project. For the transit investment, the counties will likely seek funding from the Federal Transit Administration's Capital Investment Program (Section 5309, "New Starts/Small Starts"). This discretionary grant program is highly competitive and structured to advance projects through the major phases of project development: planning, engineering, construction, and operation. Eligible projects are evaluated and re-evaluated at key phases in the process using a robust set of evaluation criteria.

With the likely need for state and/or federal funding, next steps for the counties would be to assess the potential impacts on the natural and human environments in accordance with the National Environmental Policy Act of 1969 (NEPA). After the adoption of the LPA, the responsible or "lead" federal agency will determine the appropriate level of environmental documentation to accurately assess and mitigate all potential impacts.

2.1 Project Team

The Virginia Department of Rail and Public Transportation (DRPT) managed this alternatives analysis. Key partner agencies included Fairfax County, Prince William County, the Virginia Department of Transportation (VDOT), and the Office of Intermodal Planning and Investment (OIPI). These stakeholders (listed above) met monthly and served as the Project Management Team. Additional project input and guidance was provided by:

- A **Community Involvement Committee** composed of business and community leaders and interested organizations. The committee met quarterly and provided guidance to the project team.
- An **Executive Steering Committee**, consisting of elected officials and senior agency staff, to assist with policy-related decision making and funding strategies. This committee met quarterly and provided strategic guidance throughout the study.
- A **Technical Advisory Committee** consisting of state and local agency staff with expertise in a range of relevant topic areas. This committee met quarterly and provided technical guidance on the work products.

2.2 Community and Stakeholder Engagement

The Route 1 Multimodal Alternatives Analysis project team ("team") employed a range of strategies to obtain diverse, active participation in the development and evaluation of multimodal alternatives for the project corridor. These strategies emphasized both sharing information and gathering input at key times during each project phase. The intent was to ensure that diverse community opinions were captured and served to guide project evolution. A summary of the specific strategies and outcomes is provided below, with further detail provided in *the Community and Stakeholder Engagement Report.*

The team shared information about the project:

- At public meetings
- On the project website
- Through information booths at corridor events
- Through attendance at business association and neighborhood meetings
- On hard copy flyers, newsletters, and posters distributed on the corridor
- On Twitter and Facebook
- Using press releases and newspaper advertisements

After each public meeting, the project website was updated with all of the meeting materials in an interactive format. In this way the project team could continue to receive input on the meeting materials from those who were not able to attend in person. The team regularly posted to the website and its Twitter and Facebook accounts to advertise all outreach activities. The team gathered input through discussions and activities at stakeholder and public meetings, as well as through surveys and other materials posted on the website. Any material that was shown at a public meeting was available for review on the website, along with easy-to-use comment forms. The public was also invited to share their comments via social media, email, and a website comment form throughout the process.

3.0 Relationship to Previous Studies

Community, agency, and political leaders have long recognized the transportation challenges in the Route 1 corridor. Numerous studies and plans completed over the last 15 years have assessed various transportation issues in the corridor. These studies are shown chronologically in **Figure 3-1.** The studies have consistently identified four key issues:

- Growth in general regional population and employment, as well as locally concentrated changes in job concentration, have driven greater demand for travel in the constrained corridor.
- Safety for users of all types remains a concern.
- Land use and economic plans anticipate further growth and development.
- Maintaining affordability and diversity is an increasing challenge.

Each study shown in **Figure 3-1** has identified transportation challenges in the corridor as well as provided recommendations to address these challenges. A summary of the recommendations identified in these plans is included in **Table 3-1**, and a comprehensive list is provided in the *Purpose and Need Report*.

Figure 3-1: Previous Studies

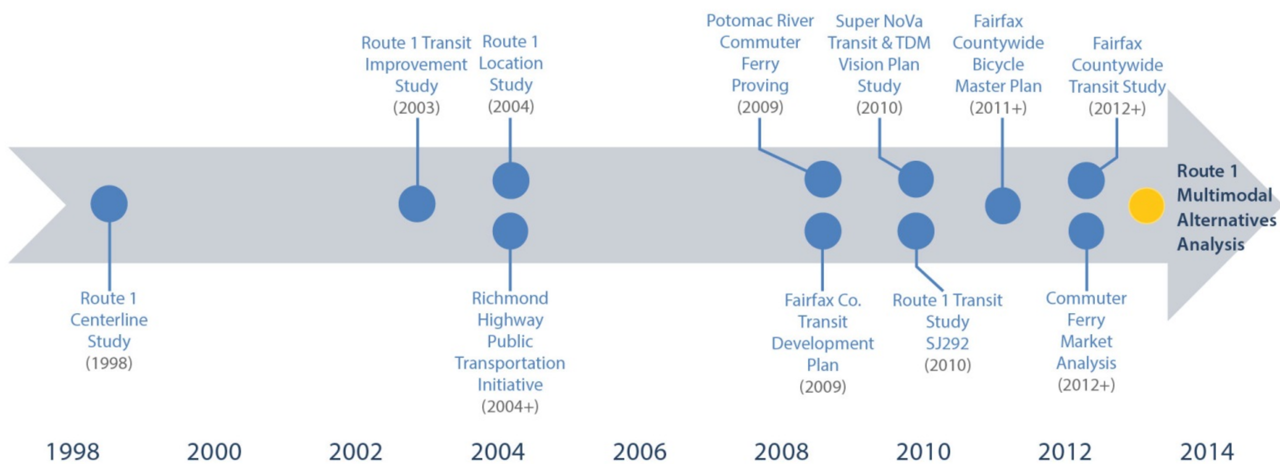


Table 3-1: Previous Plans and Recommendations for Route 1

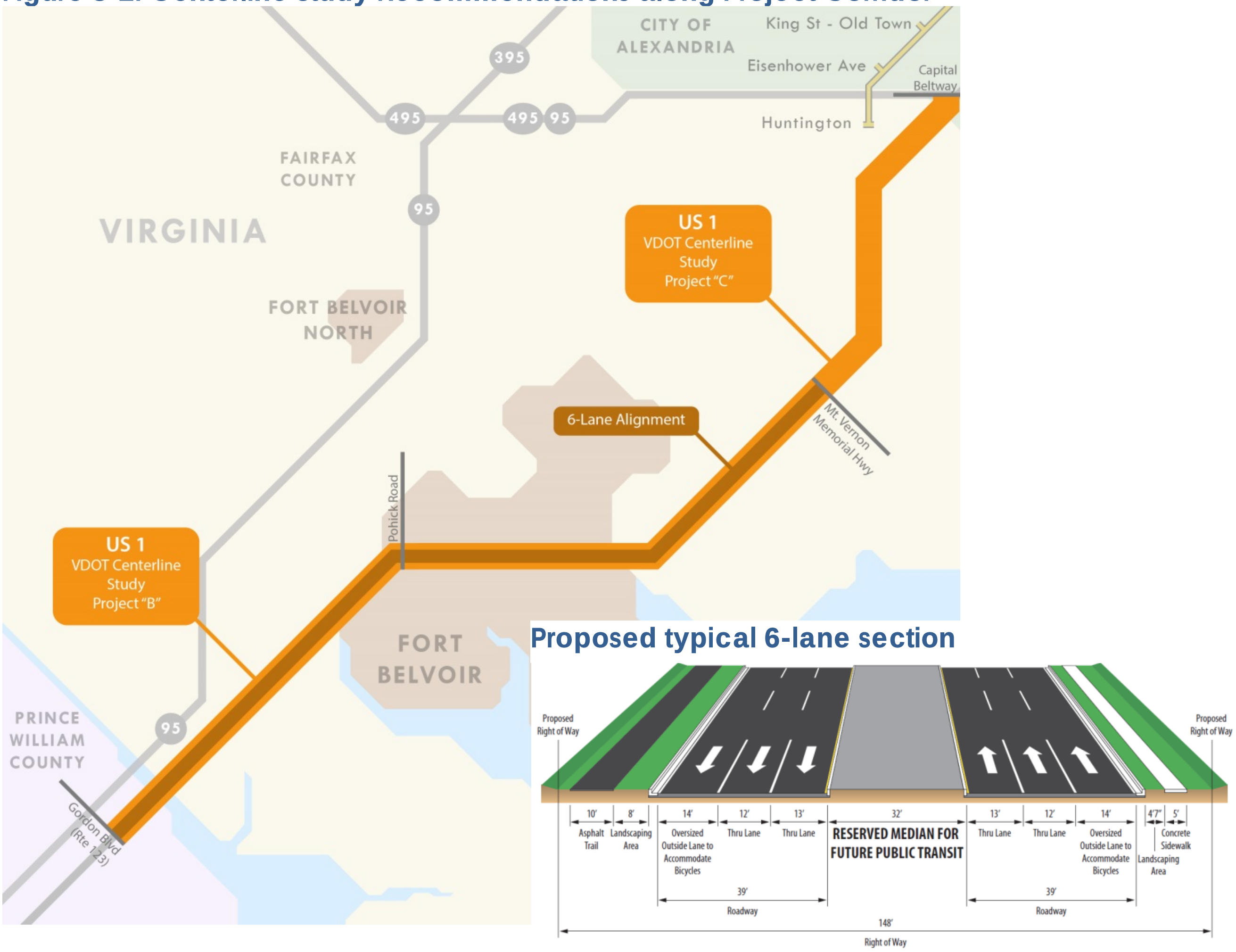
Plan	Agency	Date	Alternatives Recommended for Route 1
Route 1 Centerline Study	VDOT	1998	• Additional lane in each direction throughout • Bicycles in shared outer lane (15') • Pedestrians (10' planting strip, 6' sidewalk) • Accommodation for higher quality transit (undefined)
Route 1 Transit Improvement Study	WMATA	2003	• Phased: BRT "light" (in shared lanes) preceding BRT in dedicated curbside lanes. • Light rail in dedicated or semi-exclusive lanes
Richmond Highway Public Transportation Initiative	Fairfax County DOT	2004-present	• Safety improvements at intersections • Complete sidewalk network • Local and express bus stop improvements
Mt. Vernon Vision	Citizens	2010	• Metrorail. Light rail or monorail as an alternative • Complete sidewalk network
Route 1 Transit Study SJ292	DRPT	2010	• Bus rapid transit • Complete pedestrian network • Additional lane in each direction throughout
Fairfax County Comprehensive Plan	Fairfax County	2011, amended 2014	• High quality transit (heavy rail, light rail, monorail or bus rapid transit) in dedicated guideway (26' + 15' medians) • Consistent 3 lanes per direction throughout • Multiuse trail for bikes and pedestrians (9' buffer, 9' trail)
SuperNoVa Transit/TDM Vision Plan	DRPT	2012	• BRT or LRT north of Fort Belvoir • Pedestrian and bicycle accommodation
Constrained Long Range Plan and Regional Vision	MWCOG	2013	• Additional lane per direction (Fort Belvoir segment) • Provide bus right turn lanes

The two foundational studies for this effort are the VDOT Route 1 Centerline Study (1998) and the DRPT Route 1 Transit Study (2010), while several others are critical in highlighting, redirecting, guiding and confirming need.

VDOT Route 1 Centerline Study (1998 and 2004 Location Study)

The Centerline study examined 27 miles of Route 1 from Stafford County north to I-495 and Alexandria. The study was subdivided into three projects: Project A (Stafford County line to Route 123), Project B (Route 123 to Armistead Road), and Project C (Belvoir Woods Parkway to the Capital Beltway). Projects B and C correspond with this project study area (See **Figure 3-2**). The study recommended widening from 4 lanes to 6 in the southern portion and 6 lanes to 8 in Project C in the northern segment. Pedestrian and bicycle improvements including both facilities along the corridor as well as improved crossings were also recommended. The study recommended the preservation of right-of-way for transit but did not make a final recommendation or determination on transit alignment, running way or mode. **Figure 3-2** shows the proposed typical six-lane cross section.

Figure 3-2: Centerline Study Recommendations along Project Corridor



DRPT Route 1 Transit Study SJ292 (2010)

This transit study was intended to evaluate the level of study necessary to advance transit services to the growing employment centers of Fort Belvoir in Fairfax County and Marine Base Quantico in Prince William and Stafford Counties along Route 1. The study found that existing transit services and roadway operations were generally insufficient to address the travel demand needs resulting from the Base Realignment and Closure that concentrated employees at those facilities. It found substantial need to improve transit service on the corridor to accommodate the projected growth, increase transit mode share, and preserve mobility on the Route 1 corridor. Pedestrian access and safety were noted as significant needs. Persistent levels of extreme congestion on the corridor necessitated an increase of person capacity on the corridor to provide viable options for higher capacity vehicle travel. The study recommended further detailed assessment to examine the feasibility of dedicated transit running way and evaluation of modes. The current study builds off this previous effort.

4.0 Purpose and Need

This section summarizes the purpose of the project and describes why multimodal improvements are needed along the corridor. The "Purpose and Need" is the cornerstone of any transportation improvement project. It summarizes the existing conditions and relevant issue(s) to be solved by succinctly defining the transportation problem and setting the context for consideration of alternatives. The Purpose and Need informed the project goals and objectives and helped guide the development of alternatives for evaluation.

The Purpose and Need is derived through three primary inputs:

- Review and analysis of past plans and studies and current policy guidance
- Assessment of existing and forecasted/desired conditions for transportation and land use
- Community input through public and stakeholder meetings and communication

Past plans and studies, agency and stakeholder inputs, and assessment of existing conditions to date have repeatedly identified the following broad issue areas of need on the corridor:

- Viable multimodal travel options on the corridor are limited and/or insufficient
- Congestion impedes reliable and efficient travel
- Existing transportation services and networks fail to support planned land uses and economic development efforts

The need for the project stems from existing and expected transportation problems along the corridor related to limited transit service, poor bicycle and pedestrian facilities, and high traffic volumes. These deficiencies limit accessibility and are not supportive of the desired economic development growth along the corridor.

The existing carrying capacity of the corridor is constrained. People traveling by automobile experience congestion and delays; people traveling by transit experience infrequent service as well as delays because of traffic congestion. Integrated multimodal improvements are needed to support the anticipated high levels of employment and residential growth. County Comprehensive Plans envision this growth in the form of focused, pedestrian- and transit-oriented development. Without transportation capacity improvements that encourage pedestrian and transit travel, it is unlikely that the projected growth can be accommodated within the corridor, and the associated economic opportunity of additional jobs and residents will be limited.

Attractive multimodal options are needed to help serve the high transit-dependent population who rely on bicycling, walking and/or transit to meet the needs of daily life. According to the American Community Survey (2008-2012), within ½-mile of the study corridor, there are over 2,000 households that do not own a car.

Of the existing transit riders, nearly three-quarters of existing transit riders have no access to an automobile as a travel alternative. Over half of corridor transit riders have household incomes of less than $30,000. Preserving community and affordability over the long term requires improved transit and other transportation options to meet the needs of this population.

The document identifies four specific areas of need for a major multimodal investment in the corridor: Transit, Pedestrian and Bicycle, Vehicular, and Land Use/Economic Development. **Table 4-1** summarizes the problems and need by area; the subsequent sections describe the needs in more detail.

Table 4-1: Problems and Needs Summary

Multimodal Area	Problems and Needs	
Transit	• Transit travel time is not competitive with auto • Peak and off-peak transit service is infrequent • Dwell time at stops and peak period congestion delays transit	*Attractive and competitive transit service to support transit dependent population*
Pedestrian/ Bicycle	• Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness of single occupancy vehicle travel • Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops • Bicycle access is difficult with few alternative paths	*Safe and accessible pedestrian and bicycle access*
Vehicular	• Users experience significant congestion along Route 1 during peak periods • Travel times are highly variable and unpredictable	*Appropriate level of vehicle accommodation*
Land Use/Economic Development	• Current development patterns fail to optimize development potential at designated activity centers • Existing street connectivity is poor at commercial nodes	*Support and accommodate more robust land development to support anticipated population and employment growth*

4.1 Transit Needs

Existing transit service in the corridor does not meet the needs of current and future residents, which is leading to low rate of transit use. On an average weekday, only 3 percent of all trips are made using transit.[1] This is well below the regional average of 15 percent transit mode share for "middle ring" locations.[2]

Challenges with the existing transit service include:

- **Transit travel time is not competitive with automobile:** Frequent stops and congested segments of roadway make transit travel both slower and more unpredictable than auto travel, with bus travel times increasing significantly during peak hours. **Table 4-2** provides sample travel times to key destinations.
- **Peak and off-peak transit service is infrequent:** For travel from Fort Belvoir to Huntington Station, transit service is fairly frequent in the peak hours (every 12 to 20 minutes), but less frequent in non-peak periods (to 30 to 60 minute headways). For trips originating south of Fort Belvoir, service is even less frequent and a direct transit route to Fort Belvoir and other destinations near Huntington does not exist.
- **Dwell time at stops and peak period congestion delays transit:** Traffic congestion introduces significant delays for buses in both directions; dwell time at stops increases total transit travel time by about 20 percent, as compared to both transit travel time without dwell and general traffic.

The corridor needs attractive, high-quality transit service to improve local and regional mobility. High-quality transit would reduce travel time and increase frequency, reliability, and attractiveness.

Table 4-2: Sample Travel Times

Origin	Destination	Distance	Drive Time	Transit Time	Transit Transfers
Fort Belvoir Community Hospital	Huntington Metro Station	8.8 miles	20 min	35 min	0
Fort Belvoir Community Hospital	Mt. Vernon Shopping Center (Hybla Valley)	5.7 miles	15 min	25 min	0
Mt. Vernon Shopping Center (Hybla Valley)	Huntington Metro Station	5.2 miles	15 min	20 min	0
Woodbridge	Fort Belvoir Community Hospital	8 miles	15 min	40 min	1

[1] MWCOG 2.2
[2] MWCOG "State of the Commute" survey findings reported September 18, 2013. http://www.mwcog.org/transportation/weeklyreport/2013/files/09-17/TPB-Presetnation_2013_StateOfTheCommute.pdf

4.2 Pedestrian and Bicycle Facilities

Existing pedestrian facilities are disjointed and discontinuous, limiting pedestrian travel and reducing access to transit. Very few residents walk to access transit or to other local destinations. Public meeting attendees cited improved pedestrian and bicycle conditions as one of the most urgent improvements needed for the corridor. The poor accommodation for cyclists is reflected in a very low rate of cycling in the corridor. The US Census estimates that just 0.15 percent of commuters in both the northern and southern segments of this corridor use a bicycle to get to work. This compares with 2 percent Fairfax County-wide, according to the 2010 Census.[3] **Figures 4-1** and **4-2** show current pedestrian facilities and the network of bicycle pathways near the corridor.

Specific pedestrian and bicycle needs include:

- **Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness and efficiency of single occupancy vehicle travel**: Walking paths along the corridor are incomplete with 6.8 miles of identified sidewalk gaps.[4] The sidewalk facilities that exist are largely unbuffered from the heavy traffic on the corridor. ADA accommodations to pedestrian destinations such as bus stops are missing and/or substandard in several locations.
- **Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops:** Crosswalks are spaced at significant distances from one another, the longest gap exceeding 1.8 miles. Crossing distance commonly exceeds 100 feet.
- **Bicycle access is difficult with few alternative paths:** Few bicycle facilities currently exist on Route 1. In its Bicycle Master Plan, Fairfax County characterizes Route 1 as a "corridor of caution" -- a route where "bicyclists are urged to exercise extra caution due to narrow shoulders or lanes, poor sight distances, high traffic volumes, or other challenging characteristics."

Attractive, high-quality pedestrian and bicycle facilities are needed to accommodate the future planned growth, and appropriately meet the diverse travel demands and abilities of Route 1 residents and stakeholders. Improved bicycle and pedestrian facilities will also improve transit access along the corridor to connect transit with surrounding uses via safe and continuous pathways.

[3] http://www.fairfaxcounty.gov/news/2012/updates/may-is-bike-month.htm
[4] Richmond Highway Transportation Initiative, Fairfax County, 2004.

Figure 4-1: Existing Pedestrian Facilities

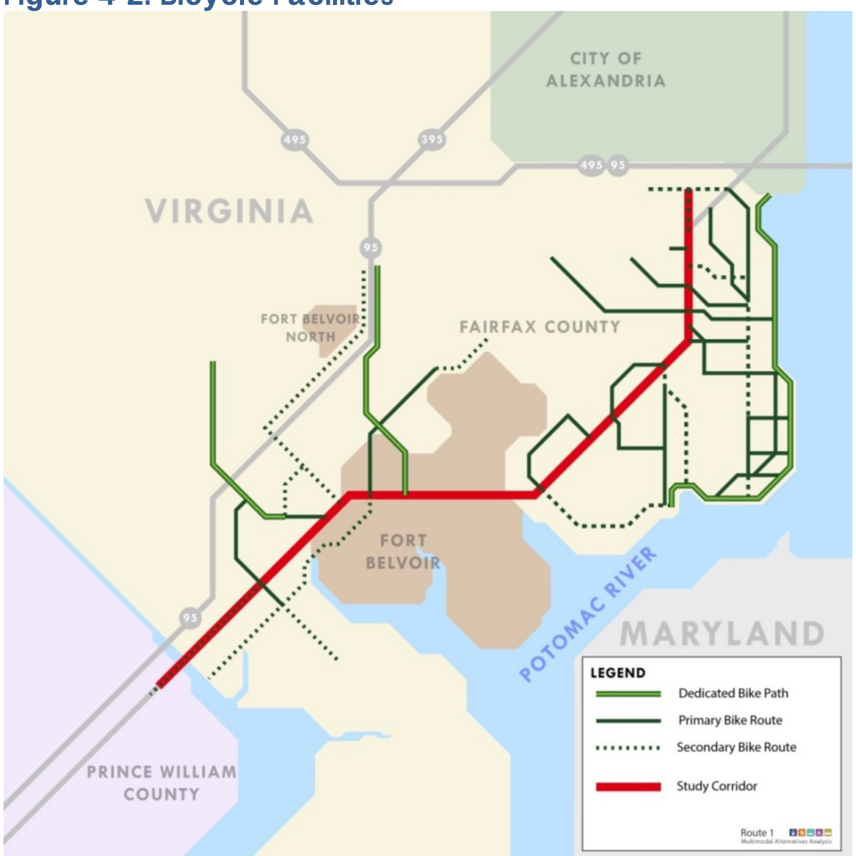
Goat Track at Groveton Spring Road

Goat Track at Groveton Spring Road

Accessibly challenges at Hybla Valley

Discontinuous sidewalk at Hybla Valley

Figure 4-2: Bicycle Facilities



4.3 Traffic Problems and Vehicular Operations Needs

Users experience significant congestion along Route 1 during peak periods and on weekends. At public meetings, participants noted this as a key concern for the corridor. Specific vehicular needs include:

- **Users experience significant congestion along Route 1 during peak periods:** The Route 1 (Richmond Highway) corridor experiences significant peak hour congestion. Presently, six intersections along the 15-mile corridor experience significant congestion and are considered "failing", operating at a Level of Service E or F in the AM or PM peak hour.
- **Travel times are highly variable and unpredictable:** Volume to capacity (v/c ratio) is a measure of congestion. A v/c ratio less than 0.85 generally indicates that adequate capacity is available and vehicles are typically not expected to experience significant queues and delays. During the AM peak hour under existing conditions, nine signalized intersections in the study area (22.5 percent of all intersections) have v/c ratios greater than 0.85 (See **Figure 4-3**).

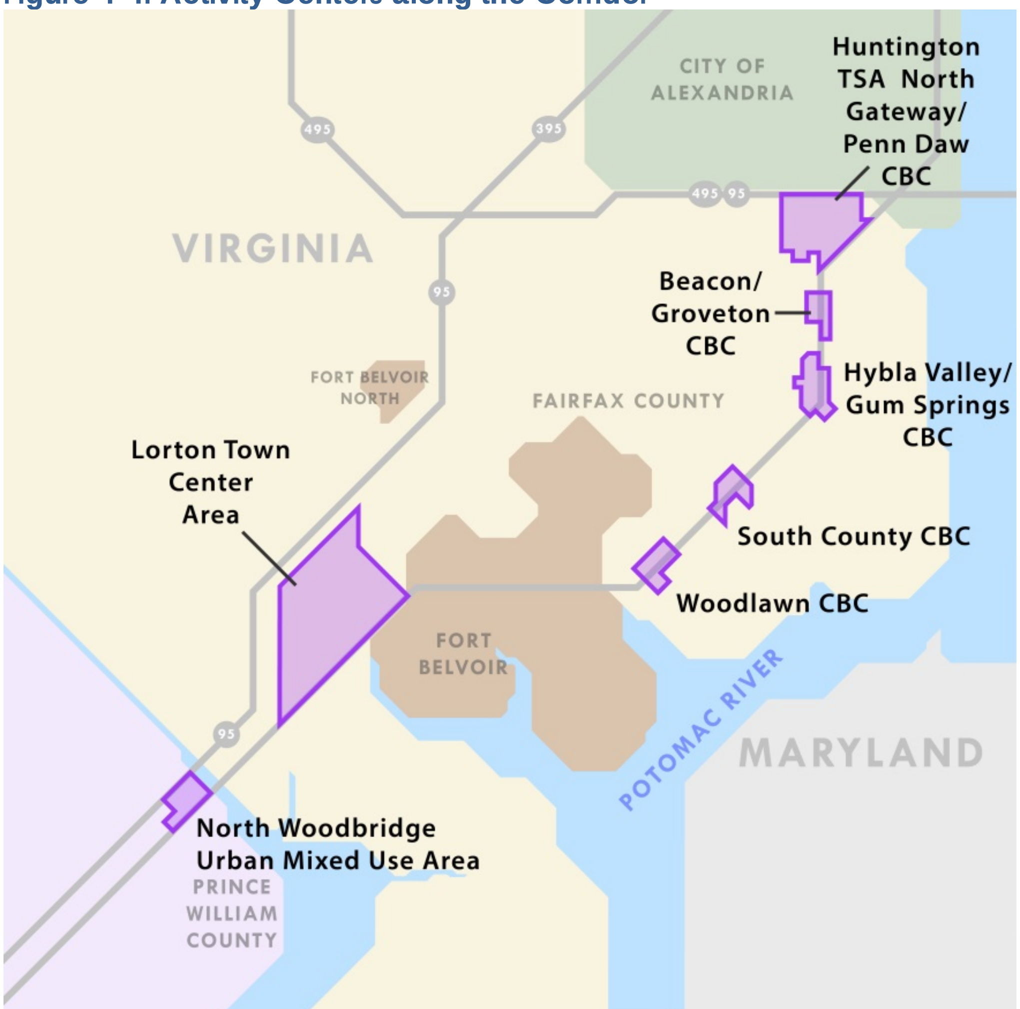
With increased population and employment growth, the corridor needs to maintain adequate vehicular accommodation to improve travel time reliability.

Figure 4-3: Intersections with High v/c ratios

4.4 Land Use and Connectivity

Significant population and employment growth is anticipated both regionally and along the Route 1 corridor. Fairfax County and Prince William County have designated several nodes along the Route 1 corridor as Activity Centers, referred to as Community Business Centers (CBCs) in Fairfax County and Urban Mixed Use Areas in Prince William County (see **Figure 4-4**). County policies anticipate growth to concentrate in these areas, thereby increasing the density of housing and employment activity on the corridor and necessitating additional travel capacity and options to support and enable this growth. The Fairfax County Comprehensive Plan lists specific development targets for each activity center.

Figure 4-4: Activity Centers along the Corridor



Fairfax County and Prince William County plans both envision nodes of compact, walkable development focused in moderate to high density activity nodes; however, current development patterns fail to optimize potential development. Much of the corridor is characterized by commercial strip malls with large setbacks and unconnected driveways and access roadways. This leads to greater dependence on driving instead of walking to local destinations.

Specific land use and economic needs include:

- **Development potential has not been realized in designated activity centers:** Although there has been significant development in recent years, this development has been lower density and typically auto-oriented (which is contrary to the vision of several communities along the corridor).
- **Existing Street connectivity is poor around commercial centers:** Within the activity zones, there are large "mega-blocks" around commercial development. This development pattern limits access and does not support a pedestrian friendly environment. **Figure 4-5** shows the existing links and nodes at Beacon Hill Station.

The corridor needs a clear plan for investment in transportation services and infrastructure that will accommodate expected growth (mix of uses and residents) and provide the basis for ongoing private investment in the corridor. It also needs to define coordinated land use and transportation policies and programmed improvements to facilitate high capacity transit investment and appropriate transit oriented development.

Figure 4-5: Beacon Station Area Street Network: Existing Links and Nodes

4.5 Goals and Objectives

Goals and objectives for the Route 1 Multimodal Alternatives Analysis emerge from the problems and needs. Goals are overarching outcomes desired in satisfying the stated needs. Goals relate to and reflect agency policies and community values. Objectives are specific, measurable steps toward achieving the larger goals.

GOAL 1: Expand attractive multimodal travel options to improve local and regional mobility

Objectives:

- Increase transit ridership
- Improve transit to reduce travel times and increase frequency, reliability, and attractiveness
- Increase transportation system productivity (passengers per hour) within the corridor
- Increase comfort, connectivity, and attractiveness of bicycle and pedestrian networks to and along the corridor
- Integrate with existing and planned transit systems and services

GOAL 2: Improve safety; increase accessibility

Objectives:

- Provide accessible pathways to and from transit service and local destinations
- Reduce modal conflicts
- Improve pedestrian crossings
- Maintain traffic delays at acceptable levels

GOAL 3: Increase economic viability and vitality of the corridor

Objectives:

- Increase and improve connectivity to local and regional activity centers
- Encourage and support compact, higher density, mixed use development consistent with local plans, policies, and economic objectives
- Secure public and investor confidence in delivery and sustainability of new transit investments
- Provide high-capacity transit facilities at locations where existing and future land uses make them mutually supportive

GOAL 4: Support community health and minimize impacts on community resources

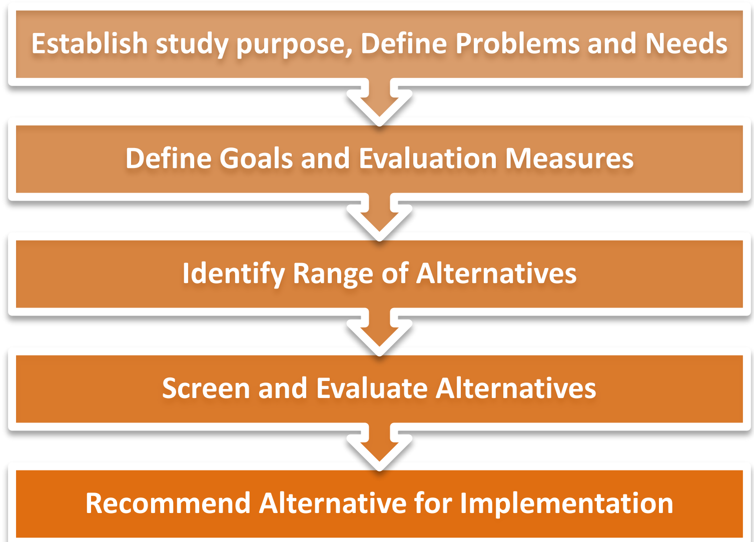
Objectives:

- Minimize negative impacts to the natural environment
- Contribute to improvements in regional air quality
- Increase opportunities for bicycling and walking to improve health and the environment

These goals serve as the basis for development of the alternatives, which are described in the subsequent sections.

5.0 Evaluation Overview

Figure 5-4-1: Evaluation Process



This alternatives analysis follows the typical approach. It first identifies an inclusive set of transportation ideas based on previous studies, input from stakeholders, and the review of problems and needs. From this range of alternatives the most appropriate to the study corridor are highlighted and carried forward for refinement and further screening and evaluation. The evaluation is based on an agreed upon set of criteria. The goal is to arrive at a recommended alternative at the end of the process. **Figure 5-1** provides an overview of the evaluation process.

The alternatives development process involves three levels of evaluation to define the recommended alternative:

Screen 1 - Basic Requirements: Evaluates a wide range of transit, vehicular lane, and bicycle and pedestrian alternatives using basic project requirements according to broad principles based on the project Purpose and Need. In order to be considered minimally viable, alternatives must:

1. Improve attractive multimodal travel by improving transit travel time (over the existing) and providing attractive bicycle and pedestrian accommodation.
2. Increase the economic viability and vitality of the corridor by supporting and advancing local land use objectives.
3. Increase public and investor confidence in delivery and sustainability of new transit investments.
4. Support competitive transit options by integrating with existing or planned regional transit systems.

Alternatives that meet these prerequisites are advanced and identified as “initial alternatives”.

Screen 2 - Qualitative and Quantitative Measures: Evaluates the initial transit, vehicular lane, and bicycle/pedestrian alternatives using key indicators and evaluation measures based on goals and objectives and competitiveness for federal funding; initial alternatives are either eliminated or carried forward for further evaluation.

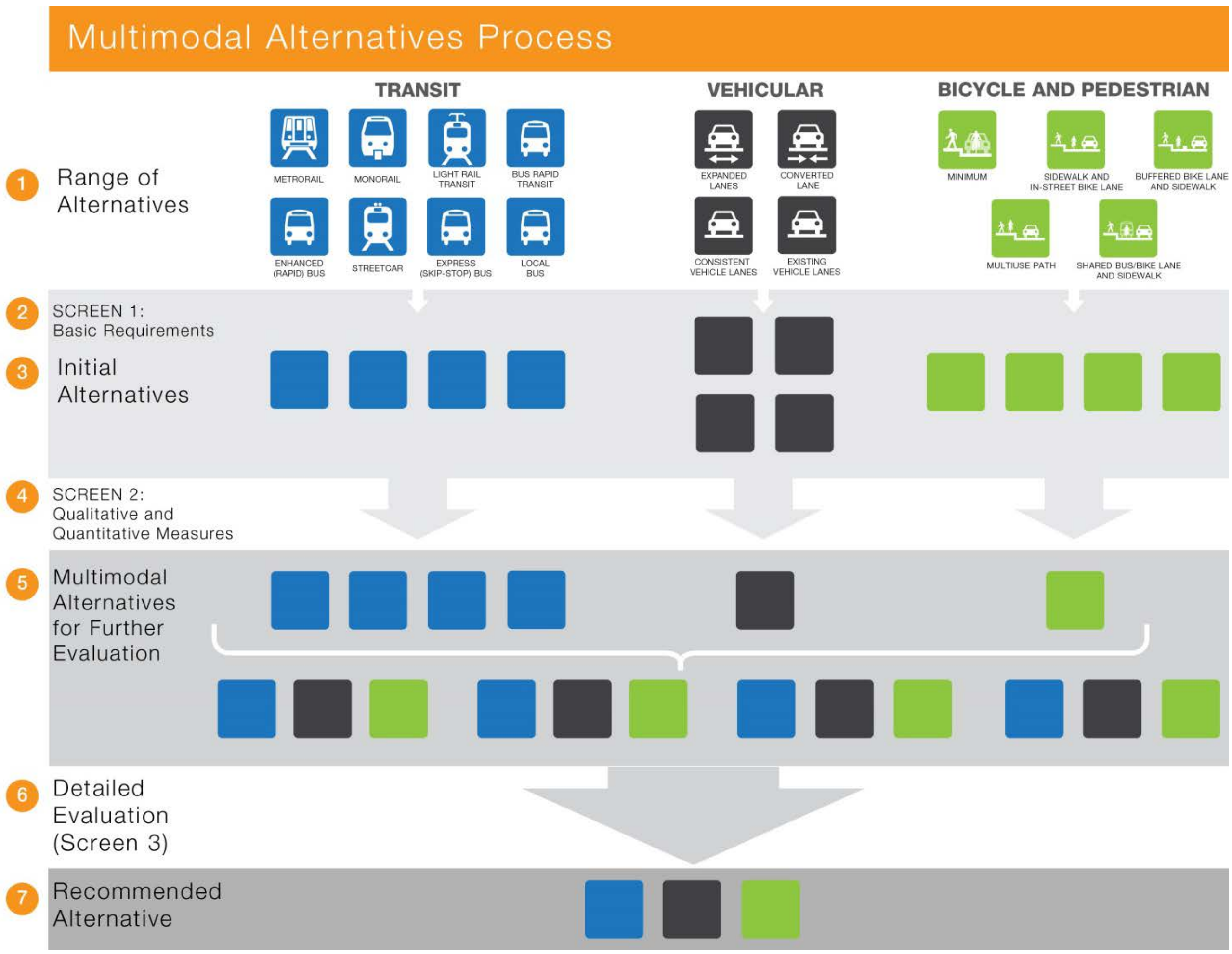
Screen 3 - Detailed Evaluation: Evaluates four multimodal alternatives using measures based on project goals and objectives and project implementation factors. The four multimodal alternatives were developed by combining the best vehicular lane configuration and bicycle and pedestrian facility alternatives with three transit modes.

Evaluation measures were developed in coordination with the project management team, elected officials, technical advisors, and community measures. The needs as well as the goals and objectives served as the basis for developing the evaluation criteria and performance measures.

At the conclusion of the detailed evaluation, Screen 3, the project team recommends a multimodal alternative to advance towards project implementation. This program of improvements is expected to be adopted by the counties as a Locally Preferred Alternative.

Figure 5-2 shows the development and screening process.

Figure 5-2: Overview of Multimodal Alternatives Development and Screening Process



6.0 Initial Alternatives

Alternatives in three different mode categories were developed and evaluated:

- **Transit technology:** Broad range of potential transit technologies (local bus to heavy rail)
- **Vehicular Travel lanes:** Variations on number and arrangement of general purpose travel lanes
- **Bicycle and Pedestrian**: Broad range of bicycle and pedestrian accommodation options

From the broad range of possible approaches to addressing transportation needs, a set of initial alternatives emerged based on their conformance to minimum requirements. The following sections describe the development and evaluation of these initial alternatives.

6.1 Bicycle and Pedestrian Alternatives

Four initial bicycle and pedestrian alternatives were developed and evaluated. The alternatives include:

1. **Minimum Accommodation- shared vehicle lane:** Sidewalk and no dedicated bike lane. Bicycle would be permitted in general purpose travel lane.

2. **Sidewalk and In-Street Bike Lane:** The sidewalk and in-street bike lane alternative proposes separate rights-of-way for pedestrians and bicyclists.

3. **Shared Bus/Bike Lane and Sidewalk:** The shared bus/bike lane and sidewalk alternative proposes separate rights-of-way for pedestrians and bicyclists.

4. **Buffered Bike Lane and Sidewalk:** The buffered bus/bike lane and sidewalk alternative proposes separate rights-of-way for pedestrians and bicyclists.

5. **Multiuse Path (Bicycle and Pedestrians):** The multiuse path alternative proposes a shared right-of-way for pedestrians and bicyclists.

The *Minimum Accommodation Alternative* was eliminated after failing to meet the minimum project requirements, as it did not provide facilities for bicyclists.

For the remaining four alternatives, three major considerations inform the recommendation:

1. Safety and comfort for cyclists of all abilities
2. Possible to implement incrementally/ flexibility over time
3. Right-of-way requirements and potential impacts on properties and community resources

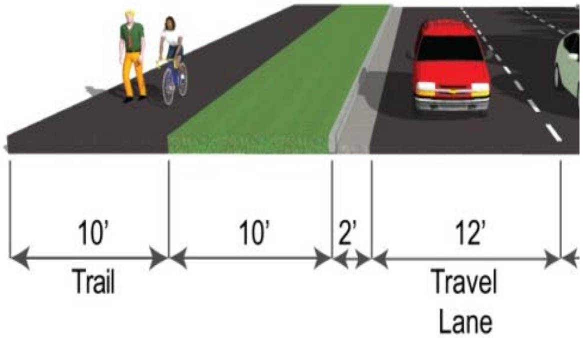
Table 6-1 summarizes the key tradeoffs of the four alternatives. The table shows that the Multiuse Path alternative best provides a safe bicycle facility, given the current posted speed limit along Route 1, and best pedestrian accommodations while minimizing impacts on right-of-way. **Figure 6-1** shows the recommended alternative.

Implementation of the recommended section will likely vary along the corridor due to availability of right-of-way, adjacent development, and other considerations. Given the 15 mile length of the corridor and the different land use characteristics along different segments of the corridor, no single solution for bicycle/pedestrian facilities is likely to be implemented for the full length of the corridor. In station areas, where multi-story buildings are constructed along Route 1, sidewalks for pedestrians and on-street bicycle facilities are appropriate. Other sections of Route 1 outside the station areas may have multiuse paths or on-street bicycle lanes as determined by right-of way availability and other considerations. The new DRPT Multimodal System Design Guidelines should be used in the final determination of the appropriate bicycle and pedestrian facility.

Table 6-1: Pedestrian and Bicycle Facility Alternatives

	In-street bike lane and sidewalk	Shared bus/bike lane and sidewalk	Buffered bike lane and sidewalk	Multiuse path
Provides access along full corridor	Improves walk & bike access to destinations	Improves walk & bike access to destinations	Improves walk & bike access to destinations	Improves walk & bike access to destinations
Provides safety and comfort given high auto speeds and volumes	In-street bike lane not recommended for 45 mph+	Shared bike/travel lane not recommended for 45 mph+	Bike lane buffered from 45 mph traffic	Bike lane buffered from 45 mph traffic with curb and landscape strip
Requires additional right-of-way	Requires some new ROW	Requires little new ROW	Requires significant new ROW	Requires some new ROW

Figure 6-1: Recommended Bicycle and Pedestrian Facility: 10-foot Multiuse Path



6.2 Vehicular Lane Alternatives

The purpose of the vehicle lane analysis is to confirm that six general purpose travel lanes along the majority of the corridor would support the projected increase of traffic volume in 2035; this recommendation is referred to as the "Consistent Lanes" alternative, as it assumes improvements identified in the VDOT Centerline Study (1998). A six general purpose lane configuration is consistent with the Fairfax County Comprehensive Plan. **Figure 6-2** shows the proposed cross-section.

Figure 6-2: Consistent Lane Configuration

The Consistent Lane Alternative was compared to three additional alternatives:

- **Existing Lanes:** Retains the varied cross section as presently built. In general, there are two travel lanes in each direction in the southern segment, and three travel lanes in each direction in most of the northern segment.

- **Expanded Lanes:** Adds an additional lane, making the majority of the corridor a four lane per direction configuration (although some areas are expanded from two to three lanes).This alternative is also the widest cross-section.

Expanded Lanes

- **Converted Lanes**: Repurposes one existing travel lane per direction to serve as a managed lane for transit and potentially other high occupancy vehicles.

Converted Lanes

The four travel lane alternatives met the minimum requirements and were evaluated using three major considerations:

1. Forecasted future traffic volumes and operational impacts along the corridor.
2. Pedestrian conditions: pedestrian-friendly environments are associated with shorter crossing distances.
3. Right-of-way requirements and potential impacts on properties and community resources.

The key evaluation measures summarized above serve to balance these considerations. Taken together they lead to an alternative for travel lanes that:

- Accommodates future traffic while being informed by pedestrian accessibility; and
- May require additional right-of-way but avoids the most pronounced impacts to properties and resources.

Table 6-2 summarizes the evaluation findings of the four initial alternatives. The table shows that the Consistent Lanes Alternative best accommodates future traffic while minimizing right-of-way needs. This alternative is also consistent with the Fairfax County and Prince William County Comprehensive Plans and findings from the VDOT Center Line Study (1998). **Figure 6-3** shows the recommended section. Further detail on traffic analysis is contained in the Traffic and Transportation Report.

Table 6-2: Vehicular Lane Evaluation

	Existing	Consistent Lanes	Expanded Lanes	Converted Lanes
Intersection Performance	4 intersections with LOS E or worse	3 intersections with LOS E or worse	No Intersections with LOS E or worse	10 intersections with LOS E or worse
Right-of-Way (ROW) Impacts	Moderate ROW impacts	Moderate ROW impacts	Significant ROW impacts	Few ROW impacts
Pedestrian Accommodation	Varies, inconsistent along the corridor	Moderate pedestrian crossings	Longest pedestrian crossings	Shortest pedestrian crossing
Consistency with Local Plans	Not included in previous plans	Consistent with Fairfax County Comprehensive Plan; Previous VDOT study recommendations	Not included in previous plans	Not included in previous plans

[5] For convenience in describing the varying typical sections within the study area, the, corridor is divided into:
(North) - the North section from I-495 to Mount Vernon Highway;
(Middle) – the central segment of the corridor from Mount Vernon Highway to Telegraph Road;
(South) - the Southern segment extends from Telegraph Road to VA 123

Figure 6-3: No Build/Consistent Lanes Alternative

6.3 Transit Alternatives

6.3.1 Range of Transit Alternatives

Several transit alternatives were considered and screened based on the minimum project requirements. Four alternatives did not meet the minimum project requirements and were not advanced for further evaluation. Alternatives that did not advance include: monorail, streetcar, express/skip stop, and local bus. **Table 6-3** summarizes this preliminary screening.

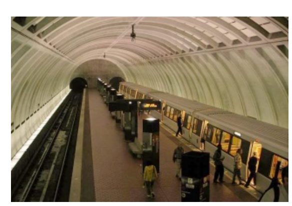
Table 6-3: Alternatives Failing to Meet Principles Based on Purpose and Need (Screen 1)

	Improves transit travel time or provides attractive multimodal accommodations	Increases economic viability and vitality of corridor	Increases public and investor confidence in delivery and sustainability of investment	Integrates with existing or planned regional transit systems
Metrorail	✓	✓	✓	✓
Monorail	✓	✓	X	X
Light Rail Transit	✓	✓	✓	✓
Bus Rapid Transit	✓	✓	✓	✓
Enhanced (or rapid) bus	✓	✓	✓	✓
Streetcar	X	✓	✓	✓
Express/skip stop bus	X	X	✓	✓
Local bus	X	X	✓	✓

6.3.2 Initial Transit Alternatives

The four transit alternatives that met the minimum requirements and were advanced for evaluation in Screen 2 include:

- **Metrorail:** operates on an electric railway. It is characterized by high speed and rapid acceleration passenger rail cars, a dedicated right-of-way separate from other modes, sophisticated signaling, and high platform loading (APTA *Mode of Service Definitions*, 2014).



- **Light Rail Transit (LRT):** LRT operates with passenger rail cars (usually in either in one-, two-, or three-car trains) on fixed rails in right-of-way that is often separated from traffic for most or part of the way. Light rail vehicles operate using electric power from an overhead electric line via a trolley or pantograph, are driven by an operator on board the vehicle, and feature high or low level platform loading (APTA *Mode of Service Definitions*, 2014).

- **Bus Rapid Transit (BRT):** BRT operates with roadway vehicles powered by diesel, gasoline, battery, or alternative fuel engines contained within the vehicle. Vehicles operate on streets and roadways in fixed-route and regular service, with “rapid transit” indicating that buses operate along a dedicated right-of-way for most or part of the route (APTA *Mode of Service Definitions*, 2014).

- **Enhanced Bus:** Enhanced Bus operates with roadway vehicles. Vehicles operate on streets and roadways in fixed-route and regular service, with “enhanced” indicating that buses make limited stops and operate at more frequent headways than local buses (APTA *Mode of Service Definitions*, 2014).

For the purposes of Screen 2, all alternatives were assumed to operate along the full 15-mile corridor. Preliminary station stop locations were identified for each transit technology (see **Figure 6-4**). To compare alternatives fairly, a consistent policy service level of 6 minute headways in the peak and 12 minute headways in the off-peak periods was assumed for all alternatives. The *Traffic and Transportation Report* (June 2014) details assumptions regarding service span, service frequency, operating days and peak and off-peak hours.

Figure 6-4: Initial Alternatives

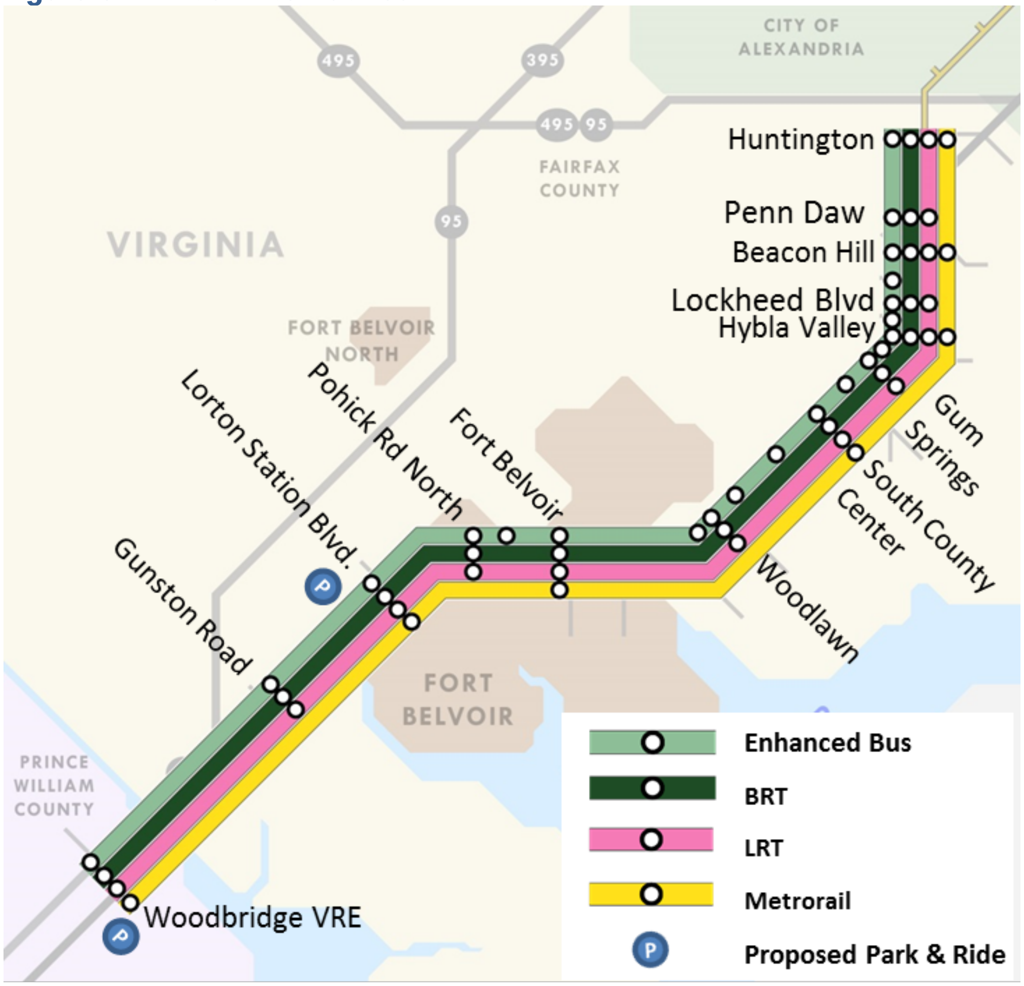


Table 6-4 summarizes the key performance indicators for the initial alternatives. Screen 2 evaluated the performance of each transit alternative in its application along the corridor as a whole from end to end. However, the performance evaluation, coupled with cost considerations, illustrates that a given transit alternative may provide the best performance when used for a portion of the corridor in conjunction with other transit alternatives.

Table 6-4: Key Indicators of Initial Alternatives

	Enhanced Bus	Bus Rapid Transit	Light Rail Transit	Metrorail
Average Weekday Ridership (2035)	9,500	16,600	18,400	38,500
Conceptual Capital Cost*	$12 M / mile ($180 M)	$52 M / mile ($780 M)	$80 M / mile ($1.20 B)	$320 M / mile ($4.80 B)
Annual O&M Cost	$14 M	$17 M	$24 M	$84 M
Cost Per Rider**	$10	$15	$21	$37

*Based on general per mile cost averages.

** Does not represent FTA Cost Effectiveness evaluation.

6.3.3 Initial Transit Alternatives: Key Findings

The key findings and conclusions for each initial transit alternative are discussed below:

- **Enhanced Bus:** Enhanced bus is the lowest-cost alternative, but also attracts the lowest ridership; for areas north of Fort Belvoir, enhanced bus provides similar service as REX and inadequate to support the 2035 population and employment estimate.

- **Bus Rapid Transit:** Bus Rapid Transit (BRT) performs moderately well in transit performance characteristics and is more cost effective than the rail alternatives. BRT was recommended to be further explored, and the performance tradeoffs among configuration options documented: BRT operating in dedicated lane in the curb lane and center median, versus BRT operating in mixed traffic.

- **Light Rail Transit:** LRT performs well in transit performance characteristics and is likely to be a strong catalyst for economic development. LRT is also more cost effective than a full 15-mile Metrorail extension. This alternative was recommended for further evaluation.

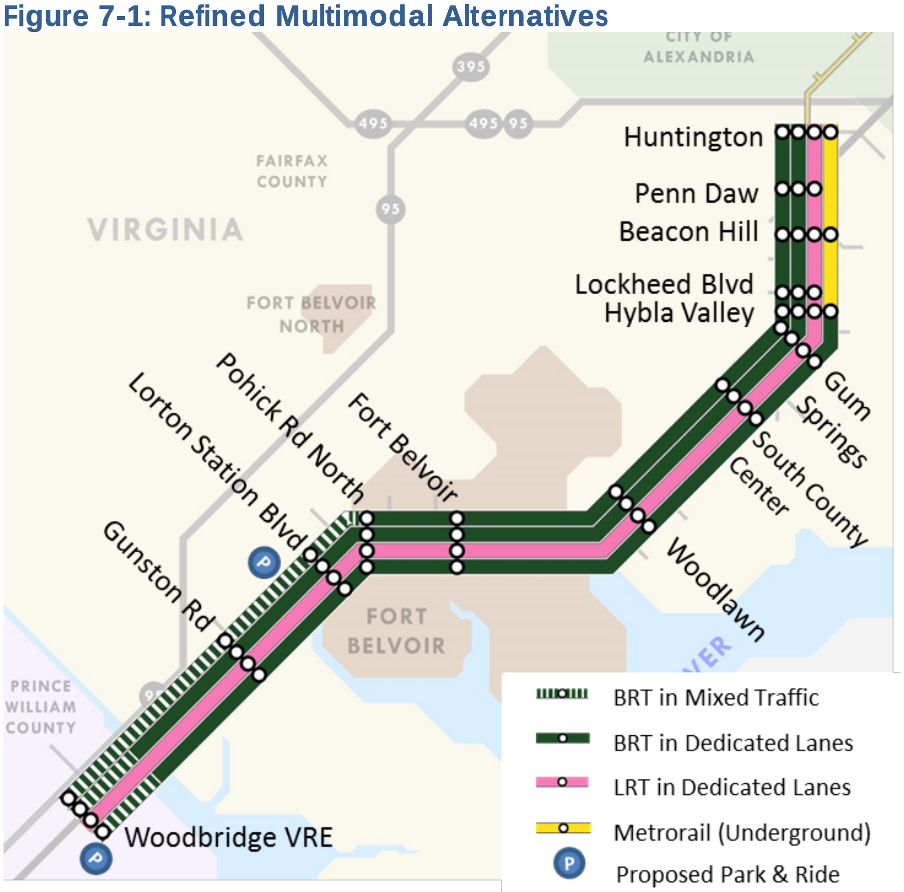
- **Metrorail:** Metrorail performed well in transit performance characteristics and attracted the highest ridership; however due to the extremely high capital cost for the full alignment to Woodbridge, it was considered infeasible. The 2035 activity density levels would not support a Metrorail extension. In the northern section, where population and employment levels are forecasted to be highest along the corridor, a two- to three-mile extension was recommended to be explored. A short Metrorail extension could be complemented by Bus Rapid Transit to Woodbridge.

7.0 Refined Multimodal Alternatives

The best performing initial alternatives from Screen 2 were combined as four multimodal alternatives for detailed evaluation. The four alternatives assume the same vehicular lane and bicycle/pedestrian facility configuration, but the transit mode and operating assumptions vary. The multimodal alternatives assume a consistent, six-lane vehicular lane configuration and a 10-foot multi-use path along the majority of the corridor. The bicycle/pedestrian facility configuration will vary depending upon urban design, right-of-way availability, and other local considerations. The four alternatives are referred to by the transit component (see **Figure 7-1**) and include:

1. Alternative 1 - Bus Rapid Transit – curb running
2. Alternative 2 - Bus Rapid Transit – median running
3. Alternative 3 - Light Rail Transit – median running
4. Alternative 4 - Hybrid – Yellow line extension to Hybla Valley with supporting Bus Rapid Transit (median) to Woodbridge

Figure 7-1: Refined Multimodal Alternatives



All the multimodal alternatives assume the following characteristics:

- 6 minute peak/ 12 min off-peak service headways
- Off-board fare collection
- TSP for peak direction[6]
- Two park and ride facilities (3,000 spaces each) at Lorton Station Blvd and Woodbridge Station

The subsequent sections describe the alternatives in detail, including operating and capital cost assumptions. All costs are reported in 2013 dollars.

7.1 Alternative 1: BRT – Curb

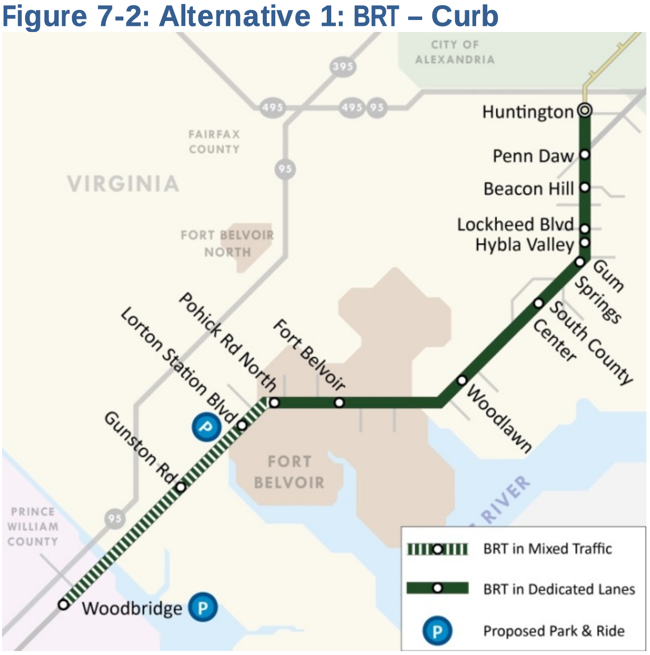
Transit Operations

This alternative assumes BRT service in dedicated outside lanes in the north portion of the corridor (10 miles) to Fort Belvoir. From Fort Belvoir south to Woodbridge, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes (5 miles). **Figure 7-2** shows the station location names and **Figures 7-3** and **7-4** show typical sections.

Capital and Operating Costs

The estimated capital cost for Alternative 1 is $832 million. The annual estimated operations and maintenance cost for Alternative 1 is $18 million.

Figure 7-2: Alternative 1: BRT – Curb



[6] Alternative 1- BRT Curb also assumes queue jump for mixed traffic sections.

Figure 7-3: Alternative 1: BRT – Curb, typical section (Huntington to Fort Belvoir)

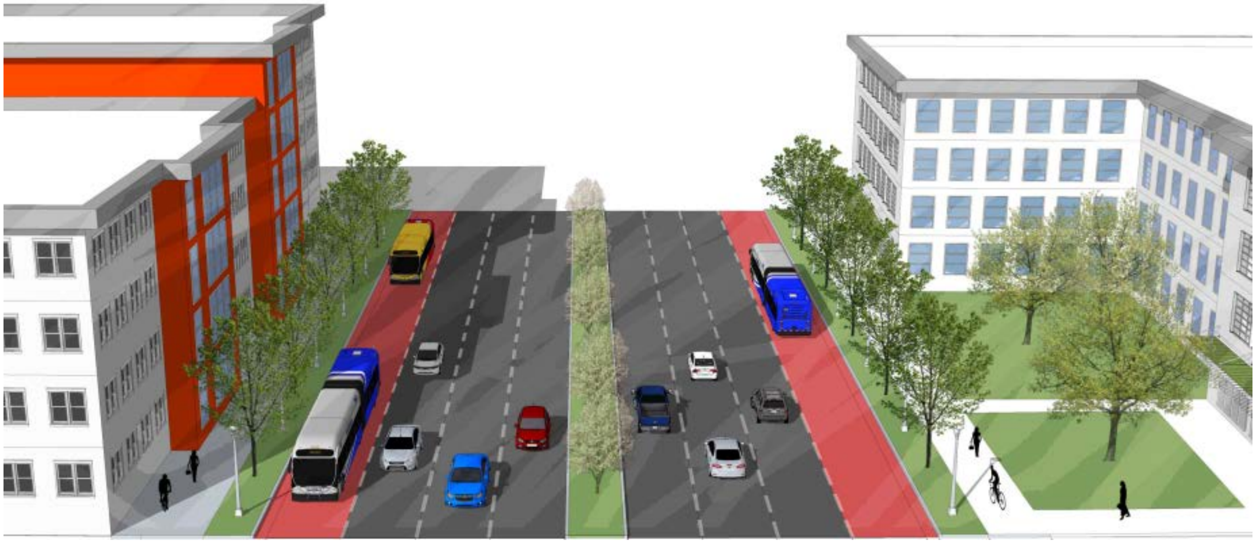


Figure 7-4: Alternative 2: BRT – Curb, typical section (Pohick Road to Woodbridge VRE)

7.2 Alternative 2: BRT – Median

Transit Operations

This alternative assumes BRT operates in the median of Route 1 in dedicated lanes in Fairfax County (14 miles), and transitions to mixed traffic in Prince William County (1 mile). Within Prince William County, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes. **Figure 7-5** shows the station location names and **Figure 7-6** shows a typical section.

Capital and Operating Costs

The estimated capital cost for Alternative 2 is $1.01 billion. The annual estimated operations and maintenance cost for Alternative 2 is $17 million.

Figure 7-5: Alternative 2: BRT – Median

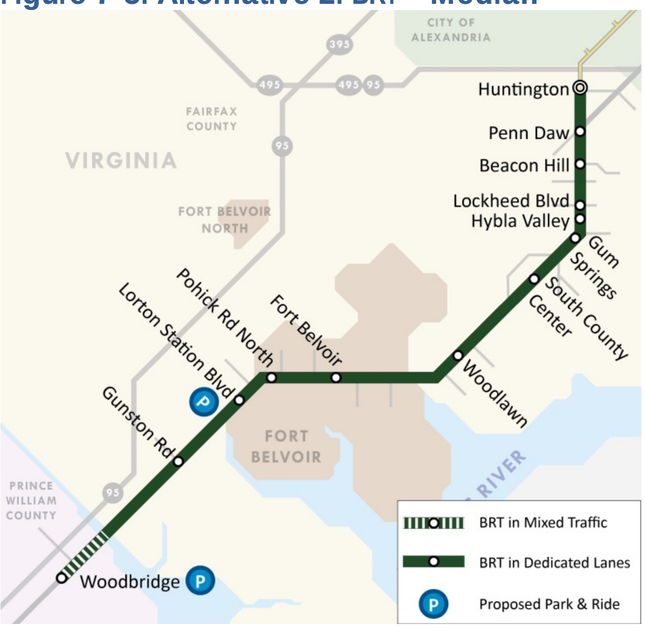


Figure 7-6: Alternative 2: BRT – Median, typical section (Fairfax County)

7.3 Alternative 3: Light Rail Transit

Transit Operations

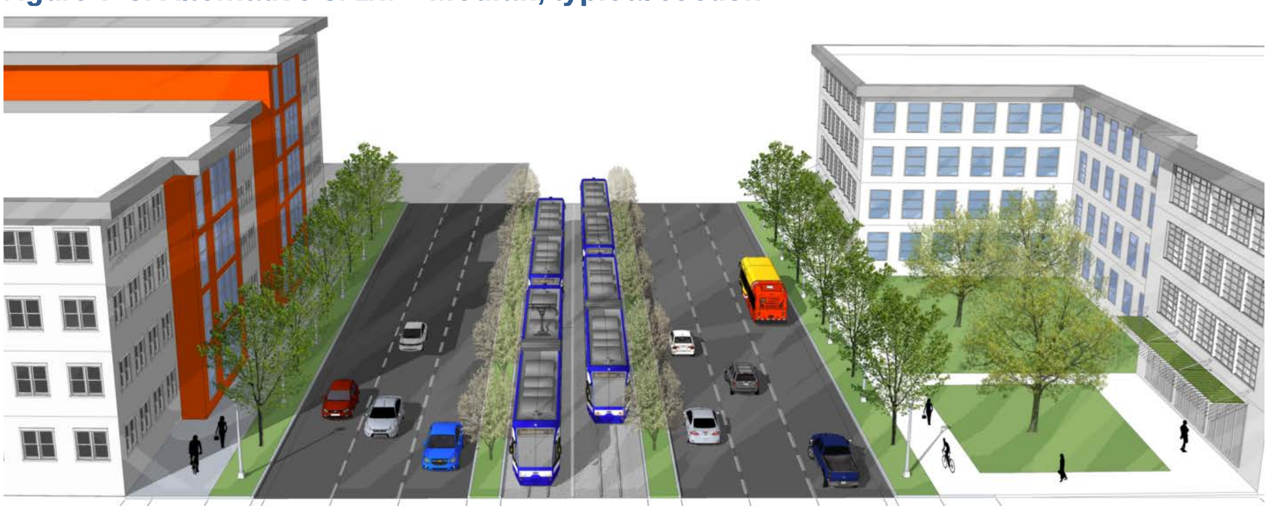
This alternative assumes Light Rail Transit service in a dedicated median transitway for the majority of the corridor (14 miles). In Prince William County, LRT service would be configured in a dedicated transitway parallel to Route 1 (1 mile). **Figure 7-7** shows the station location names and **Figure 7-8** shows a typical section.

Capital and Operating Costs

The estimated capital cost for Alternative 3 is $1.56 billion. The annual estimated operations and maintenance cost for Alternative 3 is $24 million.

Figure 7-7: Alternative 3: LRT

Figure 7-8: Alternative 3: LRT – Median, typical section



7.4 Alternative 4: Metrorail/BRT Hybrid

Transit Operations

This alternative assumes BRT operates in the median in dedicated lanes in Fairfax County (14 miles), and transitions to mixed traffic in Prince William County (1 mile). Across the Occoquan River Bridge and within Prince William County, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes. **Figure 7-9** shows the station locations. In the long-term, this alternative assumes a Yellow Line Metrorail Extension underground to Hybla Valley (3.1 miles). **Figure 7-10** shows the typical section for BRT and **Figure 7-11** shows the typical section for Metrorail extension.

Capital and Operating Costs

The estimated capital cost for Alternative 4 is $2.46 billion in 2013 dollars. The annual estimated operations and maintenance cost for Alternative 4 is $34 million in 2013 dollars.

Figure 7-9: Alternative 4: Metrorail/BRT Hybrid

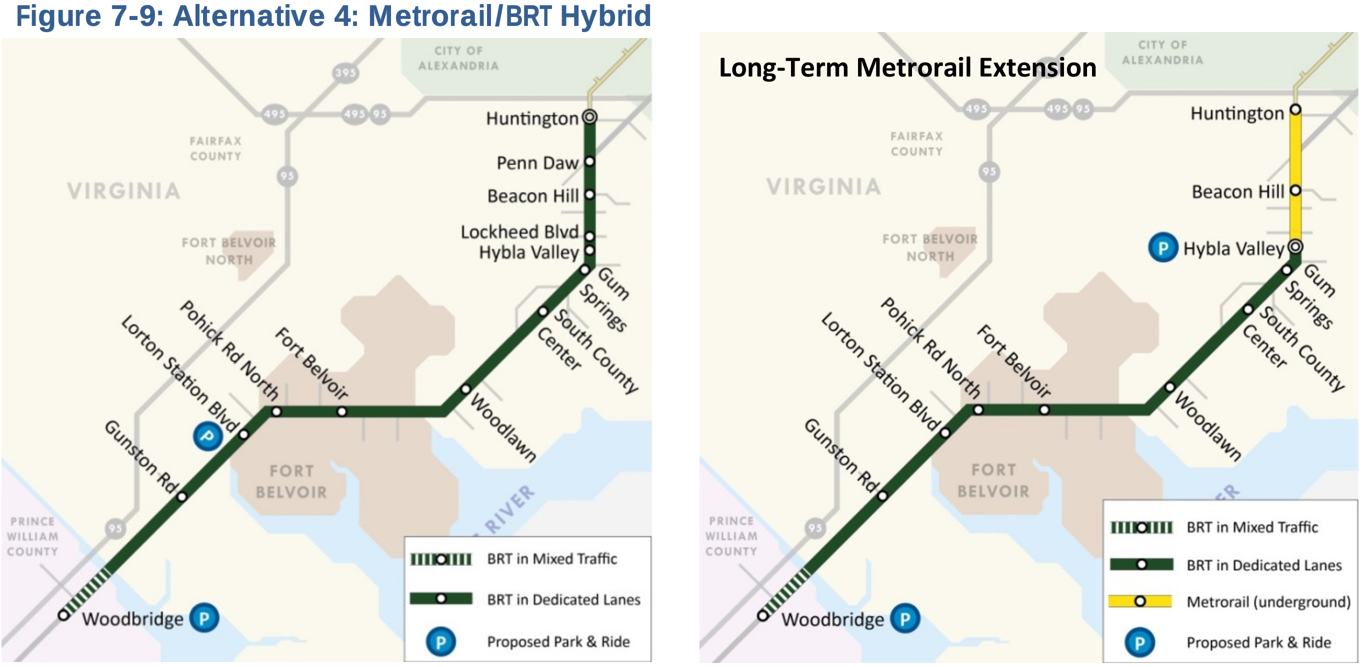
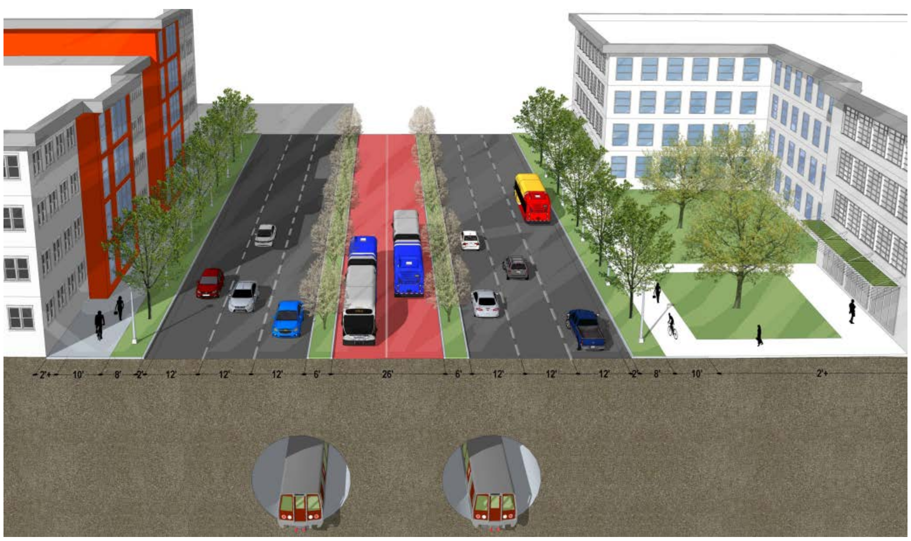


Figure 7-10: Alternative 4: Metrorail/BRT Hybrid – Median, Typical Section (Hybla Valley to Woodbridge)

Figure 7-11: Alternative 4: Metrorail/BRT Hybrid – Underground, typical section (Yellow line extension)



8.0 Evaluation of Multimodal Alternatives

8.1 Introduction and Summary of Findings

The goal of the evaluation is twofold:

1. Assess how well each alternative addresses the project goals and objectives
2. Assess feasibility of implementing each alternative (requirements articulated by public participants, elected officials, and technical staff)

The first evaluation considers the ability of each alternative to meet the project goals and objectives, as described in Chapter 4. This is performed using identified evaluation measures that provide either quantitative or qualitative data on how well each alternative meets the goals.

The second evaluation is a qualitative assessment of the feasible timing for implementation and financial feasibility of each Alternative. The evaluation focuses on development levels appropriate to the type of transportation investment, and ability to secure funding for recommended improvements.

8.1.1 Summary of Findings

The study team recommends a phased implementation of the multimodal (roadway, bicycle/pedestrian, and transit) improvements of "Alternative 4- BRT/Metrorail Hybrid", including:

- **Roadway Widening**: Widen roadway from four lanes to six lanes where necessary to create a consistent, six-lane cross section along the corridor.
- **Bicycle and Pedestrian Facilities:** Create a continuous facility for pedestrians and bicyclists along the 15 mile corridor; the configuration will vary depending upon urban design, right-of-way availability, and other local considerations.
- **Transit:** Contingent upon increased land use density and project funding, implement a median-running Bus Rapid Transit (BRT) system from Huntington to Route 123 in Woodbridge (curb-running BRT in mixed traffic within the Prince William County portion) and a 3-mile Metrorail Yellow Line extension from Huntington to Hybla Valley as expeditiously as possible.

Table 8-1 presents the evaluation results that support this technical recommendation.

Table 8-1: Evaluation of Alternatives Summary

Evaluation Factors (Goals)	Alternative 1: BRT-Curb	Alternative 2: BRT-Median	Alternative 3: LRT	Alternative 4: Metrorail-BRT (Hybrid)
Goal 1: Local and Regional Mobility	0.7	0.8	0.8	**1.00**
Goal 2: Safety and Accessibility	0.7	**0.8**	**0.8**	**0.8**
Goal 3A: Economic Development	0.6	0.6	0.6	**0.7**
Goal 3B: Cost Effectiveness	**1.0**	0.9	0.7	0.5
Goal 4: Community and Health Resources	0.7	0.7	0.7	**0.8**
Ability to Meet Project Goals Average	**0.7**	**0.8**	**0.7**	**0.8**

The next sections summarize the key findings by evaluation factor and present tables that show the comparative measures. Explanatory text for each measure is provided below the summary tables. Further detail on the technical methods that support the quantitative measures is presented in the following related reports:

- *Traffic and Transportation Report*
- *Land Use and Economic Development Report*
- *Preliminary Funding Analysis Report*
- *Environmental Scan Report*

8.2 Ability to Address Project Goals and Objectives

At the beginning of this Alternatives Analysis study, goals and objectives were established to help guide development of the alternatives. The goals and objectives were created through public and stakeholder involvement and reflect the underlying locally adopted land use and transportation plans. The goals represent the combined vision of policy-makers, stakeholders, and members of the community.

In this evaluation each alternative is assigned a score for each measure, shown in grey text below each set of results. The best performing alternative for each measure receives a perfect score of 1.0. The other alternatives are assigned values relative to the best score. This methodology provides proportional comparison of the alternatives against one another.

For each goal, specific measures are weighted more heavily than others, indicated by bold text. The weighting reflects input received from participants at the March 2014 public, results of a public survey posted on the project website from March 26 to April 26, 2014, and professional judgment of Project Management Team staff.

8.2.1 Goal 1 Evaluation and Summary

Goal 1:	**Expand attractive multimodal travel options to improve local and regional mobility**
Objectives:	Increase transit ridership
	Improve transit to reduce travel times
	Increase transportation system productivity
	Improve bicycle and pedestrian networks
	Integrate with other transit service

Key Results:

- All alternatives improve local and regional mobility by providing improved transit and bicycle/pedestrian facilities and connecting to the regional transit network
- Projected daily project ridership in 2035 ranges from 15,000-27,000; Alternative 4 attracts the highest ridership
- Transit travel time savings are greatest for alternatives that operate in dedicated right-of-way (Alternatives 2, 3, and 4)

Summary of Findings:
Compared to the other alternatives, Alterative 4 provides the greatest improvement to corridor mobility. Alternative 4 attracts the highest ridership, carries the most people along the corridor, and provides a slightly faster travel time. Alternative 4 performs best under this goal due to Metrorail's relatively higher operating speed and direct connection with the regional rapid transit network. Because the transit vehicles operate in dedicated lanes in the median, Alternatives 2 and 3 provide greater travel

time savings than Alternative 1. All alternatives provide improved bicycle and pedestrian improvements and connect to the regional transit system. The evaluation results are presented in **Table 8-2**.

Table 8-2: Goal 1 - Expand Attractive Multimodal Travel Options to Improve Local and Regional Mobility

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Daily project ridership (2035)*	15,200 0.57	16,600 0.63	18,400 0.69	26,500* (BRT 10,600; Metro 22,900) 1.00
Number of new transit riders	1,500 0.32	2,000 0.42	2,500 0.53	4,750 1.00
Number of transit dependent riders*	5,157 0.81	5,438 0.86	5,788 0.91	6,350 1.00
Transit Travel Time Savings (Ft Belvoir to Huntington Metro Station)*	6 min 0.59	9 min 0.85	9 min 0.92	10 min 1.00
Average transit person throughput	1,050 0.40	1,180 0.45	1,360 0.52	2,600 1.00
Ratio of transit person throughput to total person throughput, peak hour	26% 0.55	28% 0.60	32% 0.68	47% 1.00
Number of riders who walked to access transit	4,700 0.90	5,000 0.96	5,200 1.00	5,200 1.00
Provides improved bicycle and pedestrian facilities	High 1.00	High 1.00	High 1.00	High 1.00
Provides connections to regional transit network*	Connects to Huntington Metro Station 1.00	Connects to Huntington Metro Station 1.00	Connects to Huntington Metro Station 1.00	Connects to Huntington Metro Station 1.00
Average Score	**0.70**	**0.78**	**0.83**	**1.00**

*Measure given double weighting in the Average Score

8.2.2 Goal 2 Evaluation and Summary

Goal 2:	**Improve safety; increase accessibility**
Objectives:	Provide accessible pathways
	Reduce modal conflicts
	Improve pedestrian crossings
	Maintain traffic delays at acceptable levels

Key Results:

- All alternatives assume construction of additional lanes or guideway for transit vehicles, and therefore have comparable, relatively minor impacts on traffic operations.
- Alternative 1 operates in the curb lane, providing superior pedestrian access to stations, but results in slower travel time and precludes a future on-street bike lane.
- Alternative 1 operates in the curb lane; frequent curb cuts and access points along Route 1 degrade reliability of the transit service.
- Alternatives 1 and 4 have the narrowest roadway section which minimizes the total distance of exposure for a pedestrian crossing the street.

Summary of Findings:
This goal relates to the performance of the overall transportation system; it compares the alternatives in terms of network performance and access to corridor destinations. All of the alternatives have been developed to improve accessibility and safety.

This goal highlights the key trade-offs between median-running and curb-running transit, including pedestrian accessibility to stations, travel time, transit reliability, and flexibility for a future on-street bike lane. Alternative 1 operates in the curb lane, and Alternatives 2, 3, and 4 operate in the median. Although curb-running transit allows convenient pedestrian access to stations, it can lead to greater variability and slower travel times for transit and traffic because it shares its dedicated lane with local buses as well as cars making right turns. In general, traffic evaluation results show that impacts to the auto network are similar for curb-running versus median-running transit. However, in practice curb-running transit introduces more friction from an operations perspective; median-running transit preserves dedicated transit operations and allows different access and urban design approaches as property along Route 1 is developed and redeveloped.

With implementation of bike lanes, curb-running transit also introduces points of conflict between transit vehicles and bicycles and between transit passengers and bicyclists.

The evaluation results are presented in **Table 8-3**.

Table 8-3: Goal 2 Evaluation – Improve Safety and Increase Accessibility

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Pedestrian access to station stops*	Medium 0.60	Medium 0.60	Medium 0.60	Medium 0.60
Pedestrian crossing time (including signal delay)*	102 sec 0.95	116 sec 0.84	116 sec 0.84	97 sec 1.00
Automobile travel time (minutes during peak hour, Ft. Belvoir to Huntington Station)	24.0 0.99	23.7 1.00	24.0 0.99	23.7 1.00
Automobile network delay, Ft. Belvoir and Hybla Valley test segments (vehicle hr/hr)*	466 0.99	468 0.98	460 1.00	468 0.98
Traffic impacts due to turning vehicles (left turns)	Minimal impact 0.80	Moderate impact 0.40	Moderate impact 0.40	Moderate impact 0.40
Impacts due to turning vehicles (right turns)	Significant impact 0.20	No impact 1.00	No impact 1.00	No impact 1.00
Preserves flexibility for bike lane in higher activity nodes	Less flexible 0.40	More flexible 0.80	More flexible 0.80	More flexible 0.80
Average Score	**0.71**	**0.79**	**0.79**	**0.82**

*Measure given double weighting in the Average Score

8.2.3 Goal 3 Evaluation and Summary

Goal 3:	**Increase economic viability and vitality of the corridor**
Objectives:	Increase and improve connectivity to local and regional activity centers Encourage and support compact, higher density, mixed use development consistent with local plans, policies, and economic objectives Secure public and investor confidence in delivery and sustainability of new transit investments Provide high-capacity transit facilities at locations where existing and future land uses make them mutually supportive

This goal encompasses two distinct categories of measures; results and findings are summarized under these two categories:

3A: Ability to support corridor economic development, and
3B: Cost effectiveness

Key Results for 3A:

- Alternatives 3 and 4 offer the greatest transit travel time savings, suggesting that these alternatives could increase the pace of new development built in the corridor and lead to additional new commercial development.
- All of the alternatives provide improved access to jobs and access by employers to workforce.
- Alternatives 1 and 2 have a higher probability of commencing operations within ten years. Alternatives 3 and 4 would not be operational within the next ten years given the greater engineering and construction requirements.

Key Results for 3B:

- Alternatives 3 and 4 are the most expensive to construct and operate, as well as the least cost effective.

Summary of Findings, 3A:

This goal relates to both the viability of implementing the alternatives, and their utility as catalysts for development in the corridor. Alternative 2 performs best overall under this goal because it is relatively affordable, provides good support for development plans, and is more flexible than Alternative 1 to accommodate future conversion to a rail technology.

All alternatives improve corridor mobility by improving travel time and increasing accessibility; Alternative 4 performs highest in terms of supporting and potentially spurring economic development for the corridor because of its benefits to corridor mobility. This relationship between transportation and economic development suggests that as all alternatives improve corridor mobility, all will contribute and support economic development in the corridor. In terms of land redevelopment and the potential for a supporting street network expansion, literature reviews suggest that rail alternatives (Alternatives 3 and 4) are a stronger catalyst.

The evaluation results are presented in **Table 8-4**.

Table 8-4: Goal 3a Evaluation – Economic Development

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Tendency to encourage additional development*	Medium-Low 0.50	Medium 0.60	High 0.80	Medium-High 0.70
Tendency to accelerate pace of development	Some potential to increase pace of development 0.50	Some potential to increase pace of development 0.70	More potential to increase pace of development 0.80	More potential to increase pace of development 0.80
Per passenger O&M cost savings associated with increased population and employment growth	$0.75 0.66	$0.68 0.60	$1.14 1.00	$0.86 0.75
Jobs within 60 minutes (change over No Build)*	636 0.22	920 0.32	1,163 0.40	2,878 1.00
Potential to begin transit operations within 10 years**	High 0.8	High 0.8	Low 0.4	BRT portion is high; Metrorail is Very Low 0.5
Average Score	**0.56**	**0.62**	**0.60**	**0.72**

*Measure given double weighting in the Average Score
**Measure given triple weighting in the Average Score

Summary of Findings, 3B:

This area relates to the cost of implementing the alternatives. Alternatives 1 and 2 are less capital and operating cost intensive, while Alternative 4 is the most capital and operating cost intensive. Cost effectiveness follows the same general trend.

The evaluation results are presented in **Table 8-5**.

Table 8-5: Goal 3b Evaluation -- Cost Effectiveness

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Estimated capital cost ($)*	$832 M ($10M Ft Belvoir Shuttle) 1.00	$1.01 B ($10M Ft Belvoir Shuttle) 0.83	$1.56 B ($10M Ft Belvoir Shuttle) 0.53	$2.46 B (Metro $1.46B; BRT $1B; Ft Belvoir Shuttle $10M) 0.34
Estimated annual O&M cost ($)*	$18 M (BRT: $13M, Ft Belvoir Shuttle: $5M) 0.94	$17 M (BRT: $12M, Ft Belvoir Shuttle: $5M) 1.00	$24 M (LRT: $19M; Ft Belvoir Shuttle: $5M) 0.71	$31 M (Metro: $17M; BRT: $8M; Ft Belvoir Shuttle: $5M) 0.50
Cost per rider ($) (Annualized capital + operating cost)/ Average of 2015 and 2035 ridership)	$21 1.00	$22 0.95	$30 0.70	$30 (Metrorail: $26; BRT: $32) 0.70
Average Score	**0.98**	**0.93**	**0.65**	**0.54**

*Measure given double weighting in the Average Score

8.2.4 Goal 4 Evaluation and Summary

Goal 4:	**Support community health and minimize impacts on community resources**
Objectives:	Minimize negative impacts to the natural environment Contribute to improvements in regional air quality Increase opportunities for bicycling and walking to improve community physical health

Key Results:

- Alternative 1 requires the least additional right-of-way impacts and therefore would affect relatively fewer community resources.
- Alternatives 3 and 4 have the greatest ability to convert auto trips to non-auto alternatives, leading to a greater reduction in Vehicle Miles Traveled (VMT) and diversion of trips from I-95 and I-395 to transit—both of which minimize air quality impacts.
- Alternatives 3 and 4 would lead to the greatest temporary construction impacts. Alternative 4 includes tunneling.
- Alternatives 3 and 4 would add the most to land value which, in turn, could be leveraged to help construct the local street network and fund other supporting services.

Summary of Findings:
This goal relates to both the ability of an alternative to increase transit mode share and decrease automobile use as well as the potential impacts on the environment to the proposed project. Alternative 1 has fewer potential environmental effects because it proposes less right-of-way expansion, while Alternatives 2, 3, and 4 would attract more riders and lead more people to use transit rather than drive.

Several of the measures are drawn from an "environmental scan" conducted for each alternative according to typical approaches for assessing project impacts. Additional detail is provided in the *Environmental Scan Report*.

The evaluation results are presented in **Table 8-6**.

Table 8-6: Goal 4 Evaluation -- Support Community Health and Minimize Impacts on Community Resources

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Change in Vehicle Miles Traveled*	(20,000) 0.44	(26,000) 0.58	(34,000) 0.76	(45,000) 1.00
Trips diverted from I-95/I-395	700 0.58	900 0.75	1,200 1.00	1,200 1.00
Temporary Construction Impacts	Least Intensive 0.40	Moderate 0.60	Intensive 0.20	Intensive 0.20
Ratio of environmental benefits to annualized project cost (FTA criterion)	2.0% 0.91	2.2% 1.00	1.9% 0.86	1.7% 0.77
Total additional right-of-way required* (number of affected parcels)	20-30 1.00	30-40 0.73	35-35 0.67	30-40 0.73
Environmental Impacts: Parklands, Cultural Resources, Wetlands	Fewest Impacts 1.00	Some impacts 0.75	Moderate impacts 0.62	Some impacts 0.75
Average Score	**0.75**	**0.69**	**0.69**	**0.77**

*Measure given double weighting in the Average Score

8.3 Project Implementation Factors

This section of the report focuses on the Project Implementation Factors: critical indicators of successful and timely implementation, and financial feasibility of the project alternatives.

The implementation factors were developed based on input received by public participants at the March 26, 2014, public meeting; County leadership and elected officials during the Executive Steering Committee meeting on March 20, 2014; and technical advisors during the Technical Advisory Committee Meeting on March 6, 2014. Supplemental analysis was undertaken during Summer 2014 to complete a phasing and funding assessment that helped to differentiate the study alternatives and highlight the trade-offs surrounding implementation. The focus was on Alternatives 2 and 4, which performed best in the evaluation against the project goals and objectives.

The implementation factors are organized below as follows:

- **Development levels appropriate to the type of transportation investment**
    - Projected population and employment levels should support the intensity of land use typically associated with the mode.
    - County Comprehensive Plans should reflect the density required to support the mode.
    - A supporting street grid and other public infrastructure and services should be reflected in updated Comprehensive Plans.
- **Ability to secure funding for recommended improvements**
    - The recommended project should be potentially competitive for federal funding through the FTA Capital Investment Program.
    - Project costs should not exceed the reasonable expectation for local funding.

The evaluation and comparison of alternatives according to these factors are described in the subsequent sections.

8.3.1 Development Levels and Supporting Infrastructure

Population and employment levels in the corridor are increasing, and transportation services and infrastructure are necessary to accommodate growth. This assessment seeks to gauge the appropriate transportation investments given the projected levels of development.

Development Factor 1: Anticipated growth levels and appropriate transportation investment

Key Results:

- Alternatives 1 and 2 are most appropriate given the current and anticipated levels of population and employment growth.
- Major changes in the amount and concentration of population and employment growth would be necessary before Alternatives 3 and 4 are viable.

Summary of Findings:

Transportation investments are developed to respond to defined needs. The need for transit service relates to the levels of activity along the project corridor. In other words, a major transit investment must be supported by an appropriate level of population and employment density.

Transit investment can serve as a catalyst for growth in a project corridor, but unless there is a basic level of activity and land value already in place, decision makers run the risk that transit investments are too far ahead of activity levels and service is not utilized to an extent that—in the context of other pressing needs—justifies the expense of the project.

The DRPT Multimodal Design Guidelines describe population and employment density thresholds typically associated with levels of transit service investment. Taking into account the MWCOG projections for population and employment in 2035, and in consideration of the adopted Fairfax County and Prince William County Comprehensive Plans, Alternatives 1 and 2 are the most appropriate near-term transit investments given the projected growth and anticipated development levels. To support Alternatives 3 or 4, there would need to be a different expectation for the level of population and employment growth, and selected revisions to the Comprehensive Plans to accommodate the higher growth levels.

Development Factor 2: County Comprehensive Plans should reflect activity levels and station locations

Key Results:

- At the northern end of the corridor, the current Fairfax County Comprehensive Plan allows for growth levels that would support BRT (Alternatives 1 and 2) or LRT (Alternative 3). Current County Comprehensive Plans for areas south of Fort Belvoir do not generally support a premium transit investment.
- Changes in the planned amount and concentration of development would be necessary before Alternatives 3 and 4 are viable.

Summary of Findings

In consideration of the adopted Fairfax County and Prince William County Comprehensive Plans, Alternatives 1 and 2 are the most appropriate near-term transit investments given the projected growth and anticipated development levels. To support Alternative 3 or the Metrorail extension as part of

Alternative 4, there would need to be a different expectation for the level of population and employment growth, and selected revisions to the Comprehensive Plans to accommodate higher growth levels and associated public infrastructure investment.

The Fairfax County and Prince William County Comprehensive Plans articulate a development vision for the corridor and specify the density levels and FAR planned for this corridor. This study developed a comparison of the Comprehensive Plan development levels with the DRPT Multimodal Design Guidelines activity levels typically associated with transit investment types. BRT alternatives (Alternatives 1 and 2) are generally supported by the Comprehensive Plan activity density levels, while rail alternatives (Alternatives 3 and 4) are not currently supported by the Plans.

With regard to transit station areas, the Fairfax County Comprehensive Plan establishes Community Business Centers along the corridor between Fort Belvoir and Huntington. Transit stations for each of the alternatives have been located according to these clusters of higher-intensity development. Future updates to the Comprehensive Plans would reinforce proposed transit station areas by focusing planned development and investment in these areas.

Development Factor 3: A supporting street grid and other public infrastructure and services

Key Results:

- Traffic analysis shows that with growth levels that support a BRT investment, an enhanced local street grid would be required, including continuous street capacity parallel to Route 1—the equivalent of one or two new two-lane streets (see *Additional Transportation Analysis Report*)
- With growth levels that support Metrorail, more robust local street grid enhancements would be required, including continuous street capacity parallel to Route 1—the equivalent of up to six new two-lane streets.
- To accommodate growth, Route 1 transportation investment must be complemented by other major features including roads, schools, public safety, and parks. Metrorail supportive growth levels require significantly more infrastructure investment than BRT or LRT levels.

Summary of Findings:
A supporting street grid and other public infrastructure and services would need to be in place to support the alternatives and should be reflected in updated Comprehensive Plans. Even though these investments fall outside the formal scope of the Route 1 Multimodal Alternatives Analysis, they are important as the Counties plan for the future development and redevelopment of the Route 1 corridor.

8.3.2 Project Funding

Funding Factor 1: Ability to secure Federal Transit Administration grant funding for recommended transit projects

Key Results:

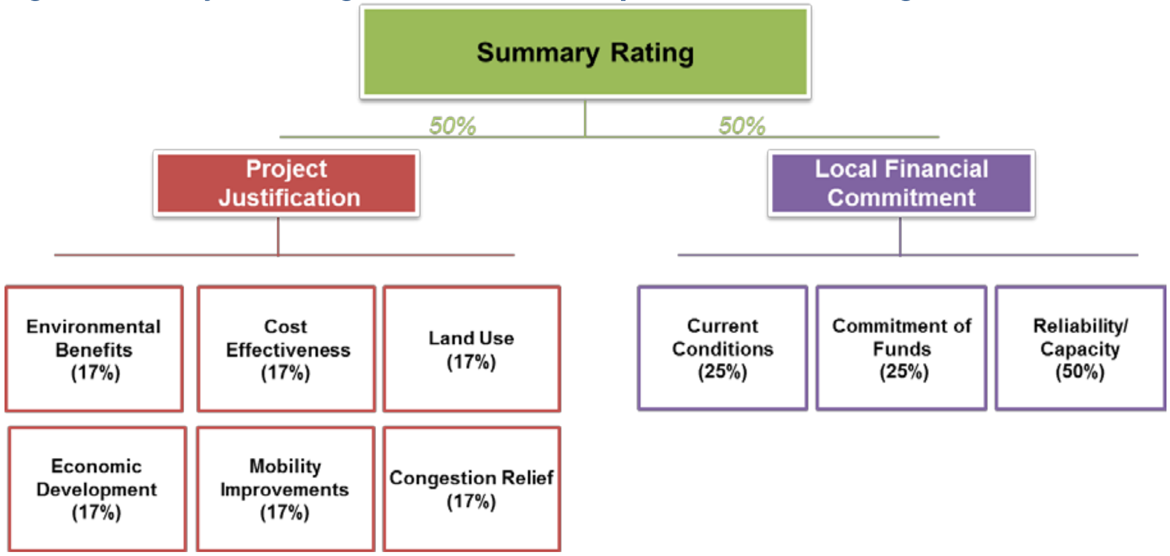
- None of the Alternatives—as a full 15-mile multimodal project—is competitive for a grant through the FTA Capital Investment Program.
- The northern segments of Alternatives 1 and 2, between Fort Belvoir and Huntington, could be competitive for a grant through the FTA Capital Investment Program.
- Alternatives 3 and 4 are more capital-intensive, and would likely not be competitive for FTA grants.
- With significant population and employment growth, and strong growth in transit ridership, a Metrorail extension (Alternative 4) could be competitive for an FTA grant in the long term.

Summary of Findings:

Given constrained local, regional, and state budgets, competitiveness for federal funds is a priority. The transit elements of the recommended multimodal project should be potentially competitive for federal funding through FTA Capital Investment Program, which has typically funded eligible transit projects at 50 percent of project capital costs.

Federal funding competitiveness for the FTA Transit Capital Investment Program is based on Project Justification Criteria and Local Financial Commitment (see Figure 8-1). For each criterion FTA assigns a rating from Low to High; a project must receive at least a Medium rating on both project justification (average of six criteria) and local financial commitment to obtain a Medium or better rating overall.

Figure 8-1: Project Rating Factors for FTA Capital Investment Program



Project Justification Criteria

Regarding Project Justification, several criteria would be consistent across alternatives; differentiators relate to Mobility Benefits (ridership) and Cost Effectiveness (cost per rider). Over the full 15-mile corridor, none of the alternatives performs well for Cost Effectiveness, but the BRT alternatives, Alternatives 1 and 2, come closest to reaching a Medium rating. A shorter initial BRT investment in the northern portion of the corridor is potentially more competitive. Section 9 below provides more detail related to potential performance of the alternatives related to the Project Justification Criteria.

Local Funding Commitment

Over the past ten years, federal funding grants have become increasingly competitive, as more projects apply for the program while the amount of available funding remains generally consistent. Recently updated guidance from the Federal Transit Administration indicates that projects with higher levels of local funding are more competitive and more likely to receive a federal grant.

Programming for locally funded transportation projects in Fairfax County and Prince William County shows commitments to major projects through 2020. After 2020 there are opportunities to commit local funds to a new significant project.

Funding Factor 2: Project costs should not exceed the reasonable expectation for local funding

Key Results:

- Without a strong commitment of funds from Fairfax County and Prince William County, the project will not only be less competitive for federal funding, it will not be feasible. The local funding commitment is an indicator of the likelihood that the project will be implemented in a reasonable time frame.
- Alternatives 1 and 2 are the least capital intensive projects and therefore are more easily funded through existing funding sources.
- Alternatives 3 and 4 are more capital intensive, and would exceed the capacity of current programs and funding sources.

Summary of Findings:

The project team developed funding assumptions for each of the Alternatives, and these were presented and discussed with senior County staff. First, these discussions confirmed the assumption that a mix of local, regional, state, and federal funds will be required to implement any of the Alternatives. Second, the project is constrained by the fact that local and regional transportation funding has been programmed and committed to other projects for the next six years (through 2020). Section 9 below provides more detail related to the project funding assumptions.

Beyond 2020, transportation and capital improvement programs will allow for addition of new projects, but there are other committed projects that will limit the amount of funding that may be available for Route 1. Therefore Alternatives 3 and 4, with their high overall capital and O&M costs, would be difficult to implement in the near term. Alternatives 1 and 2 are more likely to be funded in the near term.

9.0 Recommendations

The recommendation is for a phased implementation of the multimodal (roadway, bicycle/pedestrian, and transit) improvements of "Alternative 4 BRT/Metrorail Hybrid". A BRT system would be implemented in phases in the near term and a Metrorail extension would be implemented in the longer term. This section of the report lays out a plan for implementing the technical recommendation.

As described above, implementation of Alternative 4 consists of:

- **Roadway Widening**: Widen roadway from four lanes to six lanes where necessary to create a consistent, six-lane cross section along the corridor (three lanes in each direction).
- **Bicycle and Pedestrian Facilities:** Create a continuous facility for pedestrians and bicyclists along the 15 mile corridor; the configuration will vary depending upon urban design, right-of-way availability, and other local considerations.
- **Transit:** Contingent upon increased land use density and project funding, implement a median-running Bus Rapid Transit (BRT) system from Huntington to Route 123 in Woodbridge (curb-running BRT in mixed traffic within the Prince William County portion) and a 3-mile Metrorail Yellow Line extension from Huntington to Hybla Valley as expeditiously as possible.

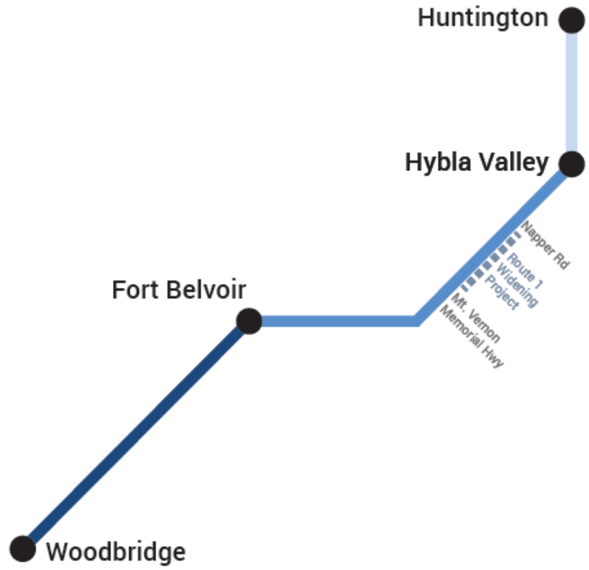
9.1 Phasing Plan

With the recommendation for a phased implementation of Multimodal Alternative 4—phased implementation of BRT and Metrorail service in the Route 1 corridor—a concrete program of actions is warranted. The BRT and Metrorail service will be implemented in phases, and reflect the following key considerations:

- **Prioritize segments that are most competitive for federal funding**—this reflects areas with higher population and employment and provide a connection to the regional transit network. The phases consider when the project could be competitive for federal funding.
- **Reflect county and VDOT planed widening project timelines** – this reflects the current programmed funding or widening plans in the CLRP.

Figure 9-1 shows the proposed phasing plan for the BRT and Metrorail implementation.

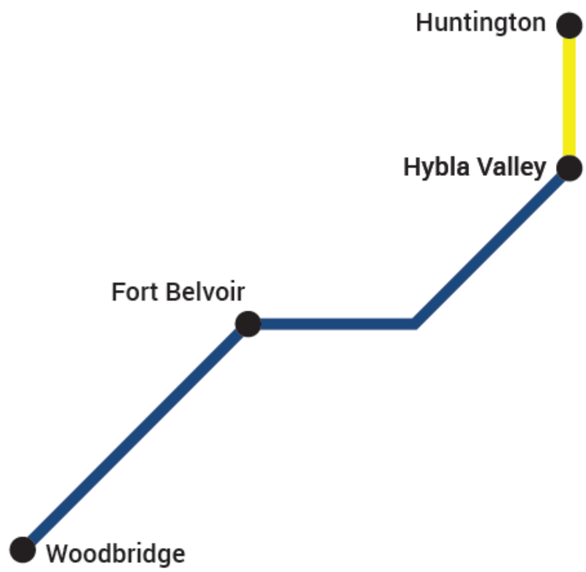
Figure 9-1: Proposed Phasing Plan



BRT Phase I (2026)
Huntington to Hybla Valley
$306M, 3.1 miles

BRT Phase II (2028)
Hybla Valley to Fort Belvoir
$224M, 7.3 miles

BRT Phase III (2032)
Fort Belvoir to Woodbridge
$472M, 4.6 miles



Metrorail Phase IV (2040)
Metrorail Yellow Line Extension to Hybla Valley
$1.46B, 3.1 miles

Note: The recommendation calls for implementation of the vehicular, bicycle, and pedestrian improvements at the same time, if not before, the phased transit improvements.

Woodlawn Vision (Artist's Rendering)

As shown in Figure 9-1, BRT would be implemented in three phases, and the fourth phase would extend Metrorail to Hybla Valley:

- **Phase I:** Huntington to Hybla Valley
- **Phase II:** Hybla Valley to Fort Belvoir
- **Phase III:** Fort Belvoir to Woodbridge
- **Phase IV:** Yellow Line Metrorail extension to Hybla Valley

Implementing Median-running BRT in the corridor is phased according to the competitiveness of the project segments for federal and state funding. Early, smaller scale projects will begin to signal to land owners and developers the permanence of the proposed transit investment and commitment. Focused effort should be on implementation of a first and second phase of BRT dedicated lanes, high-quality stations, and frequent service between Huntington and Hybla Valley, then extending south to Fort Belvoir.

Phase I and II would be most competitive for federal funding, given the higher current and future population and employment density in the area. In addition, Fairfax County has identified and programmed funding to widen Route 1 from Mount Vernon Memorial Highway to Napper Road. This widening project would occur during Phase I. Initial coordination with VDOT and FTA staff indicates that Phases I and II could be combined and advanced as an initial Multimodal project.

Phase III would be less competitive for federal funding; however, the counties could choose to advance this project without federal funding. The MWCOG Constrained Long Range Plan (CLRP) includes the proposed Route 1 widening from Fort Belvoir to Annapolis Way in 2035.

Based on preliminary analysis, Phase IV- Metrorail extension could be competitive for federal funding by 2040. This horizon year considers the future population and employment growth needed to increase transit ridership for a cost effective FTA project. An important element of this work would be to coordinate with WMATA and other regional stakeholders to address Metrorail core capacity constraints.

9.2 Recommendations for Successful Implementation

Study findings include several supporting recommendations that would be necessary for successful implementation. One key finding is that a Metrorail Yellow Line extension to Woodbridge along Route 1 (a 15-mile extension) would not be feasible. In keeping with the Prince William County Comprehensive Plan, a potential Metrorail Blue Line extension could be considered in subsequent study.

Successful implementation for all phases will require sustained and coordinated effort in three key areas: land use and economic development, transportation investment, and financial planning. The sections below summarize the recommendations; each of these topic areas are discussed in detail in a supporting technical report.

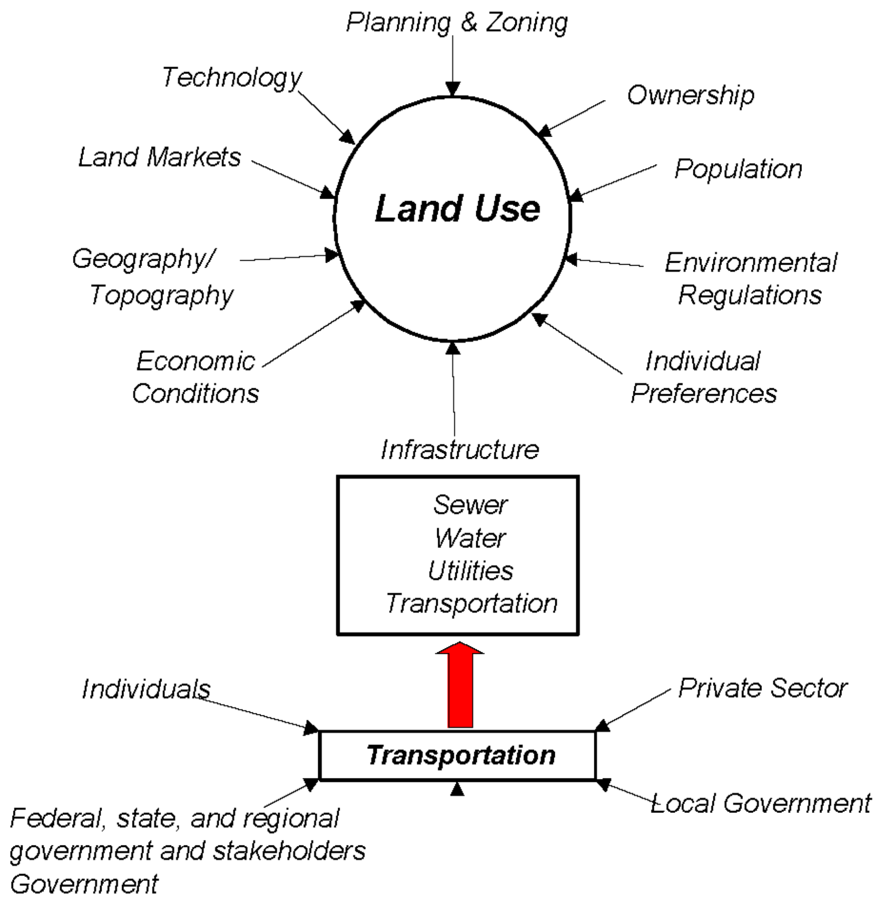
9.2.1 Land Use and Economic Development

Every transportation action affects land use, and all land use actions have transportation implications. As land development increases, it generates more travel and increases the need for new facilities; this in turn increases accessibility and attracts further development.

An integrated vision for the Route 1 corridor will guide actions to maximize economic development potential by creating a range of housing and commercial opportunities within the corridor. These actions will be taken in step with transportation infrastructure and services to achieve the maximum benefit of private and public investments. This vision will emerge in part through planned station areas that incorporate commercial space and a diversity of housing types within dynamic mixed-use centers connected by the multimodal corridor, as well as a walkable secondary street network. **Figure 9-2** shows transportation is a key influence on land use.

Fairfax and Prince William Counties have already created plans and guidelines for growth in key activity centers (called Community Business Centers and Urban Mixed Use Areas respectively) on the Route 1 corridor. The recommendations in this section build on the strong foundation already existing in the Comprehensive Plans, and take advantage of coordinated transportation investment as a mechanism to implement the Plans.

Figure 9-2: Transportation's Role in Land Use



[Source for Figure: Indirect and Cumulative Effects Analysis for Project Induced Land Development WisDOT 1996]

1. Market Absorption Study

As a first step toward implementing the study land use recommendations, County planning and economic development staff should conduct a market absorption study. The purpose of the market study is, to forecast a range of future land use and development scenarios in each station area. This exercise would not be a traditional, value-neutral real estate market analysis, which merely extrapolates from existing market trends, but a combination of quantitative market analysis techniques and qualitative, collaborative TOD planning and policy development. The objective is to identify future land use and development scenarios that are desirable from a TOD and Smart Growth standpoint and feasible from a development standpoint.

2. Comprehensive Plan Updates

Fairfax County and Prince William County have adopted Comprehensive Plans which help set the groundwork for focused transportation investments. These plans should be revisited in light of the Locally Preferred Alternative for transit and transportation, and they should be coordinated with efforts to attract added levels of employment and population growth for the Route 1 corridor. The Comprehensive Plan update should include the following:

- Station locations and specific station area plans
- Infrastructure requirements (schools, public safety, parks, and other critical public investments)
- Urban design regulations and parking policies
- Future Local Street Network

To achieve these objectives, Comprehensive Plans should include, or be accompanied by concrete, enforceable regulations and policies. The degree to which principles of the Comprehensive Plan are implemented in the form of adopted policy and physical development is a strong indicator of the success of federal transportation funding application.

3. Economic Development Activity

To encourage denser, mixed-use development at transit stations that will facilitate transit plan implementation, strategic economic development strategies should be deployed. Density bonuses, tax rebates and loan funds for transit-supportive development should be provided at higher levels than those already offered through the Richmond Highway CRD zoning overlay. The development approval process should be further streamlined to provide a greater incentive for transit station-area development.

Introduction of a major new catalyst development on or near Route 1 is a key strategy for spurring a significant increase in development that could support a high quality transit investment on the corridor. The Inova Mount Vernon Hospital and the expansions at Fort Belvoir provided further economic attraction for the corridor. An additional, successful major investment could continue this trend and could establish a model for the corridor.

The strategy would likely identify target sites for potential employers and active land assembly. The result of initial actions would be to define centers of economic activity. Over the longer term, other development would follow, reinforcing the planned centers and creating the sense of place articulated in the County Comprehensive Plans and the Route 1 Multimodal Alternatives Analysis.

4. Affordable Housing

The north section of Route 1 has a high proportion of affordable housing compared to Fairfax County as a whole. However, Fairfax County should evaluate and identify strategies to preserve and increase affordable housing in the corridor. Prince William County should consider adopting policies to preserve affordable housing in the corridor. Both jurisdictions should ensure that affordable housing is included as part of market-rate development. Within a region where land and housing prices continue to increase, active affordable housing policy is good economic development policy as well. As Route 1 transitions to a more pedestrian-friendly and transit-friendly place, the corridor will attract a new generation of residents and businesses.

9.2.2 Transportation

Travel along and within the current Route 1 corridor relies heavily on the Route 1 right-of-way. The intent of these recommendations is to implement changes along Route 1 that will safely and efficiently accommodate all modes of transportation.

1. Transit Investment

Phased implementation of high quality, high capacity transit service is at the core of the Route 1 Multimodal Alternatives Analysis. The project sponsors should act quickly to take the next steps in project development, and continue to coordinate actively across agencies to ensure consistency and efficiency of the continuing planning and design process. Phased construction/reconstruction of Route 1 will include a systematic effort to preserve right-of-way and remove utility conflicts, for median-running BRT.

2. Bicycle and Pedestrian Improvements

Fairfax County and Prince William County have already identified intersections and street segments where sidewalks and bicycle facilities are to be constructed (See Richmond Highway Public Transit Initiatives (RHPTI)). Additional locations for improvement will be identified with focus on low cost, strategic connections that will provide residents and workers with more direct walking and bicycling pathways. Specific recommendations for enhancing the bicycle and pedestrian network include:

- Prioritizing immediate small-scale connections to improve safety and access
- Aligning bus stops and cross walks to improve pedestrian safety
- Phasing construction of sidewalks and multiuse path along Route 1
- Continuing to improve intersection performance and overall traffic network functionality through signal control, signage, and focused lane reconfigurations

Given the 15 mile length of the corridor and the different land use characteristics along different segments of the corridor, no single solution for bicycle/pedestrian facilities is likely to be implemented for the full length of the corridor. In station areas, where multi-story buildings are constructed along Route 1, sidewalks for pedestrians and on-street bicycle facilities are appropriate. Other sections of

Route 1 outside the station areas may have multiuse paths or on-street bicycle lanes as determined by right-of way availability and other considerations. The new DRPT Multimodal System Design Guidelines should be used in the final determination of the appropriate bicycle and pedestrian facility.

3. Evaluate potential for supporting street grid

Successful transit-supportive land planning must be accompanied by enhancements to the local street network. The map in **Figure 9-3** shows a vision for a secondary street that generally parallels the Route 1 multimodal corridor through a network of local streets. The area of focus here is a connection between the Huntington Station Area and South County Center, on the west side of Route 1. It is intended as an alternative to Route 1 for local travelers between the station areas and should be part of a larger plan for a connected system of walkable streets, supporting access to transit stops and generating a framework for transit-related development along the entire corridor. Secondary roadways should have lower speeds and accommodate on-street bicycle facilities.

4. Protective Buying

To preserve adequate right-of-way for the proposed median BRT lanes and stations, VDOT and Fairfax County should undertake an active program of right-of-way preservation, or protective buying. As land values continue to rise in this area, protective buying will:

- Secure the corridor for future investment,
- Reduce developer/property owner uncertainty that some unknown quantity of their property will be taken at some unknown future time, and
- Signal to the market that corridor jurisdictions are committed and intent on delivering the transit projects.

Figure 9-3: Alternate Parallel Route (Illustrative purposes only)

9.2.3 Project Funding

Implementation of the recommended multimodal improvements will require funding from a variety of sources. The current study has explored a range of existing sources at the local, regional, state, and federal levels. Ongoing refinements of the project funding plan will continue to evaluate existing sources and assess possible new sources.

The current conceptual funding plan (see also the *Preliminary Funding Analysis Report*) includes the following considerations:

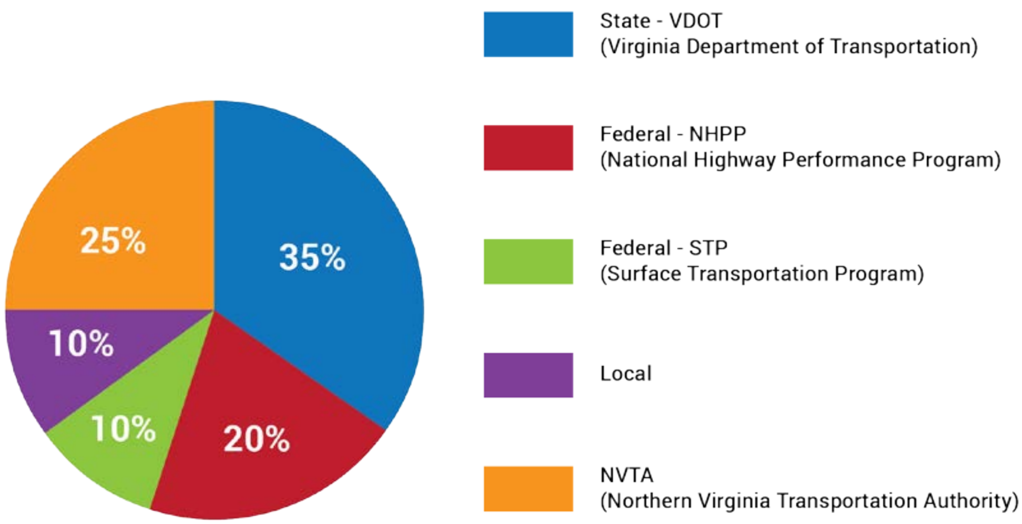
- **The project assumes FTA New Starts Funding:** The project team performed an initial analysis of the potential competitiveness for FTA New Starts funding for each phase of transit improvements. Preliminary results suggest that Phases I and II (Huntington to Fort Belvoir) of the BRT project could be competitive for FTA New Starts funding, while Phase III of the BRT project would likely not be competitive. Phase IV, Metrorail extension to Hybla Valley, may be competitive for FTA funding by 2040, contingent upon increased growth and development levels.

- **The project will rely heavily on the state and local funding sources:**
    - DRPT Capital Assistance Grant program (currently administered at 33 percent of transit capital costs).
    - NVTA dedicated funding to fund projects within 17 jurisdictions located in the Northern Virginia Transportation District (the projected current annual funding is $300 to $350 million per year).
    - Fairfax County has a dedicated revenue source for transportation in the Commercial and Industrial Real Estate Tax (roughly $50 to $60 million in annual funding).
    - Fairfax County issues general obligation and revenue bonds backed by the general fund and C&I revenues thus leveraging the tax funding it collects (currently $60 million in annual bond proceeds).
    - The Commonwealth Transportation Fund consolidates state and federal funding as well as planned bond proceeds, thus leveraging tax receipts with bond funding ($500 million allocated to rail and public transportation in FY2015-2020).
    - The potential for Value Capture and private proffer revenues will depend on the level of economic development and private sector interest. These sources are considered to provide a modest contribution to transit improvement along the corridor.

The text and graphics below illustrate the assumed mix of funding sources by type of improvement.

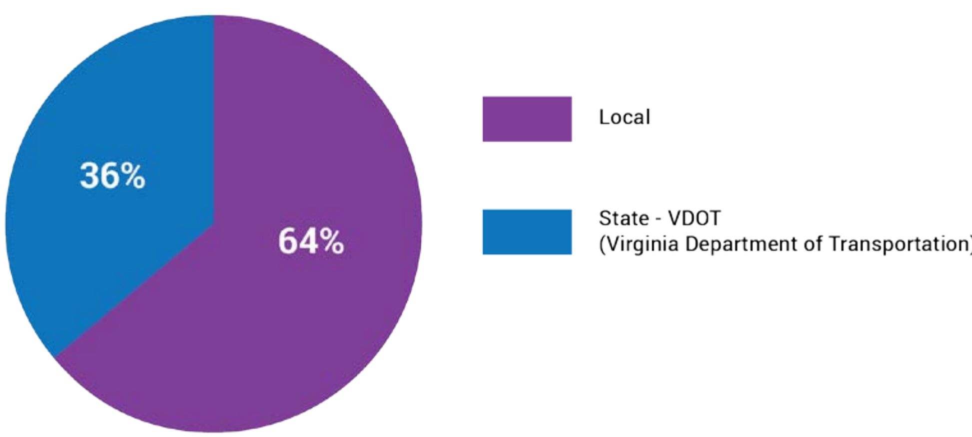
Roadway Improvements

The recommended alternative includes an estimated $292 million in roadway improvements. The funding mix for these investments would likely be a combination of state, federal formula, regional and local funds.



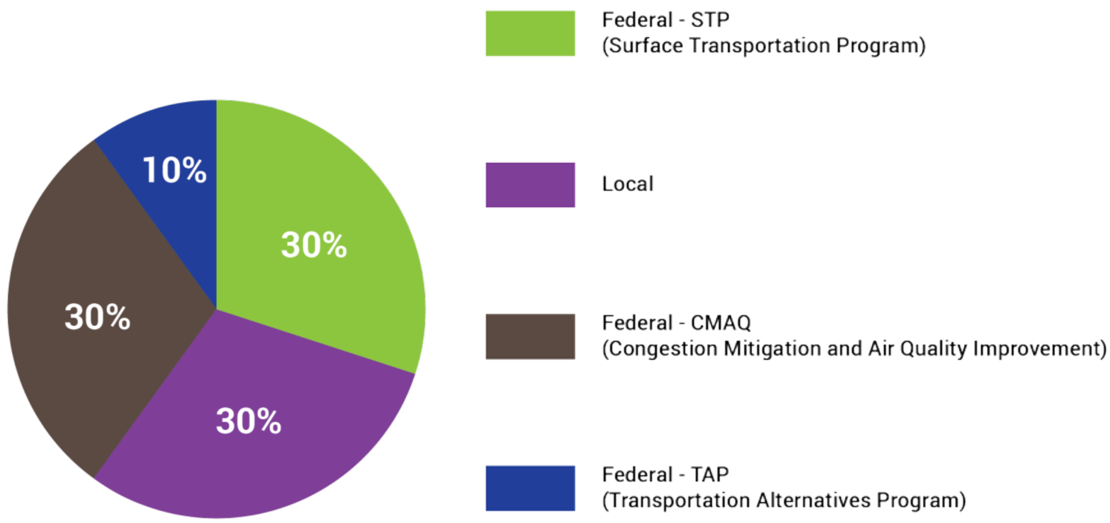
Right-of-Way

The total investment in right-of-way for the recommended alternative is an estimated $52 million.



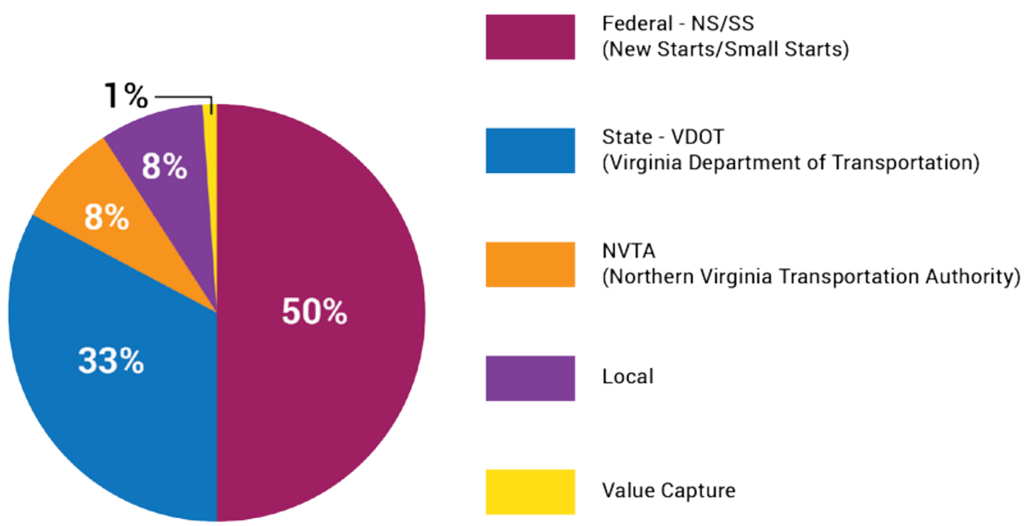
Sidewalks and Bicycle Facilities

The total investment in pedestrian and bicycle facilities is an estimated $21 million.

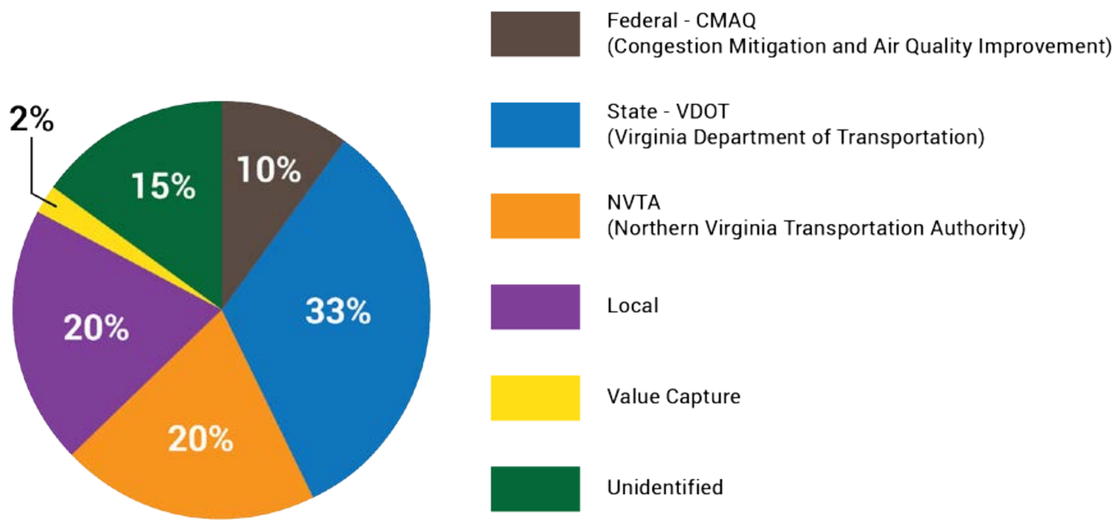


Transit

These investments total an estimated $1,764 million. The following funding mix is assumed for projects qualifying for FTA New Starts grant funding.



Preliminary analysis suggests that a BRT system from Fort Belvoir to Woodbridge may not be "completive" under FTA project justification criteria. The mix of funding for Phase III assumes a different mix of funding, including an "unidentified" category.



10.0 Project Schedule and Next Steps

This section lays out a plan for advancing the Route 1 Multimodal Alternatives Analysis recommendations. **Figure 10-1** illustrates a framework of implementation steps for both the near-term BRT project as well as the long-term Metrorail extension. **Figure 10-2** shows a more detailed implementation plan for each phase. Note that the immediate next phases of project development are accompanied by the recommended market absorption study and Comprehensive Plan updates.

Figure 10-1: Framework for Implementation

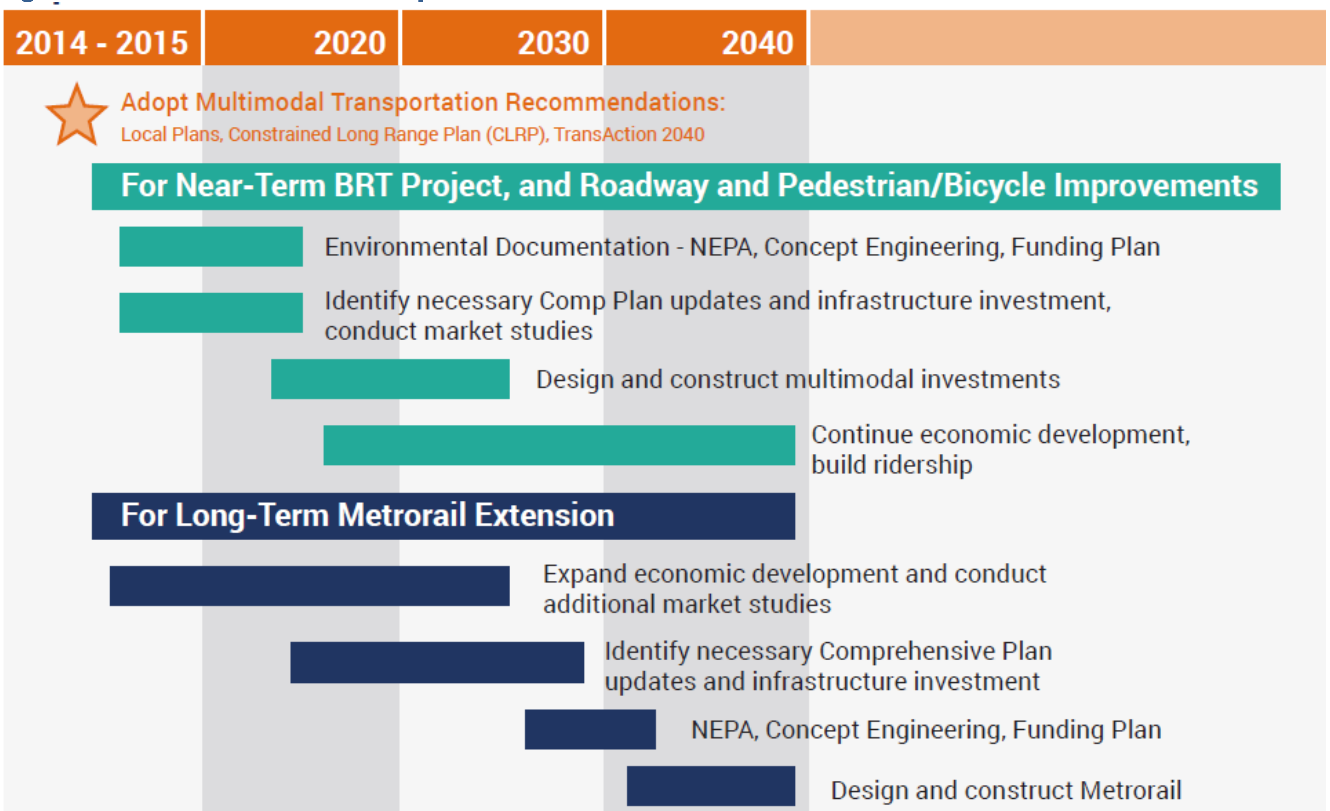
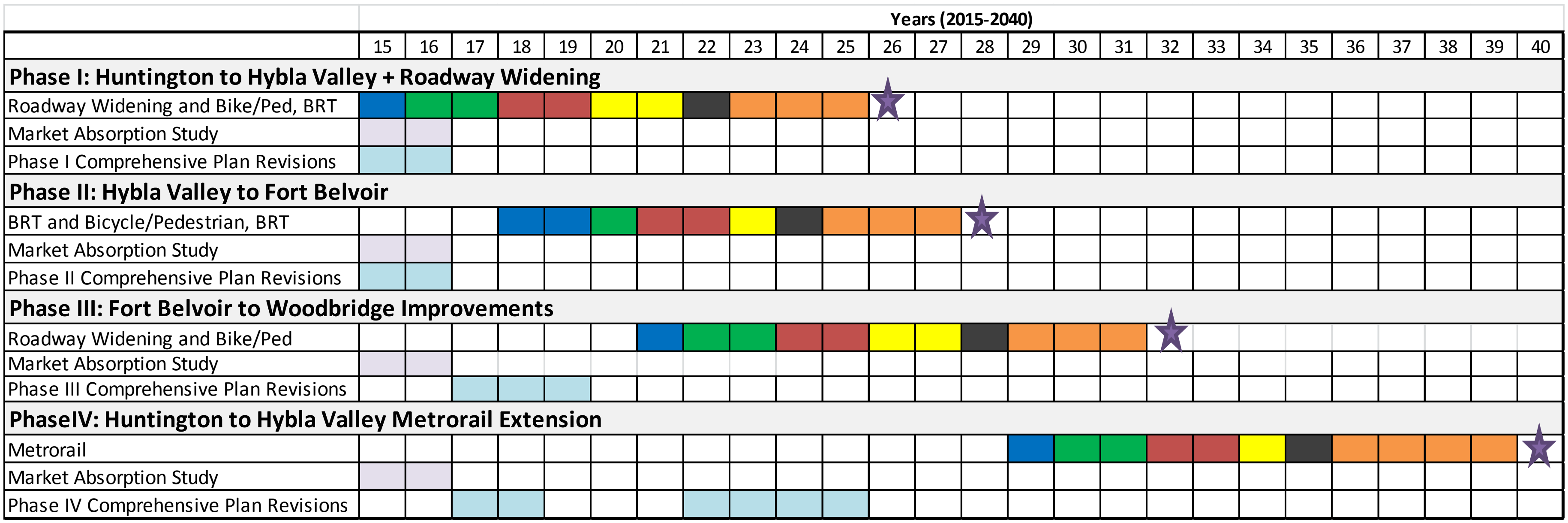


Figure 10-2: Potential Phasing and Implementation Schedule



Note: Timelines assume a funding stream to support project implementation.

*Contingent upon increased future land use density.

Legend: General Project Development Sequence

Comprehensive Plan	Planning	Scoping/ NEPA PE	Final Design	Right of Way	Utilities Relocation	Construction	Operation

The recommendations of this study recognize that many related corridor improvements are already underway. Roadway widening, a robust program of pedestrian and bicycle improvements, intersection upgrades, and transit service refinements are examples of the ongoing improvements being carried out in the study corridor by County and State agencies.

Immediate next steps toward project implementation are listed below.

1. Forward study recommendations to local governments for endorsement and implementation
2. Begin to incorporate recommendations in local, regional, and state plans:
    - County – Comprehensive Plans and Capital Improvement Programs
    - NVTA – TransAction2040 Plan and 6-Year Program
    - MWCOG – Constrained Long Range Plan and Transportation Improvement Program
    - Virginia – Statewide Transportation Plans and 6-Year Program
3. Coordinate environmental documentation “Class of Action” with responsible federal agencies: FTA and FHWA.
4. Initiate environmental documentation for Phases I and II (Huntington to Fort Belvoir)
5. Conduct corridor-wide market absorption study
6. Initiate Comprehensive Plan updates to reflect:
    - Transit station locations and station area plans
    - Infrastructure requirements due to increased land use density (roads, schools, etc.)
    - Refined street cross sections, corridor design standards, and additional street rights-of-way
7. Conduct a right-of-way survey to define potential impacts and create structure for public corridor preservation and private parcel consolidation

Route 1

Multimodal Alternatives Analysis

ROUTE 1 MULTIMODAL ALTERNATIVES ANALYSIS

APPENDICES

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APPENDIX A

Purpose and Need Report

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Route 1
Multimodal Alternatives Analysis

Route 1 Multimodal Alternatives Analysis

Purpose and Need Report

June 2014

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1.0 Introduction

The Virginia Department of Rail and Public Transportation (DRPT) is undertaking the Route 1 Multimodal Alternatives Analysis ("the Project") in coordination with Fairfax County, Prince William County, the Virginia Department of Transportation (VDOT), and the Office of Intermodal Planning and Investment (OIPI). *The purpose of the project is to provide improved performance for transit, bicycle and pedestrian, and vehicular conditions and facilities along the U.S. Route 1 ("Route 1") corridor that support long-term growth and economic development.*

The project defines key transportation issues for local and through travelers, and considers a range of transportation solutions to address the needs. These solutions include a combination of transit, roadway, and pedestrian and bicycle improvements. Solutions also consider future land use and development on the corridor. Through stakeholder participation and technical analysis, the project will result in a recommended program of transportation improvements for adoption by Fairfax County and Prince William County.

This memorandum summarizes the purpose of the project and explains why multimodal improvements are needed along the corridor. The "Purpose and Need" is the cornerstone of any transportation improvement project. It summarizes the existing conditions and relevant issue(s) to be solved, defines the transportation problem, and sets the context for consideration of alternatives. The Purpose and Need informs the project goals and objectives and helps guide the development and evaluation of alternatives. A comprehensive assessment of the corridor needs is provided in *Needs Assessment Technical Memorandum* (September 2013).

1.1 Methodology

The Purpose and Need is derived through three primary inputs:

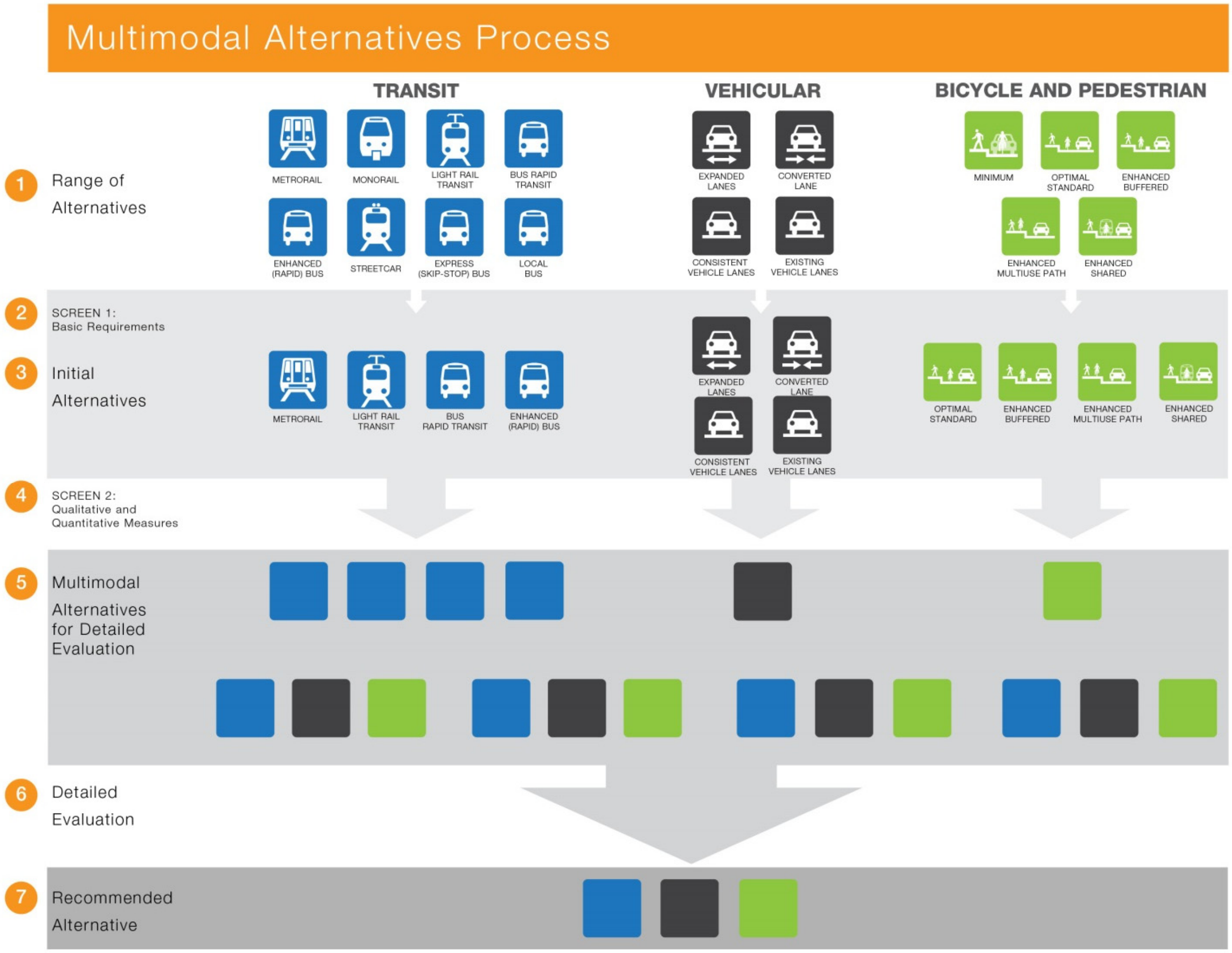
1. Review and analysis of past plans and studies and current policy guidance
2. Assessment of existing and forecasted/desired conditions for transportation and land use
3. Engagement with the community and solicitation of public and stakeholder input

Past plans and studies, agency and stakeholder inputs, and assessment of existing conditions to date have repeatedly identified the following broad issue areas of need on the corridor:

- Viable multimodal travel options on the corridor are limited and/or insufficient
- Congestion impedes reliable and efficient travel
- Existing transportation services and networks fail to support planned land uses and economic development efforts, and vice versa

The process to define and evaluate alternatives to meet the needs identified in the corridor is provided in **Figure 1-1**. This figure illustrates the general process prescribed for defining, assessing, and selecting alternatives to be advanced into detailed study.

Figure 1-1: Multimodal Alternatives Evaluation Process



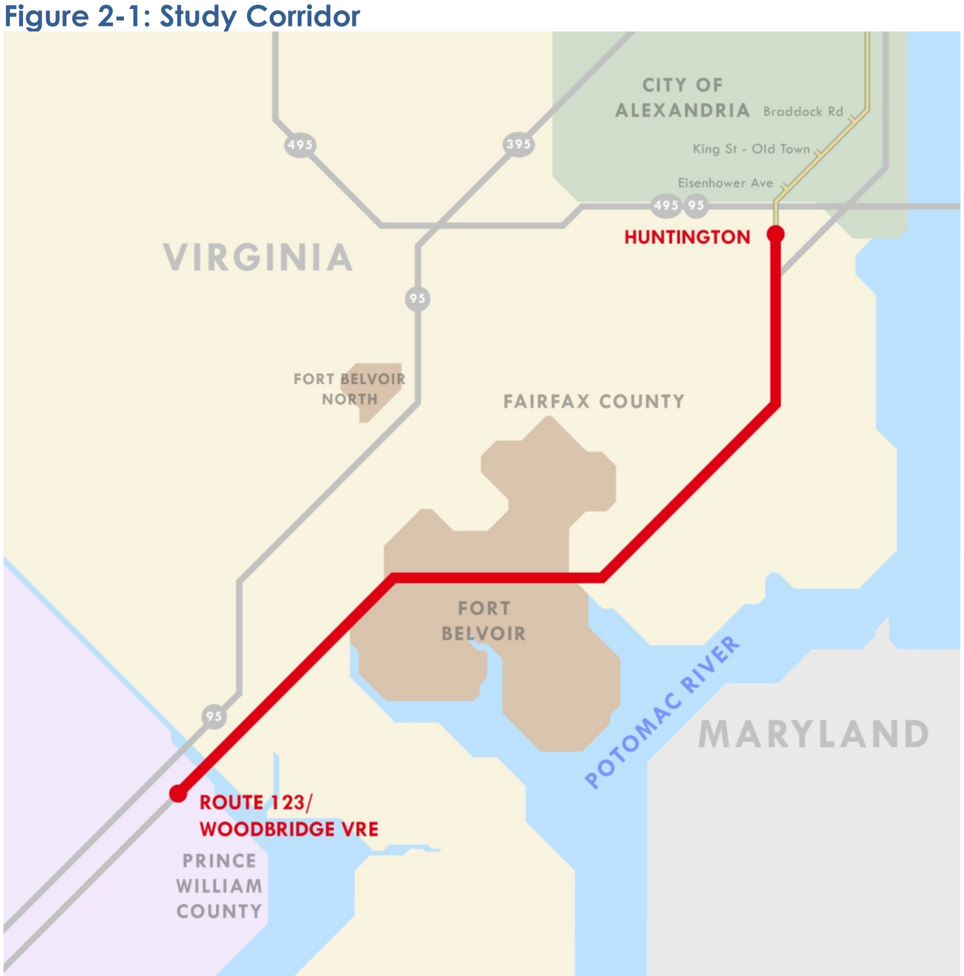
The outcome of the Alternatives Analysis will be a recommended program of transportation investments that the two counties, VDOT, and other may adopt and advance through their capital improvement programs. The transit recommendation would be defined and advanced potentially as a project through the Federal Transit Administration Capital Investment Program project development process.

2.0 Study Corridor

The study corridor consists of a 15-mile segment of Route 1, extending from Route 123 in Woodbridge in Prince William County to the I-95/I-495 Beltway in Fairfax County near its border with the City of Alexandria. The corridor is known more familiarly in this segment as Richmond Highway. **Figure 2-1** shows a map of the study corridor.

Through Prince William County, the study corridor runs parallel to I-95. Within Fairfax County, Route 1 diverges from I-95 to service the well-established communities settled between the Potomac River and I-95. The highway is a major north-south connector in the Washington Region and often used as an alternative route when disruptions occur on the interstate. Although a vital commuter route, the corridor is also a destination unto itself. Regionally recognized activity centers line the corridor, as well as major employment centers including Fort Belvoir. In Virginia, the facility was recently designated "Historic Route 1" by the Virginia General Assembly to promote tourism, transportation improvements, and economic development (House Bill No. 530, 2010 Session).

Figure 2-1: Study Corridor

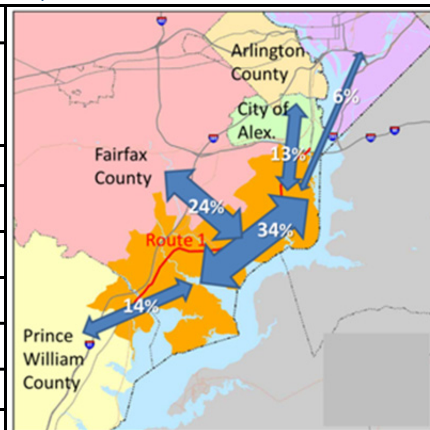


2.1 Travel Patterns and Existing Transit Service

To understand the transit and automobile trip patterns for the corridor, the Metropolitan Washington Council of Governments (MWCOG) data were used to estimate where people were traveling to and from along the Route 1 corridor. Trip patterns include the mode choice (private automobile or transit) and the origin/destinations of the trips (within the corridor, District of Columbia, etc.). The typical average weekday travel patterns to/from and within the Route 1 corridor are summarized in **Table 2-1** below. The data show the largest share of trips are intra-corridor trips, or trips that begin and end in the corridor, comprising of about 34 percent of all trips. The next largest share of travel are to and from other areas within Fairfax County, and account for 24 percent of both average weekday and peak period trips.

Table 2-1: Average Weekday (Auto and Transit) To, From, and Within Route 1 corridor

Route 1 From/To	Total Trips		
	Total Trips (Auto and transit)	% of Total Trips	Transit Share
District of Columbia	52,000	6%	29%
Arlington/Alexandria	116,000	13%	6%
Within Rt.1 Corridor	310,000	34%	1%
Fairfax Other	216,000	24%	0%
Prince William Other	124,000	13%	0%
Other Areas	95,000	10%	2%
Total	**913,000**	**100%**	**3%**



Source: MWCOG/WMATA Version 2.2 Year 2010 model and Regional On-Board Transit Survey Data

2.1.1 Transit Travel

Although there are relatively fewer total trips between the study corridor and the regional core in Washington DC and Arlington/Alexandria, those trips have the highest transit share; 29 percent of the daily trips between Route 1 corridor and D.C are being currently made by transit.

Figures 2-2 and **Figure 2-3** summarize the existing transit travel market trip patterns. Of people who live within the corridor, the majority of corridor transit users (52 percent) are commuting to Washington D.C., using Metrorail, and 86 percent of corridor transit users are traveling to either Arlington/Alexandria or Washington, DC. Of people traveling by transit to destinations within the corridor, 64 percent of transit commuters to the corridor use the bus mode exclusively, and most transit trips begin and end in the corridor.

Figure 2-2: Transit Trips originating along Route 1 traveling to various destinations

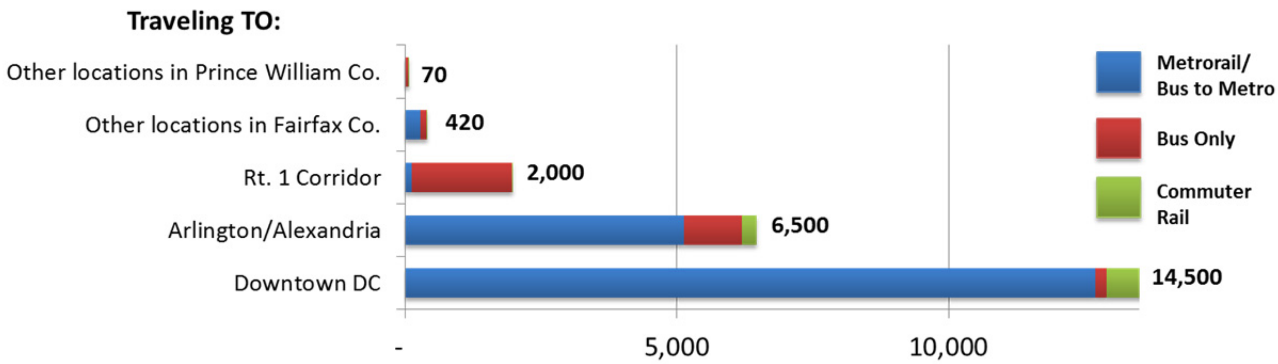
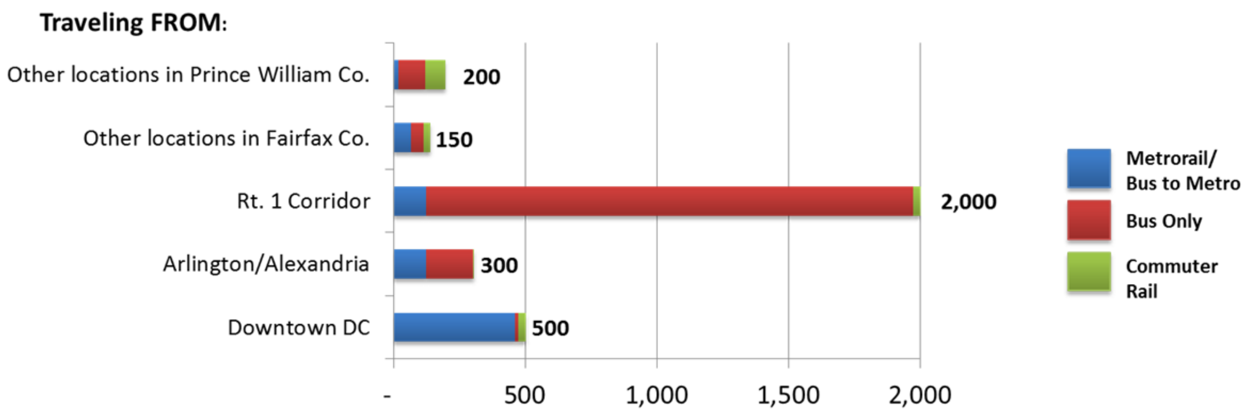


Figure 2-3: Transit Trips originating at various locations traveling to Route 1



2.2 Existing Transit Service

Several transit operators provide service along the Route 1 Corridor:

- **Fairfax County Connector (FCC):** operates standard local service and limited-stop service around the corridor, as well as circulator services to Fort Belvoir.

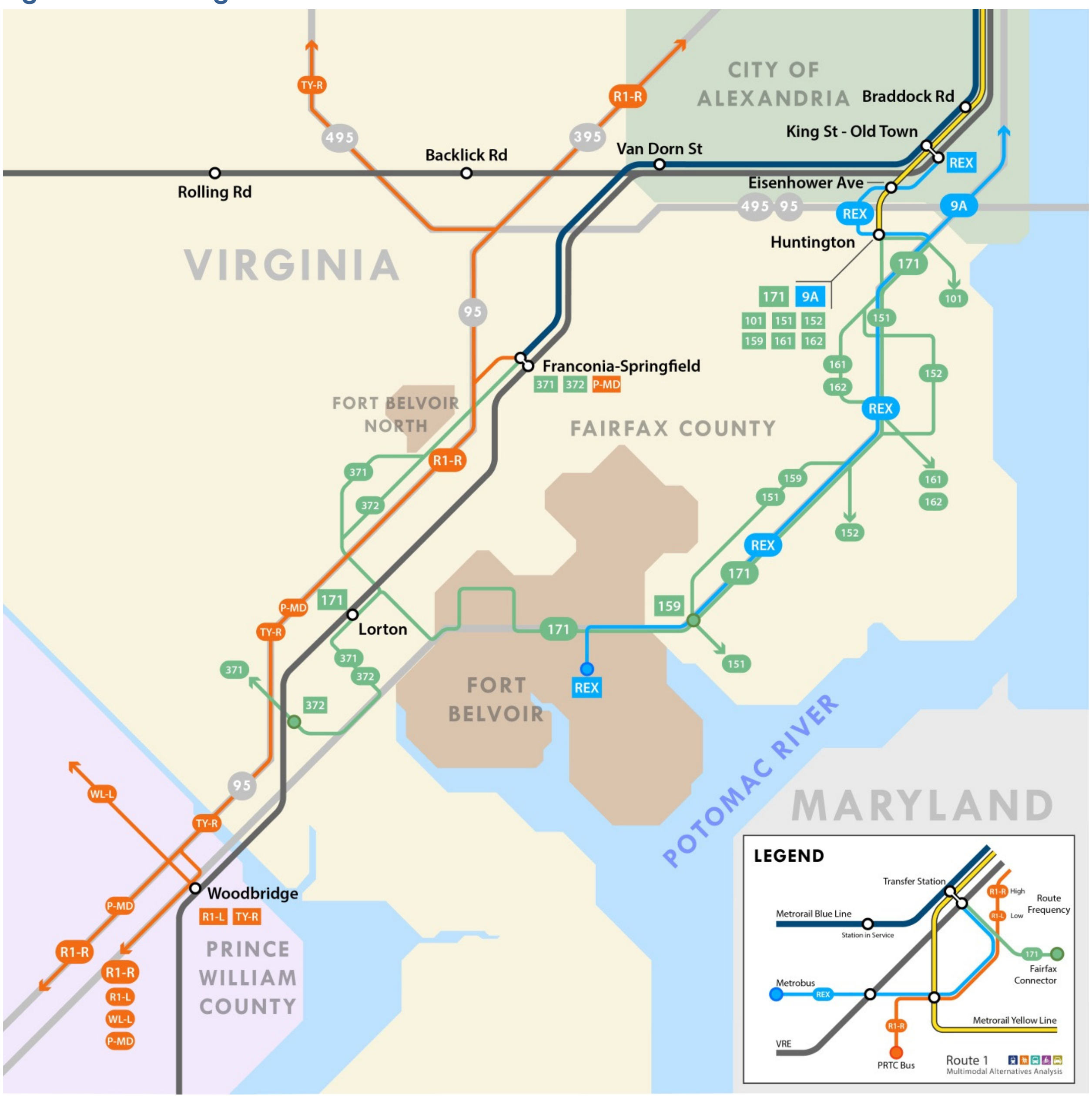
- **Potomac and Rappahannock Transportation Commission (PRTC):** operates local service (OmniLink), shuttle service (MetroDirect), and commuter service (OmniRide), in the Woodbridge portion of the Route 1 corridor.

- **Washington Metropolitan Area Transit Authority (WMATA):** operates the Richmond Highway Express Services (REX) as a limited-stop express bus service between Fort Belvoir and the Huntington and King Street Metrorail Stations. REX service operates in regular traffic along Richmond Highway, but vehicles feature signal optimization technology that adds time to green traffic signals when buses are approaching intersections. REX vehicles also features unique branding scheme on buses and has separate bus stop flags to differentiate it from other transit services.

In addition to bus transit service, the Virginia Railway Express (VRE) provides commuter rail services parallel to the southern portion of the Route 1 corridor. The VRE Fredericksburg Line operates service from Fredericksburg to Union Station in Washington, DC. VRE has stations in the Route 1 Corridor at Woodbridge and west of Route 1 at Lorton. **Figure 2-4** shows the existing transit network.

Ridership varies between bus routes along the Route 1 corridor. Routes with the greatest frequency tend to have the highest ridership. The three routes with the highest ridership are: WMATA's REX service with 3,519 daily boardings; FCC's Route 171 with 3,238 daily boardings; and FCC's Route 151 with 1,232 daily boardings.

Figure 2-4: Existing Transit Network



2.3 Population and Employment Growth

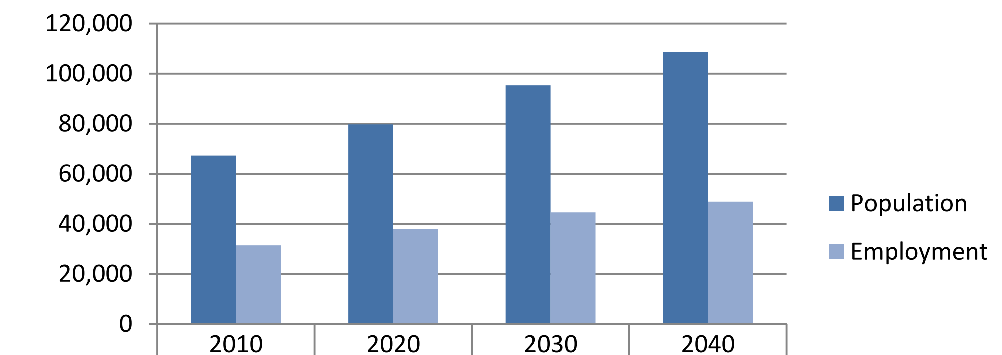
In 2010, the population and employment within ½ mile of the Route 1 was about 67,000 and 31,000, respectively. Both housing and employment are expected to increase along the study corridor by 20 percent by 2030 (see **Table 2-2**). **Figure 2-5** shows the estimated population and employment increase along the corridor between 2010 and 2040.

Table 2-2: Population and Employment Percent Change - Study Corridor

	2010-2020	2020-2030	2030-2040	2010-2040
Population	18%	20%	14%	61%
Employment	21%	17%	9%	55%

Source: MWCOG Round 8.2 Land Use Forecast.

Figure 2-5: Population and Employment Growth within ½ mile of Route 1



	2010	2020	2030	2040
Population	67,284	79,716	95,321	108,570
Employment	31,418	38,024	44,608	48,842

Fort Belvoir is a major employer along the Route 1 corridor. The 2005 Base Realignment and Closure (BRAC) Report recommends nearly 26,000 military, federal civilian, and private embedded contractor jobs to be relocated to Fort Belvoir and Quantico. Of these jobs, 90 percent will be located at Fort Belvoir. Recent reports by Fort Belvoir estimate that employment will increase by 3,500 new jobs by 2017 and 17,000 new jobs by 2030.

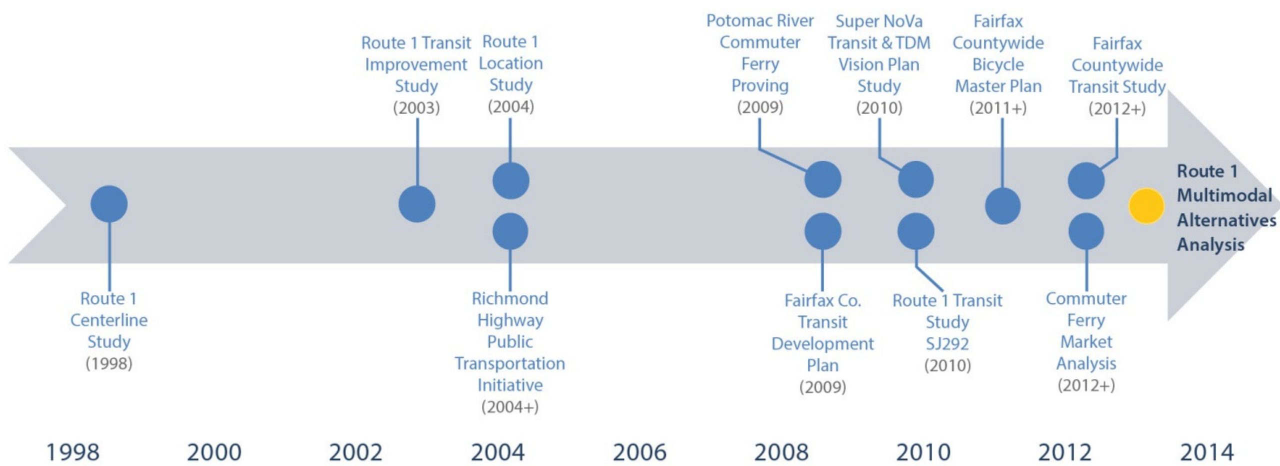
Fairfax and Prince William counties are each anticipated to add roughly a quarter of a million new residents in the coming decades. Fairfax will add roughly 230,000 more jobs, while Prince William will add about 150,000. Connecting residents to jobs, and employers to workers, will continue to be a significant need and challenge.

The Washington metropolitan region is expected to grow to nearly 6.5 million people (24 percent growth) and increase employment by 36 percent by 2040. Outer jurisdictions are expected to continue to grow more rapidly, with population more dispersed in the future than it is today. Jobs are projected to continue to be concentrated in the core and toward the western side of the region.

3.0 Planning Context

Community, agency, and political leaders have long recognized the transportation challenges in the Route 1 corridor. Numerous studies and plans have been completed for the corridor specifically. These studies are listed below in **Figure 3-1** and summarized in **Table 3-1**.The need for improvements has been identified in numerous past studies. Growth in general regional population and employment, as well as local changes in job concentration, have driven greater demand for travel in the constrained corridor. Safety for users of all types remains a concern. Land use and economic plans anticipate further growth and development. Maintaining affordability and diversity is an increasing challenge.

Figure 3-1: Previous Studies



The two foundational studies for this effort are the VDOT Route 1 Centerline Study (1998) and the DRPT Route 1 Transit Study (2010). These studies are described below.

VDOT Route 1 Centerline Study (1998 and 2004 Location Study): The Centerline study examined 27 miles of Route 1 from Stafford County north to I-495 and Alexandria: Project A (Stafford County line to Route 123), Project B (Route 123 to Armistead Road), and Project C (Belvoir Woods Parkway to the Capital Beltway). Projects B and C correspond with this project study area. The Study projected an increase in traffic of roughly 71 percent by 2025 over 2000 volumes thus requiring additional capacity recommending widening from 4 lanes to 6 in the southern portion and 6 lanes to 8 in the northern segment. Pedestrian and bicycle improvements including both facilities along the corridor and improved crossings were also recommended. The study recommended the preservation of right of way for transit but did not make a final recommendation or determination on transit alignment, running way or mode.

DRPT Route 1 Transit Study SJ292 (2010): This transit study was intended to define the next steps to advance transit services to the growing employment centers of Fort Belvoir in Fairfax County and Marine Base Quantico in Prince William and Stafford Counties along Route 1. The study found that existing transit services and roadway operations were generally insufficient to address the travel demand needs resulting from BRAC that concentrated employees at those facilities. The study found substantial need to improve transit service on the corridor to accommodate the projected growth, increase transit mode share, and preserve mobility on the Route 1 corridor. Pedestrian access and safety were noted as significant needs. Persistent levels of extreme congestion on the corridor necessitated an increase of person capacity on the corridor to provide viable options for higher capacity vehicle travel. The study recommended further detailed assessment to examine the feasibility of dedicated transit running way and evaluation of modes.

Table 3-1: Needs and Recommendations Identified from Previous Plans

Plan	Agency	Date	Needs Identified	Recommendation for Route 1
Route 1 Centerline ("Location") Study	VDOT	1998	• Increasing congestion threatens mobility and economic development • Non-motorized facilities are inadequate • Enhanced transit is necessary to meet travel demands	• Widen Route 1 to six travel lanes (three in each direction) to Mount Vernon Memorial Highway and eight lanes to Huntington • Provide bicycle and pedestrian accommodations • Provide accommodation for higher quality transit
Route 1 Transit Improvement Study	WMATA	2003	• Substantial growth in development requires enhanced transit services	• Phase I – bus service and technology improvements • Phase IIa: BRT "light" (in shared lanes) • Phase IIb: BRT in dedicated curbside lanes. • Phase III: Light rail in dedicated or semi-exclusive lanes; increased development density • Access facilities (Park and Ride and Kiss and Ride) • Intermodal stations
Richmond Highway Public Transportation Initiative	Fairfax DOT	2004 - 2010	• Seriously deficient pedestrian facilities • Bus stop amenities are lacking	• Sidewalk and pedestrian improvements • Bus stop improvements and improving bus service
Potomac River Commuter Ferry Feasibility	Prince William County	2009	• Increasing congestion threatens mobility and economic development • Roadway network may be insufficient to meet needs – must explore waterborne • Intermodal connections are needed	• Further demand analysis • Intermodal stations
Mt. Vernon Vision	Citizens	2010	• Transportation should support land use development • Substantial growth in development requires enhanced transit services	• Extend Metrorail. Light rail or monorail as an alternative • Provide/require sidewalk network
Route 1 Transit Study SJ292	DRPT	2010	• Enhanced transit is necessary to meet travel demands	• Near term BRT operations • Improve pedestrian safety and accommodation • Widen the corridor by one lane in each direction
Fairfax County Comprehensive Plan	Fairfax County	2011	• Increasing congestion threatens mobility and economic development • Substantial growth in development requires enhanced transit services	• Examine heavy rail, light rail, monorail, and bus rapid transit for the corridor • Widen Route 1 by one lane in each direction in segments to achieve consistent 3-lane per direction section.

Plan	Agency	Date	Needs Identified	Recommendation for Route 1
			• Transportation should support land use development	• Provide multiuse trails
SuperNoVa Transit/TDM Vision Plan	DRPT	2012	• Additional transportation options are necessary to accommodate growth • Enhanced intermodal connections and facilities	• BRT or LRT on northern segment / commuter bus on southern segment • Pedestrian and bicycle accommodation • Additional intermodal facilities
Fairfax County Bicycle Master Plan	Fairfax County	2012	• Identification of designated bicycle trails and paths • Safety improvements • Expanded network of recreational and commuter bikeways	• Route 1 is designated as a bicyclist “caution” zone • Bike lanes, safety improvements recommended north of Gunston Road
Watershed Management Program	Fairfax County	2012	• Comprehensive and continuing program of watershed management	• Belle Haven, little Hunting Creek, Dogue Creek, Accotink Creek, Pohick Creek, Mill Branch watersheds are impacted by Route 1
Constrained Long Range Plan and Regional Vision	MWCOG	2013	• Additional transportation options are necessary to accommodate growth • Foster walkable communities • Enhanced intermodal connections and facilities • Affordable transportation options • Secure and reliable funding for transit	• Widen Route 1 to six travel lanes (three in each direction) • Provide bus right turn lanes
Fairfax County Countywide Transit Network Study	Fairfax DOT	Ongoing	• Increasing congestion threatens mobility and economic development • Substantial growth in travel demand and increase in transit demand • Enhanced transit is necessary to meet travel demands • Transportation should support land use development	• Route 1 is a “destination corridor” • Study is ongoing; No final recommendations to date

4.0 Problems and Needs

The need for the project stems from existing and expected transportation problems along the corridor related to limited transit service, poor bicycle and pedestrian facilities, and high traffic volumes. These deficiencies limit accessibility and are not supportive of the desired economic development growth along the corridor.

The existing carrying capacity of the corridor is constrained. People traveling by automobile experience congestion and delays; people traveling by transit experience infrequent service as well as delays because of traffic congestion. Integrated multimodal improvements are needed to support the anticipated high levels of employment and residential growth. County Comprehensive Plans envision this growth in the form of focused, pedestrian- and transit-oriented development. Without transportation capacity improvements that encourage pedestrian and transit travel, it is unlikely that the projected growth can be accommodated within the corridor, and the associated economic opportunity of additional jobs and residents will be limited.

Attractive multimodal options are needed to help serve the high transit-dependent population who rely on bicycling, walking and/or transit to meet the needs of daily life. According to the American Community Survey (2008-2012), within ½-mile of the study corridor, there are over 2,000 households that do not own a car.

Of the existing transit riders, nearly three-quarters of existing transit riders have no access to an automobile as a travel alternative. Over half of corridor transit riders have household incomes of less than $30,000. Preserving community and affordability over the long term requires improved transit and other transportation options to meet the needs of this population.

The document identifies four specific areas of need for a major multimodal investment in the corridor: Transit, Pedestrian and Bicycle, Vehicular, and Land Use/Economic Development. **Table 4-1** summarizes the problems and need by area; the subsequent sections describe the needs in more detail.

Table 4-1: Problems and Need Summary

Multimodal Area	Problems and Needs	
Transit	• Transit travel time is not competitive with auto • Peak and off-peak transit service is infrequent • Dwell time at stops and peak period congestion delays transit	*Attractive and competitive transit service to support transit dependent population*
Pedestrian/ Bicycle	• Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness of single occupancy vehicle travel • Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops • Bicycle access is difficult with few alternative paths.	*Safe and accessible pedestrian and bicycle access*
Vehicular	• Users experience significant congestion along Route 1 during peak periods • Travel times are highly variable and unpredictable	*Appropriate level of vehicle accommodation*
Land Use/Economic Development	• Current development patterns fail to optimize development potential at designated activity centers • Existing street connectivity is poor at commercial nodes	*Support and accommodate more robust land development to support anticipated population and employment growth*

4.1 Transit Needs

The corridor needs attractive, high-quality transit service to improve local and regional mobility. The corridor is home to a high population of transit-dependent riders. High-quality transit would reduce travel time and increase frequency, reliability, and attractiveness. Currently, transit service in the corridor does not meet the needs of current and future residents, which is leading to low transit mode choice. The transit needs are listed and described below.

- Transit travel time is not competitive with automobile
- Peak and off-peak transit service is infrequent
- Dwell time at stops and peak period congestion delays transit

Transit travel time is not competitive with auto

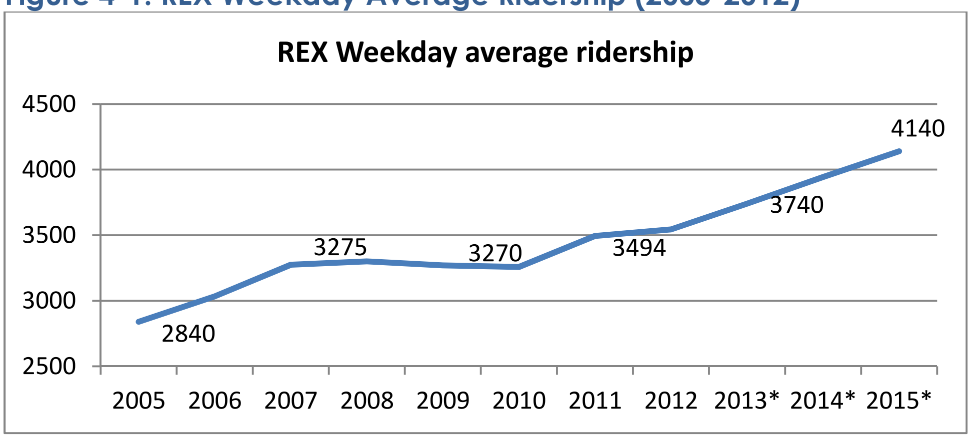
At present, transit does not compete well as an alternative to automobile travel, particularly for those with mobility choices. Frequent stops and congested segments of roadway make transit travel both slower and more unpredictable than auto travel, with bus travel times increasing significantly during peak hours. **Table 4-2** compares the travel time between automobile and transit to regional destinations. The slow transit travel time could lead to the low transit mode choice. Currently, over 92 percent of corridor travelers commute by auto and roughly 8 percent commute by bus. This is below the regional average of 15 percent transit mode share for "middle ring" locations.[1]

Table 4-2: Sample Travel Times

Origin	Destination	Distance	Drive Time	Transit Time	Transit Transfers
Fort Belvoir Community Hospital	Huntington Metro Station	8.8 miles	20 min	35 min	0
Fort Belvoir Community Hospital	Mt. Vernon Shopping Center (Hybla Valley)	5.7 miles	15 min	25 min	0
Mt. Vernon Shopping Center (Hybla Valley)	Huntington Metro Station	5.2 miles	15 min	20 min	0
Woodbridge	Fort Belvoir Community Hospital	8 miles	15 min	40 min	1

Despite the relatively high transit travel time, there appears to be significant latent demand for quality transit service on the corridor as evidenced by the dramatic ridership growth of the REX express bus service. REX service has seen a relatively steady ridership growth of approximately 25 percent over the past seven years (See **Figure 4-1**). Past studies have found strong demand for enhanced transit on the corridor.

Figure 4-1: REX Weekday Average Ridership (2005-2012)



Peak and off-peak transit service is infrequent

Transit service is fairly frequent in the peak hours (every 12 to 20 minutes), but less frequent in non-peak periods (30 to 60 minute headways). The bus routes along Route 1 have several frequency levels that vary throughout the day. Most FCC peak period services operate at a 20-30 minute headway, while off-peak services operate closer to a 60 minute headway. PRTC's OmniLink service mostly operates 30 minute peak period and 60 minute off-peak period service, while OmniRide service only runs in the peak

[1] MWCOG "State of the Commute" survey findings reported September 18, 2013. Middle Ring locations surround the inner core area and include Fairfax, Montgomery, and Prince George's counties). http://www.mwcog.org/transportation/weeklyreport/2013/files/09-17/TPB-Presetnation_2013_StateOfTheCommute.pdf

periods with approximately 30 minute headways and provides more limited runs during the midday. MetroDirect operates about every 40 minutes during the day with more limited runs after 8:00PM. Metrobus commuter routes (11Y) operate on 30 minute headways during the peak period, while local routes (9A) operate with 30 minute headways all day. REX service operates at approximately 12 minute headways during the peak period and 30 minutes during off-peak periods. Figure 4-2 compares the peak and off-peak frequency of the two most popular routes.

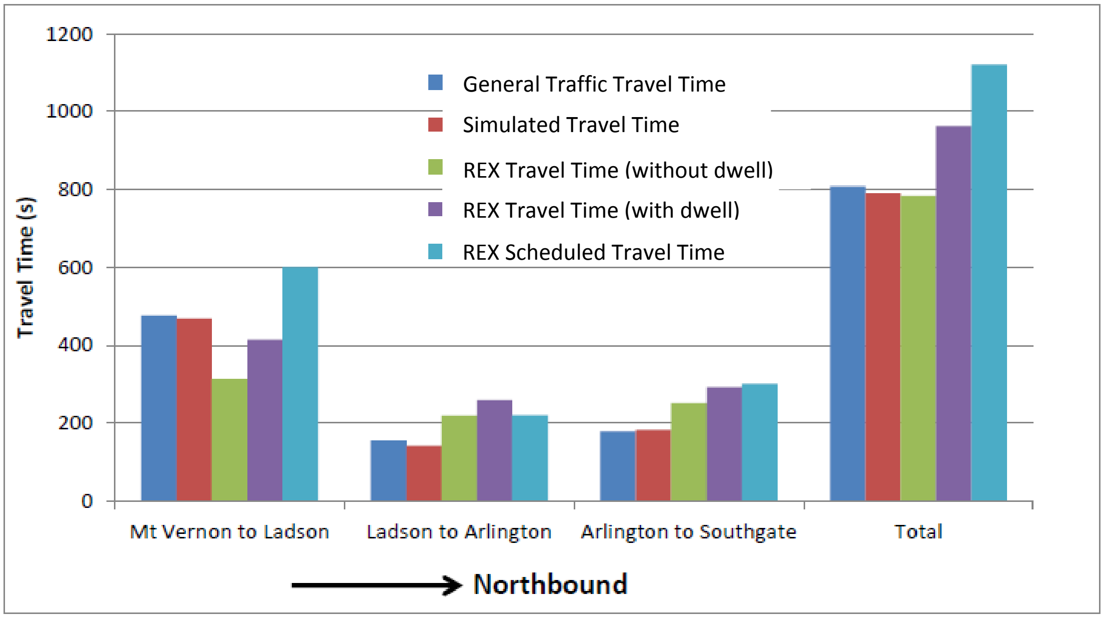
Figure 4-2: Service Frequency

	Route	Peak Wait Time	Off-Peak Frequency
	REX	11 min	30 min
	171 (FCC)	20 min	30 min

Dwell time at stops and peak period congestion delays transit

Figure 4-3 shows how travel times for transit compare to estimated travel time for general purpose traffic along segments of the corridor. It shows that while buses and general purpose traffic generally travel at about the same speeds, dwell time at stops increases total transit travel time by about 20% as compare to both transit travel time without dwell and general purpose traffic.

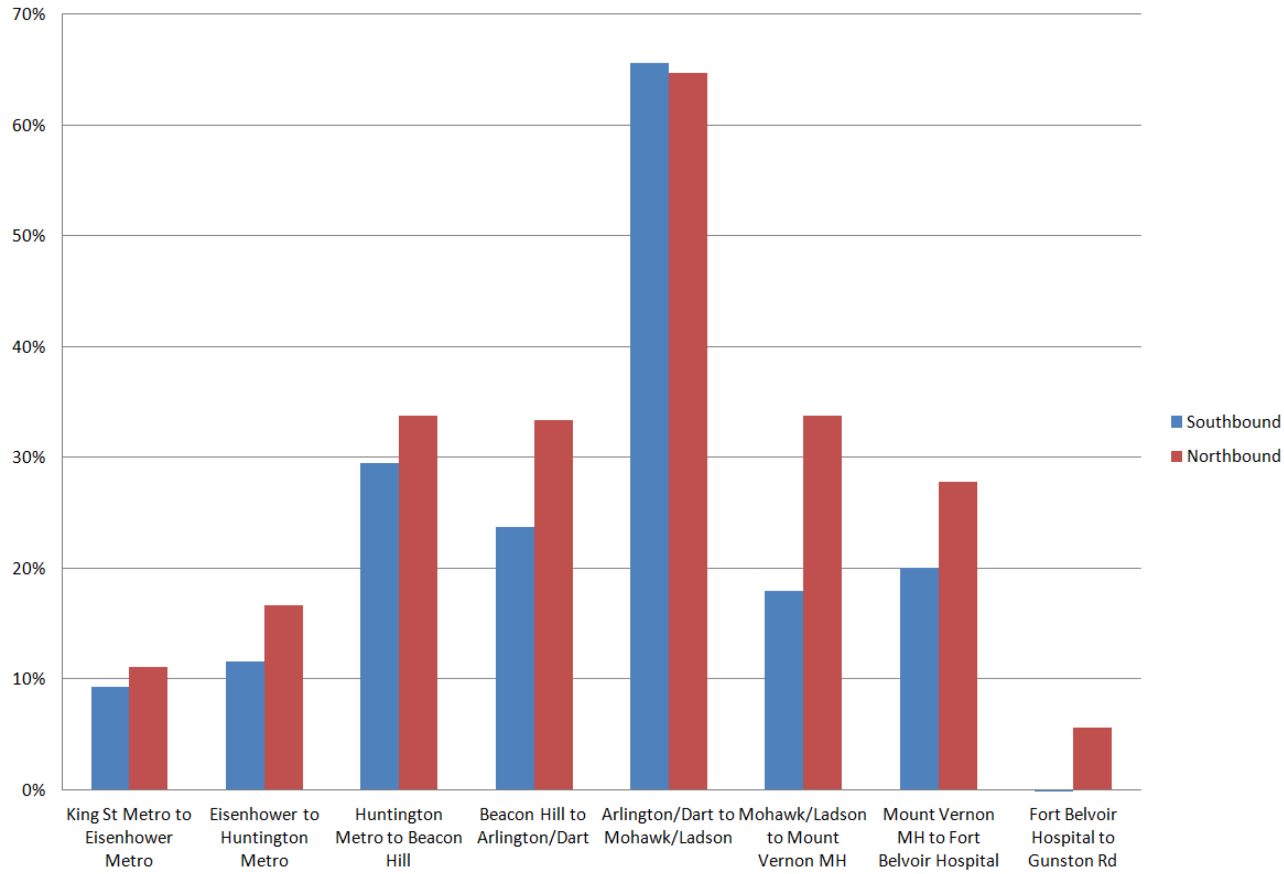
Figure 4-3: Travel Time Comparison in the Northbound Direction along Route 1 AM Peak



Source: REX travel time with dwell was obtained from WMATA, while travel time without dwell was estimated assuming 20 seconds of dwell time at each bus stop

Because transit services presently operate in general purpose travel lanes, there is little advantage to transit customers in terms of competitive travel time. Traffic congestion slows both general purpose traffic and transit during peak periods. **Figure 4-4** shows the percent increase in travel time for REX services during peak periods as compared to periods when traffic flows freely, and shows that traffic congestion introduces significant delays for buses in both directions. The existence of bidirectional congestion supports the need for transit priority treatments along the corridor to reduce transit travel times.

Figure 4-4: Transit travel time: peak vs. off-peak—(Percent increase REX Running Time by Segment, Free Flow (southbound) vs AM PEAK (northbound))



Source: WMATA travel time records, 2013

4.2 Pedestrian and Bicycle Facilities

Existing pedestrian facilities are disjointed and discontinuous, limiting pedestrian travel and reducing access to transit. Attractive, high-quality pedestrian and bicycle facilities are needed to accommodate the future planned growth and appropriately meet the diverse travel demands and abilities of Route 1 residents and stakeholders. Improved bicycle and pedestrian facilities will also improve transit access in the corridor to connect transit with surrounding uses via safe and continuous pathways. Specific pedestrian and bicycle needs are listed and described in more detail below:

- Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness of single occupancy vehicle travel
- Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops
- Bicycle access is difficult with few alternative paths

Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness and efficiency of single occupancy vehicle travel

Walking paths along the corridor are incomplete with 6.8 miles of identified sidewalk gaps.[2] The sidewalk facilities that exist are largely unbuffered from the heavy traffic on the corridor. ADA accommodations to pedestrian destinations such as bus stops are missing and/or substandard in several locations. Pedestrian ways are interrupted by curb cuts and driveways.

Pedestrian safety is a major concern as well. Jaywalking is observed on the corridor with pedestrians often waiting in the middle of the busy street in an active turn lane. From 2010 to 2012, VDOT reported 18 pedestrian collisions along the corridor. There were also two reported collisions with bicyclists during this time period.

Figure 4-5 shows examples of the existing pedestrian network along the corridor.

Figure 4-5: Current Pedestrian Conditions along the Corridor

Goat Track at Groveton Spring Road

Goat Track at Groveton Spring Road

Accessibly challenges at Hybla Valley and Lockheed Bus Stop

Discontinuous sidewalk at Groveton Spring Road

[2] Richmond Highway Transportation Initiative

Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops

As shown in **Figure 4-6**, only fifteen intersections along the corridor provide crosswalks. Crosswalks are spaced at significant distances from one another, the longest gap exceeding 1.8 miles. Crossing distance across the street commonly exceeds 100 feet. Several intersections lack a median or other type of pedestrian refuge. Residents have also complained that crosswalks are not near existing transit stops, leading to more unsafe crossings. **Table 4-3** lists the characteristics of the selected existing crosswalks along the corridor.

Figure 4-6: Crosswalk Gaps

Table 4-3: Pedestrian Crossings along Route 1 Corridor (Select Intersections)

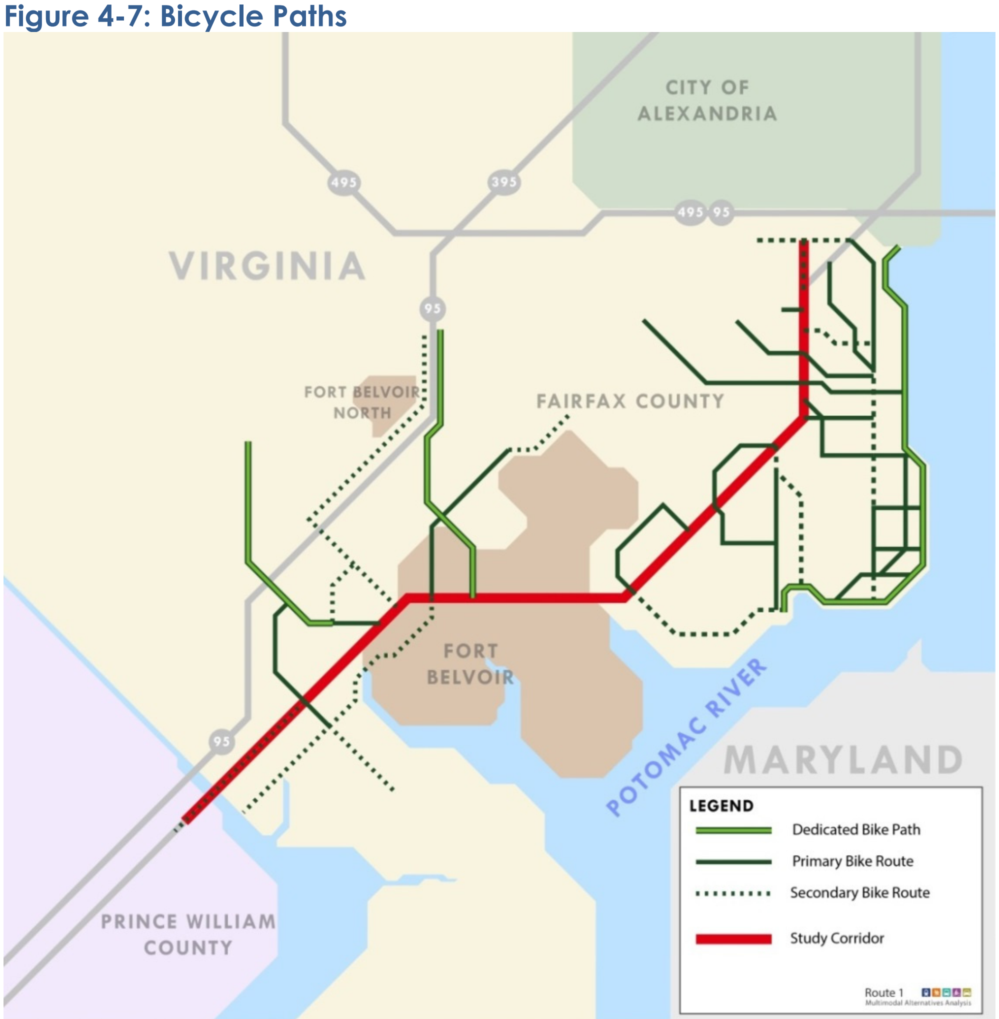
Cross Street	Crossing Distance	Lanes of traffic	Crosswalk	Median or divider
Gunston Road	160 feet	7	North leg	Channelization islands
Lorton Road	112 feet	8	South leg	Raised divider
Pohick Road (638)	140 feet	9	South leg	Raised divider
Belvoir Road	90 feet	7	North leg	none
Old Mill Road	85 feet	7	North leg	none
Luken Lane	80 feet	7	North leg	none
Haft Drive	145 feet	10	North leg	none
Boswell Avenue	116 feet	8	North leg	Raised divider
Lockheed	105 feet	7	All legs	Raised divider
Memorial Street	145 feet	9	North leg	Raised divider

Bicycle access is difficult with few alternative paths

Few bicycle facilities currently exist on Route 1 (see **Figure 4-7**). In its Bicycle Master Plan, Fairfax County characterizes Route 1 as a corridor "of caution" - a route where "bicyclists are urged to exercise extra caution due to narrow shoulders or lanes, poor sight distances, high traffic volumes, or other challenging characteristics." Of particular concern are connections along Route 1 through Fort Belvoir. As documented in the Northern Virginia Regional Bikeway and Trail Network Study (2003), when the military facility was closed to all non-military personnel, bicyclists were forced to ride along Route 1, which most bicyclists find unsafe and challenging. As a result, bicyclists often take a 10.5 mile circuitous bypass around the Richmond Highway and the Fort Belvoir Military Installation between Telegraph Road and the Mount Vernon Trail.

The poor accommodation for cyclists is reflected in a very low rate of cycling in the corridor. The US census estimates that just 0.15% of commuters in both the northern and southern segments of this corridor use a bicycle to get to work. This compares with 2 percent county-wide, according to the 2010 Census.[3]

Figure 4-7: Bicycle Paths



3 http://www.fairfaxcounty.gov/news/2012/updates/may-is-bike-month.htm

4.3 Traffic Problems and Vehicular Operations Needs

Users experience significant congestion along Route 1 during peak periods

The Route 1 corridor experiences significant peak hour congestion. The corridor is widely perceived to be difficult and congested. Six intersections presently operate at either Level of Service (LOS) E or F in the AM or PM peak hour (see **Figure 4-8**). In the AM peak period, the intersection at Mount Vernon Highway operates at LOS E, and the intersections at Fort Hunt Rd and Buckman Rd operate at LOS F. In the PM peak, the intersection of Route 1 and Backlick Road, the Fairfax County Parkway, and Mount Vernon Memorial Parkway operate at LOS E, while no intersections operate at LOS F. **Table 4-4** summarizes the number of intersections operating at LOS A-F.

Figure 4-8: AM/PM LOS Intersections with Level "E" or Worse (2013)

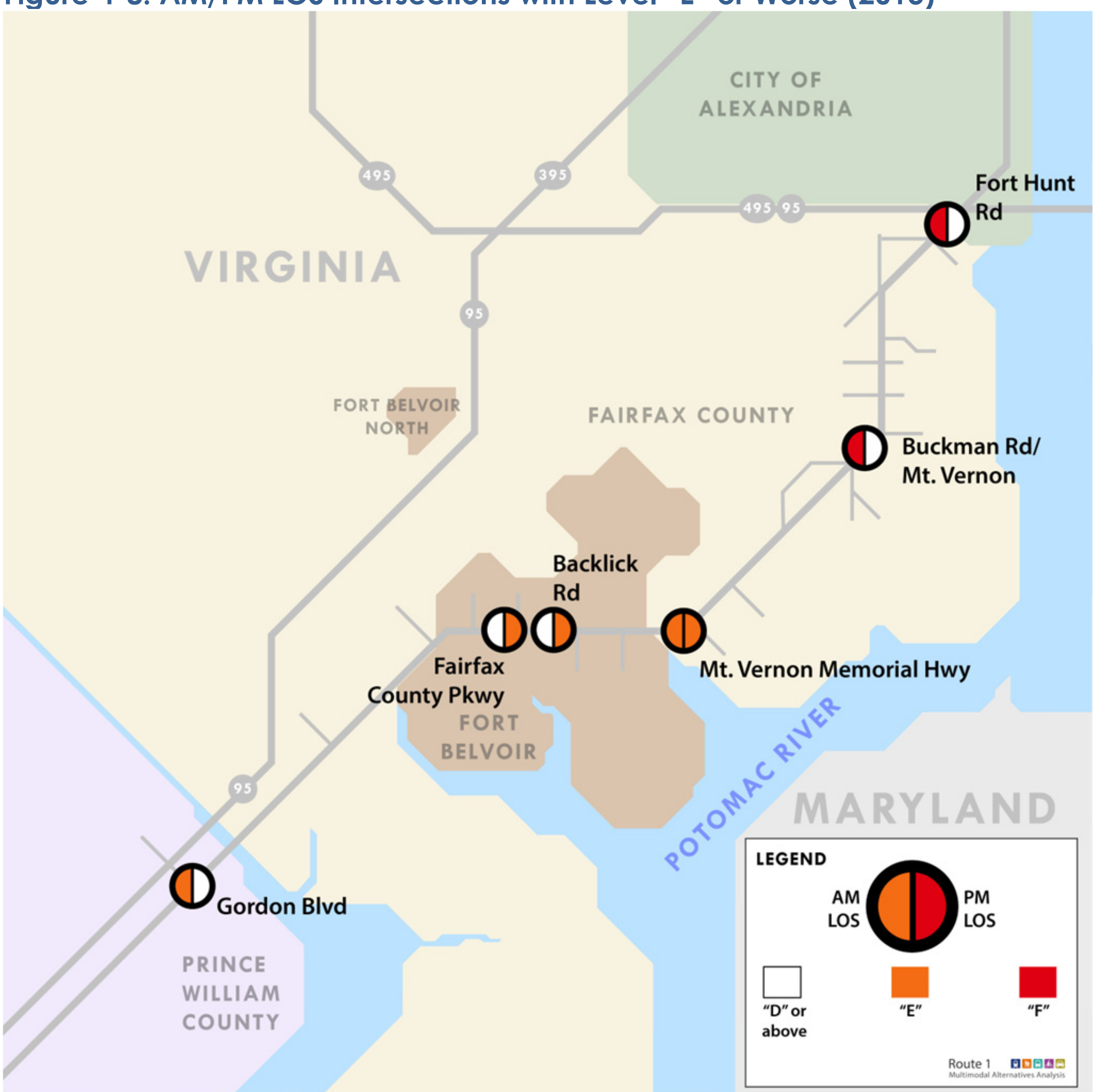


Table 4-4: Intersection Level of Service (2013)

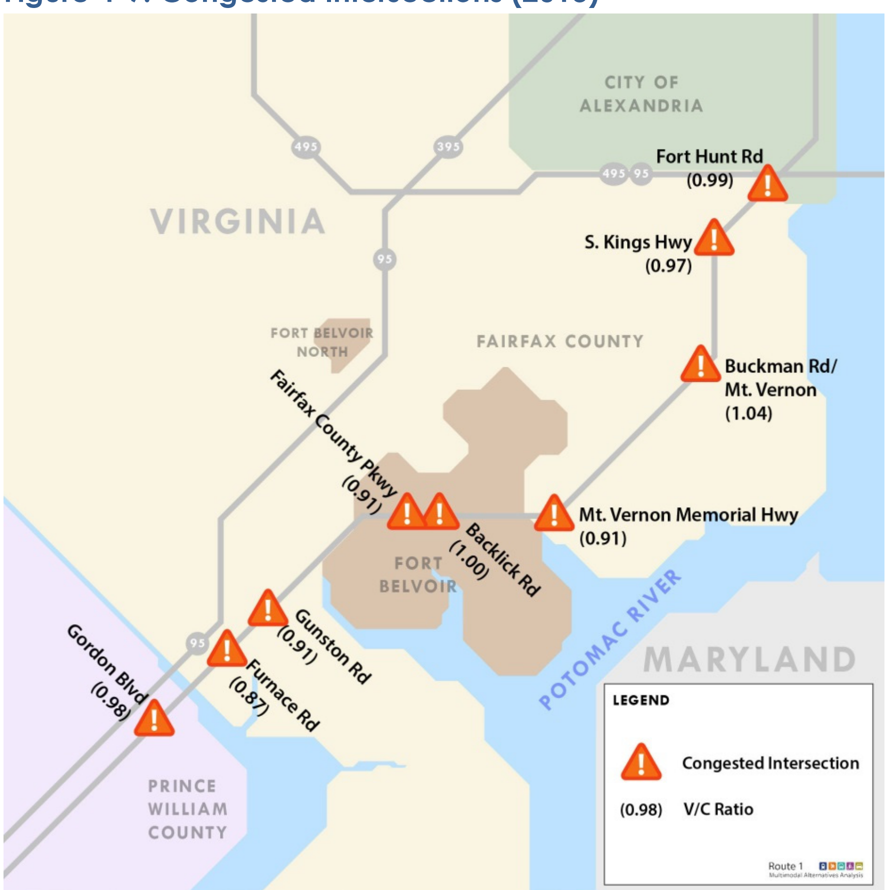
Level of Service	# of intersections: AM	# of intersections: PM
LOS A	9	5
LOS B	15	15
LOS C	9	8
LOS D	6	11
LOS E*	**1**	**3**
LOS F*	**2**	**0**

*Considered failing intersections.

Travel times are highly variable and unpredictable

Volume to capacity (v/c ratio) is a measure of congestion. A v/c ratio less than 0.85 generally indicates that adequate capacity is available and vehicles are typically not expected to experience significant queues and delays. During the AM peak hour under existing conditions, nine intersections in the study area (22.5 percent of all intersections) have v/c ratios greater than 0.85. In the PM peak hour, six intersections (15 percent of all intersections) experience v/c ratios greater than 0.85. **Figure 4-9** shows the intersections along the corridor that have a V/C ratio greater than 0.85 in the AM and PM peak periods.

Figure 4-9: Congested Intersections (2013)



While the majority of studies have focused on weekday peak-hour congestion, weekend congestion is routine and increasing, particularly in the Hybla Valley and South County area. Weekend travel demand patterns differ from weekday peak patterns. Weekend activity generates significant travel demand from other suburban destinations, as opposed to travel to and from major employment centers typical in the weekday. **Table 4-5** shows that the weekend traffic levels approach the levels observed during the weekday peak periods.

Table 4-5: Weekday and Weekend Congested Intersections

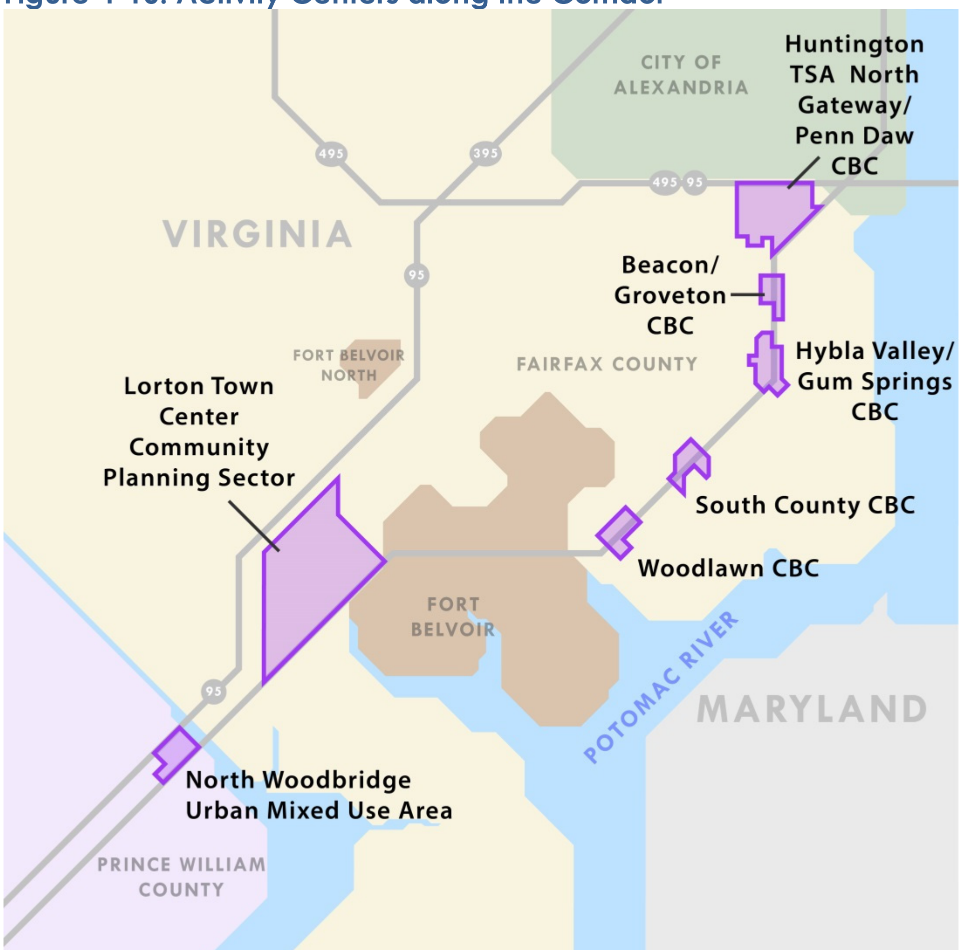
Intersection	Weekday LOS		Weekend LOS	Weekday v/c Ratio		Weekend v/c Ratio
	AM Peak Hour	PM Peak Hour	Saturday Peak Hour	AM Peak Hour	PM Peak Hour	Saturday Peak Hour
Ft Hunt Rd	F	D	D	0.90	0.61	0.73
S King Hwy	D	E	E	0.96	0.92	0.95
Buckman Rd	F	D	E	1.17	0.98	1.01
Mt Vernon Mem Hwy	F	F	E	1.05	1.19	0.96
Backlick Rd	D	F	D	1.01	1.10	0.82
Fairfax County Pkwy	D	E	C	0.90	1.11	0.75
Telegraph Rd	D	D	C	0.82	0.74	0.53
Gunston Rd	D	F	D	0.99	1.21	0.93
Gordon Blvd	D	B	C	0.91	0.82	0.73

Source: Virginia Department of Transportation.

4.4 Land Use and Connectivity

As described in Section 2.2, significant population and employment growth is anticipated regionally and along the Route 1 corridor. Fairfax County has designated several nodes along the Route 1 corridor as Activity Centers, or Community Business Centers (CBCs) (see **Figure 4-10**). County policies anticipate growth to concentrate in these areas, thereby increasing the density of housing and employment activity on the corridor and necessitating additional travel capacity and options to support and enable this growth. The Fairfax County Comprehensive Plan lists specific development targets for each activity center.

Figure 4-10: Activity Centers along the Corridor



Fairfax County and Prince William County plans envision nodes of compact, walkable development focused in moderate to high density activity nodes; however, current development patterns fail to optimize potential development. Much of the corridor is characterized by commercial strip malls with large setbacks and unconnected driveways and access roadways. This leads to greater dependence on driving instead of walking to local destinations.

The corridor needs a clear plan for investment in transportation services and infrastructure that will accommodate expected growth (mix of uses and residents) and provide the basis for ongoing private investment in the corridor. It also needs to define coordinated land use and transportation policies and programmed improvements to facilitate high capacity transit investment and appropriate transit oriented development. Specific land use and economic needs are listed and described below:

- Development potential has not been realized in the designated activity centers
- Existing Street connectivity is poor at commercial nodes

Development potential has not been realized in the designated activity centers

Supporting compact, walkable development requires high quality multimodal transportation choices, but these have not been available. **Figure 4-11** compares the existing, 2035 forecast, and planned Comprehensive Plan activity level densities at each station area. The chart illustrates that although there has been significant development in recent years, this development is lower density and auto-oriented (which is contrary to the vision of several communities along the corridor). The graph shows that the Station Area A, which comprises Huntington Station, Penn Daw, and Beacon Station (see **Figure 4-12**), is projected to have activity levels associated with a premium transit service: Bus Rapid Transit (BRT), according to the DRPT Multimodal Design Guidelines.[4] The purpose of this Figure 4-11 is to also illustrate the low level of density that currently exists along the corridor, which is associated with Fixed Route Bus. The corridor will need to dramatically increase population and employment to support a premium transit service.

[4] The DRPT Multimodal Design Guidelines (2013), specifies activity density levels associated with specific transit modes.

Figure 4-11: Existing and Future Activity Level Densities and Associated Transit Modes

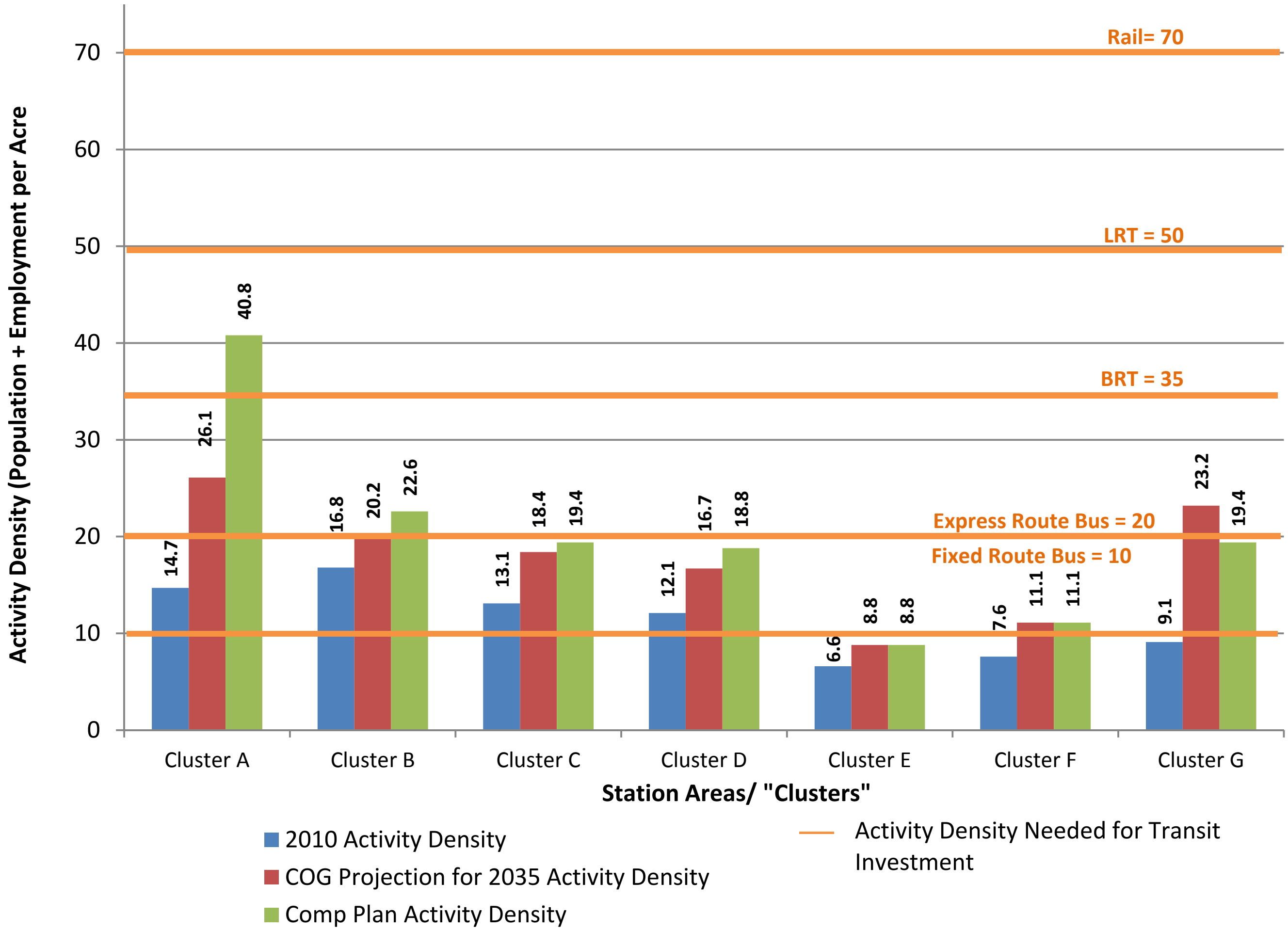
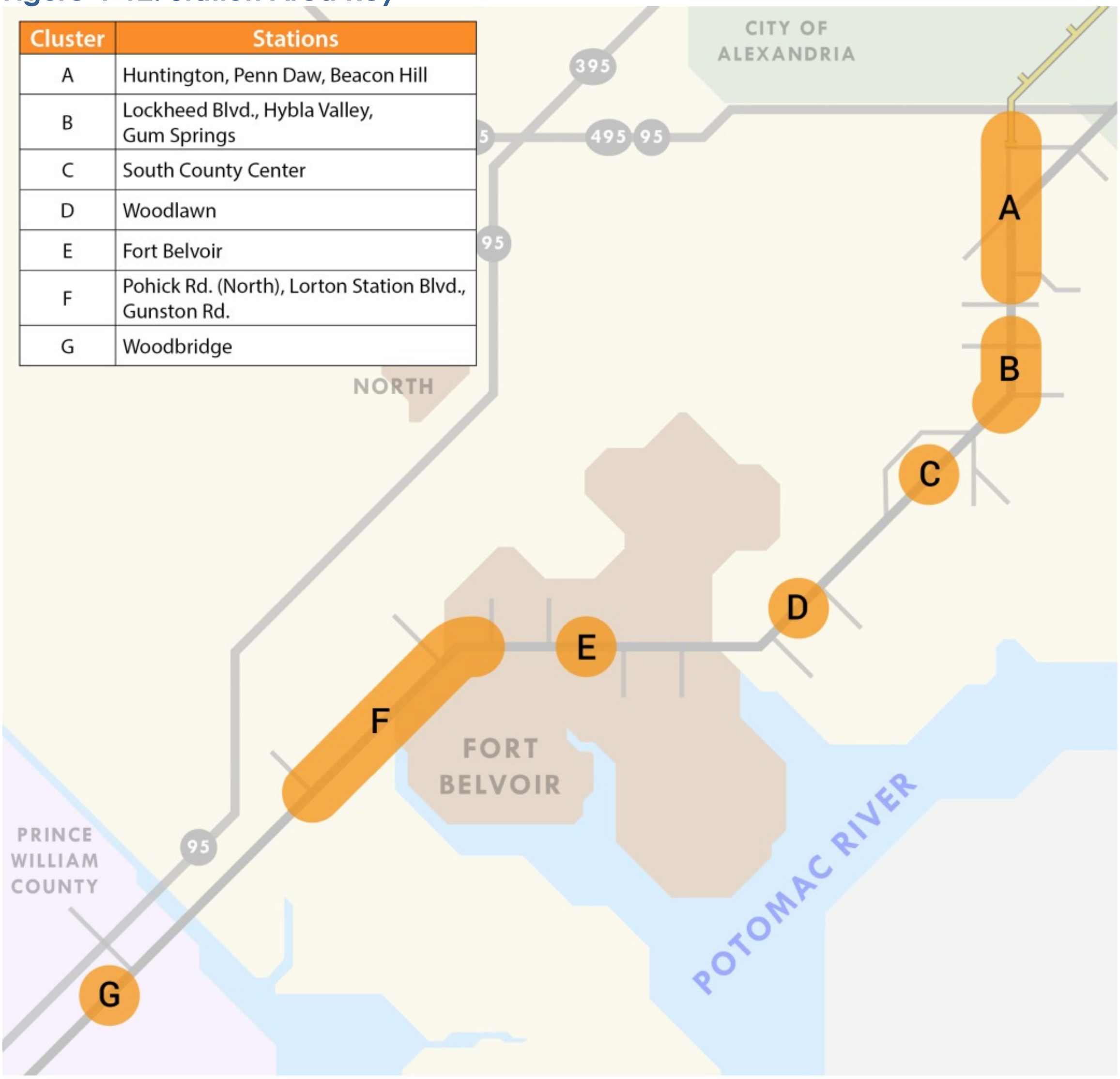


Figure 4-12: Station Area Key

Cluster	Stations
A	Huntington, Penn Daw, Beacon Hill
B	Lockheed Blvd., Hybla Valley, Gum Springs
C	South County Center
D	Woodlawn
E	Fort Belvoir
F	Pohick Rd. (North), Lorton Station Blvd., Gunston Rd.
G	Woodbridge



Existing street connectivity is poor at commercial nodes

Along the corridor, the development pattern fails to optimize potential development. Within the activity zones, there are large "mega-blocks" that support the commercial development. This development pattern limits access and does not support a pedestrian friendly environment. **Figure 4-13** shows existing "megablocks" that currently support the Beacon Mall Shopping Center and parking lot.

Figure 4-13: Beacon Station Area Existing Links and Nodes

5.0 Goals and Objectives

The documentation of needs above informs the project purpose and goals and objectives. Goals are overarching outcomes desired in satisfying the stated needs and reflect community values. Objectives are realistic and accomplishable steps toward achieving the more ambitious goals. The goals and objectives inform the evaluation of measures.

GOAL 1: Expand attractive multimodal travel options to improve local and regional mobility
Objectives:

- Increase transit ridership
- Improve transit to reduce travel times and increase frequency, reliability, and attractiveness
- Increase transportation system productivity (passengers per hour) within the corridor
- Increase comfort, connectivity, and attractiveness of bicycle and pedestrian networks to and along the corridor
- Integrate with existing and planned transit systems and services

GOAL 2: Improve safety; increase accessibility
Objectives:

- Provide accessible pathways to and from transit service and local destinations
- Reduce modal conflicts
- Improve pedestrian crossings
- Maintain traffic delays at acceptable levels

GOAL 3: Increase economic viability and vitality of the corridor
Objectives:

- Increase and improve connectivity to local and regional activity centers
- Encourage and support compact, higher density, mixed use development consistent with local plans, policies, and economic objectives
- Secure public and investor confidence in delivery and sustainability of new transit investments
- Provide high-capacity transit facilities at locations where existing and future land uses make them mutually supportive

GOAL 4: Support community health and minimize impacts on community resources
Objectives:

- Minimize negative impacts to the natural environment
- Contribute to improvements in regional air quality
- Increase opportunities for bicycling and walking to improve health and the environment

APPENDIX B

Outreach Summary Report

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Route 1
Multimodal Alternatives Analysis

Route 1 Multimodal Alternatives Analysis

Outreach Summary Report

November 26, 2014

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Table of Contents

Appendix

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1.0 Overview

The Route 1 Multimodal Alternatives Analysis project team ("team") employed a range of strategies to obtain diverse, active participation in the development, evolution, and evaluation of multimodal alternatives for the project corridor. These strategies emphasized both sharing information and gathering input at key times during each project phase.

The diversity on the Route 1 corridor is in economics, ethnicity, language, and land use (jobs, housing, military, institutional, parks, low density and high density). As a result, targeted outreach was crucial to ensure that a range of opinions and needs were captured in the process. The area north of Fort Belvoir, and the Woodbridge area support very large Spanish speaking populations (approximately 27 percent Hispanic in census blocks adjacent to the corridor in these sections). Project flyers and newspaper ads were prepared and distributed in English and Spanish. Spanish translations were made easily accessible on the website and at public meetings. All meetings were located near the corridor in locations with public transit service and ADA compliant access. DRPT's Title VI language was used on all flyers and newspaper advertisements.

A summary of the specific strategies and outcomes from the outreach process is provided below, with further detail in later sections.

The team shared information about the project:

- At public meetings
- On the project website
- Through information booths at corridor events and key locations
- Through attendance at business association and neighborhood meetings
- On hard copy flyers, newsletters, and posters distributed on the corridor
- On electronic flyers, newsletters, and posters distributed through the project listserv and other avenues (including the advisory committee members)
- Through REX bus ads and a Huntington Station advertisement
- On Twitter and Facebook
- Through press releases and newspaper advertisements

Outreach products (flyers, newsletters, display boards) were updated periodically throughout the project to be used as both an information sharing tool and an advertisement for the public meetings. After each public meeting, the project website was updated with all of the meeting materials in an interactive format to allow the team to receive input on the meeting materials from those who were not able to attend in person. The team regularly posted to the website and its Twitter and Facebook accounts to advertise all outreach activities. Press releases and newspaper advertisements were prepared and distributed prior to each public meeting. In addition, the team coordinated with the public relations staff at the Department of Rail and Public Transportation, and Fairfax and Prince William Counties to ensure that all the project announcements were distributed through those additional outreach networks.

Methods for Public Comment

The team gathered input through discussions and activities at stakeholder and public meetings, at a variety of study area events, as well as through surveys and other materials posted on the website. Any materials presented at public meetings were available for review on the website, along with easy-to-use comment forms. The public was also invited to share their comments via social media, e-mail, and a website comment form throughout the process. All e-mail, website, and hard copy comments received individual responses from the project team. These comments and responses are documented in the appendix of this memo.

How Public and Stakeholder Involvement Influenced the Project

Input from committee members, public meetings participants, elected officials, agency representatives, and other community members and stakeholders directly influenced the project from beginning to end. This included early stage input (project purpose, need, goals, and objectives) and later stage guidance (alternatives development and criteria weighting for the evaluation of alternatives).

Input from early meetings influenced an adjustment of the project purpose and need to explicitly balance the need for safe and accessible non-motorized transportation (pedestrian and bicycle) with an appropriate level of vehicle accommodation. It also made explicit the need for more robust land use in order to support high-quality transit. The project objectives were adjusted to address the need for pedestrian improvements, integration with existing and planned transit service, and minimizing impacts to the natural environment.

Input from later meetings (including input from Public Meeting #2 and from the survey taken at the meeting and available online from March 24-April 26, 2014) influenced the weights assigned to the evaluation measures. Many people have expressed a preference for Metrorail; as a result, draft funding options and a timeline and phasing plan have been developed.

The team undertook a multi-faceted stakeholder involvement process. Table 1 presents the primary outreach strategies and summarizes the methods used to implement those strategies. More information is available in the remainder of this document, as well as in the appendix.

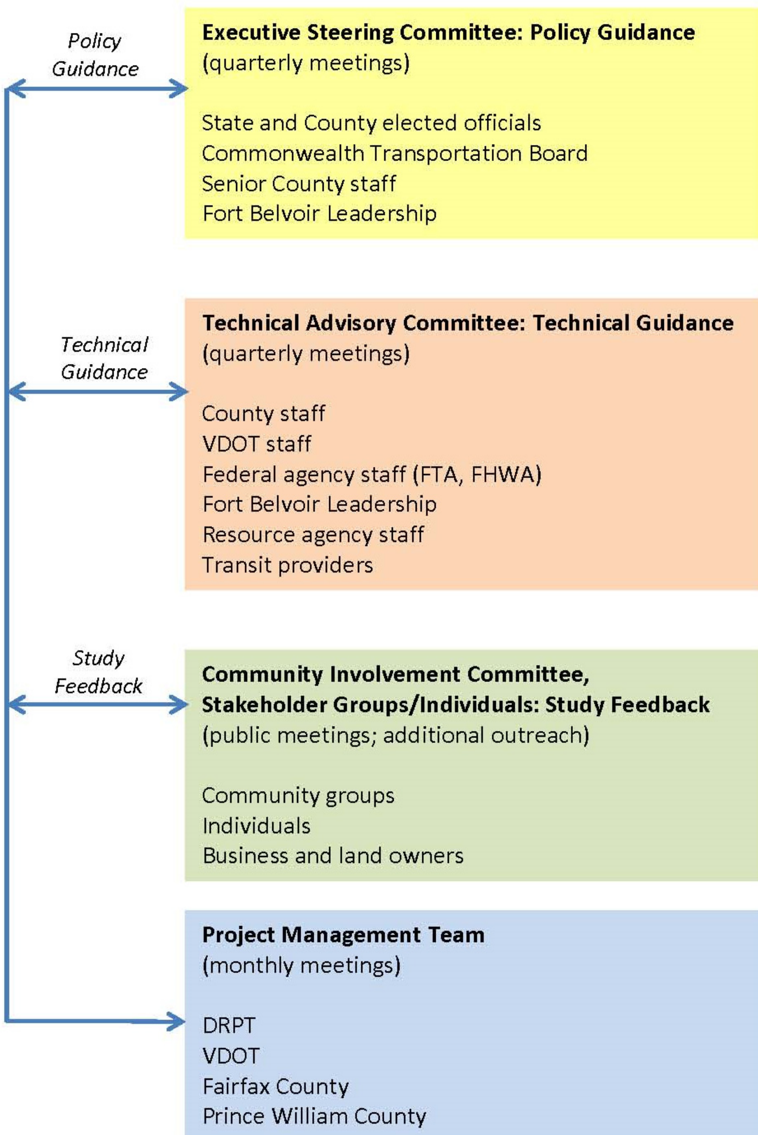
Table 1. Outreach Strategies and Implementation Summary

Strategy	Summary of Strategy Implementation
Targeted Stakeholder Engagement	• Established four committees to focus on guiding the project in ways that would respond to the overall project objectives as well as the roles and responsibilities of the relevant federal, state, and local agencies: ○ Project Management Team ○ Technical Advisory Committee ○ Executive Steering Committee ○ Community Involvement Committee • Through briefings and small group meetings, engaged elected officials and other key stakeholders to provide feedback on critical issues and build project buy-in. Targeted outreach was also used to announce and distribute information about public meetings.
Public Meetings	Conducted three rounds of educational and interactive public meetings at key points in the alternatives development and evaluation process. Meetings were held in October 2013, March 2014, and October 2014.
Community Engagement Beyond the Public Meetings	• Spoke with the community at more than 20 events, including back to school nights, markets and festivals, and other established meetings in the study area. In addition, the team set up booths at the Huntington Metro Station to distribute information about the project during peak commute hours. The team also attended homeowner and business association meetings regularly. • Reached out to existing networks, including schools, churches, grocery stores, and other gathering places, to distribute project information and public meeting notices. • Ensured outreach across the economic spectrum on the corridor. Meeting flyers were distributed at affordable housing complexes, international groceries, human service offices, and at bus stops. Flyers and newsletters were prepared and distributed in English and Spanish, and the website included a translation tool for multiple languages. • Established the project website and updated material frequently. After each meeting, all materials presented and distributed at the meeting were available online (including a video of the presentation), and people were able to take surveys online and comment on display boards. Updated informational material at regular intervals and distributed through e-mails, twitter, and Facebook accounts, newsletters, flyers, and other handouts.

2.0 Targeted Stakeholder Engagement

Committee meetings and small group discussions are described in this section, including key findings from each. Project committees included the Project Management Team (PMT), Executive Steering Committee (ESC), Technical Advisory Committee (TAC), and Community Involvement Committee (CIC). In addition, many small group discussions and presentations were held throughout the course of the study. Figure 1 provides an overview of the committees and their roles for the project.

Figure 1. Route 1 Multimodal AA Committees and Roles



Project Management Team (PMT)

The Project Management Team (PMT) served as management-level advisors for the duration of the project. The group reviewed technical documents in detail and provided strategic guidance at the state and local levels in order to deliver a successful project. The PMT met in-person on a monthly basis and spoke by conference call between meetings, as needed. The PMT comprised representatives from the following agencies:

- Virginia Department of Rail and Public Transportation (DRPT)
- VDOT Northern Virginia
- Office of Intermodal Planning and Investment (OIPI)
- Fairfax County DOT
- Prince William County DOT

Executive Steering Committee (ESC)

The Executive Steering Committee (ESC) offered policy guidance and strategic direction to the project team throughout the course of the project. The ESC comprised the key elected and appointed officials who wished to maintain consistent involvement. The full ESC met five times, as described in this section. The project team also held numerous briefings with subgroups from the ESC to discuss specific elements of the analyses and findings, and to provide jurisdiction or district specific updates. Table 2 lists the ESC members.

Table 2. Executive Steering Committee Membership

ESC Membership	
Name	**Organization/Agency**
Elected Officials/Senior Staff Members	
Congressman Gerry Connolly (Rep. by Collin Davenport)	U.S. House of Representatives, 11th District of VA
Congressman Jim Moran (Rep. by Mike Lucier)	U.S. House of Representatives, 8th District of VA
Scott Price	Office of Senator Mark Warner
Joe Montano	Office of Senator Tim Kaine
Delegate David Albo	Virginia House of Delegates, 42nd District
Senator George Barker	Virginia Senate, 39th District
Senator Charles Colgan	Virginia Senate, 29th District
Delegate L. Mark Dudenhefer	Virginia House of Delegates, 2nd District (To Jan 2014)
Delegate Michael Futrell	Virginia House of Delegates, 2nd District (From Jan 2014)
Senator Adam Ebbin	Virginia Senate, 30th District
Delegate Rob Krupicka	Virginia House of Delegates, 45th District
Senator Toddy Puller	Virginia Senate, 36th District
Delegate Mark Sickles	Virginia House of Delegates, 43rd District
Delegate Scott Surovell	Virginia House of Delegates, 44th District

ESC Membership	
Delegate Luke Torian	Virginia House of Delegates, 52nd District
Supervisor Gerald Hyland	Fairfax County, Mt. Vernon District
Supervisor Jeff McKay	Fairfax County, Lee District
Supervisor John Jenkins	Prince William County, Neabsco District
Supervisor Frank Principi	Prince William County, Woodbridge District
Supervisor Catherine Hudgins	WMATA Board of Directors (Also Fairfax County, Hunter Mill District Supervisor)
Appointed Officials	
Fran Fisher	Commonwealth Transportation Board (To May 2014)
Jim Dyke	Commonwealth Transportation Board (From May 2014)
Thelma Drake	DRPT, Director (To Jan 2014)
Jennifer Mitchell	DRPT, Director (From Jan 2014)
Helen Cuervo	Virginia Dept. of Transportation (VDOT), NOVA Administrator
Renee Hamilton	VDOT, NOVA Deputy District Administrator
Staff	
Ryan Kelly	Office of the Secretary of Transportation (To Jan 2014)
Tom Biesiadny	Fairfax County DOT, Director
Noelle Dominguez	Fairfax County, Legislative Liaison (Alternate to T. Biesiadny)
Tom Blaser	Prince William County DOT, Director
Rick Canizales	Prince William County DOT (Alternate to T. Blaser)
Christopher Landgraf	Fort Belvoir, Chief Facility Planning Garrison Commander
Rich Baier	Director, Department of Transportation and Environmental Services (Through Aug 2014)
Jim Maslanka	City of Alexandria T&ES (Alternate to R. Baier)
Kelley Coyner	NVTDC
Allison Davis	WMATA
Greg Potts	WMATA

ESC Meeting topics and summary of input

<u>ESC Meeting #1: April 10, 2013 (Virginia Megaprojects Office)</u>

ESC Meeting #1: Topics

The ESC provided feedback to the team and responded to three guiding questions:

- What are the most critical needs in the study area?
- What themes must the study address to cover the range of stakeholder priorities?
- What are the most important outcomes of the Route 1 Multimodal Alternatives Analysis?

ESC Meeting #1: Discussion Summary

The following issues were brought to the team's attention:

- Bilingual outreach is critical.
- Consider that the corridor has distinct sections – North and South of Ft. Belvoir – and what those two different populations might need in terms of outreach.
- Include large property owners as stakeholders.

- Consider water transit opportunities, parking, and real-time information.
- There are broader economic development issues to be addressed than just traffic issues.
- It's a historic corridor with historic assets.
- Help the community define what they want to see and have in their community.
- Develop a "dashboard" to measure pros/cons of options for transparency.
- Understand land use and business opportunity impacts related to the alternatives.
- Affordable housing is a major issue.
- Shouldn't feel constrained by existing funding sources, but be aware of what's available. NVTA as a potential source of funding, along with public-private partnerships.
- Identify groups that may feel threatened or vulnerable by the project and go to them to share the approach and intentions before they express concern.
- City of Alexandria should be represented at ESC meetings, not just in the TAC.

ESC Meeting #2: November 14, 2013 (Fort Belvoir)

ESC Meeting #2: Topics
The ESC provided feedback to the team on the following topics:

- Alternatives Screening and Development process
- Project Funding and Finance

ESC Meeting #2: Discussion Summary
The following issues were brought to the team's attention:

- Consider that transit mode may need to shift along corridor and not be consistent throughout, but need to also consider service implications.
- Consider transit, vehicle, pedestrian, and bicycle options together.
- Don't take any funding options off the table until we know what we are funding (type, scale, etc.).

ESC Meeting #3: March 13, 2014 (Mt. Vernon Government Center)

ESC Meeting #3: Topics
The ESC provided feedback to the team on the following topics:

- Proposed alternatives for further evaluation
- Land use scenario development
- Evaluation of alternatives

ESC Meeting #3: Discussion Summary
The following issues were brought to the team's attention:

- Consider the number of curb cuts and what they mean for the comfort of a shared-use path.
- Compare land use alternatives with something that currently exists in the Metro area, and show how areas such as Ballston and Clarendon looked (in terms of density) before and after transit investment.
- Clarify evaluation criteria, especially with regards to "what the community wants."
- Refine the message about necessary investments so that the public can see and understand the magnitude. Should show only what is feasible on Route 1.
- Clarify general implementation schedule on slide for public meeting.

- Consider how land use patterns could change and what that means for changing Comprehensive Plans, etc.

ESC Meeting #4: October 2, 2014 (Mt. Vernon Government Center)

ESC Meeting #4: Topics

The ESC discussed the following topics:

- Preliminary recommendation
- Project phasing
- Population and employment growth analysis
- Traffic capacity analysis
- Potential funding strategy
- Next steps

ESC Meeting #4: Discussion Summary

The following issues were brought to the team's attention:

- Proposed phasing suggests that the planning process needs to begin immediately in order to stay on track with the timeline.
- The Comprehensive Plan updates must respond to the infrastructure capacity demands of new development. It should contain triggers that allow higher density development when there is confirmation that Metrorail is definitely coming to the area.
- There is a need for a regional conversation about connecting BRT systems.
- The funding request for this project to NVTA should be more ambitious than is shown in the current proposal. This is the kind of regional capacity building project that is envisioned to be funded by NVTA. The project should aim high.
- There is some interest from the private sector for a public-private partnership BRT project on this corridor. It should be explored further.
- Fairfax County requests that DRPT assist in making sure the adopted recommendations from this project are reflected in all the key documents so that the projects remains eligible for funding.
- Would like to see the timeline shortened, but understand the constraints. The best way to accelerate the project is to find money sooner than expected. For example, through NVTA funding in this current funding cycle.
- There is a lot of unbuilt FAR on Route 1 in the Comprehensive Plan right now. Right-of-way acquisition is one of the biggest challenges for this project. The counties need to understand the station locations, and requirements for right-of-way, density, and infrastructure so that these elements can be incorporated into the Comprehensive Plan updates.
- It will be important to bring the recommendations from this study to the Board of Supervisors in both counties as soon as the project is complete. This will allow the Comprehensive Plan updates to begin as soon as possible. The Fairfax County Board of Supervisors will further discuss the implementation timeline. The resolution for the ESC does not address the timeline issue.

ESC Meeting #5: October 27, 2014 (South County Center)

ESC Meeting #5: Topics

The ESC discussed the following topics:

- Findings from public meeting #3
- Final study recommendations
- Potential implementation timeline
- Project action items and next steps
- Draft resolution for endorsement

ESC Meeting #5: Discussion Summary

The following issues were brought to the team's attention:

- Concern among some members of the ESC that this two phased approach to Comprehensive Planning for Phase IV will be inefficient and not provide the commitment to Metrorail that large developers wish to see before making a major investment on the corridor. Other ESC members noted that the County must phase the planning updates in order to ensure appropriate provision of county services as the population grows.
- The Mount Vernon Council sent a resolution to its county elected official stating its wish to see a Metrorail extension on Route 1. A community discussion about density would help the elected officials determine if there really is widespread public support for the densities required for Metrorail. Some members of the ESC want to see this discussion occur soon. Others feel that a discussion about Metrorail today would create unrealistic expectations among members of the public and ultimately slow the planning and rezoning process.
- There is a need to identify the project sponsors for the Route 1 projects moving forward. That project sponsor would develop a more detailed funding plan. At the next federal funding milestone (at the end of the environmental process), FTA will want to see this funding plan and a local financial commitment to the project.
- FTA is the traditional way to fund this type of project, but there are other methods too, which the project team should keep in mind. For example, ear marks. Also, with employment at Fort Belvoir growing, the army might contribute to the project.
- As the team thinks about the funding plan, consider if there are lessons learned from the silver line model. There is no airport or toll road, but there may be other applicable methods for collecting funds, for example tax strategies. However we need to understand the implications for people living on Route 1. NVTA and state money will be important funding opportunities.
- Congressman Moran's office is looking into the process for transitioning any remaining money from the current Route 1 widening project to this Route 1 Multimodal project. Since the current widening project is not complete, it is not yet clear how much money will remain at the end. The intent is to keep any remaining money in the corridor.
- Executive Steering Committee members recommended a few adjustments to the draft resolution. Participants approved these changes, and the final resolution was circulated to ESC members for signatures. The following ESC members signed the resolution at or following the ESC meeting:

- Supervisor John J. Jenkins, Prince William County Neabsco District
- Delegate Scott A. Surovell, Virginia House of Delegates, 44th District
- Delegate Mark D. Sickles, Virginia House of Delegates, 43rd District
- Supervisor Gerald W. "Gerry" Hyland, Fairfax County Mount Vernon District
- Senator Linda T. Puller, Virginia Senate, 36th District
- Supervisor Jeffrey C. McKay, Fairfax County Lee District
- Christopher W. Landgraf, Fort Belvoir
- Renee N. Hamilton, VDOT
- Delegate David B. Albo, Virginia House of Delegates, 42nd District
- Delegate K. Rob Krupicka, Jr, Virginia House of Delegates, 45th District
- Delegate Luke E. Torian, Virginia House of Delegates, 52nd District
- Senator Adam Ebbin, Virginia Senate, 30th District
- Representative Jim Moran, US House of Representatives, 8th District of VA
- Representative Gerry Connolly, US House of Representatives, 11th District of VA
- Supervisor Catherine Hudgins, WMATA Board of Directors and Fairfax County Hunter Mill District

Technical Advisory Committee (TAC)

The Technical Advisory Committee (TAC) provided interagency technical advice, feedback, information, and guidance to the team throughout the alternatives analysis. The TAC met four times during the course of the project. In addition, small group briefings were help with subgroups from the TAC for detailed discussion of specific project elements. Committee members included representatives of the following groups:

- City of Alexandria
- Fairfax County Department of Planning and Zoning (DPZ)
- Fairfax County Office of Community Revitalization (OCR)
- Fairfax County DOT
- Fairfax Connector
- Federal Highway Administration (FHWA)
- Federal Transit Administration (FTA)
- Northern Virginia Transportation Commission (NVTC)
- Office of the Virginia Secretary of Transportation
- Potomac and Rappahannock Transportation Commission (PRTC)
- Virginia Railway Express (VRE)
- Fort Belvoir
- Prince William County Planning
- Prince William County DOT
- Southeast Fairfax Development Corp.
- VDOT Northern Virginia
- VDOT Central Office
- Virginia Department of Historic Resources (VDHR)
- Virginia Department of Environmental Quality (VDEQ)
- Virginia Office of Intermodal Planning and Investment (OIPI)
- Washington Metropolitan Area Transit Authority (WMATA)

TAC Meeting topics and summary of input

TAC Meeting #1: July 17, 2013 (South County Center)

TAC Meeting #1: Topics
The TAC provided feedback to the team and responded to three guiding questions:

- What are the most critical needs in the study area?
- What are the key technical considerations for your agency?
- What are the most important outcomes of the Multimodal Alternatives Analysis?

TAC Meeting #1: Discussion Summary
The following issues were brought to the team's attention:

- Clarify whether this is an FTA New Starts project.
- Clarify analysis year for alternatives comparison.
- Definition of "public."
- Be cognizant of Title VI protected populations on corridor.
- Consider all modes when creating connectivity, including VRE.
- Determine northern terminus of corridor.
- Consider and carefully plan long-term and short-term phases, as well as the tradeoffs between land use intensity and mode selection options.
- Coordinate with ongoing studies or those that start up during project process.
- Issues in using COG model, which is designed for weekday analysis and not weekend analysis.
- Avoid delays by addressing environmental, historic, and cultural impacts early.
- Need certainty from the study to drive the economic development that will be necessary.
- Address both local and commuter needs.
- Need to address utility corridors; was an issue with the widening project.

TAC Meeting #2: September 25, 2013 (South County Center)

TAC Meeting #2: Topics
The TAC reviewed and discussed the following:

- Draft Purpose and Needs Statement
- Draft Needs Assessment
- Draft Evaluation of Alternative Methodology

TAC Meeting #2: Discussion Summary
The following issues were brought to the team's attention:

- Clarify the study area.
- Accommodate people accessing the stations and transferring between modes.
- Consider both people traveling through and within the corridor.
- Several issues regarding materials for presentation at the public meeting, including a recommendation to video record the presentation.
- Several issues regarding the draft list of goals and measures.

TAC Meeting #3: March 6, 2014 (South County Center)

TAC Meeting #3: Topics
The team presented the following topics to the TAC for discussion and comment:

- Existing travel markets and the Metrorail core capacity issue
- Initial alternatives, key indicators and evaluation factors, and the process by which the team is refining those alternatives
- The land use scenarios and economic analysis tasks
- Project funding and finance, including potential sources
- Next steps and upcoming meeting schedule

TAC Meeting #3: Discussion Summary
The following issues were brought to the team's attention:

- Utilize general travel market trends along with specific transit market trends.
- Constraints on the project related to Metrorail and highway capacity concerns.
- Consider of bus capacity issues.
- Request to see ridership results for new riders versus those switching from other transit modes.
- Take into account planned VRE service increase for Woodbridge.
- Reference other relevant plans and possible constraints they could create.
- Include County bond funding as a possible financing strategy.

TAC Meeting #4: September 10, 2014 (South County Center)

TAC Meeting #4: Topics
The team presented the following topics to the TAC for discussion and comment:

- A brief project update, including schedule and project status; highlights from the last meeting; and the process for arriving at a recommended alternative at the end of the study
- Evaluation of Alternatives
- Key considerations for project implementation including Environmental Scan findings, population and employment growth, traffic and roadway capacity
- Preliminary implementation and phasing approach
- Next steps: adopting recommendations into local and regional plans, beginning National Environmental Policy Act (NEPA) process and concept engineering, and refining cost estimates and funding plans

TAC Meeting #4: Discussion Summary
The following issues were brought to the team's attention:

- Ensure that any plan accommodates both through and local trips
- Clarify "cost per rider" vs "cost effectiveness" - the former sounds like it refers to the potential transit fare rather than a measure to compare alternatives
- Several edits/clarifications to the station activity density level information
- Simplify and clarify traffic findings
- With regards to phasing and implementation:
  - Show land use planning actions that will be needed along with the implementation timeline
  - Call out specific actions that need to be taken at multiple levels (state, county, local)
  - Consider how potential growth above current forecasts might affect other parts of Fairfax County

Community Involvement Committee (CIC)

Throughout the process, the Community Involvement Committee (CIC) offered guidance related to a range of issues, including critical guidance for strategic outreach to and engagement with the corridor's diverse set of communities. Representatives included business and residential leaders from the corridor, as well as organizations with particular areas of knowledge and interest on Route 1 (environmental, historic, economic, etc.). The team met informally with members of the CIC prior to its first official meeting on September 30, 2013, in order to introduce them to the project and identify others who should be involved in the group. Meetings with the CIC were then held prior to each of the three public meetings.

The CIC included representatives from:

- Alexandria Economic Development Partnership
- Audubon Naturalist Society
- Community Preservation and Development Corporation
- Fairfax Advocates for Better Bicycling
- Fairfax County Federation of Citizens Organizations
- Friends of Dyke Marsh
- Friends of Huntley Meadows Park
- Friends of Quander Brook
- George Mason University Center for Regional Analysis
- Good Shepherd Housing & Family Services
- Habitat for Humanity
- Lee District Association of Civic Organizations
- Lee Land Use Committee
- Mason Neck Citizens Association
- Mount Vernon Council of Citizens' Associations
- Mount Vernon-Lee Chamber of Commerce
- Northern Virginia Affordable Housing Alliance
- North Woodbridge Breakfast Club
- Planning Commissioners (Fairfax County and Prince William County)
- Sierra Club, Virginia Chapter
- South County Federation
- South Fairfax Chamber of Commerce
- Southeast Fairfax Development Corporation
- Spring Bank Community Association
- The Coalition for Smarter Growth
- Transportation Commissioners (Fairfax County)
- United Community Ministries
- Wesley Housing Development Corp. of Northern Virginia
- Woodbridge Civic Association

CIC Meeting topics and summary of input

CIC Meeting #1: September 30, 2013 (Mt. Vernon Government Center)

CIC Meeting #1: Topics

The CIC reviewed and discussed the following:

- Project purpose, goals, community and stakeholder involvement strategy, and schedule
- Corridor demographics
- Case studies of transit supported development and density
- Draft goals showing initial analysis of current conditions and trends
- Findings from a survey distributed to CIC members prior to the meeting

CIC Meeting #1: Discussion Summary

The following issues were brought to the team's attention:

- Terminology and other suggested changes for the public meeting presentation.
- Need for short term improvements.
- Consider using Level of Service analysis.
- Outreach suggestions, including reaching out at bus stops, to non-governmental organizations (NGOs), surveys.
- Consider visitors as stakeholders.

The committee also broke out into small group discussions led by members of the team. In these groups, CIC members were asked to consider the following questions:

- What are your transit visions for the Route 1 corridor within the study area, and what conditions will need to be in place to allow these to be realized?
- What do you think the community's expectations are for this study?

CIC Meeting #2: March 18, 2014 (Mt. Vernon Government Center)

CIC Meeting #2: Topics

The CIC reviewed and discussed the following:

- Travel markets and ridership modeling
- Proposed alternatives for further evaluation
- Land use scenarios and economics
- Project funding and finance
- Public meeting outreach--Specific questions that were asked of the CIC:
  - What will the community be interested in learning about at the meeting?
  - Does the presentation need to be modified to clearly provide that information?
  - Are there other meeting outreach strategies that we should consider?

CIC was also asked to review the display boards independently, or in small groups, and provide feedback to the team.

CIC Meeting #2: Discussion Summary

The CIC highlighted a number of slides for clarification and refinement prior to presentation to the public. In particular, the CIC recommended less information on each slide, and streamlining of the presentation material. The CIC suggested that some of the material could be shifted to the display boards so that the presentation could focus on the key findings and deliverables.

CIC Meeting #3: October 1, 2014 (South County Center)

CIC Meeting #3: Topics

The CIC reviewed and discussed the following:

- Outreach activities
- Evaluation of alternatives process
- Summary of key indicators and findings
- Draft recommendation
- Growth scenarios and traffic analyses
- Project phasing and funding
- Next steps

CIC Meeting #3: Discussion Summary

The following issues were brought to the team's attention:

- Clarify the differences between the transit modes. People generally do not understand which options will make their travel trips shorter, and how the transit travel time compares with auto travel times.
- Clearly explain the cost effectiveness measure.
- Many people are afraid of density as a concept. It is better to use words like "mixed-use", "live/work/play environment", "compact and convenient", and "lifestyle choices" instead of "density." Use examples, such as recent changes in Huntington, to help people understand the mixed-use, higher density, multimodal vision for the corridor.
- Add a north arrow to the visualizations to help people with orientation.

Other Targeted Engagement

The team conducted small group meetings, interviews, and briefings with many key stakeholders throughout the study. Table 3 documents many of those meetings. This was a very effective way to provide project updates and receive targeted feedback and input at critical points in the planning process.

Table 3. Briefing Dates and Attendees

Briefing Dates and Attendees	
Date	**Attendees**
8/2/13	Fairfax County Planning Staff
9/5/13	ESC Briefing: Supervisor Hyland
9/5/13	ESC Briefing: Supervisor McKay, Taylor Holland
9/9/13	ESC Briefing: Delegate Scott Surovell
9/10/13	ESC Briefing: Senator Toddy Puller, Carrie Ann Alford (legislative aide)

10/1/13	ESC Briefing: Barbara DeChene (Chief of Staff for Supervisor Principi)
10/3/13	Prince William County Office of Housing Staff
10/29/13	Southeast Fairfax Development Corporation
11/13/13	Mount Vernon-Lee Chamber of Commerce
4/9/14	Mount Vernon-Lee Chamber of Commerce
5/27/14	Greg Potts (WMATA), Senator Puller, and Delegate Surovell
5/28/14	ESC Briefing: Senator Puller and Delegate Surovell
6/9/14	Supervisor Jenkins
6/10/14	Supervisor Principi
6/25/14	Chairman Bulova
6/25/14	VDOT: Helen Cuervo, Renee Hamilton, other VDOT senior staff
6/26/14	Supervisor McKay and Supervisor Hyland
7/7/14	ESC Briefing, Fairfax: Senator Puller, Delegate Surovell, Supervisor Hyland, Supervisor McKay, and Tom Biesiadny
7/15/14	ESC Briefing, Prince William: Senator Puller, Senator Barker, Rick Canizales, Delegate Futrell, Tracy Gordon, Supervisor Jenkins, Chris Price, Supervisor Principi, Susan Roltsch
8/21/14	ESC Briefing: Tom Biesiadny (Fairfax DOT)
8/27/14	ESC Briefing: Rick Canizales (Prince William DOT)
8/28/14	Federal Transit Administration
9/2/14	ESC Briefing: Supervisor McKay and Supervisor Hyland
9/4/14	ESC Briefing: Senator Puller and Delegate Surovell
9/5/14	ESC Briefing: Rick Canizales (Prince William DOT)
9/8/14	Mount Vernon Council of Citizens' Associations, Transp. Committee
9/10/14	Montebello Condo Association
9/16/14	Fairfax County Transportation Advisory Commission
9/17/14	Southeast Fairfax Development Corporation (SFDC) Board

3.0 Engagement with General Public Outside of Public Meetings

Outreach efforts were aimed at informing the public about the project, encouraging attendance at public meetings, and providing a variety of opportunities for input. The team created several types of outreach products in order to ensure the right type and amount of information for each target group. Outreach materials were distributed both electronically (via e-mail, social media, and the website) and in print. Print materials were posted and/or placed at many locations along the corridor, including bus shelters, grocery stores, affordable housing complexes, libraries, community centers, and government centers.

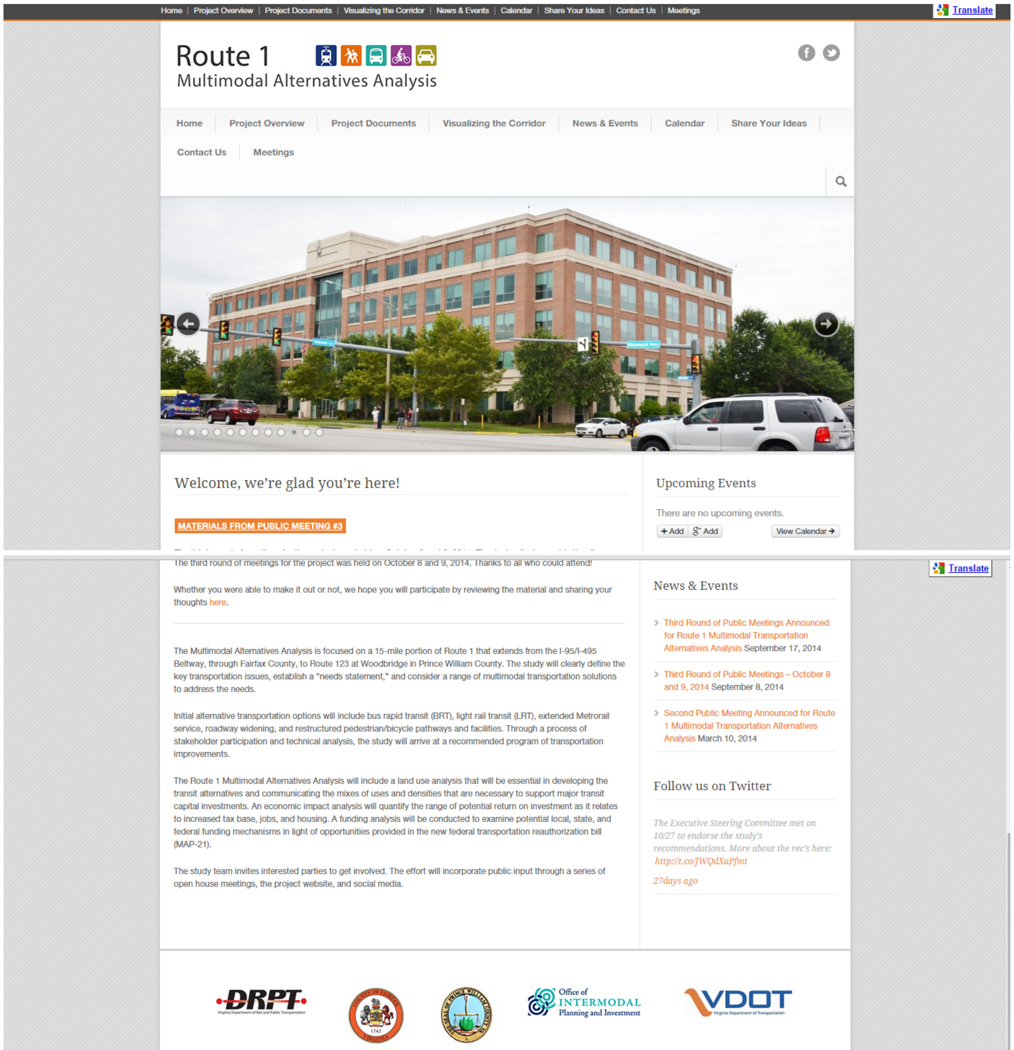
Website

The consultant team established a project website (http://route1multimodalaa.com/) and updated the content throughout the study. The website contained background information, schedules of events and meetings, materials from committee and public meetings (including surveys and presentation videos from public meetings), related reports and studies, project-specific documents/findings, news coverage related to the project, and a question/comment box.

The website served as a key opportunity to interact with stakeholders on the corridor who were not able to attend public meetings. Following each public meeting, all of the materials were posted on the website in an interactive format. The project team used its social media network, e-mail communication, and other outreach strategies to advertise this alternative method for providing project input. Comments received through the project website and e-mail address are documented, with responses, in the appendix.

The website also included the google translate tool, which allowed any user to translate the full website text into another language. Eighty language options were available, including Spanish, which is the primary language of many residents and business owners on the Route 1 corridor. Figure 2 presents a screen shot of the website cover page,

Figure 2. Website Cover Page



Social Media

The team established Facebook (route1multimodalaa) and Twitter (@rt1multimodalaa) accounts for the project. Social media was used to advertise meetings and project outreach efforts, connect the project with other related events and celebrations, and take comments. The project team coordinated with public relations staff at DRPT, Fairfax County, and Prince William County to arrange re-tweeting and re-posting of all project notifications. As a result, the project team was able to quickly broaden its social media outreach to these already established networks.

Printed Materials

Handouts

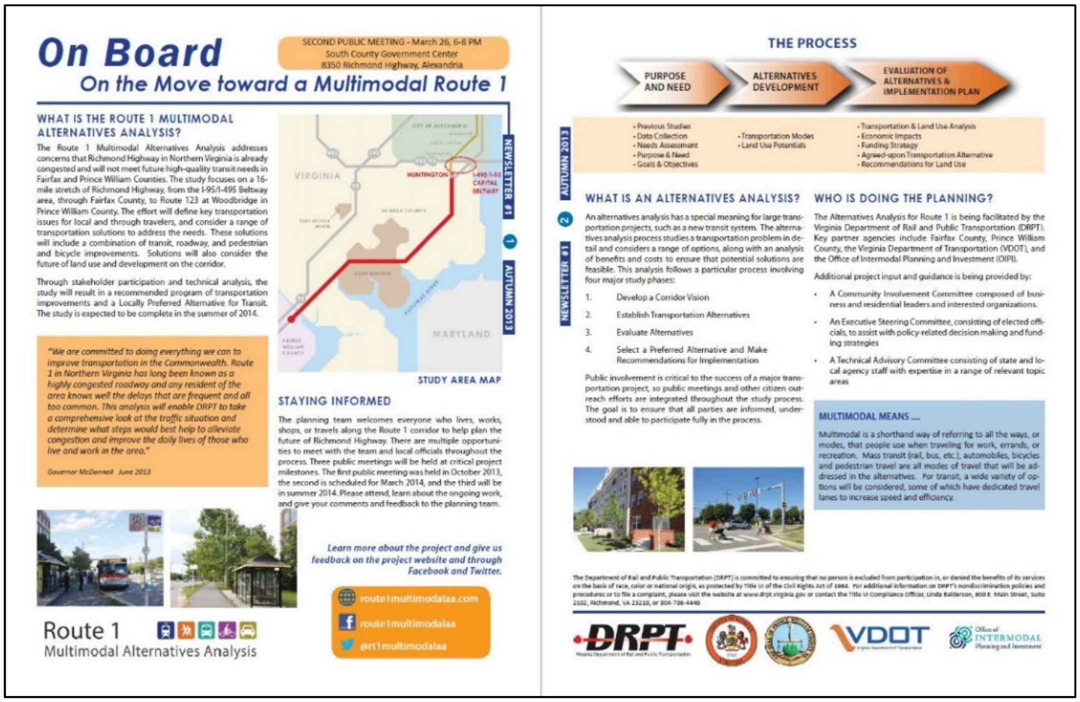
The team created a simple hand out for distribution at locations such as Metrorail stations and information booths. The handout contained links to the project website and other social media accounts. For the second and third meetings, the handout was updated to also include a map, a short paragraph about the project, and details about the next public meeting.

Flyers

In the weeks leading up to each meeting, one-page flyers were distributed in both English and Spanish. The flyers contained links to the project website and other social media accounts, as well as details about the meeting and a summary of project progress to-date. The flyer was prepared in both a hard copy and digital format with "live" links to the website and social media accounts. The e-mail distribution list included over 350 contacts including committee members, public meeting attendees, and anyone who had expressed interest in the project through the project website or at outreach events. Each of the three public meeting flyers can be found in the appendix of this memo.

Newsletters

The purpose of the two-page newsletter was to provide a more substantial overview of the current project status and findings to-date. The project newsletters were posted on the project website, distributed at events and meetings. Several of the Executive Steering Committee members made the newsletter available to constituents at their offices.



Outreach to Underrepresented Populations

To engage low-income and minority populations (who are historically underrepresented in planning processes), the team distributed print materials to community centers, low-income apartment complexes, libraries, and international markets along and near the corridor. Press releases were sent to three Spanish language newspapers and three Spanish radio stations, and ads placed in the Washington Hispanic newspaper. All meeting flyers and bus advertisements were prepared in English and Spanish. The website included a translation tool for all the text. The team also reached out to community leaders and organizations along the corridor who represent the low income and minority populations, including VOICE, Progreso, and Ventures in Community. Outreach to the study area schools and attendance at back-to-school nights included materials in English and Spanish and Spanish translators, as needed.

Information Booths

In an effort to engage those community members who typically cannot or do not attend meetings, the team reached out to community members at back-to-school nights, Town Halls, markets, festivals, and at the Huntington Metrorail station. Table 4 notes the events attended by project team members. At each, the project team set up an information table with a project display board, actively engaged attendees, and distributed meeting notices, newsletters, and other handouts.

Table 4. Information Booths

Outreach dates and locations	
9/11/13	Route 1 Widening Meeting
9/11/13	Hayfield Middle School Back to School Night
9/12/13	Potomac Communities Workshop
9/17/13	Woodley Hills Elementary School Back to School Night
9/17/13	Route 7 event
9/19/13	Walt Whitman Middle School Back to School Night
9/21/13	Lee District Community Fair
9/24/13	Groveton Elementary School Back to School Night
9/25/13	Vibrant Streets Summit
9/25/13	Riverside Elementary School Back to School Night
9/26/13	Gunston Elementary School Back to School Night
10/2/13	Mount Vernon Farmers Market
10/2/13	Ventures in Community
10/3/13	West Potomac High School Back to School Night
10/5/13	Occoquan Farmers' Market
10/6/13	Lorton Farmers Market
10/9/13	Mount Vernon Farmers Market
10/19/13	Mount Vernon-Lee Celebration!
11/6/13	Huntington Metro Station – rush hour
2/1/14	Mount Vernon Town Hall meeting booth

Schools

The team made phone calls and sent e-mails to principals and Parent Teacher Association presidents at schools throughout the Route 1 corridor study area in order to discern the best way to share information their school community. Outreach efforts included flyers sent home in backpacks, e-mails sent to parents, and listing the meeting date on school calendars or in school newsletters. The team reached out to the following schools before each of the three public meeting. The star (*) indicates a significant Spanish speaking population in the school. Bilingual materials were offered to all the school and distributed as needed. The schools included:

- Belle View Elementary School
- West Potomac High School
- Bucknell Elementary School
- Groveton Elementary School
- Hybla Valley Elementary School*
- Holland Meadows Elementary School*
- Walt Whitman Middle School*
- Mount Vernon Woods Elementary School*
- Mount Vernon High School*
- Riverside Elementary School
- Stratford Landing Elementary School
- Carl Sandburg Middle School
- Wayneswood Elementary School
- Fort Hunt Elementary School
- Woodley Hills Elementary School
- Washington Mills Elementary School
- Woodlawn Elementary School*
- Fort Belvoir Elementary School
- Lorton Station Elementary School
- Gunston Elementary School
- Belmont Elementary School

E-mail and Written Comments

Interested parties were able to submit comments throughout the project via a comment form on the website, e-mails directly to the project e-mail addresses (route1aa@aecom.com and ideas@route1multimodalaa.com), or hard copy letter to DRPT and the other project partners. The team sent individual responses for all the comments received. These comments and responses are documented in the appendix.

4.0 Public Meetings

The team conducted three educational and interactive public meetings at key points in the alternatives development and evaluation process. Press releases were distributed to approximately 50 media contacts at the beginning of the project and before each meeting. The team placed advertisements in five local papers for each meeting: Washington Hispanic (in Spanish), Prince William Times, Alexandria Gazette Packet, Mt. Vernon Gazette, and Lorton Connection. For the second meeting, a large advertisement was placed at Huntington Metro Station in English and Spanish. For the third meeting, ads were placed on REX buses running on Route 1 in English and Spanish (see photo).

All three public meetings were held at the South County Center, an accessible location along the project corridor in Fairfax County. The third public meeting was held at both the South County Center and the Belmont Elementary School in Woodbridge, Prince William County. Spanish-speaking team members were available to speak with meeting participants; this was noted at the sign-in table and on the badges of appropriate team members.

Following each public meeting, all of the meeting materials were placed on the project website in an interactive format. Those who visited the website could watch a video of the presentation, comment on the display boards, and participate in the survey. The input received through the website was incorporated in the public meeting reports for each meeting, located in the appendix of this document. Table 5 lists the public meeting dates, locations, and attendance numbers.

Table 5. Public Meeting Details

Public Meeting Details			
Mtg. #	**Date**	**Location**	**Attendance**
1	10/9/13	South County Center, Fairfax	75
2	3/26/14	South County Center, Fairfax	145
3	10/8/14 and 10/9/14	Belmont Elementary School, Prince William (10/8) and South County Center, Fairfax (10/9)	152

Public meeting topics and summary of input

Public Meeting #1

The first public meeting was focused on sharing background information about the project and gaining public input regarding the draft project goals and needs. The team received input in the form of comments on display boards, "voting" on preferences about project priorities and potential trade-offs, through a Q&A session, and through the survey (58 responses).

Key Themes:

- Create destinations on Route 1, not a throughway.
- Understand how any proposed Route 1 transit service connects to the region, not just destinations on the corridor.
- Ensure that Fort Belvoir is a key participant as we look to the future. The travel impacts from Ft. Belvoir are very significant.
- Create safe pedestrian and bicycle conditions.
- Ensure ADA compliance.
- Factor in stream protection and environmental quality.

Key Questions that Emerged:

- How will the project progress once the study is complete? What is the timeline? (Federal, State, and local responsibilities/roles)
- How will the project be funded?
- How will the corridor connect at its north end into Alexandria?

Public Meeting #2

At the second public meeting, the team shared information about outreach findings, updated goals and objectives, technical analyses, refined alternatives, land use analyses, and possible funding strategies.

Public input at the meeting was taken in the form of comments made during the Q & A session, comments written near the display boards, a short survey (124 responses), and a written activity that encouraged attendees to vote on measures for evaluating the multimodal alternatives.

Though there were a variety of opinions from the public regarding the multimodal alternatives presented at the meeting, two preferences emerged from an analysis of the input:

a) Nearly 85% of survey respondents prefer a rail alternative, with more than half preferring a Metrorail extension. Many respondents emphasized that this was their preference because of the added economic and ridership benefits that come with a rail system versus a bus system.

b) Respondents recognized the need for long-term transit planning, but emphasized the need for shorter-term solutions, including street and sidewalk improvements, bicycle lanes, and mixed-use development.

Public Meeting #3

The third public meeting for the Route 1 Multimodal Alternatives Analysis took place in two parts on October 8, 2014 (Belmont Elementary School in Prince William County, VA) and October 9, 2014 (South County Center in Alexandria, VA). Representatives from DRPT and the consultant team spoke about the process to date and the recommended alternative. Before and after the presentation, meeting attendees were invited to learn more about the project findings to date by looking at a series of display boards and speaking with members of the team.

Public input at the meetings was taken in the form of comments made during the Q & A session, comments written near the display boards, and a short survey (76 responses). All materials from the meetings (including the presentation, display boards, and survey) were posted on the project website until November 9, 2014 to allow all members of the community to give their input, even if they were unable to attend the meetings.

Though there were many who expressed an interest in seeing an expedited timeline for the recommended BRT/Metrorail alternative, the majority of people who attended the meeting and responded to meeting materials online were supportive of the recommendation for short-term median-running BRT and long-term Metrorail extension to Hybla Valley.

Please see the appendix for detailed meeting notes and survey findings from each of the three public meetings.

Route 1 Multimodal Alternatives Analysis

Public & Stakeholder Involvement Report Appendix

November 26, 2014

Appendix A: Summary of Public Meeting #1 (October 9, 2013)

Appendix B: Summary of Public Meeting #2 (March 26, 2014)

Appendix C: Summary of Public Meeting #3 (October 8/9, 2014)

Appendix D: Public Meeting Outreach Flyers

Appendix E: Website and Email Comments and Responses

Public Meeting #1
Summary Meeting Notes
October 9, 2013

DATE/TIME: October 9, 2013 – 6:00 p.m. to 8:00 p.m.

PLACE: South County Government Center, 8350 Richmond Highway, Alexandria, VA 22309

SUBJECT: Public Meeting #1

ATTENDEES: Approximately 75 attendees, plus PMT members and consultants (see sign-in sheet)
36 surveys completed

1. Presentation

Amy Inman, DRPT Project Director, opened the meeting, welcomed attendees, and introduced the elected officials, staff and consultants. Tim Roseboom, DRPT Project Manager, provided an overview of the Route 1 Multimodal Alternatives Analysis project. Jason Mumford, AECOM project manager, presented the project background, purpose, schedule, and draft goals and needs.

2. Question and Answer Period (following presentation)

A fifteen minute question and answer period followed the presentation. Comments and questions during the Q&A period are list below. To the right of each comment/question is a note as to which draft goal and need are addressed.

- Goal 1: Improve multimodal travel options
- Goal 2: Improve safety; Increase accessibility
- Goal 3: Increase the economic competitiveness and vitality of the corridor
- Goal 4: Preserve community, health, and the environment

Comment/Question	Goal & Need
a. What other studies have been conducted on this topic? Answer: Many studies have been conducted on Route 1 and they are informing this study. This is the first Alternatives Analysis for high quality transit service on Route 1.	N/A
b. What is the vision for Route 1? How do land use and transportation factor into this study? Answer: The study will define the types of land uses you will be needed for the different mode options.	Goal 3, Need: Connections to regional activity centers
c. There is a lot of interest from developers in building residential on this corridor. This may impact the selection of one mode over another.	Goal 3, Need: Support compact, mixed-use development

Comment/Question	Goal & Need
d. What about the need to link from Springfield to Lorton and Fort Belvoir, and other parts of the County/region? Answer: This study emphasizes the Route 1 corridor specifically, but recognizes that these connections need to be made if there is going to be a system. The Countywide Transit Network Study is currently looking at these network elements. We are coordinating the studies.	Goal 3, Need: Connections to regional activity centers
e. Who will determine future decisions regarding implementation of this study? Answer: The plan will need to be in the long range plans for in the Counties in order for the Feds to move ahead. It is a local decision first and will require local participation for implementation. The State would like to support the localities and assist with decisions.	N/A
f. Fort Belvoir Hospital is a largely outpatient facility, so it is a major traffic generator. This should be kept in mind during the planning process. Consider the future number of Fort Belvoir employees and visitors. Answer: The justification for the current Route 1 widening project at Fort Belvoir is largely based on the hospital traffic conditions. The design for this widening project includes preservation of space in the right-of-way for future high quality transit service.	Goal 2, Need: Decrease congestion
g. What about the bottleneck at Alexandria boundary? Will the City enter into this planning? Answer: The City has done its own study on Route 1 in its jurisdiction and the project team for this study will continue to collaborate with the City to resolve the connection at the north end of the corridor.	Goal 3, Need: Connections to regional activity centers
h. What is the implementation timeline? 1 year? 5 years? Answer: Funding availability will largely influence the implementation timeline. Implementation will likely occur in phases over time.	N/A
i. How involved has Fort Belvoir been in this study? Answer: The project leads have met with the Commander. There is also a representative from Fort Belvoir on the ESC, TAC, and CIC. Could not attend tonight due to government shutdown.	N/A

3. Information Station Comments/Feedback

Following the presentation and Q&A period, participants were encouraged to visit each of the six information stations set up around the meeting room. Each station was staffed by one member of the consultant team and one member of the Community Involvement Committee. Below is a summary of the comments and feedback received at the stations. To the right of each comment/question is a note as to which draft goal and need are addressed.

Station #1: Study Overview

Comment/Question	Goal & Need
• Intersection of Rt.1 & 95 (need to fix this). Causes bottlenecks and long backups.	Goal 2, Need: Decrease congestion
• What would happen if we do away with buses (or have dedicated bus lanes)?	Goal 1, Need: Improve transit travel time
• Need to consider other connections along corridor to destinations throughout the region • Huntington to Springfield – need to label destinations on map	Goal 3, Need: Connections to regional activity centers
• Route 1 is not a through corridor today	Goal 2, Need: Decrease congestion
• Traffic calming/slowing is needed on Route 1 – for pedestrian safety	Goal 2, Need: Improve accessible pathways/ pedestrian crossings
• Trapped in neighborhood – issues with closed gates at Ft. Belvoir on south side	Goal 2, Need: Decrease congestion
• Like to see dedicated blue path on Rt.1 – not part of road, and not shared with pedestrians	Goal 1, Need: Improve transit frequency, service, travel time
• Clear division at Rt.1 for transit, safe pedestrian path (safe overpass/underpass). Consider limited left turns or limited access • Controlled environment on Rt.1 for pedestrians, cars, transit, bikes	Goal 2, Need: Improve accessible pathways/ pedestrian crossings
• Add more signalized intersections	Goal 2, Need: Improve accessible pathways/ pedestrian crossings
• Well designed (not just standard), something architectural appealing	Goal 3, Need: compact, mixed-use development
• Environmental interest is important! Sustainability o Clean air, Clean water, parks (protect and restore, historic and cultural) o Next stage of process o Stream restoration, reducing parking lots and stormwater	Goal 4, Possible New Need

Comment/Question	Goal & Need
runoff (need more native plants) • Spring Bank Community – Natural springs – stream (Bell Haven Park) • Rt. 1 runoff is a problem • Wants to advance stream restoration project • Fairfax County owns right-of-way now but project has stagnated – what it the status?	

Station #2: Project Background

Participants added feedback directly to the project goals display board as follows:

Goals	Specific Aims	Feedback
Improve high-quality multimodal options	• Improve transit to reduce travel times and increase frequency, reliability, and attractiveness; • Improve access for workers to jobs and opportunities generally, and for minority and low-income populations specifically; • Increase comfort, connectivity, and attractiveness of bicycle and pedestrian networks to and along the corridor; • Integrate with existing (and planned) transit systems and roadway improvements	• Ped & Bike Friendly
Improve safety; improve accessibility	• Provide accessible pathways to and from transit service and local destinations along Route 1; • Reduce pedestrian-vehicle conflicts; • Improve pedestrian crossings; • Improve traffic operations; • Reduce congestion	• Improve Route 1 connectivity with neighborhoods east and west of it (e.g. Sherwood Hall, Boswell Ave); • Complete the sidewalks on both sides of Route 1; • Community friendly traffic flow in balance with pedestrian safety and crossing needs in community centers; • User-friendly corridor

Goals	Specific Aims	Feedback
Increase the economic competitiveness and vitality of the corridor	• Increase and improve connectivity to regional activity centers; • Encourage and support compact, higher density, mixed use development consistent with local plans, policies, and economic objectives; • Increase public and developer confidence in the delivery and sustainability of new transit investments	• Connections from Prince William County to DC; • Must have permanent transit structures (e.g. tracks) to get development; • Transport interactions across jurisdictions which can reduce vehicle trips yet move more individuals, drop-off Prince William County, mass transit carry into Fairfax
Protect and improve community, health, and the environment	• Minimize impacts on private property and historic and natural resources; • Expand opportunities for more and affordable housing near high quality transit; • Reduce energy consumption and greenhouse gas emissions; • Increase opportunities for "active transportation" (e.g. walking, bicycling)	• Corridor should reflect the great/lovely character of the community; • Include some interpretive signs and display opportunities linked to history along Route 1

Station #3: Corridor Issues and Project Goals

Comment/Question	Goal & Need
• Pedestrian/bike friendly • Safe easy pedestrian walkways	Goal 2, Need: Improve accessible pathways/ pedestrian crossings
• Bike path	Goal 1, Need: Improve bicycle networks
• Main street identity, not a throughway	Goal 3, Need: Support compact, mixed-use development
• Lower speeds on Route 1	Goal 2, Need: Improve accessible pathways/ pedestrian crossings
• Smooth rapid transit from PW county to DC • More frequent public transit • Mass transit into Prince William County	Goal 1, Need: Improve transit frequency, service, travel time
• Grand Boulevard – separate though traffic and local traffic	Goal 2, Need: Decrease congestion
• Widen Route 1 into Prince William County	Goal 2, Need: Decrease congestion
• Need a funding plan	Possible new goal

Station #4: Transit Types

Comment/Question	Goal & Need
• How will riders access the mode (median vs. run on the side)?	Goal 2, Need: provide accessible pathways and pedestrian crossings

• Consider Connectivity
  ○ Long range trips to DC
  ○ Connect to Alexandria City
  ○ Branch to Mt. Vernon
  ○ Connectivity to Metrorail
	Goal 2, Need: Connections to regional activity centers

• Can our preferred mode handle our daytime commuters and tourists? • More frequent services (at least every 15 feet) (smaller buses)	Goal 1, Need: Improve transit frequency, service, travel times
• Mode should allow riders to see the street, which will help out businesses	Goal 3, Possible new need
• Alternative fuels • Solar?	Goal 4, Need: Reduce energy consumption and greenhouse gas emissions
• Cost • “Band Aid” vs. longer range solution • Wi-Fi capabilities	Possible new goals

Station #5: Visions for the Future

Comment/Question	Goal & Need
• Current infrastructure on Rt.1 is old, outdated and inadequate. The road and old developments have storm sewers that pollute our streams, etc. • More permeable surfaces • Clear-cut the entire road and redevelop by reinventing the Richmond Corridor to have stormwater facilities that slow down the erosion and catch the trash and road debris.	Goal 4, Possible new need
• Activity center development/targeted growth views	Goal 3, Need: Support compact,

• Create destinations on Rt. 1 (at activity centers)	mixed use development
• One side of the clear – cut development could have rail transit, the route 6 travel lanes and mixed developed on the other side could be good – bicycle and pedestrian friendly. Tunnels connect bicycles, pedestrians cross the transit and road.	Goals 1, 2, 3 Need: Support compact mixed-use development Need: Improve bicycle networks Need: Improve accessible pathways, improve pedestrian crossings
• Scooters: make provision for the use of scooters and gold carts – especially for use by seniors and those who can't get around via bikes and walking – also needed implications for frontage roads and sidewalks. Will support light rail/ streetcars (buses are a pain)	Goal 2, Need: Provide accessible pathways
• Fun is a factor. People should enjoy the ride. People don't think buses are fun.	Possible new goal
• Underground utilities, communication lines, Wi-Fi	Goal 3, possible new need

At station #5, participants were asked to respond to "priorities" scenarios. Below is the response compilation:

Scenario	Agree	Disagree	Need More information
1. I would be willing to deal with more traffic congestion in my car (i.e., wait two more minutes at a signal) if Route 1 became a place where I felt safe and comfortable walking and crossing the street.	**6**	**2**	**1**
2. I would be willing to have ten story buildings in key activity centers on Route 1 if I would also be able to walk safely from my home to destinations (sidewalks and crosswalks at intersections, etc.).	**8**		
3. I would be willing to have ten story buildings in key activity centers on Route 1 (e.g., Beacon Center) if I would also get higher quality transit service.	**9**		

Station #6: Evaluation of Alternatives

Comment/Question	Goal & Need
• Widen Route 1 and locate the transit in the center	Possible new goal

• Limit pedestrian crossing at grade (safety issues). Consider overhead crossways	Goal 2, Need: provide accessible pathways and pedestrian crossings
• Consider alternatives routes to Route 1 to alleviate traffic (for example Olde Mill Road or Telegraph Road through Ft. Belvoir as a Saturday facility)	Goal 2, Need: Decrease congestion
• Possible technology—buses or subway • Choose buses that are stable – strong against wind (if bus is the selected alternative)	Possible new goal
• Something for all: alternatives for traffic calming, lane width and plantings • Drivers should drive speed limit	Goal 2, Need: provide accessible pathways and pedestrian crossings
• Better management of thought traffic vs. local traffic • U-turn lanes at all lights to reduce cross streets • People making left turns cause backups	Goal 2, Need: Decrease congestion
• Bike paths will make streets too wide (take the bike route off of Rt. 1) • Add bike lanes • Bike access to Huntington metro needed, guide fixes to improve bike conditions along corridor (e.g., remove utility poles from sidewalks)	Goal 1, Need: Improve bicycle networks
• Go green – use photovoltaic/solar panels at station emphasize ECO whenever possible	Goal 4, Need: Reduce energy consumption and greenhouse gas emissions
• Regional analysis of no build-- Regional opportunity costs (economic and environmental) of no build	Goal 3, Possible new need
• Bi-directional connections to North Woodbridge	Goal 3, Need: Connections to regional activity centers
• Include underground utilities • Wi-Fi the entire corridor • Considerate calculation of risk management per capita. Is it worth the risk to leave private auto?	Possible new goals

4. Survey Findings

Thirty-six surveys were completed and submitted during the public meeting. Below is a summary of the survey findings.

Q1: What is your zipcode? 20002- Washington DC 20039- Washington DC 20052 (2)- Washington DC 20171- Herndon 22038 (2)- Fairfax 22079 (3)- Lorton 22303 (3)- Huntington 22304- Alexandria 22306 (2)- Groveton 22307 (2)- Belle Haven 22308 (3)- Ft. Hunt 22309 (11)- Mt. Vernon 22314- Alexandria NA (3)
Q2: How often do you use public transportation (bus, metro, etc.) on Route 1? A. Daily (4) B. Weekly (4) C. Monthly (5) D. I don't use public transportation (22)
Q3: If you do use public transportation on Route 1, what systems do you use? **A.** Metrorail (13) **B.** Metrobus (1) **C.** REX (1) **D.** Fairfax Connector (7) **E.** OmniRide/OmniLink F. Virginia Railway Express
Q4: What is the most important transportation need along Route 1? **A.** Provide better public transportation (13) **B.** Improve the walking environment (6) **C.** Improve car traffic flow (13) **D.** Other (10)
Q4 "Other" responses: • More affordable housing, more parks, more smart growth planning, more town centers • Need to connect public transportation of Prince William County with Springfield • Safe crosswalks • Safety • Slow traffic down • Improve rail

- Improve biking environment
- Keep cars and people from crossing in places other than intersections
- Reduce through traffic flow with better public transport - rail transit will get commuters through quickly
- Improve cycling environment, both North-South and East-West
- All of the above
- Widen Route 1 to 6 lanes for the entire length to respond to the needs of "A" and "C"
- Connections (Springfield, Lorton, I-95)
- Connect Huntington and Springfield Metro liens and add a spur to Fort Belvoir (multiple stops) and even add lop to Route 1 (multiple stops)

Q5: What improvements would make it more likely that you would choose to WALK to get around on Route 1? (Rank the three most important items, using #1 for the <u>most</u> important)

- More sidewalks (**<u>highest</u>** ranking overall)
- More destinations within walking distance (**second** highest ranking overall)
- More marked crosswalks across busy streets (**third** highest ranking overall)
- Slower vehicle traffic (**fourth** highest ranking overall)
- More shade or places to sit (**fifth** highest ranking overall)
- Better lighting (**sixth** highest ranking overall)
- Maps showing safe routes for walking to popular destinations (**seventh** highest ranking)

Q5 "Other" Responses:

- Traffic lights better synced
- Would like completed sidewalks along north side of Richmond Highway (Route 1)
- Distances along Route 1 are too great for walking!
- Added pedestrian overpasses and underpasses

Q6: What improvements would make it more likely that you would ride a BIKE to get around on Route 1? (Rank the three most important items, using #1 for the <u>most</u> important)

- Bike lanes on Route 1 (**<u>highest</u>** ranking overall- tied with on-street bike paths)
- On street bike paths separated from car traffic by parked cars or a curb (**<u>highest</u>** ranking overall- tied with bike lanes on Route 1)
- More destinations in my neighborhood (**second** highest ranking)
- Off-street paths (**third** highest ranking)
- Neighborhood streets that give bicycles and pedestrian priority by reducing vehicle traffic and speeds (**fourth** highest ranking)
- Slower vehicle traffic (**fifth** highest ranking)
- More marked crosswalks across busy streets (**sixth** highest ranking)
- Better lighting (**seventh** highest ranking)

Q6 "Other" Responses:

- I would never bike on Rt. 1 period.
- Eliminating gaps for bike connections
- None of these improvements would work. Bikes are already quite well served on neighborhood/residential streets. Bike should not be allowed to complicate the Route 1

problem.
- A linked bike trail for Route 1 form Woodbridge to the Beltway.

Q7: What most accurately reflects your vision for the future of Route 1?

A. It will be a street that I'd like to walk or jog along for exercise. (2)
B. It will be a green boulevard that accommodates several modes of transportation like bike lanes, bus lanes or even streetcar routes. (17)
C. It will be a corridor that I can drive from point A to point B in a timely manner. (14)

Q7 "Other" Responses:
- Metrorail Stations at ½ mile intervals.
- A series of communities (neighborhoods and commercial districts) linked and accessible by bike trails, sidewalks, walkways, and mass transit
- It will accommodate through North-South traffic as well as East-West traffic to neighborhood destinations along the way
- A destination I want to go to
- It will be an efficient corridor for expediting vehicular traffic relating to Route 1's interstate and Northern Virginia's function where smooth traffic flows augmented by rail more transit that does not reduce right of way.

Q8: What would you like to see happen as a result of the Route 1 multimodal transportation alternatives analysis?
- Lights better synced.
- 1. A median that prohibits left turns across traffic. 2. Dedicated public transportation lanes. 3. Overhead pedestrian crossings with no pedestrian crossings available at ground level.
- US Route 1 is a North/South federal highway. It's a piece of the US Highway system. [It] should be enhanced while still increasing retail, business offices, apartments (mixed-use development) with grids so that mixed-use developments encourage walkability and bicycle friendly commutes. This can be achieved if Fairfax County follows Prince William County's lead; clearly adding a path and redeveloping the same so that development is on one side and the road is on the other.
- Incremental steps begin to make corridor pedestrian and bike friendly for access to businesses and Metro (Huntington)
- Finish
- Develop Plan for "grand boulevard" with center for fast traffic and side roads for local traffic and mass transit (e.g. Light Rail), bike path, and sidewalks
- My vision is A & C (see Q7)
- Improved egress into Prince William County. Mass transit terminating in Prince William County or beyond. Improved commercial quality and better pedestrian ability
- Establish Metrorail between Huntington Station and Prince William County
- A smart growth, transit friendly neighborhood with more green infrastructure, more low and moderate income housing, more workable town centers, get current level of cars off the road.
- Try to project Metro to Kings Crossing or even Hybla Valley - Light or Monorail beyond; Project light or Metrorail south along Route 1 to Fairfax County Parkway then west to Kingman to serve the Army Museum and Fort Belvoir employees and others using Kingman entrances, then back to Route 1 to serve Lorton and Woodbridge; Identify how to secure a viable connection with Old Town Alexandria beyond Metro.

- Any plan to accommodate bicyclists as a legitimate transportation mode, not just for exercise. US 1 is a cyclist nightmare today. I'd love to be able to ride to a restaurant or other business on US 1 and leave my car at home.
- Transit with tracks to connect neighborhoods and commercial activity centers
- Focus on destinations along Route 1 (e.g. Community Business/Residential Centers)
- This study needs to recognize that the Route 1 corridor is a lot wider than the Richmond Highway footprint. Many people who travel Route 1 are commuters - this study should look at who they are, where they live, and where they are going (e.g. Fort Belvoir or DC). If you get these commuters off Route 1, you will lessen traffic congestion immensely
- Find a way (any way) to support denser, walkable neighborhoods and capture growth. I want to see a regional analysis of the no-build option that takes environmental and economic impacts in Prince William, Prince George, Alexandria, Loudon, etc… into account.
- Need to know what kind of development you want to encourage and where to plan transportation
- Expand connections, too much emphasis on "transit alternatives" rather than how to get people around
- More bike lanes, better walkability between modes, landscaping improvements, public transportation interconnecting Prince William County and Springfield
- Get rid of the buses for 2 months, see what happens. Get buses to travel along service roads. Dedicate lane "Buses and Trucks Only" - ticket others
- I'd like Route 1 to be easier to drive (i.e. less congestion) as well as be more capable of handling public transit
- Move quickly toward widening Route 1 to 6 lanes; Select a rail mass transit approach that does not reduce right of way capability for autos
- A better public transportation network that focuses on alternative modes of transportation. More emphasis on cycling and walking to get to destinations, less focus on automobile traffic
- Beautify the highway (cleaner intersections and streets, plants, grass mowed). Better lighting (street). Better flow of traffic.
- Select high capacity transit modes; Turn Route 1 into a boulevard for transit, bike, ped, etc…; Create mixed use, mixed income, walkable, bikeable transit oriented community, include parks and stream restoration
- Construct a complete street to accommodate all kinds of traffic
- I'd like to see the elimination of low density strip malls and frontage roads and be replaced by high density buildings that are connected to transit (thus eliminating the need to drive everywhere) to create more well-used spaces. Thus, I'd like to see more priority placed on public transit and biking/walking and less on driving.
- Light rail or other rail service, bike lane on-street
- Sidewalks on both sides of Route 1, crosswalks, better public transportation to include bus lanes, turnouts for bus stops, traffic lights which are timed better, safer for pedestrians
- Build transit demand by using BRT first; Use "moran" cross section north, especially to Buckman Road

Q9: Is there anything else that you would like for the project team to know as we move forward?

- In addition to the existing businesses and residences, there are millions of visitors to the INOVA Hospital, Fort Belvoir Community Hospital, the future Army Museum, Mount Vernon, and Woodlawn. These visitors would use rail transit to get to businesses and back to historical tourist sites. Need to address the millions of trips by tourists and/or hospital visitors!

- East/West Accessibility
- See Stewart Schwartz at Smart Growth. PLEASE include proper contaminant system for runoff to keep areas and river clean. Include development of Quander Creek Park
- There is an unspoken risk factor not being addressed to participants. Have had a bus accident, the company evaluated driver in compliance. My being hurt was slight risk factor, which should have been factored when I choose to ride. Spoke with Karen of [organization illegible]
- Reduction of industrial truck traffic.
- Fairfax County Comp. Plan has 176 ft Right of Way. Use all of it.
- US 1 needs more green space, more people-friendly parks (like dog parks), and more trees and native plants. Reduce current parking lots to reduce polluted runoff; do stream restoration.
- Traffic Count will differ once Mulligan Road connecting Route 1 and Telegraph Road is open; Do not permit bike traffic until a continuous bike trail is opened on Route 1; Identify the locations where you expect an East-West connection via residential traffic; in briefing, please repeat the questions of participants who face you but not the audience.
- SE Fairfax County has terrible options for cyclists crossing US 1 and moving East-West. Topography matters. Please consider how to integrate East-West cycle routes in the plan. Also, cycle routes are like any other road; they do no good if they simply stop like the US1/GWMP connector. Don't build "bridges to nowhere". Please also name a bicyclist/pedestrian liaison and post the name and contact on your website.
- Need to set back bus pull offs at bus stops, to avoid buses blocking blend of traffic; Connectivity to Springfield (west) and Mount Vernon/Sherwood Hall/Bellview (East); Traffic generators, tourism, Belvoir Hospital
- Be willing to look beyond the Richmond Highway footprint!
- Affordable housing plans and stormwater management plans must be included in study
- Walking will only happen within "town centers". Use buses or rail between them. Use multilevel parking to make more compact layout; Need much more specific alternatives to make choices; Need 10-15 year perspective for developments to occur
- Project needs to be expanded to whole corridor to connect Huntington to Springfield via a loop through Fort Belvoir, connection to Lorton, alternatives like Telegraph Road and Fort Hunt Road
- Places safe for children
- Bypass Route 1 buses only
- If studies were asphalt instead of paper, there would have been plenty of permits to widen Route 1 by now
- Whatever alternatives or conventional transportation recommendations are made, the existing infrastructure that already exists is doing damage to watersheds. Plan must include a fix to old infrastructure that impacts negatively on adjacent communities and the surrounding watersheds
- Do NOT extend project north into historic Alexandria.
- There seems to be a constant emphasis on selecting the cheapest options for public transit (i.e. Dulles Silver Line station, no tunnel through Tysons) rather than a holistic look at the

benefits the additional investment will have (both monetarily and aesthetically). While costs should be a concern, how transit will bring greater development and thus tax revenues and livability should also be highly important to any analysis.
- I think it is important to take into account the needs of the many pedestrians who utilize Route 1, making it a safer environment. It is important to secure enough funding to make the project a success, and that the project can be completed

5. Public Input through the Project Website

Following the public meeting, all of the meeting materials were posted on the project website under a page called "participate in public meeting #1." Announcements about this opportunity to participate on-line were made at the public meeting and through Facebook and Twitter. On the webpage, visitors can:

- Watch a video of the presentation and questions and answer period.
- View the display boards and provide comments/feedback for each board (similar to visiting the stations at the public meeting)
- Complete the survey
- View the PowerPoint document from the meeting

Results from the website survey and display board comments will also be compiled and summarized as the information becomes available.

Public Meeting #2
Summary of Input
March 26, 2014

DATE/TIME: March 26, 2014 – 6:00 p.m. to 8:00 p.m.

PLACE: South County Center, 8350 Richmond Highway, Alexandria, VA 22309

SUBJECT: Public Meeting #2

ATTENDEES: Approximately 145 attendees (see sign-in sheet and list of elected officials and staff below)

ESC Members

Officials:

Senator Adam Ebbin
Supervisor Gerald Hyland
Supervisor Jeff McKay
Delegate Mark Sickles
Delegate Scott Surovell

Officials' Staff:

Trent Armitage, Delegate Sickles' Office
Sam Bosch, Senator Ebbin's Office
Joan Clark, Supervisor McKay's Office
Taylor Holland, Supervisor McKay's Office
Megan Howard, Delegate Surovell's Office

Other members of ESC:

Tom Blaser, Prince William County
Allison Davis, WMATA (also on TAC)
Christopher Landgraf, Fort Belvoir (also on TAC)

Official not on ESC

Delegate Patrick Hope

PMT Members

Thomas Burke, Fairfax County
Amy Inman, DRPT
George Phillips, Prince William County
Tim Roseboom, DRPT
Bud Siegel, VDOT
Leonard Wolfenstein, Fairfax County

TAC Members

Hyojung Garland, Fairfax County
Edythe Kelleher, Southeast Fairfax Development Corporation
Jim Maslanka, City of Alexandria
Randy White, Fairfax County

Consultants

Lauryn Douglas, AECOM
Meredith Judy, Rhodeside & Harwell
Jennifer Koch, Rhodeside & Harwell
Barrett Lane, AECOM
Jason Mumford, AECOM
Bill Pugh, AECOM
Prasad Pulaguntla, AECOM
Dan Reed, Nelson\Nygaard
Deana Rhodeside, Rhodeside & Harwell
Jeff Roux, AECOM

i. Summary of Meeting and Findings

The second public meeting for the Route 1 Multimodal Alternatives Analysis took place on March 26, 2014, at the South County Center in Alexandria, VA. The meeting format was a presentation by members of the Consultant Team followed by a question and answer session. Before and after the presentation, meeting attendees were invited to learn more about the project findings to date by looking at a series of display boards and speaking with members of the team. Approximately 145 people attended the meeting.

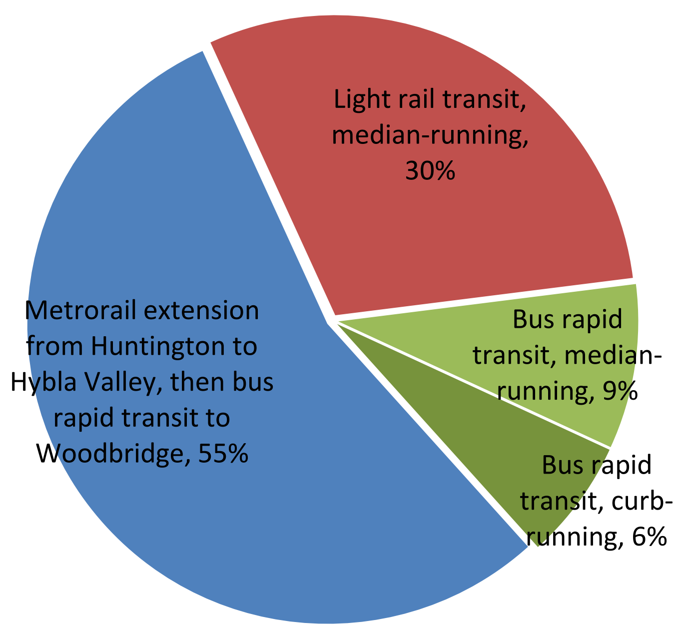
Public input at the meeting was taken in the form of comments made during the Q & A session, comments written near the display boards, a short survey, and a written activity that encouraged attendees to vote on measures for evaluating the multimodal alternatives. All material from the meeting (including the presentation, display boards, survey, and the evaluation measures activity) was posted on the project website until April 25, 2014 to allow members of the community to give their input even if they were unable to attend the meeting.

Though there were a variety of opinions from the public regarding the multimodal alternatives presented at the meeting, two preferences emerged from an analysis of the input:

a) Nearly 85% of survey respondents prefer a rail alternative, with more than half preferring a Metrorail extension. Many respondents emphasized that this was their preference because of the added economic and ridership benefits that come with a rail system versus a bus system. Many also expressed a preference that the rail be extended beyond Hybla Valley to Ft. Belvoir or Woodbridge.
b) Respondents recognized the need for long-term transit planning, but emphasized the need for shorter-term solutions, including street and sidewalk improvements, bicycle lanes, and mixed-use development.

The remainder of this document provides a more detailed description of the meeting proceedings and the public input received.

Which high quality transit alternative do you prefer? (N=123)



1. **Presentation**

   Amy Inman, DRPT Project Director, opened the meeting by welcoming attendees and introducing the elected officials, staff, and consultants. Delegate Scott Surovell (D-Fairfax), Delegate Patrick Hope (D-Arlington), Supervisor Jeff McKay, and Supervisor Hyland took a few minutes to describe their roles in the project and their support for multimodal transportation improvements on the Route 1 corridor. Tim Roseboom (DRPT Project Manager) then provided an overview of the Route 1 Multimodal Alternatives Analysis project. Jason Mumford (AECOM project manager) and Meredith Judy (Rhodeside & Harwell) presented the project background, outreach findings, goals and objectives, technical analyses, refined alternatives, land use analysis, and project funding strategy examples from other communities in the region.

2. **Question and Answer Period**

   A twenty minute question and answer period followed the presentation. Comments and questions during the Q&A period are listed below.

- I have lived in the area for 25 years and I always use public transportation. We should not build more houses. To make the area better we need fewer houses.
  - Answer: Thank you for your comment.

- The lease will not be renewed at Woodlawn Stables. Does this study take into account all the new development that will go in that location? Also, the new Mulligan Road connection will bring a lot of new traffic to the area. We need to keep that in mind.
  - Answer: The Woodlawn Stables site falls into a historic district, which will require an easement and thereby lessen the intensity of development. Fort Belvoir has also been actively engaged with this study, helping the project team understand the current construction and project schedule occurring near the site. The project team is continuing to coordinate closely.

- Nothing has been improved on the Route 1 corridor for the past forty-three years. The kind of economic development that we really need requires a first rate transit system. Metrorail is a “boomtown” for all locations it serves. We need to take into account all the visitors to the area from the south, and commuters, including Fort Belvoir workers and residents. It does not make sense to consider bus as one of the alternatives. We need Metrorail. Don’t show all the development that could occur on the corridor only at Beacon Hill.
  - Answer: The study team is also looking at all modes (not just improved bus service), including Bus Rapid Transit, Light Rail Transit, and Metrorail, as well as a combination of Metrorail and Bus Rapid Transit, and assessing the development potential of each.

    The Beacon Hill images in the presentation are an example only. The study includes an analysis of land use and development for all the proposed station locations.

- Remember all the tourists that travel to this area.
    - Answer: The team is taking all travel types into account in the study, including visitors and tourists.

- What is the time frame for implementation on this project? We are already experiencing extremely heavy traffic on Route 1 and many transportation problems. Will it take five years? More?
    - Answer: This study's work will help local governments make the decisions necessary to advance the project. The next steps are the environmental evaluation phase and preliminary engineering design. The New Starts funding process is rigorous and competitive and takes quite a few years.

- Are there any short-term solutions? We are having problems on the corridor every day at 5:00 p.m.
    - Answer: The study is looking at roadway, transit, and pedestrian/bicycle improvements. The focus of this particular study is on long-term improvements, but shorter-term solutions are also being explored. In addition, the Counties have other ongoing projects in the works to address shorter-term transportation improvements.

- How many Metrorail stops are being considered?
    - Answer: The "refined Metrorail alternative" has two new stops in a Yellow Line extension (at Beacon Hill and Hybla Valley). In this refined alternative, BRT continues after Hybla Valley for the rest of the corridor.

- A shared use path is a bad idea if there is any significant pedestrian traffic. I see that the County is already beginning to implement a shared use path on portions of the corridor. This project (transportation improvements on Route 1) should begin with pedestrian and bicycle infrastructure investments. These are much less expensive than implementing a new transit system.
    - Answer: Fairfax County has been working for many years on improving pedestrian and bicycle conditions on Route 1. These low cost solutions include sidewalk and crosswalk improvements, among others. There are also several other plans that are currently underway and are scheduled to become fully realized by the end of this year.

- Is the study looking in the short-term to provide bus pull-offs on the roadways?
    - Answer: The study is looking at curb- and median-running transit options. The study is not looking at providing bus pull-offs for current bus services.

- The problem with bus pull-offs is that it can be difficult for the buses to pull back into traffic. This slows down the service for hundreds of people who are riding the buses. If we provide bus

pull-offs, we need to be more aggressive with signal priority and other methods for improving bus service times.
  - Answer: Thank you for your comment.

- Is there a way to provide input for the evaluation factors other than on the handout tonight?
  - Answer: Yes, all the materials, including the evaluation factors handout/survey can be accessed on the project website (http://route1multimodalaa.com/). We encourage you to visit the website and to share the links with your neighbors, friends, and colleagues.

- Is the roadway alternative already decided?
  - Answer: The vehicular alternative of consistent lanes throughout the corridor is the recommendation. The transit alternatives being studied for further consideration will assume the preferred vehicular alternative.

- In Arlington, there are currently two streetcar projects underway: Columbia Pike and Crystal City. This is already increasing property values in those areas. I would hope that you are pursuing all potential funding sources for this Route 1 project, including contributions from property owners who are benefitting from the increases in property values.
  - Answer: Yes, we are looking at a wide range of funding options and strategies.

- Why can't we put something on the ballot that would allocate money to this project?
  - Answer: Local contributions (County funds) are a critical component of a funding strategy, and that local financial commitment must be demonstrated when applying for federal funding.

- The vehicular cross sections in the presentation show six lanes of traffic, but if there are dedicated transit lanes then there will actually be more lanes. That makes it even more difficult for pedestrians to cross the street. The advantage of Metrorail is that it is underground, so does not require additional lanes on the roadway.
  - Answer: That is correct. The dedicated transit lanes would be in addition to the six lane cross section for car travel.

- In the interim (before this project is implemented), will anything be done about the thousands of cars going into and out of Fort Belvoir? Anything other than the Mulligan Road connection? I can't leave my house after 3:00 p.m.
  - Answer: Fort Belvoir is kicking off a Route 1 roadway widening project between Mount Vernon Memorial Highway and Telegraph Road. The project will begin in June and is expected to be completed in March/April 2016. This is a three-and-a-half mile road widening that will include enough right-of-way for future dedicated transit facilities. The Mulligan Road connection is scheduled for completion in June 2014.

- More roads mean more traffic. We don't need more traffic, we need transit. This area has been neglected. None of the earlier studies were adequate.
    - Answer: Thank you for your comment.

- How does a pedestrian cross a transit median? Pedestrian accessibility is very important.
    - Answer: The transit median will be designed so that it is easy for a pedestrian to cross at the intersection. The land uses will be more conducive to walking and the crosswalks would also be designed to facilitate pedestrian activity. The study team is aware how critical walkability will be in the future design for transit and land use.

- Will the travel flow improve with any of these alternatives? It needs to be easy for people to take transit or walk/bike. The transfers must be smooth and easy in order for people to select these other modes.
    - Answer: The transit ridership modeling takes into account the ease of transfers. We will explore this further.

- There is lots of traffic between the Route 1 study area and the Tysons Corner area. Does this study look at improving transportation connections between these two areas?
    - Answer: This study does not include an evaluation of connections between Route 1 and the Tysons Corner area. However, the Fairfax Countywide Transit Network Study is looking at this and other transit connections throughout Fairfax.

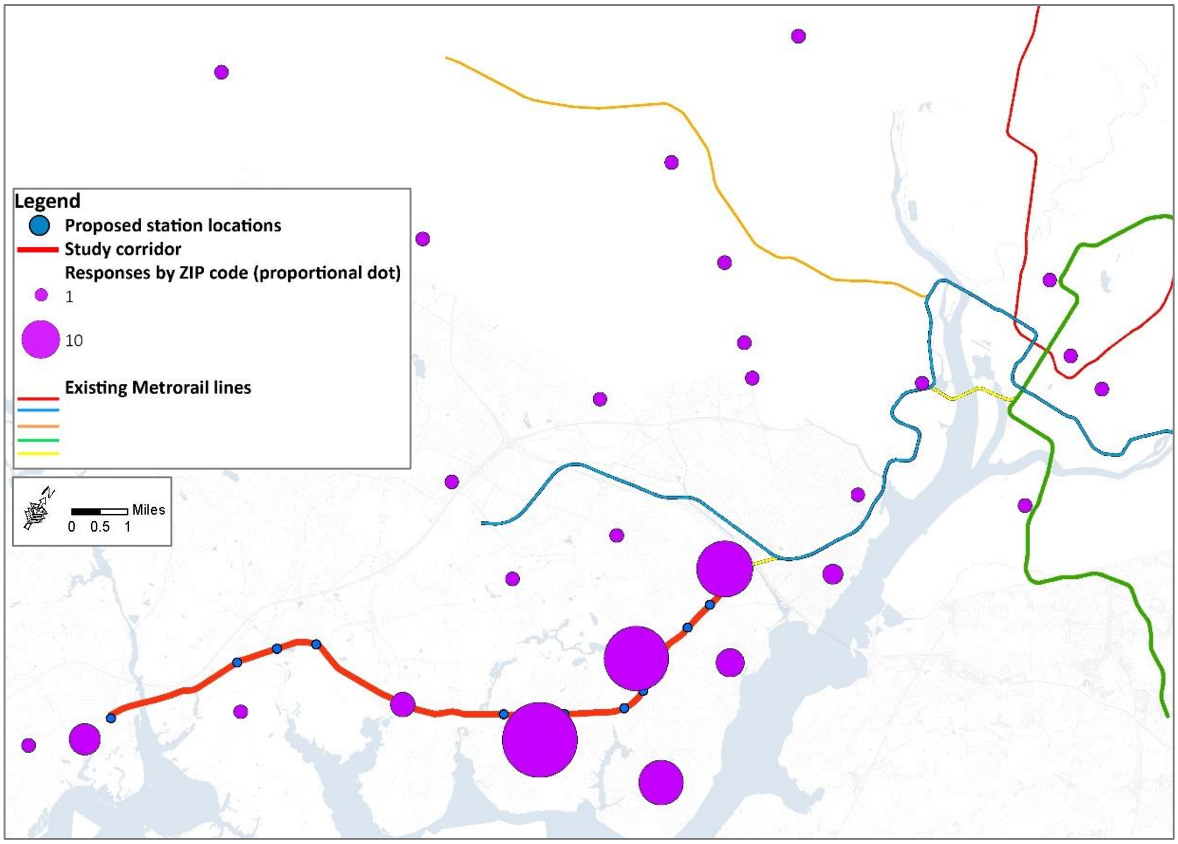
- There is a major bottleneck on Route 1 at the Route 1/I-95 split near Fort Belvoir. The solution here requires involvement of the railroad. Is this study looking at that issue?
    - Answer: This study is not specifically addressing this issue, however VDOT has a project underway that does address this bottleneck. Bud Siegel from VDOT is in attendance tonight and is available to speak about this project after the presentation.

- Would there be park and ride available at the stations if the Metrorail is extended to Hybla Valley? Otherwise people might begin parking in the adjacent neighborhoods.
    - Answer: The project team has currently identified parking garages at two potential stations along the corridor: Woodbridge VRE and Lorton Station Blvd. As the alternatives are evaluated in more detail, the project team will look at the parking needs.

- The type of development shown in the presentation tonight doesn't just happen by itself. The residents and other property owners need to get involved and encourage mixed use and enhanced development options that will serve the needs of residents and others. I encourage you to get involved in the Mount Vernon Council, which is meeting right after this presentation. The land use and transportation link is very important.
    - Answer: Thank you for your comments.

3. **Survey results** (Including those completed at the meeting, online submissions, and email submissions)

Question 1: What is your zip code? (N=123)

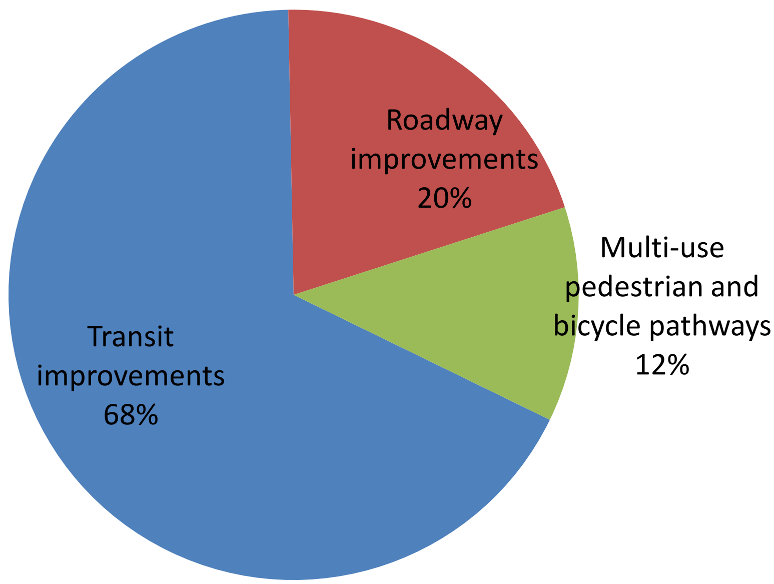


Sources: Fairfax County; Prince William County; Prince Georges County; City of Alexandria

Place	ZIP	Number of responses
Mt. Vernon	22309	30
Groveton/Hybla Valley	22306	22
Ft. Hunt/Belle Haven	22308, 22307	18
Huntington	22303	17
Woodbridge	22191, 22193	7
Alexandria	22314, 22301, 22305	5
Arlington	22203,22204, 22206, 22201	4
Washington, DC	20002, 20009, 20018, 20019	4
Franconia/Rose Hill	22315, 22310	3
Ft. Belvoir	22060	3
Fairfax	22030	2
McLean	22036, 22101	2
Other – 1 each (Falls Church, Lincolnia, Lorton, Springfield, Sterling*, Vienna)	22046, 22312, 22079, 22150, 20165, 22182	6

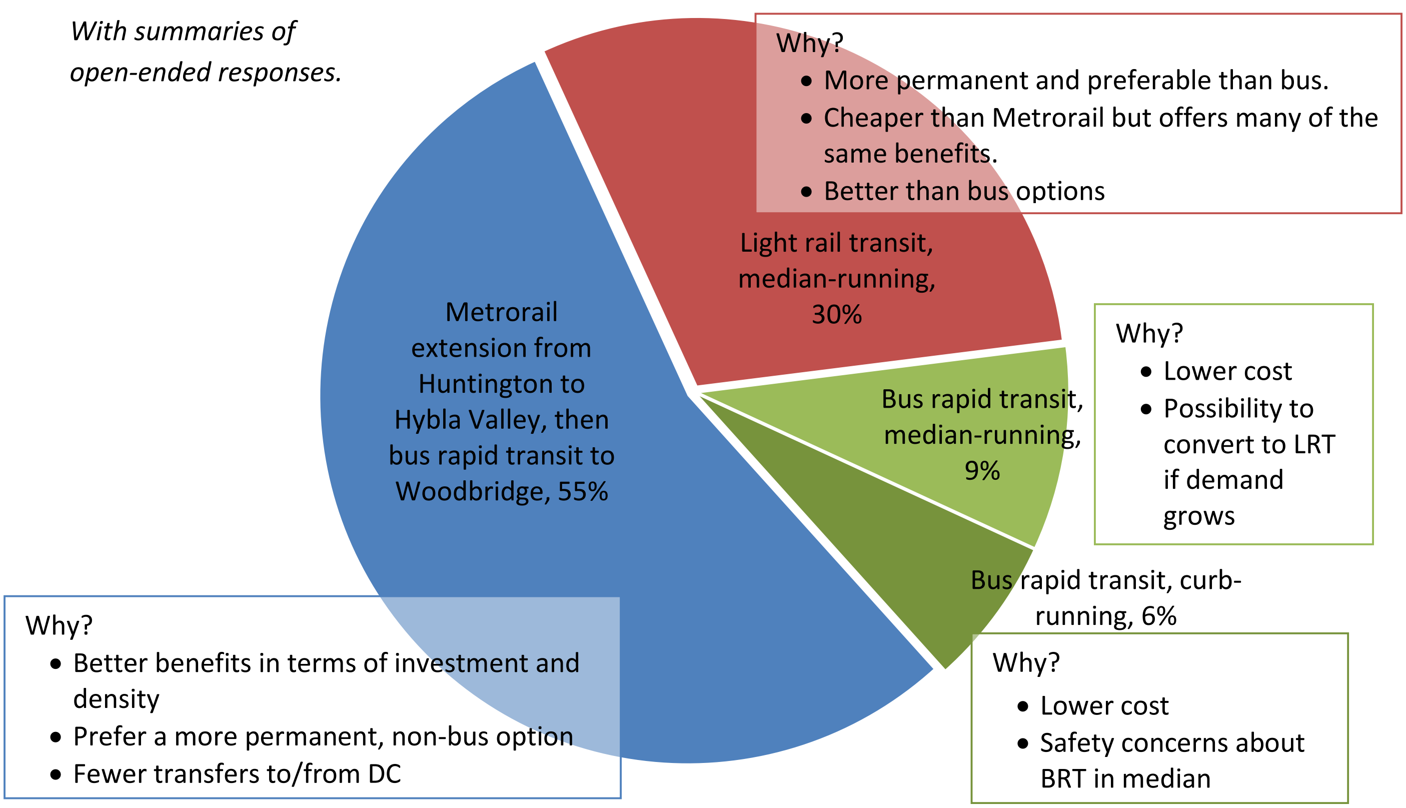
**not shown on map*

Question 2: All of the alternatives include pedestrian, bicycle, car, and transit improvements. Which of these should have the highest priority for implementation? (Choose one.) (N=123)

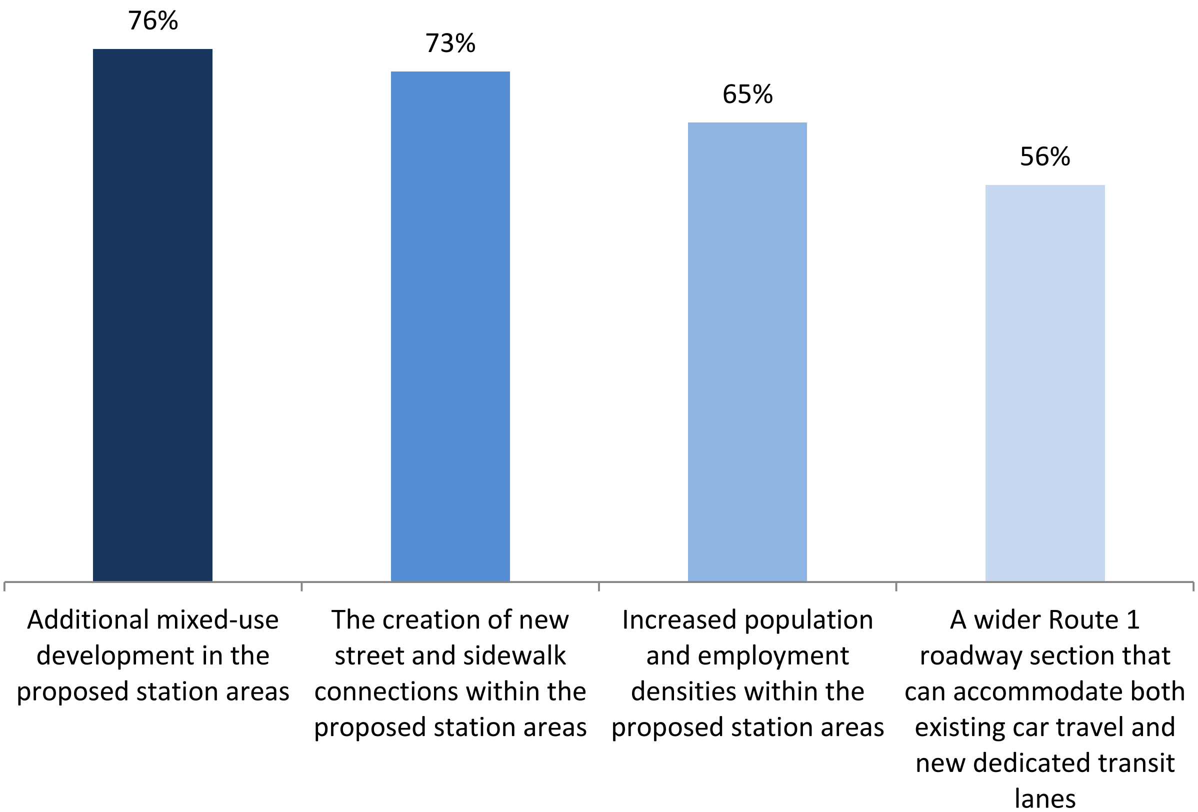


Question 3: Which high quality transit alternative do you prefer and why? (Choose one.) (N=124)

With summaries of open-ended responses.



Question 4: The introduction of high quality transit on Route 1 will require changes along this corridor. Please choose those changes that you feel would be worthwhile in order to bring better transit to Route 1. (Choose all that apply.) (N=124)



Question 5: Do you have any additional questions or suggestions based on the information presented at the meeting?

# responses	*Coded responses*
13	Yes to fixed rail
12	Improve bicycle/pedestrian infrastructure. (Including connections to bus or rail stations. For mixed-use path, need to address safety issues.)
8	No to BRT. (Bus is slower; fewer people ride the bus; BRT can be easily watered down in its implementation, leading to an only slightly improved level of service.)
6	Extend Metro further. (In order of frequency: to Woodbridge, Ft. Belvoir, Woodlawn.)
6	Need action in the short-term
6	Need rail to bring other investment
5	Do not widen the road
4	Prioritize densification and growth/evolution of businesses community
4	Need to address congestion
3	Willing to pay for fixed rail
3	Take into account who (with regards to income level) will ride the different types of transit and what that means for long-term development

4. **Evaluation Measures** (Including online exercise responses, paper responses from the meeting, and "dot" votes from the meeting display board)

For two sets of evaluation measures, participants were asked to indicate the measure that is most important to them within each goal or set of criteria.

Evaluation Measures 1: Project Goals and Objectives			
Goal	**Objective**	**Multimodal Measure**	**Votes**
GOAL 1: Expand attractive multimodal travel options to improve local and regional mobility	Improve transit to reduce travel times	Transit travel time, automobile travel time	17
	Integrate with other transit service	Connections to existing and planned transit	15
	Increase transit ridership	Transit ridership	9
	Increase transportation system productivity	Total person throughput	8
	Improve bicycle and pedestrian networks	Continuous sidewalk and bike pathway	6
GOAL 2: Improve safety; increase accessibility	Improve pedestrian crossings	Average pedestrian delay to cross, adequate pedestrian refuges	15
	Provide accessible pathways	Walkability Index and Bicycle Level of Service	11
	Maintain traffic operations	Traffic Level of Service	9
	Reduce modal conflicts	Separate facilities for separate modes	7
GOAL 3: Increase economic viability and vitality of the corridor	Support higher activity levels	Accommodate 2035 density (growth scenarios)	23
	High-capacity transit facilities at appropriate locations	Serves low-income residents, value added to adjacent properties	13
	Investments are financially feasible to construct and operate	Project costs, cost effectiveness, allows incremental implementation	7
GOAL 4: Support community health and minimize impacts on community resources	Contribute to improvements in regional air quality	Change in vehicle miles traveled	20
	Increase opportunities for bicycling and walking	Continuous sidewalk and bike pathway	12
	Minimize negative impacts to the natural environment	Right of way impacts on environmental and historic resources	8

Evaluation Measures 2: FTA New Starts/Small Starts			
	Criterion	**Transit Measure**	**Votes**
Project Justification	Congestion Relief	Project sponsors will receive a medium rating until further guidance is released	12
	Mobility Improvements	Total project boardings; transit-dependent ridership is weighted 2x	8
	Economic Development	Transit supportive plans and policies; plans to preserve affordable housing	7
	Land Use	Quantitative analysis of station area development; proportion of legally binding affordability	5
	Environmental Benefits	Environmental benefits are monetized and compared to the annualized costs	2
	Cost Effectiveness	Annualized cost per annual linked trip on the project	1
Financial Commitment	Commitment of Funds	Capital and Operating	16
	Reasonableness of Assumptions and Financial Capacity	Capital and Operating	6
	Current Financial Condition	Capital and Operating	2

5. **Display Board Area Notes** (Including comments recorded at the meeting and comments collected on the project website)

- Land Use
  - Depth of lots on Route 1 limits development potential
  - Keep diversity in the area. Keep low-cost workforce housing
- Pedestrian and bicycle infrastructure
  - Pedestrian and (especially) bike connections are lousy. (So are car connections, which causes congestion on the arterials.) Nearby stuff is a long way around.
  - Please keep building pedestrian infrastructure
  - Eliminate left turns for pedestrian safety and to reduce congestion
  - Bicycle and pedestrian improvements are the most important to reduce auto traffic
- Vehicle infrastructure
  - Use a local/through lane concept: Two through lanes in the middle with a median and local/slow lanes on the right – “grand boulevard” concept
  - 45 mph road design is incompatible with the planned, walkable land use and may cause greater traffic congestion
  - Kings Crossing and Walmart/Costco: Bad traffic intersections. Sometimes bus stopping at Kings Crossing blocks traffic. Use barriers to prevent illegal left turns.
- Transit
  - Like the LRT best, or Metro/BRT with inside lanes
  - Place “Park & Rides” at new transit stations
  - Smaller and more frequent buses
  - How to get Belvoir worker there quickest via transit?
  - We do not want BRT as the long-term goal. It is a great intermediate step, but without fixed rail, landowners will not invest to meet 2035 plan and we will not be able to achieve the benefits being promised.
  - Extension
    - Needs another option, extending Metrorail to either Fort Belvoir or to the Lorton VRE station. Stopping Metrorail at Hybla Valley is too shortsighted, especially when there's a major anchor at Ft. Belvoir.
    - Fails to take into account Metrorail all the way to Woodbridge via underground and above ground. Please add these slides.

Public Meeting #3
Summary Report
October 8th & 9th, 2014

Summary of Meetings and Findings

The third public meeting for the Route 1 Multimodal Alternatives Analysis took place in two parts on October 8, 2014 at Belmont Elementary School in Prince William County, VA, and October 9, 2014 at The South County Center in Alexandria, VA. The format of both meetings was a presentation by members of the client and consultant team followed by a question and answer session. Before and after the presentation, meeting attendees were invited to learn more about the project findings to date by looking at a series of display boards and speaking with members of the team. Approximately 152 people attended the two meetings.

Public input at the meetings was taken in the form of comments made during the Q & A session, comments written near the display boards, and a short survey. All materials from the meetings (including the presentation, display boards, and survey) were posted on the project website until November 9, 2014 to allow members of the community to give their input even if they were unable to attend the meetings.

The remainder of this document provides a more detailed description of the meeting proceedings and the public input received at both meetings.

DATE/TIME: October 8, 2014 – 6:00 p.m. to 8:00 p.m.
PLACE: Belmont Elementary School, 751 Norwood Lane, Woodbridge
SUBJECT: Public Meeting #3
ATTENDEES: Approximately 49 attendees, including 25 members of the general public. See sign-in sheet and list of elected officials and staff below.

ESC Members
Officials: (3)
Senator Toddy Puller
Delegate Michael Futrell
Supervisor Principi

Officials' Staff: (5)
Colin Davenport, Congressman Gerry Connolly's Office
Carrie Ann Alford, Senator Puller's Office
Philip Castle Newell, Delegate Torian's Office
Michael Tudor, Supervisor Principi's Office
Patrick Durany, Supervisor Jenkins' Office

Other members of ESC: (1)
Rick Canizales, Prince William County

PMT Members (5)
Amy Inman, DRPT
Tim Roseboom, DRPT
Thomas Burke, Fairfax County DOT
George Phillips, Prince William County
Bud Siegel, VDOT NoVa

TAC Members & Other Agency Staff (2)
Richard Burke, VDOT
Randy White, Fairfax County

Consultants (8)
Lauryn Douglas, AECOM
Jason Mumford, AECOM
Ben Chambers, AECOM
Jeff Roux, AECOM
Jeff Schlossberg, RHI
Deana Rhodeside, RHI
Meredith Judy, RHI
Karina Ricks, Nelson\Nygaard

1. **Presentation**
Amy Inman, DRPT Project Director, opened the meeting by welcoming attendees and introducing the elected officials, staff, and consultants. Jason Mumford (AECOM) presented an overview of the study purpose, process, and status. Mr. Mumford also described the evaluation of alternatives, findings, key considerations for implementation, and next steps.

Senator Puller, Supervisor Principi, and Delegate Futrell took a few minutes to describe their roles in the project, and their interest in promoting multimodal transportation improvements on the Route 1 corridor.

2. **Question and Answer Period**
A thirty minute question and answer period followed the presentation and elected officials' statements. A summary of the discussion is provided below.
   - **a.** VDOT has plans to widen Route 1 in Woodbridge in the near future. How does this dovetail with any plans to widen Route 1 in Fairfax County?
     - Answer: The Fairfax Comprehensive Plan shows widening of Route 1 in Fairfax County between the river and Fort Belvoir. This project is not currently funded; however it is seen as a high priority by Supervisor Hyland.
   - **b.** I am frustrated that the alternatives are discrete. Would like to see early investment in right-of-way acquisition for the full corridor, rather than acquiring it over time (potentially after development has already occurred). Also, agree with the "blueway" transportation concept.
     - Answer: Thank you for your comment.
   - **c.** What is being done to increase transit ridership rather than just investing in highways?
     - Answer: The intent of this study is to increase travel opportunities beyond the automobile. Right now the corridor is designed to promote automobile travel. As the counties invest in sidewalk infrastructure and walkable development patterns, the percentage of non-auto based travel trips will increase. The intent is to change land use patterns in order to increase transit ridership and walk trips.
     - Answer: As transit reliability and frequency increases, this will increase transit ridership on the corridor. The current REX service is very competitive. It has good frequencies and travel times. The recommendations in this study would further advance high quality transit service on the Route 1 corridor.
   - **d.** I understand that PRTC is overcrowded and needs expansion. What is being done to address this problem?
     - Answer: The funding to improve PRTC service needs to come from the localities. The Commonwealth offers some capital and operating cost assistance programs; however, the localities need to take the lead on making these types of improvements. The Route 1 Multimodal study has considered ridership and service on PRTC and Metrobus routes. The intent is to provide a high quality transit option on Route 1 that is designed to complement and leverage existing services.

e. Rail seems like the best option for the corridor, but an opening year of 2040 is too far away.
  - Answer: In order to implement a long-range plan for a Metrorail extension, the planning, design, and funding work will need to begin immediately. Based on current FTA criteria, the project will not likely be competitive for federal funding before 2035.

f. Is the Prince William County ride share program included in this study (carpool, vanpool, and slug lines)?
  - Answer: Yes, all of these commuter travel methods are included in the regional forecast used for the ridership and traffic projections. The I-395/I-95 HOT lanes are also included in the forecast.
  - Answer: Park and Ride accommodations have been included in the Route 1 Multimodal Study. Park and Rides are shown at Woodbridge (with a pedestrian overpass over Route 1) and Lorton.

g. How do the activity density scenarios compare with the Comprehensive Plan? Please explain the land use scenario diagrams.
  - Answer: The activity level charts show the population and employment levels (activity density levels) within a half mile around each proposed station. The colored bars represent: 2010 activity density, 2035 projections (regardless of whether this project occurs), allowable densities under the Comprehensive Plans, and the two new land use scenarios created as part of this project (called Scenarios 2 and 3). Scenario 2 refers to the increase in development that we could reasonably expect due to the investment in high quality transit (approximately 15-25%, depending on the station location). Scenario 3 refers to the amount of development generally needed to support Metrorail (Huntington to Hybla Valley) or BRT/LRT (Gum Springs to Woodbridge). These analyses can assist the counties in determining how much additional development should be allowed in the station areas in order to support high-quality transit service. The counties also recognize the need to provide other types of infrastructure to support new development (schools, streets, parks, public safety, water/utilities, and other public services).

h. Transportation is a means to an end. High quality public transportation is a method for promoting economic development in the area. If we get more economic development, we will see investments in the schools and infrastructure. It is expensive to run the Metrorail line to Woodbridge, but it means economic development, and will allow us to expand PRTC lines and other public services. If we want to make money, we need to spend money.
  - Answer: Thank you for your comment.

i. Is the Blue Line Metrorail extension to Woodbridge part of this study?
  - Answer: The blue line extension is not a part of this study; however, the study will note that the blue line extension is the best Metrorail commuter line option for Prince William County. It will provide better commuter service at a lower construction cost compared with a Yellow Line extension to Woodbridge. However, it is up to the localities to advance any studies required to move the Blue Line project forward.

j. PRTC has an upcoming funding shortfall. I am concerned about ADA compliance on future transit service, and in access to future transit stations (for example the pedestrian overpass over Route 1 at Woodbridge).
   - Answer: All buses and stations will be ADA compliant. This will be noted in the final report.

k. Prince William County is being left out of this study. If planning changes in Prince William County, will the recommendations from this study change? Supervisor Principi is doing a lot to improve economic development conditions in Woodbridge. Are these efforts reflected in the study?
   - Answer: Efforts to improve economic development in the study area will assist in an FTA funding application. It will be important to document the policies and efforts that promote transit-oriented development when applying for funding. The counties should take care to adopt the policies today that will make the transit project more competitive in the federal process in the future. If the transit projects are not competitive for federal funding, there will need to be other sources to fund the projects.

l. If Fairfax does not do their part, what happens to the Prince William County section?
   - Answer: The counties need to work together, and every indication is that they will continue to do so. This study is identifying needs and the counties will work together to advance the projects.

3. **Display Board Area Notes** (Including comments recorded at the meeting and comments collected on the project website)
   - <u>Project Schedule, Purpose, and Need</u>
     - Need for further study of Route 1 multimodal through PWC as was the original intent of the directing and enabling legislation. Make this recommendation as a priority of one of the following actions of the output action plan.
   - <u>Evaluation of Transit Alternatives</u>
     - Full Metrorail extension to Woodbridge.
     - When considering the alternatives, another perspective to consider them as phases which can support improvements in sequence as economics and demographics improvements/growth can progress through the alternatives in stages. – When looking at right-of-way width go with width for Metrorail along with early/temporary light rail and BRT so that Metrorail can/could come to PWC.
   - <u>Visualizing Future Station Areas</u>
     - What about using the park-and-ride at 1-95?
     - Would like longer extension of Metrorail. If you build it (Metrorail) in right spot, they will come.
     - Would rather see LRT than BRT.
     - Ecological impact – BRT vs. LRT. What is energy source for these buses? Think about long-term impact and cost.

  - Glad to see pedestrian improvement plans. Making Route 1 a destination.
  - The Disability Board meets the 1st week of December. Make sure there is handicap parking near the station.
  - Parking with Northern PWC/Woodbridge should be focused toward the East side of Route 1, associated with the existing VRE station and its parking area which can handle expansion in the vertical direction.

- Infrastructure and Traffic Assessment
  - Think Big (Metro)
  - Right size for future
  - Why was ferry transit not included?
    - Especially the Ft. Belvoir to National Harbor area – rush hour.
  - Resolve the scheduling mismatch for the widening of Route 1 Occoquan River Bridge to move the widening earlier/to the left in the schedule.
  - Grow the study to include more multimodal – Rail! And water service: Rail to include VRE expansion! In parallel with Metrorail extension into PWC with the ROW capacity to be included for BRT, LRT & Metro ROW capacity!
- Recommendations & Action Plan
  - Need earlier widening of Occoquan River Bridge. Concerned about planned widening at Route 123 without bridge widening. (Especially given new development proposal off of Annapolis way).
  - Need to include plans THRU Woodbridge to Stafford County
    - Include this in study action plan
  - In calculating the long term cost of new roads, have you considered all the land and buildings taken out of the tax base?
  - Phase 4 should come earlier than 2040.

DATE/TIME: October 9, 2014 – 6:00 p.m. to 8:00 p.m.
PLACE: South County Center 8350 Richmond Highway, Alexandria, VA
SUBJECT: Public Meeting #3
ATTENDEES: Approximately 103 attendees, including 75 members of the general public. See sign-in sheet and list of elected officials and staff below.

ESC Members
Officials: (4)
Senator Toddy Puller
Delegate Mark Sickles
Delegate Scott Surovell
Supervisor Jeff McKay
Officials' Staff: (2)
Carrie Ann Alford, Senator Puller's Office
Brett Kenney, Supervisor Hyland's Office
Other members of ESC: (2)
Chris Landgraf, Fort Belvoir
Allison Davis, WMATA

PMT Members (5)
Amy Inman, DRPT
Tim Roseboom, DRPT
Leonard Wolfenstein, Fairfax County DOT
Thomas Burke, Fairfax County DOT
Bud Siegel, VDOT NoVa

TAC Members & Other Agency Staff (10)
Edythe Kelleher, Southeast Fairfax Development Corporation
Hyojung Garland, Fairfax County OCR
Marianne Gardner, Fairfax County DPZ
Kristen Hushour, Fairfax County DPZ
Suzanne Matyas, Southeast Fairfax Development Corporation
James Migliaccio, Fairfax County Planning Commission
Anna Fortune, VDOT
Terry Yates, VDOT
Cindy Engelhart, VDOT
Adam Behrens, DOT

Consultants (6)
Lauryn Douglas, AECOM
Jason Mumford, AECOM
Barrett Lane, AECOM
Meredith Judy, RHI
Jeff Schlossberg, RHI
Jenny Koch, RHI

1. **Presentation**

Tim Roseboom, DRPT Project Manager, opened the meeting by welcoming attendees. Amy Inman, DRPT Project Director, introduced the elected officials, staff, and consultants.

Senator Puller, Delegate Surovell, Delegate Sickles, and Fairfax Supervisor McKay took a few minutes to describe their roles in the project, and their interest in promoting multimodal transportation improvements on the Route 1 corridor.

Jason Mumford (AECOM) presented an overview of the study purpose, process, and status. Mr. Mumford and Meredith Judy (Rhodeside & Harwell) described the evaluation of alternatives, findings, key considerations for implementation, and next steps.

2. **Question and Answer Period**

A thirty minute question and answer period followed the presentation and elected officials' statements. A summary of the discussion is provided below.

- **a.** How would the plan address local access to the transit on Route 1?
  - o Answer: Local bus service will be adjusted and improved to feed into the main transit improvements along Route 1.
- **b.** If the Metro is to be extended from Huntington how would it be extended? What specific route would it take?
  - o Answer: The route would take North Kings Highway down to Route 1.
- **c.** What would happen to the adjacent buildings along North Kings Highway?
  - o Answer: The right-of-way acquisition to widen the road and allow for dedicated transit lanes would not impact anyone's homes. The Metro extension would be built underground and similarly not impact adjacent buildings.
  - o Answer: These recommendations are conceptual and more engineering studies will be conducted later in the process which would look at specific right-of-way acquisition.
- **d.** We should be thinking overpasses and underpasses to help move traffic through congested intersections.
  - o Answer: Thank you for your comment.
- **e.** Monorail should be considered as a transit option. Las Vegas is a good example of a functioning monorail system.
  - o Answer: Thank you for your comment.
- **f.** Arlington is a good example of what this plan is trying to achieve along Route 1. What was the economic impact of the growth along Wilson Boulevard for Arlington?
  - o Answer: We have studied Arlington, and it is a corridor that has been studied in many reports. Investment in high-quality transit and planning for the surrounding areas focused on street networks and appropriate levels of density. This planning has attracted investment and growth.
- **g.** This growth creates a flood of property taxes, without any increment in tax rates.

    - Answer: That is correct. Changes in future tax revenues are dependent on future planning in the coming years. The numbers on future tax revenue are highly dependent on changes in the comprehensive plan and the level of density allowed.

h. Are you planning on putting in infrastructure for electric buses in the dedicated transit lanes?
    - Answer: We haven't studied the specific vehicles to be used in the transit lanes. That is something for Fairfax County to consider as they advance the project.

i. What are our biggest project competitors in Fairfax County that could compete for funding on a local level? Also, how supportive are our Governor and State legislators for funding the next steps of this project?
    - Answer: The state is funding this study right now. The state is very supportive of funding transit improvements in the Commonwealth, as is the governor. Fairfax has many competing transit needs. The six year transportation priorities plan was approved in January. There is some money to move this project forward within that priorities plan, like funding the environmental study. After six years the county would be free to allocate money for construction.
    - Answer: DRPT transit funding can offer significant assistance, and NVTA is another major funding source. We need to look at all levels of government for sources of funding.

j. Comment: Thank you for your work on the plan. It's a great plan. I'm a little disappointed in the length of the implementation timeline. What can we do as citizens to speed up the timeline?
    - Answer: We looked at the timeline carefully and consider it aggressive given the constraints of the implementation system.

k. We should have a plan in place to immediately move forward when the funding becomes available.
    - Answer: The phases are in place, so it does really come down to funding. There is some required time associated with the environmental work and land acquisition that even funding can't speed up. There is also time associated with pursuing federal funding. We need to keep the project moving along so that when funding does become available we can immediately proceed. The next step is project advancement by Fairfax and Prince William Counties, based on the recommendations from this study.

l. Comment: The planning for phase III does not begin for a number of years. Some planning should be started immediately to ensure that new development in the phase III area does not interrupt what is called for in phase III.
    - Answer: We will take that into consideration. The Comprehensive Plan needs to be updated to allow for the redevelopment called for in the plan.

m. How do the alternative transit options accommodate disabled individuals?
    - Answer: The designs of the stations will be ADA compatible. Those specific designs come at a later stage.

n. What role does affordable housing have in this plan?

  - Affordable housing will be part of the implementation plan.

o. If funding is not secured for phase III, does that impact the planning or implementation of phase IV?
  - Answer: without funding, it will be difficult to advance any phases of the project.

p. Has the project team visited other cities to observe best practices? Are there places in the D.C. area we can go to see what we are trying to achieve already implemented?
  - Answer: Transit implementation on corridors similar to Route 1 is a challenge faced by many communities across the country. Rockville Pike in Maryland is grappling with similar issues of how to deal with an important arterial highway that wants to become a corridor with walkable development. The Arlington example is also frequently cited. We have some leading examples in this region that will influence what other cities around the country decide to do.

q. We feel that Metrorail should be the first priority. Metro is a game changer that brings the kind and intensity of development that brings revenue which can be used to implement other beneficial plans.
  - Answer: Thank you for your comment.

r. Assuming we have a functioning BRT system in place, the plan then calls for it to be replaced by a Metro extension?
  - Answer: The BRT will remain in operation. The Metro extension will be under ground and serve three major stations. The BRT will serve additional stations in between the new Metro stations.

s. Is something being done to improve the Yellow line Metro service during the evening rush hour now?
  - Answer: Metro has a "core capacity" problem. Metro is focusing on making all trains 8 cars instead of some with only 6 cars. Then, restoring Blue line service to its pre-silver line levels of service. The Blue line improvements will help your commute, but the core capacity issues drive the immediate future of Metro service. The system can't handle additional trains in the core of the system.
  - Answer: Metro cannot expand the system until the core capacity issues are addressed. That is why Metrorail extensions in the near term can't happen. BRT is something that can be done in the near-term to improve transit on the corridor.

t. I have heard that the population projections can change significantly based on the transit mode implemented? For instance bus vs. rail. How has the study adjusted to those different projections?
  - Answer: We have looked at different examples around the country and talked with developers to obtain the range of activity at which the development community would respond.
  - Answer: The big parcels on Route 1 and their owners need a 20 year time frame to arrange their leases and tenants to prepare for new development and rearranging tenants. These are big parcels that can result in large town centers to anchor the corridor. They need the timeframe to prepare for those new developments, and respond to the future transit conditions.

- **u.** Can you explain the cost per rider numbers for implementing the different transit options? It's kind of skewed right now with metro costing more.
  - Answer: It is skewed right now because we analyzed them on an equal playing field. We are assuming the same population and employment projections for all the alternatives in this analysis. This is based on FTA funding application requirements. As areas grow, the cost per rider of the infrastructure investments will change and go down.
- **v.** You mentioned that it takes the larger parcel owners a long time to turn their properties around. It might be a good idea to bring in small business owners to accelerate the development while we wait for the larger businesses to turn around.
  - The Southeast Fairfax Development Corporation is set up primarily to help small businesses. Unfortunately securing financing for projects often require single large users or tenants. It's hard to get funding with multiple smaller tenants. There is also a lot of vacant office space in Fairfax which makes it difficult to secure funding.

3. **Display Board Area Notes** (Including comments recorded at the meeting and comments collected on the project website)
   - Project Schedule, Purpose & Need
     - No comments.
   - Evaluation of Transit Alternatives
     - Public relations along the corridor to get riders from SFH.
     - Need ASAP – 4 way stop @ Pole Rd & Jeff Todd Way.
   - Visualizing Future Station Areas
     - Would rather see LRT than BRT.
     - Overpass at Tulley Gate, Mt. Vernon Hwy. – to bypass stop lights.
     - Underpass at King's Hwy.
     - Plan for bike parking at Stations (see demand on Silver Line).
     - Metrorail segments should be planned earlier – and should be more definitive (too many "probablies" tonight). Especially since they will carry more passengers.
     - Do all the comprehensive planning for station areas at one time!
     - Time is money – if planning and construction can be done sooner, it will cost less.
     - How do passenger projections compare to "real world" results? For instance, passengers at Weihle Ave. Station on Silver Line are already above the one–year projections without much new development in place yet.
     - How will passengers on feeder buses transfer at BRT stations?
   - Infrastructure & Traffic Assessment
     - Expedite the Metro stations.
     - Backlick Rd choke point.
   - Recommendations & Action Plan
     - No comments.

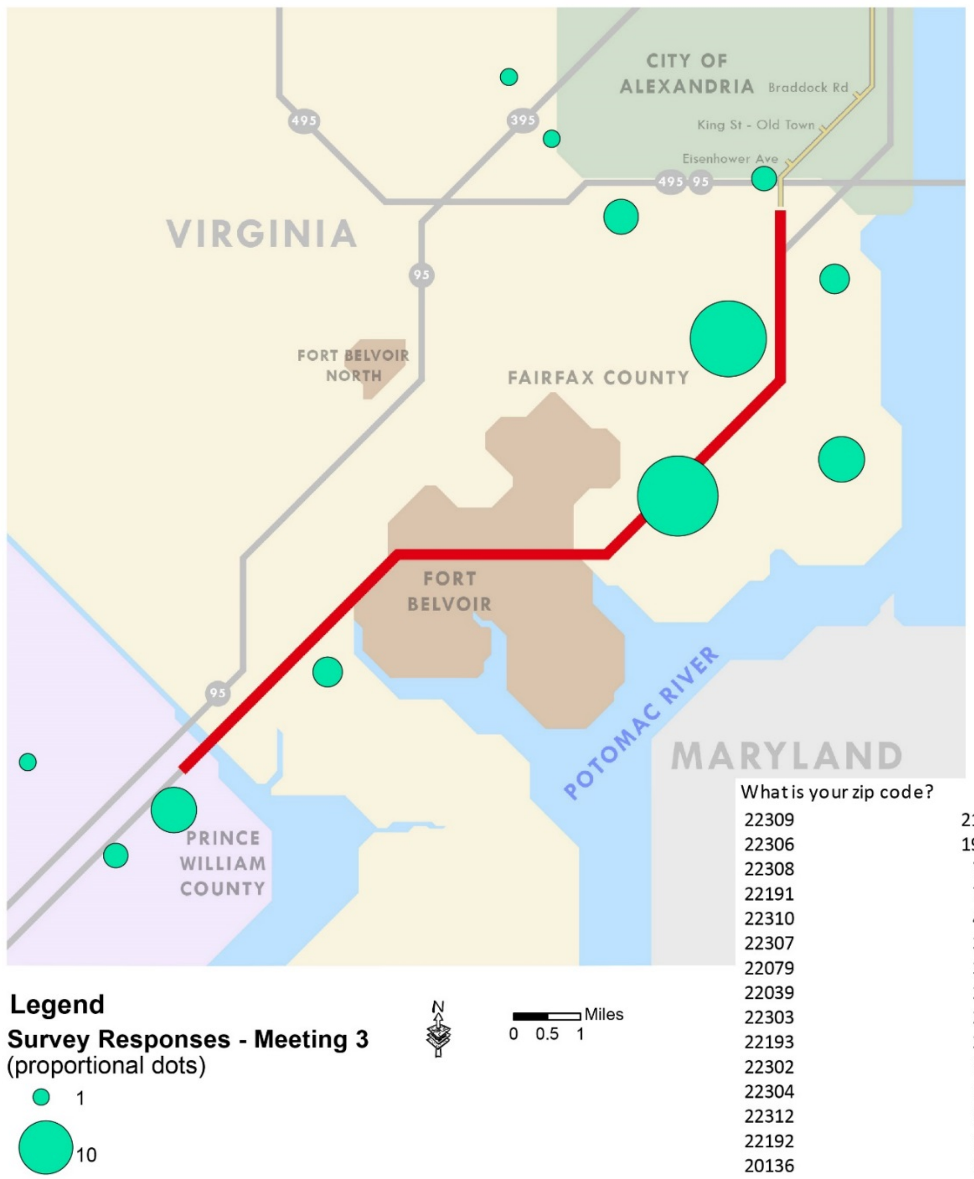
Survey results

76 responses, including those completed at the two meetings, online submissions, and email submissions.

October 8 (Prince William County): 49 attendees (25 members of the public), 13 completed surveys
October 9 (Fairfax County): 103 attendees (75 members of the public), 51 completed surveys

Question 1: What is your zip code? (N=76)

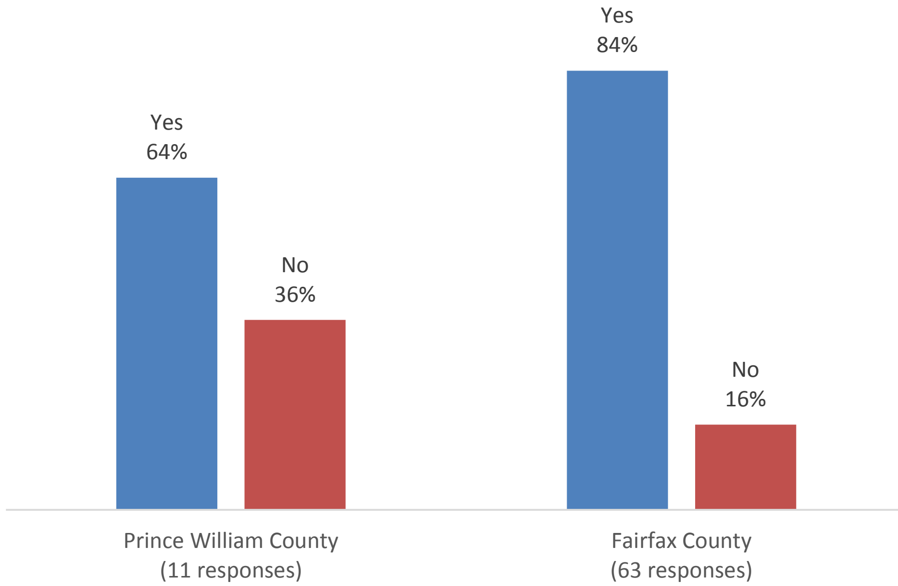
Survey Reponse Rates By ZIP Code (N=76)
Public Meeting #3 - October 2014
ROUTE 1 MULTIMODAL ALTERNATIVES ANALYSIS

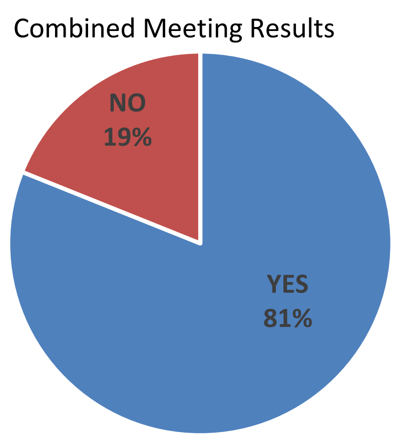


What is your zip code?	
22309	21
22306	19
22308	7
22191	7
22310	4
22307	3
22079	3
22039	2
22303	2
22193	2
22302	1
22304	1
22312	1
22192	1
20136	1
22508	1
Total	76

(3 responses outside of map area)

Question 2: Do you generally support the draft recommendations? (N=74)



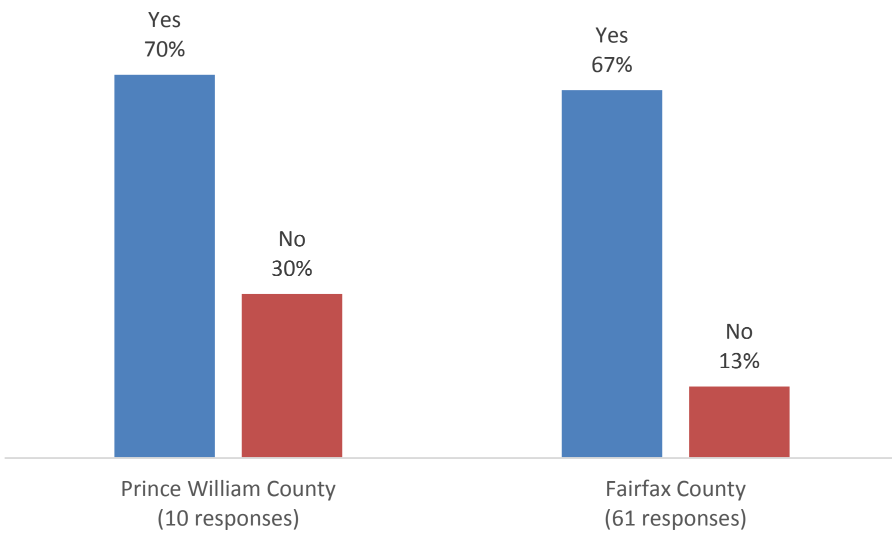


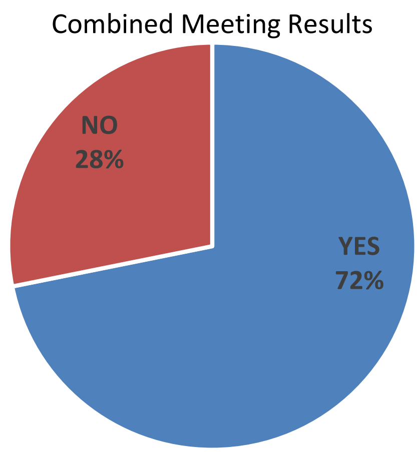
Question 3: What are your comments on the draft recommendations?

# of Comments	Coded Comments
13	Implement plan sooner
12	Develop Metro sooner
6	Want extension of transit further into Prince William County
4	LRT instead of BRT
4	Focus on Blue Line extension down I-95
4	Extend Metro further
3	Study should consider ferry service as transit alternative
2	Prefer hybrid BRT and Metrorail option
2	Increased density and rezone is key to making the transit work

***See appendix for full list of comments.**

Question 4: Do you generally support the implementation action plan? (N=71)



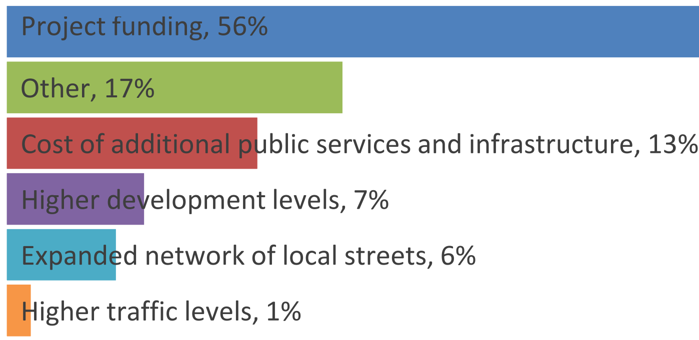


Question 5: What are your comments on the implementation action plan?

# of Comments	Coded Comments
21	Accelerate timetable of implementation action plan
9	Implement Metro phase earlier
7	Phasing makes sense

***See appendix for full list of comments.**

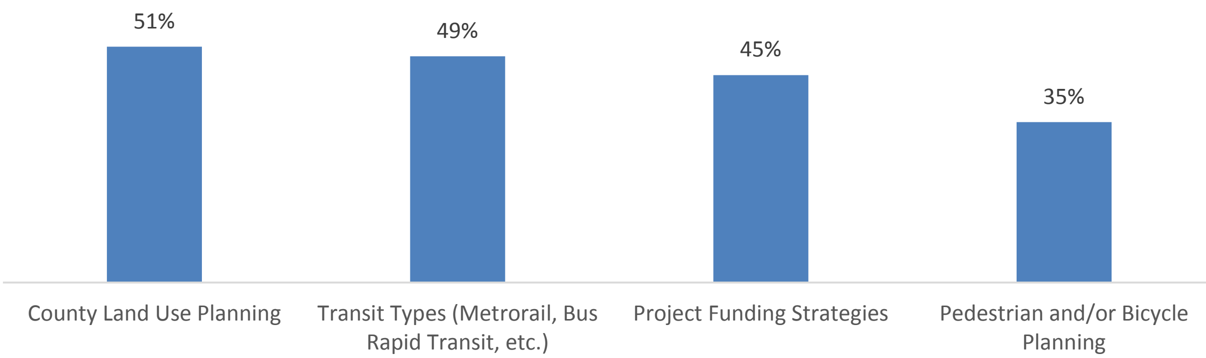
Question 6: Which of the following do you see as the most significant challenge as part of a Metrorail extension between Huntington and Hybla Valley? (Please select one and provide details below.) (N=70)



Comments
Getting the necessary stakeholders on-board
Parking - You can provide temporary parking at all stops until higher density alternatives are more feasible.
Lack of development. Need to follow the example of Arlington County in developing areas around stations.
Potential destruction of businesses during ROW acquisition and then decades later add a Metro.
I can't imagine Metrorail can be extended without displacing many residents, families, and local businesses. Some will probably be forced into bankruptcy by the years of construction alone. I expect many will fight losing their homes and businesses and drive up the project's cost of time and money significantly. Despite the ability to force them out using eminent domain, there should be provisions included to assist these citizens and business owners in relocating and/or rebuilding nearby or at a different location of their choice.
Parking - could there be free or less than $5 cost option at Hybla Valley.
Funding - Lots of money to extend just a few miles.
Pace of implementation
Parking requirements were not presented to support businesses in mixed-use areas.
Lack of a local connected street grid
Potential disruption to local neighborhoods
Prejudice
Density - As a Fairfax county resident I would like to see the County take bonds to pay for accelerating phase 1 so that more time is given to achieve the development levels necessary to obtain funding for Metro eventually.
Funding - Comes down to the money and finding state/federal partners. The trouble with building just a new Metrorail station in Alexandria highlights the issues with funding such large-scale capital projects.
Politicians keep trying to lower taxes without admitting the consequences.
The segmented approach is not a long-term integrated plan.
Concerned about sufficient state and federal funding.
There is not enough population east of Rt 1 to justify Metro. If it is extended, it should be down Rt 95, where there is a much bigger area it could draw from. Other aspects mentioned above don't seem to have been given much thought but should be of concern. Expanded network of local streets – it's almost impossible to get to Penn Daw or Beacon Hill from east of Rt 1 during rush hour- it will only get worse if metro is extended. Cost of infrastructure doesn't seem to be justified by potential ridership shown on charts; it would seem better to figure out how to make bus and or light rail work effectively, which would that would mean stopping development like Beacon at Groveton that goes right up to Rt 1 so it can't be widened.
Bonds should be used to help accelerate early phases of this work while continuing to pursue all available funding paths. It is pretty much annually that Fairfax asks its citizens to pay for projects in the other parts.
Providing adequate parking at the new stations and getting the stations built faster.

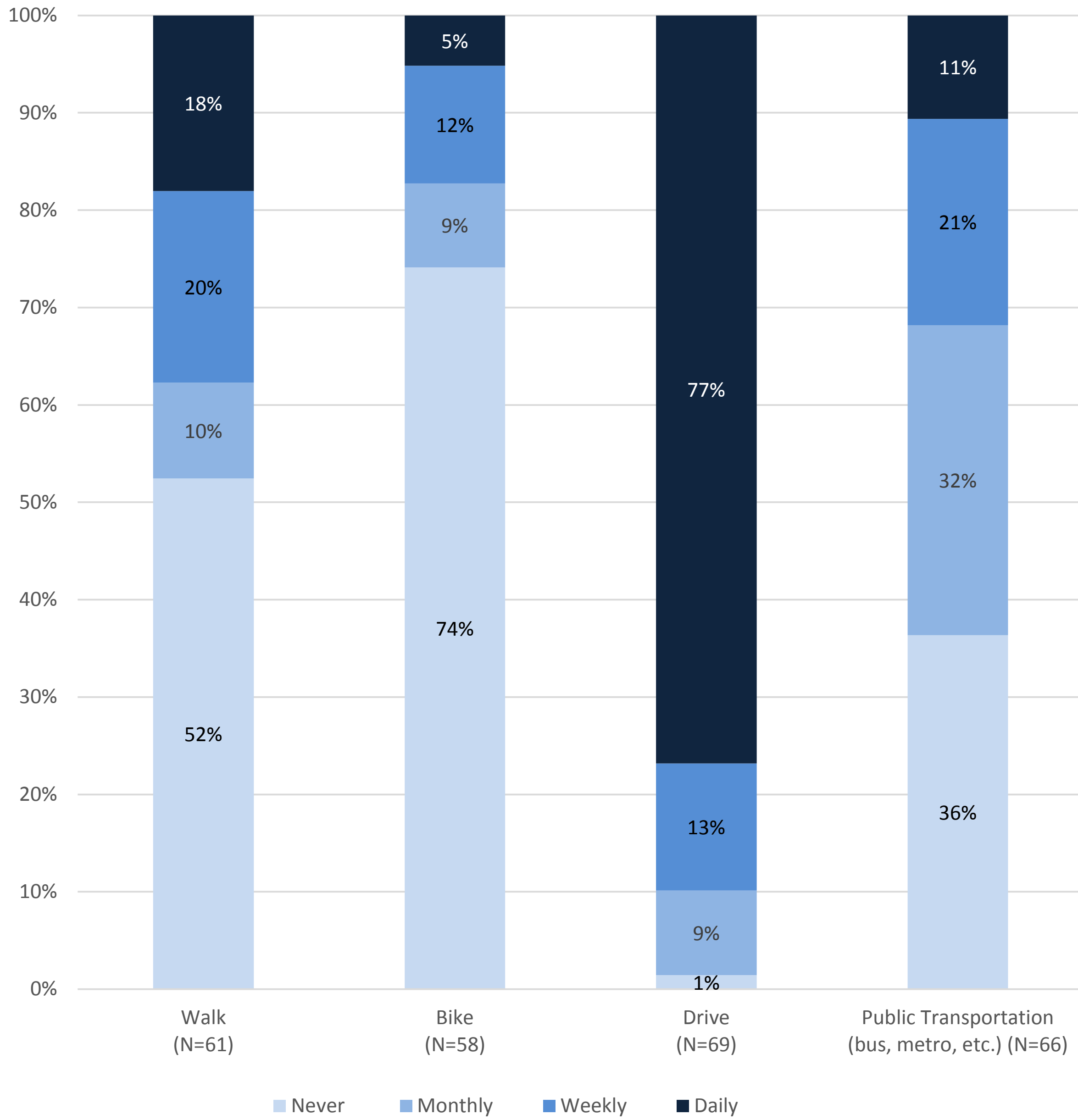
***See appendix for full list of comments.**

Question 7: What aspects of this project would you like to learn more about? (Select all that apply) (N=49)

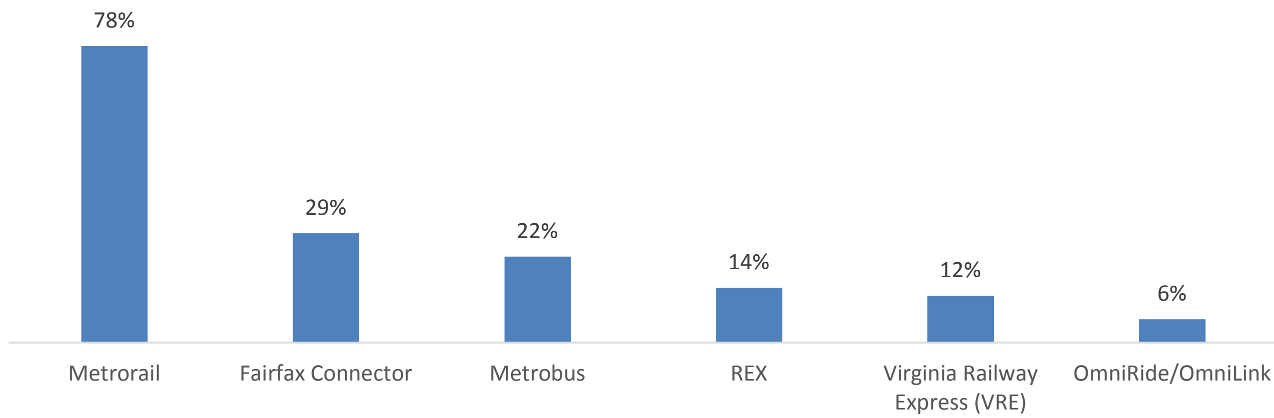


Other (please specify)
How to get this speeded up and to get a greater role for parking.
Monorail
Projected GIS overlay showing land acquisition required
Streetcars will attract new riders. LRT. Curb cuts for buses to keep from blocking traffic.
FTA requirements that evidently drove this implementation duplication.
Monorail & future inventions
What traffic control systems will be implemented and will they be adequate.
ADA compliant aspects of project
Better understanding of commuter vs. other trips
When is it going to happen?
Integration of the options into a continuum
Woodbridge Area

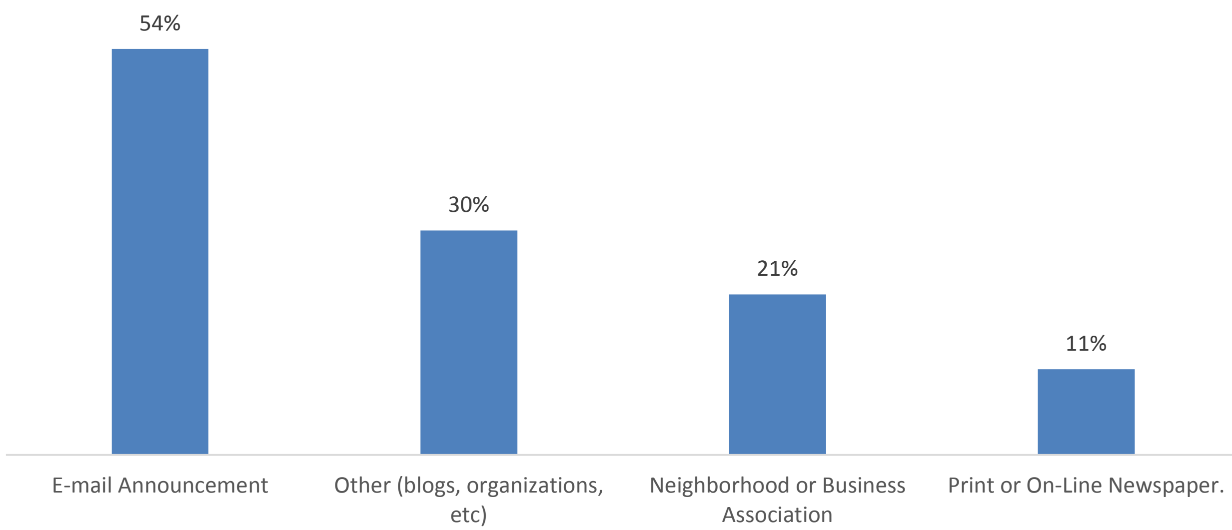
Question 8: How often do you use the following transportation methods on Route 1?



Question 9: If you do use public transportation on Route 1, what systems do you use? (Select all that apply) (N=49)



Question 10: How did you learn about this public meeting? (N=71)



Question 11: Do you have any additional questions or suggestions based on the information presented tonight?

***See appendix for full list of comments.**

Question 12: Name and email [optional] (N=23)

***See appendix for full list of comments.**

Appendix

The body of this report includes summaries of the public meeting responses for survey questions #3, #5, #6, #11, and #12. This appendix displays the full list of comments for those questions.

Question # 3 (Comments on: Do you generally support the draft recommendations?)

Comments
Need Metro!
Prefer Hybrid Option
Schedule too far right
Important to carry through to Metrorail; phase time frame is long.
Well done analysis
As a resident of Lorton, I think 2035 is too far out to fox where it narrows to 1 lane under the CSX bridge.
We should extend metro to Ft. Belvoir and all stations should offer Huntington type parking, including substantial handicapped parking.
I believe the focus on BRT is misplaced. Focus should be on LRT instead.
If light rail and/or streetcars were used instead of buses. Many people will not ride a bus of any kind but will ride streetcars. Buses will not attract new riders in large numbers.
If ROW acquisition from Hybla Valley to Huntington Metro is not needed as Metrorail underground would avoid the need to condemn newly constructed buildings with ROW. I fear that nothing will be built as Phase 1 wants to acquire ROW in the most dense area. Is there a feasible plan? Because the duplicative transit from Huntington Metro via Huntington Ave will be expensive and will require businesses to be torn down.
A caveat to my support of the Hybrid plan for Metrorail from Huntington to Hybla Valley is that not having this begun until 2035-2040 is way too far in the future. This phase needs to be studied, funded, and built ASAP, not after most of us are retired and even dead. Pick up the pace!!! Implementation of Phase IV should be started immediately coincident with Phase I. If Phase IV is going to take 15 years from Comp Plan to Operation, then implementing Phase IV immediately would have it completed just about the current projected operational date for Phase III. If funding cannot be obtained for this aggressive progress, then start with Phase IV and add Phases I, II, and III as soon as funding allows. Please keep in mind that the design and implementation of Phase I should NOT be done in a manner that Phase IV will tear up what's been bought in Phase I.
Please ensure that median LR/BRT systems balance the road needs along Rte 1. Basically are 3 lanes enough for cars? I was hoping we could maintain 4 lanes.
Would like to see Metro sooner.
Replacing buses with buses in transit lanes won't get people out of cars, won't improve traffic & won't generate high quality redevelopment. Elevated monorail makes better sense to me.
It is a well thought out plan. I hope it happens sooner than the schedule that was presented.
Much too slow.
I don't think phase 4 will ever happen.
Looks great! Would be nice to know if phase 4 is somehow dependent on phase 3.
The timeline is too long for the metro portion. Most of the people footing the bill will be long gone by completion.
Delivery of first phase is too slow
Further planning on funding is necessary
Three lanes of mixed traffic plus an extra two lanes for transit will widen the highway, harming the potential for pedestrians to get around as well as use transit.
The timelines are excessive - move to #4 ASAP
Would love to see Metro first, but all things considered...
Can Alexandria City be brought into this collaboration, if/assuming it makes sense passengers would want a "one seat ride" along Rt. 1 (e.g., ride from Hybla Valley to Potomac Yard)

Comments
Let's get it "on the road"
Parking plan for phase 2? Hybla Valley. I like both the short term & long term. Primarily as both support bike & pedestrian conditions.
Need to start soon
If the metro alt is split into 2 phases - 1 to Beacon Hill - 2 to Hybla Valley. The study staff have not adequately studied the grade limiting inadequacies of light rail. Light rail is a flawed alternative
You need more Fairfax Connector like a new 172, 163 Mt. Vernon Hospital new replace now the 161 new route.
Except for the timeline and metro last. Outrageous draft recommendations.
Too long before Metro extension.
But I agree with the gentleman who said develop METRO first to generate the growth and funding to support the project financially.
A copy of the draft recommendation would be helpful.
I would like to receive an analysis of oppositional/compromising disadvantage
We should be pushing to execute phase 1 more aggressively than 2026. Plans should be in place to compress this timeframe should money become available. Elected officials should push for this to be a priority project and work diligently to push local, state and federal leaders to fast track this project. Saving a 1-4 years from the 12 year timeline will mean significant benefits for stakeholders who have been waiting for 20+ years.
I think the plan is very realistic that, absent massive rezoning along the corridor, BRT (dedicated lanes, running in median) is the best high-capacity mass transit option.
I would have also liked to have seen inclusion of a ferry service from North Woodbridge.
The key to getting them to work is density. The County can upzone, but that doesn't mean that builders will come.
Any of the options will vastly improve the Rt. 1 corridor. My biggest concern is how we're going to pay for it. Raising taxes IS NOT an option. If you even approach that as an option, this turns into a partisan political battle.
Did you include references we can look up re/ the PWC studies (ie-Blue Line). 1) Should have extended through Woodbridge. 2) Ignored ferry services possible addition from cross-river.
Alt #2, Alt # 4. Wish there was a handout to take home to review.
Does not go far enough on extent of study area & mode of transit like water service. See entries on posted sheets for input along lines of Supervisor Principi.
2040 is way too far out - final implementation must be sooner. I'd prefer LRT from Hybla South instead of BRT
Not sure how this would benefit Woodbridge as a whole. Traffic would increase in that area, cost to Woodbridge residents, but no benefits. I think funding should go into blue line down 95. This would bring ridership & growth in Prince William county. Stop this plan in Fairfax.
I support the draft recommendations. However, I would prefer to see the draft include expansion deeper into Woodbridge to cut commute time for local citizens.
There is no EIC recommendation for the Blue Line.
The Metro extension isn't included for Prince William
Good but not much for Prince William except on the coat tails of Fairfax
The timeline needs to be accelerated. Metro needs to be extended further. The current proposal will barely meet the current transportation needs and falls short of addressing the most conservative growth estimates.

Comments
Given the fact that it will be almost impossible to increase population (and ridership) from east of rte 1 because of the Potomac River barrier, it would make more sense to extend metro from Springfield along rte 95 because it could draw a much larger ridership from a wider area in the long run. Metro extension to Dulles will serve a much greater population because there is more room for development in the area the stations serve. (see growth projections for Reston, etc, vs Mt. Vernon District in county population growth projections). I don't believe metro extension to Hybla Valley is cost effective. Also believe that too much emphasis given to bike trails and pedestrian trails (and looking at groups involved in this effort, planners should recognize that vocal groups don't always mean that their ideas make the most sense. Improving bus and/or light rail movement should be maximum effort for the foreseeable future. A check of Ft Belvoir expansion makes clear that most of it will take place much closer to Springfield (mark center and gis).
Accelerate the timeline for phase 1
Need to promptly bring metro all along the Route 1 corridor as far as Ft. Belvoir and need to provide parking unless you plan to have an extensive bus network to existing car-based neighborhoods.
Yellow line extension needs to occur sooner than scheduled. As seen is Tysons, the Metro extension will revitalize the area and bring in new high quality projects.
1) would have liked to see how the crime rates are predicted to change if/when the metro line is extended to Hybla Valley 2) don't understand why travel times on Rt 1 will be 2 minutes longer if the plan IS implemented
Too long of a timeline. The growth from Ft. Belvoir will happen much before the draft recommendation timeline.
We can't wait until 2029 to begin planning Metrorail expansion. We need to start NOW so we can be done in 10 years.
Extend the Yellow Line FIRST. Then, add the BRT or light rail aspect. Route 1 needs a major overhaul ASAP and your draft recommendations do nothing to effect such an overhaul.
Too long to make a decision, and everything seems to be in series, while much could be done in parallel safely.
Move Phase 4 Metro to Begin 2019, submit bill to U.S. Congress (Sen's Warner, Kaine): Include Phase 5 with Metro to Fort Belvoir (Federal, Hospital)
Not running Metro to Fort Belvoir seems awfully short-sighted

Question #5 (Comments on: Do you generally support the implementation action plan?)

Comments
Need Metro!
Takes too long to implement Metro
Stages seem reasonable
Metro sooner
Too Slow! We need this in 10-15 years max.
I think the metro to Hybla Valley and Woodbridge should be first after the Blue line was built to Springfield there development came soon after.
You need to provide a walkable means for people who live on existing side streets to get from their home to route 1 stations or provide parking.
We live in one of the wealthiest counties in the wealthiest country in the world. this project requires more capital and its schedule should be accelerated.
Too slow
Since the current widening of Route 1 includes dedicated transit lanes, the project should stand at Fort Belvoir and then move to Hybla Valley. The ROW acquisition or negotiation with FTA should be occurring at the same time. If the initial leg has a spike in passenger trips the projected, Metro may be possibly built instead of ROW center-lane dedicated to transit. Also, once built partially, it may be easier to obtain the necessary funding.
Again, not beginning Phase IV until 2035-2040 is way too far in the future. This phase needs to be studied, funded, and built ASAP, not after most of us are retired or even dead. Pick up the pace!!! Implementation of

Comments
Phase IV should be started immediately coincident with Phase I. Accepting the timeline on page 55, Phase I would be going operational just as Phase IV construction is beginning, and Phases II and III would be operational the year prior to Phase IV's completion. If funding cannot be obtained for progress this aggressive, then start with Phase IV and add Phases I, II, and III as soon as funding allows. And please, do NOT design and implement Phase I in a manner that Phase IV will have to tear up what's been bought in Phase I.
Find ways to speed the process! Work with Fairfax connector/REX to set BRT schedules that could run now!
Need to stay flexible - for example, the onset of self driving cars may, by itself, eliminate much of our traffic woes.
Time line too long
Much too slow.
Time line far too long. Tax rate unclear.
Only concern is the need o be more aggressive on timing
Need immediate planning on Phase 3 to assure no interference with plan by current developments
Blueprints - actual blueprints - get these done.
Waiting until 2040 is ABSURD! Move the project forward now please.
The phasing makes sense to me. I don't understand why some people are pushing for the Yellow Line Metro extension to be completed first.
Verify funding before you tear up existing businesses and properties.
Maximize opportunities to make it happen faster! Always easier to pull something forward in the plan vs. no plan/funding.
Improvements should be from the ends toward the middle
Route One a new 172 limited. Stop between Lorton VRE to Huntington North.
Starting sooner and Metro first.
How do we expedite implementation? Suggest we have a "champion" in Fairfax Co to shepherd this. (not sure Leonard is the right person based on his answers)
Too long before Metro extension.
Push for METRO first. Compress the schedule. The schedule is too stretched out.
The phased approach is logical however the timeline should be compressed wherever possible.
The implementation plan seems reasonable, but on the longer side. Although the density might not yet be there for the entire segment, the first section or two (or divide phase 2 into 2.1 and 2.2) should be implemented sooner rather than later. BRT, versus extending Metro, should not require the density to be in place before it opens. The lower costs of BRT make it more amenable to building first, and then letting the people come to it over time (vs Metro, which requires immediate mass utilization to offset its costs).
Can't happen soon enough! Happy to see the opportunity to fix the area of North Woodbridge. There's so much potential!
I like the staging. Whether Metrorail makes sense is impossible to determine now. I don't like the long time lags. Is this due to funding?
Again, it's funding...
Way too long time frame to do anything for Woodbridge. Too long- 25 yrs?
But it is only considering individual options instead of the options representing a continuum of action plan phases/places. The options should be considered as a continuum of plans with eco/demographic trigger criteria to support execution.
The implementation action plan needs to be done sooner. I would recommend a 5-7 year plan.
Still not enough for Prince William County
It should be on integrated plan that doesn't leave the following phases at risk.
Unlike the politicians currently wailing about the delay, I personally support the idea of postponing Metrorail construction while we see if there is really going to be the kind of development that would justify billions of dollars in transit improvement. More likely people would live closer to work than try to commute from MD or Washington or North Fairfax way down the rte 1 corridor.

Comments
I support the implementation plan but do not believe the plan is aggressive enough. Waiting for 12 years to implement phase 1 of the plan is way to slow and will significantly inhibit growth, public trust and the overall success of the corridor
Too slow on rolling out improvements and unrealistic on parking needs given existing car-based pattern of development. Need to provide parking for at least the next twenty years. You can always convert the parking to something else.
Extend metro and not push bus. The bus transit corridor in Alexandria & Crystal City is along an existing metro line.
We can't wait until 2029 to begin planning Metrorail expansion. We need to start NOW so we can be done in 10 years. Bus service will only do so much.
I strongly oppose the Commonwealth's current timetable and I, too, believe that our community needs investment and transit relief NOW. Waiting 10 years before a shovel even hits the ground is absurd. Please do not allow another $2 million+ transit study to go to waste. I URGE you to prioritize the transportation needs of Richmond Highway. I have attended all of the Route 1 Multimodal Alternatives Analysis public meetings and I have heard from my fellow Fairfax County residents (from Mount Vernon and Lee) that a Yellow Line extension is the overwhelmingly preferred choice. And not in 2040, either. We need it much, much, much sooner than that. Extending the Metro to Hybla Valley must be done FIRST, with a clear plan to extend it to Fort Belvoir. The base is the largest employer in Fairfax County and is only expected to grow with the next round of BRAC. It would be irresponsible for Fairfax County to be unprepared for these changes when we know they are coming. I cannot fathom why our Fairfax County elected officials are "sharply divided over what kind of transit should be the goal for the traffic clogged Route 1 corridor." The BOS was elected to represent the will of the people and the people are speaking out in favor of a Metro extension. I could not encapsulate things any better than Mr. Martin Tillett did in his comment to a recent WAMU article. Please take a couple of minutes to read his comment below. Mr. Tillett speaks for me and many thousands of us here in South County who are pleading for the kind of attention that you have been giving to other parts of the County for years. *** "I've lived in the Route 1 corridor for 33 years. It is in desperate need of revitalization and has been neglected by the Board of Supervisors for decades while they favored development in the western areas of Fairfax County. We all know that metro rail is the game changer that will spur new growth and economic development needed to both revitalize this corridor and to increase the revenues to pay for thus far unfunded infrastructure needs for modern stormwater systems, stream restoration, sidewalks, bike trails, and a host of community assets known to communities elsewhere in Fairfax County but lacking in many of the neighborhoods adjoining Route 1. It is outrageous that this area of the county continues to be treated like the unwanted step child by the Board Of Supervisors, county agencies and departments. This older developed part of the county has antiquated and failing infrastructure that has rendered our watersheds the most degraded in all of Fairfax County. Fairfax leaders seemingly direct to the Route 1 corridor a poverty culture mentality that perpetuates the highest concentration of people in need of social services and assistance. The Route 1 commerce continues to evolve into a mish mash of poverty based retail and predatory businesses that thrive on the misfortunes of economically challenged citizens. Nearby, across the river, the National Harbor development along with the now promised Casino will draw thousands of visitors daily through this area and other nearby locations. Alexandria city has begun planning ways by which they can increase accommodations and attractions to expand commerce from this projected influx of visitors to the area. Fairfax County has done absolutely nothing in this regard unless you consider permitting an abundance of car title and quick cash loan businesses on Route 1 to meet the need for fast money to the casino gamblers a plan. This kind of abject neglect is testimony to the ever present negative attitude towards this section of the county originating from Fairfax County officials. All of the surveys and voices from the citizens in this area overwhelmingly support metro rail extension yet the plan presented does not respond to what the citizens want but rather the plan that the county officials want representative of their persistent negative attitude regarding the Route 1 corridor. The citizens have had three scripted presentations over the past 9 months where the people doing the proposed plan have heard consistently the call for extending metro and the outcome is a recommendation that puts metro dead last in their timeline with no guarantee that it will ever come. The citizens will hear from Fairfax County that they were given a voice in the process and now the officials that know what is best will make the final decisions on these

Comments
recommendations. The plan recommendations as I view them suggests to local citizens that Fairfax County officials have had a heavy hand in this process steering the way to the outcomes they desire and then adding insult by cynically telling citizens thanks for your input and engagement. This is not representative democracy but rather an economically prejudiced ineptocracy in what is supposed to be one of the wealthiest and best managed counties of the nation. They were voted into office and given agency and department appointments to find workable solutions to problems and issues for all citizens and areas of the county. Their mandate is not to only support select areas of Fairfax County they deem worthy of their love and financial largess but rather to engage all areas of the county in a fair, meaningful, respectful and constructive way. It is high time that Fairfax County show the citizens along the Route 1 corridor some of that same love and money they so willingly bestow elsewhere in the county. As it stands for right now, the key priorities essential to revitalization, a better environment, economic growth, improved infrastructure and improved communities on Route 1 gets kicked down the road yet again."
Too long to make a decision, and everything seems to be in series, while much could be done in parallel safely.
Start phase 4 and phase 5 Bill to U.S. congress now!!
What exactly is the plan? Sounds more like, "Let's wait and see what happens" position, I wouldn't call this a plan yet, too many unknowns. Until the funding is received, there is no point in these meetings. We are basically talking about what could happen if certain conditions, such as funding and population growth would be met. Which assures me that nothing will be done soon.
Takes forever. 25 years?

Question #6 (Comments on: Which of the following do you see as the most significant challenge as part of a Metrorail extension between Huntington and Hybla Valley?)

Comments
Support Metro!
Development will come if transportation is improved.
Getting the necessary stakeholders on-board
Good Job!
You can provide temporary parking at all stops until higher density alternatives and more feasible.
Need to follow the example of Arlington County in developing areas around stations.
All can be done! Do it as soon as possible.
Lacking foresight by the decision to destroy businesses on a ROW and then decades later add a Metro. I could write a novel.
I can't imagine Metrorail can be extended without displacing MANY residents, their families, and local businesses. Some will probably even be forced into bankruptcy by the years of construction alone. I can expect MANY will fight losing their homes and businesses and drive the project's cost of time and money up significantly. Despite the ability to force them out using imminent domain, there should be provisions included to assist these citizens and business owners in relocating and/or rebuilding nearby or at a different location of their choice.
Parking - could there be free or Less than $5 cost option at Hybla Valley? Ensure that the Yellow line express service to Springfield is eliminated! Diverting yellow service will not increase usage.
Lots of money to extend just a few miles.
Too slow
Parking requirements were not presented to support businesses in mixed-use areas.
A grid that isn't connected to thoroughfares of the area, i.e., putting additional streets through strip mall redevelopment, is not a grid.
Overpass at Fort Belvoir needs to be considered as well.
Will have to disrupt neighborhoods.
Prejudice

Comments
Especially mass transit
Extend Metro to Fort Belvoir. Hybla Valley is not ambitious enough.
Thank you for a copy of your PowerPoint based on disabilities.
As a Fairfax County resident I would like to see the county take bonds to pay for accelerating phase 1 so that more time is given to achieve the development levels necessary to obtain funding for Metro eventually.
Like all things, it comes down to the money and finding state/federal partners. The trouble with building just a new Metrorail station in Alexandria highlights the issues with funding such large-scale capital projects.
Politicians keep trying to lower taxes w/o admitting the consequences.
that the segmented approach is not a long-term integrated plan to truly include multimodal transport capabilities/capacities as the economic and development grow and trigger changes
Concerned about sufficient state and federal funding.
it doesn't go far enough
Quite simply, there is not enough population east of Rt. 1 to justify metro extension. If Metro is extended, it should be down Rt. 95, where there is a much bigger area it could draw from; and perhaps across Woodrow Wilson bridge to Maryland to cut down some of the beltway and highway congestion caused by people trying to travel north along the Potomac River. Other aspects mentioned above don't seem to have been given much thought but should be of concern (expanded network of local streets for example-it's almost impossible now to get to Penn Daw or Beacon Hill from east of Rt. 1 during rush hour- it will only get worse if metro is extended); cost of infrastructure doesn't seem to be justified by potential ridership shown on charts; it would seem better to figure out how to make bus and or light rail work effectively -- that would mean stopping development like Beacon at Groveton that goes right up to Rt. 1 so it can't be widened) . Bus pull-offs or lanes in the median should be top priorities, because the bus system seems to work pretty effectively most of the time when I travel Rt. 1. Bike activists have had far too large a role in the planning. I seriously doubt that more than a handful of people would bike the long distances that will cost millions of dollars of taxpayer money. This money would be better spent addressing real shortcomings on existing roads like ft. hunt, which is rapidly becoming one of the most dangerous roads in the county as traffic increases exponentially along that line. The county and the state would do better if they had a few traffic analysts instead of bike and trails specialists because too much planning seems to take place in response to a few noisy people rather than real consideration of best solutions to countywide problems.
Bonds should be used to accelerate early phases of this work while continuing to pursue all available funding paths. It is pretty much annually that Fairfax asks its citizens to pay for projects in the other parts of the county and its time that the County return some of these funds to Mount Vernon and Lee district. As a tax payer and land owner I would be happy to pay for such a needed project, not just for those who are land owners but for those who are in more needing situations (under employed, lower incomes, disabled) where improving transit and multi-modal connections are essential for remaining connected to the employment centers of the Greater Washington DC area
Providing adequate parking at the new stations and getting the stations built on a faster timeline than you envision.
If a metro extension is built more development (and better) will come.
I would have checked "project funding" but that is over simplified. There are only so many ways to split the current tax revenue and you can only raise taxes so high on those of us who actually pay into the system.
We need to push for dedicated Metro funding.
Is it worth doing BRT today, and trash it when Metro is extended?
Submit bill to U.S. Congress. Traffic from south of Woodbridge should be considered
The metro itself (the metro employee at the meeting said that there will be no extensions until the core is fixed). It is really bad as it is, with unreasonably long wait times. I can only use it as an emergency backup transportation, not on the regular basis.

Question # 11 (Do you have any additional questions or suggestions based on the information presented tonight?)

Comments
Is this material available online?
With Prince William currently working on widening, saving Lorton for last creates a major choke point narrowing to one lane in each direction.
What provisions do you have for persons with disabilities?
1- No mention of ADA facilities. 2) Projections should note additional ridership with streetcars.
How is the Rapid going to work when the traffic lights are timed so that one has to stop 5x between the City of Alex and Boswell (10 minute delay)
Could you re-prioritize the phrases - put the metro extension first. Fairfax connection/REX run pretty well currently w/o dedicated lanes!
What are the assumptions re increased property (and therefore) tax valuations with better transit & walkability.
How do we help push this forward? We are okay putting money up for this. Float county bonds please. We want the development.
We need a 4-way stop at Jeff Todd Way & Pole Rd.
Capital costs must be recouped through development impact fees. Dedicate lanes, but don't widen Rt. 1!
The County board must raise the priority of funding in Richmond Hwy Corridor.
For future meetings can you please address parking structures as an evaluation criteria and/or land use.
Install charging stations & have electric buses
Educate the community better and make them provide feedback with their property tax returns. Too many people don't know what is going on.
Early phases of this project need to happen sooner. The County should take bonds to make this project happen. As a tax payer in Fairfax County I see justification for paying more taxes up front to make this happen with the understanding that future recoveries would help stabilize the tax base.
Glad you're using Facebook so I can keep up to date on what's being planned. It also makes it easy for me to share with my friends and neighbors.
Needed to highlight that only 3% of commuters use public transportation (one of your posters) we need to work on changing this!! Did you consider ways to increase carpooling?
How can we learn more about land use planning and right-of-way?
I would recommend that the expansion be extended deeper into Woodbridge or to the south edge.
Please provide an environmental study for the Blue Line for Prince William
If recommendation for PWC is to extend the Blue Line, then say so.
Keep a cool head, don't rush into things that make little sense.
Very little communication about this process was provided to people in the impacted area. Greater communication should be made around this process and the impacts to the area. You would receive significant support for expediting this project, including support for bonds, from landowners. This support would also include support for a change in the development patterns on the Route 1 corridor - particularly toward a form based code. Ffollow Arlington County's example as it relates to development on Columbia Pike in this regard.
Overpasses - Ft. Belvoir Tulley Gate; Mt. Vernon Hwy/Costco; & Quander Rd; Underpass - Kings Hwy
Recommendation to extend the metro is great, but contradicts with what the metro itself is saying: "Until the core gets fixed, there will be no extensions". At the meeting, it was clear that the bottom line is: we are going to build BRT, which is going to take 10-15 years to build. And the Metro- We would all like it, but it is not happening in the foreseeable future. The meeting could have been done within 15 minutes :) Knowing this, we can anticipate years of restricted lanes due to road work on Rt1, building the BRT lane:) I am not impressed and am losing interest. Flying cars might come sooner than this plan is implemented! :) I do want to point out that roads parallel to Rt 1 and more connecting local streets are great ideas! Ideally Rt 1 should be a non-stop highway for the most part, with ramps and bridges connecting parallel sides, and allowing pedestrians to cross.

Question #12 (Name and email [optional])

Comments
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earlflanogan@verizon.net
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teugolfer@cox.net
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Route 1
Multimodal Alternatives Analysis

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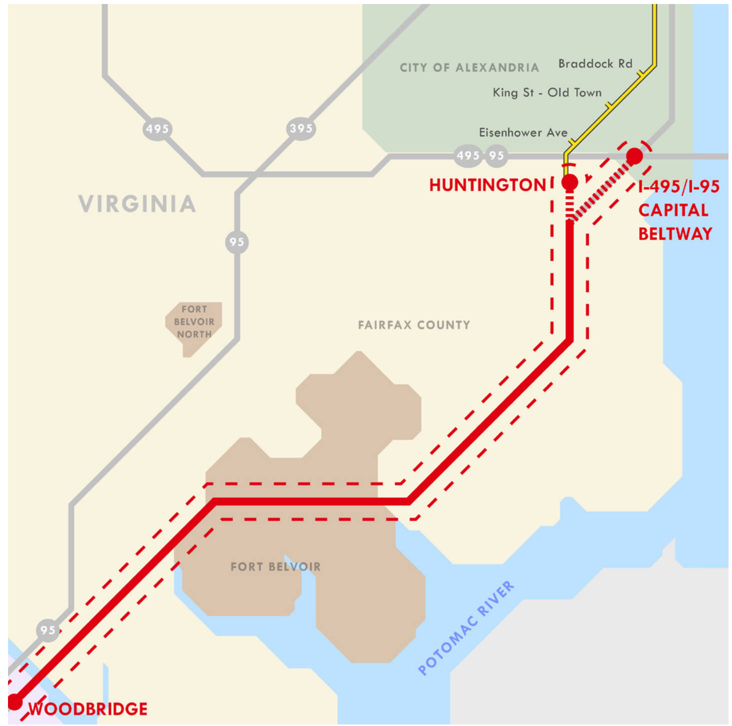
The Virginia Department of Rail and Public Transportation (DRPT), in coordination with Fairfax County, Prince William County, the Office of Intermodal Planning and Investment, and the Virginia Department of Transportation are developing and evaluating solutions to improve mobility along a 14-mile corridor of Route 1 from Woodbridge to I-495.

Improvements will include:

- Transit
- Roadway
- Bicycle and Pedestrian Facilities
- A combination of all of the above



Get Involved!

Join us at our first Public Meeting!

Wednesday
October 9, 2013
6-8pm

South County
Government Center
8350 Richmond Highway
Alexandria, VA

Provide Input On:

- The critical transportation needs
- The future vision of the corridor

Learn More About:

- Study process and outcomes
- Schedule for key decisions

The Department of Rail and Public Transportation (DRPT) is committed to ensuring that no person is excluded from participation in, or denied the benefits of its services on the basis of race, color or national origin, as protected by Title VI of the Civil Rights Act of 1964. For additional information on DRPT's nondiscrimination policies and procedures or to file a complaint, please visit the website at www.drpt.virginia.gov or contact the Title VI Compliance Officer, Linda Balderson, 600 E. Main Street, Suite 2102, Richmond, VA 23219, or 804-786-4440

DRPT Virginia Department of Rail and Public Transportation
Office of Intermodal Planning and Investment
VDOT

Ruta 1
Análisis de Alternativas Multimodales

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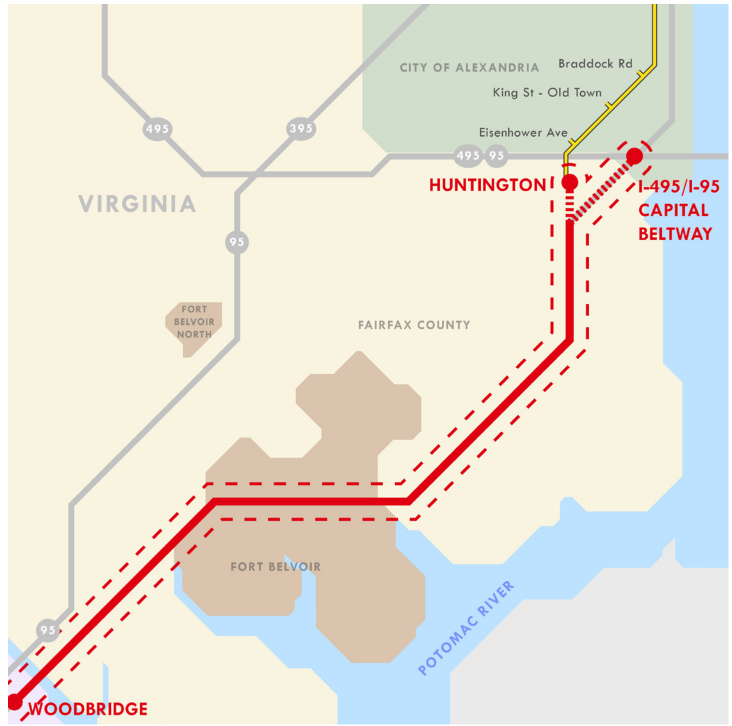
El Departamento de Trenes y Transporte Público de Virginia (DRPT), en coordinación con los Condados de Fairfax, Prince William, la Oficina de Planeación e Inversión Intermodal y el Departamento de Transporte de Virginia están evaluando y desarrollando soluciones para mejorar la movilidad a lo largo de un corredor de 14 millas de la Ruta 1 desde Woodbridge hasta la I-495.

Las mejoras incluye:

- Tránsito
- Carreteras
- Instalaciones para ciclistas y peatones
- Una combinación de todo lo anterior



¡Involúcrese!

¡Acompáñenos a nuestra primer junta pública!

Miércoles
9 de Octubre, 2013
De 6 a 8 p.m.

South County
Government Center
8350 Richmond Highway
Alexandria, VA

Podrá aportar ideas en:

- Las necesidades de transporte más criticas
- La visión futura del corredor

Aprenderá más sobre:

- Los procesos y resultados del estudio
- El calendario de decisiones clave

El Departamento de Trenes y Transporte Público de Virginia (DRPT) tiene el compromiso de asegurar que ninguna persona quede excluida de participar o sin poder disfrutar de los beneficios de sus servicios con base en su raza, color u origen tal como queda protegido por el Título VI del Acto de Derechos Civiles de 1964. Para información adicional en las políticas y procedimientos de no discriminación del DRPT y para poner una queja, puede visitar la página web www.drpt.virginia.gov o contactar a la Oficial del Cumplimiento del Título VI, Linda Balderson en 600 E. Main Street, Suite 2102, Richmond, VA 23219 o al teléfono (804) 786-4440.

DRPT
Virginia Department of Rail and Public Transportation

Office of INTERMODAL Planning and Investment

VDOT

Route 1

Multimodal Alternatives Analysis

JOIN US FOR OUR SECOND PUBLIC MEETING!

Wednesday, March 26
6:00 p.m. – 8:00 p.m.
South County Center
8350 Richmond Highway
Alexandria, Virginia 22309

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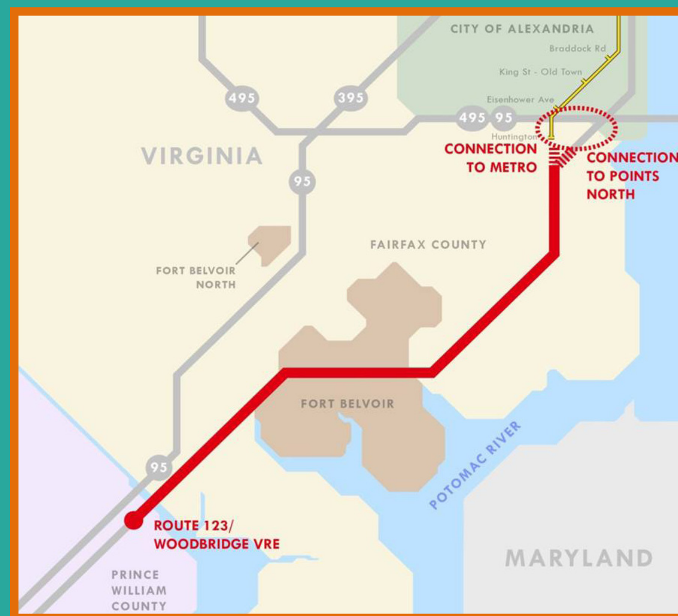

The Route 1 Multimodal Alternatives Analysis is a year-long study to enhance mobility along a 15-mile segment of Route 1 between Route 123 in Woodbridge and Huntington Metro Station/I-495. Recommended improvements will include transit, roadway, bicycle and pedestrian facilities. This is the second of three public meetings; the first was held in October 2013.

A Few Key Facts:

- "Multimodal" is a shorthand way of referring to the many ways, or modes of transportation, that people use when traveling for work, errands, or recreation. Mass transit (rail, bus, etc.), automobile, bicycle and foot travel are all included in the Route 1 alternatives.
- The study's evaluation factors include transit ridership, capital and operation costs, traffic flow, safety, right-of-way requirements, development impacts, financing, and other key considerations.
- Based on the evaluation of alternatives and input received through the engagement process, the study team will recommend a multimodal alternative for implementation. This recommended alternative will be presented at the final public meeting in the summer 2014.

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Ruta 1

Análisis de Alternativas Multimodales

¡ACOMPÁÑENOS PARA LA SEGUNDA REUNIÓN PÚBLICA!

Miércoles, 26 de marzo
6:00 p.m. – 8:00 p.m.
South County Center
8350 Richmond Highway
Alexandria, Virginia 22309

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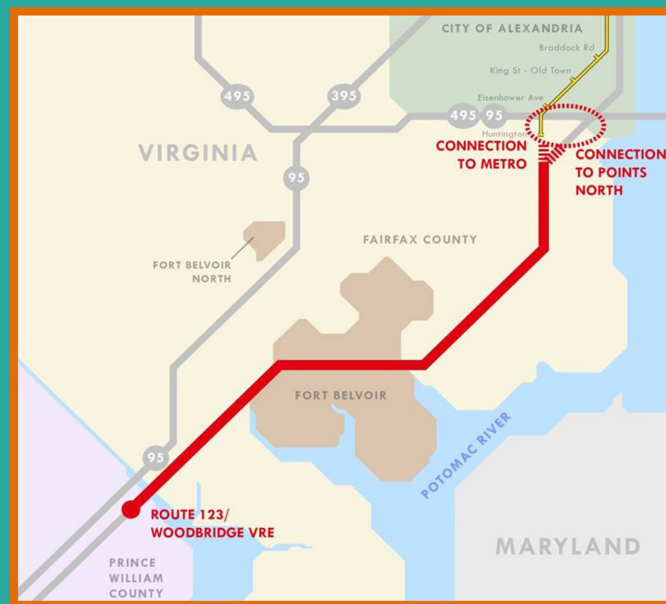

El análisis de alternativas multimodales de la Ruta 1 es un estudio de un año para mejorar la movilidad a lo largo de un segmento de 15 millas de la ruta 1 entre la Ruta 123 en Woodbridge y La Estación de Metro Huntington/I-495. Las mejoras recomendadas incluyen transporte público, carreterra, e instalaciones para ciclistas y peatones. Esta es la segunda de tres reuniones públicas; la primera se celebró en octubre de 2013.

Algunos hechos claves:

- "Multimodal" es una forma abreviada de referirse a las muchas maneras o modos de transporte, que la gente usa cuando viaja por trabajo, compras o recreación. Opciones de transporte público (tren, autobús, etc.), automóvil, bicicleta y viajes a pie están incluidos en las alternativas de la Ruta 1.
- Factores de evaluación del estudio incluyen pasajeros de transporte público, costos de obras y operación, el flujo de tráfico, seguridad, requisitos de propiedad, impactos en el desarrollo urbano, financiamiento y otras consideraciones claves.
- Basado en la evaluación de alternativas y propuestas recibidas a través del proceso de participación pública, el equipo de estudio recomendará una alternativa multimodal para la implementación. Esta alternativa recomendada, será presentada en la última reunión pública en el verano de 2014.

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DRPT Virginia Department of Rail and Public Transportation

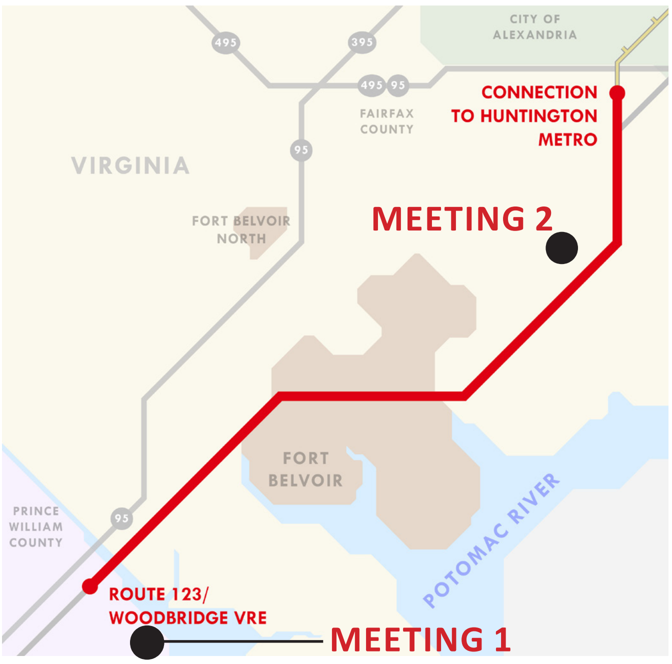
Office of INTERMODAL Planning and Investment

VDOT Virginia Department of Transportation

Route 1

Multimodal Alternatives Analysis

JOIN US FOR OUR THIRD PUBLIC MEETING!



MEETING 1: PRINCE WILLIAM COUNTY
Wednesday, October 8
6:00 p.m. – 8:00 p.m. (Presentation at 7:00)
Belmont Elementary School
751 Norwood Lane, Woodbridge
Public Transit: OmniLink's Route One bus will travel off-route to serve the elementary school that evening.

MEETING 2: FAIRFAX COUNTY
Thursday, October 9
6:00 p.m. – 8:00 p.m. (Presentation at 6:30)
South County Center
8350 Richmond Hwy, Alexandria
Public Transit: Fairfax Connector Route 171 and the REX.

The Route 1 Multimodal Alternatives Analysis is a study to enhance mobility along a 15-mile segment of Route 1 between the VRE station in Woodbridge and Huntington Metro Station. Join us at the upcoming public meeting to learn about the study's findings and recommendations for improved transit, roadway, bicycle, and pedestrian facilities along Route 1.

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DRPT Virginia Department of Rail and Public Transportation
Office of Intermodal Planning and Investment
VDOT Virginia Department of Transportation

Route 1

Multimodal Alternatives Analysis

¡ACOMPÁÑENOS A LA TERCERA REUNIÓN PÚBLICA!

REUNIÓN 1: PRINCE WILLIAM COUNTY

el miércoles 8 de octubre

6:00 pm – 8:00 pm (Presentación a las 7:00)

Belmont Elementary School

751 Norwood Lane, Woodbridge

Transporte Público: La Ruta Uno de OmniLink se desviará de su ruta para proveer servicio a la escuela el día de la junta.

REUNIÓN 2: FAIRFAX COUNTY

el jueves 9 de octubre

6:00 pm – 8:00 pm (Presentación a las 6:30)

South County Center

8350 Richmond Hwy, Alexandria

Transporte Público: Fairfax Connector Ruta 171 y REX.

El Análisis de Alternativas Multimodales de la Ruta 1 es un estudio para mejorar la movilidad a lo largo de un segmento de 15 millas de la Ruta 1 entre la Estación de VRE en Woodbridge y la Estación de Metro Huntington. Acompáñenos a la próxima reunión pública para aprender sobre los resultados del estudio y las recomendaciones para mejorar el transporte público, las carreteras, y la movilidad de bicicletas y peatones a lo largo de la Ruta 1.

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DRPT Virginia Department of Rail and Public Transportation

Office of Intermodal Planning and Investment

VDOT Virginia Department of Transportation

APPENDIX C

Traffic and Transportation Report

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Route 1
Multimodal Alternatives Analysis

Route 1 Multimodal Alternatives Analysis

Traffic and Transportation Report

May 2014

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1.0 Introduction

This report provides an overview of the key transportation analyses conducted for the Route 1 Multimodal Alternatives Analysis. The report describes the technical methodologies and presents results of the vehicular lane and traffic analysis, as well as the ridership projections for the proposed transit alternatives. The technical findings presented support the evaluation of alternatives and will inform the technical recommendation of a multimodal alternative for implementation. Detailed appendices provide thorough documentation of the assumptions and processes applied in the analysis.

The report is organized into four key sections:

Section 2: General Corridor Travel Patterns
Section two describes the current travel patterns for the corridor. It provides information on where people travel to and the mode they choose to get there.

Section 3: Traffic Analysis: No Build Lane Analysis
Section three presents the vehicular lane analysis and is organized into two subsections. It confirms that six general purpose travel lanes along the majority of the corridor would support the projected increase of traffic volume in 2035; this recommendation is referred to as the "No Build" alternative, as it includes projects listed in the regional Constrained Long Range Plan (2013) and assumes improvements identified in the VDOT Centerline Study (1998). A six general purpose lane configuration is consistent with the Fairfax County Comprehensive Plan. **Figure 1-1** shows the proposed cross-section.

Figure 1-1: No Build Lane Configuration

Section 4: Traffic Analysis: Alternative Vehicular Lane Analysis
Section four compares the effects of four different transit alternatives on auto and transit operations. It describes the other vehicular lane configurations and summarizes the performance measure results.

Section 5: Projected Ridership of Transit Alternatives
Section five relates to ridership forecasting for the proposed transit alternatives and is organized into three sections. It discusses the operating and forecasting assumptions related to the transit alternatives, describes the methodological process, and presents the ridership results for both the initial and refined transit alternatives.

The project team notes that several ongoing studies and plans are geared toward understanding the impacts on the corridor traffic network and selecting projects that address those impacts:

- VDOT project selection process
- Fairfax and Prince William County implementation of DRPT Transit Design Guidelines
- Fairfax Countywide Transit Network Study
- MWCOG Constrained Long Range Plan

The project team discussed the forecasting approach with Fairfax County staff, who is conducting a concurrent Countywide Transit Network Study. The approach and key inputs were also coordinated with VDOT staff. The forecasts consider interactions among regional facilities and services, such as VRE and the greater I-95 transportation corridor.

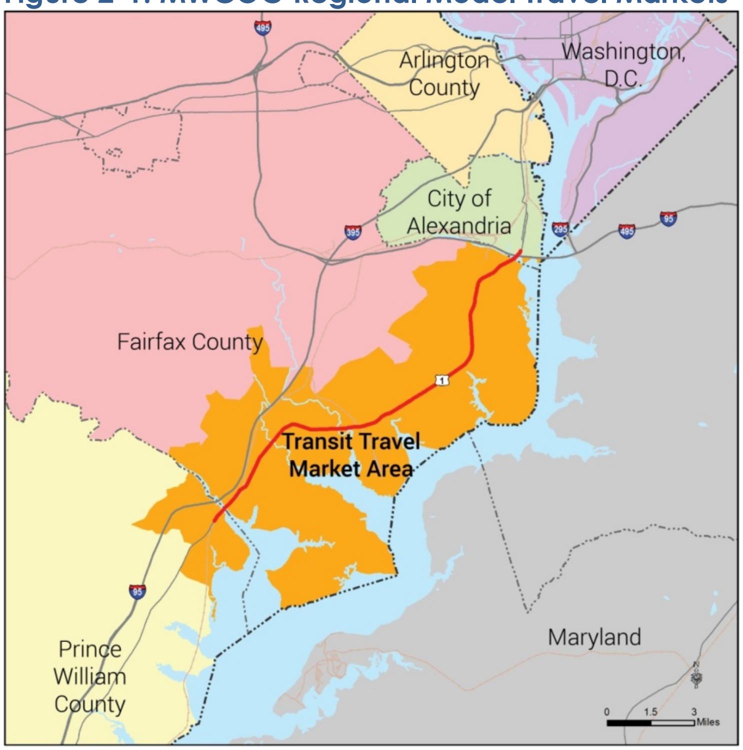
2.0 General Corridor Travel Patterns

Within the study area in Prince William and Fairfax counties, U.S. Route 1 (Route 1) serves local, regional, and longer-distance travel. Any assessment of transportation in the Route 1 corridor must consider the regional context as well as localized travel patterns.

2.1 Travel Origins and Destinations

The project team identified the trips to and from the Route 1 corridor using the Metropolitan Washington Council of Governments (MWCOG Version 2.2) regional travel demand model, refined for the Route 1 corridor. **Figure 2-1** shows the travel markets which were defined to study the trip patterns from the MWCOG regional model. The Route 1 corridor was defined by grouping all MWCOG TAZs within a half-mile buffer around Route 1 from the Huntington Metrorail station to the Woodbridge VRE station.

Figure 2-1: MWCOG Regional Model Travel Markets



In general, the largest shares of corridor travel, 34 percent of average weekday and 31 percent of peak period trips, are trips that begin and end in the corridor. The next largest share of travel are to and from other areas within Fairfax County, and account for 24 percent of both average weekday and peak period trips.

The typical average weekday and peak period (AM and PM peak) travel patterns to/from and within the Route 1 corridor are summarized in **Table 2-1** and **Table 2-2** below. Although there are relatively fewer total trips between the study corridor and the regional core in Washington DC and Arlington/Alexandria, those trips have the highest transit share; 29 percent of the daily trips and 39 percent of the peak period trips between Route 1 corridor and D.C are being currently made by transit. Of people who live within the corridor, the majority of corridor transit users (52 percent) are commuting to Washington D.C., using Metrorail, and 86 percent of corridor transit users are traveling to either Arlington/Alexandria or Downtown. Of people traveling by transit to destinations within the corridor; 64 percent of transit commuters to the corridor use the bus mode exclusively, and most transit trips begin and end in the corridor.

Table 2-1: Average Weekday (Auto and Transit) To, From, and Within Route 1 Corridor

Route 1 From/To	Total Trips		
	Total	% of Total	Transit Share
DC	52,000	6%	29%
Arlington/Alexandria	116,000	13%	6%
Within Rt.1 Corridor	310,000	34%	1%
Fairfax Other	216,000	24%	0%
Prince William Other	124,000	13%	0%
Other Areas	95,000	10%	2%
Total	**913,000**	**100%**	**3%**

Source: MWCOG/WMATA Version 2.2 Year 2010 model and Regional On-Board Transit Survey Data

Table 2-2: AM and PM Peak Period (Auto and Transit) To, From, and Within Route 1 Corridor

Route 1 From/To	Total Trips		
	Total	% of Total	Transit Share
DC	28,000	7%	39%
Arlington/Alexandria	54,000	13%	9%
Within Rt.1 Corridor	127,000	31%	1%
Fairfax Other	95,000	24%	0%
Prince William Other	55,000	14%	0%
Other Areas	46,000	11%	2%
Total	**404,000**	**100%**	**4%**

Source: MWCOG/WMATA Version 2.2 Year 2010 model and Regional On-Board Transit Survey Data

3.0 No Build Lane Configuration Analysis

The purpose of this analysis was to confirm whether a consistent, six-lane cross section along the majority of the corridor (No Build lane configuration alternative) could adequately support the future traffic volumes in 2035 (See **Figure 3-1**). The No Build alternative assumes widening Route 1 from Annapolis Way to Mount Vernon Memorial Highway from two-lanes to three-lanes, as identified in the 1998 VDOT Centerline Study (See **Figure 3-2**). A significant portion of the recommendation is either under construction or is a committed project in the National Capital Region's Financially Constrained Long Range Plan (CLRP 2013).

Figure 3-1: No Build Lane Configuration

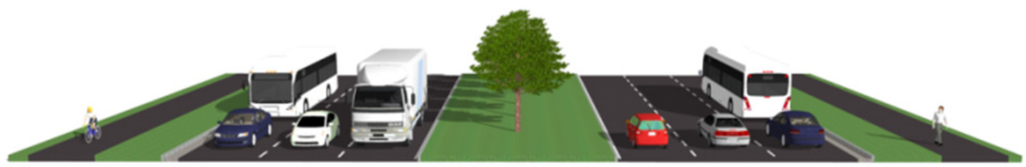
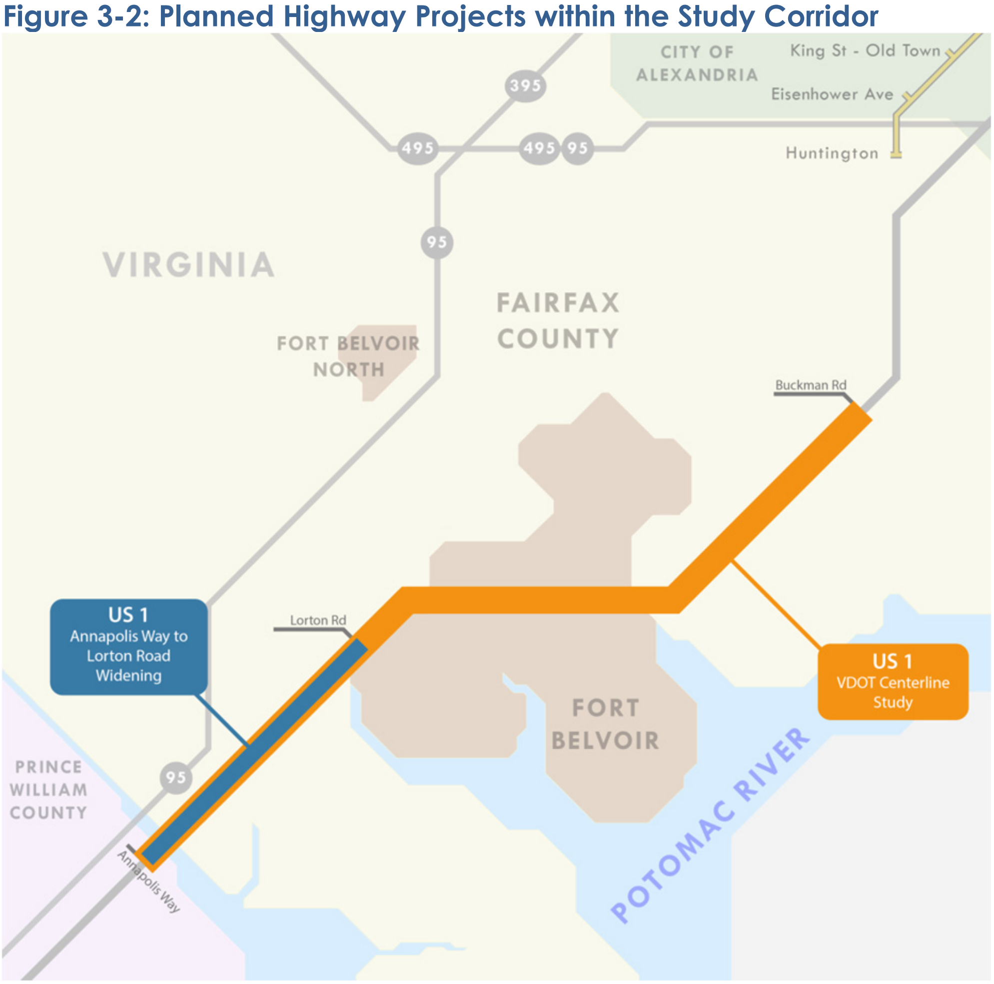


Figure 3-2: Planned Highway Projects within the Study Corridor



The No Build alternative is compared to the existing Lane configuration, which varies from four to six lanes along the corridor. The current lane configuration is shown in **Attachment A**.

To confirm the No Build alternative, the project team took a two-step approach:

1. Analyzed No Build traffic conditions in 2035 under two traffic growth scenarios.
2. Analyzed traffic impacts in 2035 for varied lane configurations to confirm whether the No Build could best accommodate future vehicular demand while minimizing impacts on right-of-way and improving pedestrian safety and accommodation.

The following sections describe the methodology and findings for each approach.

3.1 2035 No Build traffic conditions (two traffic growth scenarios)

This section presents the results of the 2035 No Build condition. The purpose of the analysis was to understand traffic conditions along the entire corridor by developing growth scenarios and applying the future volumes to analyze intersection performance.

For purposes of this analysis, the project team developed and tested two growth scenarios: moderate growth rates, where historical growth rates were blended with MWCOG projections; and high growth rates, based directly on MWCOG projections. For both growth rate scenarios, intersection level of service (LOS) and volume to capacity (v/c) ratio in the morning and evening peak hour were analyzed for each study intersection using SYNCHRO. Study intersections include all signalized intersections along the 15-mile project corridor and comprise of 40 intersections in total. **Attachment A** shows all of the study intersections.

3.1.1 Development of Growth Scenarios

In coordination with VDOT staff, the project team studied historical growth in Annual Average Daily Traffic (AADT) along the corridor, and reviewed growth projections based on MWCOG Version 2.2 Model with Land Use Round 8.2 projections. Between 2001 and 2012 traffic volumes grew at a rate of between negative one percent and positive one percent per year, depending upon the location along the corridor. By contrast, MWCOG projections for future traffic volumes show greater rates of growth—between one and two percent each year. Given the large difference between the historical growth rates and the MWCOG growth rate, the project team developed two growth rate scenarios to apply to the No Build alternative:

1. Moderate Growth Rate: Considers both historical and MWCOG growth rates, ranging from 0.75-1.3 percent annually
2. High Growth Rate: MWCOG output growth rate, which varies from 1.0 to 2.0 percent annually

Attachment B provides detailed information on the development and detailed definition of the two growth rate scenarios. Section 3.1.2 describes the results on both the intersection LOS and V/C ratio.

3.1.2 Intersection Performance with 2035 Traffic Projections

Using SYNCHRO traffic analysis software, the team analyzed future traffic conditions at intersections along the entire length of the corridor. For both growth rate scenarios, intersection LOS and V/C ratio in the morning and evening peak hour were analyzed.

Table 3-1 provides a summary of LOS and intersection V/C for the 40 study intersections under the moderate growth rate and high growth rate scenarios in 2035. For comparison purposes, the existing 2035 lane configuration results were also included.

Under the moderate growth rate scenario, results show that with the consistent six-lane cross-section, three intersections in the morning peak and four intersections in the evening peak hour operate with LOS E or worse. Only one intersection in the morning peak hour operates with LOS F. Under the high growth rate scenario, with the consistent 6-lane cross-section, four intersections in the morning peak and ten intersections in the evening peak hour operate with LOS E or worse. One intersection in the morning peak and three intersections in the evening peak operate with LOS F. Detailed traffic analysis which includes intersection LOS and v/c ratios for all study intersections is provided in **Attachment C**.

Table 3-1: Intersection Level of Service and Volume to Capacity Summary for 2035 Growth Scenarios (No Build alternative)

Measure	Existing Lane Configuration (2035)		No Build Moderate Growth (2035)		No Build High Growth (2035)	
	AM	PM	AM	PM	AM	PM
# of intersections with LOS E or worse	3	3	3	4	4	10
# of intersections with volume/capacity > 0.95	5	4	4	7	7	17

*Note: LOS analysis included no additional traffic operations improvements

3.2 2035 Traffic Impacts 2035 for Alternative Lane Configurations

The second step to confirm the No Build alternative was to compare it against other vehicular lane configurations to understand the tradeoffs between accommodating future vehicular demand, and minimizing right-of-way and improving pedestrian safety and accommodation. Two additional roadway configurations were developed and performance results were compared to the existing roadway configuration and the No Build alternative, including:

1. Expanded Lane: Adds an additional lane to the existing configuration, making the majority of the corridor four general purpose lanes in each direction
2. Converted lanes: Repurposes one existing travel lane per direction to serve as a managed lane for transit and potentially other high occupancy vehicles

All four vehicular lane alternatives analyzed are described and shown in Section 3.2.2.

3.2.1 Methodology

To evaluate the performance of intersections under the different general purpose lane alternatives, the project team considered intersection LOS, V/C, and pedestrian crossing time as performance measures.

Intersection level of service and volume to capacity ratio were obtained using SYNCHRO's Highway Capacity Manual (HCM) signalized intersection capacity analysis module. Pedestrian crossing times were calculated based on the crossing distances and signal delays at the intersections. It is assumed that under the additional (expanded) lane scenario, cycle lengths would be higher to accommodate longer pedestrian crossing times (i.e., longer pedestrian clearance intervals). MUTCD's recommended pedestrian travel speed of 3 ½ feet per second (3.5 ft/s) was used to determine pedestrian clearance intervals.

Alternatives were evaluated utilizing the moderate growth rate scenario and tested at 12 intersections along two segments; five intersections along Route 1 near Fort Belvoir and seven intersections at Hybla Valley (See **Figures 3-3** and **3-4**). The two segments were selected based on:

- High variability in LOS and V/C ratios in the No Build analysis
- Variability of general purpose lanes under existing conditions (4 lane vs. 6 lane operation)
- Location of the transition from BRT to Metro Rail for the Hybrid Alternative (Hybla Valley)

The selection was not based on the areas that have the worst traffic performance. Rather the selection was conducted such that the performance of the intersections can be generalized or extrapolated from the selected intersections to the entire corridor.

Given the relationship between population growth and growth in traffic over the past several years, and the range of intersection performance levels associated with the two growth scenarios, the project team recommended applying the moderate growth scenario for subsequent traffic analysis.

Figure 3-3: Analyzed Intersections, Route 1- Hybla Valley Segment

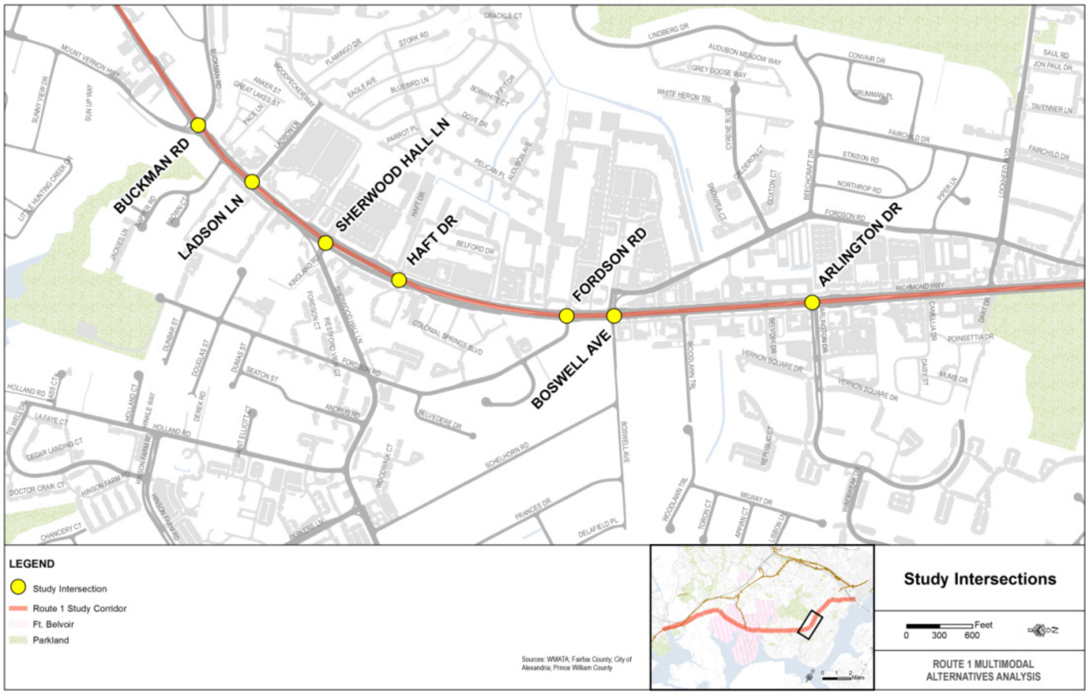
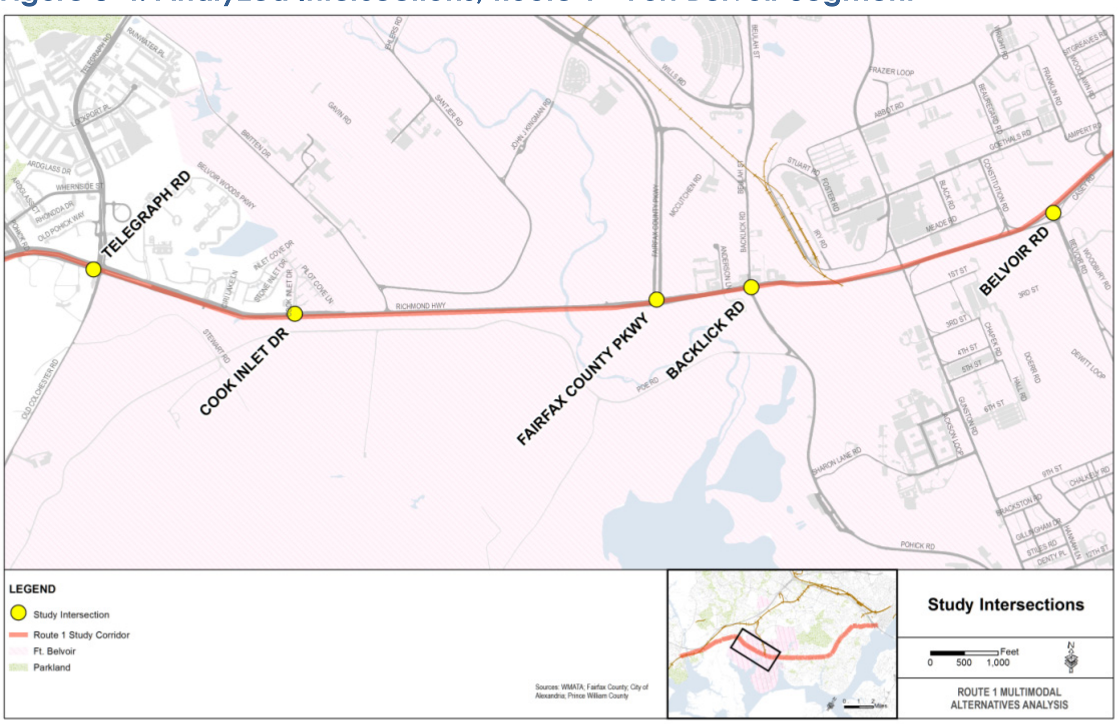


Figure 3-4: Analyzed Intersections, Route 1- Fort Belvoir Segment

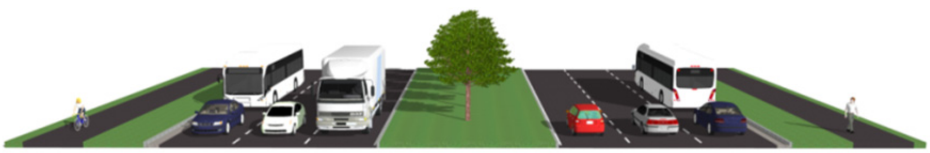


3.2.2 Vehicular Roadway Alternatives

Two lane configurations were analyzed in addition to the No Build alternative and the Existing Lane configuration, including "expanded lanes" and "converted lanes." The lane configuration alternatives are described below:

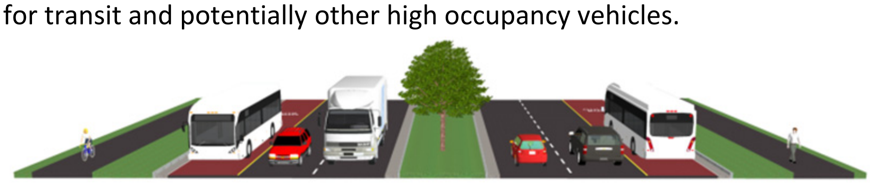
1. **Existing Lanes:** Retains the varied cross section as presently built. In general, there are two travel lanes in each direction in the southern segment, and three travel lanes in each direction in most of the northern segment. **Attachment A** shows the existing lane configuration.

2. **No Build** (also referred to as "consistent lanes"): Consists of planned improvements identified in the VDOT Centerline Study (1998) and the highway improvements included in the adopted CLRP 2013. The No Build assumes a consistent three-lane per direction (6-lane total) configuration for the majority of the subject segment with the exception of the northernmost portion which would retain its existing four-lanes per direction.



3. **Expanded Lanes:** Adds an additional lane, making the majority of the corridor a four lane per direction configuration (although some areas are expanded from two to three lanes).This alternative is also the widest cross-section.

4. **Converted Lanes**: Repurposes one existing travel lane per direction to serve as a managed lane for transit and potentially other high occupancy vehicles.



3.2.3 Performance of Roadway Alternatives

Table 3-2 shows intersection LOS and **Table 3-3** displays intersection volume to capacity ratios for Hybla Valley and Fort Belvoir segments under different roadway alternatives in 2035.

Results indicate that in the morning peak hour, consistent travel lane alternative or the No Build (3 travel lanes in each direction) yields similar intersection level of service and volume to capacity results as compared with the expanded lanes alternative. In the evening peak hour, the expanded lanes alternative performs better than the consistent number of lanes alternative, resulting in improved intersection level of service and lower volume to capacity ratio; however, it is also important to note that none of the selected intersections within Hybla Valley and Fort Belvoir segments operates with LOS F under the No Build, or consistent lanes alternative.

Table 3-2: Intersection Level of Service (Hybla Valley and Fort Belvoir Route 1 segments) 2035

Intersection	Existing Lane Configuration		No Build (Consistent Lanes)		Expanded Lanes		Converted Lane	
	LOS AM	LOS PM	LOS AM	LOS PM	LOS AM	LOS PM	LOS AM	LOS PM
Hybla Valley								
Arlington Dr	B	C	B	C	B	C	D	E
Boswell Ave	C	D	C	D	C	D	D	F
Fordson Rd/Shopping Cen.	B	D	B	D	B	D	B	F
Haft Dr	A	B	A	B	A	B	A	D
Sherwood Hall Lane	C	E	C	E	C	D	D	F
Ladson Ln	A	C	A	C	A	B	C	F
Buckman Rd/Mt Vernon	E	E	E	E	E	D	F	F
Fort Belvoir								
Belvoir Rd	C	D	B	C	B	C	C	D
Backlick Rd	E	F	D	E	D	D	E	F
Fairfax County Pkwy	C	F	C	D	C	C	C	F
Cook Intel Dr	D	E	A	A	A	A	D	E
Telegraph Rd	D	D	D	D	D	D	F	F
Total								
# of Intersections with LOS E or worse	**2**	**5**	**1**	**3**	**1**	**0**	**3**	**10**

Table 3-3: Volume to Capacity Ratios (Hybla Valley and Fort Belvoir Route 1 segments) - 2035

Intersection	Existing Lane Configuration		No Build (Consistent Lanes)		Additional Lane		Converted Lane	
	LOS AM	LOS PM	LOS AM	LOS PM	LOS AM	LOS PM	LOS AM	LOS PM
Hybla Valley								
Arlington Dr	0.67	0.90	0.67	0.90	0.67	0.88	0.89	1.02
Boswell Ave	0.76	0.94	0.76	0.94	0.65	0.84	0.97	1.17
Fordson Rd/Shopping Cent	0.64	0.92	0.64	0.92	0.62	0.85	0.85	1.15
Haft Dr	0.51	0.78	0.51	0.78	0.41	0.76	0.72	0.98
Sherwood Hall Lane	0.79	1.00	0.79	1.00	0.76	0.89	0.98	1.22
Ladson Ln	0.68	0.84	0.68	0.84	0.55	0.80	0.96	1.19
Buckman Rd/Mt Vernon	1.06	0.99	1.06	0.99	0.98	0.94	1.22	1.20
Fort Belvoir								
Belvoir Rd	0.83	0.94	0.80	0.73	0.80	0.66	0.83	0.94
Backlick Rd	1.17	1.29	1.16	1.04	1.14	0.92	1.17	1.29
Fairfax County Pkwy	0.74	1.22	0.70	0.96	0.70	0.84	0.74	1.22
Cook Intel Dr	1.08	1.13	0.75	0.79	0.60	0.64	1.08	1.13
Telegraph Rd	0.88	1.11	0.88	1.11	0.79	0.94	1.15	1.42
Total Intersection volume/capacity > 0.95	**3**	**6**	**2**	**5**	**2**	**0**	**7**	**11**

3.2.4 Pedestrian Crossing Time

Table 3-4 provides average pedestrian crossing times based on the signal delay and crossing distances for the Hybla Valley and Fort Belvoir intersections. The No Build alternative offers better pedestrian conditions compared to expanded lanes; shorter crossing time and crossing distance will potentially improve pedestrian compliance (preventing pedestrians from jay-walking) and improve pedestrian access to transit. However, the National Cooperative Highway Research Program Report 562[1] stated that above a delay of about 30 seconds, pedestrians are more likely to accept shorter gaps in traffic through which to cross. Even though the NCHRP Report mainly addresses pedestrian crossings at unsignalized intersections, long red duration (wait cycles) for pedestrians as a result of long cycle lengths along Route 1 may cause pedestrian compliance issues for all roadway alternatives.

[1] *National Cooperative Highway Research Program Report 562*: "Improving Pedestrian Safety at Unsignalized Crossings", Washington, D.C., 2006

Table 3-4: Average Pedestrian Crossing Time (seconds)

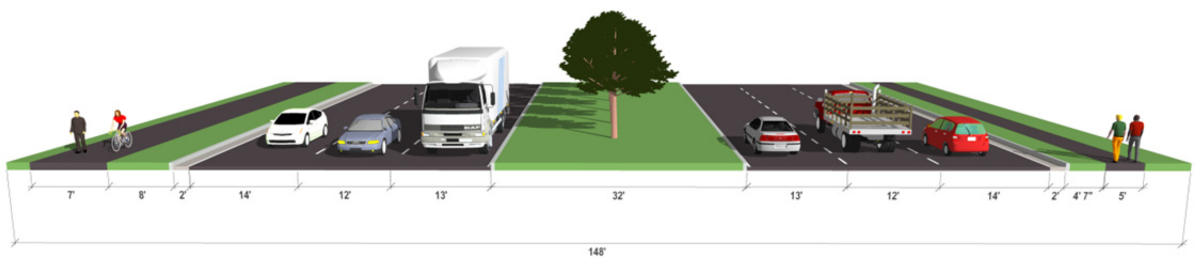
Segment	Existing (2 Lane)	No Build	Additional lane	Converted lane
Hybla Valley	95	100	110	94
Fort Belvoir	89	105	115	94

3.2.5 Conclusions

After evaluating existing travel patterns and future growth projections, and taking into account the desire to concurrently minimize pedestrian crossing distance in order to support access to and use of transit, the project team confirmed the No Build (consistent lanes) alternative as the recommendation. This alternative accommodates current and forecasted demand while enabling a transit-supportive environment.

The consistent number of lanes alternative is also supported in the Fairfax County Comprehensive Plan (as depicted in **Figure 3-5**).

Figure 3-5: Fairfax County Comprehensive Plan Recommended Section



The project team also examined the effects of shorter cycle length and reduced speeds on Route 1 travel time and network delay with implementation of the No Build alternative. The results of this analysis are provided **Attachment D**.

The next step in the traffic analysis was to simulate the No Build alternative with four different transit modes to understand the potential impacts on traffic. The results are discussed in the next section of the report.

4.0 Performance Results of No Build alternative with transit alternatives

This section presents the vehicular and transit performance results of the four multimodal alternatives under detailed evaluation. The No Build lane configuration, combined with the refined transit alternatives and the preferred bicycle and pedestrian alternative (10-foot multiuse path along the entire corridor) make up the four multimodal alternatives that are analyzed in detail and could be recommended for implementation. The four multimodal alternatives are defined below and described in further detail in the *Evaluation of Alternatives Report* (June 2014).

1. Alternative 1- Bus Rapid Transit – curb running
2. Alternative 2- Bus Rapid Transit- median running
3. Alternative 3- Light Rail Transit – median running
4. Alternative 4- Hybrid- Yellow line extension to Hybla Valley with supporting Bus Rapid Transit (median) to Woodbridge

4.1 Methodology

The analysis of the four refined Multimodal alternatives was based on 2035 projected traffic volumes using the moderate growth rate (described in 3.1.1). Performance measures were obtained through VISSIM traffic analysis. VISSIM is a microscopic traffic simulation software with the ability to simulate multi-modal traffic flows (e.g., pedestrians, bicycles, vehicles, and transit) through a network of street segments and intersections. VISSIM is a very effective tool in simulating transit behavior within the context of vehicular traffic. It is able to model different transit routes, various transit vehicle types (e.g., BRT or LRT), schedules, stops, dwell times of passengers, as well as transit preferential treatments.

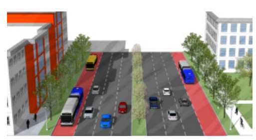
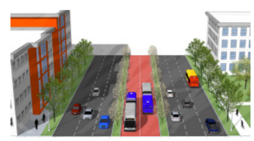
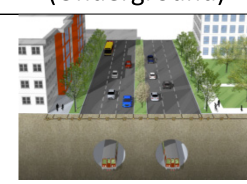
Key outputs of this analysis include performance measures for interdependent vehicular traffic flow and transit operations:

- Total Auto Network Delay (vehicle.hr/hr)
- Peak Direction Corridor Auto Travel Time (min/vehicle)
- Peak Direction Corridor Transit Travel Time (min/transit-vehicle)

4.1.1 Key Transit Inputs

Detailed characteristics of the transit elements of the multimodal alternatives are described in Section 5.0. Key features of transit operations relevant to the traffic analysis are shown in **Table 4-1** below and used as inputs to the VISSIM model.

Table 4-1: Key Transit Characteristics

	Alt 1- Bus Rapid Transit - Curb	Alt 2 - Bus Rapid Transit - Median	Alt 3 - Light Rail Transit	Alt 4 - Metrorail/Bus Rapid Transit Hybrid
Peak service headway	6 min	6 min	6 min	6 min
Principal Transit Operating Environment	Curb Running Bus Only Lane	Median Running Bus Only Lane	Median Running Transit Only Lane	Median Running Bus Only Lane + Exclusive Right-of-Way (Underground)
				
Local Bus Operating Environment	Curb Running Bus Only Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic
Fare Collection Method	Off-Board	Off-Board	Off-Board	Off-Board
Preferential Treatments	TSP for Peak Direction, (queue jump for mixed traffic section)	TSP for Peak Direction	TSP for Peak Direction	TSP for Peak Direction

4.1.2 Key Traffic Analysis Assumptions

The following assumptions were made during the development and analysis of VISSIM model:

- The average free-flow traffic speeds were 45 mph for the Hybla Valley segment analysis and 45 mph for the Fort Belvoir segment analysis (posted speeds).
- For the median running BRT (Alternative 2) and LRT (Alternative 3) alternatives, it is assumed that left turn phases on Route 1 operate under protected only phasing in order to eliminate a potential conflict between left-turning vehicles and transit, and improve safety. Moreover, local buses operate in mixed traffic under these two alternatives.
- For the curb running BRT alternative (Alternative 1), it is assumed that local buses also operate on the curb running bus-only lanes to take advantage of bus lanes. Furthermore, right-turning vehicles can enter the bus-only lanes to make right turns at intersections.

- Transit Signal Priority (TSP) is provided only for the transit vehicles traveling in the peak direction (e.g., TSP for northbound direction in the morning peak). No TSP was given for non-peak direction in order to limit the impact on non-transit traffic. Green extension and red truncation (also known as early green) were applied as TSP tactics. 10 seconds of green extension and red truncation (10 seconds truncation for each conflicting phase) were considered in the analysis.
- Transit performance measures for the No Build, such as travel time savings, were obtained based on the operation of Richmond Highway Express (REX) service.
- Transit travel time measure includes only in vehicle travel time and does not consider the delay due to transfers (e.g., transfer delay from BRT to Metrorail in the Hybrid Alternative).

The results of VISSIM findings for the two segments are provided in the following two sections.

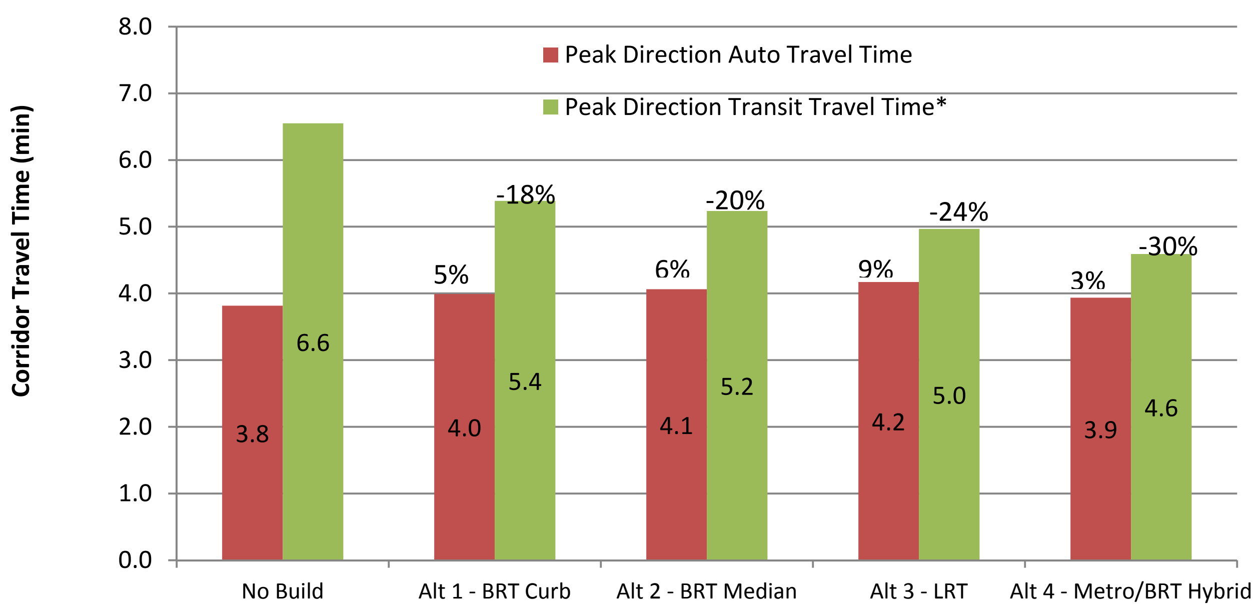
4.2 Travel Time Savings

Transit and automobile travel times were calculated for seven intersections within the two segments along the corridor: Hybla Valley and Fort Belvoir. The travel time data presented in this section are reported in two forms: absolute travel time and the percent difference. The differences in absolute travel time among the alternatives are minor due to the short study segment lengths. The percentage differences reflect the absolute differences extrapolated to the entire corridor.

4.2.1 Hybla Valley Study Segment

For the Hybla Valley segment (see **Figure 3-2** for reference), simulation results showed that all alternatives result in significant peak direction transit travel time savings, as compared with the existing conditions. Alternative 4 (Hybrid Metrorail and median running BRT) yielded the largest travel time saving (30 percent). Median running LRT (Alternative 3) and BRT (Alternative 2) reduced transit travel time by 24 percent and 20 percent, respectively. Curb running BRT resulted in the least travel time savings (about 18 percent), which can be explained by the right turning vehicles that also use bus-only lanes as well as the interaction between local buses and BRT. **Figure 4-1** shows the peak travel time results for automobiles and transit.

Figure 4-1: Peak Direction Travel Time – Hybla Valley



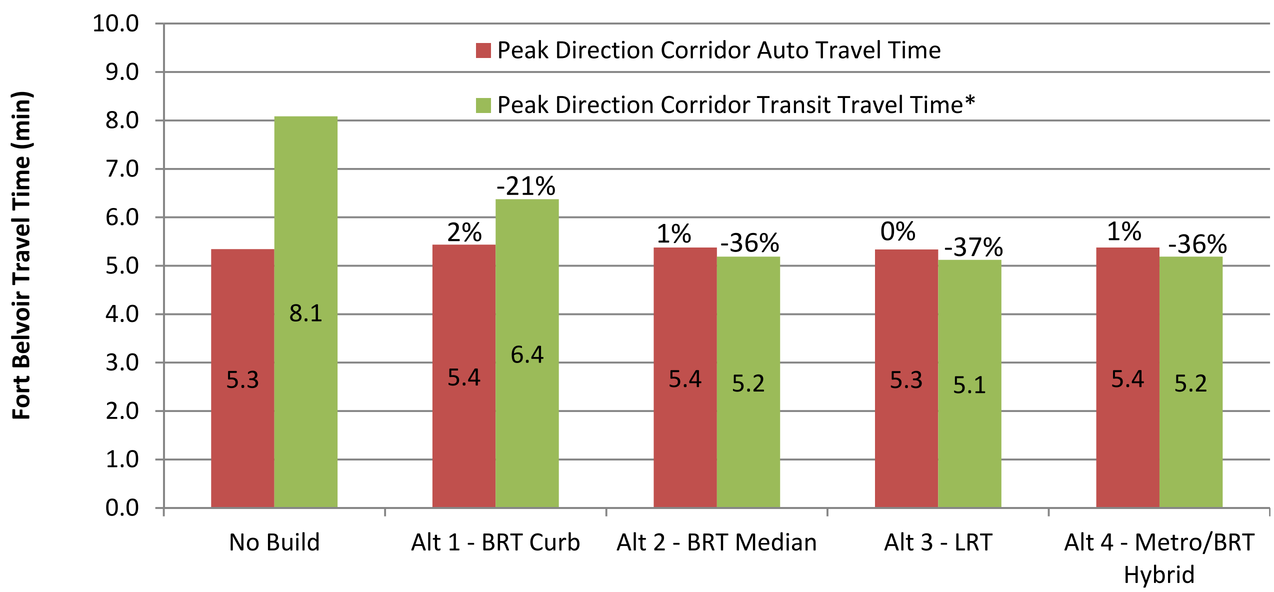
4.2.2 Fort Belvoir Study Segment

For the Fort Belvoir segment (see **Figure 3-3**), the VISSIM analysis findings show less impact on transit and auto travel time than along the Hybla Valley segment. The transit alternatives operate slightly differently through Fort Belvoir than through Hybla Valley:

- Alternative 4, BRT operates in the median through Fort Belvoir, similar to Alternative 2.
- Alternative 1 transitions from curb bus-only lanes to median bus-only lane (east of Telegraph Road intersection) through a special bus-only signal in order to permit buses to make all movements free of conflicting traffic movements. These signals are only activated when an approaching bus is detected.

Alternatives 2, 3, and 4, which operate in the dedicated median would reduce transit travel time and very marginally increase auto travel times. Results showed that the curb running BRT alternative reduced transit travel time by more than 20 percent compared to current REX travel times. All other transit alternatives resulted in travel time reduction of more than 35 percent. **Figure 4-2** shows the peak travel time results.

Figure 4-2: Peak Direction Travel Time



4.2.3 Corridor-wide findings

Because the VISSIM analysis only looked at two short segments, the travel time savings between the transit alternatives are relatively small (e.g., only 0.2 minutes difference between curb running BRT and median BRT). However, the travel time savings are more substantial when segment findings are extrapolated to the entire corridor. Extrapolation of VISSIM findings, for example, indicated approximately six minutes reduction in corridor travel time (between Mt Vernon Highway and Huntington Station) with curb running BRT and nine minutes reduction with median running BRT, as compared to REX operation. **Tables 4-2** and **4-3** summarize the impacts on auto travel time and transit travel time savings for each segment and extrapolated to the corridor.

Table 4-2: Corridor Peak Direction Auto Travel Time (Increase over Existing)

	Alternative 1: BRT- Curb	Alternative 2: BRT Median	Alternative 3: LRT	Alternative 4: Metro-BRT Hybrid
Hybla Valley Segment	5%	6%	9%	3%
Fort Belvoir	2%	1%	0%	1%
Corridor Peak Direction Travel Time Increase (Estimate)	1.0 min	0.7 min.	1.0 min.	0.3 min.

Table 4-3: Transit Travel Time Savings

	Alternative 1: BRT- Curb	Alternative 2: BRT Median	Alternative 3: LRT	Alternative 4: Metro-BRT Hybrid
Hybla Valley Segment	-18%	-20%	-24%	-30%
Fort Belvoir	-21%	-36%	-37%	-36%
Corridor Peak Direction Travel Time Savings (Estimate)	6 min	8.7 min	9.4 min	10.2 min

4.3 Auto Network Delay

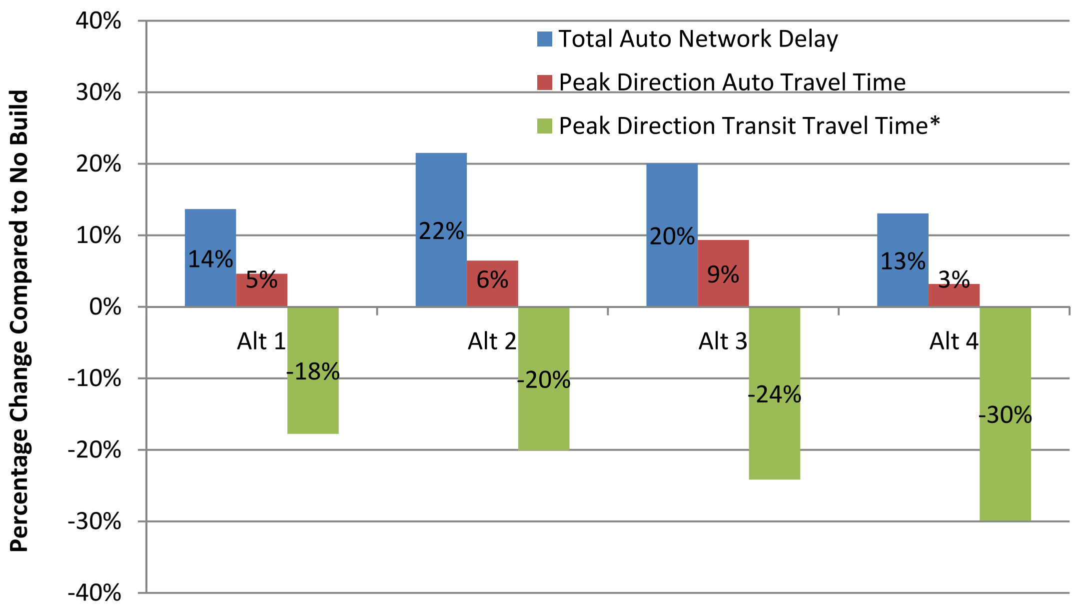
This section summarizes the impact on auto network delay. Auto network delay represents the impact on the surrounding roadway network, not just the Route 1 corridor. Results also indicated that transit alternatives caused considerable amount of auto network delay in the corridor.

4.3.1 Hybla Valley

For Alternatives 2 and 3, auto network delay increased by 22 percent and 20 percent, respectively. The increase in auto delay is primarily attributed to the application of TSP, causing impacts on non-transit traffic, and the elimination of permissive left turn phases (only protected left turn is allowed under median running transit only lanes to improve safety).

For Alternatives 1 and 4, the impacts on auto network delay are relatively lower than Alternatives 2 and 3, with delays of about 14 percent and 13 percent, respectively. The reason for lower impact on auto is due to the fact that curb running BRT (Alternative 1) does not require restriction of permissive left turns (does not conflict with the left-turn phases) and the Metrorail portion of the hybrid alternative (Alternative 4) has no impact on general traffic as it runs underground. **Figure 4-3** shows the results.

Figure 4-3: Auto Network Delay vs. Transit Travel Time



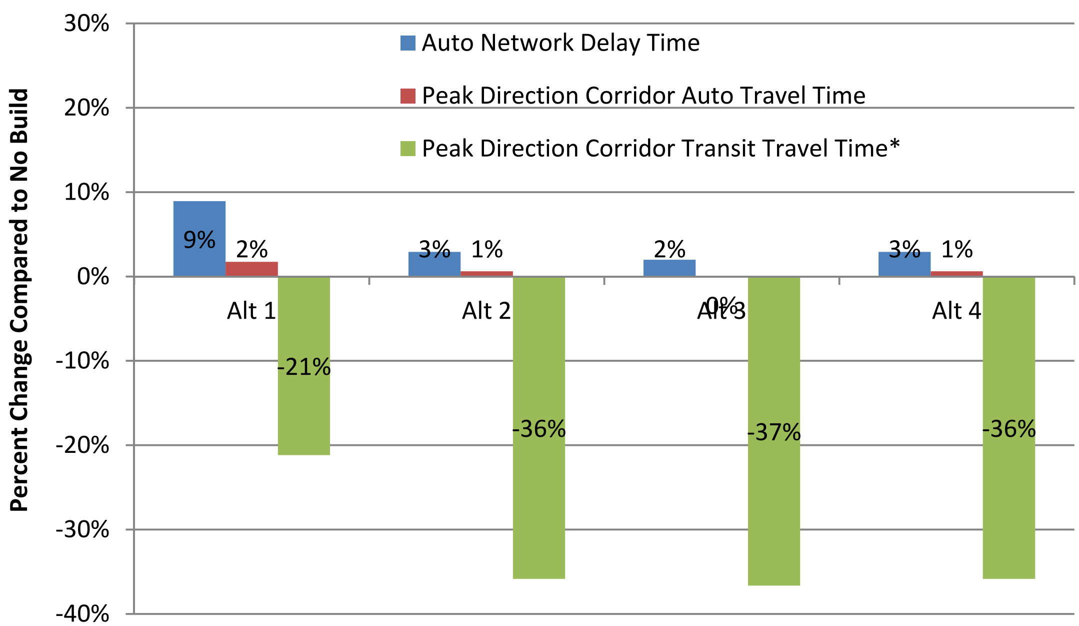
*Negative values indicate a reduction in transit travel time compared to the No-Build scenario

4.3.2 Fort Belvoir Segment

The impact on auto network delay was lower in the Fort Belvoir segment than in the Hybla Valley segment. Relatively lower increases in auto delay can be attributed to the long green intervals for Route 1 phases (therefore also long green intervals for transit alternatives) and better signal progression at Fort Belvoir intersections, which in turn eliminate the need for TSP and limit the impact on general traffic.

Alternative 1 increased auto network delay by 9 percent, while all other transit alternatives caused an increase of less than five percent delay. Higher auto delay under Alternative 1 is due in part to the special transit-only signal at Telegraph Road, which reduces intersection capacity when a bus is detected. **Figure 4-4** shows the auto network delay and transit travel time.

Figure 4-4: Auto Network Delay vs. Transit Travel Time



*Negative values indicate a reduction in transit travel time compared to the No-Build scenario

5.0 Transit ridership forecasts

Transit ridership forecasts were developed for a set of initial transit alternatives and a subsequent set of refined alternatives. Forecasts were prepared using a modeling tool and methodology used previously for an FTA-approved forecast. The goal of the ridership forecasting effort at this stage of project planning is to facilitate the comparison among the range of transit alternatives and provide an initial assessment of how the alternatives perform with respect to FTA's New & Small Starts rating criteria. This section is organized into three sections: description of the forecasting tool, list of transit operating characteristics, and a summary of ridership forecasts for each alternative.

5.1 Forecasting Tool

The FTA requires that project sponsors seeking Capital Investment Program (New Starts/Small Starts) funding to rigorously develop travel demand forecasting model tools used to evaluate fixed guideway transit investments. The forecasting approach which was applied represents an adaptation of the forecasting methods used and applied for the Columbia Pike Transit Initiative. As part of its review of the Columbia Pike Transit Initiative, FTA approved this variant of the MWCOG model for the purposes of New and Small Starts evaluation.

For the purpose of enhancing this variant of the MWCOG model, the project team implemented a number of refinements to enhance the forecasting capabilities in the Route 1 corridor. This work included:

- Updates to the transportation analysis zone (TAZ) structure
- Updates to the transportation network for both the highway and transit system
- Refinements to ensure that the model replicates observed transit customer behavior in the Route 1 corridor, including access mode, time of day distribution, route selection, low income/transit dependents, and mode selection (bus, Metrorail and bus-to-Metrorail)

A complete list of model enhancements made for the Route 1 corridor is included in the Travel Demand Forecasting Methodology report, **Attachment E**.

The resulting Route 1 forecasting model has a number of methodological advantages over the current MWCOG model and the current WMATA Regional Transit System Plan model as it pertains to transit forecasting:

- It does not need to rely on large transit submode-specific constants in the mode choice model to describe sub-transit mode preferences.
- The MWCOG home-based-work (HBW) trip distribution model is replaced with a hybrid data/modeled process that better reflects observed travel behavior. This process uses the MWCOG “trip ends” (trip generation), while replacing the home-to-work travel patterns (trip distribution) with real, observed data.

The 2035 No-Build alternative reflects committed highway and transit projects as reflected in the MWCOG Constrained Long Range Plan for 2030. The committed projects that are directly relevant to the Route 1 corridor include:

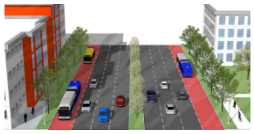
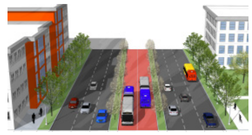
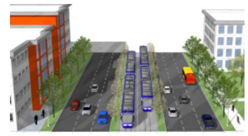
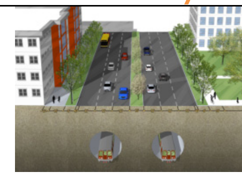
- Travel lane expansions along Route 1 between Woodbridge and Mt. Vernon Highway,
- HOV and HOT lanes along I-95, and
- Improvements to bus stops and bus stop intersections along Route 1.

5.2 Transit Operating Characteristics

This section summarizes the service plans and operating characteristics of the four refined transit alternatives. The operating characteristics of transit play a major role in the performance of transit systems (e.g., travel time and reliability). For example, high frequency transit service operating with off-board fare collection and transit signal priority (TSP) increases the relative attractiveness of transit by improving transit speed and reliability, which in turn results in higher ridership.

Service headway (or frequency) and transit travel time are the two key model parameters that typically affect ridership forecasting. In order to make a fair comparison among the alternatives, the same service headway was assumed for each of the transit alternatives. **Table 5-1** shows transit operating characteristics for different transit alternatives for the Route 1 corridor. Detailed information on the assumptions is provided in **Attachment F**.

Figure 5-1: Transit Operating Characteristics

	Alternative 1: BRT- Curb	Alternative 2: BRT Median	Alternative 3: LRT	Alternative 4: Metro-BRT Hybrid
				
Weekday peak service headway	6 min	6 min	6 min	6 min
Weekday off-peak service headway	12 min	12 min	12 min	12 min
Weekend service headway	20 min	20 min	20 min	20 min
Vehicle Capacity	90 pax/bus	90 pax/bus	160 pax/car – Single car train	120 pax/car – 8 car train
Operating Environment	Mixed Traffic + Curb Running Bus Only Lane	Median Running Bus Only Lane	Median Running Transit Only Lane	Median Running Bus Only Lane + Exclusive Right-of-Way (Underground)
Local Bus Service	Mixed Traffic + Curb Running Bus Only Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic
Fare Collection Method	Off-Board	Off-Board	Off-Board	Off-Board
Preferential Treatments	Queue Jump (for Mixed Traffic Section) and TSP for Peak Direction	TSP for Peak Direction	TSP for Peak Direction	TSP for Peak Direction

5.3 Transit Travel Time Estimation

This section discusses the methodology for estimating the transit travel times along the corridor to develop ridership forecasts. Travel time for the four refined transit alternatives were estimated for the peak periods using an analytical approach and spreadsheet calculations. The estimated travel times were then used in the travel demand forecasting model to develop ridership.

Travel time components for the transit alternatives include in-motion travel time, transit stop dwell time, and traffic signal delay. Travel time components are below and details are described in **Attachment G.**

In-motion travel time is calculated based on the assumed free-flow travel time using a maximum defined speed (free flow speed) for each alternative. For the transit alternatives operating in exclusive bus lane (i.e., curb running BRT, median running BRT and LRT), 45 mph was assumed as the maximum speed. For BRT in mixed traffic and Metrorail, 35 mph and 55 mph were assumed, respectively.

Transit stop dwell time includes passenger boarding and alighting times at each stop as well as the delay that occurs due to acceleration and deceleration. Based on the ridership forecasts obtained from the initial screening alternatives, dwell time was assumed as 25 seconds at stops with high ridership and 15 seconds at stops with moderate ridership. Note that these relatively short dwell times were used assuming the availability of off-board fare collection, level boarding platforms, and boarding through multiple doors.

Traffic signal delay estimation assumed uniform, deterministic arrivals at intersections, using the well-known cumulative arrivals and departures concept (based on the duration of red and green signal and the arrival volumes, Highway Capacity Manual 2000). Delay savings associated with TSP and queue jump lanes were estimated using results of past research.

5.4 Summary of Ridership Forecast Results

Ridership forecasts were prepared at two stages in the development of alternatives: initial and refined alternatives. These ridership forecasts were prepared using MWCOG year 2035 Round 8.2 (Scenario 1) land use forecasts. Additional forecasts were also developed for refined alternatives using enhanced land use growth scenarios, Scenario 2 and Scenario 3.

5.4.1 Initial Transit Alternatives

The first stage forecasts related to the initial transit alternatives, which assumed a transit mode and alignment for the full 15-mile study corridor. The descriptions of the alternatives are provided in the *Evaluation of Alternatives Report* (June 2014). These forecasts were developed with high-level transit operating assumptions, to provide screening of initial alternatives. **Table 5-1** summarizes the average weekday project ridership forecasts for these initial alternatives. The forecasts reflect the range of transit service characteristics and amenities associated with different modes.

Table 5-1: Project Ridership Forecasts for the Initial Multimodal Transit Alternatives

Land Use Scenario	Average Weekday Ridership (2035)			
	Enhanced Bus	Bus Rapid Transit	Light Rail Transit	Metrorail
Scenario 1	9,500	16,600	18,400	38,500

5.4.2 Refined Transit Alternatives

The second set of forecasts is for the refined, multimodal transit alternatives. The refined alternatives represent a narrower range of travel times and transit amenities. The key transit operating assumptions are detailed above in Section 5 of this report. **Table 5-2** summarizes the ridership results of the four refined alternatives.

Table 5-2: Project Ridership Forecasts for the Refined Multimodal Alternatives

Land Use Scenario	Average Weekday Ridership (2035)			
	Alternative 1: BRT- Curb	Alternative 2: BRT - Median	Alternative 3: LRT	Alternative 4: Metro-BRT Hybrid
Scenario 1	15,200	16,600	18,400	26,500 (10,600 BRT; 22,900 Metro)

The detailed ridership forecasts for all modes and key statistical measures are shown in **Attachment F**.

5.4.3 Enhanced Land Use Scenarios

The enhanced land use scenarios were modeled to identify the market potential with additional land use intensity, along Route 1 corridor, over the MWCOG (Scenario 1) 2035 forecasts. The ridership forecasts were developed for two enhanced land use scenarios: Scenario 2 and Scenario 3. The Scenario 2 assumes 15-25 percent growth above the MWCOG forecasts whereas Scenario 3 assumes very high growth, upwards of 150 percent along the Route 1 corridor. The detailed descriptions of the land use scenarios are provided in the Land Use and Economics Report (May 2014). Ridership forecasts were prepared for each of the refined alternatives with Scenario 2 land use, and for Alternative 4- Metro-BRT Hybrid with Scenario 3 land use.

Table 5-3 summarizes ridership results for the Scenario 2 and Scenario 3 land use. As shown in the table the Scenario 2 ridership changes are consistent with the assumed land use growth in the Route 1 corridor. For the local travel oriented BRT and LRT alternatives there is a higher increase (17-18%) compared to the more urban core travel oriented Metrorail /BRT (10%) alternative.

For Scenario 3 ridership forecasts were prepared for the Metrorail/BRT alternative assuming significant (over 150%) growth in the land use in the Route 1 corridor. As shown in the table, ridership forecasts for the project increase by about 40 percent compared to Scenario 1.

Table 5-3: Project Ridership Forecasts for the Enhanced Land Use Scenarios

Land Use Scenario	Average Weekday Ridership (2035)			
	Alternative 1: BRT- Curb	Alternative 2: BRT Median	Alternative 3: LRT	Alternative 4: Metro-BRT Hybrid
Scenario 2	17,900	19,500	21,500	28,900 (11,800 BRT; 24,400 Metro)
Percent Change from Scenario 1	*18%*	*17%*	*17%*	*10% (11% BRT; 7% Metro)*
Scenario 3	n/a	n/a	n/a	36,800 (13,000 BRT; 31,000 Metro)
Percent Change from Scenario 1	*n/a*	*n/a*	*n/a*	*39% (23% BRT; 35% Metro)*

Note: Table 5-3 does not include a Park & Ride facility at the Hybla Valley Metrorail station. AECOM also ran these alternatives with a PNR facility at Hybla Valley (1,500 spaces) and each scenario generated approximately 3,500 additional trips (Scenarios 1, 2 and 3).

5.5 Ridership Forecasting Next steps

The analyses Next steps related to ridership forecasting for subsequent studies, including NEPA documentation for the Route 1 Multimodal Project, would be to upgrade the version MWCOG mode 2.3 to satisfy FTA requirements. This work would involve upgrading to the Version 2.3 platform, then splitting TAZs to represent the grain of analysis required for walk and transit trips. The model constants that reflect the range of mode preference would need to be refined to match FTA expectations.

The current forecasts are generally being developed from the transit perspective, but the study recommendations will document general system deficiencies from the multimodal and highway perspectives. With land use changes, recommendations will address general anticipated impacts on the roadway network and outline potential mitigation approaches.

Attachment A: Current and Proposed Lane Configuration and Study Intersections

Figure A-1: Existing and Proposed Lane Configuration

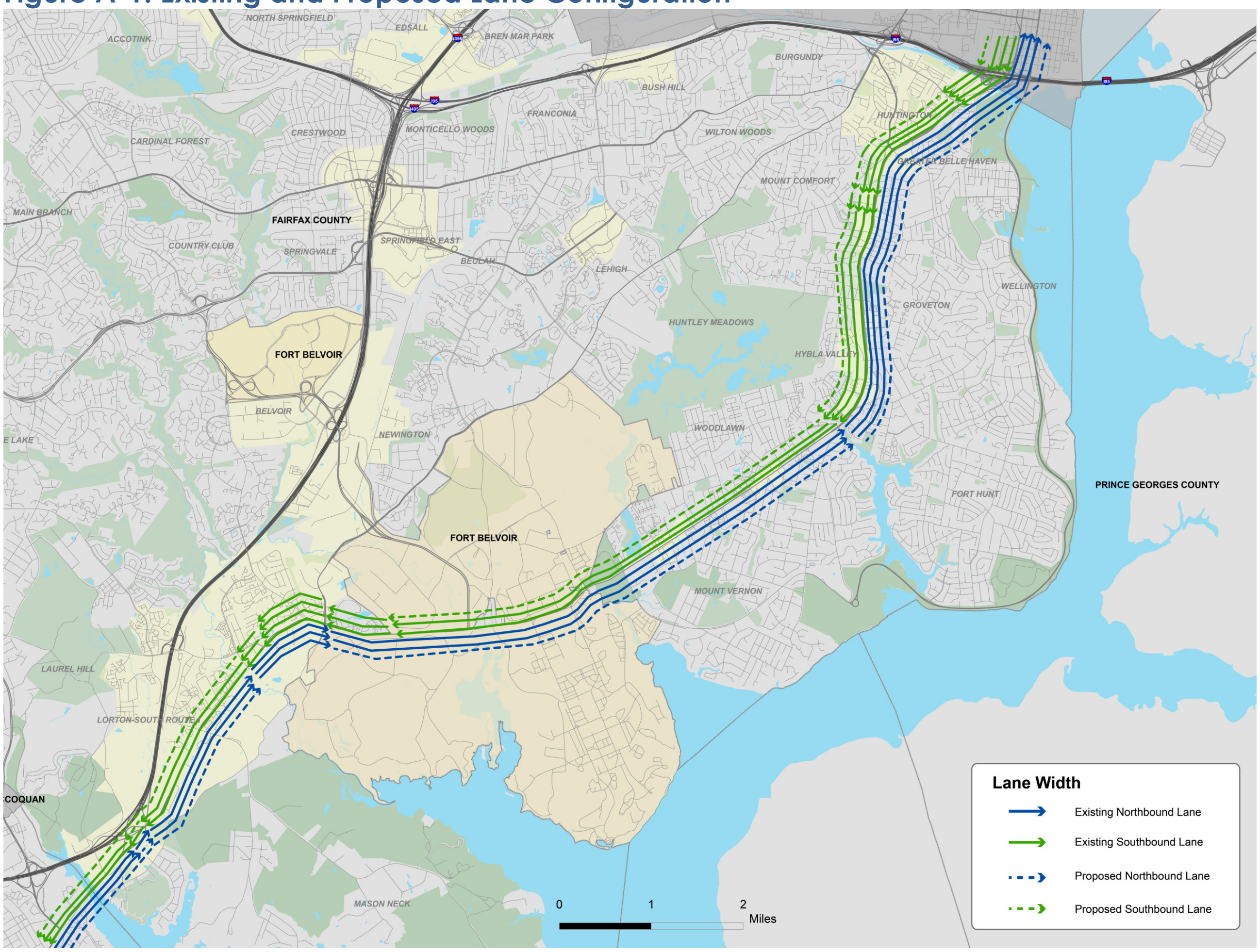
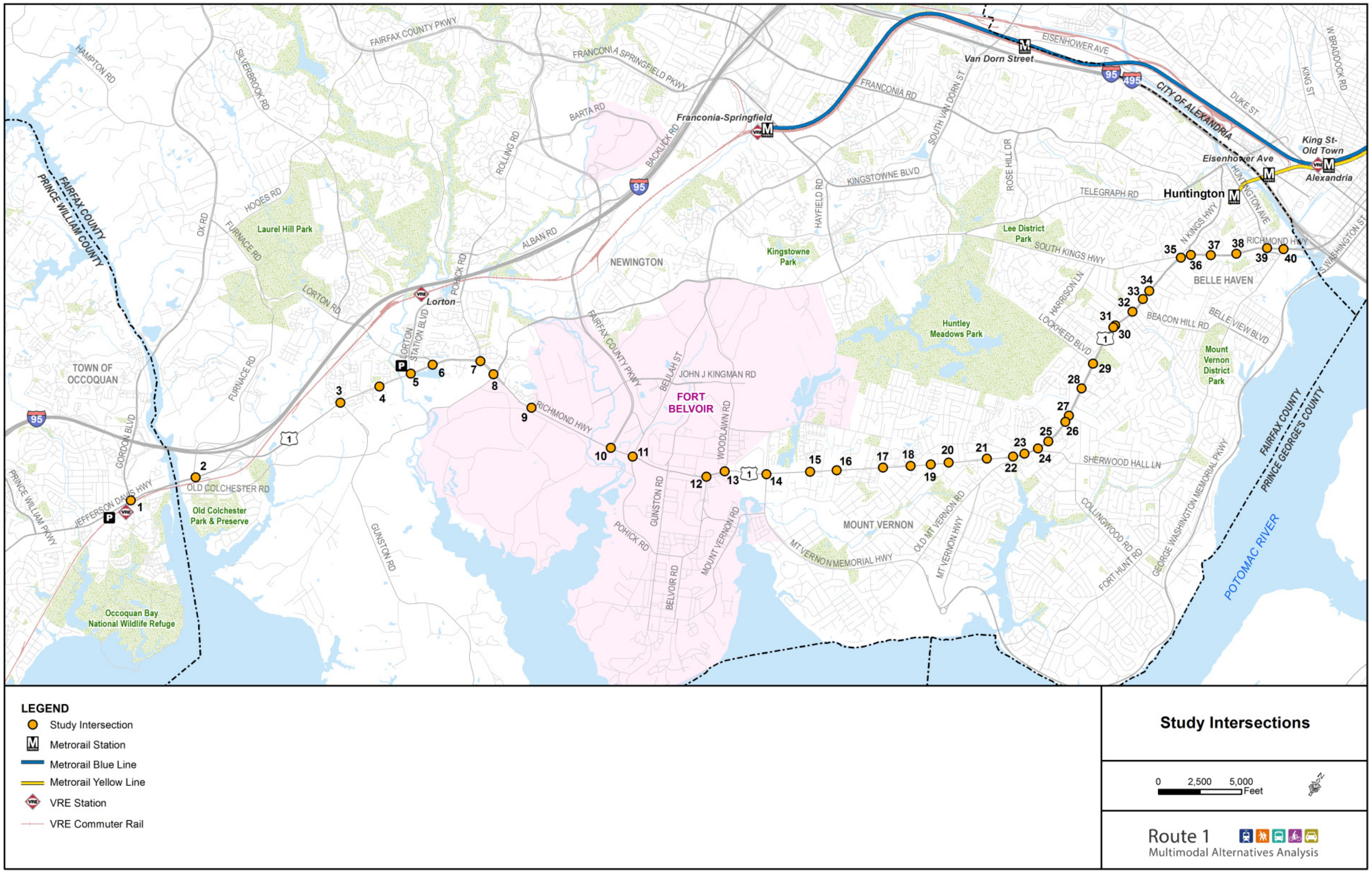


Figure A-2: Study Intersections



Attachment B: Traffic Growth Rate Development Methodology

Methodology

The project team considered historical growth rates in Annual Average Daily Traffic (AADT) and growth rates obtained from Metropolitan Washington Council of Governments (MWCOG) Version 2.2 with Land Use Round 8.2 model. For purposes of this analysis, the project team developed and tested two growth scenarios: moderate growth rates, where historical growth rates were blended with MWCOG projections; and high growth rates, based directly on MWCOG projections. For both growth rate scenarios, intersection LOS and volume to capacity (v/c) ratio in the morning and evening peak hour were analyzed for each study intersection using SYNCHRO. Study intersections include all signalized intersections along the 15-mile project corridor comprise of 40 intersections in total.

Historic Growth Rates

To understand the historic growth pattern along the corridor, AADT volumes between 2001 and 2012 were analyzed. **Figure B-1** displays the annual percentage growth rates. Positive values indicate an increase in volume from 2001 to 2012. Results indicate that, except for Segment 3 (Gunston Road to Woodlawn Road), traffic volumes along the corridor stayed relatively constant or decreased between the years 2001 and 2012.

Table B-1 shows recent corridor demographic growth trends. In general, traffic growth rates have been less than population and employment growth rates in the corridor.

Table B-1: Combined Population and Employment Growth, 2000 to 2010

	North Area	South Area
Census 2000	89,214	27,806
Census 2010	98,852	41,152
Percent Growth	**10.8%**	**48.0%**
Annual Percent Growth	**1.0%**	**4.0%**

Figure B-1: Annual Percentage Growth Rates based on Historical Traffic Data (2001 - 2012)

MWCOG Growth Rates

Table B-2 provides annual percentage growth rates based on the MWCOG model 2010 and 2035 outputs. MWCOG model results show approximately one to two percent annual growth rate along the corridor, where the rates are typically higher in the off-peak direction (i.e., southbound in the morning peak and northbound in the evening peak). This could be attributed to the increase in reverse commuting trips (i.e., non-peak direction trips), particularly due to employment growth in the Fort Belvoir area. MWCOG forecasts indicate that population along the corridor will grow by about 32 percent and employment will grow by about 38 percent, which approximately results in 1.2 percent annual growth along the corridor.

Table B-1 – Annual Percentage Growth Rates based on MWCOG 2010 and 2035 Models

	Annual Growth Rate (%)									
	Gunston Road to Armistead		Telegraph Road and Fairfax County Parkway		Frye to Mt Vernon Highway		S Kings Hwy to Fairhaven		Fairhaven to Huntington	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
AM	2.31	1.02	2.24	1.44	1.36	1.39	0.91	0.01	1.48	0.50
PM	1.20	1.45	1.59	1.86	1.94	1.74	1.44	0.83	0.95	1.18

Findings: Proposed Growth Rates

The project team identified two growth rates to apply: “moderate” and “high” growth rate to analyze the Consistent Lane (No Build Alternative).

Given the results of the MWCOG model outputs, reverse commute impacts, and historic growth rates, the project team developed a “moderate” growth scenario to evaluate the 2035 traffic conditions. Additionally, to test the robustness of the intersections, the project team also analyzed with a “high growth” rate scenario, in which the growth rates were based on MWCOG model outputs.

Moderate Growth Rate: This scenario considered both historical and MWCOG growth rates to develop annual percentage growth rates. **Figure B-2** shows segment growth rates under the moderate growth scenario.

High Growth Rate: In general, this scenario used MWCOG model outputs. It should be noted that the maximum growth rate along the segments was limited to two percent (based on engineering judgment). Therefore, in areas where MWCOG model indicated more than two percent growth (e.g., Segment 1, morning peak in the southbound direction, see **Table B-1**), a two percent growth rate was proposed. **Figure B-3** shows segment growth rates under the high growth scenario.

Figure B-2: Annual Percentage Growth Rates by Segment – Moderate Growth Rate

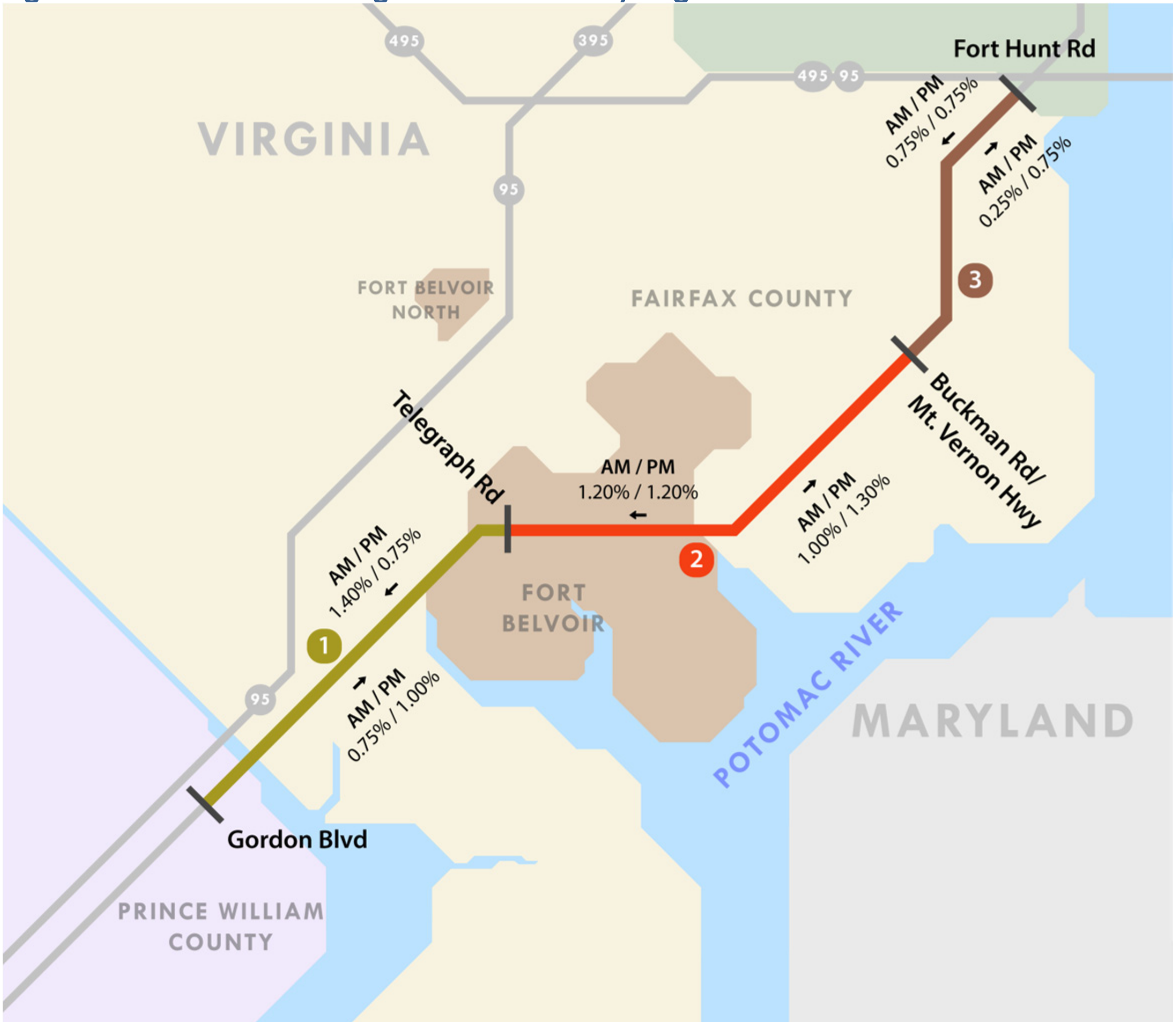


Figure B-3: Annual Percentage Growth Rates by Segment - High Growth Rate Scenario

Attachment C: Intersection Performance Results

Intersection LOS and v/c ratio under the moderate growth rate and high growth rate scenario were evaluated. For comparison purposes, existing intersection LOS results were also included.

LOS is based on the average vehicle delay per vehicle for the traffic movements in the intersection. **Table C-1** defines signalized intersection LOS based on observed delay per vehicle.

Table C-1: Relationship between Average Vehicle Delay and LOS for Signalized Intersections

Delay Per Vehicle (seconds)	Level of Service (LOS)
≤ 10	A
> 10 - 20	B
> 20 - 35	C
> 35 - 55	D
> 55 - 80	E
> 80	F

Source: Highway Capacity Manual

Under the moderate growth scenario, results show that with the consistent 6-lane cross-section, none of the intersections operate with LOS F in the evening peak and only one operates with LOS F in the morning peak. Three intersections in the morning peak and four intersections in the evening peak operate with LOS E or worse.

Under the high growth rate scenario, with the consistent 6-lane cross-section, only one intersection in the morning peak and three intersections in the evening peak operate with LOS F. Four intersections in the morning peak and ten intersections in the evening peak hour operate with LOS E or worse. **Table C-2 and Table C-3** provide intersection LOS and v/c ratio under the moderate and high growth rate scenarios, respectively. For comparison purposes, existing and No Build moderate growth intersection LOS results are also included

Table C-2: Intersection LOS and v/c ratios- Moderate Growth Scenario (2035)

Intersection	Existing		Consistent Lanes – Moderate Growth			
	LOS AM	LOS PM	LOS AM	v/c - AM	LOS PM	v/c - PM
Ft Hunt Rd	F	D	F	1.16	D	0.86
Huntington Ave	C	D	C	0.69	D	0.69
Holiday Inn Ent	B	B	B	0.61	B	0.55
Quander Rd	B	B	B	0.79	B	0.67
N Kings Hwy	B	C	B	0.74	D	0.77
S King Hwy	D	D	D	0.92	E	0.95
Southgate Dr	A	B	B	0.70	B	0.65

Intersection	Existing		Consistent Lanes – Moderate Growth			
	LOS AM	LOS PM	LOS AM	v/c - AM	LOS PM	v/c - PM
Beacon Hill Rd	C	D	C	0.89	D	0.88
Memorial St	B	C	B	0.80	C	0.97
Collard St	A	A	A	0.77	A	0.67
Popkins Lane	B	B	B	0.77	B	0.82
Lockheed Blvd/Dart Dr	C	D	D	0.81	D	0.93
Arlington Dr*	B	C	B	0.67	C	0.90
Boswell Ave*	C	D	C	0.76	D	0.94
Fordson Rd/Shopping Center*	B	C	B	0.64	D	0.92
Haft Dr*	A	B	A	0.51	B	0.78
Sherwood Hall Lane*	C	D	C	0.79	E	1.00
Ladson Ln*	A	B	A	0.68	C	0.84
Buckman Rd/Mt Vernon*	F	D	E	1.06	E	0.99
Janna Lee Ave	A	B	A	0.52	B	0.57
Russell Rd	C	B	C	0.75	B	0.85
Mohawk Ln	A	B	A	0.52	B	0.68
Buckman Rd/Radford Ave	B	B	B	0.49	B	0.64
Frye Rd	B	B	B	0.59	B	0.66
Lukens Ln	B	B	B	0.51	B	0.70
Cooper Rd	B	B	C	0.66	B	0.63
Mt Vernon Memorial Hwy	E	E	D	0.90	D	0.92
Woodlawn Rd	A	A	A	0.59	A	0.52
Belvoir Rd*	B	C	B	0.80	C	0.73
Backlick Rd*	D	E	D	1.16	E	1.04
Fairfax County Pkwy*	D	E	C	0.70	D	0.96
Cook Intel Dr*	B	A	A	0.75	A	0.79
Telegraph Rd*	D	D	D	0.88	D	1.11
Pohick Rd	C	B	C	0.94	C	0.91
Lorton Rd	C	B	D	0.90	C	0.92
Armistead Rd	B	C	C	0.82	C	0.86
Dutchman Drive	A	B	A	0.64	A	0.64
Gunston Rd	D	C	D	0.87	C	0.97
Furnace Rd	C	D	C	0.74	D	0.74
Gordon Blvd	D	B	E	1.03	C	0.95

Table C-3: 2035 No Build Intersection LOS & v/c Ratios under High Growth Rate Scenario

Intersection	Existing		Moderate Growth		High Growth			
	LOS AM	LOS PM	LOS AM	LOS PM	LOS AM	v/c - AM	LOS PM	v/c – PM
Ft Hunt Rd	F	D	F	D	F	1.16	F	0.93
Huntington Ave	C	D	C	D	C	0.70	D	0.75
Holiday Inn Ent	B	B	B	B	B	0.62	C	0.60
Quander Rd	B	B	B	B	B	0.83	B	0.74
N Kings Hwy	B	C	B	D	B	0.74	D	0.84
S King Hwy	D	D	D	E	D	0.94	F	1.04

Intersection	Existing		Moderate Growth		High Growth			
	LOS AM	LOS PM	LOS AM	LOS PM	LOS AM	v/c - AM	LOS PM	v/c – PM
Southgate Dr	A	B	B	B	B	0.70	B	0.71
Beacon Hill Rd	C	D	C	D	C	0.92	E	0.96
Memorial St	B	C	B	C	B	0.81	D	1.08
Collard St	A	A	A	A	A	0.77	A	0.74
Popkins Lane	B	B	B	B	B	0.78	B	0.88
Lockheed Blvd/Dart Dr	C	D	D	D	D	0.81	E	1.01
Arlington Dr*	B	C	B	C	C	0.69	C	0.88
Boswell Ave*	C	D	C	D	C	0.79	D	1.01
Fordson Rd/Shopping Center*	B	C	B	D	B	0.69	D	0.99
Haft Dr*	A	B	A	B	A	0.51	B	0.81
Sherwood Hall Lane*	C	D	C	E	D	0.82	E	1.08
Ladson Ln*	A	B	A	C	A	0.68	D	0.93
Buckman Rd/Mt Vernon*	F	D	E	E	E	1.11	E	1.09
Janna Lee Ave	A	B	A	B	A	0.57	B	0.64
Russell Rd	C	B	C	B	D	0.83	C	0.96
Mohawk Ln	A	B	A	B	A	0.57	C	0.77
Buckman Rd/Radford Ave	B	B	B	B	B	0.57	B	0.72
Frye Rd	B	B	B	B	B	0.66	B	0.78
Lukens Ln	B	B	B	B	B	0.59	C	0.81
Cooper Rd	B	B	C	B	D	0.75	B	0.71
Mt Vernon Memorial Hwy	E	E	D	D	D	1.00	E	1.03
Woodlawn Rd	A	A	A	A	A	0.67	A	0.58
Belvoir Rd*	B	C	B	C	C	0.90	D	0.82
Backlick Rd*	D	E	D	E	D	1.08	F	1.16
Fairfax County Pkwy*	D	E	C	D	C	0.75	E	1.07
Cook Intel Dr*	B	A	A	A	A	0.82	A	0.89
Telegraph Rd*	D	D	D	D	D	0.96	E	1.23
Pohick Rd	C	B	C	C	C	0.99	D	1.00
Lorton Rd	C	B	D	C	D	0.95	D	1.02
Armistead Rd	B	C	C	C	D	0.87	D	0.95
Dutchman Drive	A	B	A	A	A	0.68	A	0.71
Gunston Rd	D	C	D	C	E	0.94	D	1.00
Furnace Rd	C	D	C	D	C	0.79	D	0.82
Gordon Blvd	E	B	E	C	E	1.09	D	0.97

Attachment D: Shorter Cycle Length and Reduced Speed Limit Test

The objective of this exercise is to test Route 1 intersections with shorter cycle lengths and lowered speed limit to evaluate the impact on automobiles and transit, as well as pedestrians. In order to perform the analysis, Hybla Valley intersections (the same seven signalized intersections considered for the roadway and transit alternatives) in the morning peak hour will be tested. VISSIM will be used in the analysis of intersections.

Traffic signal cycle lengths may have a considerable impact on the quality of access for bicycles and pedestrians since long cycle lengths can make crossing a street frustrating, discouraging walking and turning streets into barriers for non-motorized users. This in turn impacts the operation of public transit as bicycles and in particular pedestrians are the primary users of transit. Moreover, transit vehicles typically are not able to follow signal coordination (also known as “green wave”) provided for arterial traffic as they make stops to serve passengers. Therefore longer cycle lengths also tend to increase transit delay.

Webster’s well-known optimal cycle length concept indicates that longer cycle lengths increase capacity and as a result, there is often a tendency for traffic engineers to use longer cycle lengths during periods of high demand. However, recent research also showed that during periods of high demand and oversaturation, using a shorter cycle length resulted in slightly increased throughput[2].

Similarly, reducing speed limits will potentially improve traffic safety by reducing the number of crashes, promoting walking and cycling. Furthermore, the secondary benefits of lowered speed limits include reduced fuel costs, and reduction in vehicle emissions and noise. However, there are also concerns regarding mobility due to the impact on travel time.

Results show that reduced speed and cycle lengths would lead to incremental increases in travel time but overall improvements in network delay.

Hybla Valley VISSIM Analysis

Intersections in Hybla Valley under the existing conditions operate with 180 seconds cycle length in the morning peak hour and the posted speed limit is 45 mph. In order to evaluate the impact of shorter cycle length and reduced speed limit for multimodal road users, cycle length was reduced to 120 seconds and 35 mph was used as the posted speed limit for the vehicular traffic. Only the median running BRT alternative (i.e., Alternative 2) was considered in the analysis. Note that the maximum speed limit defined for BRT (45 mph) was kept unchanged in the evaluation.

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[2] Denney, R.W., E. Curtis, and L. Head. “Long Green Times and Cycles at Congested Traffic Signals.” Transportation Research Record No. 2128, pp. 1-10, 2009.

Table D-1 presents VISSIM findings under the No Build (consistent 6-lane with REX service), median running BRT (Alternative 2), and median running BRT with 120 seconds cycle length and 35 mph speed limit.

Table D-1: Evaluation of Performance Measures with Shorter Cycle Length and Reduced Speed Limit for Hybla Valley Intersections

		No Build[1]	Median Running BRT: C = 180 s, Posted Speed Limit = 45 mph	Median Running BRT (Alt 2): C = 120 s, Posted Speed Limit = 35mph
Network Level Performance Measures	Total Auto Network Delay Time (veh.hr/hr)	192	234 (22%[2])	220 (14%)
	Average Auto Network Speed (mph)	21.6	19.7 (-9%)	17.8 (-18%)
	Total Auto Network Travel Time (veh.hr/hr)	389	433 (11%)	480 (23%)
	Average Pedestrian Signal Delay[3] (s)	74	74 (0%)	50 (-33%)
Segment Level Performance Measures	Segment Auto Travel Time - Northbound (min)	3.8	4.1 (6%)	5.2 (37%)
	Segment Auto Travel Time - Southbound (min)	3.5	4.2 (19%)	4.8 (37%)
	Segment Transit Travel Time - Northbound (min)	6.6	5.2 (-20%)	5.8 (-12%)
	Segment Transit Travel Time - Southbound (min)	6.6	6.0 (-8%)	5.1 (-22%)

1: No Build measures were obtained based on the consistent six travel lane alternative and the operation of REX Service
2: Values in parentheses indicate percentage change compared to No Build
3: Average pedestrian signal delay was obtained using Highway Capacity Manual [HCM].

Results show that compared to median running BRT with 180 second cycle length scenario, the reduction of cycle length decreased total auto network delay from 234 to 220 vehicle hours during the morning peak hour. This reduction can be explained by better allocation of green time, that is, better serving cross street traffic as a result of shorter red time, which in turn results in shorter delay. Note that delay is not affected by the change in free-flow speed as free-flow conditions are considered as the baseline in the delay calculation. Average pedestrian signal delay was also reduced from 74 seconds to 50 seconds due to shorter waiting times, corresponding to a 33 percent reduction.

Peak direction auto travel time along the analysis segment, however, increased from 4.1 minutes to 5.2 minutes with the decrease in cycle length and free-flow speed. This increase can be explained in two ways: (1) The 180 second cycle length provides very generous green time for Route 1 at the cost of high cross street and pedestrian delay. Reduction of cycle length results in relatively shorter green times for Route 1 and causes longer corridor travel time. (2) Reduction of posted speed limit from 45 mph to 35 mph increases travel time along certain segments which allow vehicles to reach the posted speed limit (typically segments with large intersection spacing and good signal coordination).

Results also indicate that reducing the cycle length increased the average peak direction transit travel time (from 5.2 mins to 5.8 mins) as a result of shorter green times for Route 1 (similar to the impact on auto travel time). However, it is worth noting that shorter cycle length improved corridor level transit travel time in the non-peak direction (6.0 vs. 5.1 minutes), where TSP was not applied. With shorter cycles, when a transit vehicle stops at a red signal (which happens more frequently in the non-peak direction due to the lack of TSP), the wait time until the green signal is also shorter, resulting in shorter non-peak direction transit travel time.

Attachment E: Detailed Transit Demand Forecasting Methodology

This attachment describes the travel demand forecasting approach to be used to evaluate the Route 1 multimodal alternatives. This technical memorandum will describe our rationale for selecting the appropriate forecasting methodology, our step-by-step approach for enhancing it to ensure a robust evaluation of the alternatives, the required inputs and the key resulting outputs to be used in this analysis.

Process

During the early stage of the alternatives analysis, demand forecasts were used to screen alternatives. Subsequently, forecasts were refined to support detailed evaluation and selection of a preferred alternative.

Overview

As defined in our scope of work, AECOM developed Federal Transit Administration (FTA) compliant travel demand forecasts to support the evaluation of a series of multimodal alternatives for the Route 1 corridor between Prince William and Fairfax Counties. The FTA-compliant requirement for the forecasting procedures is a very important factor in selecting the proper forecasting tool to evaluate Route 1 corridor improvements. It is anticipated that the resulting recommended transit alternative for the Route 1 corridor would be a refined and advanced as a potential New/Small Starts submittal to FTA.

FTA requires project sponsors seeking New/Small Starts funding to develop rigorous travel demand forecasting model tools to evaluate fixed guideway transit investments. Of particular emphasis the forecasting models must be able to:

- Replicate the total travel market in the project corridor
- Understand the existing propensity to use transit in the corridor
- Understand the existing automobile and transit travel times and service frequency
- Generate realistic estimates of future year automobile and transit travel times
- Understand the existing transit markets, by key segmentation group:
    - Trip Purpose (Home-to-Work, Home-to-Other, Non-Home Based)
    - Income/Auto Ownership
    - Relative attractiveness by key attraction market (travel to DC, versus City of Alexandria, versus local transit on Route 1)
    - Transit sub-mode (bus, express bus, VRE and Metrorail)
    - Mode of access (walk, drop-off, park-and-ride)
- Properly reflect transit sub-mode choice without the use of large or illogical transit sub-mode specific constants in the mode choice model.

The last bullet listed above is one of the most important elements in FTA reviews of travel demand forecasting procedures. Transit sub-mode specific constants are travel time advantages given to fixed guideway transit service to reflect the "unmeasured attributes" that accompany fixed guideway services (versus local bus). These unobserved attributes generally include elements of the travel experience such as:

- Enhanced ride quality
- Enhanced visibility
- Increased reliability
- Enhanced stations
- Passenger information systems

These constants are expressed in an equivalent amount of travel time benefits for the fixed guideway alternative. While FTA generally allows for the use of transit mode-specific constants, they require that their maximum magnitude be in the range of 15-20 minute advantage for fixed guideway transit, versus local bus.

Forecasting Tool

When attempting to identify the most appropriate forecasting tool to conduct the Route 1 analysis, AECOM reviewed both the recently released MWCOG forecasting model and the current version of the WMATA Regional Transit System Plan (RTSP) forecasting model to determine how FTA compliant both forecasting tools are. Both forecasting tools use the current MWCOG Version 2.3 platform (3722 traffic analysis zones) and both also rely on the use of transit sub-mode specific constants with magnitudes outside of the FTA expected range.

AECOM evaluated the magnitude of the constants in both forecasting models and found that Metrorail had transit sub-mode biases in the range of 30-75 minutes for home-based work travel. In application, this means that a Metrorail alternative will be 30-75 minutes faster than bus, before considering the actual travel times and costs offered by each line-haul mode. FTA generally allows transit sub-mode biases of up-to 15-20 minutes for premium transit (versus the 30-75 minutes in MWCOG and RTSP models). The magnitude of these constants means that the model will likely over-simulate response to a Metrorail alternative. At a minimum, both of these current forecasting tools would need a substantial restructuring and recalibration of the mode choice models and likely also require adjustment to the trip distribution processes to replicate observed behavior in a FTA compliant fashion.

Rather than venturing into an extensive model calibration exercise, which is time consuming and expensive, AECOM did a review of prior applicable forecasting methodologies. Like the Route 1 corridor, the Columbia Pike corridor is located within the area covered by the MWCOG transportation model. It was determined that the Columbia Pike forecasting model, which employs the WMATA Transit Post-Processor (using the MWCOG model Version 2.2) was the preferred way to proceed.

In 2010 AECOM, with WMATA, Arlington County, and Fairfax County, engaged the Federal Transit Administration (FTA) on the travel demand forecasting methodology to support the Columbia Pike Streetcar Environmental Assessment (EA). Through a series of meetings with FTA technical staff, the project obtained FTA acceptance of using a variant of the older MWCOG 2.2 forecasting model to identify the ridership impacts associated with Columbia Pike. Ultimately the version of the model that was applied was the original version of the Regional Transit System Plan (RTSP) model, with further enhancements in the Columbia Pike project corridor.

This forecasting model has a number of methodological advantages for performing FTA New Starts/Small Starts project evaluations over the current MWCOG model and the current RTSP model as it pertains to transit forecasting:

- It has no transit sub-mode specific constants in the mode choice model to describe sub-transit mode preferences. Instead, it relies on IVTT discounts, which were discussed and vetted by FTA to differentiate higher quality transit services (Metrorail) versus local bus services. By not having transit sub-mode constants, this allows for a mode neutral evaluation of a variety of transit modes in the Route 1 corridor and facilitates an easier review by FTA technical staff.

- The MWCOG home-based-work (HBW) trip distribution model is replaced with a hybrid data/modeled process. Rather than using the MWCOG gravity model to represent trip distribution, AECOM has embedded a process that 1) starts with MWCOG trip ends (productions and attractions) and 2) FRATAR factors the Year 2000 US Census CTPP Journey-to-Work Trip Tables to those trip ends. In essence, this preserves the MWCOG trip generation process while replacing the modeled trip distribution with real, measured Census-based surveyed trip patterns.

  Our experience is that traditional trip distribution models generally do a poor job of representing realistic home-to-work, origin-destination travel patterns for a metropolitan area. This is due to the fact that trip distribution models use only travel time as the explanatory value for where people live and work. Other variables such as housing stock, price of housing, quality of schools, and income of jobs are all very important variables that in reality drive residential location choice to which gravity models cannot consider. Obtaining realistic origin-to-destination trip patterns is essential to transit planning, as transit requires both trip ends (home and work) to be accessible to the transit system. We've employed this approach in a number of large metropolitan areas including Chicago, New York and Los Angeles and have significantly improved the performance of the HBW models.

- The proposed forecasting approach includes detailed micro-coding of transit fixed guideway stations and stops. As part of this micro-coding approach, the forecasting tool provides additional detail between the interface of kiss-and-ride, park-and-ride, and bus transfer locations at fixed guideway stations.

To confirm that this forecasting model provides a realistic understanding of transit demand from the Route 1 corridor, AECOM reviewed the transit validation statistics from the base year 2010 forecasting model (see **Table E-1**).

Table E-1: DRAFT EARLY LOOK VALIDATION AS OF OCTOBER 9, 2013

Comparison of Average Weekday Transit Boardings:
Forecasting Model vs. Observed by Operator

Bus Ridership		Columbia Pike
Route	Observed (2008)*	Model
REX	3,400	1,331
F151	1,480	2,916
F152	1,555	290
F161	665	791
F162	585	678
F171	3,575	1,741
Total	**11,260**	**7,747**
Major Routes on Route 1	8,455	5,988
*Fairfax County Transit development Plan Report		
REX Boardings from WMATA 2008 Survey		
Metro Ridership		Columbia Pike
Station	Observed (2008)	Model
Huntington	8,863	10,177
Franconia	10,335	10,623
	19,198	**20,800**
VRE		Columbia Pike
Station	Observed (2012)	Model
WoodBridge	663	1,379
Lorton	617	271
	1,279	**1,650**

As the table shows, the forecasting model without any adjustment in the Route 1 corridor reflects existing transit markets in the corridor (replicates overall Metrorail and VRE ridership, and understates bus ridership). This fidelity to existing conditions, combined with its enhanced FTA compatibility make it an ideal platform to evaluate Route 1 alternatives.

As described below, the project team undertook a robust improvement program for this tool for the purpose of evaluating Route 1 alternatives.

Step 1: Define the Traffic Analysis Zone System

Working with Fairfax County land use and transportation divisions, AECOM defined an enhanced Traffic Analysis Zone (TAZ) system for the Route 1 corridor. The existing Columbia Pike forecasting model uses a relatively course zone system in the Route 1 corridor and needed to be substantially improved for the purpose of representing activity centers in the corridor. This step was coordinated with Fairfax County to ensure that we adequately represent both current and key planned/proposed development to properly represent automobile and transit attributes. Together AECOM and Fairfax County added approximately 70 zones in the Route 1 corridor in Fairfax County to isolate current/future activity centers. As a result of changing the TAZ system in the project corridor, a number of mechanical changes to the forecasting model were necessary to accommodate the increased zonal resolution. The following 3 steps discuss these enhancements.

Step 2: Implement MWCOG Round 8.2 Land Use Forecasts for Enhanced TAZ System

FTA requires that project sponsors use the regionally adopted land use forecasts when evaluating New/Small Starts projects. In this step, the MWCOG Round 8.2 land use forecasts were incorporated into the new TAZ system. This required two elements:

1. Start with the “native” MWCOG Round 8.2 Land Use forecast
2. Allocate the land use variables (such as population, households and employment) to the “split” zones based on current and future development.

An important component of this work was to maintain the MWCOG original TAZ level forecasts contained with the Round 8.2 land use forecasts. This work was performed for current conditions (2014/2015) and a 20-year horizon (2035). Fairfax County staff assisted with allocations from MWCOG TAZ’s to the Route 1 model sub-TAZ’s defined in Step 1 above.

Step 3: Enhance the Transportation Network

An important step with the Route 1 analysis was to enhance the underlying transit system in the Route 1 corridor. With the additional TAZs defined in Step 1, AECOM embedded a series of measures to ensure that 1) the transportation network provides enough resolution to adequately represent accessibility to the highway and transit networks, 2) the current highway speeds represent realistic observed speeds for peak period and off-peak service, 3) transit services correctly represent alignments with stops and park-and-ride locations.

Step 4: Recalibrate the Base Year Model

With the enhanced TAZs, enhanced land use inputs, and the enhanced transportation network, AECOM recalibrated the model to represent current travel behavior in the corridor. Emphasis was placed on:

- Representing roadway volumes on Route 1
- Representing realistic highway travel times on Route 1
- Representing transit utilization in the corridor by:
  - Trip Purpose
  - Transit Sub-Mode (Metrorail, VRE, commuter bus, bus, bus-to-Metrorail)
  - Access Mode (walk, park and ride and kiss and ride)
  - Income level
  - Time of day (peak vs. off-peak)
- Representing transit utilization by route
- Representing demand for parking at park-and-ride facilities

The end product of this step was an enhanced travel demand forecasting methodology that replicates observed travel behavior from the corridor with a high degree of accuracy.

Step 5: Develop 2035 No-Build Forecasts

Following the recalibration of the base year model, AECOM ran no-build forecasts for the 2035 horizon year. The No-Build alternative contains all regional projects from MWCOG's Constrained Long Range Plan (CLRP). The purpose of the no-build alternative is to understand:

- How land use changes impact total trip making in the Route 1 corridor.
- How the highway network performance is impacted by the additional growth programmed for the Route 1 corridor.
- How the programmed transportation investments and growth impact total transit utilization and modal share.
- Can the growth in land use be accommodated where transit system constraints might exist in the horizon year in the corridor (for example parking at VRE and Metrorail stations in the corridor)?
- Can regional and corridor growth in land use be accommodated where transit system constraints might exist in the future (Metrorail line haul volumes crossing the Potomac River absent investment)?

One of the most important elements from the 2035 forecasts is to understand how forecasted growth would affect the performance of the highway system in the project corridor. This is especially important for automobile travel times along Route 1. In general, regional forecasting tools such as the MWCOG model overstate the impacts of congestion. That is because the MWCOG model uses static time-of-day procedures and has no ability to shift trip making from congested to non-congested time periods. In capacity constrained networks (Washington DC is one) typically several phenomena occur (which the MWCOG process can't represent):

- Peak spreading (shifting to less congested portions of the peak period)
- Peak to off-peak shifts (shifting to off-peak)
- Trips not occurring at all

On completion of the 2015 and 2035 No-Build forecasts AECOM assessed the resulting future year highway speeds from the MWCOG model to ensure the modeled degradation is realistic on Route 1. The highway travel times play a crucial role in the quality of the resulting forecasts; they establish:

- Highway network performance/customer travel times in the corridor
- Transit travel times for service operating in mixed traffic
- The degree to which fixed guideway will improve mobility in the corridor

AECOM's travel forecasting group and traffic engineering group worked extensively on the quality of the resulting automobile travel times along Route 1.

Step 6: Develop 2015/2035 Build Alternative Forecasts

Upon completion of the 2015 2035 No-Build forecasts, AECOM evaluated the build alternatives for 2015 and 2035. As part of this exercise, the AECOM team developed operating plans for the transportation alternatives (see **Attachment F**).

Alternatives were developed and evaluated in two phases.

First, four *Initial* transit build alternatives were evaluated. For the purpose of seeding the analysis, these runs provided an order of magnitude market assessment for a variety of transit mode technologies. These include:

- Metrorail extension to Woodbridge. This service would provide a Yellow Line one-seat ride between Woodbridge to Downtown Washington DC.
- New LRT between Woodbridge and Huntington.
- New BRT between Woodbridge and Huntington. The BRT would operate in a dedicated running way and would provide a significant travel time advantage over the current local bus operation.
- New enhanced bus between Woodbridge and Huntington. Here the bus option would operate in mixed traffic and would offer limited improvements versus local bus.

Second, four *Refined* transit build alternatives were evaluated:

- Alternative 1: Bus Rapid Transit- Curb
- Alternative 2: Bus Rapid Transit- Median
- Alternative 3: Light Rail Transit
- Alternative 4: Metrorail/ Bus Rapid Transit Hybrid

Step 7: Enhanced Land Use Scenarios

In Step 7, AECOM developed forecasts for two enhanced land use scenarios, defined as Scenario Two and Scenario Three as part of the land use analysis task of this alternatives analysis. FTA requires that the land use forecasts used to support a New Starts/Small Starts application use fixed land use assumptions (i.e. no change in development with the build alternative). The enhanced land use scenarios anticipate the potential that a major transit investment would serve as a catalyst for more rapid population and employment growth in the corridor, and provide a sensitivity test to ensure that the alternatives provides sufficient capacity to handle projected loadings if growth levels exceed those projected in the MWCOG forecast for 2035.

As noted above, the base land use assumption (“Scenario One”) is tied to the 2035 MWCOG (version 8.2) projections for the ½ mile radius around each proposed station location. 2035 TAZ data were used to analyze the population and employment currently projected for the station locations. Scenario One represents “current trends for growth” under the 2035 population and employment projections, with assumed concentration of population and employment developed in close collaboration with Fairfax County and Prince William County planning staff.

The Scenario Two land use analysis reflects a “reasonable increment of growth” above the 2035 MWCOG projections. The “reasonable increment of growth” is assumed to result from:

(1) New development that can be attributed to a high quality transit investment, and
(2) New development that can be attributed to a change in County policies that promotes transit-oriented development.

The growth increment for each station area has been estimated to range from 15 to 25 percent, depending on the station location, and input provided by Fairfax and Prince William County staff members. The percentages are further informed by national experience with transit-oriented development and associated policies. For this scenario, population and employment is concentrated within the half-mile station core, at greater densities than Scenario One.

Ridership forecasts were generated for each of the four alternatives under Scenario Two.

Scenario Three: The Scenario Three land use analysis reflects the amount of population and employment needed to achieve development densities typically associated with Metrorail stations. Population and employment is concentrated within the half-mile core, but may also be distributed locally as needed to achieve the requisite high activity density for Metrorail.

Ridership forecasts were generated only for the Metrorail alternative under Scenario Three.

Attachment F:
Transit Operations Assumptions

This attachment details the key assumptions and metrics related to operations of the transit alternatives. These assumptions informed the definition of initial and refined alternatives, and provide the basis for comparison and evaluation of the refined alternatives.

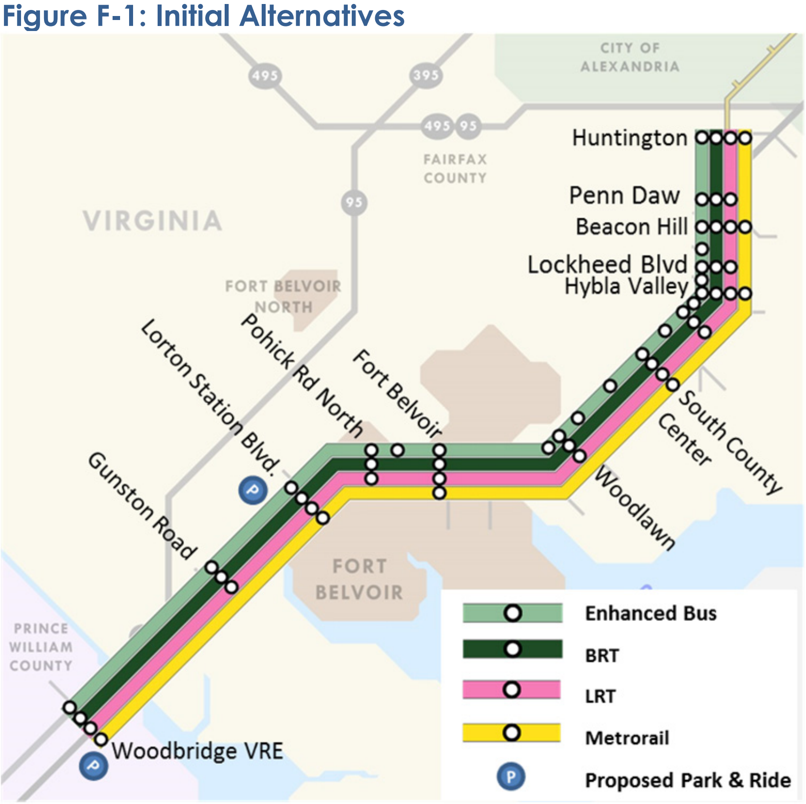
Alternatives

Operating requirements (service hours, number of vehicles, etc.) and the operations and maintenance (O&M) costs estimates were developed for the four initial alternatives and the four refined alternatives advancing from the initial screening of alternatives. The initial alternatives include:

1. Enhanced Bus
2. BRT Alternative
3. LRT Alternative
4. Metrorail Alternative

Figure F-1 shows the initial alternatives.

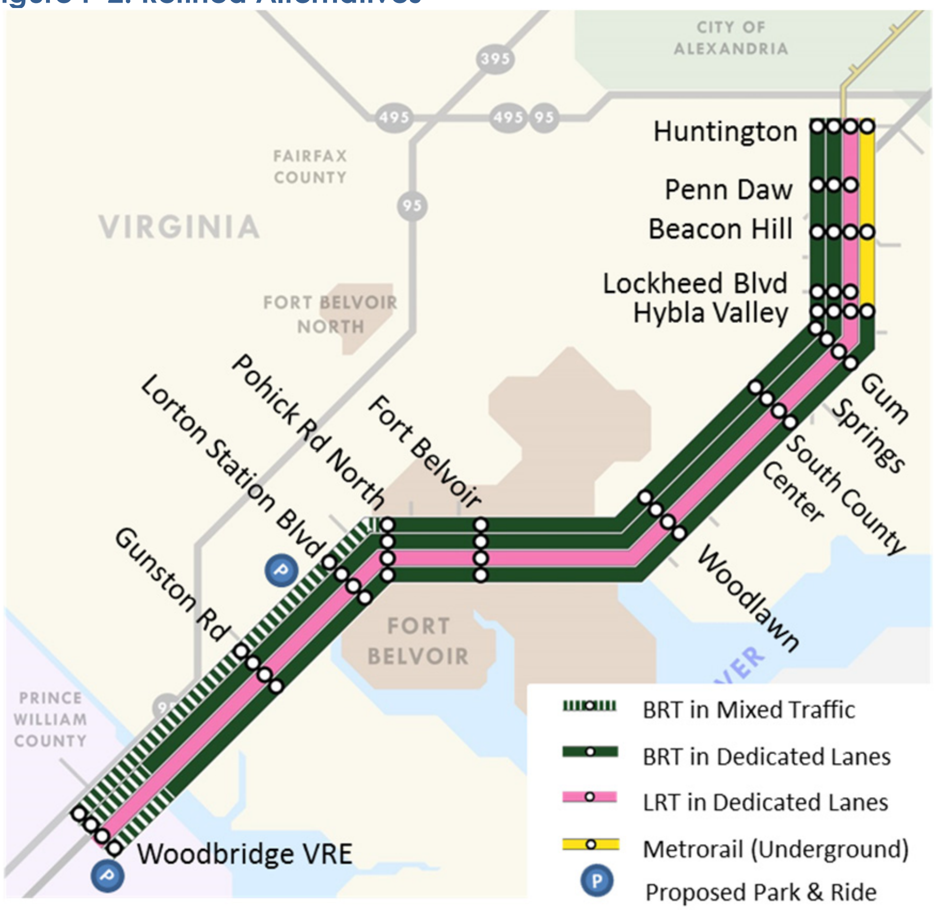
Figure F-1: Initial Alternatives



The four refined alternatives are listed below and shown in **Figure F-2**:

1. Curb-running BRT Alternative
2. Median-running BRT Alternative
3. Median-running LRT Alternative
4. Metrorail and median-running BRT Alternative

Figure F-2: Refined Alternatives



In addition, service plans and operating requirements were defined for a Fort Belvoir shuttle timed to interface with alternatives serving the Richmond Highway Corridor.

Operating Plans

The operating requirements for each alternative reflect the following service plan assumptions. The service span Monday-Thursday is from 05:00 to 00:00 and includes 205 operating days annually. The service span on Friday is from 05:00 to 03:00 and includes 52 operating days annually. The service span on Saturday is from 07:00 to 03:00 and includes 52 operating days annually. The service span on Sunday is from 07:00 to 00:00 and includes 56 operating days annually, including holidays.

The weekday AM peak period is defined from 05:00-09:30 and the weekday PM peak period is defined from 15:30-19:00, an effective peak service span of 8 hours. During the morning and afternoon peak periods, to reflect the need for additional peak directional capacity (vehicles) based on peak hourly load, additional vehicles are placed into service for 1 hour in the AM and 1 hour in the PM peaks. The weekday peak headways are a vehicle every 6 minutes and every 12 minutes in the off-peak. Saturday and Sunday headways are a vehicle every 20 minutes.

The cost per trip (cost per boarding) is calculated based on the annual operating costs divided by the annualized demand.

The shuttle service plan for Fort Belvoir assumes the following. A weekday service span from 05:00-00:00 and includes 254 annual operating days. The weekday peak periods are 05:00-09:30 and 15:30-19:00, a daily effective peak service span of 8 hours. The weekday peak headways equate to a vehicle operating every 6-minutes. The weekday off-peak headways equate to a vehicle operating every 15-minutes. No service will be operated on weekends. The shuttle will run a 13-mile round trip of bidirectional service with an effective cycle time of 58 minutes during the peak periods and 52 minutes in the off-peak.

Operations and Maintenance Costs

The operating requirements and cost basis for the alternatives build upon the following assumptions. The vehicle operating capacities by mode are:

- Enhanced Bus and BRT assume a 60 foot articulated vehicle with a capacity of 90 persons;
- LRT assumes a 2-car train with capacity of 160 persons per car;
- Metrorail assumes an 8-car train with a capacity of 120 persons per car.

Peak load demand estimates were used to assure the estimated demand requires 80% of scheduled service capacity. This planning target is intended to assure that the operating plans provide sufficient capacity relative to forecast demand and anticipated variability in the peak hour demand. Vehicle requirements are calculated to serve the larger of either the service policy service requirements (the amount of service required to meet service span and peak and off-peak headways) or estimated demand (the capacity required to serve 1.25% of estimated demand).

To accommodate directional demand peaking (to make sure adequate capacity is scheduled in the peak hour travel direction) additional peak directional service was added to the peak morning and evening hours. The same was applied to off-peak service if additional capacity was required to serve estimated demand. The additional peak directional service for BRT was calculated only for northern segment of the corridor where the peak hourly load is experienced. Operationally this reflects the use of trippers and/or turn-back service above the policy service headways for the entire corridor.

Metrorail costs are based on the difference between operations (train-miles) from Mount Vernon Square to Huntington compared to service from Mount Vernon Square to Woodbridge (Initial Alternatives) or Hybla Valley (Refined Alternatives). This approach recognizes that changes to the Metrorail operating plan affect operations for the entire length of Yellow Line service.

The Refined Alternatives were defined based on modeled demand and an established cost basis for each mode. Demand is identified as average daily trips, peak hour directional load, and off peak demand. In **Table F-1** is the peak hour directional demand and off-peak hourly demand.

Table F-1: Peak Hour Directional Demand and Off-peak Hourly Demand

Modal Alternative	Peak Hour Demand	Off-Peak Demand
Enhanced Bus	1049	490
BRT	1180	510
LRT	1364	613
Metrorail+BRT	3465	1242

The cost basis for BRT and Metrorail were defined using existing WMATA cost information from the WMATA 2015 Budget. The bus based services, enhanced bus, Fort Belvoir Shuttle, and BRT, use the Virginia Regional Bus cost per vehicle revenue hour as the basis for cost estimation. In the case of BRT, an additional 21% of the Virginia Regional Bus cost basis was added to reflect the additional non-labor component often associated with BRT services.

The cost basis for LRT is defined in terms of per revenue train-hour using a set of peer transit agencies as reported by the National Transit Database (2012). The peer costs were also factored to reflect the WMATA cost structure. The Metrorail cost basis is the per car-mile cost reported in the WMATA 2015 Budget, adjusted to a cost per 8-car train in terms of train-miles. **Table F-2** summarizes the unit cost assumptions.

Table F-1: Unit Cost by Alternative

Modal Alternative	Unit Cost
Enhanced Bus	$156.65 vehicle rev-hour
BRT	$189.55 vehicle rev-hour
LRT	$346.28 train-hour
Metrorail+BRT	$67.08 8-car train-mile

The operating run times (cycle times) by alternative and mode include station dwell times and layover time (calculated as 10% of the round trip running time). Off peak cycle times are 10% less than peak cycle times for all modes but Metrorail. Speeds by alternative and mode were provided by AECOM based on modeled travel speeds including acceleration and deceleration rates, station dwell times, and traffic controls.

Performance metrics were calculated for each alternative and mode as a basis for comparison and for the purpose of evaluation and screening. As the alternatives were developed a policy service plan (headways and service span) based operating requirements are compared to demand based operating requirements to allow an evaluation of modal alternatives in terms of service hours and costs relative to demand and capacity. Peak and off-peak vehicle requirements are included as a metric. Annual revenue hours of service, annual train-miles for Metrorail, and annual O&M costs based on policy service plan and demand based service plan. In addition, the cost per trip (boarding) is a standard industry metric, and lower cost per trip indicates more efficient system performance.

Peak demand capacity over peak policy capacity is included, a score over 1 means demand requires additional capacity and a score under 1 means service policy capacity is greater than what is required to serve demand. Finally, available peak capacity, the inverse of the previous metric, is provided, a score over 1 means the service operated is in excess of what demand requires.

Table F-3 below presents the summary findings for the Initial Alternatives screened. **Table F-4** reports the summary of findings for the screening and evaluation of alternatives

Table F-3: Initial Alternatives Performance Metrics

Alternative Summary	Peak Vehicles Policy Service	Annual Rev-Hours Policy Service	Annual O&M Costs Policy Service	Daily Demand	Peak Vehicles Demand Based	Weekday Off-Peak Vehicles	Annual Rev-Hours Demand Based	Annual O&M Costs Demand Based	Cost / Trip	Peak Demand/Policy Capacity	Available Peak Capacity
Metrorail (Alt 4)	8	37,339	$74,065,828	48,999	8	10	37,339	$74,065,828	$ 5.04	0.88	1.14
BRT (Alt 2)	14	57,633	$10,924,133	16,397	19	9	61,231	$11,606,122	$ 2.36	1.21	0.82
LRT (Alt 3)	14	54,650	$18,924,373	18,228	14	6	54,650	$18,924,373	$ 3.46	0.43	2.33
Enhanced Bus (Alt 1)	13	55,577	$8,706,137	9,505	13	7	55,577	$8,706,137	$ 3.05	0.69	1.44
Ft. Belvior Shuttle	10	31,868	$4,992,122								

Table F-4: Refined Alternatives Performance Metrics

Alternative Summary	Peak Vehicles Policy Service	Annual Rev-Hours Policy Service	Annual O&M Costs Policy Service	Daily Demand	Peak Vehicles Demand Based	Weekday Off-Peak Vehicles	Annual Rev-Hours Demand Based	Annual O&M Costs Demand Based	Cost / Trip	Peak Demand/Policy Capacity	Available Peak Capacity
Metro + BRT (Alt 4)	13	52,770	$26,431,926	33,473	15	6	53,622	$26,626,780	$ 2.65	1.00	1.00
BRT (Alt 2)	14	57,633	$10,924,133	16,397	19	9	61,231	$11,606,122	$ 2.36	1.21	0.82
LRT (Alt 3)	14	54,650	$18,924,373	18,436	14	6	54,650	$18,924,373	$ 3.42	0.43	2.33
BRT + Enhanced Bus (Alt 1)	15	61,681	$10,769,691	15,179	20	7	65,279	$11,447,826	$ 2.51	1.00	1.00
Ft. Belvior Shuttle	10	31,868	$4,992,122								

Attachment G: Transit Travel Time Methodology

This attachment summarizes the methodology and key assumptions in estimating travel times for transit service for the Route 1 Multimodal Alternatives Analysis. Transit travel times were estimated and applied in two basic iterations. First, as input to ridership forecasting for the initial set of transit alternatives, in which the estimates were general, based on average speeds for the transit modes in current application on other projects. In the second iteration the project team applied more detailed assumptions regarding free-flow travel time, vehicle performance, boarding/alighting times, and traffic signal delays. The resulting refined travel time estimates were applied to the ridership forecasts and detailed comparison of the multimodal transportation alternatives.

In-Motion Travel Time

In-motion travel time is calculated based on the assumed free-flow travel time using a maximum defined speed (free flow speed) for each alternative. For the transit alternatives operating in exclusive bus lane (i.e., curb running BRT, median running BRT and LRT), 45 mph was assumed as the maximum speed. For the enhanced bus and Metrorail, 35 mph and 55 mph were assumed, respectively.

Transit Stop Dwell Time

Transit stop dwell time includes passenger boarding and alighting times at each stop as well as the delay that occurs due to acceleration and deceleration. Based on the ridership forecasts obtained from the initial screening alternatives, dwell time was assumed as 25 seconds at stops with high ridership and 15 seconds at stops with moderate ridership. Note that relatively lower dwell times were used due to the availability of off-board fare collection, level boarding platform, and boarding through multiple doors. Acceleration and deceleration delay due to stops were calculated using the following equation:

$$d_{accel} = \frac{V_{max}}{2a} \qquad\qquad d_{decel} = \frac{V_{max}}{2d} \tag{1}$$

where d_{accel} and d_{decel} are the acceleration and deceleration delays (second), V_{max} is the maximum defined speed (mph), and a and d are the acceleration and deceleration rates (miles per hour per second, mphps), respectively. **Table G-1** provides the acceleration and deceleration rates used for each transit alternative.

Table G-1: Assumed Acceleration and Deceleration Rates for Transit Alternatives

	Acceleration Rate (mphps)	Deceleration Rate (mphps)
BRT*	2.0	2.0
LRT	2.2	2.5
Metrorail	2.8	2.8

*Same acceleration and deceleration rates were assumed for Alternative 1 (Enhanced Bus + Curb Running BRT)

Traffic Signal Delays

Traffic signal delay estimation assumed uniform, deterministic arrivals at intersections. Using the well-known cumulative arrivals and departures concept (based on the duration of red and green signal and the arrival volumes, Highway Capacity Manual 2000), uniform delay was calculated for the transit alternatives using the following equation:

$$d = \frac{0.5 * r^2}{C} * \left[\frac{1}{1 - v/s}\right] \tag{2}$$

- Where d is the signal delay, r is the effective red time, C is the cycle length, v is the arrival volume, and is the saturation flow rate. Note that the arrival volume was considered as zero for median-running BRT and LRT service.
- The formula given above assumes uniform arrivals (random arrivals), which typically occurs at isolated intersections without signal coordination. However, along Route 1, intersections are coordinated, which may result in transit vehicles arriving during green signal, particularly when there is no transit stop upstream of an intersection, resulting in lower transit delays. In order to take into account signal coordination benefits, delay calculated using equation (2) was reduced by 67 percent at intersections where there is no upstream transit stop (i.e., the probability of a transit vehicle stopping at an intersection is 33 percent or a transit vehicles stops at a red signal once in every three intersections). The 67 percent reduction factor was assumed based on the quality of signal progression observed in the field and in the simulation and engineering judgment). However, when there is an upstream stop at an intersection, it is assumed that transit arrivals are random due to the dwell time at the stop and signal delay calculated using equation (2).

Transit Preferential Treatment Savings

Delay savings associated with TSP and queue jump lane were estimated using the results of past research. For example, Zlatkovic et al.[3] evaluated the individual and combined effects of queue jump

[3] Zlatkovic M., Stevanovic A., and Reza Z., "Effects of Queue Jumpers and Transit Signal Priority on Bus Rapid Transit", presented at the 92nd Transportation Research Board Annual Meeting, Washington D.C., 2013

lanes and TSP on performance of a BRT system in West Valley City, Utah. Altun and Furth [4] developed a deterministic model for isolated intersections to estimate TSP delay savings, which uses the fundamentals of traffic flow theory at signalized intersections. The current VISSIM analysis was also performed to validate and supplement the application of these findings to the Route 1 study.

The total savings as a result of preferential treatments were then subtracted from the signal delay. Note that the probability of stopping (0.33) as described above, was used in estimating preferential treatment savings with signal coordination. For example, if the total savings due to preferential treatments were estimated as 10 seconds, signal delay was reduced by 3.3 seconds at an intersection when there is no upstream stop to take into account signal coordination benefits.

[4] Altun, S. Z. and P. G. Furth, "Scheduling Buses to Take Advantage of Transit Signal Priority", Transportation Research Record: No. 2111, Washington D.C., 2009, pp.50-59

APPENDIX D

Land Use and Economic Development Report

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Route 1

Multimodal Alternatives Analysis

Route 1 Multimodal Alternatives Analysis

Land Use and Economic Development Report

Revised: November 11, 2014

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Overview

The purpose of the land use analysis is to explore a range of land use configurations and densities for the Route 1 corridor and evaluate the role of land use in supporting the multimodal transportation alternatives under consideration. This information contributes to the screening and evaluation of transportation alternatives and informs selection of a Locally Preferred Alternative (LPA). Additionally, Land Use and Economic Development Effectiveness are key criteria for the Federal Transit Administration (FTA) Capital Investment Program (Section 5309) New Starts/Small Starts rating process. In Section 3, this memo provides an initial evaluation of existing land use policies and plans, and presents recommendations for improving a future FTA New Starts/Small Starts funding application.

The study culminates in a recommendation for a program of multimodal transportation investments. The following transit alternatives were evaluated in detail:

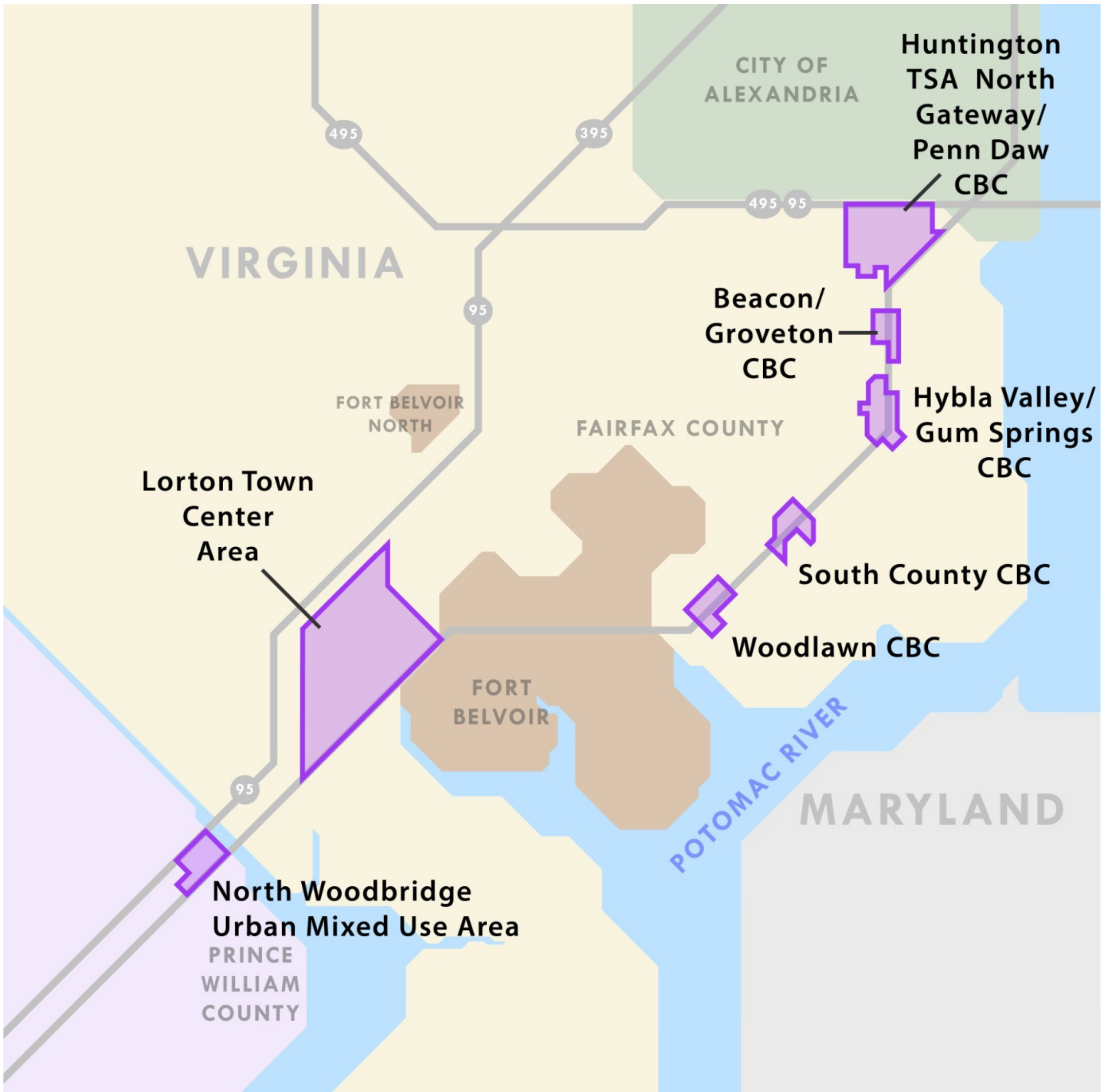
- Curb running bus rapid transit
- Median running bus rapid transit
- Light rail transit
- Bus rapid transit/Metrorail hybrid (Metrorail extension from Huntington to Hybla Valley)

Each alternative includes the following roadway, pedestrian, and bicycle elements:

- Construction of additional travel and turn lanes along portions of Route 1 to achieve a consistent 6-lane cross-section for vehicular traffic
- Continuous sidewalks and multi-use path along Route 1 to accommodate pedestrians and bicyclists (note: implementation and special treatments will vary along the corridor)
- Signals and infrastructure to improve pedestrian crossings of Route 1

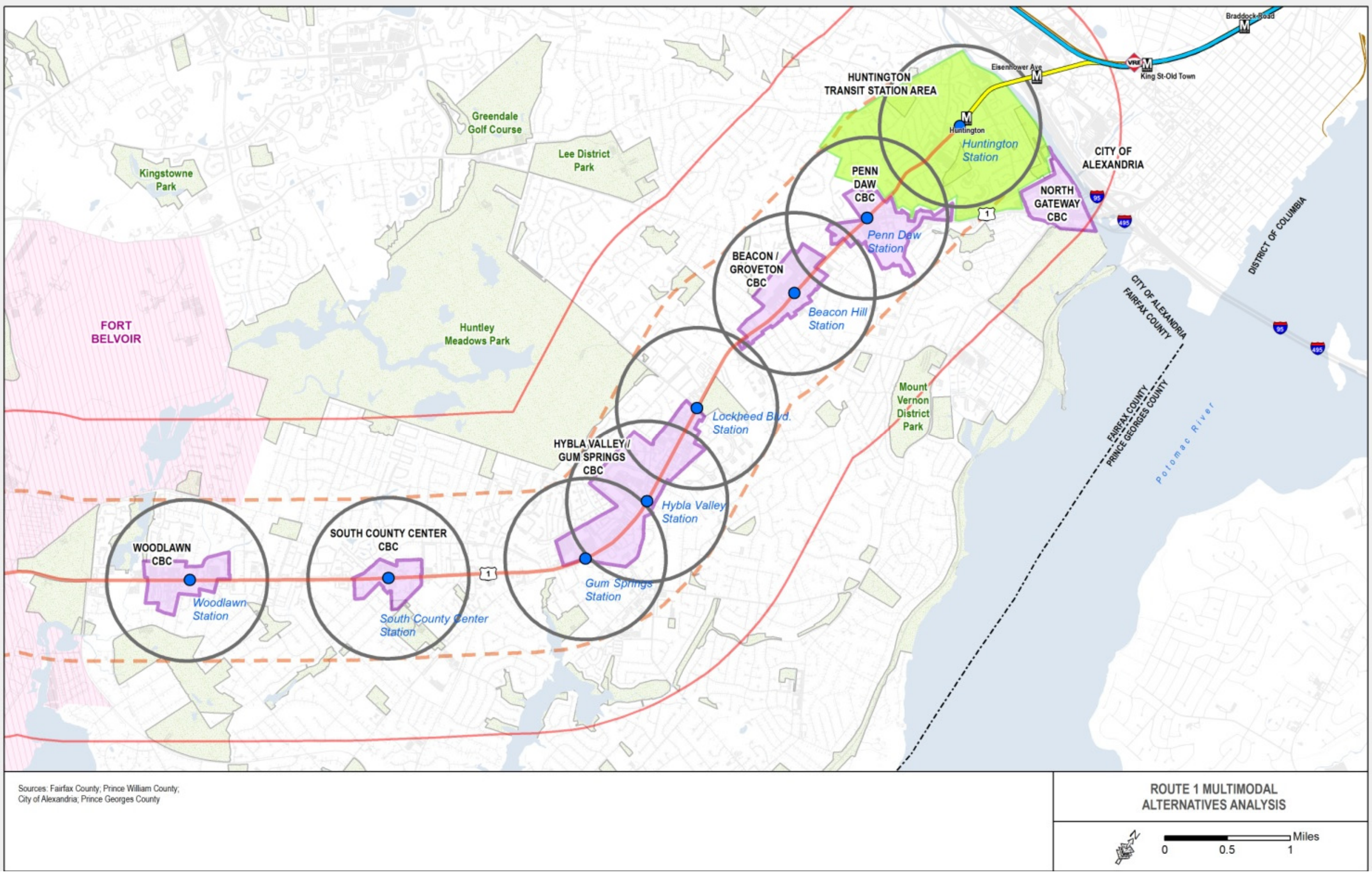
The regional strategy for directing growth is the Activity Centers concept, advanced by the Region Forward Coalition and member organizations, including the Metropolitan Washington Council of Governments (MWCOG). Activity Centers are focal areas for population density and employment, and are the cornerstone of a linked land use-transportation concept for directing strategic growth and investment across the region. The Regional Activity Centers within the study area include Huntington/Penn Daw, Beacon/Groveton, Hybla Valley/Gum Springs, Fort Belvoir, and North Woodbridge. Fairfax and Prince William Counties use a very similar concept in their Comprehensive Plans, which generally correspond with the Activity Centers defined by the Region Forward Coalition. These are described as Community Business Centers in the Fairfax Comprehensive Plan and as Urban Mixed Use Areas in the Prince William Comprehensive Plan. In addition, Fairfax County has defined a Lorton-South Route 1 Suburban Town Center within the larger Lorton South Route 1 Suburban Center. (see **Overview Figure 1**).

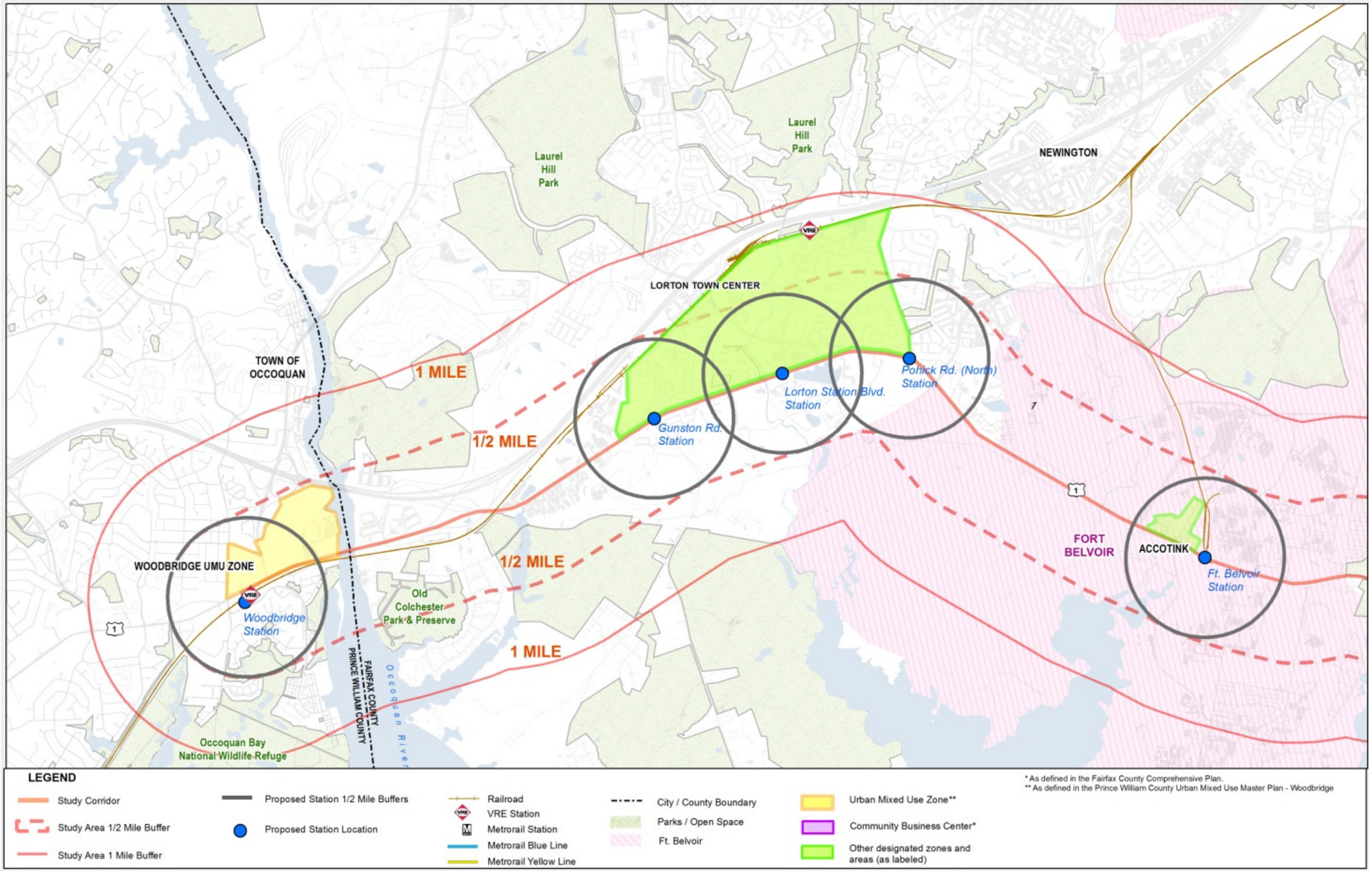
Overview Figure 1: Community Business Centers, Lorton Town Center, and Urban Mixed Use Area



This study has defined thirteen potential transit stations on the Route 1 corridor, which apply to all of the multimodal alternatives. The station locations are shown, along with the CBC, UMU, and other key land use designations, in **Overview Figure 2**. The half-mile radius around each station refers to the area used for the land use analysis. The half mile radius was used because it represents a typical walking distance for transit riders, and therefore a generally appropriate location for transit-oriented development. It is also the area of analysis for many of the FTA criteria relating to land use and economic development.

Overview Figure 2: Huntington Transit Station Area, Community Business Centers, Lorton Town Center, Woodbridge Urban Mixed Use Area, and Proposed Station Locations




Laurel Hill Park
Laurel Hill Park
NEWINGTON
LORTON TOWN CENTER
TOWN OF OCCOQUAN
1 MILE
1/2 MILE
Pohick Rd. (North) Station
Lorton Station Blvd. Station
Gunston Rd. Station
FORT BELVOIR
ACCOTINK
Ft. Belvoir Station
WOODBRIDGE UMU ZONE
Woodbridge Station
1/2 MILE
Old Colchester Park & Preserve
1 MILE
FAIRFAX COUNTY
PRINCE WILLIAM COUNTY
Occoquan River
Occoquan Bay National Wildlife Refuge
LEGEND
Study Corridor
Study Area 1/2 Mile Buffer
Study Area 1 Mile Buffer
Proposed Station 1/2 Mile Buffers
Proposed Station Location
Railroad
VRE Station
Metrorail Station
Metrorail Blue Line
Metrorail Yellow Line
City / County Boundary
Parks / Open Space
Ft. Belvoir
Urban Mixed Use Zone**
Community Business Center*
Other designated zones and areas (as labeled)
* As defined in the Fairfax County Comprehensive Plan.
** As defined in the Prince William County Urban Mixed Use Master Plan - Woodbridge

The land use analysis has been carried out in three phases as shown in **Overview Figure 3**. Phase #1 examines corridor-wide conditions pertaining to land use, development conditions, and accommodation for growth. Data tables for various land use factors are provided as a means to compare proposed station areas in terms of transit-supportive potential. The proposed station areas include one Metrorail station (Huntington), five Fairfax Community Business Centers (Penn Daw, Beacon, Hybla Valley, South County & Woodlawn), two additional Fairfax Activity Centers (Fort Belvoir and Pohick/Lorton/Gunston Road in the Lorton Suburban Center) and one Urban Mixed Use Area in Prince William County (Woodbridge).

Overview Figure 3: Flow Chart for Land Use Evaluation

Phase #2 examines the extent and type of development needed to achieve the goals and objectives for the multimodal transportation alternatives under study. Factors under consideration include the development densities, desired mix of uses, and contributing street network and pedestrian and bicycle connectivity. Three land use scenarios have been developed, reflecting different land use scenarios, as a way to understand the types of multimodal alternatives that can potentially be supported on the corridor. Scenario One is the land use development that can be expected under forecasted population and employment growth, using MWCOG 8.2 forecast models for 2035.[1] Scenarios Two and Three use different land use mixes, reflecting increased growth assumptions and development densities for the purpose of demonstrating the economic, transit ridership, and livability impacts of selected multimodal alternatives. (The economic impacts of Scenarios Two and Three are discussed in Chapter 4 of this memo.)

Phase #2 also describes the three land use scenarios developed and evaluates the proposed station areas under each scenario using the Multimodal Center Types as defined in the Department of Rail and Public Transportation (DRPT) *Multimodal System Design Guidelines*.[2] These Multimodal Center Types provide an indication of the transit options that can likely be supported based on the development densities illustrated in each of the scenarios. Overview Table 1 presents a table from the DRPT

[1]Metropolitan Washington Council of Governments, 2013.
[2]Virginia Department of Rail & Public Transportation (DRPT).*Multimodal System Design Guidelines*, *Final Report October, 2013*.

Multimodal System Design Guidelines that relates activity density to specific transit modes, and defines the associated Multimodal Center Type.

Overview Table 1: Multimodal Center Types and Corresponding Transit Investment

	Multimodal Center Type	Activity Density (Jobs + People/ Acre)	Supported Transit Investment
P-6	Urban Core	70.0 or more	LRT/Rail
P-5	Urban Center	33.75 to 70.0	BRT/LRT
P-4	Large Town or Suburban Center	13.75 to 33.75	Express Bus
P-3	Medium Town or Suburban Center	6.63 to 13.75	Fixed Route Bus
P-2	Small Town or Suburban Center	2.13 to 6.63	Demand Response
P-1	Rural or Village Center	2.13 or less	Demand Response
SP	Special Purpose Center	Varies	Varies

Source: DRPT Multimodal System Design Guidelines, 2013

Phase #3 focuses on recommendations for promoting transit-oriented development around the proposed station locations. This includes urban design concepts and land use plans for three specific locations on the corridor – Beacon Groveton (Beacon Hill), Hybla Valley and Woodbridge. These urban design concepts highlight the key elements for creating transit supportive communities and are illustrated with graphics that include land use plans, connectivity diagrams, and massing models that correspond to the three land use scenarios described in Phase #2.

Phase #3 also provides an assessment of transit-supportive development prospects under current land use and zoning policies, with reference to FTA New Starts/Small Starts Land Use and Economic Development criteria. This includes recommendations for how project sponsors may improve Land Use and Economic Development ratings under the FTA New Starts/Small Starts project justification criteria.

Many of the land use analyses for this study emphasize the half mile radius around each proposed station. The intent is to focus on the area that will most likely support transit-oriented, mixed-use development at a walkable distance. However, as the counties progress with specific small area plans for each station, these station area boundaries will be refined to reflect the specific needs and realities of that neighborhood. For example, the Fairfax Comprehensive Plan shows a boundary for the Huntington Metro Station Area that is larger than a half mile radius around the station, while the Beacon Groveton and Hybla Valley CBC's are smaller than this radius. The small areas for the CBC's are intended to focus commercial and mixed use development while protecting established neighborhoods.

1.0 Land Use Analysis

To determine the most appropriate strategy for transitioning the Route 1 corridor from its current land use configurations to a form that can better support transit service, it is critical to first understand the existing patterns of development. This process includes identifying the key features that should be maintained and protected, as well as the elements that can change over time in order to promote transit use, and pedestrian and bicycle activity.

The following section will examine existing land use conditions with regard to how these inform the alternatives analysis process.

1.1 Existing Land Use Conditions

The land use analysis for this study includes a detailed review of land use conditions, plans, and policies in Fairfax and Prince William Counties as they relate to the Route 1 corridor. This analysis includes:

- Existing land use character
- Historic resources
- Environmental constraints
- Population and employment (current and future)
- Other key demographic data (current and future)
- Land use policies and plans (including allowable density, mix of uses, etc.)
- Zoning
- Affordable housing policies

Sections describing existing land use character, historic resources and environmental constraints can be found in **Appendices D1-D11**. The sections included below provide a baseline of conditions that will be pertinent to a future FTA Capital Investment Program ("New Starts") funding application.

1.1.1 Population and Employment Centers

The population and employment figures for the Route 1 corridor, defined as the number of persons living or working within a half-mile of the Route 1 roadway centerline, was obtained through county and MWCOG demographic data. Boundaries of the Community Business Centers in Fairfax County and the Urban Mixed Use Area in Prince William County, as shown on the maps, are the basis for the Activity Center boundaries used for scenario development in Phases #2 and #3. See **Appendix D8, Population & Employment Per Acre - 2010 Map**.

Under scenario development, the Activity Centers have been further refined as station areas, which are inclusive of the current Community Business Centers, Lorton area and Fort Belvoir in Fairfax County and the Urban Mixed Use Area in Prince William County. In terms of future TOD development, the counties will need to make substantial efforts to increase density and jobs within the corridor and around station areas in particular, if an FTA funding application is to be successful.

Table 1-1: 2010 Population and Employment by Station Area

(Analysis within half-mile radius of each station)

Proposed Station Area	2010 Population	2010 Employment	2010 Activity Density (population + employment) /acre)
Huntington*	7,714	1,289	17.9
Penn Daw	4,661	2,272	13.8
Beacon Hill	3,736	2,809	13.0
Lockheed Blvd.	7,728	1,802	18.9
Hybla Valley	5,010	2,387	14.7
Gum Springs	6,483	2,306	17.5
South County	5,169	1,399	13.1
Woodlawn	4,508	1,576	12.1
Fort Belvoir	539	2,794	6.6
Pohick Rd. (North)	2,479	1,181	7.3
Lorton Station Blvd.	3,462	609	8.1
Gunston Road	2,752	981	7.4
Woodbridge**	2,793	1,632	9.1

Source: MWCOG 8.2 Land Use
*Existing Metrorail Station
**Exiting Virginia Railway Express (VRE) Station

1.1.2 Existing development by station area

The Comprehensive Plans for Fairfax and Prince William Counties have detailed descriptions of existing and future land uses along the Route 1 corridor. The Fairfax County Comprehensive Plan describes current and intended future land uses for each Community Business Center (CBC) and the Lorton area. Mixed-use development, with street frontage retail and mid-to-high-rise residential above, is the preferred development type for the CBC areas The Huntington Transit Station Area and Community Business Centers of North Gateway, Penn Daw, and Beacon Groveton, and the Fort Belvoir/Accotink area all have mixed-use developments on the ground or plans for these in the approvals stage, as of spring 2014.

Huntington: The core of this area is the Huntington Metro station, serving approximately 9,000 transit patrons on a typical weekday. Huntington is developing at higher densities than the surrounding area, with rezoning up to an intensity of 3.0 floor area ratio (FAR) for a recent mixed-use project.

Penn Daw: This proposed station is located at the Penn Daw CBC. Located less than a mile from the Huntington Metro station, the Penn Dawn CBC (totaling 112 acres) is transitioning from a highway-oriented retail area to a hub of urban mixed-use activity. New mixed-use developments are planned, as a response to the 2012 Penn Daw Comprehensive Plan Amendment which permits denser development in this CBC.

Beacon Hill: This proposed station is located at the Beacon Groveton CBC, which is at one of the highest points in the D.C metropolitan area, with views of Alexandria, Tysons Corner and the Washington Monument. Beacon Mall, home to several national retailers, is sited at the former Beacon Airfield site. The 290 unit mixed-use Beacon of Groveton development opened in summer 2012 and represents the first urban scale mixed-use development built on Route 1.

Lockheed/Hybla Valley/Gum Springs: These three proposed station locations are located in the Hybla Valley/Gum Springs CBC. Mount Vernon Plaza is the focal point of this large (239 acres) CBC. This recently renovated shopping center provides over 560,000 square feet of retail space and includes large national retailers. Surrounding the Mount Vernon Plaza are areas of retail, dining, and service businesses. Costco opened adjacent to Mount Vernon Plaza in 2013. Gum Springs, a historic black community of mainly single family houses with some affordable multi-family housing, is at the southern end of this CBC on the east side of Richmond Highway. Hybla Valley/Gum Springs has the highest percentage of public and affordable housing within the project corridor, an important factor in FTA scoring of New Starts projects.

South County: This proposed station is located at the South County CBC. The central feature of this area is the South County Center, a human service center operated by Fairfax County government. Active residential neighborhoods surround this area, and about 500 new residential units are planned between the intersections of Buckman Road and Janna Lee Avenue. The area is connected to residential neighborhoods to the east via Mount Vernon Memorial Highway (Route 235).

Woodlawn: This proposed station is located at the Woodlawn CBC. The Woodlawn CBC abuts Fort Belvoir and is expected to absorb some new residential development related to the Base Realignment and Closure (BRAC) activity at the base. The intersection of Richmond Highway and Mount Vernon Memorial Highway is the gateway to many historical attractions such as Woodlawn Plantation, George Washington's Mount Vernon Estate and Grist Mill, and Frank Lloyd Wright's Pope-Leighey House.

Fort Belvoir: This proposed station is located at Fort Belvoir, near the Accotink Village. Under the currently implemented BRAC plan, Fort Belvoir is transitioning from a traditional military base to an employment center expected to provide 48,000 jobs to the region[3]. The centerpiece of the BRAC development, Fort Belvoir Community Hospital, was completed in 2012, providing 3,100 jobs. As of August 2013, Fort Belvoir housed 26,000 employees and 7,000 residents[4]. The planned National Army Museum will be located two miles south of Woodlawn, within the northern section of Fort Belvoir on the Fairfax County Parkway. Approximately one million visitors are expected annually.[5] Fort Belvoir's 2014 Real Property Master Plan is expected to be released in June 2014.

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[3] Draft *Fort Belvoir Real Property Master Plan, Long Range Component*, December 2009. Fort Belvoir New Vision prepared for the U.S. Army Corps of Engineers

[4] *Fort Belvoir*, Southeast Fairfax Development Corporation website, http://www.sfdc.org/visit-shop/ft-belvoir/

[5] National Museum, United States Army website: http://thenmusa.org/about-the-museum.php (accessed 5/16/14)

The Village of Accotink is a historic community of homes and businesses along Backlick Road, completely surrounded by Fort Belvoir. Several sites, including the Accotink United Methodist Church, are protected by the county. A 283-unit mixed use development is planned for this area.

Pohick Road (North)/ Lorton Station Blvd/Gunston Road: These three proposed stations are located in the Lorton area. According to the Fairfax Comprehensive Plan, Lorton is planned as a Suburban Center rather than as a CBC. The Lorton Town Center lies between Interstate 95 and Route 1, with an Amtrak/Virginia Railway Express (VRE) rail station, and draws heavy commuter use. Mixed use development exists near the VRE station.

Woodbridge: This proposed station is located in North Woodbridge, adjacent to the existing VRE station. The North Woodbridge Urban Mixed Use Zoning Plan envisions the area surrounding Route 1 and Virginia Route 123 as a significant mixed use development, proposed for 3,300 housing units and over one million square feet of office and retail development.[6] The area is located in Prince William County close to the scenic Occoquan River and is undergoing rapid housing development between Route 1 and the Potomac River.

1.2 Existing and Planned Development

1.2.1 Parcel Analysis

The success of any transit investment depends, to some extent, on the development pattern around the stations. A high-quality transit investment, such as bus rapid transit, light rail, or Metrorail, will benefit from pedestrian-oriented, mixed-use development on adjacent parcels. An analysis of parcel sizes by station area was performed as part of assessing readiness for potential mixed-use developments. Although there is no one particular parcel size for infill mixed-use development, a desirable size to accommodate strong street access and sufficient area for buildings, internal alleys and open space would be four to five acres or more. Within the Route 1 corridor, few parcels are greater than five acres, the exceptions being shopping centers such as Beacon Mall and Mt. Vernon Plaza. The implication for future land use is that extensive parcel consolidation will likely be necessary to develop significant mixed use projects associated with some of the transit stations. **Table 1-2** presents the parcel sizes within half-mile radius of each station. A set of maps shows the location of large parcels (over five acres) throughout the corridor and the proximity of these to the designated Community Business Centers or Urban Mixed Use area. See **Appendix D-11, Parcel Acreage Map**.

[6] *Urban Mixed Use Master Zoning Plan for North Woodbridge*, 2005.

Table 1-2: Parcel Sizes by Station
(analysis of all parcels that fall within a half-mile radius of each station)

Station	Total Number of Parcels	Number of Parcels			
		0-0.5 Acres	0.5-5 Acres	5-10 Acres	> 10 Acres
Huntington	3750	2314	1426	6	4
Penn Daw	1375	1257	101	5	12
Beacon Hill	1215	1088	113	5	9
Lockheed Blvd.	938	849	74	7	8
Hybla Valley	1200	1014	170	9	7
Gum Springs	1290	1009	263	10	8
South County	1704	1579	109	11	5
Woodlawn	1556	1324	217	5	10
Fort Belvoir	45	27	16	1	1
Pohick (North)	1131	1036	77	7	11
Lorton Station Blvd.	845	734	93	7	11
Gunston Rd.	1400	1236	66	24	14
Woodbridge	928	801	95	12	20

Source: Fairfax and Prince William County GIS

1.2.2 Approved Mixed-Use Development

As of February 2014, the far north end of the project corridor (within one mile of Huntington Metro Station) is experiencing significant new housing and mixed-use development, with five new housing projects totaling 1,487 housing units currently in the development pipeline.[7] The rest of the corridor continues to redevelop with primarily low density commercial properties, but mixed-use projects are beginning to be proposed further south as well. **Table 1-3** shows a summary of newly planned or rezoned housing and mixed-use development in the study area. Overall, there is approximately 748 million square feet of existing development in the study corridor.

[7] *Status of Projects and Issues, February 2014.* Southeast Fairfax Development Corporation. http://www.sfdc.org/develop/documents/

Table 1-3: Approved / Proposed Mixed-Use Development & High Density Housing

Activity Area	Projects	Status as of May 2014	Residential units	Non-residential GSF
Huntington	The Parker at Huntington Station	Zoning approved	360	210,000
	Huntington Biscayne	Zoning approved	141	3,500
	Huntington Club Condominiums	Comprehensive Plan Amendment approved	1,200	727,000
Penn Daw	The Shelby	Zoning approved	240	0
	Penn Daw Plaza	Comprehensive Plan Amendment approved	471	45,000
	The Grande at Huntington	Zoning approved	275	25,000
Beacon/Groveton	Beacon of Groveton Phase II	Zoning approved	0	50,000
Hybla Valley/Gum Springs	No mixed-use development			
South County	Mount Vernon Gateway at Buckman Road	Comprehensive Plan Amendment approved	500	0
Woodlawn	No mixed-use development			
Fort Belvoir Accotink Village	Bainbridge Accotink Village	Zoning proposed	283	24,000
Lorton	No planned or approved mixed-use development			
Woodbridge	No planned or approved mixed-use development			
	Total (pending final plans)		**3,470**	**1,084,500**

Source: Southeast Fairfax Development Corporation website, March 2014 and Review by Fairfax DPZ staff

1.2.3 Future Development Conditions Within Corridor as per Adopted County Comprehensive Plan

Although the Route 1 corridor does not have large parcels of land available for development, it is reasonable that a number of currently developed parcels could undergo redevelopment as market demand for housing grows. The Fairfax County Comprehensive Plan anticipates 11.3 million gross square feet (GSF) of non-residential development and 12,300 residential units. In 2014, approximately 5.3 million GSF of non-residential use and 5,000 dwellings exist, not including the Huntington Transit Station Area and the Lorton Suburban Center. Within this smaller portion of the Route 1 corridor, almost 500 new residential units have been approved through the zoning process. The projects are occurring on land previously developed for other uses. **Table 1-3** indicates that around 3,470 new residential units are being proposed for the corridor in the near future, an amount that would achieve about a third of the anticipated new housing for the corridor before 2020.

Through the Urban Mixed Use Master Zoning Plan for North Woodbridge, Prince William County has projected development of 3,300 residential units and 1.03 gross square feet of non-residential development for the area along Route 123, adjacent to southbound Route 1. The projected density is 1.65 FAR at plan build out. See **Appendix D-13, Allowable FAR within half-mile Buffer Map**.

1.3 Review of existing county zoning and land use policies

The majority of the zoning along the Route 1 corridor is commercial, typified by low-density shopping centers fronting on parking lots throughout the north section of the project. South of Fort Belvoir, residential zoning is prevalent, with pockets of commercial land at Lorton and Woodbridge. The area just north of the I-95 interchange near Lorton is primarily industrial and includes a wastewater treatment plant owned and operated by Fairfax County. **Table 1-4** outlines the primary Fairfax and Prince William land use documents that direct future growth and development in the corridor. These documents are used in the land use analysis to understand the current land use conditions and the vision for each segment of the corridor, as defined by the Counties and Fort Belvoir in their plans and studies. **Table 1-4** lists relevant county plans and policies, organized by county, area scale and date. Plans not county-adopted are listed at the end.

The Fairfax County Comprehensive Plan directs growth to specific employment centers – such as Community Business Centers and Suburban Centers - that can potentially become station areas with transit-supportive development densities. Prince William County has created an Urban Mixed Use plan for North Woodbridge that envisions a high-density, mixed use area surrounding the Woodbridge Virginia Railway Express (VRE) station. Housing affordability is addressed in the counties' five-year consolidated housing plans, which call for a percentage of affordable housing for new market-rate development. Both counties are in the process of revisiting their requirements for affordable housing in targeted growth areas.

Policies relating to urban design, street design, parking and multimodal transportation vary throughout the counties and in the study area. The Fairfax County Comprehensive Plan provides guidance pertaining to streetscape, parking, landscape, and the scale and siting of new buildings for the area extending south of I-495 to Fort Belvoir. Policies relating to multimodal transportation should be developed if one of the alternatives is adopted by the Board of Supervisors. Prince William County has recently developed a set of urban design guidelines for the Route 1 corridor in North Woodbridge, emphasizing building interface, street connectivity and a vibrant pedestrian community. This policy could be considered a model for developing transit-supportive urban and street guidelines for other station areas.

Table 1-4: Land Use Resources

Document	Year	Summary	Key Finding/Relevant Recommendations
Fairfax County Comprehensive Plan AREA IV Mount Vernon Planning District, 2013 edition with amendments 2014 (Section for MV1 Huntington Community Planning Sector) Fairfax County VA	2014	Identifies land use conditions for Huntington Transit Development Area	Maximum gross square feet of development, number of dwelling units and building height limits specified for Huntington Transit Development Area. Parking reductions & bicycle amenities and other transportation demand management techniques can be used to achieve traffic mitigation requirements.
Fairfax County Comprehensive Plan - AREA IV Mount Vernon Planning District, 2013 edition with amendments 2014 (Sections for Planning Sectors MV2-MV8) Fairfax County VA	2014	Guiding document for county future land use and transportation.	Envisions six Community Business Centers (CBC) along the Rt 1 Corridor: North Gateway, Penn Daw, Beacon/Groveton, Hybla Valley/Gum Springs, South County Center and Woodlawn.
Fairfax County Comprehensive Plan - AREA IV Lower Potomac Planning District, 2013 edition with amendments 2014 Fairfax County VA	2014	Lower Potomac District extends from Fort Belvoir/Lorton to PW County line.	Transportation objectives identical to Mount Vernon, including widening of Rt. 1 between PW County line & Fort Belvoir.
Fairfax County Zoning Ordinance Part 8 2-800 Affordable Dwelling Unit Program Fairfax County VA	2014	Regulates development location, type and character for county	Provides potential density bonuses up to 20%, based on housing type. ADU requirements range from 6.25% for 4+ story buildings to 12.5% for 3 story or less
Fairfax County Five-Year Consolidated Plan, 2011 – 2015 Fairfax County VA	2011	HUD-required five-year affordable housing plan for Fairfax County, updated annually.	The County's affordable housing ordinance calls for a 5% goal for affordable housing, 12% workforce housing goal within all new development.
Fairfax County Policy Plan 2013 Edition with amendments 2014 Fairfax County VA	2014	Broad statement of policy that gives direction to Area Plans and TOD planning	Emphasizes the need for a balanced transportation system that reduces dependence on the automobile. Also encourages protection of established neighborhoods while strategically promoting efficient patterns of mixed-use development that support an interconnected, multimodal system (transit, sidewalks, trails, bicycle facilities, and roadways).

Document	Year	Summary	Key Finding/Relevant Recommendations
Mount Vernon District Visioning Task Force Fairfax County VA	2010	25 year vision for District with recommendations for Richmond Highway, focus on Smart Growth guiding principles	Desire for livable corridor articulated, with entertainment, cultural destinations, walkability along Rt 1 and nearby streets.
Prince William County 2008 Comprehensive Plan – Land Use Component Prince William County, VA	2008	County plan for land use, economic growth, livability & transportation, updated at five-year intervals	Concentrate growth in town centers / TOD with supportive mixed use zoning, density bonuses, and lower parking requirements. Includes the North Woodbridge Urban Mixed use Master Plan (with additions since 2005).
Potomac Communities Design Guidelines Prince William County, VA	2014	Proposes design guidelines for buildings, sites, streets and landscape for projects in the Route 1 Corridor of Prince William County	Establishes standards for urban development in North Woodbridge / Route 1, promoting pedestrian environment and vibrant mixed use.
Prince William County Housing Affordability Market Analysis, December 2012 Prince William County, VA	2012	An analysis of affordable housing needs in the County.	Significant need for housing for families at or below 30% AMI (Area Median Income). Need for work force rental units for families 30% AMI-120% AMI.
Prince William County Strategic Plan, 2004-2008 Prince William County, VA	2012	An adopted plan to meet the goals and principles of guiding future growth of the county.	Implement the Urban Mixed Use Master Zoning Plan in north Woodbridge. Implement Streetscape and Utility Plan for Route 1.
Prince William County Redevelopment Overlay – Woodbridge Prince William County, VA	2011	Redevelopment overlay districts are established by the Board of County Supervisors to encourage economic redevelopment of lands in proximity to major thoroughfares.	Route 1 corridor through Woodbridge is within Redevelopment Overlay; parcels eligible for financial incentives to redevelop in manner consistent with Comprehensive Plan.
Urban Mixed Use Zoning Master Plan – North Woodbridge Prince William County, VA	Dec. 2005	Provides a mixed use land use strategy for the redevelopment of 164 acres of land along Route One, across from the VRE Station at Woodbridge.	Proposes medium-high density residential and office uses.

Document	Year	Summary	Key Finding/Relevant Recommendations
Fort Belvoir Real Property Master Plan, Long Range Component Department of Defense, US Army Corps of Engineers	2010	Master plan addressing proposed land use changes as a result of 2005 Base Realignment and Closure (BRAC)	Assumes 48,000 total employment by 2030 concentrated on several base activity centers. Transit connectivity to region is a key goal.
Urban Land Institute Study of Richmond Highway Corridor	2005	Study intent was to develop strategies to revitalize the corridor and determine potential for commercial office market	Development along Richmond Hwy should be focused on CBCs and activity nodes. Called for increased FAR in key locations.

1.4 Amount of Approved Affordable Housing Within Corridor

The Route 1 corridor contains a significant amount of affordable housing directed at low-to-moderate and moderate-to-middle income residents. In 2009 there were approximately 10,045 legally binding affordability-restricted housing units in Fairfax County; of these, 2149 or 21percent are located in the Route 1 corridor study area.[8] The Mount Vernon Planning District and the Route 1 corridor have much higher percentages of publicly assisted housing than the county as a whole.[9]

Each new development in Fairfax County is encouraged to provide at least 12 percent affordable and/or workforce housing. **Table 1-5** provides a list of the affordable housing units within the Route 1 study corridor. This is an initial list demonstrating the large number of affordable housing units on the Route 1 corridor; however it will require further research and updates prior to an FTA application. The existing affordable housing units are shown on a map in **Appendix A.12, Existing Affordable Housing map**.

[8] *Housing Fundamentals: How Affordable Housing is provided in Fairfax County*. Board of Supervisors Housing Committee, Powerpoint presentation, June 2009.
Correspondence with Fairfax County Department of Housing and Community Development, September 2013.
[9] *Fairfax County Comprehensive Plan 2013 edition, amended through 1-28-*2014 - Area IV Mount Vernon Planning District, Richmond Highway Corridor Area.

Table 1-5: Legally Binding Affordability Restricted Housing in the Route 1 Corridor[10]

Nearby Activity Center	Housing	Type	Number of Affordable Units	Legally Binding	Meets 60% AMI[11] criteria
Penn Daw	**Pen Daw Plaza (approved, unbuilt)**	Affordable Dwelling Unit	21	yes	yes
Beacon – Groveton	**The Atrium**	FCHRA owned rental housing	37	yes	yes
Beacon – Groveton	**Tavenner Lane**	FCHRA owned rental housing	24	yes	yes
Beacon – Groveton	**Lafayette Apartments (aka Groveton Gardens)**	Low Income Housing Tax Credit	340	yes	yes
Beacon – Groveton	**Woodley Hills Estates**	Manufactured Housing	115	yes	yes
Hybla Valley	**Audubon Apartments**	Public Housing	46	yes	yes
Hybla Valley	**West Ford I**	Public Housing	24	yes	yes
Hybla Valley	**West Ford II**	Public Housing	22	yes	yes
Hybla Valley	**West Ford III**	Public Housing	59	yes	yes
Hybla Valley	**Murrygate Village**	FCHRA owned rental housing	198	yes	yes
Hybla Valley	**Gum Springs Glen**	FCHRA owned rental housing	60	yes	yes
Hybla Valley	**Colchester Towne**	Public Housing	8	yes	yes
		FCHRA owned rental housing	24		
Hybla Valley	**Spring Gardens**	Federally assisted rental units	207	yes	yes
Hybla Valley	**Hunting Creek Townhomes**	LIHTC/Federally assisted rental	35	yes	yes
Hybla Valley	**Stony Brook Apartments**	LIHTC/Federally assisted rental	204	yes	yes
Hybla Valley	**Mount Vernon House**	FCHRA owned rental housing	130	yes	yes
Hybla Valley	**Janna Lee I & II**	LIHTC/Federally assisted rental	300	yes	yes
South County	**Old Mill Gardens**	Public Housing	48	yes	yes
Lorton	**Armistead I & II**	Low Income Housing (LIHTC)	248	yes	yes
Woodbridge	**None planned at this time**				

Source: Fairfax County Comprehensive Plan, Prince William County Office of Housing & Community Development (as of September 2013)

[10] Table last updated May 2014 with proffers information obtained from Fairfax County Zoning Approvals
[11] Area Median Income (AMI) is the midpoint in the family-income range for a metropolitan statistical area or for the non-metro parts of a state. The figure often is used as a basis to stratify incomes into low, moderate and upper ranges. (Source: Freddie Mac, 2013)

2.0 Land Use Scenarios

Three land use scenarios were developed as part of the Route 1 Multimodal Alternatives Analysis. These scenarios are intended to demonstrate the relationships between population and employment growth, multimodal transportation demand, economic development, and high quality public investments. In this way, the land use scenarios inform the evaluation of multimodal transportation alternatives.

The three land use scenarios represent a range of potential development scales. The approach for each scenario is described below:

Scenario One: The Scenario One land use analysis is based on the 2035 Metropolitan Washington Council of Governments (MWCOG) version 8.2 projections for the half-mile radius around each proposed station location. 2035 Traffic Analysis Zone (TAZ) data were used to analyze the population and employment currently projected for the station locations. Scenario One represents "current trends for growth" under the 2035 population and employment projections, with a concentration of population and employment within the half-mile station core area.

For this and subsequent scenarios, the principles outlined in the Fairfax County Comprehensive Plan's Guidelines for Transit-Oriented Development are used as a framework for proposing station area plans to support a transit investment. This includes establishing a street grid, defining appropriate building massing and frontage, providing a mix of uses, creating plaza and park spaces, and designing pedestrian-oriented streetscapes around the station areas.

Scenario Two: The Scenario Two land use analysis reflects a "reasonable increment of growth" above the 2035 MWCOG projections. The "reasonable increment of growth" is assumed to result from:

(1) New development that can be attributed to a high quality transit investment, and
(2) New development that can be attributed to a change in county policies that promotes transit-oriented development.

The growth increment for each station area has been estimated to range from 15 to 25 percent, depending on the station location, and input provided by Fairfax and Prince William County staff members. The percentages are further informed by national experience with transit-oriented development and associated policies. For this scenario, population and employment is concentrated within the half-mile station core, at greater densities than Scenario One.

Scenario Three: The Scenario Three land use analysis reflects the amount of population and employment needed to achieve development densities typically associated with:

- Metrorail stations at the Huntington, Beacon Hill, and Hybla Valley locations, and
- BRT stations at all other station locations on the corridor.

These population and employment thresholds were determined using the DRPT Multimodal System Design Guidelines, and analysis of existing Metrorail station area development patterns in the DC region and BRT/LRT stations in the Commonwealth. Population and employment is concentrated within the half-mile core, but may also be distributed locally as needed to achieve the requisite activity density for Metrorail.

2.1 Scenario One

The Scenario One land use analysis is based on the 2035 MWCOG (version 8.2) projections for the half-mile radius around each proposed station location. 2035 TAZ data were used to analyze the population and employment currently projected for the station locations.

Table 2-1 presents the 2010 MWCOG and 2035 MWCOG projections by station. In some cases, the stations are clustered for the analysis because there was significant overlap of the half-mile radii around each station. Table 2.1 also presents the anticipated activity density and associated Multimodal Center Type for each station and station cluster. The activity density calculation is a way to standardize and compare the various station areas. Activity density is calculated by adding together population and employment, then dividing by the station area acreage. Multimodal Center Type is a concept for understanding the relationship between activity density and corresponding level of transit investment. Generally higher development densities can support higher levels of transit investments. **Table 2-2** presents a table from the *DRPT Multimodal System Design Guidelines* that relates activity density to specific transit modes, and defines the Multimodal Center Types. The activity levels are based on a sampling of several hundred communities in Virginia, grouped within ranges that support different types of transit.

Table 2-1: MWCOG 2010 and Scenario One (MWCOG 2035) Analysis

Station or Station Cluster	Acreage	2010 Pop + Emp	2010 Activity Density	Multimodal Center Type (MWCOG 2010)	2035 Pop + Emp (Scenario One)	2035 Activity Density (Scenario One)	Multimodal Center Type (Scenario One)
Huntington, Penn Daw, Beacon Hill	1,340	19,686	14.7	P-4	34,926	26.1	P-4
Lockheed Blvd, Hybla Valley, Gum Springs	1,209	20,320	16.8	P-4	24,433	20.2	P-4
South County	503	6,569	13.1	P-3	9,276	18.4	P-4
Woodlawn	503	6,084	12.1	P-3	8,388	16.7	P-4
Fort Belvoir	503	3,333	6.6	P-3	4,425	8.8	P-3
Pohick Rd. (North), Lorton Station Blvd., Gunston Rd.	1,426	10,797	7.6	P-3	15,803	11.1	P-3
Woodbridge	503	4,569	9.1	P-3	11,646	23.2	P-4
Total	5,987	71,356			108,897		
Average		10,194	11	P-3	15,557	18	P-4

Notes:

- 2010 and 2035 Data Source: MWCOG 8.2 Forecast
- All data analyzed within half-mile of the station/station cluster locations

- Activity Density = (Population + Employment)/Acre
- Source for Multimodal Center Type: DRPT Multimodal Design Guidelines, 2013

Table 2-2: Multimodal Center Types and Corresponding Transit Investment

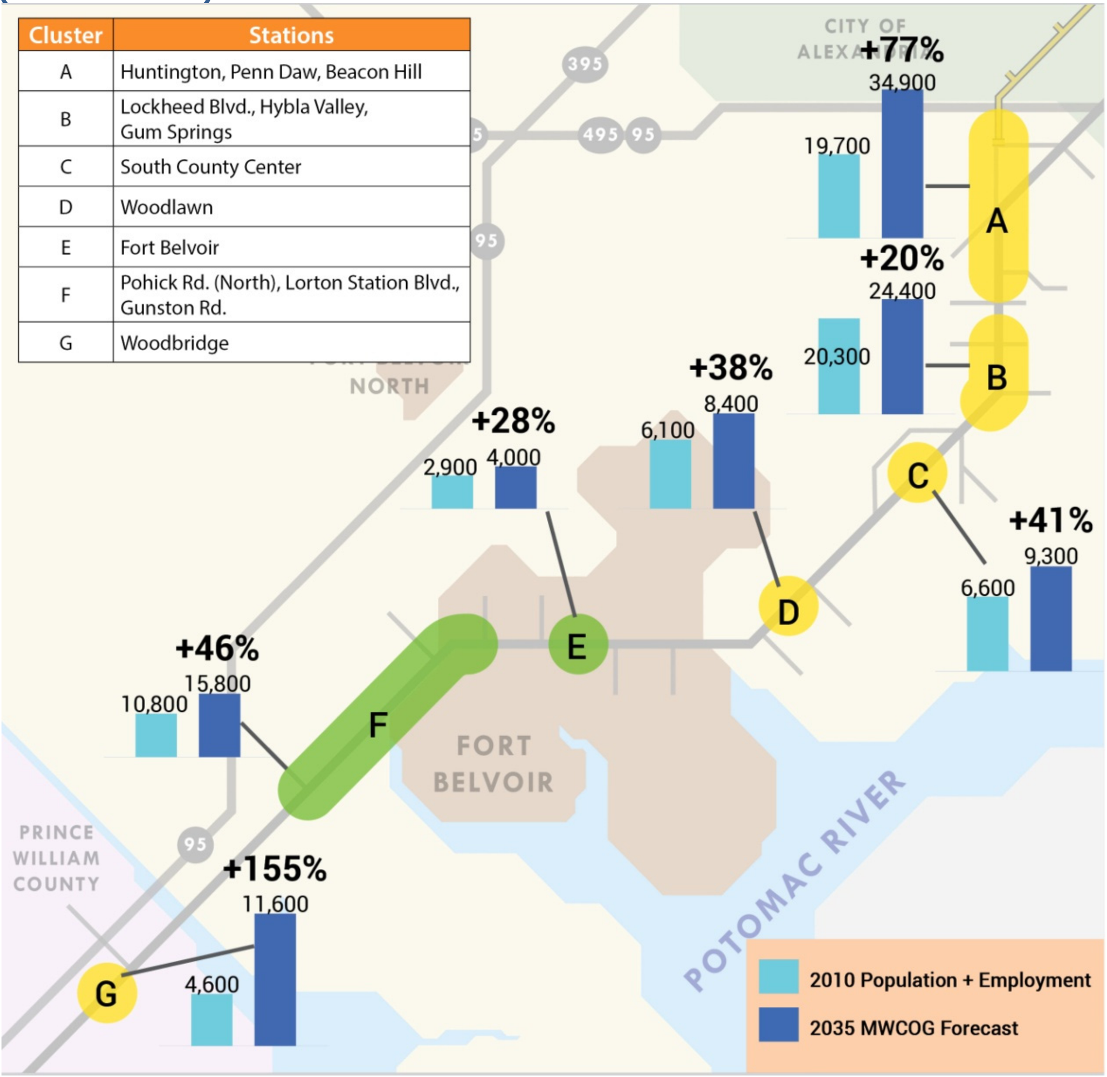
	Multimodal Center Type	Activity Density (Jobs + People/ Acre)	Supported Transit Investment
P-6	Urban Core	70.0 or more	LRT/Rail
P-5	Urban Center	33.75 to 70.0	BRT/LRT
P-4	Large Town or Suburban Center	13.75 to 33.75	Express Bus
P-3	Medium Town or Suburban Center	6.63 to 13.75	Fixed Route Bus
P-2	Small Town or Suburban Center	2.13 to 6.63	Demand Response
P-1	Rural or Village Center	2.13 or less	Demand Response
SP	Special Purpose Center	Varies	Varies

Source: DRPT Multimodal System Design Guidelines, 2013

Figure 2-1 presents Scenario One (MWCOG 2035 projections), the growth percentage from 2010 to 2035, and the Scenario One Multimodal Center Types by station and station cluster. The northern portion of the corridor (north of Fort Belvoir) and the southern end of the corridor (Woodbridge) have growth projections consistent with the large town/suburban center (P-4) Multimodal Center Type. This level of development is generally associated with an express bus type transit service. The middle segment of the corridor (Fort Belvoir and Lorton areas) has development expectations consistent with the medium town/suburban center (P-3) Multimodal Center Type. This level of development is generally associated with a fixed route bus type transit service.

Figure 2-1: MWCOG Projections by Station and Station Cluster: 2010 and 2035 (Scenario One)

Cluster	Stations
A	Huntington, Penn Daw, Beacon Hill
B	Lockheed Blvd., Hybla Valley, Gum Springs
C	South County Center
D	Woodlawn
E	Fort Belvoir
F	Pohick Rd. (North), Lorton Station Blvd., Gunston Rd.
G	Woodbridge



Supported Transit Technologies by Multimodal Center Type

Multimodal Center Intensity		
Center Type	**Activity Density (Jobs + people/acre)**	**Typical Supported Transit Technology**
P-6 Urban Core	70.0 or more	LRT/Rail
P-5 Urban Center	33.75 to 70.0	BRT/LRT
P-4 Large Town or Suburban Center	13.75 to 33.75	Express Bus
P-3 Medium Town or Suburban Center	6.63 to 13.75	Fixed Route Bus

Source for Multimodal Center Types: DRPT Multimodal System Design Guidelines, 2013

2.2 Scenario Two

The Scenario Two land use analysis reflects a "reasonable increment of growth" above the 2035 MWCOG projections. The "reasonable increment of growth" is assumed to result from:

(1) New development that can be attributed to a high quality transit investment, and
(2) New development that can be attributed to a change in county policies that promotes transit-oriented development.

This growth increment for each station area ranges from 15 to 25 percent, depending on the station location, and input provided by Fairfax and Prince William County staff members. The percentages are informed by national experience with transit-oriented development and associated policies.

Table 2-3 presents Scenario One (MWCOG 2035) and Scenario Two population and employment by station and station cluster. It also presents the percentage increase applied to each station (Scenario One to Scenario Two), the activity density for each station, and the associated Multimodal Center Type.

Table 2-3: Scenario One and Scenario Two Analysis

Station or Station Cluster	Acre-age	2035 Pop + Emp (Scenario One)	2035 Activity Density (Scenario One)	Multi-modal Center Type (Scenario One)	Percent Increase Sc. 1 to Sc. 2	Scenario Two Pop + Emp	Scenario Two Activity Density	Multi-modal Center Type (Scen-ario Two)
Huntington, Penn Daw, Beacon Hill	1,340	34,926	26.1	P-4	25%	43,658	32.6	P-4
Lockheed Blvd, Hybla Valley, Gum Springs	1,209	24,433	20.2	P-4	25%	30,541	25.3	P-4
South County	503	9,276	18.4	P-4	15%	10,667	21.2	P-4
Woodlawn	503	8,388	16.7	P-4	15%	9,646	19.2	P-4
Fort Belvoir	503	4,425	8.8	P-3	15%	5,088	10.1	P-3
Pohick Rd. (North), Lorton Station Blvd., Gunston Rd.	1426	15,803	11.1	P-3	15%	18,174	12.7	P-3
Woodbridge	503	11,646	23.2	P-4	25%	14,558	28.9	P-4
Total	5,987	108,897				132,332		
Average		15,557	18	P-4		18,905	21.4	P-4

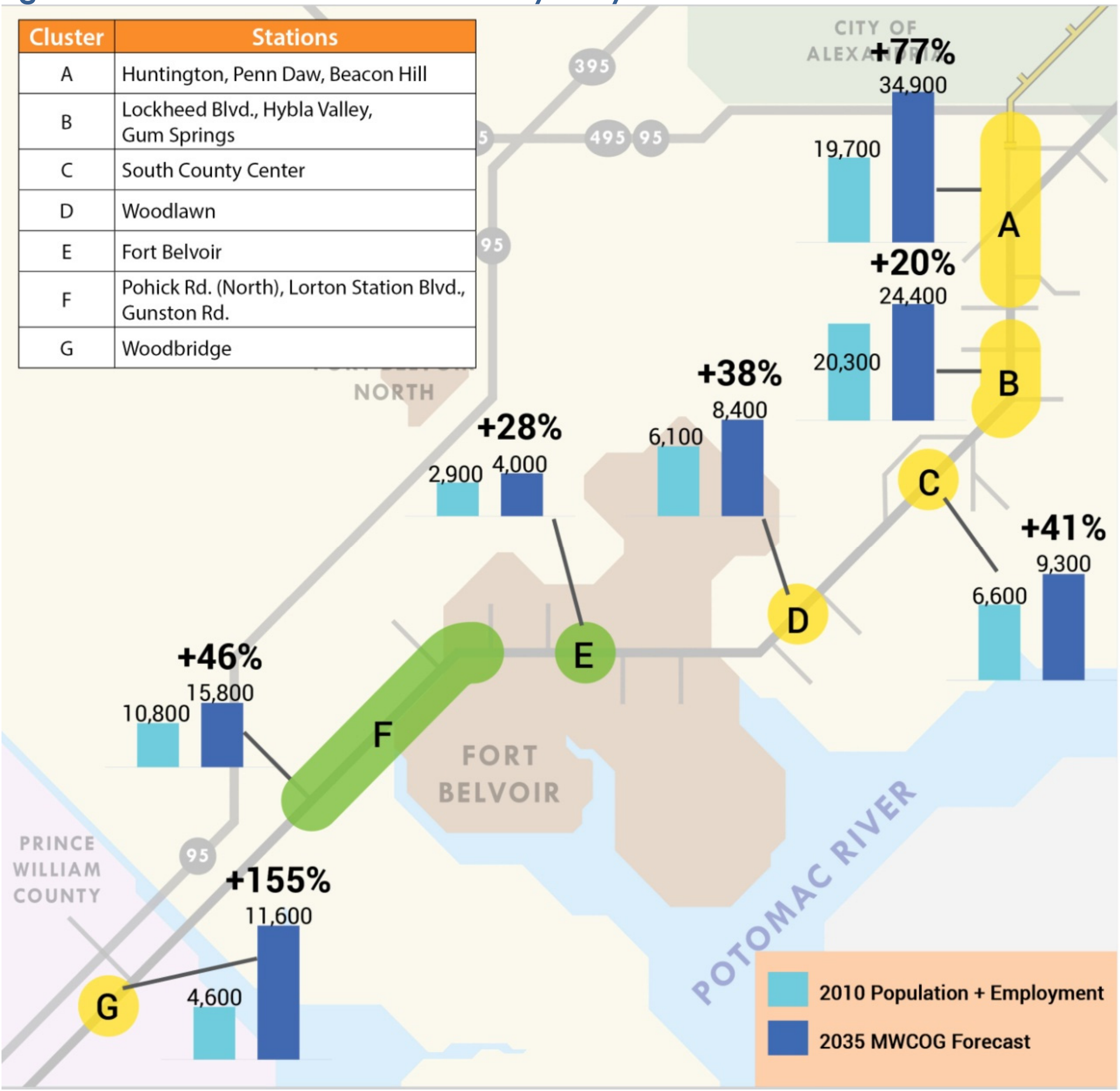
Notes:

- 2035 Data Source: MWCOG 8.2 Forecast
- All data analyzed within half-mile of the station/station cluster locations
- Activity Density = (Population + Employment)/Acre
- Source for Multimodal Center Type: DRPT Multimodal Design Guidelines, 2013

Figure 2-2 presents Scenario Two, the growth percentage increase from 2010 to Scenario Two, and the Scenario Two Multimodal Center Types by station and station cluster. The northern-most segment of the corridor (Huntington to Beacon Hill) and the southern end of the corridor (Woodbridge) have Scenario Two growth consistent with the large town/suburban center Multimodal Center Type (P-4), approaching the urban core Multimodal Center Type (P-5). This level of development is generally associated with express bus and BRT/LRT type transit services. The middle segment of the corridor south of Beacon Hill (Lockheed Blvd. to Woodlawn) has Scenario Two growth also consistent with the large town/suburban center (P-4) Multimodal Center Type. This level of development is generally associated with express bus type transit service. The Fort Belvoir and Lorton areas have Scenario Two growth consistent with the medium town/suburban center (P-3) Multimodal Center Type. This level of development is generally associated with a fixed route bus type transit service.

Figure 2-2: Scenario Two Growth Analysis by Station and Station Cluster

Cluster	Stations
A	Huntington, Penn Daw, Beacon Hill
B	Lockheed Blvd., Hybla Valley, Gum Springs
C	South County Center
D	Woodlawn
E	Fort Belvoir
F	Pohick Rd. (North), Lorton Station Blvd., Gunston Rd.
G	Woodbridge



Supported Transit Technologies by Multimodal Center Type

Multimodal Center Intensity		
Center Type	Activity Density (Jobs + people/acre)	Typical Supported Transit Technology
P-6 Urban Core	70.0 or more	LRT/Rail
P-5 Urban Center	33.75 to 70.0	BRT/LRT
P-4 Large Town or Suburban Center	13.75 to 33.75	Express Bus
P-3 Medium Town or Suburban Center	6.63 to 13.75	Fixed Route Bus

Source for Multimodal Center Types: DRPT Multimodal System Design Guidelines, 2013

2.3 Scenario Three

The Scenario Three land use analysis reflects the amount of population and employment needed to achieve Metrorail supportive development densities at the northern station locations (Huntington, Beacon Hill, and Hybla Valley) and BRT supportive development densities at all other station locations on the corridor. This corresponds with transportation Alternative 4. The DRPT Multimodal System Design Guidelines and analysis of existing Metrorail station area development patterns and BRT/LRT stations in the Commonwealth served as the foundation for determining the densities required to support Metrorail and BRT on the corridor. As shown in **Table 2.2**, Metrorail service is generally associated with station area activity densities of 70 or more (jobs + population)/acre. BRT service is generally associated with station area activity densities of 37 or more.

Table 2-4 presents Scenario Two and Scenario Three population and employment by station and station cluster. It also presents the activity density for each station, and the associated Multimodal Center Type.

Table 2-4: Scenario Two and Scenario Three Analysis

Station or Station Cluster	Acreage	Scenario Two Pop + Emp	Scenario Two Activity Density	Multimodal Center Type (Scenario Two)	Scenario Three Pop + Emp	Scenario Three Activity Density
Huntington, Penn Daw, Beacon Hill	1.340	43,658	32.6	P-4	79,437	70.0 at Huntington and Beacon Hill; 37.0 at Penn Daw
Lockheed Blvd, Hybla Valley, Gum Springs	1.209	30,541	25.3	P-4	61,332	70.0 at Hybla Valley; 37.0 at Lockheed and Gum Springs
South County	503	10,667	21.2	P-4	18,611	37.0
Woodlawn	503	9,646	19.2	P-4	18,611	37.0
Fort Belvoir	503	5,088	10.1	P-3	5,088	10.1
Pohick Rd. (North), Lorton Station Blvd., Gunston Rd.	1426	18,174	12.7	P-3	52,749	37.0
Woodbridge	503	14,558	28.9	P-4	18,611	37.0
Total	5,987	132,332			267,963	
Average		18,905	21.4	P-4	38,280	

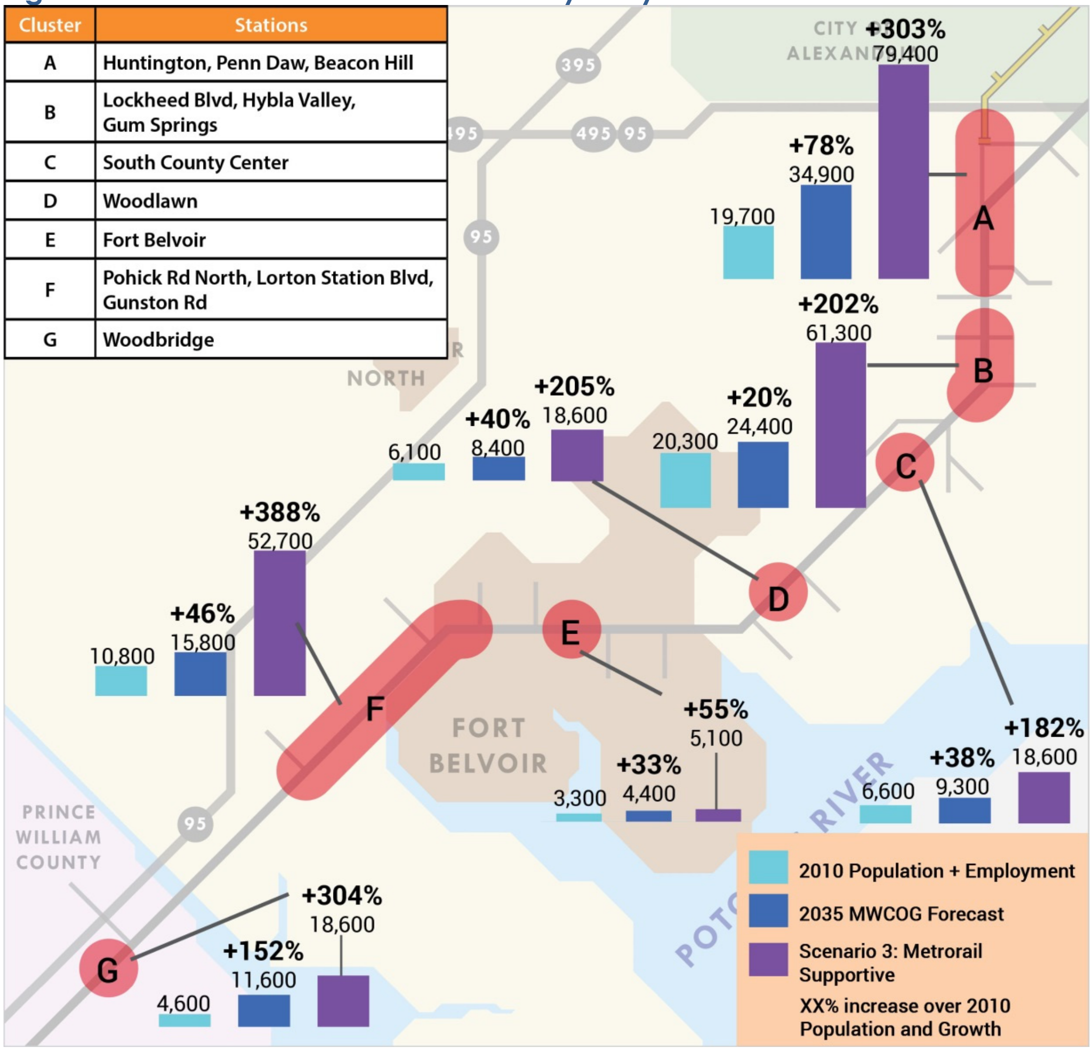
Notes:

- All data analyzed within half-mile of the station/station cluster locations
- Activity Density = (Population + Employment)/Acre
- Source for Multimodal Center Type: DRPT Multimodal Design Guidelines, 2013

Figure 2-3 presents Scenario Three, the growth percentage increase from 2010 to Scenario One, and the growth increase from 2010 to Scenario Three. The Scenario Three Multimodal Center Types all show the same activity density level (P-6). This development density is typically supportive of a Metrorail investment.

Figure 2-3: Scenario Three Growth Analysis by Station and Station Cluster

Cluster	Stations
A	Huntington, Penn Daw, Beacon Hill
B	Lockheed Blvd, Hybla Valley, Gum Springs
C	South County Center
D	Woodlawn
E	Fort Belvoir
F	Pohick Rd North, Lorton Station Blvd, Gunston Rd
G	Woodbridge



Supported Transit Technologies by Multimodal Center Type

Multimodal Center Intensity		
Center Type	**Activity Density (Jobs + people/acre)**	**Typical Supported Transit Technology**
P-6 Urban Core	70.0 or more	LRT/Rail
P-5 Urban Center	33.75 to 70.0	BRT/LRT
P-4 Large Town or Suburban Center	13.75 to 33.75	Express Bus
P-3 Medium Town or Suburban Center	6.63 to 13.75	Fixed Route Bus

Source for Multimodal Center Types: DRPT Multimodal System Design Guidelines, 2013

3.0 Land Use Recommendations

Section Three provides recommendations for land use planning on the Route 1 corridor in three ways:

1. Presentation of transit-oriented urban design concepts for three station locations.
2. Evaluation of current land uses using quantitative measures.
3. Evaluation of county land use planning policies using qualitative and quantitative measures.

The Fairfax County Comprehensive Plan offers a useful framework for evaluating station area plans for their ability to support transit-oriented development (TOD). These are the "Guidelines for Transit-Oriented Development"[12] and include the following principles:

1. **Transit Proximity and Station Area Boundaries** (focus highest densities around the station)
2. **Station-specific Flexibility** (examine the unique character of particular stations)
3. **Pedestrian and Bicycle Access**
4. **Mix of Land Uses**
5. **Housing Affordability**
6. **Urban Design** (excellence in site planning, streetscape and building design)
7. **Street Design** (grid of safe, attractive, connected streets)
8. **Parking** (encourage use of transit and maximize available parking)
9. **Transportation and Traffic** (promote a balance between TOD intensity and multimodal transportation infrastructure)

In Sections 3.1 through 3.3, the Fairfax County Guidelines for TOD are used (where applicable) to create transit-oriented urban design concepts for three station locations - Beacon Hill Station, Hybla Valley Station Area Cluster (including Lockheed Blvd. Station, Hybla Valley Station, and Gum Springs Station), and the Woodbridge Station. The three locations were selected to represent sites in each county that were also of a sufficient size to demonstrate all three scenarios. The scenarios are intended to depict the components of a strong transit-oriented development (TOD) concept for each station area, and graphically present the differences between the three land use scenarios.

An important note is that the scenario graphics are illustrative, shown here for visualization purposes, and not conceptual station area plans that are being proposed for local adoption. The concepts simply depict examples of potential development patterns that could be used to accommodate the growth assumptions associated with each alternative. Each concept reflects several key principles for transit-oriented development described in the Fairfax County Comprehensive Plan Guidelines for TOD, specifically:

- Transit proximity and higher density development
- Pedestrian-oriented street design with bicycle access
- A vertical mix of uses (housing, jobs, and services)

[12] Fairfax County Comprehensive Plan, 2007 Edition, Policy Plan, Land Use Appendix II, Amended Through 9-22-2008, Page 33.

- Street design and connectivity

The graphics depicting Scenario One and Scenario Two remain within the defined CBC areas in Fairfax County, and generally within the UMU area in Prince William County, based on county direction). However, the Scenario Three massing diagrams extend slightly outside of the CBC areas, recognizing that growth at this scale would likely extend the area for growth. The massing diagrams are conceptual in order to understand the scale of development for the three scenarios. They are not intended as refined plans for development.

Sections 3.4 through 3.6 focus on the criteria used by FTA to evaluate projects for potential funding. Evaluation of current land uses using quantitative measures is presented using land use data summarized by county and corridor. The focus for this assessment is population density, number of households and total employment. For the qualitative assessment, county land use policies are evaluated using criteria under the current FTA ratings system for existing Land Use and Economic Effectiveness. The tables are organized according to the required criteria. Ratings breakpoints, likely ratings, and recommendations for potentially improving the ratings are supplied under each criterion. This documentation can be used as a starting place for an eventual FTA Capital Investment Program application, but does not represent a complete set of submittal documentation.

Section 3.7 discusses current transit projects that are underway in the FTA New Starts/Small Starts funding pipeline, as a basis of comparison for Route 1.

3.1 Beacon Hill Station Area Analysis

The Beacon Hill Station Area is one of three station areas that were studied in further detail for the land use analysis. **Figure 3-1** shows the location of the Beacon Hill Station in relation to the other stations on the corridor. **Table 3-1** summarizes the 2010, Scenario One, Scenario Two, Comprehensive Plan, and Scenario Three numbers for this station area.

Figure 3-1: Beacon Hill Station Location

Table 3-1: Beacon Hill Station Scenarios Summary

	Population + Employment	Activity Density	Multimodal Center Type (and potentially supported transit investment)	FAR (within CBC)	Pop/Jobs Ratio
MWCOG 2010	6,545	13.0	P-3 (Fixed Route Bus)	0.07	6.2
MWCOG 2035 (Scenario One)	13,669	27.2	P-4 (Express Bus)	1.3	4.3
Scenario Two (25% increase on Sc. 1)	17,086	34.0	P-5 (BRT/LRT)	1.9	3.0
Comprehensive Plan	19,413	38.6	P-5 (BRT/LRT)	2.2	3.0
Scenario Three	35,210	70.0	P-6 (LRT/Rail)	3.4	3.0

Notes:

- All data analyzed within half-mile of the station/station cluster locations (except the FAR, which is calculated within the new development area, which is generally the CBC)
- Activity Density = (Population + Employment)/Acre
- Source for Multimodal Center Type and Potentially Supported Transit Investment: DRPT Multimodal Design Guidelines, 2013

- Pop/Jobs Ratio for Scenarios Two and Three are based on the Comprehensive Plan distributions

County Land Use Plan vs. Scenarios

The 2014 County Comprehensive Plan for the Beacon Community Business Center proposes an alternative use with redevelopment for the current Beacon Mall parcel, tied to meeting certain conditions rather than a specific intensity. Remaining parcels fronting Richmond Highway are proposed for mixed office, retail and/or higher density residential. The Beacon Hill scenarios shown in this memo propose mixed-use development for the entire mall parcel and the lots which front on Richmond Highway across from the mall parcel. The Comprehensive Plan allows slightly higher building density in the core area closest to the transit station than is shown in Scenario Two. Densities are similar at the edges of the half-mile area.

Unique Features

This Community Business Center is focused on a potential single station– Beacon Hill Station. The existing street grid offers multiple opportunities to connect to existing neighborhoods on both the east and west sides of Richmond Highway (Route 1). A more refined grid of blocks could be created within the CBC with redevelopment.

Scenario Land Uses

In the proposed land use plan, non-residential uses (office, retail and hotel) are clustered around the station. For the most part, residential uses are shown a minimum of a half block back from Route 1. In the southern part of the Community Business Center, some residential uses are proposed along Route 1, although courtyards at the front of the buildings attempt to create a buffer and some separation from Route 1. All scenarios accommodate both multifamily buildings and townhouses.

Open Space

A large town square is proposed one block west of Beacon Hill Station and is linked to Route 1 via a boulevard with a wide median. The land use plan shows several other open spaces, including both linear and pocket parks, as well as boulevards with wide medians throughout the Community Business Center.

Scenario Comparisons

The target quantities for Scenario Three are such that proposed development is shown beyond the current Community Business Center boundaries. In this instance development might also occur on land west of South Kings Highway.

Figure 3-2 shows existing land use conditions at the potential Beacon Hill Station area.

Figure 3-3 presents conceptual "bird's eye views" of the potential Beacon Hill Station area, based on Scenario Two and Scenario Three land use densities. It should be noted that this view has been created solely for illustrative purposes, in order to demonstrate examples of how the proposed densities for these scenarios might be implemented.   Scenario Two is similar to the build out assumed under the current Comprehensive Plan.

Figure 3-2: Existing Conditions View of Beacon Hill Area

Figure 3-3: Beacon Hill Station Bird's Eye View, Scenarios Two and Three

Scenario Two Bird's Eye View

Scenario Three Bird's Eye View

Figure 3-4 presents a potential illustrative plan for the Beacon Hill Station area, to show the land use pattern, including buildings and open spaces, along with connecting streets in greater detail. **Figure 3-5** is a conceptual land use plan, showing the types of land uses, location and approximate sizes that might surround the potential transit station under a transit-supportive scenario.

Figure 3-4: Beacon Hill Station Illustrative Plan, Scenario Two

BEACON HILL STATION ILLUSTRATIVE PLAN

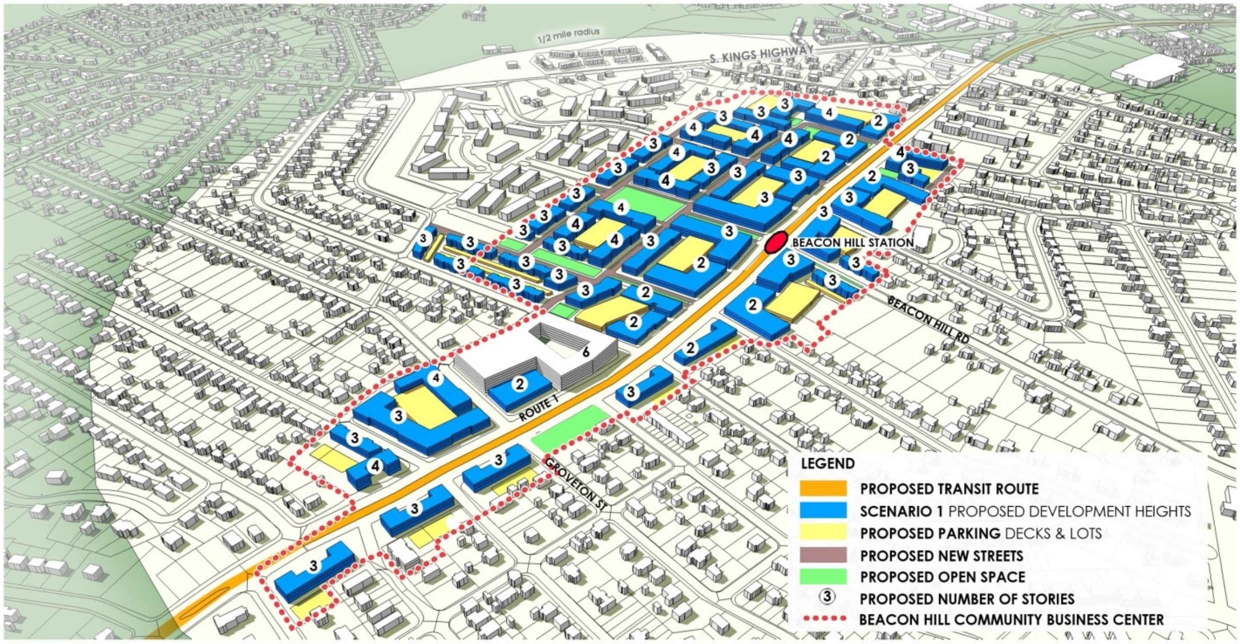
Figure 3-5: Beacon Hill Station Land Use Plan, Scenario Two

BEACON HILL STATION LAND USE PLAN

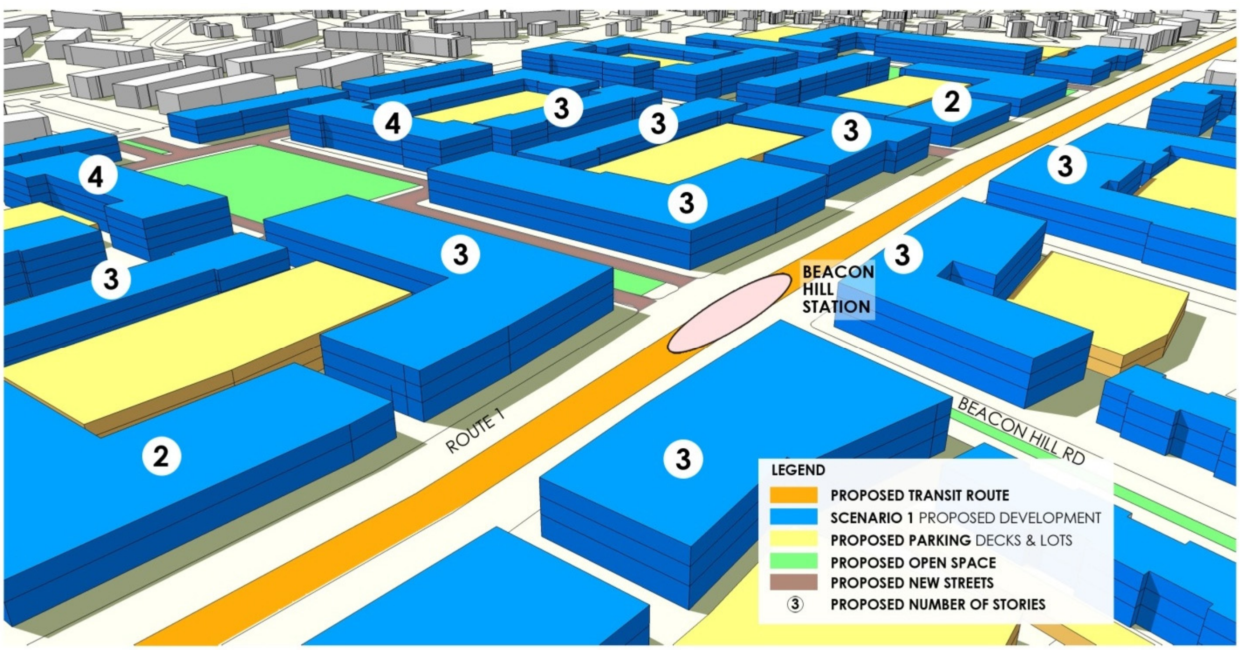
Figure 3-6 (multiple illustrations) demonstrates the potential development massing differences between Scenarios One, Two, and Three at Beacon Hill Station. The massing diagrams also include the amount of potential development based on the Fairfax County Comprehensive Plan as a benchmark for comparison. Several key principles for transit-oriented development are reflected in the land use and urban design plans for Beacon Hill Station:

- Higher density development, with buildings highest near station and stepping back to neighborhoods (Scenarios One and Two)
- A vertical mix of uses, including office, retail and residential
- Street configurations that allow for wide sidewalks, street trees and furniture, and on-street parking, all of which promote pedestrian activity
- Street connectivity internally and to adjacent neighborhoods where possible

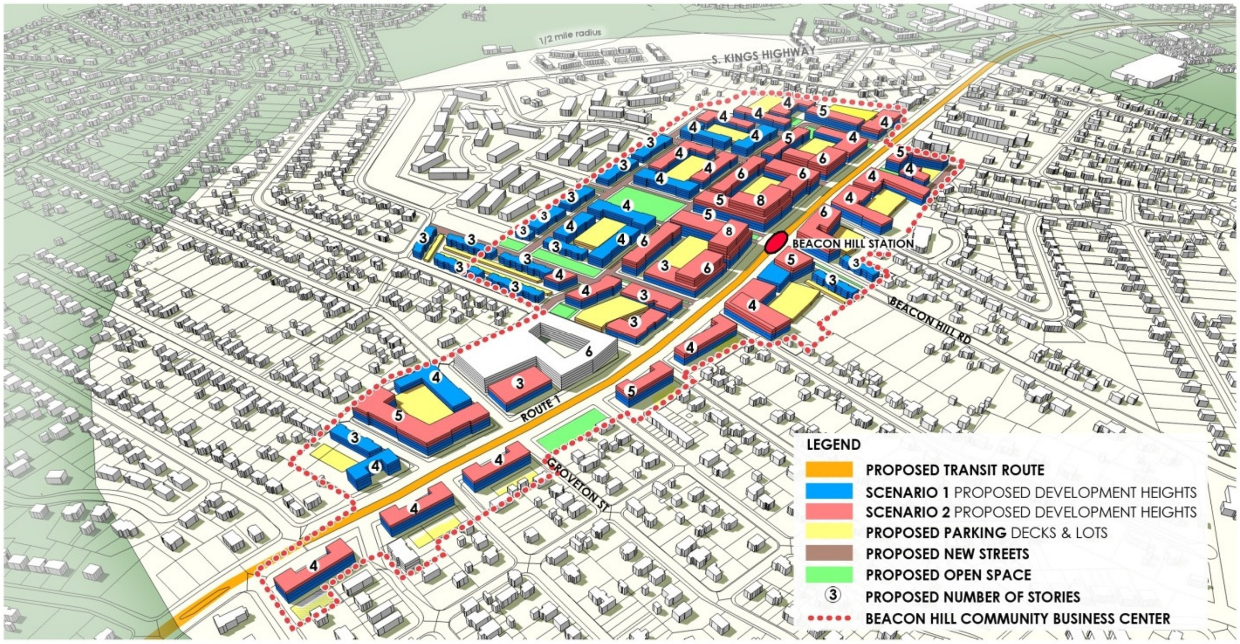
Figure 3-6: Beacon Hill Station Massing Diagrams: Scenarios One and Two, Comprehensive Plan, and Scenario Three



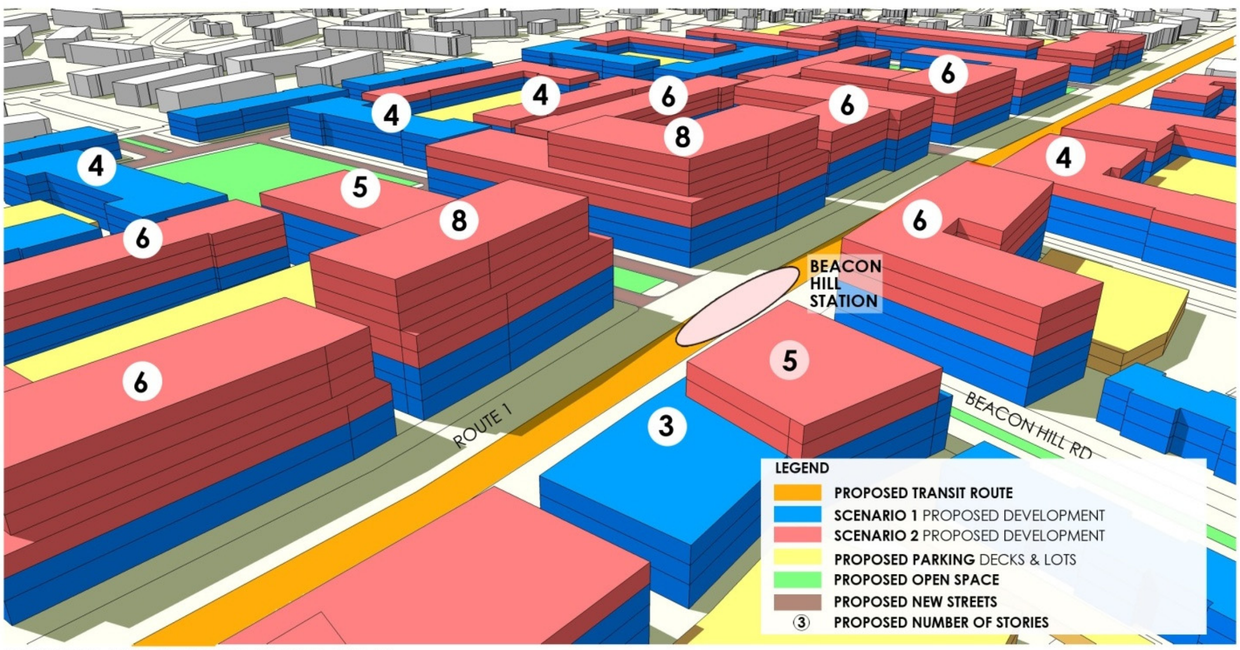
BEACON HILL STATION SCENARIO 1



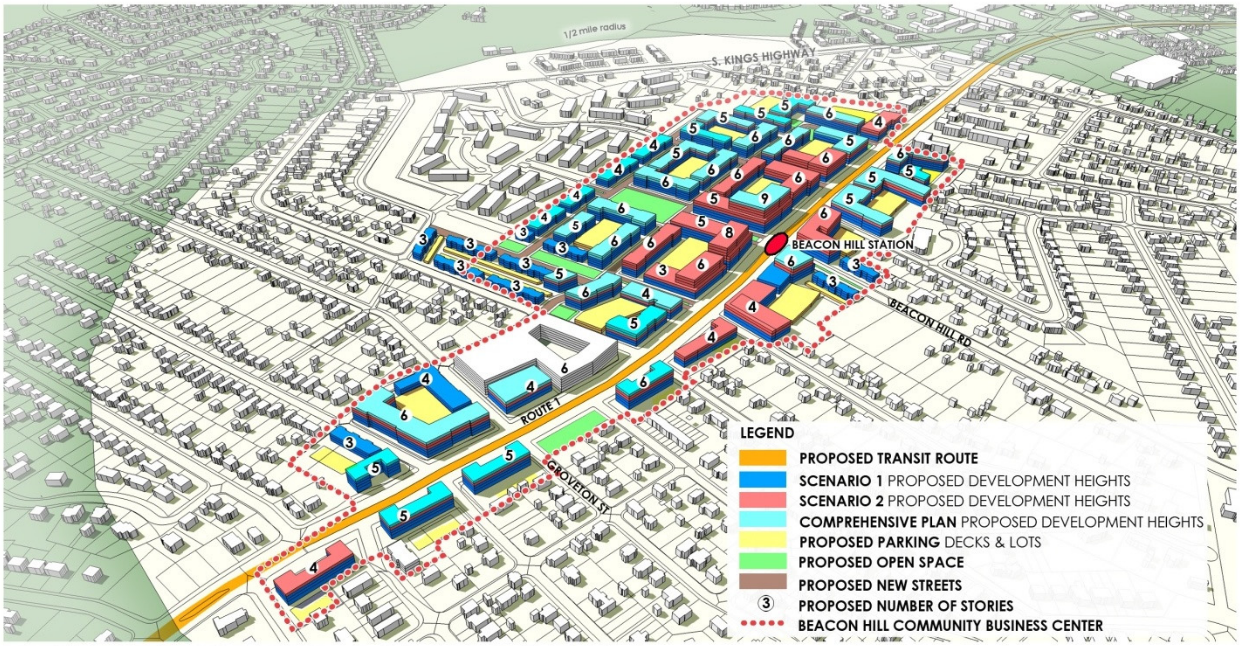
BEACON HILL STATION SCENARIO 1



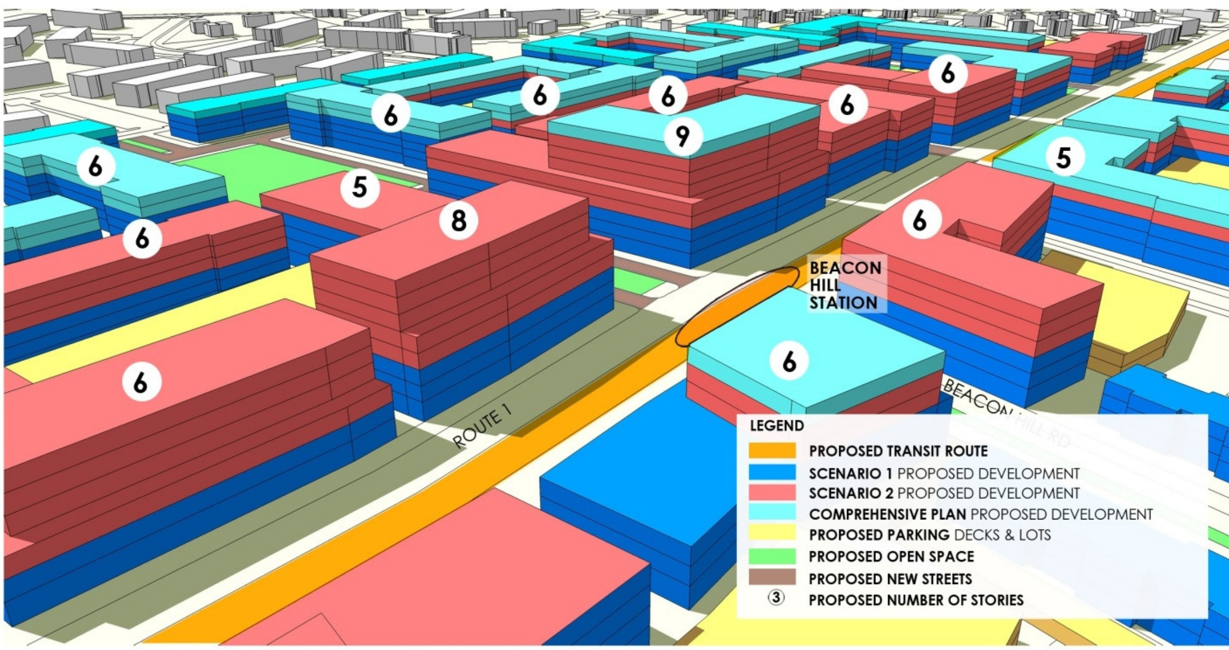
BEACON HILL STATION SCENARIO 2



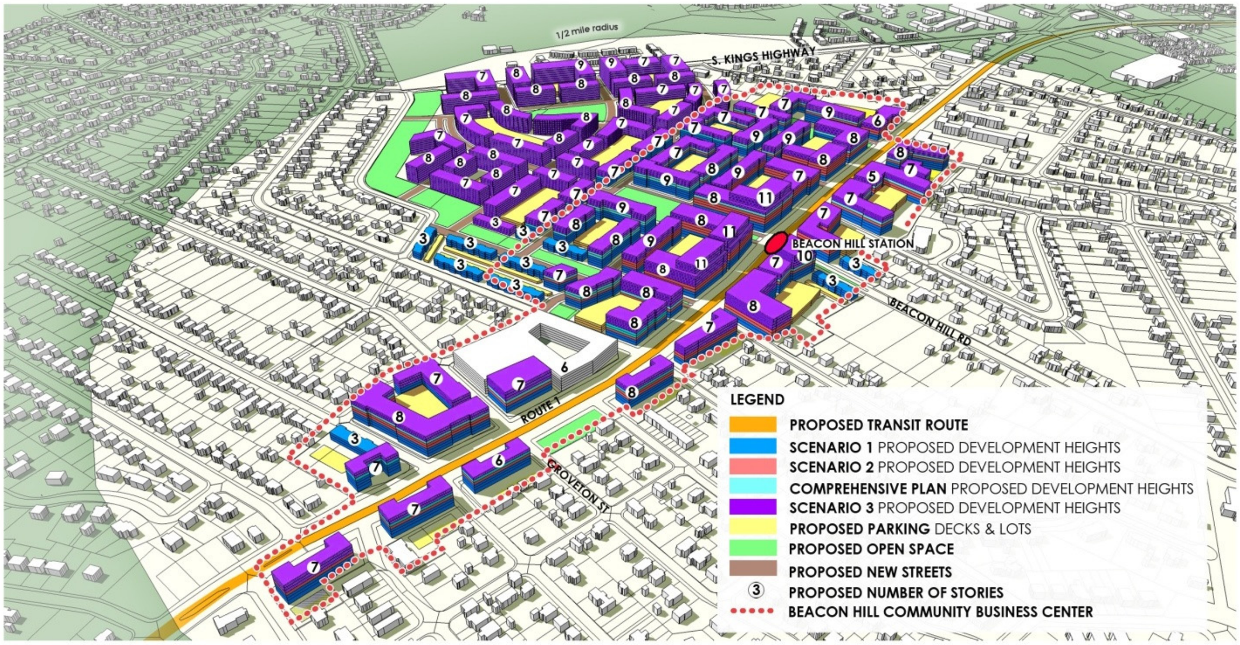
BEACON HILL STATION SCENARIO 2



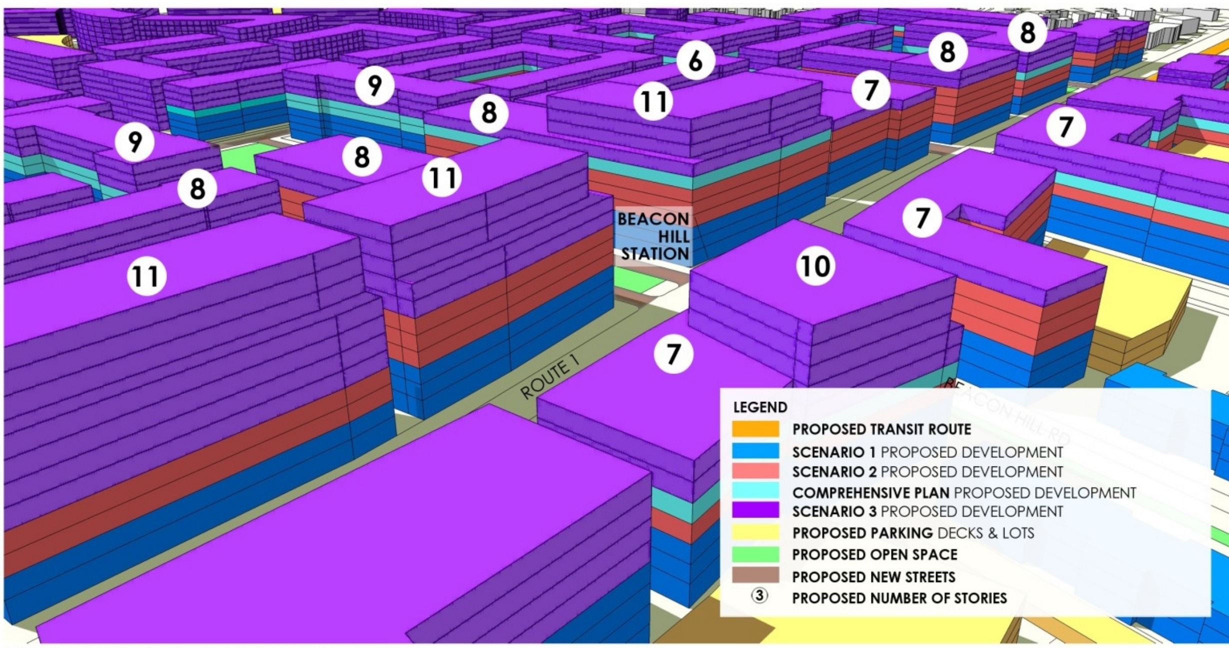
BEACON HILL STATION SCENARIO COMPREHENSIVE PLAN



BEACON HILL STATION SCENARIO COMPREHENSIVE PLAN



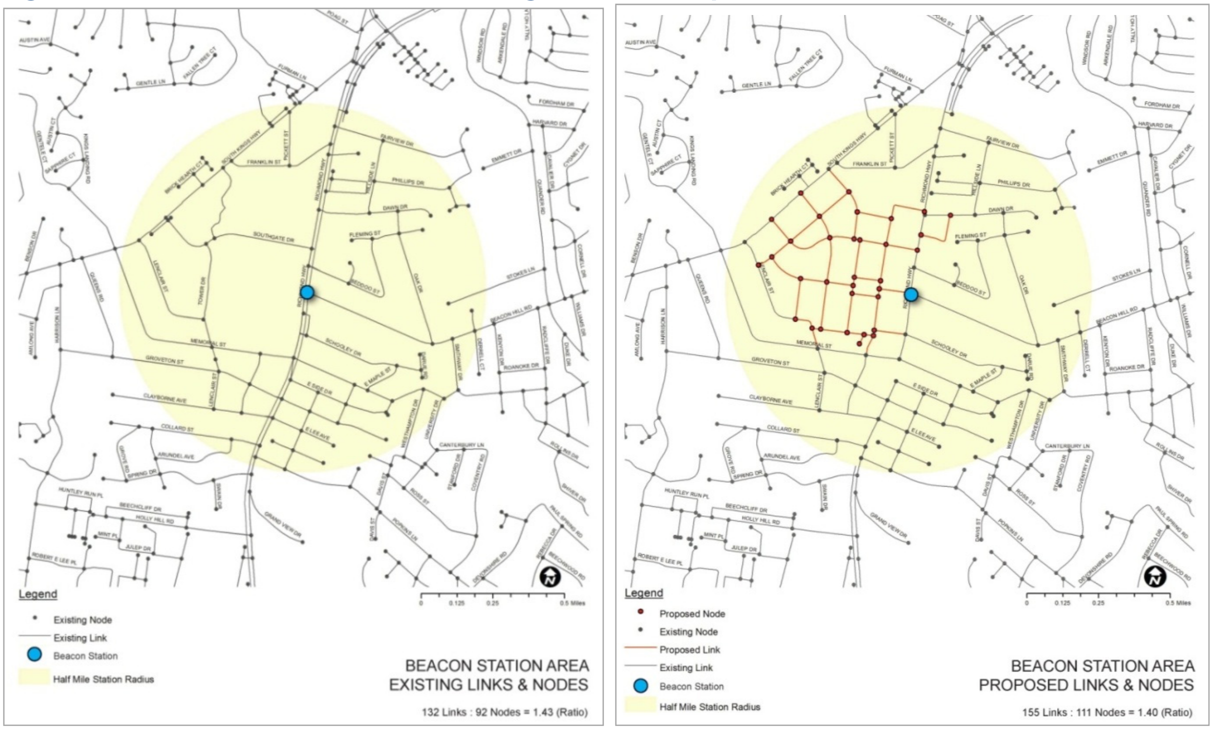
BEACON HILL STATION SCENARIO 3



BEACON HILL STATION SCENARIO 3

Figure 3-7 demonstrates the proposed improvements to the street network as shown in the urban design concepts. At the proposed Beacon Hill Station, a new grid of streets is shown on the existing "megablock" that currently supports the Beacon Mall Shopping Center and parking lot. This new grid of streets increases the "nodes" or street intersections from 92 nodes within the half-mile radius to 111 nodes within that same area.

Figure 3-7: Beacon Hill Station Existing and Conceptual Street Network



3.2 Hybla Valley Station Area Analysis

The Hybla Valley Station Area Cluster is the second of three station areas that were studied in further detail for the land use analysis. **Figure 3-8** shows the location of the Hybla Valley Station Area Cluster in relation to the other stations on the corridor. **Table 3-2** summarizes the 2010, Scenario One, Scenario Two, Comprehensive Plan, and Scenario Three numbers for this station area cluster.

Figure 3-8: Hybla Valley Station Cluster Location

Table 3.2: Hybla Valley Station Cluster Scenarios Summary

	Population + Employment	Activity Density	Multimodal Center Type (and Potentially Supported Transit Investment)	FAR (within CBC)	Pop/Jobs Ratio
MWCOG 2010	20,320	16.8	P-4 (Express Bus)	0.15	3.3
MWCOG 2035 (Scenario One)	24,433	20.2	P-4 (Express Bus)	0.6	2.9
Scenario Two (25% increase on Sc. 1)	30,541	25.3	P-4 (Express Bus)	1.4	1.3
Comprehensive Plan	27,324	22.6	P-4 (Express Bus)	1.2	1.3
Scenario Three	84,630	70.0	P-6 (LRT/Rail)	5.2	1.3

Notes:

- All data analyzed within half-mile of the station/station cluster locations (except the FAR, which is calculated within the new development area, which is generally the CBC)
- Activity Density = (Population + Employment)/Acre
- Source for Multimodal Center Type and Potentially Supported Transit Investment: DRPT Multimodal Design Guidelines, 2013
- Pop/Jobs Ratio for Scenarios Two and Three are based on the Comprehensive Plan distributions

County Land Use Plan vs. Scenarios

The Fairfax County Comprehensive Plan anticipates a lower level of development density for Hybla Valley than the Beacon Hill Station Area. For Hybla Valley, the county hopes to achieve active, mixed-use neighborhoods and better pedestrian circulation through development of low- to mid-rise offices, townhomes and street oriented retail. The Scenario Two and Three concepts show density patterns that are generally greater than those anticipated in the Comprehensive Plan, particularly in the mixed-use areas closest to the three transit stations.

Unique Features

The Hybla Valley/Gum Springs Community Business Center includes three proposed stations within its boundaries – Lockheed Boulevard Station, Hybla Valley Station and Gum Springs Station. The CBC boundaries focus future development on the west side of Richmond Highway (Route 1). The Gum Springs Conservation Area is located on the east side of Route 1 and will limit development in this location. Fairfax County is currently considering a Bus Transfer Center on the Route 1 corridor. The Hybla Valley/Gum Springs Community Business Center is one of several possible locations. The land use concepts show a potential location for the bus transfer center and related recreational facilities in this area. An existing Resource Protection Area (RPA), part of the Huntley Meadows Park wetland system, bisects the Community Business Center. All new development is shown to avoid this environmentally sensitive area.

Scenario Land Uses

In the proposed scenario land use plans, non-residential uses (office, retail, hotel) are clustered around each of the three station areas. Wherever possible, residential uses are shown at least a half block back from Route 1. Where that is not possible, residential uses are separated from Route 1 by open space, such as residential courtyards. A potential Route 1 Bus Transfer Center is shown conceptually on the land use graphic.

Open Space

All scenario plans offer significant open spaces, such as town squares, parks, courtyards and boulevards with wide medians. The Resource Protection Area (RPA) could also become a recreational community asset. The recreation facilities associated with the proposed Fairfax County Bus Transfer Center are shown immediately behind the Transfer Center, a block away from Route 1.

Scenario Comparisons

Scenario One (reflecting the MWCOG 2035 forecasts) includes low quantities of residential development. As a result, all residential development could be designed in the form of townhouses. There is a significant difference between the target quantities for both residential and non-residential uses in Scenario One versus Scenario Three. Residential uses in Scenario Three would, for the most part, be accommodated in high-rise apartment buildings. Scenario Three target quantities suggest that development would need to occur beyond the current Community Business Center boundaries.

Figures 3-9 and 3-10 present an illustrative plan and a land use plan for the Hybla Valley Station Area Cluster. The illustrative plan shows placement of buildings, location of open spaces and street configuration. The plan illustrates how the new mixed use development relates to the existing multi-family development to the west and the lower-density residential neighborhoods to the east and south. Importantly, both the illustrative and land use plans show preservation of the Gum Springs Conservation District as well as the Resource Protection Area wetland system.

Figure 3-9: Hybla Valley Station Area Cluster Illustrative Plan, Scenario Two

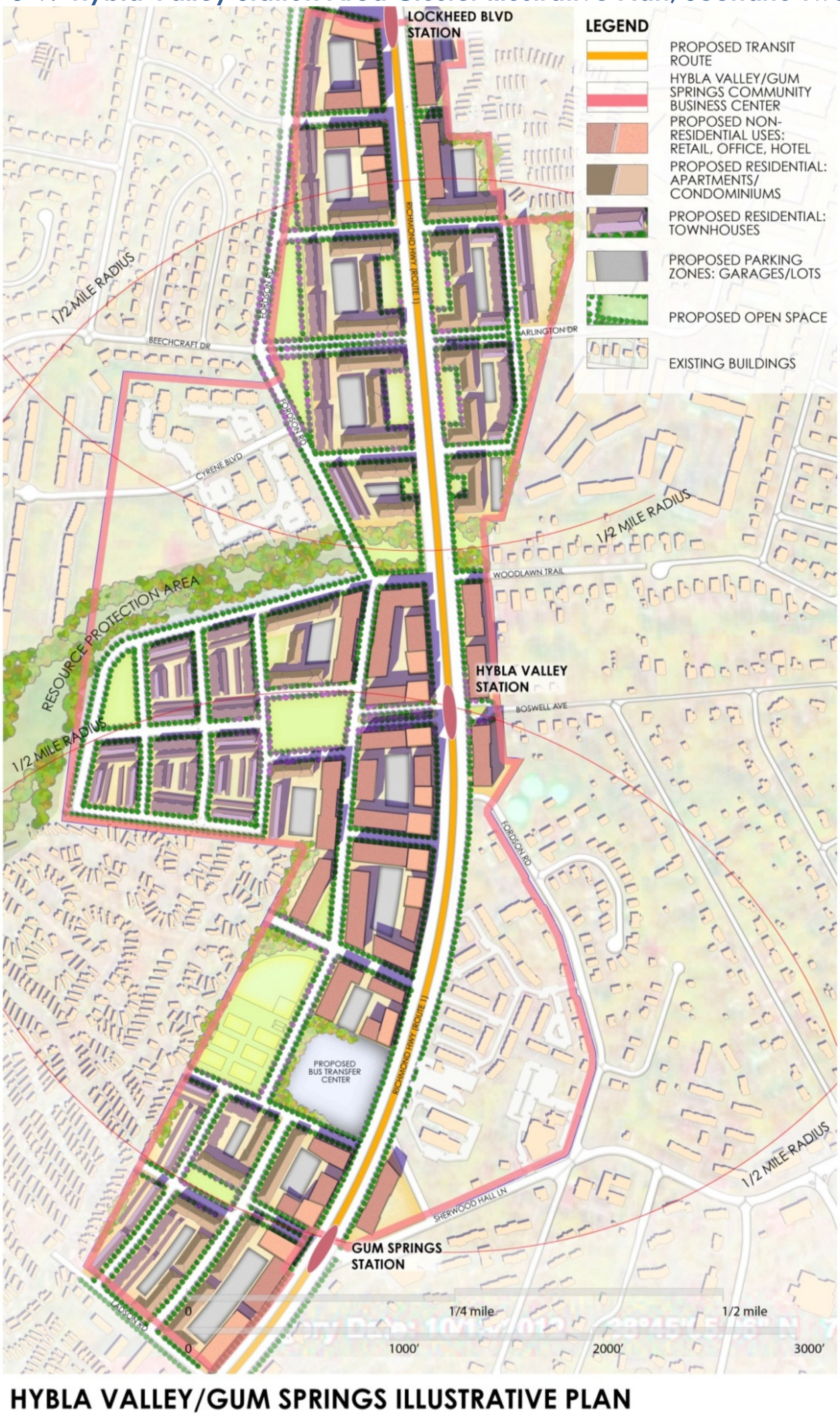
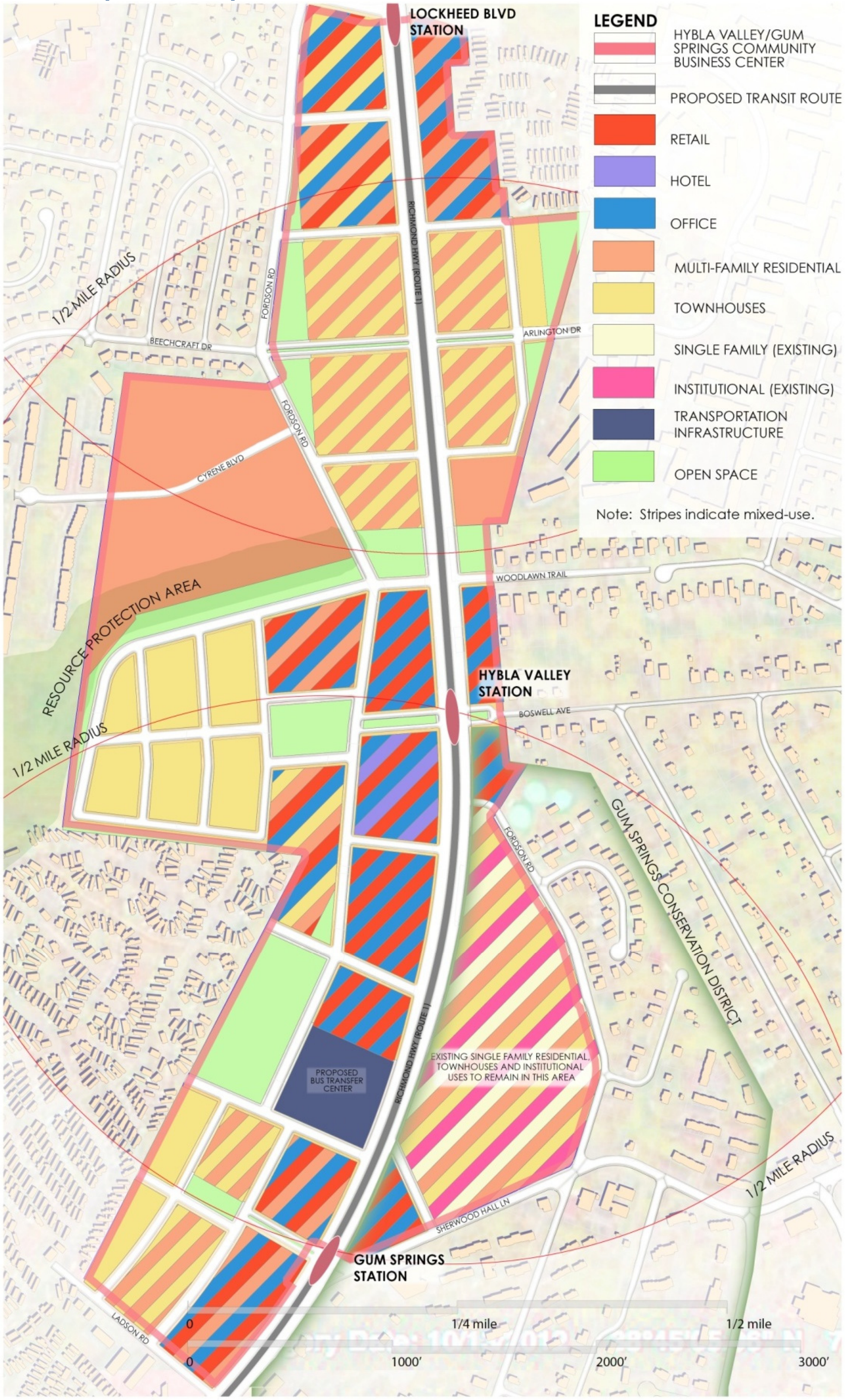


Figure 3-10: Hybla Valley Station Area Cluster Land Use Plan, Scenario Two



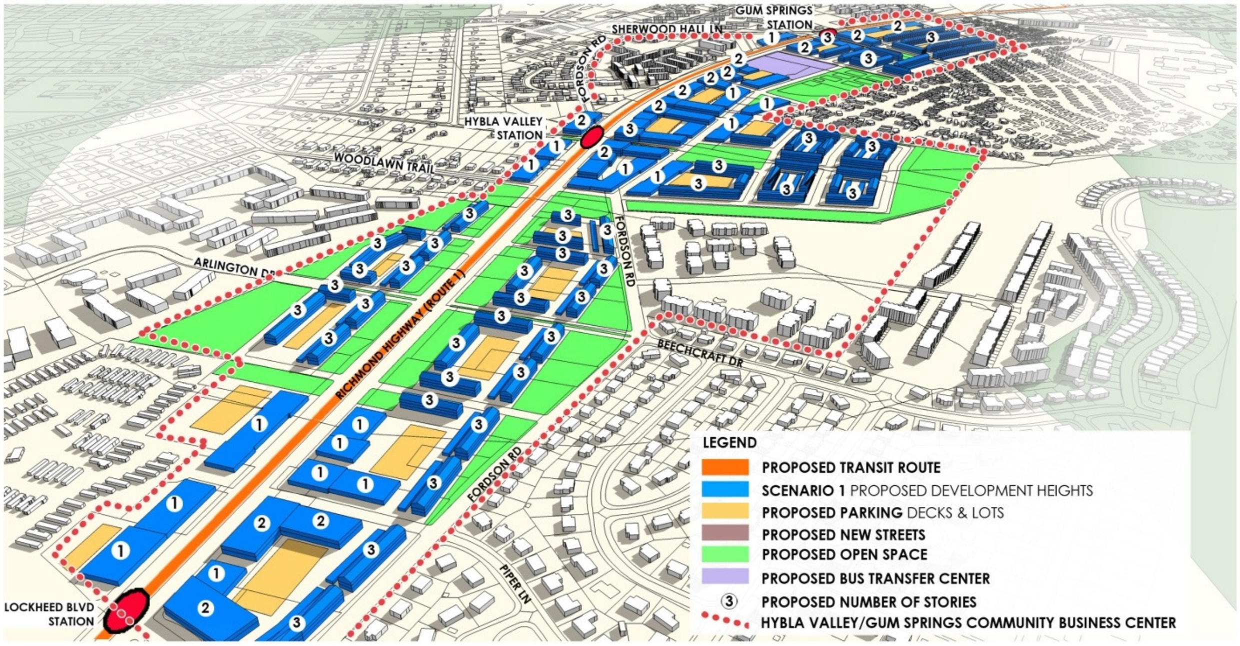
HYBLA VALLEY/GUM SPRINGS LAND USE PLAN

Figure 3-11 demonstrates the potential development massing for Scenarios One, Two, and Three at Hybla Valley. The massing diagrams also include the Fairfax County Comprehensive Plan allowable development potential as a benchmark for comparison.

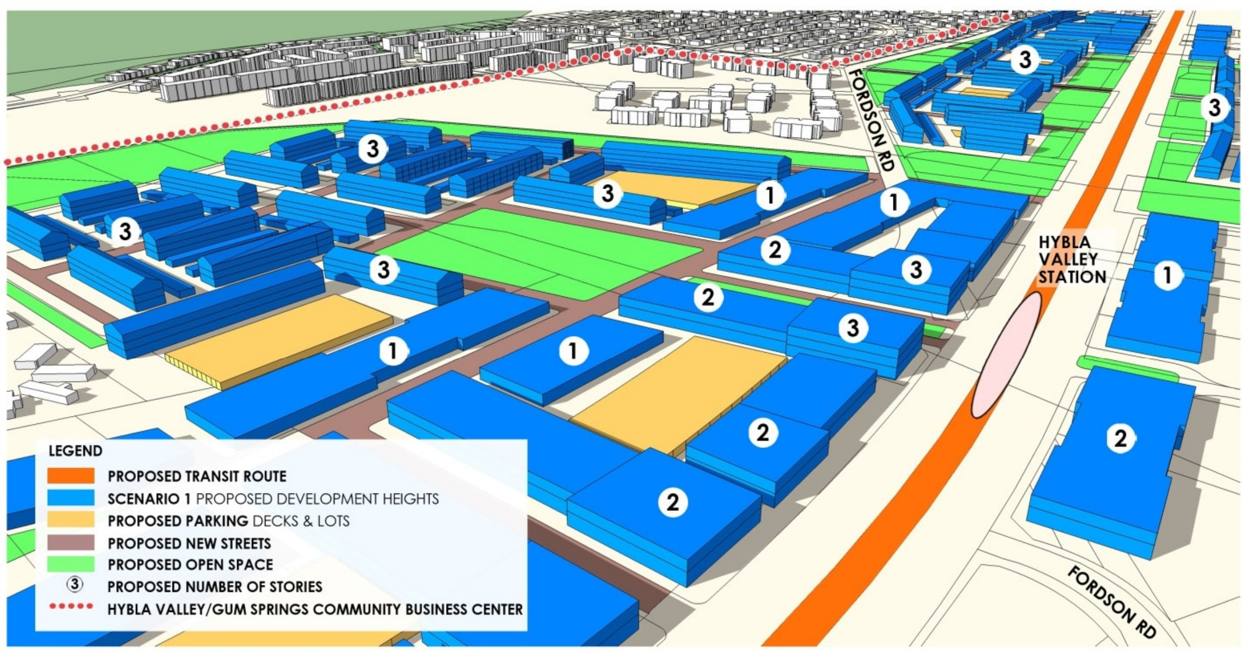
Several key principles for transit-oriented development are reflected in the land use and urban design plans for the Hybla Valley Station Area Cluster:

- Higher density development, with buildings highest near station and stepping back to neighborhoods
- A vertical mix of uses, including office, retail and residential
- Pedestrian-oriented street design
- Street connectivity internally and to neighborhoods where possible

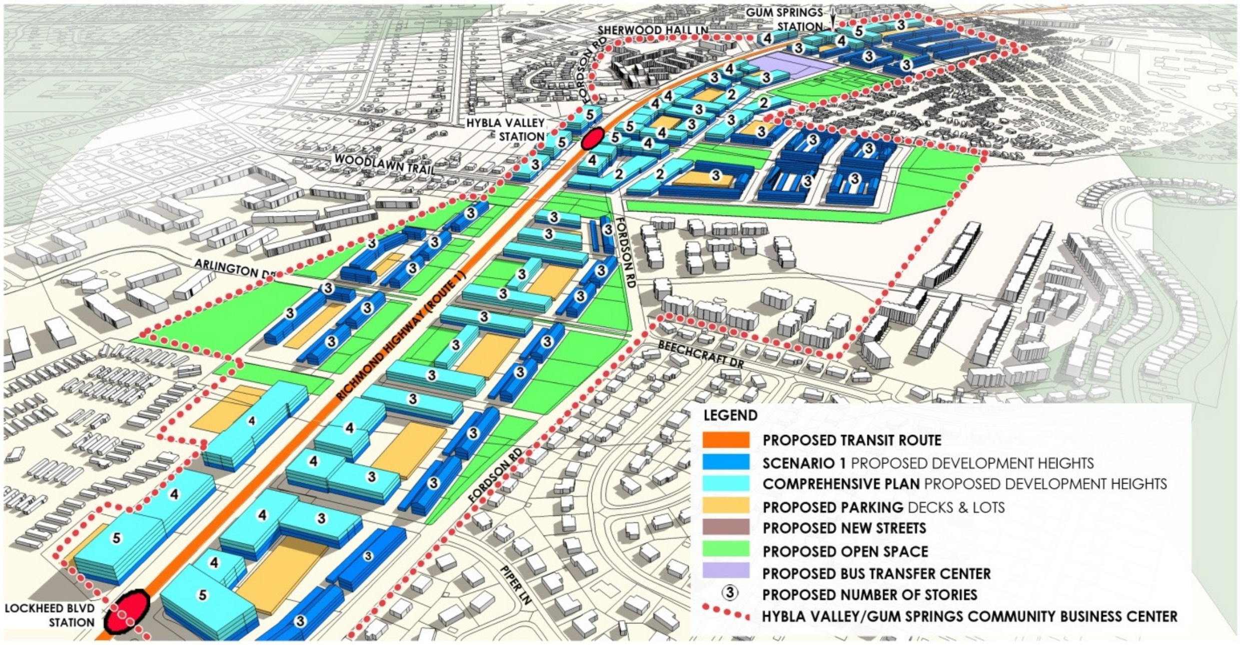
Figure 3-11: Hybla Valley Station Area Cluster Massing Diagrams: Scenario One, Comprehensive Plan, and Scenarios Two and Three



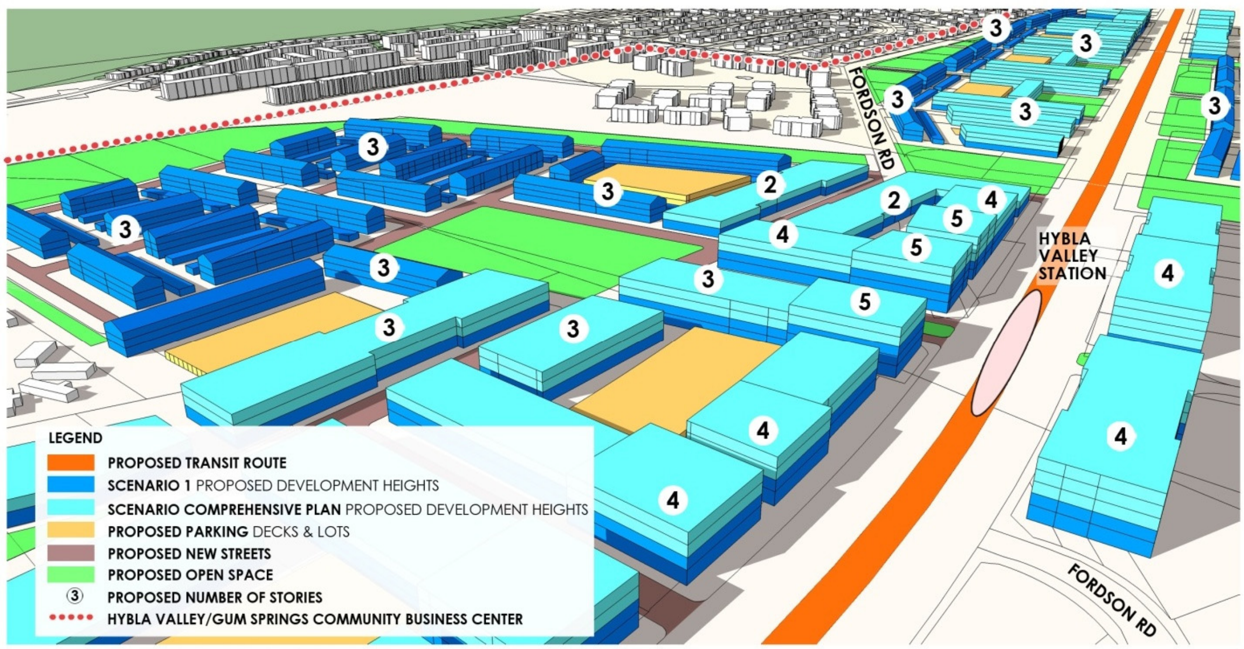
HYBLA VALLEY/GUM SPRINGS SCENARIO 1 VIEW LOOKS SOUTH



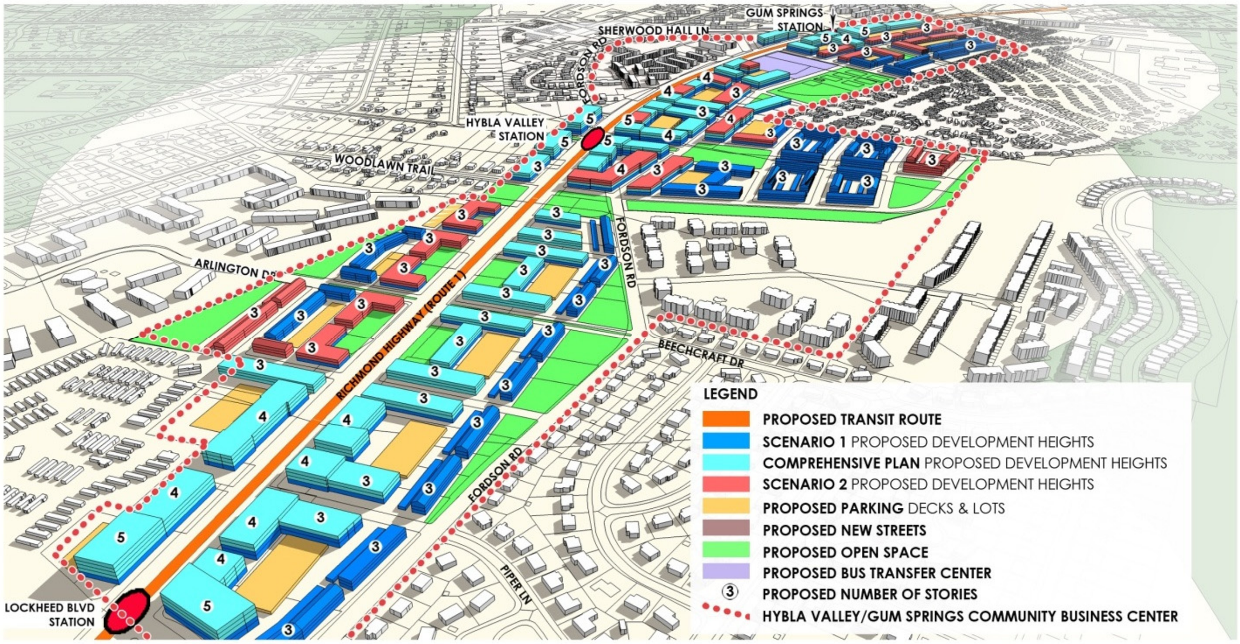
HYBLA VALLEY/GUM SPRINGS SCENARIO 1 VIEW LOOKS NORTH-WEST



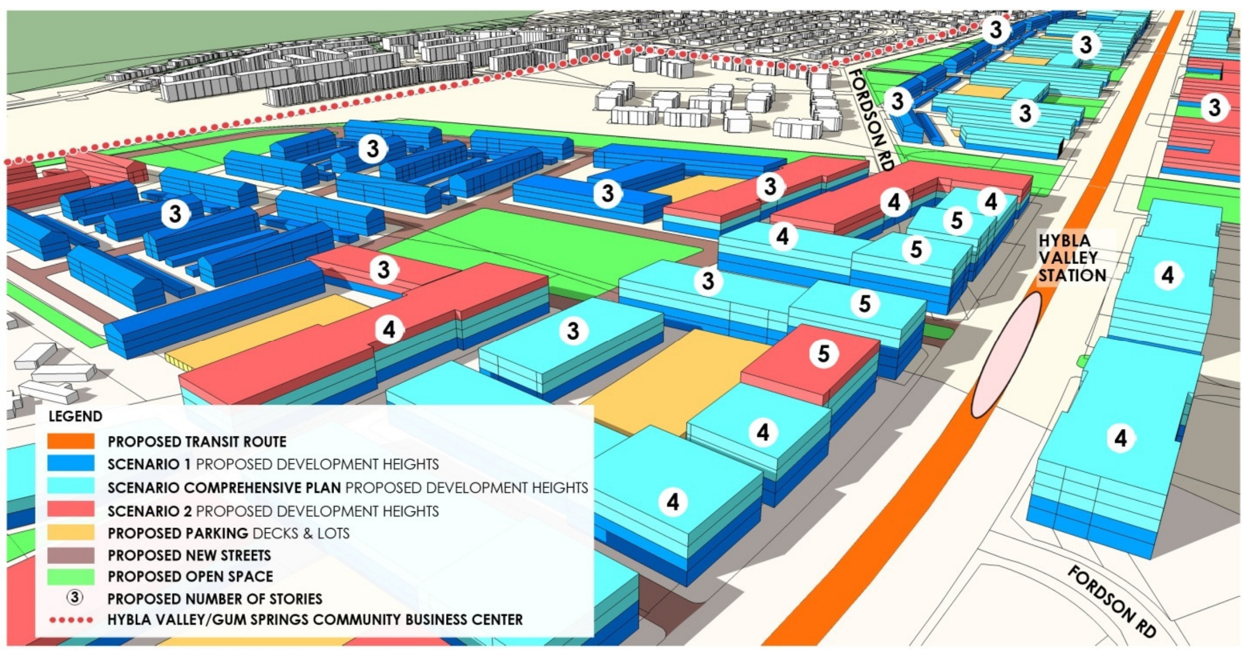
HYBLA VALLEY/GUM SPRINGS SCENARIO COMPREHENSIVE PLAN VIEW LOOKS SOUTH



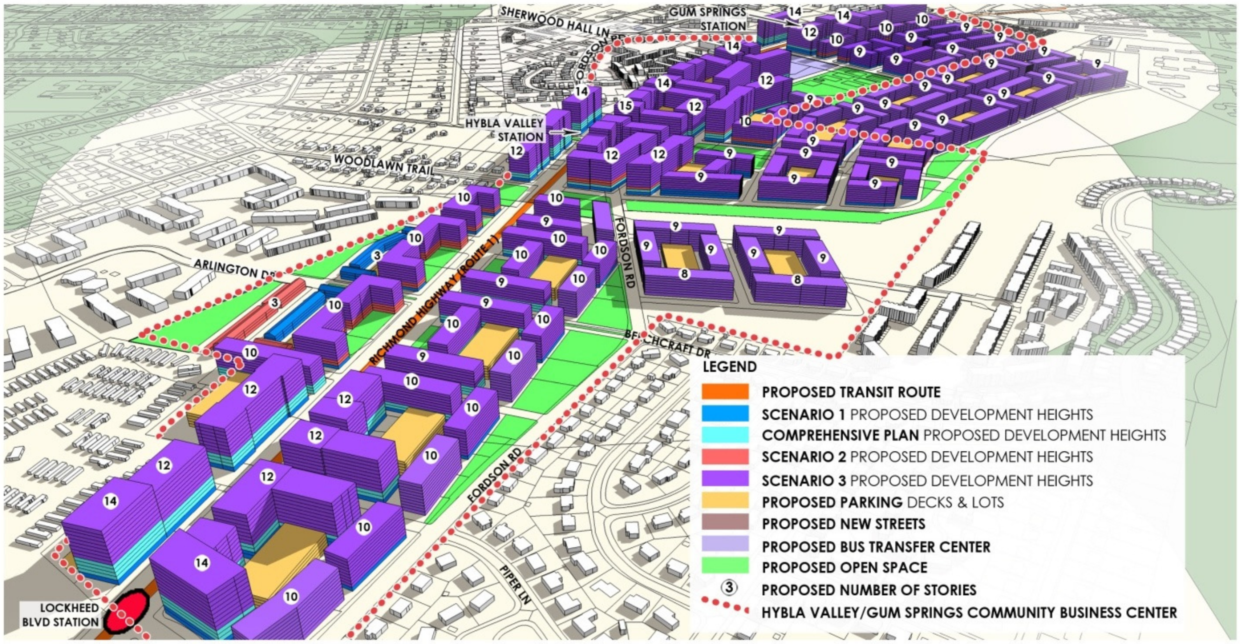
HYBLA VALLEY/GUM SPRINGS SCENARIO COMPREHENSIVE PLAN VIEW LOOKS NORTH-WEST



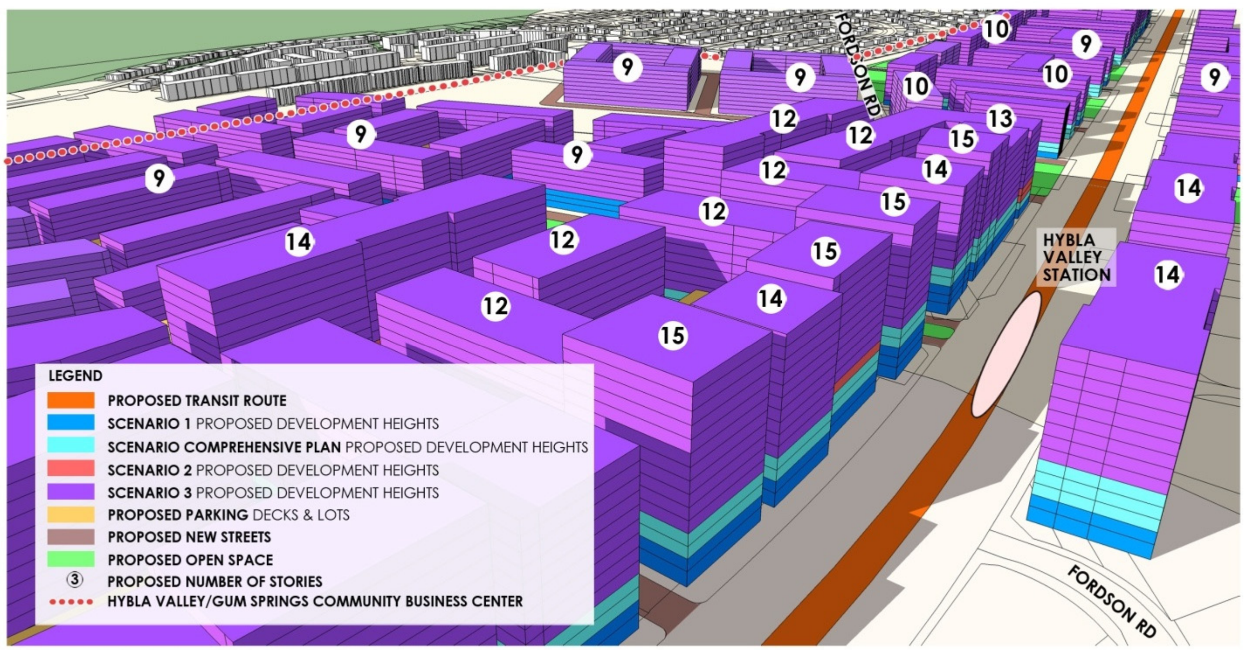
HYBLA VALLEY/GUM SPRINGS SCENARIO 2 VIEW LOOKS SOUTH



HYBLA VALLEY/GUM SPRINGS SCENARIO 2 VIEW LOOKS NORTH-WEST



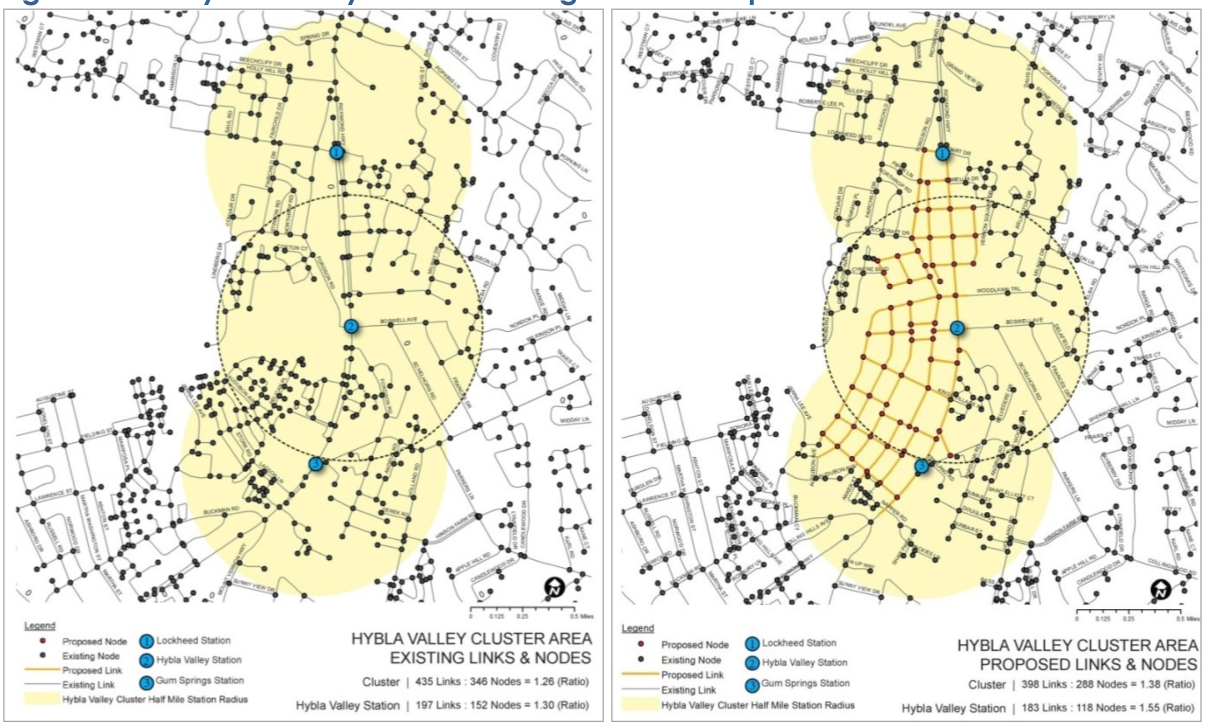
HYBLA VALLEY/GUM SPRINGS SCENARIO 3 VIEW LOOKS SOUTH



HYBLA VALLEY/GUM SPRINGS SCENARIO 3 VIEW LOOKS NORTH-WEST

Figure 3-12 demonstrates the proposed improvements to the street network as shown in the urban design concept. In the Hybla Valley Station Area, a new grid of streets is shown in the area currently occupied by Mount Vernon Plaza and the associated parking lot. This new grid of streets improves the link (street section) to node (intersection or dead end) ratio from 1.30 to 1.55.

Figure 3-12: Hybla Valley Station Existing and Conceptual Street Network



3.3 Woodbridge Station Area Analysis

The Woodbridge Station Area is the third of three station areas that were studied in further detail for the land use analysis. **Figure 3.13** shows the location of the Woodbridge Station in relation to the other stations on the corridor. **Table 3.3** summarizes the 2010, Scenario One, Scenario Two, Comprehensive Plan, and Scenario Three numbers for this station area.

Figure 3-13: Woodbridge Station Location

Table 3-3: Woodbridge Station Area Scenarios Summary

	Population + Employment	Activity Density	Multimodal Center Type (and Potentially Supported Transit Investment)	FAR (within UMU)	Pop/Jobs Ratio
MWCOG 2010	4,569	9.1	P-3 (Fixed Route Bus)	0.08	1.7
MWCOG 2035 (Scenario One)	11,646	23.2	P-4 (Express Bus)	1.4	2.5
Scenario Two (25% increase on Sc. 1)	14,558	28.9	P-4 (Express Bus)	1.8	1.6
Comprehensive Plan	9,745	19.4	P-4 (Express Bus)	1.3	1.6
Scenario Three	18,611	37.0	P-5 (BRT)	2.0	1.6

Notes:

- All data analyzed within half-mile of the station/station cluster locations (except the FAR, which is calculated within the new development area, which is generally the UMU)
- Activity Density = (Population + Employment)/Acre
- Source for Multimodal Center Type and Potentially Supported Transit Investment: DRPT Multimodal Design Guidelines, 2013
- Pop/Jobs Ratio for Scenarios Two and Three are based on the Comprehensive Plan distributions

County Land Use Plan vs. Scenarios

The Prince William Comprehensive Plan presents a vision for the North Woodbridge area in its Urban Mixed Use plan as a higher-density, mixed-use development area. The scenario plans are consistent with the county intent for future development, showing greater density, and transit supportive land uses with access to the proposed new transit station. This new transit station is proposed in the same location as the current VRE station in order to create a “transit hub” for North Woodbridge.

Unique Features

This station area differs from the other two locations in that the proposed transit station at Woodbridge is located on the southeast side of Route 1 and is connected to the proposed Urban Mixed Use Area and the Park and Ride garages via a pedestrian bridge. In the other two station locations, the station itself was located directly at the future station area development sites. For the Woodbridge site, a large 3,000 space park and ride garage is accommodated in all scenarios. The Virginia Department of Transportation’s (VDOT) proposed grade separated interchange at Route 1/Route 123 is also reflected in all scenarios.

Additionally this location includes a major natural feature, the Occoquan River, which runs along the northern boundary of the Urban Mixed Use Area.

Scenario Land Uses

In the proposed scenario plans, non-residential uses (office, retail and hotel) are generally shown close to the station area within the blocks contained by Gordon Boulevard (Route 123), Jefferson Davis Highway (Route 1), Occoquan Drive and Horner Road, creating a commercial core. Residential uses are predominantly proposed on the north side of Gordon Boulevard, extending toward the Occoquan River. Some limited neighborhood serving retail is shown within this largely residential area, which can also be accessed from Route 1.

Open Space

In the scenario plans, a large riverside community park is located between the river and residential areas to provide a recreational asset for residents and to avoid building in the floodplain. Additionally, a linear park is located between Route 1 and the residential areas; a large town square is shown within the commercial core adjacent to Route 123; and a boulevard with a median connects the town square in the commercial core to another secondary square nestled within the residential area and toward the river.

Scenario Comparisons

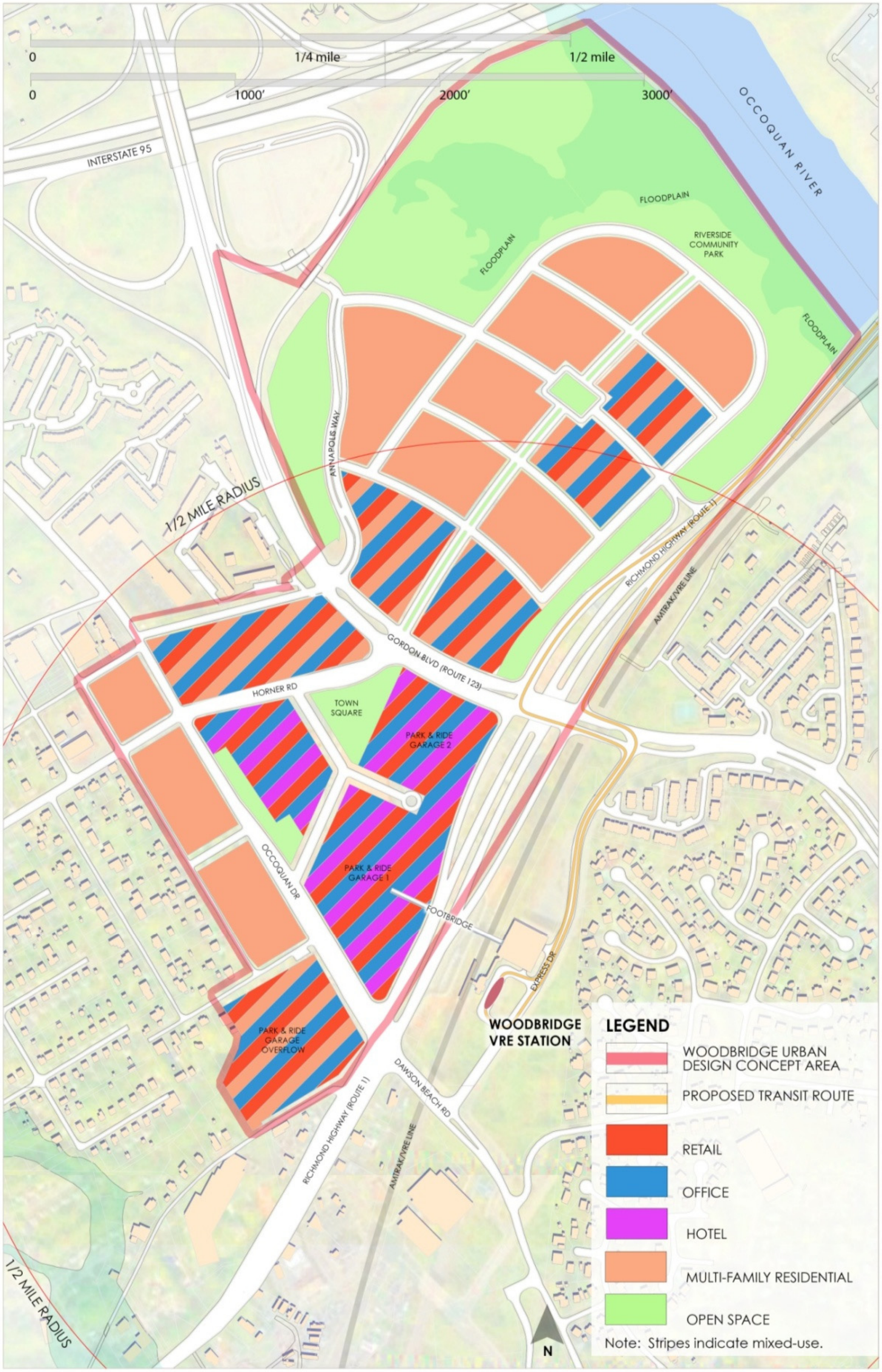
Scenario One is the only Woodbridge scenario that proposes residential uses above non-residential uses in the commercial core. This is due to the low quantities of commercial reflected in the MWCOG 2035 forecasts. In the other three scenarios, residential uses are generally located away from the heavily trafficked roads and the commercial core is dedicated to office, commercial, hotels and commuter parking.

Figures 3-14 and 3-15 present a proposed illustrative plan and a land use plan for the Woodbridge Station Area. The illustrative plan shows all development occurring west of Route 1, north and south of Gordon Boulevard. Both plans show park and ride garage areas opposite the Woodbridge VRE station. Preservation of protected floodplains is shown, and Route 1 is shown as a landscaped parkway through the area.

Figure 3-14: Woodbridge Station Illustrative Plan, Scenario Two

WOODBRIDGE ILLUSTRATIVE PLAN

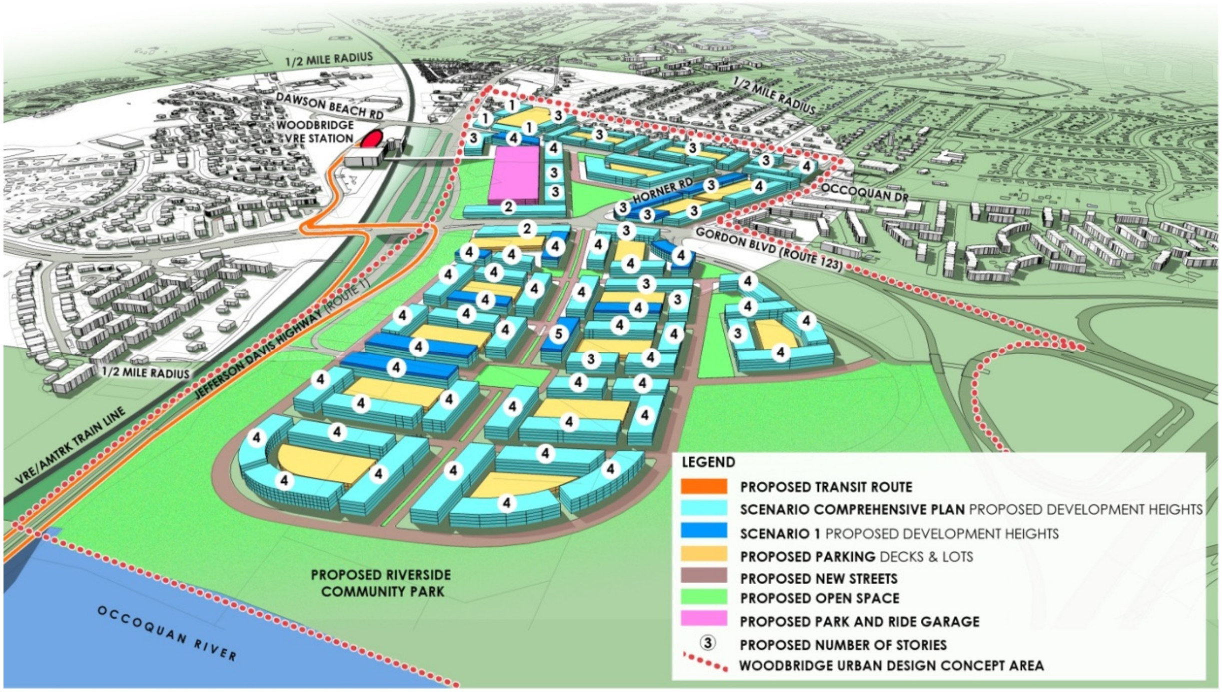
Figure 3-15: Woodbridge Station Land Use Plan, Scenario Two



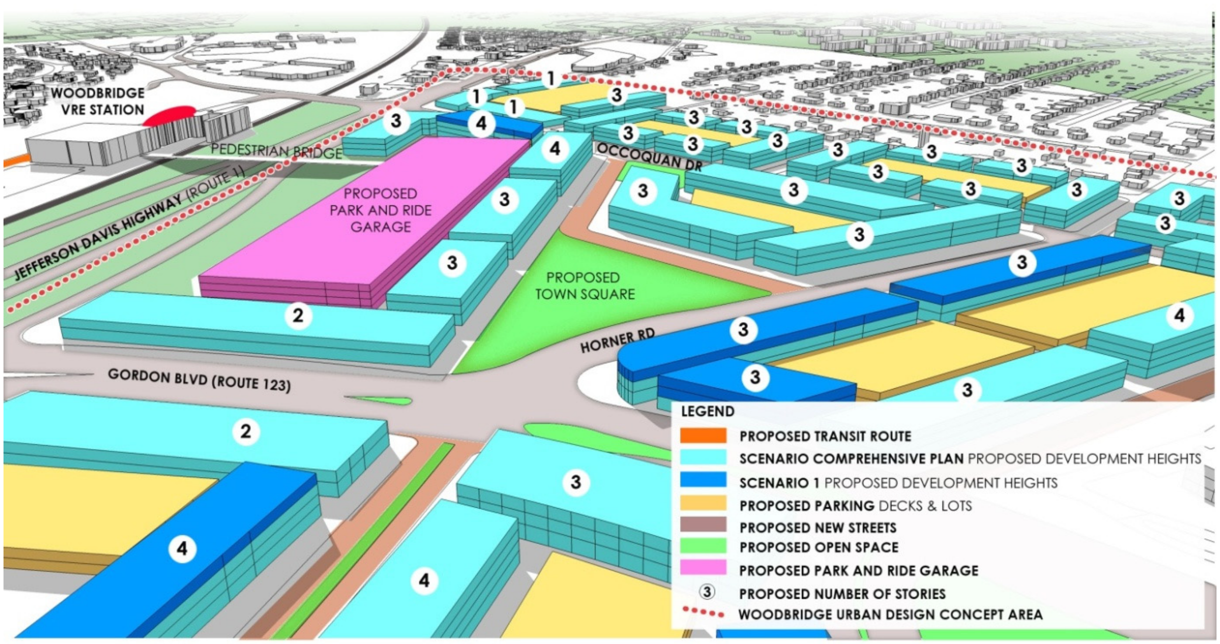
WOODBRIDGE LAND USE PLAN

Figure 3-16 (multiple illustrations) demonstrates the potential development massing for Scenarios One and Two at Woodbridge. The massing diagrams also include the Prince William County Comprehensive Plan allowable development as a benchmark for comparison.

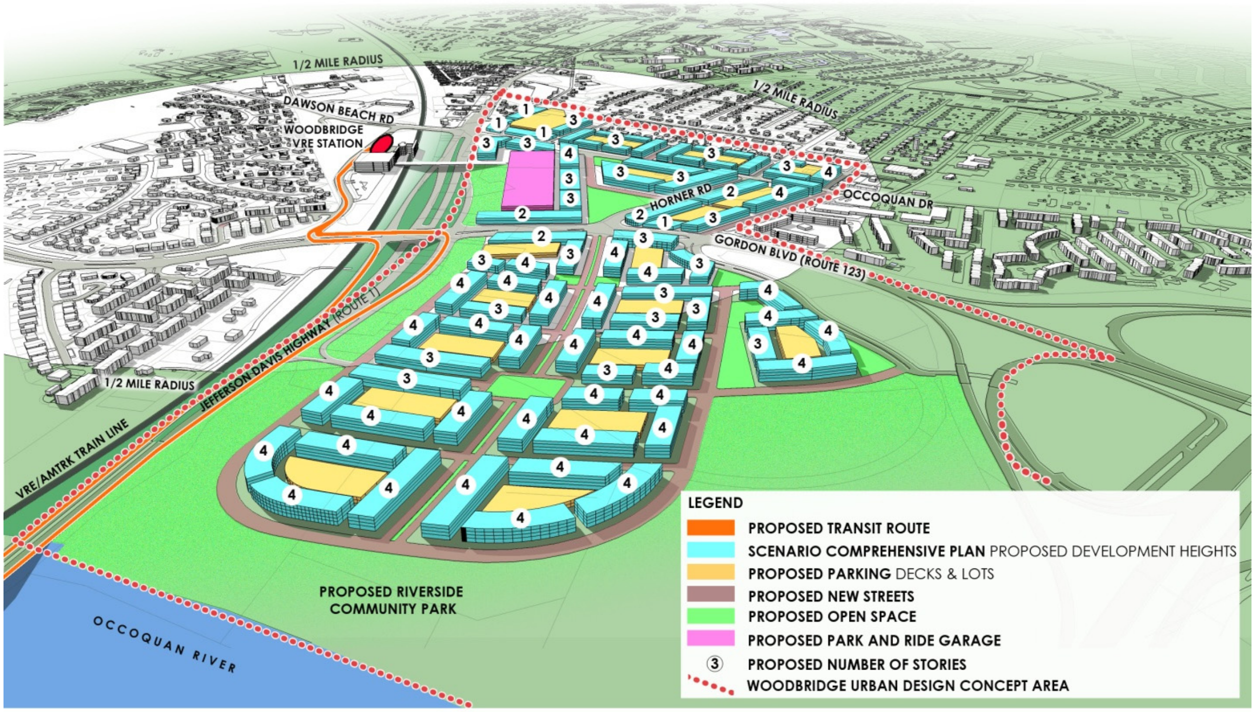
Figure 3-16: Woodbridge Station Massing Diagrams: Scenario One, Comprehensive Plan, and Scenarios Two and Three



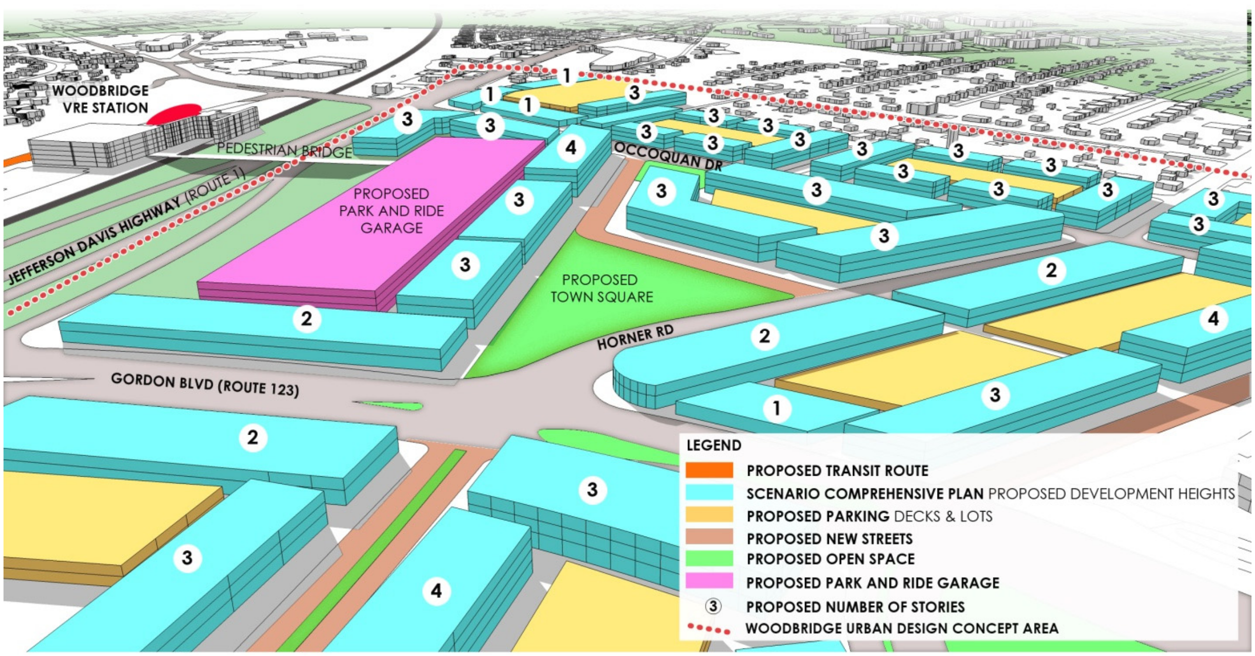
WOODBRIDGE SCENARIO 1 VIEW LOOKS SOUTH-WEST



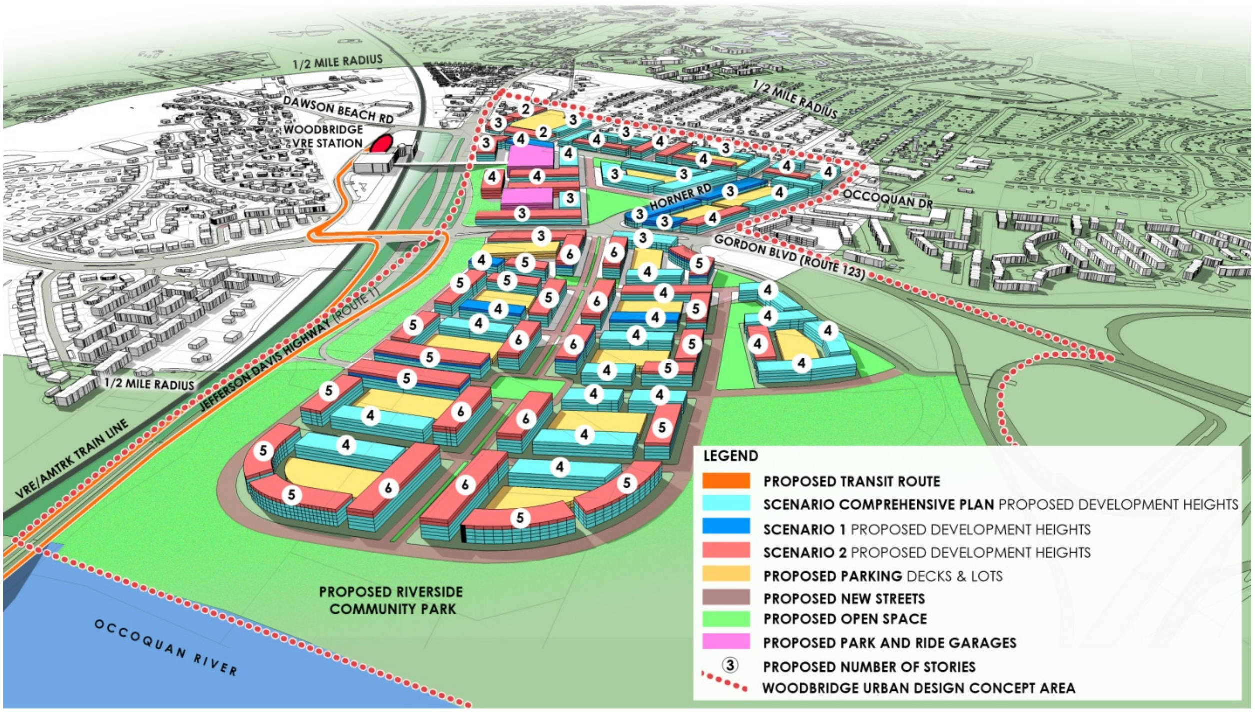
WOODBRIDGE SCENARIO 1 VIEW LOOKS SOUTH-WEST



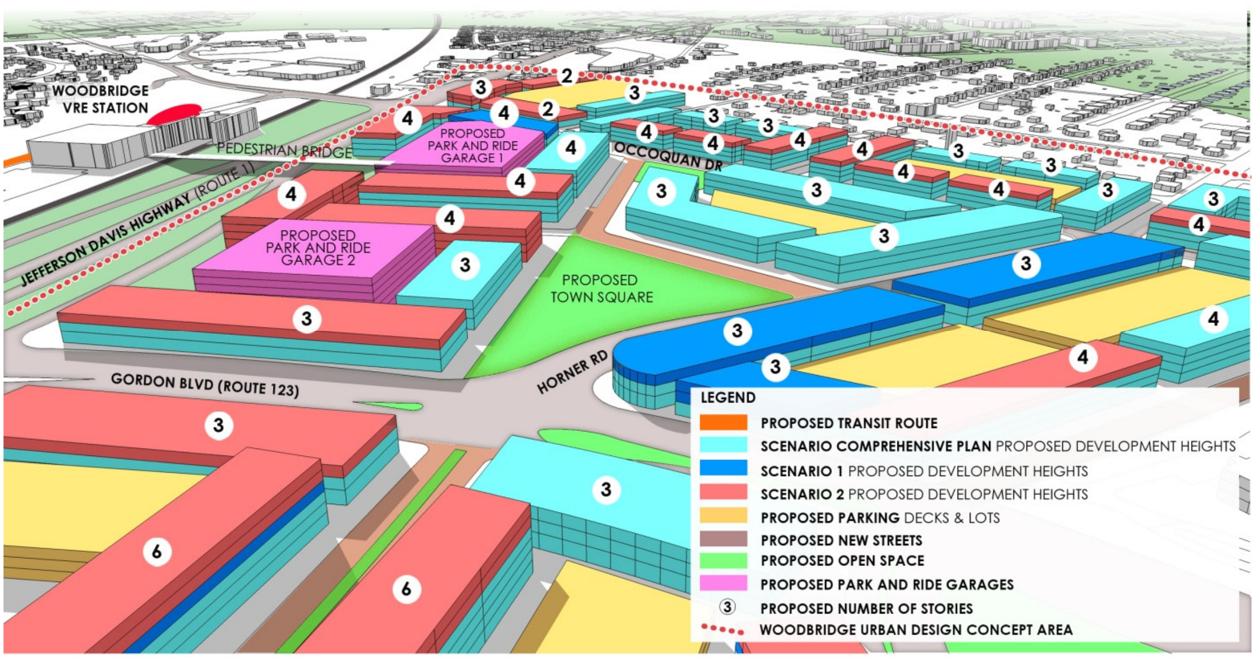
WOODBRIDGE SCENARIO COMPREHENSIVE PLAN VIEW LOOKS SOUTH-WEST



WOODBRIDGE SCENARIO COMPREHENSIVE PLAN VIEW LOOKS SOUTH-WEST



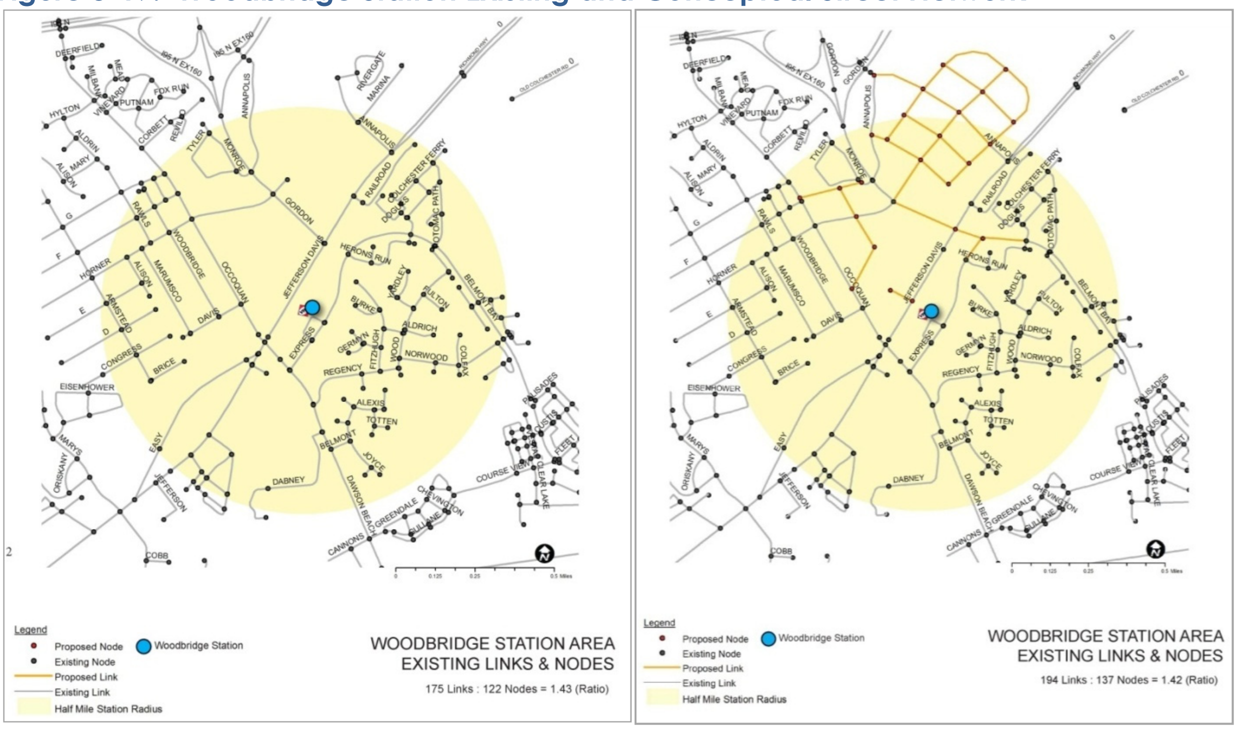
WOODBRIDGE SCENARIO 2 VIEW LOOKS SOUTH-WEST



WOODBRIDGE SCENARIO 2 VIEW LOOKS SOUTH-WEST

Figure 3-17 demonstrates the proposed improvements to the street network as shown in the urban design concepts. At Woodbridge a new grid of streets is shown on the existing "megablock" that is northwest of the Route1/Route 123 intersection. This new grid of streets increases the "nodes" or street intersections from 122 nodes within the half-mile radius to 137 nodes within that same area. This is a relatively small change because much of the new street grid is outside the half-mile radius of the station.

Figure 3-17: Woodbridge Station Existing and Conceptual Street Network



3.4 Existing Land Use Quantitative Information

This chapter evaluates current land uses using a baseline of quantitative data that allow comparison to other projects and transit corridors across the country. It also summarizes several items useful to a potential FTA funding application:

- Population density per square mile for each proposed station area and the corridor
- Total employment for each proposed station area and the corridor
- Housing density per square mile for each proposed station area

Even though the Route 1 transportation investments may not be funded through an FTA grant, the Capital Investment Program project justification criteria and guidance on local financial commitment represent "best practices" for transit investments and serve as good measures for appropriate scale and benefits of major capital projects.

Tables 3-4 and 3-5 are provided as baseline information on population, employment and housing within the Route 1 corridor. This data would be required as part of a future FTA New Starts funding application.

Table 3-4: Fairfax and Prince William Counties Land Use Data

County Demographic	County - 2010	All Station Areas within half-mile buffer
Housing Units	522,412	19,275
Affordable Housing[13]	15,199	2,170[14]

Table 3-5: Corridor-wide Land Use Data

Demographic	Countywide Total--2010 (Fairfax)	Countywide Total--2010 (Prince William)	Corridor – 2010 (with half-mile buffer)	All Station Areas within half-mile buffer
Corridor land area	406.3 sq. mi.	348.5 sq. mi.	15.7 square miles	9.3 square miles
Total population	1,081,726	402,002	67,038	51,306
Total employment	558,906	83,363	27,000	19,891
Population density	2,766.8 persons/sq. mi.	1195.0 persons/sq. mi.	4,280.5 persons per sq.mi.	5,496.6 persons per sq. mi.
Employment density	1375.8 persons/sq. mi.	239.2 persons/sq. mi.	1,724.0 persons per sq.mi.	2,130.2 persons per sq. mi.

Source: 2010 Census, 2010 County Business Patterns, and MWCOG 8.2

[13] Affordable housing refers to legally-binding, affordability-restricted housing under the definition used by the FTA: "a lien, deed of trust or other legal instrument attached to a property and/or housing structure that restricts the cost of the housing units to be affordable to renters and/or owners with incomes below 60 percent of the area median income for a defined period of time. This definition includes, but is not limited to state or Federally supported public housing, and housing owned by organizations dedicated to providing affordable housing."
[14] Estimate requiring further research prior to official FTA application.

3.5 Existing Land Use Assessment

An assessment of existing land use, using both quantitative and qualitative data, is a necessary part of the documentation for an FTA New Starts funding application[15]. **Table 3-6** gives an abbreviated summary of the FTA ratings breakpoints and an assessment for each station area or a cluster/grouping of stations. Possible rating scores are provided based on the assessment of current 2010 data for population, employment, housing and land use conditions.

The possible overall rating for the Land Use criterion is **Low**, based on the low-medium density of population, low total employment within corridor, automobile-centric development patterns, and lack of pedestrian facilities and connections to transit locations. The ratio of corridor affordable housing to county-total affordable housing is the only criterion where the corridor is likely to achieve a rating of Medium or above.

Table 3-6: Existing Land Use

<table>
<tr><th>Information Requested</th><th>FTA Ratings Breakpoint</th><th>Station Cluster</th><th>Assessment</th><th>Possible Rating</th></tr>
<tr><td rowspan="6">Existing corridor and station area development</td><td rowspan="6">High: Avg. population density >15,000 persons per sq. mile; employment served by project >220,000
Medium: Avg. population density 5,760-9,600 per sq. mile; employment served by project 70,000-139,999
Low: Avg. population density <2,560 per sq. mile; employment served by project <40,000</td><td>Huntington Metrorail station</td><td>Within half-mile radius of station area, population density in 2010 is 9,733. Total employment is 1,116.</td><td>Medium</td></tr>
<tr><td>Penn Daw and Beacon</td><td>Within half-mile radius of station areas, population density in 2010 is 5,476. Total employment is 4,038.</td><td>Low-Medium</td></tr>
<tr><td>Lockheed, Hybla Valley & Gum Springs</td><td>Within half-mile radius of station areas, population density in 2010 is 8,274. Total employment is 4,690.</td><td>Low-Medium</td></tr>
<tr><td>South County, Woodlawn, Fort Belvoir</td><td>Within half-mile radius of station areas, population density in 2010 is 4,333. Total employment is 5,769.</td><td>Low</td></tr>
<tr><td>Pohick, Lorton Blvd. Gunston Rd</td><td>Within half-mile radius of station areas, population density in 2010 is 3,645. Total employment is 2,676.</td><td>Low</td></tr>
<tr><td>Woodbridge</td><td>Within half-mile radius of station area, population density in 2010 is 3,576. Total employment is 1,632.</td><td>Low</td></tr>
</table>

[15] *Guidelines for Land Use and Economic Development Effects for New Starts and Small Starts Projects*. US Department of Transportation, Federal Transit Administration Office of Planning, August 2013.

Information Requested	FTA Ratings Breakpoint	Station Cluster	Assessment	Possible Rating
Existing corridor and station area development character	**High.** Site and urban design scaled to pedestrian use, with fine-grained mix of uses conducive to foot traffic. **Medium.** Urban design a mix of auto-oriented and pedestrian scale; less conducive to foot traffic. **Low.** Corridor is primarily auto-oriented with large parking lots and absence of pedestrian facilities	Huntington	Current development is trending to more walkable; area still lacks fine grained mix of uses.	Medium
		Penn Daw, Beacon, Lockheed, Hybla Valley & Gum Springs	Extensive large areas of parking throughout this section serving commercial strip district. Walking is difficult and dangerous in some areas.	Low
		South County, Woodlawn, Fort Belvoir	South County has a town center character; Woodlawn and Fort Belvoir are suburban in character. Little foot traffic, highly auto-oriented.	Low
		Pohick, Lorton Blvd. Gunston Rd	Lorton has a town center character; Pohick and Gunston are suburban in character. Little foot traffic, highly auto-oriented.	Low
		Woodbridge	Extensive large areas of parking throughout this section serving commercial strip district. Walking is difficult due to lack of facilities.	Low
Existing station area pedestrian facilities, including access for persons with disabilities	**High.** Continuous sidewalks, well marked crosswalks, adequate lighting and ADA facilities throughout. **Medium.** Sidewalks may be discontinuous, with some crosswalks missing, lighting less than optimal. **Low.** Many sidewalks & crosswalks missing, lighting not adequate, ADA facilities not provided.	Huntington	Pedestrian facilities surrounding Huntington Metro station are adequate.	Medium
		Penn Daw, Beacon, Lockheed, Hybla Valley & Gum Springs	Pedestrian sidewalks missing along corridor and within the CBCs. Few crosswalks. Lighting is at level for automobiles, not pedestrians.	Low
		South County, Woodlawn, Fort Belvoir	Same as above.	Low
		Pohick, Lorton Blvd. Gunston Rd	Same as above.	Low
		Woodbridge	Same as above.	Low

Information Requested	FTA Ratings Breakpoint	Station Cluster	Assessment	Possible Rating
Existing corridor and station area parking supply	**High.** CBD cost >$16/day; spaces per employee <0.2 **Medium.** CBD cost $12-$16/day; spaces per employee 0.3-0.4 **Low.** CBD cost <$4/day; spaces per employee >0.5	Huntington	On-street parking is limited at the Huntington Metro station. Cost of parking within Washington DC CBD >$16/day. Cost of parking at Hungtinton Metro Station is $4.85 per day for 3,617 spaces.	Medium-High.
		Penn Daw, Beacon, Lockheed, Hybla Valley & Gum Springs	Parking is free and widely available within all CBC areas for employees and patrons of retail areas. Adequate parking for residents of multi-family units.	Low.
		South County, Woodlawn, Fort Belvoir, Pohick, Lorton Blvd. Gunston Rd	Parking is free and generally available within South County and Woodlawn CBCs. Limited area for parking at Fort Belvoir and Pohick station areas. Adequate parking for residents of multi-family units at all areas.	Low.
		Woodbridge	Parking is free and widely available within all CBC areas for employees and patrons of retail areas. Limited parking available at VRE station.	Low.
Proportion of existing legally binding affordability restricted housing in the corridor compared to the proportion of legally binding affordability restricted housing in the counties in which the project travels	**High.** Ratio of corridor affordable housing (as a share of total housing) to county total share is >2.5. **Medium.** Ratio of corridor affordable housing to county total is 1.50 to 2.24. **Low.** Ratio of corridor affordable housing to county total is <1.10.	Huntington	No quantitative measure available for legally binding affordability restricted housing in this area. Market rate affordable housing likely exists within a ½ mile of the station.	Medium.
		Penn Daw, Beacon, Lockheed, Hybla Valley & Gum Springs	Quantitative measure of existing legally binding affordable housing is > 2.50. Station areas have some of highest ratio of affordable housing within county.	High.
		South County, Woodlawn, Fort Belvoir, Pohick, Lorton Blvd. Gunston Rd	No quantitative measure available for legally binding affordability restricted housing in this area. Market rate affordable housing likely exists within a ½ mile of the station. .	Medium.
		Woodbridge	Housing is currently very limited within 1.2 miles of station area. No legally binding affordability restricted housing.	Low.

3.6 Economic Development Effects Assessment

3.6.1 Assessment of land use policies for transit supportive development

Transit-supportive plans and policies is an FTA rating criterion with multiple factors, including growth management, transit-supportive corridor policies, supportive zoning regulations near transit stations, and tools to implement transit supportive plans and policies. Relevant documentation for each of these factors is listed in **Tables 3-7** through **3-10**, below.

Fairfax County has taken steps to concentrate development around future station areas by allowing increased development densities at Huntington Station (3.0 FAR) and at Beacon (performance based development potential). Developers have begun to propose projects in line with the county's expectations for greater densities in the north end of the Route 1 corridor. The middle section of the corridor and the south corridor below Fort Belvoir within Fairfax County remain at relatively low densities; Fairfax County does not have plans to increase densities to transit-supportive levels at these future station areas. For Prince William County, the as-of-right development is low-density commercial; the county has adopted policies to increase density in the Woodbridge vicinity to an FAR of 1.65, which would support higher-capacity transit.

Fairfax County has also initiated, or participated in, planning processes to accelerate the development of high-capacity transit within the project corridor. In addition to the Route 1 Multimodal Alternatives Analysis, the county has undertaken a High-Quality Transit Network Concept Study, which included consideration of Route 1 as a corridor for increased transit options.[16]

The possible FTA rating for Economic Development Effects is **Low-Medium**. The tables below list recommendations that the counties could implement to attempt to improve potential ratings. Once the station areas have been formally defined and a locally-preferred transit alternative selected, this information would be updated as needed to support a potential FTA New Starts funding application.

[16] *Proposed 2050 High Quality Transit Network Concept*, Fairfax County Department of Transportation. Website accessed March 2014. http://www.fairfaxcounty.gov/fcdot/2050transitstudy/

Table 3-7: Transit-Supportive Plans and Polices: Growth Management

Information Requested	FTA Ratings Breakpoint	Assessment	Possible Rating	Recommendations
Concentration of development around established activity centers and regional transit	**High.** Existing and planned densities & market trends strongly support transit. **Medium.** Incentive-based (voluntary) policies; densities moderately supportive. **Low.** Policies weak or limited; densities minimally supportive	Both counties have comprehensive plans in place to concentrate development around established activity centers. Fairfax County Comprehensive Plan envisions six Community Business Centers (CBC) along Rt 1 Corridor and one Transit Station Area: Huntington Transit Station Area, North Gateway CBC, Penn Daw CBC, Beacon/Groveton CBC, Hybla Valley/Gum Springs CBC, South County Center CBC and Woodlawn CBC. Prince William County Urban Mixed Use Area envisions a mixed use land use strategy for a proposed transit-related development near the VRE Station at Woodbridge. Stations in north end of corridor are beginning to see development densities that are supportive of transit.	**Low-Medium.** Both counties have created activity centers along corridor. However, development densities and market trends are not yet supportive of transit.	To potentially achieve medium-high rating, Fairfax County can consider allowing higher densities in the CBCs south of Beacon/Groveton, and creating plans for higher density, mixed-use development activity centers supportive of transit in the proposed station areas in Lorton and at Fort Belvoir. Prince William can consider allowing higher densities in its UMU at North Woodbridge. Both counties could adopt policies restricting infrastructure outside of designated growth areas, as well as smart-growth codes that specify pedestrian-friendly design for new developments. .
Land conservation and management				

Table 3-8: Transit-Supportive Plans and Polices: Transit-Supportive Corridor Policies

Information Requested	FTA Ratings Breakpoint	Assessment	Possible Rating	Recommendations
Plans and policies to increase corridor and station area development Plans and policies to enhance transit-friendly character of corridor and station area development Plans to improve pedestrian facilities, including facilities for persons with disabilities Parking policies	**High.** Conceptual plans for corridor & station area. Proposed development patterns in local comprehensive plans strongly support transit investment. **Medium.** Conceptual plans for corridor & stations being developed. Development patterns moderately supportive of transit investment. **Low**. Limited progress toward station area plans; development patterns marginally supportive of transit investment.	Prince William County has created a conceptual plan for North Woodbridge near the VRE station. Fairfax County is in the process of creating a conceptual plan for Huntington Station Area; conceptual plans for other station areas have not yet begun. Development patterns in the north end of the corridor, including Huntington Metro station and Penn Daw and Beacon station areas are beginning to see development patterns that are supportive of transit investment. Fairfax County has a policy, Guidelines for Transit-Oriented Development, in the adopted Comprehensive Plan. The policy identifies principles for TOD including higher density, mixed-use, pedestrian connectivity, affordable housing mix, economic development	**Low-Medium.** Conceptual planning for station areas is in the early stages, with the exception of Huntington and Woodbridge. Development patterns are starting to be more transit-supportive. Pedestrian plans and guidelines are limited to the area around Huntington Metro station. Parking policies, such as parking maximums, shared parkng and parking fee structures do not yet exist in the corridor.	To potentially achieve a Medium rating, the counties can develop conceptual station area plans and multimodal system plans for stations that do not have plans at present. Fairfax County can ensure implementation and enforcement of the Guidelines for Transit-Oriented Development. The counties can also adopt urban design requirements for the station areas that ensure building placement and sidewalk/streetscape design that promotes pedestrian activity. Policies could also require street networks and a mix of uses in new development. The counties may also consider developing parking policies that incorporate shared use parking and maximum parking requirements for new mixed-use developments.

Table 3-9: Transit-Supportive Plans and Polices: Supportive Zoning Regulations near Transit Stations

Information Requested	FTA Ratings Breakpoints	Assessment	Possible Rating	Recommendations
Existing and proposed zoning regulations that allow densities supportive of transit	**High.** Strong zoning regulations in most or all station areas. Incentives for increased development in station areas. **Medium.** Local jurisdictions are examining and changing zoning to support transit. **Low**. Initial efforts only to prepare station area plans and related zoning. Existing zoning marginally or not transit supportive	Fairfax and Prince William counties have begun to implement mixed-use zoning allowing for higher densities around proposed station areas, including Huntington, Beacon and Woodbridge stations. Lower-density commercial zoning still predominates in the remaining station areas, as well as portions of Beacon and Woodbridge. As-of- right low density zoning remains an issue in Prince William County. Reduced parking requirements are not yet used as a tool to increase development. Fairfax County allows bicycle facilities as a traffic mitigation strategy. Fairfax has implemented additional transportation demand strategies designed to reduce vehicle miles traveled (VMT) such as ridesharing, vanpools, and employer-subsidized transit passes.	**Low-Medium.** Both local jurisdictions are examining zoning to support transit; the effort is still in initial stages and has not yet begun to swing densities to transit-supportive levels except in Huntington.	To potentially achieve a Medium rating, the counties can continue to examine zoning around proposed station areas for higher densities (FTA Rating Guide uses an FAR = 6.0 in the CBD as the threshold for Medium.). Urban design guidelines, transit-supportive overlay districts and incentive structures for increasing density are part of a transit-supportive planning package.
Zoning ordinances that enhance transit oriented character of stations				
Zoning allowances for reduced parking and traffic mitigation				

Table 3-10: Transit-Supportive Plans and Polices: Tools to Implement Land Use Policies

Information Requested	FTA Ratings Breakpoint	Assessment	Possible Rating	Recommendations
Outreach to government agencies and the community in support of transit-supportive planning	**High.** Agencies are working proactively to promote transit-supportive planning and station area development. Capital improvement programs support transit investment. **Medium.** Some outreach has been conducted; incentives to promote TOD are being investigated. **Low.** Limited effort has been made to promote transit planning; little or no effort to identify capital improvements.	The counties and the state transit agency (DRPT) have begun preliminary outreach as part of this study and the Fairfax Countywide Transit Network Study. Current VDOT roadway improvements accommodate a median-running transit lane and a separated multi-use path. Fairfax County has an extensive program of public outreach through their land use approval process and would utilize this process in the consideration of future station areas. Revitalization and Incentive programs exist but a fuller range of tools is needed to attract transit-supportive development densities.	**Low-Medium.** The counties have not yet made transit supportive development a priority along the Route 1 corridor, with the result being that low density commercial centers continue to be developed.	To potentially achieve a Medium rating, counties should incorporate successful elements from their other transit focused land use studies into a corridor or station area planning process. The process should accommodate specific outreach to transit-dependent populations such as affordable housing residents and senior citizens. Building off the Comprehensive Plans, a more complete range of incentives designed to promote density at transit stations can be developed, including streamlined permits, reduced zoning requirements for traffic mitigation fees and land assembly programs.
Regulatory and financial incentives to promote transit-supportive development				
Efforts to engage the development community in station area planning and transit-supportive development				

Performance and Impacts of Policies

Since this analysis is proposing station areas and a preferred alternative for future transit, it precedes development of station-specific policies of the sort needed to address the Performance and Impacts of Policies criterion described in the following tables. **Tables 3-11** and **3-12** should be completed as part of a future FTA funding application.

Table 3-11: Performance and Impacts of Policies: Performance of Transit-Supportive Plans and Policies

Information Requested	FTA Ratings Breakpoints	Assessment	Possible Rating	Recommendations
Demonstrated cases of developments affected by transit-supportive policies	**High.** Transit supportive housing and employment is occurring in the corridor. Significant amounts of TOD have occurred in the region. **Medium.** Station locations have not been established, so TOD would not be expected. **Low.** Other transit corridors in the region lack examples of transit supportive housing and employment.	Successful examples of transit-supportive development exist in the corridor, notably development near the Huntington Metro Station.	**Medium.** Station locations on this corridor have not yet been established, however transit supportive policies have been established in the region and their effects have been demonstrated through the presence of transit-supportive development patterns.	Study what has worked elsewhere in the region in order to reinforce policies for this corridor that will result in transit-supportive development.
Station area development proposals and status				

Table 3-12: Performance and Impacts of Policies: Potential Impact of Transit Investment on Regional Development

Information Requested	FTA Ratings Breakpoints	Assessment	Possible Rating	Recommendations
Adaptability of station area land for development Corridor economic environment	**High.** A significant amount of land in station areas is available for new development or redevelopment at transit-supportive densities. Local plans and market conditions strongly support this development. **Medium.** Moderate amount of land available; local plans & market conditions moderately support such development. **Low.** Modest amount of developable land; plans and local market provide marginal support for transit station development.	Forecasted population and employment for the corridor shows reasonably strong growth in the north; less growth in the middle and south parts of the corridor. Available land for redevelopment exists as commercial centers age; however, the parcel analysis shows that there are relatively few large development sites, so parcel assembly would be required. As of yet, market impetus for mixed-use development is limited to station areas in the north – Huntington, Penn Daw and Beacon.	**Low-Medium.**	To determine if a medium or low rating is appropriate, the counties should conduct a market study that examines short- and long-term opportunities for different types of development in the corridor and station areas. An initial assessment of existing and potential development values around the stations is presented in Chapter 4, Economic Development Analysis.

3.6.2 Tools to Maintain or Increase Share of Affordable Housing in Corridor

Both Fairfax and Prince William Counties are in the process of preparing updated affordable housing plans. Fairfax is in the process of adopting more rigorous standards for its expected high-growth areas. These standards are likely to be adjusted for the Route 1 corridor, which already possesses a substantial proportion of the county's affordable housing. Fairfax has also moved to preserve the current stock of affordable housing in the corridor by adopting a mobile home retention policy and continuing to study the issue of affordable home ownership.

Table 3-13: Tools to maintain or increase share of affordable housing in corridor

Information Requested	FTA Ratings Breakpoints	Assessment	Likely Rating	Recommendations
Evaluation of corridor-specific affordable housing needs and supply	**High.** Plans and policies to address current and prospective affordable housing are in place along the corridor, together with robust financial incentives. Developers are actively working to secure affordable housing sites. **Medium.** Affordable housing plans and development strategies are being prepared to preserve existing housing and address needs of very low income. **Low**. Polices are not in place; financing not identified and strategies to preserve affordable housing does not exist.	Prince William County has conducted a 2012 Housing Affordability study to engage economic partners around affordable housing preservation. Policies also focus on needs of very low-income households. Fairfax County Affordable Dwelling Unit program provides potential density bonuses up to 20% to new development, based on housing type. In addition, the Fairfax County Comprehensive Plan encourages at least 12% of all residential development to be affordable.	**Medium-High.** The current stock of affordable housing is plentiful; Fairfax plans to increase this with new development. Prince William County is identifying locations for affordable housing in the corridor, though not at North Woodbridge.	To obtain a higher rating, the counties should evaluate the best strategy for the corridor, which could focus on preservation of existing affordable housing ratios. Continue and expand programs for density bonuses and inclusion of affordable units in market rate development.
Adopted financing tools and strategies targeted to preserving and increasing affordable housing in the region and/or corridor				
Evidence of developer activity to preserve and increase affordable housing in the corridor				

3.7 Project Comparison

Recent projects that have received FTA New Starts/Small Starts funding have also received at least a Medium rating under criteria for Land Use and Economic Development Effects. Several projects that recently received or are awaiting funding agreements from FTA are summarized here for comparison to Route 1. These projects have low or medium ratings for existing land use conditions, but were able to achieve a medium or medium-high economic development rating because of land use policies.
Table 3-14 offers a comparison of key elements of these selected projects with those same elements on the Route 1 corridor.

Table 3.14: Comparison - Selected Recent Projects under FTA New/Small Starts

Project	Miles/# stations	Service Type	Population Density (persons/ sq. mile)	Employment (CBD or stations)	Overall FTA Rating	Current Project Phase
Route 1	14/12	Metro / BRT	4,280	27,000 (station areas)	TBD	Alternatives Analysis
National Capital Purple Line	16/21	LRT	9,200	154,000 (CBC)	Medium	New Starts Project Develop
West Eugene EmX extension	9/13	BRT	4,200	38,000 (CBC)	Medium	Small Starts Project Develop
South Sacramento LRT extension	4.3/4	LRT	5,100	105,000 (CBC)	Medium	Final Funding Agreement

National Capital Purple Line, MD (LRT)

Received "Medium" Land Use rating for New Starts

- Proposed 16 mile LRT line connecting Bethesda (Montgomery County, MD) and New Carrollton (Prince George's County, MD) via Silver Spring and College Park
- Population density around proposed stations = 9,200 people per square mile
- Employment around proposed stations = 154,000 jobs
- Parking costs average $10-$15 per day in downtown Bethesda and $8 per day in downtown Silver Spring
- Corridor includes stations dominated by strip commercial development, residential neighborhoods of single-family homes, townhouses, and intermittent high-rise apartment buildings
- Downtown Bethesda and Silver Spring are pedestrian-friendly; most other stations are automobile-oriented

Received "Medium-High" Economic Development rating

- Strong population and employment growth is projected in the corridor
- Montgomery County directs development to areas where public services are in place; Prince George's County has designated the corridor for concentrated growth
- Zoning around downtown stations allows for dense transit-oriented development
- Land use policies have played a key role in redevelopment projects around Metrorail stations in Bethesda and Silver Spring

West Eugene EmX extension, Eugene OR (BRT)

Received "Low" Land Use rating for Small Starts

- Population density around proposed stations = 4,200 people per square mile
- Employment around proposed stations = 38,000 jobs
- Project will indirectly serve University of Oregon (20,000 students)
- Downtown Eugene is pedestrian-friendly and has street-fronting mixed-use buildings between two and four stories
- Rest of corridor is includes mix of single-family homes and apartment complexes, big box commercial development, and industrial properties

Received "Medium" Economic Development rating

- Regional and municipal planning documents call for concentrated development in pedestrian-friendly "nodes"
- Planning specifically to support transit has not been conducted in the corridor outside of downtown
- Densities appear high for a small city; parking requirements outside downtown are low
- Limited evidence of development being shaped to support transit in the corridor

South Sacramento Extension (LRT)

Received "Low" Land Use rating for

- Extension of current LRT line from its current southern terminus through one of the fastest-growing areas of the Sacramento County
- Population density around proposed stations = 5,100 people per square mile
- Employment around proposed stations = 1,800 jobs
- Project provides direct connection to 105,000 jobs in the CBD
- Significant pockets of vacant land surround station areas
- Limited pedestrian connectivity to stations

Received "Medium" Economic Development rating

- Sacramento is beginning to implement policies to encourage infill development
- City zoning has provided for higher density development around stations
- Growth is occurring in the general vicinity of the existing South Sacramento Corridor line

4.0 Economic Development Analysis

4.1 Introduction

With increased rail transit or bus service along the Route 1 corridor, it will become increasingly possible for families and businesses to make location choices that minimize financial, environmental, and social costs. The stations will serve a variety of purposes, from daily commutes and regional business travel to occasional recreational trips. Over time, areas that are well served by transit will become nodes of residential and economic activity.

The purpose of this section is to assess the development impact of the economic activity that would be attracted to or newly built in the corridor under alternative growth scenarios. The work has several steps.

The first step is to assess the value of development already in place in the candidate station areas and the associated tax. The analysis relies on a careful evaluation of assessor's records collected from Fairfax and Prince William Counties.

The second step is to project the future economic development that would be in place according to adopted land use forecasts. This future state relies on MWCOG projections of anticipated growth in the corridor. These projections extrapolate existing trends into the future—thus they reflect the future economic development that would be anticipated even if transit investment were not made in the Route 1 corridor. The tax revenue associated with this commercial investment is calculated using current tax rates applied to the projected growth in development.

The third step projects the alternative development outcomes associated with significant transit investment in the corridor. Three scenarios (including the base case) were developed. The scenarios developed represent a range of potential development for the Route 1 corridor. Key outputs of the scenario analysis are the economic value associated with the development, and the associated change in tax revenues.

4.2 Current Economic Development Trends in the Route 1 Corridor

The total value of property in the Route 1 Corridor is about $8.5 billion ($2013), of which about three quarters or $6.3 billion is taxable. This estimate is based on an analysis of assessed parcels located within a one-half mile radius of the thirteen station areas under consideration as part of the Route 1 alternatives analysis. The presence of Fort Belvoir in the corridor, which is an exempt property, accounts for the unusually large difference between the taxed and untaxed values.

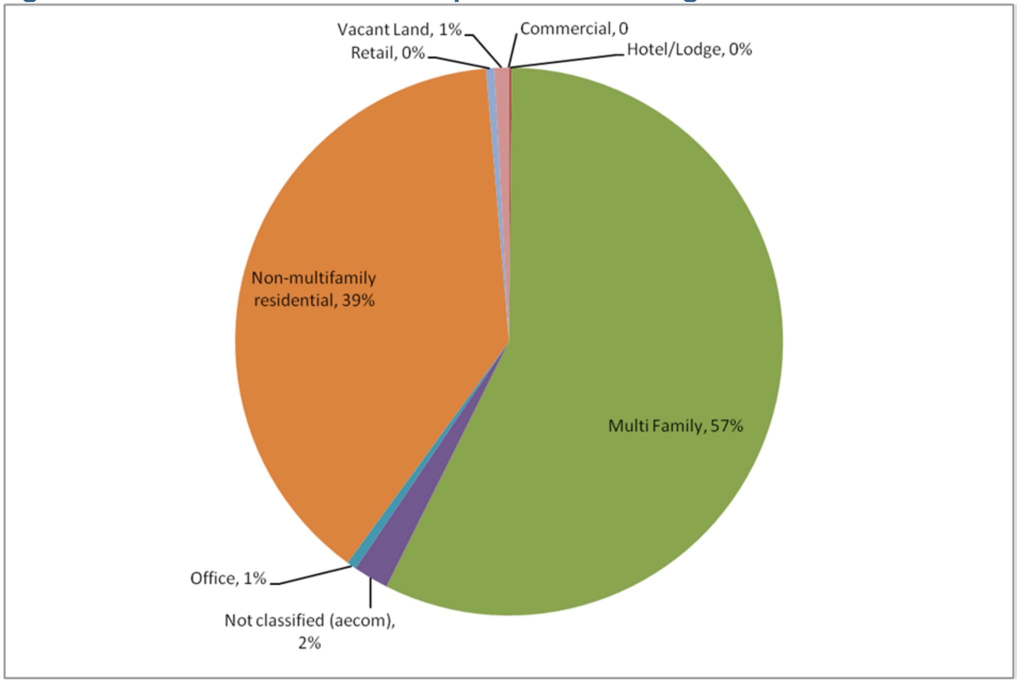
The corridor has a heavy concentration of residential uses (comprised of multifamily and other residential types such as single family or townhouses, for example), consistent with its comparative affordability within the larger Washington, DC metropolitan area[17]. Over 50% of taxable parcels are non-multifamily residential properties. Nearly 30% of taxable parcels are multifamily properties, comprising 60% of all residential properties. Offices (2%), retail (3%), and vacant land (1%) make up another 6% of taxable properties. Collectively, these uses account for over 86% of taxable properties in the corridor. The balance is made up of a diverse mix of hotel, entertainment, light industrial, and other taxable uses.

Taxable value varies significantly across station areas. The taxable value ranges from lows of $28 million at Accotink Village, because of the presence of Fort Belvoir, to a high of over $1 billion at Huntington. Penn Daw, Beacon, Mount Vernon, and South County Center all have taxable valuations between $500 and $600 million each.

The mix of uses varies across station areas too. For example, in the Huntington station area, 57% of taxable property is multifamily (see **Figure 4-1**). By contrast, in the Penn Daw station area, the dominant use is non-multifamily residential—accounting for 69% of taxable parcels (see **Figure 4-2**). There are also commercial parcels that account for 5% of the total parcels. None of the station areas has retail as the dominant use, but the Beacon area has a comparatively high 6% of its taxable properties in retail.

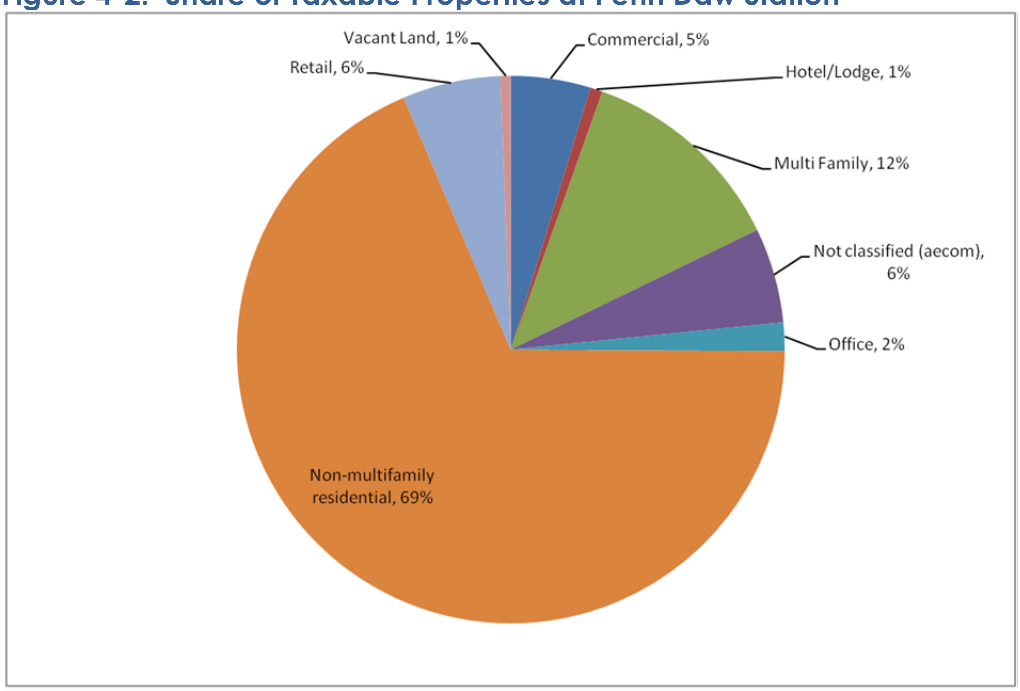
[17] Residential housing comes in a variety of forms including single-family and townhomes (which may be owner occupied or rental) and multifamily for example. In the narrative, we have adopted the convention "multifamily and other residential types" to describe residential uses in order to distinguish between multifamily which is largely commercial real estate and other forms of residential (collectively described as non-multifamily residential) which are more heavily dominated by multiple owners and less commercial.

Figure 4-1: Share of Taxable Properties at Huntington Station



Source: AECOM Analysis

Figure 4-2: Share of Taxable Properties at Penn Daw Station



Source: AECOM Analysis

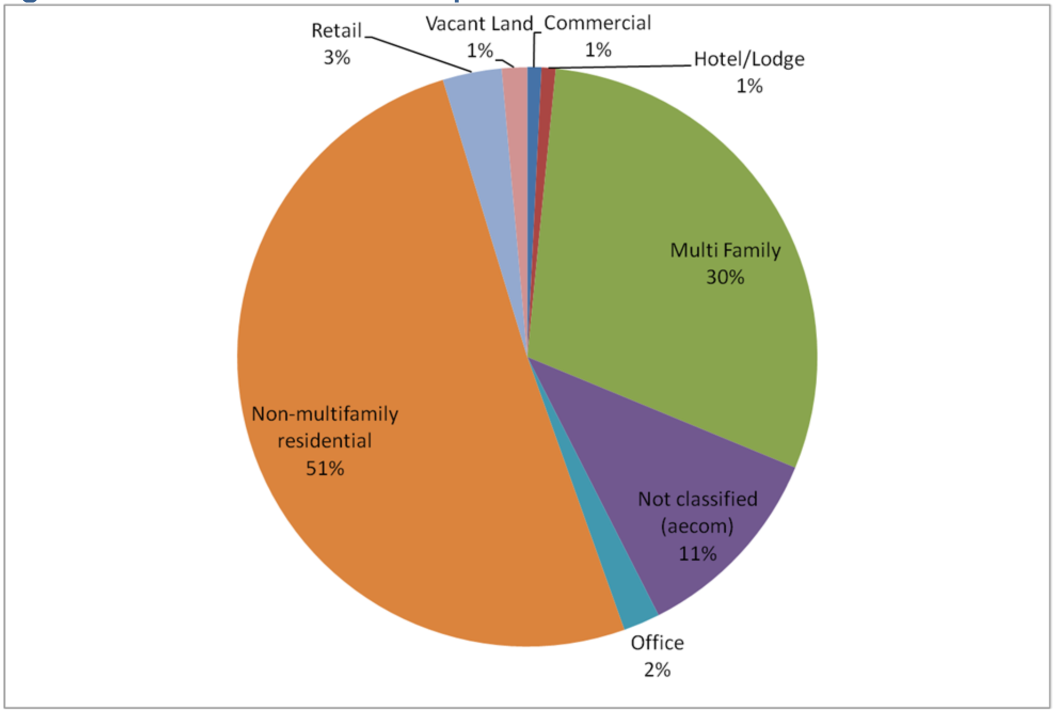
Figure 4-3 shows the share of all taxable properties across all 13 stations in the study area, and **Figure 4-4** shows the value of taxable properties. **Table 4-1** provides a summary of the 2013 parcel and assessment information for all the thirteen station areas combined. The summary table describes the land use, land value, improvement value, total value, square footage of the parcels by property type and by exempt and non-exempt tax status. Summaries for the individual station areas have been included at the end of the report. Where individual parcels fall within two overlapping station areas, the values associated with the overlapping parcels were divided evenly between the two overlapping station areas to ensure that there is no double counting in the valuation. The data are tabulations based on 2013 assessors' records collected from Fairfax and Prince William Counties. The high percentage of non-classified exempt properties in the table is due to the presence of Fort Belvoir, which is exempt and falls under the Accotink Village station buffer.

Table 4-1: Property Value and Square Footage Summary for all stations

Property Type	Tax Status	2013 Land Value	2013 Improvement Value	2013 Total Value	Area (Sq-Ft)	% of Sq-Ft
Commercial	non-exempt	20,101,790	29,546,720	49,648,510	1,179,691	0.16
Hotel/Lodge	non-exempt	17,239,370	32,651,790	49,891,160	1,281,398	0.17
Multi Family	exempt	4,167,000	11,149,240	15,316,240	688,451	0.09
Multi Family	non-exempt	415,663,040	1,461,850,090	1,877,513,130	90,523,909	12.10
Not classified	exempt	945,180,010	1,087,244,920	2,032,424,930	480,904,578	64.29
Not classified	non-exempt	273,740,530	440,333,050	714,073,580	46,399,383	6.20
Office	exempt	8,048,680	41,262,690	49,311,370	524,674	0.07
Office	non-exempt	42,266,440	87,012,740	129,279,180	3,933,857	0.53
Non-multifamily residential	exempt	9,643,850	18,697,120	28,340,970	1,012,406	0.14
Non-multifamily residential	non-exempt	1,140,776,480	2,070,707,100	3,211,483,580	71,159,063	9.51
Retail	exempt	654,480	423,730	1,078,210	40,844	0.01
Retail	non-exempt	112,107,530	96,372,210	208,479,740	7,305,111	0.98
Vacant Land	exempt	26,292,190	28,700	26,320,890	13,275,107	1.77
Vacant Land	non-exempt	89,098,450	469,560	89,568,010	29,780,437	3.98
Total (All)	exempt + non-exempt	**3,104,979,840**	**5,377,749,660**	**8,482,729,500**	**748,008,909**	**100**
Total (Taxable)	non-exempt	**2,110,993,630**	**4,218,943,260**	**6,329,936,890**	**251,562,850**	**34**

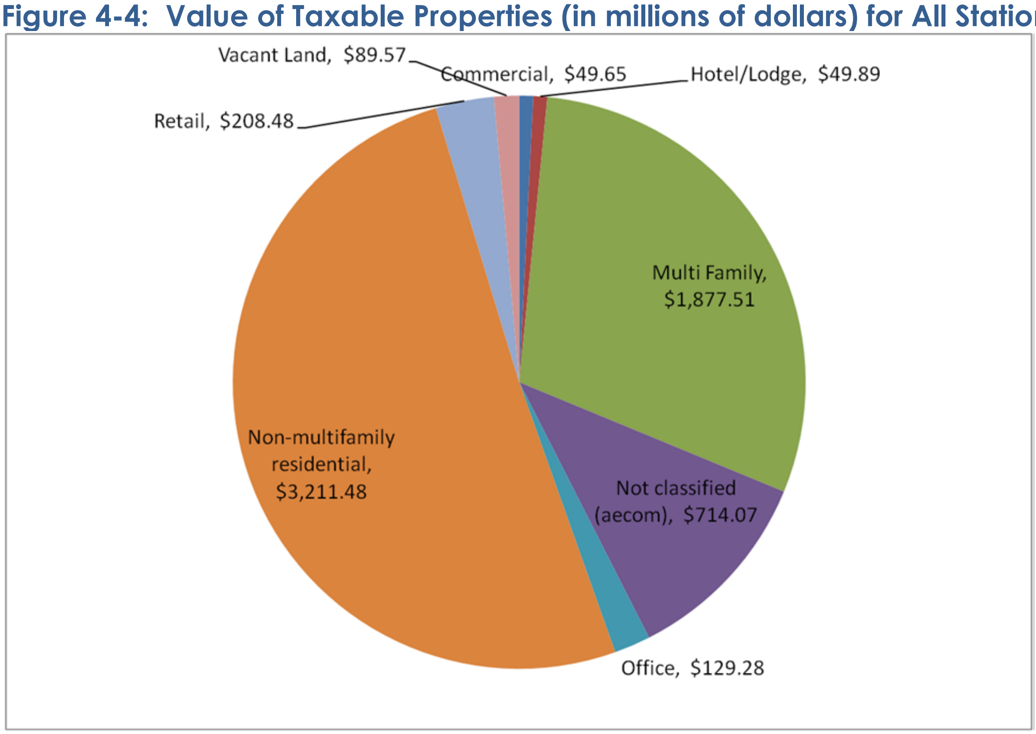
Source: AECOM Analysis

Figure 4-3: Share of Taxable Properties for All stations



Source: AECOM Analysis

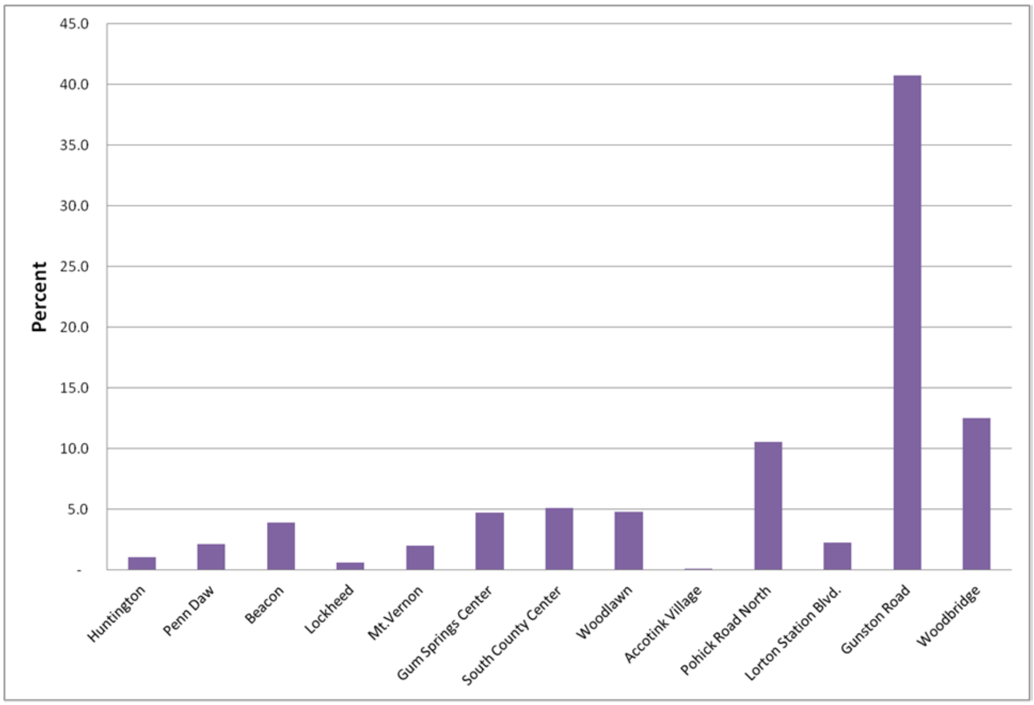
Figure 4-4: Value of Taxable Properties (in millions of dollars) for All Stations



Source: AECOM Analysis

Figure 4-5 depicts the distribution of vacant land (non-exempt) by square footage across the station areas in the Route 1 corridor. About 40% of the square footage in the Gunston Road station area is vacant land (non-exempt)[18]. For Woodbridge and Pohick Road station areas, which have the next highest shares of vacant land (non-exempt), the percentages are 12.5% and 10.5% respectively. **Figure 4.6** shows the value of vacant land (non-exempt) across the station areas. The large quantity of vacant land influences the value of the tax base currently in place and also suggests that there may be greater ease of development or land assembly in these locations. Zoning and county plans, however, play a large role in the timing and ultimate shape of the development that occurs in the corridor.

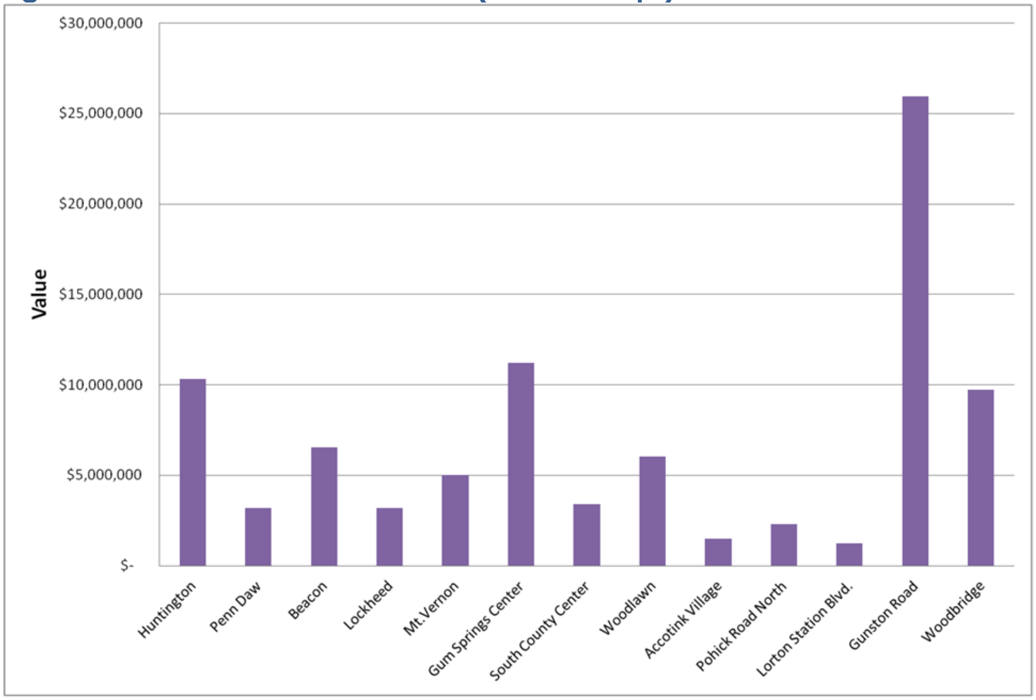
Figure 4-5: Percentage of Square Feet of Vacant Land (Non-Exempt) Across Station Areas



Source: AECOM Analysis

[18] The percentage of vacant land is an important initial screening factor in understanding development potential, but additional analysis is required to obtain the complete picture. For example, available vacant land can be offset by environmental constraints, unwillingness of owners to sell for redevelopment, or issues of topography, for example. In the case of the Gunston Road Station area, landfill and environmentally sensitive land contribute to the large share of vacant land, but would not foster development.

Figure 4.6: Value of Vacant Land (Non-Exempt) Across Station Areas



Source: AECOM Analysis

4.3 Methodology for Projecting Alternative Economic Development Outcomes

Based on the three land use scenarios developed for the Route 1 corridor, the value of anticipated development and the tax revenue for years between 2013 and 2035 were assessed. In order to predict land use impacts and related economic development impacts due to transit investment, a half-mile radius around potential station locations along the corridor was used for the analysis. The half-mile radius around a transit station largely represents the distance people are willing to walk to transit, and thus where significant transit-focused development is likely to occur.

Assessing the value of anticipated development associated with the land use scenarios, as well as the tax revenue for years between 2013 and 2035 involved the following steps.

Step 1 –Developing the Square Footage Projections

In this step, the anticipated square footage by property category for years between 2013 and 2035 was developed for the station areas along Route 1 corridor. Property types were aggregated into four categories: Total residential (includes single family, multifamily, and other forms of residential property), Office, Retail, and Other (includes commercial property as well as hotels and lodging). Both tax exempt and non-exempt properties within each of the above categories were included.

2013 Square Footage by Property Category

Square footage for the property categories corresponding to year 2013 was derived based on current parcel and assessment data from Fairfax County and Prince William County. This served as the starting point for the future year interpolations. **Table 4.2** shows the total square footage across all stations by property category for 2013.

Table 4.2: Total Square Footage by Property Type in 2013

Property Type	Square Footage
Total Residential(Single Family, Multifamily, and other forms of residential)	163,383,829
Office	4,458,531
Retail	7,345,955
Other (Commercial, Hotel& Lodging)	2,461,089

Source: AECOM Analysis

2035 Square Footage by Property Category

Square footage by property category corresponding to future year 2035 was developed based on the population and employment forecasts. The land use analysis provided the 2035 population and employment forecasts by station areas for each of the land use scenarios. The land use analysis also provided the 2010 population and employment estimates by station areas[19]. The growth in population and employment numbers between 2010 and 2035 was computed by station area for each of the land use scenarios.

Any growth in population within the station areas was translated to an increase in residential property square footage. Conversion of the growth in population to growth in property square footage was performed by using an assumed value for square footage per person corresponding to residential property. For this analysis, the square footage per person for residential property was assumed as 800[20].

[19] 2010 Population and Employment estimates are based on 2010 COG 8.2 forecasts.
[20] Based on the median square footage per person corresponding to Residential property from the 2009 American Housing Survey (AHS), National Association of Home Builders (NAHB) Tabulations;

Similarly, any growth in employment within the station areas was translated to an increase in square footage for Office, Retail and Other property categories. Conversion of the growth in employment to growth in property square footage was performed by using an assumed value for square footage per worker corresponding to Office, Retail and Other property categories. The square footage per worker[21] was assumed to be 250 for Office, 500 for Retail, and 1000 for Other.

By applying the aforementioned factors to the population and employment growth, estimates on growth in square footage by property category within each station area were derived. Square footage by property category corresponding to future year 2035, was computed by adding the derived growth in square footage to the 2013 square footage.

Interpolating Square Footage for Years between 2013 and 2035

The 2013 square footage and 2035 square footage served as the start and end points respectively for the intermediate year interpolations. The year-to-year interpolations between 2013 and 2035 were calculated with the assumption of linear growth between the starting year 2013 and the forecast year 2035.

Step 2 –Developing the Valuations

Value per square foot for each property category within the study area was derived based on 2013 assessment information. The 2013 Total Value (Land Value + Improvement Value) was divided by the 2013 square footage for each property category. Out of the thirteen station areas in consideration, twelve station areas fall within Fairfax County and one station area falls within Prince William County. An average value per square foot by property category was calculated based on data corresponding to station areas within Fairfax County. Value per square foot for the Woodbridge station area was calculated separately. This was done to aid in tax revenue calculations, as Woodbridge is the only station in Prince William County and thus has a different tax rate in comparison to station areas in Fairfax County. For the purpose of this analysis, the value per square foot was held constant over time, and does not account for inflation. In other words, the analysis results are not adjusted for inflation, and simply presented in 2013 dollars. This gives flexibility to the user of the analysis of value capture, allowing the user to scale the results according to their own assumptions on inflation rates. The projection in value reflects the change in total building stock constructed in the corridor. This is a conservative assumption as it is likely that at least some new construction in the corridor would be constructed in a higher valued manner over time. The working assumption is that this “upscaling” would likely happen over time but also unevenly across station locations. To the degree that this would take place, it represents a “high” scenario relative to the baseline growth projections developed here.

Source: http://www.nahb.org/generic.aspx?genericContentID=171558&channelID=311

[21] Factors based on information on building area per employee by business type from various sources including Institute of Transportation Engineers, U.S. Department of Energy, and San Diego Association of Governments, Source: http://www.usgbc.org/Docs/Archive/General/Docs4111.pdf.

The square footage projections by property type within each station area between years 2013 and 2035 (from Step 1) were multiplied with the value per square foot to estimate the Total Valuations for 2013 – 2035.

Step 3 – Calculating Tax Yields

The tax yield for each year between 2013 and 2035 was calculated by multiplying the total value for the given year by the tax rate for each property type. For station areas in Fairfax County, a tax rate of 1.121[22] (per $100) was applied for residential property. A tax rate of 1.246[23] (per $100) was applied for Office, Retail, and Other properties.

For station areas in Prince William County, tax rate of 1.2562[24] (per $100) was applied to all property types. No transportation tax levy associated with the Prince William Parkway Transportation Improvement District was included in the tax yield calculations, as fiscal year 2015 may be the final year the district is needed before the general fund is fully reimbursed[25].

Steps 1, 2 and 3 described above were implemented for each of the three land use scenarios, resulting in assessed value of anticipated development, as well as the tax revenue for years between 2013 and 2035.

Validating Results

In order to validate the calculations and results, several checks were put in place. A ratio between total value for Scenario Two to the total value of Scenario One was calculated for each year (between 2013 and 2035), for each of the four property categories, as well as all categories put together. This allowed for a better understanding in the outcomes of Scenario Two in comparison to Scenario One. To ensure that the tax yield was calculated properly, total tax revenue was divided by the total value to obtain the tax rate, and the results were checked against the tax rates that were applied in these calculations.

4.4 Results/Findings

Scenario One showed a growth in overall property values from $5.6 billion in 2013 to about $6.4 billion in 2035. During that period, value for residential property grew from $5.1 billion to $5.78 billion. Office property value grew from $178.6 million to $265 million. Value of retail property grew from $209.6 million to $260 million. Other property increased from $99.5 million to $125.3 million. Each property

[22] Based on tax rates/fees for Mt. Vernon District in Fairfax County. Residential Property tax rate was calculated to include General + Leaf Collection + Pest Infestation + Stormwater = 1.121 (per $100); Source: Fairfax county Real Estate tax rate and Fee table; http://www.fairfaxcounty.gov/dta/pdf_files/2013_tax_fee_table.pdf

[23] Based on tax rates/fees for Mt. Vernon District in Fairfax County. Residential Property tax rate was calculated to include General + Leaf Collection + Pest Infestation + Stormwater + Transportation = 1.246 (per $100); Source: Fairfax county Real Estate tax rate and Fee table; http://www.fairfaxcounty.gov/dta/pdf_files/2013_tax_fee_table.pdf

[24] Based on tax rates/fees for Prince William County. Property tax rate was calculated to include Base + Fire and Rescue Levies + Gypsy Moth Levy = 1.2562 (per $100); Source: http://www.pwcgov.org/government/dept/finance/pages/tax-rates.aspx

[25] Source: http://eservice.pwcgov.org/documents/bocs/agendas/2014/0225/13-B.pdf

type's value as a share of total value largely remained unchanged between 2013 and 2035, with residential property slightly declining from 91% to 90%, office growing from 3% to 4%, retail remaining at 4%, and other remaining at 2%. Total annual tax revenue showed a growth from $63.9 million in 2013 to $73.4 million in 2035.

Scenario Two showed a growth in overall property values from $5.6 billion in 2013 to about $6.8 billion in 2035. During that period, value for residential property grew from $5.1 billion to $5.87 billion. Office property value grew from $178.6 million to $398.1 million. Value of retail property grew from $209.6 million to $365.8 million. Other property increased from $99.5 million to $139.2 million. Residential property's share of total value declined slightly from 91% to 87%. Office property's share went from 3% to 6%, retail property went from 4% to 5%, and other remained at 2%. Total annual tax revenue showed a growth from $63.9 million in 2013 to $77.6 million in 2035. While residential property's share declined in this scenario, the tax base grew more than in Scenario One because office, retail and other property types are all taxed at a higher rate than residential property types.

When comparing Scenario One and Scenario Two, 15% to 25% additional growth in population and employment in Scenario Two does not result in comparable additional growth in property values. The additional property value growth for all four property types in Scenario Two is about 5%. This can be attributed to the allocation of growth in population and employment (combined) across stations according to County Comprehensive Plans, which does not necessarily translate to 15% - 25% overall growth because the base employment is currently small compared to the population. Overall share in employment makes up a much smaller portion of combined growth than the growth in population, affecting the overall growth. Population and employment growth in Scenario Two (in comparison to Scenario One) translates to about 5% growth in square footage across all property categories. Thus, when compared to Scenario One, the additional property value growth in Scenario Two is 5%.

The FEIS for the Dulles Corridor Rapid Transit Project (p. 5-22) reports potential increases in Corridor developments summarized below for the full LPA:

- Office - 17%
- Retail - 18%
- Industrial - 1%
- Residential - 10%
- Total - 12%

Scenario Three showed a growth in property values from $5.6 billion in 2013 to about $10 billion in 2035. During that period, value for residential property grew from $5.1 billion to nearly $8.1 billion. Office property value grew from $178.6 million to $840.6 million. Value of retail property grew from $209.6 million to $463.5 million. Other property grew from $99.5 million to $642.1 million. Residential property's share of total value declined from 91% to 81%. Office property's share grew from 3% to 8%, retail's share grew from 4% to 5%, and other property's share grew from 2% to 6%. Total annual tax revenue showed a growth from $63.9 million in 2013 to $115.6 million in 2035. As with Scenario Two, residential property's share declined, but Scenario Three yielded higher tax revenues than Scenario One because office, retail, and other property types are all taxed at a higher rate than residential property types. This scenario is illustrative of what would be needed to reach the density required to support a hybrid of BRT and Metrorail; it is not a market driven scenario.

When comparing Scenario Three and Scenario One, we see that Scenario Three results in additional growth in total property value of 56.2% over Scenario One. This is significantly larger than the additional growth in Scenario Two because Scenario Three assumes activity density along the corridor to be between 35 and 70 (population plus employment per acre), which corresponds to the density supportive of the BRT and Metrorail combination proposed under this scenario.

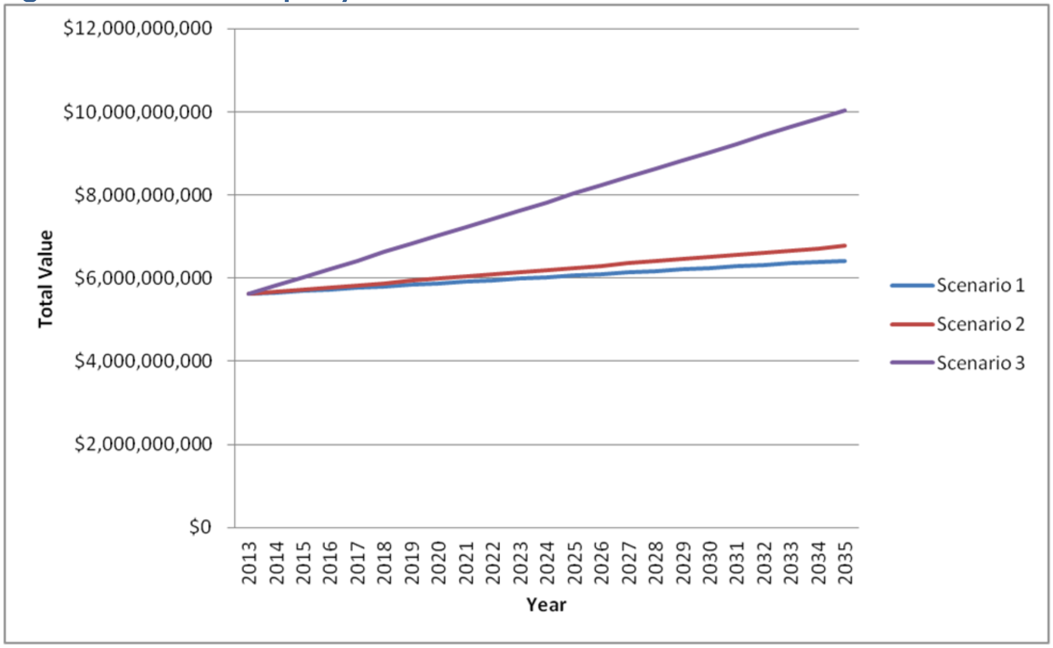
Figure 4-7 demonstrates the growth in total property value from 2013 to 2035 for the three scenarios.

Figure 4-8 demonstrates the growth in tax revenue from 2013 to 2035 for the three scenarios.

Table 4-3 shows the total value in 2013 and 2035 for the three scenarios.

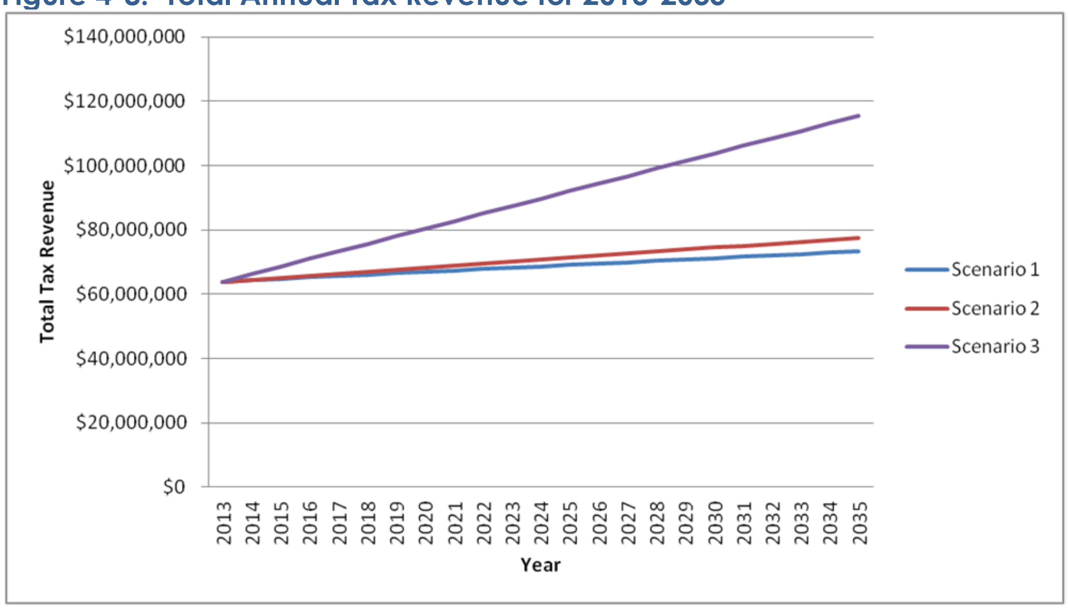
Table 4-4 shows total annual tax revenue in 2013, 2035, as well as the cumulative tax revenue between 2013 and 2035 for all three scenarios.

Figure 4-7: Total Property Values for 2013-2035



Source: AECOM Analysis

Figure 4-8: Total Annual Tax Revenue for 2013-2035



Source: AECOM Analysis

Table 4-3: Total Valuation in 2013 and 2035

Scenario	2013	2035
Scenario One	**$5,620,342,090**	**$6,424,383,573**
Total Residential(Single Family, Multifamily, and other forms of residential)	$5,132,653,920	$5,773,422,725
Office	$178,590,550	$265,074,868
Retail	$209,557,950	$260,626,362
Other (Commercial, Hotel& Lodging)	$99,539,670	$125,259,617
Scenario Two	**$5,620,342,090**	**$6,772,862,626**
Total Residential(Single Family, Multifamily, and other forms of residential)	$5,132,653,920	$5,869,762,455
Office	$178,590,550	$398,142,701
Retail	$209,557,950	$365,781,655
Other (Commercial, Hotel& Lodging)	$99,539,670	$139,175,816
Scenario Three	**$5,620,342,090**	**$10,033,529,156**
Total Residential (Single Family, Multifamily, and other forms of residential)	$5,132,653,920	$8,087,321,590
Office	$178,590,550	$840,626,977
Retail	$209,557,950	$463,463,966
Other (Commercial, Hotel& Lodging)	$99,539,670	$642,116,623

Source: AECOM Analysis

Note: The analysis does not factor in any assumed changes in quality of development in station areas.

Table 4-4: Total Annual Tax Revenue in 2013 and 2035

Scenario	2013	2035	2013-2035 Cumulative Revenue
Scenario One	**$63,964,281**	**$73,370,076**	**$1,579,345,109**
Total Residential(Single Family, Multifamily, and other forms of residential))	$57,879,598	$65,248,605	$1,415,974,333
Office	$2,228,537	$3,306,519	$63,653,146
Retail	$2,614,686	$3,251,414	$67,460,145
Other (Commercial, Hotel& Lodging)	$1,241,460	$1,563,539	$32,257,485
Scenario Two	**$63,964,281**	**$77,615,698**	**$1,628,169,762**
Total Residential(Single Family, Multifamily, and other forms of residential)	$57,879,598	$66,350,204	$1,428,642,725
Office	$2,228,537	$4,964,925	$82,724,810
Retail	$2,614,686	$4,562,056	$82,532,534
Other (Commercial, Hotel& Lodging)	$1,241,460	$1,738,513	$34,269,693
Scenario Three	**$63,964,281**	**$115,557,741**	**$2,064,503,259**
Total Residential(Single Family, Multifamily, and other forms of residential)	$57,879,598	$91,292,817	$1,715,482,774
Office	$2,228,537	$10,479,432	$146,141,648
Retail	$2,614,686	$5,779,270	$96,530,494
Other (Commercial, Hotel& Lodging)	$1,241,460	$8,006,222	$106,348,343

Source: AECOM Analysis

Note: A tax rate of 1.121 (per $100) was applied for residential property in Fairfax County, a tax rate of 1.246 (per $100) was applied for Office, Retail, and Other properties in Fairfax County, and a tax rate of 1.2562 (per $100) was applied to all property types in Prince William County.

The economic analysis shows that there is significant land value in the corridor. However, the assumptions of higher growth in commercial uses over the analysis period, combined with the fact that the mix of uses still leans heavily towards residential, has the result of limiting the amount of tax revenue being generated by new development in each of the scenarios. Future analysis would assess the potential of transportation and other public investments to increase land value in the corridor and thus increase the estimated tax revenues.

5.0 Recommendations

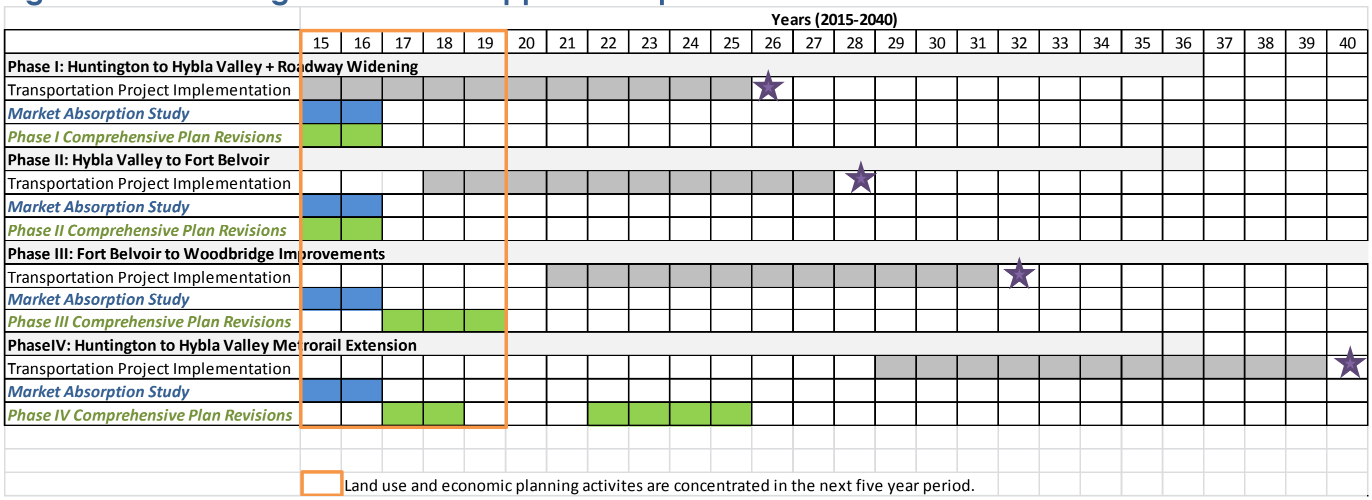
An integrated vision for the Route 1 corridor will guide actions to maximize economic development potential by creating a range of housing and commercial opportunities within the corridor. These actions will be taken in step with transportation infrastructure and services to achieve the maximum benefit of private and public investments. This vision will emerge in part through planned station areas that incorporate commercial space and a diversity of housing types within dynamic mixed-use centers, connected by the multimodal corridor and a walkable secondary street network. This section describes five strategies—or sequential steps—to achieve this transportation/land use vision:

1. Conduct a market absorption study
2. Shape a planning and economic development strategy
3. Codify policies and regulations
4. Create incentives, and
5. Attract major catalyst development

Fairfax and Prince William Counties have already created strong plans and guidelines for growth in key activity centers (called Community Business Centers and Urban Mixed Use Areas respectively) on the Route 1 corridor. The recommendations in this section build on the principles articulated in the County Comprehensive Plans, and leverage the recommended transportation investment as a mechanism to implement the Plans.

A successful federal funding application depends upon how well the *principles* of land use and economic development plans are reflected in the form of *adopted policy* and *development response*. These recommendations are not specific to a particular transit mode for Route 1, but instead reflect the design principles and policies that create high quality transit-supportive development for all transit modes and meet FTA project justification criteria. As shown in **Figure 5-1**, updates to the Comprehensive Plans would occur in phases, to support growth and development related to the proposed phased implementation of transportation improvements.

Figure 5-1: Planning Activities to Support Transportation Recommendations



5.1 Recommendation #1: Market Absorption Study

The existing Comprehensive Plans have been structured around potential development scenarios, and look beyond the adopted 2035 forecasts for population and employment growth. The important immediate next step in follow-up to the current Multimodal Alternatives Analysis is a closer look at economic trends and market forces that will shape development in the near-term and longer-term future.

The purpose of the market study is, in large part, to predict the future—or at least a range of future land use and development scenarios in each station area. This exercise should not be a traditional, value-neutral real estate market analysis, which merely extrapolates from existing market trends, but a combination of quantitative market analysis techniques and the more qualitative TOD planning and policy framework developed to support transit implementation. The objective is to identify future land use and development scenarios that are desirable from a TOD and Smart Growth standpoint and feasible from a development standpoint.

Anticipated outcomes of the market absorption study are:

- Perspectives on the pace and location of anticipated private development and redevelopment
- A clearer understanding of where the opportunities are for focused planning
- Input to policy decisions around potential incentives and strategic investments

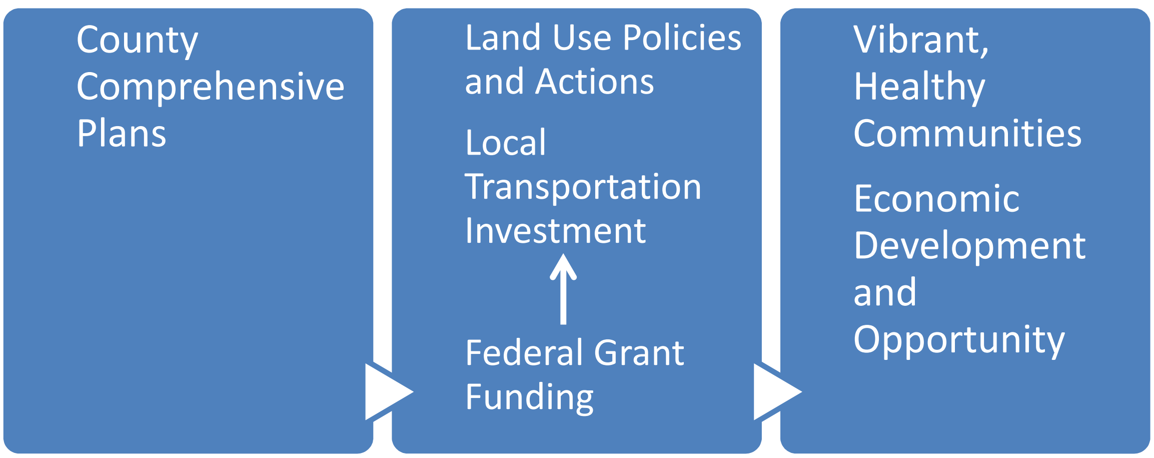
The process for the market absorption study should include participation by a cross-section of corridor interests from the private and public sectors. The goal is to create a baseline for discussions of where and when to prioritize investment.

5.2 Recommendation #2: Planning and Economic Development Strategy

Fairfax County and Prince William County have adopted Comprehensive Plans that help set the groundwork for focused transportation investment. These plans should be revisited in light of the Locally Preferred Alternative for transit and transportation, and they should be coordinated with efforts to attract added levels of employment and population growth for the Route 1 corridor. The relationships are depicted in **Figure 5-2**.

Updated plans will focus on the public infrastructure and services to support higher levels of population and employment. Comprehensive Plans will document the need for schools, public safety, parks, and other critical public investments.

Figure 5-2: Relationship of Land Use Planning, Transportation Investment, and Economic Development



A key finding of the Route 1 study is the need for enhancements to the local street network. The maps in **Figure 5-3** show a vision for a future network of local streets that would have lower speeds and accommodate on-street bicycle facilities. The concept shows a connection between the Huntington Station Area and South County Center, along the west side of Route 1. It is intended as an alternative to Route 1 for local travelers between the station areas and should be part of a larger plan for a connected system of walkable streets, supporting access to transit stops and generating a framework for transit-related development along the entire corridor.

<u>Specific Recommendations for Planning:</u>

- Prepare station area plans for all proposed stations to encompass, at minimum, the full half-mile radius around each proposed station:

    - Ensure transit-supportive density, diversity of housing and commercial development, and high quality design in new mixed-use development
    - Define centers for the Lorton and Fort Belvoir station areas
- Prepare plans for investment in public infrastructure and services (schools, public safety, parks, etc.)
    - Prepare a detailed needs assessment, including a hierarchy of investment priorities
    - Identify locations for priority investment and prepare an implementation plan
- Create a street connectivity vision for the entire corridor
    - Identify a parallel secondary street network to Route 1
    - Establish an interconnecting grid of streets around each station, emphasizing a hierarchy of walkable local streets
    - Accommodate bicycle facilities in the street designs
- Adopt the station area plans, public services plans, and street connectivity vision as part of the comprehensive plans for Fairfax and Prince William Counties

5.3 Recommendation #3: Policies and Regulations

The effort to codify policies and regulations is an important step in implementing plans. Without well-defined rules, developers cannot assess the risks or potential return on their investments in the corridor. Well-articulated standards create a sense of place that serves to attract further development and build momentum toward realization of plans.

Urban Design Guidelines

Prince William County has recently created a set of design guidelines for Potomac Communities to establish the design intent for the North Woodbridge area. Fairfax County has urban design recommendations for the Richmond Highway Corridor and design guidelines to augment the Comprehensive Plan for Tyson's Corner. Guidelines for the Route 1 corridor would provide specific standards for the appearance, character, and arrangement of elements, including buildings, streets, sidewalks, street furniture, planting, lighting, and open space.

Since many jurisdictions in Virginia do not rezone as a method for directing development, urban design guidelines are especially important to indicate the counties' intentions for development intensity and quality. FTA normally uses transit-supportive zoning regulations as a key criterion under its Economic Effectiveness rating.

Parking

Parking policy and standards must be addressed throughout the corridor. At present, readily accessible and free parking is a dominant land use along Route 1. Shared parking should be permitted and parking management districts explored, e.g. Hybla Valley district, instead of on a site-by-site basis, to reduce individual parcel development costs, optimize land use and development intensity, and encourage the development of walkable, "park once" areas. Parking located behind commercial and residential buildings allow pedestrian access to building front entrances and can minimize curb cuts improving access management and traffic flow on the corridor main line. Newer developments at the north end of the corridor have proposed less parking than required by code; this practice could be codified as a matter of right allowance for transit-oriented projects, further reducing barriers to the type of quality development that would support and enable a significant transit investment.

The Fairfax County Guidelines for Transit-Oriented Development list a number of ways to reduce the need for parking, including maximum parking requirements, shared use parking facilities, carpooling, metered parking, car-sharing programs, neighborhood parking programs, and other techniques.

Affordable Housing

The northern section of Route 1 has a high proportion of affordable housing units, compared to Fairfax County as a whole. Current FTA criteria compare the ratio of affordable to total housing units within the corridor to that for the entire county. This measure—currently almost 4:1—should achieve a "High" rating for Route 1 under FTA's affordable housing criteria. During the funding application process, FTA may look to see that the counties have policies in place to maintain the current level of affordability in market-rate station area development. Fairfax County has a stated goal of 12 percent affordable/workforce housing, which is now being implemented for new projects within the Route 1 corridor. Prince William County does not currently have policies to maintain or grow affordable housing levels in the study area as new development occurs.

Specific Recommendations for Policies / Regulations:

- Refine and adopt Route 1 urban design guidelines:
  - Establish appropriate streetscape standards: street and sidewalk widths, building setbacks, street trees, street furniture, and lighting
  - Ensure active street level building design: building form, façade penetration, ground floor interface, and entrances on the front street/sidewalk
- Adopt parking policies:
  - Locate parking on-street or behind buildings, and create parallel parking on secondary street networks (between sidewalks and through traffic)
  - Establish parking policies for the Route 1 corridor that focus on parking maximums, shared-parking and other methods as outlined in the Fairfax County TOD Guidelines
- Develop and enforce affordable and workforce housing policies:
  - Protect current levels of affordable housing
  - Ensure that affordable housing is included as part of market-rate development

5.4 Recommendation #4: Incentives

A carefully crafted system of incentives that encourages denser, mixed-use development at transit stations will facilitate transit plan implementation. Incentives could include density bonuses for high quality mixed-use projects, tax rebates, grant and loan funds for commercial projects that incorporate quality mixed use, and continuance of incentives for affordable housing.

Fairfax County already has a system of incentives for its revitalization areas, including the Route 1 corridor, known as the Commercial Revitalization District (CRD) zoning overlay. The Fairfax County Office of Community Revitalization (OCR) uses the CRD to prioritize and incentivize development within the CBCs. The policies are designed to expedite development review and offer flexibility for infill development. This could be extended to the transit station areas in order to provide increased flexibility and streamlining for transit-supportive development and/or construction of transit facilities.

A well-coordinated, clear and timely plan review and approval process is another method for incentivizing mixed-use transit-oriented development. Fairfax and Prince William Counties could formalize corridor proffer requirements for transit-oriented development projects, so that developers know what to expect at the early stages of the development process. The counties should consider other methods for making the approval process for transit-oriented development more predictable and efficient for developers.

<u>Specific Recommendations for Incentives:</u>

- Offer density bonuses, tax rebates and loan funds for transit-supportive development that provide a greater incentive than what is already offered through the Richmond Highway CRD zoning overlay
- Streamline approvals to provide a greater incentive for transit-area development

5.5 Recommendation #5: A Major Catalyst Development

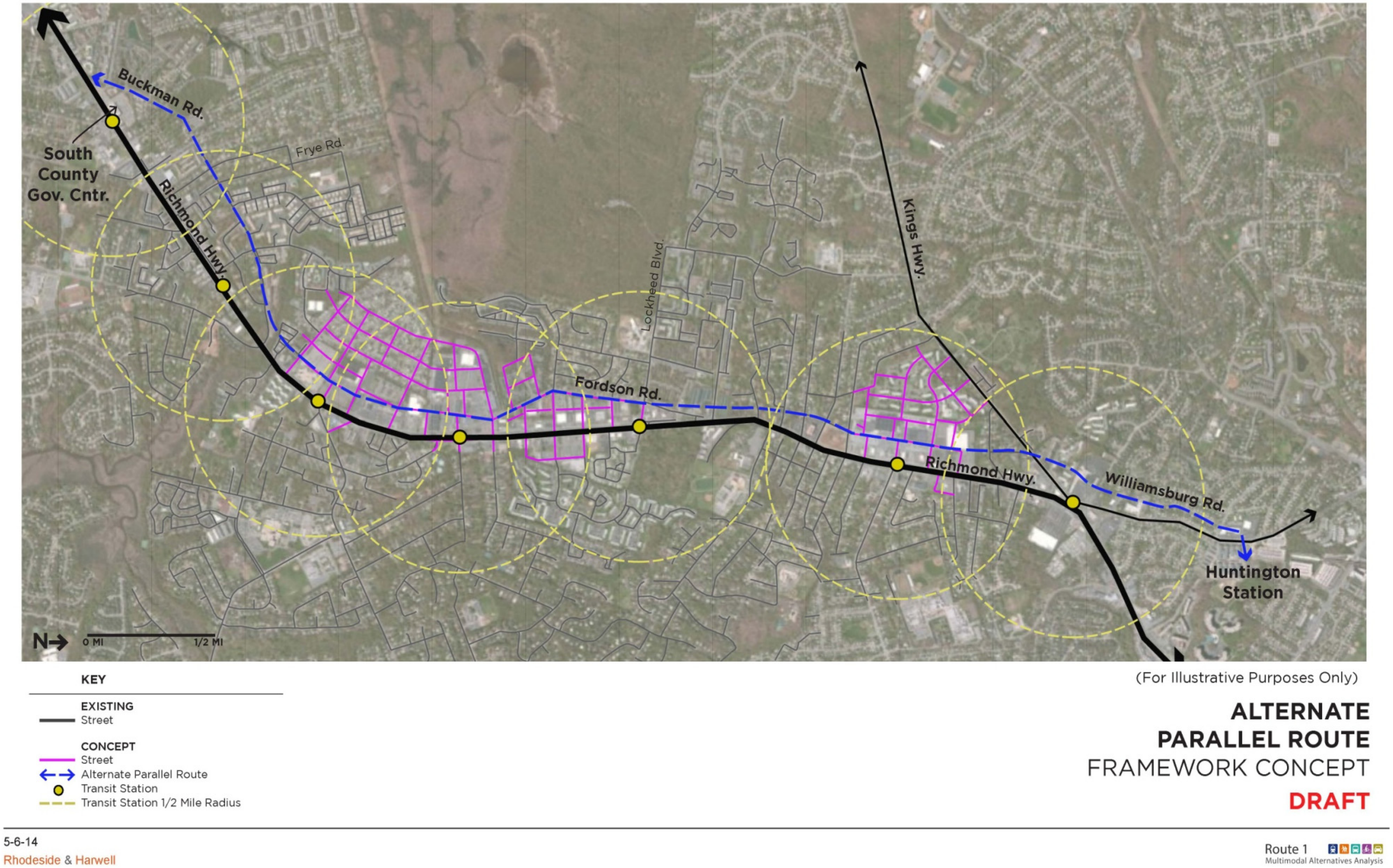
Introduction of a major new catalyst development on or near Route 1 is a key strategy for spurring a significant increase in development that could support a high quality transit investment on the corridor. The Inova Mount Vernon Hospital and the expansions at Fort Belvoir provided further economic attraction for the corridor. An additional, successful major investment could continue this trend and could establish a model for the corridor.

Accomplishing this strategy would require concerted action by Fairfax County and Prince William County leadership. This recommendation should relate to the proposed Market Absorption Study (Recommendation #1) but is proactive; it does not wait for the market to respond but rather incentivizes investment at key locations along the corridor.

The strategy would encompass the use of a range of incentives to attract and locate large employers or concentrations of retail firms at key points along the corridor. It would likely identify target sites for potential employers and active land assembly.

The result of initial actions would be to define centers of economic activity. Over the longer term, other development would follow, reinforcing the planned centers and creating the sense of place articulated in the County Comprehensive Plans and the Route 1 Multimodal Alternatives Analysis.

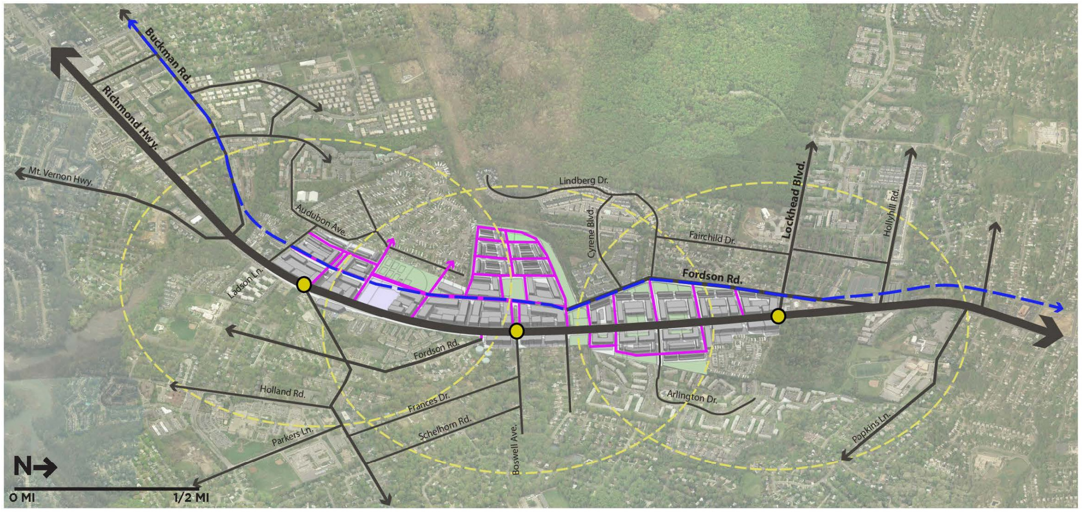
Figure 5.3: Alternate Parallel Route (Illustrative purposes only)



Existing Street Network

KEY

EXISTING
Street



Conceptual Street Network
(For Illustrative Purposes Only)

KEY

EXISTING
Street

CONCEPT
Street
Alternate Parallel Route
Transit Station
Transit Station 1/2 Mile Radius

HYBLA VALLEY
STREET CONNECTIVITY
FRAMEWORK CONCEPT
DRAFT

5-6-14
Rhodeside & Harwell

Route 1
Multimodal Alternatives Analysis

APPENDIX E

Additional Traffic Transportation For Future Land Use Scenarios

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Route 1
Multimodal Alternatives Analysis

ROUTE 1 MULTIMODAL ALTERNATIVES ANALYSIS

ADDITIONAL TRAFFIC ANALYSIS FOR FUTURE LAND USE SCENARIOS

DRAFT January 7, 2015

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1.0 Introduction/Summary

The *Additional Transportation Analysis Report* complements the *Route 1 Multimodal Alternatives Analysis Traffic and Transportation Report* (June 2014) and the *Land Use and Economic Analysis Report* (November 2014). This report extends and enhances the traffic operations analysis summarized in the *Route 1 Multimodal Alternatives Analysis Traffic and Transportation Report*, and develops traffic projections based on the alternative growth scenarios outlined in the *Land Use and Economic Analysis Report*.

1.1 Purpose

Previous traffic analysis focused on intersections in Hybla Valley and Fort Belvoir areas. The purpose of the additional traffic analysis was twofold:

1. Evaluate long-term traffic effects and transit performance at additional key intersections at the northern end of the study corridor, specifically in the Beacon and Penn Daw areas.

2. Estimate potential traffic impacts at key points along the corridor associated with station area development at levels associated with land use Scenarios 2 and 3.

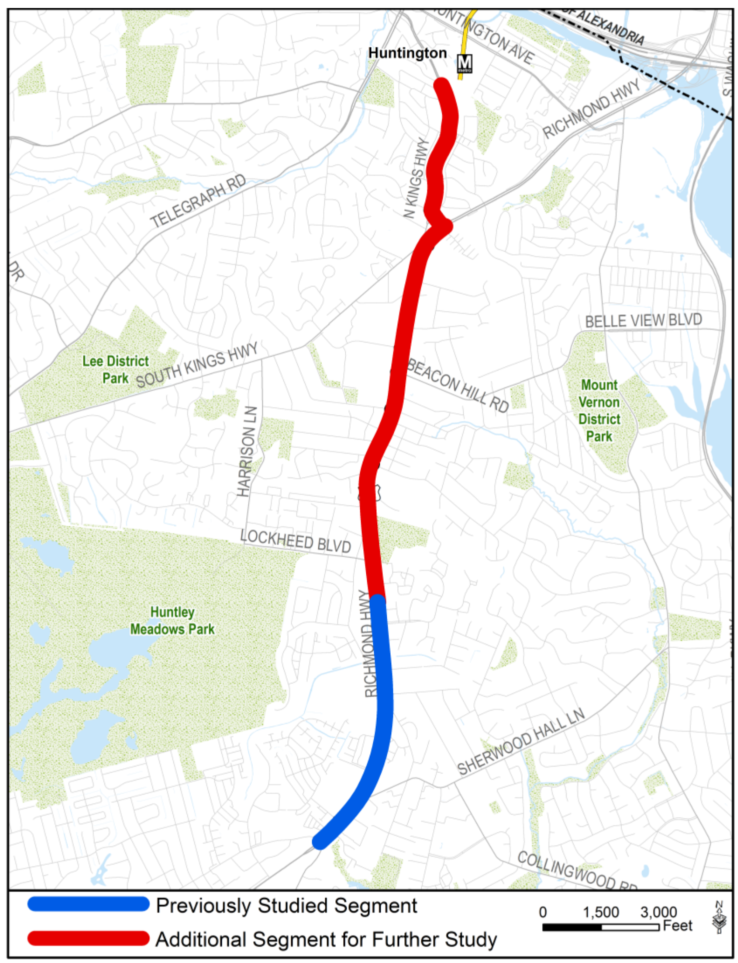
1.2 Level of Analysis

The analysis described in this report provides a general framework for understanding potential traffic levels and intersection performance. Due to the significant levels of assumed growth and the general nature of assumptions regarding the locations and types of land development, outputs from the applied modeling tools have a high degree of variability and must be interpreted as general findings. Future traffic analysis work in the Route 1 corridor will incorporate more specific development plans and more detailed design of proposed transportation investments.

1.3 Scenario 1 Traffic and Transit Operations

The analysis considered 13 additional intersections beyond the seven that were modeled in detail with VISSIM under land use Scenario 1 ("base" land use scenario using the Metpolitan Washington Council of Governments (MWCOG) 2035 regional forecast). The results provide additional information regarding likely performance of a consistent six-lane cross section for general traffic along Route 1.

Figure 1: Segments included in VISSIM Analysis



This work involved expanding the VISSIM network previously prepared for the Hybla Valley segment (see **Figure 1**) to include 13 additional intersections between Hybla Valley and Huntington/North Gateway. This analysis provides further detail and understanding of the interaction of traffic and transit operations and potential traffic impacts along this segment during the AM peak period. The VISSIM tool provides a base model for further refinement in the future to model specific design approaches. In addition to the AM VISSIM analysis, a SYNCHRO analysis was performed to understand the AM and PM peak conditions.

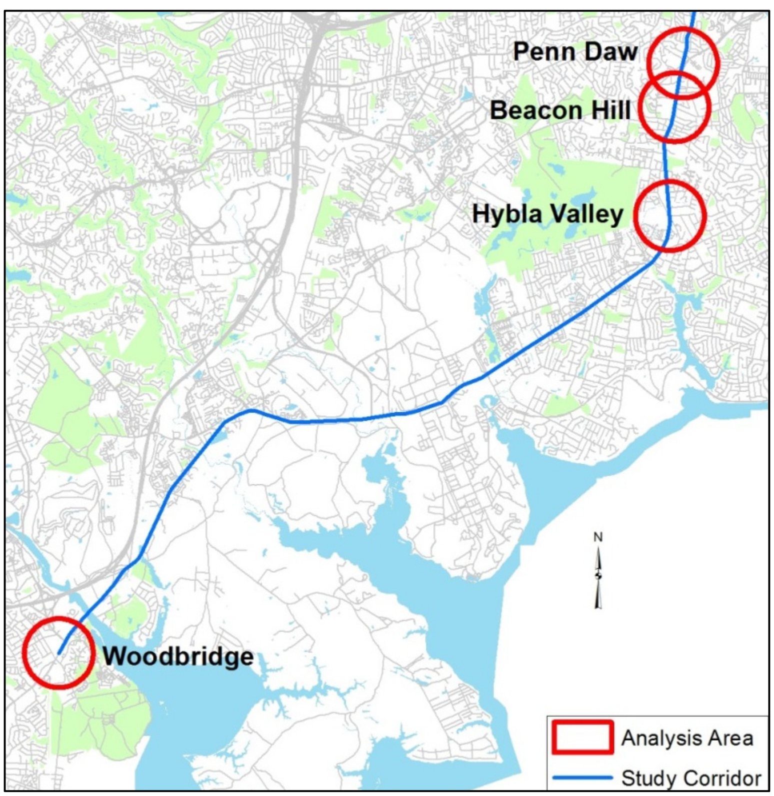
The results of this analysis suggest that operation of a median-running transitway along Route 1 would not significantly degrade traffic delays at intersections. Increases in traffic delays due to projected growth between 2015 and 2035 range from 0 to 35 percent, depending upon the intersection. Additional increases in traffic delays related specifically to transit operations range from 20 to 25 percent.

1.4 Scenarios 2 and 3 Traffic Projections

This analysis considered traffic impacts associated with the levels of new development assumed under land use Scenarios 2 and 3. The new development is assumed to be focused generally within ½-mile of the proposed transit stations. This report examines four example station areas (see **Figure 2**). The evaluation quantifies the projected levels of transportation demand in the proposed station areas, assumes apportionment of that demand according to different modes of travel, and then distributes trips to the roadway and transit network.

The analysis for Scenarios 2 and 3 combines two analytical approaches to understand future traffic conditions:

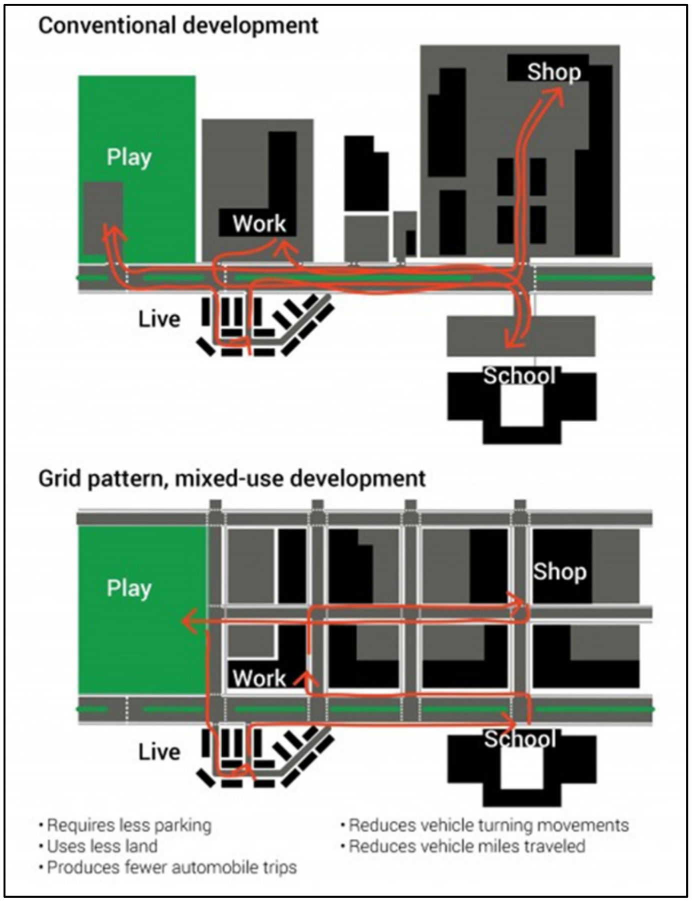
Figure 2: Scenarios 2 and 3 Analysis Areas



First, Scenarios 2 and 3 growth levels are applied within the MWCOG regional model. The model accounts for transit and walk trips, then distributes automobile trips within the network of roadways. This resulting traffic volumes provide a starting point for the analysis, including traffic levels along Route 1.

Second, typical "trip generation" rates are applied to Scenarios 2 and 3 growth levels within a spreadsheet model. Person trips are divided among the range of travel modes, then automobile trips are distributed to the network of existing roadways using factors derived from the MWCOG model. Output includes projected traffic volumes and intersection performance.

Figure 3: Travel Improvements from an Expanded Network of Local Streets



Findings of Scenarios 2 and 3 analyses point to the need for a robust program of local and corridor-wide transportation investment to support the modeled levels of development. Investment in an expanded network of local streets, such as the one demonstrated in the bottom half of **Figure 3**, would be necessary to support the expected traffic levels associated with Scenarios 2 and 3 growth levels . Otherwise, with these growth scenarios, Route 1 traffic volumes would increase and intersection performance would worsen to unacceptable levels.

1.5 General Findings and Recommendations

The analysis described in this report suggests that regardless of the growth scenario, there are deficiencies in the transportation network that should be addressed as the corridor prepares for anticipated growth and invests further in multimodal transportation.

Scenario 1 operations analysis shows that median-running dedicated transit lanes can be accommodated without unduly impacting overall traffic operations. However, delays for left turning vehicles would increase at several locations along Route 1 as a result of median-running transit operation. Likewise, increasing pedestrian volumes over time has the potential to further increase traffic delays along Route 1. A short-term recommendation is to study shorter signal cycle lengths, which will have the effect of reducing queue lengths and delays for turning vehicles.

Traffic analysis for growth Scenarios 2 and 3 indicates that increased traffic volumes would not be adequately accommodated without additional street and intersection capacity along the corridor: a single two- to three-lane facility for Scenario 2, and the equivalent of up to three four-lane facilities for Scenario 3.

Scenario 2 growth level represent a 15 to 25 percent increase in development over the 2035 MWCOG forecast. The growth levels associated with Scenario 3 are more significant, with 100 to 200 percent growth beyond the MWCOG 2035 forecast. These theoretical development densities are representative of existing conditions at such places as Rosslyn or Ballston, and have been evaluated in the Route 1 Alternatives Analysis in connection with a potential future Metrorail investment. Case studies of areas in the region that have experienced similar development densities surrounding Metrorail investments are summarized later.

As anticipated population and employment growth occur in the near future, 2035 population and employment estimates will need to be revised to more accurately evaluate projected traffic conditions. Further study is also recommended to assess the likely development absorption rates, which will provide a better sense of the pace and locations for street network improvements.

Analysis of all scenarios, particularly Scenarios 2 and 3, suggest that traffic operations and growing traffic levels would be best accommodated through a set of targeted, parallel improvements, including the planned roadway widening of Route 1, investment in premium transit service, and refinements to the street networks along the corridor. The refinements to the street network would make additional connections among existing local streets and plan for selected new continuous parallel roadways.

Case Studies

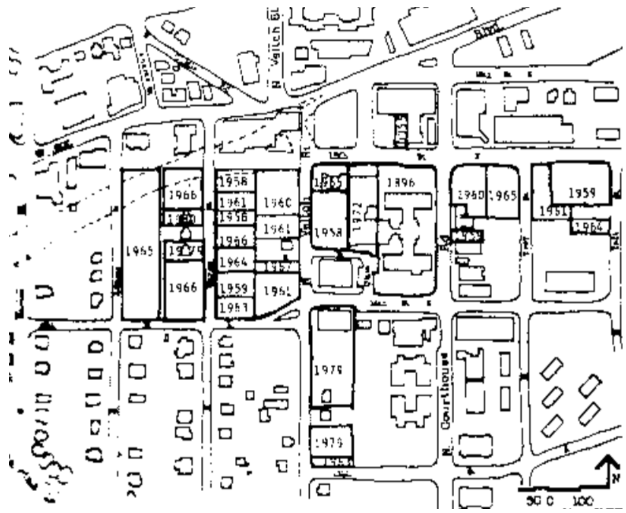
At higher population and employment densities, like those found in Scenarios 2 and 3, an enhanced grid can improve overall accessibility and increase transit and pedestrian mode shares. To evaluate the impacts of growth and the needs for additional roadway infrastructure, two case study areas from other parts of metropolitan Washington DC were reviewed, the Ballston-Rosslyn Corridor and White Flint on Rockville Pike. Both case study locations have developed additional roadways to enhance their grid networks and become more friendly to pedestrians and transit users.

Ballston-Rosslyn Corridor:

Metrorail expanded to the corridor in 1979 and it has since had massive population and employment growth. Since 1990, population within a quarter-mile of these Metrorail stations has increased 107 percent. Between 1970 and 2009, 22 million square feet of office space has been added to the corridor.

In addition to pedestrian-friendly design elements, an enhanced grid was implemented in the Courthouse area following the 1981 sector plan. The addition of Clarendon Boulevard provided additional roadway capacity for employment growth at the Government Center and new office developments, while also providing new pedestrian connections to residential development to the east.

Map of the new Clarendon Blvd and the Government Center (1981)

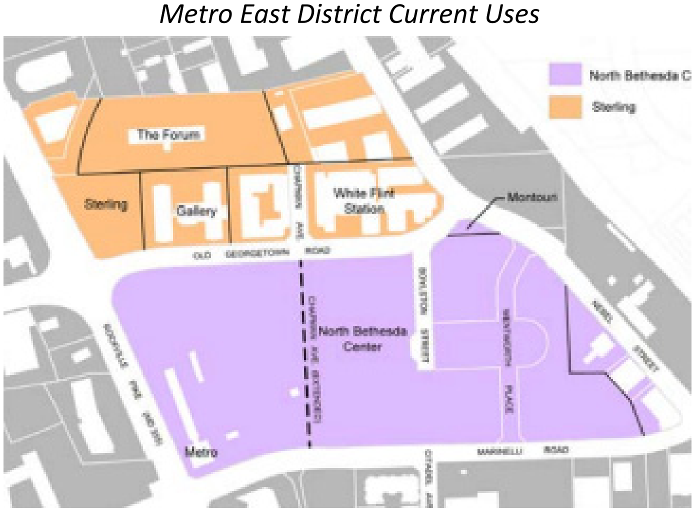


White Flint-Rockville Pike:

Since the opening of the White Flint Metrorail station in 1984, the nearby areas along Rockville Pike have grown from low-density residential uses to a mixed-use district. The current sector plan at White Flint proposes even further growth, with more than triple the existing housing units and doubling of commercial floor area ratio (FAR).

The White Flint Sector Plan (2010) accommodates travel to new commercial uses by developing a street grid that provides more options for pedestrians. For example, in the Metro East district of White Flint, the current commercial FAR limit is 2.0 and the proposed FAR limit for many of the parcels in 3.0 or 4.0. Rather than widening the lanes of existing streets, new parallel streets are proposed for the grid, creating a more inviting space for pedestrians.

Metro East District Current Uses



Metro East District Proposed Density and Street Grid

2.0 Scenario 1 Traffic and Transit Operations

This work involves expanding the VISSIM network previously prepared for the seven intersections in the Hybla Valley segment to include 13 additional intersections between Hybla Valley and Huntington/North Gateway (see **Figure 4**). By expanding the VISSIM network, more robust findings related to impacts of traffic and transit operations along this segment can be evaluated and understood. This tool could also be expanded further in the future to model potential street grid enhancements in the proposed station areas.

Key assumptions:

- Traffic growth rates considered both historical trends and the MWCOG forecast growth rate, which ranged from -0.02% to 2.31%. This methodology is described in further detail in the *Route 1 Multimodal Alternatives Analysis Traffic and Transportation Report* (June 2014). The MWCOG growth rates for the relevant segments are provided for reference in **Appendix A**.
- The typical Virginia Department of Transportation (VDOT) and Fairfax County standard for mainline lanes is level of service (LOS) D. For this analysis, LOS E is assumed to be acceptable for Route 1 travel lanes in 2035.
- Traffic signal priority (TSP) is applied only for the peak direction buses (e.g., for northbound buses in the morning peak hour) and only at intersections with available capacity in order to minimize the impact of TSP on non-transit vehicles.
- The Build analysis presented in this report is for Alternative 2, which includes median-running BRT through the corridor.
- VISSIM calibration was performed using field-measured travel times. **Appendix B** provides detailed information on the calibration process.
- Due to scheduling constraints, only morning (AM) peak hour was modeled and analyzed in VISSIM. A separate analysis was conducted for the selected intersections using SYNCHRO for both AM and PM peak hours (see **Appendix C**).

Figure 4 shows the intersections that were studied in the earlier phase of the work and the new intersections that are analyzed in VISSIM. The North Gateway area – the intersections of Route 1 at Huntington Avenue and Fort Hunt Road – is not located directly on the study alignment used for comparing the alternatives at this stage; therefore, these intersections are not included in the current analysis. That area, also being analyzed as part of the Huntington Area Transportation Study (Fairfax County, 2015), would likely be included in a subsequent phase of work.

Figure 5 shows No Build lane configurations at study intersections. The No Build lane configurations include road widening projects on Route 1 from the MWCOG Financially Constrained Long Range Plan (CLRP).

Figure 4: Intersections Added to Scenario 1 VISSIM Analysis

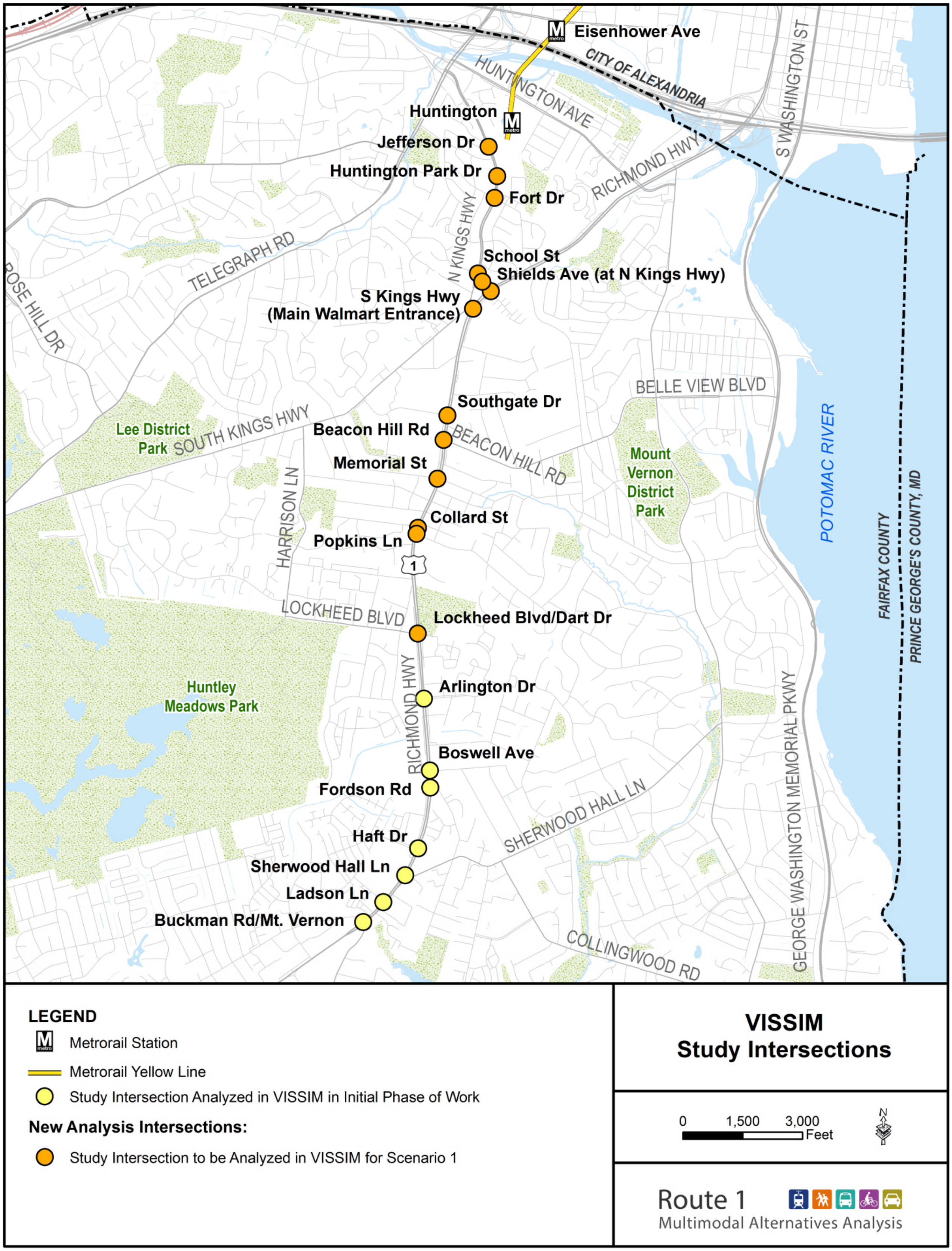
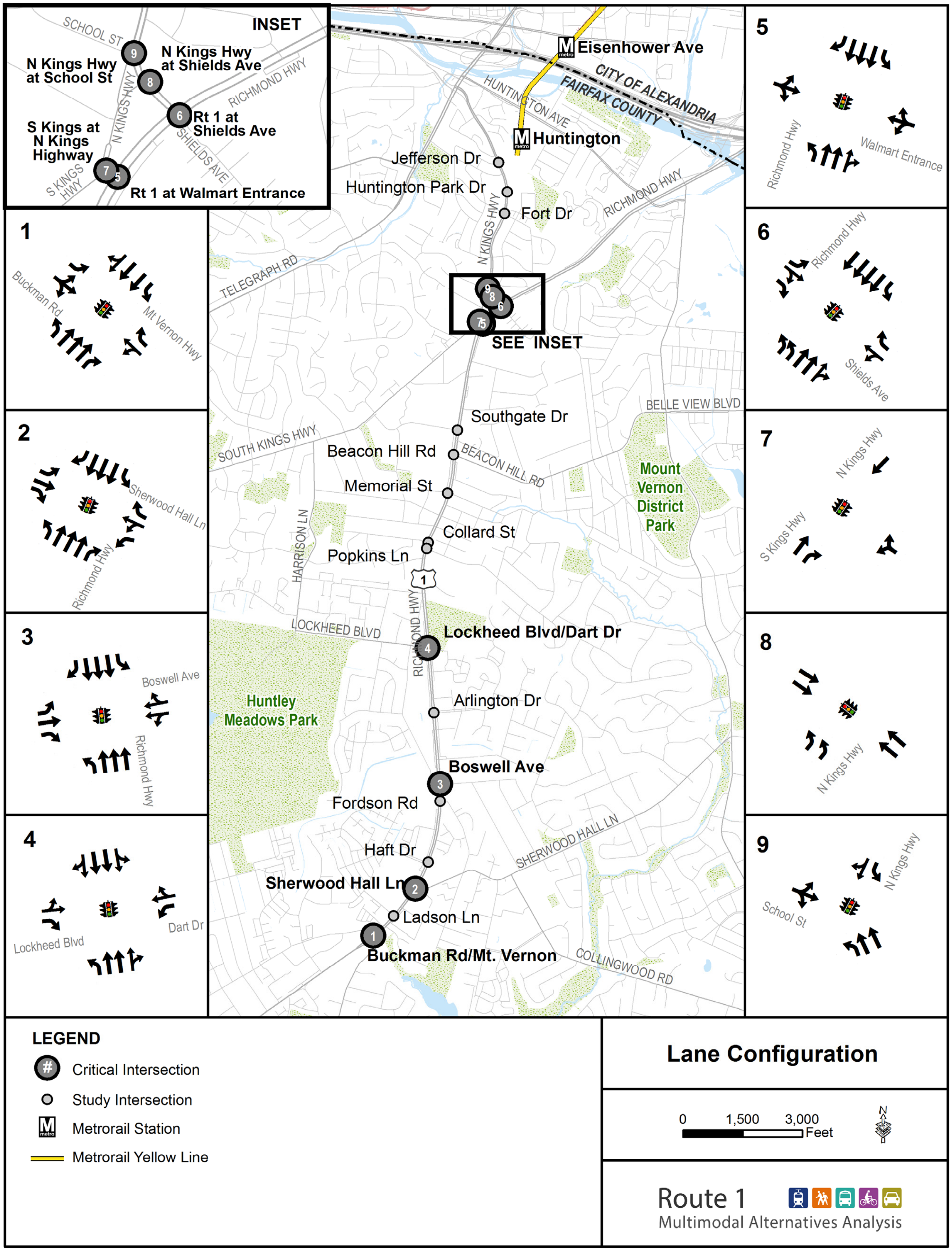


Figure 5: No Build Lane Configurations at Critical Study Intersections



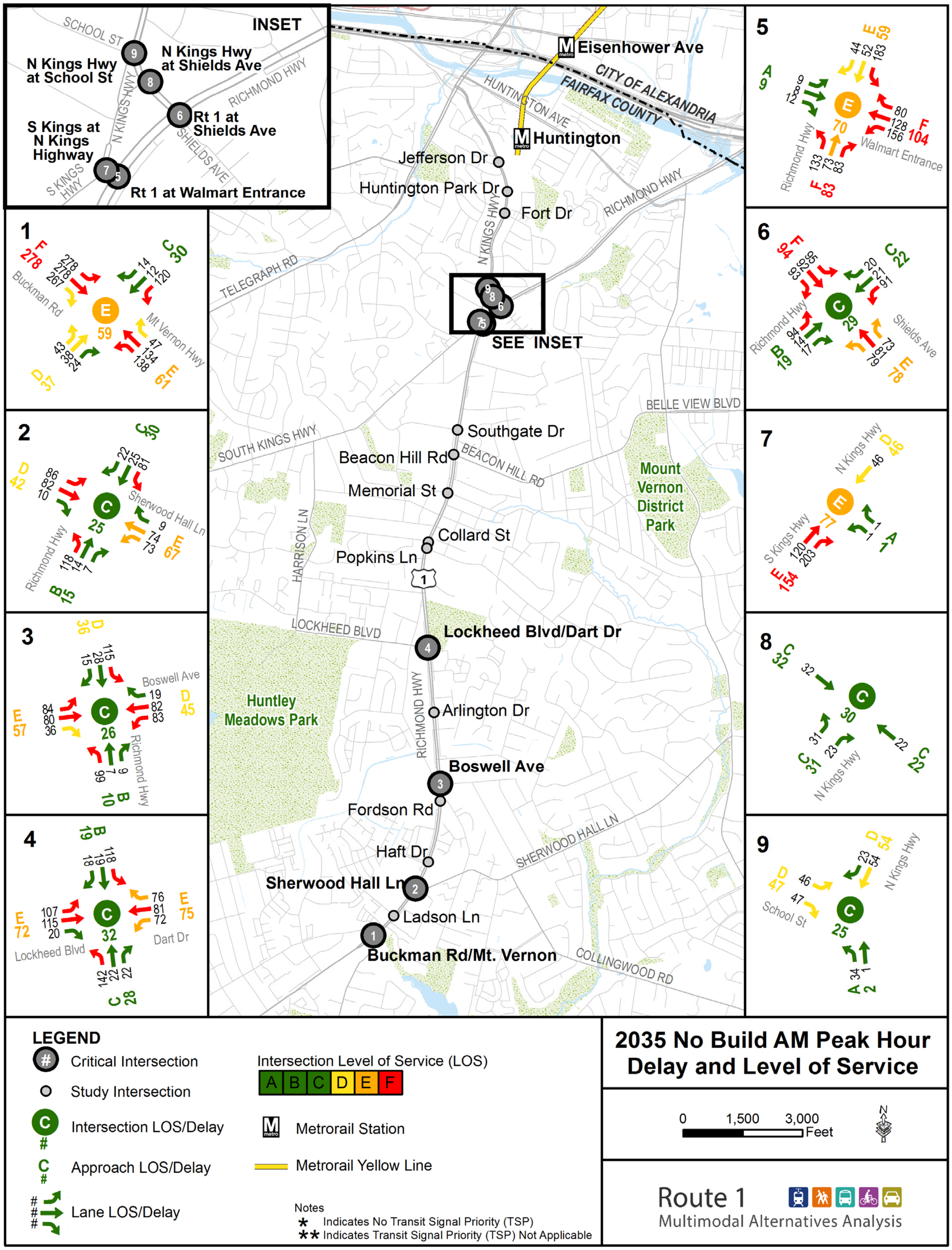
2.1 Findings for key intersections

Figure 6 shows 2035 No Build AM peak hour delay and LOS from VISSIM at critical intersections, defined as those with estimated 2035 intersection delay greater than 25 seconds, identified in **Figure 5**. (The exception is the North Kings Highway/School Street intersection, which is included in the analysis to capture the queue interactions between this intersection and North Kings Highway/ Shields Avenue.)

2.1.1 2035 AM No Build Results

In the 2035 projected conditions, none of the intersections operates at LOS F in the morning peak hour. High levels of congestion and delay, with intersection delays higher than 70 seconds, occur at the Route 1/Walmart Entrance and South Kings Highway/North Kings Highway intersections. The intersection of Route 1 at Mount Vernon Highway/Buckman Road also operates at LOS E. However, this intersection has lower delay as compared to the other two intersections, particularly for the through-movements. Although the through-movement on Route 1 experiences low delays at most intersections, the mainline left turns operate at LOS F. This can be attributed to the long red durations resulting from 180-second cycle length.

Figure 6: VISSIM No Build Delay and Level of Service at Critical Intersections



2.1.2 2035 AM Build Results

Figure 7 shows 2035 Build (median running BRT) VISSIM delay and LOS results for the morning peak hour at critical intersections. The Build Scenario includes median running BRT and TSP for BRT vehicles. TSP is applied only for the peak direction buses (e.g., for northbound buses in the morning peak hour) and only at intersections with available capacity in order to minimize the impact of TSP on non-transit vehicles. The intersections where TSP was not considered due to capacity constraints are denoted by an asterisk (*) in **Figure 7**. **Table 1** provides a summary of the VISSIM delay and LOS results for both the 2035 No Build and Build morning peak hour at critical intersections.

Intersection Operations, General Results

The operation of median running BRT has minor impacts on intersection operations. The findings from the VISSIM analysis can be summarized as follows:

- Because the phasing for the mainline left turn movements are changed from protected plus permissive to protected only operation with median running BRT, left turn delay for the mainline movement is increased. For example, northbound left turn (NBL) delay at Route 1 and Buckman Road/Mt. Vernon Highway intersection (Intersection #1) is increased from 43 seconds to 100 seconds due to the elimination of the permissive phase.

- Due to higher transit ridership, intersections with a BRT station have higher pedestrian volumes crossing Route 1 in the Build Scenario than in the No Build Scenario. With the increase in the number of pedestrian calls, cross-streets typically require longer green times to allow pedestrians to clear the intersection safely. Green time is taken from the mainline movements, resulting in higher delay. This higher delay can be illustrated by looking at delay results at Lockheed Boulevard/Dart Drive intersection (Intersection #4). Delay for the northbound movement is increased from 22 seconds to 44 seconds in the Build Scenario. However, the eastbound and the westbound (cross-street) approach delays are reduced due to changes in signal timing resulting from the increase in pedestrian calls.

- Pedestrian calls were modeled as requests to cross via push button; however, pedestrian volumes were high enough to have a pedestrian call every cycle, resulting in a pattern similar to one with an automatic pedestrian cycle.

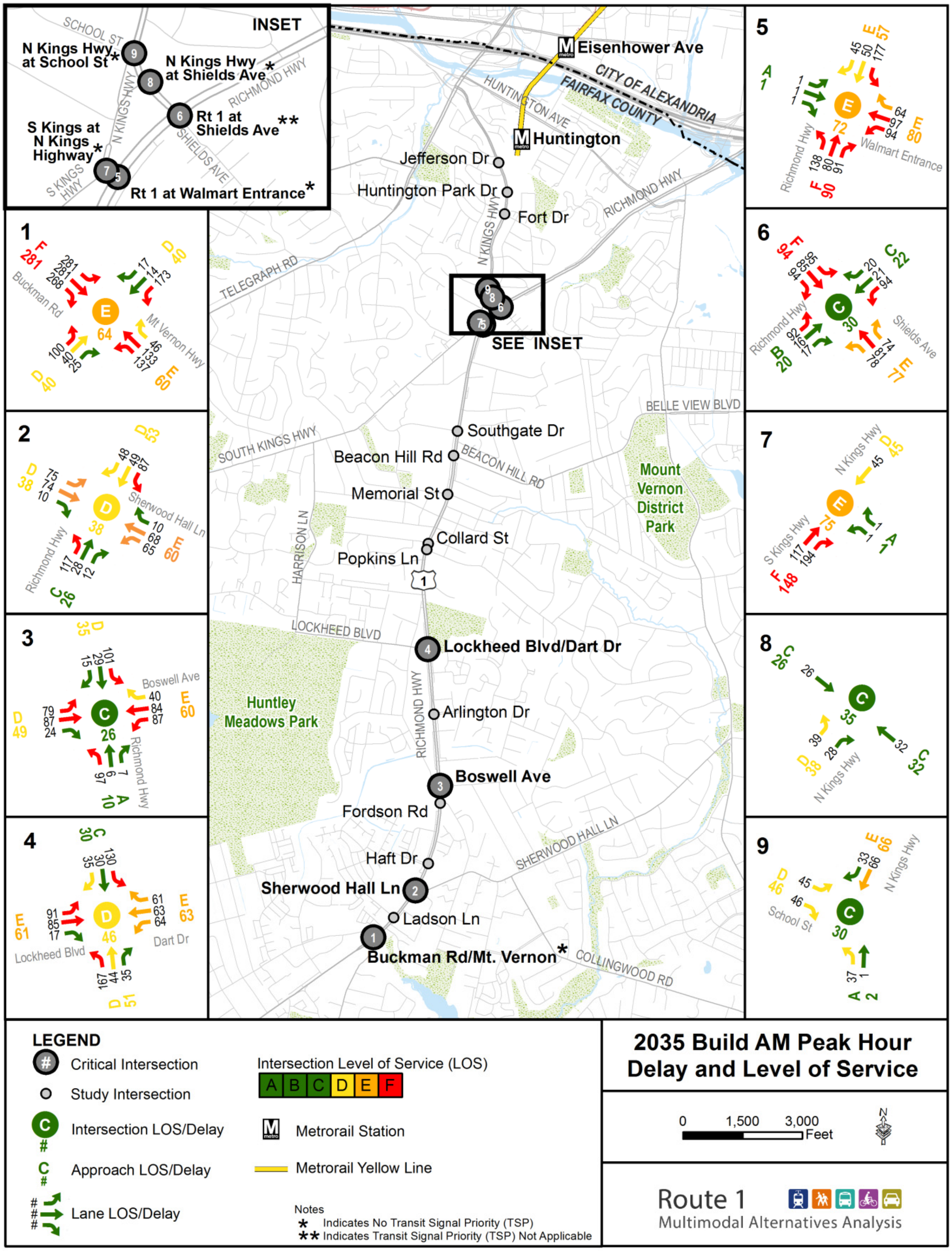
- The application of transit signal priority (TSP) increases delay for the conflicting movements. However, the impact of TSP is relatively small since limited priority was applied.

Note that the VISSIM analysis was limited to AM peak conditions. To understand future PM conditions of intersections in the northern end of the corridor, a SYNCHRO analysis was performed. The SYNCHRO results show that except for the Richmond Highway and Walmart Entrance intersection (#1), all other intersections operate with LOS D or better in 2035 during the morning and evening peak hours. Similar to the VISSIM findings, movements that are unable to take advantage of signal coordination, including the turning traffic from the mainline movement and the cross street traffic, experience relatively higher delays and degraded LOS. Detailed SYNCHRO findings for the AM and PM peak hours are provided in **Appendix C**.

Table 1: Summary of Estimated Delay and LOS in Intersections in VISSIM (2035)

#	Intersection	No Build		Build	
		LOS	Delay (s)	LOS	Delay (s)
1	Buckman Road/Mount Vernon Highway	E	59	E	64
2	Sherwood Hall Lane	C	25	D	38
3	Boswell Avenue	C	26	C	26
4	Lockheed Boulevard/Dart Drive	C	32	D	46
5	Walmart Entrance	E	70	E	72
6	Shields Avenue	C	29	C	30
7	South Kings Highway at North Kings Highway	E	77	E	75
8	North Kings Highway at Shields Avenue	C	30	C	35
9	North Kings Highway at School Street	C	25	C	30

Figure 7: VISSIM Build Delay and Level of Service at Critical Intersections



2.2 Corridor and Network Level Transit Findings

Median-running BRT affects traffic operations at the corridor and network levels. **Figure 8** shows the extents of the corridor study in this analysis. **Figures 9** and **10** show estimated peak direction auto and transit corridor travel times during the morning peak hour under the No Build and Build scenarios for 2035. The No Build transit travel time is calculated based on the current operation of REX Service, adjusted to account for the proposed BRT routing.

Peak direction auto travel time increases by 20 to 25 percent with the median running BRT alternative, with the average auto travel time in the corridor increasing from 12.1 minutes in the No Build scenario to 14.6 minutes in the Build scenario and average auto network speed decreasing from 18.6 mph in the No Build scenario to 16.3 mph in the Build scenario. Auto travel time increases can primarily be attributed to the increase in the number of pedestrian calls, reducing the green time for Route 1 through-movement. Total auto network delay also increases by 25 percent due to the elimination of permissive left turns and application of TSP. However, the median running BRT alternative reduces transit travel time by more than 3 minutes, nearly a 20 percent reduction. Given the estimated 9,400 estimated daily passengers in 2035 for this segment, this reduction in transit travel time would save 500 passenger hours on an average weekday. Modeled BRT travel time is shorter than the auto travel time (13.6 vs. 14.6 minutes), indicating the efficiency of median running BRT service.

Figure 8: Extents of Auto and Transit Travel Time Analysis

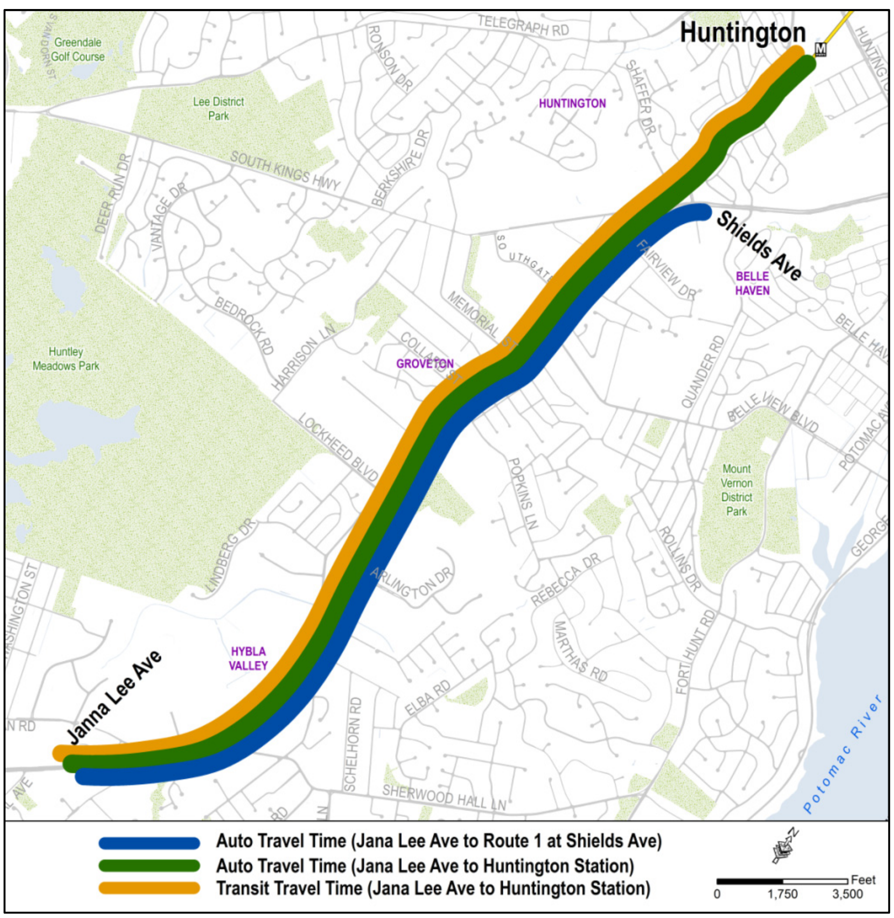


Figure 9: 2035 Estimated Auto and Transit Travel Times

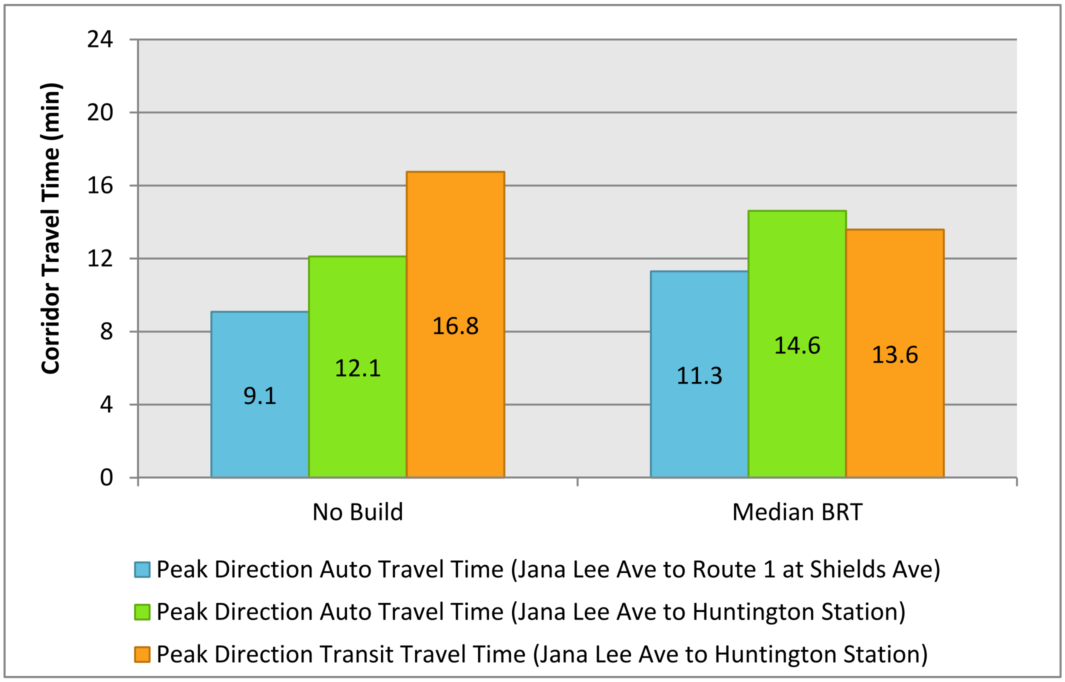
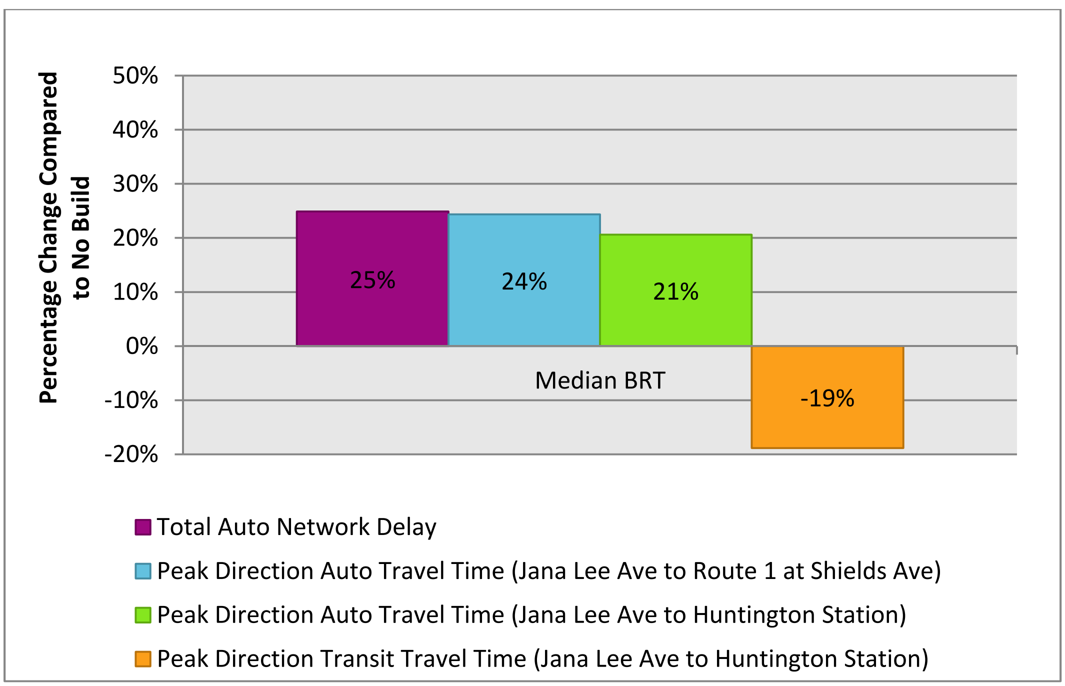


Figure 10: No Build versus Build Travel Times (2035)



3.0 Scenarios 2 and 3 Traffic Projections

This analysis projects traffic impacts of station area development levels assumed under land use Scenarios 2 and 3. The purpose of this effort is to quantify in general terms the levels of transportation demand in the areas around selected proposed stations and test the resulting performance of the transportation network. This analysis focuses on the proposed Penn Daw, Beacon Hill, Hybla Valley, and Woodbridge station areas (see **Figure 11**). More detailed maps of these areas is shown in **Figures 12** through **15**. These areas were selected as representative "worst case" traffic impacts to help define the need for roadway and intersection capacity.

Figure 11: Scenarios 2 and 3 Analysis Areas

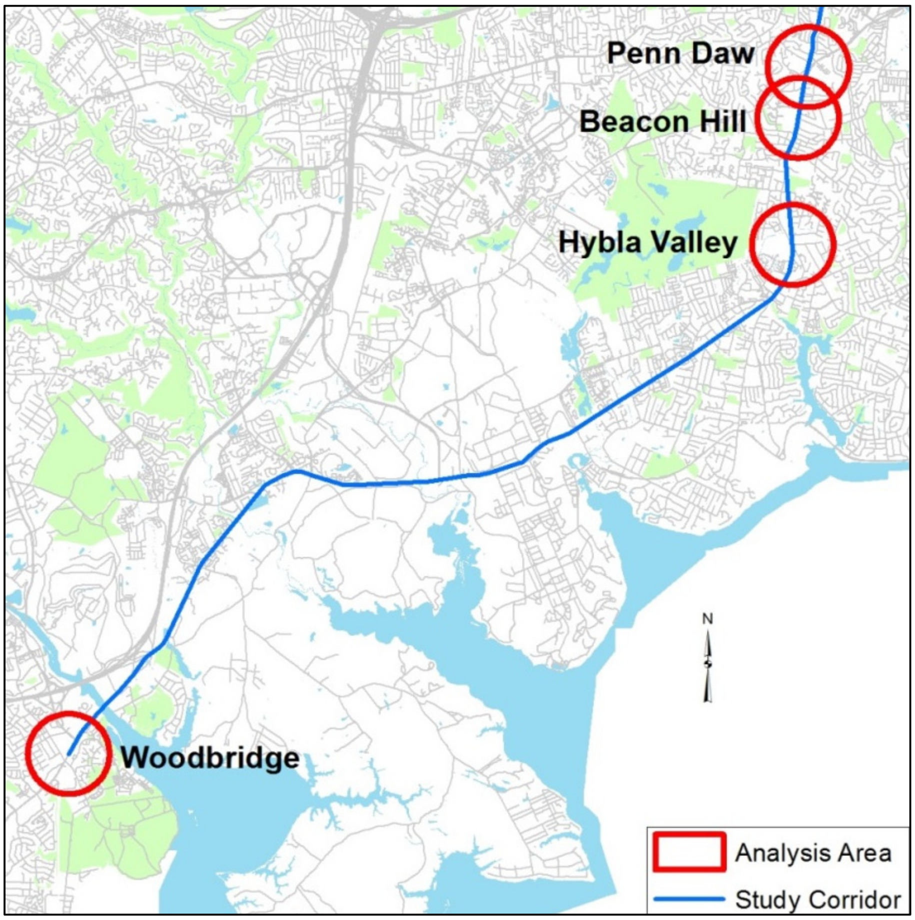


Table 2 shows the intersections analyzed as part of this task. These intersections were chosen for their proximity to potential transit stations, and thus the likelihood that they would need to accommodate increased traffic with the alternative growth scenarios.

In general, the analysis assumes the future street grid resembles the existing street grid; growth in traffic volumes would be distributed across today's street network. In reality, future conditions associated with growth scenarios would likely distribute traffic across a more robust grid of local street connections.

Table 2: Intersections for Scenarios 2 and 3 Traffic Assessment

Station Area	Intersection for Land Use Scenarios 2 & 3 Traffic Assessment
Penn Daw (see Figure 11)	Route 1 at South Kings (Walmart Entrance)
	Shields Avenue
Beacon Hill (see Figure 12)	Beacon Hill Road
	Memorial Street
Hybla Valley (see Figure 13)	Boswell Avenue
	Sherwood Hall Lane
	Buckman Road
North Woodbridge (see Figure 14)	Annapolis Way
	Gordon Blvd

Figure 12: Intersections in Penn Daw for Scenarios 2 and 3 Traffic Assessment

Figure 13: Intersections in Beacon Hill for Scenarios 2 and 3 Traffic Assessment

Figure 14: Intersections in Hybla Valley for Scenarios 2 and 3 Traffic Assessment

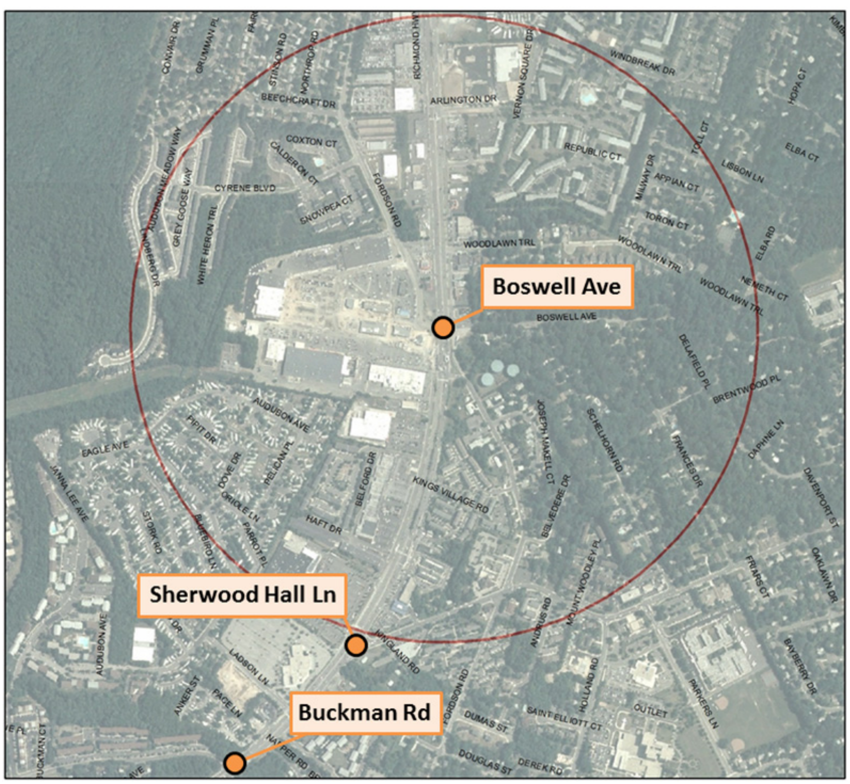


Figure 15: Intersections in North Woodbridge for Scenarios 2 and 3 Traffic Assessment

3.1 Applicability of Findings

This analysis presents projected traffic performance in terms of roadway capacity and intersection LOS because these are typical ways of understanding traffic levels. However, given the significant growth associated with each potential land use scenario and the complexity of travel patterns in a congested transportation network, the findings must be understood not as specific tests of intersections or of corridor segments, but rather as a general assessment of the Route 1 corridor capacity to accommodate additional travel.

3.1.1 Key General Assumptions

The methodologies and findings are described in detail below. Several general assumptions apply to both approaches:

- The traffic assessment assumes Multimodal Alternative 2 (i.e., median running BRT) for land use Scenario 2, and Multimodal Alternative 4 (i.e., hybrid BRT and Metrorail) for land use Scenario 3.
- The mix of residential and commercial/office land uses for each growth scenario is consistent with the Fairfax County Comprehensive Plan (2013) and Prince William County Comprehensive Plan (2008) for the study station areas in question.

- "No Build" traffic volumes are based on recent traffic counts, observed traffic growth rates, and the calibrated MWCOG model.

3.1.2 Distribution of Trips to the Street Network

The key questions in the assessment are: a) How to translate the land use scenario growth levels into trips using a range of travel modes? and b) How to apply vehicular trips to the network of streets?

To provide perspectives on these questions, the analysis was conducted in two interrelated ways:

1) Traffic assignment to the street network using outputs of the MWCOG model; and

2) Application of Institute of Transportation Engineers (ITE) Trip Generation rates and Fairfax and Prince William County mode share assumptions related to transit-oriented development patterns.

3.2 MWCOG Model Process and Outputs

The MWCOG regional model to generate traffic growth rates and transit ridership forecasts was applied in the *Route 1 Multimodal Alternatives Analysis Traffic and Transportation Report* (June 2014). In the analysis found in this report, the MWCOG model is applied to test impacts on the transportation system—and specifically the street network—associated with Land Use Scenarios 2 and 3.

The analysis included the following steps:

1. A detailed review of the areas slated for the large increases in land use intensity in Scenarios 2 and 3: As inputs to the ridership forecasting effort, the study team applied growth associated with Land Use Scenarios 2 and 3 along the corridor and tabulated growth according to the current TAZ structure.

2. Running the MWCOG model to generate person-trips and levels of use by transportation mode: This step reflects the existing and proposed transit services associated with the Build alternatives.

3. Assigning automobile trips to the MWCOG highway network for each of the growth scenarios: The result of this step includes estimated traffic volumes and assumed annual growth rates along each modeled link or roadway segment.

3.2.1 Transit and Pedestrian Mode Share

The purpose of the MWCOG approach is to make an initial estimate of future traffic volumes with concentrated new growth along the corridor. The MWCOG model was run two different ways:

First, with pedestrian and transit mode shares typical for areas within the Washington DC metropolitan area. This provided an "upper limit" on traffic volumes of "unadjusted" assignment of automobile trips to the roadway network.

Second, transformative land use changes are reflected in adjustments to the model inputs:

- Larger internal capture rates by non-motorized modes. Moving to a stronger mixed use development pattern shifts some portion of travel from motorized to non-motorized, as people can access more activity centers (attractions) without an automobile.

- Mode shift driven in part by availability and cost of parking. With higher levels of development density, there will be more structured parking and paid parking which tend to discourage vehicle trips.

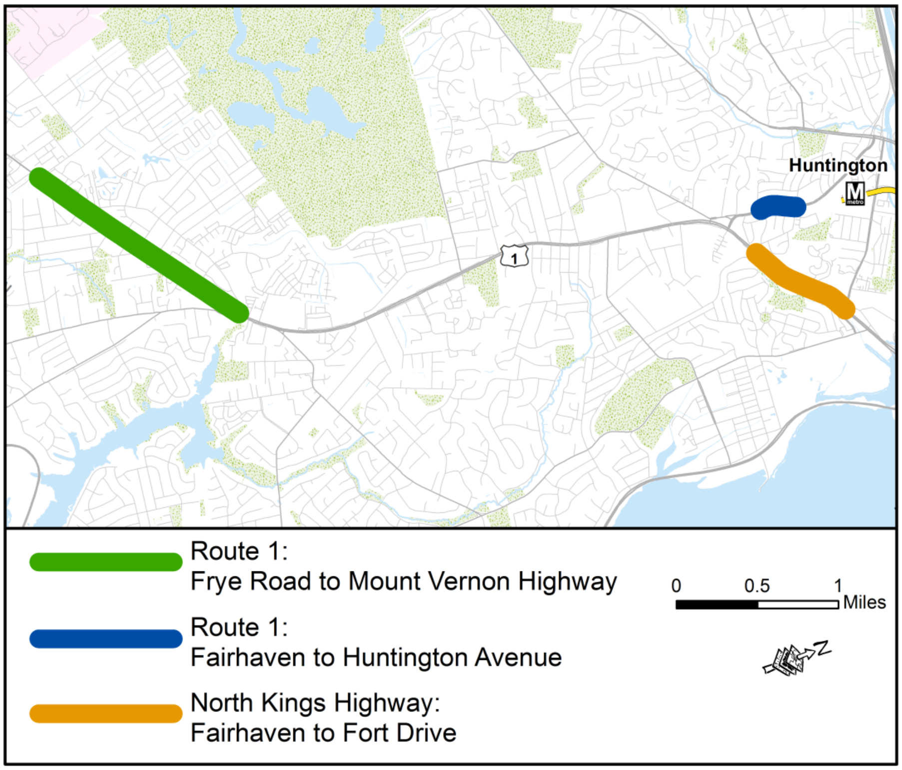
The MWCOG automobile trip table is adjusted based on the "factored" trip generation rates, then the refined estimates of automobile trips are assigned to the network. **Table 3** shows projected daily traffic volumes at selected locations (see **Figure 16**) and compares the unadjusted roadway network assignment to the factored network assignment. Detailed information regarding the projected daily and peak period traffic volumes at a range of locations for each scenario is provided in **Appendix D**.

Table 3: Comparison of MWCOG Network Volumes

	A-Route 1: Frye to Mt Vernon Highway		B-North Kings Highway: Fairhaven to Fort Drive		C-Route 1: Fairhaven to Huntington Av	
	Southbound	Northbound	Southbound	Northbound	Southbound	Northbound
2010 Average Daily Traffic (ADT)	16,275	16,893	18,095	16,535	16,945	21,170
Scenario 1						
Scen. 1 ADT	24,300	24,530	15,880	15,095	22,785	24,765
Avg. Annual Growth 2010-2035	1.62%	1.50%	-0.52%	-0.36%	1.19%	0.63%
Scenario 2						
Scen. 2 ADT	25,660	26,255	17,565	16,390	19,575	22,505
Avg. Annual Growth 2010-2035	1.84%	1.78%	-0.12%	-0.04%	0.58%	0.24%
Scen. 2 ADT Factored	25,270	26,100	17,576	16,247	19,096	22,288
Avg. Annual Growth 2010-2035	1.78%	1.76%	-0.12%	-0.07%	0.48%	0.21%
Scenario 3						
Scen. 3 ADT	27,200	28,715	19,250	18,515	25,269	26,385
Avg. Annual Growth 2010-2035	2.08%	2.14%	0.25%	0.45%	1.61%	0.88%
Scen. 3 ADT Factored	26,130	27,885	19,010	18,110	24,325	25,575
Avg. Annual Growth 2010-2035	1.91%	2.03%	0.20%	0.36%	1.46%	0.76%

Note: Factored ADT assumes greater pedestrian and transit mode shares.

Figure 16: Selected Locations for Comparison of MWCOG Network Volumes



3.2.2 Findings

The MWCOG approach to assessing the traffic growth associated with Scenarios 2 and 3 development levels shows that:

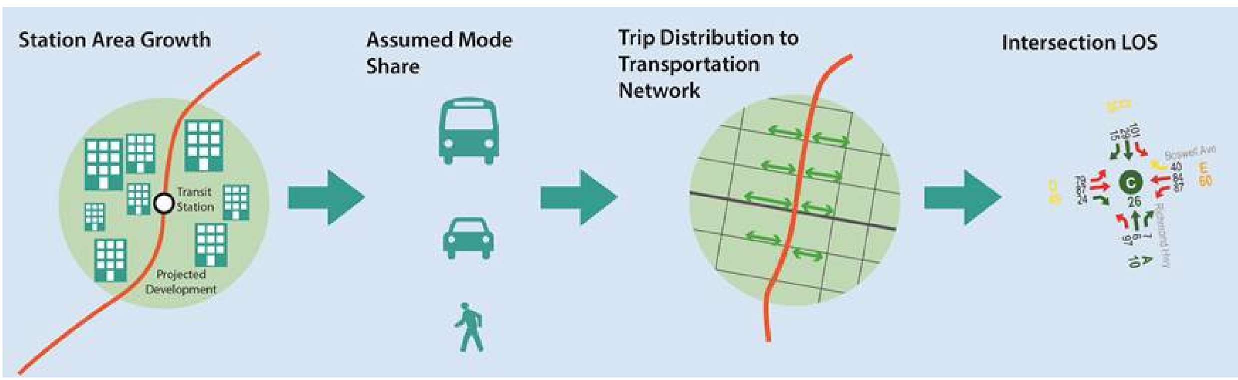
- Traffic levels for Scenario 2 would grow by 10 to 20 percent over Scenario 1.
- Traffic levels for Scenario 3 would grow by 20 to 30 percent over Scenario 1.

Factored model inputs have a modest effect on traffic growth projections; this is likely due to the already congested modeled roadway network. Overall, these findings establish a range of the potential growth in traffic volumes that is constrained by the capacity of the planned highway network. The trip generation approach, detailed below, provides a way of estimating "unconstrained" traffic volumes associated with Route 1 corridor growth scenarios.

3.3 Station Area Trip Generation Process and Outputs

The trip generation approach uses background growth levels along Route 1 as supplied by the MWCOG forecast, then adds finer detail related to trip making within the study station areas. As compared to the findings based on the MWCOG model alone, trip generation provides an unconstrained estimate of the capacity needed to accommodate the Scenario projected growth levels. **Figure 17** summarizes the steps involved in estimating trips generated by changes in land use, population, and employment. The approach uses the ITE Trip Generation methodology in conjunction with assumed shares of transit and walk/bike trips based on Fairfax County experience and transportation demand management goals.

Figure 17: Trip Generation Approach Methodology



3.3.1 Transit and Pedestrian Mode Share

Fairfax County staff provided guidance on the range of reasonable levels of non-automobile travel for transit-oriented development areas. The main source was the *Fairfax County Comprehensive Plan*, 2013 Edition – Tysons Corner Urban Center, Amended Through 4-9-2014.

Other sources for non-auto mode shares included:

- *WMATA Development Related Ridership Survey* (2005)
- *Arlington County Residential Building Transportation Performance Monitoring Study* (2013)

In general, each of these sources suggest a combined share of transit and walk/other trips in TOD areas of 15 to 40 percent. A description of each of the studies reviewed is provided in **Appendix E**.

Table 4 presents the current population, dwelling units, employees, and office space for the four station areas and demographic projections for all three scenarios. Population and employment estimates were based on MWCOG Land Use Round 8.2. The calculation of dwelling units assumes 2.14 persons per dwelling unit. The calculation of office square footage assumes 300 square feet per employee.

Table 4: Demographics by Station and Land Use Scenario

Station Name	Scenario	Population	Dwelling Units	Employees	Office (sf)
Penn Daw	Current	4,661	2,178	2,272	681,600
	Scenario 1	7,820	3,654	4,393	1,317,900
	Scenario 2	10,284	4,806	4,983	1,494,900
	Scenario 3*	10,284	4,806	4,983	1,494,900
Beacon	Current	3,736	1,746	2,809	842,700
	Scenario 1	9,098	4,251	4,570	1,371,000
	Scenario 2	9,300	4,346	7,787	2,336,100
	Scenario 3	19,164	8,955	16,046	4,813,800
Hybla	Current	5,010	2,341	2,387	716,100
	Scenario 1	5,948	2,779	3,549	1,064,700
	Scenario 2	6,414	2,997	5,456	1,636,800
	Scenario 3	19,025	8,890	16,185	4,855,500
Woodbridge	Current	2,793	1,305	1,632	489,600
	Scenario 1	8,363	3,908	3,283	984,900
	Scenario 2	9,011	4,211	5,547	1,664,100
	Scenario 3	11,520	5,383	7,091	2,127,300

*Penn Daw area does not include a proposed Metrorail station in Scenario 3, however considered in the analysis at Scenario 2 development levels.

The assumed mode shares for each scenario are provided in **Table 5** below. Relatively lower transit and walk/bike shares are used for Woodbridge Station since it would be served by BRT, while the other stations would be served by Metrorail in land use Scenario 3. A similar methodology is applied in estimating the generated trips associated with land use Scenario 2. However, to account for lower land use intensity and BRT service (all stations will be served by BRT in land use Scenario 2), a lower non-auto mode share is assumed. The analysis for Scenarios 2 and 3 was conducted for a likely mode share and an "enhanced mode share" to establish a potential range of impacts

Table 5: Mode Share Assumptions for Scenarios 1,2,3

	Beacon and Hybla Valley Stations (served by Metro)			Woodbridge Station (served by BRT)		
	Transit	Walk & Other	Auto	Transit	Walk & Other	Auto
Scenario 1	10%	5%	85%	10%	5%	85%
Scenario 2	15%	5%	80%	15%	5%	80%
Scenario 3	29%	11%	60%	15%	5%	80%

Table 6 shows the additional dwelling units and office space for Scenario 2 (compared to Scenario 1) as well as the daily and peak hour auto trips that would be generated.

Table 6: Additional Vehicular Trips Generated for Land Use Scenario 2

Area	Land Use (ITE Category)	Units (Change Compared to Scenario 1)	Total Generated Trips			Total Auto Trips	
			Daily	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
PENN DAW STATION	High Rise Apartment 222	1,151 DU	4,836	345	403	276	322
	General Office 710	177 ksf	1,952	276	264	221	211
	Total		***6,788***	***621***	***667***	***497***	***533***
BEACON STATION	High Rise Apartment 222	94 DU	396	28	33	23	26
	General Office 710	965 ksf	10,645	1,506	1,438	1,204	1,150
	Total		***11,042***	***1,534***	***1,471***	***1,227***	***1,177***
HYBLA STATION	High Rise Apartment 222	218 DU	915	65	76	52	61
	General Office 710	572 ksf	6,310	892	852	714	682
	Total		***7,225***	***958***	***929***	***766***	***743***
WOODBRIDGE STATION	High Rise Apartment 222	303 DU	1,272	91	106	73	85
	General Office 710	679 ksf	7,492	1,060	1,012	848	810
	Total		***8,763***	***1,150***	***1,118***	***920***	***894***

Table 7 provides the additional dwelling unit and office space for Scenario 3 as compared with Scenario 1, and the associated vehicular trips that would be generated in the morning and evening peak hours.

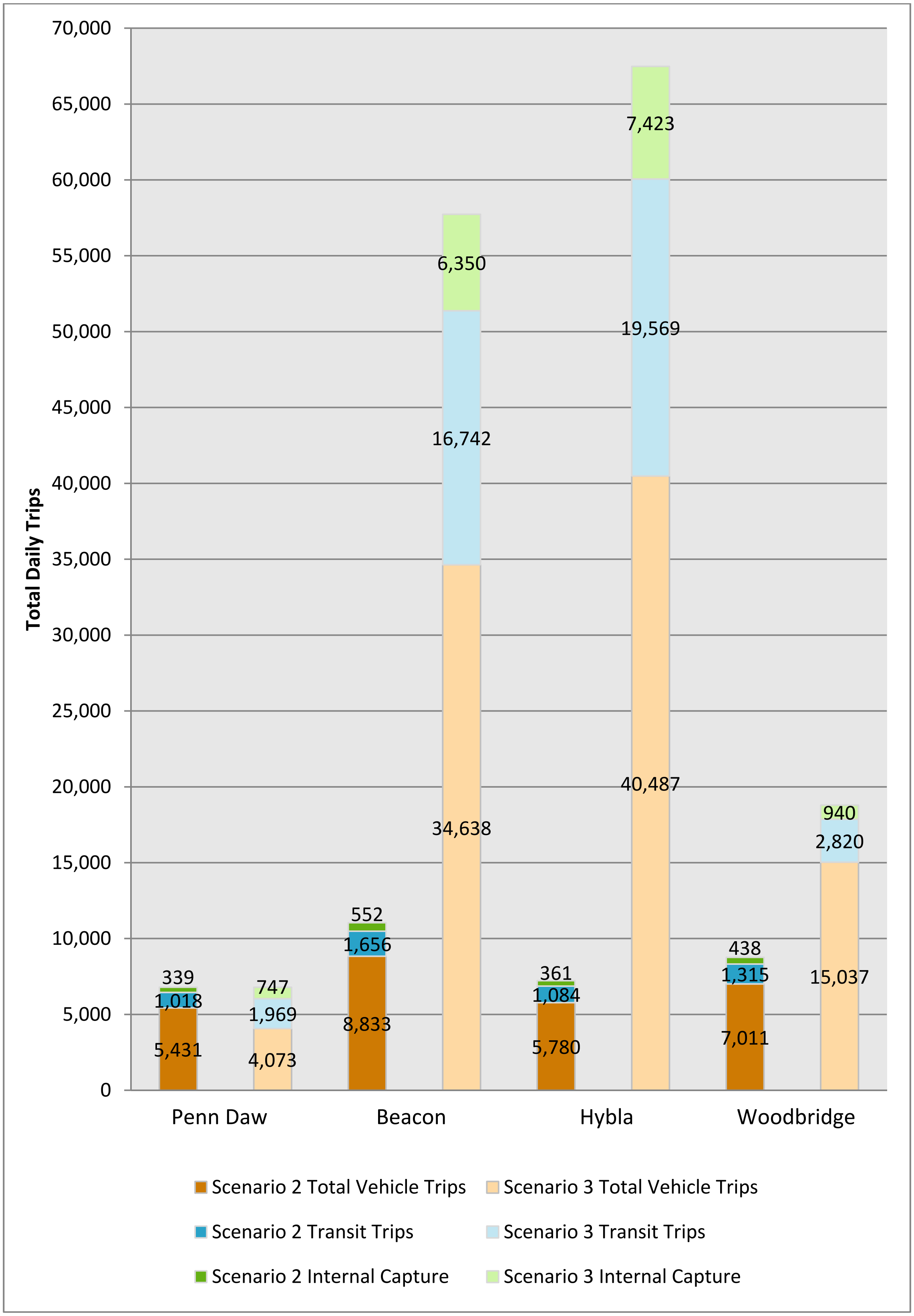
Table 7: Additional Vehicular Trips Generated for Land Use Scenario 3

Area	Land Use (ITE Category)	Units (Change Compared to Scenario 1)	Total Generated Trips			Total Auto Trips	
			Daily	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
PENN DAW STATION	High Rise Apartment 222	1,151 DU	4,836	345	403	207	242
	General Office 710	177 ksf	1,952	276	264	166	158
	Total		***6,788***	***621***	***667***	***373***	***400***
BEACON STATION	High Rise Apartment 222	4,704 DU	19,756	1,411	1,646	847	988
	General Office 710	3,443 ksf	37,974	5,371	5,129	3,223	3,078
	Total		***57,730***	***6,782***	***6,776***	***4,069***	***4,065***
HYBLA STATION	High Rise Apartment 222	6,111 DU	25,665	1,833	2,139	1,100	1,283
	General Office 710	3,791 ksf	41,813	5,914	5,648	3,548	3,389
	Total		***67,478***	***7,747***	***7,787***	***4,648***	***4,672***
WOODBRIDGE STATION	High Rise Apartment 222	1,475 DU	6,196	442	516	354	413
	General Office 710	1,142 ksf	12,601	1,782	1,702	1,426	1,362
	Total		***18,797***	***2,225***	***2,218***	***920***	***1,775***

Figure 18 shows additional daily trips generated with land use Scenarios 2 and 3 compared to Scenario 1 and the breakdown of the additional trips by transit, internal capture (walk and bike), and auto trips.

Scenario 3 growth levels generate significantly larger numbers of trips (auto, transit, and internal) than Scenario 2. Even with the high transit and walk/other modal splits, Scenario 3 is estimated to generate about 4,500 additional vehicular trips during the AM and PM peak hours within each potential Metrorail station area.

Figure 18: Additional Daily Trips Generated by Mode for Land Use Scenarios 2 and 3



3.3.2 Station Area Trip Distribution Approach

No Build traffic volumes are used as the baseline for estimating additional, scenario-related trips. Residential trips are assumed to originate from each station area and office trips would be destined to the study area in the morning peak. Symmetry was assumed between the morning and evening trips (i.e., the number of trips leaving the area in the morning peak hour is equal to the number of trips entering the area during the evening peak hour). Directional distributions of trips for the proposed Beacon Hill Metrorail Station for residential and office trips are shown in **Figure 19** and **Figure 20.** A similar approach was used at other stations.

- Scenario growth is applied to the exising roadway network to assess "worst case" intersection LOS.
- The number of theoretical through lanes needed to provide an "acceptable" intersection LOS is calculated. "Acceptable" volume is defined as lower than 85 percent of design capacity (generally better than operating at LOS E).
- The typical 6-lane Route 1 cross section was assumed, operating at "acceptable" levels due to enhanced transit and walk mode share and expanded theoretical local street capacity. The local street capacity is assumed as 600 vehicles per hour per lane.

Once the additional trips at each station area are generated, their impacts on other stations (external or through-trips) are also considered in the analysis. The Woodbridge station was analyzed independently and the impact of external trips beyond the Scenario 1 baseline was not considered due to its relatively long distance from other stations.

Figure 19: Residential Trip Distribution for Beacon Hill Metro Station

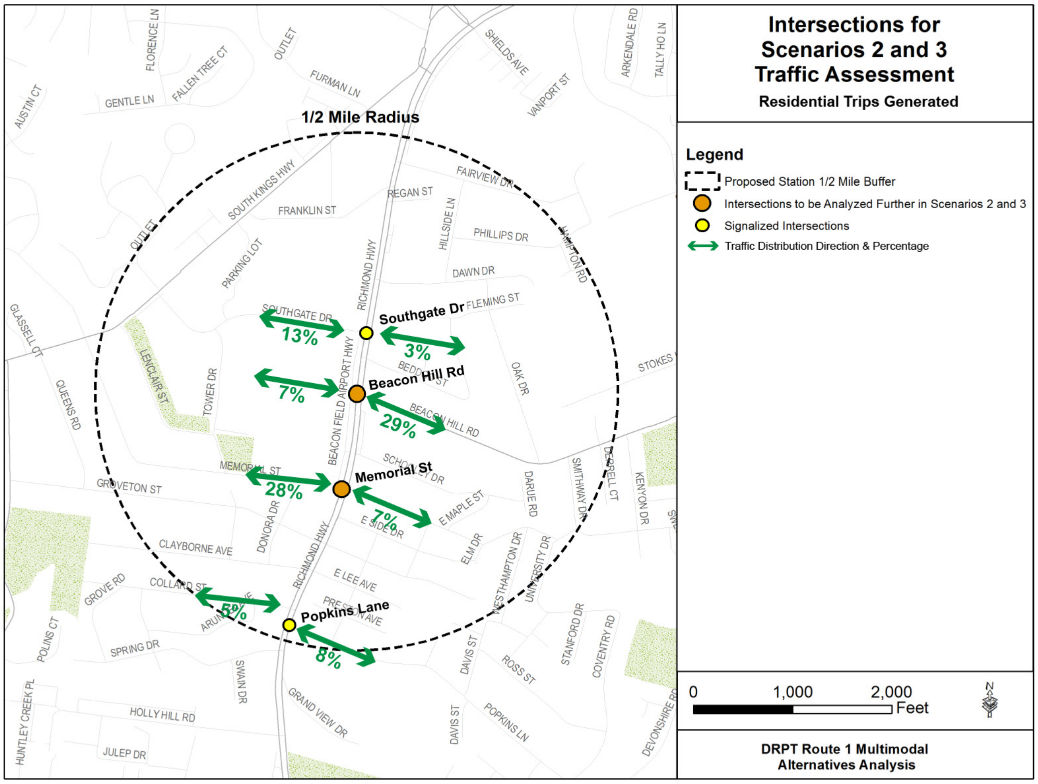
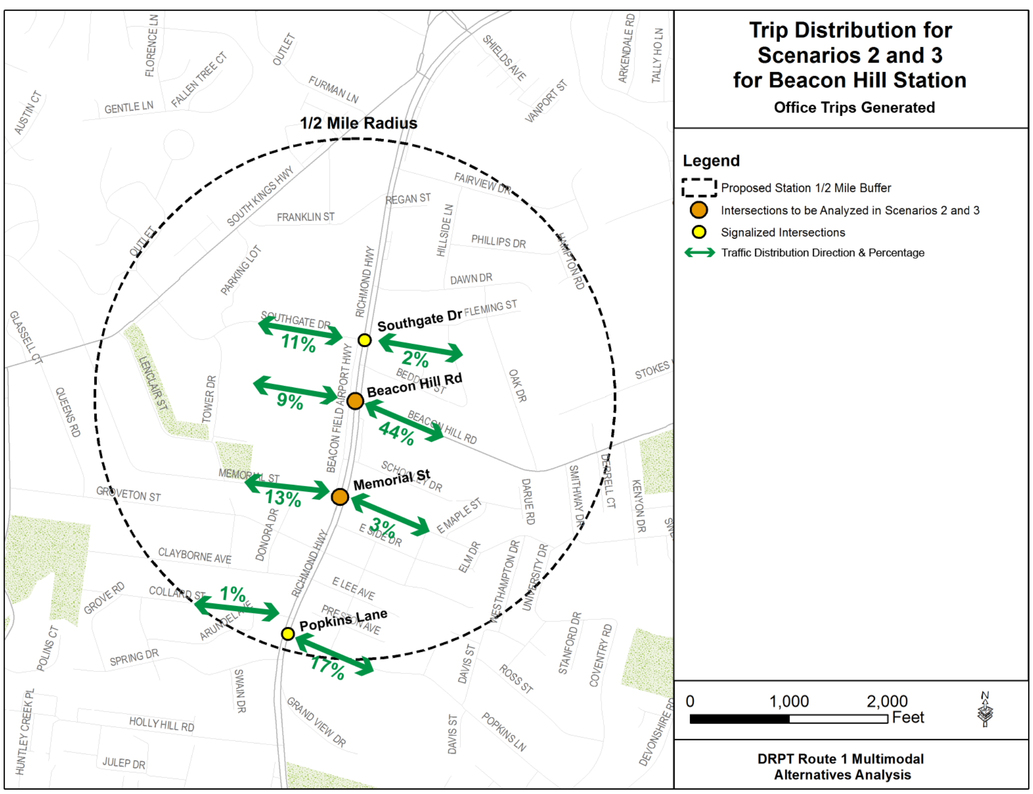


Figure 20: Office Trip Distribution for Beacon Hill Metro Station



3.3.3 Intersection-specific Results

Tables 8, 9, 10, and 11 below summarize intersection LOS for the key study intersections.

Overall, these findings must be understood not as specific tests of intersections or of corridor segments, but rather as a general assessment of the Route 1 corridor capacity to accommodate additional travel demand associated with the potential growth scenarios.

Table 8: Findings for Scenario 2 Traffic Assessment - AM Analysis

Station Area	Intersection	Scenario 1		Scenario 2 Existing Grid		Scenario 2 Enhanced Mode Share and Expanded Through-Capacity	
		LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
Penn Daw	Shields Avenue	B	18	D	55	D	35
	Walmart Entrance	D	45	F	91	D	47
Beacon	Beacon Hill	C	31	F	98	E	70
	Memorial Road	B	16	C	25	B	16
Hybla Valley	Boswell Avenue	C	31	E	62	D	37
	Sherwood Hall Ln	C	34	E	80	C	34
	Buckman Road	E	65	F	134	E	75
Woodbridge	Annapolis Road	A	4	A	5	A	5
	Gordon Boulevard	D	46	F	87	D	51

Table 9: Findings for Scenario 2 Traffic Assessment- PM Analysis

Station Area	Intersection	Scenario 1		Scenario 2 Existing Grid		Scenario 2 Enhanced Mode Share and Expanded Through-Capacity	
		LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
Penn Daw	Shields Avenue	D	36	D	45	D	37
	Walmart Entrance	E	60	F	91	E	68
Beacon	Beacon Hill	D	48	F	156	E	74
	Memorial Road	C	32	F	102	D	42
Hybla Valley	Boswell Avenue	D	43	F	111	D	52
	Sherwood Hall Ln	E	57	F	124	E	68
	Buckman Road	D	48	F	104	E	64
Woodbridge	Annapolis Road	A	8	B	15	B	10
	Gordon Boulevard	C	25	E	74	C	32

Table 10: Findings for Scenario 3 Traffic Assessment- AM Analysis

Station Area	Intersection	Scenario 1		Scenario 3 Existing Grid		Scenario 3 Enhanced Mode Share and Expanded Through-Capacity	
		LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
Penn Daw	Shields Avenue	B	18	F	176	D	40
	Walmart Entrance	D	45	F	266	D	54
Beacon	Beacon Hill	C	31	F	275	E	72
	Memorial Road	B	16	F	275	C	23
Hybla Valley	Boswell Avenue	C	31	F	286	C	33
	Sherwood Hall Ln	C	34	F	347	D	36
	Buckman Road	E	65	F	344	E	73
Woodbridge	Annapolis Road	A	4	A	6	A	5
	Gordon Boulevard	D	46	F	158	E	59

Table 11: Findings for Scenario 3 Traffic Assessment- PM Analysis

Station Area	Intersection	Scenario 1		Scenario 3 Existing Grid		Scenario 3 Enhanced Mode Share and Expanded Through-Capacity	
		LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
Penn Daw	Shields Avenue	D	36	F	113	D	49
	Walmart Entrance	E	60	F	253	E	68
Beacon	Beacon Hill	D	48	F	491	D	49
	Memorial Road	C	32	F	330	D	44
Hybla Valley	Boswell Avenue	D	43	F	308	D	49
	Sherwood Hall Ln	E	57	F	259	D	51
	Buckman Road	D	48	F	221	E	57
Woodbridge	Annapolis Road	A	8	C	22	B	12
	Gordon Boulevard	C	25	F	166	D	39

3.4 Summary of Results

The overall traffic levels include baseline growth derived from the MWCOG model, plus Scenario 2 or 3 station area growth as calculated through the trip generation method described above. With the assumed trip distribution factors and mode splits, the intersections in each station area are evaluated. To calculate design capacity the analysis uses a Highway Capacity Manual (HCM) approach, which considers the total number of through lanes and green to cycle ratio (g/C).

Table 12 summarizes findings for worst performing intersection in each station area, in either the AM or PM. Additionally, the analysis in **Table 12** first assesses the number of additional theoretical Route 1 lanes required to maintain "acceptable capacity". Recognizing that building up to ten additional lanes on Route 1 is not feasible, the analysis assesses the number of lanes required in a parallel street network to maintain "acceptable capacity" on Route 1 with its current amount of planned lanes and with enhanced transit and walk mode shares.

Table 12: Growth Scenario Results- LOS and Additional Lanes

	Penn Daw			Beacon			Hybla Valley			Woodbridge		
Scenarios	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*
Station area growth with no new roadway capacity												
Planned Route 1 through lanes	7	7	7	7	7	7	6	6	6	6	6	6
Assumed transit mode share*	10%	15%	29%	10%	15%	29%	10%	15%	29%	10%	15%	15%
Assumed walk trips*	5%	5%	11%	5%	5%	11%	5%	5%	11%	5%	5%	5%
"Worst case" intersection LOS (6-lane Route 1 section)	E	F	F	D	F	F	E	F	F	D	F	F
Expanded corridor through-capacity												
Additional theoretical Route 1 through-lanes for "acceptable" capacity (v/c = 0.85)	0	1	4	0	1	7	0	4	10	0	2	2
Enhanced mode share and expanded corridor through-capacity												
Enhanced transit mode share	10%	18%	35%	10%	18%	35%	10%	18%	35%	10%	18%	18%
Enhanced walk trips	5%	7%	15%	5%	7%	15%	5%	7%	15%	5%	7%	7%
Resulting Route 1 intersection LOS	E	E	E	D	E	E	E	E	E	D	D	E
Theoretical through-lanes on parallel local streets	0	2	2	0	3	10	0	2	12	0	2	4

*Mode share percentages based on input from Fairfax County and Prince William County staff.

3.4.1 Scenario 2

Scenario 2 results in LOS F at several locations, though not as many locations as Scenario 3. Of the eleven study intersections, two operated with LOS F in the AM peak and three operated with LOS F in the PM peak under Scenario 2. While conditions in most locations worsen in comparison to Scenario 1, results show that acceptable volumes can be achieved with relatively lower transit and walk/bike mode splits and fewer parallel local streets compared to Scenario 3.

3.4.2 Scenario 3

For Scenario 3, the “worst case” analysis shows that at least one of the study intersections in each area operates with LOS F during both the AM and PM peak hours. Of the eleven study intersections, ten operated with LOS F in the AM peak and nine operated with LOS F in the PM peak. With an enhanced grid and transit mode split, only four of the study intersections reach LOS E in the AM peak, with the rest at LOS D or better, and in the PM peak, five study intersections operate with LOS E, with the remaining intersections operating at LOS D or better.

The results indicate that other measures would be required to maintain acceptable traffic volumes assuming the current proposed Route 1 cross-section.

- **An enhanced mode shift to transit and walk trips would be required.**
  The assumptions included in this analysis align with high performing, non-downtown TOD areas from the Washington DC region. Refinements to the mode shift assumptions would affect traffic performance and required roadway capacity.

- **An enhanced secondary street network would be required.**
  This analysis acknowledges that the secondary, local street network along Route 1 is currently limited in terms of continuity and capacity. More street network capacity should be created to provide improved access and accommodate growth, particularly near planned transit stations. Further analysis is required to assess the required capacity of additional street infrastructure.

3.4.3 Findings

The results in **Table 12** show that expanded traffic capacity would be necessary to ensure the required LOS on Route 1 and estimated needs for expanded capacity to maintain required LOS, both with and without enhanced transit and walking mode shares. Recognizing that expanding Route 1 beyond the current planned number of lanes is not desirable or feasible, the analysis focuses on the capacity of potential theoretical parallel through-streets. Under Scenario 2, the parallel streets would need two to four lanes in addition to the existing lanes. Under Scenario 3, ten to twelve lanes would need to be built in a parallel street network to maintain acceptable capacity on Route 1.

ATTACHMENTS

Attachment A: Growth Rates for Scenario 1 VISSIM Analysis

Attachment B: VISSIM Calibration

Attachment C: PM SYNCHRO Results

Attachment D: MWCOG Model Methodology

Attachment E: Trip Generation Methodology

Attachment A: Growth Rates for Scenario 1 VISSIM Analysis

Table A-1 below presents the growth factors used to project 2035 No-Build traffic volumes along North Kings Highway.

Table A-1: Projected Average Annual Growth Rates for North Kings Highway (2015 to 2035)

	Morning Peak Hour	Evening Peak Hour
NB Annual Growth Rate	0.25%	0.75%
SB Annual Growth Rate	0.75%	0.75%

Tables A-2 and **A-3** below show MWCOG Model annual percent growth rates for the AM and PM peak periods at various locations, including North Kings Highway segments based on 2010 and 2035 link volumes. MWCOG Model results indicate higher growth rates south of Mt. Vernon Memorial Highway, however the growth rate is relatively small north of South Kings Highway (Walmart Entrance) and show even negative numbers on North Kings Highway.

Table A-2: MWCOG Model Annual Growth Rates for Route 1 (2015 to 2035)

	ANNUAL GROWTH RATE (%) (SCENARIO 1) ALONG ROUTE 1											
	Gunston Cove to Armistead		Telegraph Road to Fairfax County Parkway		Frye to Mt Vernon Highway		South Kings Hwy (Walmart Entrance) to Fairhaven		Fairhaven to Huntington		Huntington to 495	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
AM	2.31	1.02	2.24	1.44	1.36	1.39	0.91	0.01	1.48	0.50	1.21	-0.02
PM	1.20	1.45	1.59	1.86	1.94	1.74	1.44	0.83	0.95	1.18	0.65	0.47
24 hr	1.36	1.32	1.51	1.39	1.62	1.50	0.95	0.41	1.19	0.63	1.05	0.29

Table A-3: MWCOG Model Annual Growth Rates for North Kings Highway (2015 to 2035)

	ANNUAL GROWTH RATE (%) (SCENARIO 1) ALONG NORTH KINGS HIGHWAY					
	Route 1 to Fairhaven		Fairhaven to Fort Dr		Fort Dr to Hungtinton	
	SB	NB	SB	NB	SB	NB
AM	-0.71	-0.08	-0.77	-0.33	-0.59	-0.19
PM	-0.65	-0.38	-0.70	-0.71	0.07	-0.51
24 hr	-0.50	-0.18	-0.52	-0.36	-0.17	-0.15

Attachment B: VISSIM Calibration

In order to calibrate the existing VISSIM model, travel time along Route 1 (between Jana Lee Avenue to Shields Avenue) was used as the performance measure. VISSIM travel time in the northbound direction (i.e., the peak direction) was compared to the VDOT and AECOM field travel times.

VDOT field travel time results were based on three runs collected in May 2011 while AECOM performed a single field travel time run in September 2013. Ten simulation runs were initially performed in VISSIM. To determine the necessary number of simulation runs, a standard statistical "t-Test", as explained in *VDOT Traffic Operations Analysis Tool Guidebook* (2013) was performed. The necessary number of runs can be calculated using the following equation

$$N = \frac{Z^2 * S^2}{E^2} \quad (1)$$

where *N* is the necessary simulation runs, *Z* is the number of standard deviations away from the mean corresponding to the required confidence interval (corresponds to 1.96 assuming a normal distribution and 95th percentile confidence interval), and *E* is the margin of error. The default confidence interval and margin of error assumed by the Federal Highway Administration (FHWA) are 95 percent and 10 percent, respectively, which were also used in this analysis. **Table B-1** shows the mean travel time and standard deviation of VISSIM travel time results as well as the necessary simulation runs calculated using equation (1).

Table B-1: Necessary Simulation Runs

Mean Travel Time (s)	499.1
S - Standard Deviation of Travel Time (s)	15.5
N – Necessary Simulation Runs	9.3

The results indicate that at least 9.3 runs are required in order to achieve the required confidence interval with the specified margin of error. Therefore, ten simulation runs were concluded to be adequate.

Table B-2 provides travel time comparison during the morning peak hour based on VDOT, AECOM, and VISSIM travel time runs. Results show that VISSIM travel time is 6 percent higher than the VDOT travel time and approximately 8 percent lower the AECOM travel time. Moreover, VISSIM total travel time (497.4 s) is almost the same as the average of VDOT and AECOM field travel time runs (505.5 s).

Table B-2: Travel Time Comparison in the Morning Peak Hour

	VDOT Field Travel Time (s) – 3 Runs	AECOM Field Travel Time (s) – 1 Run	VISSIM Travel Time (s)
Jana Lee Ave to Mt Vernon Highway	50.7	26.6	56.3
Mt Vernon Highway to Ladson Ln	11.7	31.5	17.7
Ladson Ln to Sherwood Ln	36.7	21.3	26.5
Sherwood Ln to Bedford Dr	14.0	12.4	15.9
Bedford Dr to Fordson Rd	30.3	25.1	34.4
Fordson Rd to Boswell Ave	10.7	7.2	12.0
Boswell Ave to Arlington Dr	62.7	97.5	54.3
Arlington Dr to Lockheed Blvd	30.3	33.4	43.9
Lockheed Blvd to Collard St	70.3	67.3	48.0
Collard St Memorial St	33.0	25.5	25.1
Memorial St to Beacon Hill Rd	31.7	15.1	25.2
Beacon Hill Rd to Southgate Dr	12.3	10.8	11.7
Southgate Dr to South Kings Hwy	62.7	154.6	96.6
South Kings Hwy to Shields Avenue	12.3	13.4	29.7
Total	**469.3**	**541.7**	**497.4**

Attachment C: SYNCHRO Findings

Figures C-1 to **C-4** show the 2013 and 2035 AM and PM Synchro results.

Figure C-1: 2013 AM Peak Hour Delay and LOS

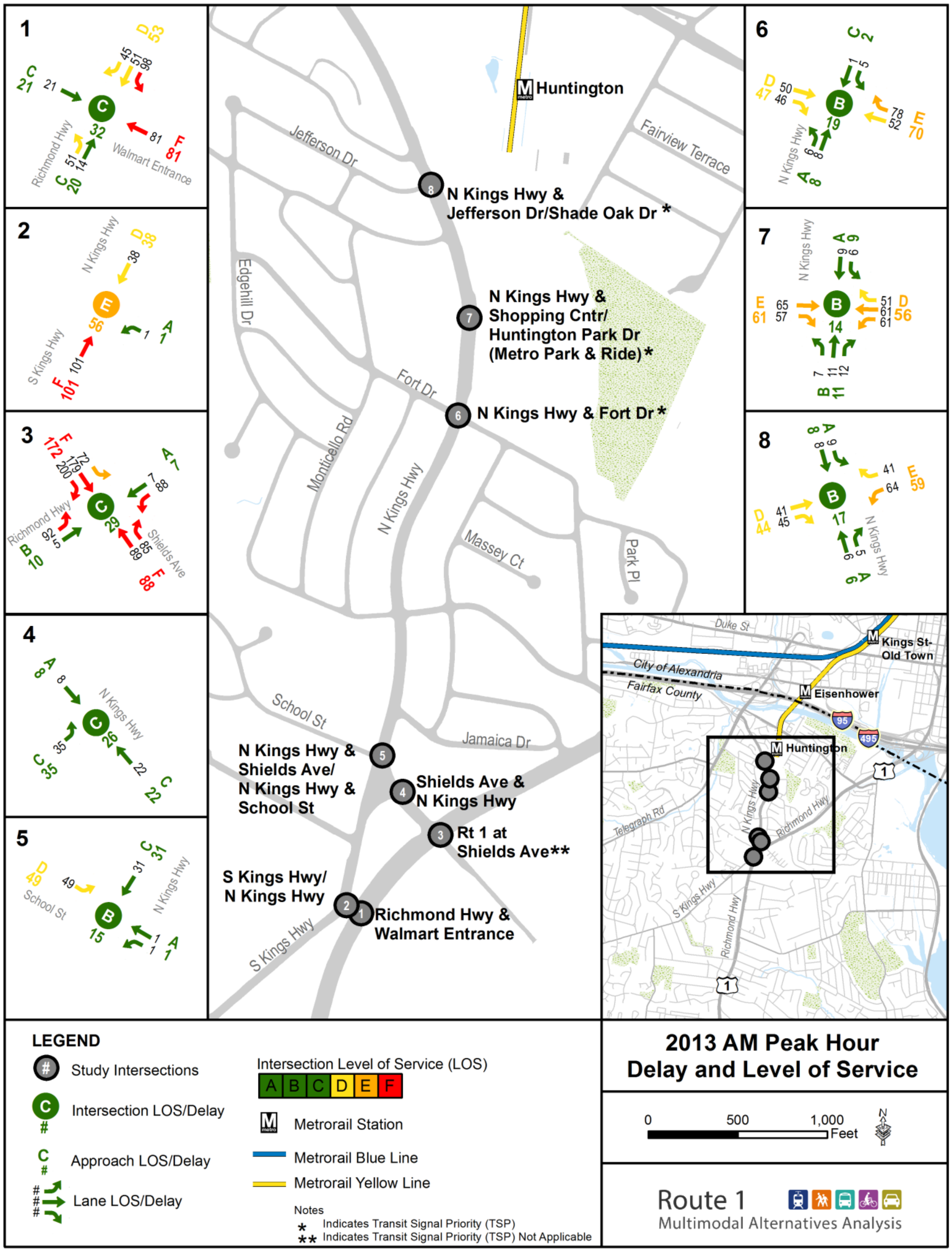


Figure C-2: 2013 PM Peak Hour Delay and LOS

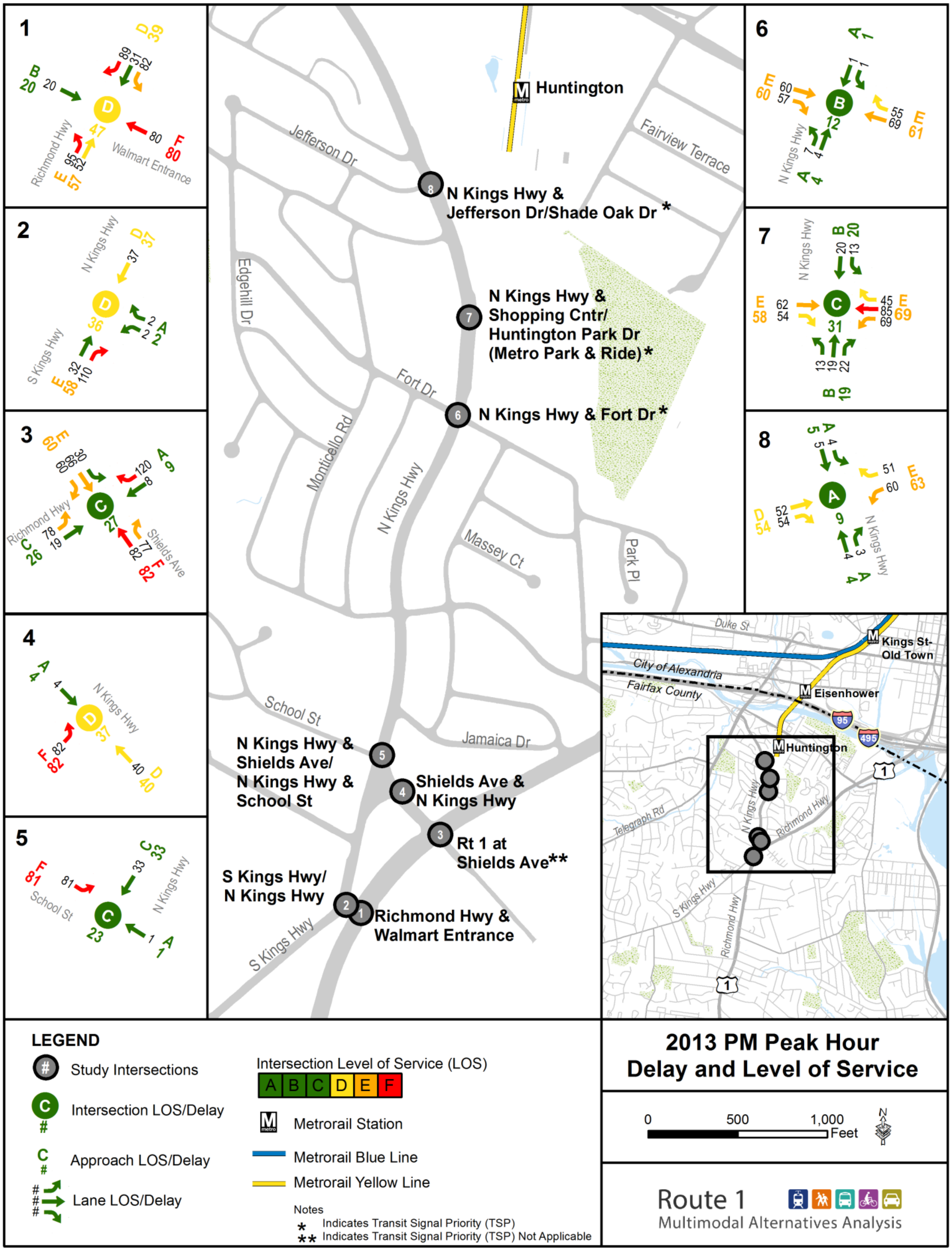


Figure C-3: 2035 AM Peak Hour Delay and LOS

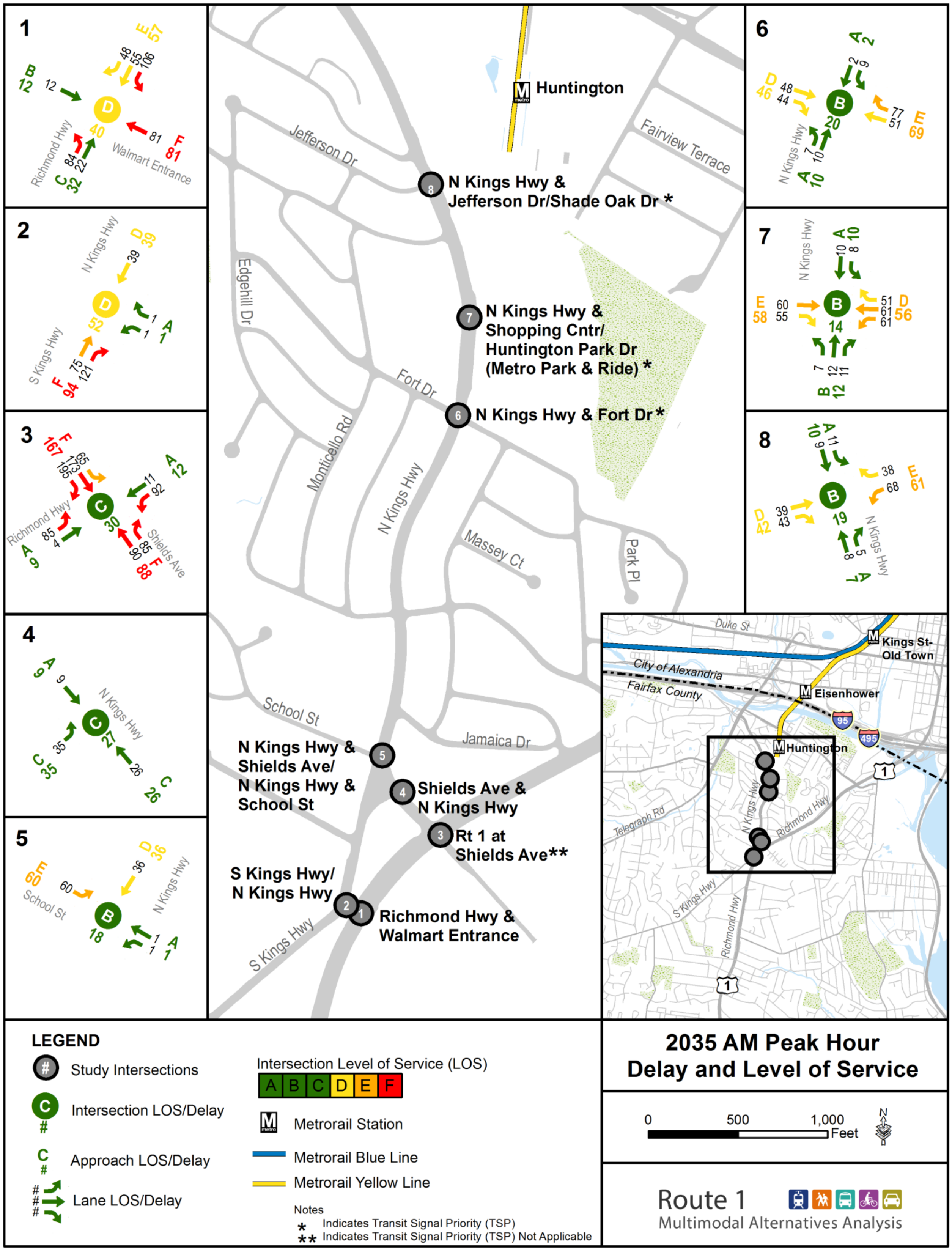
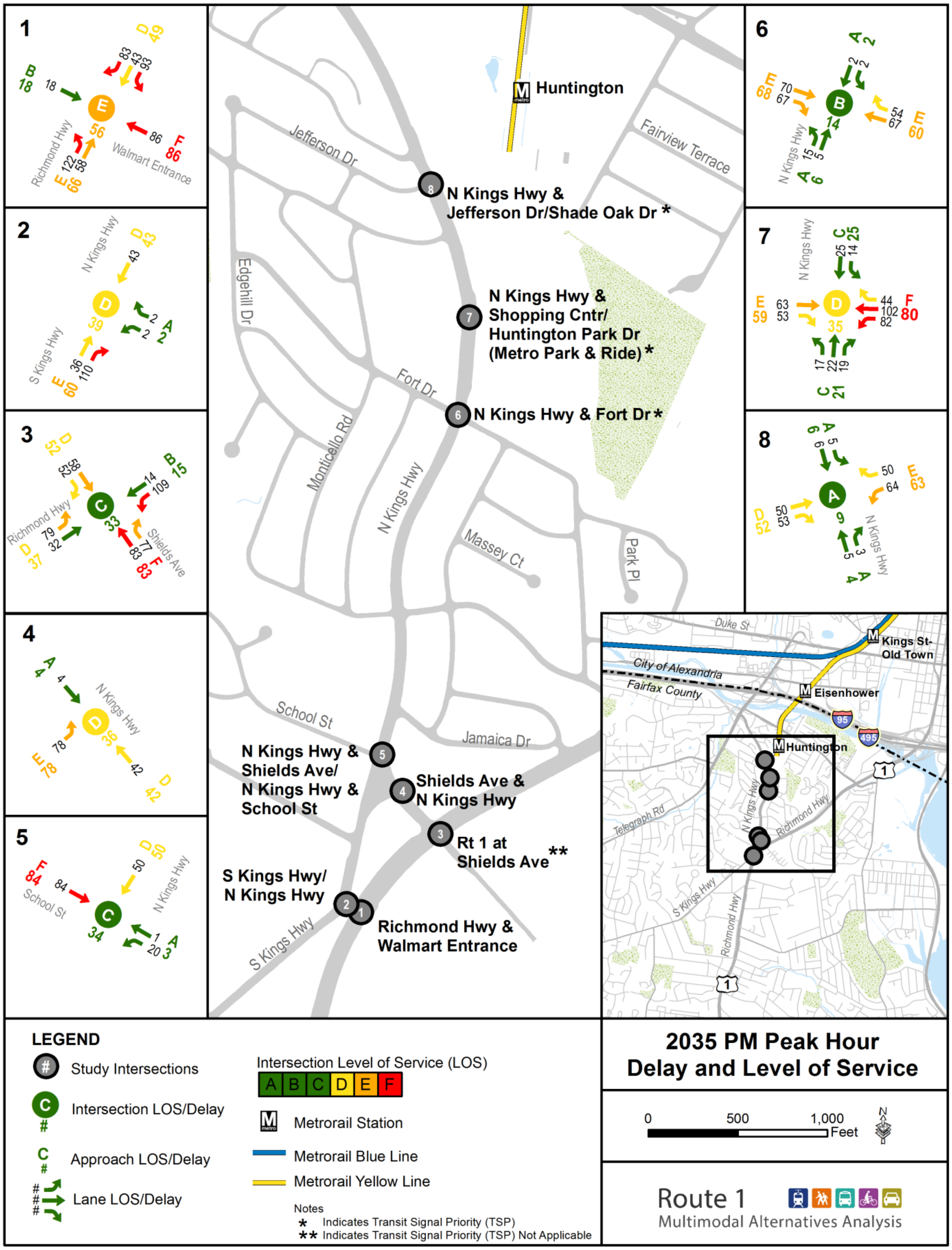


Figure C-4: 2035 PM Peak Hour Delay and LOS



Attachment D: MWCOG Model Methodology

MWCOG Model Validation

The MWCOG/TPB Travel Forecasting Model Version 2.2 used for the Route 1 Alternatives Analysis was validated for both highway and transit. The MWCOG model is a regional tool, and the link volumes that it generates, while generally close to the observed volumes, are subject to the limitations of a regional model: aggregate access/egress due to centroids, poor traffic signal representations, aggregate 4-hour volume delay functions, etc.

As such, off-model traffic analysis is important to ensure applicability to real, observed traffic conditions. The MWCOG model is best used to establish traffic growth rates. This has the advantage of basing the traffic analysis in actual data and applying the growth implied by the MWCOG process.

MWCOG Model Application

The traffic growth forecasts for Scenarios 2 and 3 require post-processing of MWCOG model outputs, due to models generally offering crude aggregate trip generation rates that may/may not understand the impacts of transformational land use impacts.

In revisiting the MWCOG Travel Model 2.2 trip generation procedures, the models use a typical cross-classification structure for trip rates (income by auto ownership) to estimate production end (home) trip rates and very simple attraction models (generally employment based). In addition, the MWCOG Travel Model 2.2 makes a crude statement for non-motorized trips, based on area type.

To establish network traffic growth rates, the following inputs are introduced as “factors” to the regional model: expected changes to internal capture rates, trip making, and automobile ownership between projected Scenario 1 versus Scenarios 2 and 3 development patterns.

Tables D-1 through **D-5** show the annual growth rates by scenario and segment along Route 1.

Table D-1: Annual Growth Rates (%) Projected for Scenario 1

	Gunston Cove to Armistead		Telegraph Road and Fairfax County Parkway		Frye to Mt Vernon Highway	
	SB	NB	SB	NB	SB	NB
AM Vol	2.31	1.02	2.24	1.44	1.36	1.39
PM Vol	1.20	1.45	1.59	1.86	1.94	1.74
24 hr vol	1.36	1.32	1.51	1.39	1.62	1.50

	S Kings Hwy to Fairhaven		Fairhaven to Huntington		Huntington to 495	
	SB	NB	SB	NB	SB	NB
AM Vol	0.91	0.01	1.48	0.50	1.21	-0.02
PM Vol	1.44	0.83	0.95	1.18	0.65	0.47
24 hr vol	0.95	0.41	1.19	0.63	1.05	0.29

	Route 1 to Fairhaven		Fairhaven to Fort Dr		Fort Dr to Hungtinton	
	SB	NB	SB	NB	SB	NB
AM Vol	-0.71	-0.08	-0.77	-0.33	-0.59	-0.19
PM Vol	-0.65	-0.38	-0.70	-0.71	0.07	-0.51
24 hr vol	-0.50	-0.18	-0.52	-0.36	-0.17	-0.15

Table D-2: Annual Growth Rates (%) Projected for Scenario 2

	Gunston Cove to Armistead		Telegraph Road and Fairfax County Parkway		Frye to Mt Vernon Highway	
	SB	NB	SB	NB	SB	NB
AM Vol	2.51	1.24	2.64	1.55	1.46	1.87
PM Vol	1.36	1.68	1.69	2.15	2.20	1.98
24 hr vol	1.47	1.31	1.88	1.80	1.84	1.78

	S Kings Hwy to Fairhaven		Fairhaven to Huntington		Huntington to 495	
	SB	NB	SB	NB	SB	NB
AM Vol	0.19	-0.69	0.94	-0.28	1.21	-0.31
PM Vol	0.97	0.65	0.12	0.94	0.43	0.65
24 hr vol	0.45	0.05	0.58	0.24	0.94	0.29

	Route 1 to Fairhaven		Fairhaven to Fort Dr		Fort Dr to Hungtinton	
	SB	NB	SB	NB	SB	NB
AM Vol	0.12	-0.09	-0.23	-0.40	0.25	-0.21
PM Vol	-0.62	-0.01	-0.74	-0.26	0.11	0.03
24 hr vol	-0.08	0.15	-0.12	-0.04	0.22	0.20

Table D-3: Annual Growth Rates (%) Projected for Scenario 2 with Post-Processed Outputs

	Gunston Cove to Armistead		Telegraph Road and Fairfax County Parkway		Frye to Mt Vernon Highway	
	SB	NB	SB	NB	SB	NB
AM Vol	2.42	1.04	2.48	1.56	1.37	1.89
PM Vol	1.22	1.39	1.76	2.00	2.12	1.94
24 hr vol	1.44	1.31	1.82	1.73	1.78	1.76

	S Kings Hwy to Fairhaven		Fairhaven to Huntington		Huntington to 495	
	SB	NB	SB	NB	SB	NB
AM Vol	0.18	-0.77	0.82	-0.36	1.07	-0.31
PM Vol	0.84	0.66	0.00	0.87	0.35	0.62
24 hr vol	0.32	0.04	0.48	0.21	0.82	0.25

	Route 1 to Fairhaven		Fairhaven to Fort Dr		Fort Dr to Hungtinton	
	SB	NB	SB	NB	SB	NB
AM Vol	0.06	-0.09	0.05	-0.40	0.20	-0.25
PM Vol	-0.64	-0.02	-0.73	-0.30	0.07	0.00
24 hr vol	-0.09	0.12	-0.12	-0.07	0.20	-6.29

Table D-4: Annual Growth Rates (%) Projected for Scenario 3

	Gunston Cove to Armistead		Telegraph Road and Fairfax County Parkway		Frye to Mt Vernon Highway	
	SB	NB	SB	NB	SB	NB
AM Vol	2.46	0.50	2.17	1.61	0.58	2.21
PM Vol	0.66	1.25	1.87	2.08	2.16	1.88
24 hr vol	1.21	1.14	2.04	1.96	2.08	2.14

	S Kings Hwy to Fairhaven		Fairhaven to Huntington		Huntington to 495	
	SB	NB	SB	NB	SB	NB
AM Vol	1.51	-1.54	3.02	-0.43	2.90	-0.13
PM Vol	0.69	1.29	0.25	1.43	0.94	1.38
24 hr vol	0.92	0.30	1.61	0.88	1.92	0.94

	Route 1 to Fairhaven		Fairhaven to Fort Dr		Fort Dr to Hungtinton	
	SB	NB	SB	NB	SB	NB
AM Vol	-0.71	-0.08	-0.77	-0.33	-0.59	-0.19
PM Vol	-0.65	-0.38	-0.70	-0.71	0.07	-0.51
24 hr vol	-0.50	-0.18	-0.52	-0.36	-0.17	-0.15

Table D-5: Annual Growth Rates (%) Projected for Scenario 3 with Post-Processed Outputs

	Gunston Cove to Armistead		Telegraph Road and Fairfax County Parkway		Frye to Mt Vernon Highway	
	SB	NB	SB	NB	SB	NB
AM Vol	2.41	0.42	2.06	1.52	0.43	2.11
PM Vol	0.62	1.16	1.77	1.97	2.03	1.77
24 hr vol	1.15	1.06	1.92	1.86	1.91	2.03

	S Kings Hwy to Fairhaven		Fairhaven to Huntington		Huntington to 495	
	SB	NB	SB	NB	SB	NB
AM Vol	1.40	-1.57	2.90	-0.56	2.76	-0.20
PM Vol	0.41	1.09	0.04	1.35	0.75	1.28
24 hr vol	0.76	0.16	1.46	0.76	1.76	0.84

	Route 1 to Fairhaven		Fairhaven to Fort Dr		Fort Dr to Hungtinton	
	SB	NB	SB	NB	SB	NB
AM Vol	0.42	-0.39	0.49	-0.52	0.84	-0.71
PM Vol	-0.67	0.29	-0.84	-0.01	0.49	0.86
24 hr vol	0.11	0.19	0.20	0.36	0.74	0.79

Attachment E: Trip Generation

Options for Trip Generation Methodology

Case studies and previous research were used to determine the most appropriate method in estimating trips generated by land use in Scenarios 2 and 3.

The Institute of Transportation Engineers (ITE) Trip Generation model[1] uses manual numbers, based on corresponding land uses, to generate a total number of daily trips as well as morning and evening peak hour trips. However, the ITE method typically reflects isolated, suburban developments with poor transit service, limited walking and cycling accessibility. The Route 1 study area under the proposed land use scenarios, in particular under land use Scenario 3, will be well-serviced by multiple transit options and be accessible to walkers and cyclists. Therefore, the direct application of ITE Trip Generation Manual will result in significant overestimation of the number of trips generated.

The US Environmental Protection Agency (EPA) Trip Generation[2] tool was developed with mixed-use developments in mind and land use data from household travel surveys, GIS databases, and other sources to calculate resulting travel from areas with more than one land use. This model is able to estimate internal capture as well as transit use for trips that start and end in mixed-use developments based on the mix and densities of the land uses in the site. However, the EPA method involves a large data input that is complex to collect. Moreover, the model has size and density limitations based on the range of data used to develop the model. Since the level of development in our study area has data that surpassed the model's maximum inputs and since the details regarding the future development that is required for the EPA analysis is not available, the EPA model was not considered in the analysis.

A six-region study[3], conducted by a diverse group of stakeholders, researched to what extent the ITE method understated the traffic benefits of mixed-use developments. The findings suggested that TOD with diverse activities on-site captured a larger share of trips internally, while walkable areas with transit access generated a significant share of walking and transit trips. A different report by the Texas Transportation Institute[4] (TTI) studied the estimation of trip generation for mixed-use developments with a focus on sufficiently capturing internal site trips. The National Cooperative Highway Research Program (NCHRP)[5] also published a report on ways to improve the methodologies used to estimate the extent to which trips made within mixed-use developments are internalized or satisfied with both origin and destination within the development.

WMATA Development Related Ridership Survey[6] conducted by Washington Metropolitan Area Transit Authority (WMATA) in 2005 surveyed the travel behavior of persons traveling to and from office and residential sites near Metrorail stations. Thirteen Metrorail stations participated in the study. The goal of the study was to estimate modal splits for certain physical site characteristics.

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[1] *http://www.ite.org/tripgeneration/trippubs.asp*
[2] *http://www.epa.gov/dced/mxd_tripgeneration.html*
[3] *http://www.reconnectingamerica.org/assets/Uploads/trafficmixedusedevelopments2009.pdf*
[4] *http://tti.tamu.edu/documents/5-9032-01-1.pdf*
[5] *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_684.pdf*
[6] *https://www.wmata.com/pdfs/planning/2005_Development-Related_Ridership_Survey.pdf*

The WMATA study reflects numbers from the Washington Metropolitan Area and offers insights regarding mode splits based on different typologies (e.g., station located in central business district); consequently, the project team decided to use the ITE method in conjunction with the WMATA study findings. The combined method essentially uses standard ITE rates first to compute daily trip estimates and then considers the WMATA study to capture transit as well as walk and other mode splits on similar transit oriented developments in the region. Once modal splits were determined, trip generation for vehicular trips were calculated.

Table E-1 summarizes the results from the *WMATA Development Related Ridership Survey* (2005). This report provides mode share data for stations inside and outside the beltway. Stations inside the beltway include Ballston, Court House, Eisenhower Avenue, King Street, and Silver Spring. These do not include stations in the urban core. Outside the beltway stations include Dunn-Loring, Grosvenor, and New Carrollton.

Table E-1: WMATA Development Related Ridership Survey (2005)

Typology	Trip Type	Transit	Walk & Other	Auto
Suburban – Inside the Beltway	Residential Mode Share for All Trips	49%	14%	37%
	Commute Mode Share at Office Sites	30%	6%	64%
Suburban – Outside the Beltway	Residential Mode Share for All Trips	32%	6%	62%
	Commute Mode Share at Office Sites	11%	0%	89%

Source:http://www.reconnectingamerica.org/assets/Uploads/2005developmentrelatedridershipstudy

The study team also referred to the *Fairfax County Comprhensive Plan, 2013 Edition – Tysons Corner Urban Center, Amended Through 4-9-2014, Vision for Tysons*. To support the level of development in Tysons, Fairfax County developed transit mode split values for the Tysons area for different future years as a strategy to meet a target automobile trip reduction level. These mode split values assume future investment in high-quality transit and TOD development. **Table E-2** summarizes mode share goals for Tysons, and **Table E-3** shows trip reduction goals for Tysons.

Table E-2: Mode Share Targets for Tysons Area

Required Transit Mode Share During Peak Periods to Meet Target Auto Trip Reduction Level			
Year	TOD Areas	Non-TOD Areas	All of Tysons
2040	29%	15%	25%

Source: *Fairfax County Comprhensive Plan, 2013 Edition – Tysons Corner Urban Center, Amended Through 4-9-2014, Vision for Tysons*

Table E-3: Trip Reduction Targets for Tysons Area

Development		0 to 1/4 Mile from Station	1/4 to 1/2 Mile from Station	Non-TOD Locations (More than ½ Mile from Station)
Office	Baseline	30%	25%	20%
	Transportation Demand Management Goal	45% - 35%	40% - 30%	35% - 25%
Residential	Baseline	30%	25%	15%-10%
	Transportation Demand Management Goal	45% - 35%	40% - 30%	25% - 15%

Source: *Fairfax County Comprhensive Plan, 2013 Edition – Tysons Corner Urban Center, Amended Through 4-9-2014, Vision for Tysons*

Trip Generation Process

In order to determine the trip generation numbers associated with land use in Scenarios 2 and 3, population and employment estimates were converted into units that are compatible with the ITE method. Dwelling units (DU) were calculated from population size, based on the average persons per household (pph) number for high-rise multi-family units in Fairfax County (2.14 pph) divided by the projected population. For the employment numbers, the average square feet needed per employee (300 ft) was multiplied by the employment projections to determine the amount of new office space needed in the future.

Once the inputs for the three transit-oriented stations were determined, ITE Trip Generation (9th edition) rates were used to calculate the daily or hourly trip estimates. For the dwelling units, land use designation 222, “High-Rise Apartments”, was used based on the assumption the proposed development will be needed to achieve high densities to support transit. For the office space, land use designation 710, “General Office”, was assumed as there is little information available at this stage of the study regarding what type of employment will be located around these stations.

Based on input from Fairfax County and Prince William County staff, the modal splits assumptions used for Scenario 3 were finalized. The residential mode share numbers are for all trips; therefore, the mode share numbers for residential during the peak hours can actually be higher than what is shown below. Relatively lower transit and walk and other modal split values are used for Woodbridge Station since it will be served by BRT, while the other two stations will be served by Metrorail in land use Scenario 3.

Table E-4: Assumed Mode Share for Current Route 1 Analysis

Station	Transit	Walk & Other	Auto
Beacon and Hybla Valley Stations (served by Metro)	29%	11%	60%
Woodbridge Station (served by BRT)	15%	5%	80%

A similar methodology is applied in estimating the generated trips associated with land use in Scenario 2. However, to account for lower land use intensity and BRT service (all stations will be served by BRT in Scenario 2), a lower non-auto mode share is assumed. Using the MWCOG Travel Model Scenario 2 results and *NCHRP Report 758*[7], transit and walk & other mode shares were assumed to be 14 percent and 4 percent, respectively.

The mode split assumptions also considered *Arlington County Residential Building Transportation Performance Monitoring Study* (2013). The report presents survey results of commuting and mode share patterns in TOD and non-TOD areas in Arlington. The TOD areas within Arlington County include both bus and Metrorail corridors. Results of the study are below in **Table E-5**.

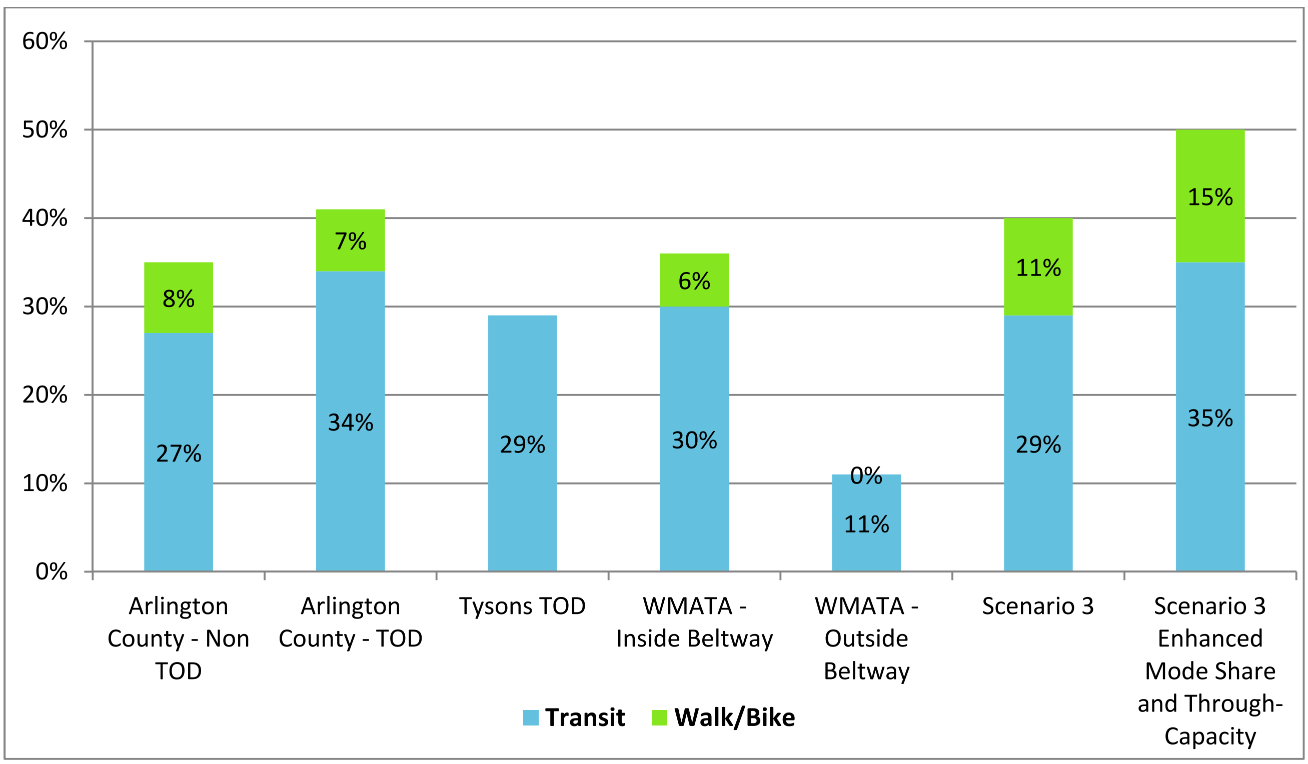
Table E-5: Arlington County Survey Results: Non-Auto Mode Split

	TOD Areas	Non-TOD Areas
Commute Trips	43%	35%
Non-Work Trips	39%	33%

Source: http://mobilitylab.org/wp-content/uploads/2013/10/ACCS_ResidentialBuildingStudy_Presentation17Sept2013.pdf

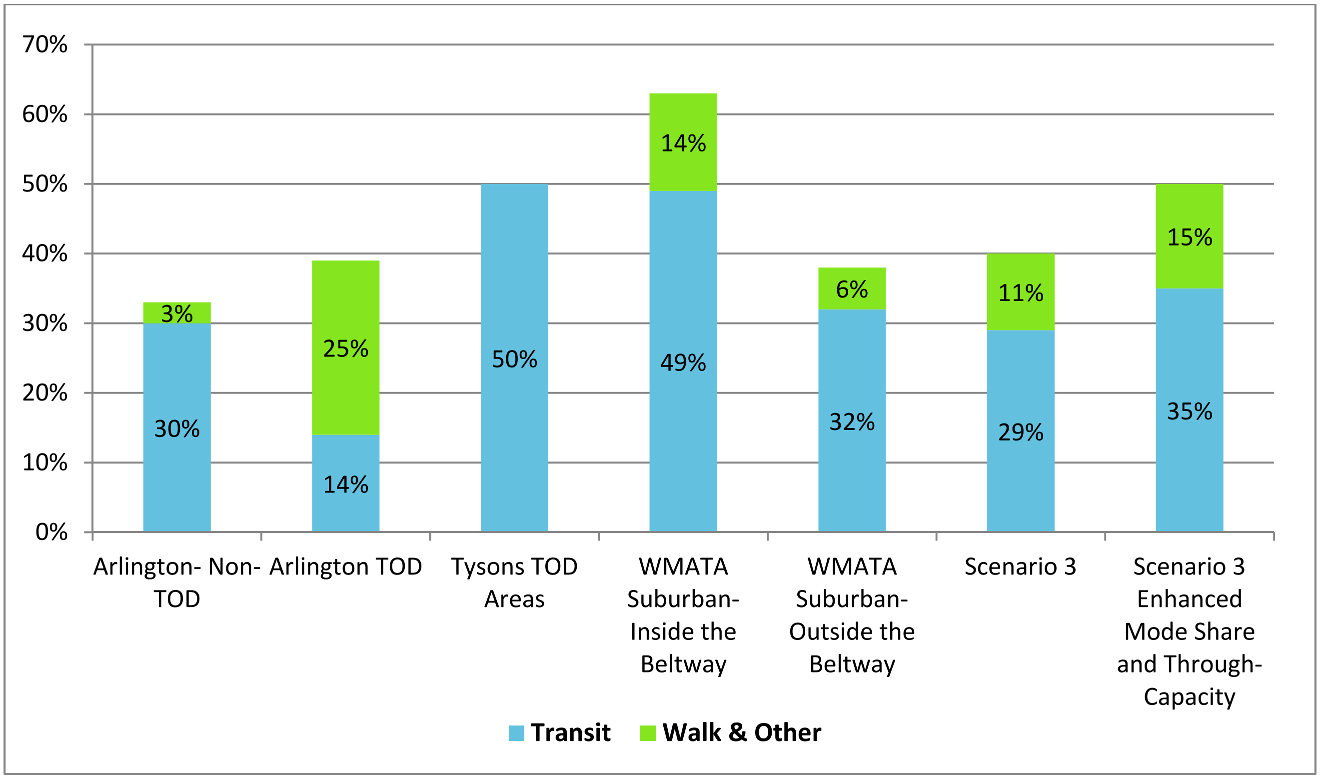
Figures E-1 and E-2 show Scenario 3 internal capture rate assumptions with the other case studies for both commute trips and non-work trips.

Figure E-1: Commute Trips Mode Share



[7] http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_758.pdf

Figure E-2: Non-Work Trips Mode Share



Once transit and internal capture percentages were determined, vehicular trips are calculated as follows:

$$VehicularTrips = TotalTrips \times (100 - P_{Transit} - P_{Walk\&Other})$$

where $P_{Transit}$ and $P_{Walk\&Other}$ represent transit and walk & other modal splits in percentages, respectively.

APPENDIX F

Detailed Evaluation of Alternatives Report

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Route 1
Multimodal Alternatives Analysis

ROUTE 1 MULTIMODAL ALTERNATIVES ANALYSIS

DETAILED EVALUATION OF ALTERNATIVES REPORT

June 2014

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Table of Contents

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List of Tables

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1.0 Introduction

The purpose of this technical memorandum is to summarize the evaluation of alternatives and provide supporting documentation on the evaluation measures and methodology.

This memorandum describes the process of developing and evaluating the multimodal alternatives. It provides detail on performance measures and associated analysis methodologies used to screen and recommend a multimodal solution that best meets the needs of the corridor. The memorandum does not discuss the associated recommendations, which are described in the Final Report.

An important part of the alternatives evaluation is an assessment of potential funding and implementation steps for the alternatives. Implementation considerations are the levels of anticipated population and employment, the need for additional transportation infrastructure, and general viability of the preliminary funding plan including competitiveness for federal transit funding.

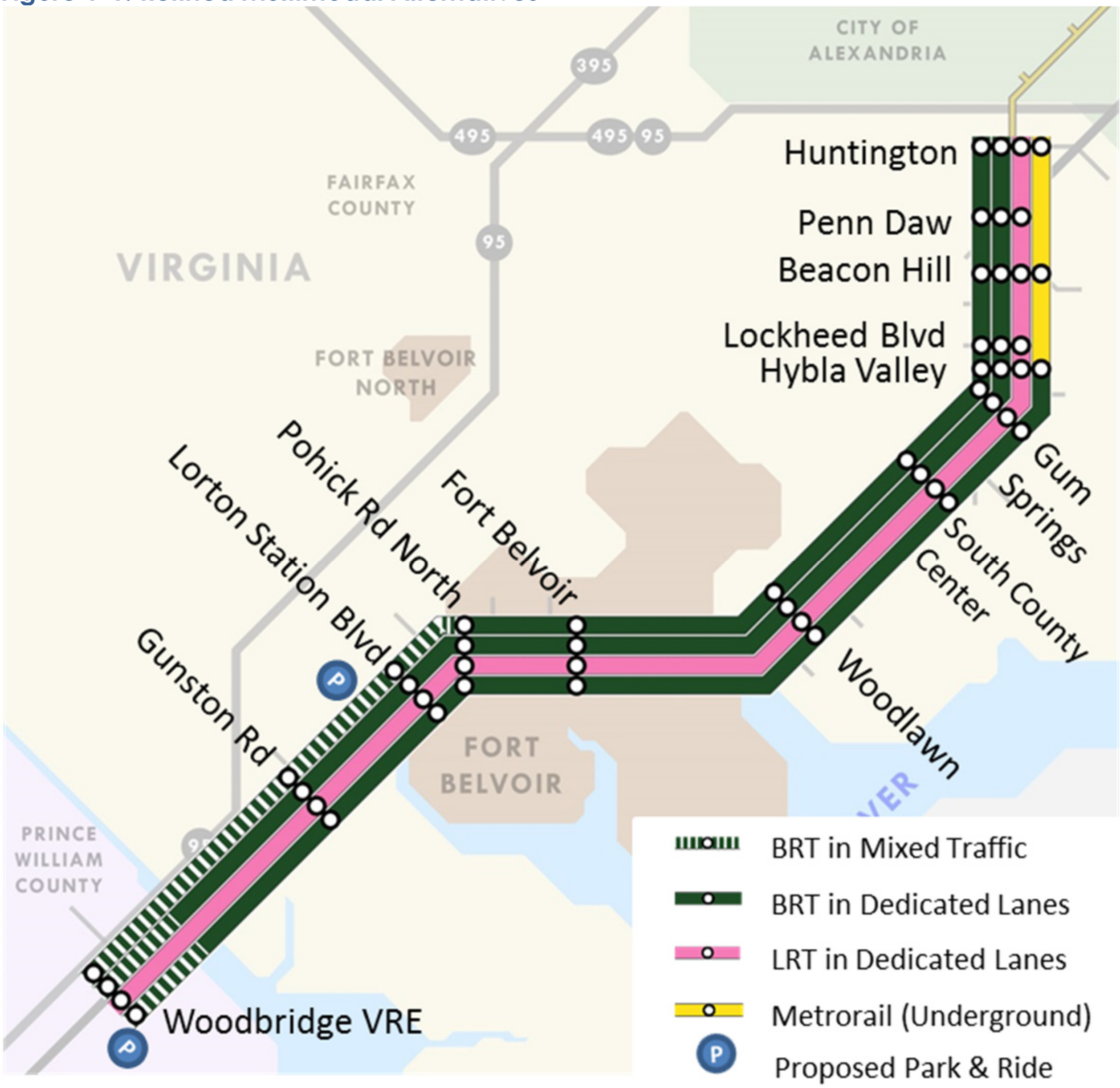
1.1 Refined Multimodal Alternatives

Four multimodal alternatives were evaluated in detail. The four alternatives assume the same vehicular lane and bicycle/pedestrian facility configuration, but the transit mode and operating assumptions vary. The multimodal alternatives assume a consistent, six-lane vehicular lane configuration and a 10-foot multi-use path along the majority of the corridor; however, the bicycle/pedestrian facility configuration will vary depending upon urban design, right-of-way availability, and other local considerations .The four alternatives are referred to by the transit component and include:

1. Alternative 1 - Bus Rapid Transit – curb running
2. Alternative 2 - Bus Rapid Transit – median running
3. Alternative 3 - Light Rail Transit – median running
4. Alternative 4 - Hybrid – Yellow line extension to Hybla Valley with supporting Bus Rapid Transit (median) to Woodbridge

Figure 1-1 shows the refined multimodal alternatives for detailed evaluation. The more detailed description of each alternative is provided in Section 2.0 of the Final Report.

Figure 1-1: Refined Multimodal Alternatives



2.0 Evaluation of Multimodal Alternatives

2.1 Introduction and Summary of Findings

The goal of the evaluation is twofold:

1. Assess how well each alternative addresses the project goals and objectives
2. Assess feasibility of implementing each alternative (requirements articulated by public participants, elected officials, and technical staff).

The first evaluation considers the ability of each alternative to meet the project goals and objectives. This is performed using identified evaluation measures that provide either quantitative or qualitative data on how well each alternative meets the goals.

The second evaluation is a qualitative assessment of the feasible timing for implementation and financial feasibility of each Alternative. The evaluation focuses on development levels appropriate to the type of transportation investment, and ability to secure funding for recommended improvements.

2.1.1 Summary of Findings

The study team recommends a phased implementation of the multimodal (roadway, bicycle/pedestrian, and transit) improvements of "Alternative 4 BRT/Metrorail Hybrid", including:

• **Roadway Widening**: Widen roadway from four lanes to six lanes where necessary to create a consistent, six-lane cross section along the corridor;

• **Bicycle and Pedestrian Facilities:** Create a continuous facility for pedestrians and bicyclists along the 15 mile corridor; the configuration will vary depending upon urban design, right-of-way availability, and other local considerations; and

• **Transit:** Contingent upon increased land use density and project funding, implement a median-running Bus Rapid Transit (BRT) system from Huntington to Route 123 in Woodbridge (curb-running BRT in mixed traffic within the Prince William County portion) and a 3-mile Metrorail Yellow Line extension from Huntington to Hybla Valley as expeditiously as possible.

Table 2-1 presents the evaluation results that support this technical recommendation.

The next sections summarize the key findings by evaluation factor and present tables that show the comparative measures. Explanatory text for each measure is provided below the summary tables. Further detail on the technical methods that support the quantitative measures is presented in the following related reports:

- *Transportation Report*
- *Land Use and Economic Analysis Report*

- *Funding Analysis Report*
- *Environmental Scan Report*

Table 2-1: Evaluation of Alternatives Summary

Evaluation Factors (Goals)	Alternative 1: BRT-Curb	Alternative 2: BRT-Median	Alternative 3: LRT	Alternative 4: Metrorail-BRT (Hybrid)
Goal 1: Local and Regional Mobility	0.7	0.8	0.8	**1.00**
Goal 2: Safety and Accessibility	0.7	**0.8**	**0.8**	**0.8**
Goal 3A: Economic Development	0.6	0.6	0.6	**0.7**
Goal 3B: Cost Effectiveness	**1.0**	0.9	0.7	0.5
Goal 4: Community and Health Resources	0.7	0.7	0.7	**0.8**
Ability to Meet Project Goals Average	**0.7**	**0.8**	**0.7**	**0.8**

2.2 Ability to Address Project Goals and Objectives

At the beginning of this Alternatives Analysis study, goals and objectives were established to help guide development of the alternatives. The goals and objectives were created through public and stakeholder involvement and reflect the underlying locally adopted land use and transportation plans. The goals represent the combined vision of policy-makers, stakeholders, and members of the community.

In this evaluation each alternative is assigned a score for each measure, shown in grey text below each set of results. The best performing alternative for each measure receives a perfect score of 1.0. The other alternatives are assigned values relative to the best score. This methodology provides proportional comparison of the alternatives against one another.

For each goal, specific measures are weighted more heavily as the others, indicated by bold text. The weighting reflects input received from participants at the March 2014 public, results of a public survey posted on the project website from March 26 to April 26, 2014, and professional judgment of Project Management Team staff.

2.2.1 Goal 1 Evaluation and Summary

Goal 1: **Expand attractive multimodal travel options to improve local and regional mobility**

Objectives: Increase transit ridership
Improve transit to reduce travel times
Increase transportation system productivity
Improve bicycle and pedestrian networks
Integrate with other transit service

Key Results:

- All alternatives improve local and regional mobility by providing improved transit and bicycle/pedestrian facilities and connecting to the regional transit network
- Projected daily project ridership in 2035 ranges from 15,000-27,000; Alternative 4 attracts the highest ridership
- Transit travel time savings are highest for alternatives that operate in dedicated right-of-way (Alternatives 2, 3, and 4)

Summary of Findings:
Compared to the other alternatives, Alterative 4 provides the greatest improvement to corridor mobility. Alternative 4 attracts the highest ridership, carries the most people along the corridor, and provides a slightly faster travel time. Alternative 4 performs best under this goal due to Metrorail's relatively higher operating speed and direct connection with the regional rapid transit network. Because the transit vehicles operate in dedicated lanes in the median, Alternatives 2 and 3 provide greater travel time savings than Alternative 1. All alternatives provide improved bicycle and pedestrian improvements and connect to the regional transit system. The evaluation results are presented in **Table 2-2**.

Table 2-2: Goal 1 - Expand Attractive Multimodal Travel Options to Improve Local and Regional Mobility

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Daily project ridership (2035)*	15,200 0.57	16,600 0.63	18,400 0.69	26,500* (BRT 10,600; Metro 22,900) 1.00
Number of new transit riders	1,500 0.32	2,000 0.42	2,500 0.53	4,750 1.00
Number of transit dependent riders*	5,157 0.81	5,438 0.86	5,788 0.91	6,350 1.00
Transit Travel Time Savings (Ft Belvoir to Huntington Metro Station)*	6 min 0.59	9 min 0.85	9 min 0.92	10 min 1.00
Average transit person throughput	1,050 0.40	1,180 0.45	1,360 0.52	2,600 1.00
Ratio of transit person throughput to total person throughput, peak hour	26% 0.55	28% 0.60	32% 0.68	47% 1.00
Number of riders who walked to access transit	4,700 0.90	5,000 0.96	5,200 1.00	5,200 1.00
Provides improved bicycle and pedestrian facilities	High 1.00	High 1.00	High 1.00	High 1.00
Provides connections to regional transit network*	Connects to Huntington Metro Station 1.00	Connects to Huntington Metro Station 1.00	Connects to Huntington Metro Station 1.00	Connects to Huntington Metro Station 1.00
Average Score	**0.70**	**0.78**	**0.83**	**1.00**

*Measure given double weighting in the Average Score

Quantitative Measures:

- **Project ridership:** Average weekday ridership for the alternatives, assessed using the regional forecasting tool for 2035.
- **New transit riders:** number of average estimated weekday transit riders who did not take transit before. These figures represent a mode shift to the project alternatives.
- **Number of transit dependent riders:** Number of projected average weekday riders that use the system that are in the lowest income bracket as defined by MWCOG.
- **Transit travel time savings:** transit travel time savings from Fort Belvoir to Huntington Metrorail Station compared to the No Build. Transit travel time savings obtained from the VISSIM model tool (average of the two segments) were applied to REX No-Build travel time. REX No-Build travel time was calculated using schedule travel time for existing increased by 10 percent to account for future year traffic.
- **Ratio of transit person throughput to total person throughput, peak hour:** This measure compares one-way 2035 peak hour transit volumes against the total number of people traveling along Route 1 (by transit and automobile combined) in the peak hour. Peak direction transit person throughput (maximum load at the peak segment) was obtained from projections of daily ridership. Automobile throughput was calculated using the No-Build peak hour traffic volume in the peak direction at the same location as for transit, multiplied by average auto occupancy (assumed 1.15 persons/car).
- **Number of riders who walked to access transit:** this output from the ridership forecast tool approximates the number of average daily riders who accessed the alternatives by walking to a station. The other riders used a variety of modes including park and ride, kiss and ride, and transfers from other transit.

Qualitative Measures:

- **Provides improved bicycle and pedestrian facilities:** All alternatives propose a 10-foot multiuse path along the entire length of the corridor to improve bicycle and pedestrian facilities. All alternatives are assumed to conform to ADA best practices and guidelines and therefore all alternatives perform well in this evaluation measure.
- **Provides connections to regional transit network:** All alternatives connect to the Huntington Metrorail Station, providing connections to the regional transit network; therefore, all alternatives are assumed to perform well in this evaluation measure.

2.2.2 Goal 2 Evaluation and Summary

Goal 2: **Improve safety; increase accessibility**
Objectives: Provide accessible pathways
Reduce modal conflicts
Improve pedestrian crossings
Maintain traffic delays at acceptable levels

Key Results:

- All alternatives assume construction of additional lanes or guideway for transit vehicles, and therefore have comparable, relatively minor impacts on traffic operations.
- Alternative 1 operates in the curb lane, providing superior pedestrian access to stations, but results in slower travel time and precludes a future on-street bike lane.
- Alternative 1 operates in the curb lane which means that the frequent curb cuts and access points along Route 1 degrade reliability of the transit service.
- Alternatives 1 and 4 have the narrowest roadway section which minimizes the total distance of exposure for a pedestrian crossing the street.

Summary of Findings:
This goal relates to the performance of the overall transportation system; it compares the alternatives in terms of network performance and access to corridor destinations. All of the alternatives have been developed to improve accessibility and safety. Alternative 4 performs best overall under this goal, as the three-mile underground Metrorail extension allows for a narrower cross-section, full modal separation, reduced impact on turning vehicles, and convenient pedestrian access to stations.

This goal highlights the key trade-offs between median-running and curb-running transit, including pedestrian accessibility to stations, travel time, transit reliability, and flexibility for a future on-street bike lane. Alternative 1 operates in the curb lane, and Alternatives 2, 3, and 4 operate in the median. Although curb-running transit allows convenient pedestrian access to stations, it can lead to greater variability and slower travel times for transit and traffic because it shares its dedicated lane with local buses as well as cars making right turns. In general, traffic evaluation results show that impacts to the auto network are similar for curb-running versus median-running transit. However, in practice curb-running transit introduces more friction from an operations perspective; median-running transit preserves dedicated transit operations and allows different access and urban design approaches as property along Route 1 is developed and redeveloped.

With implementation of bike lanes, curb-running transit also introduces points of conflict between transit vehicles and bicycles and between transit passengers and bicyclists.

The evaluation results are presented in **Table 2-3**.

Table 2-3: Goal 2 Evaluation – Improve Safety and Increase Accessibility

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Pedestrian access to station stops*	Medium 0.60	Medium 0.60	Medium 0.60	Medium 0.60
Pedestrian crossing time (including signal delay)*	102 sec 0.95	116 sec 0.84	116 sec 0.84	97 sec 1.00
Automobile travel time (minutes during peak hour, Ft. Belvoir to Huntington Station)	24.0 0.99	23.7 1.00	24.0 0.99	23.7 1.00
Automobile network delay, Ft. Belvoir and Hybla Valley test segments (vehicle hr/hr)*	466 0.99	468 0.98	460 1.00	468 0.98
Traffic impacts due to turning vehicles (left turns)	Minimal impact 0.80	Moderate impact 0.40	Moderate impact 0.40	Moderate impact 0.40
Impacts due to turning vehicles (right turns)	Significant impact 0.20	No impact 1.00	No impact 1.00	No impact 1.00
Preserves flexibility for bike lane in higher activity nodes	Less flexible 0.40	More flexible 0.80	More flexible 0.80	More flexible 0.80
Average Score	**0.71**	**0.79**	**0.79**	**0.82**

*Measure given double weighting in the Average Score

Quantitative measures:

- **Pedestrian crossing time (including signal delay):** measure of the total time it takes a pedestrian to cross from one side of the street to the other. In general, shorter crossing times and crossing distances encourage pedestrian compliance (preventing pedestrians from jay-walking) and improve pedestrian access to transit. Pedestrians prefer shorter crossing time. The crossing time is informed by the number of lanes and total right-of-way width, including buffer areas and a 10-foot multi-use path.
- **Automobile travel time:** estimated automobile travel times between Fort Belvoir and the Huntington Metrorail Station. Times are estimated based on the VISSIM traffic simulation modeling for each alternative for the Hybla Valley and Fort Belvoir segments of detailed analysis. The percent

change in travel times for the alternatives compared to the No-Build scenario were applied to the average peak direction, peak hour No-Build trip time between Fort Belvoir (Gunston Road/Route 1 intersection) and the Huntington Metrorail Station.

- **Automobile Network Delay, Hybla Valley and Fort Belvoir Segments (vehicle hr/hr):** measure of total network delay (including cross street vehicles and Route 1 vehicles) experienced by motorists during the peak hour for the Hybla Valley and Fort Belvoir segments. The measure combines delay for the two segments that were modeled in detail using VISSIM.

Qualitative measures:

- **Pedestrian access to stations:** evaluation of the convenience and ease for pedestrians to access a station stop. Alternative 1- BRT Curb allows pedestrians to board from the curb; however, pedestrians must cross the entire street width for stations providing service in the opposite direction. Alternatives 2, 3, and 4 require pedestrians to cross the street to board the vehicle in the median regardless of the direction of service. For the Metrorail segment of Alternative 4, the stations are assumed to be underground and pedestrians access the station from street-level.

- **Transit interaction with left turning automobiles:** for left turns, alternatives that operate in the median (Alternatives 2, 3, and 4) have a more significant impact on left-turning vehicles. This is due to: 1) left turn movements operate with protected phase-only under median running transit to improve safety, 2) median running transit conflict with both left turn phases (e.g., southbound left and northbound left movements on Route 1), therefore Transit Signal Priority (TSP) for transit has a greater impact in terms of delay on left turning vehicles.

  Along some areas of the corridor it may be advisable to prohibit left turns at certain locations, and thus reduce delays to transit vehicles and general traffic. This approach may be more feasible in the longer term, as the local street network develops and provides more alternative pathways for access across Route 1. The VDOT Access Management Regulations and Standards and associated documents have provisions that apply.

- **Interaction with right turning vehicles:** for right turns, curb running BRT (Alt 1) has more impact on right-turning vehicles as they conflict with transit flow turning both in and out of intersecting streets and access points. The Metrorail segment of Alternative 4 does not affect left or right turns, as Metrorail operates underground. Alternatives 2 and 3 received the same score, while Alternative 4 performed slightly better due to the short Metrorail extension that would not cause additional impacts.

  With ongoing redevelopment along Route 1—and differing configurations for access to that development—a curb-running configuration can lead to more obstacles in maintaining continuity of transit operations. In general, as the corridor redevelops, one of the objectives would be to consolidate access points and introduce additional cross streets and local street network. These measures will reduce some of the traffic delay associated with the current large numbers of access points and provide improved safety for travelers on all modes.

- **Preserves flexibility for bike lane in higher activity nodes**: as nodes develop, it is anticipated that bicycles would be re-accommodated (or separated from the proposed multiuse path) at the curb to reduce conflicts with pedestrians in these high-activity areas. With curb-running transit, bicycle traffic is routed behind the station boarding area, or moved into the curb lane where it can be in conflict with transit vehicles serving the stop. The result is degraded transit operations, increased bicyclist stress, and increased safety concerns. Transit vehicles operating in a dedicated median or underground do not conflict with on-street bicycle lanes.

2.2.3 Goal 3 Evaluation and Summary

Goal 3: **Increase economic viability and vitality of the corridor**

Objectives: Increase and improve connectivity to local and regional activity centers
Encourage and support compact, higher density, mixed use development consistent with local plans, policies, and economic objectives
Secure public and investor confidence in delivery and sustainability of new transit investments
Provide high-capacity transit facilities at locations where existing and future land uses make them mutually supportive

This goal encompasses two distinct categories of measures; results and findings are summarized under these two categories:

3A: Ability to support corridor economic development, and
3B: Cost effectiveness

Key Results for 3A:

- Alternatives 3 and 4 offer the greatest transit travel time savings, suggesting that these alternatives could increase the pace of new development built in the corridor and lead to additional new commercial development.
- All of the alternatives provide improved access to jobs and access by employers to workforce.
- Alternatives 1 and 2 have a higher probability of commencing operations within ten years. Alternatives 3 and 4 would not be operational within the next ten years given the greater engineering and construction requirements.

Key Results for 3B:

- Alternatives 3 and 4 are the most expensive to construct and operate, as well as the least cost effective.

Summary of Findings, 3A:

This goal relates to both the viability of implementing the alternatives, and their utility as catalysts for development in the corridor. Alternative 2 performs best overall under this goal because it is relatively affordable, provides good support for development plans, and is more flexible than Alternative 1 to accommodate future conversion to a rail technology.

All alternatives improve corridor mobility by improving travel time and increasing accessibility; Alternative 4 performs highest in terms of supporting and potentially spurring economic development for the corridor because of its benefits to corridor mobility. This relationship between transportation and economic development suggests that as all alternatives improve corridor mobility, all will contribute and support economic development in the corridor. In terms of land redevelopment and the potential for a supporting street network expansion, literature reviews suggest that rail alternatives (Alternatives 3 and 4) are a stronger catalyst.

The evaluation results are presented in **Table 2-4**.

Table 2-4: Goal 3a Evaluation – Economic Development

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Tendency to encourage additional development*	Medium-Low 0.50	Medium 0.60	High 0.80	Medium-High 0.70
Tendency to accelerate pace of development	Some potential to increase pace of development 0.50	Some potential to increase pace of development 0.70	More potential to increase pace of development 0.80	More Potential to increase pace of development 0.80
Per passenger O&M cost savings associated with increased population and employment growth	$0.75 0.66	$0.68 0.60	$1.14 1.00	$0.86 0.75
Jobs within 60 minutes (change over No Build)*	636 0.22	920 0.32	1,163 0.40	2,878 1.00
Potential to begin transit operations within 10 years**	High 0.8	High 0.8	Low 0.4	BRT portion is high; Metrorail is Very Low 0.5
Average Score	**0.56**	**0.62**	**0.60**	**0.72**

*Measure given double weighting in the Average Score
**Measure given triple weighting in the Average Score

Qualitative Measures:

- **Tendency to encourage additional land development:** Transportation, and transit investment in particular, can serve as a strong catalyst for land redevelopment. Different transit mode alternatives are associated with different levels of "catalyst" effect on land development. Among the alternatives, Metrorail encourages the highest densities and pace of development, followed by LRT then BRT.

  Dedicated guideway transit (transit operating in its own facility) and especially rail transit, has a greater catalytic effect on land development than non-rail, shared lane transit. This redevelopment provides additional value and an opportunity to develop a more complete local street network. An expanded local network has several benefits including increasing alternative routes, potentially reducing trip distances by providing more direct linkages, promoting conversion to bicycle and pedestrian trips, and the opportunity for local trips (trips less than 3 miles) to be completed solely on the local network without adding traffic to the main line corridor. Alternative 3 and 4, both involving dedicated guideway rail, would serve as a stronger catalyst for land redevelopment and local network expansion.

- **Tendency to accelerate pace of development:** As with the catalyst effect of transit investment on the quantity of development, studies have also suggested a correlation between transit investment and the speed with which private projects are conceived and carried out. Among the transit modes, Metrorail encourages the highest densities and pace of development, followed by LRT then BRT. In the qualitative rating for Alternative 4, the effect of Metrorail is averaged with the effect of BRT.

- **Potential to begin transit operations within 10 years:** More favorable ratings are associated with alternatives with smaller right-of-way impacts, less intensive construction requirements, and existing technologies. More intensive construction, such as Alternative 3 and 4 could require more detailed design, environmental documentation, and funding approaches, which would expand the planning, engineering, and construction timeframes.

  This measure also speaks to the question of which organizations will implement the recommended project. To construct the investments and begin operations within 10 years, the project will need to rely on an experienced agency or jurisdiction for construction and operations, and the project will most likely need to rely on transit technologies already in use in the Washington, DC area. This consideration again favors Alternatives 1 and 2 which rely on bus technologies that are operated currently by Fairfax County, Prince William County, and WMATA.

<u>**Quantitative Measures:**</u>

- **Jobs within 60 minutes (change over No build):** total number of jobs accessible within 60 minutes of the project. This measure is a function of transit corridor travel time. As travel time savings increase, the more jobs are accessible within 60 minutes from trip origins along the Route 1 corridor.

- **Difference in O&M cost per rider associated with theoretical 50% ridership increase:** this quantitative measure is a proxy for the capacity of an alternative to carry additional passenger demand without adding significantly to O&M costs. The measure assumes that if population and employment increase, transit ridership would also increase. For each of the alternatives, a 50% increase in ridership would be accompanied by savings in per passenger costs related to the ease of adding passenger capacity. Alternative 3 performs best because the LRT vehicles have adequate capacity to accommodate the additional ridership; for Alternatives 1, 2, and 4 additional BRT vehicles would be added during peak periods.

Summary of Findings, 3B:

This area relates to the cost of implementing the alternatives. Alternatives 1 and 2 are less capital and operating cost intensive, while Alternative 4 is the most capital and operating cost intensive. Cost effectiveness follows the same general trend.

The evaluation results are presented in **Table 2-5**.

Table 2-5: Goal 3b Evaluation -- Cost Effectiveness

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Estimated Capital Cost ($)*	$832 M ($10M Ft Belvoir Shuttle) 1.00	$1.01 B ($10M Ft Belvoir Shuttle) 0.83	$1.56 B ($10M Ft Belvoir Shuttle) 0.53	$2.46 B (Metro $1.46B; BRT $1B; Ft Belvoir Shuttle $10M) 0.34
Estimated Annual O&M cost ($)*	$18 M (BRT: $13M, Ft Belvoir Shuttle: $5M) 0.94	$17 M (BRT: $12M, Ft Belvoir Shuttle: $5M) 1.00	$24 M (LRT: $19M; Ft Belvoir Shuttle: $5M) 0.71	$31 M (Metro: $17M; BRT: $8M; Ft Belvoir Shuttle: $5M) 0.50
Cost per rider ($) (Annualized capital + operating cost)/ Average of 2015 and 2035 ridership)	$21 1.00	$22 0.95	$30 0.70	$30 (Metrorail: $26; BRT: $32) 0.70
Average Score	**0.98**	**0.93**	**0.65**	**0.54**

*Measure given double weighting in the Average Score

Quantitative Measures:

- **Estimated Capital Cost:** estimated project capital cost by alternative, including bicycle and pedestrian improvements, roadway, and transit improvements. Capital cost estimates at this stage in project development are very general. These estimates do, however, reflect an accurate order-of-magnitude comparison among transit alternatives.

- **Estimated Annual Operating and Maintenance (O&M) cost:** estimated yearly transit operations and maintenance cost by alternative. Unit operating costs are based on regional experience and peer systems. In general, costs are lower for Bus Rapid Transit and higher for Light Rail and Metrorail.

- **Cost per rider ($):** Annualized capital cost of the project plus the annual operating and maintenance cost, divided by yearly estimated project ridership (average of 2015 and 2035 project boardings). This measure corresponds to the FTA evaluation criterion on cost effectiveness, where a "medium" rating is below $10 per annualized project boarding. Note that for the full 15-mile corridor, none of the alternatives is very close to this threshold, so all fall far below the 1.0 scoring level.

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2.2.4 Goal 4 Evaluation and Summary

Goal 4: **Support community health and minimize impacts on community resources**
Objectives: Minimize negative impacts to the natural environment
Contribute to improvements in regional air quality
Increase opportunities for bicycling and walking to improve community physical health

Key Results:

- Alternative 1 requires the least additional right-of-way impacts and therefore would affect relatively fewer community resources.
- Alternatives 3 and 4 have the greatest ability to convert auto trips to non-auto alternatives, leading to a greater reduction in Vehicle Miles Traveled (VMT) and diversion of trips from I-95 and I-395 to transit—both of which minimize air quality impacts.
- Alternatives 3 and 4 would lead to the greatest temporary construction impacts. Alternative 4 includes tunneling.
- Alternatives 3 and 4 would add the most to land value which, in turn, could be leveraged to help construct the local street network and fund other supporting services.

Summary of Findings:

This goal relates to both the ability of an alternative to increase transit mode share and decrease automobile use as well as the potential impacts on the environment to the proposed project. Alternative 1 has fewer potential environmental effects because it proposes less right-of-way expansion, while Alternatives 2, 3, and 4 would attract more riders and lead more people to use transit rather than drive.

Several of the measures are drawn from an "environmental scan" conducted for each alternative according to typical approaches for assessing project impacts. Additional detail is provided in the *Environmental Scan Report*.

The evaluation results are presented in **Table 2-6**.

Table 2-6: Goal 4 Evaluation -- Support Community Health and Minimize Impacts on Community Resources

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Change in Vehicle Miles Traveled*	(20,000) 0.44	(26,000) 0.58	(34,000) 0.76	(45,000) 1.00
Trips diverted from I-95/I-395	700 0.58	900 0.75	1,200 1.00	1,200 1.00
Temporary Construction Impacts	Least Intensive 0.40	Moderate 0.60	Intensive 0.20	Intensive 0.20
Ratio of environmental benefits to annualized project cost (FTA criterion)	2.0% 0.91	2.2% 1.00	1.9% 0.86	1.7% 0.77
Total additional right-of-way required*	20-30 1.00	30-40 0.73	35-35 0.67	30-40 0.73
Environmental Impacts: Parklands, Cultural Resources, Wetlands	Fewest Impacts 1.00	Some impacts 0.75	Moderate impacts 0.62	Some impacts 0.75
Average Score	**0.75**	**0.69**	**0.69**	**0.77**

*Measure given double weighting in the Average Score

Quantitative Measures:

- **Change in Vehicles Miles Traveled:** Represents the change in total vehicle miles traveled in the region, compared to the No Build Alternative. This measure correlates with travel time and the attractiveness of the transit mode. Because Alternative 4 has the fastest corridor travel time and integrates with the regional Metrorail system, more people would change their travel choices away from private automobile. Alternatives 1, 2, and 3 have a measureable effect on travel choice.

- **Total right-of-way (ROW) required (acres):** measure of the area of additional ROW required for the Multimodal alternatives. Alternative 1 has the narrowest typical cross section and has the fewest potential ROW impacts. Alternatives with a dedicated median for transit operations (Alternatives 2, 3, and 4) have more potential ROW impacts. **Table 2-7** is a summary of the initial right-of-way impact assessment.

Table 2-7: Summary of Potential Right-of-Way Impacts

Category of Potential Impacts	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Total Area (acres)	20-30	30-40	35-35	30-40
Number of Parcels	290-310	340-360	350-370	340-360
Number of Buildings	15-20	25-30	25-30	25-30

- **Ratio of environmental benefits to annualized project cost:** this measure considers four different elements of projects' projected environmental benefits - air quality, greenhouse gas emissions, energy savings, and safety – and presents those benefits as a ratio relative to annualized project cost. This is one of the six Project Justification Criteria that FTA uses to evaluate a project. All alternatives perform similarly, and each would receive a Medium rating, defined as 0% to 5% for this criterion.

Qualitative Measures:

- **Environmental impacts:** this measure combines several of the resource areas that would be documented in subsequent environmental analysis including parklands, wetlands, and architectural/archaeological resources. It takes an average of the total potential area and number of impacts for each of these resources, and then assigns a qualitative measure. Alternative 1 tends to have the fewest impacts, as it has the narrowest right-of-way, while Alternative 2, 3 and 4 with their wider cross-sections have greater impacts.

- **Temporary construction impacts:** this measure is a preliminary comparison of the degree of potential temporary construction impacts associated with each alternative. Alternative 1 performs best in this category because it requires the least amount of roadway widening and reconfiguration. Alternatives 3 and 4 are the most capital intensive, and would cause more temporary construction impacts; impacts could include lane closures and land reserved for temporary laydown and storage. The current Alternatives Analysis has not included detailed assessment of the staging or sequencing of construction activities.

2.3 Project Implementation Factors

This section of the report focuses on the Project Implementation Factors: critical indicators of successful and timely implementation, and financial feasibility of the project Alternatives.

The implementation factors were developed based on input received by public participants at the March 26, 2014, public meeting; County leadership and elected officials during the Executive Steering Committee meeting on March 20, 2014; and technical advisors during the Technical Advisory Committee Meeting on March 6, 2014. Supplemental analysis was undertaken during Summer 2014 to complete a phasing and funding assessment that helped to differentiate the study alternatives and highlight the trade-offs surrounding implementation. The focus was on Alternatives 2 and 4, which performed best in the evaluation against the project goals and objectives.

The implementation factors are organized below as follows:

- **Development levels appropriate to the type of transportation investment**
    - Projected population and employment levels should support the intensity of land use typically associated with the mode.
    - County Comprehensive Plans should reflect the density required to support the mode.
    - A supporting street grid and other public infrastructure and services should be reflected in updated Comprehensive Plans.

- **Ability to secure funding for recommended improvements**
    - The recommended project should be potentially competitive for federal funding through FTA Capital Investment Program.
    - Project costs should not exceed the reasonable expectation for local funding

The evaluation and comparison of alternatives according to these factors are described in the subsequent sections.

2.3.1 Development Levels and Supporting Infrastructure

Population and employment levels in the corridor are increasing, and transportation services and infrastructure are necessary to accommodate growth. This assessment seeks to gauge the appropriate transportation investments given the projected levels of development.

Development Factor 1: Anticipated growth levels and appropriate transportation investment

Key Results:

- Alternatives 1 and 2 are most appropriate given the current and anticipated levels of population and employment growth.
- Major changes in the amount and concentration of population and employment growth would be necessary before Alternatives 3 and 4 are viable.

Summary of Findings:

Transportation investments are developed to respond to defined needs. The need for transit service relates to the levels of activity along the project corridor. In other words, a major transit investment must be supported by an appropriate level of population and employment density.

Transit investment can serve as a catalyst for growth in a project corridor, but unless there is a basic level of activity and land value already in place, decision makers run the risk that transit investments are too far ahead of activity levels and service is not utilized to an extent that—in the context of other pressing needs—justifies the expense of the project.

The DRPT Multimodal Design Guidelines describe population and employment density thresholds typically associated with levels of transit service investment. Taking into account the MWCOG projections for population and employment in 2035, and in consideration of the adopted Fairfax County and Prince William County Comprehensive Plans, Alternatives 1 and 2 are the most appropriate near-term transit investments given the projected growth and anticipated development levels. To support Alternatives 3 or 4, there would need to be a different expectation for the level of population and employment growth, and a revision to the Comprehensive Plans to accommodate the higher growth levels.

Development Factor 2: County Comprehensive Plans should reflect activity levels and station locations

Key Results:

- At the northern end of the corridor, the current Fairfax County Comprehensive Plan allows for growth levels to support BRT (Alternatives 1 and 2) or LRT (Alternative 3). Current County Comprehensive Plans for areas south of Fort Belvoir do not generally support a premium transit investment.
- Changes in the planned amount and concentration of development would be necessary before Alternatives 3 and 4 are viable.

Summary of Findings

In consideration of the adopted Fairfax County and Prince William County Comprehensive Plans, Alternatives 1 and 2 are the most appropriate near-term transit investments given the projected growth and anticipated development levels. To support Alternative 3 or the Metrorail extension as part of Alternative 4, there would need to be a different expectation for the level of population and employment growth, and significant revisions to the Comprehensive Plans to accommodate the higher growth levels.

The Fairfax County and Prince William County Comprehensive Plans articulate a development vision for the corridor and specify the density levels and FAR planned for this corridor. This study has developed a comparison of the Comprehensive Plan development levels against the DRPT Multimodal Design Guidelines thresholds for activity levels typically associated with transit investment types. BRT alternatives (Alternatives 1 and 2) are generally supported by the Comprehensive Plan activity density levels, while rail alternatives (Alternatives 3 and 4) are not currently supported by the Plans.

With regard to transit station areas, the Fairfax County Comprehensive Plan establishes Community Business Centers along the corridor between Fort Belvoir and Huntington. Transit stations for each of the alternatives have been located according to these clusters of higher-intensity development. Future updates to the Comprehensive Plans would reinforce proposed transit station areas by focusing planned development and investment in these areas.

Development Factor 3: A supporting street grid and other public infrastructure and services

Key Results:

- Traffic analysis shows that with growth levels that support BRT/LRT, an enhanced local street grid would be required, including continuous street capacity parallel to Route 1—the equivalent of one new two-lane street.
- With growth levels that support Metrorail, more robust local street grid enhancements would be required, including continuous street capacity parallel to Route 1—the equivalent of up to six new two-lane streets.
- To accommodate growth, Route 1 transportation investment must be complemented by other major features including roads, schools, public safety, and parks. Metrorail supportive growth levels require significantly more infrastructure investment than BRT or LRT levels.

Summary of Findings:

A supporting street grid and other public infrastructure and services would need to be in place to support the alternatives and should be reflected in updated Comprehensive Plans. Even though these investments fall outside the formal scope of the Route 1 Multimodal Alternatives Analysis, they are important as the Counties plan for the future development and redevelopment of the Route 1 corridor.

2.3.2 Project Funding

Funding Factor 1: Ability to secure Federal Transit Administration grant funding for recommended transit projects

Key Results:

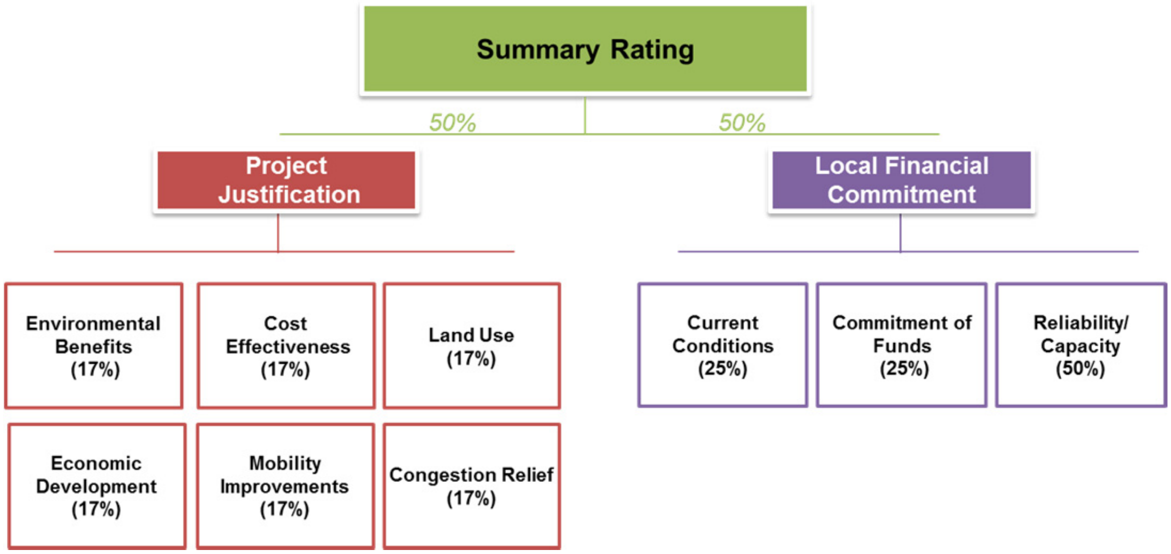
- None of the Alternatives—as a full 15-mile multimodal project—is competitive for a grant through the FTA Capital Investment Program.
- The northern segments of Alternatives 1 and 2, between Fort Belvoir and Huntington, could be competitive for a grant through the FTA Capital Investment Program.
- Alternatives 3 and 4 are more capital-intensive, and would likely not be competitive for FTA grants.
- With significant population and employment growth, and strong growth in transit ridership, a Metrorail extension (Alternative 4) could be competitive for an FTA grant in the long term.

Summary of Findings:

Given constrained local, regional, and state budgets, the transit elements of the recommended multimodal project should be potentially competitive for federal funding through FTA Capital Investment Program, which has typically funded eligible transit projects at 50 percent of project capital costs.

Federal funding competitiveness for the FTA Transit Capital Investment Program is based on Project Justification Criteria and Local Financial Commitment (see **Figure 2-1**). For each criterion FTA assigns a rating from Low to High; a project must receive at least a Medium rating on both project justification (average of six criteria) and local financial commitment to obtain a Medium or better rating overall.

Figure 2-1: Project Rating Factors for FTA Capital Investment Program



Project Justification Criteria

Regarding Project Justification, several criteria would be consistent across alternatives; differentiators relate to Mobility Benefits (ridership) and Cost Effectiveness (cost per rider). None of the alternatives performs well for Cost Effectiveness, but the BRT alternatives, Alternatives 1 and 2, come closest to reaching a Medium rating. Section 9 below provides more detail related to potential performance of the alternatives related to the Project Justification Criteria.

Local Funding Commitment

Over the past ten years, federal funding grants have become increasingly competitive, as more projects apply for the program while the amount of available funding remains generally consistent. Recently updated guidance from the Federal Transit Administration indicates that projects with higher levels of local funding are more competitive and more likely to receive a federal grant.

Programming for locally funded transportation projects in Fairfax County and Prince William County shows commitments to major projects through 2020. After 2020 there are opportunities to commit local funds to a new significant project.

Funding Factor 2: Project costs should not exceed the reasonable expectation for local funding

Key Results:

- Without a strong commitment of funds from Fairfax County and Prince William County, the project will not only be less competitive for federal funding, it will not be feasible. The local funding commitment is an indicator of the likelihood that the project will be implemented in a reasonable time frame**.**
- Alternatives 1 and 2 are the least capital intensive projects and therefore are more easily funded through existing funding sources.
- Alternatives 3 and 4 are more capital intensive, and would exceed the capacity of current programs and funding sources.

Summary of Findings:

The project team developed funding assumptions for each of the Alternatives, and these were presented and discussed with senior County staff. First, these discussions confirmed the assumption that a mix of local, regional, state, and federal funds will be required to implement any of the Alternatives. Second, the project is constrained by the fact that local and regional transportation funding has been programmed and committed to other projects for the next six years (through 2020). Section 9 below provides more detail related to the project funding assumptions.

Beyond 2020, transportation and capital improvement programs will allow for addition of new projects, but there are other committed projects that will limit the amount of funding that may be available for Route 1. Therefore Alternatives 3 and 4, with their high overall capital and O&M costs, would be difficult to implement in the near term. Alternatives 1 and 2 are more likely to be funded in the near term.

APPENDIX G

Environmental Report and NEPA Recommendation

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Route 1
Multimodal Alternatives Analysis

ROUTE 1 MULTIMODAL ALTERNATIVES ANALYSIS

ENVIRONMENTAL REPORT AND NEPA RECOMMENDATION

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1.0 Introduction

Note: *The findings in this document are preliminary. Documentation of potential project impacts is "preliminary" and intended for use by the project team. As the project advances, this document will serve as an aid for the responsible agencies as they oversee environmental documentation and other planning and design activities.*

The Virginia Department of Rail and Public Transportation (DRPT) is undertaking a Multimodal Alternatives Analysis in coordination with Fairfax County, Prince William County, the Virginia Department of Transportation (VDOT), and the Office of Intermodal Planning and Investment (OIPI). The purpose of the project is to provide improved performance for transit, bicycle and pedestrian, and vehicular conditions and facilities along the Route 1 corridor that support long-term growth and economic development.

Corridor needs include improved traffic flow; more frequent and more reliable transit "trunk" service; and transportation capacity that will accommodate planned development in the corridor. Multimodal alternatives have been conceived to address these critical needs.

The purpose of this technical memorandum is to provide a preliminary inventory of environmental resources within the study corridor, and review potential impacts that may result from the construction and implementation of the various alternatives under evaluation. This inventory of resources and potential impacts informs the evaluation of alternatives and assists in framing the appropriate level of environmental documentation associated with each alternative. Categories for discussion in this document were chosen based on the specific features of this corridor and the list of considerations that are typically included in a NEPA document.

The National Environmental Policy Act (NEPA) of 1969 requires that federal agencies assess the potential impacts of their actions on the human and natural environment. In addition to NEPA, various state and local regulations and policies require proposed activities to obtain a variety of permits and approvals. This memorandum will help inform the lead agencies who ultimately determine the appropriate level of NEPA documentation for the recommended alternative.

1.1 Federal Environmental Documentation Requirements

In order to advance the proposed transit improvements using federal funds, the appropriate level of federal environmental review must be undertaken. Under NEPA, there are three possible classes of action that determine the documentation required. Class I actions are those which are likely to significantly affect the environment, and require preparation of an Environmental Impact Statement (EIS). Class II actions are those which do not individually or cumulatively have significant environmental impacts. For these actions, a Categorical Exclusion (CE) would be issued. Projects qualifying for CEs can either be listed in regulations, in either 23 CFR 771.117 (for FHWA projects) or 23 CFR771.118 (for FTA projects) or agreed to by the federal agency. VDOT and FHWA maintain a list of additional highway projects beyond those listed in regulation that also qualify for a CE. Class III actions are those where the significance of the environmental impact is not clear. These actions require the preparation of an Environmental Assessment (EA), which can result either in a Finding of No Significant Impact (FONSI), or in an identification of potentially significant impacts, in which case an EIS is required.

Given the phased nature of the project, documentation may proceed in a number of ways. The discussion of NEPA class of action will be tied to the anticipated phasing of corridor projects. The project team will discuss the findings of the environmental scan with appropriate federal agency staff who will ultimately determine the appropriate level of documentation for the recommended alternative and implementation phasing approach.

1.2 Study Area Overview

Between I-495/Capital Beltway and Fort Belvoir, the northern section of Route 1 within Fairfax County is frequently referred to as Richmond Highway and is comprised mostly of low-density shopping centers, apartment complexes and office buildings.

Most of the corridor from Beacon Hill through Hybla Valley and Gum Springs is a continuous commercial strip, including several large retailers and the renovated Mount Vernon Plaza. Development is more limited toward Mount Zephyr/South County, which primarily consists of a small shopping center anchored by the South County Government Center. Further south, the Woodlawn area serves as an access point for the historic Mount Vernon site and supports low-density commercial development, along with motels and multi-family and affordable housing.

South of the Woodlawn area and beginning at Mulligan Road and Mount Vernon Highway, the corridor includes views of Woodlawn Plantation and Stables as well as additional strip developments.[1] Beyond Woodlawn Road are two entrances to Fort Belvoir. Industrial sites occur beyond Fort Belvoir on the way to Lorton, where there are both multi-family and single family housing, as well as commercial development. Fort Belvoir is the single largest land use within the corridor. The southern terminus of the project corridor is Woodbridge, across the Occoquan River in Prince William County. This section of Woodbridge is comprised of commercial development with large parking areas and is being master planned for mixed-use development to complement the nearby Virginia Railway Express (VRE) station.

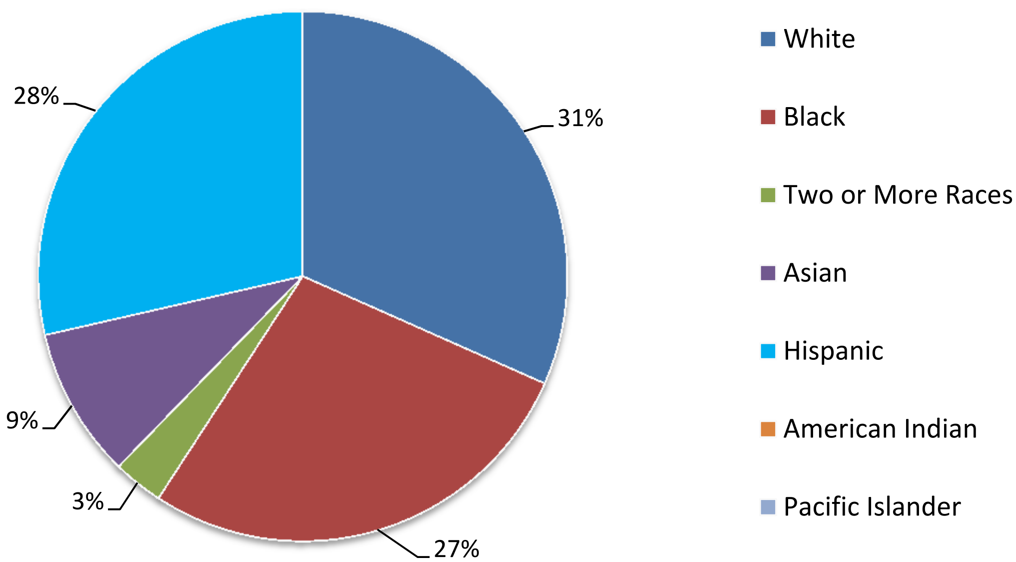
1.2.1 Demographics

According to the 2010 US Census, the population within ½ mile of the 15-mile study corridor of Route 1 is 72,823. Minorities (black, Asian-American, American Indian and Alaska Native, Pacific Islander, and other races) comprise 69 percent of the study area population. **Figure 1-1** shows the racial distribution of the population.

[1] This segment of the corridor, between Mulligan Road and Telegraph Road, is scheduled for widening to six-lanes by VDOT, beginning in 2014.

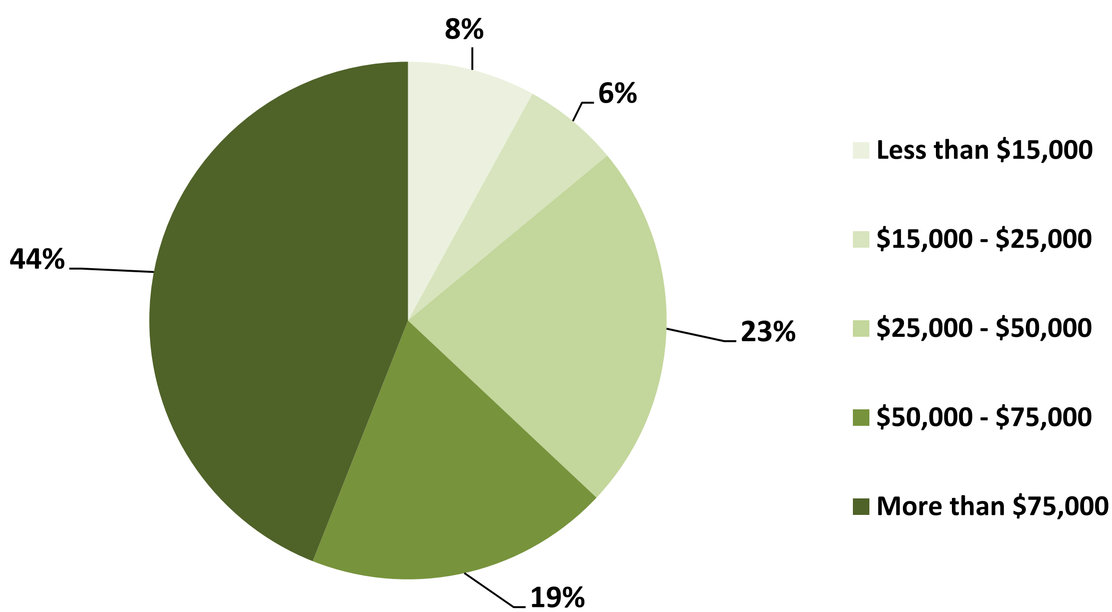
The American Community Survey (ACS) 2008 – 2012 identified 25,099 households within the study area. The median household income of the study area is $86,598. About 10 percent of the study area is considered low-income. **Figure 1-2** provides a graphic representation of the households by household income within the study area.

Figure 1-1: Study Area Distribution of Population by Race/Ethnicity (2010)



Source: U.S. Census Bureau. Census 2010.

Figure 1-2: Study Area Distribution of Households by Annual Household Income



1.2.2 Existing Transit Service

Several transit operators provide service along the Route 1 Corridor:

- **Fairfax County Connector (FCC):** operates standard local service and limited-stop service around the corridor, as well as circulator services to Fort Belvoir.

- **Potomac and Rappahannock Transportation Commission (PRTC):** operates local service (OmniLink), shuttle service (MetroDirect), and commuter service (OmniRide), in the Woodbridge portion of the Route 1 corridor.

- **Washington Metropolitan Area Transit Authority (WMATA):** operates the Richmond Highway Express Services (REX) as a limited-stop express bus service between Fort Belvoir and the Huntington and King Street Metrorail Stations. REX service operates in regular traffic along Richmond Highway, but vehicles feature signal optimization technology that adds time to green traffic signals when buses are approaching intersections. REX vehicles also features unique branding scheme on buses and has separate bus stop flags to differentiate it from other transit services.

In addition to bus transit service, the Virginia Railway Express (VRE) provides commuter rail services parallel to the southern portion of the Route 1 corridor. The VRE Fredericksburg Line operates service from Fredericksburg to Union Station in Washington, DC. VRE has stations in the Route 1 Corridor at Woodbridge and west of Route 1 at Lorton. **Figure 1-3** shows the existing transit network.

Ridership varies between bus routes along the Route 1 corridor. Routes with the greatest frequency tend to have the highest ridership. The three routes with the highest ridership are: WMATA's REX service with 3,519 daily boardings; FCC's Route 171 with 3,238 daily boardings; and FCC's Route 151 with 1,232 daily boardings.

Figure 1-3: Existing Transit Network

1.3 Purpose and Need of the Project

The need for the project stems from existing and expected transportation problems along the corridor related to limited transit service, poor bicycle and pedestrian facilities, and high traffic volumes. These deficiencies limit accessibility and are not supportive of the desired economic development growth along the corridor.

The existing carrying capacity of the corridor is constrained. People traveling by automobile experience congestion and delays; people traveling by transit experience infrequent service as well as delays because of traffic congestion. Integrated multimodal improvements are needed to support the anticipated high levels of employment and residential growth. County Comprehensive Plans envision this growth in the form of focused, pedestrian- and transit-oriented development. Without transportation capacity improvements that encourage pedestrian and transit travel, it is unlikely that the projected growth can be accommodated within the corridor, and the associated economic opportunity of additional jobs and residents will be limited.

Attractive multimodal options are needed to help serve the high transit-dependent population who rely on bicycling, walking and/or transit to meet the needs of daily life. According to the American Community Survey (2008-2012), within ½-mile of the study corridor, there are over 2,000 households that do not own a car.

Of the existing transit riders, nearly three-quarters of existing transit riders have no access to an automobile as a travel alternative. Over half of corridor transit riders have household incomes of less than $30,000. Preserving community and affordability over the long term requires improved transit and other transportation options to meet the needs of this population.

The project identified four specific areas of need for a major multimodal investment in the corridor: Transit, Pedestrian and Bicycle, Vehicular, and Land Use/Economic Development. **Table 1-1** summarizes the problems and need by area.

Table 1-1: Problems and Needs Summary

Multimodal Area	Problems and Needs	
Transit	• Transit travel time is not competitive with auto • Peak and off-peak transit service is infrequent • Dwell time at stops and peak period congestion delays transit	*Attractive and competitive transit service to support transit dependent population*
Pedestrian/ Bicycle	• Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness of single occupancy vehicle travel • Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops • Bicycle access is difficult with few alternative paths.	*Safe and accessible pedestrian and bicycle access*
Vehicular	• Users experience significant congestion along Route 1 during peak periods • Travel times are highly variable and unpredictable	*Appropriate level of vehicle accommodation*
Land Use/Economic Development	• Current development patterns fail to optimize development potential at designated activity centers • Existing street connectivity is poor at commercial nodes	*Support and accommodate more robust land development to support anticipated population and employment growth*

1.4 Alternatives

This section describes the four refined multimodal alternatives under evaluation. The four refined alternatives assume the same vehicular lane and bicycle/pedestrian facility configuration, but the transit mode and operating assumptions vary. The refined multimodal alternatives assume a consistent, six-lane vehicular lane configuration and a 10-foot multi-use path along the majority of the corridor. The four refined alternatives are referred to by the transit component and include:

1. Alternative 1 - Bus Rapid Transit – Curb Running
2. Alternative 2 - Bus Rapid Transit – Median Running
3. Alternative 3 - Light Rail Transit – Median Running
4. Alternative 4 - Metrorail/Bus Rapid Transit Hybrid – Yellow line extension to Hybla Valley with supporting Bus Rapid Transit – Median Running to Woodbridge

1.4.1 Alternative 1: Bus Rapid Transit – Curb Running

This alternative assumes Bus Rapid Transit (BRT) service in dedicated outside lanes in the north portion of the corridor (8.4 miles) to Fort Belvoir. From Fort Belvoir south to Woodbridge, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes (6.7 miles). **Figure 1-4** shows the alignment and station locations.

Alternative 1 has a typical section of 154 feet along the mainline with 172 feet at the intersections and stations in Fairfax County. In Prince William County, Alternative 1 has a typical section of 126 feet along the mainline with 134 feet at the intersections and stations. **Figure 1-5** and **Figure 1-6** show the typical sections.

Figure 1-4: Alternative 1: BRT – Curb Running

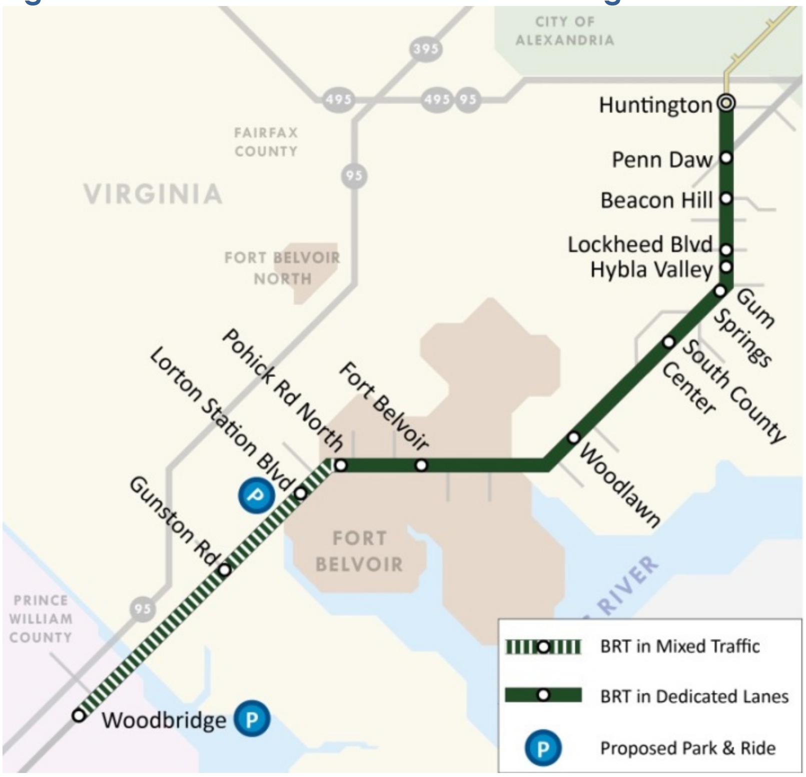


Figure 1-5: Alternative 1: BRT – Curb Running, Typical Section (Huntington to Fort Belvoir)

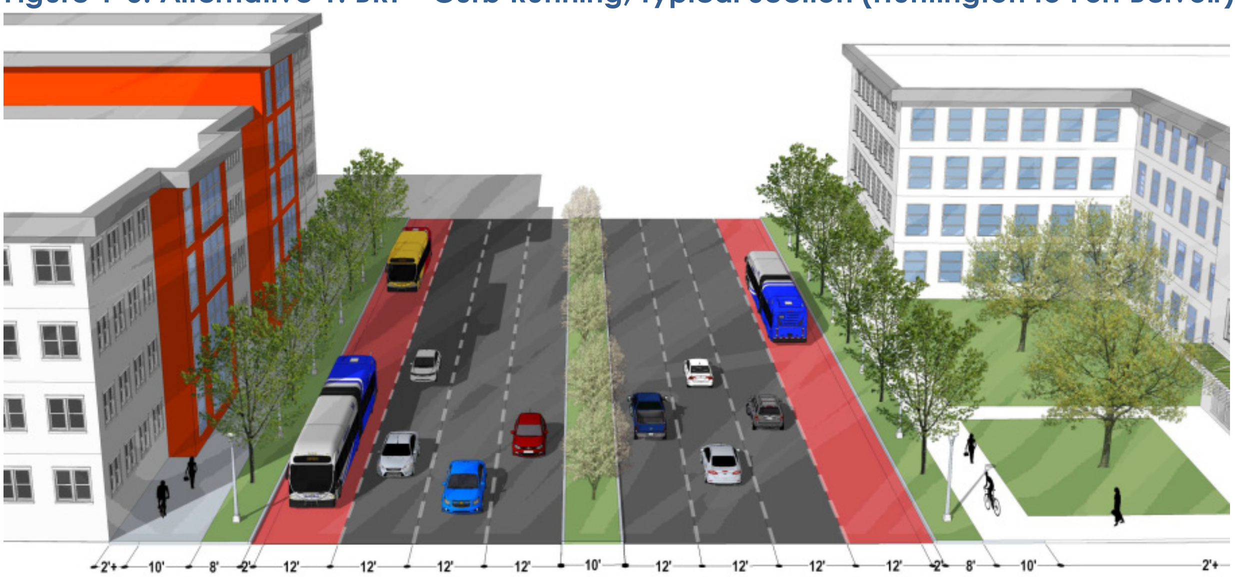
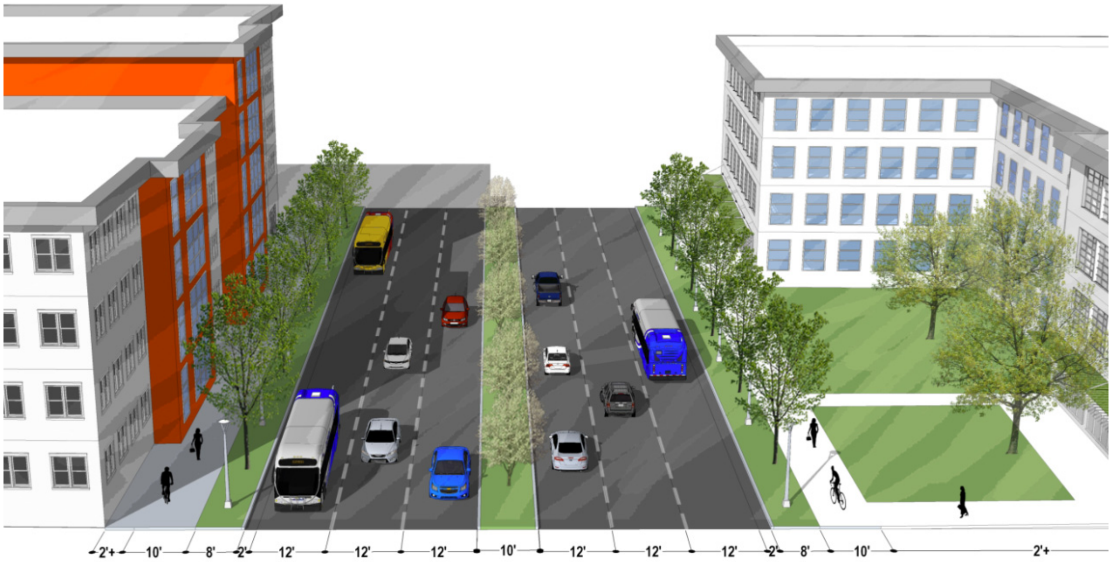


Figure 1-6: Alternative 2: BRT – Curb, Typical Section (Pohick Road to Woodbridge VRE)



1.4.2 Alternative 2: Bus Rapid Transit – Median Running

This alternative assumes BRT operates in the median in dedicated lanes in Fairfax County (14.2 miles), and transitions to mixed traffic in Prince William County (0.67 miles). Across the Occoquan River Bridge and within Prince William County, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes. **Figure 1-7** shows the station locations.

Alternative 2 has a typical section of 150 feet along the mainline with 156 feet at the intersections and stations in Fairfax County. In Prince William County, Alternative 2 has a typical section of 126 feet along the mainline with 134 feet at the intersections and stations. **Figure 1-8** shows the typical section in Fairfax County. Refer to **Figure 1-6** for the typical section in Prince William County.

Figure 1-7: Alternative 2: BRT – Median

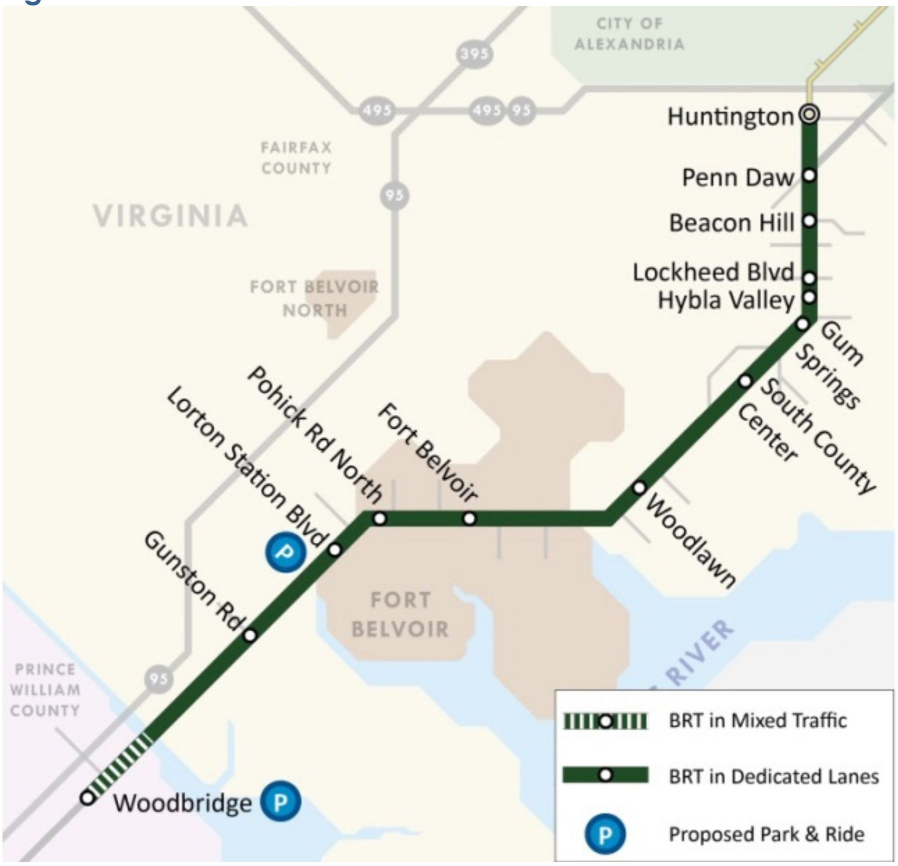
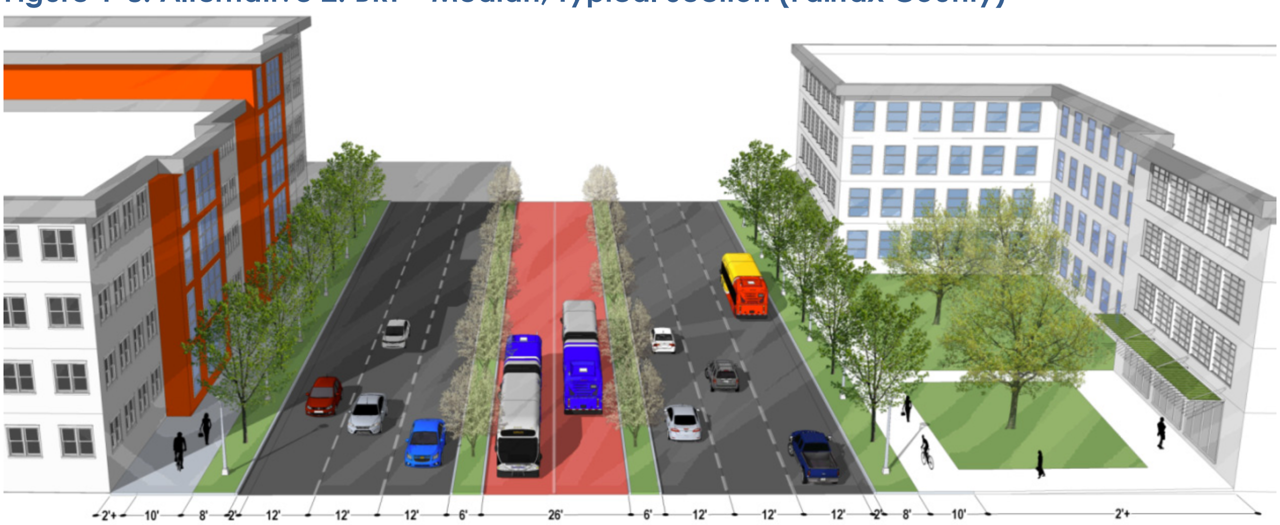


Figure 1-8: Alternative 2: BRT – Median, Typical Section (Fairfax County)



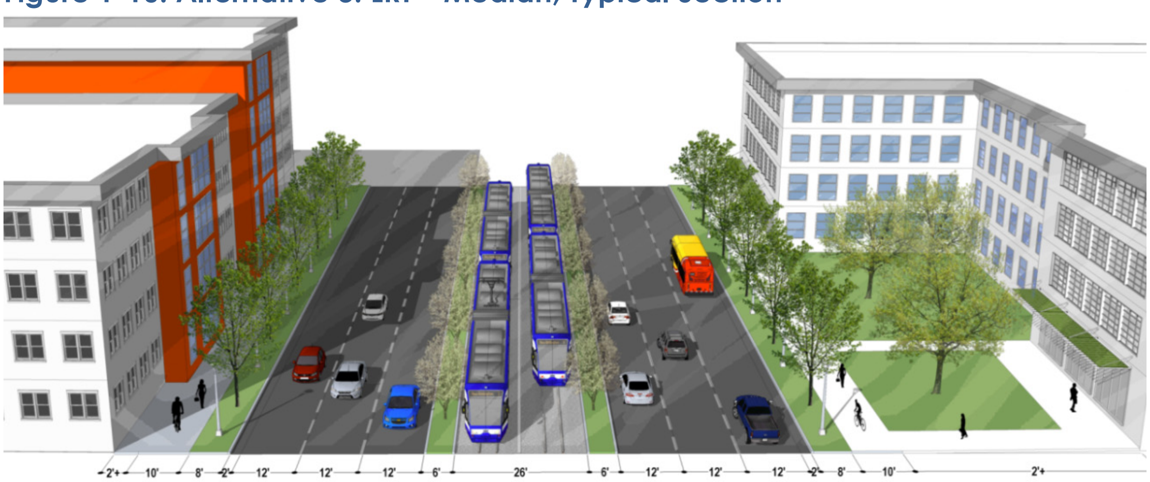
1.4.3 Alternative 3: Light Rail Transit

This alternative assumes Light Rail Transit (LRT) service in a dedicated median transitway for the majority of the corridor. In Prince William County, and along the southern portions of the corridor in Fairfax County, LRT service would be configured in a dedicated transitway parallel to Route 1 but outside the Route 1 right-of-way. **Figure 1-9** shows the station locations.

Alternative 3 has a typical section of 154 feet along the mainline with 172 feet at the intersections and stations in Fairfax County. In Prince William County, Alternative 3 has a typical section of 126 feet along the mainline with 134 feet at the intersections and stations. **Figure 1-10** shows a typical section.

Figure 1-9: Alternative 3: LRT

Figure 1-10: Alternative 3: LRT – Median, Typical Section

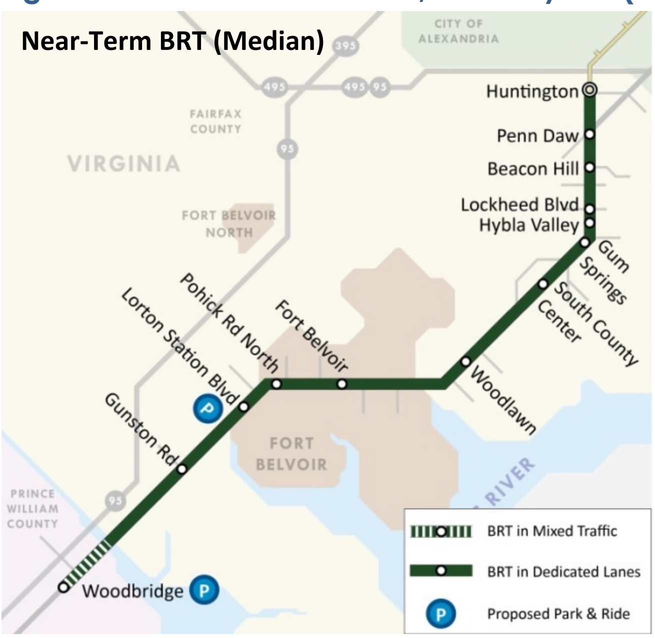


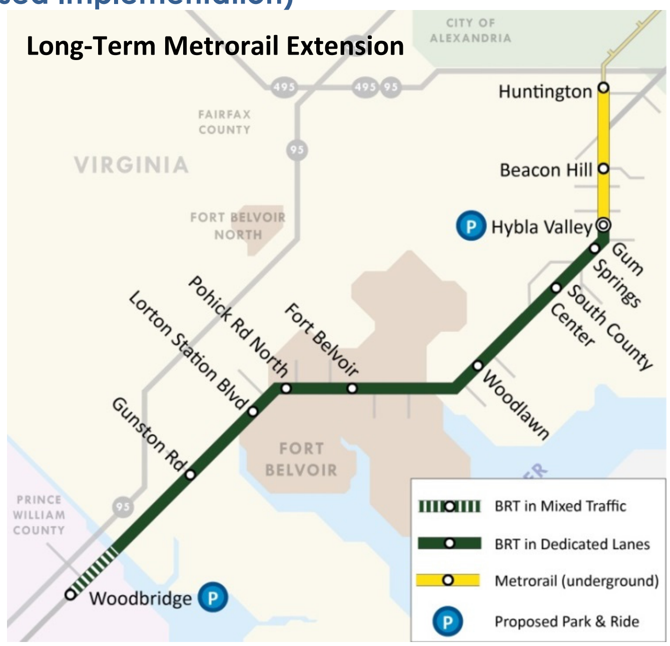
1.4.4 Alternative 4: Metrorail/BRT Hybrid

This alternative assumes BRT operates in the median in dedicated lanes in Fairfax County (14.2 miles), and transitions to mixed traffic in Prince William County (0.67 miles). Across the Occoquan River Bridge and within Prince William County, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes. **Figure 1-11** shows the station locations.

In the long-term, this alternative assumes a Yellow Line Metrorail Extension underground to Hybla Valley (3.1 miles).

Figure 1-11: Alternative 4- BRT/Metro Hybrid (Phased Implementation)





Alternative 4 BRT elements are the same as Alternative 2: a typical section of 154 feet along the mainline with 172 feet at the intersections and stations. The underground Metrorail alignment between Huntington and Hybla Valley has a cross-section width of approximately 60 feet. In Prince William County, Alternative 4 (BRT in mixed traffic) has a typical section of 126 feet along the mainline with 134 feet at the intersections and stations. Error! Reference source not found. **Figure 1-12** show a typical section for Metrorail and BRT. Refer to **Figure 1-6** for the typical section in Prince William County.

Figure 1-12: Alternative 4: Metrorail/BRT Hybrid – Median, Typical Section (Hybla Valley to Route 1 Bridge)

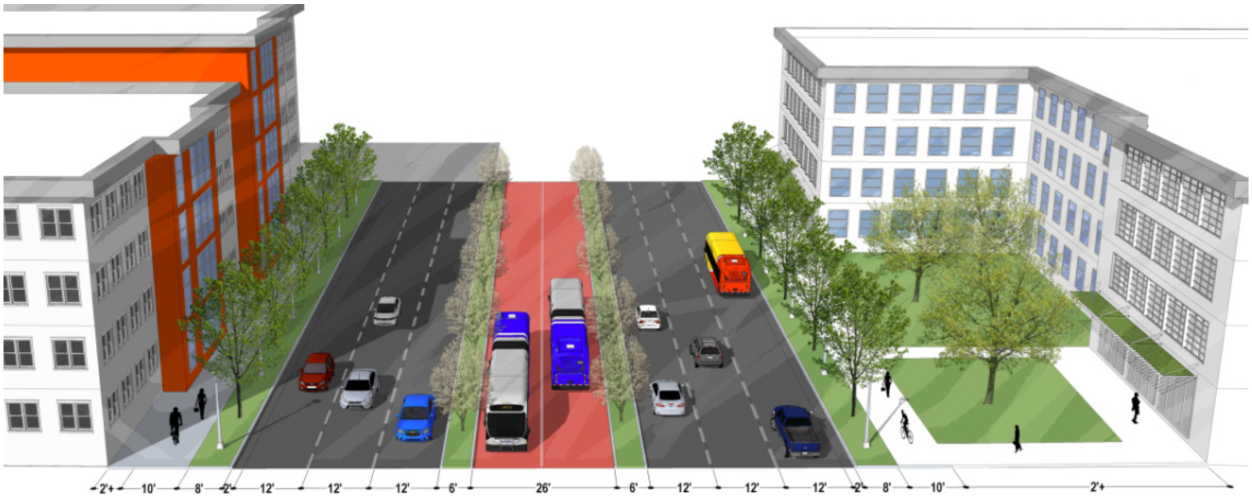
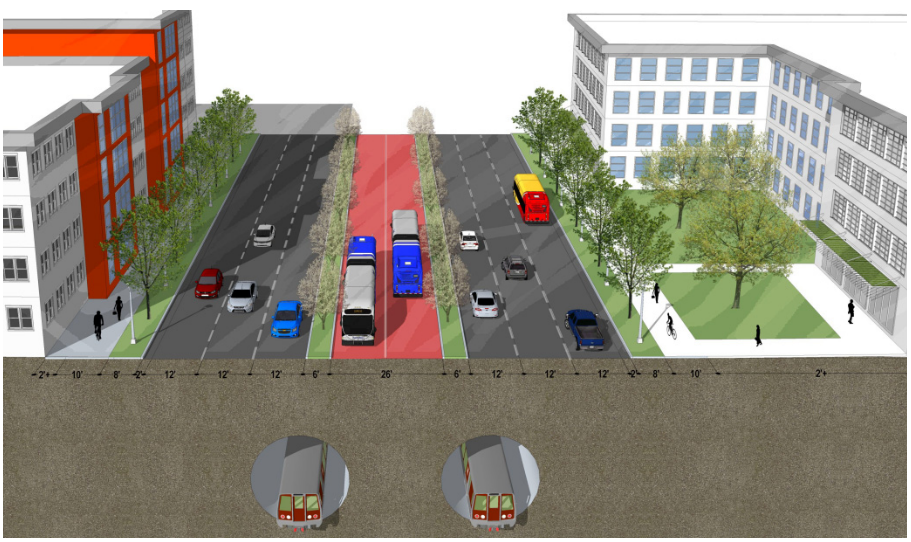


Figure 1-13: Alternative 4: Metrorail/BRT Hybrid – Underground, Typical Section (Yellow Line Extension)



2.0 Methodology

The environmental scan was conducted using available Geographic Information System (GIS) data provided by Fairfax County, Prince William County, and the Virginia Department of Transportation (VDOT), as well as web-based inventory tools for each resource area.

2.1 Study Area Definition

The environmental scan considered all resources that lie within the project study area. The study area is defined as a ½-mile buffer from the Route 1 centerline from the Huntington Metrorail station to the Woodbridge VRE station (See **Figure 2-1**).

Figure 2-1: Study Area

2.2 Ongoing Corridor Projects

Two major roadway projects along the corridor have been evaluated under separate environmental studies. These projects are listed below and shown in **Figure 2-2**. Both projects widen Route 1 to six general purpose travel lanes, propose a 10-foot shared use path, and 6-foot sidewalk on either side of Route 1. The Route 1 Improvements at Fort Belvoir also reserves median space for future transit. The potential impacts within the footprints of these two projects are not included in this assessment.

Figure 2-2: Recent Projects with Environmental Clearances

2.2.1 Route 1 (Jefferson Davis Highway) and Route 123 (Gordon Boulevard) Interchange Project

The Federal Highway Administration (FHWA) and VDOT completed an EA for the Route 1/123 Interchange Project in Prince William County, Virginia.[2] Within this project's study area, the project proposes widening Route 1 to six general purpose lanes, a 10-foot shared-use path, and a 6-foot sidewalk on both Routes 1 and Route 123. **Figure 2-3** shows the typical cross section.

The EA was completed in 1999 and a FONSI was issued by FHWA on January 3, 2004. In 2008, FHWA and VDOT initiated a reevaluation of the EA, and the reevaluation and FONSI (with Section 4(f) de minimis Evaluation) was made available to the public in 2011. Phase 1 construction is anticipated to begin 2015 and Phase 2 in 2016, pending funding.

Alternatives 1, 2, and 4 assume that the BRT operates in mixed traffic within Prince William County and therefore does not propose any additional right-of-way. Alternative 3 follows a different alignment and potential impacts are documented accordingly.

Figure 2-3: Route 1/123 Interchange Project Proposed Cross Section

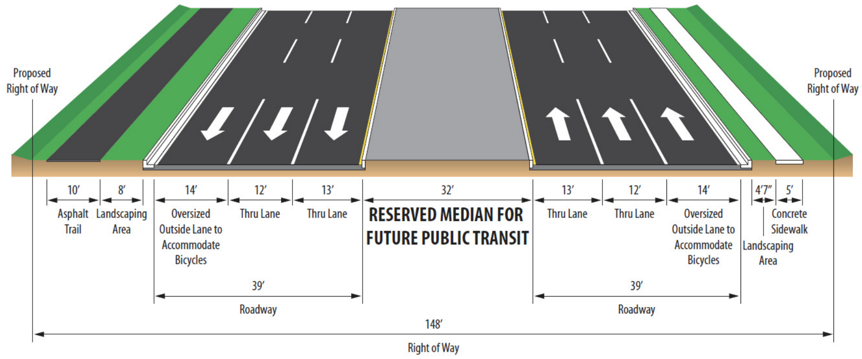
Source: VDOT, 2012.

2.2.2 Route 1 Improvements at Fort Belvoir

FHWA prepared an EA for the project, extending between Telegraph Road and Mount Vernon Memorial Highway in Fairfax County. The EA was prepared in coordination with Fairfax County, VDOT, Department of the Army, and FHWA. The purpose of the project is to address traffic capacity deficiencies on Route 1 within the study limits by widening Route 1 from four travel lanes to six travel lanes. The project is constructing a 32-foot median to accommodate future transit as well as a 10-foot shared use path on one side and a 6-foot sidewalk on the other side of Route 1. The project received its FONSI in 2012. **Figure 2-4** shows the typical cross section.

[2] http://www.virginiadot.org/projects/northernvirginia/route_1-123_interchange.asp

Figure 2-4: Proposed Typical Cross Section



Source: VDOT, 2014.

2.3 Impact Footprints

During the planning and impact assessment for this Alternatives Analysis, mapping activities were conducted using available GIS data from state and local agencies. Using this GIS data, as well as conceptual designs and typical sections for each alternative, assumptions were made regarding locations of existing right of way limits and proposed configuration of potential improvements for the project.

The resulting "footprints" for each alternative were used to identify potential impacts for features or resources that would be directly affected by the project components. As described above, the broader ½-mile study area was used to identify other features and resources that would be less directly affected by the project alternatives.

Assumptions include the following:

- The existing VDOT right of way boundary was estimated using the edge of parcel boundaries within the corridor (using County GIS parcel data).
- A centerline of the existing roadway was created by digitizing the centerlines of the corridor shown on GIS based aerials.
- The project study area was identified by placing the proposed typical sections for each alternative along the mapped centerline, therefore splitting the impacts halfway between the east and west sides of the corridor. The next phase of work would assess corridor segments where widening could be done on one side only to minimize property impacts.
- Modifications to building and site access from Route 1 were not considered. It is assumed at this stage that any existing access points would be maintained. However, in reality, changes to access would likely be required in order to facilitate efficient movements along the corridor, in particular for the BRT alternative options, which could result in additional right of way impacts.
- Locations of existing utilities were not identified; however, it is assumed that adjustments and relocations will be necessary as part of any future improvements to this corridor.

- The capacity of existing facilities, including the bus loop at Huntington Metro Station, was not considered. Enlargement or repurposing of existing facilities to support the capacity requirements of the alternatives will need to be studied in the future.

Table 2-1 summarizes the footprint assumptions.

Table 2-1: Footprints Limits

		Alternative 1	Alternative 2	Alternative 3	Alternative 4
		BRT 1 - Curb	*BRT 2 - Median*	*LRT*	*Metrorail - BRT Hybrid*
		Footprint Width			
Northern Terminus (Huntington Metro Station)		Utilize existing bus loop	Utilize existing bus loop	58' (LRT Station)	BRT utilizes existing bus loop; Metrorail extension of Yellow Line
Northern Terminus to Richmond Hwy		104'	104'	104'	104'
Richmond Hwy to Hybla Valley Station	Mid-block	150'	154'	154'	154'
	Intersection/ Station	156' (200' nearside/300' farside of intersection)	172' (350' to either side of intersection)	172' (350' to either side of intersection)	172' (350' to either side of intersection)
Hybla Valley Station to Mount Vernon Hwy	Mid-block	150'	154'	154'	154'
	Intersection/ Station	156' (200' nearside/300' farside of intersection)	172' (350' on either side of intersection)	172' (350' on either side of intersection)	172' (350' on either side of intersection)
Mount Vernon Hwy (South) to Pohick Road		148’ Under construction	148’ Under construction	148’ Under construction	148’ Under construction
Pohick Road to Prince William County Line	Mid-block	126'	154'	154'	154'
	Intersection/ Station	134' (200' nearside/300' farside)	172' (350' on either side of intersection)	172' (350' on either side of intersection)	172' (350' on either side of intersection)
Prince William County Line to Southern Terminus		Within proposed ROW	Within proposed ROW	38' (West of Rt 1)	Within proposed ROW
Southern Terminus		Utilize existing bus loop	Utilize existing bus loop	LRT Station West of Rt 1	Utilize existing bus loop

3.0 Environmental Scan Findings

This scan covers several topic areas typically documented in a NEPA document. Other topics are documented elsewhere in the AA or are not specifically defined at this stage. The sections below summarize findings for each area of the environmental scan. Four key areas emerged as the most relevant resource areas; these are anticipated to have potentially significant impacts and have the greatest influence on the determination of NEPA Class of Action and would be points of emphasis in subsequent NEPA documentation:

- Environmental Justice
- Historic and cultural resources
- Water resources
- Property/ ROW impacts

Environmental Justice: Minority populations and low-income populations are present along the corridor. Community analysis and impact assessment conducted during the NEPA phase will identify minority and low income populations, identify any disproportionately high and adverse effects to Environmental Justice (EJ) populations, minimize or avoid those effects, and ensure a concerted effort is made to include EJ populations in public outreach efforts. Additionally, benefits from improved mobility and accessibility due to the project will be documented.

Historic and cultural resources: Historic properties are present along the corridor, particularly near Fort Belvoir. Although the potential direct impacts are addressed in the 2012 Improvements at Fort Belvoir Environmental Assessment and FONSI, close agency coordination will be required to ensure all potential effects are documented.

Water Resources: Two major creeks and one major waterbody are present along the corridor: Pohick Creek, Accotink Creek, and the Occoquan River. Floodplains, Resource Protection Area (RPA), and wetlands have been identified near these environmentally sensitive areas. These areas will need to be closely studied in the NEPA phase.

Property/ ROW impacts: All alternatives would require additional right-of-way and may lead to direct impacts on existing properties and buildings. Preliminary analysis was conducted using available GIS data; however, right-of-way and boundary surveys are needed to more accurately assess potential impacts in the subsequent NEPA and design phases. Alternative 1 has the least property impacts, while Alternatives 2, 3, and 4 have the most.

3.1 Socioeconomics/Environmental Justice

3.1.1 Regulatory Considerations

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to "promote nondiscrimination in federal programs substantially affecting human health and the environment, and provide minority and low-income communities access to public information on, and an opportunity for public participation in matters relating to human health or the environment." In general, to give due consideration to the goal and intent of Executive Order 12898, proposed federally funded transportation projects must provide equitable distribution of benefits and avoid inequitable distribution of negative impacts.

FTA and FHWA released guidance on EJ analysis in 2012:

- FTA Environmental Justice Circular 4703.1 (July 2012)
- FHWA Order 6640.23A (June 2012)

The guidance defines an adverse effect as the totality of significant individual or cumulative human health or environmental effects to human health, the natural and social environment, community function, etc. It also includes the denial, reduction, or delay in receiving benefits, which should be addressed like any other impact. A "disproportionately high and adverse effect" includes taking into consideration "mitigation and enhancements measures that will be taken and all offsetting benefits to the affected minority and low-income populations… as well as the design, comparative impacts, and the relevant number of similar existing system elements in nonminority and non-low-income areas."

The order identifies minority communities as "Black, Hispanic, Asian, American Indian and Alaskan Native, Native Hawaiian or other Pacific Islander."

FTA and FHWA define low-income as a person whose median household income is at or below the Department of Health and Human Services poverty guidelines. For the purposes of this analysis, the FY2010 AMI income limits for a "Low Income" family of four of $64,400 was used as the AMI definition for low income in this analysis.[3]

[3] In regions where the 80 percent of AMI exceeds the U.S. median income, the low-income limit is capped by the United States median income, except in cases where 85 percent of the area's annual 2 bedroom fair market rent is greater than 35 percent of the United States median income. In FY2010 the Washington, DC FMR region low income limit was capped by the United States median income.
Source: http://www.huduser.org/portal/datasets/il/il2010/2010summary.odn?inputname=METRO47900M47900*Washington-Arlington-Alexandria%2C+DC-VA-MD+HUD+Metro+FMR+Area&selection_type=hmfa&year=2010.

3.1.2 Study Area Conditions

Minority populations

Figure 3-1 shows the year 2010 percentages of minority population within the study area (see **Figure 2-1**) based on US Census Bureau data. Minority groups make up 69 percent of the population in the study area, which is higher than the percentage of minorities in Fairfax County (45 percent) and Prince William County (52 percent). Within the study area there are 52 block groups with a higher proportion of minority residents than Fairfax County or Prince William County. **Table 3-1** summarizes the minority and low income populations for the study area, Fairfax County, and Prince William County. There are 44 block groups where 50 percent or more of the population of a Census block group is minority.

Table 3-1: Minority Populations

	Study Area		Fairfax County		Prince William County	
	Population	% of total population	Population	% of total population	Population	% of total population
Total Population	72,823		1,081,726		402,002	
Minority Population	22,898	69%	491,104	45%	206,346	51%

Source: U.S. Census Bureau. Census 2010.

Low-income populations

The FY2010 AMI income limits for a "Low Income" family of four of $64,400 was used as the AMI definition for low income in this analysis.[4] Within the study area, 22 block groups have median household incomes below the $64,400 income limit for the Washington DC region.

Figure 3-2 shows the year 2012 percentages of low-income population in areas within the study area based on US Census Bureau data. The two largest concentrations of low-income population are on the west side of Route 1 near Beacon Hill and around Hybla Valley. There are no census tracts where 50 percent or more of the population is low-income. Four census tracts have low-income populations greater than 10 percent of the County.

3.1.3 Findings

In consideration of the existing communities and their populations within the study area, many of which are considered to be low-income and minority, Title VI and Environmental Justice concerns will be a factor in the future NEPA process. Community analysis and impact assessment should identify whether

[4] In regions where the 80 percent of AMI exceeds the U.S. median income, the low-income limit is capped by the United States median income, except in cases where 85 percent of the area's annual 2 bedroom fair market rent is greater than 35 percent of the United States median income. In FY2010 the Washington, DC FMR region low income limit was capped by the United States median income.
Source: http://www.huduser.org/portal/datasets/il/il2010/2010summary.odn?inputname=METRO47900M47900*Washington-Arlington-Alexandria%2C+DC-VA-MD+HUD+Metro+FMR+Area&selection_type=hmfa&year=2010.

disproportionately high and adverse effects to EJ populations are anticipated and avoid and/or mitigate those effects.

Because all of the alternatives follow the same alignment and have similar service characteristics, Title VI and Environmental Justice concerns are important for all alternatives during subsequent phases of work.

During subsequent planning, NEPA and design phases, the project should engage these populations at all stages of project development. A public engagement plan that responds to community needs should be developed and the proposed project will need to evaluate any adverse effects and benefits to these populations. Subsequent study will identify and address reasonably foreseeable adverse social, economic, and environmental effects on minority populations and low-income populations. These effects can include construction impacts, indirect effects, cumulative effects, and post-construction/operations impacts. It is anticipated that communities within the study area would benefit from all alternatives under consideration due to improved mobility, transit reliability and access within the study area. It is anticipated that all alternatives would result in travel time savings, which would support livability in the corridor. Over time, property values could increase as the corridor gains in attractiveness. This in turn would have a positive secondary effect on the local tax base; however, an adverse secondary effect of redevelopment may be the potential loss of some affordable housing for low-income residents currently residing along the corridor. In anticipation of this potential effect, the counties can develop tools to adjust, enforce, and increase availability of affordable housing to ensure that the current residents of the corridor can remain in the corridor and share in the benefits offered by the project.

Figure 3-1: Minority Populations

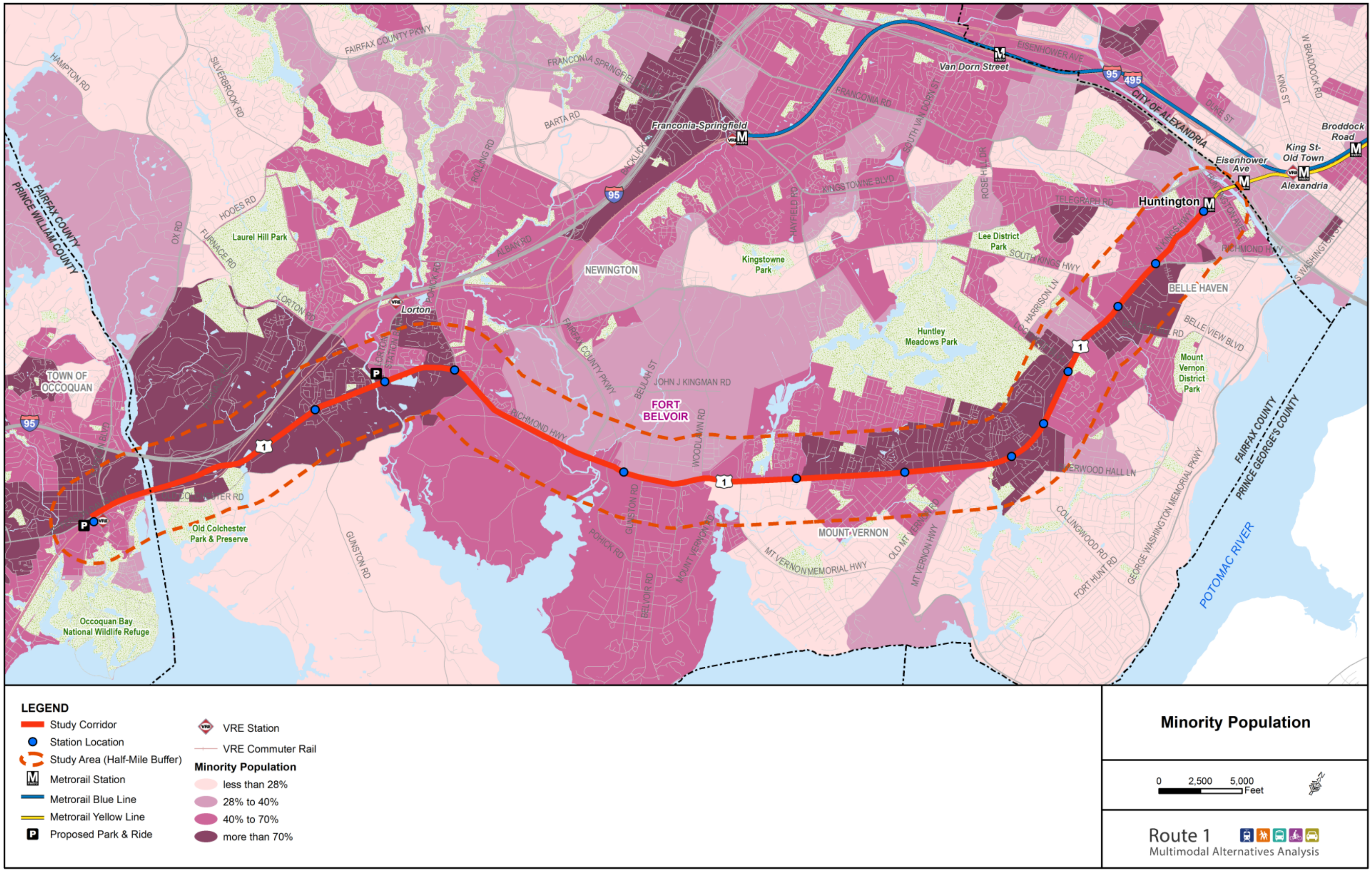
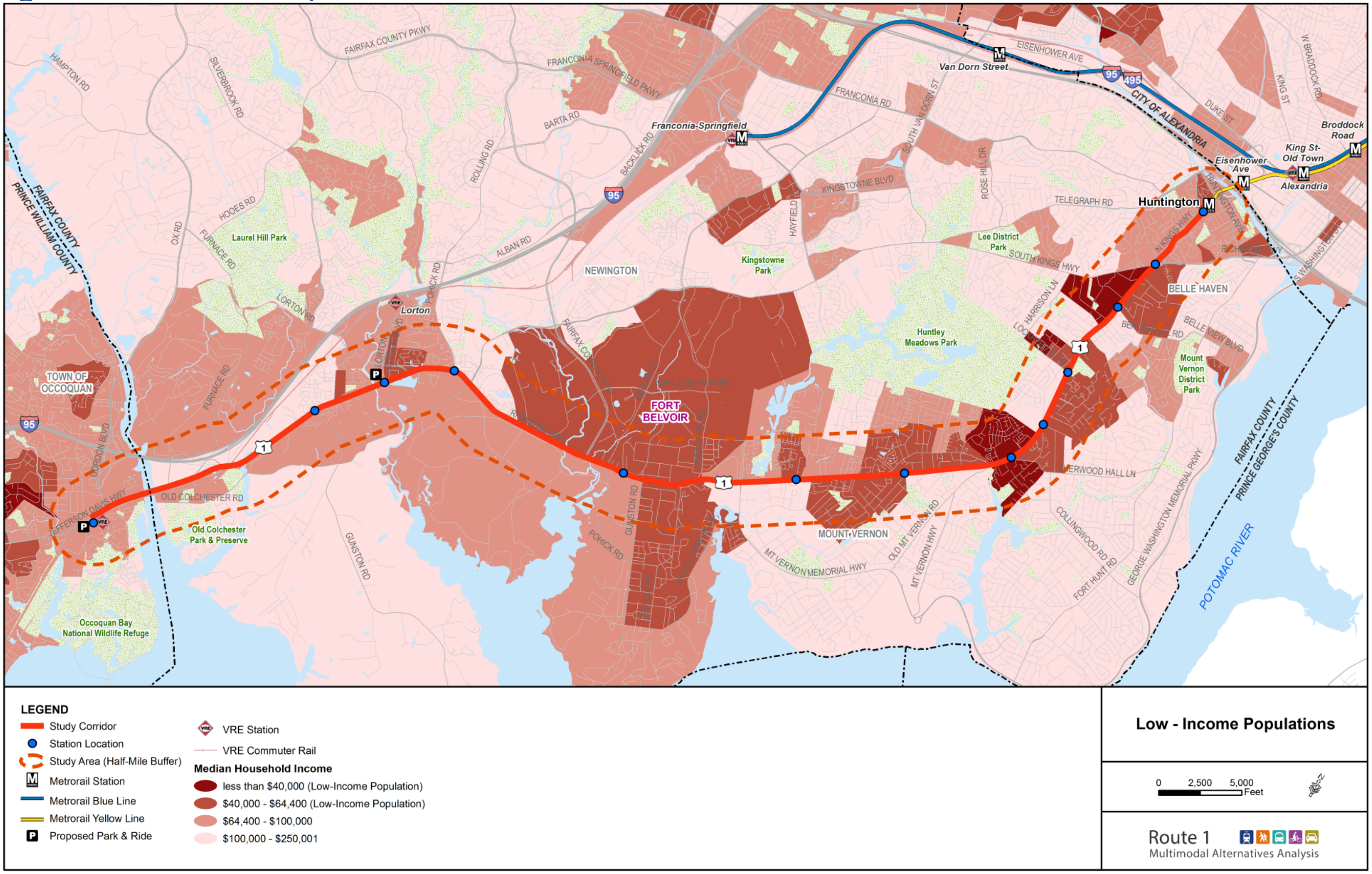


Figure 3-2: Low-Income Populations



3.2 Property Acquisition and Potential Displacements (Potential Right of Way Impacts)

3.2.1 Regulatory Considerations

Federal and state laws require that property owners be paid fair market value for their land and improvements, and that they be assisted in finding replacement business sites or dwellings. Displacements result from right-of-way (ROW) acquisitions that require the use of a property occupied by a residence or business. Under the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970, federal agencies are required to meet certain standards for the fair and equitable treatment of persons displaced by federally supported actions. Relocation assistance will follow the guidelines set forth in Title 49, Part 24 of the Code of Federal Regulations (49 CFR Part 24).

A GIS analysis assessed the footprints of proposed facilities within the corridor and their relationship to existing public ROW and land parcels. The analysis then identified the portions of land parcels where permanent ROW acquisition would be needed to accommodate project facilities.

3.2.2 Findings

Based on the assumptions stated in Section 2.3 and the data contained in **Table 3-2**, there are anticipated to be a number of parcels impacted by either partial acquisitions or total acquisitions. Table 3-2 does not distinguish between partial and total acquisitions at this stage of the project.

Table 3-2: Potential ROW Impacts

Potential Impacts		Alt 1: BRT Curb	Alt 2: BRT Median	Alt 3: LRT	Alt 4: Hybrid
Total Number of Buildings Impacted		17	29	29	29
Fairfax County	**Number of Parcels Impacted**	299	347	349	347
	Total Area of Parcels Impacted	25.94 Acres	35.70 Acres	36.32 Acres	35.70 Acres
Prince William County	**Number of Parcels Impacted**	0	0	11	0
	Total Area of Parcels Impacted	0	0	2.53 Acres	0

The **Appendix** provides detailed mapping of potential impacts associated with each alternative. Note: The findings in this document are preliminary and the potential direct impacts, particularly property impacts associated with the alternatives under evaluation are draft and for internal use only. The analysis was performed using GIS and is not based on survey data.

3.3 Neighborhoods and Community Facilities

3.3.1 Study Area Conditions

A major impetus for the development of improved transportation service in the corridor has been to support the future residential and commercial development over the next 10 to 20 years. Station stops have been sited to provide access to current and future development and within designated activity centers. People residing and working along the corridor would benefit from improved transit service and access to employment and retail centers.

3.3.2 Findings

Community facilities in the study area include schools, libraries, churches, and religious institutions, post offices, and emergency services. Because all of the alternatives follow the same alignment and have similar service characteristics, likely impacts on neighborhoods and community facilities are comparable for all alternatives. More detailed analysis of potential impacts to these facilities will be conducted during the NEPA and design phases. **Table 3-3** lists and **Figure 3-3** shows major community facilities within the study area.

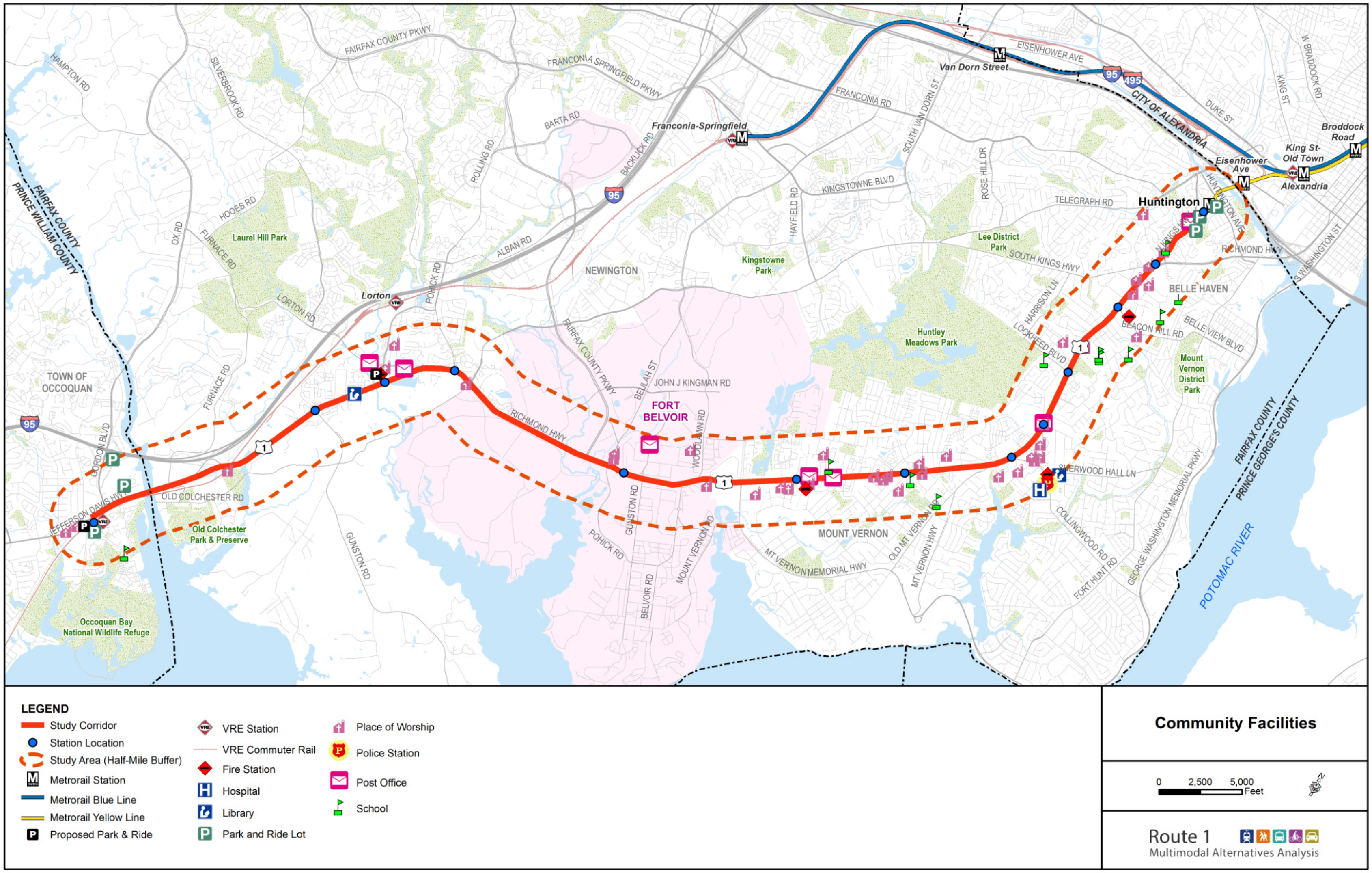
Table 3-3: Community Resources

Facility Type	Name	
Library	Sherwood Regional Library Lorton Library	
Police Stations	Fairfax County Police Department Mount Vernon District Station	
Fire Stations	Mount Vernon Penn Draw	Woodlawn Lorton
Post Offices	US Post Office (5) Jefferson Manor PO	
Schools	Woodlawn Elem. Hybla Valley Elem. Bryant Alternative High Achievement, Integrity and Maturity Lyles-Crouch Elem. Islamic Saudi Academy	Bucknell Elem. West Potomac High Quander Road School Riverside Elem. Mount Eagle Elem.
Places of Worship	Bethlehem Church Emmanuel Church Engleside Church Pohick Church Wesley Church Woodlawn Church Woodlawn Church Saint Louis Catholic Church	Seventh Day Adventist Church Gateway International Mt Vernon Iglesia Del Nazareno Greater Shiloh Baptist Church Fair Oaks Baptist Church Harvest Assembly Baptist Church Spirit of Faith Rising Hope United Methodist Church

Facility Type	Name
	Calvary Presbyterian Church Groveton Baptist Church Bethany Lutheran Church Roberts Memorial United Methodist Church Beulah Baptist Church All Saints Chapel Occoquan Church (historical) Accotink United Methodist Church Alfred Street Baptist Church Bethel World Outreach Church Bethlehem Baptist Church Christian Science Reading Room First Baptist Church of Lorton Unity Christian Fellowship* Favor House Ministries Evangelical Church Apostles Spirit of Faith Ministries Washington Community Church Alexandria Miracle International Chúa Hoa Nghiêm New Hope Church Hope Aglow Empowerment Center* Boku Bethlehem First AME Church Ship of Zion Baptist Church in Christ Mount Calvary Baptist Church Jesus is Lord Ministries Church of God in Christ
Hospitals	Inova Mount Vernon Hospital
Government Centers	South County Center
Park & Ride Lots	VRE Woodbridge* WMATA Huntington (2 lots) Oxbridge Center* King's Highway Route 123 & I-95*

*Facilities in Prince William County.

Figure 3-3: Community Facilities



3.4 Parklands

3.4.1 Regulatory Considerations

Section 4(f) of the U.S. Department of Transportation Act of 1966, protects public parks and recreational lands, wildlife habitat, and historic sites of national, state, or local significance. Section 4(f) precludes transportation projects from using these lands and requires that all prudent and feasible alternatives to the use of these lands be investigated. For unavoidable impacts, all planning to minimize harm and appropriate mitigation is required. In addition, Section 6(f) of the U.S. Land and Water Conservation Fund Act preserves, develops, and assures the quality and quantity of outdoor recreation resources and requires that certain conditions be met before conversion of these resources can occur.

3.4.2 Study Area Conditions

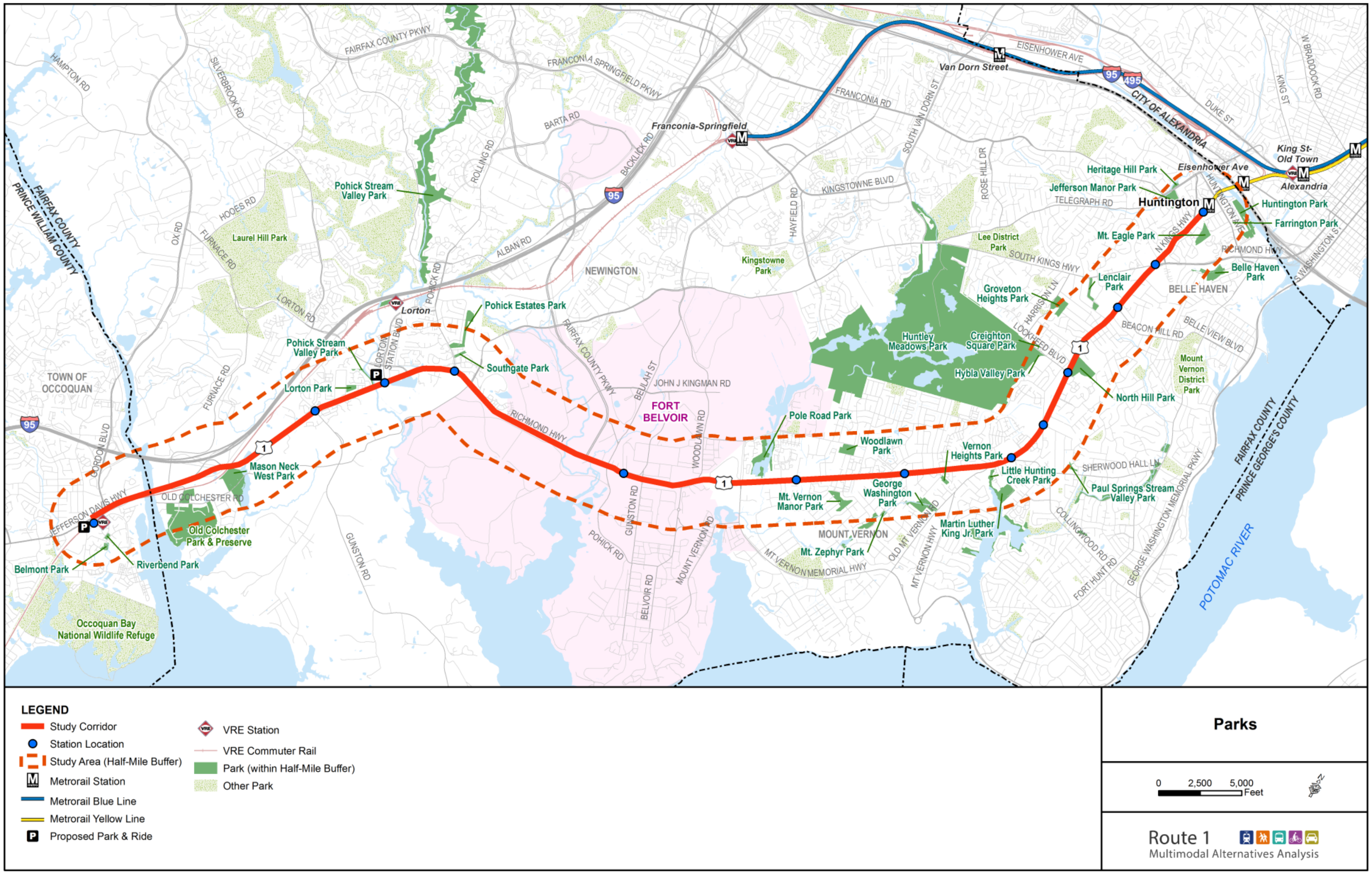
Within the study area, 29 publicly owned parks lie within Fairfax County and two publicly owned parks are located in Prince William County. The parks within the study area are listed below in **Table 3-4** and shown in **Figure 3-4**. According to the National Park Service (NPS) Land & Water Conservation Fund database, no parks within the study area are 6(f) funded parks.[5]

Table 3-4: Parks within Study Area

Fairfax County		**Prince William County**
Mount Zephyr Park	Walt Whitman School Site	Riverbend Park
Huntley Meadows Park	North Hill Park	Belmont Park
Pohick Stream Valley Park	Paul Springs Stream Valley Park	
Pole Road Park	Old Colchester Park & Preserve	
Dogue Creek Stream Valley Park	Southgate Park	
Hollin Meadows Park	Vernon Heights Park	
Farrington Park	Martin Luther King Jr. Park	
Lorton South Park	Lenclair Park	
Mount Vernon Manor Park	Fort Willard Historic Site	
George Washington Park	Pohick Estates Park	
Mount Eagle Park	Woodlawn Park	
Belle Haven Park	Creighton Square Park	
Huntington Park	Mason Neck West Park	
Little Hunting Creek Park	Hybla Valley Park	
Groveton Heights Park	North Hill Park	

[5] http://waso-lwcf.ncrc.nps.gov/public/index.cfm

Figure 3-4: Parks (Publicly Owned)



3.4.3 Findings

Two parks (Lorton South Park and North Hill Park) are directly adjacent to the alignment and could be directly impacted by the alternatives.

Because all of the alternatives follow the same alignment and have similar service characteristics, likely impacts on parklands are comparable for all alternatives. More in-depth analysis will be required to determine potential proximity effects such as noise and visual impacts. Future project planning and design of station stops and other facilities should be carried out to avoid or minimize the potential impacts on these parks and recreational resources. Coordination should occur with the affected federal, state, and local agencies to avoid impacts to the extent possible on identified resources within the study areas.

3.5 Historic and Cultural Resources

3.5.1 Regulatory Considerations

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effects of their actions on historic properties. Historic properties are defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior." NEPA also requires federal agencies to coordinate and plan their actions so as to preserve significant historic, cultural, and natural resources. In Virginia, the Department of Historic Resources (VDHR) provides assistance to Federal agencies and associated interested parties and project stakeholders in carrying out Section 106 and its associated implementing regulations found at 36 CFR Part 800.

3.5.2 Study Area Conditions

According to a search of VDHR's V-CRIS database, nine previously recorded properties within the study area are listed in the National Register of Historic Places. Error! Reference source not found. lists the properties.

Table 3-5: NRHP-listed Properties within Study Area

Property Name	Quadrant	NRHP Listing Date	DHR#
Pohick Church	Belvoir	10-16-1969	029-0046
Fairfax Arms	Belvoir	05-21-1979	029-0043
Woodlawn Plantation*	Belvoir	02-26-1970	029-0056
Pope-Leighey House	Belvoir	12-18-1970	029-0058
Camp A.A. Humphreys Pump Station and Filter Building	Belvoir	06-19-1996	029-0096
Woodlawn Society of Friends Meeting House	Belvoir	05-21-2009	029-0172
George Washington Grist Mill	Belvoir	08-08-2003	029-0330
George Washington's Distillery and Grist Mill	Belvoir	11-04-2009	029-0330
Hollin Hills Historic District	Mount Vernon	09-30-2013	029-5471

Source: VDHR V-CRIS database, updated June 16, 2014

*Property is also a listed National Historic Landmark (NHL), may require additional coordination during NEPA phase

Figure 3-5 shows all 170 architectural sites that are either eligible (12 sites), not evaluated (58 sites), or not eligible (109 sites) for listing in the NRHP. Table 3-6 lists the eligible architectural sites. The nine places listed in the National Register of Historic Places are labeled. The 58 sites that have not been evaluated by VDHR would likely need to be evaluated during the NEPA phase of the project.

Table 3-6: Eligible Architectural Sites

Property Name	Quadrant	DHR#
9 Hole Golf Course (South Post), #1432, Ft. Belvoir	Fort Belvoir	029-5423
Railroad Bridge #1433, Route 1, Ft. Belvoir	Fort Belvoir	029-5424
Hollin Hills Historic District	Alexandria/Mount Vernon	029-5471
U.S. Post Office (Alexandria Post Office, 200 S. Washington St)	Alexandria	100-0063
Gunston Hall Apartments, 901-915 S Washington Street	Alexandria	100-0121-1006
Mount Vernon High School	Mount Vernon	029-0230
Fort Belvoir/Jones Point Storage Building, Rte 100	Alexandria	100-0167
Old Colchester Road (Ft. Belvoir)	Fort Belvoir	029-0953
Railroad Bridge #2298, Rt 617 (Cinder Bed Rd), Ft. Belvoir	Fort Belvoir	029-5010
Woodlawn Historic District	Fort Belvoir	029-5181
Hunting Terrace Apartments, 1205 S Washington	Alexandria	100-5019
Freedmen's Cemetery (Contraband Cemetery)	Alexandria	100-0121-1085

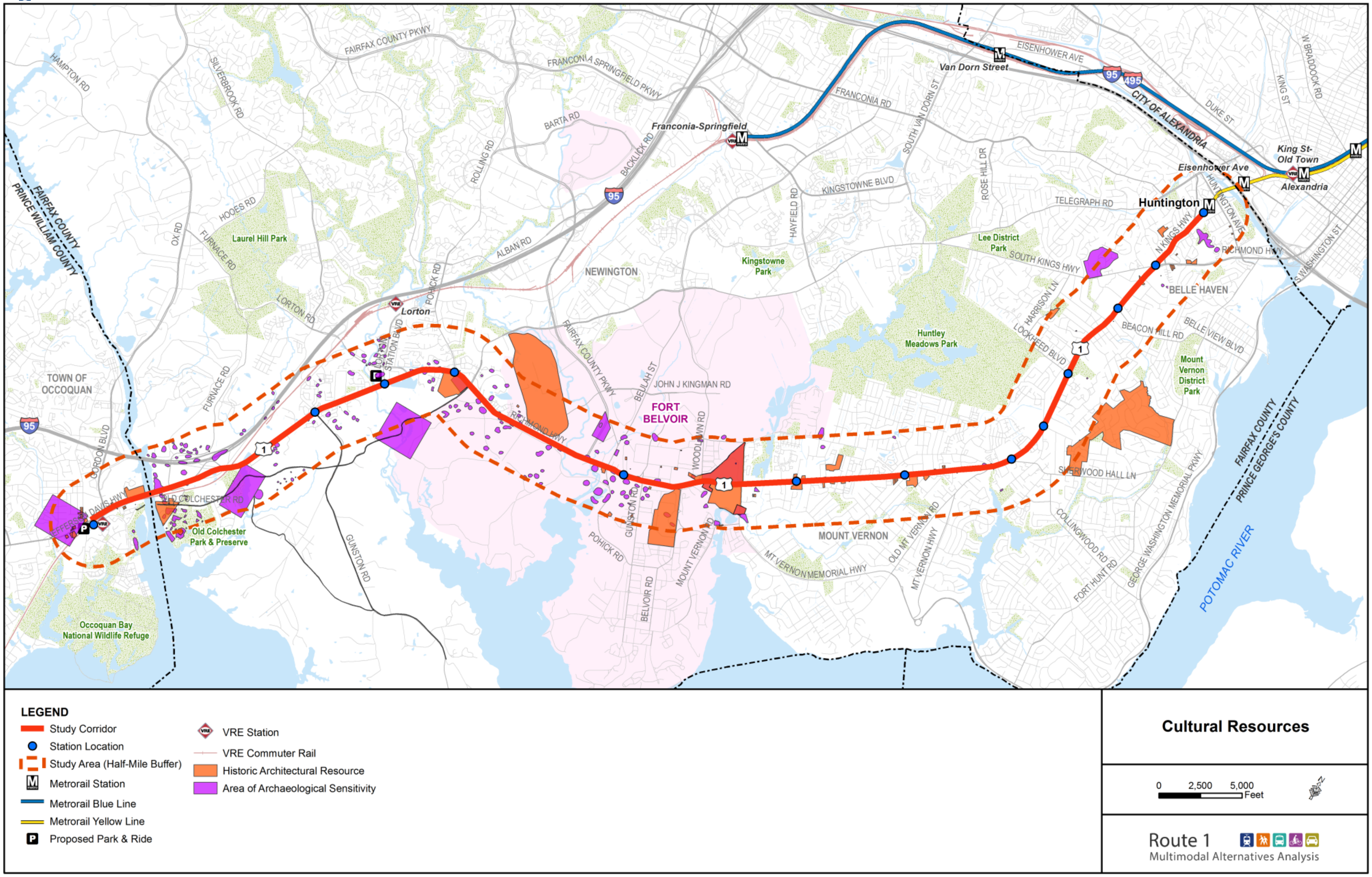
Figure 3-5 also shows the archeological sensitive areas. Within the study area, three sites are listed as NRHP eligible, nine sites have potential for eligibility, 204 sites are not evaluated, and 47 are not eligible.

3.5.3 Findings

Eight of the nine architectural properties listed in the NRHP lie within the study area boundary of the Route 1 Improvements Project at Fort Belvoir. Only one eligible architectural resource (Hollins Hill Historic district) lies within the study area and outside of Fort Belvoir. It is unlikely that this resource would be affected by any of the proposed alternatives.

Because all of the alternatives follow the same alignment and have similar service characteristics, likely impacts on cultural resources are comparable for all alternatives. Further investigation and coordination with VDHR as part of environmental review will be necessary to comply with Section 106 of the National Historic Preservation Act. Archeologically sensitive sites fall within the study area. These sites will need to be further reevaluated and sensitive areas could be subject to testing.

Figure 3-5: Historic and Cultural Resources



3.6 Air Quality

3.6.1 Regulatory Considerations

The Clean Air Act (CAA) of 1990 (with major revisions in 1977 and 1990), is the basis for most federal air pollution control programs. The Environmental Protection Agency (EPA) regulates air quality nationally, while the Virginia Department of Environmental Quality (VDEQ) is responsible for statewide air quality monitoring and development and implementation of programs to ensure Virginia meets national air quality standards.

The CAA establishes National Ambient Air Quality Standards (NAAQS) for ground level ozone, carbon monoxide, particulate matter, lead, sulfur dioxide and nitrogen dioxide. Areas where the NAAQS are not met, known as nonattainment areas, are classified by the CAA depending on the area's measured levels of criteria pollutant compared to the federal standard.

3.6.2 Study Area Conditions and Findings

The Route 1 corridor is located in Fairfax County and Prince William County, which are located in an EPA-designated non-attainment area for the one-hour ozone standard and marginal nonattainment for the eight-hour ozone standard for ozone. The overall effect on corridor-level and regional air quality created by any alternative will largely depend on the following factors: The ability of the service to attract more people to use transit and reduce automobile-related emissions; any difference in the type and amount of vehicular emissions between the baseline compressed natural gas (CNG) fueled bus system and the new transit system and propulsion method; the impact on traffic; and emissions from construction activities, e.g. equipment, trucks, and fugitive dust emissions.

Alternative 4 would provide the greatest benefit to air quality because of reduced automobile-related emissions. Alternative 4 would require excavation and tunneling to support the Metrorail alignment, which has the potential for greater temporary impacts on air quality as compared with the other Alternatives.

As the project progresses, air quality issues will be addressed in greater detail through emissions modeling, microscale analysis and confirmation of the project's inclusion in the regional Transportation Improvement Plan (TIP). Future analysis would include a demonstration of project air quality conformity with Virginia's State Implementation Plan (SIP).

3.7 Noise and Vibration

3.7.1 Regulatory Considerations

The following are four sources of criteria for detailed evaluation of noise impacts and related mitigation measures:

- The Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment Guidance Manual (DOT-95-16, April 1995).
- The Federal Highway Administration's (FHWA) Highway Traffic Noise: Analysis and Abatement Guidance (23 CFR 772, July 2010).
- Virginia Department of Transportation's State Noise Abatement Policy.
- Local jurisdiction noise ordinances.

3.7.2 Study Area Conditions

Existing sources that would contribute to the ambient background noise and vibration levels include motor vehicles, buses, trucks, and other ongoing construction activities along the corridor. It is anticipated that both the construction and ongoing operation of the selected transit system will contribute to ambient noise levels.

3.7.3 Findings

It is expected that the noise generated by any of the alternatives would not significantly increase the current level of ambient noise from the roadway traffic. However, further analysis would be needed to identify the locations of noise sensitive areas and determine if the project would result in potential impacts on noise sensitive receptors in those areas.

Noise levels from construction activities related to proposed transit improvements along the study corridor, although temporary, could create a nuisance at nearby locations. Alternative 4 would require tunneling to support the Metrorail alignment, which would likely produce greater temporary impacts than the other alternatives. Best management practices would be employed to minimize temporary effects.

3.8 Water Resources

3.8.1 Regulatory Considerations

The federal and state laws and regulations that protect the quality of water resources are listed below:

- The Clean Water Act (CWA) sets water quality standards for all bodies of surface water, including wetlands. Section 404(b)(1) of CWA requires the selection of the practicable alternative that causes the least harm to the "aquatic environment" which consists of wetlands and other jurisdictional waters of the U.S., so long as the alternative does not have other significant adverse environmental consequences.
- U.S. DOT Order 5660.1A requires the protection, preservation, and enhancement of the nation's wetlands during the planning, construction, and operation of transportation facilities and projects.
- The Coastal Zone Management Act of 1972 and related amendments require that federal actions that are likely to affect any coastal zone resources complete a federal consistency determination.
- U.S. DOT Order 5650.2 requires transportation facilities and projects to give proper consideration to the avoidance and mitigation of adverse floodplain impacts.
- The Chesapeake Bay Preservation Act requires tidewater local governments (including Fairfax County) to designate and protect water resources affecting the Chesapeake Bay. Local governments were required to implement an ordinance to regulate and minimize development-related impacts on the Bay through the designation of Resource Protection Areas (RPAs) and Resource Management Areas (RMAs). RPAs were designated along all perennial streams in the County. RPAs include the land area within 100 feet of a perennial stream bank or edge of wetlands adjacent to the perennial stream. RPA areas are protected under state law and local ordinances. In general, no development, land disturbance or vegetation removal is allowed in an RPA. Development is permitted within RMAs but must adhere to criteria established in the county's Comprehensive Plan.
- Within the Commonwealth, the VDEQ has primary responsibility for day-to-day administration of federal and state laws and regulations affecting surface and groundwater resources.

3.8.2 Study Area Conditions

Coastal Zone

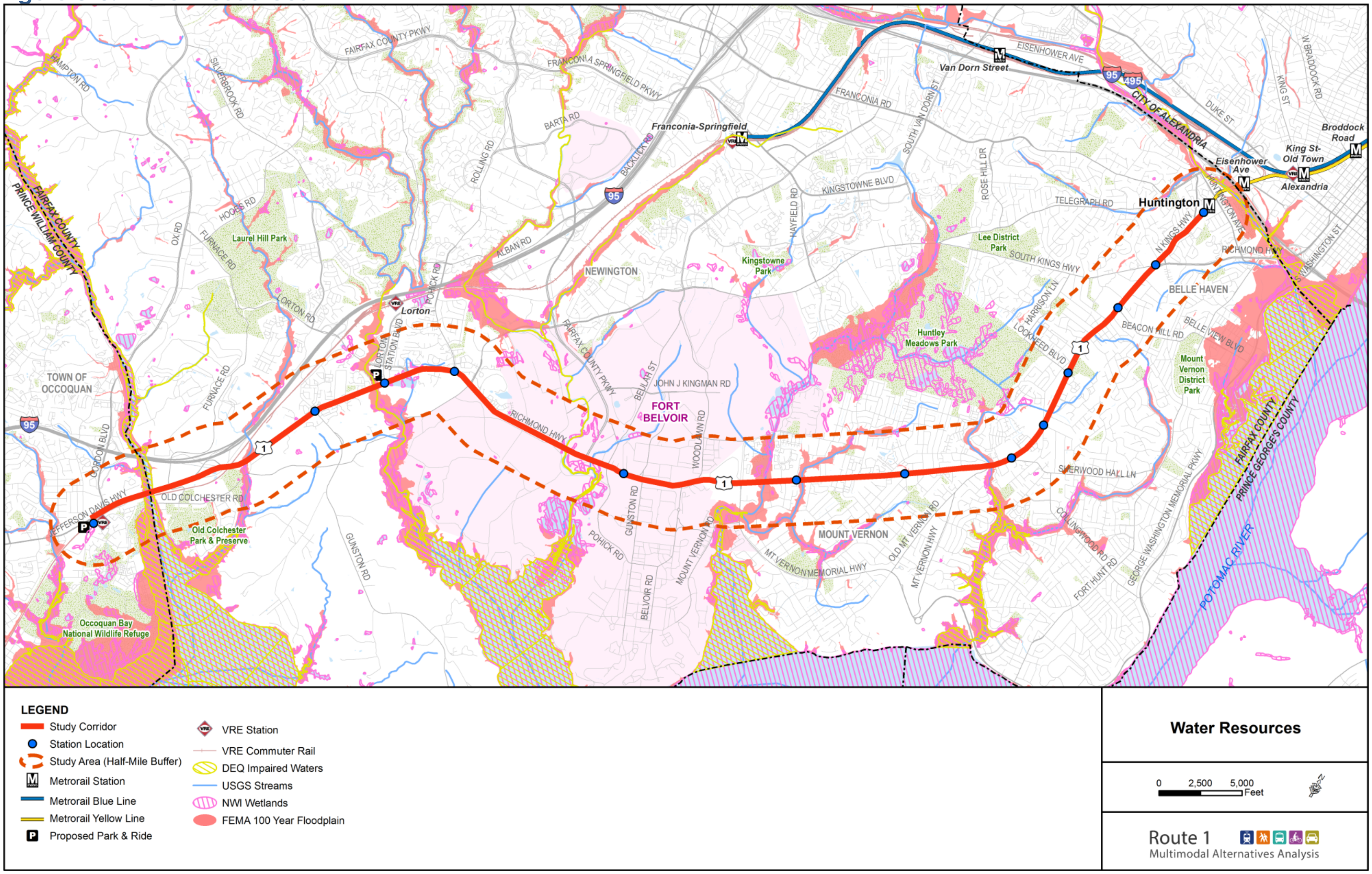
The study area is within Fairfax County and Prince William County, which are located within Virginia's Coastal Zone.

Floodplain

The corridor crosses the Occoquan River and several large named creeks and a number of small streams and drainages. GIS analysis noted streams, potential floodplain, and wetland vegetation that are within the study area.

Figure 3-6 displays water resources, floodplains, wetlands, and RPAs within the study area.

Figure 3-6: Water Resources



Stormwater management controls the flow of stormwater runoff by sending it through the storm drainage system before discharging it to lakes and streams. This reduces the amount of pollution carried by stormwater runoff that reaches local waterways and the Chesapeake Bay and helps prevents flooding.

Virginia requires Prince William and Fairfax County, as well as VDOT, to develop watershed management plans as a part of the state's permits for Municipal Separate Storm Sewer System (MS4). The project corridor runs through several watershed management areas: Belle Haven, Little Hunting Creek, Dogue Creek, Accotink Creek, Pohick Creek, and Mill Branch in Fairfax County and Occoquan River in Prince William County. As the project will be contributing more impervious surface, specifically through road-widening, the proposed project would need to be accounted for in the watershed management plans in the study area. **Table 3-7** lists the estimated contribution of impervious surface to the study area associated with each alternative.

3.8.3 Findings

All four alternatives could potentially have direct impacts on streams, wetlands, and stormwater management policies. Wetlands have been mapped near Pohick Creek (Lorton), Massey Creek, and Occoquan River in Prince William County. Alternative 3 is the only alternative that would require additional right-of-way near Occoquan River, and therefore has the greatest potential to impact wetlands and other habitat areas. For Alternatives 1, 2, and 4, potential impacts from widening the existing bridge over the Occoquan River will need to be studied. **Table 3-7** lists the potential impacts associated with each alternative. Potential impacts were calculated using available GIS data.

Temporary indirect impacts to these resources could result from construction-related activities. During construction, proposed improvements will be required to comply with applicable federal, state, and local standards. All necessary permits will be assessed during the NEPA phase and acquired prior to construction. Because the project is located within the Coastal Zone, a federal consistency determination will be required.

Table 3-7: Potential Impacts to Water Resources

	Alt 1: BRT Curb	Alt 2: BRT Median	Alt 3: LRT	Alt 4: Hybrid
Floodplains	7.5 acres	8.4 acres	8.4 acres	8.4 acres
Impaired Waters	0.06 acres	0.07 acres	0.6 acres	0.07 acres
Wetlands	0.09 acres	0.2 acres	0.66 acres	0.2 acres
Streams	1,104 feet	1,260 feet	1,299 feet	1,260 feet
Stormwater Management (Impervious Surface added from Road Widening)	7.29 acres	25.11 acres	24.76 acres	25.11 acres

3.9 Protected Species and Critical Habitats

3.9.1 Regulatory Considerations

Section 7 of the Endangered Species Act of 1973 regulates federally-listed threatened and endangered species and designated critical habitats. The National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) identify, manage and protect those species in danger of extinction. USFWS also maintains a list of candidate species that do not have threatened or endangered status but are of special concern.

Virginia protects threatened or endangered plants and insects under its Endangered Plant and Insect Species Act of 1979. The Act provides for the listing and protection of species through the Virginia Department of Agriculture and Consumer Services (VDACS) with help from the Division of Natural Heritage (DNH) of Virginia Department of Conservation and Recreation (VDCR). The DNH of VDCR also protects rare plant and animal species and natural heritage areas throughout the Commonwealth. Non-endangered wildlife is protected under federal law by the Migratory Bird Treaty Act of 1918, last amended in 1986, which provides protection for native migratory game and non-game birds. The Virginia Department of Game and Inland Fisheries (VDGIF) regulates non-endangered wildlife at the state level.

3.9.2 Study Area Conditions

According to the USFWS on-line database, four threatened or endangered species were identified within the study area. The four species within the study area are listed in

Table 3-8. Threatened and Endangered Species habitat, as well as Anandromous Fish Use areas, is shown in **Figure 3-7**.

Table 3-8: Threatened or Endangered Species

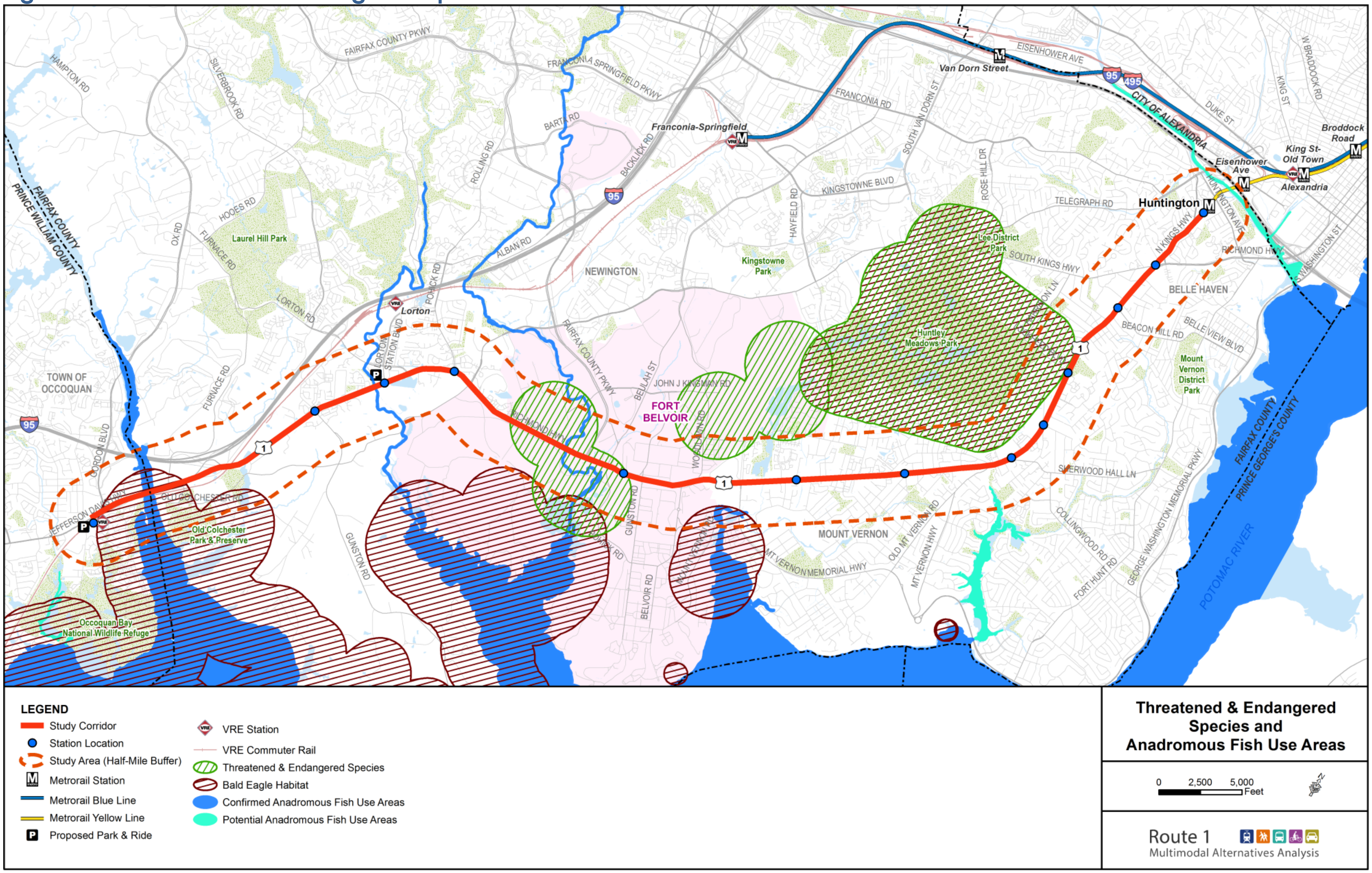
Common Name	Genus	Species	Status	Notes
Dwarf wedgemussel (Clam)	*Alasmidonta*	*heterodon*	Federal Endangered	
Bald Eagle	Haliaeetus	leucocephalus	Federal Species of Concern	The College of William & Mary Center for Conversation Biology does not report any bald eagle nests immediately within the study area, but the southernmost portion of the project is within a Bald Eagle concentration area.
Wood Turtle	*Glyptemys*	*insculpta*	State Threatened	
Peregrine Falcon	*Falco*	*peregrinus*	State Threatened	
Harperella (Flowering plants)	*Ptilimnium*	*nodosum*	Federal Endangered	

Sources: USFWS IpAC . Accessed 2014 http://ecos.fws.gov/ipac/wizard/trustResourceList!prepare.action; VDCR database, 2014.

3.9.3 Findings

Because all of the alternatives follow the same alignment and have similar service characteristics, likely impacts on protected species and critical habitats are comparable for all alternatives. During the NEPA phase, more detailed analysis will be required to understand if any of these resources could be affected by any of the alternatives. To identify whether any other species inhabit the study area, coordination with USFWS agency and field investigations may be required.

Figure 3-7: Threatened & Endangered Species and Anandromous Fish Use Areas



3.10 Potentially Contaminated Sites

3.10.1 Study Area Conditions

According to an inventory search using Virginia Department of Environmental Quality (DEQ) and EPA databases, the following potentially contaminated sites were present in the study area and are shown in **Figure 3-8**.

- 6 DEQ Petroleum Release Sites
- 3 EPA Toxic Release Inventory Sites
- 1 Landfill
- 1 EPA RCRA Site

3.10.2 Findings

Only two of the previously documented sites are adjacent to the alignment. A gas station near Grovetown could be directly potentially impacted by the Alternatives. Alternative 3 could also directly impact a site (Vulcan materials, crushed stone supplier) in Prince William County. No field work was conducted, and a Phase I Environmental Site Assessment is recommended during the NEPA phase to further research these sites and any other potentially contaminated areas along the corridor.

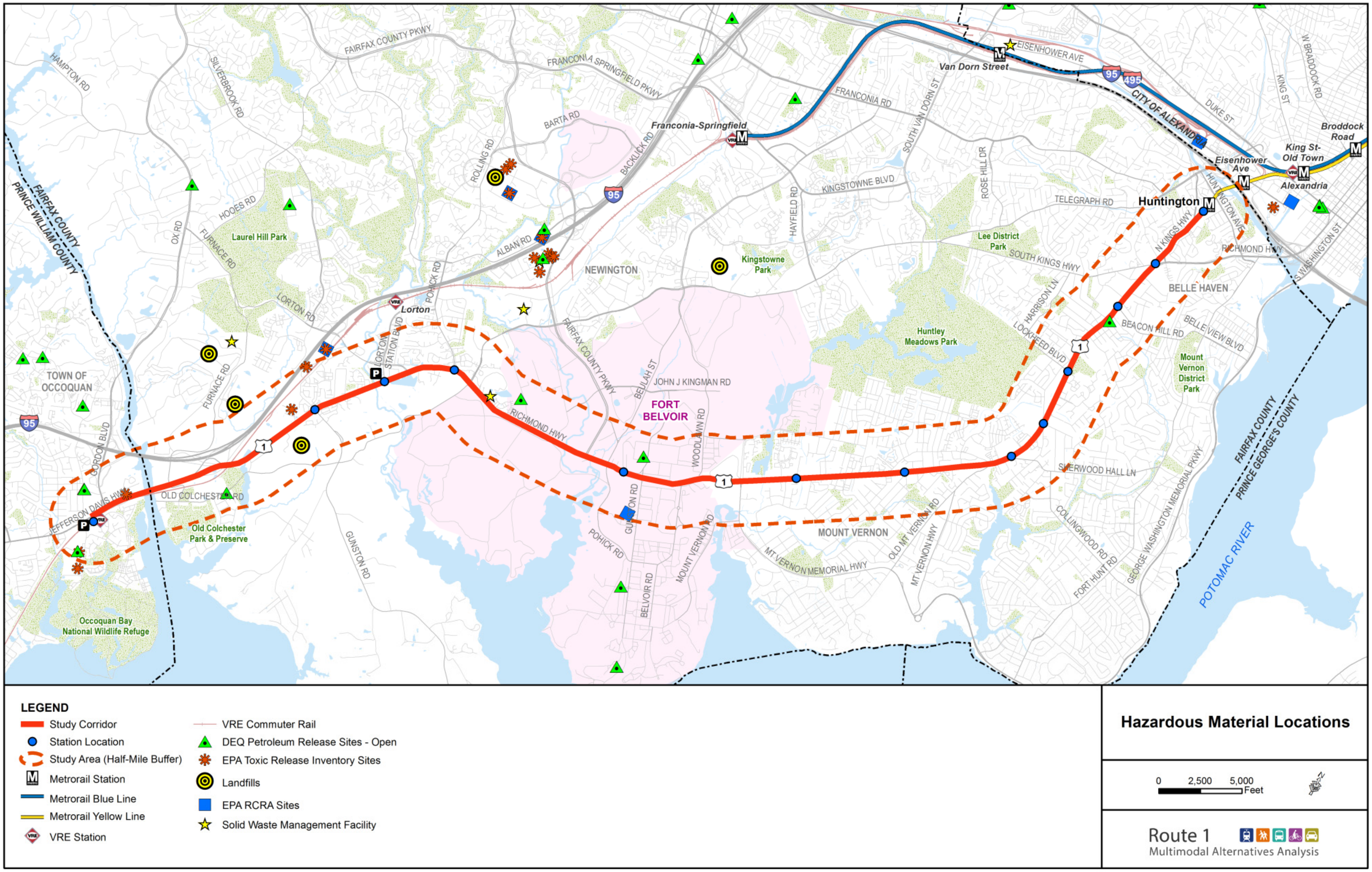
3.11 Construction Impacts

Project construction impacts are defined as those impacts that are localized, temporary and short-term, occurring only during the construction period. These impacts generally are limited to the immediate construction area and would occur primarily in the form of traffic changes along with physical changes to land use from earth moving and vegetation removal by means of construction equipment. Throughout construction, impacts are controlled by the use of specifically defined and/or regulated construction practices.

3.11.1 Findings

Construction activities may result in impacts to air quality, noise, soils, water quality, wetlands, streams, wildlife and their habitat, and transportation conditions. In particular, traffic impacts could include lane closures, diversion of traffic, and removal of shoulders, potentially affecting traffic safety and flow. Effects of construction impacts could be mitigated by following applicable state and local procedures as well as industry standards for each of the various resources. For traffic impacts, implementation of traffic maintenance plans will be likely be required which would include signage and detour information. In preparation for construction, the contractor would coordinate with applicable authorities, including VDOT, to ensure that effects related to construction on the roadways are addressed and minimized. This could include developing traffic maintenance plans and mitigation of potential construction impacts. During the potential construction of Alternative 4 – Metrorail portions, there could also be concerns of noise and vibration impacts during the tunnel construction that would need to be addressed during the NEPA phase and public involvement activities.

Figure 3-8: Potentially Contaminated or Hazardous Materials Locations



4.0 Discussion of Likely NEPA Class of Action

The purpose of this environmental scan is to help identify some of the potential environmental constraints and effects associated with the alternatives for refinement and implementation. This information is valuable in providing background to the lead federal agency/agencies to identify the appropriate NEPA class of action should federal funding be identified for the project.

At the end of this current study, a recommendation of a preferred transit alternative and program of projects for multimodal improvements will be made. The identification of a recommended preferred alternative will be made based on the alternative's ability to meet the stated purpose and need of the proposed action based on detailed technical evaluation and stakeholder input. This preferred alternative will advance for further evaluation and study, and advanced into local and regional transportation plans by the project sponsor.

For federally funded projects, the requirements of NEPA must be met. NEPA defines three (3) classes of action: Categorical Exclusion (CE), Environmental Assessment (EA) and Environmental Impact Statement (EIS). **Table 4-1** defines these classes of action.

Table 4-1: NEPA Classes of Action

	Environmental Impact Statement	Environmental Assessment	Categorical Exclusion
Applicability	• Significant impacts are anticipated • Complex projects that have a high likelihood of legal challenge or public controversy	• Project type is not listed as a CE in (CE list) • Significance of impacts is uncertain • EAs may be elevated to EIS when significant impacts are identified during the study	• Listed as a CE in regulations • Projects with no significant impacts • Often primarily within existing right-of-way
Requirements	• Evaluates a range of alternatives (including a No Build) • Notice of Intent (published in the Federal Register) • Formal Scoping process • Public hearings required • Decision documented in a Record of Decision (ROD)	• May evaluate a preferred alternative or range of alternatives (including a No Build) • Public information meetings and hearings are not always required • Decision documented in a Finding of No Significant Impact if no significant impacts are identified. If significant impacts are identified, preparation of an EIS may be required.	• May be completed through a CE Checklist identified by lead agency or if more information is needed, a Documented CE may be prepared. • Public involvement requirements not as stringent as with EA/EIS • Decision is a signed CE
General time frames*	• Typically 18 months to 3 years for Draft EIS and another 1 to 2 years for a Final EIS/ROD(depending on the complexity of the project)	• Typically 6 to 18 months	• Typically 2 to 6 months

*Timeframes provided are for general discussion purposes; timeframes vary by project

The following section discusses the potential classes of action associated with each alternative.

4.1 Potential Class of Action Discussion

Generally, the three key drivers that help determine the potential for significant impacts, and therefore the level of NEPA documentation, are:

- Context and intensity of the impacts to key resources,
- Scale (size and cost) of the anticipated project, and
- Potential areas for and magnitude of public discussion/controversy.

During the Alternatives Analysis process, all of the alternatives were found to have similar footprints, and consequently similar impacts. However, the alternatives vary in scale - ranging from adding BRT service largely within existing right of way to the inclusion of new underground heavy rail service or surface running light rail service. A consideration for each alternative is also the likely construction effects. Each alternative would have some degree of construction effects that contribute to the complexity of the project and vary by alternative. **Table 4-2** highlights the factors associated with each alternative that will likely influence the class of action.

Table 4-2: Factors that Influence Class of Action

	Alt 1- BRT Curb	Alt 2- BRT Median	Alt 3- LRT	Alt 4- Hybrid
Context and intensity of the impacts to key resources	May have the greatest limitations to existing access points to businesses entering/exiting Route 1	Higher amount of right of way impacts	Greatest amount of right of way impact	For BRT project, higher amount of right of way impacts
Scale (size and capital cost)	Least estimated project cost ($832M)	Lower estimated project cost ($1.01B)	Higher estimated project cost ($1.56B)	Greatest estimated project cost ($2.46B)
Potential areas for and magnitude of public discussion/controversy	Generally lower controversy and concern; potential right-of-way impacts most likely issue	Generally lower controversy and concern; potential right-of-way impacts most likely issue	Raises greater controversy and concern; high overall project cost and potential right-of-way impacts most likely issue	Potential for greater controversy and concern; high overall project cost, tunneling and vibration most likely issue
Likely Class of Action	Environmental Assessment	Environmental Assessment	Environmental Impact Statement	Environmental Impact Statement

Alternatives 1 and 2 propose BRT service, either operating along the curb or within the median area within Fairfax County and within mixed traffic in Prince William County. The proposed footprints would not vary greatly and the scale and magnitude of the implementation of either of these alternatives may not be considered significant, and therefore an Environmental Assessment would likely be required for either Alternative 1 or 2.

Alternative 3 would include the LRT option operating in the median area to southern Fairfax County, where it would operate in a parallel dedicated transitway across the Occoquan River and in Prince William County. This alternative would likely require a larger amount of new right of way, property acquisitions, and relocations beyond that anticipated for the other proposed alternatives. Additionally, the scale of the project is typically considered more substantial and often more significant, therefore an EIS would likely be required if this alternative were to be carried forward.

Alternative 4 would include a Metrorail running underground in the northern part of the corridor with BRT operating in the median and in mixed traffic in the south. The addition of heavy rail systems underground may give the appearance of minimum physical impacts and right of way acquisitions, but the scale of the project is often considered large enough to warrant a full analysis of alternative approaches for underground running transit. Should this alternative be carried forward, it is anticipated that an Environmental Assessment would be required for the BRT portion/phases and that an EIS would be required for the Metrorail portion/phase.

4.2 Next Steps

As funding is underway and uncommitted at this time for design and construction of the proposed transit alternatives at this time, it is the current goal of DRPT, VDOT, Fairfax County, and Prince William County to identify a potential footprint for potential future alternatives, thereby preserving the corridor for future implementation of transit improvements. Identification of this potential footprint would not preclude the appropriate analysis of all reasonable alternatives in the NEPA process. With the redevelopment that is currently ongoing throughout the project corridor, it is anticipated that the future land uses will continue to change compared with what is present today.

Since the potential for significant impacts under future conditions cannot be determined with certainty, an EA could be suggested as the first step for the NEPA process for any of the alternatives currently under consideration. Once additional agency coordination and scoping activities are initiated, it may become clear to the lead federal agency/agencies that significant impacts are anticipated. The NEPA process could then easily transition from an EA to an EIS if needed to ensure the proper level of analysis and documentation is completed for the project.

As part of subsequent discussions with the lead federal agency/agencies, a phased approach to NEPA could be considered for the project corridor (see Section 5.0, below).

After a recommended alternative is identified, the project team will refine information on the proposed project including a project description, a summary of prior planning work on the project, the project's general purpose and need, a map of the alignment and proposed station locations, its potential effects on the environment and human health, and other project features.

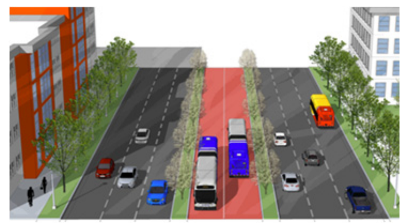
5.0 Addendum: Phasing and Implementation Approach

5.1 Draft Multimodal Recommendation and Phasing Implementation Plan

Since the Environmental Scan was first developed, the project team has recommended a preferred alternative and phasing implementation plan. This plan was presented and discussed with the Technical Advisory Committee, the Executive Steering Committee, the Community Involvement Committee, and at the Public Meeting in fall 2014. The recommendation and phasing plan is as follows:

Recommendation:

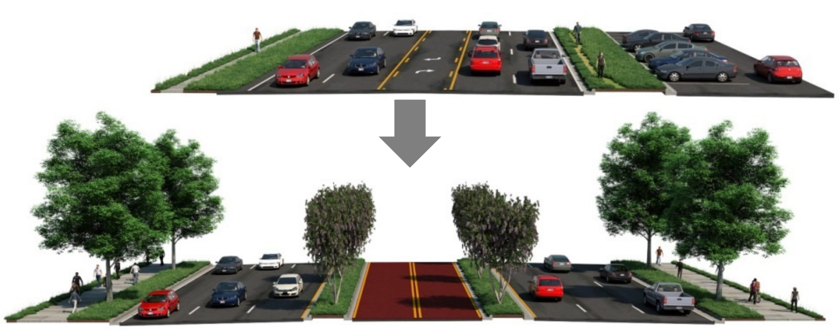
- **Transit:**
  - Median running **Bus Rapid Transit (BRT)** in the **near-term** would provide a cost effective transportation solution to support economic development plans.



  - **Metrorail extension** to Hybla Valley in the **long-term** has potential to provide a higher level of local and regional mobility and support long-term corridor development, contingent upon increased future land use density.

- **Bicycle/Pedestrian:** Construct a continuous pathway for pedestrians and bicyclists along the 15-mile corridor; the configuration will vary depending upon urban design, right-of-way availability, and other local considerations.

- **Roadway Widening**: Widen roadway from four lanes to six lanes to create a consistent, six-lane cross section along the corridor. This involves widening two segments along Route 1: (i) Napper Road to Mount Vernon Memorial Highway; and (ii) Lorton Road to Annapolis Way.



Bus Rapid Transit would be implemented in three phases, and the Metrorail extension would be completed in the fourth and final phase. **Figure 5-1** shows the construction phasing implementation plan and **Figure 5-2** provides a preliminary implementation timeline for each phase. The *Evaluation of Alternatives Report (Fall 2014)* provides more detailed information on the costs and key considerations that informed the phasing plan.

Figure 5-1: Phasing Plan

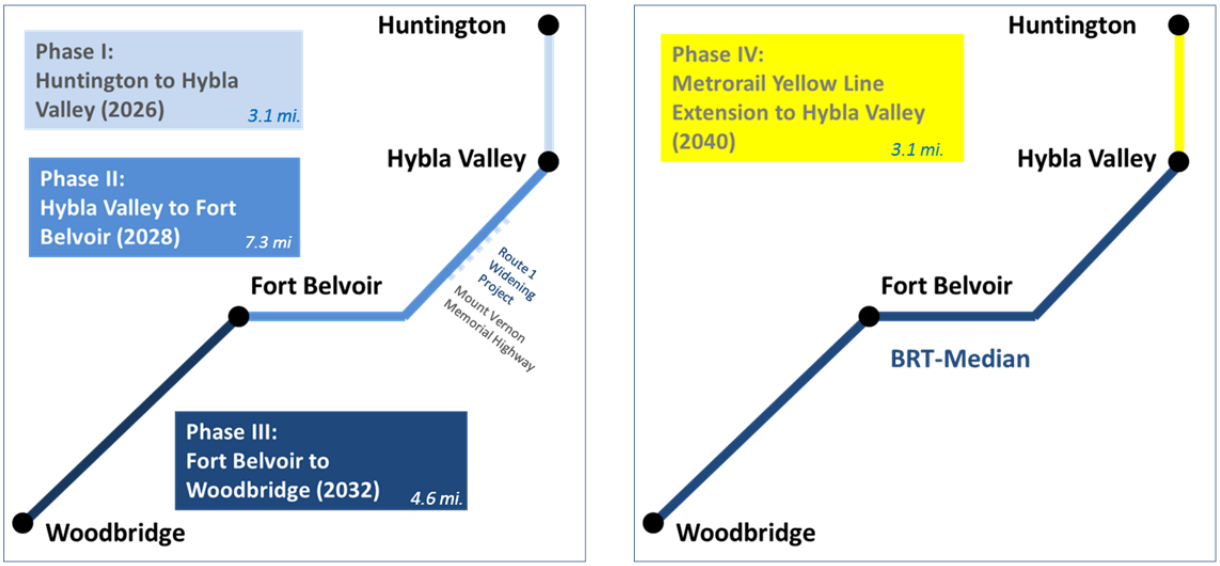
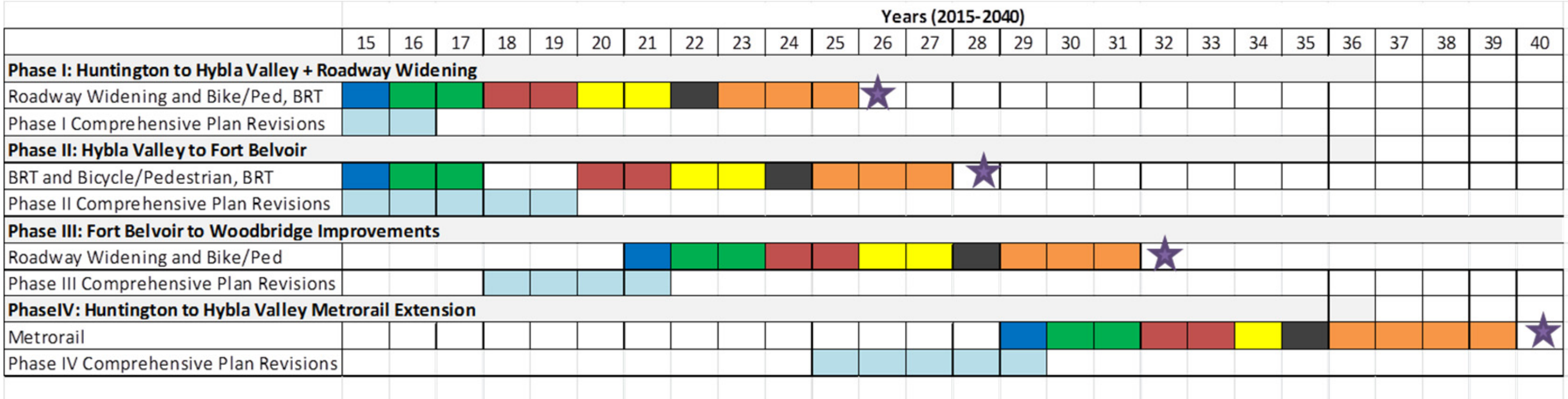


Figure 5-2: Potential Implementation Timelines



Note: Timelines assume a funding stream to support projects implementation.
*Contingent upon increased future land use density.

Legend: General Project Development Sequence

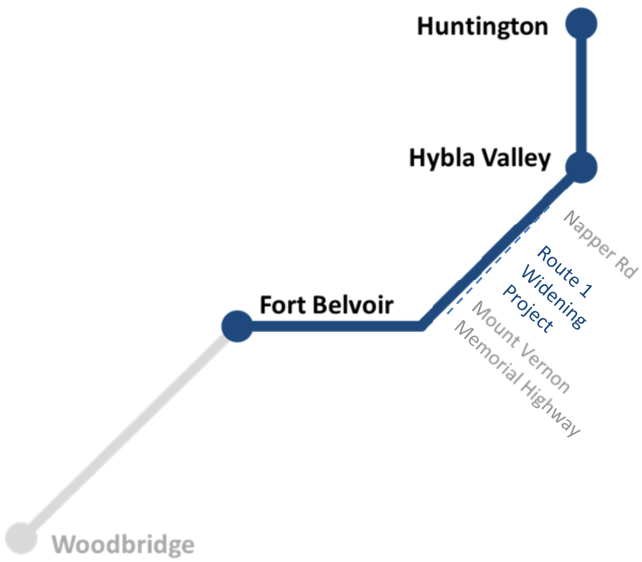
Comprehensive Plan	Planning	Scoping/ NEPA PE	Final Design	Right of Way	Utilities Relocation	Construction	Operation

5.2 NEPA Considerations and Likely Class of Action Determination

Based on the environmental scan findings and precedent projects, the project team recommends conducting environmental documentation for Phases I and II, concurrently. Although the construction of Phase I and II of the BRT project may be completed in two phases (as shown in Figure 5-1), the project team recommends completing environmental documentation for the 10-mile corridor segment between Huntington and Fort Belvoir. Preliminary analysis suggests that this BRT segment may be competitive for federal funding under the FTA Capital Investment Program (Section 5309) New Starts/Small Starts program.

The NEPA Class of Action for the multimodal improvements from Huntington to Fort Belvoir would likely be an Environmental Assessment given the findings of the Environmental Scan and preliminary conversations with agency partners. Given the multimodal nature of the improvements and range of assumed funding sources, it is likely that both FHWA and FTA would have oversight roles during the NEPA process.

Figure 5-3: Phase I of NEPA Documentation

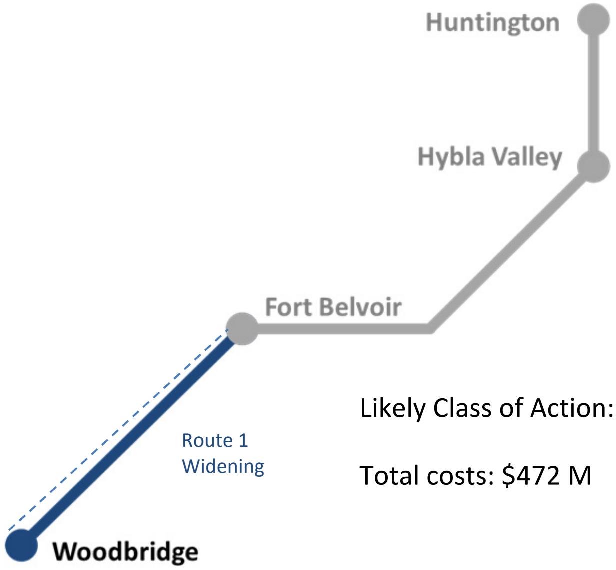


Likely Class of Action: Environmental Assessment

Total costs: $530M

Implementation of multi-modal improvements between Fort Belvoir and Woodbridge (see **Figure 5-4**) would likely be an Environmental Assessment as well. Preliminary analysis suggests that this segment is less competitive for federal funding under the FTA Capital Investment Program (Section 5309) New Starts/Small Starts program.

Figure 5-4: Phase II of NEPA Documentation

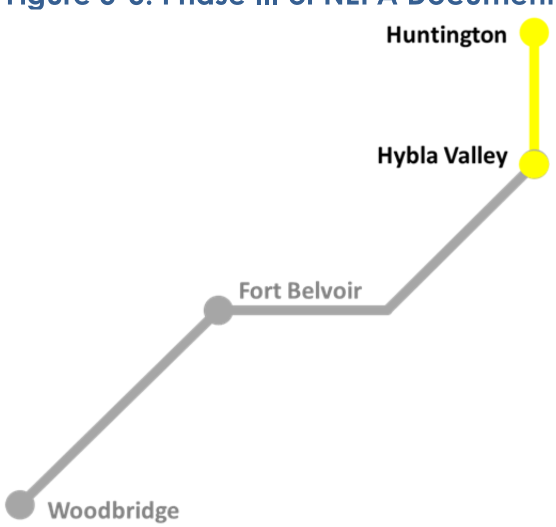


Likely Class of Action: Environmental Assessment

Total costs: $472 M

A Metrorail extension to Hybla Valley in 2040 would likely require an Environmental Impact Statement, given the scale of the project and likely impacts. Figure 5-5 shows the proposed Metrorail extension.

Figure 5-5: Phase III of NEPA Documentation



Likely Class of Action: Environmental Impact Statement

Total costs: $1.46 B

APPENDIX H

Funding Analysis Report

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Route 1

Multimodal Alternatives Analysis

ROUTE 1 MULTIMODAL ALTERNATIVES ANALYSIS

FUNDING ANALYSIS REPORT

November 18, 2014

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Attachment A: Value Capture Funding Preliminary Findings

1.0 Introduction

The Route 1 Alternatives Analysis scope calls for a comprehensive assessment of applicable funding sources. Scarcity of funds and competition among projects at federal, state, local levels means that the project will need to be creative and resourceful, drawing from a mix of sources. As a recommended alternative is defined, and implementation steps and configuration of the project are established, a detailed funding plan will be developed. The purpose of this preliminary report is to assess the applicability and capacity of funding sources, informed by the anticipated project configuration and guided by initial discussions with County and agency staff.

The report describes the landscape of the potential federal, state, and local funding sources to support the recommended program of multimodal improvements. It explains the capacity of existing revenue sources (annual appropriations and matching requirements), competition from other projects and modes of transportation for these revenue sources, project eligibility, and process requirements. This discussion will help inform the project's future funding plan.

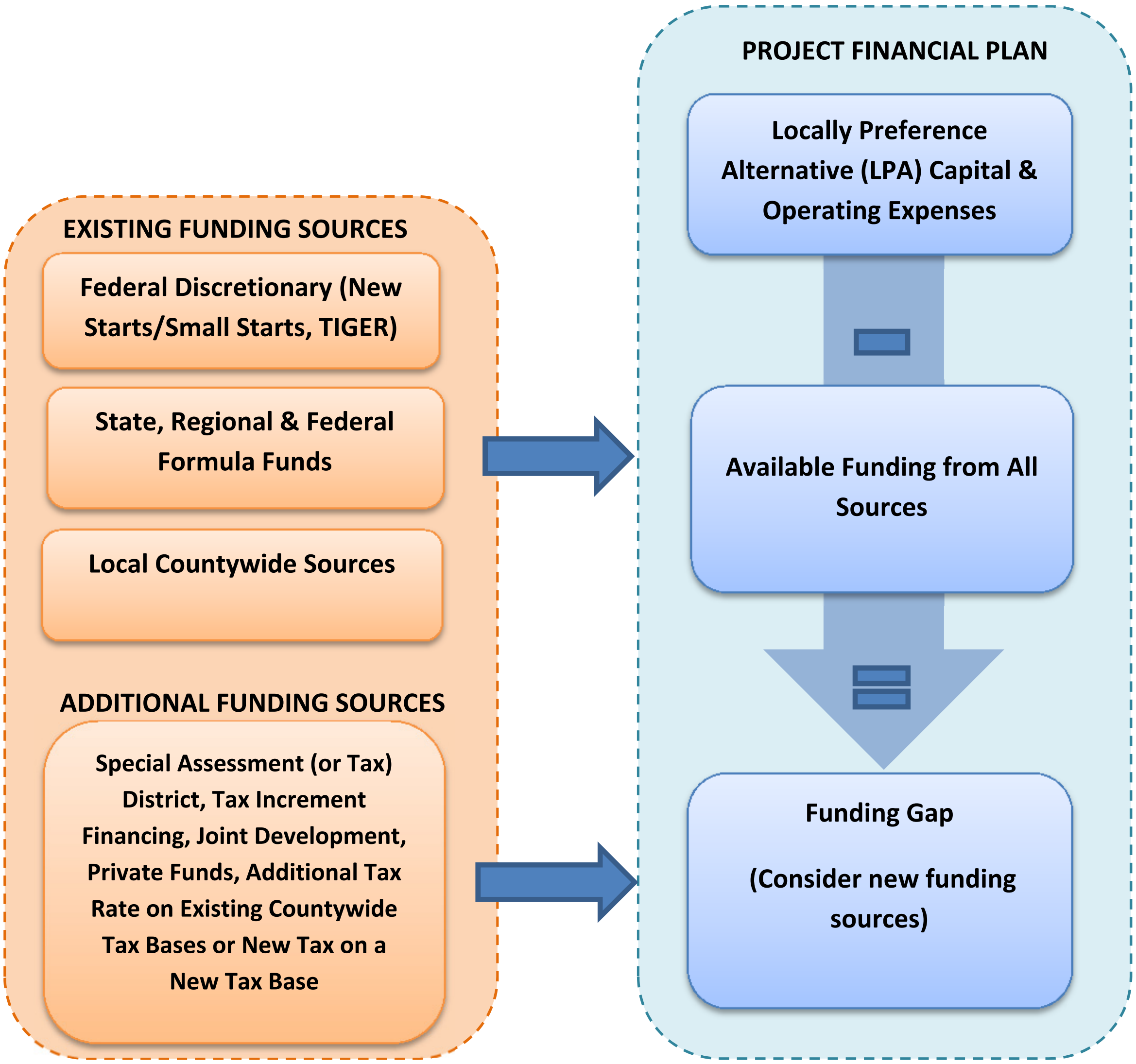
Because the transit component is the most capital-intensive portion of the multimodal recommendations, the early phases of project planning have been structured according to protocols from the Federal Transit Administration (FTA) Capital Investment Program. However, given the likely phasing of investments along the Route 1 corridor, this report assumes that different project sponsoring agencies will advance the different types of projects and draw from a range of funding sources. Again as an organizing principle, this report references FTA MAP-21 language and policy guidance on Local Financial Commitment.

Figure 1-1 summarizes conceptually the revenue sources reviewed in this report (listed on the left side) and how they can be applied in development of a Project Financial Plan (right side). Identification of local revenue sources early at the project development stage (including the project's capacity to encourage development and generate value) will be important for developing the project funding strategy.

The report is organized as follows:

- **Section 2.0:** Project's regulatory and institutional environment
- **Section 3.0:** Relevant federal funding sources
- **Section 4.0:** Relevant state funding sources
- **Section 5.0:** Northern Virginia specific or regional funding sources
- **Section 6.0:** Local funding sources
- **Section 7.0:** Summary of funding sources and recommendation of sources for the future project funding strategy
- **Section 8.0:** Application of the funding sources to the potential implementation schedules of the proposed Route 1 investments
- **Attachment A:** Summary of potential funding through value capture

Figure 1-1: Financial Analysis Summary Diagram



2.0 Transportation Planning Process and Resource Allocation

This section summarizes the transportation project planning process and explains its importance in the funding and resource allocation process for different transportation funding agencies. This section also discusses the key state and regional agencies that could potentially help fund the project.

2.1 Project Planning and Funding Environment

Regional, State, and Federal Funding Eligibility Requirement

To be eligible for state and/or federal formula funding, the project needs to be included in the Metropolitan Washington Council of Governments (MWCOG) National Capital Region's Financially Constrained Long-Range Transportation Plan (CLRP) and in the Transportation Improvement Program (TIPs). In Virginia, there are two kinds of TIPS: (i) a three-year Statewide Transportation Improvement Program (STIP), and (ii) the six-year Transportation Improvement Program (SYIP).

The CLRP and TIPs are the main transportation policy and planning documents which prioritize projects for funding in a fiscally constrained environment. The CLRP is developed and updated by the Transportation Planning Board (TPB), which is responsible for unified transportation planning for the region comprising the District of Columbia, suburban Maryland, and Northern Virginia and serves as the Metropolitan Planning Organization (MPO) for the Washington, DC—MD—VA Urbanized Area. TPB receives technical support from the Metropolitan Washington Council of Governments (MWCOG). TPB is required to conduct a major update of the CLRP and develop a new Financial Plan every four years. The latest update for 2014 has not yet been released.[1] The six-year TIP is updated every year.

State Funding Eligibility Requirements

In Virginia, the Commonwealth Transportation Board (CTB) establishes policies for Virginia's transportation system and apportions state and federal funds. The CTB governs Virginia Department of Transportation or VDOT (highway funding) and Virginia Department of Rail and Public Transportation or DRPT (rail and transit funding) and approves these agencies' six-year plans with specific projects and funding sources. Within northern Virginia, VDOT and DRPT plans inform the regional CLRP and TIP. The 18-member CTB is chaired by the Secretary of Transportation and supported by the Office of Intermodal Planning and Investment (OIPI). OIPI was created in 2002 to encourage coordination of multimodal and intermodal planning across the various transportation modes within the Commonwealth.

The OIPI assists the CTB in conducting a comprehensive review of statewide transportation needs focusing primarily on corridors of statewide significance, regional networks and urban development

[1] http://www.mwcog.org/clrp/process/schedule.asp

areas and developing the VTrans Vision policy document (VTrans 2040 is planned for completion in 2015). The VTrans policy document, in its turn, guides development of the long range Statewide Surface Transportation Plan and the respective agencies' long range plans:

- Statewide Highway Plan
- Statewide Rail Plan
- Statewide Transit and Transportation Demand Management Plan

Federal Formula Funding Eligibility Requirements and Plans

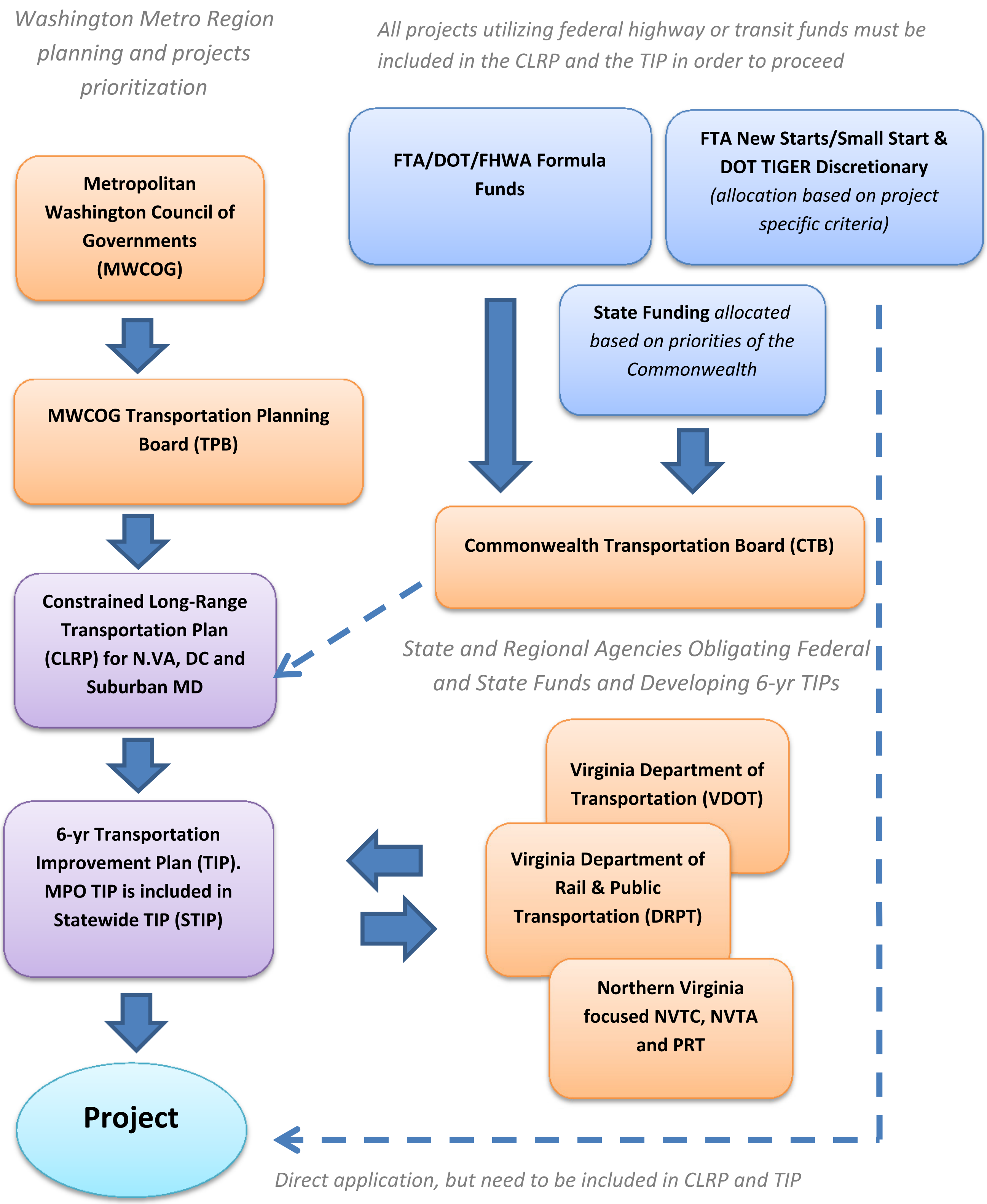
The Six-Year Improvement Program (SYIP) is the federally required transportation improvement plan that documents how Virginia will obligate its share of federal funds. This plan identifies those transit and highway construction and maintenance projects that will use federal funding, or for which federal approval will be required. DRPT and VDOT update the SYIP multiple times per year and the CTB adopts the SYIP annually in June. SYIP must include all projects included in the MPO TIPs. The current SYIP covers FY 2015 to FY2020, with funds programmed for 2015 for projects already recommended and approved for funding by the respective agencies, MPOs and the CTB.

Regional Funding Eligibility Requirements

Regional agencies obligating state and federal funding to the projects in Northern Virginia include Northern Virginia Transportation Authority (NVTA), Northern Virginia Transportation Commission (NVTC), and Potomac & Rappahannock Transportation Commission (PRTC).

Figure 2-1 summarizes the transportation planning and intergovernmental funding environment relevant to this project.

Figure 2-1: Transportation Planning and Funding Environment



2.2 Project Sponsors and Potential Project Funding Partners

At the local level, the counties whose population will benefit from the improved transit service and road improvements are Fairfax County and Prince William County. Fairfax and Prince William County will likely be the project sponsors.

Given the institutional landscape, the potential funding partners include state agencies such as the Department of Rail and Public Transportation and Virginia Department of Transportation, and regional agencies active in the Northern Virginia such as Northern Virginia Transportation Authority, Northern Virginia Transportation Commission, and Potomac & Rappahannock Transportation Commission. **Figure 2-2** summarizes local, regional and state stakeholders in the project.

2.2.1 State Agencies

State agencies include:

- **Virginia Department of Rail and Public Transportation (DRPT):** The Department of Rail and Public Transportation (DRPT) is an agency of the Commonwealth of Virginia. Its mission is "to improve the mobility of people and goods while expanding transportation choices in the Commonwealth." The three primary areas of DRPT activity are the state's railroads, public transportation, and commuter services. The Agency's director is a member of Northern Virginia Transportation Commission, and Potomac & Rappahannock Transportation Commission described below. The DRPT cooperates with VDOT on issues related to the TPB.

- **Virginia Department of Transportation (VDOT):** The Virginia Department of Transportation (VDOT) is responsible for building, maintaining and operating the state's roads, bridges and tunnels. VDOT is directed by a commissioner who sits on CTB. VDOT also serves as staff to the CTB and is a voting member of TPB.

2.2.2 Regional Agencies

Three regional agencies include:

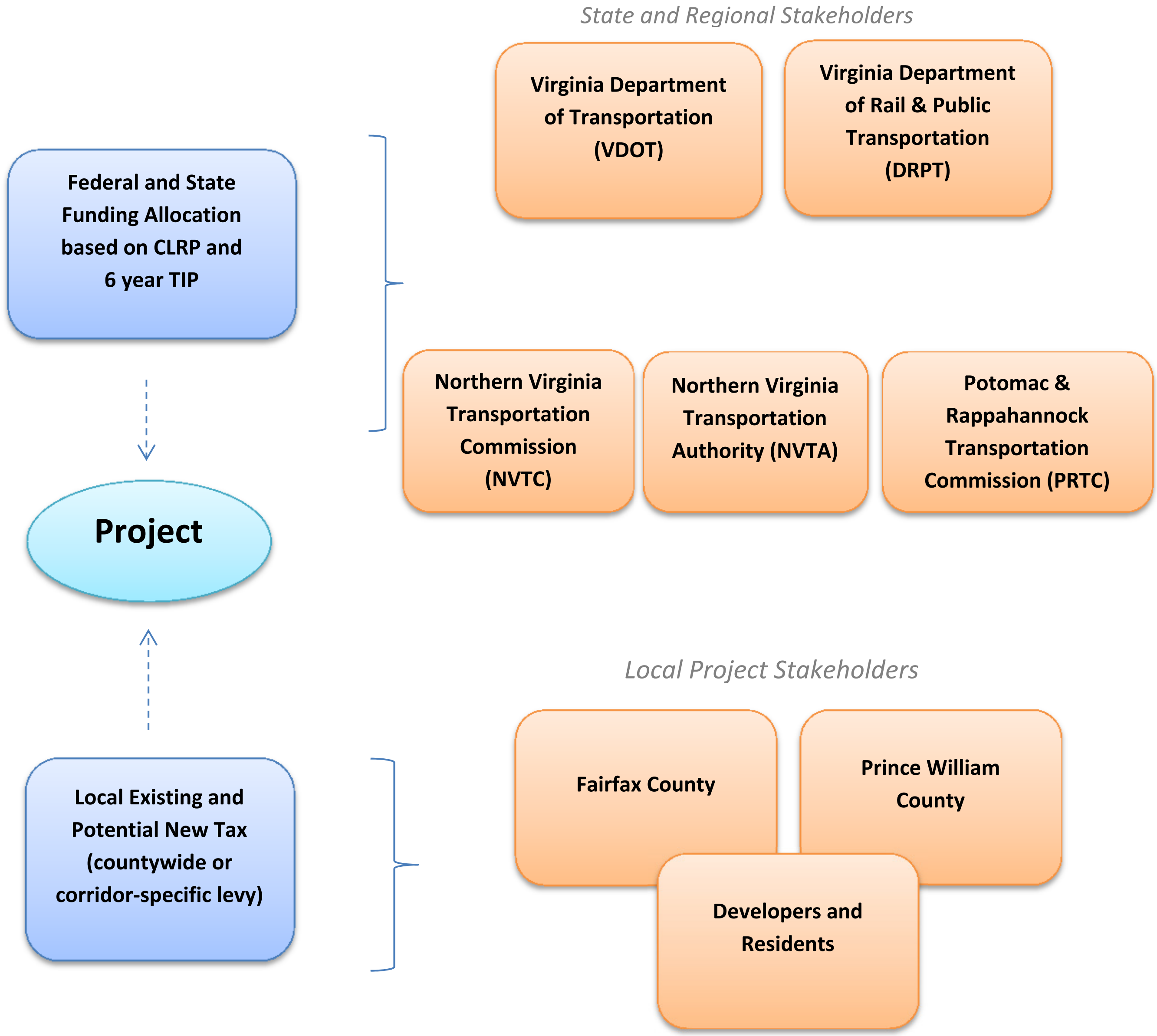
- **Northern Virginia Transportation Authority (NVTA):** NVTA was created by the Virginia General Assembly in 2002, to develop a regional transportation plan for Northern Virginia, including projects of regional significance. The Authority is made up of nine jurisdictions including: the counties of Arlington, Fairfax, Loudoun and Prince William; as well as the cities of Alexandria, Fairfax, Falls Church, Manassas and Manassas Park. NVTA sets priorities for regional transportation projects. NVTA communicates priorities for federal and state funding to TPB. In 2012 the Authority completed TransAction 2040, its regional transportation plan consisting of projects of which would "reduce congestion, improve travel times, reduce delays, connect regional activity centers, improve safety, improve air quality, and move the most people in the most cost-effective manner”.[2]

- **The Northern Virginia Transportation Commission (NVTC):** NVTC was created in 1964 by General Assembly to manage and control the functions, affairs, and property of the Northern Virginia Transportation District and to facilitate planning and developing a transportation system for Northern Virginia. Member jurisdictions include Arlington County, Fairfax County, and Loudoun County, and the cities of Alexandria, Fairfax, and Falls Church. It allocates over $100 million per year of regional, state and federal assistance to the six member jurisdictions and serves as a forum for regional transit and ridesharing policymaking. NVTC co-manages the Virginia Railway Express commuter rail service with PRTC.

- **The Potomac & Rappahannock Transportation Commission (PRTC):** The Potomac & Rappahannock Transportation Commission (PRTC), created in 1986, is a public transportation system in Prince William County, Virginia, plus two adjacent independent cities, Manassas and Manassas Park, that together are surrounded by the county. Transit services provided by PRTC include OmniRide, OmniLink, and OmniMatch. Together with the NVTC, PRTC operates the Virginia Railway Express.

[2] http://www.thenovaauthority.org/mission.html

Figure 2-2: Project State and Local Stakeholders and Relationships to Funding Sources



3.0 Federal Funding Sources

This section describes the Federal transit and highway funding options, including both discretionary grants and formula grants. Discretionary grant programs such as the Federal Transit Administration (FTA) Capital Investment Program (Section 5309) and TIGER are competitive nationwide programs. FTA Urbanized Area Grants, Federal Highways Administration (FHWA) Surface Transportation Program, and National Highway Performance Program (NHPP) provide transportation funding to the states and regions based on a specific formula.

The following sub-sections describe each federal funding source which may be considered for the project, recent trends, and the size of potential funding which could be expected.

3.1 FTA Transit Grants

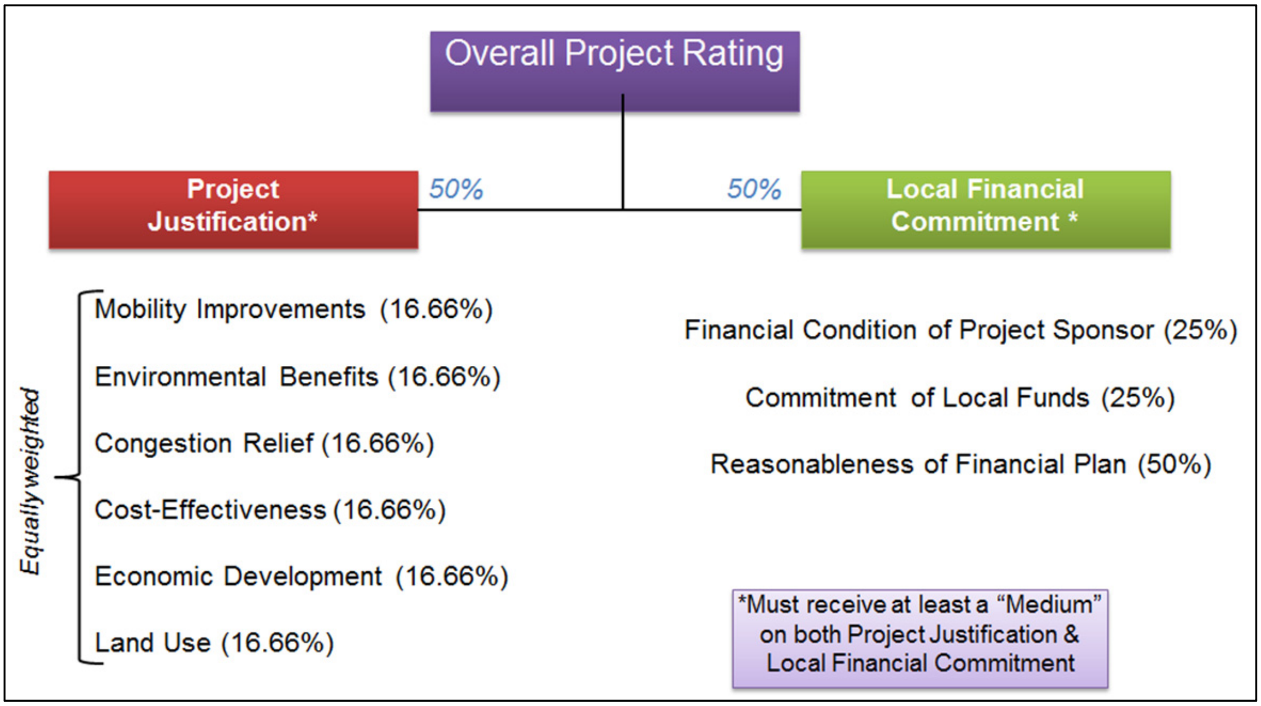
3.1.1 FTA New Starts/Small Starts

Program Eligibility and Evaluation Criteria

FTA Section 5309 Fixed Guideway Capital Investment Grant Program, also known as "New Starts/Small Starts", awards grants on a competitive basis for major investments in new and expanded rail, bus rapid transit (BRT), and ferry systems. Projects with a capital cost of over $250 million are eligible for New Starts funding, while projects eligible for Small Starts funding are less than $250 million.

New Starts/Small Starts Grant Program is becoming more competitive, placing a greater focus on local funding commitment. There are two sets of criteria that guide the FTA project selection. FTA applies *Project Justification* criteria shown on the left of the **Figure 3-1** (assigning equal weights to each criteria) and *Local Financial Commitment* criteria shown on the right side of the figure (assigning 25 percent weight to the Financial Condition of the Project Sponsor(s), 25 percent to the Commitment of Local Funds, and 50 percent weight to the strength of the Project Financial Plan. The overall rating is a combined rating based both on the strength of the Project Justification and the Local Financial Commitment.

Figure 3-1: New Starts Evaluation Framework



Source: http://www.fta.dot.gov/documents/NS-SS_Final_PolicyGuidance_August_2013.pdf

It is important to recognize that the Financial Plan requirements for FTA New Starts/Small Starts submission are different for New Starts and Small Starts. Development of a Financial Plan for the project will require clarification on the following assumptions:

- Assumption on target amount of federal share, which will determine the local match (based on the track record of previous projects-applicants 50 percent federal share will be a conservative estimate).
- Assumed maximum annual funding which may be available under the Full Funding Grant Agreement (based on the recent trends, also could be confirmed with the FTA New Starts/Small Starts Program staff).

Program Funding

Table 3-1 summarizes federal fiscal years 2011-2014 budget requests for New Starts/Small Starts. The budget funds newly signed Full Funding Grant Agreements (FFGAs), FFGAs that carry over from prior years, and FFGAs for projects under construction.

Table 3-1: FY 2011-FY2014 Budget Request for New Starts/Small Starts

Fiscal Year	Budget Request	New FFGAs	FFGAs approved in prior years, carry over	Continued Funding (Construction)
FY 2014	$1.9 billion for 27 projects	8 new projects	9 projects	10 projects
FY 2013	$2.2 billion for 29 projects	7 new projects	10 projects	12 projects
FY 2012	$3.2 billion for 28 projects	10 new projects	11 projects	7 projects
FY 2011	$1.82 billion for 27 projects	10 new projects	9 projects	8 projects

Source: http://www.fta.dot.gov/12347_5221.html

The Government Accountability Office (GAO) analysis of the FTA's 2004 through 2012 New Starts/Small Starts project data revealed that historically the federal share in the New Starts financing has been about 45.0 per cent, local about 48.1 per cent and state 6.9 percent. For Small Starts, the federal share was larger or 67 percent, with local contributing 24.1 percent and state - about 8.8 percent.[3]

If the project submits a competitive application and is approved by FTA into Engineering or for a Full Funding Grant Agreement, FTA could be expected to provide about 50 percent in federal share for the capital costs. Projects seeking FTA funding must demonstrate strong local financial commitment and achieve sufficient ratings in the Project Justification factors listed on the left side of the **Figure 3-1** above.

3.1.2 Section 5307 Urbanized Area Formula Grants

Program Eligibility and Evaluation Criteria

Section 5307 Urbanized Area Formula Grants program provides grants to urbanized areas (UZAs) with populations of more than 50,000 to support public transportation. Funding is distributed by formula based on the level of transit service provided, population, and other factors. Eligible projects include capital projects, planning, job access and reverse commute projects, operating and maintenance for operators in UZAs less than 200,000 in population and for small operators in larger UZAs.

Unlike FTA New Starts/Small Starts, Section 5307 Urbanized Area Formula funds are distributed through the state agencies such as Virginia Department of Rail and Public Transportation (DRPT) based on the federally-determined formula and project eligibility requirements as well as state and regional transportation priorities laid out in the Financially Constrained Long-Range Transportation Plan (CLRP) developed and updated by the National Capital Region Transportation Planning Board (TPB).

[3] GAO Report to Congressional Committees on Public Transit Funding for New Stars and Small Starts Projects, October 2004 through June 2012, November 2012
http://www.gao.gov/assets/660/650030.pdf

Program Funding

Total program FY 2014 Funding was about $4.45 billion. Northern Virginia receives Section 5307 Urbanized Area Formula funds as part of the Washington, DC, VA, and MD urbanized area (UZA). **Table 3-2** shows the FTA allocation of Section 5307 and 5340 funding to Northern Virginia as part of the Washington Capital Metro region under MAP-21.

Table 3-2: FTA 2013 Section 5307 and 5340 Urbanized Area Apportionments[4]

Area	Amount
Regional Total	$169.3 million
District of Columbia	$87.9 million
Maryland	$48.6 million
Northern Virginia	$32.9 million

Source: http://www.fta.dot.gov/12853_14875.html

3.2 Other Federal Highway Administration Grants

FHWA administers two relevant formula grant programs. Federal Surface Transportation Program (STP) funds and National Highway Performance Program (NHPP) funds are obligated by the Virginia Department of Transportation (VDOT) based on the transportation plans approved by the TPB and the CTB. The following sub-sections describe both programs.

3.2.1 FHWA Surface Transportation Program (STP)

Program Eligibility and Evaluation Criteria

The Surface Transportation Program (STP) provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge, and tunnel projects on any public road; pedestrian and bicycle infrastructure and transit capital projects, including intercity bus terminals.

VDOT jointly with DRPT obligates federal STP funding based on the list of recommended regional STP projects approved by the Commonwealth Transportation Board (CTB). VDOT works with NVTA to identify and obligate funding for eligible STP projects in Northern Virginia (including Fairfax and Prince Williams Counties). NVTA receives applications for regional STP funding, reviews them and recommends a list of projects for funding approval by VDOT and CTB.

Program Funding

STP is funded from the Highway Account of the Highway Trust Fund. $10.1 billion were allocated to the Program for FY 2014 under MAP-21[5]. About $41 million in regional STP funds were projected to become

[4] Section 5340, the Growing States and High Density States Formula Program (49 U.S.C. 5340), can be applied to qualifying UZAs in addition to section 5307 funds

[5] http://www.fhwa.dot.gov/map21/factsheets/stp.cfm

available for FY 2020 STP applications within Northern Virginia. STP funds recipients have 12 months to obligate the funds and then 36 months to expend the funds.

Projected STP funding is fully programmed for FY 2014 to FY2020. New projects can be added only after funding of the next phase of the existing projects is provided. **Table 3-3** shows the projects and funding allocations for FY2020, which is indicative of the potential funding capacity for this source.

Table 3-3: Projected FY 2020 STP Regional Funding for Fairfax and Prince William Counties [1]

County	Total STP Funding	Funding Breakdown
Fairfax County	Total $18.3 million	$8 million for Tysons Corner Roadway Improvements, $4 million for Route 236/Beauregard Street Intersection Improvements, Route 7, $4.3 million for Reston Ave to Reston Pkwy and $2 million for Rolling Road (Old Keene Mill to FCP)
Prince William County	Total $8.1 million	$8.1 million for Route 1 widening from Featherstone Drive to Mary's Way

3.2.2 National Highway Performance Program (NHPP)

Program Eligibility and Evaluation Criteria

The NHPP Program was formed under MAP-21 through consolidation of Interstate Maintenance, National Highway System and some provisions of Highway Bridge programs under the prior federal funding authorization legislation, SAFETEA-LU. NHPP funds are used to support the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and to ensure that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in an asset management plan of a State for the NHS.[6] MAP-21 establishes a performance basis for maintaining and improving the NHS. Eligible projects include rural and urban roads on the NHS, links to intermodal terminals, transit, bicycle and pedestrian improvements in NHS corridors.

Program Funding

The NHPP is authorized at $21.8 billion in FY 2014. A brief review of the VDOT FY 2014 annual budget shows that most of the NHPP funding is recommended for constructing roads and bridges on the interstate highway systems.[7]

[1] http://www.thenovaauthority.org/PDFs/Meetings/2013/12.12.13/X%20FY20%20CMAQ%20RSTP%20Strawman.pdf

[6] http://www.fhwa.dot.gov/map21/factsheets/stp.cfm

[7] http://www.virginiadot.org/about/resources/FY_14_Budget_final.pdf

3.3 Combined Multimodal Programs

The following sub-sections describe The Transportation Investment Generating Economic Recovery (TIGER) Grant Program, which is administered by the Department of Transportation (DOT), and the Congestion Mitigation and Air Quality Improvement (CMAQ) Program administered jointly by FHWA and FTA.

3.3.1 Federal TIGER Grants

Program Eligibility and Evaluation Criteria

The TIGER is a discretionary Grant program that provides competitive grants to fund investments in road, rail, transit, and port projects that promise to have a significant impact on the Nation, a region or a metropolitan area. Projects must demonstrate strong non-federal contribution and TIGER funding is usually the "last dollar in" to complete the financial plan. Projects need to be “shovel ready”, demonstrating project readiness. Projects should have received all Federal, State, and local permits and approvals, including completion of the NEPA process at the time the project is submitted.

The primary selection criteria for TIGER Grants include:

- **State of Good Repair:** Improving the condition of existing transportation facilities and systems, with particular emphasis on projects that minimize life-cycle costs.
- **Economic Competitiveness:** Contributing to the economic competitiveness of the United States over the medium- to long-term.
- **Livability:** Fostering livable communities through place-based policies and investments that increase transportation choices and access to transportation services for people in communities across the United States.
- **Environmental Sustainability:** Improving energy efficiency, reducing dependence on oil, reducing greenhouse gas emissions and benefitting the environment.
- **Safety:** Improving the safety of U.S. transportation facilities and systems.
- **Job Creation & Economic Stimulus:** quickly creating and preserving jobs and stimulating rapid increases in economic activity, particularly jobs and activity that benefit economically distressed areas.

The TIGER program has provided funding to many transit projects including Fort Lauderdale Wave Streetcar $18 million), Kansas City Downtown Streetcar ($20 million), Houston Regional Multimodal Connections Project ($15 million), City of Foley (AL) Transportation Regional Infrastructure Pedestrian System ($4.7 million) and others.

Program Funding

Congress provided $600 million for the FY 2014 round of TIGER Grants. In 2013, the DOT announced TIGER grants awards for 52 capital projects in 37 states.

The FY 2013 Appropriations Act specified that individual TIGER Discretionary Grants may be not less than $10 million (except in rural areas) and not greater than $200 million. It further stated that no more than 25 percent of the funds made available for TIGER Discretionary Grants could be awarded to projects in a single State.[8] "Eligible Applicants" for TIGER Discretionary Grants are State, local, and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), other political subdivisions of State, or local governments.

Similar to FTA Capital Investment Program, the TIGER program is highly competitive. **Table 3-3** compares the number of applicants versus the awarded grants per year from 2010-2013.

Table 3-3: TIGER Grant Awards (2010-2014)

Program	Applications Received	Grants Awarded
TIGER 2014	797 applications for $9.5 billion	72 grants split $600 million
TIGER 2013	585 applications for $9 billion	52 grants split $474 million
TIGER 2012	703 applications for $10.2 billion	47 grants split $500 million
TIGER 2011	848 applications for $14.29 billion	46 grants split $511 million
TIGER 2010	1700 applications for $54 billion	75 grants split $583.7 million

Source: Eno Center for Transportation, Lessons Learned from the TIGER Discretionary Grant Program (April 2013), https://www.enotrans.org/wp-content/uploads/wpsc/downloadables/TIGER-paper.pdf

Based on the brief review of the past history of grant awards for other transit projects the potential TIGER grant size could be in the range of $10 to $20 million. Richmond Broad Street BRT received a $24.9 million grant award in 2014. A project needs to meet TIGER Grant eligibility criteria to qualify.

3.3.2 Congestion Mitigation and Air Quality Improvement (CMAQ) Program

Program Eligibility and Evaluation Criteria

Jointly administered by the FHWA and FTA, the Congestion Mitigation and Air Quality Improvement (CMAQ) Program provides a flexible funding source for transportation projects and programs that help improve air quality and reduce congestion. Funds are distributed by formula for areas that do not meet the National Ambient Air Quality Standards (nonattainment areas) as well as former nonattainment areas that are now in compliance (maintenance areas). The distribution formula is based on an area's population by county and the severity of its ozone and carbon monoxide problems within the nonattainment or maintenance area, with greater weight given to areas that are both carbon monoxide and ozone nonattainment or maintenance areas. Eligible uses are projects that reduce emissions or improve air quality, including capital costs of transit and highway projects; intermodal freight facilities

[8] TIGER Program website, FAQ: http://www.dot.gov/tiger/application-resources

and operations; and three years of operating and maintenance costs for new service, such as transit service or traffic management operations centers.

Program Funding

VDOT and DRPT jointly obligate federal CMAQ funding based on the list of recommended CMAQ projects approved by the CTB. VDOT works with NVTA to identify and obligate funding for CMAQ eligible projects in Northern Virginia (including Fairfax and Prince William Counties). NVTA receives applications for CMAQ funding, reviews them and recommends a list of projects for funding approval by VDOT and CTB. Thus, about $30 million in CMAQ funds were projected to be available for FY 2020 CMAQ applications. For CMAQ programs, the recipient has 24 months to obligate the funds and then 48 months to expend the funds.

CMAQ projects are included in the agencies' six-year plans. Projected CMAQ funding is fully programmed for FY 2014 to FY2020. New projects can be added but only after funding of the next phase of the existing projects is provided.

Fairfax County was proposed to receive about $11.2 million for the Columbia Pike Streetcar Project and $0.6 million for the Countywide Transit Stores project.[9] DRPT has an overall budget of CMAQ funding of $789.000 for FY15 and FY16, then $2.3 million in FY17 and $8.6 million in FY18.

The project area is located in nonattainment area for ozone and for particulate matter.[10] The project may be eligible to apply for funding for post FY 2020 regional CMAQ allocation. A brief review of the FY 2020 CMAQ projects recommended by the NVTA for funding in Fairfax County shows that CMAQ budgets are in the range of $5 to $10 million.

[9] http://www.thenovaauthority.org/PDFs/Meetings/2013/12.12.13/X%20FY20%20CMAQ%20RSTP%20Strawman.pdf

[10] Air Quality Conformity Determination of the 2013 Constrained Long Range Plan, the FY2013-2018 Transportation Improvement Program for the Washington Metropolitan Region: 2013, http://www.mwcog.org/transportation/activities/quality/Conformity/2013/2013_Conformity_Report.pdf

4.0 State Funding

4.1 DRPT Capital Assistance Grants

DRPT uses a tiered approached for the allocation of all transit capital funding allocations. The CTB adopted capital tiers are listed as follows:

- Tier 1 at 68% of State Share: rolling stock for replacement or expansion and related items
- Tier 2 at 34% of State Share: infrastructure and facilities
- Tier 3 at 17% of State Share: support vehicles, shop equipment, spare parts, etc.

Major capital investments, such as this project, would be funded at Tier 2 level for DRPT (or an assumed 33% state funding).

4.2 Commonwealth Transportation Fund

The Commonwealth Transportation Fund (CTF) receives state revenues from collection of:

- Motor Fuels Tax
- Motor Vehicle Sales and Use Tax
- State Retail Sales Tax
- Motor Vehicle Licenses

Composed of the Highway Maintenance and Operating Fund (HMOF) and the Transportation Trust Fund (TTF), the CTF is the major source of revenues for the construction and maintenance of highways in the Commonwealth. In 2013 the HMOF received about $1.4 billion in revenue and the TTF received about $1.1 billion in revenue. The funding projected for 2014 includes $1.6 for HMOF and $1.2 billion for TTF, or a total of $2.8 billion for both.[11] **Table 4-1** presents VDOT six-year forecast of CTF revenues and Table 4-2 summarizes how these funds are projected to be expended. Both tables compare FY2015-2020 funding to FY2014-2019 funding levels. **Table 4-2** shows a slight reduction in allocation to Rail and Public Transportation and shows a steady funding to the Northern Virginia Transportation Authority. VDOT notes that "DRPT reduction impacts Mass Transit and Rail Enhancement programs". [12]

Based on the 2013 adopted Virginia Transportation Funding Bill HB2313 and effective July 1, 2013, a new 0.3 percent additional state Retail Sales and Use Tax was imposed statewide bringing the existing state sales tax from 5 percent to 5.3 percent (4.3 percent state tax which increased from 4 to 4.3 percent and the remaining state levy of 1 percent local tax).[13] This additional 0.3 percent sales tax will accrue to the CTF and fund projects throughout the state as determined by the CTB priorities.

[11] http://www.dmv.state.va.us/webdoc/pdf/fiscal.pdf
[12] http://www.ctb.virginia.gov/resources/2014/jan/pres/Presentation_Agenda_Item_4.pdf
[13] HB2313 § *58.1-638.3*.: http://lis.virginia.gov/cgi-bin/legp604.exe?131+sum+HB2313

Table 4-1: VDOT Reported Preliminary CTF Revenue Forecast for FY 2015-2020

(Amounts in millions)

	2015	2016	2017	2018	2019	2020	Total	FY 14-19	Difference
State Transportation Revenues									
HMO	$1,824.3	$1,956.1	$2,004.7	$2,028.9	$2,052.8	$2,078.8	$ 11,945.6	$ 11,903.7	$ 41.9
TTF net interest	1,108.9	1,149.7	1,185.1	1,218.8	1,251.7	1,285.7	7,199.9	7,316.8	(116.9)
PTF (From TTF)	168.7	177.3	183.1	189.9	200.8	207.8	1,127.6	1,108.1	19.5
Regional Transportation Funds	455.2	494.1	512.1	531.5	551.9	572.5	3,117.2	3,174.8	(57.6)
Local and Other Revenues	338.8	369.0	394.1	433.3	480.0	379.1	2,394.3	2,208.7	185.6
Total	**3,895.9**	**4,146.2**	**4,279.1**	**4,402.4**	**4,537.2**	**4,523.9**	**25,784.6**	**25,712.1**	**72.6**
Federal Revenues	**891.2**	**923.3**	**923.3**	**923.3**	**923.3**	**923.3**	**5,507.6**	**5,634.7**	**(127.2)**
Total Revenues	**4,787.1**	**5,069.5**	**5,202.3**	**5,325.6**	**5,460.4**	**5,447.2**	**31,292.2**	**31,346.8**	**(54.6)**
Other Financing Sources									
GARVEE Bonds	-	375.0	225.2	130.0	110.0	-	840.2	1,042.9	(202.7)
Capital Projects Revenue Bonds	122.9	122.9	122.9	122.9	61.6	50.0	603.2	837.3	(234.1)
Total	**122.9**	**497.9**	**348.1**	**252.9**	**171.6**	**50.0**	**1,443.5**	**1,880.3**	**(436.8)**
Total Revenues and Other Financing Sources	**$4,910.0**	**$5,567.4**	**$5,550.4**	**$5,578.5**	**$5,632.1**	**$5,497.2**	**$ 32,735.6**	**$ 33,227.1**	**$ (491.4)**

Table 4-2: VDOT Reported Preliminary Allocations of CTF Funds, FY 2015-2020

(in millions)

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	Total	Total from FY14-19 SYFP	Difference
Debt Service	$ 338.7	$ 369.1	$ 424.2	$ 481.4	$ 540.2	$ 404.1	$ 2,557.7	$ 2,371.2	$ 186.5
Other Agencies & Transfers	60.5	60.6	43.3	43.7	44.8	45.8	298.7	304.1	(5.5)
Maintenance & Operations	1,922.8	1,984.2	2,028.1	2,062.7	2,099.7	2,139.5	12,237.0	11,934.4	302.5
Tolls, Administration & Other Programs	431.2	441.4	453.0	464.0	474.1	484.4	2,748.1	2,712.7	35.3
Rail and Public Transportation	495.3	511.7	525.4	547.5	489.8	478.3	3,048.0	3,141.5	(93.5)
Port Trust Fund	38.5	41.1	42.3	43.5	44.7	45.8	255.9	262.4	(6.5)
Airport Trust Fund	21.9	23.4	24.1	24.8	25.5	26.2	146.0	150.4	(4.4)
Northern Virginia Transportation Authority Fund	299.3	310.4	321.0	332.3	344.1	356.4	1,963.4	1,898.5	64.9
Hampton Roads Transportation Fund	155.9	183.7	191.1	199.1	207.7	216.2	1,153.8	1,276.3	(122.5)
Construction	1,145.9	1,641.9	1,497.8	1,379.5	1,361.4	1,300.6	8,327.2	9,175.4	(848.2)
Total	**$ 4,910.0**	**$ 5,567.4**	**$ 5,550.4**	**$ 5,578.5**	**$ 5,632.1**	**$ 5,497.2**	**$ 32,735.6**	**$ 33,227.1**	**$ (491.4)**

Source: http://www.ctb.virginia.gov/resources/2014/jan/pres/Presentation_Agenda_Item_4.pdf

Table 4-3: VDOT Reported Preliminary Allocations of CTF Funds, FY 2015-2020

Six Year Projection of Allocations for the Rail and Public Transportation Improvement Program

	FY15	FY16	FY17	FY18	FY19	FY20	Total
Mass Transit Trust Fund:							
Operating Assistance:	$ 175,379,366	$ 176,994,284	$ 183,819,431	$ 188,843,488	$ 193,886,221	$ 198,371,488	$ 1,117,294,278
Operating Assistance - I-95 Technical Memo #3	-	629,000	629,000	629,000	629,000	1,355,000	3,871,000
Capital Assistance:	60,534,070	47,953,932	52,917,380	54,661,310	56,412,292	59,148,185	331,627,169
Capital Assistance - Multi Year/Other Projects	3,520,513	3,520,513	926,908	926,908	926,908	-	9,821,750
Special Projects-Other:	2,363,954	1,576,933	1,861,314	2,070,586	2,280,704	2,497,782	12,651,273
Special Projects-TDM/TMP:	3,820,036	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	23,820,036
Paratransit Assistance Program (From MTTF):	1,258,949	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	8,758,949
Total Mass Transit Trust Fund Allocation:	**246,876,888**	**236,174,662**	**245,654,033**	**252,631,292**	**259,635,125**	**266,872,455**	**1,507,844,455**
Mass Transit Capital Fund (Bond Funds):	44,740,482	60,000,000	60,000,000	60,000,000	27,333,390	-	252,073,872
Capital Bonds / PRIIA Match:	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	300,000,000
Capital Bonds - Multi Year/Other Projects	22,301,500	3,910,000	-	-	-	-	26,211,500
Dulles Extension:	-	-	-	-	-		-
Local Funds:	701,000	855,290	872,396	889,844	907,641	907,641	5,133,812
State Match to FTA Section 5303/5304 Program:	482,762	600,000	600,000	600,000	600,000	600,000	3,482,762
Rail Enhancement Program (Including Interest):	41,496,682	31,129,331	33,873,205	12,815,802	12,282,539	7,680,000	139,277,559
Intercity Passenger Rail Program:	51,933,988	46,289,768	67,619,744	41,316,627	29,345,618	13,270,444	249,776,188
Rail Preservation Program (Including Interest):	13,850,639	12,915,616	4,608,770	4,011,608	1,444,800	1,188,600	38,020,033
Flexible STP Funds for Transit:	11,204,782	16,831,390	24,224,312	24,224,312	24,224,312	25,587,412	126,296,520
Flexible STP - Multi Year/Other Projects	6,938,102	6,938,102	1,363,100	1,363,100	1,363,100	-	17,965,504
FHWA Program Funds:	26,640,511	12,056,482	9,276,137	2,618,771	35,323,781	10,262,299	96,177,981
State Match to FHWA Program Funds:	-	12,891,347	14,291,737	47,758,664	20,196,574	28,683,697	123,822,019
FTA State Administered Program Funds:	45,701,544	34,283,482	34,283,482	34,283,482	34,283,482	34,283,482	217,118,954
FRA High Speed Rail Funds:	7,176,800	7,176,800	2,808,000	2,808,000	4,492,800	-	24,462,400
Total Rail and Public Transportation Allocations:	**570,045,680**	**532,052,270**	**549,474,916**	**535,321,502**	**501,433,162**	**439,336,030**	**3,127,663,559**
Congestion Mitigation Air Quality (CMAQ)	789,202	789,202	2,398,741	8,632,734	5,924,498	8,879,070	27,413,447
Regional Surface Transportation Program (RSTP)	-	-	-	4,011,431	2,400,000	1,840,000	8,251,431
State Match from Transportation Trust Fund (TTF)	197,301	197,301	599,685	3,161,041	2,081,125	2,679,767	8,916,220
Total MPO CMAQ and RSTP Allocations	**986,503**	**986,503**	**2,998,426**	**15,805,206**	**10,405,623**	**13,398,837**	**44,581,099**
Total Allocations	**$ 571,032,183**	**$ 533,038,773**	**$ 552,473,342**	**$ 551,126,708**	**$ 511,838,785**	**$ 452,734,867**	**$ 3,172,244,657**

Source: http://www.drpt.virginia.gov/about/files/FY15%20SYIP%20Draft%204-7-2014.pdf

5.0 Regional Funding

Regional funding consists of the regional 2.1 percent Motor Vehicle Wholesale Fuel Sales Tax and recently adopted additional 0.7 percent Regional Sales and Use tax, Grantor's Tax (a tax on home sales), the Transient Occupancy Tax (a tax on hotels based on occupancy).

5.1 Northern Virginia 2.1% Motor Vehicle Wholesale Fuel Sales Tax

A 2.1 percent motor vehicle wholesale fuel sales tax is imposed on sales of fuel to any retail dealer for retail sale in the Northern Virginia Transportation District (Counties of Arlington, Fairfax and Loudoun and the Cities of Alexandria, Fairfax, and Falls Church) and in the Potomac and Rappahannock Transportation District (Counties of Prince William, Spotsylvania and Stafford and the Cities of Fredericksburg, Manassas and Manassas Park).[14] The tax receipts are remitted to the Northern Virginia Transportation Commission (NVTC) and Potomac and Rappahannock Transportation Commission (PRTC) to fund operation of the Virginia Railway Express (VRE) and bus operations.

PRTC and NVTC maintain the tax receipts separately for the benefit of each member jurisdiction and are used to pay administrative costs of PRTC and NVTC and transportation projects serving a particular jurisdiction.[15] According to the 2013 NVTC Comprehensive Annual Financial Report, Fairfax County contributed about $25.1 million in motor vehicle fuel sale taxes in FY 2013. Similar data from Prince William is not readily available from the PRTC.

5.2 Northern Virginia Additional Sales, Grantor's and Transient Occupancy Taxes

The 2013 adopted Virginia Transportation Funding Bill HB2313 imposed an additional 0.7 percent sale tax in the Northern Virginia (Planning District Commission 8) and Hampton Roads (Planning District Commission 23) regions bringing the total rate of the state and local Retail Sales and Use Tax in these jurisdictions to 6.0 percent.[16] The regional tax will be administered in the same way as the state Retail Sales and Use Tax and will constitute a dedicated source of funding for NVTA.

In addition to the 0.7 percent sales tax increase, HB2313 enacted increase in two other additional regional taxes which will be dedicated to the Northern Virginia Transportation Authority Fund to fund project in Northern Virginia. These are:

- **A Regional Congestion Relief Fee**: a fee at a rate of $0.15 per $100 of the value of the real property sold in Northern Virginia[17]

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[14] http://www.tax.virginia.gov/Documents/TaxFacts.pdf
[15] http://www.prtctransit.org/docs/PRTC_FY12_Audited_Financial_Statements.pdf, p. 4.
[16] HB2313 § *58.1-604.01*.
[17] HB2313 § 58.1-802.2.: http://lis.virginia.gov/cgi-bin/legp604.exe?131+ful+CHAP0766

- **Additional 2 percent Transient Occupancy Tax**: additional transient occupancy tax at the rate of two percent of the amount of the charge for the occupancy of any room or space occupied.[18] This tax increase from the original rate of 5 percent to 7 percent.

The amount of estimated funding NVTA could receive from the additional sales tax, regional congestion fee, and additional transient occupancy tax are reported to be in the order of $300 to $350 million annually.[19]

[18] HB2313 § 58.1-1742.: http://lis.virginia.gov/cgi-bin/legp604.exe?131+ful+CHAP0766
[19] http://www.fairfaxcounty.gov/chairman/pdf/va_transportation.pdf

6.0 Local Funding

This section describes the local revenue sources considered for the project that do not yet exist in the corridor. The local revenue sources are not only the most likely revenue source for the project, they are also very important to consider early in the planning process if the project applies for FTA New Starts/Small Starts funding.

6.1 Application of Broad-Based County-Level Budget Funds to Specific Projects

In order to implement large capital projects, local jurisdictions are applying broad-based tax revenues to fund their Capital Improvement Programs either via sales of general obligation debt backed predominantly by the county property taxes revenue or on a pay-as-you-go basis.

6.1.1 Fairfax County

Fairfax County Capital Improvement Program is funded from the General Obligation Bond sales, pay-as-you-go or current year funding from the General Fund, as well as from other sources such as federal funds, revenue bonds and user fees (sewer system revenues). Fairfax County maintains a policy of funding project through the sale of General Obligation Bonds.[20] According to the County's adopted 2012-2016 CIP document "this allows the cost of the facility to be spread over a number of years so that each generation of taxpayers contributes a proportionate share of the use of these long-term investments". The bond program is projected to provide "a healthy level of approximately $1.2 billion of capita construction funds over the CIP five year period.[21] Every bond sale has to be approved by voters.

The county directs funds raised though bond sale to funding transportation and pedestrian access projects. In addition to bond proceeds, the County's commercial and industrial real estate tax rate (approved by County legislators in 2007) provides a dedicated source of funding for transportation projects. The current rate of 12.5 cents per $100 of assessed value (adopted at the maximum allowable rate) approved for FY2014 budget would generate approximately $50.5 million for capital and transit projects.

As a result of passage of HB2313, as discussed in section 5.2, Fairfax County will generate approximately $125.2 million in additional transportation revenues annually beginning in FY 2014. Of this total, $37.5 million of 30 percent will be available directly to the County with the balance of $87.7milion of 70

[20] Fairfax County, 2012-2016 Capital Improvement Program, p 26: http://www.fairfaxcounty.gov/dmb/fy2012/adopted/cip.pdf

[21] Fairfax County 2014 Adopted Budget, p 2: http://www.fairfaxcounty.gov/dmb/fy2014/adopted/volume1/00140.pdf

percent flowing to the Northern Virginia Transportation Authority.[22] NVTA will use its portion of new funding to fund projects priorities and selected as part of the NVTA's TransAction 2040 Plan.

Error! Reference source not found. below lists the funds programmed by Fairfax County in its current Four-year Transportation Program.

Table 6-1: Fairfax County Four-Year Transportation Program (2013-2016)

Program	Four-Year Total	Share of Total
Regional Surface Transportation Program (RSTP) and Federal Congestion Mitigation and Air Quality funds (CMAQ)	$237 million ($59 million annual average)	25%
Existing and proposed County General Obligation and Revenue Bonds	$245 million (61 million annual average	26%
County Commercial and Industrial Tax revenues	$262 million (66 million annual average)	25%
Other federal and private sources	$193 million (48 million annual average)	21%
Total	**$937 million**	100%

Source: http://www.fairfaxcounty.gov/fcdot/fouryearprogram.htm

6.1.2 Prince William County

Similarly to Fairfax County, Prince William County is funding its capital improvement program through a mix of federal and state assistance, bond proceeds, general fund support and dedicated revenue. Thus, the County earmarks a portion of the Recordation tax revenue for transportation purposes or predominantly for road improvement projects. Recordation tax is a tax on admission to records of deeds, deeds of trusts, mortgages, leases and contracts relating to real estate. This tax generates about $5 million annually for transportation projects.[23]

For the transit and rail services in Prince William County, the County contributes to the operating subsidy as well as the capital improvement program expenditures of the Potomac and Rappahannock Transportation Commission (PRTC). This subsidy is funded from the revenues generated by a 2.1 percent motor vehicle wholesale fuel sales tax discussed in section 5.0.

[22] Ibid.

[23] Virginia Department of Taxation: http://www.tax.virginia.gov/Documents/TaxFacts.pdf

6.2 Value Capture (VC)

Funding for the transit and highway improvements along the Route 1 corridor may come from the application of approaches categorized as Value Capture (VC), which include:

- Tax Increment Financing (TIF)
- Special Assessment District (SAD)
- Joint Development

Value Capture mechanisms "capture" increases in property values that occur over time resulting from public investments in infrastructure, including transit and transportation projects, possibly in combination with other public redevelopment investments. The "captured" value, typically in the form of additional tax revenue resulting incremental property assessed value or a special property tax assessment, are then applied, in part, to fund investments in public infrastructure or repay debt incurred to fund the public investment.

Attachment A provides preliminary findings of potential use of value capture in the corridor.

6.2.1 Tax Increment Financing (TIF)

Under Virginia law, a TIF District can include all taxable real estate (office, commercial, retail, industrial and residential properties) located in TIF District designated area.[24] TIF can be established by a local ordinance. TIF districts examples in Virginia include the Crystal City TIF (established by Arlington County Board in 2010) which includes properties in Crystal City, Pentagon City, and Potomac Yard. Per the Board's policy, up to 33 percent of the incremental new property tax revenues generated in the TIF defined area may go into the TIF Fund to benefit the Crystal City streetcar and the street-grid realignments needed to enable new development including public spaces.

TIF District revenues are dependent on the magnitude and timing in real estate appreciation in the project area. This makes it difficult to finance a portion of the project costs with a pure TIF-backed revenue bond. Thus, many localities in Virginia have used different versions of a "shadow TIF" approach:

- **Shadow TIF 1:** The County does not actually set up a TIF district. Instead, bonds issued to pay for upfront investment costs are general obligation (GO) debt, as is normally the case for infrastructure investment in a locality. However, the results of the TIF analysis—demonstrating the expected future development and tax revenues—are used to convince the project stakeholders and beneficiaries of the worth of the investment and its ability to pay for itself over time.
- **Shadow TIF 2:** The County does designate and create a TIF district and segregates the incremental property tax revenues in that district into a separate account which is dedicated to paying back the investment costs. However, the bonds are still GO bonds (thus avoiding the higher interest rates associated with a pure TIF-backed revenue bond), and County general

[24] Virginia Code, sections § 58.1-3245.2: https://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+58.1-3245.2

funds are likely to be used to pay debt service in the early years, while TIF revenues are still building. In later years, once the majority of the development has occurred, the TIF fund would then be able to take over the debt service and also pay back the general fund for its earlier expenditures.

6.2.2 Special Assessment Districts

A Special Assessment District (SAD) is another form of Value Capture which involves establishment of a special tax district to generate funds which would fund public investments such as transit improvements. A special tax or a fee is then applied to the commercial and industrial properties (per $100 of assessed value or per square foot basis) located in the district which would benefit from the public investment. SADs Districts generally exclude residential properties. This tax or a fee is applied to the assessed value in addition to the existing real estate property tax rate.

In Virginia, a SAD is referred to as a Transportation Improvement Districts (TID). The Virginia Code allows creation of a TID to fund transportation projects upon petition by owners of 51 percent (by land area or assessed value) of taxable property in the proposed district. The law precludes inclusion of residential properties in TID (rental property such as apartment buildings can be included as commercial use). The law also specifies the statutory maximum rate of $0.40 per $100 assessed value with all funds raised to be used for District purposes.[25] Once a TID is in place, it may have a significant advantage of producing a sizable stream of revenue immediately upon its adoption, as opposed to TIF where revenue stream will depend on the timing of increase in land values and hence the increase in the real estate assessed value.

Examples of TIDs in Virginia include:

- Dulles Metrorail extension in Fairfax County: A special assessment district covers the entire rail corridor. This special tax district imposes a levy of $0.21 per $100 assessed value on commercial and industrial zoned property.
- Route 28 Transportation Tax District in Fairfax and Loudon Counties: This special tax district imposes a levy of $0.18 per $100 assessed value on commercial and industrial zoned property, or property used for commercial or industrial purposes within the district.

6.2.3 Joint Development

Joint Development (JD) is another value capture mechanism often applied on a small scale of one or more related parcels of real property. Joint development commonly refers to the coordinated development of public transportation facilities with other non-transit development, including commercial and residential development. Coordinated development often involves private and public entities working in concert on projects of mutual interest where transit and non-transit developments are integrally related to one another and are often co-located. Interested developers could be engaged in JD whereby they would pay a part of the station construction costs (example: WMATA NoMa-

[25] Virginia Code, sections §§ 33.1-430 to 33.1-446

Gallaudet U--formerly New York Avenue--Station Development). Other examples include leasing or sale by transit agencies of the surface and or air rights owned by them to the private developers when such development does not interfere with the operation of the transit system (examples include Washington Metropolitan Area Transit Authority (WMATA), Metropolitan Atlanta Rapid Transit Authority, (MARTA), Bay Area Rapid Transit (BART), and Miami Dade Transit (MDT).

Examples of Joint Development mechanisms applied in Virginia include:

- WMATA Dunn Loring-Merrifield Station: High density development including the creation of 628 residential units (including 8 percent affordable housing units) and 125,000 retail square feet, including new Harris Teeter supermarket (60,000 square feet of the 125,000 retail square feet will be in and adjacent to a Metro parking structure.
- WMATA East Falls Church Station: Future plans include similar development to the above, recently advertised in the I-66 Air Rights Request for Information to developers.

Feasibly of Joint Development potential will be assessed if public land within the project corridor (including properties to be purchased for the construction and operation of the project) can be leased or sold for development around the stations.

Excess property which could be leased or sold to private developers and air rights around the planned stations along the proposed Route 1 Corridor would determine the potential for Joint Development. The Joint Development however, is more frequently utilized around the rail stations development and BRT technology may not attract a significant developers' interest as it does not involve "tracks on the ground" like heavy rail and light rail options.

7.0 Preliminary Findings and Conclusions

This section draws conclusions from the review of the potential federal, state, and local funding sources for the project described in Sections 3 to 6. Section 7.2 presents various funding strategies used by other projects in the region to fund capital project expenses. **Table 7-1** summarizes the funding sources reviewed and suggests sources which could be advanced for further consideration as part of the project funding strategy. **Section 8** is a specific application of funding assumptions applied to the recommended project in a phased approach.

7.1 Conclusions

7.1.1 Federal Funding Considerations

FTA Capital Investment Program (New Starts)

The potential mix of local revenue sources (local, state and regional) is very important to consider early on in the project development if the project is to apply for the FTA New Starts/Small Starts Capital Investment Program. If the decision is made to apply for the FTA New Starts capital grant the project can expect that about 50 percent of the project capital costs would have to be covered through the local revenue sources ("local match") with the FTA contributing the remaining 50 percent. The FTA's share of funding could be higher for Small Starts program. FTA looks favorably at project applications that commit a higher level of the "local match" to the project costs.

With the annual budget allocation of about $2 billion, FTA New Starts/Small Starts became a popular and highly competitive nationwide capital grants program for the transit industry. An FTA-ready Financial Plan could be developed for the project once the Locally Preferred Alternative (LPA) for the project is selected.

Transportation Investment Generating Economic Recovery (TIGER)

The other federal discretionary grant program to be considered is the Transportation Investment Generating Economic Recovery (TIGER) grant program. Similar to the FTA New Starts/Small Starts the TIGER Grant Program is a nationwide competitive grant program, and project sponsors must demonstrate strong non-federal contribution. The TIGER Grant Program funds other transportation modes such as highways, intercity rail, transit, and ports that can demonstrate significant economic impacts (such as potential to improve livability, environmental sustainability, safety, create jobs). The TIGER Grant Program is also smaller than the FTA New Starts/Small Starts in terms of annual funding available; FTA provided roughly $2 billion on annual basis for transit projects in recent years. The typical project award amount ranges from $15-20 million and is usually the "last dollar in" to complete the financial plan.

The TIGER Program provided funding to a number of transit projects including Fort Lauderdale Wave Streetcar ($18 million), Kansas City Downtown Streetcar ($20 million), Houston Regional Multimodal Connections Project ($15 million), and many others.

Federal Formula Funds

Unlike discretionary funds such as FTA New Starts/Small Starts and TIGER Grant Program, federal formula funds are distributed through state agencies based on the federally determined formulas and state transportation priorities laid out in the Long Range Financial Constrained Long Range Transportation Plan (CLRP) and six-year Transportation Improvement Plan (TIP). Federal formula funds include Section 5307, Urbanized Area Formula Grants; Surface Transportation Program (STP) funds, National Highway Performance Program (NHPP), and Congestion Mitigation and Air Quality Improvement Program (CMAQ). The project would need to be included in the CLRP as well as VDOT's and DRPT's six-year TIPs to be eligible for this funding.

Regional Funding

Both Fairfax County and Prince William County are members of the Northern Virginia Transportation Authority (NVTA) which in 2002 received a legislative mandate to facilitate regional transportation planning and congestion relief in the Northern Virginia Region. The agency was tasked with preparation of TransAction 2040 (a regional transportation plan for Planning District 8) and with the passage of Commonwealth of Virginia House Bill 2313 (Acts of Assembly 2013, Chapter 766) in 2013 it was provided with a dedicated funding to invest in priority transportation projects in the Northern Virginia. As a result of HB2313 the NVTA would receive about $300 to $350 in annual funding starting in 2014.

State Funding

The project funding strategy should consider state funding. In Virginia, these funds are distributed by the VDOT and DRPT. Both state and federal formula funds may not be available to the project in the short run, as the project will need to be first included in the CLRP and the six-year TIP. In accordance with HB2313, major capital investments are funded at Tier 2 investment levels, or 34 percent state funding.

Local Funding: General Funds

Many jurisdictions implementing major transit capital investments dedicate general revenues to the projects and impose additional tax mechanisms to generate additional revenue. Fairfax County and Prince William County will consider adding the Route 1 improvements to their priorities to be funded through their ongoing Capital Improvement Programs. Given recent increases in sales tax rates to fund transportation improvements in northern Virginia, the jurisdictions would seek to make use of these funds through NVTA, and it is unlikely that additional taxes would be imposed.

Local Funding: Value Capture

In weighing the decision to pursue TIF or SAD funding mechanisms, a local jurisdiction must evaluate not only the financial feasibility (i.e. potential revenue yield), but also the likelihood of successful implementation, reflecting the advantages and disadvantages of each. **Attachment A** provides a summary of a conceptual approach to assessing the scale of potential value capture within the Route 1 corridor.

Table 7-1: Summary of Funding Sources & Decision to Advance for Further Consideration

Candidate Sources	Description	Main Considerations	Consider for Further Analysis? Yes or No
FTA New Starts/Small Starts Discretionary Nationwide Grant Program	Capital Grants for investments in new and expanded rail, bus rapid transit, and ferry	Competitive, depends on congressional appropriations but a large source of capital funding dedicated to mass transit – approx. $2 billion/year for about 30 projects (new & ongoing). Focus on local project sponsorship & local commitment (about 50% of costs)	Yes, this source may provide up to **50% of project costs** for New Starts and about 65% for Small Starts
TIGER Discretionary Nationwide Grant Program	Capital Grants for investments in road, rail, transit & port projects that promise to achieve national objectives (job creation, economic competitiveness, environment)	Competitive, dependent on congressional appropriations. The funding is about $500-600 million per annum for about 50 projects on average. Need to demonstrate project readiness and long term economic impact.	Yes, this source may provide **$10 to $20 million** if project qualifies and Congress continues funding
Federal Formula Grants: STP, CMAQ, Urbanized Area Grants (UZAs), NHPP	• Section 5307: Urbanized Area Grants for capex, opex & planning for UZAs's public transportation • CMAQ: flexible funding for projects that reduce congestion and improve air quality • STP: projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian & bicycle infrastructure, and transit capital projects, including intercity bus terminals • NHPP: supports condition and performance of the National Highway System	• Section 5307: apportioned based on population to Northern VA as part of total apportionment to Washington DC-VA-MD Metro Area • CMAQ: the project should be located in or benefit a nonattainment or maintenance area. Route 1 project is located in nonattainment area for ozone, but attainment for particulate matter and carbon monoxide. • STP: flexible funding for projects to improve conditions on Federal–aid highway and transit capital projects. • NHPP: A brief review of the VDOT FY 2014 annual budget revealed that most of the NHPP funding is recommended for constructing roads and bridge on the interstate highway systems.	Yes for Section 5307, CMAQ, STP and NHPP. The project cannot count on funding until it is included in Long Range Transportation Plan & 6-yr TIPs. These funds are already programmed until FY2020. • Section 5307: About $30m for all of Northern VA. • CMAQ: About $5 to $10 million, for post FY 2020 allocation, if project qualifies on air quality • STP: $2 to $8 million depending on type of improvement • NHPP: funded at $21.8 billion for nationwide allocation in 2014. This source may provide funding for road widening, adding new lanes.

Table 7-1: Summary of Funding Sources & Decision to Advance for Further Consideration (Continued)

Candidate Sources	Description	Main Considerations	Consider for Further Analysis? Yes or No
State	• Commonwealth Transportation Trust Fund or CTF (consolidates state and federal funding and planned bond proceeds) • House Bill 2313 imposed an additional 0.3% Sales Tax	• Grants applied to statewide priorities with about $500 million allocated to rail and public transportation in FY 2015-2020 VDOT Revenue Forecast • Planned to be allocated to the CTF	• Yes, but likely delay in programming, as funds are allocated based on the six year TIP priorities.
Regional	• Northern Virginia 2.1% Motor Vehicle Wholesale Fuel Sales Tax • House Bill 2313 imposed an additional 0.7% Sales Tax, additional 2% Transient Occupancy Tax and a Regional Congestion Relief Fee of $0.15 per $100 of the value of the real property sold in the Northern Virginia and Hampton Roads regions	• 2.1 % Motor Vehicle Wholesale Fuel Sales Tax is apportioned between NVTC and PRTC to fund rail and transit operations in member jurisdictions. • Both Fairfax County and Prince William County are members of NVTA. As reported by the Fairfax County about 30% of the new revenues will go directly to the County and 70% will flow to the NVTA. For NVTA funding the project needs to be part of the TransAction 2040 plan or its next update	• No, 2.1 % motor fuel sales tax is funding transit and rail operations of NVTC and PRTC in Prince William and Fairfax. These agencies rely on this tax for operations and capital needs. • Yes. Fairfax County projects about $37.5 million of the new HB2313 related funding will be available to the County directly, could be used for additional bonding or direct contribution. NVTA receives about $300-$350 million in annual funding from VDOT due to House Bill 2313 additional taxes
Local	County General Funds	Sales, property and/or other taxes used to fund county level transportation projects	Yes, likely source of local funds if Counties become project sponsors
Value Capture	Corridor-specific revenue tied to increases in property tax base, potential to earn revenue for leasing/sale of land or air rights around the stations to developers	Most likely revenue sources for the project, revenue yield will depend on the real estate development potential	Yes, likely source of local funds

7.2 Funding Structures of Other Regional Projects

Several planned and recently implemented transit projects in the region provide examples of the potential funding structure for a Route 1 project. These projects and their funding structures are described below.

Richmond Broad Street Rapid Transit: FTA, State, and Local

The proposed project is a 7.6-mile and 13-station BRT line on existing streets with operation expected to begin 2017. The total capital costs are estimate at $50 Million. The funding structure is shown in **Table 7-2**.

Table 7-2: Richmond Broad Street Rapid Transit – Funding Structure

Funding Source	Type	Share (YOE)
Federal	Small Starts	$25 M (50%)
State	DRPT	$17 M (34%)
Local	City County	$8 M (15%) $0.4 M (1%)
Total Cost		*$50 M*

Norfolk TIDE Light Rail: FTA, State, and Local

The first modern light rail line in Virginia, the initial project is a 7.4-mile and 13-station LRT line on rail right of way and existing streets in Norfolk, Virginia. The revenue service began in 2011. The total costs were $316 Million. The funding structure is shown in the **Table 7-3**.

Table 7-3: Norfolk TIDE Light Rail – Funding Structure

Funding Source	Type	Share (YOE)
Federal	FTA New Starts Other Federal Total Federal	$129 M (41%) $74 M (23%) $200M (64%)
Regional	n/a	
State	Commonwealth of Virginia	$62 M (20%)
Local	City of Norfolk	$54 M (17%)
Total Cost		*$316 M*

MWAA Silver Line Phase 1 & Phase 2 FTA, State, Local, and Tolls (Dulles Toll Road)

The Silver Line, expected to begin operations in 2014 is a Metrorail line extension to the Dulles Airport build in two phases:

- Phase 1: 11.7 miles/5 stations , operation expected end of summer 2014
- Phase 2: 11.4 miles/6 stations + yard

The total capital cost is estimated at $5.5 billion. The funding structure is shown in **Table 7-4**.

Table 7-4: MWAA Silver Line Phase 1 & Phase 2 – Funding Structure

Funding Source	Type	Phase I (YOE)	Phase II (YOE)	Total Share (YOE)
Federal	New Starts	$900 M		$900 M (16%)
State	DRPT	$252 M	$323 M	$575 M (11%)
Local	Fairfax County	$400 M	$484 M	$884 M (16%)
	Loudoun County		$264 M	$264 M (5%)
Other	MWAA (Aviation)		$225 M	$225 M (4%)
	MWAA (Dulles Toll Road)	$1.4 B	$1.3 B	$2.6 B (48%)
Total Cost		*$2.9 B*	*$2.6 B*	*$5.5 B*

MDOT Purple Line: FTA, State, TIFIA, and Private Equity

The Purple Line is a 16-mile / 21-station LRT line along exclusive and shared ROW with operation expected to start in 2020. The project is currently being tendered and the final RFP is expected to be sent to private bidders currently in the run for this contract in June 2014. The project will be delivered via a Design-Build-Finance-Operate-Maintain contract between MDOT and a competitively selected private contractor. The private contractor will operate and maintain the line for 30 years after which it will be handed over to MDOT. The private contractor will be compensated by the MDOT via availability payments which will be tied to the performance, i.e. financial penalties will be trigged if the contractor fails to deliver a service as agreed with MDOT.

This project is an example of the transit investment delivered through an alternative delivery mechanism involving a private financing partner. The funding structure included an FTA New Starts capital grant, state funds, a TIFIA loan, private equity and borrowed funds. The funding structure is presented in **Table 7-5**.

Table 7-5: MDOT Purple Line – Funding Structure

Funding Source	Type	Share (YOE)
Federal	New Starts	$0.9 B (38%)
Regional	n/a	
State	MD Transportation Trust Fund (TTF)	$0.7 B (28%)
Other	-Federal TIFIA with financing by private sector -Private equity & borrowed funds	$0.7 B (31%) $0.1 B (3%)
Total Cost		*$2.4 B*

8.0 Preliminary Findings: Application to Route 1 Funding Approaches

This section describes application of the funding sources described in **Table 7-1** to the potential implementation schedules or phasing of the proposed Route 1 roadway, transit and bike/pedestrian and ROW investments. **Table 7-1** summarized the funding sources reviewed and suggested sources that could be applied as part of the project funding strategy.

A potential funding mix showing relative proportions of funding by each source was created for and is summarized in sub-sections 8.0 and **Error! Reference source not found.**. The findings and funding assumptions are preliminary and serve to facilitate future funding discussions.

It is important to note that in order to access state, regional and federal funding the project needs to be:

- **Incorporated in MWCOG Constrained Long Range Plan (CLRP):** the project needs to be included in the regional long range transportation plan in order to qualify for funding, including New Starts or Small Starts funding. This step includes a preliminary identification of local funding levels.
- **Included in the Fairfax County Long Term Transportation Plans:** the project needs to be consistent with the Fairfax County Comprehensive Plan, included in the Fairfax County Transportation Plan, and endorsed for funding by its Board of Supervisors as part of the Boards of Supervisors Four-Year Transportation Program. The Comprehensive Plan is used as a guide in decision-making about the built and natural environment by the county's Board of Supervisors and other agencies, such as the Planning Commission and the Board of Zoning Appeals. The project needs to be a part of the Fairfax County long terms plans have has to have some form of local funding identified to support it before it is submitted for consideration for LRTP and regional TIP.
- **Submitted for NVTA and CTB project prioritization** (congestion mitigation, economic development, accessibility, safety and environmental quality). In Northern Virginia congestion mitigation may be required to be weighted the highest among factors.[26] The weights are currently being developed with a lead by the Commonwealth of Virginia Office of the Secretary of Transportation. Currently, highway projects need to be scored on congestion mitigation (while transit projects are exempt). Transit projects however will be subject to ranking against other prioritization criteria listed.

[26] Commonwealth of Virginia Office of the Secretary of Transportation , House Bill 2 Update; http://www.ctb.virginia.gov/resources/2014/may/pres/Presentation_Agenda_Item_7.pdf

8.1 Initial Implementation Approach

The implementation approach is intended to implement the multimodal improvements, including roadway, bicycle/pedestrian, and transit projects, in four phases (see **Figure 8-1**). The first phase would implement multimodal improvements, including initiating Right of Way acquisition, from Huntington to Hybla Valley; Phase II would implement multimodal improvements from Hybla Valley tot Fort Belvoir; Phase III would implement improvements from Fort Belvoir to Woodbridge. Finally, Phase IV would extend the Metrorail Yellow Line to Hybla Valley. **Figure 8-1** shows the phasing approach, and **Table 8-1** summarizes the total capital expenditure costs by phase.

Figure 8-1: Phasing Approach

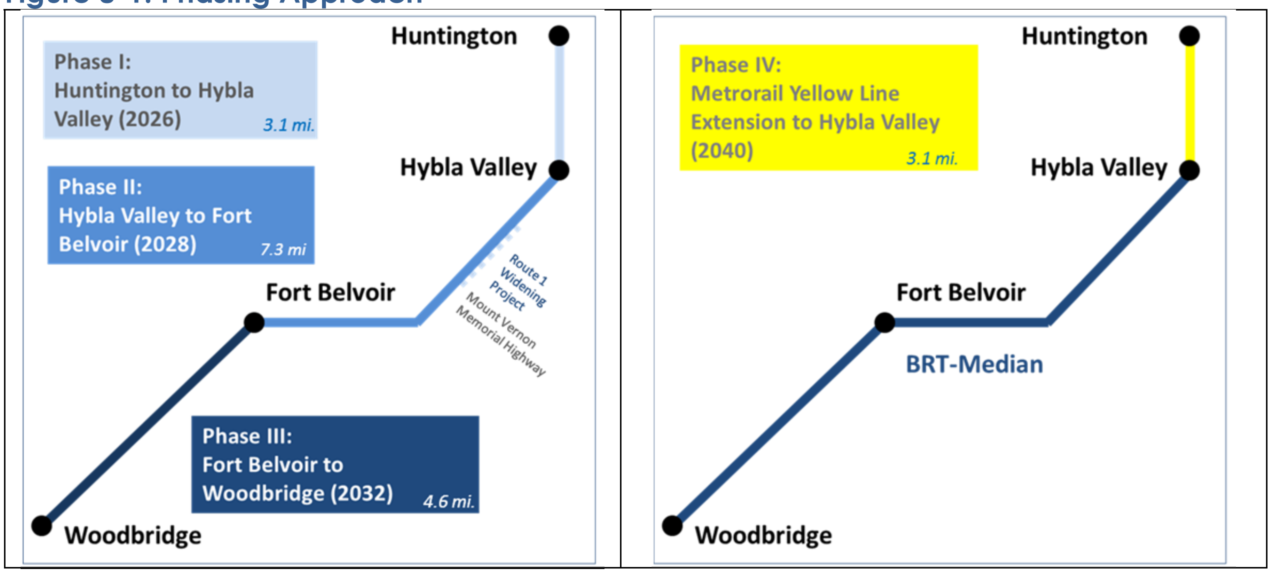


Table 8-1: Capital Expenditure Costs by Phase (Costs in millions, 2014 dollars)

	Phase I: Multimodal Improvements from Huntington to Hybla Valley (and planned roadway widening near Hybla Valley)	Phase II: Multimodal Improvements from Hybla Valley to Pohick Road North (Fort Belvoir)	Phase III: Multimodal Improvements from Pohick Road North (Fort Belvoir) to Woodbridge	Phase IV: Extend to Metrorail to Hybla Valley
Roadway	$118	$29	$145	
Bike/Ped	$21	$2.5	$11	
Transit	$116	$188	$310	$1,461
ROW	$52	$5	$6	
Total	***$305***	***$224***	***$472***	***$1,461***

Figure 8-2 summarizes required annual funding levels by phases (2014 $ million), **Figure 8-3** summarized annual funding levels by type of projects (2014 $ million). The Transit-Metro metro investment makes up 59 percent of the total investment in the project of $2.46 billion.

Figure 8-2: Construction Funding Required By Phases (2014 $ Millions)

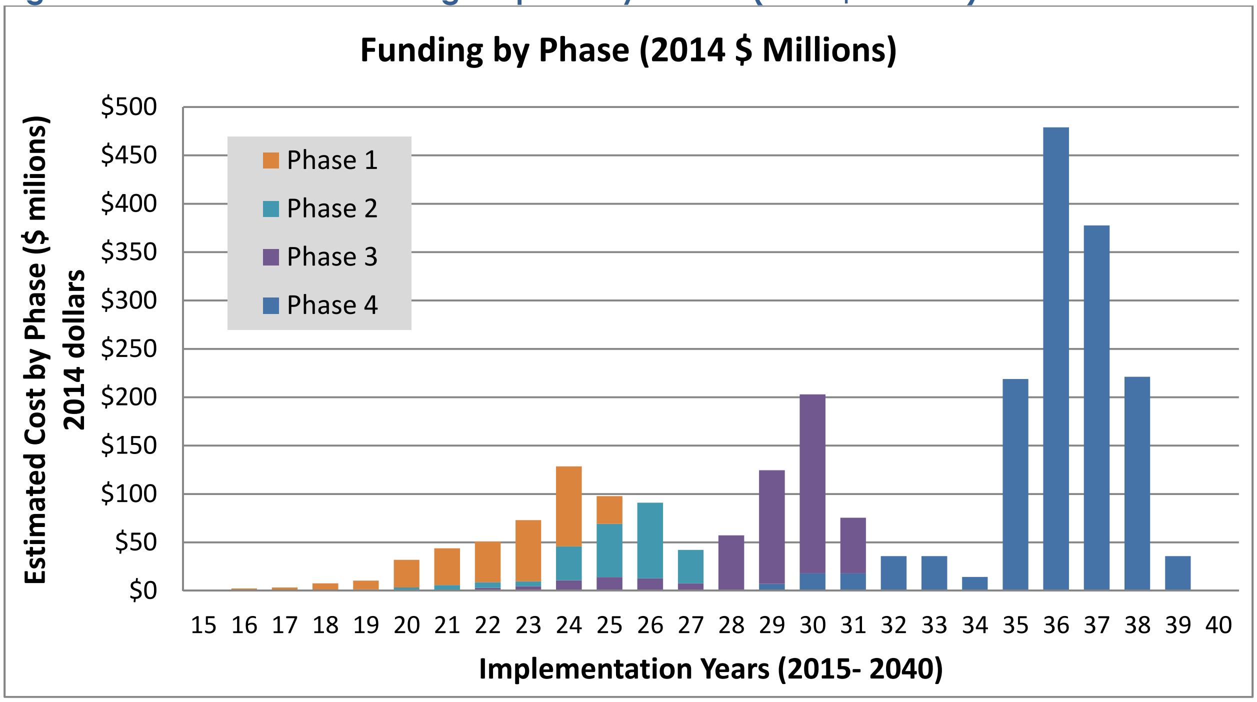
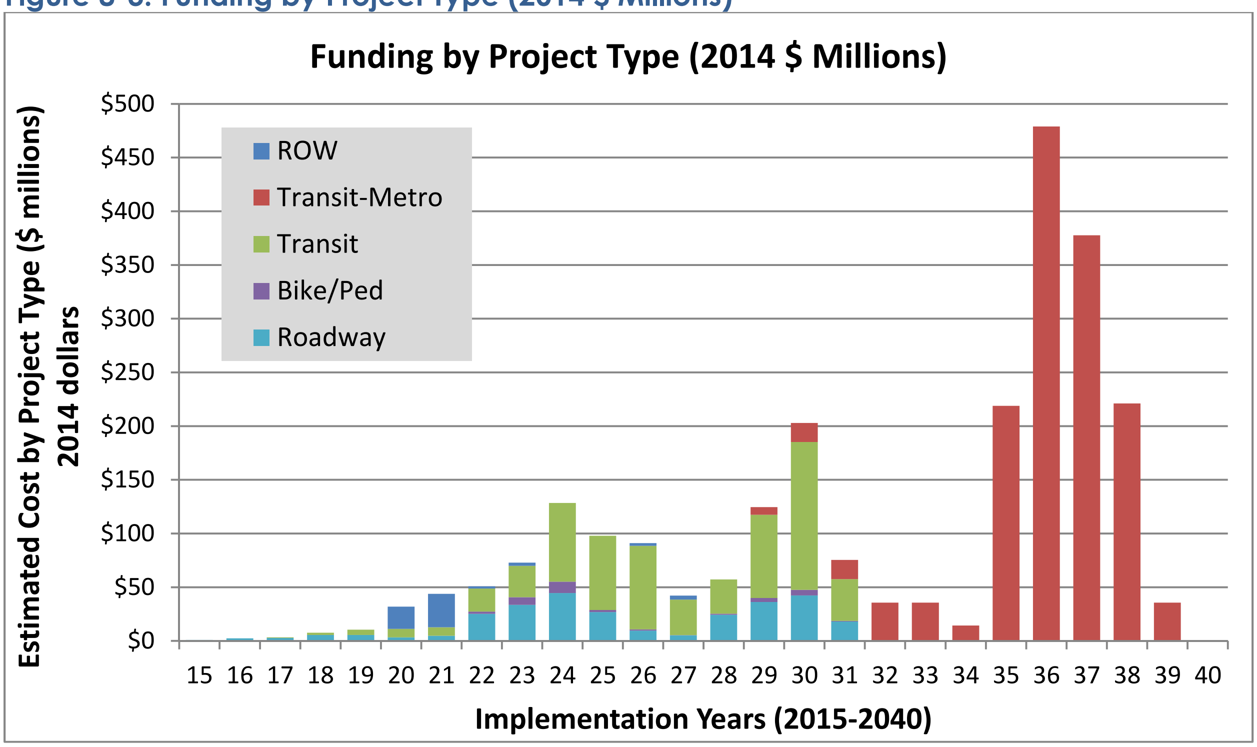


Figure 8-3: Funding by Project Type (2014 $ Millions)



8.1.1 The Funding Mix for the Overall Project

The rationale for determining the potential overall funding mix consisted of the following considerations:

- **Modest share of FTA New Starts Funding:** The project team performed an initial analysis of the potential competitiveness for FTA New Starts funding for each phase. In regards to FTA New Starts project justification criteria (mobility improvements, environmental benefits, congestion relief, cost effectiveness, economic development, and land use) described in sub-section 3.1.1, preliminary findings suggest that Phases I and II (Huntington to Fort Belvoir) of the BRT project could be competitive for FTA New Starts funding, or it could receive a "medium" rating required for FTA funding.[27] At present, Phase III of the BRT project would likely not receive a "medium" rating under the project justification criteria. The Metrorail investment of Phase IV is also assumed to obtain at least a "medium" rating required for FTA funding, but these investments will only be competitive for FTA funding if there is substantial development growth in the corridor by 2040.

  BRT phases may also score well under the FTA local financial commitment criteria as funding is not as capital intensive as the Metrorail extension and may be available from either the recently augmented NVTA budget and/or Fairfax County budget. Also, transit projects are currently exempt from the NVTA's ranking of projects for funding based on congestion mitigation criteria. The project may need to demonstrate economic development, accessibility, safety and environmental quality benefits, the criteria which reportedly may be added to both CTB and NVTA project prioritization processes[28].

- **The project will rely primarily on state and local funding sources, specifically on the NVTA and Fairfax County as well as the Commonwealth Transportation Fund (VDOT and DRPT funds).**
  - NVTA received dedicated funding to fund projections within 17 jurisdictions located in the Northern Virginia Transportation District (the projected annual funding of $300 to $350 million a year).
  - Fairfax County has a dedicated revenue source for transportation -Commercial and Industrial (C&I) Real Estate Tax (the current rate of $0.125 per $100 of assessed value adopted at the maximum allowable rate). Roughly $50 to $60 million in annual funding.
  - Fairfax County issues general obligation and revenue bonds backed by the general fund and C&I revenues thus leveraging the tax funding it collects. Roughly $60 million in bond proceeds a year under the current Four Year Transportation Plan.
  - The Commonwealth Transportation Fund consolidates state and federal funding as well as planned bond proceeds, thus leveraging tax receipts with bond funding. $500 million is allocated to rail and public transportation in FY2015-2020.

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[27] The analysis assumed that the right-of-way acquisition, roadway widening and realignment would not be included in the total transit project costs, as these improvements would be implemented along with the roadway improvements and paid for under a separate funding source.

[28] http://www.ctb.virginia.gov/resources/2014/may/pres/Presentation_Agenda_Item_7.pdf

  - The potential for Value Capture and private proffer revenues will depend on the level of economic development and private sector interest. These sources would likely provide a modest contribution to transit improvement along the corridor.
- **The federal formula funds will not make up a significant portion of funding.** Federal formula funds are distributed amongst a large number of recipients or projects. The funding from federal formula funds (STP, CMAQ) have been roughly in order of up to 5 to 10 million per project. The recipients of Section 5307 Urbanized Area Formula Funds are primarily transit agencies with funding formula tied to the systems size and population.

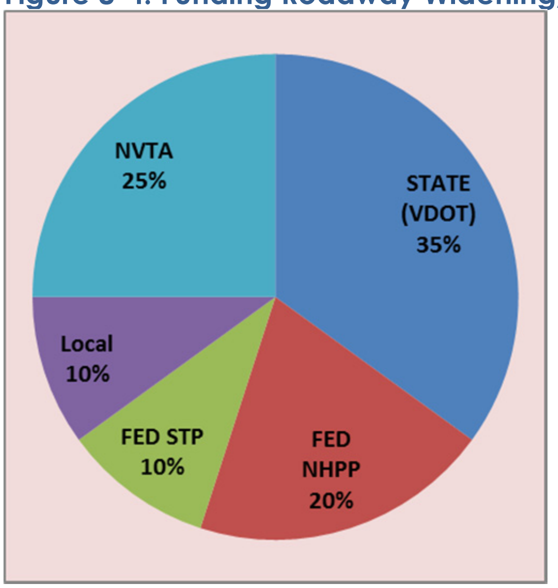
8.1.2 Funding Roadways Widening and Improvements

The Approach includes $292 million in roadway improvements. The funding mix for these investments may include a combination of state, federal formula, regional and local funds as shown in **Figure 8-4**[29]**.** The combination of assumed funding includes:

- 20 percent National Highway Performance Program (NHPP) ($54 million total)
- 10 percent Surface Transportation Program (STP) ($27 million total)
- 10 percent local share ($27 million total)
- 25 percent NVTA share ($67 million total)
- 35 percent state funding (CTF) through VDOT ($94 million total).

In order to access NVTA funding, the project's roadway improvements will need to demonstrate congestion mitigation impact per NVTA project prioritization criteria. NHPP, STP and State CTF funds are obligated by the VDOT as part of its 6-year TIP.

Figure 8-4: Funding Roadway Widening/Reconfiguration (2014 $ Millions)



[29] Funding for Roadway Widening and Improvements is partially reliant on Fairfax County's Six Year Transportation Improvement Program, which is not included in the breakdown of funding sources, as the funding for the Six Year Transportation Improvement Program already represents a mix of local, regional, state, and federal sources.

8.1.3 Funding Right-Of-Way

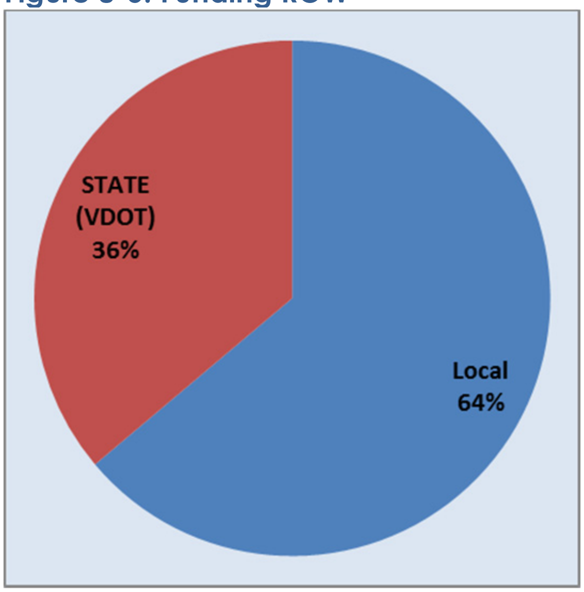
The total estimated investment in Right-Of-Way stands at about $52 million[30]. The investments related to securing and reserving Right-Of-Way are assumed to be funded by a combination of:

- 64 percent local share ($20 million total)
- 36 percent state funding (CTF) through VDOT ($11 million total).

The funding mix for Right-Of-Way can also be seen in

Figure 8-5**.**

Figure 8-5: Funding ROW



8.1.4 Funding Multi-Use Paths

The total estimated investment in Multi-Use Paths for the Phase I stands at about $21 million. As these are bike and pedestrian improvements, the analysis assumed a combination of:

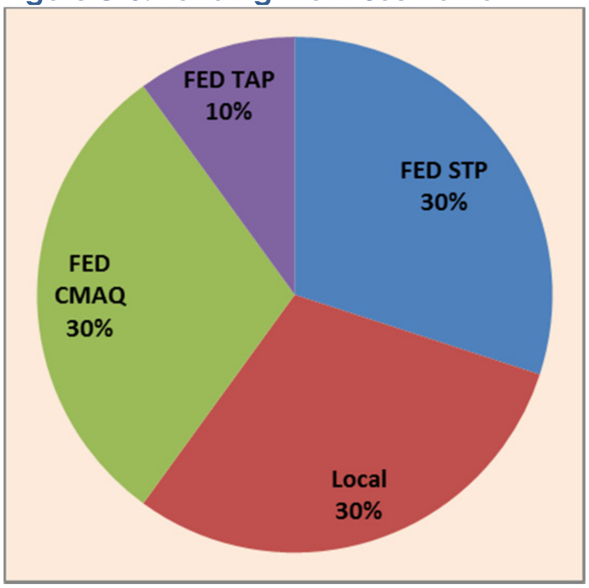
- 30 percent Surface Transportation Program (STP) ($6 million total)
- 30 percent Congestion Mitigation and Air Quality (CMAQ) ($6 million total)
- 10 percent Transportation Alternatives Program (TAP) ($2 million total)
- 30 percent local share ($6 million total)

[30] Funding for Right-Of-Way is partially reliant on Fairfax County's Six Year Transportation Improvement Program, which is not included in the breakdown of funding sources, as the funding for the Six Year Transportation Improvement Program already represents a mix of local, regional, state, and federal sources.

About $6 million from STP, CMAQ, and local sources is a reasonable estimate given past allocations to projects in Fairfax County in the range of up to $10 million. These small scale projects contribute to less driving and alternatives to more environmentally friendly commuting and thus better air quality.

Figure 8-6 shows the funding mix for the investments in multi-use paths.

Figure 8-6: Funding Multi-Use Paths



8.1.5 Funding Transit – FTA Competitive Investments

As mentioned in section 8.1.1 for the purpose of defining a potential funding mix, the transit investments were reviewed in regards to the FTA's project justification criteria (mobility improvements, environmental benefits, congestion relief, cost effectiveness, economic development, and land use). Based on this review, both BRT-related transit improvements in Phases I and II as well as Phase IV investments (three mile Metrorail extension) by 2040 were identified as "FTA Competitive". These investments totaling $1,764 million (2014 $) are listed in

Table 8-2. These investments may qualify to be submitted for FTA New Starts grant funding.

Table 8-2: Transit Stations and Park and Ride, FTA-Competitive Investments

Project Element	Cost (2014 $Millions)
Phase 1	
Transit Elements (all other)	$ 71
Stations	$ 26
Vehicle Maintenance Capacity	$ 8
Phase 2	
Transit Elements (all other)	$ 65
Stations	$ 26
Transit Elements (all other)	$ 80
Stations	$ 17
Fort Belvoir Shuttle System	$ 11
Phase 4	
Transit Elements (all other)	$ 715
Underground Guideway	$ 499
Metro Stations	$ 247
Total	**$ 1,764**

A potential funding mix for investments listed in

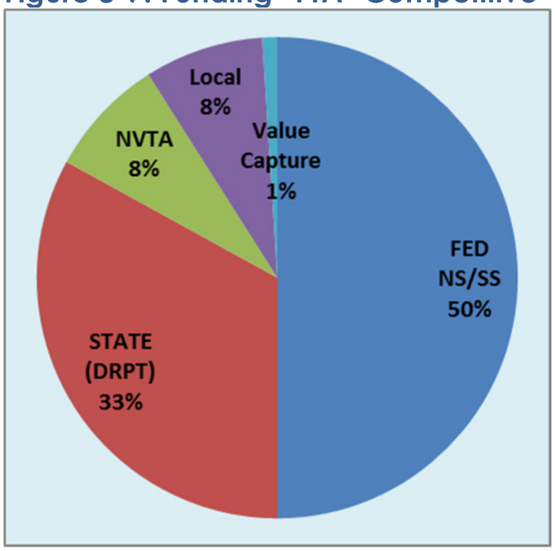
Table 8-2 is summarized in

- **Figure** 8-7. FTA will require submission of a robust financial plan and analysis. The funding mix described in

Figure 8-7 consists of:

- 50 percent FTA share in the total capital funding ($867 million total).
- 8 percent NVTA share ($139 million total)
- 8 percent local share ($139 million)
- 1 percent local value capture/private proffer ($17 million total)
- 33 percent DRPT share ($572 million total)

Figure 8-7: Funding "FTA- Competitive" Transit Investments



8.1.6 Funding Transit – All Other Investments

The capital expenditures for transit improvements for Phase III are listed in **Table 8-3**. These investments may be funded by a mix of state (including NVTA) and local funding source and some federal formula funds. Preliminary analysis suggests that a BRT system from Fort Belvoir to Woodbridge may not be "competitive" under FTA project justification criteria (mobility improvements, environmental benefits, congestion relief, cost effectiveness, economic development, and land use); therefore, this phase did not assume any federal discretionary grants. Due to this limitation, the mix of funding for Phase III assumes a gap of 15%, which will need to be funded from a source that is currently unidentified.

Table 8-3: Transit Stations and Park and Ride, FTA-Non Competitive Investments

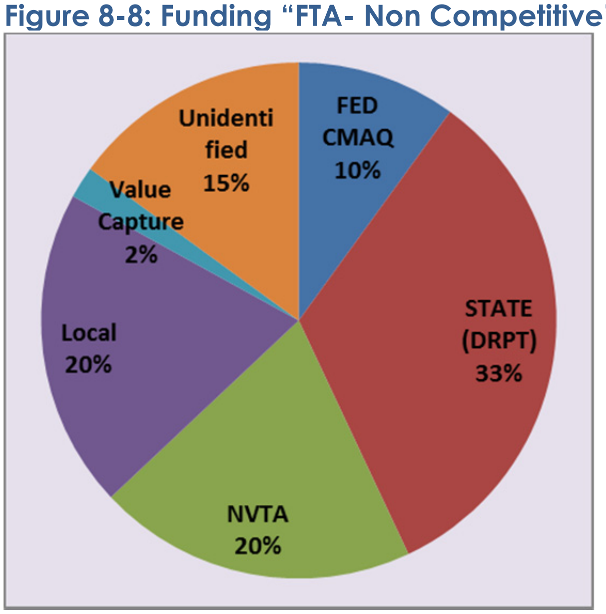
Project Element	Cost (2014 $Millions)
Phase 3	

Transit Elements (all other)	$ 112
Stations	$ 17
Park & Ride at Lorton	$ 64
Transit Elements (all other)	$ 48
Stations	$ 4
Park & Ride at Woodbridge	$ 64
Total	**$ 310**

The funding mix described in **Figure 8-8** consists of:

- 20 percent NVTA share ($62 million total)
- 20 percent local share ($64 million)
- 2 percent local VC including Proffer ($4 million total)
- 10 percent federal formula funds including CMAQ, STP and Urbanized Area/Section 5307 ($31 million total)
- 33 percent DRPT share ($102 million total)
- 15 percent funding gap, denominated as "Unidentified" ($46 million total)

Figure 8-8: Funding "FTA- Non Competitive" Transit Investments



Attachment A

Value Capture Funding Preliminary Findings

A-1. Value Capture Funding Preliminary Findings

This section describes a preliminary quantification of the potential revenue yield from the application of the Tax Incremental Finance (TIF) and Special Assessment District (SAD) for the project as described in section 6.0.

The SAD or TIF districts were assumed to start in 2018 which is the year the project is assumed to begin construction. The District was assumed to dissolve in 25 years. The objective was to estimate potential revenue streams from TIF and SAD to determine % of the total capital costs that could be funded

- **TIF:** existing tax rate of $1.085 per $100 is applied to incremental tax base; all incremental property tax base and tax receipts were assumed to accrue to TIF fully
- **SAD:** additional tax rate was applied to existing and future growth in tax base; limited to tax rate charged for similar projects (Dulles Metrorail Extension & Route 28) = $0.20 per $100

The projected increase in assessed value was based on three land use scenarios which were considered as part of the Alternatives Analysis. The land use scenarios determine the magnitude of increase in the assessed value in the TIF District and therefore the size of the potential revenue yield. **Table A-4** describes the assumed land scenarios.

Table A-4: Assessed Value Growth Scenarios to Be Considered by Funding Analysis

Land Use Scenario	Basis for Assessed Value Growth Assumptions	To Be Applied to
Scenario 1	"Base Land Use Scenario" per 2035 Metropolitan Washington Council of Governments(MWCOG) regional forecast	Initial comparison of all mode alternatives: BRT, LRT, Metrorail and Metro Rail/BRT Hybrid
Scenario 2	Assumes population and employment growth 25% growth over MWCOG regional forecast	BRT, LRT, Metrorail and Metro Rail/BRT Hybrid
Scenario 3	Assumes population & employment growth rate to achieve density levels supportive of Metrorail, based on DRPT Guidelines (activity density of 70)	Metrorail and Metro Rail/BRT Hybrid

Source: Route 1 Alternatives Analysis

In addition to the change in the land use and increased density in the project corridor, the installation of the new transit line may positively impact the existing land values resulting in additional property premium due to the project. The potential land value increase will vary by mode: Metrorail may induce a higher property premium than BRT for example. A TIF revenue analysis considered the potential increase in property taxes due to changes in the land use and installation of the transit line. The methodology included the following steps:

- Drawing of the TIF boundary, i.e. all taxable properties along a one-half mile-wide corridor from the proposed project alignment and/or all taxable properties with one-half of the planned stations, based on data from Fairfax and Prince William County assessors' records.
- Quantifying the Baseline Assessed Value of properties located within the TIF boundaries by type of use (residential, commercial, industrial, other)
- Estimating the potential increase in the Baseline Assessed Value due to the project (projected increase in land value due to the project and change in the land use around the stations will result in higher assessed value)
- Quantifying the incremental assessed value due to the project (Projected Assessed Value minus Baseline Assessed Value)
- Applying the existing base tax rate to the Incremental Assessed Value
- Deriving a stream of property tax revenues and calculate the total present value of the projected revenues over a 20-year to 30-year horizon.

The revenue yield results were measured as total 25 year revenue yield discounted at 5% as a share of total project capital costs. These results are presented in Table A-6

, **Table A-7**, and **Table A-8** are preliminary and will be further refined. The results will depend on the further refinement of the land use scenarios for the corridor and will also depend on the transit technology chosen for the project (BRT, LRT, HRT/BRT and HRT).

The analysis provides early insights on the TIF and SAD potential for the project.

Table A-5 summarizes the baseline Assessed Value which would be the tax base for the project if TIF or SAD districts are established to include all taxable properties within on-half mile of the planned stations.

Table A-5 shows that the Assessed Value in the project area is predominantly residential use. The TIF district would include both residential and commercial land uses.

Table A-5: VC Analysis: Existing Tax Base

Land Use	2013 Assessed Value $Millions
Residential	$5,133
Office	$178
Retail	$209
Commercial, Hotel & Lodging	$100
Total	$5,620

Source: Fairfax County and Prince William County assessor records.

Table A-6: Conceptual Construction Costs

	Bus Rapid Transit 1 – Curb	Bus Rapid Transit 2- Median	Light Rail Transit- Median	Metrorail/ BRT- Median Hybrid	Metrorail (15-Miles)
Conceptual Capital Cost	$500 M	$780 M	$1,200 M	$1,570 M	$4,800 M

Table A-7: TIF revenue (@ $1.085 per $100) as % of construction cost

	Bus Rapid Transit 1 – Curb	Bus Rapid Transit 2- Median	Light Rail Transit- Median	Metrorail/ BRT- Median Hybrid	Metrorail (15-Miles)
Scenario 1	32.4%	20.8%	13.5%	N/A	N/A
Scenario 2	41.4%	26.5%	17.2%	13.2%	4.3%
Scenario 3	N/A	N/A	N/A	40.6%	13.3%

Table A-8: SAD revenue (@ $0.20 per $100) as % of construction cost:

	Bus Rapid Transit 1 – Curb	Bus Rapid Transit 2- Median	Light Rail Transit- Median	Metrorail/ BRT- Median Hybrid	Metrorail (15-Miles)
Scenario 1	5.0%	3.2%	2.1%	N/A	N/A
Scenario 2	6.7%	4.3%	2.8%	2.1%	0.7%
Scenario 3	N/A	N/A	N/A	6.5%	2.1%