



MEMORANDUM

TO: Jim Maslanka
Steve Sindiong
City of Alexandria

FROM: David Whyte
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Kimley-Horn and Associates, Inc.

DATE: February 28, 2011

SUBJECT: Selection of Final Alternatives for Transitway Corridor C (Beauregard/Van Dorn Corridor)

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Introduction

A series of seven transitway alternatives were developed for Corridor C (the Beauregard/Van Dorn corridor). Each alternative included a specific alignment, set of regional connections, and transit mode technologies. Each of the seven alternatives was screened using a set of preliminary screening criteria. These alternatives were presented to the High Capacity Transit Corridor Work Group (CWG) at the CWG meeting held on January 20, 2011. The CWG and the public were given an opportunity to provide comments at the meeting and after the meeting within a specified comment period.

Following the meeting and receipt of comment from the public and CWG, City of Alexandria staff and Kimley-Horn met to discuss comments received and to identify preferred alternatives to be studied in greater detail in a secondary evaluation. During the meeting, three alternatives were identified for further study. This memorandum briefly summarizes the process used to select the three alternatives for further study.

Preliminary Alternatives and Initial Screening

The seven preliminary alternatives were developed using a “kit of parts” approach that took into consideration regional connectivity, alternative alignments within the Beauregard/Van Dorn corridor, and several different transit mode technologies. The alternatives also took into account CWG and public input regarding origins and destinations, impacts, priorities and other factors.

Figure 1 shows regional connection and alignment options considered in the development of the preliminary alternatives.

Northern Connection Options

1. Columbia Pike via Northern Virginia Community College (alignment under discussion)
2. Shirlington/Pentagon via Beauregard Street
3. Pentagon via I-395

Alignment Options

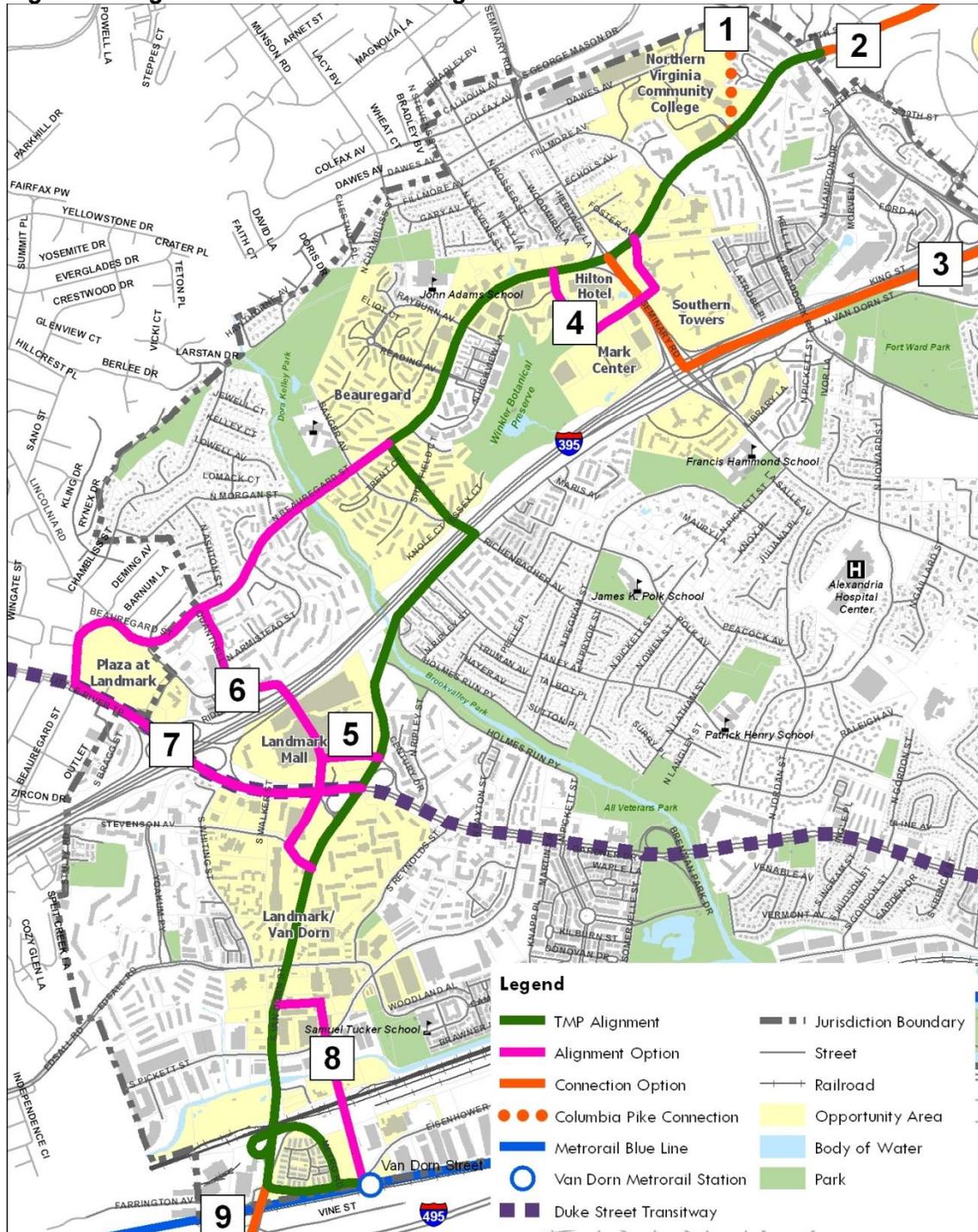
4. Mark Center/Southern Towers
5. New High Street (Landmark Mall)
6. New High Street/Quantrell Avenue
7. Landmark Plaza/Beauregard Street
8. Multimodal Bridge to Van Dorn Metrorail Station

Southern Connection Option

9. Kingstowne via Van Dorn



Figure 1: Regional Connection and Alignment “Kit of Parts”





The transit modes considered in the development of the initial seven alternatives were the following:

- Rapid bus
- Streetcar in mixed flow
- Bus rapid transit (BRT)
- Streetcar in dedicated lanes

Table 2 describes key characteristics of the transit modes.

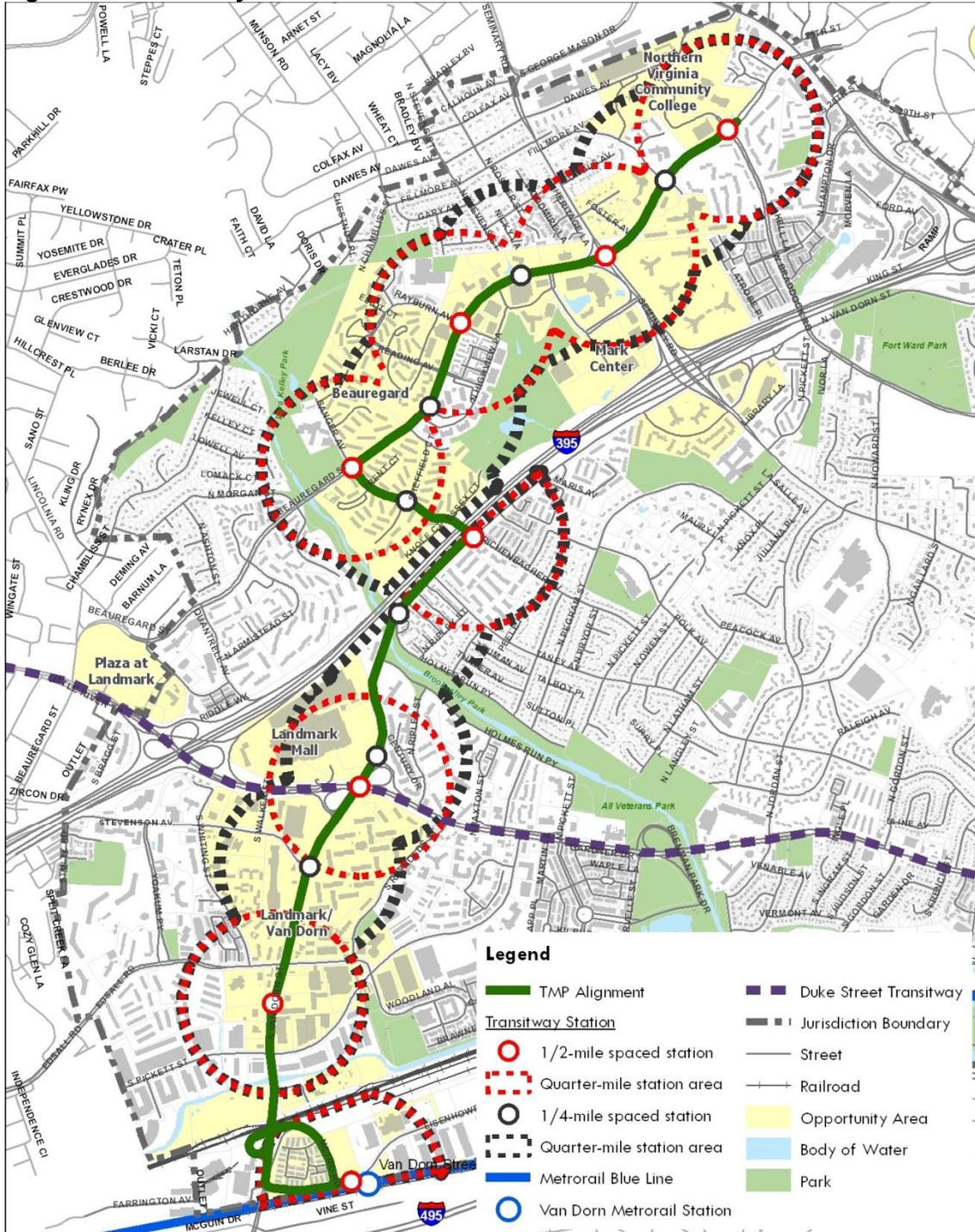
Table 2: Transit Mode “Kit of Parts”

Transit Mode	Runningway Elements	Approximate Station Spacing
Rapid Bus	<ul style="list-style-type: none"> • Mixed flow • Transit signal priority (TSP) • Queue jump lanes at significant intersections 	¼-mile
Streetcar in Mixed Flow	<ul style="list-style-type: none"> • Mixed flow • Transit signal priority (TSP) 	¼-mile
Bus Rapid Transit (BRT)	<ul style="list-style-type: none"> • Combination of dedicated lanes and mixed flow • Transit signal priority (TSP) • Queue jump lanes at intersections without dedicated lanes 	½-mile
Streetcar in Dedicated Lanes	<ul style="list-style-type: none"> • Dedicated lanes for majority of the corridor • Transit signal priority (TSP) 	½-mile

During the initial evaluation of the seven alternatives, the station spacing varied based on the identified transit mode technology. Conceptual station spacing along a general alignment within the Bearegard/Van Dorn corridor is shown in **Figure 2**. Actual station locations will be identified during more detailed evaluations of corridor alternatives. In addition to showing general station spacing, **Figure 2** also shows quarter-mile zones around each station representing an approximately 5-minute walkshed.



Figure 2: Preliminary Station "Kit of Parts"





Using beneficial and effective combinations of regional connections, alignment alternatives within the Beaugard/Van Dorn corridor, and transit mode technologies, the following seven alternatives were created:

- Alternative A: Streetcar in Mixed Flow Connecting to Columbia Pike
- Alternative B: Rapid Bus in Mixed Flow Connecting to the Pentagon and Shirlington
- Alternative C: Rapid Bus in Mixed Flow Connecting to the Pentagon and Streetcar in Mixed Flow Connecting to Beaugard Town Center
- Alternative D: Bus Rapid Transit Connecting to the Pentagon and Shirlington
- Alternative E: Bus Rapid Transit Connecting to the Pentagon and Streetcar in Mixed Flow Connecting to Beaugard Town Center
- Alternative F: Bus Rapid Transit Connecting to the Pentagon and Shirlington via the Plaza at Landmark
- Alternative G: Streetcar in Dedicated Lanes Connecting to Columbia Pike

The alternatives are shown in **Figures 3** through **9**. **Table 2** describes key features of each alternative.

Table 2: Features of Preliminary Alternatives

Feature	Alternative						
	A	B	C	D	E	F	G
<i>Northern Connections</i>							
1. Columbia Pike via NOVA	✓		✓	☐	✓	☐	✓
2. Shirlington/Pentagon via Beaugard		✓		✓		✓	
3. Pentagon via I-395 HOV		✓	✓	✓	✓	✓	
<i>Alignments</i>							
4. Mark Center/Southern Towers	✓	✓	✓	✓	✓	✓	✓
5. New High St (Landmark Mall)	☐	☐	☐	☐	☐		☐
6. New High St/Quantrell Ave						☐	
7. Landmark Plaza/Beaugard St						✓	
8. Multimodal Bridge to Van Dorn Metrorail Station	☐	☐	☐	☐	☐	☐	☐
<i>Southern Connections</i>							
9. Kingstowne via Van Dorn	☐	☐	☐	☐	☐	☐	☐
<i>Transit Mode</i>							
Rapid Bus		✓	✓				
BRT (Bus Rapid Transit)				✓	✓	✓	
Streetcar in mixed flow	✓		✓		✓		
Streetcar in dedicated lanes							✓
<i>Station Spacing</i>							
1/4-mile station-spacing	✓	✓	✓		✓		
1/2-mile station-spacing				✓	✓	✓	✓
Legend: ✓ Alternative contains feature ☐ Optional long-term alignment							



Evaluation criteria were presented to the CWG at the November 18, 2010 meeting. From the evaluation criteria, screening criteria were selected for the preliminary review of the seven initial alternatives. **Table 3** shows the detailed evaluation and screening criteria.

Table 3: Evaluation Criteria

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Screening of Concepts	For Use in Comparative Evaluation 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 option
		Transit Connectivity	✓	✓	Access to other transit services (existing and planned)
	Operations	Running-way Configuration(s)	▪	✓	Quantify amount of runningway 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 runningway configuration and transit mode technology are compatible with regionally planned systems
		Avoidance of Congestion	▪	✓	Number and locations of LOS E/F intersections avoided
		Transit Travel Time	✓	✓	Transit travel time
		Intersection Priority	▪	✓	Percent of intersections where TSP is needed and can be implemented successfully - notation of where it cannot be implemented successfully
		Ridership	▪	✓	Forecast number of riders
	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, transportation are affected	Economic	Development Incentive	▪	✓	Perceived value of transit mode technologies with regard to development potential
	Natural Environmental	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
	Neighborhood and Community	Property	✓	✓	Number, use type, and quantity of properties impacted with anticipated level of impact (ROW only, partial take, total take)
		Streetscapes	▪	✓	Impact to existing streetscapes
		Community Resources	▪	✓	Identify number and location of historical, cultural, community, archaeological resources affected



Table 3: Evaluation Criteria

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Screening of Concepts	For Use in Comparative Evaluation of Concepts	Measurement Method
		Demographics	▪	✓	Identification of impacts to special populations
		Noise and Vibration	▪	✓	Summarize relative noise and vibration impacts of different mode types and corridor configurations
	Transportation	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, runningway, etc.)
		Operating cost	▪	✓	Order of magnitude operating cost
		Cost Per Rider	▪	✓	Order of magnitude cost per rider
Financial Feasibility Cost of system/concept is in alignment with available funding	Funding	Funding	▪	✓	Availability to specific funding sources
		Private Capital Incentive	▪	✓	Judgment as to whether the concept has the potential to attract private capital investment and innovative procurement

Each of the seven alternatives was screened and rated using the criteria shown in **Table 3**. In the alternatives that include dedicated runningway for the transit service, it was assumed that through vehicle lanes and left-turn lanes at intersections would not be displaced. A summary of the ratings for each alternative are shown in **Figures 3** through **9** and a comparative summary is shown in **Table 4**.

Opinions of probable cost for each alternative are shown in year 2010 dollars and do not include additional contingency or escalation to a future year mid-point of construction. Totals listed do not include costs for initial (or programmed replacement) vehicle purchases, maintenance facilities, right-of-way acquisition (including any condemnation, damages, or relocation costs), 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. A more detailed cost analysis will be performed during the full evaluation of a more limited number of alternatives.



Figure 3: Alternative A (Streetcar in Mixed Flow Connecting to Columbia Pike)

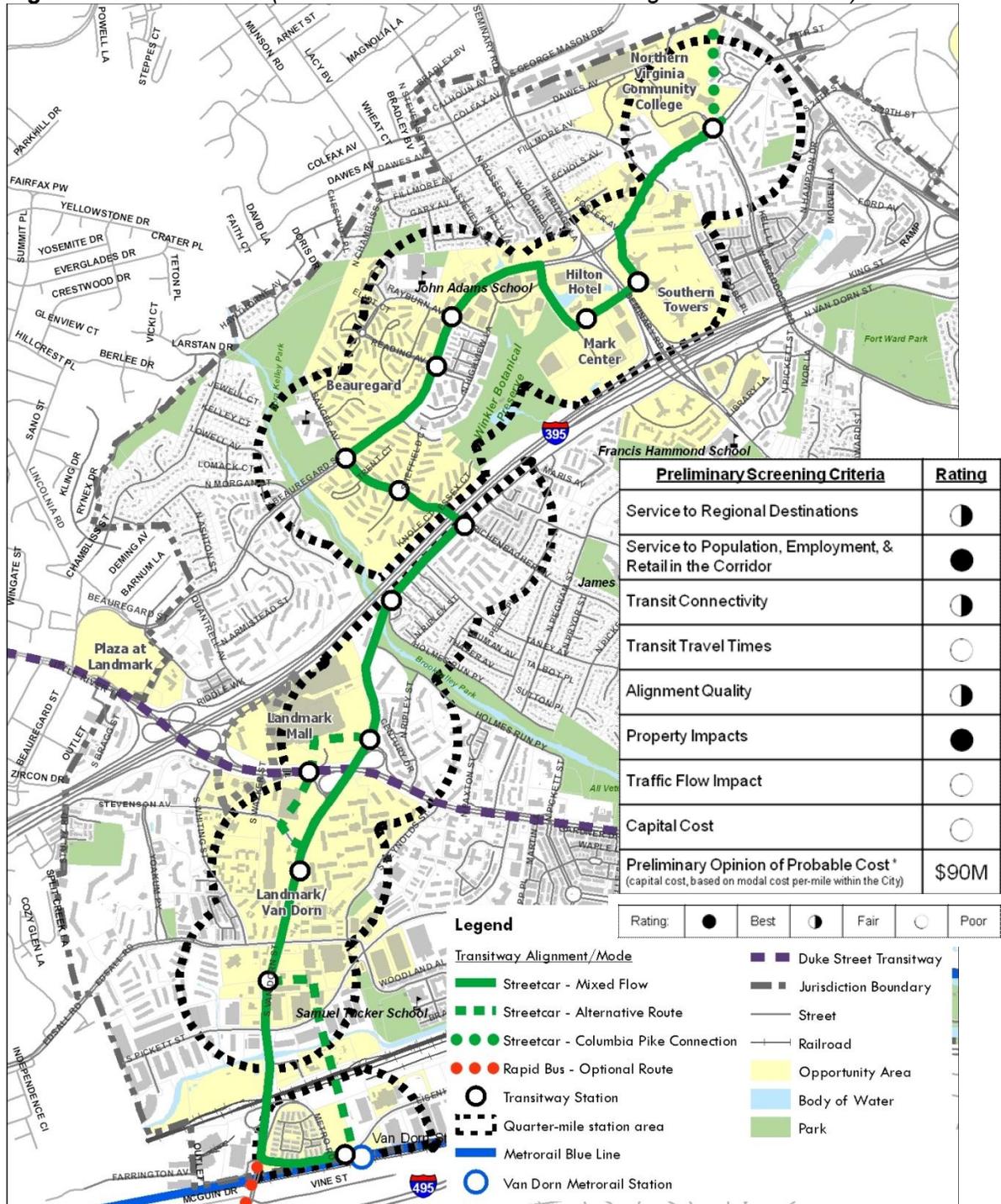




Figure 4: Alternative B (Rapid Bus in Mixed Flow Connecting to the Pentagon and Shirlington)

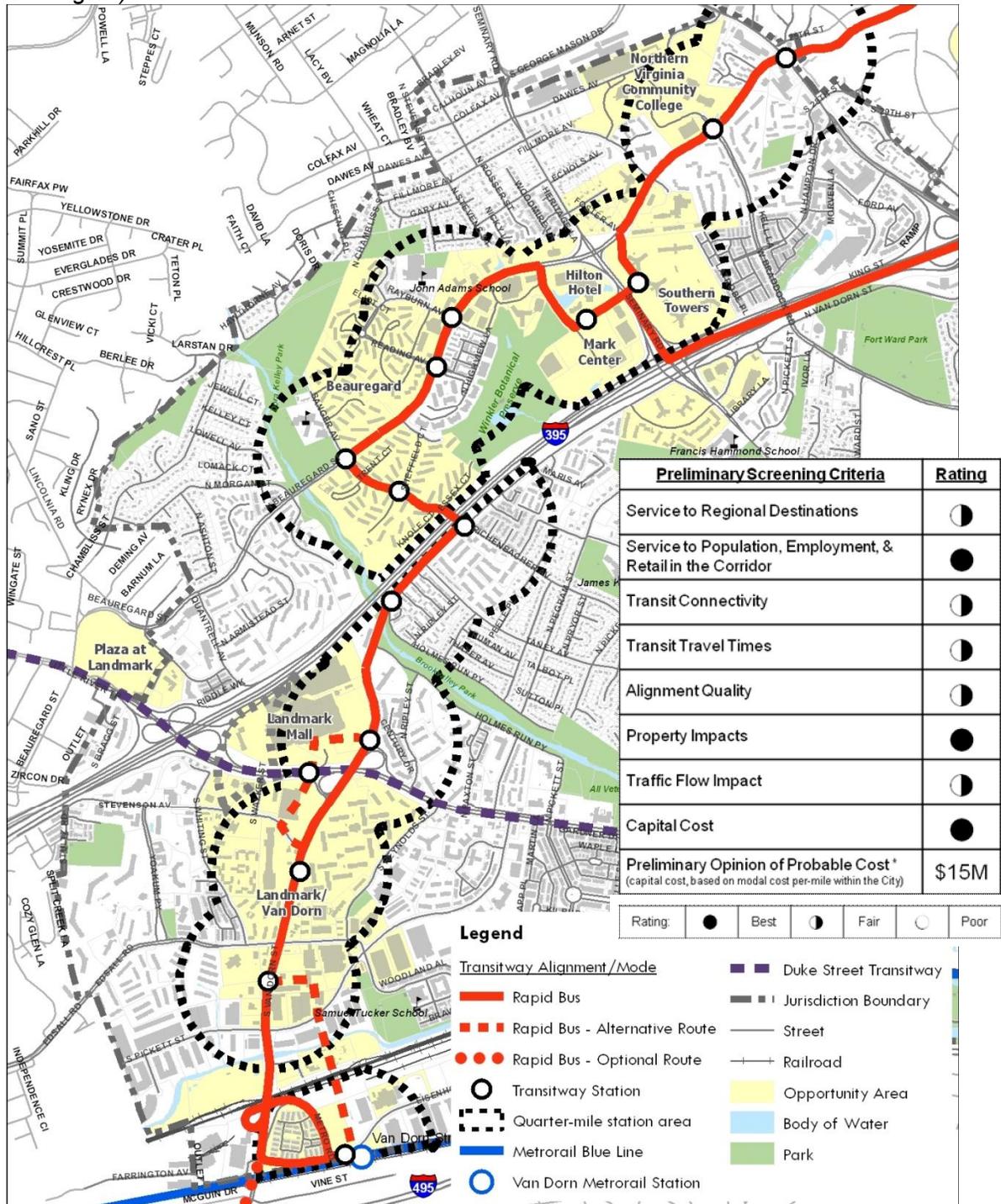




Figure 5: Alternative C (Rapid Bus in Mixed Flow Connecting to the Pentagon and Streetcar in Mixed Flow Connecting to Beauregard Town Center)

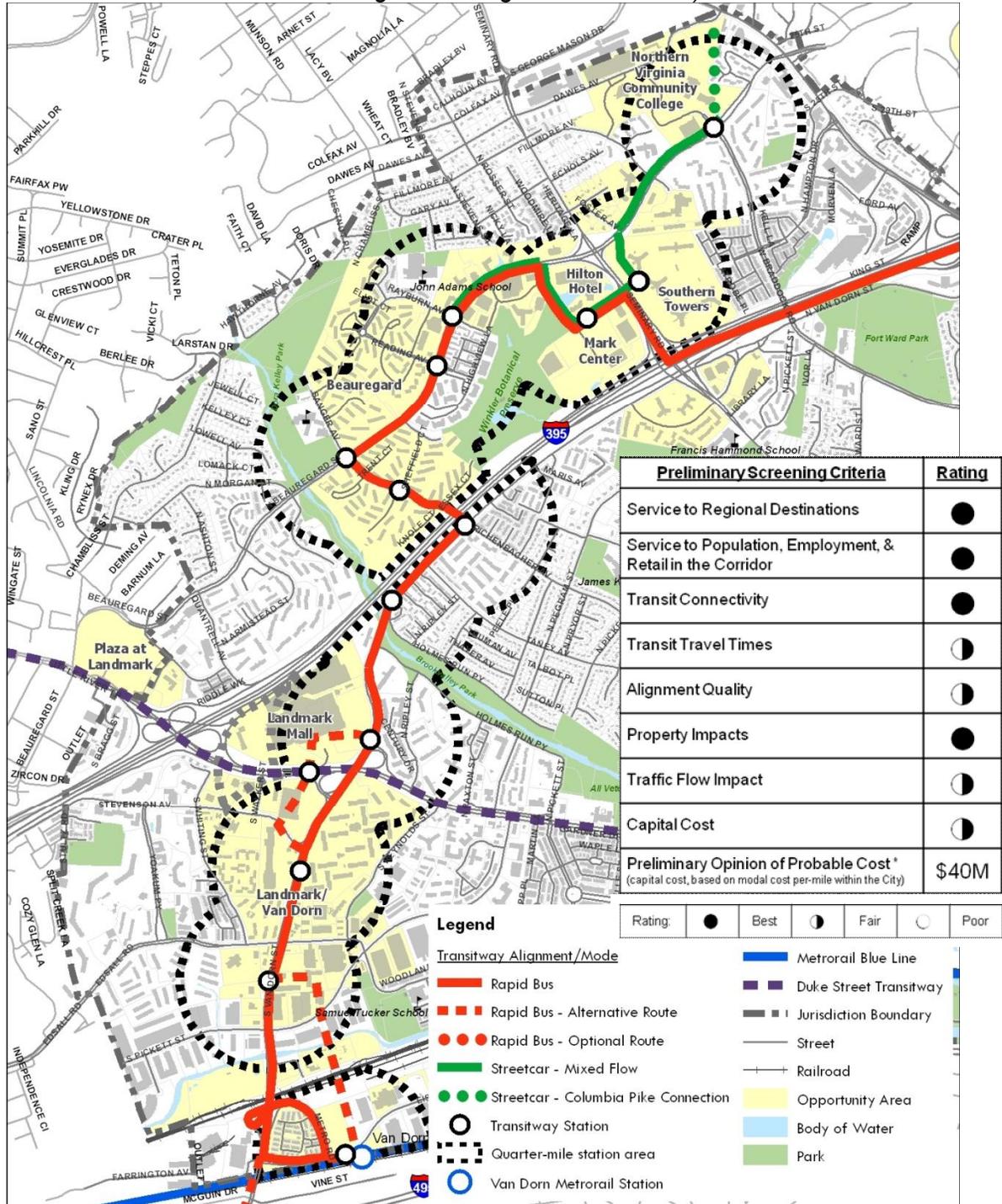




Figure 6: Alternative D (Bus Rapid Transit Connecting to the Pentagon and Shirlington)

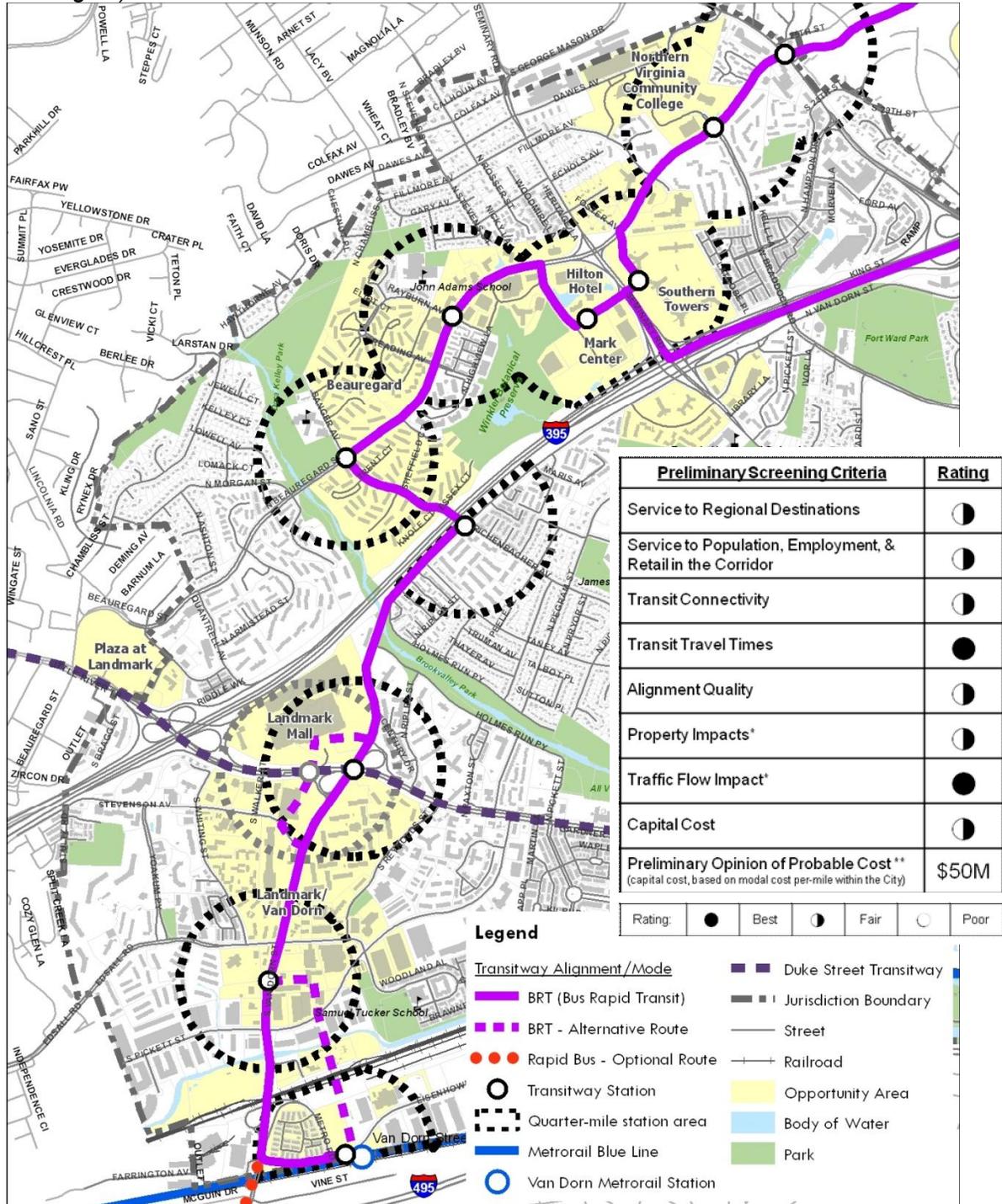




Figure 7: Alternative E (Bus Rapid Transit Connecting to the Pentagon and Streetcar in Mixed Flow Connecting to Beauregard Town Center)

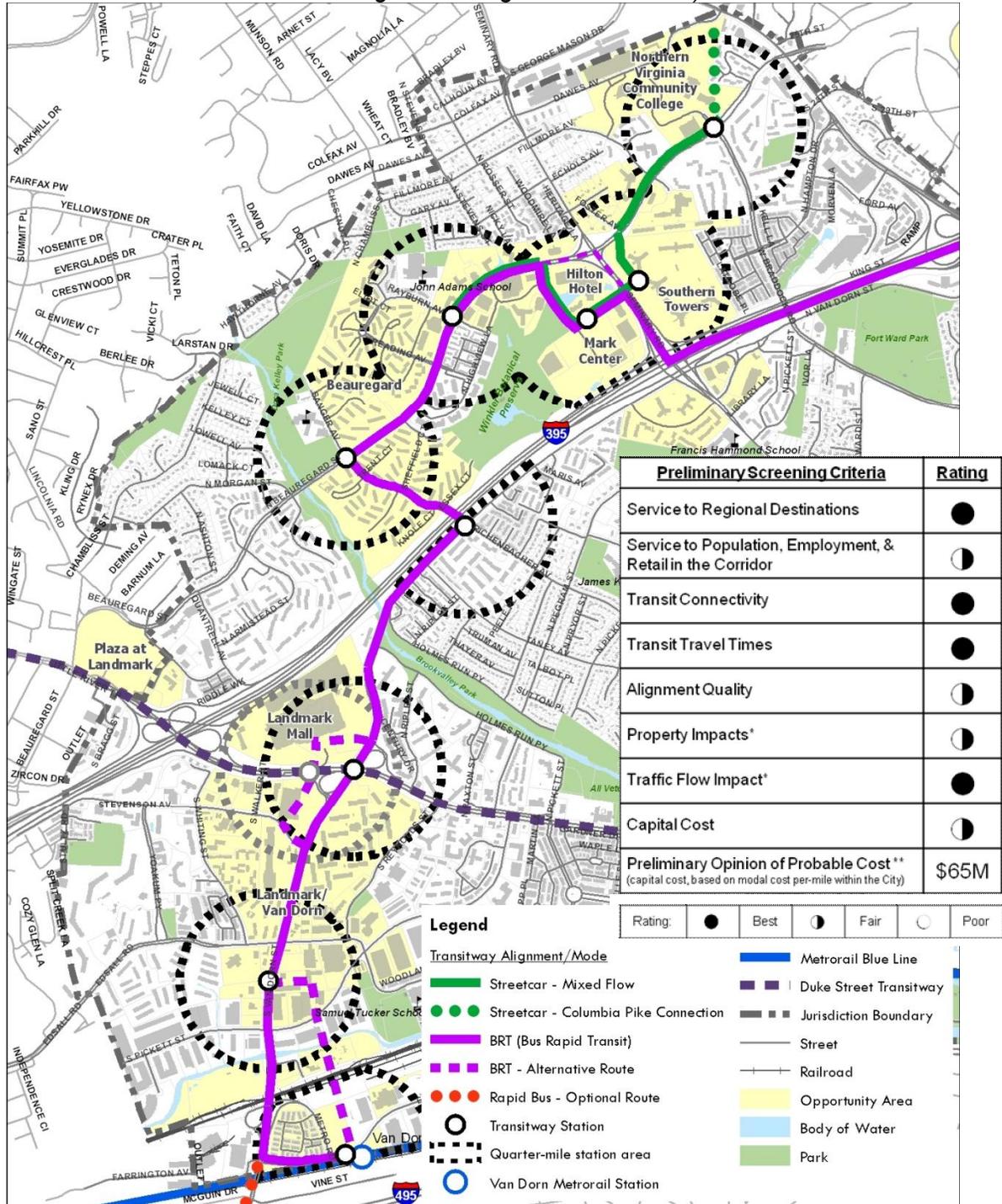




Figure 8: Alternative F (Bus Rapid Transit Connecting to the Pentagon and Shirlington via the Plaza at Landmark)

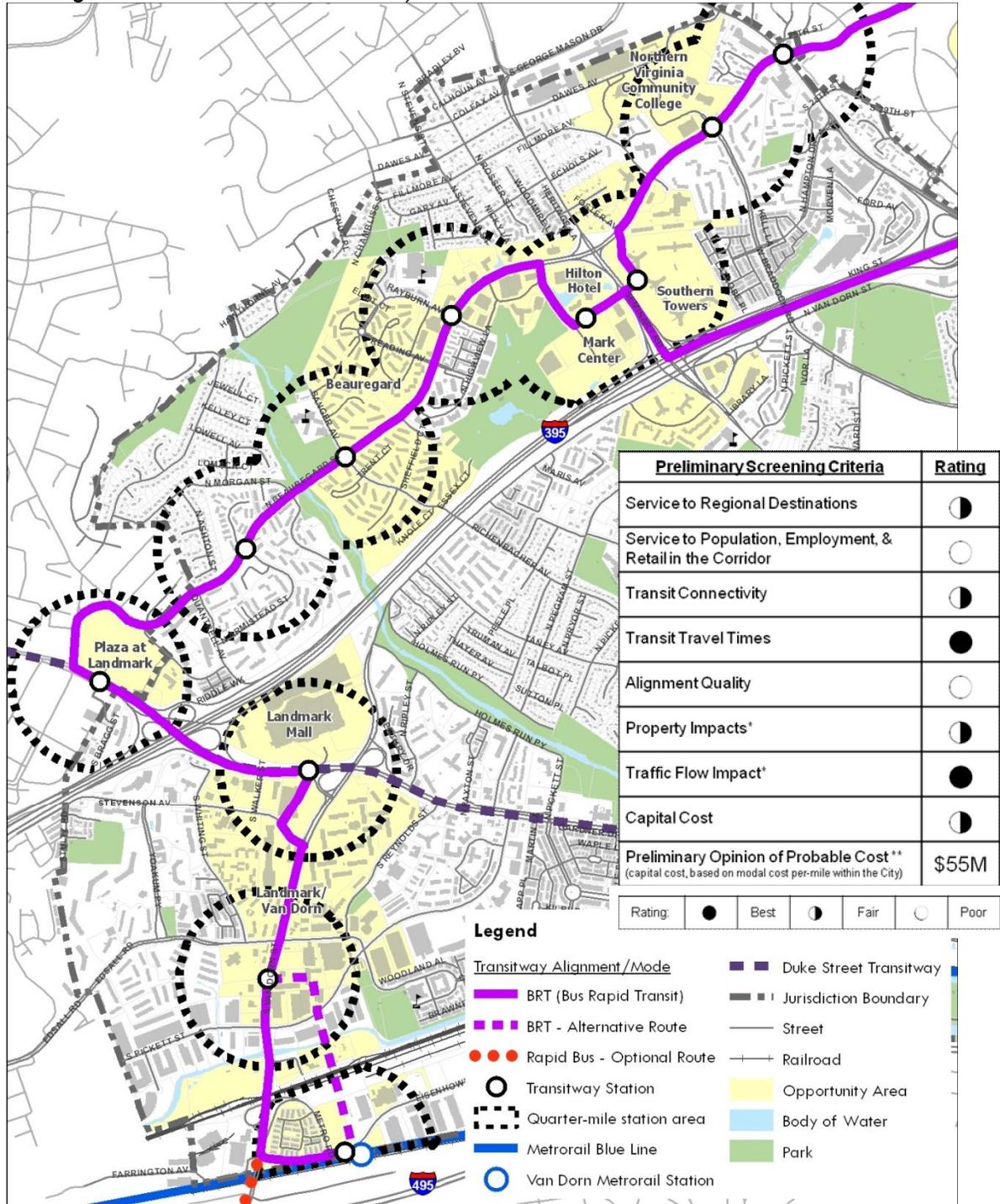




Figure 9: Alternative G (Streetcar in Dedicated Lanes Connecting to Columbia Pike)

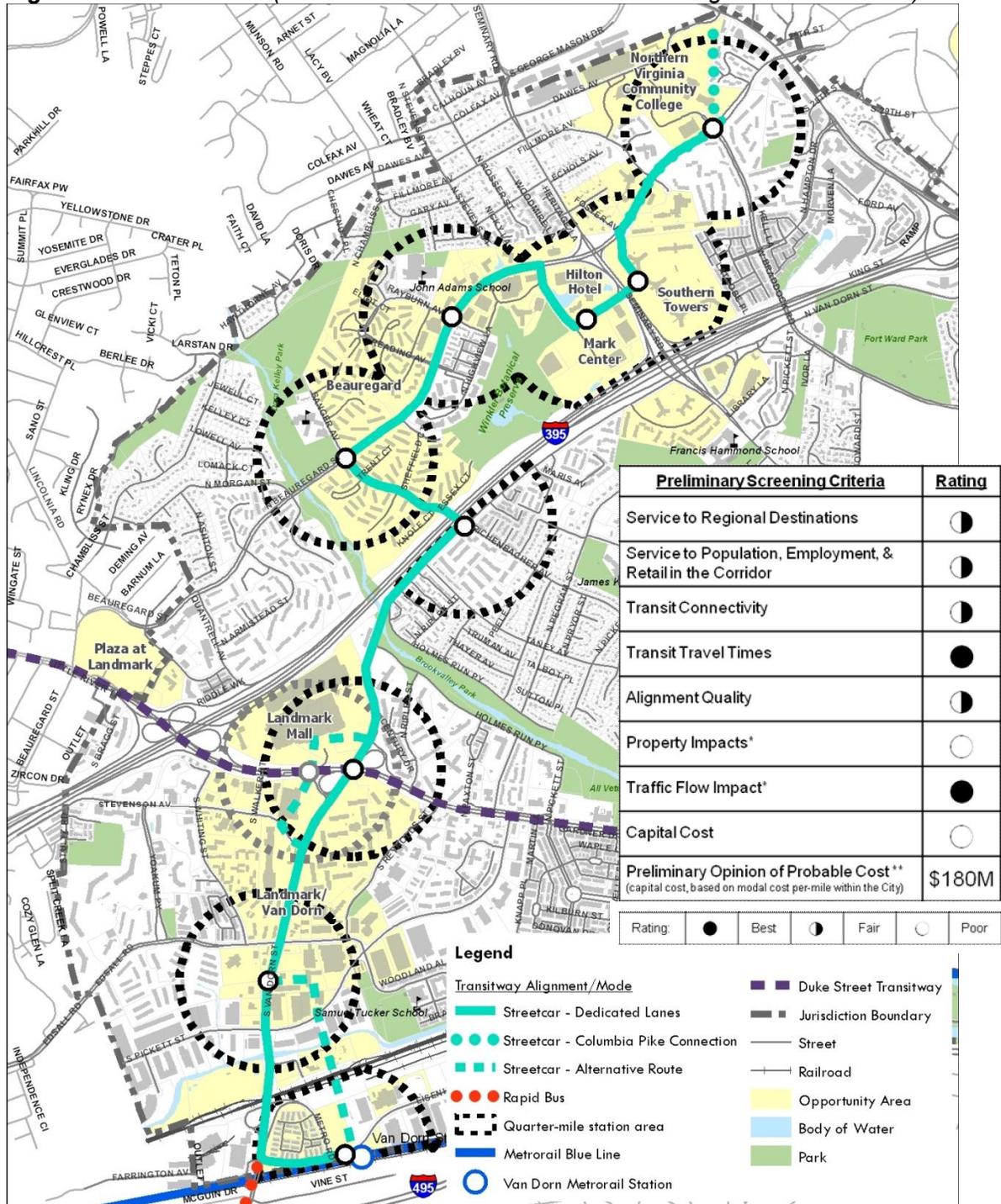




Table 4: Preliminary Screening Summary

Preliminary Screening Criteria	Alternative						
	A	B	C	D	E	F	G
Transit Mode:	Streetcar (mixed)	Rapid Bus (mixed)	Streetcar (mixed) & Rapid Bus (mixed)	BRT (mixed & dedicated)	Streetcar (mixed) & BRT (mixed & dedicated)	BRT (mixed & dedicated)	Streetcar (dedicated)
Northern Connection:	Columbia Pike	Shirlington & Pentagon	Columbia Pike & Pentagon	Shirlington & Pentagon	Columbia Pike & Pentagon	Shirlington & Pentagon	Columbia Pike
Service to Regional Destinations	◐	◐	●	◐	●	◐	◐
Service to Population, Employment, & Retail in the Corridor	●	●	●	◐	◐	○	◐
Transit Connectivity	◐	◐	●	◐	●	◐	◐
Transit Travel Times	○	◐	◐	●	●	●	●
Alignment Quality	◐	◐	◐	◐	◐	○	◐
Property Impacts	●	●	●	◐	◐	◐	○
Traffic Flow Impact	○	◐	◐	●	●	●	●
Capital Cost	○	●	◐	◐	◐	◐	○
Prelim. Opinion of Probable Cost (capital cost, based on modal cost per-mile within the City)	\$90M	\$15M	\$40M	\$50M	\$65M	\$55M	\$180M
Key to Ratings							
Best ●							
Fair ◐							
Poor ○							



CWG and Public Comments and Preferences

The CWG and public provided comments and expressed preferences for the seven preliminary alternatives at the January 20, 2011 CWG meeting. After the meeting, a 10-day comment period was provided to collect additional public comments. Based on feedback received during the January CWG meeting, CWG members’ preferences were identified and are summarized in **Table 5** for reference.

Table 5: Summary of CWG Members’ Alternative Preference

CWG Member	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Paul Smedberg				✓	✓		
Bill Denton				✓		✓	
Donna Fossum		✓ (1)	✓ (2)	✓ (3)	✓ (4)		
Nancy Jennings			✓	✓	✓		
Dak Hardwick		✓	✓	✓	✓		
John Komoroske		✓		✓		✓	
Poul Hertel							
Summary	0	4	3	6	4	2	0

Notes related to CWG member preferences included the following:

- Alternative B had some degree of preference due to its low initial cost and shorter time period for implementation
- Streetcar and higher level of investment alternatives were liked due to their ability to operate with less traffic-related delay and the ability to tie to the regional streetcar network
- Connectivity to the Pentagon and Shirlington was expressed

Comments from the public relating to the preliminary alternatives included:

- Need for a multi-phased approach to implementing the transitway
- Start out with something smaller, not high capacity transit
- Need something that is permanent, like streetcars, that will attract visitors and development
- Need dedicated lanes for system effectiveness
- Need to know the ridership estimates before dismissing streetcars
- Sanger Avenue cannot handle a transitway – already constrained and potential environmental impacts to Holmes Run
- Why are we trying to serve / connect to the Pentagon?
- Need to serve local residents over regional trips and provide connectivity to local activity centers
- Need to include access to activity and transit centers in Arlington and Fairfax
- Need to serve more destinations than just along Beauregard/Van Dorn

A full summary of the public and CWG comments from the January 20, 2011 CWG meeting are available in the minutes from that meeting.



Review and Selection of Alternatives for Further Analysis

The following summarizes a discussion among Alexandria City staff and Kimley-Horn regarding the selection of alternatives for further analysis.

Alternative A: Streetcar in Mixed Flow Connecting to Columbia Pike

- High capital cost
- Low travel speed/long travel time from end-to-end
- Viewed as having a disproportionate cost to benefit
- **Eliminate from consideration**

Alternative B: Rapid Bus in Mixed Flow Connecting to the Pentagon and Shirlington

- City is in the process of implementing a project with TIGER funding that will install Transit Signal Priority (TSP), queue jump lanes, and transit stop enhancements along Corridor C
- Improvements associated with the TIGER funding will not include all of the features of full Rapid Bus implementation, but additional features could be implemented as additional funding becomes available
- **Consider as a preliminary phase of the ultimate development of any of the other alternatives**

Alternative C: Rapid Bus in Mixed Flow Connecting to the Pentagon and Streetcar in Mixed-Flow Connecting to Beauregard Town Center

- May be considered as an initial phase of the ultimate development of any alternative
- Provides a single-seat ride to Mark Center and potentially to Beauregard Town Center from Columbia Pike/Pentagon City
- **Eliminate from consideration as an alternative for further evaluation**

Alternative D: Bus Rapid Transit Connecting to the Pentagon and Shirlington

- One of the CWG's preferred preliminary alternatives
- Viewed as potentially efficient and effective
- Reasonable capital cost for implementation
- Transit mode will transition from BRT to Rapid Bus at Mark Center when traveling to the Pentagon and Shirlington
- **Consider alternative for further analysis**

Alternative E: Bus Rapid Transit Connecting to the Pentagon and Streetcar in Mixed Flow Connecting to Beauregard Town Center

- One of the CWG's preferred preliminary alternatives
- Mixed mode (BRT and streetcar) option
- Bus transit mode will transition from BRT to Rapid Bus at Mark Center when traveling to the Pentagon and Shirlington
- Provides a single-seat ride to Mark Center and potentially to Beauregard Town Center from Columbia Pike/Pentagon City
- **Consider alternative for further analysis**



Alternative F: Bus Rapid Transit Connecting to the Pentagon and Shirlington via the Plaza at Landmark

- Duplicative routing with Transitway Corridor B (Duke Street)
- Deviates from the Transportation Master Plan alignment
- Section between Landmark Plaza and Landmark Mall is largely devoid of destinations and topography and transportation infrastructure are barriers to non-vehicular connectivity with Duke Street
- **Eliminate from consideration as a preferred alternative**

Alternative G: Streetcar in Dedicated Lanes Connecting to Columbia Pike

- Streetcar in dedicated lanes from Columbia Pike to Van Dorn Metrorail station
- Provides a single-seat ride for entire Beauregard/Van Dorn and Columbia Pike Corridors
- Considerable public interest in further evaluation of a streetcar
- CWG and public interest in long-term interface with regional streetcar network
- **Consider alternative for further analysis**

Conclusions and Next Steps

Alternatives D, E, and G were identified for further analysis. Alternative B is being considered a phase of any alternative due to the City's planned investment in transit improvements funded by their TIGER grant. Similarly, Alternative C is being considered as a phase of the three alternatives. The secondary screening of the selected alternatives will be presented at the March 17, 2011 CWG meeting.