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MEMORANDUM

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DATE: April 11, 2011
Updated May 12, 2011

SUBJECT: Draft Selection of Preferred Alternative for Transitway Corridor C (Beauregard/Van Dorn Corridor)

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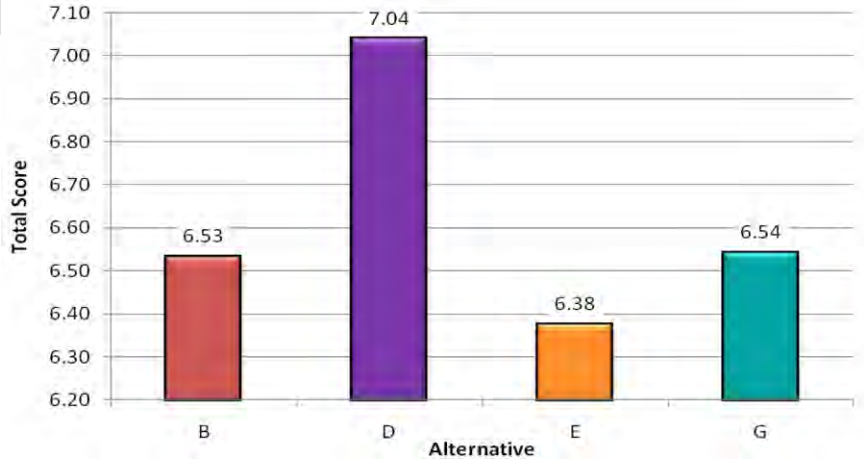
Executive Summary

This technical memorandum is part of the City of Alexandria High Capacity Transitway Corridor Feasibility Study. The memorandum describes the process that led to the identification of a preliminary preferred alternative for Transitway Corridor C (the Beauregard/Van Dorn corridor) based on an alternatives screening process.

A baseline alternative (B) and three build alternatives (D, E, and G) were screened using a set of detailed evaluation criteria. The application of the screening criteria to each of the build alternatives resulted in Alternative D being ranked the highest, as shown in **Chart 1**. Based on the evaluation using the screening criteria and comments received from the project's Corridor Working Group (CWG) and the public, a preliminary preferred alternative and phasing strategy was identified. Alternative D (Bus Rapid Transit connecting to the Pentagon/Pentagon City and Shirlington) is recommended as the preferred alternative for implementation of transit in dedicated lanes in Corridor C. Alternative D should be constructed in a manner that does not preclude future implementation of streetcar in the corridor. The results of the Corridor C alternative scoring will be presented at the May 19, 2011 CWG meeting.

Chart 1: Alternative Scoring Summary



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INTRODUCTION

As part of the City of Alexandria High Capacity Transitway Corridor Feasibility Study, transitway alternatives were developed for Corridor C (the Beauregard/Van Dorn corridor). Alternatives included the consideration of a specific alignment, set of regional connections, and transit mode technologies. A preliminary screening was undertaken to begin the evaluation process and resulted in the identification of a baseline and three distinct build alternatives for further study. The process by which the baseline and three build alternatives were developed is documented in a study memorandum dated February 28, 2011[1].

The baseline and three build alternatives were screened with a set of detailed evaluation criteria. These alternatives and the secondary screening were presented to the High Capacity Transit Corridor Work Group (CWG) at the CWG meeting held on March 17, 2011. The CWG and the public were given an opportunity to provide comments within a specified review period.

Following the comment period and CWG meeting, City of Alexandria staff and Kimley-Horn met to discuss feedback received as well as the results of the secondary screening. Using information collected during the CWG meeting, from public comments, and from the meeting with the City, a preliminary preferred alternative and phasing strategy was identified. This memorandum briefly summarizes the process and the results of the secondary screening that lead to the selection of a preliminary preferred alternative.

Alternatives

The baseline alternative for the secondary screening is Alternative B, which is shown in **Figure 1**. Alternative B consists of a rapid bus operating in mixed-flow traffic. It assumes connections to Shirlington and Pentagon/Pentagon City. The City of Alexandria will implement some elements of Alternative B through the TIGER grant-funded Van Dorn/Beauregard Transit Improvements Project. The improvements to be implemented with the TIGER grant-funded project include transit signal priority, queue jump lanes, and enhanced bus stops at selected locations along Van Dorn Street and Beauregard Street. Locations for the aforementioned elements within the Van Dorn/Beauregard Transit Improvements Project are shown in **Figure 2**. The three build alternatives selected for secondary screening are shown in **Figures 3**, **4,** and **5**, and described briefly below:

Alternative D: Bus Rapid Transit (dedicated lanes) connecting to Pentagon/Pentagon City and Shirlington

Alternative E: Bus Rapid Transit (dedicated lanes) connecting to Pentagon/Pentagon City and Streetcar (dedicated lanes) connecting to Mark Center and the Rayburn Avenue area along Beauregard Street

Alternative G: Streetcar (dedicated lanes) connecting to Columbia Pike

[1] Memorandum is available on the City of Alexandria's project website, www.alexandriava.gov/highcapacitytransit

Figure 1: Alternative B - Baseline *(Rapid Bus in Mixed-Flow connecting to Pentagon/Pentagon City and Shirlington)*

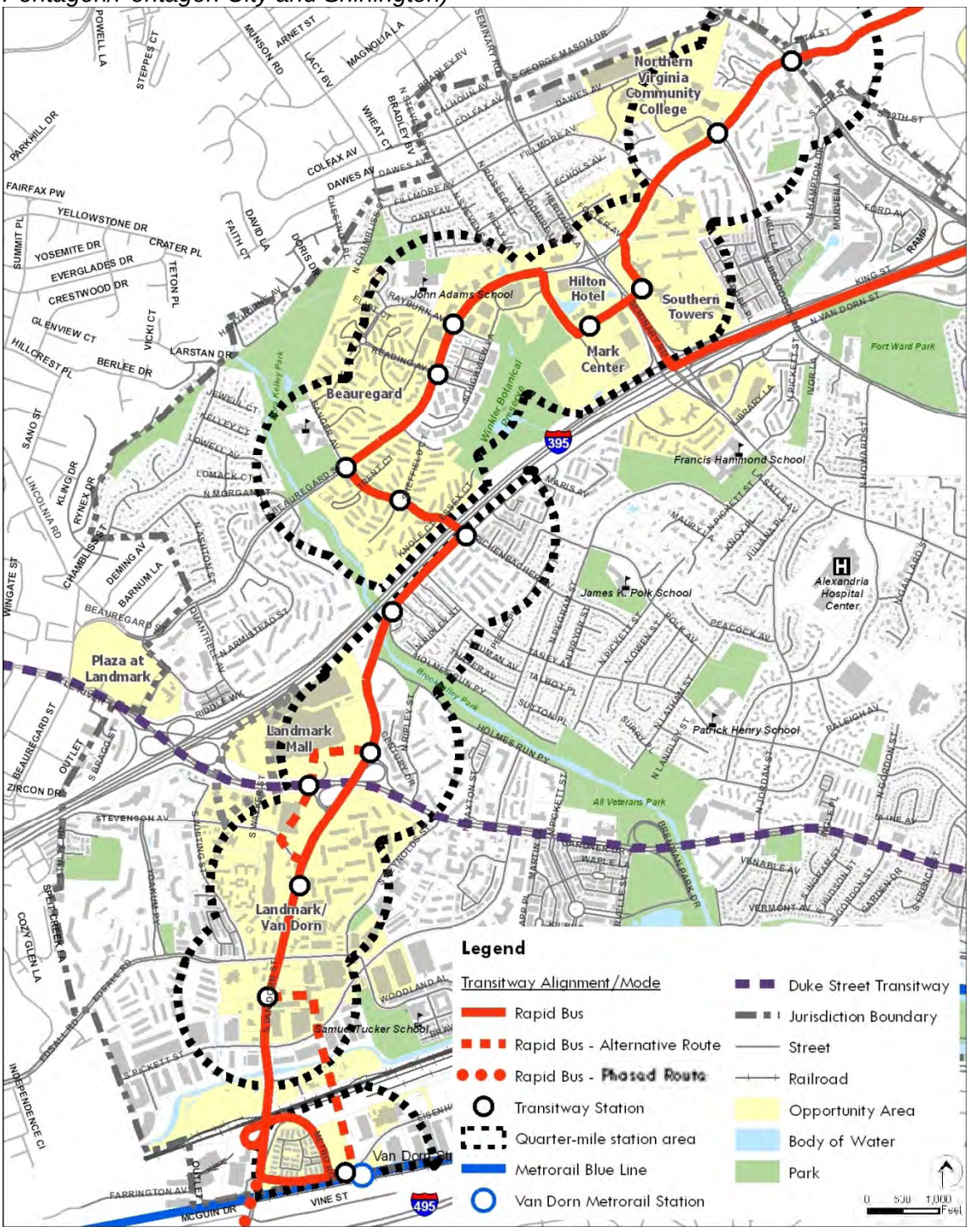


Figure 2: Van Dorn/Beauregard Transit Improvements Project

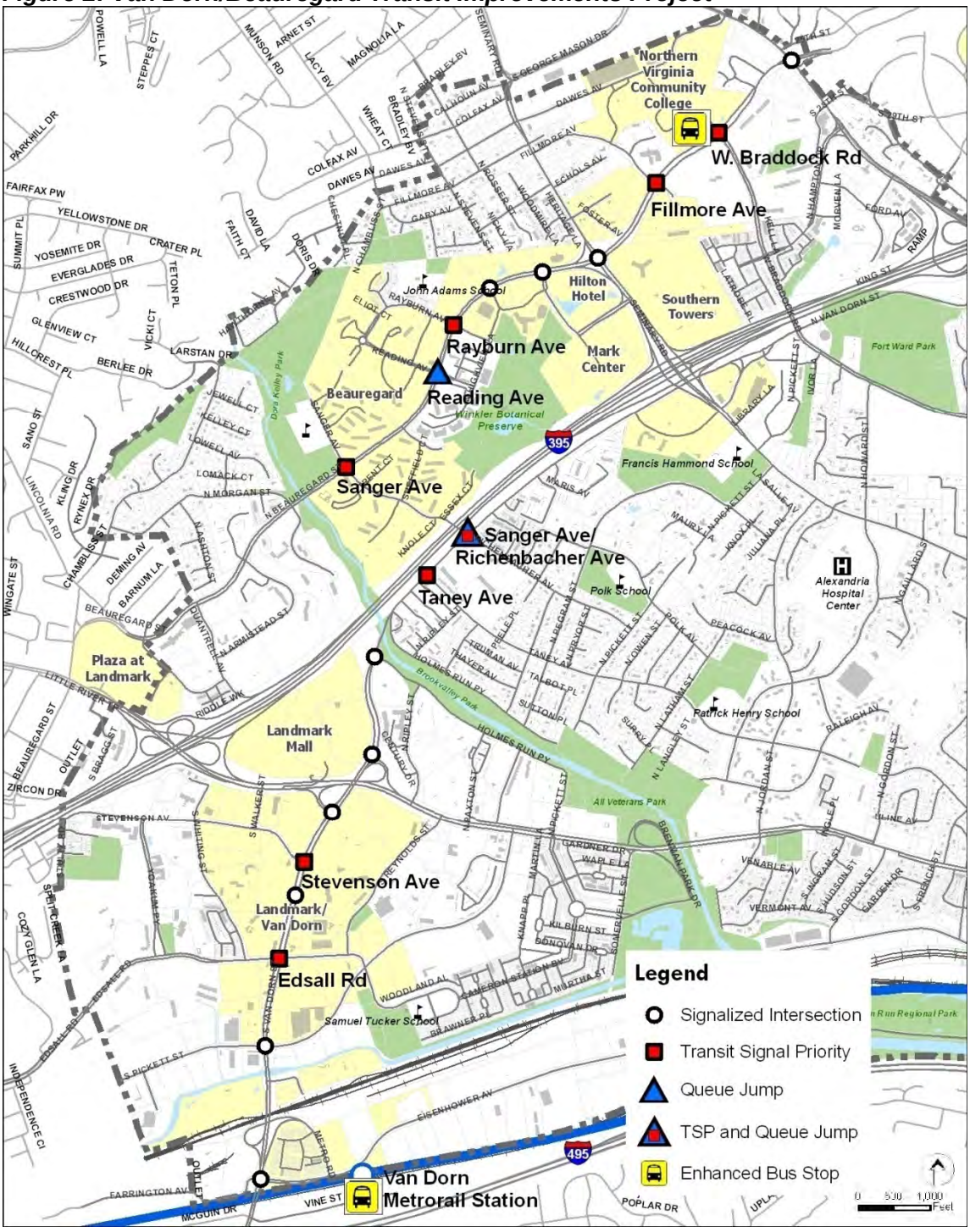


Figure 3: Alternative D *(Bus Rapid Transit (dedicated lanes) connecting to Pentagon/Pentagon City and Shirlington)*

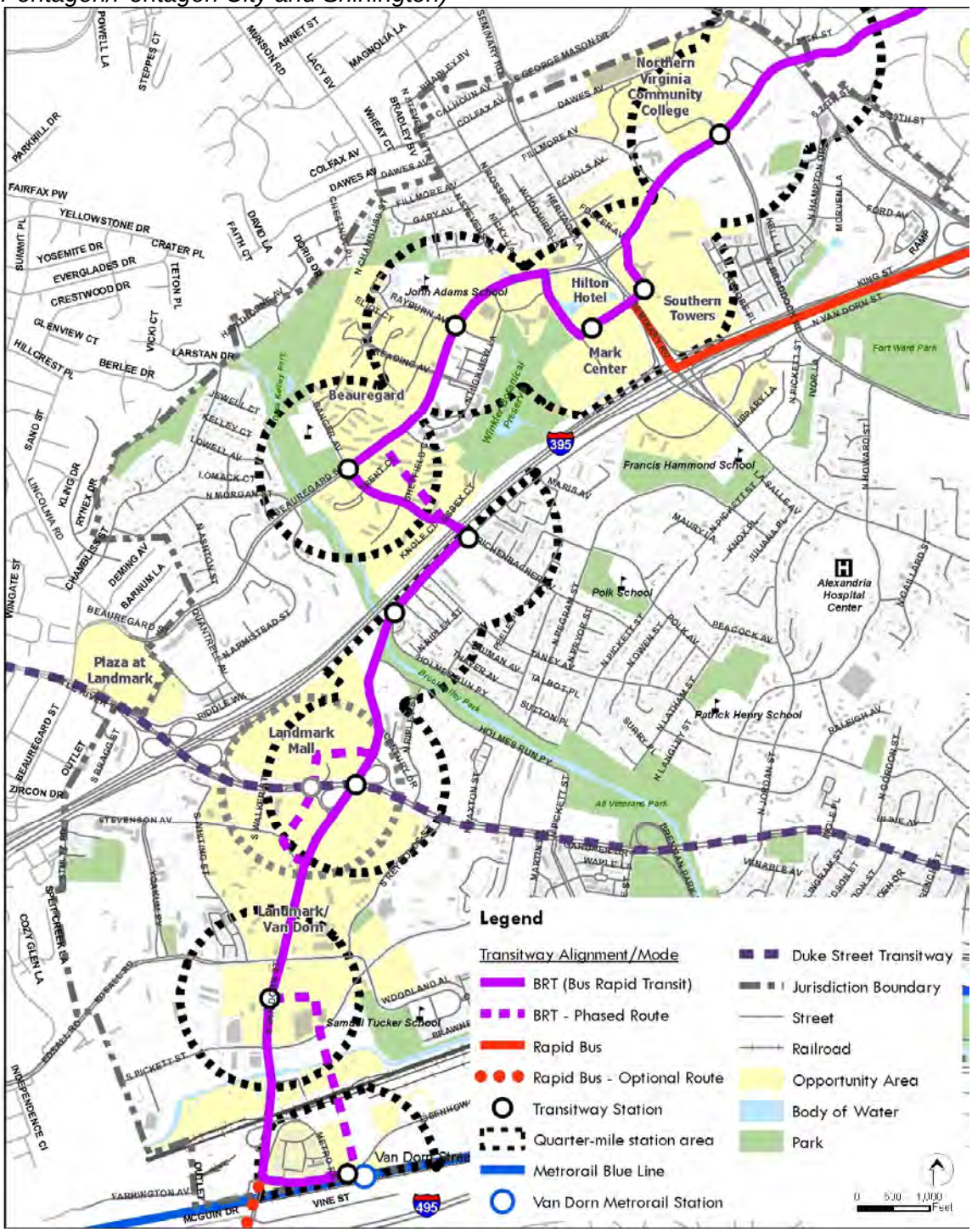


Figure 4: Alternative E *(Bus Rapid Transit (dedicated lanes) connecting to Pentagon/Pentagon City and Streetcar (dedicated lanes) connecting to Mark Center and the Rayburn Avenue area along Beauregard Street)*

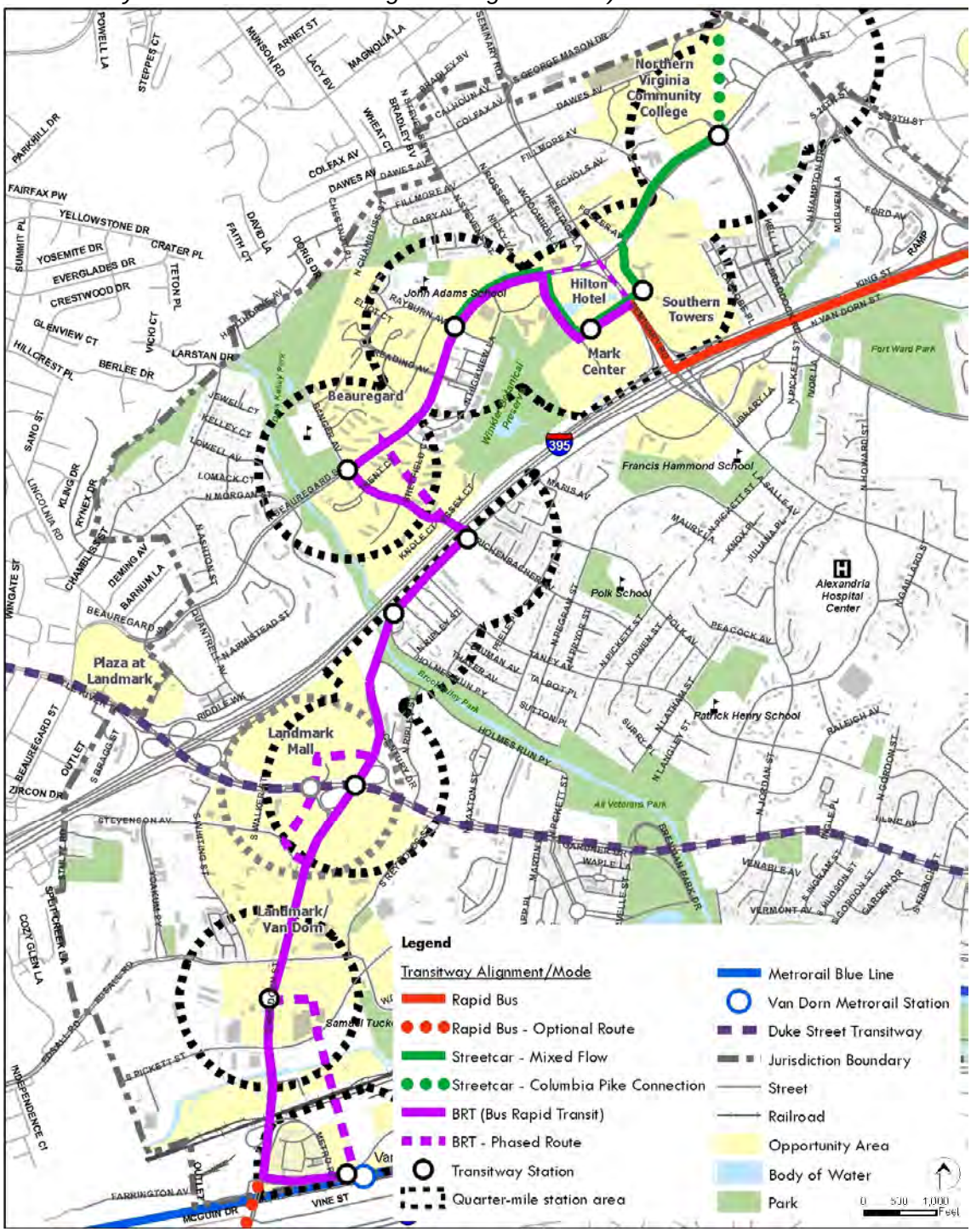
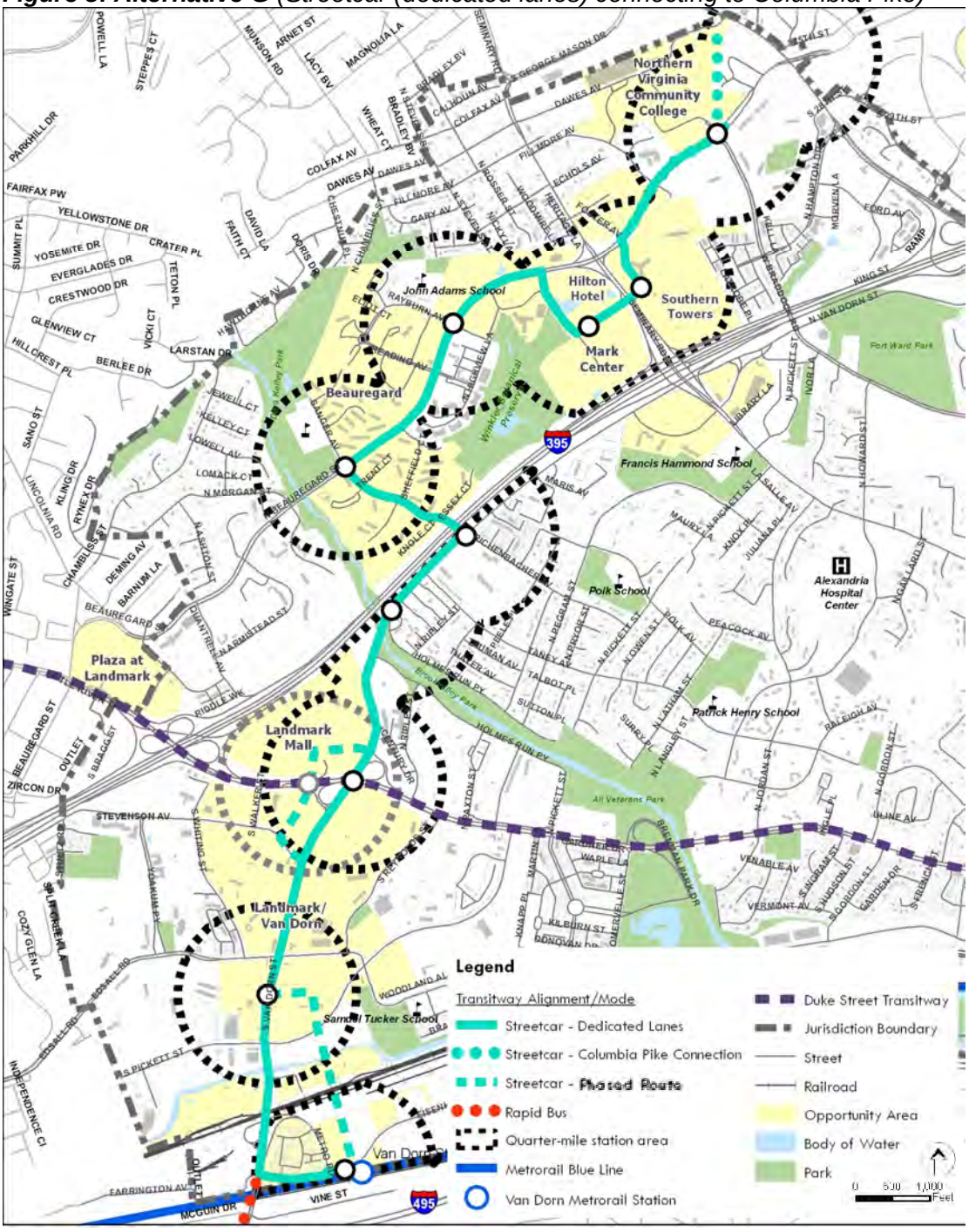


Figure 5: Alternative G *(Streetcar (dedicated lanes) connecting to Columbia Pike)*



Evaluation Criteria

The evaluation criteria to be used in the study were presented to the CWG at the November 18, 2010 meeting[2]. The evaluation criteria developed for this study are modeled after those used in a standard Federal Transit Administration (FTA) Alternatives Analyses and are divided into four major groups: effectiveness, impacts, cost effectiveness, and financial feasibility. **Table 1** shows the detailed evaluation and screening criteria by group along with the measurement method for evaluation. Screening criteria were selected for the preliminary review of alternatives. All criteria with the exception of those in the financial feasibility group were used in the secondary comparative evaluation of the alternatives.

Table 1: Evaluation Criteria

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Screening of Concepts	For Use in Secondary Screening of Concepts	Measurement Method
Effectiveness Addresses stated transportation issues in the corridor	Coverage	Service to Population, Employment, and Other Destinations	✓	✓	Tabulate population, employment, key destinations, and similar served by alternative
		Transit Connectivity	✓	✓	Access to other transit services (existing and planned)
	Operations	Running-way Configuration(s)	▪	✓	Quantify amount of running-way that is dedicated and amount that is mixed-flow
		Corridor Length	▪	✓	Measured length of the corridor (mi or feet)
		Capacity	▪	✓	Potential corridor capacity (hourly) based on mode technology, headways, and other conditions
		Interoperability		✓	Identification of whether the chosen running-way configuration and transit mode technology are compatible with regionally planned systems
		Avoidance of Congestion	▪	✓	Number and locations of level of service E/F intersections avoided
		Transit Travel Time	✓	✓	Transit travel time
		Intersection Priority	▪	✓	Percent of intersections where transit signal priority is needed and can be implemented successfully - notation of where it cannot be implemented successfully
		Ridership	▪	✓	Forecast number of riders (estimated)
	Alignment	Geometrics	✓	✓	Geometric quality of alignment
		Runningway Status	▪	✓	Percent of corridor to be located on new or realigned roadway
	Phasing	Phasing	▪	✓	Identification of ability to phase operations and implementation
Impacts Extent to which economics, environment, community, and transportation are affected	Economic	Development Incentive	▪	✓	Perceived ability to encourage economic development
	Natural Environ-mental	Natural Environment	▪	✓	Summary of key environmental conditions affected (wetlands, floodplains, T&E, streams, and similar)
		Parks and Open Space	▪	✓	Summary of parks and/or open spaces affected

[2] Meeting minutes are available on the City of Alexandria's project website, www.alexandriava.gov/highcapacitytransit

Table 1: Evaluation Criteria (continued)

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Screening of Concepts	For Use in Secondary Screening of Concepts	Measurement Method
Impacts (continued) Extent to which economics, environment, community, and transportation are affected	Neighbor-hood and Community	Property	✓	✓	Number, use type, and quantity of properties impacted with anticipated level of impact (right-of-way only, partial, or total take)
		Streetscapes	▪	✓	Impact to existing streetscapes
		Community Resources	▪	✓	Number and location of historical, cultural, community, archaeological resources affected
		Demographics	▪	✓	Identification of impacts to special populations
		Noise and Vibration	▪	✓	Summarize relative noise and vibration impacts of different mode types and corridor configurations
	Transport-ation	Traffic Flow Impact	✓	✓	Effect of transit implementation on vehicular capacity of corridor
		Traffic Signals	▪	✓	Number of existing signalized intersections affected by transit, identification of need for new signal phases, and number/location of new traffic signals needed to accommodate transit
		Multimodal Accommodation	▪	✓	Impacts to, and ability to accommodate bicycles and pedestrians
		Parking	▪	✓	Impacts to parking
Cost Effectiveness Extent to which the costs are commensurate with their benefits	Cost	Capital cost	✓	✓	Order of magnitude capital cost for corridor (stations, running-way, etc.)
		Right-of-Way Cost			Order of magnitude for right-of-way acquisition
		Operating cost	▪	✓	Order of magnitude operating cost
		Order of Magnitude Operating Cost Per Rider	▪	✓	Order of magnitude cost per rider
Financial Feasibility Cost of system/ concept is in alignment with available funding	Funding	Funding	▪	▪	Availability of specific funding sources
		Private Capital Incentive	▪	▪	Ability to attract private capital investment and innovative procurement

Secondary Screening

The baseline alternative and three selected alternatives were evaluated based on the secondary screening criteria shown in **Table 2**[3]. Comparative ratings of best, fair, and poor were applied to each alternative. A summary of the ratings for each alternative is shown in **Table 2**.

[3] Opinions of probable cost for each alternative were based on year 2010 dollars and do not include additional contingency or escalation to a future year mid-point of construction. Cost assumptions do not include costs for major utility relocations/new service or roadway/streetscape improvements that may be implemented concurrently, but are not required for the transit project. Alignments designated as "optional" are not included in the cost assumptions. Costs assume that Arlington County extends Columbia Pike to Northern Virginia Community College.

Table 2: Secondary Screening Summary

Screening Criteria			Alternative			
			B (baseline)	**D**	**E**	**G**
		Transit Mode:	Rapid Bus (mixed)	BRT (mixed & dedicated)	Streetcar (mixed) & BRT (mixed & dedicated)	Streetcar (dedicated)
Group	**Sub-Group**	**Northern Connection:**	Shirlington & Pentagon	Shirlington & Pentagon	Columbia Pike & Pentagon	Columbia Pike
Effectiveness	Coverage	Service to Regional Destinations	◑	●	●	◑
		Service to Population, Employment, & Retail in the Corridor	●	◑	◑	◑
		Transit Connectivity	◑	◑	●	◑
	Operations	Running-way Configuration(s)	○	●	●	●
		Corridor Length	◑	◑	●	●
		Capacity	◑	◑	◑	●
		Interoperability	◑	●	●	●
		Avoidance of Congestion	◑	●	●	●
		Transit Travel Times in Corridor	◑	●	●	●
		Transit Travel Times between Terminii	◑	●	●	○
		Ridership	○	◑	●	●
		Intersection Priority	○	●	◑	◑
	Alignment	Alignment Quality	◑	◑	◑	◑
		Runningway Status	●	◑	◑	◑
	Phasing	Phasing	●	●	◑	○
Impacts	Economic	Development Incentive	○	◑	◑	●
	Natural Environ-ment	Natural Environment	●	◑	◑	◑
		Parks and Open Space	●	◑	◑	◑

Key to Ratings

Best ● Fair ◑ Poor ○

Table 2: Secondary Screening Summary (continued)

Screening Criteria			Alternative			
			B (baseline)	**D**	**E**	**G**
		Transit Mode:	Rapid Bus (mixed)	BRT (mixed & dedicated)	Streetcar (mixed) & BRT (mixed & dedicated)	Streetcar (dedicated)
Group	**Sub-Group**	**Northern Connection:**	Shirlington & Pentagon	Shirlington & Pentagon	Columbia Pike & Pentagon	Columbia Pike
Impacts	Neighbor-hood	Property	●	◑	◑	◑
		Streetscape	●	◑	◑	◑
	and Community	Community Resources	●	●	●	●
		Demographics	●	◑	◑	◑
		Noise and Vibration	○	◑	◑	●
	Transportation	Traffic Flow Impact	○	●	●	●
		Traffic Signals	◑	○	○	○
		Multimodal Accommodation	○	◑	◑	●
		Parking	●	◑	◑	◑
Cost Effectiveness	Cost Effectiveness	Capital Cost	●	◑	◑	○
		Right-of-Way Cost	●	◑	○	○
		Operating Cost	◑	●	◑	●
		Order of Magnitude Operating Cost per Rider	○	◑	○	●

Key to Ratings

Best ● Fair ◑ Poor ○

Scoring

A numeric score was applied to the ratings. Best scored a three, fair scored a two, and poor scored a one. The scores were used to numerically compare the alternatives by criteria group (effectiveness, impacts, cost effectiveness) and overall (combined criteria groups). Based on feedback from the City, CWG, public, and from experience on similar projects, several evaluation criteria were identified as being of greater importance within each criteria group. These evaluation criteria were doubly weighted as compared to the other evaluation criteria:

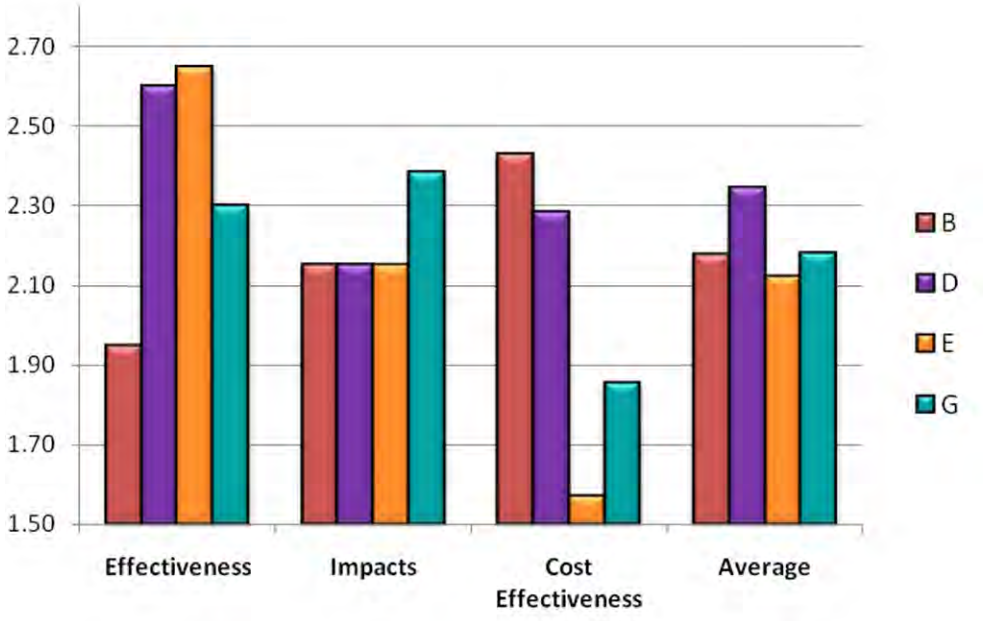
- Transit travel times in corridor
- Transit travel times between termini
- Ridership
- Phasing
- Traffic flow impact
- Capital cost
- Right-of-way cost
- Operating cost

The total scores for each criteria group were averaged (total of individual scores divided by the number of criteria multiplied by the weights) so that each of the three criteria groups would be weighted equally when compared to one another. The average scores from the three criteria groups were added to create a total score for each alternative. The resulting scores (and ranks, based on score) are shown in **Table 3** and **Chart 2**.

Table 3: Scoring Summary

	Alternative			
	B (baseline)	**D**	**E**	**G**
Transit Mode:	Rapid Bus (mixed)	BRT (mixed & dedicated)	Streetcar (mixed) & BRT (mixed & dedicated)	Streetcar (dedicated)
Northern Connection:	Shirlington & Pentagon	Shirlington & Pentagon	Columbia Pike & Pentagon	Columbia Pike
Screening Criteria Croup	**Average Score**			
Effectiveness	1.95	2.60	2.65	2.30
Impacts	2.15	2.15	2.15	2.38
Cost Effectiveness	2.43	2.29	1.57	1.86
Average Score	**2.18**	**2.35**	**2.13**	**2.18**
Total Score	**6.53**	**7.04**	**6.38**	**6.54**
Rank	***3***	***1***	***4***	***2***

Chart 2: Scoring Summary by Group



Results and Recommendation

The following summarizes a discussion among City of Alexandria staff and Kimley-Horn regarding the secondary screening and selection of a preferred alternative.

Alternative D: Bus Rapid Transit connecting to Pentagon/Pentagon City and Shirlington

- Pros
  - Highest total score of all alternatives studied (including baseline)
  - Second-highest or better score for each screening criteria group
  - Short travel time in corridor and between termini
  - Lowest capital cost of the three build alternatives
- Cons
  - Lowest level of development incentive
  - Lowest ridership projection
  - Does not provide regional streetcar connectivity
- **Recommendation: Alternative D is the preferred alternative for implementation of transit in dedicated lanes in Corridor C. Alternative D should be constructed in a manner that does not preclude future implementation of streetcar in the corridor.**

Alternative E: Bus Rapid Transit connecting to Pentagon/Pentagon City and Streetcar connecting the Mark Center/the Rayburn Avenue area of Beauregard Street and Columbia Pike

- Pros
  - Highest score in the effectiveness group
  - Serves local and regional destinations well and has short travel times in corridor and on Bus Rapid Transit to Pentagon/Pentagon City
  - Lower capital cost than Alternative G
  - Attractive to development in the Beauregard corridor
  - Regional streetcar connectivity

- Cons
  - Lowest total score of three build alternatives
  - Lowest score in the cost effectiveness group
  - Highest operations cost of three alternatives
  - Long travel times between termini on streetcar
  - Duplicative service in Beauregard corridor between Mark Center and Rayburn Avenue
- **Recommendation: Columbia Pike streetcar extension to Mark Center and the Rayburn Avenue area of Beauregard Street could be implemented as a second phase of transit in Corridor C, should future conditions support additional transit service implementation.**

Alternative G: Streetcar connecting to Columbia Pike

- Pros
  - Highest score in the impact group
  - Lowest operational cost
  - Short travel times in corridor
  - Highest level of development incentive
  - Highest ridership projections
  - Interface with regional streetcar network
- Cons
  - Lowest score in the effectiveness group
  - Longest travel times between termini
  - Highest capital cost and largest maintenance facility needed
- **Recommendation: If future conditions support additional transit service in Corridor C, implement the streetcar extension element of Alternative E prior to full corridor streetcar implementation. If Alternative G is implemented fully, Bus Rapid Transit service is likely to be discontinued between Mark Center and the Van Dorn Metrorail station.**

Conclusions and Next Steps

The results of the secondary screening evaluation and scoring show that Alternative D, Bus Rapid Transit service connecting to Columbia Pike and Pentagon/Pentagon City, scores the highest of the three build alternatives in the cost effectiveness group and in total score. Based on the results of the secondary screening and scoring, CWG and public comments, and discussions between City of Alexandria staff and Kimley-Horn, it is recommended that Alternative D (Bus Rapid Transit connecting to Pentagon/Pentagon City and Shirlington) be selected as the preferred alternative for implementation of transit in dedicated lanes in Corridor C. Alternative D is an effective high-quality and high-capacity transit service and would operate in dedicated lanes. It would have a significantly lower construction cost than rail alternatives that were studied.

Based on an understanding of transit projects recently awarded funds by the Federal Transit Administration (FTA), lower cost projects with high levels of effectiveness are more attractive than higher cost projects with similar levels of effectiveness. Additionally, recent FTA awards have indicated that lower cost projects have had higher levels of federal funding participation (as a percentage of overall cost) than more capital-intensive (expensive) projects.

The pursuit of Alternative D would not preclude an extension of the Columbia Pike streetcar to

the Mark Center/Rayburn Avenue area (streetcar element of Alternative E) or later extension of streetcar service to the Van Dorn Metrorail station. These streetcar projects could be pursued when conditions warrant their consideration. Future conditions that have the potential to affect the decision to pursue rail transit in Corridor C include:

- Columbia Pike streetcar completion to Northern Virginia Community College
- Ridership in-excess of what can be served practically (based on vehicle capacities and maintainable headways) with buses in Corridor C
- Demand for additional transit services in, and connecting to Corridor C
- Rising operating costs due to inefficient rubber tire operations

The results of the Corridor C alternative scoring will be presented at the May 19, 2011 CWG meeting.