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MEMORANDUM

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DATE: March 9, 2012

SUBJECT: Draft Selection of Preferred Alternative for Transitway Corridor B (Duke Street/Eisenhower Avenue Corridor)

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 B (the Duke Street/Eisenhower Avenue corridor) based on an alternatives screening process.

Four alternatives were screened using a set of detailed evaluation criteria. The evaluation, input from the project's Corridor Working Group (CWG), and feedback from the public led to further investigation of two of the alternatives. Based on the additional understanding of property and parking impacts, evaluation of bicycle connectivity options, and comments received from the CWG and the public, a preliminary preferred alternative and phasing strategy was identified. Alternative 3c (Reversible Lane with On- and Off-Duke Street Bicycle Accommodations) is recommended as the preferred alternative for implementation of bus rapid transit in Corridor B. Alternative 3c should be constructed in a manner that does not preclude the provision of fully-dedicated transit lanes and on-corridor bicycle facilities in the corridor should redevelopment allow. The preliminary recommendation will be presented at the March 15, 2012 CWG meeting.

Introduction

As part of the City of Alexandria High Capacity Transitway Corridor Feasibility Study, transitway alignment alternatives were developed for Corridor B (the Duke Street/Eisenhower Avenue corridor). The three alignments were evaluated to weigh the benefit of a transitway along Duke Street, Eisenhower Avenue, or a combination of Duke Street and Eisenhower Avenue. The alignment information was presented at two High Capacity Transit Corridor Working Group (CWG) meetings (August 18, 2011 and November 17, 2011). Duke Street was selected as the preferred alignment for a dedicated transitway, based upon an evaluation of preliminary screening criteria, feedback from the CWG, and public input. At the same time, it was recommended that existing transit service along Eisenhower Avenue be improved through additional service and improved passenger amenities.

For the Duke Street preferred alignment, six preliminary transitway alternatives were evaluated. The alternatives varied by the number of lanes and manner in which transit and general purpose lanes were accommodated, but had identical termini. A meeting was held on November 17, 2011 with the CWG to present the alternatives and receive feedback. The CWG and the public were provided an additional 10 days after each working group meeting to submit comments. At the end of the comment period, City of Alexandria staff and the consultant team discussed comments received and the original six alternatives were narrowed to four refined alternatives for further study. The process by which the alternatives were refined is documented in a study memorandum dated January 6, 2012[1].

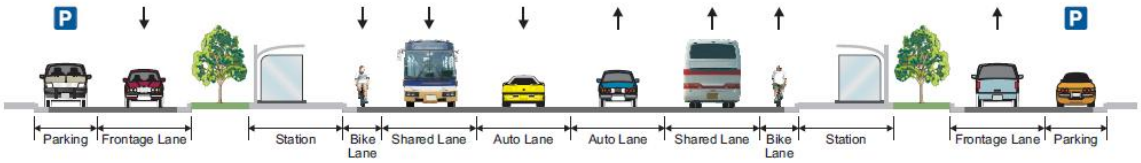
The four refined alternatives were screened with a set of detailed evaluation criteria. These alternatives and the secondary evaluation were presented at the CWG meeting held on January 19, 2012. The secondary evaluation is briefly summarized in this memorandum. The CWG and the public expressed an interest in two of the alternatives and were requested a further examination of property and parking impacts. An additional impact analysis was presented at the CWG meeting held on February 16, 2012. The CWG expressed their preference for a phased approach to implementation of an effective transit operation with minimized property impacts. Based on this preference and an additional evaluation of bicycle connectivity options, a preliminary preferred alternative and phasing strategy were identified. This memorandum briefly summarizes the process and the results of the secondary screening and additional evaluation that lead to the selection of a preliminary preferred alternative.

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

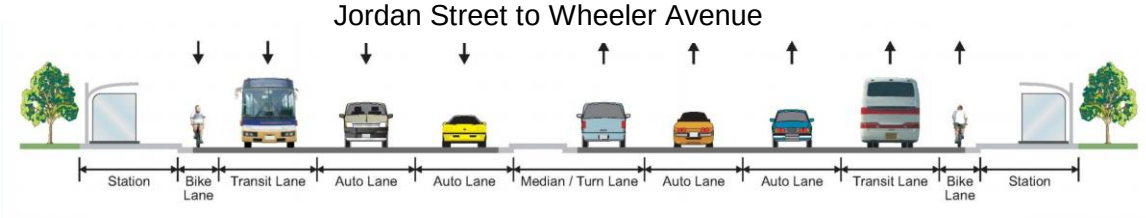
Description of Alternatives

Typical sections and design descriptions for Duke Street Alternatives 1 through 4 are provided below. The sections vary depending on the location along Duke Street, as noted.

Alternative 1: Existing Lane Configuration



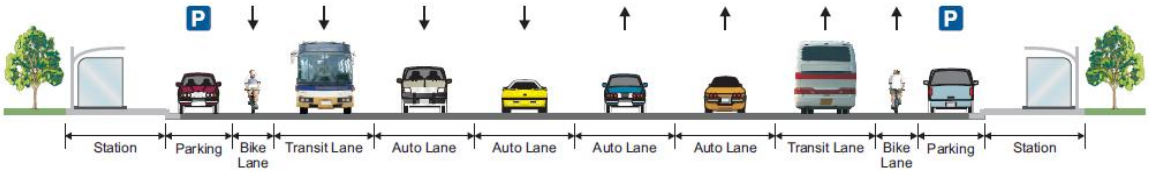
Jordan Street to Wheeler Avenue



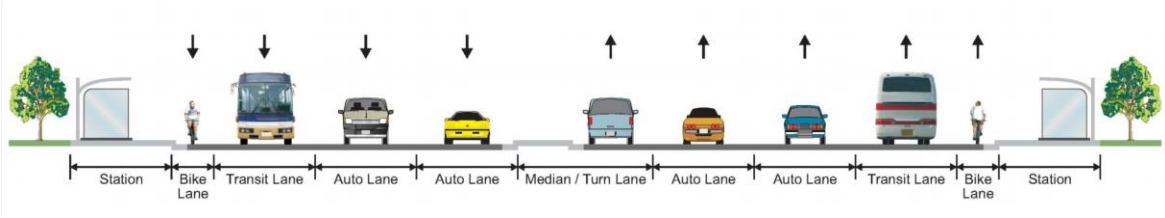
Landmark Mall to Jordan Street/Roth Street to King Street Metro

- Transit running along curb
- Transit in mixed flow on existing four-lane segments (2 miles total) and in dedicated lanes on existing six-lane segments (2.5 miles total)
- Uses existing lanes for transit and widens the road to accommodate bicycle facilities
- Uses queue jumps where there are not dedicated lanes
- Impacts to property and service roads to accommodate queue jumps and bike lanes

Alternative 2: Uses Service Road Right-of-Way



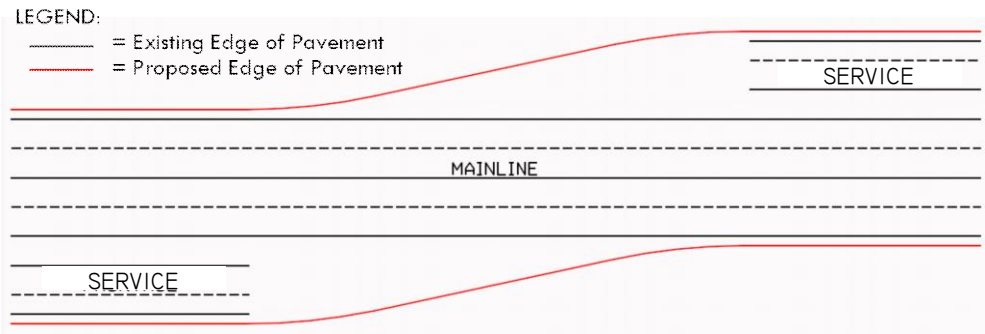
Jordan Street to Wheeler Avenue



Landmark Mall to Jordan Street/Roth Street to King Street Metro

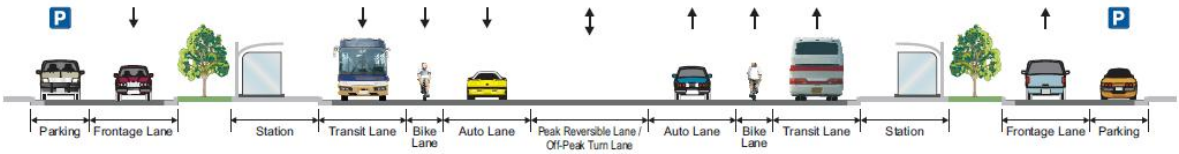
- Transit running along curb
- Transit in dedicated lanes for full corridor length
- Adds one lane per direction in existing four-lane segments (2 miles total)

- Reduces impacts to property by shifting roadway centerline to make use of service roads (described by Alignment Shift figure below)
- On-street parking in some locations to replace service road parking losses
- Bike lanes or shared outside lane

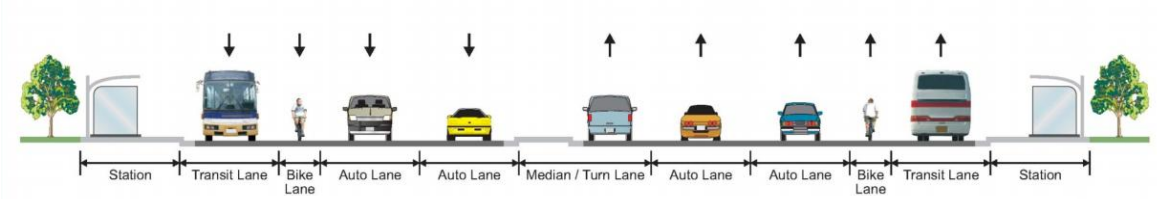


Alignment Shift

Alternative 3: Reversible Lane



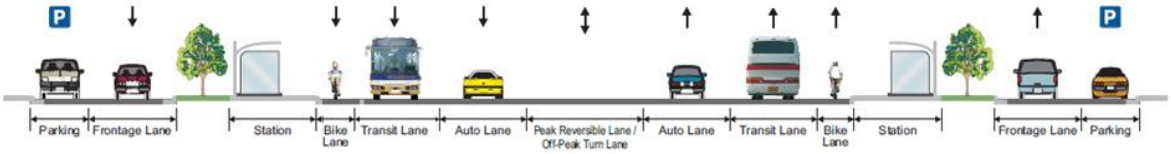
Jordan Street to Wheeler Avenue



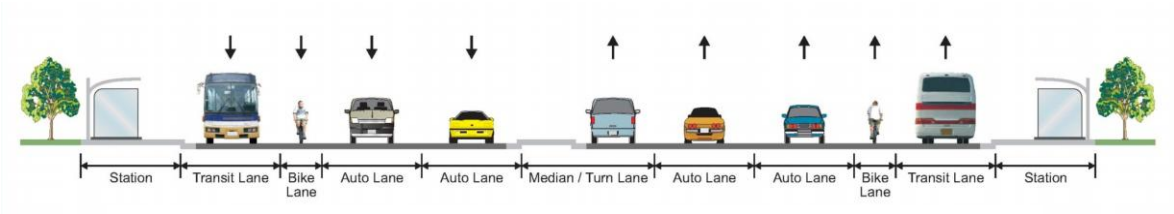
Landmark Mall to Jordan Street/Roth Street to King Street Metro

- Transit running along curb
- Transit in dedicated lanes for full corridor length
- Adds ½ lane in each direction (1 lane total) in existing four-lane segments (2 miles total)
- Center lane would function as reversible lane for traffic during peak periods
- Center lane would act as a turn-lane during off-peak periods
- Reversible lane would transition at Jordan Street and Wheeler Avenue
- Impact to property and existing streetscape
- Service roads would be maintained
- Bike lanes or shared outside lane

Alternative 3: Variation



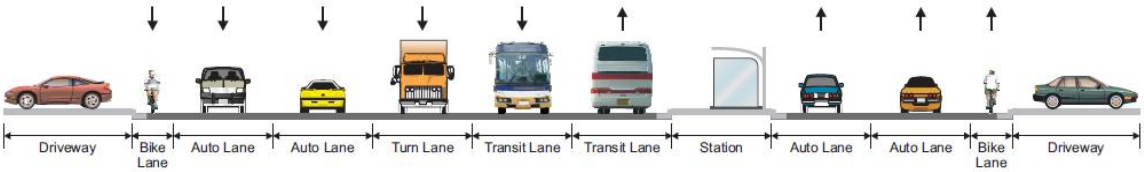
Jordan Street to Wheeler Avenue



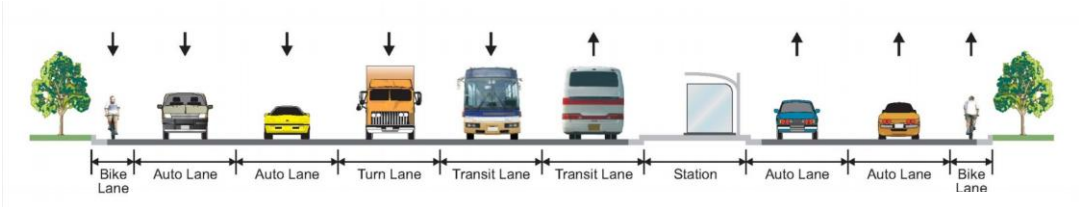
Landmark Mall to Jordan Street/Roth Street to King Street Metro

- Same as Alternative 3 between Landmark Mall and Jordan Street & Roth Street and King Street Metro
- Peak direction and period dedicated transit lane between Jordan Street and Roth Street
- Off-peak direction, during peak period, transit operates in mixed flow between Jordan Street and Roth Street
- Off-peak period, both directions, transit operates in mixed flow
- Adds ½ lane in each direction in existing four-lane segments (2 miles total)
- Reversible lane transitions at Roth Street and Jordan Street
- Less property impact between Jordan Street and Roth Street
- Service roads would be maintained
- Bike lanes or shared outside lane

Alternative 4: Median Running



Jordan Street to Wheeler Avenue



Landmark Mall to Jordan Street / Roth Street to King Street Metro

- Transit running in median
- Transit in dedicated lanes for full corridor length
- Adds two lanes in each direction in existing four-lane segments (2 miles total)
- Significant impacts to property
- Service roads would be removed and driveways would be accessed directly from Duke Street
- Bike lanes or shared outside lane

Evaluation Criteria

Evaluation criteria were presented to the CWG at the July 21, 2011 meeting[2]. The CWG recommended a selected group of evaluation criteria to be used as screening criteria toward the preliminary review the six alternatives and ratings according to their relative importance (high, average, and low). **Table 1** shows the detailed evaluation and screening criteria.

Table 1: Evaluation Criteria

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Screening of Concepts	For Use in Secondary Evaluation of Concepts	Measurement Method
Effectiveness Addresses stated transportation issues in the corridor	Coverage	Service to Regional Destinations		✓	Notation of regional destinations directly served
		Service to Population, Employment, and Other Destinations		✓	Tabulate population, employment, key destinations, and similar, served by option
	Operations	Transit Connectivity	✓	✓	Access to other transit services (existing and planned)
		Runningway Configuration(s)		✓	Quantify amount of runningway that is dedicated and amount that is mixed flow
		Corridor Length		✓	Measured length of the corridor (miles 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

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

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Screening of Concepts	For Use in Secondary Evaluation of Concepts	Measurement Method
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
		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 operating 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

Legend: ★ Highest importance ✓ Normal importance ● Lesser importance

Secondary Evaluation

The four alternatives that remained following the preliminary screening were evaluated based on the secondary evaluation criteria shown in **Table 2**. The detailed presentation of the secondary evaluation of the alternatives is available on the City of Alexandria's project website. A summary of the advantages and disadvantages of each alternative are summarized in **Table 2**.

Table 2: Alternatives Comparison

Alternative 1- Use Existing Lanes for Transit	
Advantages	**Disadvantages**
• Fewest negative impacts (including property) • Maintains service roads • Lowest capital cost • Easy to phase	• Worst transit operation due to shared lanes • Highest operating cost • Highest fleet cost • May be impacted by congestion on Duke Street • Longest transit travel time • Lowest ridership potential
Alternative 2- Use Service Road Right-of-Way	
Advantages	**Disadvantages**
• Minimal impact to traffic flow • High-quality transit operation • Moderate capital, fleet, and operating cost • Some avoidance of congestion for transit	• Curvilinear alignment • On-street parking could disrupt transit operations • Impacts service roads and streetscape as a result
Alternative 3- Reversible Lane	
Advantages	**Disadvantages**
• High-quality transit operation • Maintains most service roads • Moderate capital, operating, and fleet cost • Provides turn lanes at some new locations to help traffic flow	• Impact to off-peak direction traffic or off-peak direction transit • Property impacts • Requires overhead gantries to control reversible condition • May be confusing to drivers due to changing lane use condition
Alternative 3 Variation - Reversible Lane	
Advantages	**Disadvantages**
• Maintains most service roads • Less property impact than Alternative 3 • Provides peak direction, peak period transit lane • Lower capital cost than Alternative 3	• No dedicated lanes off-peak time and direction • Property impacts • Requires overhead gantries to control reversible condition • May be confusing to drivers due to changing lane use condition
Alternative 4- Median Running	
Advantages	**Disadvantages**
• Best transit operation by eliminating conflicts with driveways and traffic • Lowest fleet and operating cost • Avoids impacts from traffic congestion • Highest ridership potential	• Largest property impact • Eliminates service roads and parking (impact to 28 homes) • Highest capital cost • Highest right-of-way cost and impacts

CWG and Public Comment

The findings of the secondary screening were presented at the January 19, 2012 CWG meeting. The location of the bicycle lanes and paths was a recurring theme in the CWG and public comments. Feedback suggested that greater consideration of a bicycle facility location and pedestrian accommodation and safety were needed. Common themes also included the need to retain left-turn lanes, provide opportunities for high-quality streetscapes, and minimal impacts to businesses. Preservation of neighborhood integrity was also a common theme. Members of the CWG generally opposed alternatives that widened Duke Street. Specific comments on alternatives are summarized below.

Alternative 1

- Low transit efficiency because dedicated transit lanes are not provided between Wheeler Avenue and Roth Street
- Preferred by some because it protects neighborhoods by minimizing impacts to residential and commercial property and parking

Alternative 2

- Increases width of street for pedestrians to cross and does not provide refuges
- Property impacts are moderate to high

Alternative 3

- Preferred by some because of the flexibility to retain service roads while providing dedicated transit lanes

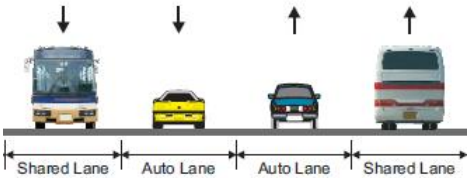
Alternative 4

- Do not like that service roads and residential parking would be significantly impacted or eliminated
- Property impacts very high, especially to the area between Jordan Street and Roth Street

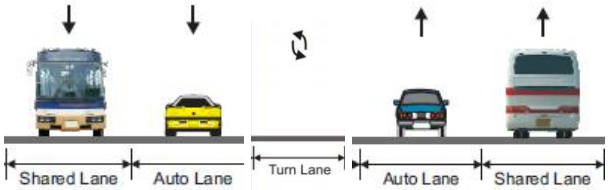
Alternatives Retained for more Detailed Impact Evaluation

As a result of the secondary evaluation, Alternative 1 and a variation of Alternative 3 were selected for further investigation. The CWG expressed interest for a more detailed impact evaluation of these alternatives both with and without on-street bike lanes. Typical sections and descriptions for these refined alternatives are summarized below.

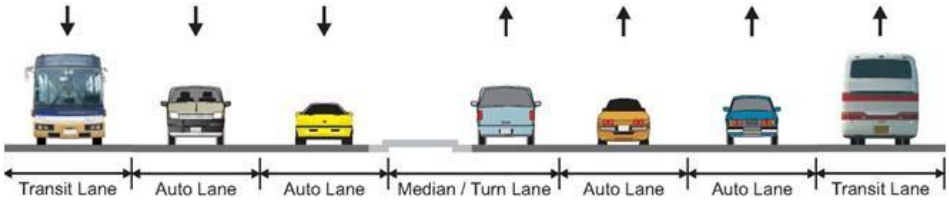
Alternative 1:



Gordon Street to Wheeler Avenue



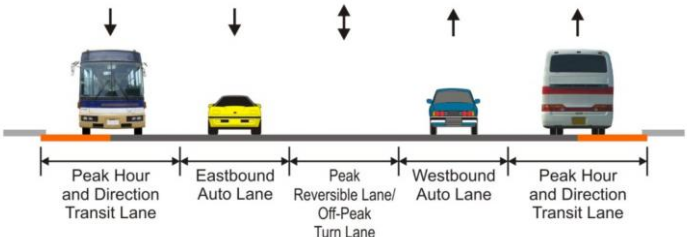
Wheeler Avenue to Roth Street



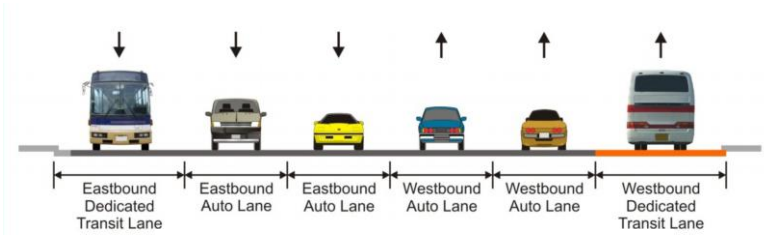
Landmark Mall to Jordan Street/Roth Street to King Street Metro

- Transit in mixed flow on existing four-lane segments and in dedicated lanes on existing six-lane segments
- Transitway uses queue jump lanes to avoid congestion and reduce disruption to Duke Street traffic
- Adds a westbound lane between Jordan Street and Gordon Street, converting the existing two-way service road to one-way
- Adds a westbound lane between Wheeler Avenue and S. Quaker Lane
- Realigns the existing eastbound on-ramp at Telegraph Road and access to adjacent property to accommodate a dedicated transit lane
- Alternative 1a does not have on-street bike lanes
- Alternative 1b includes on-street bike lanes

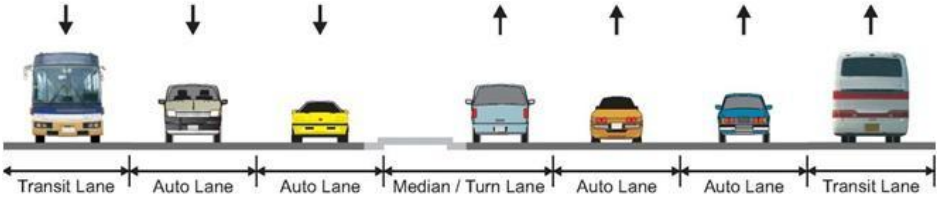
Alternative 3:



Gordon Street to Wheeler Avenue



Wheeler Avenue to Roth Street



Landmark Mall to Jordan Street/Roth Street to King Street Metro

- Identical to Alternative 1 between Landmark Mall and Gordon Street, between Roth Street and Taylor Run Parkway, between Callahan Drive and King Street Metrorail
- Travelway widened to provide an additional through lane in the eastbound direction at Telegraph Road
- Travelway widened to approximately 61 feet between Gordon Street and Wheeler Avenue (resulting in Duke Street of the width as section the existing section between Wheeler Avenue and Roth Street)
- Travelway widened to approximately 72 feet between Wheeler Avenue and Roth Street (resulting in an additional general purpose travel lane to accommodate heavy traffic flow between N. Quaker Lane and Telegraph Road)
- No dedicated left-turn lane during peak periods between Jordan Street and Roth Street
- Alternative 3a does not have on-street bike lanes
- Alternative 3b includes on-street bike lanes

The advantages and disadvantages for each alternative are summarized in **Table 3**.

Table 3: Alternatives Comparison

Alternative 1a- Use Existing Lanes for Transit	
Advantages	**Disadvantages**
• Fewest property impacts • Maintains service roads	• Worst transit operation due to shared lanes • No Duke Street bicycle facility
Alternative 1b- Use Existing Lanes for Transit with Bike Accommodations	
Advantages	**Disadvantages**
• Maintains service roads • Provides bike lanes	• Worst transit operation due to shared lanes • Large property impacts due to bike lanes and streetscape enhancements
Alternative 3a- Reversible Lane	
Advantages	**Disadvantages**
• Quality transit operation • Maintains service roads	• Off-peak auto impact from Gordon to Wheeler • No Duke Street bicycle facility • Lane control gantries • Potentially confusing to drivers
Alternative 3b- Reversible Lane with Bike Accommodations	
Advantages	**Disadvantages**
• Quality transit operation • Maintains service roads • Provides bike lanes	• Off-peak auto impact from Gordon to Wheeler • Large property impacts due to bike lanes and streetscape enhancements • Lane control gantries • Potentially confusing to drivers

CWG and Public Comment

A meeting was held on February 16, 2012 to review the refined analysis for Alternative 1 (with and without bike lanes) and Alternative 3 (with and without bike lanes). A recurring theme in the discussion was again bike and pedestrian safety and accommodation. Members of the CWG expressed interest in an option that combined Alternative 3b (where space is available for bike lanes) and Alternative 3a (where bike facilities are provided along a parallel route to Duke Street). Other general comments included the following:

- Consider a phased approach to transit implementation—Begin with Alternative 1 and eventually implement Alternative 3 with a bike facility
- Bike lanes on Duke Street are not desired in the section between Jordan Street and Telegraph Road due to property impacts
- Bike facility should be included near Landmark Mall to take advantage of planned redevelopment
- Include a bicycle/pedestrian connection to Eisenhower Avenue
- Pedestrian safety and accommodation along and across Duke Street is important
- Improved transit on Eisenhower Avenue should be part of the overall corridor strategy
- Minimize impacts to residences and small businesses
- Concern with cut-through traffic in adjacent neighborhoods

- Sensitivity to fire station location and public safety
- Streetscape should be considered for each impacted parcel
- Ensure feeder streets to stations have pedestrian facilities

Recommendation

Based on evaluations conducted and feedback received from the public and the CWG, the study team recommends the further consideration of Alternative 3 with on- and off-street bicycle accommodations and pedestrian improvements at intersections and along the Duke Street corridor. Alternative 3 provides the opportunity to maximize the performance of the transitway, while minimizing property impacts along the corridor. It also provides flexibility in accommodating a continuous bicycle facility along Duke Street in the short- and long-term. Along with the recommendation for Alternative 3 for Duke Street, it is recommended for the City to continue to pursue transit service and facility enhancements along the Eisenhower Avenue corridor to provide frequent, high-quality services along Eisenhower Avenue.

In existing six-lane sections of Duke Street, Alternative 3 proposes to convert the outermost travel lane to a dedicated transit lane. In existing four- and five-lane sections of the corridor, Duke Street would be widened to accommodate a reversible lane in order to create a dedicated transit lane during the peak hour in the peak direction of traffic flow. Each of these strategies to improve transit performance minimize the need for widening along Duke Street and focus on providing physical modifications to Duke Street that optimize transit reliability.

Adding to the attractiveness of Alternative 3 is the ability for it to be implemented in phases. Early phases could be focused on upgrading traffic signals in the corridor to accommodate transit signal priority. In coordination with signal improvements, existing six-lane sections of Duke Street could be reconfigured (one lane in each direction reassigned) to accommodate the proposed dedicated transit lanes. Where station locations within these sections will remain the same, stations could be constructed in coordination with the six-lane section reconfiguration. In an incremental manner, or as a part of a larger infrastructure project, modifications could later be constructed to provide the additional reversible lane, where proposed by the Alternative 3 concept plan.

In addition to Alternative 3 being flexible and effective—minimizing right-of-way impacts and providing the opportunity for a phased approach to implementation—it would provide the opportunity for a continuous bicycle facility to be provided along the Duke Street corridor while minimizing impacts to property. **Figure 1** shows the potential bicycle facility strategy proposed to accompany Alternative 3 for Duke Street. As shown, the strategy includes a combination of a parallel corridor (off of Duke Street) and a multi-use path along Duke Street. It is likely that in the near-term (prior to redevelopment of selected properties along Duke Street), the parallel facility would be pursued first. As redevelopment occurs throughout time and right-of-way can be secured through development processes or as a part of larger infrastructure projects, the Duke Street facility would be developed.

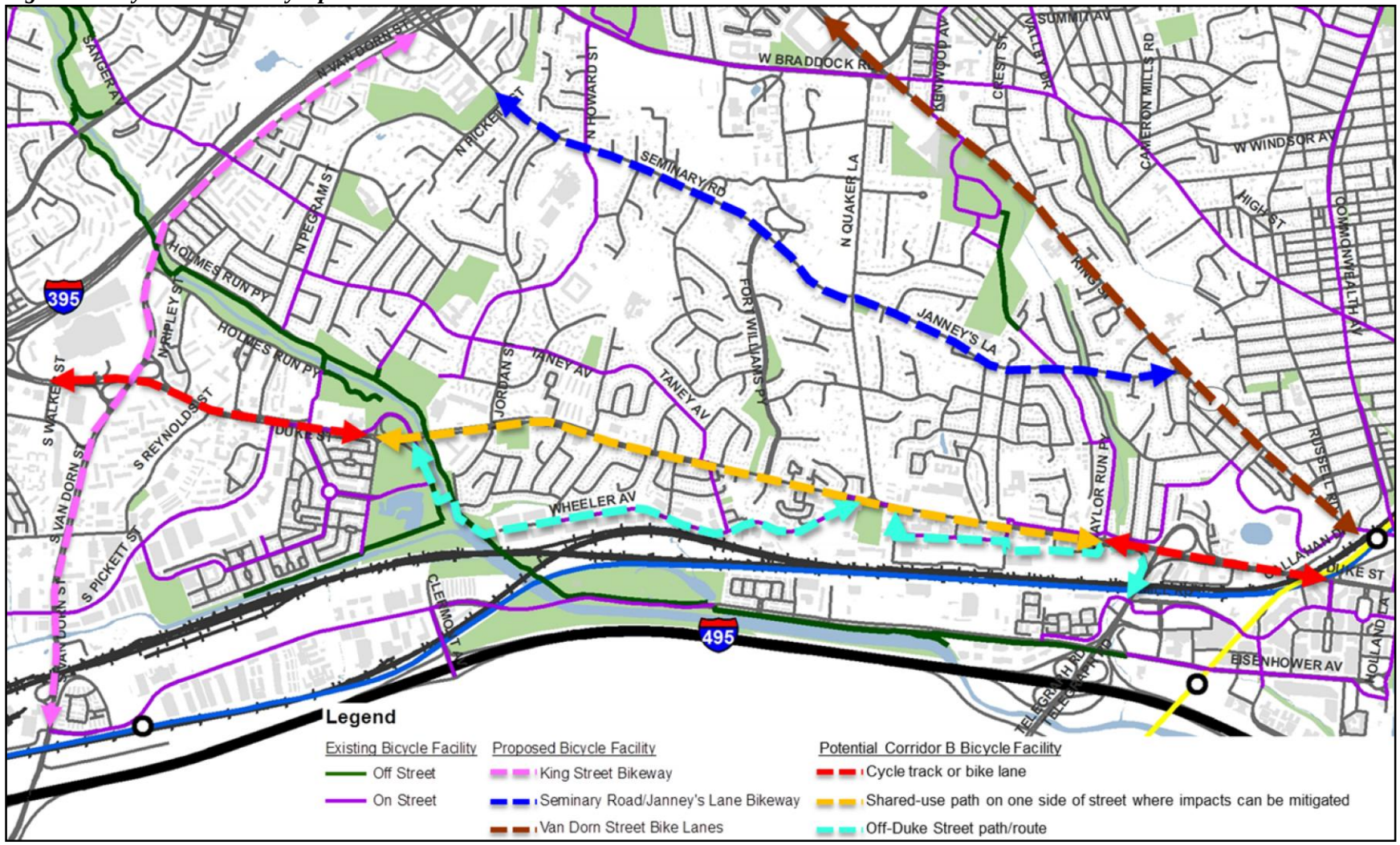



Figure 1: Bicycle Connectivity Options