I-66 Multimodal Study

Inside the Beltway

Appendices

prepared for

Virginia Department of Transportation
Virginia Department of Rail and Public Transportation

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June 8, 2012

CAMBRIDGE SYSTEMATICS

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Appendix A

Public Information and Participation Report

Appendix A – Public Information and Participation Report

This appendix summarizes the process and strategies used to provide a forum for public and stakeholder input into the planning process, and to educate citizens and all regional transportation agencies on the findings of the study. Stakeholder comments from the two rounds of public involvement meetings and targeted stakeholder interviews are included in this appendix. Comments were submitted to, and reviewed by, the Lead Agencies, the project team, and the Participating Agency Representatives Committee. This input was used to inform key decisions in the study, including the development of the mobility options and multimodal packages.

A market research survey also was conducted as a part of the outreach effort for this study. The complete results from market research survey are documented in Appendix B.

A.1 Overview of Public Information and Participation Plan

Federal and State Requirements

Public engagement to support the I-66 Multimodal study was conducted in accordance with Federal and state regulations, policies, and guidelines related to project participation. The Virginia Department of Transportation (VDOT) *Policy Manual for Public Participation in Transportation Projects* served as the overarching guideline for public participation. It included requirements for scheduling timely public meetings, providing public information via the VDOT web site, creating visual materials explaining the study, and developing and utilizing means for updating and communicating information about the study.

In addition, Federal requirements for public involvement, outlined in 23 CFR Part 450.210, were adhered to during all transportation planning processes. These include:

- Establishment of early and continuous public involvement opportunities;
- Provision of reasonable public access to technical information;
- Provision of adequate public notice of public involvement activities;
- Convenient and accessible public meeting locations and times;
- Use of visualization techniques to describe proposed improvements;
- Use of electronic media to make public information accessible;
- Explicit consideration and response to public input; and
- Consideration and solicitation of needs of those traditionally underserved by existing transportation systems.

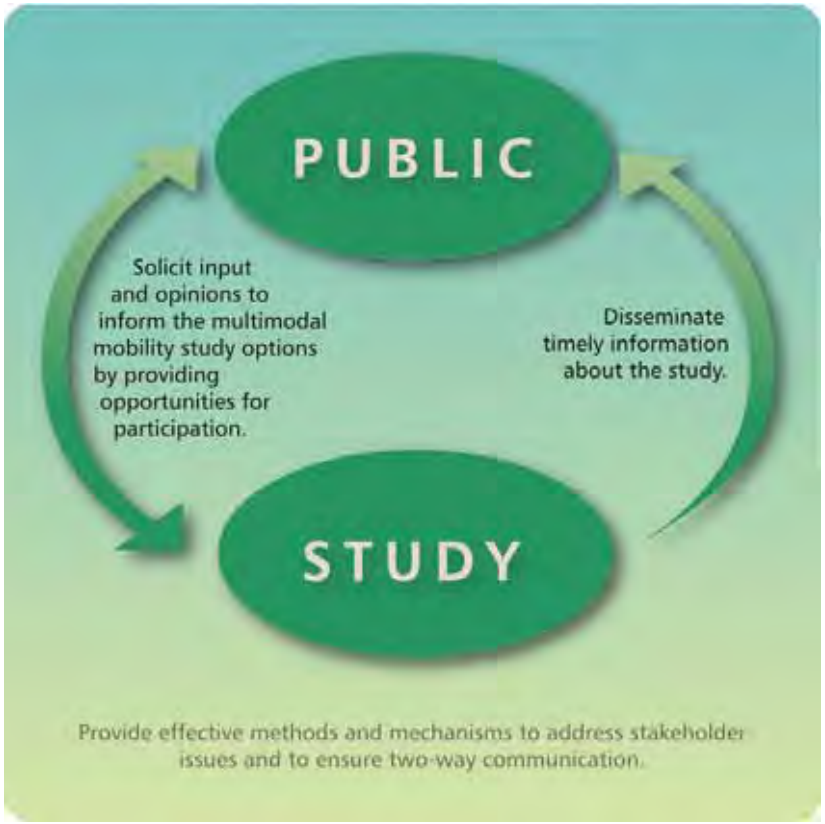
Goal and Objectives

The overall goal for public involvement efforts for the I-66 Multimodal Study was to inform a broad array of stakeholders and to obtain their input and suggestions related to the study.

As illustrated in Figure A.1, the objectives of public involvement and participation were threefold:

1. Solicit input and opinions to inform the multimodal mobility study options;
2. Disseminate timely information about the study; and
3. Provide effective methods and mechanisms to address stakeholder issues and to ensure two-way communication.

Figure A.1 Public Information and Participation Plan Objectives



Stakeholders

For the purpose of this public involvement and participation effort, stakeholders include those affected by proposed solutions inside the Beltway, such as individuals, agencies, and organizations representing interested groups. Stakeholders were recognized as state and local jurisdiction technical staff, local transportation agencies, elected officials, residents, commuters, I-66 corridor roadway commuters or transit users, businesses, and the general public that is within, adjacent to, or using the study corridor.

A.2 Public Information and Participation Strategies

Strategies to achieve the goal and objectives of the Public Information and Participation Plan were closely aligned to the technical milestones of the project. The following strategies were utilized throughout the study to facilitate early dialogue, continuous information flow, and meaningful engagement. The program of strategies was designed to accommodate various stakeholder communication preferences and reflect the diversity of stakeholders in the study area.

Participating Agency Representatives Committee

VDOT formed an advisory committee with voluntary representation from stakeholder jurisdictions or agencies within the study area to review and provide input on draft materials. In addition, representatives performed a liaison and coordination role with their respective agencies and elected officials, distributing study information via stakeholder e-mail distribution lists, agency web sites, and regular briefings. The Participating Agency Representatives Committee (PARC) met 12 times over the course of the study between July 2011 and May 2012. For a complete list of PARC members, see Section 1 – Introduction.

Study Identifier

To distinguish materials and other information that was distributed for this study, a simple, unique study identifier was created. It added visual interest and unified the materials developed for the study, including the webpage, presentations, advertising materials, and the four fact sheets. The study identifier is illustrated in Figure A.2.

Figure A.2 I-66 Multimodal Study Identifier

Study Contact Database

A contact database was developed to reach an array of stakeholders and distribute project information and news through e-mail blasts. The database was updated and maintained throughout the duration of the project. Original contacts in the database included individuals identified by PARC members, VDOT staff, and e-mail contacts from previous studies. As the study progressed, new names were added, including stakeholders who submitted a comment via info@i66multimodalstudy.com, submitted a mail or phone comment, attended a public meeting, or were interviewed as part of this study. In total, there were over 200 contacts in the database.

Informational Project Webpage

Having information easily accessible to stakeholders was key to meeting the goal and objectives of the Public Information and Participation Plan. A unique domain name for this study was secured to facilitate easy reference to the VDOT webpage dedicated to the I-66 Multimodal Study. The webpage, http://www.i66multimodalstudy.com, provided a valuable resource in this respect. Webpage content included a short description of the study, a map of the study area, project milestones, public meeting announcements, public meeting PowerPoint presentations, public meeting presentation boards, fact sheets, comment forms, study reports, and contact information.

In addition, the webpage included an e-mail address, which was used to collect stakeholder comments at info@i66multimodalstudy.com. All comments were forwarded to VDOT for informational purposes and tracked in a comment log. Comments were used to inform all aspects of the study.

Project Phone Line

A telephone hotline for the study, 855-STUDY66, was secured to receive and document public comments from those who did not have access to a computer. This alternate form of access was advertised on the webpage and distributed in paper-copy project materials. The message was recorded in English and Spanish languages. All comments were forwarded to VDOT for informational purposes and tracked in a comment log. Comments were used to inform all aspects of the study.

Public Meetings

Public meetings create an opportunity to give a human face to the technical work conducted as part of the study and reinforce VDOT's commitment to including the public by providing information as well as soliciting input. Two rounds of public meetings were held at key points in the study process. The first round of meetings was held in December 2011 and the second round was held in April 2012.

Both rounds of public meetings were held at two key locations in the study area, Fairfax County and Arlington County. Accessibility to Metrorail stations and Metrobus lines was a key consideration when selecting a location. Public meeting dates were determined based on a number of factors: site availability, schedule availability of key participants, and seasonal weather conditions. Meetings were announced in conformance with the VDOT *Policy Manual for Public Participation in Transportation Projects*. Announcements were made through the webpage, via e-mail blast, via the PARC, via select local area advertising outlets, and to the media. The VDOT Public Affairs Office managed media inquiries and announcements.

The public meetings were conducted in an open house format. Citizens were invited to view study posters. These posters included informational text about the study, explanatory text about the technical work, and supporting graphics (charts, graphs, and maps). Together, the posters presented at the public meetings served to highlight key aspects of the study and helped to both share information and generate opportunities for discussion between the public

and members of the project team. Citizens also viewed a PowerPoint presentation that gave greater detail about the study. Written comments submitted during the meetings were documented and summarized for consideration during project decision-making. Photos were taken to document all public meetings visually.

Public Meeting Round One

Two public meetings were held in December 2011. The first meeting occurred on December 6, 2011, at Mary Ellen Henderson Middle School in Fairfax County, Virginia and had 36 public attendees. The second meeting was held on December 14, 2011, at the Arlington County Government Offices in Arlington, Virginia and had 40 public attendees. The key topics addressed at these meetings were: study background, corridor needs and conditions, study process, potential mobility options, and market research results. This round of meetings consisted of an open house portion and a presentation portion. The open house included multiple posters with information on the key topics listed above. During this period, members of the project team, VDOT, and the Virginia Department of Rail and Transport (DRPT) were available to discuss the project with the public and answer individual questions from the attendees. The presentation posters were available for continuous viewing from 6:00 p.m. to 8:00 p.m. A 45-minute informational presentation also was conducted during this time.

Table A.1 provides a summary of the 85 public comments, organized by mobility option, received at the December 2011 public meetings and within the designated public comment period. If more than one person made the same comment or similar comment, the number of respondents appears in parentheses at the end of the comment. In total:

- Seven completed comment forms were received at the meetings: four in Fairfax and three in Arlington;
- Ten comments were transcribed by the court reporter: two in Fairfax and eight in Arlington;
- Fifty-eight comments were submitted through the e-mail address, posted on the webpage (info@i66multimodalstudy.com);
- One comment was submitted through the project phone line;
- Two comments were submitted through standard mail; and
- Seven comments, from the Arlington Civic Federation, were e-mailed directly to Sharp & Company (public involvement subconsultant for this project).

Figures A.3 through A.7 provide visual documentation of the December 2011 public meetings.

Table A.1 Comment Summary from Round One Public Meetings

Theme	Summary Comment
1 Highway Capacity	**17 respondents were in favor of adding highway capacity to I-66.** **25 respondents were opposed to any additional highway capacity on I-66.**
2 Bus	**15 respondents were in favor of increased/improved bus services. Specific comments include:** • Add more buses in general in the study area. (5) • Improve bus services from Metro stations in study area to downtown D.C. and Virginia during peak periods to alleviate Metrorail congestion. (4) • Add Priority Bus to major roads, considering routes on U.S. 29, U.S. 50, VA Route 7 between King Street Metro and Tysons Corner, I-395 to Little River Turnpike to Main Street Fairfax, and Columbia Pike between Pentagon and Annandale with connection to Little River Turnpike/Main Street Fairfax Line. (3) • Establish large parking lots along the I-66 corridor that would be serviced by buses that would travel to Metro stations. (3) • Add a bus-only lane to I-66. (2) • Add more 3Y buses on Lee Highway. • Allow buses to use shoulders on urban Interstates when speeds drop below 25 mph. **No respondents stated opposition to bus options.**
3 Metrorail	**12 respondents were in favor of Metrorail improvements. Specific comments include:** • More frequent trains and track improvements to ease peak Metrorail congestion periods. (7) • Parking availability at Metro stations should be addressed. (3) • Revisit the East Falls Church Metrorail Project. (3) • A western entrance to the Ballston Metrorail station would help ease crowding. (3) • Before widening I-66, wait and see how the new Metrorail Silver Line will affect traffic on this corridor. (2) • 8 car trains on the Orange Line should be a high priority for Metrorail. (2) • Add an interline connection between the Orange and Blue Lines on Metro, as well as an interline connection between the Yellow and Blue Lines. (2) • Add a double-deck track over the Orange Line Metro. • Extend the Metrorail Orange Line to Centerville and Manassas. **No respondents stated opposition to Metrorail options.**

Table A.1 Comment Summary from Round One Public Meetings (continued)

Theme	Summary Comment
4 Bicycle	**14 respondents were in favor of bicycle improvements. Specific comments include:** • Improvements in bicycle travel and key connections are needed throughout the study area. This includes new and wider pavement on existing paths such as Washington and Old Dominion (W&OD) and Custis, as well as new connections to transit. (6) • Provide a bike/pedestrian crossing near West Falls Church Metro to link Haycock Road/W&OD with Pimmitt Hills neighborhood. (2) • More bicycle parking is needed at Metro stations. (2) • Provide bicycle access along U.S. 50 across the Beltway to connect Merrifield and Graham Road areas. (2) • Try to create a safe bike trail into the heart of Tysons Corner from the W&OD trail. • Extend the Custis Trail beyond East Falls Church. • The Custis Trail needs to be completely redesigned and rebuilt. The steep slopes discourage commuter cycling. The trail should have the same gradual changes in elevation as do the highway travel lanes. • A viable two-way solution to reducing traffic is to further promote the use of what already is there along I-66 – a bike path. • Need an improved bike/pedestrian connection from Rosslyn/Iwo Jima Memorial to Theodore Roosevelt Bridge. **1 respondent stated reservations about bicycle options, as they thought few people would commute very long distances via bicycle, especially in extreme weather.**
5 Arterial Enhancements	**11 respondents provided comments on arterial enhancements. Specific comments include:** • Improve critical intersections on U.S. 50 that create bottlenecks and are unsafe. (5) • Consider public transit for U.S. 50 that extends into D.C. This already is a huge commuting corridor that could benefit further from rail or rapid bus transit. (3) • Eliminate some of the left turns on U.S. 50 to alleviate congestion. • Widen U.S. 50 from Eaton Place to Main Street and through the Seven Corners intersection. • Without widening U.S. 29 through Falls Church (which, in my opinion, would be strongly opposed by Falls Church), the enhancements to U.S. 29 identified in the report will not reduce congestion on I-66 inside the Beltway.

Table A.1 Comment Summary from Round One Public Meetings (continued)

Theme	Summary Comment
5 Arterial Enhancements (continued)	**2 respondents stated opposition to arterial enhancements. The specific comments are:** • The widening of nonhighway, local roads would simply serve to turn local roads into more highly congested routes. It creates a more dangerous new problem without remotely solving the first problem. • Changes to U.S. 50, especially those designed to turn it into a freeway, should be done with caution. Pedestrians use U.S. 50 and cross U.S. 50 – these connections need to be maintained. The ability to drive faster along this road shouldn't necessarily be a goal in of itself.
6 High-Occupancy Vehicle (HOV) Restrictions	**12 respondents provided comments on HOV options. Specific comments include:** • Eliminate hybrid vehicle exemptions. (5) • Increase enforcement. (3) • Make it HOV-3+ under current HOV hours. (3) • Introduce the same carpool restrictions on both sides of I-66 during a.m. and p.m. peak commute periods. (3) • Make I-66 inside the Beltway HOV 24/7. • Include a process or metric to trigger an increase of the HOV standard to 4 or more persons per vehicle. • Mobility Option A should be analyzed to be sensitive to the length of HOV restrictions in the reverse direction. It should look at 1 hour, 1.5 hours, 2 hours, and 2.5 hours reverse direction HOV restrictions to minimize adverse impacts on alternate routes. • Increase the fine for first and repeat violators. If they don't pay the fine within a week, double the fine. This will help pay for transportation alternatives. Eliminate all warnings. **7 respondents stated opposition to HOV-3+ options. The specific comments are:** • Continue current HOV-2+restrictions, not HOV-3+. (5) • Increases in HOV passenger requirements will simply shift the congestion to secondary roads that are even less capable of handling more traffic. (2)

Table A.1 Comment Summary from Round One Public Meetings (continued)

Theme	Summary Comment
7 High-Occupancy/Toll (HOT) Lanes	**4 respondents mentioned support for tolling in their comments. The specific comments include:** • The only way to successfully address congestion (short of improved land management practices) on highways is to implement tolls on major highways, such as I-66. (3) • Revenue needs to drive all options for the future. Fast service is worth money. People driving in luxury vehicles can afford to pay. The rest of us should be happy taking the train and its connecting bus. • Converting the entire highway to toll during non-HOV hours should be considered. **5 respondents mentioned opposition or concern about HOT Lanes. The specific comments are:** • HOT lanes disproportionately benefit the rich and should not be considered. (3) • Opposed to tolling I-66 24 hours a day, 7 days a week with HOT Lanes. Only toll when there is congestion, not during free-flow. (2) • Tolls might be justified for a new road on a new right-of-way but not for an existing one.
8 Transportation Demand Management	**4 respondents expressed support for TDM in their comments. The specific comments include:** • Think about rideshares and bicycling incentives (2). • Promote carpooling, vanpools, and ridesharing and establish locations for slug lines. (3) • TDM measures are critical and must be part of the package. Some local jurisdictions in the region have had considerable experience with these measures which should be put in place for all routes under consideration. The measures must be ongoing and considered an important element to maintain facility performance. • Telework should be included as part of the solution. **No respondents stated any opposition to TDM options.**

Table A.1 Comment Summary from Round One Public Meetings (continued)

Theme		Summary Comment
9	**Public Meetings**	**10 respondents provided comments on the public meetings. The specific comments include:** • I think there should have been room for people to ask questions after the presentation. (5) • I was going to attend one of the public input sessions, but if VDOT already has determined that the outcome will include widening the highway, what is the point of doing public input for this multimodal study at all, if part of the "recommendations" already are set? (e-mail referred to pre-meeting press release that also discussed opening of Spot Improvement #1) • I think that the public participation should have been much earlier in this process so that the public could have helped define the study, not just giving input after six months of the study. • Place more materials on the project webpage in advance of public meetings. • A multitude of different ideas and options were described in the slide show but were not handed out or otherwise made available to participants to physically look at. • Having public meetings in April and then providing a final report in May does not seem like you are taking the public comments seriously in this process.
10	**Miscellaneous**	**9 respondents provided comments on topics that were not directly relevant to any of the mobility options. The specific comments include:** • Any attempts to relieve congestion in the study corridor will be unsuccessful if current zoning and urban planning practices continue. The final report should recommend changes in local zoning and land use practices. (3) • Phase #1 and #3 spot improvements should be removed from the Baseline. The study was established to consider alternatives to these lane additions. (2) • Fairfax County should follow Arlington's lead and increase zoning and density of development near Metro stations to encourage Metro ridership and use of trails for bicycle commuting. • Why is VDOT ignoring I-66 outside the Beltway? Those of us that live in Manassas and below have no alternative to get to Tysons Corner or McLean other than a two-hour commute via public transportation. • Please continue exploring streetcars/light rail up the VA 7 corridor from the Skyline Area (where the Columbia Pike Street Car plans to terminate) up through to the Tysons Corner Metro stations. • If a business moves into the Dulles corridor, adding hundreds of new cars on the roads, they should be taxed with developing more public transportation (including bike and pedestrian paths) and require a percentage of its employees use such transportation.

Table A.1 Comment Summary from Round One Public Meetings (continued)

Theme	Summary Comment
10 Miscellaneous (continued)	• Arlington County with only 1 representative on a PARC of 17 members is grossly underrepresented, suggesting the results will have little to do with the County's interests. A supplementary group representing corridor residents in Arlington and Fairfax should be established to increase the value and acceptability and credibility of the final recommendations. • Discuss all of the baseline data, specifically how it has accounted for Federal spending reductions, which is expected to slow growth, new traffic alignments, and new roadway capacity (specifically the Beltway HOT Lanes). • In front of our development site (the former Colony House furniture store (1700 Lee Highway), I-66 is sandwiched between the eastbound and westbound lanes of Lee Highway. If the I-66 widening was to occur, how would it be accomplished in the vicinity of our site?

Figure A.3 Open House Portion of Public Information Meeting in Fairfax County

Figure A.4 Open House Portion of Public Information Meeting in Fairfax County

Figure A.5 Presentation Portion of Public Information Meeting in Fairfax County

Figure A.6 Open House Portion of Public Information Meeting in Arlington County

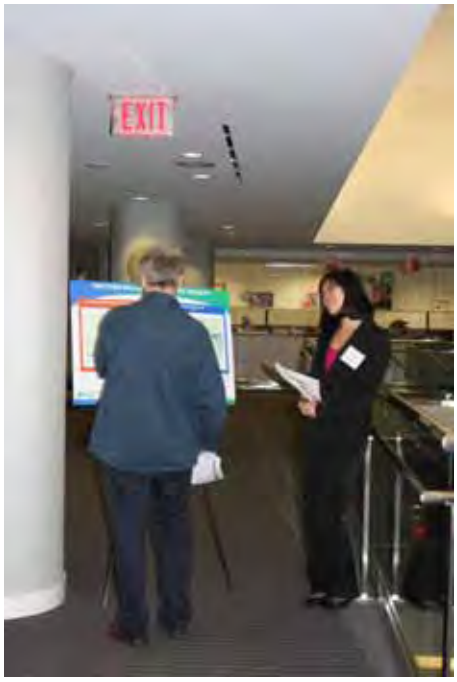
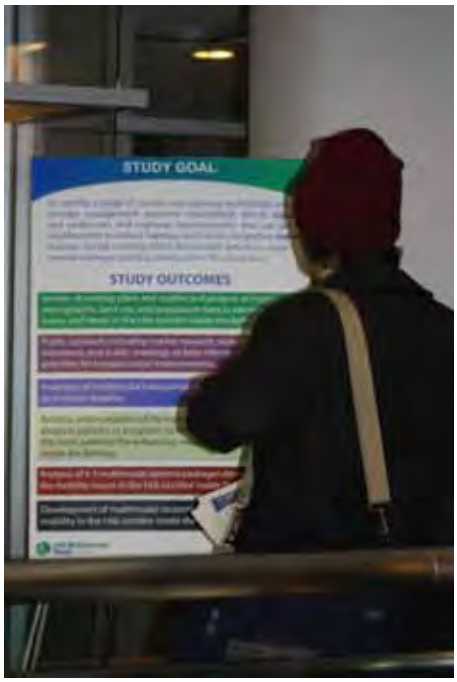


Figure A.7 Open House Portion of Public Information Meeting in Arlington County



Public Meeting Round Two

Two public meetings were held in April 2012. The first meeting occurred on April 24, 2012, at the Navy League Building in Arlington, Virginia and had 19 public attendees. The second meeting was held on April 25, 2012, at Mary Ellen Henderson Middle School in Fairfax, Virginia and had 21 public attendees. The key topics addressed at these meetings were: multimodal mobility packages, modeling results, funding strategies, and level of service (LOS) maps. This meeting was held in an open house format. The open house included multiple posters with information on the key topics listed above. During this period, members of the project team, VDOT, and DRPT were available to discuss the project with the public and answer individual questions from the attendees. The presentation posters were continuously available for viewing from 6:30 p.m. to 8:30 p.m. A six-minute narrated informational study presentation also was continuously available to watch during the open house.

Table A.2 provides a summary of the 42 public comments, organized by theme, received at the April 2012 public meetings and within the designated public comment period. Whereas the previous public comments referenced the study in general and information presented at the December 2011 meetings, the following comments specifically address the multimodal mobility packages and information presented at the April 2012 meetings. If more than one person made the same comment or similar comment, the number of respondents appears in parentheses at the end of the comment. In total:

- Fourteen completed comment forms were received at the meetings: six in Fairfax and eight in Arlington;
- Three comments were transcribed by the court reporter: two in Fairfax and one in Arlington;
- Twenty-one comments have been submitted through the e-mail address, posted on the webpage (info@i66multimodalstudy.com);
- Two comments were submitted through the project phone line; and
- Two comments were submitted through standard mail.

Figures A.8 through A.12 provide visual documentation of the April 2012 public meetings.

Table A.2 Comment Summary from Round Two Public Meetings

	Theme	Summary Comment
1	**Preferred Package**	Package #1 (8)
		Package #2 (0)
		Package #3 (4)
		Package #4 (16)

Table A.2 Comment Summary from Round Two Public Meetings (continued)

Theme	Summary Comment
2 **General Comments on the Packages**	**Package #1:** • #1 would produce best benefits in relation to the costs. (2) • #1 is the lowest cost and it promotes HOV-3. • #1 would require permission from FHWA to impose tolls on I-66 which may prove difficult to get. • The 24-7 tolling posed by Packages #1 and #2 would unfairly raise substantial costs and decrease the transit flexibility of residents inside the Beltway. • Focus on Package #1, but test variations (e.g., no tolls and variations of bus and HOV time period restrictions). • Like #1, but only include the tolls at rush hour. **Package #2:** • No Comments. **Package #3:** • It adds lanes, addresses off-peak free usage, and allows for peak hours service improvements. • This is the only package that makes sense. • How do your projections deal with HOV cheaters in Package #3? Did you include a certain percentage over and above the projected HOV traffic (25 to 33 percent), or did you assume some special effective enforcement mechanism? If it is the latter, please provide a description of what enforcement mechanism is assumed and its cost. • I-66 HOV3+ restrictions on all lanes during Morning eastbound and Evening westbound are politically unrealistic. • I prefer a different take on Package #3 (not modified package 3). *Morning eastbound and Evening westbound*: 1 lane Bus/HOV 3+, 2 lanes Bus/HOV 2+. • *Morning westbound and Evening eastbound*: As proposed (1 lane Bus/ HOV 2+, 2 lanes All Traffic) Off-peak: 1 lane Bus/HOV 2+, 2 lanes All Traffic.

Table A.2 Comment Summary from Round Two Public Meetings (continued)

Theme	Summary Comment
2 **General Comments on the Packages (continued)**	**Package #4:** • Just put buses on the existing roadway in a HOV lane. No need to add a lane. • #4, if any. A lane should not be added to I-66, inside the Beltway. • #4 because a mass transit option is sorely needed on Route 50 and its configuration precludes HOV 2 lanes. • I would like to see Package #1 combined with Package #4 as a recommendation, but I would like Package #4 modified so that Route 50 is not widened to provide shoulder bus lanes, at least in Arlington, but instead it is enhanced in terms of upgrading it towards an expressway, that 2 of the lanes, 1 in each direction, is used as a managed lane. • For Route 29 a streetcar style transit option should replace some of the enhanced priority bus services.
3 **Key Considerations to Guide Final Recommendations**	a. Increase personal mobility regardless of mode of travel. (2) b. Enhance and expand transit options. (13) c. Implement tolling. (3) d. Add new road capacity. (2) e. Give priority to bike and pedestrian options. (8) f. Adjust HOV restrictions and hours. (8) g. Other: • Be sensitive to environmental impacts. (2) • Commitment to multimodal solutions. (2)

Table A.2 Comment Summary from Round Two Public Meetings (continued)

	Theme	Summary Comment
4	**Additional Comments – Highway Capacity**	• Do not support any option that would add a lane to I-66. (6) • All packages remain silent on the issue of the Rosslyn tunnel and the Roosevelt Bridge. It can be inferred that both the tunnel and bridge will remain as is, jut moving the bottlenecks further down the road. (3) • The only circumstance under which we would support additional lanes on I-66 inside the Beltway is if they were dedicated lanes for BRT as part of an areawide BRT system that extended into the outer suburbs. This however is not in the mobility packages. • It would be helpful to have I-66 exit ramps that enter Metro parking garages at Vienna, Dunn Loring, West falls Church, East Falls Church. • Please test the last spot improvement and post results. Including improvements in speed and congestion as well as noise levels. • If there is a recommendation to widen, please increase sound walls to mitigate noise. Also, work with metro to build a sound absorption panel along Metro. • As you settle on a final package, examine each segment of I-66 both east and westbound to determine if there may be other spot improvements which would appreciably improve the operation of your recommended package. • There's no question that I-66 widening will be needed at some point. However, this should come LAST, not first, to prove VDOT's commitment to a true multimodal approach. • Widening I-66 has little more than face validity as a solution for addressing congestion in our region for the long-term. It will merely shift cars from 50 and 29 to I-66 until I-66 is highly congested again. It will discourage transit usage and encourage sprawled development patterns in the meantime.
5	**Additional Comments – Bus**	None.
6	**Additional Comments – Metrorail**	• Excess toll revenue should go to Metro. • Add more Metrorail lines (especially circulator to link existing lines). • More funding needs to be put into Metrorail (as well as Virginia Railway Express (VRE) and potentially light rail). These options are more economical than enhanced bus services or express bus routes.

Table A.2 Comment Summary from Round Two Public Meetings (continued)

Theme		Summary Comment
7	**Additional Comments – Bicycle and Pedestrian**	• Redesign Custis Trail to make it more level and attract more bike commuters. People don't use it because of the steep hills. • Whatever you do, ensure it is safe for pedestrians. • It would be great to be able to walk/bike from Rossyln to Pentagon City. • Maintain bike paths. • Facilitate bike commuting and walking to Metro along the I-66 corridor inside the Beltway. • There needs to be a discussion of the right-of-way impact from an expansion of I-66 especially since portions of the W&OD Trail and/or Four Mile Run would have to be removed or relocated for any expansion of I-66.
8	**Additional Comments – Arterial Enhancements**	Add streetcar lines.
9	**Additional Comments – HOV Restrictions and HOT Lanes**	• Do not put tolled lanes on a previously untolled road. (3) • Avoid penalizing residents who live inside the Beltway and reverse commute. DO NOT implement HOT or HOV restrictions for all lanes of I-66 for reverse commuters (or apply them to all lanes in both directions 24-7). (2) • Look at optimizing the current HOV restrictions before tolling or implementing new restrictions. • This study does not make clear how HOT Lanes would be implemented.
10	**Additional Comments – Transportation Demand Management**	None.
11	**Additional Comments – Public Meetings**	If you only have 85 public comments after the first round of public meetings, you're not trying very hard and/or trying to keep it under wraps. You will be hard pressed to find anyone in Arlington in favor of widening I-66.

Table A.2 Comment Summary from Round Two Public Meetings (continued)

Theme		Summary Comment
12	**Additional Comments – Miscellaneous**	One of the key issues that arose in previous considerations of I-66 improvements over the years was the impact on the TR Bridge and the capacity and operational situation at the east end of the bridge. I realize that the Bridge is outside of the study limits, but the study should nevertheless include some discussion of what may have to be done to accommodate any additional vehicular traffic that may be generated by the proposed improvement to I-66. VDOT also MUST address issues outside the study area, particularly the following: • Orange Line extension to Centreville is critical to take cars off the road and create new high-density centers for jobs, housing, and retail. • VRE extension to Gainesville/Haymarket is likewise critical, and can take more than 5,000 cars a day of I-66. • D.C. has limited capacity to absorb inbound traffic during peak morning commuting hours. That's why it is so critical to maximize the capacity of Metro and buses and/or work on new bridge options. • VDOT should compare its proposed packages with conditions on the ground in 2012, as well as the 2040 Constrained Long-Range Plan (CLRP). The studies to extend VRE to Haymarket should have been acknowledged in this study. I remain concerned that: 1) no social equity or economic equity analysis has been conducted to date or is planned for in the near future; and 2) to my knowledge, there was no targeted outreach to potentially vulnerable and/or transit-dependent populations.

Figure A.8 Open House Portion of Public Information Meeting in Fairfax County

Figure A.9 Open House Portion of Public Information Meeting in Fairfax County

Figure A.10 Presentation Portion of Public Information Meeting in Arlington County

Figure A.11 Open House Portion of Public Information Meeting in Arlington County

Figure A.12 Public Information Meeting in Arlington County

Targeted Stakeholder Interviews

Stakeholder interviews were held to accomplish several objectives. They were used to engage and inform community leaders about the study and to disseminate information. They served as an additional source of stakeholder input for the formulation of mobility options. Lastly, they helped the project team identify stakeholder issues early on. The original list of project stakeholders to interview was developed in consultation with the Lead Agencies and the PARC. Feedback from the interviews was documented and considered as input into the study process.

Twenty-eight stakeholder interviews were able to be completed. About 50 stakeholder interviews were originally planned, but challenges with scheduling, including lack of responsiveness by stakeholders, led to the smaller number of completed interviews. Interviewees included representatives of residential and civic organizations, Federal agencies, member associations, and government leaders. Table A.3 details the completed stakeholder interviews. Table A.4 provides a summary, organized thematically, of the comments received. If more than one person made the same or similar comment, the number of respondents appears in parentheses at the end of the comment.

Table A.3 List of Interviewed Stakeholders

	Organization	Contact	Position
1	AAA	Lon Anderson	Director of Public Affairs
2	Arlington Chamber of Commerce	Rich Doud	President
3	Arlington Civic Federation	James Schroll	President
4	Arlington County Board	Christopher Zimmerman	Chairman
5	Arlington County Board	Mary Hughes Haynes	Member
6	Arlington County Board	Jay Fisette	Member
7	Arlington County Board	J. Walter Tejada	Member
8	Arlington Transportation Advisory Commission	Bill Gearhart	Chairman
9	City of Falls Church	David Snyder	Vice Mayor
10	Coalition for Smarter Growth	Stewart Schwartz	Executive Director
11	Commonwealth Transportation Board	J. Douglas Koelemay	Board Member, Northern Virginia District
12	District Department of Transportation	Faisil Hameed	Director
13	Fairfax County Board of Supervisors	Sharon Bulova	Chair
14	Fairfax County Chamber of Commerce	Jim Corcoran	President
15	Fairfax County Supervisors	Linda Q. Smyth	Providence District
16	Fairfax County Supervisors	Penelope Gross	Mason District
17	Fairfax County Supervisors	John Foust	Dranesville District
18	Fairfax County Transportation Advisory Commission	Jeffrey Parnes	Chair
19	Greater Washington Board of Trade	Bob Grow	Senior Director, Government Relations
20	Metropolitan Washington Airport Authority	Bill Lebegern and Michael Hewitt	Transportation Planners
21	National Park Service	Steve Whitesell	Regional Director, National Capital Region

Table A.3 List of Interviewed Stakeholders (continued)

	Organization	Contact	Position
22	Northern Virginia Transportation Alliance	Bob Chase	President
23	Northern Virginia Transportation Authority	Martin Nohe	Chair, Prince William County
24	Sierra Club – Mount Vernon Group	Dean Amel	Conservation Chair
25	Virginia Bicycling Federation	Allen Muchnick	Northern Virginia Board Member
26	Virginia State Police	Lieutenant James E. DeFord and Sargent Neil Johnson	Field Lieutenant, Northern Virginia
27	Washington Area Bicyclist Association	Greg Billings	Executive Director
28	Washington Metropolitan Area Transit Authority	Tom Harrington	Director of Office of Long Range Planning

Table A.4 Stakeholder Comment Summary

Theme		Summary Comment
1	**Capacity**	**10 respondents were in favor of adding capacity to I-66.** **10 respondents were opposed to any additional capacity on I-66.**
2	**Bus**	**17 respondents expressed support for bus improvements. Specific comments include:** • A dedicated bus lane, particularly during rush hour. (16) • Focus bus improvements on making the connections that Metro doesn't make and where the data shows they are most needed. (7) • Increase bus frequencies. (2) • Offer more amenities (e.g., wi-fi, cleanliness, etc.) on buses so they can compete with rail as a viable transportation option. (2) • Add a bus terminal at East Falls Church Metro. • Better coordinate bus schedules/times. **3 respondents expressed opposition to bus improvements. The specific comment is:** • Using the shoulders for buses could create a safety problem. (3)
3	**Metrorail**	**16 respondents expressed support for Metrorail improvements. Specific comments include:** • Need more feeder connections (e.g., bus, streetcar, light rail, bike, pedestrian) to Metro. (9) • Increase capacity on Orange Line. (6) • Right-of-way (ROW) should be preserved for future Metrorail expansion. (4) • Need to alleviate congestion at Rosslyn station. (4) • Additional entrance at Ballston. (3) • More parking at transit stations. (3) • Extend Metro down the corridor into Centerville. (2) • Consider how Silver Line will impact congestion. (2) • Need another option for getting trains across the Potomac (2). • Ensure pedestrians have the option to walk to all the Metro stations. **No respondents expressed opposition to Metrorail improvements.**

Table A.4 Stakeholder Comment Summary (continued)

Theme		Summary Comment
4	**Bicycle**	**15 respondents expressed support for bicycle improvements. Specific comments include:** • Make connections to neighborhoods and transit stations from bike trails. (14) • Bicycle trails along I-66 were designed as recreational trails with curves and hills, which slow down commuting – needs to be redesigned for commuters. (4) • More bicycle facilities (e.g., stands, lockers, bikeshares) at Metro stations. (4) • Need safety improvements (e.g., lighting, signage, buffers) on trails. (6) • Address gaps in bike network. (2) • Look at adding bike/trial networks on U.S. 50, U.S. 29, and/or Washington Boulevard • Add bike enhancements at East Falls Church station. • Better bicycle and pedestrian access across Theodore Roosevelt bridge. **No respondents expressed opposition to bicycle improvements**.
5	**Arterial Enhancements**	**11 respondents provided expressed support for arterial improvements. Specific comments include:** • Need bike and pedestrian improvements on U.S. 29 (1) and U.S. 50. (3) • Additional transit options, specifically Streetcars (3) and BRT. (4) • Look at queue jumping for public transportation. (2) • Better coordination of traffic lights to move traffic better. (2) • Make 1 lane bus-only on U.S. 50. • Add urban character to arterials. **No respondents expressed opposition to arterial improvements.**

Table A.4 Stakeholder Comment Summary (continued)

Theme		Summary Comment
6	**HOV Restrictions**	**16 respondents provided comments on HOV options. Specific comments include:** • HOV restrictions should be enacted for both eastbound and westbound travel during peak periods. (9) • Change HOV-2 to HOV-3. (9) • Increase HOV enforcement. (5) • HOV hours and restrictions should be consistent inside and outside Beltway. (3) • Expand HOV hours during peak periods. (3) • Addition of more parking (inside and outside Beltway) would enable HOV increase in terms of hours and number of riders. (2) • Remove hybrid exemptions. (2). **4 respondents expressed opposition to HOV improvements. The specific comment is:** • HOV-3 will put more traffic on adjacent streets. (4)
7	**HOT Lanes**	**12 respondents expressed support for HOT Lanes.** **4 respondents were undecided on the benefits of HOT lanes and wanted more information before making a decision.** **6 respondents expressed opposition or concern about HOT Lanes. The specific comments are:** • Not politically viable. (2) • Could discourage businesses from locating in the corridor. (2)
8	**Integrated Corridor Management**	**7 respondents expressed support for ITS improvements. The specific comments are:** • Better technology to let drivers know about congestion/accidents in advance. (6) • Need on the spot control of current HOV lanes so the lanes can be dynamically managed during non-peak hours (e.g., in case of an accident). (2) **No respondents expressed opposition to ITS improvements.**

Table A.4 Stakeholder Comment Summary (continued)

Theme		Summary Comment
9	**Transportation Demand Management**	**12 respondents expressed support for TDM. The specific comments include:** • Promote telework and provide incentives to businesses/employees. (4) • Provide incentives for ride sharing. (3) • Need additional park-and-ride lots in the study area. (2) • Need to introduce slugging to the corridor, especially if HOV-3 is enacted. • More businesses should provide shuttle services. **No respondents expressed opposition to TDM options.**
10	**Public Meetings**	**13 respondents provided comments on the public meetings. The specific comments include:** • Be more transparent. Let the public see the results of different improvements. (4) • Allow people to provide verbal input at meetings, have them hear each other, and discuss issues. (2) • Consider hosting meetings in different places to pick up different population segments. • Encourage open microphone at next round of meetings. • Consider presentation to Arlington Transportation Commission. • Give more description in advertisements about format of meetings. • Provide constant information through web site, presentations, etc. • Everything presented to the PARC should be on the study webpage. • Keep attention on the multimodal aspect of study. • Provide civic and residential organizations with I-66 updates for their newsletters and web sites. • Consider direct mailings or e-mails to individuals in corridor. • Keep people in Washington, D.C. informed of the study and results.

Table A.4 Stakeholder Comment Summary (continued)

Theme		Summary Comment
11	**Miscellaneous**	**9 respondents provided comments on topics that were not directly relevant to any of the multimodal improvements. The specific comments include:** • Need to look at land use as part of this study – it needs to be convenient for people to access transit options. (5) • Change parking policies and increase pricing to discourage SOV. (3) • Make sure to coordinate with other relevant transportation studies. (3) • Westbound Spot Improvement project(s) could help educate people as to what can be done within the ROW. • Would like to see something in the mobility option relative to emergency evacuations. • Need to keep Dulles and Washington core connected in meaningful way so it doesn't pull development westward.

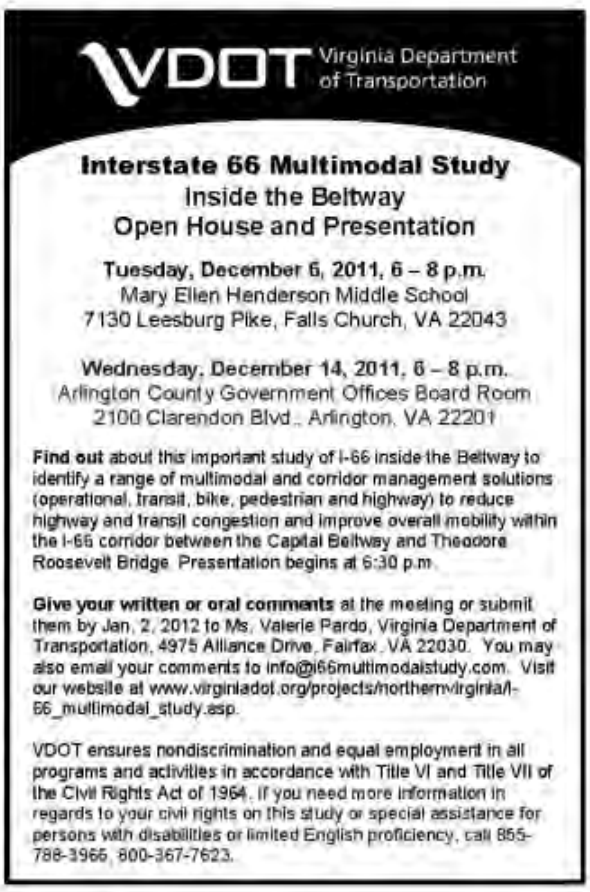
Advertising Materials

Advertisements announcing the December 2011 and April 2012 public meetings were published in local newspapers prior to both of the meetings. Local and regional print publications were chosen to effectively target stakeholders, including minority and disadvantaged communities. The media schedules for the December 2011 and April 2012 meetings are shown in Table A.5 and Table A.6, and the advertisements that were placed are shown in Figures A.13 and A.14.

Table A.5 Public Meeting Round One Media Schedule

	Newspaper	Run Date
1	Washington Post	11/21/11 and 12/1/11
2	Arlington Gazette	11/17/11, 11/23/11, and 12/8/11
3	El Tiempo Latino	11/18/11, 11/ 25/11, and 12/2/11
4	Fairfax Times	11/18/11 and 11/25/11
5	Falls Church News Press	11/17/11 and 11/24/11

Figure A.13 Public Meeting Round One Advertisement



VDOT Virginia Department of Transportation

Interstate 66 Multimodal Study
Inside the Beltway
Open House and Presentation

Tuesday, December 6, 2011, 6 – 8 p.m.
Mary Ellen Henderson Middle School
7130 Leesburg Pike, Falls Church, VA 22043

Wednesday, December 14, 2011, 6 – 8 p.m.
Arlington County Government Offices Board Room
2100 Clarendon Blvd., Arlington, VA 22201

Find out about this important study of I-66 inside the Beltway to identify a range of multimodal and corridor management solutions (operational, transit, bike, pedestrian and highway) to reduce highway and transit congestion and improve overall mobility within the I-66 corridor between the Capital Beltway and Theodore Roosevelt Bridge. Presentation begins at 6:30 p.m.

Give your written or oral comments at the meeting or submit them by Jan. 2, 2012 to Ms. Valerie Pardo, Virginia Department of Transportation, 4975 Alliance Drive, Fairfax, VA 22030. You may also email your comments to info@i66multimodalstudy.com. Visit our website at www.virginiadot.org/projects/northernvirginia/I-66_multimodal_study.asp.

VDOT ensures nondiscrimination and equal employment in all programs and activities in accordance with Title VI and Title VII of the Civil Rights Act of 1964. If you need more information in regards to your civil rights on this study or special assistance for persons with disabilities or limited English proficiency, call 855-788-3966, 800-367-7623.

Table A.6 Public Meeting Round Two Media Schedule

	Newspaper	Run Date
1	Washington Post	4/5/12 and 4/19/12
2	Arlington Gazette	4/5/12 and 4/19/12
3	El Tiempo Latino	4/6/12 and 4/20/12
4	Fairfax Times	4/6/12 and 4/20/12
5	Falls Church News Press	4/12/12 and 4/19/12
	Washington Hispanic	4/13/12 and 4/20/12
	Fairfax Connection	4/12/12 and 4/19/12
	Arlington Connection	4/11/12 and 4/18/12
	McLean Connection	4/11/12 and 4/18/12

Figure A.14 Public Meeting Round Two Advertisement

Social Media

In addition to traditional advertising media, resources were directed to cost-effective communication forms like social media tools (e.g., Facebook) where VDOT already has a presence. Social media was used both to inform audiences of participation and information opportunities and to reach out to stakeholders who typically do not participate in the traditional public meeting-type forums. The VDOT Public Affairs Office posted public meeting announcements on VDOT's Facebook and Twitter pages at key milestones throughout the study.

Project Fact Sheets

Four fact sheets, prepared and released at key milestones, were developed to inform the public about study progress and key findings. The fact sheets addressed overall project goals and methodology, frequently asked questions (FAQ), project milestones, study findings, meeting announcements, and other topics of interest to stakeholders. Adobe Portable Document Format (PDF) versions of the fact sheets were shared with PARC representatives for dissemination to their respective e-mail lists and were also made available on the project webpage. Additionally, a notification was sent to the e-mail distribution database advising stakeholders when the fact sheets were available on the project webpage. Paper copies also were available at the public meetings. Fact sheets are shown below in Figures A.15 to A.18.

Figure A.15 Project Fact Sheet #1

I-66 Multimodal Study Inside the Beltway 1

Identifying solutions between I-495 and the Theodore Roosevelt Bridge FACT SHEET 1

IN THIS FACT SHEET

Moving Closer to Improving Travel in the I-66 Corridor

The I-66 Multimodal Study was initiated in July 2011 by the Virginia Department of Transportation (VDOT), in partnership with the Virginia Department of Rail and Public Transportation (DRPT). The study will identify and evaluate the transportation options for addressing the congestion and mobility needs of the I-66 corridor inside the Capital Beltway, between I-495 and the Theodore Roosevelt Bridge. It will consider a wide range of complementary and mutually supportive multimodal improvement options, such as public transportation, transportation demand management, high occupancy vehicle lanes, high occupancy toll lanes, congestion pricing, managed lanes, active traffic management, bicycle and pedestrian corridor access, and highway improvements.

The study builds on the results of the I-66 Transit/Transportation Demand Management Study, completed in 2009 for DRPT. The study is also being coordinated with the I-66 Tier 1 Environmental Impact Study (EIS) outside the Beltway, led by VDOT and DRPT. The I-66 Multimodal Study will focus primarily on assessing the performance of various alternatives in improving travel mobility in the corridor. The findings from this study will lead to a recommended set of improvements for the I-66 corridor inside the Beltway. A final report is anticipated in Summer 2012.

1

Factors Influencing Travel

There are a number of factors influencing travel, including growth in the region and significant transportation investments being made, including the extension of Metrorail (the Silver Line), and the expansion of HOT lanes on I-495. The study is designed to explore and define transportation solutions to address current and future transportation issues and needs in the I-66 corridor inside the Beltway.

Study Outcomes

The study will identify a number of solutions to alleviate the congestion and mobility issues in the I-66 corridor inside the Beltway. The principal outcomes of the study include:

- Review of existing plans and studies and analysis of travel, demographic, land use, and population data to identify key issues and needs in the I-66 corridor inside the Beltway
- Extensive public outreach, including market research, stakeholder interviews, and public meetings to help inform commuter priorities for transportation improvements
- Inventory of multimodal transportation options available to enhance mobility
- Analysis and evaluation of the transportation strategies, projects, policies, or programs to identify 8-10 options with the most potential for enhancing mobility in the I-66 corridor inside the Beltway
- Analysis of 4-5 multimodal options packages designed to address the mobility issues in the I-66 corridor inside the Beltway
- Development of multimodal recommendations to improve mobility in the I-66 corridor inside the Beltway

Next Steps

In order to present the preferred options for reducing highway and transit congestion, several key tasks will be conducted between now and Summer 2012. Key short-term steps include the following items.

Define Future Transportation Needs and Issues: Identify factors influencing travel within the study area, including population and employment growth, changes in land use and development, and changes in travel. Existing and planned infrastructure will also be inventoried and assessed to determine the specific long-term transportation needs and issues within the study corridor.

Inventory of Mobility Option Elements: Develop a list of possible mobility options to address the transportation needs and issues. Project types include improved transit facilities and/or services (e.g., priority bus, dedicated lane, new service), modifications to highway facilities and/or operating policies (e.g., high occupancy vehicle lanes, high occupancy toll lanes, arterial road widening), intelligent transportation systems (e.g., signal timing optimization and dynamic message signs), intermodal access (e.g., bus bays, bicycle parking, access to transit), ridesharing, and bicycle and pedestrian mobility enhancements (e.g., new trail connectors, on-road facilities, and trail widening).

Organize the Set of Mobility Options: Based on the needs and issues assessment, the mobility option elements will be organized into a series of mobility options that will undergo a quantitative assessment to distill the mobility options into a set of packages and ultimately a set of recommendations.

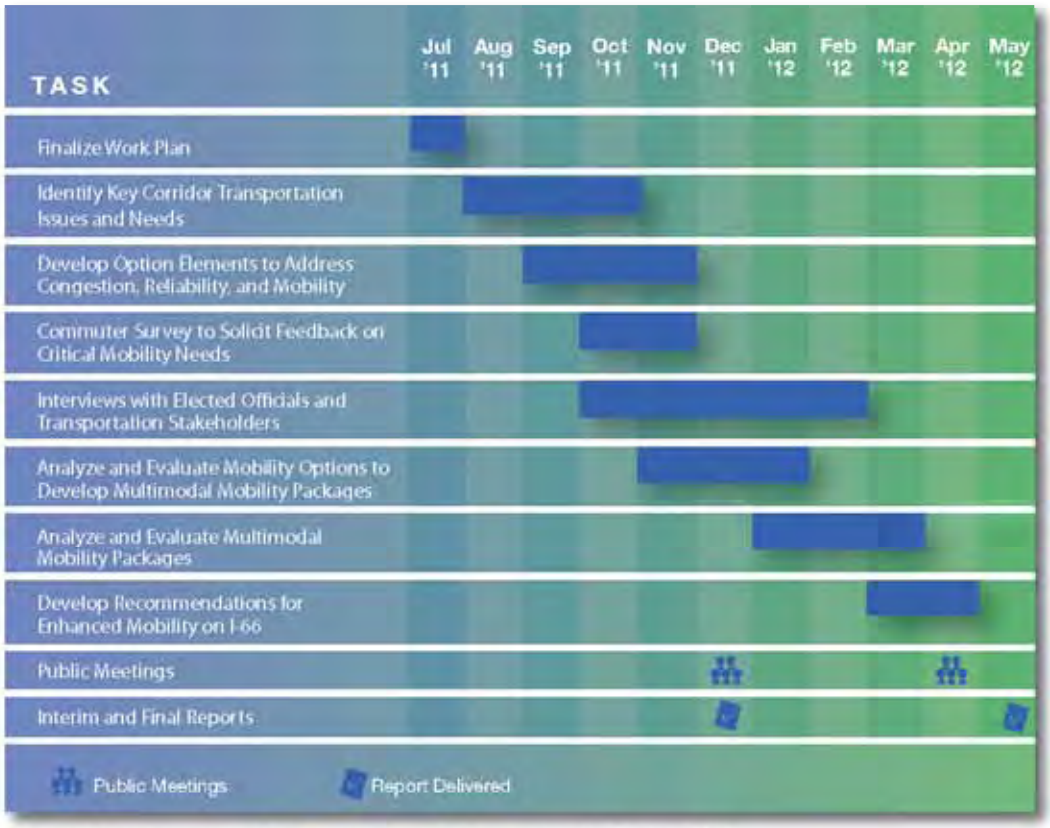
Mobility Options Public Dialog: There will be several opportunities to review and comment on the mobility options, including two public meetings held at locations in Fairfax County and Arlington County in December 2011. The study team is also conducting market research to help capture the opinions of commuters. Finally, a series of individual interviews will be conducted to help inform the study team and agencies guiding the study.

Toll-free 855 STUDY66 (788-3966) *www.i66multimodalstudy.com*

Study Participants

To ensure that the study uses a broad lens to evaluate options, VDOT has formed a Participating Agency Representative Committee (PARC). The PARC meets with VDOT, DRPT, and the project consulting team to provide input on draft materials and advise the study. In addition, representatives have been asked to serve as a liaison with their respective agencies and elected officials and to help distribute study information to their constituents and interested citizens. The membership includes transportation representatives from: Arlington County, City of Alexandria, City of Fairfax, City of Falls Church, District of Columbia, Fairfax County, Loudoun County, Metropolitan Washington Council of Governments, Northern Virginia Transportation Commission, Potomac and Rappahannock Transportation Commission, Prince William County, Town of Vienna, Virginia Railway Express, and the Washington Metropolitan Area Transit Authority.

Schedule/Key Milestones



This study has an aggressive schedule, with all work to be completed by Summer 2012

UPCOMING PUBLIC PARTICIPATION MEETINGS

Two public meetings will be held to capture valued input.

Fairfax County Meeting
December 6, 2011
6-8 pm
Mary Ellen Henderson Middle School
7130 Leesburg Pike
Falls Church, VA 22043

Arlington County Meeting
December 14, 2011
6-8 pm
Arlington County Government Offices
2100 Clarendon Boulevard
Arlington, VA 22201

Contact Us

Have an idea? Want to be sure to be notified of upcoming meetings and events? Please send us an email or leave us a message. Your input and suggestions are greatly appreciated and will be reviewed by the study team. As we reach study milestones, we will share timely updates on the project website.

Email
info@i66multimodalstudy.com

Call toll-free
855 STUDY66 (788-3966)

Visit
www.i66multimodalstudy.com

DRPT

VDOT
Virginia Department of Transportation

Public Participation Opportunities

Public input is critical to the success of this study. As noted, public meetings are being scheduled and numerous personal interviews are being held with elected officials and key stakeholders. Additionally, market research is being conducted to capture the opinions of commuters. The input received from the outreach efforts is being documented and will be used to help identify solutions for addressing the long-term mobility needs in the I-66 corridor inside the Beltway.

If you are interested in commenting by phone and/or email, please use the contact information noted in this fact sheet (see left column) or stay informed by visiting the study webpage at http://www.i66multimodalstudy.com/.

Figure A.16 Project Fact Sheet #2

I-66 Multimodal Study Inside the Beltway 2

Identifying solutions between I-495 and the Theodore Roosevelt Bridge FACT SHEET 2

IN THIS FACT SHEET

Overview of I-66 Multimodal Study

The I-66 Multimodal Study is focused on developing a set of recommendations for multimodal mobility options which can help reduce congestion and improve mobility along the I-66 corridor inside the Beltway, between I-495 and the Theodore Roosevelt Bridge. The study employs a structured framework for arriving at a set of multimodal recommendations, including the process of screening a list of potential mobility option elements for the I-66 corridor down to a focused set of recommendations. As illustrated below, the evaluation methodology for the study provides a means to move from a starting point of numerous ideas – referred to as mobility option elements – down a path to recommendations, considering first a set of eight to ten mobility options. The best of these mobility options are combined into a set of four or five mobility option packages for evaluation before recommendations are developed.

...the study provides a means to move from a starting point of numerous ideas – referred to as mobility option elements – down a path to recommendations...

1

Identification of Issues and Needs

The first step in the I-66 Multimodal Study is to systematically identify the key issues and needs in the corridor. The defined set of transportation issues and needs provides the foundation for the entire study since eventual mobility solutions will target these specific problems. The issues and needs were developed based on a number of inputs. A review of relevant studies and proposed projects revealed a list of existing and new planning ideas. Forecasts were done to identify the regional factors influencing travel demand in the study area, including growth patterns, employment and demographic data, and the existing and planned modal networks. A top level analysis of year 2040 travel patterns was also conducted to understand mobility in the corridor.

Collectively, the technical analyses and insight from commuters and stakeholders identified the primary issues and needs within the study area, which include:

> Westbound Roadway Congestion

> Eastbound Roadway Congestion (include interchange capacity constraints at the Dulles Toll Road)

> Capacity Issues at I-66/Arterial Interchanges

> Non-HOV Users during HOV Operation Hours

> Orange Line Metrorail Congestion

> Adverse Impact of Roadway Congestion on Bus Service

> Challenges to Intermodal Transfers (rail, bus, bike, car)

> Bottlenecks on W&OD and Custis Trails

> Limitations/Gaps in Bicycle and Pedestrian Accessibility and Connectivity

Mobility Option Elements

A comprehensive list of mobility option elements was assembled from existing plans and studies as well as through identification of gaps in the transportation system. The initial inventory includes over 100 highway, transit, bicycle/pedestrian, transportation demand management (TDM), and intelligent transportation systems (ITS) strategies, projects, programs, or policies that have the potential to address congestion and/or enhance mobility in the I-66 corridor. The list of mobility option elements was refined through discussions with Participating Agency Representatives Committee (PARC) members, staff from the Virginia Department of Transportation (VDOT) and Virginia Department of Rail and Transportation (DRPT), other stakeholders, and the consultant team.

Preliminary Mobility Options to Address Issues and Needs

The next step in this process is to take the large list of mobility option elements and assemble a discrete set of mobility options for testing to address the identified issues and needs. Moving from mobility option elements to mobility options requires application of a synthesis process that:

> Focuses on the alignment of mobility option elements with the identified issues and needs,

> Ties mobility option elements to the study area and goal, and

> Addresses potential fatal implementation constraints associated with the mobility option elements.

Eight to ten mobility options are currently being developed for testing using this process.

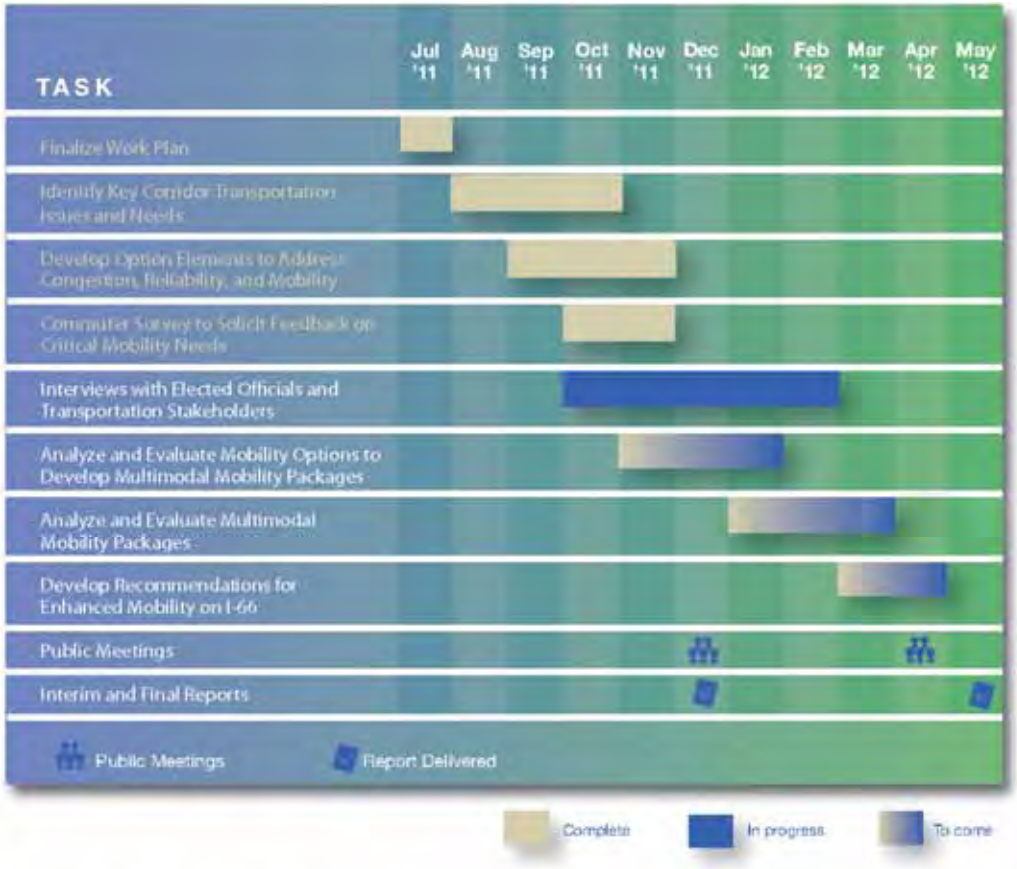
2 **I-66 Multimodal Study** Inside the Beltway

Toll-free 855 STUDY66 (788-3966) *www.i66multimodalstudy.com*

Next Steps

The next several months include several technical analysis activities associated with the Study. First, formulation of the eight to ten mobility options for testing will be completed. These options will then be assessed using quantitative measures from the travel demand forecasting model, including change in share of non-SOV (single occupancy vehicle) travel, change in person throughput, and change in congested vehicle miles traveled (VMT) in the study area. A qualitative assessment will also be performed. Next, four to five multimodal mobility option packages will be developed, informed by the mobility option testing. After these packages are assembled, additional technical analyses and evaluation to arrive at potential study recommendations will be undertaken, again employing the travel forecasting model. Once recommendations are drafted, another round of public meetings will be held to review them with the public in advance of the publication of a final report. It is anticipated that these meetings will be scheduled in April 2012.

Schedule/Key Milestones



This study has an aggressive schedule, with all work to be completed by Summer 2012.

3 **I-66 Multimodal Study** Inside the Beltway

Toll-free 855 STUDY66 (788-3966) *www.i66multimodalstudy.com*

PUBLIC PARTICIPATION MEETINGS

Public meetings will be held to capture valued input.

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December 14, 2011
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The next round of Public Meetings will occur in April 2012.

Contact Us

Have an idea? Want to be sure to be notified of upcoming meetings and events? Please send us an email or leave us a message. Your input and suggestions are greatly appreciated and will be reviewed by the study team. As we reach study milestones, we will share timely updates on the project website

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www.i66multimodalstudy.com

DRPT

VDOT

Public and Stakeholder Involvement

Two key public involvement activities are underway or completed. These include:

> **Market Research** – A market research effort was undertaken to explore transportation characteristics, perceptions, attitudes, and preferences of commuters in the I-66 corridor inside the Beltway. The survey reached commuters using single occupant vehicles, hybrid vehicles, carpools, local bus, express bus, Metrorail, VRE, and bicycle in the corridor. More than 3,500 respondents in total completed the survey. Preliminary results support looking at a variety of mobility options in the corridor. The market research will assist in identifying appropriate mobility options to advance towards testing.

> **Stakeholder Interviews** – To engage and inform elected officials and transportation stakeholders, a series of nearly sixty stakeholder interviews are being conducted. These interviews will enable the project team to obtain valuable input and insights into the corridor and its users. Information received is serving as additional input into the formulation of the mobility options for testing.

How to Stay Informed and Involved

There are several ways that you can stay informed and involved in the I-66 Multimodal Study. You can provide comments at the December public meetings. Alternatively, you can provide comments anytime via email: info@i66multimodalstudy.com or the project hotline: 855-STUDY66 (788-3966).

To view the study area map, Fact Sheet #1, and other pertinent information about the study, visit the study webpage at: www.i66multimodalstudy.com.

Figure A.17 Project Fact Sheet #3

I-66 Multimodal Study Inside the Beltway 3

Identifying solutions between I-495 and the Theodore Roosevelt Bridge FACT SHEET 3

IN THIS FACT SHEET

About the Study

The I-66 Multimodal Study is focused on developing a set of recommendations for multimodal mobility packages which can help reduce congestion and improve mobility along the I-66 corridor inside the Beltway, between I-495 and the Theodore Roosevelt Bridge

Fact Sheets

1 **Study Overview and Outcomes**

2 **Issues and Needs and Study Process**

From Issues and Needs to Options

The identified issues and needs (see Fact Sheet #2) in the I-66 study corridor, served as the basis for formulating eleven mobility options. The options represent potential elements that could be incorporated into solutions to address the specific capacity and congestion challenges commuters face on a daily basis. The identification and development of these options was initially informed by market research, stakeholder interviews, previous studies, the technical study team, and members of the Public Agency Representative Committee (PARC). The mobility options were presented to the public at the first round of public meetings in December and refined by the project management team based on public comments. The mobility options selected for the first level of assesment include

- A. HOV Restrictions
- B1. I-66 Bus/HOV/HOT Lane System – Option 1
- B2. I-66 Bus/HOV/HOT Lane System – Option 2
- C1. I-66 Capacity Enhancement – Option 1
- C2. I-66 Capacity Enhancement – Option 2
- D. Integrated Corridor Management
- E. Arterial Capacity Enhancement
- F. Metrorail Level of Service and Capacity
- G. Bus Transit Level of Service and Capacity
- H. Transportation Demand Management
- I. Bike/Pedestrian System Enhancements

Each mobility option was evaluated to see how it would:

> Increase the share of non-single occupancy vehicle (SOV) travel in the study area.

> Increase personal mobility, regardless of mode

> Reduce congested Vehicle Miles of Travel (VMT).

To move from options to packages, the study objectives attempt to balance the assessment measures by improving travel options and personal mobility, and minimizing vehicle miles of travel

1

Mobility Options

The following descriptions of the mobility options provide suggested applications and key findings.

A. HOV Restrictions

> I-66 lanes in both directions are designated Bus/HOV during peak periods
> No new lanes added
:: In the peak direction, all lanes are Bus/HOV 3+ only during peak periods (no change from CLRP)
:: In the reverse-peak direction, all lanes are Bus/HOV 2+ only during peak periods
:: In off-peak periods all lanes are open to all traffic

Key Finding: **Due to the HOV 2+ restriction, this option reduces travel on I-66** in the reverse-peak direction and shifts vehicle travel onto parallel roads or outside the study area.

B1. I-66 Bus/HOV/HOT Lane System – Option 1

> Converts I-66 into an electronically tolled Bus/HOV/high occupancy toll (HOT) roadway
:: SOV and HOV 2 vehicles would be tolled
:: Bus/HOV 3+ vehicles would not be tolled
:: Applies to all lanes in both directions 24/7

Key Finding: This mobility option allows non-HOV 3 vehicles to use I-66 by paying a toll, making full use of the available capacity while maintaining a good level of service. This increases person throughput on I-66 in the peak direction and eases congestion on some of the surface arterials.

B2. I-66 Bus/HOV/HOT Lane System – Option 2

> Converts I-66 into an electronically tolled Bus/HOV/HOT roadway and adds a lane in each direction
:: SOV and HOV 2 vehicles would be tolled
:: Bus/HOV 3+ vehicles would not be tolled
:: Applies to all lanes in both directions 24/7

Key Finding: **This option is similar to Option B1 and, due to the added tolled** capacity, allows more SOV's access to I-66. This shift helps ease congestion on the surface arterials but also attracts travelers who had previously been using transit.

C1. I-66 Capacity Enhancement – Option 1

> An additional lane is added in both directions
:: In the peak direction, all lanes are Bus/HOV 3+ only during peak hours
:: In the reverse-peak direction, one lane is Bus/HOV 2+ during peak hours, and the rest are general purpose lanes
:: In off-peak periods all lanes are open to all traffic

Key Finding: **This option primarily eases congestion on I-66 in the reverse-peak** direction, although the additional incremental capacity is restricted to HOV 2+. The HOV 3+ restriction on all lanes during peak periods limits use of new incremental capacity in the peak direction.

C2. I-66 Capacity Enhancement – Option 2

> An additional lane is added in both directions
:: In the peak direction, all lanes are Bus/HOV 3+ during peak hours
:: In the reverse-peak direction, all lanes are general purpose lanes during peak hours
:: In off-peak periods all lanes are open to all traffic

Key Finding: **Because there are no restrictions in the reverse-peak direction w**ith the added capacity, this option primarily eases congestion on I-66 in the reverse-peak direction. This new capacity shifts some traffic from surface arterials. As with Option C1, the HOV 3+ restriction in the peak direction limits use of the new capacity in that direction.

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D. Integrated Corridor Management (ICM)

> Deploy ICM strategies throughout the corridor
- :: I-66 Active Traffic Management
- :: Multimodal Real Time Traveler Information
- :: Ramp Metering
- :: Dynamic Merge
- :: Transit Signal Priority

Key Findings: This option includes a range of technological improvements designed to improve traffic flow and operations on roadways throughout the corridor. Improvements will affect both automobiles and buses, making travel in the corridor easier at key locations, such as the I-66/Dulles Connector Road merge.

E. Arterial Capacity Enhancement

> Enhance U.S. 50
- :: Apply access management principles
- :: Implement Bus-Only lane in each direction and improve bus service in the corridor
- :: Bus lane was introduced by adding new shoulders
- :: Shoulder is not open to general traffic during off-peak hours

Key Findings: This option transforms U.S. 50 into a limited access expressway, which increases its capacity and increases vehicle traffic. The increased transit speeds and services from the bus-only lanes do not offset the effects of the capacity improvements for autos. In part, the transit service provided in the option does not fully serve the most-productive transit markets.

F. Metrorail Level of Service and Capacity Enhancement

> Provide operating flexibility for Metrorail and an alternative connection between the I-66/Dulles Access Road Corridors and South Arlington through an interline connection between the Orange Line and Blue Line.

Key Findings: This option changes the operating plan for Metrorail to provide direct service between the Ronald Reagan Washington National Airport, South Arlington, the Rosslyn-Ballston Corridor, and points west along the Silver Line via a new interline connection between Court House and Arlington Cemetery. This option provides additional service on the Orange/Silver Lines between Court House and East Falls Church and direct connections to new markets. Flexibility of Metrorail is enhanced, but ridership effects in the study area are modest.

G. Bus Transit Level of Service and Capacity

> Includes several planned enhancements to local, commuter, and regional bus services including bus route changes and additions
> Includes new and enhanced Priority Bus services with 10-minute peak period frequency on I-66, US 29 and US 50.

Key Findings: This option increases bus service in the corridor and has the most positive impact on reducing the level of congestion in the study area. The increased transit service also attracts new transit riders and reduces the single occupancy vehicle mode share in the study area.

H. Transportation Demand Management (TDM)

> Enhanced TDM strategies are drawn from the I-66 Transit/TDM Study.

- :: Enhanced Corridor Marketing
- :: Vanpool Driver Incentive
- :: I-66 Corridor Specific Startup Carpool Incentives
- :: Rideshare Program Operational Support
- :: Carsharing at Priority Bus Activity Nodes
- :: Enhanced Virginia Vanpool Insurance Pool
- :: Enhanced Telework! VA

Key Findings: A range of improved TDM strategies and programs including marketing and outreach, vanpool programs, and financial incentives will be able to attract some new commuters to alternative modes, decreasing the SOV mode share for work trips. The success of this option is dependent on the level of investment.

I. Bike/Pedestrian System Enhancements

> Add new connections (on- and off-road) to address gaps and improve connections
> Improve bicycle/pedestrian access to transit (bus and rail)
> Expand bicycle parking at transit stations
> Expand bikesharing program

Key Findings: This option includes many improvements to the pedestrian and bicycle systems designed to make non-motorized travel in the study area easier and more appealing. The improvements are especially focused on improving access to Metrorail stations, encouraging more transit use.

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HOW TO STAY INFORMED AND INVOLVED

Stay informed by visiting www.i66multimodalstudy.com where you can learn more about the study and key milestones, find contact information, and view and download study documents, including the December 2011 public meeting presentation and presentation boards, market survey, comment form, map of the study area, Fact Sheets, and Interim Report.

If you are interested in commenting by phone and/or email, please contact us at info@i66multimodalstudy.com or 855 STUDY66 (788-3966)

UPCOMING PUBLIC PARTICIPATION MEETINGS

Two public meetings will be held to capture valued input on the proposed recommendations.

Arlington County Meeting
April 24, 2012
6:30-8:30 pm
The Navy League Building,
Main Floor Board Room
2300 Wilson Boulevard
Arlington, VA 22201

Fairfax County Meeting
April 25, 2012
6:30-8:30 pm
Mary Ellen Henderson
Middle School
7130 Leesburg Pike
Falls Church, VA 22043

DRPT

VDOT
Virginia Department of Transportation

Next Steps

> Working with the PARC, the study team is currently sorting through the Mobility Option results to define up to 5 Multimodal Packages for detailed assessment. The Packages represent fully integrated options that combine transit, TDM, bicycle, pedestrian, technology and roadway improvements to address congestion and mobility in the I-66 study area.

> The various Multimodal Mobility Packages will be presented at the next round of public meetings. The PARC and the study team will develop a final set of recommendations based on the technical results and the public input received.

Public Participation

Eighty-five public comments have been received since the study's inception and over twenty-five stakeholders have been interviewed about their preferences for multimodal solutions in the I-66 study area. The comments and suggestions were used to inform the mobility options and will be carried forward to the multimodal packages.

Key public and stakeholder comments include:

> Congestion is a major issue in the I-66 corridor and should be addressed as soon as possible.

> Prior to considering capacity improvements to I-66, all multi-modal mobility solutions should be evaluated.

> Support for HOT lanes was mixed, with most respondents wanting more information before making a decision.

Suggested improvements include:

Metrorail: Increase Metro train frequency on the Orange Line during peak periods; address the issues of parking availability at Metrorail stations; and increase access to Metrorail stations with bus, bike, and pedestrian connections.

Bus: Improve and add bus services (express and local), especially during peak periods, to alleviate Metrorail congestion; and coordinate bus schedules and times so it is a reliable mode for commuters.

TDM: Provide incentives to businesses and employees to promote carpooling and alternative mode choices.

Bike/Pedestrian: Address the network gaps and improve connections to Metrorail stations and Metrobus stops; add bicycle facilities (e.g., stands, lockers, bikeshares) at Metrorail station; and make safety improvements (e.g., lighting, signage, buffers) to trails.

HOV: Implement HOV restrictions for reverse usage and increase the hours of use, but create additional incentives and opportunities for ridesharing; eliminate the hybrid exemption; and increase enforcement.

Widen I-66: Increase the number of lanes on I-66 that could be used by general traffic, Bus/HOV traffic or as HOT lanes.

Arterials: Improve critical intersections on U.S. 50; and add more public transit to the arterials, including additional buses and/or priority buses.

Technology: Improve technology to let drivers know about congestion and accidents.

Figure A.18 Project Fact Sheet #4

I-66 Multimodal Study Inside the Beltway 4

Identifying solutions between I-495 and the Theodore Roosevelt Bridge FACT SHEET 4

IN THIS FACT SHEET

About the Study

The I-66 Multimodal Study is focused on developing a set of recommendations for multimodal mobility packages which can help reduce congestion and improve mobility along the I-66 corridor inside the Beltway, between I-495 and the Theodore Roosevelt Bridge.

Fact Sheets

From Mobility Options to Multimodal Packages

Based on the analysis of the eleven Mobility Options, described in Fact Sheet 3, and input from the Participating Agency Representatives Committee (PARC) and stakeholders, four Multimodal Packages have been developed. Each package includes a variety of projects and programs to reduce congestion and improve mobility along the I-66 corridor inside the Beltway, between I-495 and the Theodore Roosevelt Bridge. These four packages are comprised of previously tested Mobility Options with some modifications and enhancements to better meet the needs of the corridor. All packages include integrated corridor management (ICM) solutions, transportation demand management (TDM) programs, and a range of pedestrian and bicycle improvements.

Key Components for Each Multimodal Package:

MULTIMODAL PACKAGE 1
Convert I-66 to a Bus/High Occupancy Vehicle (HOV)/High Occupancy Toll (HOT) Lane System

MULTIMODAL PACKAGE 2
Convert I-66 to a Bus/HOV/HOT Lane System and add a lane in each direction

MULTIMODAL PACKAGE 3
Add an HOV/Bus Lane to I-66 in each direction

MULTIMODAL PACKAGE 4
Enhanced Bus Service, including buses on shoulders along Route 50

1

Multimodal Packages

The following descriptions of the Multimodal Packages provide suggested applications and key findings. The findings for the packages are compared against the projected mobility and congestion outputs from the 2040 Baseline for this study.

Baseline Assumptions for 2040

The 2040 Baseline for the I-66 Multimodal Study is called the CLRP+ Baseline and is comprised of the 2011 Fiscally-Constrained Long-Range Plan (CLRP) plus the recommended bus services and Transportation Demand Management (TDM) measures from the 2009 I-66 Transit/TDM study. The CLRP is developed cooperatively by governmental bodies and agencies represented on the National Capital Region Transportation Planning Board and identifies all regionally significant transportation projects and programs that are planned and funded in the Washington metropolitan area between 2011 and 2040. Key assumptions included are:

- I-66 restricted to Bus/HOV 3+ in the peak direction
- I-66 westbound spot improvements #1, #2, #3
- Same I-66 HOV hours of operation as today
- Silver Line Phase I (to Wiehle Avenue) and Silver Line Phase II (to Dulles)
- New and enhanced Priority Bus services on I-66, U.S. 29, and U.S. 50
- TDM elements from the I-66 Transit/TDM Study
- Metrorail core capacity improvements, including 8-car trains

ICM, TDM, and Bicycle/Pedestrian Package Components

Integrated corridor management, transportation demand management, and bicycle/pedestrian solutions will be included in all four of the Multimodal Packages.

Integrated Corridor Management (ICM)

ICM brings together a variety of technology elements, providing drivers, transit users, carpoolers, and bicyclists, with information to be able to make informed transportation decisions in advance or in real time. When ICM elements are implemented, users can expect greater travel time reliability and more efficient use of corridor infrastructure. The I-66 Active Traffic Management (I-66 ATM) project is addressing several such improvements.

Specific elements of ICM considered in the I-66 Multimodal Study include:

- Enhanced Ramp Metering (I-66 ATM)
- Dynamic Merge (Junction Control) (I-66 ATM)
- Enhanced Dynamic Message Signs (I-66 ATM)
- Continuous Closed-Circuit Television Coverage (I-66 ATM)
- Speed Harmonization
- Advanced Parking Management System
- Multimodal Traveler Information
- Signal Priority for Transit Vehicles

Transportation Demand Management (TDM)

The following TDM measures, which are strategies and policies used to reduce travel demand, have been chosen for inclusion in the packages. These measures have proven effective for reducing single occupancy travel and person-miles of travel, and complement the corridor enhancements in each Multimodal Package.

Bicycle
- Bike Hubs/Storage at Priority Bus Activity Nodes
- Capital Bikeshare Marketing

Employer Outreach
- Enhanced Corridor Marketing
- Enhanced Telework! VA
- Northern Virginia Ongoing Financial Incentive
- Enhanced Employer Outreach

Technology
- Online/Mobile Traveler Information Apps

Transit
- Try Transit and/or Direct Transit Subsidy

Carpool
- I-66 Corridor Specific Startup Carpool Incentives
- Rideshare Program Operation Support
- Carsharing at Priority Bus Activity Nodes
- Dynamic Ridesharing

Vanpool
- Vanpool Driver Incentive
- Enhanced Virginia Vanpool Insurance Pool
- Capital Assistance for Vanpools
- Flexible Vanpool Network
- Van Priority Access

Bicycle/Pedestrian

Bicycle and pedestrian improvements are included to support active transportation by bicycling and walking, increasing the potential for shift from motorized modes. Recommendations are primarily sourced from existing plans from Arlington and Fairfax counties, as well as the City of Falls Church.

- On road bicycle facilities: bike lanes, shared lane markings, signed bike routes, and bike boulevards.
- Off road improvements: new or improved shared use paths, Metro station access improvements, and trail / road intersection safety improvements.
- Spot improvements: intersection crossing improvements.
- End of trip improvements: bike parking at county facilities, commercial areas, and Metrorail stations new Capital Bikeshare stations in Arlington and Falls Church.

Multimodal Package 1

> Converts I-66 into an electronically tolled Bus/HOV/high occupancy toll (HOT) roadway
  :: SOV and HOV 2 vehicles would be tolled
  :: Bus/HOV 3+ vehicles would not be tolled
  :: Applies to all lanes in both directions 24/7

> **Several planned enhancements to local, commuter, and regional bus** services including route changes and additions. Many of the increases in bus service feed rail stations in the corridor.
> New and enhanced Priority Bus services with 10-minute peak period frequency
  :: I-66, U.S. 29, and U.S. 50

10-minute service frequency represents an enhancement over I-66 Transit/TDM Study service levels.

Key Findings: This package adds no additional physical lane capacity, maintaining the present configuration of I-66. It does apply a pricing strategy to permit SOV and HOV 2 users. Congested automobile usage decreases as a percentage of total automobile usage. However, in total there is a slight increase in automobile usage for both the morning and evening peak periods. Transit usage levels remain generally unchanged.

Multimodal Package 2

> Converts I-66 into an electronically tolled Bus/HOV/HOT roadway and adds a lane in each direction
  :: SOV and HOV 2 vehicles would be tolled
  :: Bus/HOV 3+ vehicles would not be tolled
  :: Applies to all lanes in both directions 24/7

> **Several planned enhancements to local, commuter, and regional bus** services including route changes and additions. Many of the increases in bus service feed rail stations in the corridor.
> New and enhanced Priority Bus services with 10-minute peak period frequency
  :: I-66, U.S. 29, and U.S. 50

10-minute service frequency represents an enhancement over I-66 Transit/TDM Study service levels.

Key Findings: This package adds lane capacity and applies a pricing strategy as in Package 1. It results in the lowest proportion of congested automobile usage among the packages for the study area. However, the added lane capacity produces the highest automobile usage for the study area. The additional transit service helps maintain the mode share, with only a slight reduction in transit mode share for work trips with destinations in the study area.

Multimodal Package 3

> An additional lane is added in both directions
  :: In the peak direction, all lanes are Bus/HOV 3+ only during peak hours.
  :: In the reverse-peak direction, one lane is Bus/HOV 2+ during peak hours, and the rest are general purpose lanes.
  :: In off-peak periods all lanes are open to all traffic.

> **Several bus planned enhancements to local, commuter, and regional** bus services including bus route changes and additions.
> Enhanced U.S. 50 bus service with new routes from Tysons and Fair Oaks continuing on U.S. 50 into the D.C. Core.
> New and enhanced Priority Bus services with 10-minute peak period frequency
  :: I-66, U.S. 29, and U.S. 50

10-minute service frequency represents an enhancement over I-66 Transit/TDM Study service levels.

Key Findings: This package adds lane capacity and provides a Bus/HOV 2+ only lane in the reverse peak direction. There is a slight increase in HOV 2 usage but HOV 3+ usage does not increase. Multimodal mobility increases during the off-peak periods, when the added lane on I-66 is open to all traffic, not during the peak commuter periods due to the HOV 3+ requirement. This package improves travel times for HOV and transit.

Multimodal Package 4

> Increased transit service for all routes entering the study area
  :: This included increased frequency on local, commuter, and regional bus services
  :: Headway on individual routes that were not part of trunk line services were set at a minimum of 15 minutes in the peak and 30 minutes in the off-peak.
  :: Trunk line routes were set for a combined headway of 15 minutes in the peak and 30 minutes in the off-peak.
> Enhanced U.S. 50 bus service with new routes from Tysons and Fair Oaks continuing on U.S. 50 into the D.C. Core using an added bus-only shoulder lane on U.S. 50.
> New and enhanced Priority Bus services with 10-minute peak period frequency
  :: I-66, U.S. 29, and U.S. 50

10-minute service frequency represents an enhancement over I-66 Transit/TDM Study service levels.

Key Findings: This package focused on enhancing transit service throughout the study area. It had the highest number of commuters using transit and the lowest number using single occupant automobiles. It produces slight decreases in overall vehicle travel (VMT) and congested VMT.

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Sensitivity Tests

All four packages were evaluated to see how they would reduce congestion and improve mobility in the corridor. In two instances, package assumptions were modified to see how the performance of packages would change. This process is called a sensitivity analysis or test.

Test 1 - Modified Package 1: In the original Package 1, the lanes on I-66 are converted to HOT Lanes at all times (24/7). The sensitivity test keeps the HOT lanes in both directions during peak periods only.

Key Finding: This sensitivity test showed that tolling in only the peak periods also helped address the study goals. The congestion in the peak periods was reduced similar to Package 1. During off-peak periods usage remained similar to the year 2040 baseline and was higher than in Package 1.

Test 2 - Modified Package 3: In the original Package 3, a lane is added to I-66 in both directions. The sensitivity test changes the additional lane to a HOT lane, which would be tolled at all times (24/7) in both directions.

Key Finding: The sensitivity test showed the impacts of a new lane being tolled. The price for the toll had to be relatively high due to the high demand and limited supply. In the peak direction, more volume is present in the tolled lane than in the adjacent free Bus/HOV 3+ lanes. In general, this configuration offers more mobility benefits than the original Package 3.

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Stay informed by visiting **www.i66multimodalstudy.com** where you can learn more about the study and key milestones, find contact information, and view and download study documents, including the public meeting presentation and presentation boards, market research, comment form, map of the study area, Fact Sheets, and Interim Report.

If you are interested in commenting by phone and/or email, please contact us at **info@i66multimodalstudy.com** or **855 STUDY66 (788-3966)**

Next Steps

Each Multimodal Package has meritorious aspects as well as unique issues. To fully evaluate the benefits and challenges of each one, a recommendations framework has been developed. The framework assesses package performance against the study goals and objectives. The recommendations framework will help synthesize the the various technical analyses and incorporate feedback from stakeholders and the public into a useful guide to potential future investment in the I-66 corridor to improve mobility and reduce congestion.

Schedule / Key Milestones

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Appendix B

Market Research Final Report

Appendix B

Market Research Final Report

I-66 Multimodal Inside The Beltway Market Research Study

February 28, 2012

Outline of Report

- Objectives and Methodology
- Detailed Findings
  - Tripographics
  - Factors Influencing Mode Choice
  - Perceptions of I-66
  - HOV Lanes on I-66
  - Proposed Changes to I-66
  - Roadway Changes
  - Transit
  - TDM
  - Scenario Testing
  - Bikes
- Conclusions and Implications

Market Research Objectives

- Identify and assess inside the Beltway commuters' perceptions of issues related to transportation, travel and mobility in the I-66 corridor
- Identify and rank their travel and mobility needs, expectations and priorities
- Determine their priorities for transportation improvements
- Identify and profile current travel modes used, routes traveled and purpose of trips
- Identify the factors guiding commute choice decisions
- Assess the propensity of commuters to change their current mode choices
- Identify the relative appeal of specific mobility option elements (i.e., roadway, transit, bicycle and TDM alternatives) to increase the likelihood of using non-SOV modes by assessing commuter responses to such possible changes

Study Methodology

- In order to meet the objectives established for this research, an online survey was conducted among commuters in the I-66 corridor.
- A Topics Guide was developed and used to create the questionnaire. The Participating Agency Representatives Committee (PARC) reviewed and provided input for both the Topics Guide and the questionnaire.
- The questionnaire was programmed and tested prior to launch. It included elaborate skip patterns to accommodate multiple modes, travel behaviors and commute patterns. It required approximately 25 minutes for respondents to complete the survey.
- The questionnaire included scaled attitude and opinion questions, open-ended questions, and "scenario testing," addressing preferences for mode (SOV, Priority Bus, carpool and Metrorail) given various cost and time parameters.
- A $5 gourmet coffee card was offered to respondents as a "thank you" incentive.

Study Methodology

- In order to qualify for this study, respondents had to commute to work/school in the I-66 corridor inside the Beltway. They could be traveling along I-66, U.S. 29, U.S. 50, Wilson Boulevard, Clarendon Boulevard, Washington Boulevard or other roadway in the corridor. Alternatively, they could be traveling one of these roadways but had chosen a mode that did not require them to travel one of these roadways, such as riding a bike, Metrorail or VRE.
  - They had to be traveling *inside* the Beltway.
  - Their commute had to occur during morning peak travel times.
  - They could be traveling any direction.

Study Methodology

- The sample consists of commuters across a variety of transportation modes:
  - SOV (gasoline engine and hybrid)
  - Formal carpool
  - Vanpool
  - Express bus
  - Local bus
  - Metrorail
  - VRE
  - Bike or walk
- Sample size quotas were established for each commute mode, headed east and headed west. Target sample sizes ranged from 100 to 300.

Survey Invitation Approach by Mode

- Residents (SOVers and other modes): Mailed 75,000 postcards announcing this study to residents living across the study area.
- Carpoolers: Emailed an online survey invitation and link to COG's Commuter Connections' database registrants who live in the study area.
- Local and Express Bus: Reached through postcard mailing and Commuter Connections' database.
- Metrorail: Hand distributed postcard invitations at various Metrorail stops during peak travel times.
- VRE: Posted survey invitation in VRE's electronic newsletter.
- Bike Riders and Pedestrians: Hand distributed cards on trails and paths.

Research Sample by Mode

- Mode classification is based on primary commute mode, using this question:

  Which of the following types of transportation do you use as your **primary mode of commute** on your morning trip to work or school? That is, which do you use most days of the week? If you use more than one type of transportation on a single day, please tell us the type you use for the **longest portion** of your trip to work or school.

- Some commuters ride a bus, rail or bike although this mode might not be their primary commute mode. Thus, regardless of whether these alternate modes are their primary modes, all bus and rail riders and all bike riders and pedestrians are also classified by these "other" modes. Consequently, some of the mode classifications are not mutually exclusive.

Research Sample by Mode

Mode and direction defined by morning commute. VRE runs only east during morning peak.

Mode	Target Quota	Analytical Sample Size
SOV		
Gas engine – Eastbound	300	781
Gas engine – Westbound	300	255
Hybrid – Eastbound	-	171
Hybrid – Westbound	-	17
Formal carpool – Eastbound	200	581
Formal carpool – Westbound	100	30
Local bus – Eastbound	125	152
Local bus – Westbound	125	14
Express bus – Eastbound	100	372
Express bus – Westbound	-	19
Metrorail – Eastbound	200	674
Metrorail – Westbound	100	108
VRE – Eastbound	100	194
Bike	150	191
Total	**1,800**	**3,559**

Note: In addition, 33 vanpoolers and 9 pedestrians (only) completed the survey.

Data Analysis

- To make the best use of the data, this report focuses on the following commute groups:
  - Eastbound SOV
  - Westbound SOV
  - Eastbound Carpool
  - Eastbound Local Bus
  - Eastbound Express Bus
  - Eastbound Metrorail
  - Westbound Metrorail
  - VRE
  - Bike

Routes traveled in corridor

Proportions indicate commuters who travel the roadway at least 3 days per week. Metrorail and VRE riders not shown because these commuters may not consider themselves traveling on these roadways.

I-66 Is the Most Frequently Traveled Route in the Corridor; U.S. 50 Is a Distant Second

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - East
I-66	71%	88%	95%	95%	94%
U.S. 50	15%	8%	9%	0	2%
U.S. 29	8%	4%	<1%	1%	2%
Wilson Boulevard	4%	3%	1%	3%	1%
Clarendon Boulevard	2%	2%	1%	1%	1%
Washington Boulevard	7%	4%	2%	1%	1%
Other roadway	3%	<1%	1%	1%	1%

Note: Commuters could be traveling on several of these roadways.

Q3/Q8/Q15. How many days a week (Monday through Friday) do you travel on I-66 / U.S. 29 / U.S. 50 / Wilson Boulevard / Clarendon Boulevard / Washington Boulevard / other roadway?

Travel inside the Beltway

Frequency of Travel Inside and Outside the Beltway Varies Considerably by Mode; VRE Riders Are Most Likely to Travel Both Inside and Outside the Beltway; Eastbound Metrorail Riders Are Least Likely to Travel Both Inside and Outside the Beltway; Other Modes More Closely Resemble Metrorail than VRE

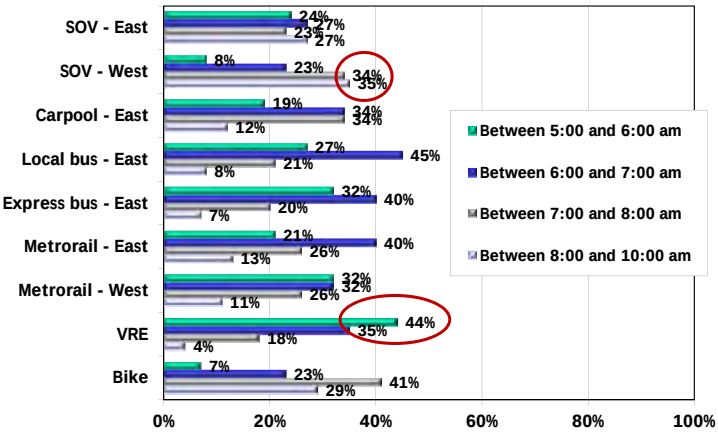
Question asked of those who travel on I-66 at least 3 days a week.

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - East	Metro -rail - East	Metro rail - West	VRE
Inside the Beltway only	31%	38%	37%	24%	37%	42%	34%	6%
Both inside and outside the Beltway	69%	62%	63%	76%	63%	58%	66%	94%

Q3a. When you travel on I-66 on your morning commute, do you travel only inside the Beltway or do you travel both inside and outside the Capital Beltway?

Time leave home for morning commute

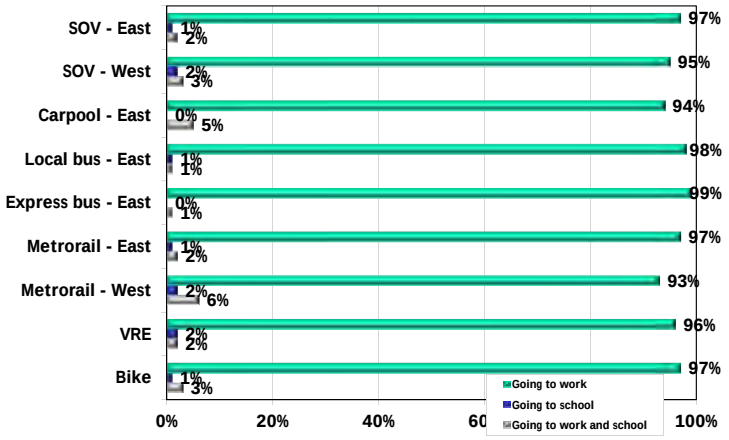
VRE Commuters Have the Earliest Commutes; 79% of VRE Riders Are Out the Door by 7:00 am. SOV (Especially those Headed West) and Bike Commuters Leave Home the Latest



Q26. About what time do you typically leave home for your morning commute?

Purpose of trip

For the Most Part, Commuters Are Traveling to Work

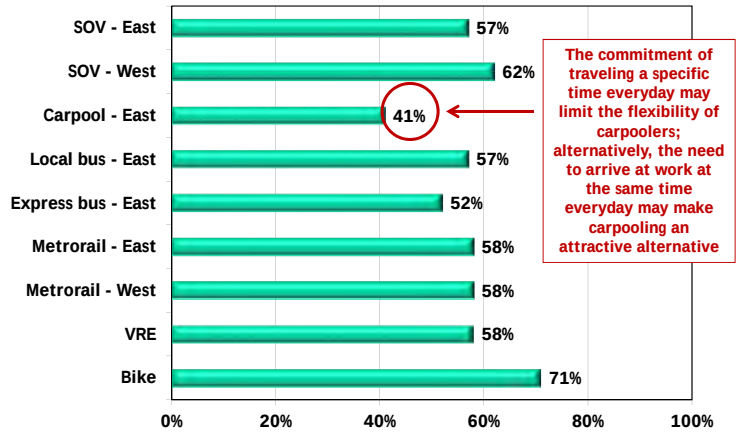


Q25. What is the purpose of your morning travel in the I-66 corridor? Are you going to work, going to school, or going to work and school?

Have flexibility in morning departure time

More than Half Say They Have Flexibility in their Morning Departure Time; the Exception Is Carpoolers

-- Bike Riders Are Especially Likely to Have Flexibility in their Morning Departure Time --

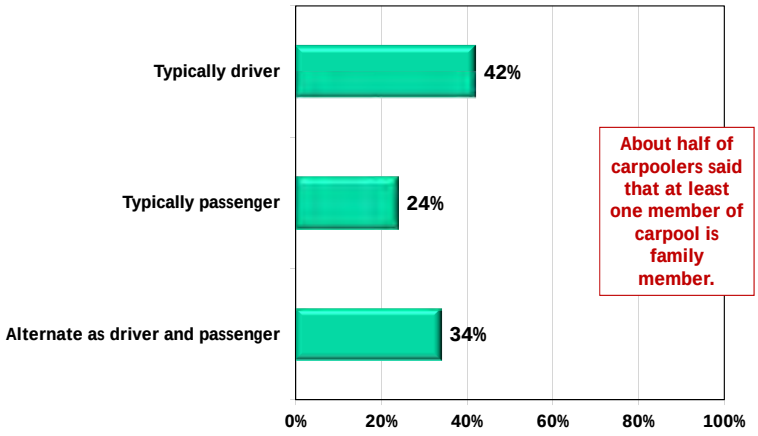


Q27. Do you have flexibility in your daily departure time – that is, can you vary your arrival time at work/school?

Carpool role - Eastbound Carpool

Base size for Westbound carpoolers too small to report.

Carpool Respondents Were More Likely to Be the Driver of the Carpool or to Alternate as Driver and Passenger

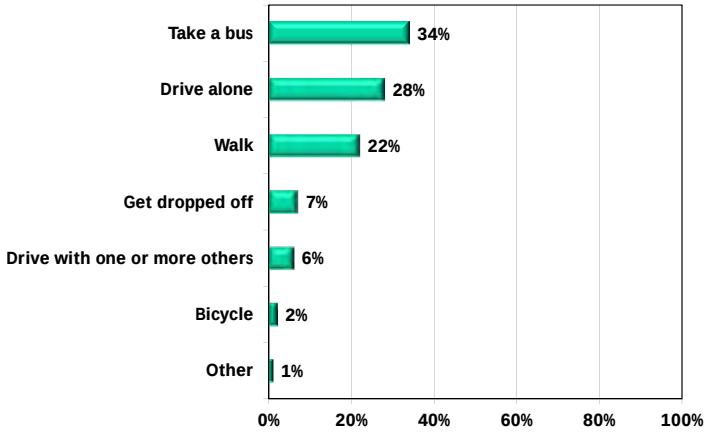


About half of carpoolers said that at least one member of carpool is family member.

Q31. What is your typical role when carpooling or vanpooling?

Mode to Metrorail - Eastbound

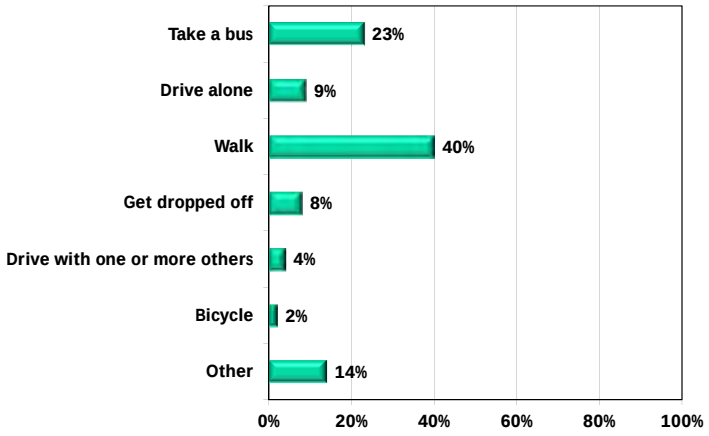
Eastbound Metrorail Riders Most Often Take a Bus, Drive Alone or Walk to the Metrorail Station



Q41. How do you get to the Metrorail station that you use for your morning commute?

Mode to Metrorail - Westbound

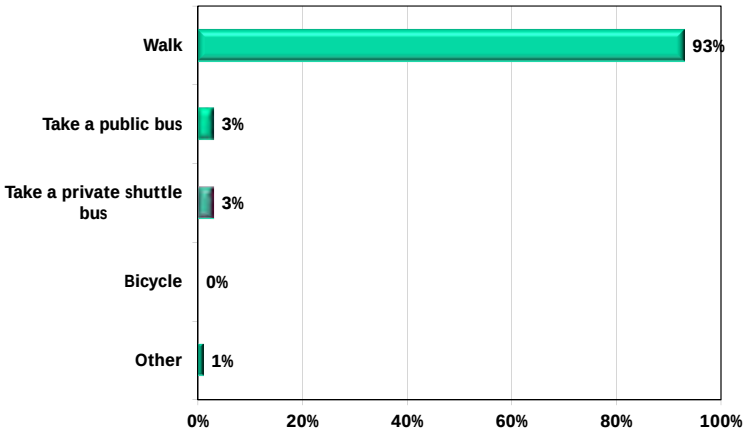
Westbound Metrorail Riders Most Often Walk or Take a Bus to the Metrorail Station



Q41. How do you get to the Metrorail station that you use for your morning commute?

Mode from Metrorail to final destination - Eastbound

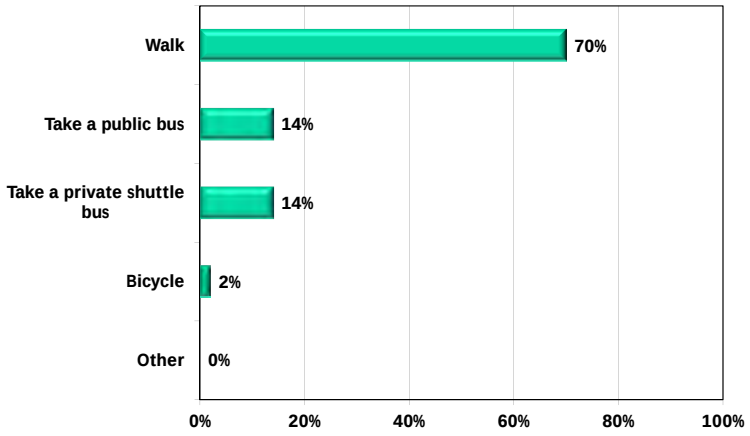
Eastbound Metrorail Riders Most Often Walk from the Metrorail Train to their Final Destination



Q44. How do you typically get from the Metrorail train to the final destination of your morning commute?

Mode from Metrorail to final destination - Westbound

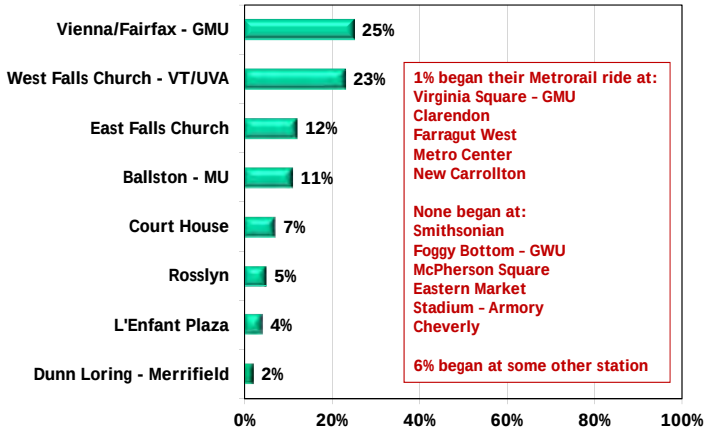
Westbound Metrorail Riders Also Most Often Walk from the Metrorail Train to their Final Destination – But, about a Fourth Take a Bus



Q44. How do you typically get from the Metrorail train to the final destination of your morning commute?

Metrorail station at start of Metrorail trip

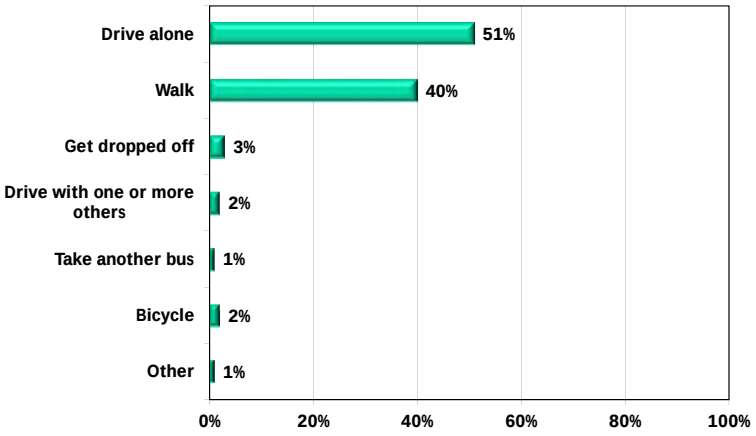
In This Study, the Largest Proportion of Metrorail Riders Boarded Metrorail at Vienna/Fairfax - GMU



Q36. At which Metrorail station do you typically begin the Metrorail portion of your commute?

Mode to bus stop – Eastbound Local bus

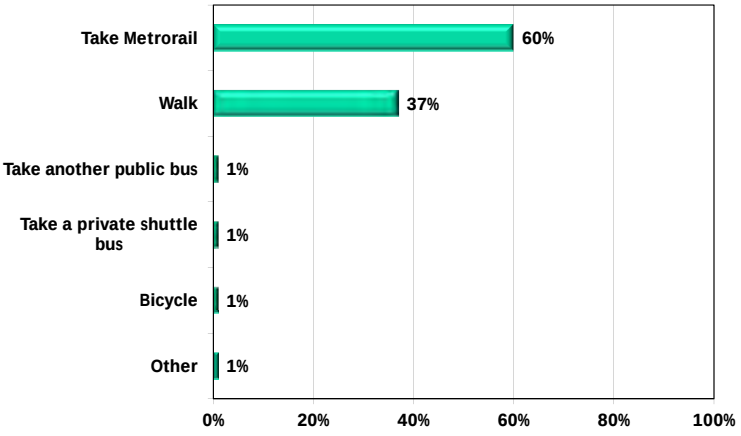
Most Local Bus Riders Either Drive Alone or Walk to their Bus Stop



Q40. How do you get to the bus stop or bus service that you use for your morning commute?

Mode from bus to final destination - Eastbound Local bus

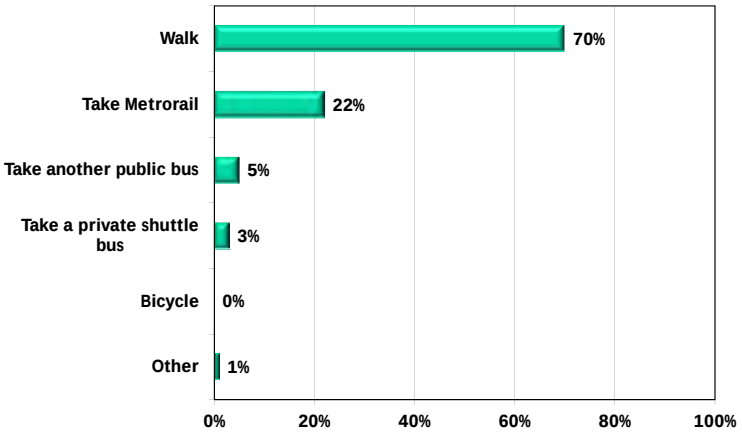
Nearly Two-thirds of Local Bus Riders Take Metrorail to their Final Destination; Another Third Walk to their Destination



Q43. How do you typically get from the bus drop-off to the final destination of your morning commute?

Mode from bus to final destination - Eastbound Express bus

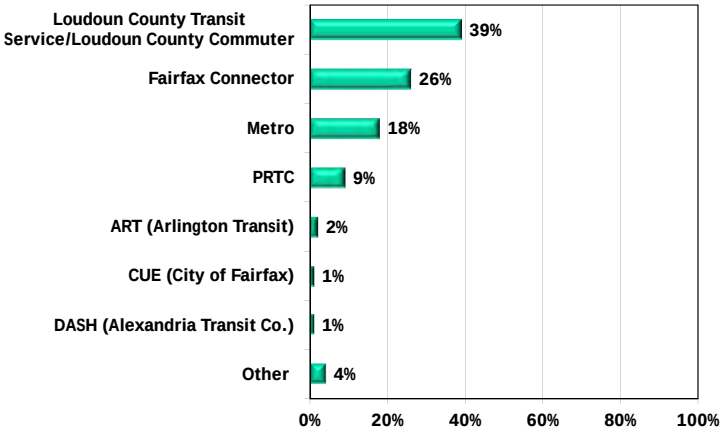
Express Bus Riders Typically Walk to their Final Destination



Q43. How do you typically get from the bus drop-off to the final destination of your morning commute?

Bus companies used

Bus Riders in the Survey Most Often Use Loudoun County Transit, Fairfax Connector, Metro and PRTC



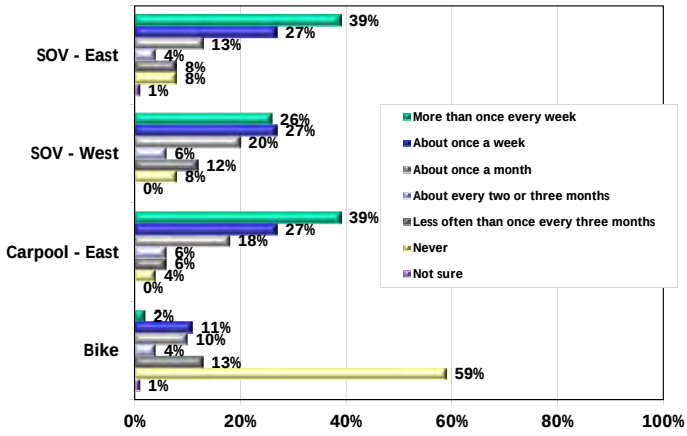
Q34. What bus service do you typically use? Q35. What is the name of the bus service you use?

Frequency of late to work

Proportions shown indicate frequency of arriving late to work.

Eastbound SOVers and Carpoolers Report Being Late to Work More Often than Westbound SOVers Due to Traffic Delays or Congestion; Nearly 4 out of 10 Eastbound Travelers Report Being Late More than Once a Week Due to Traffic

-- Those Riding Bikes Have the Best Record of Never Being Late Due to Traffic Delays or Congestion --

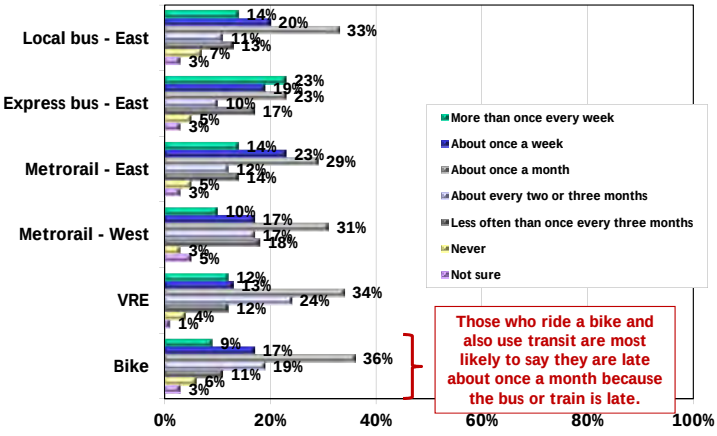


Q42a. About how often are you late to work 15 minutes or more due to traffic delays or congestion?

Frequency of late to work

Proportions shown indicate frequency of arriving late to work.

Among Transit Riders, Express Bus Riders Are Most Often Late for Work



Q42. About how often are you late to work 15 minutes or more because the train or bus is late?

Entrance to I-66

Proportions indicate commuters who travel the roadway at least 3 days per week. Modes shown only when sample of those using the road is large enough. Only most frequent mentions are shown. Continues on next slide.

These Entrances Are Most Often Used to Access I-66; Some Obvious Differences Are Apparent for Eastbound and Westbound Commuters

-- List of Entrances Continues on Next Slide --

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - east
Exit 67 - Dulles Access Road, Fairfax County	11%	1%	17%	27%	47%
Exit 57 - Route 50/Lee Jackson Memorial Highway, Fairfax County	13%	1%	8%	11%	1%
Exit 53 - Route 28/Sully Road, Fairfax County	11%	2%	6%	5%	2%
Exit 43 - Route 29, Prince William County	9%	0%	9%	0%	4%
Exit 69 - Sycamore Street, Arlington	3%	18%	6%	0%	2%
Exit 71 - Route 120/337/Glebe Road/Fairfax Drive, Arlington	3%	22%	5%	1%	3%
Exit 44 - Route 234, Prince William County	7%	0%	3%	0%	5%
Exit 62 - Route 243/Nutley Street, Fairfax County	5%	1%	3%	2%	1%
Exit 66 - Route 7/Leesburg Pike, Fairfax County	5%	5%	3%	0%	3%
Exit 40 - Route 15, Prince William County	5%	0%	4%	0%	2%
Exit 47 - Route 234, Prince William County	3%	1%	2%	0%	5%
Exit 55 - Fairfax County Parkway, Fairfax County	4%	1%	1%	3%	1%

Q46. Which entrance to I-66 do you use on your morning commute? Q47. Which entrance to I-66 do you use?

Entrance to I-66 (con't.)

Proportions indicate commuters who travel the roadway at least 3 days per week. Modes shown only when sample of those using the road is large enough. Only most frequent mentions are shown.

Some I-66 Commuters Use these Entrances to Access I-66

-- List Continued from Previous Slide --

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - east
Exit 72 - Route 29/Lee Highway, Arlington	1%	12%	0%	0%	0%
Exit 52 - Route 29/Mosby Highway, Fairfax County	3%	0%	2%	10%	1%
Exit 60 - Route 123/Chain Bridge Road, Fairfax County	2%	2%	1%	1%	1%
Exit 64 - Interstate 495, Fairfax County	2%	3%	3%	1%	2%
Exit 73 - Route 29/Lee Highway, Arlington	0%	8%	1%	0%	1%
HOV Exit - Stringfellow Road, Fairfax County	1%	0%	3%	5%	0%
HOV Exit 64 at I-495, to I-66	1%	1%	1%	3%	3%
Exit 75 - Route 50/Arlington Blvd., Arlington	1%	5%	1%	0%	1%
Exit 68 - Westmoreland Street, Arlington	0%	5%	0%	0%	1%

Q46. Which entrance to I-66 do you use on your morning commute? Q47. Which entrance to I-66 do you use?

Entrance to U.S. 29

Proportions indicate commuters who travel the roadway at least 3 days per week. Modes shown only when sample of those using the road is large enough. Only most frequent mentions are shown.

Nutley Street Is Often Used to Enter U.S. 29 for the Morning Commute by Eastbound SOVers; Other Entrances Are Used Less Often

	SOV – East
Nutley Street/Route 243, Fairfax	17%
Exit 72 on I-66 East - Sport Run Parkway, Arlington	4%
Fairfax County Parkway/SR 7100, SR 608/West Ox Road - Reston/Springfield, Fairfax/Fairfax County	3%
Exit 43 on I-66 - Strasburg, Washington, Gainesville, Prince William County	3%
Exit 73 on I-66 East (Rosslyn/Key Bridge)	3%
State Road 28 - Manassas/Dulles Airport, Centreville - Fairfax County	1%
State Road 643 (Meetze Road), Warrenton	1%
Exit 52 on I-66 - Manassas/Washington, Centreville, Fairfax County	1%
GW Parkway North - to Capital Beltway, Rosslyn	1%

Q48. Which entrance to U.S. 29 do you use on your morning commute? Q49. Which entrance to U.S. 29 do you use?

Entrance to U.S. 50

Proportions indicate commuters who travel the roadway at least 3 days per week. Modes shown only when sample of those using the road is large enough. Only most frequent mentions are shown.

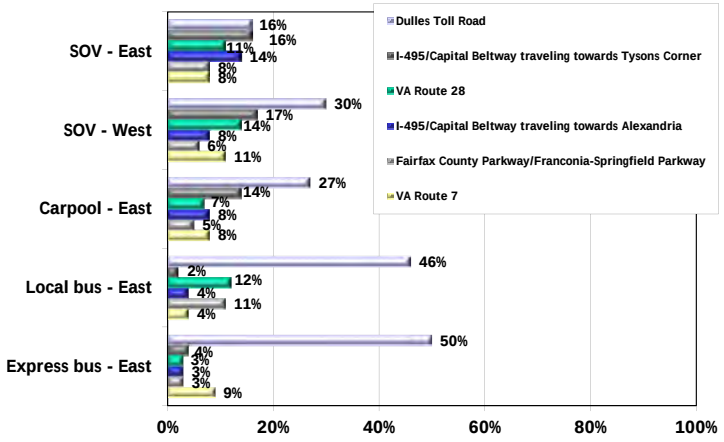
Most Often U.S. 50 Is Accessed by Exit 50 on the Capital Beltway and VA 7 – Seven Corners

	SOV – East
VA 7 - Seven Corners, Fairfax County	16%
Exit 50 on I-495/Capital Beltway/Jefferson, Fairfax County	11%
VA 237, City of Fairfax	6%
U.S. 29, City of Fairfax	6%
VA 120 - Glebe Road, Arlington	3%
Nutley Street/Route 243, Fairfax	3%
U.S. 15 - Aldie, Loudoun County	3%
VA 110, Arlington	3%
I-66 at Washington, DC, Arlington	2%
U.S. 29/VA 236, City of Fairfax	2%
VA 28, Chantilly, Fairfax County	1%

Q50. Which entrance to U.S. 50 do you use on your morning commute? Q51. Which entrance to U.S. 50 do you use?

Other roadways used

Commuters in the I-66 Corridor Travel on a Variety of Other Roadways in Northern Virginia; Bus Riders – Both Local and Express – Are Especially Likely to Travel on the Dulles Toll Road



Q52. On which other major highways, if any, do you typically travel during your regular morning commute?

Other roadways used (con't.)

Some Commuters Also Travel these Roadways on their Morning Commutes – Bus Riders Are More Likely to Be Traveling on Virginia Route 7 than Are Carpoolers and those Who Drive Alone

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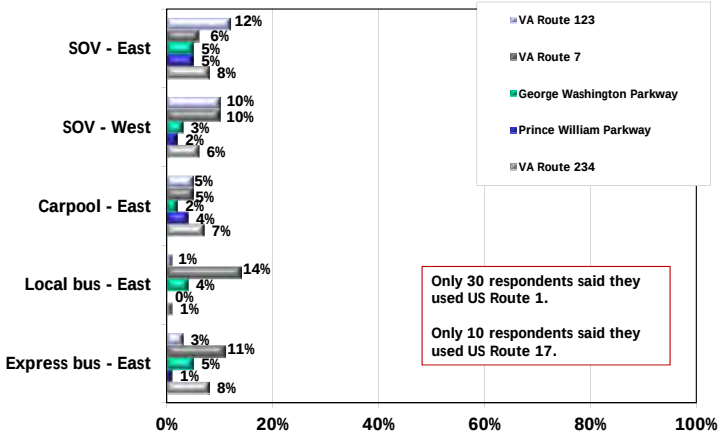
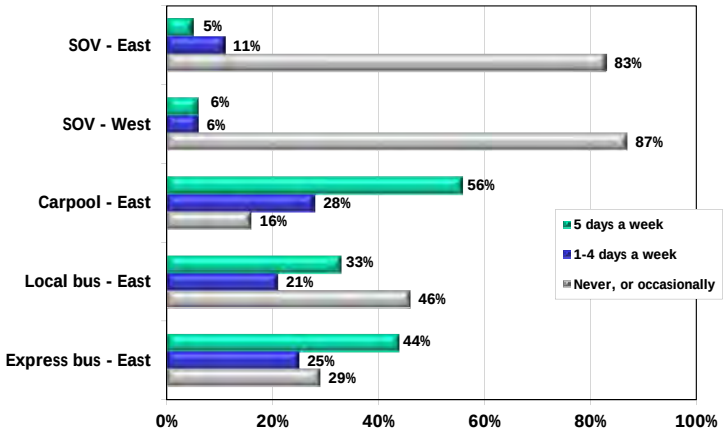


Q52. On which other major highways, if any, do you typically travel during your regular morning commute?

Use of HOV Lanes

Carpoolers Are Most Likely to Use the HOV Lanes on I-66



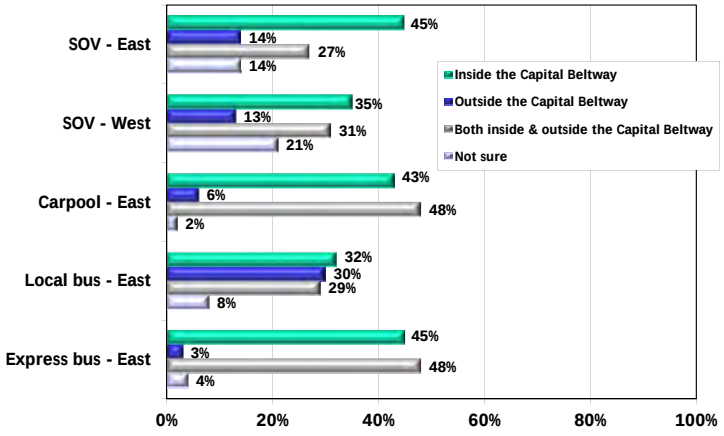
Q71. How frequently during your weekday morning commute do you use the HOV lanes on I-66, either driving alone in your vehicle or traveling in a carpool, vanpool, bus or motorcycle?

Use of HOV Lanes inside or outside Capital Beltway

Question asked of those who said that they used the HOV lanes.

A Third to Nearly One-half in Each Mode Use Only the HOV Lanes Inside the Beltway

-- Recall that Respondents Had to Commute Inside the Beltway (not necessarily on I-66) in Order to Qualify for this Study --

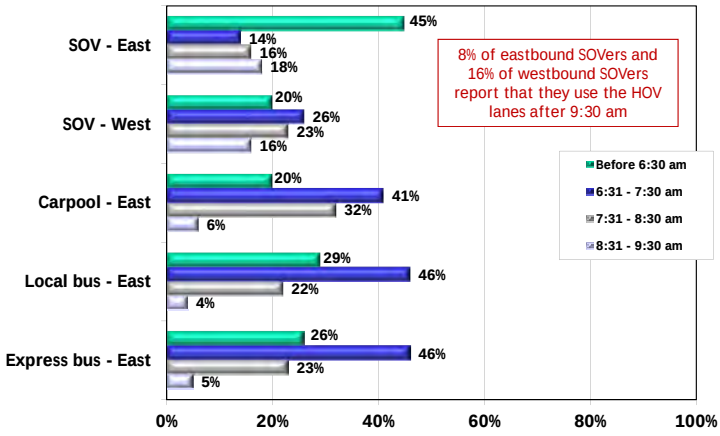


Q72. Do you use the HOV lanes on I-66 **inside** the Capital Beltway or **outside** the Capital Beltway on your regular morning commute?

Time enter HOV lanes

Question asked of those who said that they used the HOV lanes.

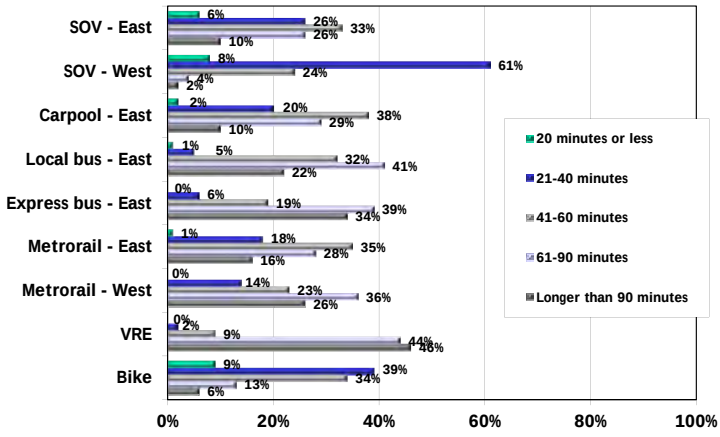
Nearly Half of Eastbound SOVers Who Use the HOV Lanes Say that They Use the Lanes Prior to 6:30 am; Peak Usage for Bus Riders and Carpoolers Is 6:30-7:30 am



Q73. About what time most mornings do you typically enter the HOV lanes on I-66 inside the Beltway?

Length of commute - minutes

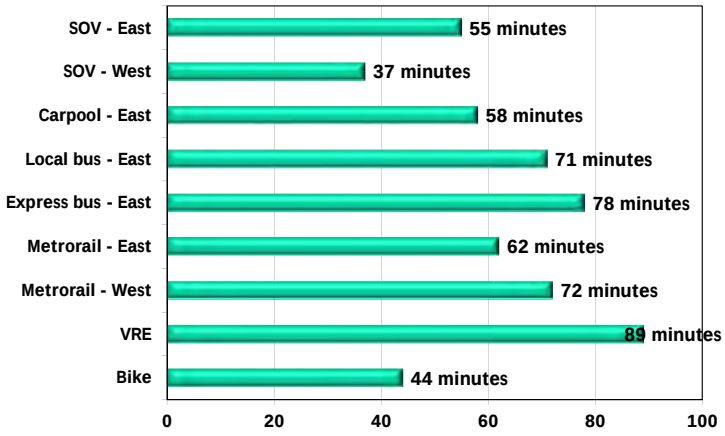
SOVers and Bike Riders Have the Shortest Commutes (in minutes), While VRE Riders Have the Longest; Many Express Bus Riders Also Have Fairly Long Commutes



Q55. On average, about how many minutes long is your **total** morning commute, door-to-door?

Length of commute - minutes *Average*

VRE Commuters Also Post the Longest *Average* Commute – 89 Minutes on Average; Westbound SOVers Have the Shortest Commute, 37 Minutes

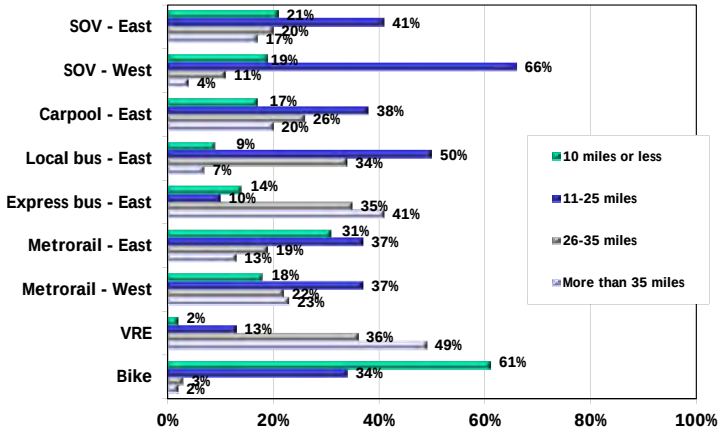


Q55. On average, about how many minutes long is your **total** morning commute, door-to-door?

Length of commute - miles

Not Surprisingly, VRE Riders Travel the Most Miles for their Commute – Nearly Half Travel More than 35 Miles; In Contrast, Nearly a Third of Eastbound Metrorail Riders Travel 10 Miles or Less

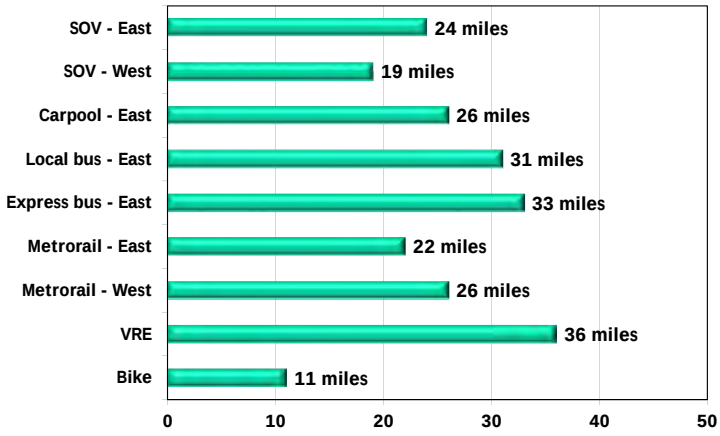
-- But, 61% of Bike Riders Travel 10 Miles or Less --



Q56. About how many miles long is your **total** morning commute, door to door?

Length of commute - miles
Average

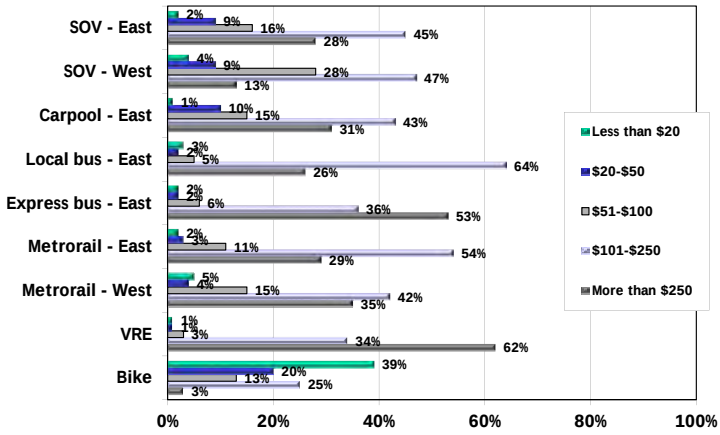
Based on Average Distance Traveled, Those Who Ride Bikes Have the Shortest Average Commute at 11 miles, Followed by Westbound SOVers at 19 Miles on Average; In Contrast, VRE Riders Have the Longest Commute, 36 Miles



Q56. About how many miles long is your **total** morning commute, door to door?

Cost of commute

With the Exception of Bike Riders, Half of Each Mode Have Commutes Costing at Least $100 per Month; VRE Riders and Express Bus Riders Have the Most Expensive Commutes



Q56a. About how much is the cost of your commute per month?

Cost of commute - Average per month

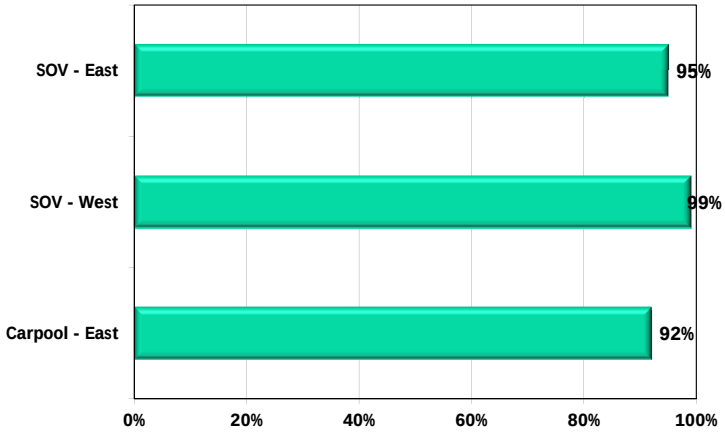
At $78 per Month, Commuters Who Ride Bikes Have the Lowest Average Commute Cost; VRE Riders Have the Most Expensive Commute, $292 per Month

Q56a. About how much is the cost of your commute per month?

Availability of parking

Proportions indicate those who have parking available.

Parking Is Available for Nearly All Who Drive or Carpool



Q57. Is parking available at your destination?

Pay to park

Nearly Half of Eastbound SOVers and Carpoolers Who Have Parking Available Pay to Park at their Destination

Question asked of those who said they have parking available.

	SOV - East	SOV - West	Carpool - East
Yes, I have to pay for parking and I use the lot	43%	10%	47%
Yes, I have to pay to park, but I do not use the lot	4%	1%	13%
No, there is no charge for parking	53%	89%	40%

Q58. Do you have to pay to park?

Cost of parking at destination

Among those Who Pay to Park at their Destination, SOVers and Carpoolers Pay about the Same Amount; Those Headed East Pay Slightly More than those Headed West

-- Example of how to read table: The average cost to park among SOVers traveling east who pay to park and answered with a per day parking cost is $11.09 per day. The average daily cost among SOVers headed west who pay to park and gave a daily rate is $9.58 per day. --

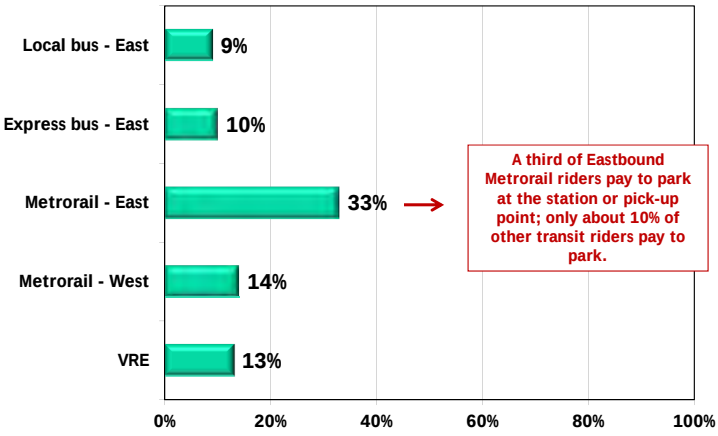
Only a few respondents reported parking cost for time period other than per day or per month.

SOV - East	SOV - West	Carpool - East
Average: Pay per Day		
$11.09	$9.58	$10.73
Average: Pay per Month		
$152.10	$118.20	$144.34

Q59. How much do you pay to park? Q60: Is that per day, per week, every two weeks, per month, per year, other?

Pay to park at train station or pick-up point

Among Transit Riders, Eastbound Metrorail Riders Are Most Likely to Have to Pay to Park at Station or Pick-up Point



Q61. Do you have to pay to park at the train station or other pick-up point?

Cost of parking at train station or pick-up point

Metrorail Riders Pay More to Park at the Station or Pick-up Point than Do Express Bus Riders

Only a few respondents reported parking cost for time period other than per day.

Express Bus	Metrorail
Average: Pay per Day	
$4.28	$7.23

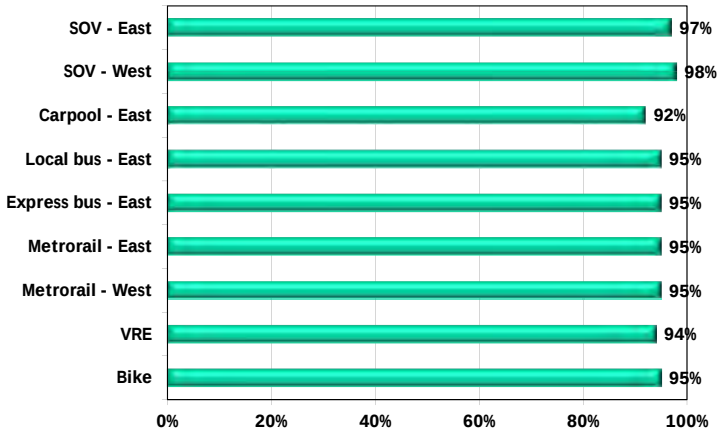
Note: Eastbound and westbound commuters are combined for these calculations.

Q62. How much do you pay at the train station or other pick-up point? Q63: Is that per day, per week, every two weeks, per month, per year, other?

Use same mode in afternoon as morning

Carpoolers who switch in the afternoons most often ride Metrorail or the bus in the afternoons. Local bus riders and express bus riders who switch in the afternoon most often take Metrorail or carpool. Bike riders who switch tend to ride Metrorail or the bus.

Commuters Tend to Use the Same Transportation Mode in Both the Morning and Afternoon



Q64. Do you typically use the same mode of transportation for your afternoon commute as you do for your morning commute during a typical week, Monday through Friday?

Reasons for using different mode in afternoon

Issues Related to Schedule Most Often Lead Commuters to Use a Different Mode in the Afternoon; and, Due to Small Base Sizes, Frequencies Rather than Percentages Are Reported (Interpret with Caution)

	SOV n	Carpool n	Local bus n	Express bus n	Metrorail n	VRE n	Bike n
Schedule of morning mode does not work for afternoon	3	9	3	4	9	4	3
Leave at different time than rider/driver	0	18	1	2	8	1	0
Avoid traffic	12	2	0	0	1	0	0
Fastest way to get home	1	2	3	6	7	0	1
Someone picks me up	2	3	1	4	4	1	0
More commute time in afternoon	0	0	0	2	4	0	4
Cannot use HOV lanes in afternoon	5	1	0	0	1	0	0
Family responsibilities/need to stop on way home	2	0	0	0	1	1	0
Morning mode is too crowded in afternoon	0	0	0	1	2	0	0
Can use HOV lanes	1	1	0	0	0	0	0
Other responses	6	10	1	4	8	4	3
No particular reason	1	1	0	0	2	0	0

Note: Due to small base sizes, responses for Eastbound and Westbound commuters are combined. Also due to small base sizes, frequencies are shown rather than percentages

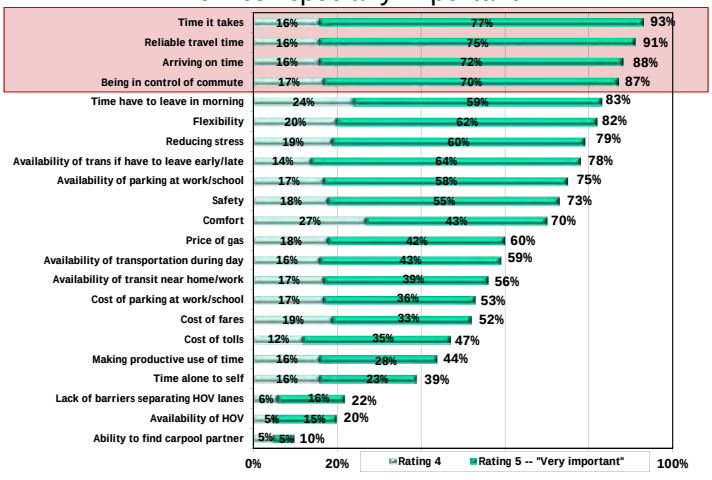
Q66. Earlier, you indicated that you use a different commute mode(s) in the afternoon than you do in the morning. Why do you use a different mode(s) in the afternoon?

Detailed Findings

Factors Influencing Mode Choice

Attribute importance - Eastbound SOV

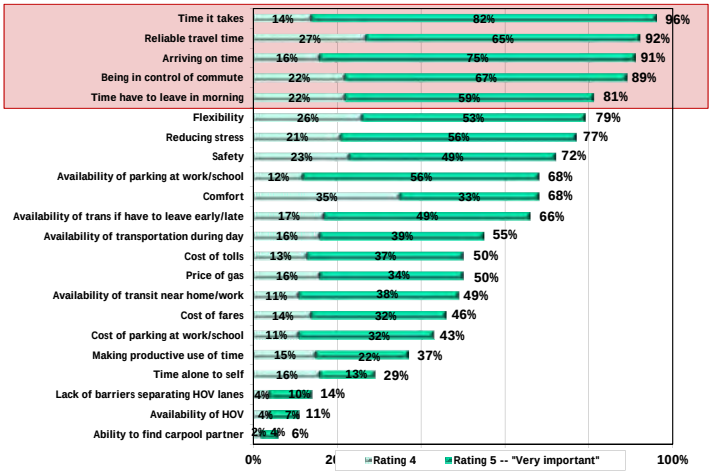
Eastbound SOVers Emphasize Time When Selecting their Commute Mode; But, Being in Control of their Commute Is Also Especially Important



Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

Attribute importance - Westbound SOV

SOVers Driving West Also Value Time; But, Being in Control of their Commute Is Also Important



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Attribute importance - Eastbound Carpool

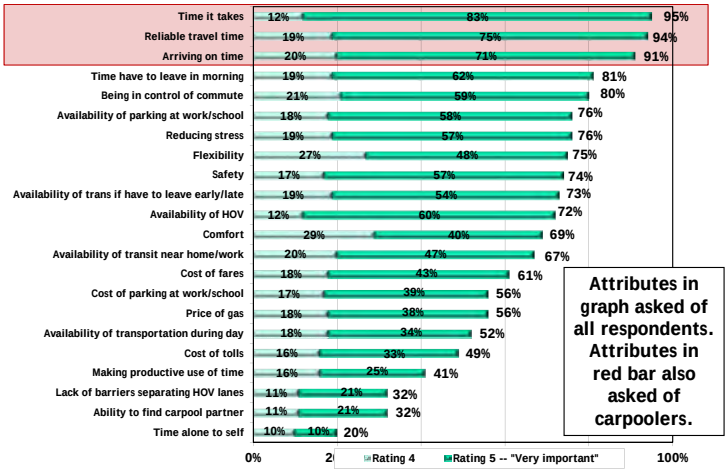
Carpoolers were also asked the importance of:

Preferential parking for carpools 51%

Avail. of parking at pick-up point 36%

Slug lines 14%

When Selecting their Commute Mode, Eastbound Carpoolers Are Concerned about Time: The Time their Commute Will Take, Reliable Travel Time and Arriving on Time



Attributes in graph asked of all respondents. Attributes in red bar also asked of carpoolers.

Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

Attribute importance - Eastbound Local bus

Bus riders were also asked the importance of:

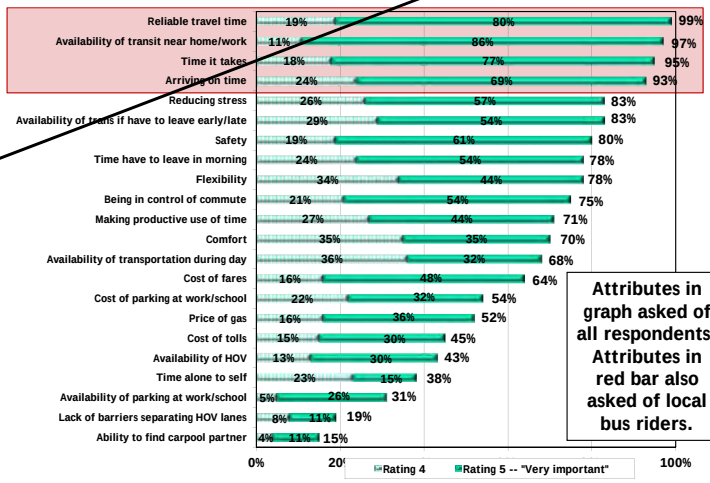
Avail. of bus at right time 100%

Employer provided transit subsidy 60%

Avail. of parking at pick-up point 55%

Cost of parking at pick-up point 41%

In Addition to Time, the Availability of Transit Where They Live and Work Is Important to Local Bus Riders – As Is the Availability of the Bus at the *Right Time*



Attributes in graph asked of all respondents. Attributes in red bar also asked of local bus riders.

Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

Attribute importance - Eastbound Express bus

Bus riders were also asked the importance of:

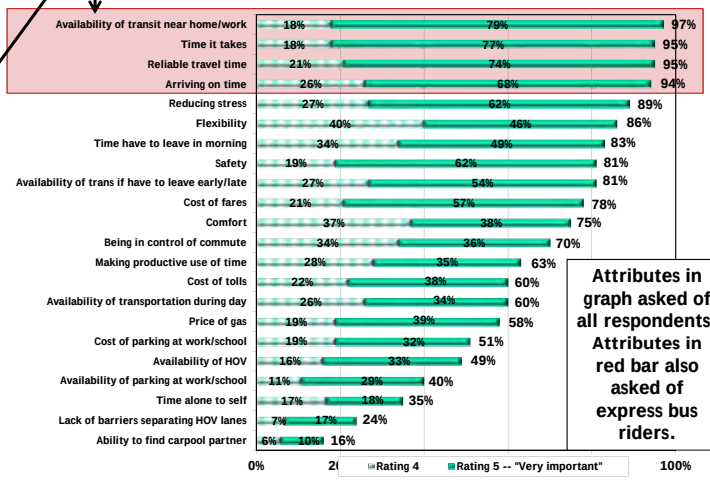
Avail. of bus at right time 100%

Avail. of parking at pick-up point 75%

Employer provided transit subsidy 80%

Cost of parking at pick-up point 59%

Availability of Transit and Time Management Are Important to Express Bus Riders



Attributes in graph asked of all respondents. Attributes in red bar also asked of express bus riders.

Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

Attribute importance - Eastbound Metrorail

Metrorail riders were also asked the importance of:

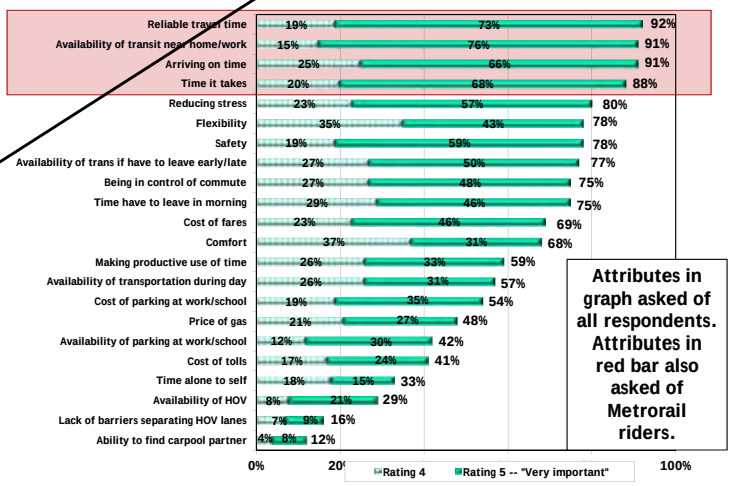
Avail. of train at right time 53%

Employer provided transit subsidy 76%

Avail. of parking at pick-up point 46%

Cost of parking at pick-up point 41%

Time and Availability of Transit Are Important to Eastbound Metrorail Riders; But, Availability of Train at Right Time Is Less Important for this Group



Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

Attribute importance - Westbound Metrorail

Metrorail riders were also asked the importance of:

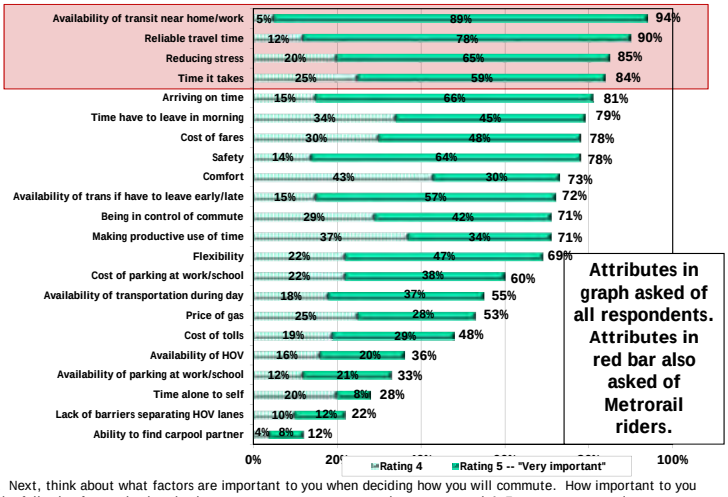
Avail. of train at right time 63%

Employer provided transit subsidy 68%

Avail. of parking at pick-up point 40%

Cost of parking at pick-up point 44%

Time and Availability of Transit Are Important to Westbound Metrorail Riders; They Also Value Reducing Stress



Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

Attribute importance - VRE

VRE riders were also asked the importance of:

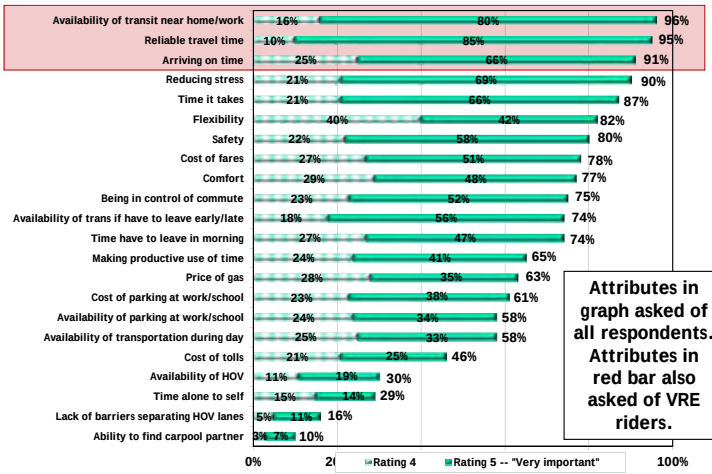
Avail. of train at right time 97%

Avail. of parking at pick-up point 52%

Employer provided transit subsidy 73%

Cost of parking at pick-up point 59%

Availability and Time Are Also Important to VRE Riders

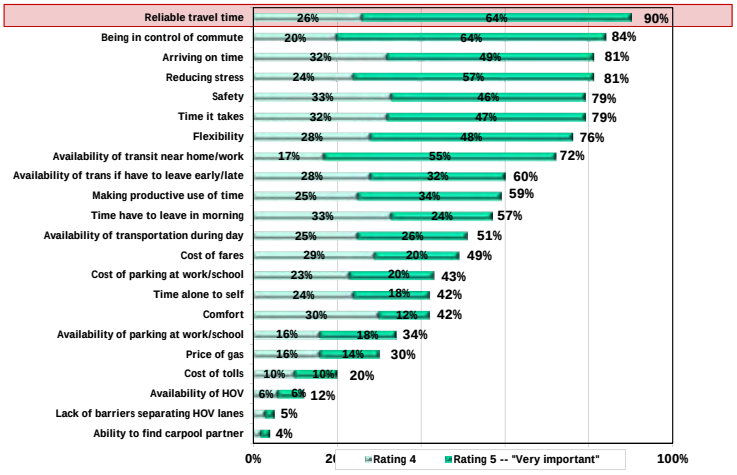


Attributes in graph asked of all respondents. Attributes in red bar also asked of VRE riders.

Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

Attribute importance - Bike

Above All, Bike Riders Value Reliable Travel Time



Q67. Next, think about what factors are important to you when deciding how you will commute. How important to you are the following factors in choosing how you commute on your morning commute trip? For your answers, please use a scale of 1 to 5 where "1" means it is "not at all important" and "5" means it is "very important" in choosing your mode of transportation. How important is each of the following?

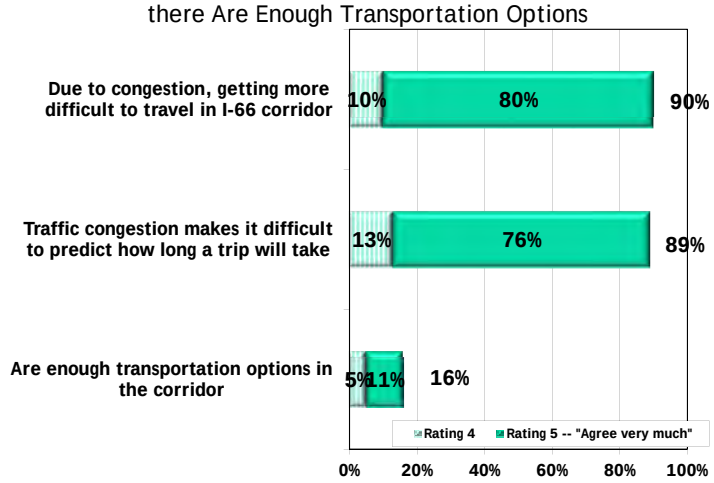
Detailed Findings

Perceptions of I-66

Percep-tions of I-66 corridor - Eastbound SOV

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

Eastbound SOVers Believe It Is Getting More Difficult to Travel through the Corridor and that Congestion Is Making It More Difficult to Predict How Long a Trip Will Take; But, They Do Not Believe there Are Enough Transportation Options

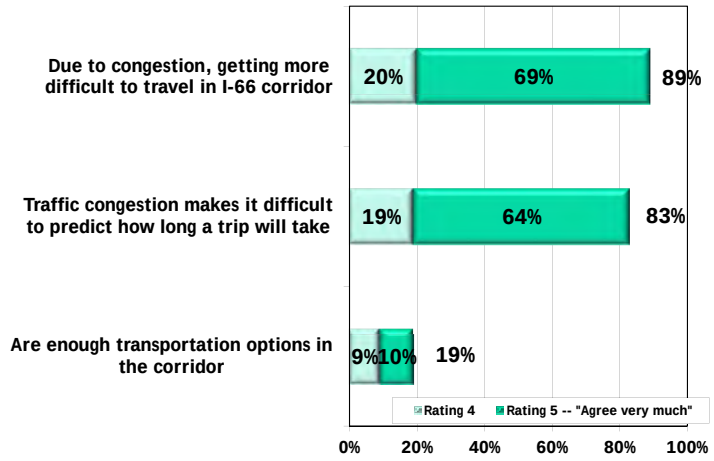


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

Percep-tions of I-66 corridor - Westbound SOV

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

Westbound SOVers Agree that Congestion Makes It More Difficult to Travel in the Corridor and to Predict Trip Time; and, They Do Not Think there Are Enough Transportation Options

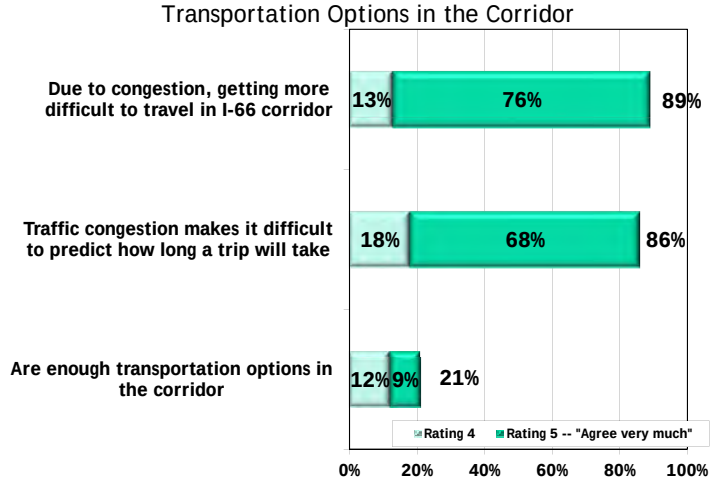


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

Percep-tions of I-66 corridor - Eastbound carpool

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

Carpoolers Agree that It Is Getting More Difficult to Travel in the Corridor and Traffic Makes It Difficult to Predict the Time a Trip Will Take; They Do Not Think there Are Enough Transportation Options in the Corridor

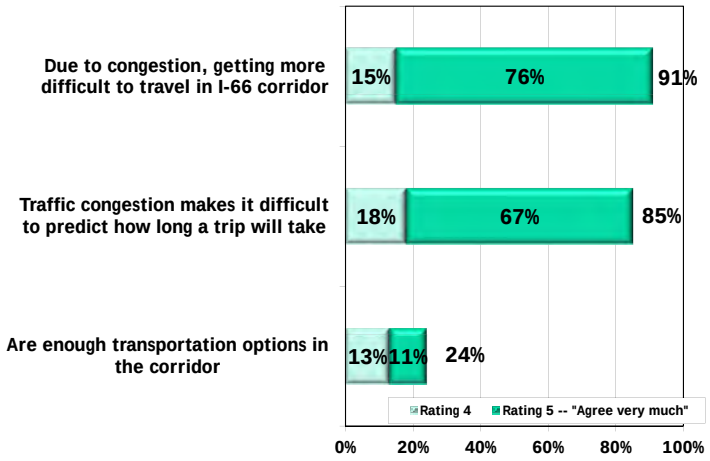


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

Percep-tions of I-66 corridor - Eastbound Local bus

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

Local Bus Riders Agree with Carpoolers and SOVers Regarding Traffic Congestion and Transportation Options in the I-66 Corridor

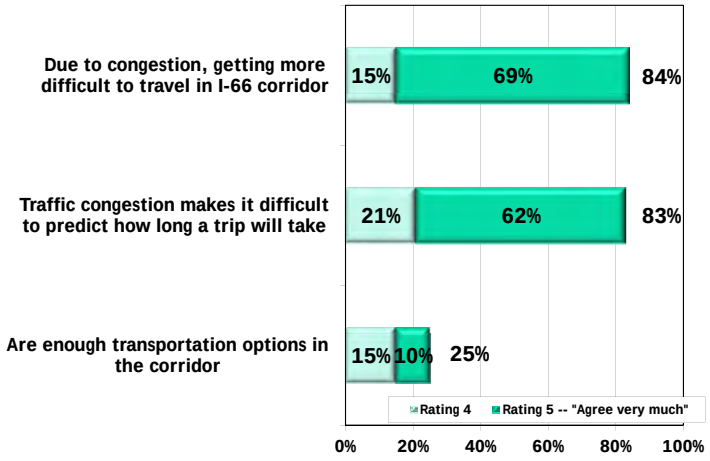


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

Percep-tions of I-66 corridor - Eastbound Express bus

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

Express Bus Riders Agree with Other Commuters about Traffic in the Corridor

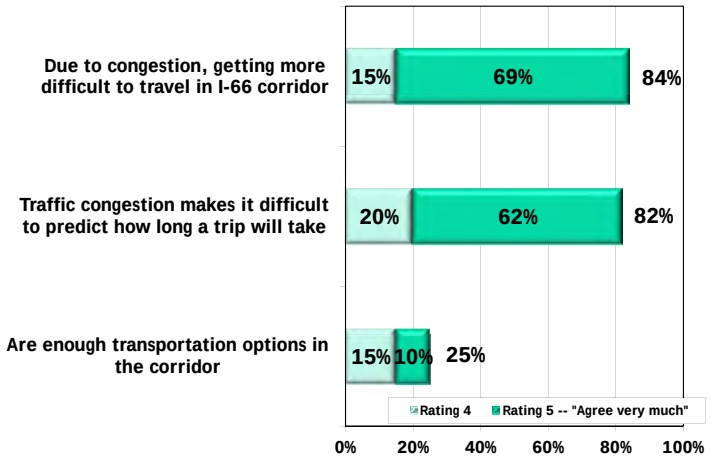


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

Percep-tions of I-66 corridor - Eastbound Metrorail

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

The Views of Eastbound Metrorail Riders Are the Same

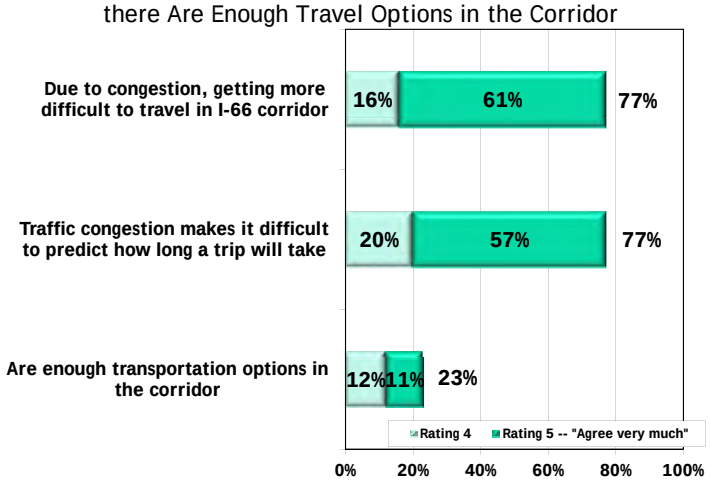


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

Percep-tions of I-66 corridor - Westbound Metrorail

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

Similarly, Westbound Metrorail Riders Believe Congestion Is Making Travel in the Corridor More Difficult and Making It More Difficult to Predict How Long a Trip Will Take; They Are Not Convinced that there Are Enough Travel Options in the Corridor

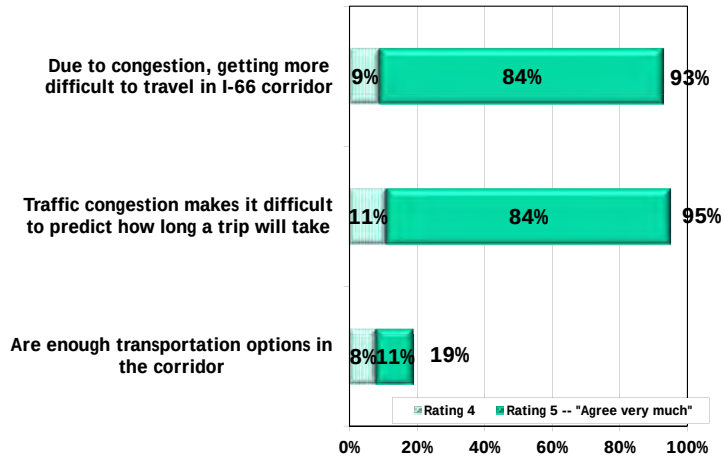


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

Percep-tions of I-66 corridor - VRE

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

The Views of VRE Riders Are the Same

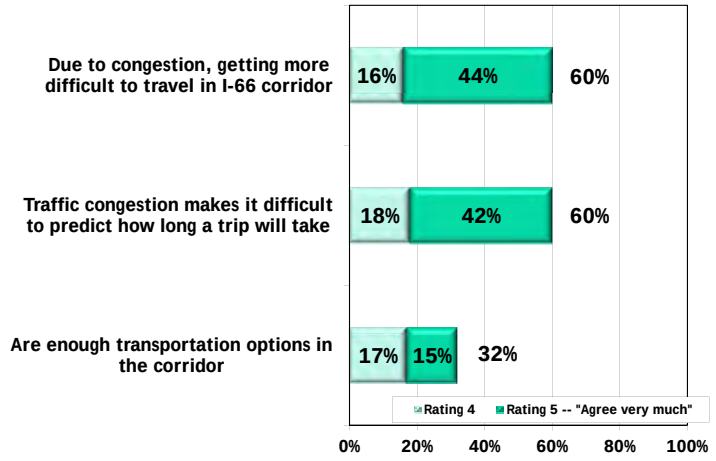


Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.

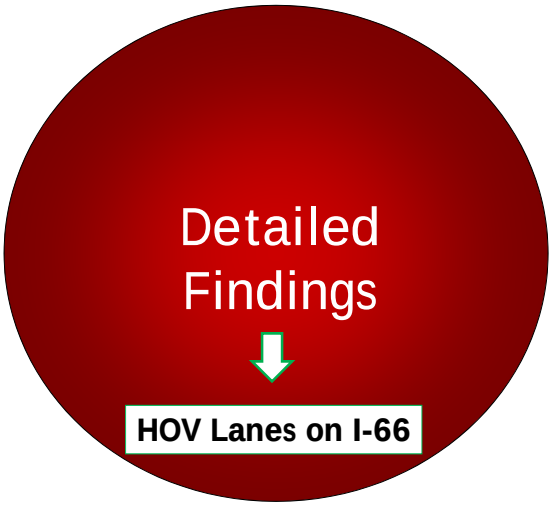
Percep-tions of I-66 corridor - Bike

Proportions indicate those who agree that the statement describes travel in the I-66 corridor.

Bike Riders Are Less Likely than Other Groups to Believe It Is Getting More Difficult to Travel in the I-66 Corridor or that Congestion Makes It Difficult to Predict How Long a Trip Will Take



Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.



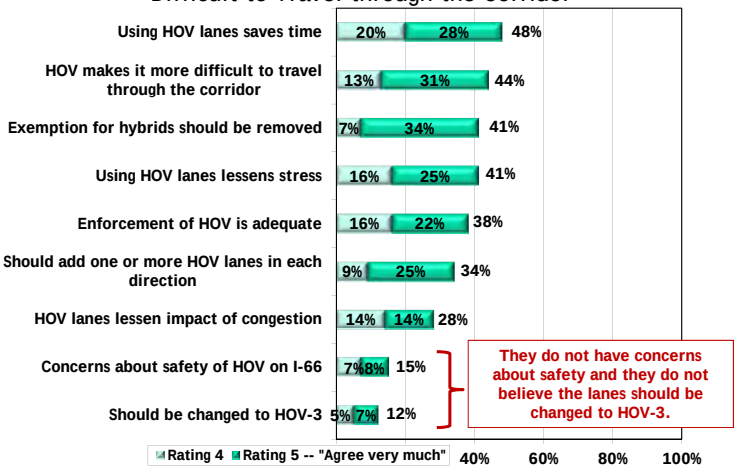
Demand Discount Factor

Many of the following slides report stated likelihood of usage of specific transit and TDM enhancements and alternatives or travel options. Research on research indicates that respondents often overstate their likelihood of usage in research surveys. A demand discount factor has been developed that allows researchers to more accurately project behavior.

This demand discount factor has been applied to the measures reported on the following slides when a 5-point "likelihood" scale is used, as appropriate. The values obtained by applying the demand discount factor are reported in (red parentheses).

Opinions of HOV on I-66 - Eastbound SOV

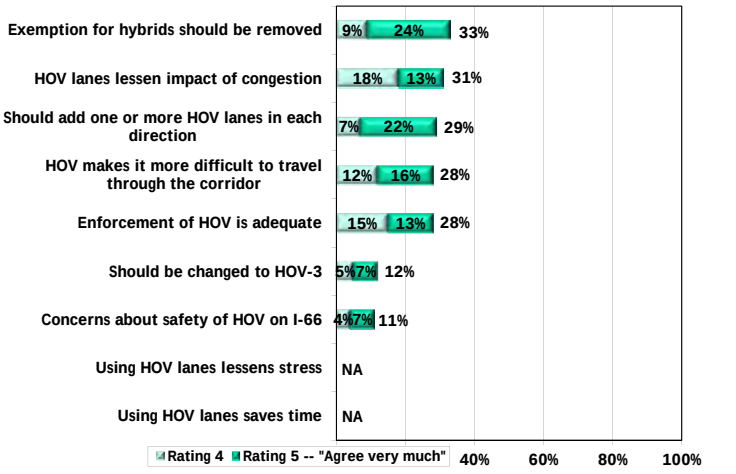
Eastbound SOVers Express Mixed Views about the HOV Lanes on I-66; All Are Not Convinced that the HOV Lanes Save Time; But, All Don't Believe the HOV Lanes Make It More Difficult to Travel through the Corridor



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - Westbound SOV

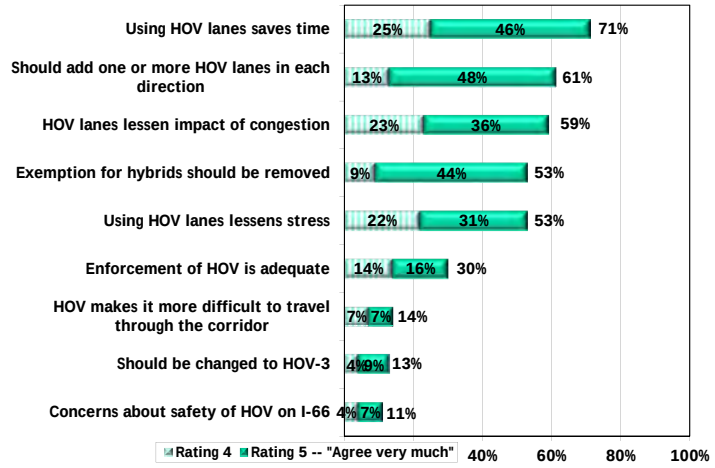
Westbound SOVers Do Not Seem to Have Strong Views about the HOV Lanes



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - Eastbound carpool

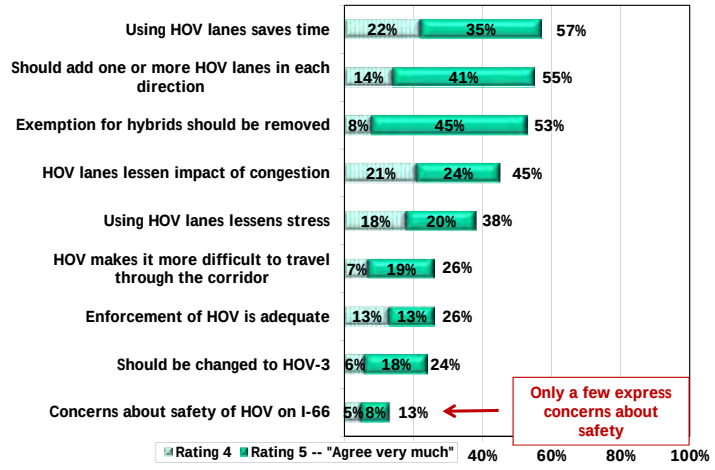
Carpoolers Believe that Using the HOV Lanes Saves Time, that HOV Lanes Should Be Added, and that HOV Lanes Lessen the Impact of Congestion; But, They Are Not Convinced that Enforcement Is Adequate



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - Eastbound Local bus

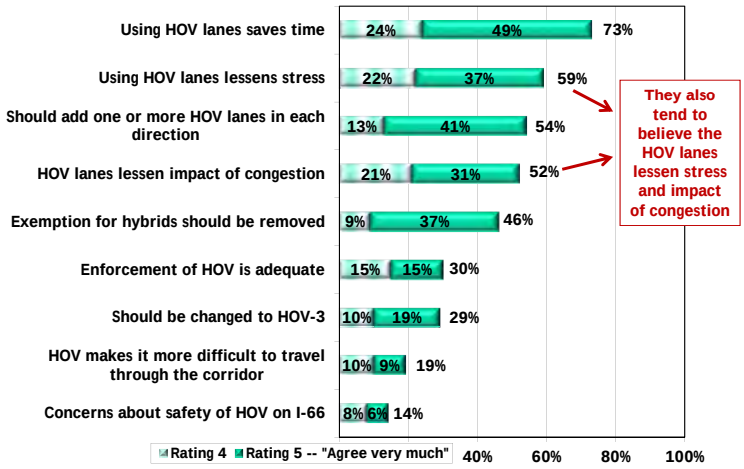
Local Bus Riders Tend to Believe that HOV Lanes Save Time, One or More HOV Lanes Should Be Added, and that the Exemption for Hybrids Should Be Removed



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - Eastbound Express bus

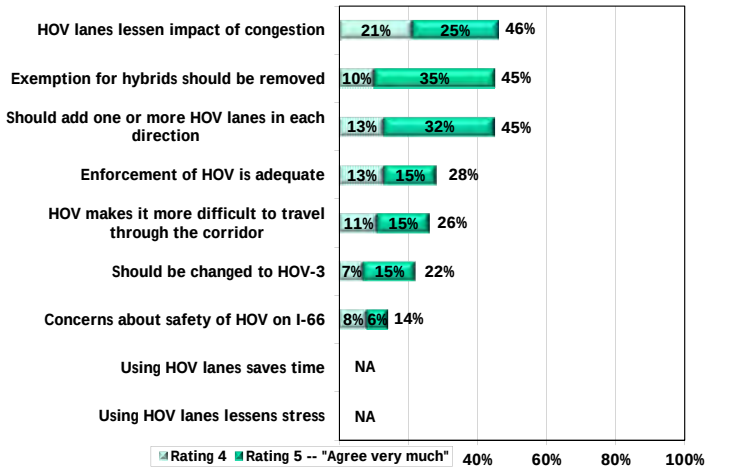
Most of All, Express Bus Riders Believe the HOV Lanes Save Time and Reduce Stress; And, They Would Like More HOV Lanes Added



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - Eastbound Metrorail

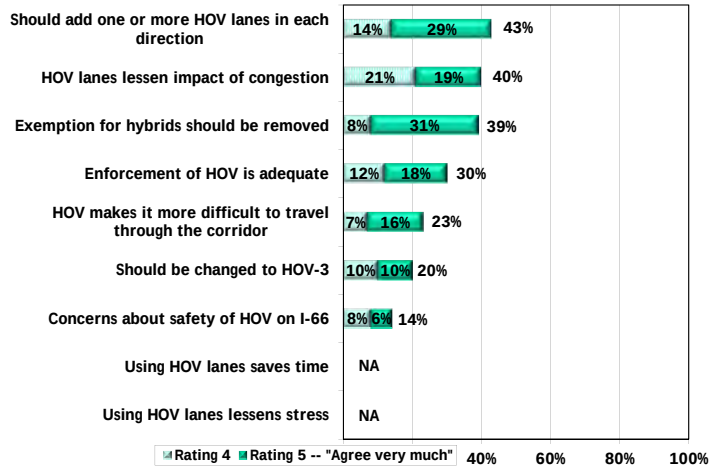
Eastbound Metrorail Riders Tend to Believe that the HOV Lanes Lessen the Impact of Congestion, Hybrid Exemption Should Be Removed and More HOV Lanes Should Be Added



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - Westbound Metrorail

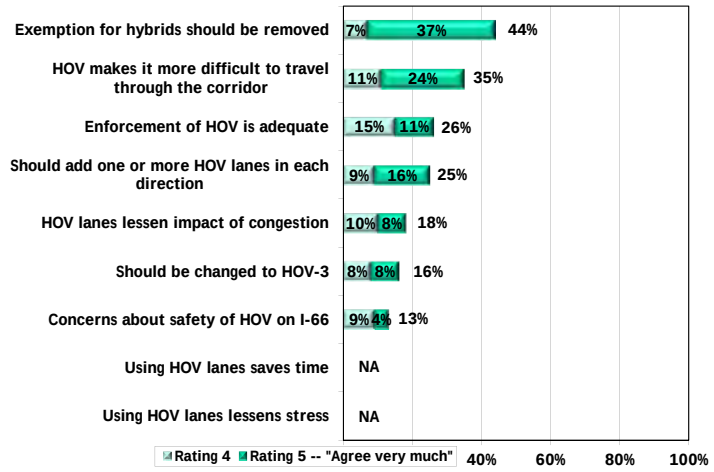
Westbound Metrorail Riders Tend to Have Slightly Less Firmly Held Beliefs about the HOV Lanes than Most of the Other Modes; But, They Tend to Believe More Lanes Should Be Added, HOV Lanes Lessen the Impact of Congestion and the Exemption for Hybrids Should Be Removed



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - VRE

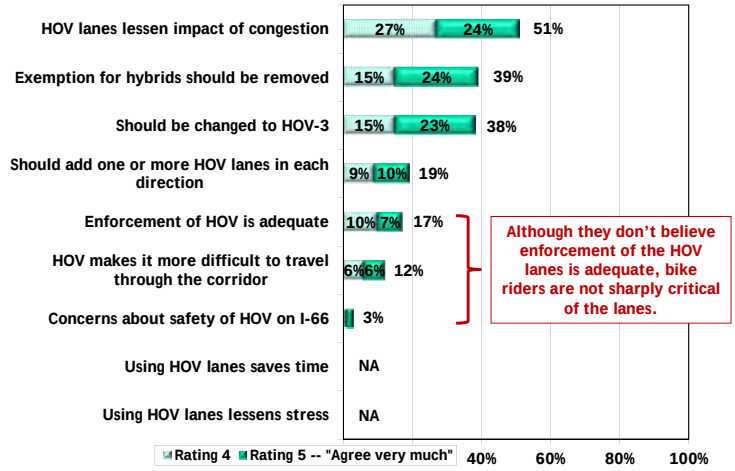
VRE Riders Are More Likely to Believe that the HOV Lanes Make It More Difficult to Travel through the Corridor than to Believe that the Lanes Lessen the Impact of Congestion



Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66 - Bike

Bike Riders Tend to Believe the HOV Lanes Lessen the Impact of Congestion

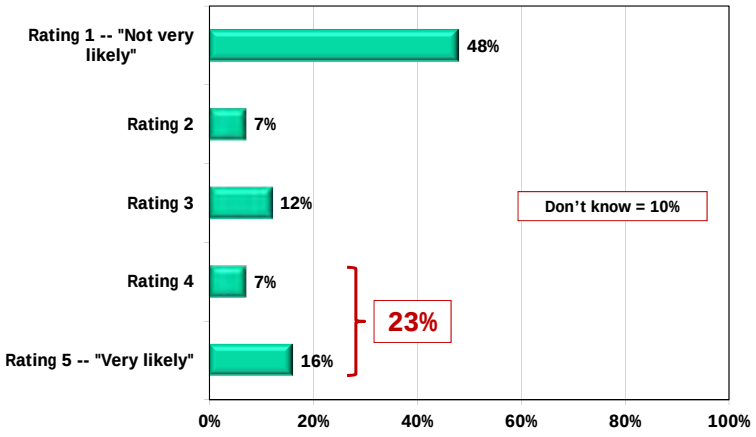


Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Likelihood of continuing to use HOV lanes - Eastbound SOV

Question asked of those who currently use HOV lanes.

Nearly a Fourth of Eastbound SOVers Who Currently Use the HOV Lanes Say They Will Continue Using the Lanes

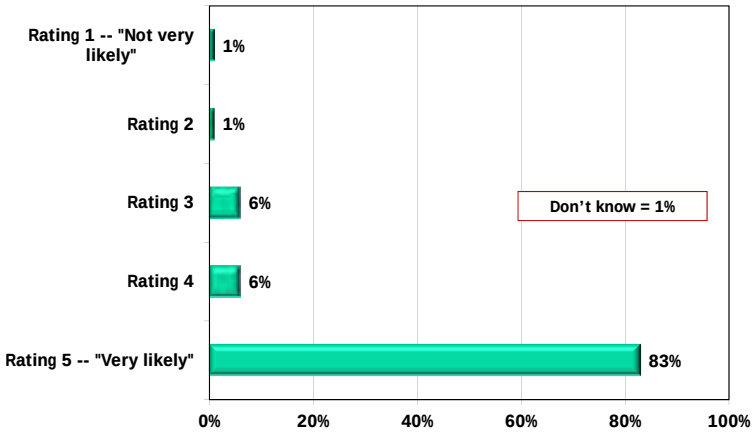


Q75. How likely are you to continue using the HOV lanes on I-66 inside the Beltway for your morning commute?

Likelihood of continuing to use HOV lanes – Eastbound carpool

Question asked of those who currently use HOV lanes.

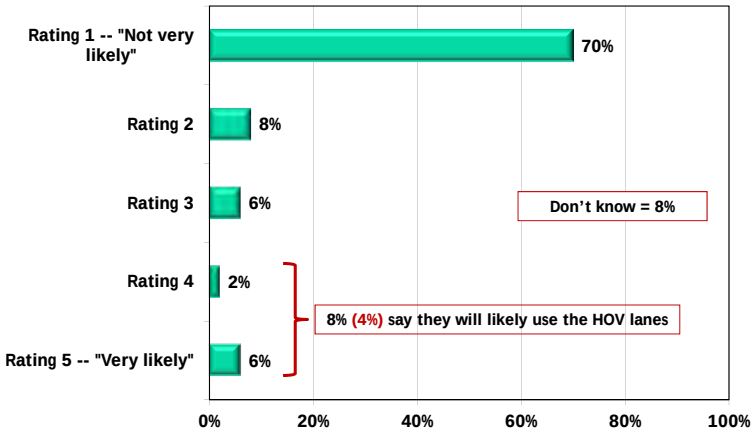
Nearly 9 out of 10 Carpoolers Say They Will Continue Using the HOV Lanes



Q75. How likely are you to continue using the HOV lanes on I-66 inside the Beltway for your morning commute?

Likelihood of using HOV lanes in future (among nonusers) - Eastbound SOV

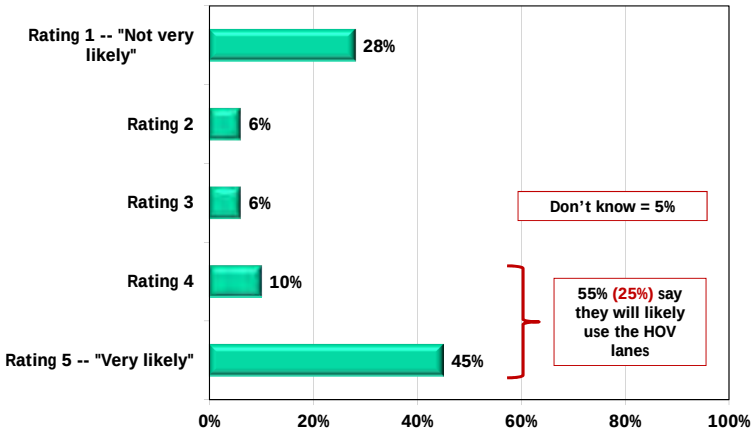
Only a Few Eastbound SOVers Who Do Not Currently Use the HOV Lanes Are Likely to Use the Lanes in the Future



Q76. How likely are you to use the HOV lanes for your morning commute in the future at least occasionally?

Likelihood of using HOV lanes in future (among nonusers) - Eastbound carpool

Slightly More than Half of Eastbound Carpoolers Who Do Not Currently Use the HOV Lanes Say They Are Likely to Use the Lanes in the Future



Q76. How likely are you to use the HOV lanes for your morning commute in the future at least occasionally?

Likelihood of using HOV lanes in future (among nonusers) - Current transit users and bike riders

About a Fourth of Bus and VRE Riders Say They Will Use the HOV Lanes in the Future; About 15% of Metrorail Riders Say They Will Use the HOV Lanes; Few Bike Riders Think They Will Use the HOV Lanes

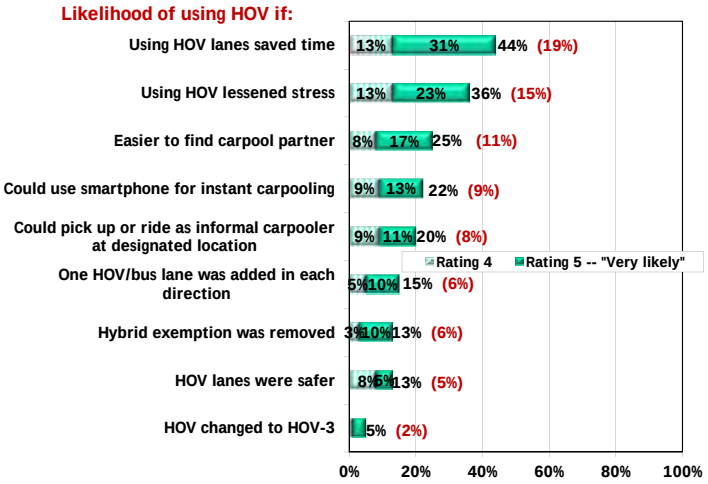
	Likely to use HOV in future among current nonusers
Local bus - Eastbound	27% (12%)
Express bus - Eastbound	24% (11%)
Metrorail - Eastbound	13% (6%)
Metrorail - Westbound	17% (7%)
VRE	18% (7%)
Bike riders	4% (2%)

Q76. How likely are you to use the HOV lanes for your morning commute in the future at least occasionally?

Likelihood of using HOV lanes under various conditions - Eastbound SOV

Question asked of those who do not currently use HOV lanes.

Eastbound SOVers Would Be Most Persuaded to Use the HOV Lanes If the Lanes Saved Time or Lessened Stress; In Addition, about 1 out of 10 Would Use the HOV Lanes If It Was Easier to Find a Carpool Partner

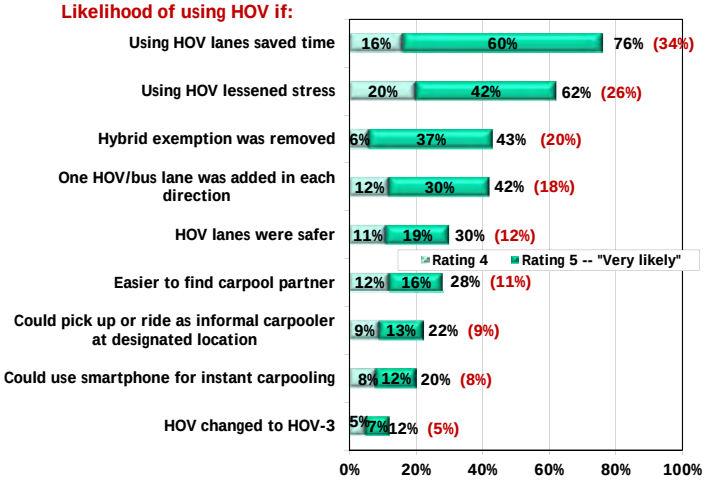


Q77. How likely would you be to use the HOV lanes for your commute at least occasionally if:

Likelihood of using HOV lanes under various conditions - Eastbound carpool

Question asked of those who do not currently use HOV lanes.

Eastbound Carpoolers Not Currently Using the HOV Lanes Could Most Be Persuaded to Use the Lanes If It Would Save Time; Second, They Would Use the Lanes If It Lessened Stress



Q77. How likely would you be to use the HOV lanes for your commute at least occasionally if:

Likelihood of using HOV lanes in future (among nonusers) - Current transit users and bike riders

The Ability to Save Time Also Makes the HOV Lanes Most Attractive to Transit and Bike Users; Lessening Stress Also Has Appeal; Adding HOV/Bus Lanes Has the Greatest Appeal among Current Bus Riders

	Save time	Lessened stress	Easier to find carpool partner	Instant carpooling by smartphone	Informal carpooling at designated locations	One HOV/bus lane added each direction	Hybrid exemption removed	HOV lanes safer	Changed to HOV-3
Local bus - Eastbound	51% (22%)	41% (17%)	23% (9%)	25% (10%)	19% (7%)	47% (20%)	27% (13%)	17% (8%)	17% (7%)
Express bus - Eastbound	69% (30%)	56% (24%)	25% (10%)	30% (12%)	22% (9%)	58% (26%)	29% (14%)	23% (10%)	25% (11%)
Metrorail - Eastbound	45% (19%)	36% (15%)	27% (10%)	25% (10%)	20% (8%)	31% (13%)	17% (7%)	15% (6%)	11% (4%)
Metrorail - Westbound	35% (15%)	35% (15%)	19% (8%)	20% (8%)	18% (7%)	23% (11%)	19% (9%)	11% (5%)	10% (4%)
VRE	51% (22%)	44% (18%)	26% (10%)	23% (9%)	28% (11%)	29% (11%)	22% (11%)	15% (5%)	10% (4%)
Bike riders	35% (14%)	25% (10%)	19% (6%)	22% (8%)	14% (5%)	15% (6%)	11% (5%)	8% (3%)	11% (5%)

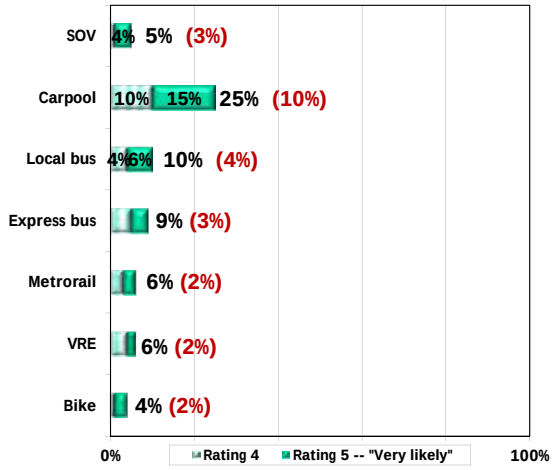
Q77. How likely would you be to use the HOV lanes for your commute at least occasionally if:

I-66 Multimodal Study

Impact of changing morning HOV hours - Eastbound morning commuters

Responses shown for those who do not currently use HOV lanes.

Changing the Morning Hours of HOV Would Attract a Few New HOV Users, Particularly Current Carpoolers



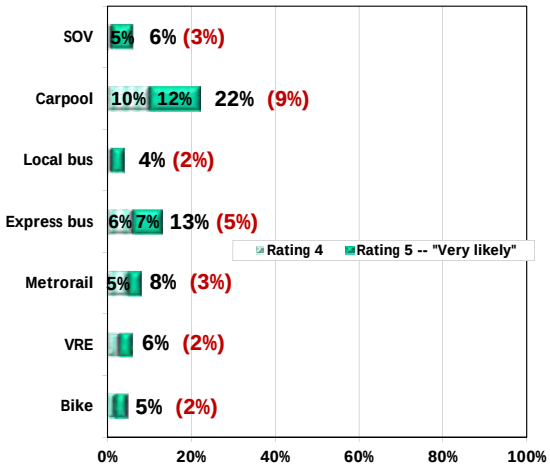
Q78. Assume that the HOV lane restrictions eastbound on I-66 inside the Beltway went into effect at 5:30 a.m. and stayed in effect until 9:30 a.m., instead of going into effect at 6:30 a.m. and staying in effect until 9:00 a.m. as they now do. How likely would you be to use the eastbound HOV lanes inside the Beltway for your morning commute if they went into effect at 5:30 a.m. instead of 6:30 a.m. and stayed in effect until 9:30 a.m. instead of 9:00 a.m.?

I-66 Multimodal Study

Impact of changing afternoon HOV hours - Westbound afternoon commuters

Responses shown for those who do not currently use HOV lanes.

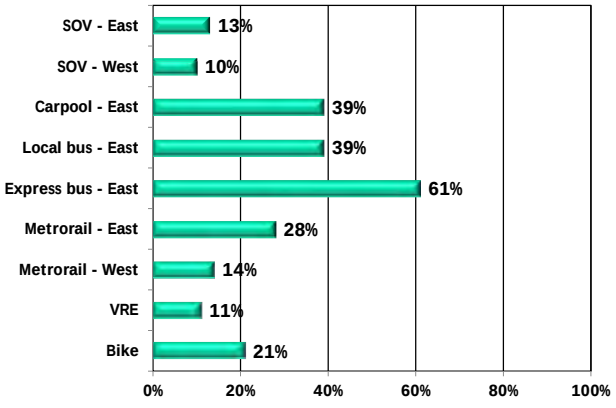
A Few New Commuters Would Use the HOV Lanes If the Afternoon Hours Were Changed to 3:00 to 7:00 pm, Primarily Current Carpoolers



Q79. Assume that the HOV lane restrictions westbound on I-66 inside the Beltway went into effect at 3:00 p.m. and stayed in effect until 7:00 p.m., instead of staying in effect from 4:00 p.m. until 6:30 p.m., as they now do. How likely would you be to use the westbound HOV lanes inside the Beltway for your afternoon commute if they went into effect at 3:00 p.m. and stayed in effect until 7:00 p.m.?

Use of HOV lanes on DTR

Some Commuters in Each Mode Use the HOV Lanes on the Dulles Toll Road; Express Bus Riders, Local Bus Riders and Carpoolers Are Most Likely to use the HOV Lanes on DTR



Q86. Do you use the HOV lanes on the Dulles Toll Road?

Frequency of using HOV on DTR

Express Bus Riders, Local Bus Riders and Carpoolers Are Most Likely to Be Regular Users of the HOV Lanes on DTR; Bike Riders Use the Lanes Least Often

Question asked of those who said they use the HOV lanes on the Dulles Toll Road.

	SOV - East	Carpool - East	Local bus - East	Express bus - East	Metrorail - East	Bike
At least 5 days a week	7%	35%	42%	50%	28%	2%
3 or 4 days a week	7%	19%	17%	30%	13%	5%
1-2 days a week	22%	11%	14%	4%	12%	7%
Less often than one day a week	65%	35%	27%	16%	48%	85%

Note: SOV West, Metrorail West and VRE not shown due to small base sizes.

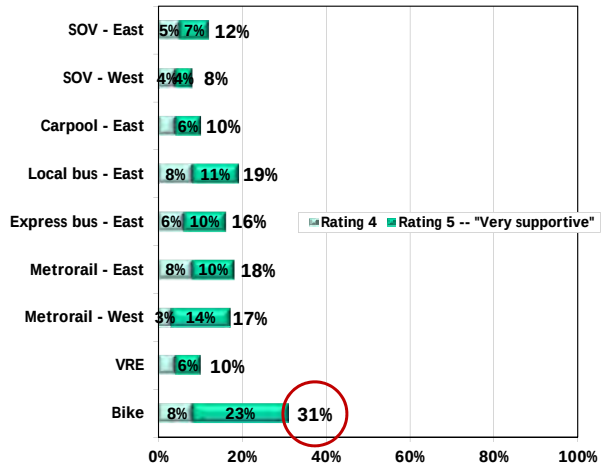
Q87. About how often do you use the HOV lanes on the Dulles Toll Road?

Detailed Findings

Proposed Changes to I-66

Support for toll on I-66

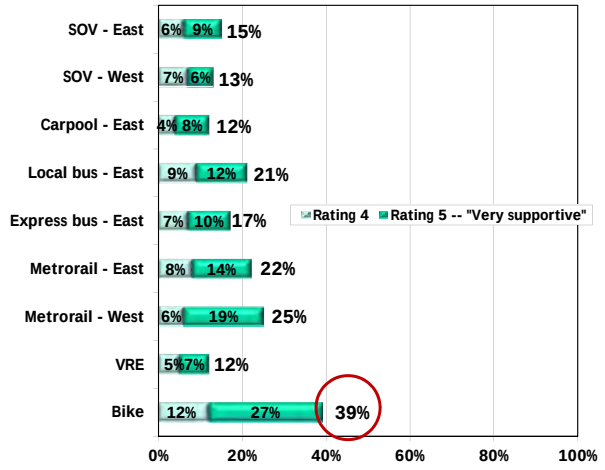
Support for a Toll on I-66 Is Fairly Low, Especially among those Who Would Most Likely Be Paying the Toll Directly – SOVers and Carpoolers; Support Is Highest among Bike Riders



Q80. Assume that a toll is put in place for all traffic on I-66. All vehicles would pay a toll to travel on I-66. How supportive would you be of putting a toll on I-66? By supportive, we mean that you believe that tolling should be put in place inside the Beltway on I-66.

Support for congestion priced tolling on I-66

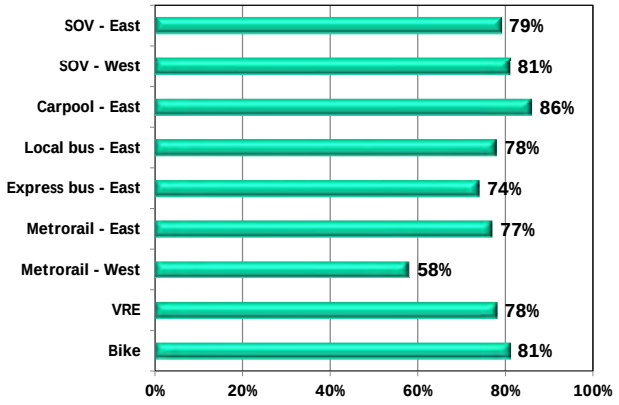
Support for Congestion Priced Tolling on I-66 Is about the Same as Support for Tolling in General on I-66 – Fairly Low; The Highest Level of Support Is Posted for Bike Riders



Q80a. [Description of congestion priced tolling] How supportive would you be of pricing possible tolls on I-66 using a congestion pricing approach? By supportive, we mean that you believe that congestion priced tolling should be put in place for tolls inside the Beltway on I-66.

Aware of HOT lanes

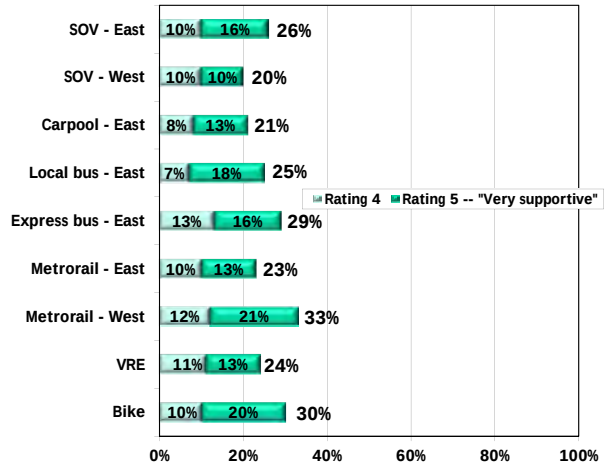
Awareness of the HOT Lanes Concept Is Fairly High; about 8 out of 10 Have Heard of HOT Lanes



Q81. Have you ever heard or read anything about an idea referred to as "HOT lanes," or High Occupancy Toll lanes?

Support for HOT lanes

Support for HOT Lanes on I-66 Is Slightly Higher than Support for Tolling in General; about a Quarter Support HOT Lanes on I-66

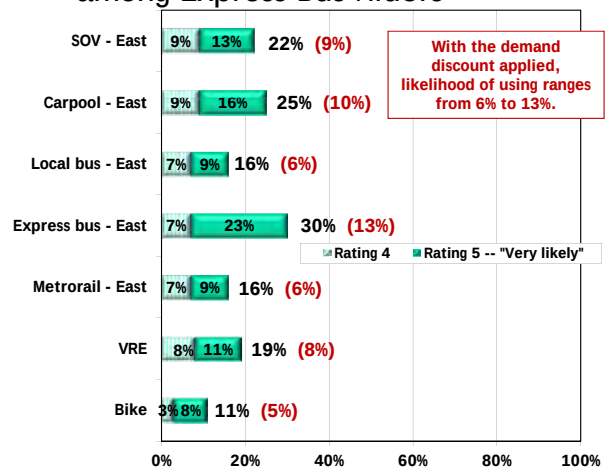


Q82. [Explanation of HOT lanes.] How supportive are you of implementing HOT lanes on I-66 inside the Beltway, 7 days a week, 24 hours a day? By supportive, we mean that you believe HOT lanes should be put in place on I-66 inside the Beltway.

Likelihood of using eastbound HOT lanes for morning commute

Question asked only of those who travel east in the morning.

Stated Likelihood of Using HOT Lanes on I-66 Runs from 11% among Bike Riders to 30% among Express Bus Riders



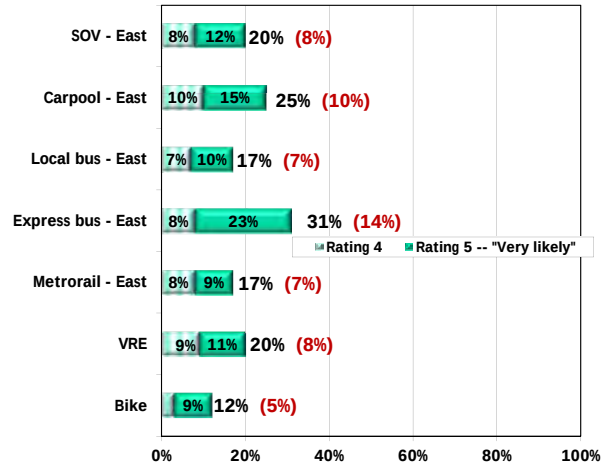
With the demand discount applied, likelihood of using ranges from 6% to 13%.

Q83. How likely would you be to use HOT lanes at least occasionally for your morning commute if they were put in place on eastbound I-66 inside the Beltway?

Likelihood of using westbound HOT lanes for afternoon commute

Question asked only of those who travel west in the afternoon.

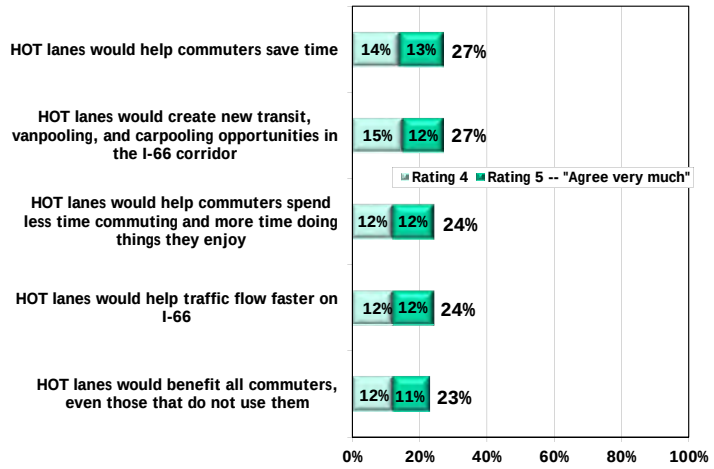
Express Bus Riders and Carpoolers Express the Greatest Interest in Using Westbound HOT Lanes for their Afternoon Commute



Q84. How likely would you be to use HOT lanes at least occasionally for your afternoon commute if they were put in place on westbound I-66 inside the Beltway?

Opinions about HOT lanes – Eastbound SOV

Only about a Quarter of Eastbound SOV Commuters Recognize these Benefits of HOT Lanes

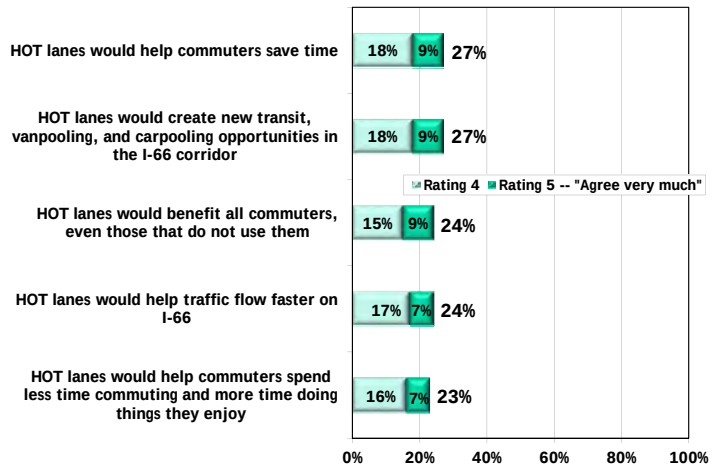


Q85. Next is a list of statements about potential HOT lanes on I-66. Please indicate the extent to which you agree or disagree with each statement. Use a scale of 1-5 for your answer where "1" means that you "do not agree at all" with the statement and "5" means that you "agree very much" with the statement.

I-66 Multimodal Study

Opinions about HOT lanes – Westbound SOV

Similarly, about a Fourth of Westbound SOVers Recognize these Benefits of HOT Lanes



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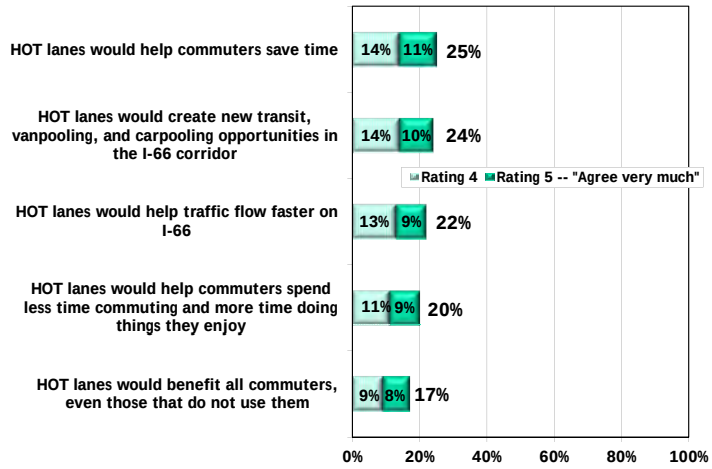
I-66 Multimodal Study

Opinions about HOT lanes – Eastbound carpool

Carpoolers Are Most Likely to Recognize Saving Time and New Transportation Options as Benefits of HOT Lanes; But, Still, Only about a Quarter of Carpoolers Recognize these Benefits of HOT Lanes



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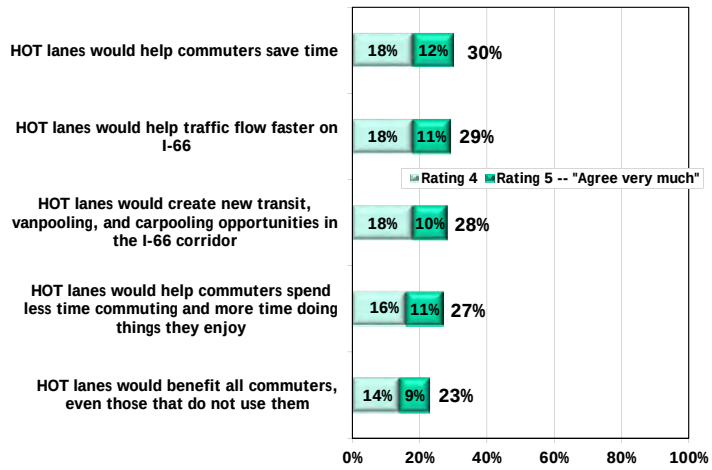
Opinions about HOT lanes – Eastbound Local bus

About a Quarter of Local Bus Riders Recognize these Benefits of HOT Lanes



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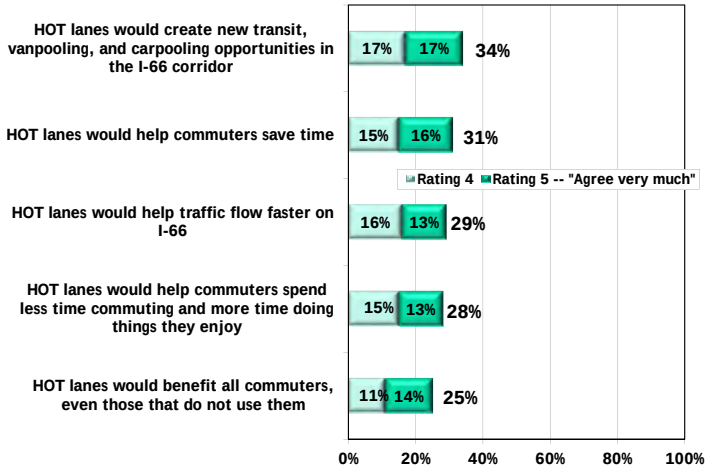
Opinions about HOT lanes – Eastbound Express bus

Express Bus Riders Are about as Likely to See the Benefits of HOT Lanes as Other Commuters



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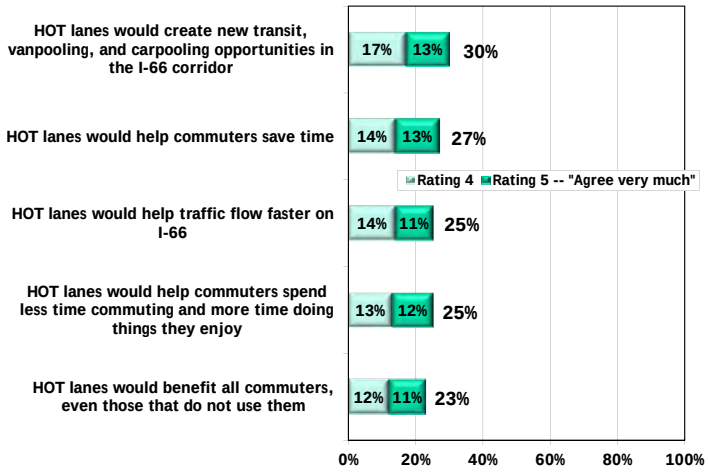
Opinions about HOT lanes – Eastbound Metrorail

About One-fourth of Eastbound Metrorail Riders Also Recognize Benefits of HOT Lanes



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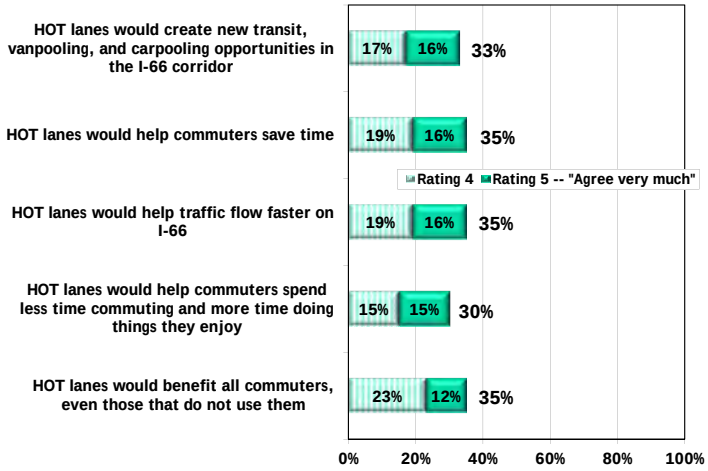
Opinions about HOT lanes – Westbound Metrorail

About a Third of Westbound Metrorail Riders Recognize Benefits of HOT Lanes



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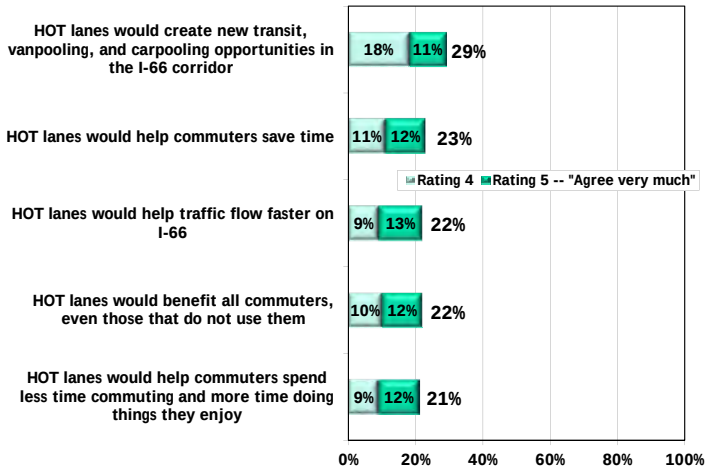
I-66 Multimodal Study

Opinions about HOT lanes - VRE

Similarly, About One-fourth of VRE Riders Recognize Benefits of HOT Lanes

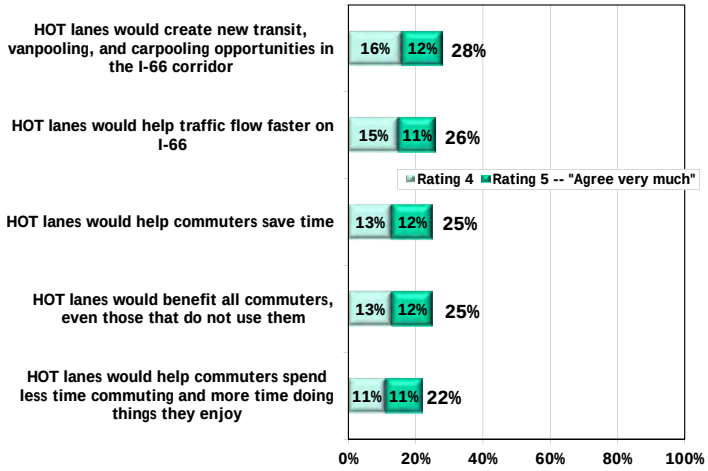


Q85. Next is a list of statements about potential HOT lanes on I-66. Please indicate the extent to which you agree or disagree with each statement. Use a scale of 1-5 for your answer where "1" means that you "do not agree at all" with the statement and "5" means that you "agree very much" with the statement.

I-66 Multimodal Study

Opinions about HOT lanes - Bike

The Views of Bike Riders Are Consistent with Commuters Who Use Other Modes



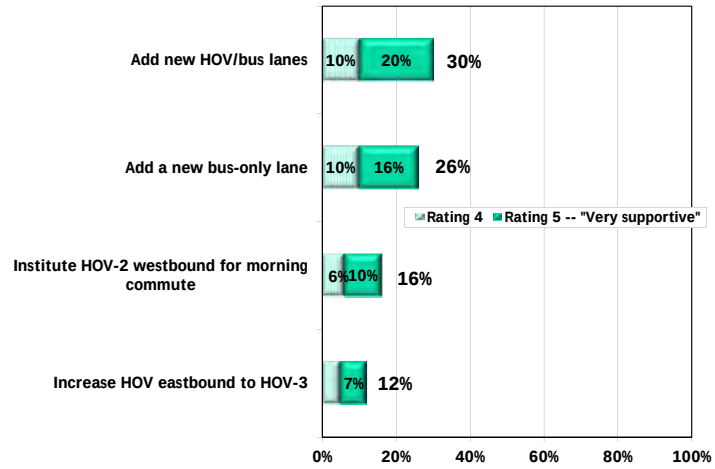
Q85. Next is a list of statements about potential HOT lanes on I-66. Please indicate the extent to which you agree or disagree with each statement. Use a scale of 1-5 for your answer where "1" means that you "do not agree at all" with the statement and "5" means that you "agree very much" with the statement.

Detailed Findings

Roadway Changes

Support for I-66 changes – Eastbound SOV

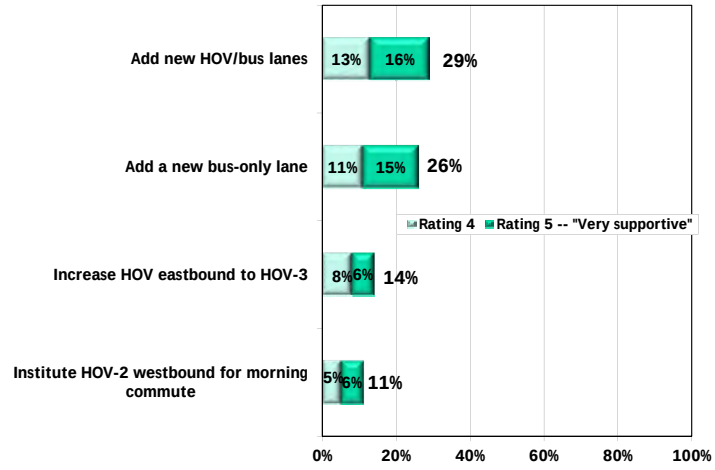
Of these Four Options for I-66 Changes, Eastbound SOVers Express the Greatest Support for Adding New HOV/Bus Lanes and Adding a New Bus-Only Lane; Support for Increasing Eastbound HOV to HOV-3 Is Low



Q88. Numerous suggestions have been made by the public and by officials for changes to I-66 to improve the flow of traffic on I-66 inside the Beltway. How supportive are you of each of these possible changes to I-66 inside the Beltway? By supportive, we mean that you believe that this change should be made.

Support for I-66 changes – Westbound SOV

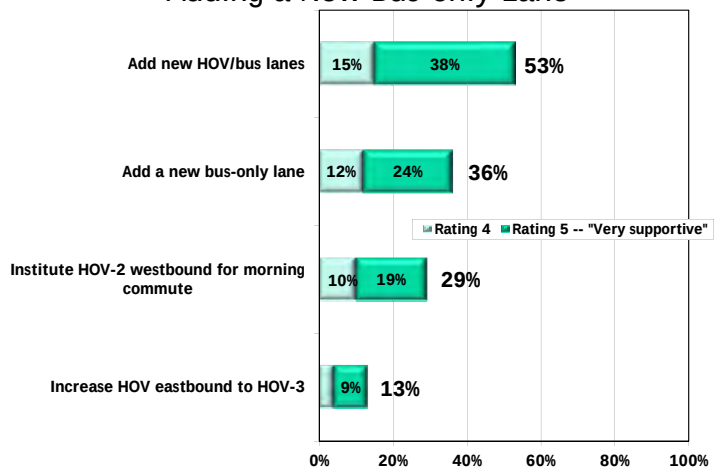
Westbound SOVers Also Voice the Most Support for Adding HOV/Bus Lanes and Adding a New Bus-Only Lane



Q88. Numerous suggestions have been made by the public and by officials for changes to I-66 to improve the flow of traffic on I-66 inside the Beltway. How supportive are you of each of these possible changes to I-66 inside the Beltway? By supportive, we mean that you believe that this change should be made.

Support for I-66 changes – Eastbound carpool

Over Half of Carpoolers Support Adding New HOV/Bus Lanes to I-66; More than a Third Support Adding a New Bus-only Lane



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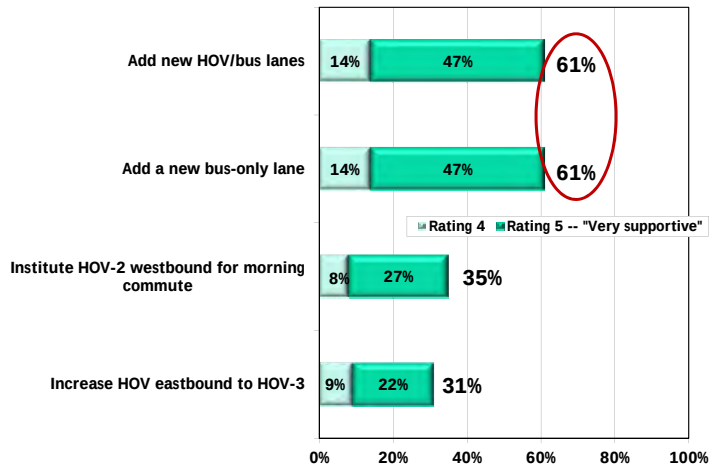
Support for I-66 changes – Eastbound local bus

Not Surprisingly, Bus Lanes Are the Most Appealing Options for Local Bus Riders



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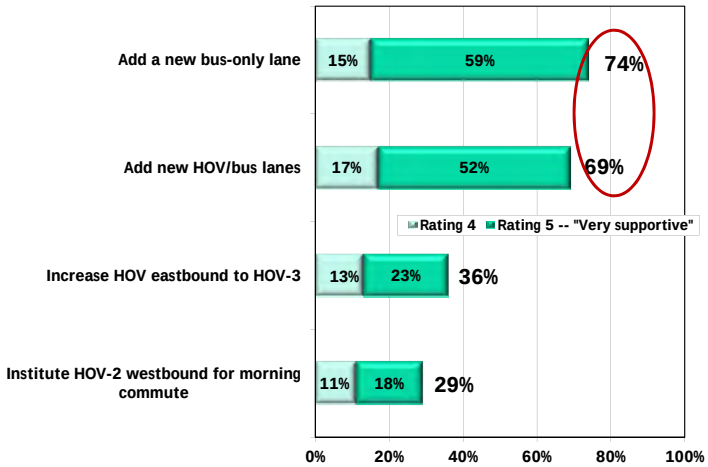
Support for I-66 changes – Eastbound express bus

Express Bus Riders Are Even More Supportive of New Bus Lanes than Are Local Bus Riders



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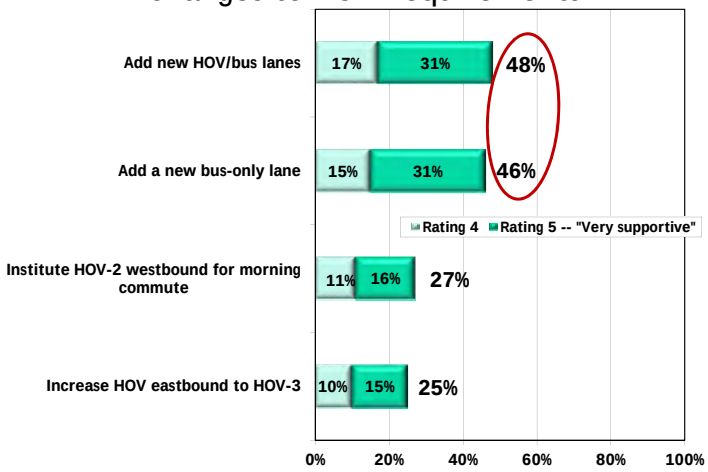
Support for I-66 changes – Eastbound Metrorail

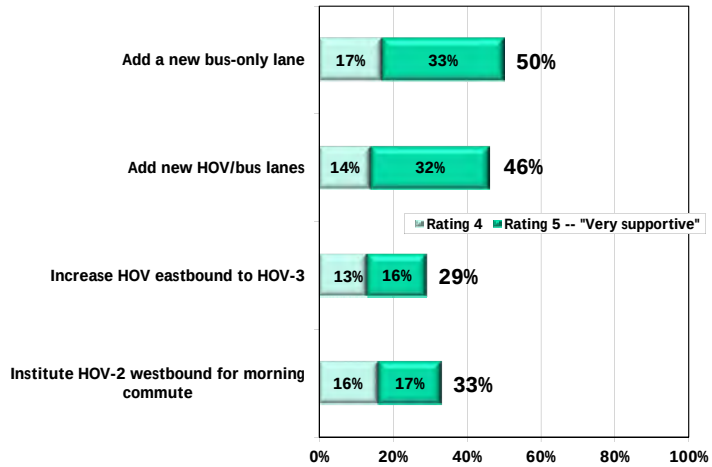
Half of Metrorail Riders Support a New Bus-only Lane or New HOV/Bus Lanes; a Fourth Support Changes to HOV Requirements



Q88. Numerous suggestions have been made by the public and by officials for changes to I-66 to improve the flow of traffic on I-66 inside the Beltway. How supportive are you of each of these possible changes to I-66 inside the Beltway? By supportive, we mean that you believe that this change should be made.

Support for I-66 changes - Westbound Metrorail

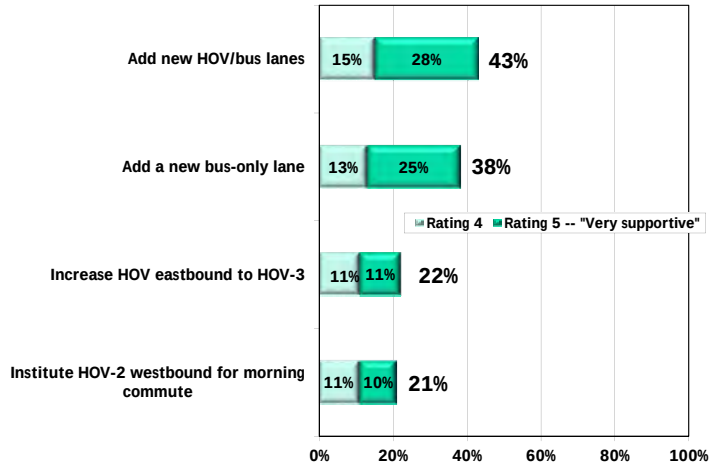
The Pattern of Support Is Similar for Westbound Metrorail Riders



Q88. Numerous suggestions have been made by the public and by officials for changes to I-66 to improve the flow of traffic on I-66 inside the Beltway. How supportive are you of each of these possible changes to I-66 inside the Beltway? By supportive, we mean that you believe that this change should be made.

Support for I-66 changes - VRE

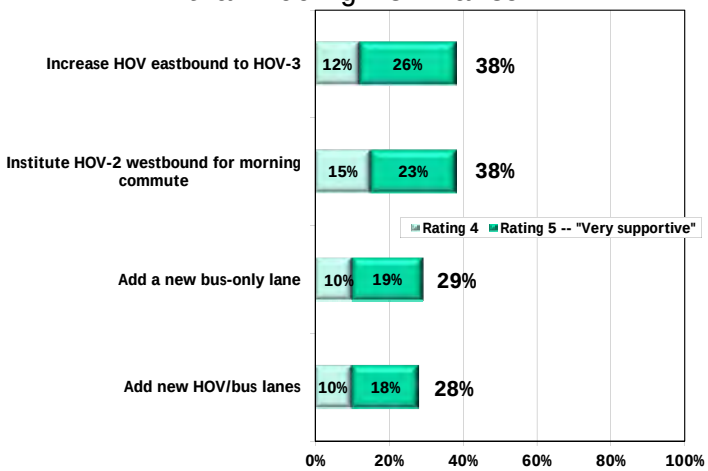
About 40% of VRE Riders Support New HOV or Bus Lanes to I-66; Only about Half that Many Support Changing Eastbound HOV to HOV-3 or Instituting HOV-2 Westbound



Q88. Numerous suggestions have been made by the public and by officials for changes to I-66 to improve the flow of traffic on I-66 inside the Beltway. How supportive are you of each of these possible changes to I-66 inside the Beltway? By supportive, we mean that you believe that this change should be made.

Support for I-66 changes - Bike

Bike Riders Are More Supportive of Instituting Changes to HOV Requirements than Adding New Lanes



Q88. Numerous suggestions have been made by the public and by officials for changes to I-66 to improve the flow of traffic on I-66 inside the Beltway. How supportive are you of each of these possible changes to I-66 inside the Beltway? By supportive, we mean that you believe that this change should be made.

Detailed Findings

Transit

Reasons for not using bus/train

Only most frequent responses are shown.

No One Reason Dominates for Not Using Transit; Most Often Cited Reasons Include Travel Time Being Too Long, Needing Car for Job, Too Far to the Station or Stop from Home

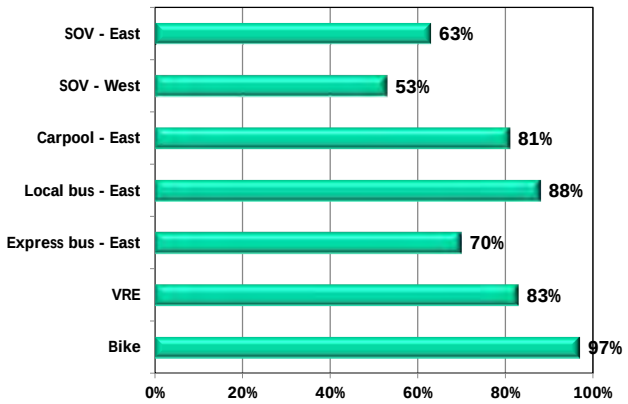
	SOV - Eastbound	SOV - Westbound	Carpool - Eastbound
Travel time is too long	18%	28%	26%
Need my car for my job	16%	19%	6%
Too far to the station or stop from my house	15%	5%	14%
Need to make stops on the way to/or from work	10%	6%	8%
Too many transfers required for my trip	8%	10%	5%
Too expensive	4%	1%	9%
Bus/train does not go to my destination	6%	7%	2%
Bus/train does not come often enough	5%	5%	3%
Too far to the station from work	1%	1%	2%
Seat on bus/train not available	4%	11%	3%
Parking not available at station or stop	1%	0%	1%
Lack of control over on-board atmosphere	1%	0%	2%

Q68. What is the main reason you do not commute by bus or train more often to get to work or school from your home?

Availability of Metrorail

Question asked of those who do not currently ride Metrorail.

SOV Commuters – Especially those Headed West – Are Least Likely to Have Metrorail Available for their Commute; Bike Riders Are Most Likely to Have Metrorail Available

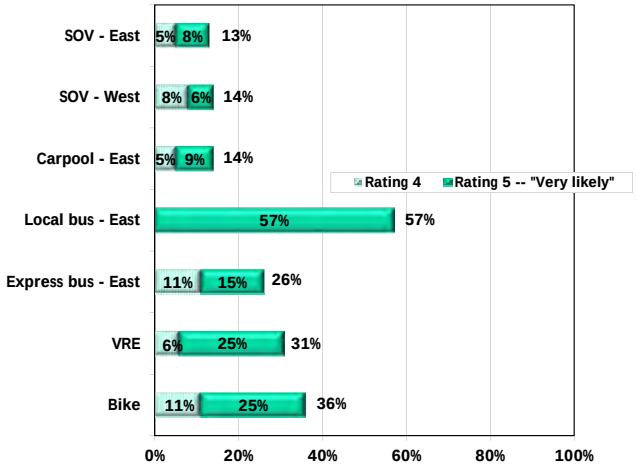


Q89. Is Metrorail available for at least a portion of your commute?

Likelihood of riding Metrorail

Question asked of those who do not currently ride Metrorail and it is available for their commute.

SOV Commuters and Carpoolers Express the Least Interest in Riding Metrorail; Local Bus Riders Express the Most Interest

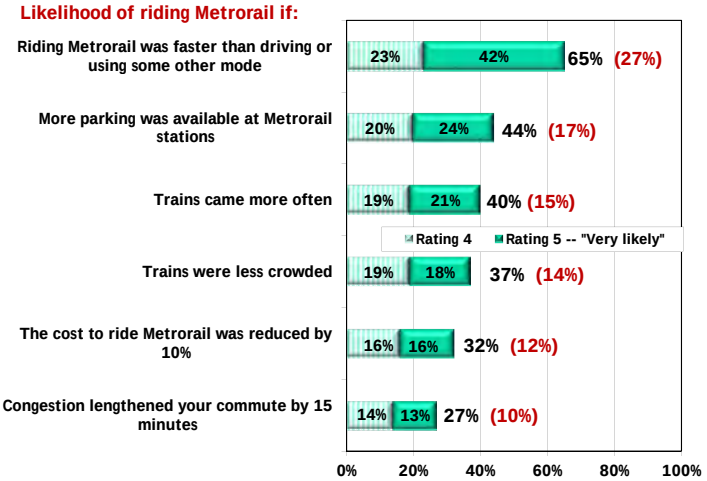


Q90. Regardless of the mode of transportation you use today for your commute, how likely are you to use Metrorail for at least part of your commute at least 1-2 days a week in the future? Please use a scale of 1 to 5 for your answer, where "1" means that you are not at all likely and "5" means that you are very likely.

Likelihood of riding Metrorail under various conditions - Eastbound SOV

Question asked of those who do not currently ride Metrorail and it is available for their commute.

A Faster Commute Would Attract Eastbound SOVers to Metrorail

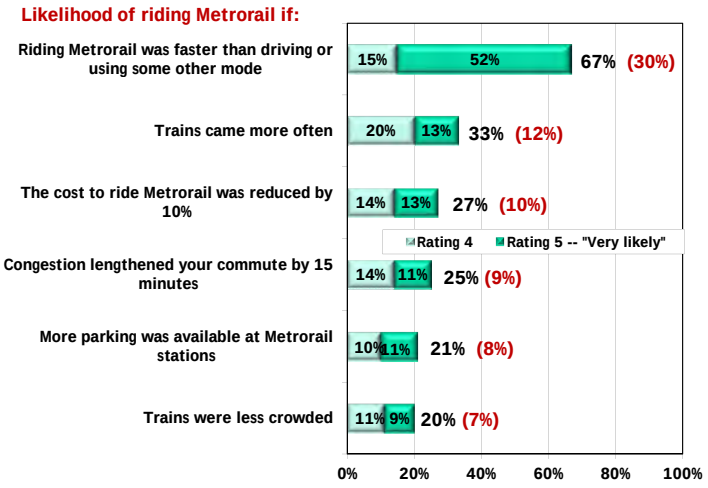


Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

Likelihood of riding Metrorail under various conditions - Westbound SOV

Question asked of those who do not currently ride Metrorail and it is available for their commute.

Westbound SOVers Would Be Most Likely to Try Metrorail If It Was Faster than Other Modes



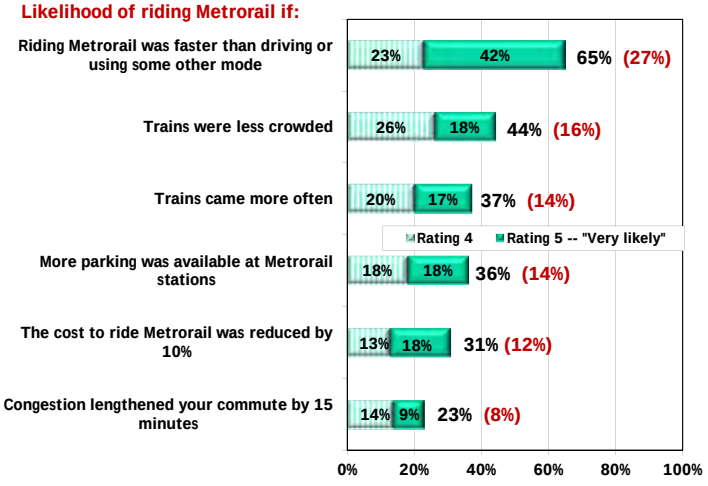
Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

I-66 Multimodal Study

Likelihood of riding Metrorail under various conditions - Eastbound carpool

Question asked of those who do not currently ride Metrorail and it is available for their commute.

Carpoolers Also Like the Potential of a Faster Commute with Metrorail; As with Some SOVers, Less Crowded Metro Trains Also Enhances the Appeal of Metrorail



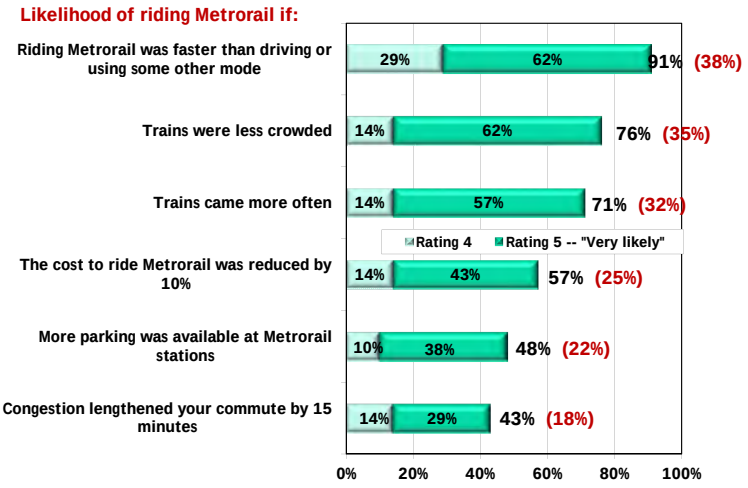
Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

I-66 Multimodal Study

Likelihood of riding Metrorail under various conditions - Eastbound local bus

Question asked of those who do not currently ride Metrorail and it is available for their commute.

Local Bus Riders Express Interest in Riding Metrorail Under Several Scenarios: If the Train Were Faster than Other Modes, If Trains Were Less Crowded and Came More Often, and If the Cost to Ride Metrorail Was Reduced by 10%



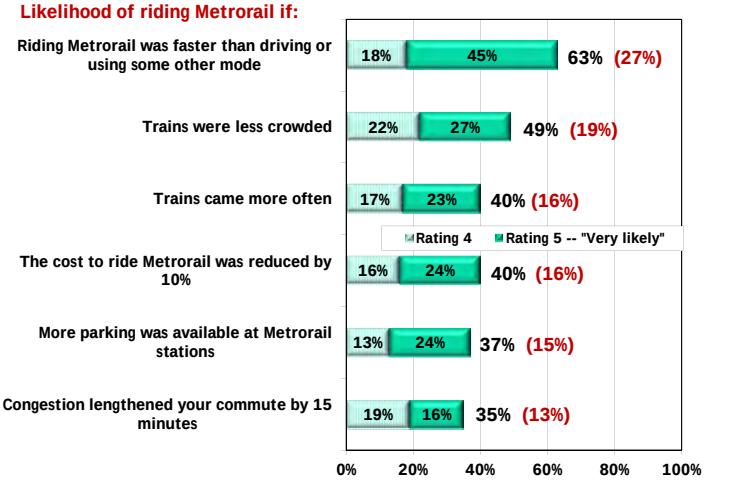
Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

I-66 Multimodal Study

Likelihood of riding Metrorail under various conditions - Eastbound Express bus

Question asked of those who do not currently ride Metrorail and it is available for their commute.

A Faster Commute Also Appeals to Current Express Bus Riders



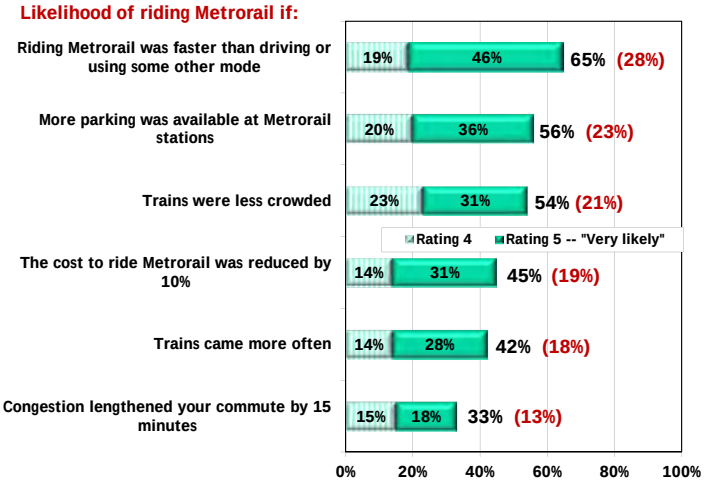
Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

I-66 Multimodal Study

Likelihood of riding Metrorail under various conditions - VRE

Question asked of those who do not currently ride Metrorail and it is available for their commute.

VRE Riders Would Switch to Metrorail If It Was Faster; This Group Is Relatively More Sensitive to Availability of Parking



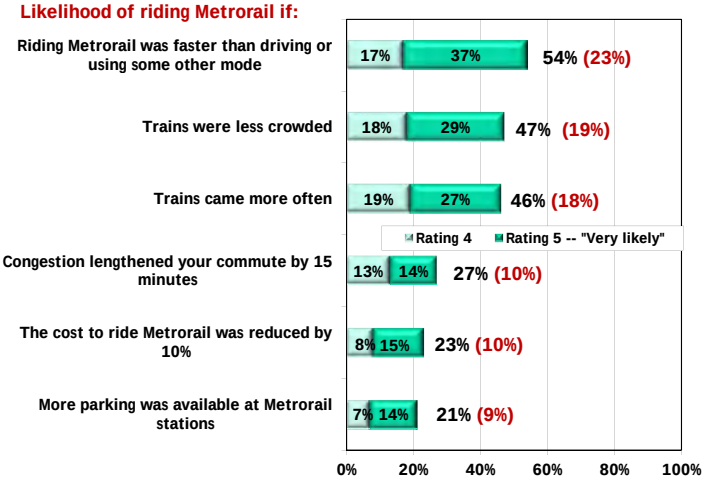
Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

I-66 Multimodal Study

Likelihood of riding Metrorail under various conditions - Bike

Question asked of those who do not currently ride Metrorail and it is available for their commute.

Generally, Bike Riders Are Slightly Less Interested in Metrorail Regardless of the Benefit Tested; A Faster Commute by Metrorail Is the Most Attractive Attribute

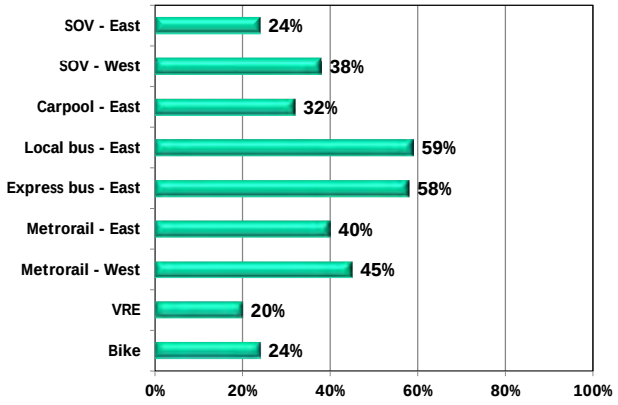


Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

I-66 Multimodal Study

Silver Line will be an option

At Least 20% in All Modes Say that the Silver Line Will Be an Option for them; The Silver Line Is Particularly Likely to Be Available for Current Bus Riders, Both Local and Express

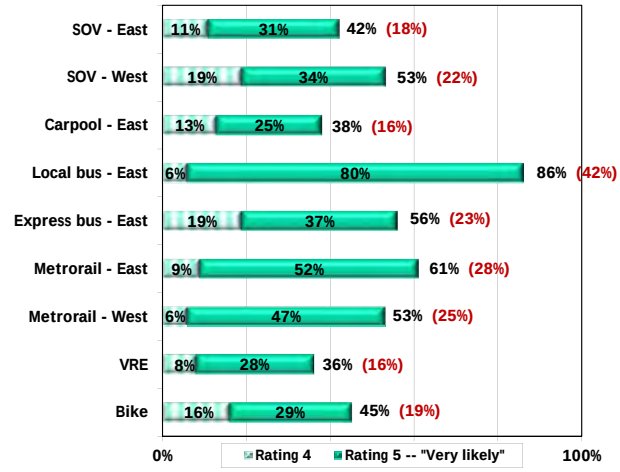


Q92. The Dulles Corridor Metrorail, sometimes called the "Silver Line," will provide service to Dulles International Airport and Tysons Corner. It is scheduled to open in two phases in 2013 and 2016. When finished, will the "Silver Line" be a transportation option you could use for your commute even if you choose not to use it?

Likelihood of using Silver Line

Question asked of those who said Silver Line would be available for their commute.

Greatest Likelihood of Using the Silver Line for their Commute Is Posted for Local Bus Riders; But, All Modes Express Interest in Riding the Silver Line

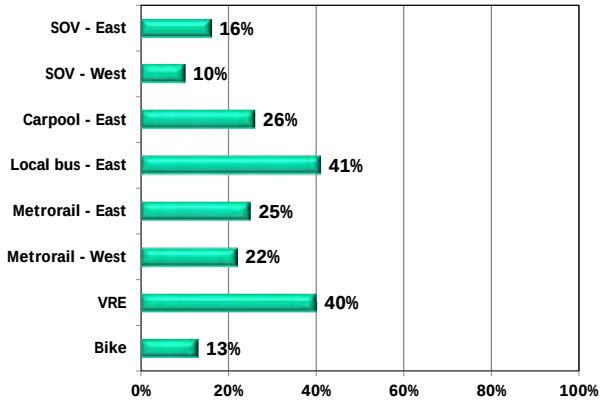


Q93. How likely will you be to use the Dulles Corridor Metrorail ("Silver Line") for at least part of your commute 1-2 days a week when it opens?

Availability of express bus

Question asked of those who do not currently ride express bus.

Among those Not Currently Riding Express Bus, Local Bus Riders and VRE Riders Are Most Likely to Have Express Bus Available

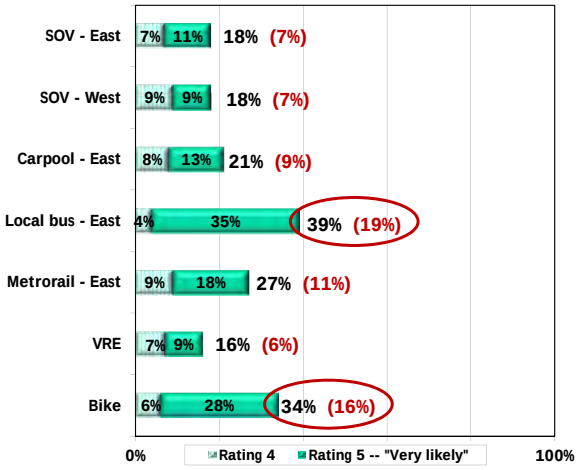


Q94. Is there express bus service reasonably available from the area where you commute? An express bus service is a motorcoach or bus, generally traveling longer distances with limited stops, taking commuters to their destinations. Is express bus service available from the area where you live to your destination that you could use?

Likelihood of riding express bus

Question asked of those who have express bus service available but do not currently use it. Metrorail West not shown due to small base size.

The Greatest Likelihood of Riding an Express Bus in the Future Is Posted for Local Bus Riders and Current Bike Riders

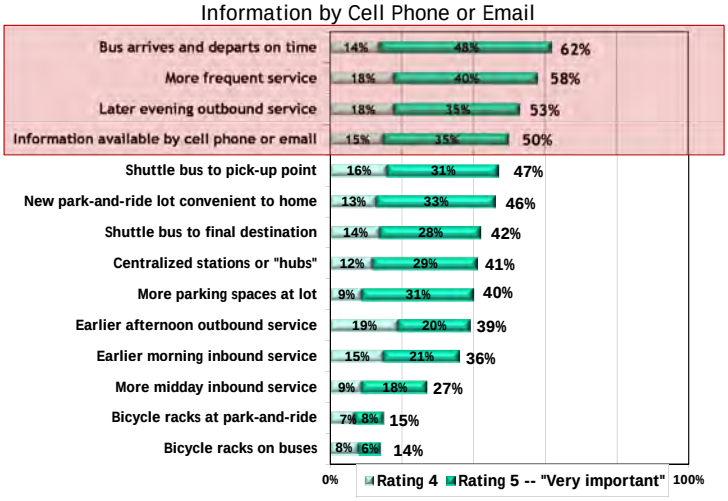


Q96. Regardless of the mode of transportation you use today for your commute, how likely are you to take an express bus in the future? Please use a scale of 1 to 5 for your answer, where "1" means that you are "not at all likely" and "5" means "very likely."

Importance of express bus features - Eastbound SOV

Question asked of those who have express bus service available but do not currently ride express bus regularly.

To Ride an Express Bus or to Ride More Often, Eastbound SOVers Place Most Importance on Bus Arriving and Departing on Time, More Frequent Service, Later Evening Outbound Service, and Availability of Information by Cell Phone or Email

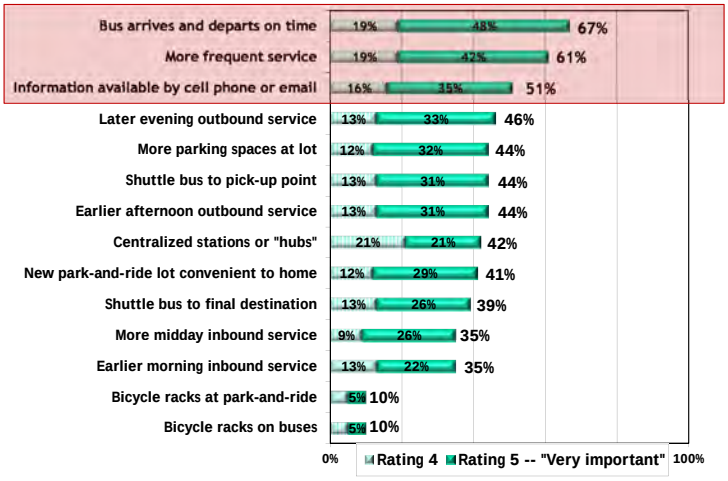


Q97. Please indicate how important each improvement would be in helping you choose to continue riding express bus service or to increase your usage. Use a scale of 1-5 for your answer where "1" means "not at all important" and "5" means "very important."

Importance of express bus features - Eastbound carpool

Question asked of those who have express bus service available but do not currently ride express bus regularly.

To Ride an Express Bus or to Ride More Often, Eastbound Carpoolers Give Priority to the Bus Arriving and Departing on Time, More Frequent Service, and Availability of Information by Cell Phone or Email

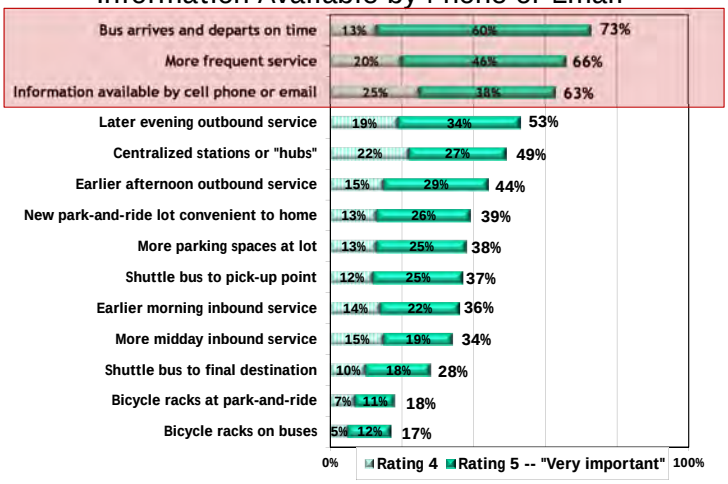


Q97. Please indicate how important each improvement would be in helping you choose to continue riding express bus service or to increase your usage. Use a scale of 1-5 for your answer where "1" means "not at all important" and "5" means "very important."

Importance of express bus features - Eastbound Metrorail

Question asked of those who have express bus service available but do not currently ride express bus regularly. Westbound Metrorail not shown due to small base size.

To Ride an Express Bus, Eastbound Metrorail Riders Value On-time Arrival and Departure, More Frequent Service and Information Available by Phone or Email

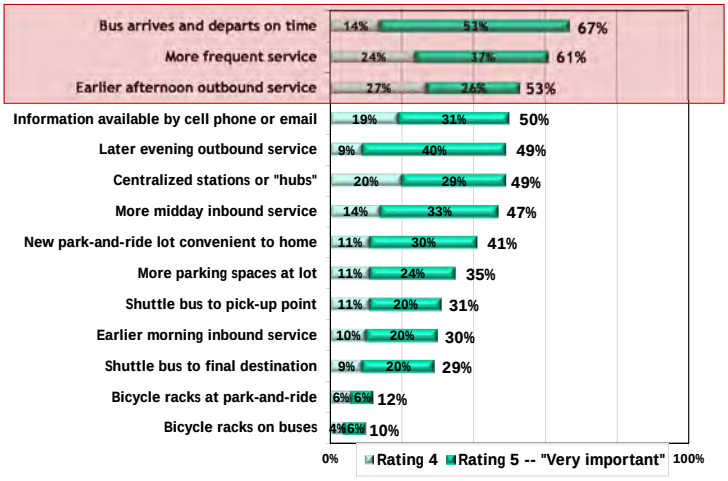


Q97. Please indicate how important each improvement would be in helping you choose to continue riding express bus service or to increase your usage. Use a scale of 1-5 for your answer where "1" means "not at all important" and "5" means "very important."

Importance of express bus features - VRE

Question asked of those who have express bus service available but do not currently ride express bus regularly.

To Ride an Express Bus or to Ride More Often, VRE Riders Want the Bus to Arrive and Depart on Time, More Frequent Service and Earlier Outbound Service

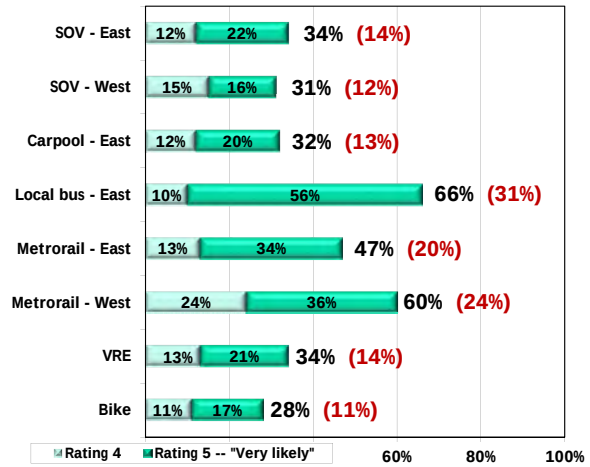


Q97. Please indicate how important each improvement would be in helping you choose to continue riding express bus service or to increase your usage. Use a scale of 1-5 for your answer where "1" means "not at all important" and "5" means "very important."

Likelihood of using new express bus service

Question asked of those who do not currently have express bus service available.

If New Express Service Were Available, Current Local Bus Riders Would Be Most Likely to Use It; Bike Riders, SOVers and Carpoolers Would Be Least Likely to Use It

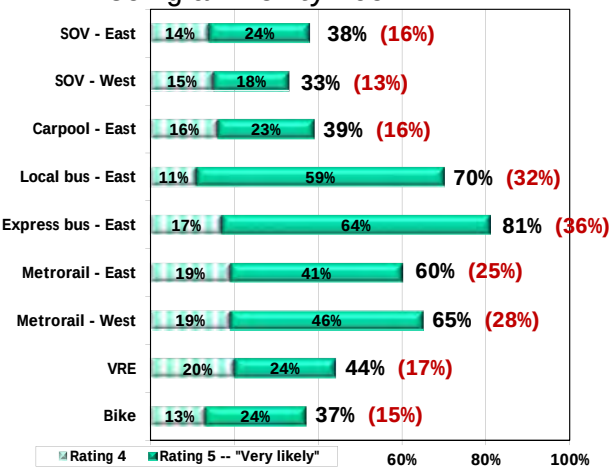


Q98. If new express bus service were available from where you live to where you work, how likely would you be to use it at least 1-2 days a week?

Likelihood of using Priority Bus service

Question asked of all respond-ents.

Current Bus Riders and Current Metrorail Riders Express the Greatest Likelihood of Using a Priority Bus



Q105. Suppose a Priority Bus service was conveniently accessible from the area where you live to your destination, that is the place where you work or attend school. How likely would you be to use a Priority Bus service for your regular commute to work or school at least 2 days per week?

Reasons for using Priority Bus

A Variety of Reasons Were Mentioned for Likely Use of Priority Bus; But, the Most Frequently Cited Appeal of Priority Bus Is a Faster Commute

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - East	Metrorail - East	Metrorail - West	VRE
Faster commute	46%	36%	37%	50%	60%	49%	50%	42%
To have an alternative transportation mode	18%	9%	24%	46%	25%	44%	31%	11%
Reduce commuting cost	22%	27%	24%	11%	10%	10%	6%	16%
Alleviate stress	20%	27%	22%	4%	6%	11%	13%	5%
Convenience	18%	14%	14%	18%	11%	12%	13%	32%
Easier commute	11%	14%	10%	11%	2%	5%	13%	5%
Predictable schedule	6%	5%	8%	7%	5%	11%	6%	26%
Can do other things while riding	8%	0%	8%	0%	3%	4%	0%	11%
Reduce congestion/ help environment	2%	5%	8%	4%	3%	2%	0%	0%
Safety	5%	5%	0%	4%	0%	0%	6%	0%

Note: Bike not shown due to small base size.

 Q106. Why would you be likely to use a Priority Bus service?

Reasons for not using Priority Bus

Satisfaction with Current Mode (Especially Among Bike Riders) Often Limits Appeal of Priority Bus; the Need for Flexibility and Convenience Also Prevent Trial of Priority Bus

	SOV - East	SOV - West	Carpool - East	Metrorail - East	VRE	Bike
Satisfied with current mode	13%	15%	20%	35%	17%	77%
Need flexibility in schedule	23%	15%	15%	4%	0%	8%
Not convenient	9%	6%	15%	12%	13%	8%
Don't like public transportation/bus	10%	9%	17%	13%	17%	15%
Need car for work	16%	24%	5%	0%	0%	0%
Would take longer than current mode	6%	18%	10%	8%	4%	4%
Cost	2%	0%	13%	8%	4%	0%
Need car to pickup/drop off family members	6%	12%	5%	2%	4%	0%
Depends on how it compares to current mode	3%	0%	7%	10%	13%	0%
Other modes are better	0%	0%	5%	6%	13%	8%

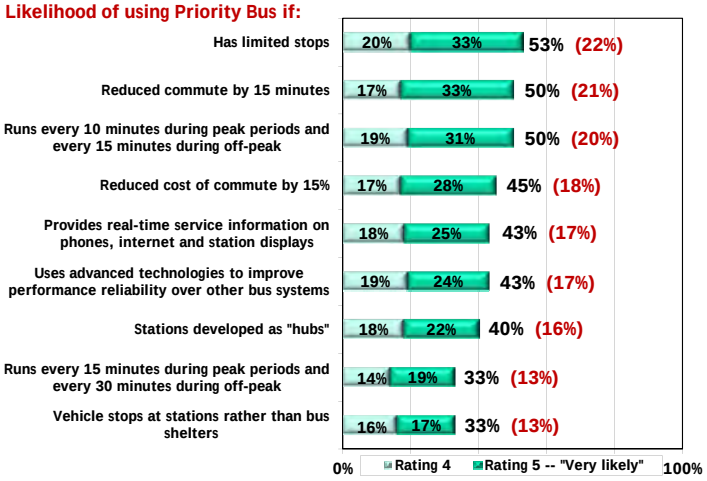
Note: Local and express bus and Metrorail - West not shown due to small base size.

Q106. Why would you not be likely to use a Priority Bus service?

Likelihood of using Priority Bus based on specific features - Eastbound SOV

Eastbound SOVers Would Be Most Likely to Ride Priority Bus If It Had Limited Stops, Reduced their Commute by 15 Minutes or Ran Every 10 Minutes During Peak Periods

Likelihood of using Priority Bus if:

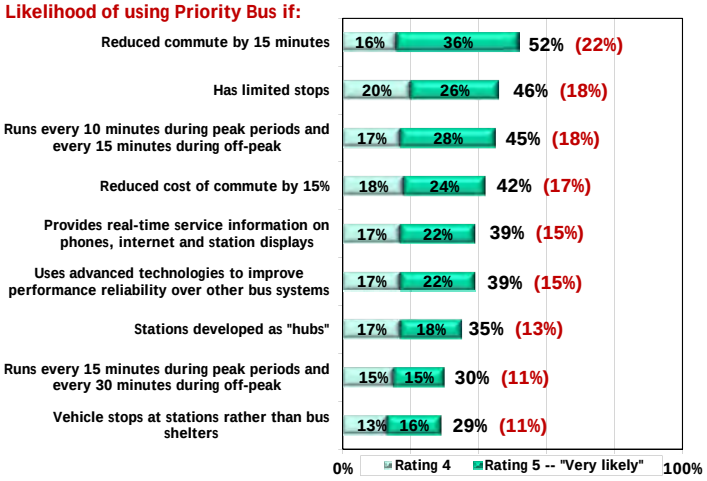


Q107. How likely would you be to use Priority Bus services based on the following information about this service?

Likelihood of using Priority Bus based on specific features - Westbound SOV

For Westbound SOVers, the Most Compelling Attribute or Benefit Is Reducing Commute Time

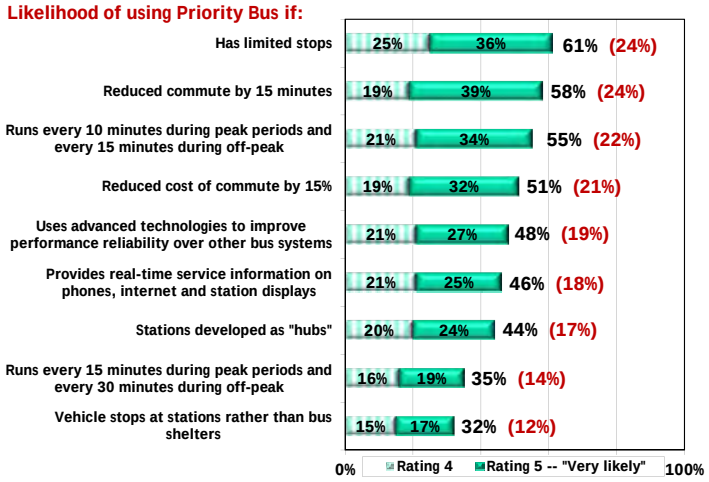
Likelihood of using Priority Bus if:



Q107. How likely would you be to use Priority Bus services based on the following information about this service?

Likelihood of using Priority Bus based on specific features - Eastbound carpool

For Carpoolers, the Potential Time Savings of Priority Bus Is Most Appealing – Its Limited Stops, Reduction of Commute Time and Running Every 10 Minutes

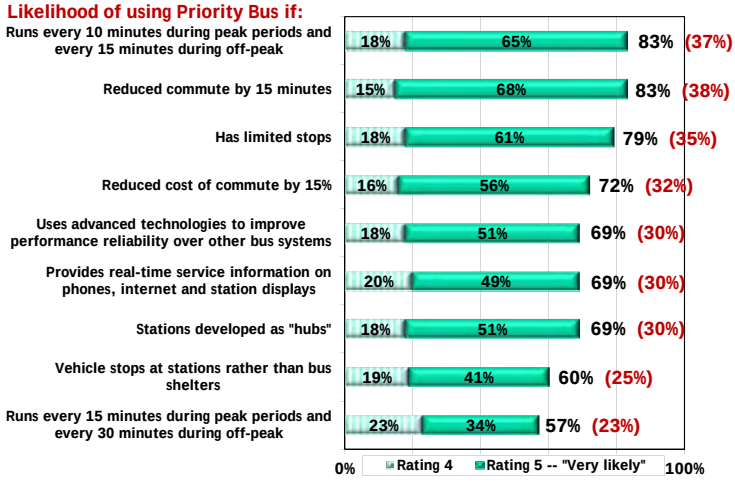


Q107. How likely would you be to use Priority Bus services based on the following information about this service?

I-66 Multimodal Study

Likelihood of using Priority Bus based on specific features - Eastbound local bus

Generally, All of the Potential Benefits of Priority Bus Enhance Its Appeal among Current Local Bus Riders; But, Benefits Related to Time Are Most Persuasive

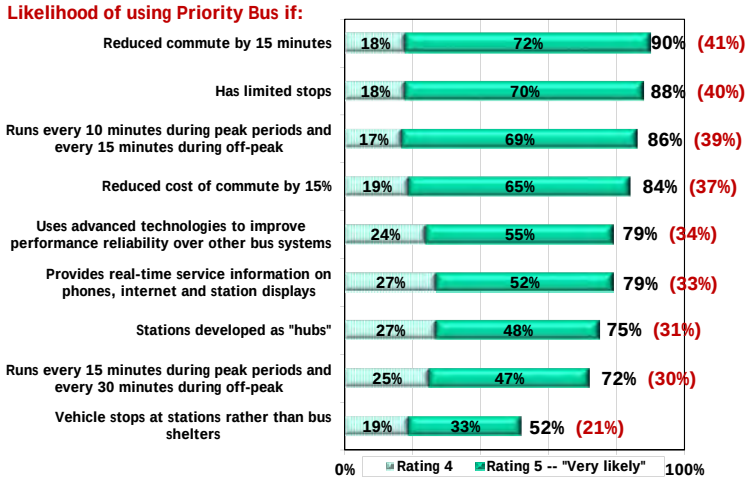


Q107. How likely would you be to use Priority Bus services based on the following information about this service?

I-66 Multimodal Study

Likelihood of using Priority Bus based on specific features - Eastbound express bus

Among Express Bus Riders, All of the Potential Benefits of Riding a Priority Bus Are Persuasive; the Weakest Is Stopping at Stations Rather than Shelters

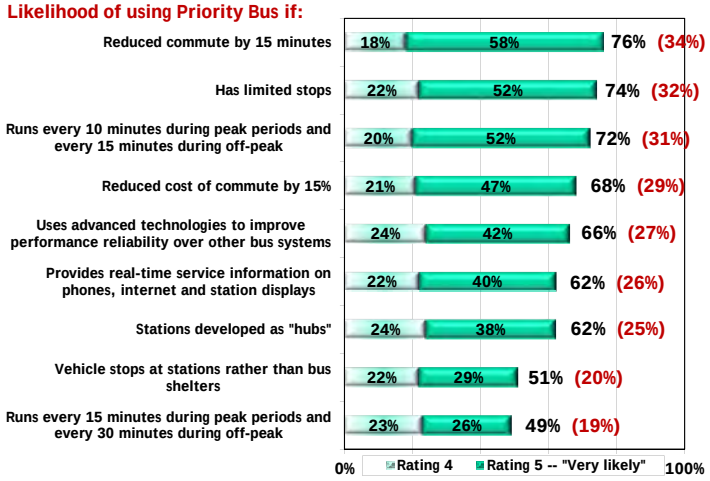


Q107. How likely would you be to use Priority Bus services based on the following information about this service?

I-66 Multimodal Study

Likelihood of using Priority Bus based on specific features - Eastbound Metrorail

Metrorail Riders Would Be Most Likely to Ride a Priority Bus If It Reduced their Commute by 15 Minutes, Has Limited Stops, Runs Every 10 Minutes or Reduced Cost of Commute by 15%



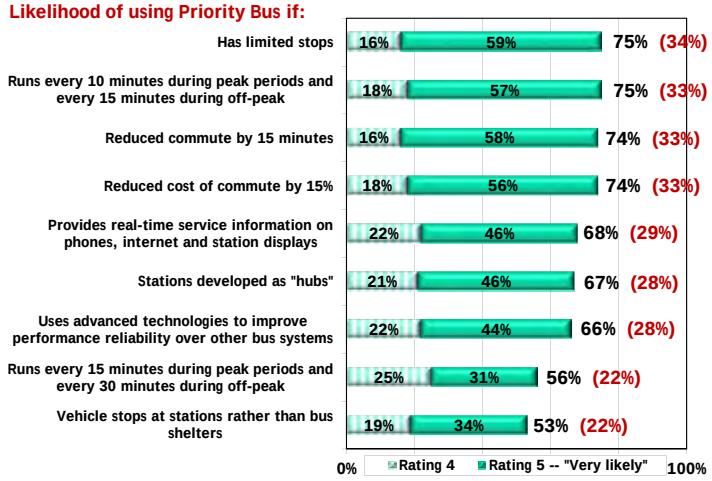
Q107. How likely would you be to use Priority Bus services based on the following information about this service?

I-66 Multimodal Study

Likelihood of using Priority Bus based on specific features – Westbound Metrorail

Westbound Metrorail Riders Would Be Attracted to Priority Bus by the Same Benefits as Eastbound Metrorail Riders – Limited Stops, Reducing the Time and Cost of their Commute and Running Every 10 Minutes during Peak Hours and Every 15 Minutes During Off-peak

Likelihood of using Priority Bus if:

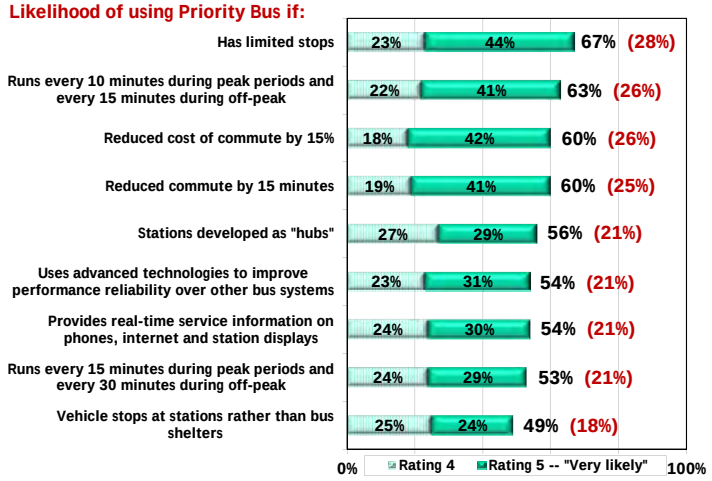


Q107. How likely would you be to use Priority Bus services based on the following information about this service?

Likelihood of using Priority Bus based on specific features – VRE

The Same Benefits that Attract Other Commuters Would Also Attract VRE Riders to Priority Bus

Likelihood of using Priority Bus if:

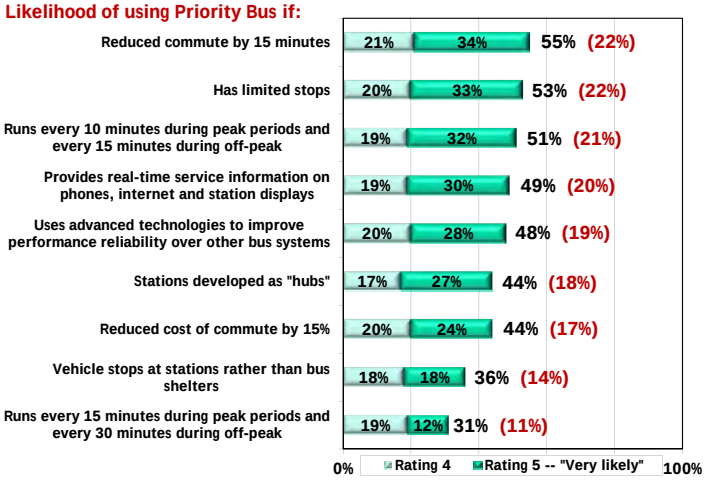


Q107. How likely would you be to use Priority Bus services based on the following information about this service?

Likelihood of using Priority Bus based on specific features - Bike

The Appeal of Priority Bus to Bike Riders More Nearly Resembles the Pattern of Responses of SOVers than Current Transit Riders; Still, Time Prevails

Likelihood of using Priority Bus if:



Q107. How likely would you be to use Priority Bus services based on the following information about this service?

Detailed Findings

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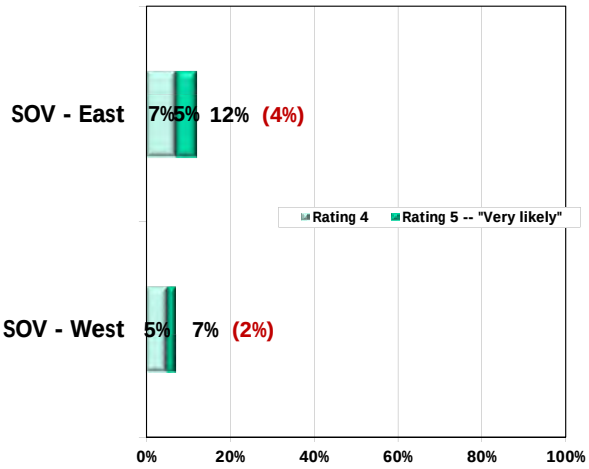
Likelihood of carpooling

Question asked of those who currently commute by SOV.

Stated Likelihood of Carpooling by Current SOVers Is Fairly Low



Q123. Regardless of the mode of transportation you use today for your commute, how likely are you to carpool in the future?

Changes to encourage carpooling

Question asked of SOV commuters

SOVers Offer No Strong Suggestions for Making Carpooling More Attractive; Most Often They Suggest Making It Easier to Find a Carpool and Adding More Lanes to the Roadway

	SOV - East	SOV - West
Make it easier to find carpools	18%	9%
Add more lanes	9%	11%
Less traffic/less congestion	4%	0%
HOV lanes' comments - negative	4%	2%
HOV lanes' comments - positive	2%	0%
Make commute faster	2%	0%
HOT lanes comments - positive	1%	2%
HOT lanes' comments - negative	1%	0%
Nothing	46%	62%
Don't know	3%	4%

Q123a. What changes or improvements in the I-66 corridor could convince you to carpool at least occasionally?

Commute programs offered by employer

SOVers Often Work for Organizations that Have Free or Subsidized Parking; Transit Users Often Work for Organizations that Provide Transit Fare Support

-- Carpoolers Are More Likely than the Other Mode Users to Work for an Organization that Offers Ridematching and Preferred Parking for Carpools --

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - East	Metrorail - East	Metrorail - West	VRE	Bike
Free/subsidized parking	60%	77%	50%	35%	32%	33%	42%	36%	46%
Preferred parking for car/vanpools	18%	13%	30%	23%	21%	22%	22%	26%	23%
Transit fare support	42%	20%	56%	68%	64%	66%	60%	67%	64%
Pre-tax salary deduction for transit	27%	16%	30%	31%	38%	36%	40%	35%	34%
Ridematching	11%	8%	20%	13%	17%	16%	19%	15%	15%
Flexible work hours	59%	64%	64%	64%	67%	66%	70%	68%	77%
Compressed work week	30%	25%	44%	44%	42%	41%	42%	42%	45%
Telework	43%	42%	55%	56%	56%	55%	62%	58%	65%
Shuttle to transit station	14%	12%	14%	10%	12%	11%	19%	18%	14%

Q128. Which of the following does your employer offer?

Commute programs offered by employer - and used by employee

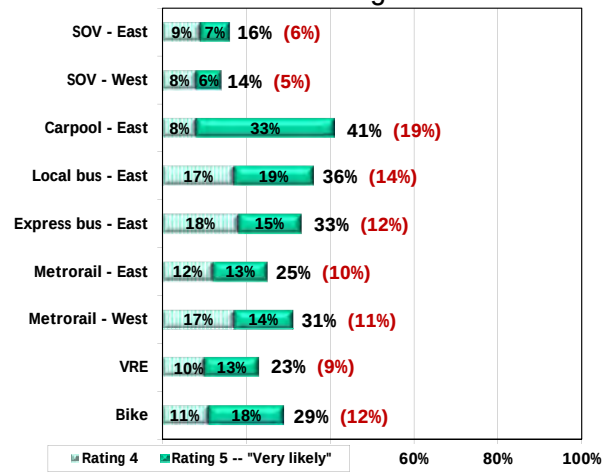
SOVers and Carpoolers Take Advantage of Free or Subsidized Parking; Transit Riders Utilize Fare Support and Pre-tax Deduction Programs; Transit Riders Also Take Advantage of Shuttle Service

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - East	Metrorail - East	Metrorail - West	VRE	Bike
Free/subsidized parking	86%	86%	84%	32%	27%	33%	33%	37%	36%
Preferred parking for car/vanpools	9%	3%	41%	6%	6%	7%	4%	8%	2%
Transit fare support	18%	18%	38%	92%	92%	90%	92%	93%	63%
Pre-tax salary deduction for transit	29%	25%	48%	83%	73%	74%	83%	80%	48%
Ridematching	11%	16%	19%	11%	19%	12%	20%	14%	7%
Flexible work hours	83%	79%	73%	79%	81%	78%	84%	78%	78%
Compressed work week	47%	42%	44%	40%	48%	43%	51%	50%	37%
Telework	77%	75%	69%	75%	77%	69%	70%	73%	59%
Shuttle to transit station	17%	26%	27%	53%	54%	51%	75%	51%	41%

Q129. Do you use this program?

Appeal of incentive rewards program

An Incentive Rewards Program Has the Greatest Appeal among those Already Using an Alternate Mode Rather than among SOVers



Q133. Assume that you could earn points that could be redeemed toward rewards at various retailers every time you share a ride to work or school. How likely would you be to share a ride if you could earn points that can be redeemed for rewards?

Telework

The Incidence of Teleworking Varies across Modes; SOVers and Bike Riders Are Most Likely to *Never* Telework; VRE Riders Are Most *Likely to Telework*

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - East	Metrorail - East	Metrorail - West	VRE	Bike
Never	71%	69%	66%	67%	58%	66%	61%	57%	69%
Occasionally, but less than once a week	14%	16%	19%	18%	19%	18%	12%	19%	16%
1 day a week	10%	7%	11%	12%	15%	10%	17%	18%	9%
2 days a week	4%	6%	4%	2%	8%	4%	7%	3%	2%
3 or 4 days a week	1%	2%	<1%	0%	2%	1%	3%	3%	3%
More than 4 days a week	0%	0%	0%	0%	0%	0%	0%	0%	0%

Q134a. How often, if ever, do you telework?

Choice Based Conjoint Analysis Was Used

- Conjoint analysis allows us to identify and prioritize the factors important in (purchase) decision making. It is sometimes referred to as "trade-off analysis" because respondents are asked to make trades that reflect what is and is not important to them. It is a multivariate technique that measures the relative importance of different variables, attributes or product features related to a brand, product or service.
- In these carefully controlled experiments, respondents are asked which one product they would select, given scenarios that vary specific conditions. In each scenario, the respondent is presented with a different combination of attributes and asked which combination they select. The type of decision that the respondents make in each scenario is designed to mimic the real market.
- Choice Based Conjoint was used for this analysis because it works well for decisions that are made for longer periods of time. That is, commuters do not typically change commute modes every day or even every week.

Question Used for Scenario Testing

Please read the following 3 options, Option A, Option B and Option C.

Option A	Option B	Option C
You could commute by (insert commute mode). Your commute trip would (be ____ minutes shorter/____ minutes longer/require the same amount of time as it currently does). It would cost _____ compared to your current commute.	You could commute by (insert commute mode). Your commute trip would (be ____ minutes shorter/____ minutes longer/require the same amount of time as it currently does). It would cost _____ compared to your current commute.	You could commute by (insert commute mode). Your commute trip would (be ____ minutes shorter/____ minutes longer/require the same amount of time as it currently does). It would cost _____ compared to your current commute.

Which would you be most likely to select for your commute, Option A, B, or C?

Attribute Levels Tested

- Commute Mode:
  - Single occupancy vehicle
  - Carpool
  - Priority Bus
  - Metrorail
- Time Reduction:
  - 10% less than current commute
  - 20% less than current commute
  - 30% less than current commute
  - the same as current commute
  - 30% more than current commute
  - 20% more than current commute
  - 10% more than current commute

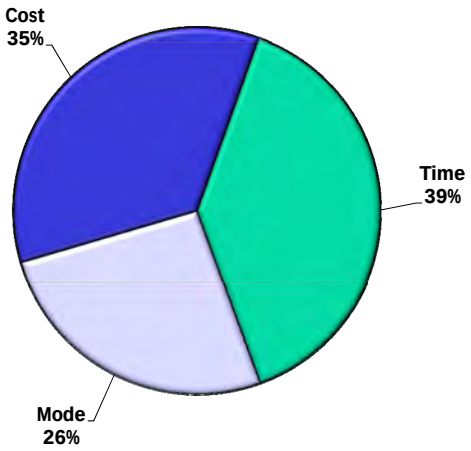
  (Note: Times were asked in terms of minutes rather than as percentages.)
- Cost:
  - 10% less than current commute
  - 20% less than current commute
  - 30% less than current commute
  - the same as current commute
  - 30% more than current commute
  - 20% more than current commute
  - 10% more than current commute

Overall

Relative impact of commute mode, cost and time

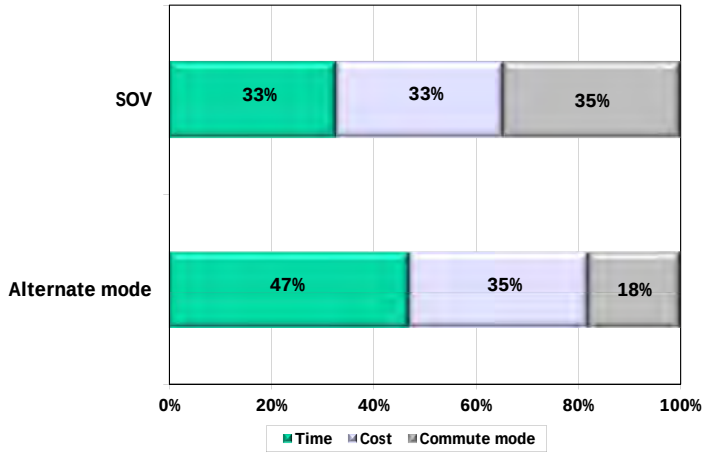
Results for total respondents - all commute modes

Overall, Time and Cost Are More Important than Commute Mode



Relative impact of commute mode, cost and time - by current commute mode

Time, Cost and Mode Are Equally Important for Current SOV Commuters; Time Is Much More Important than Mode for Those Already Using Alternate Modes



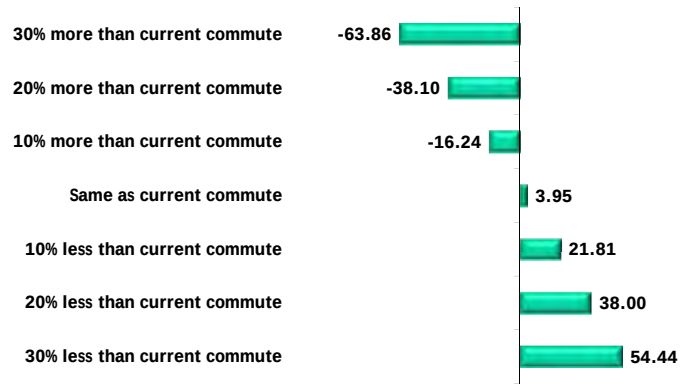
Part-worth Utilities Reflect the Desirability of (Preference for) Specific Features

- The higher the utility, the more important the attribute.
- One level of an attribute should not be compared with one level from another attribute because conjoint utilities are scaled to an arbitrary constant within each attribute (zero-centered).
- Differences between two levels of one attribute can be compared to two levels of another attribute.

Impact of time savings - Total Respondents

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

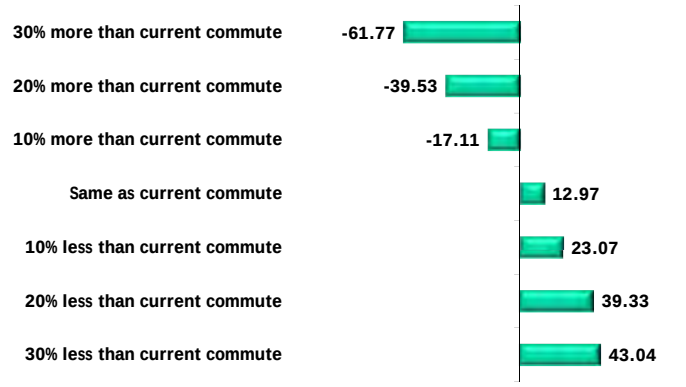
As Expected, Preference Is Highly Correlated with Time Saved



Impact of cost - Total Respondents

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

Likewise, Preference Is Highly Correlated with Price Such that Lower Prices Are More Preferred

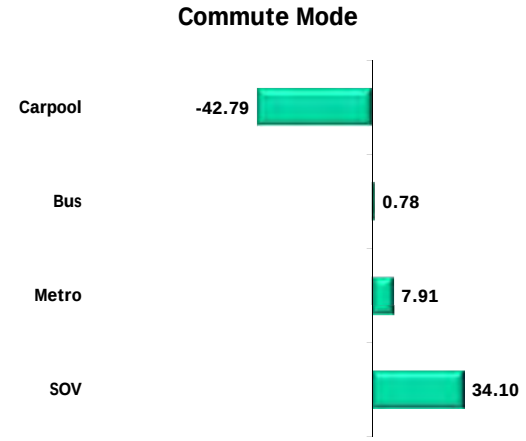


Impact of mode -

Total Respondents

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

Overall, Respondents Would Much Rather Drive Alone than Carpool

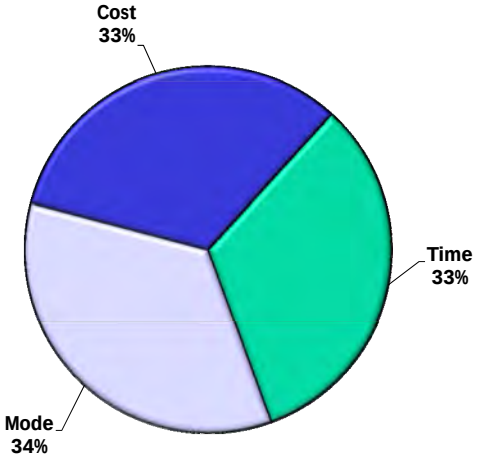


SOV Commuters

Relative impact of commute mode, cost and time - SOV Commuters

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

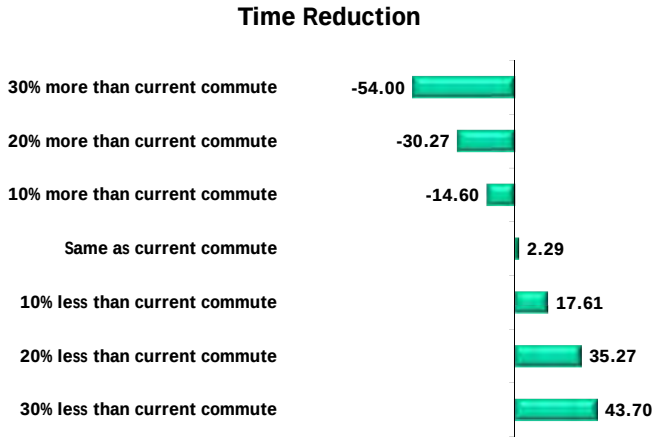
Cost, Time and Mode Are about Equally as Important for Current SOV Commuters



Impact of time savings - SOV Commuters

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

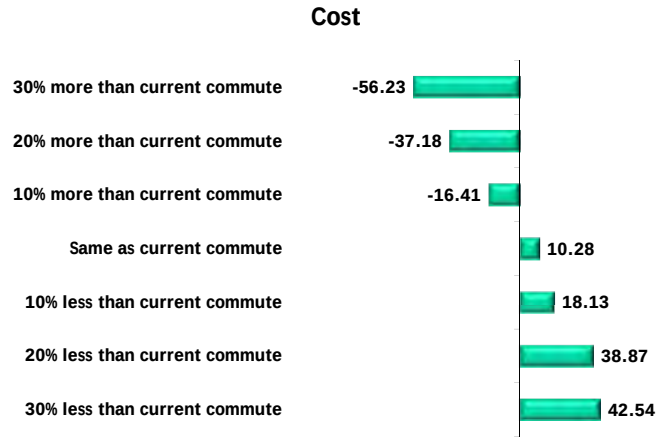
As with Respondents Overall, Preference Is Highly Correlated with Time Saved among Current SOV Commuters



Impact of cost - SOV Commuters

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

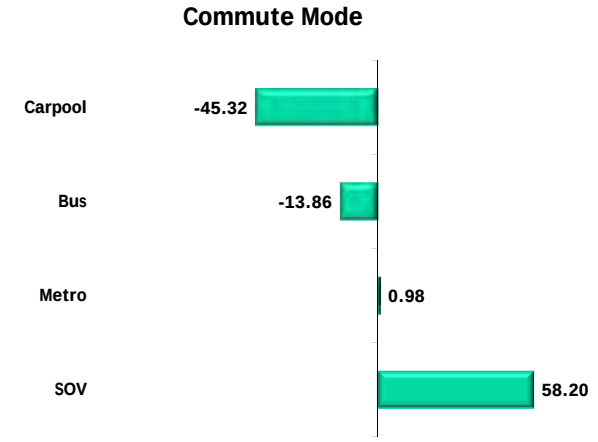
Likewise, Among Current SOVers, Preference Is Highly Correlated with Price Such that Lower Prices Are More Preferred



Impact of mode - SOV Commuters

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

Current SOV Commuters Are Even More Likely than Those Overall to Prefer Driving Alone

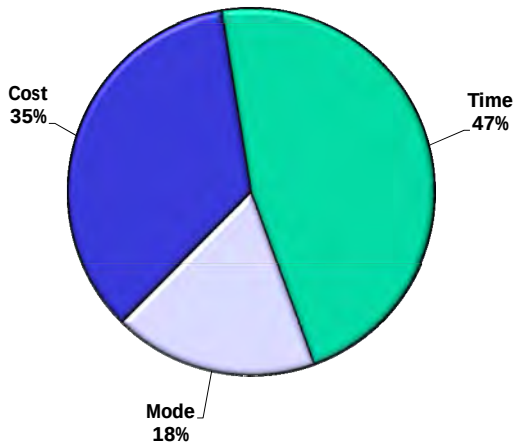


Alternate Mode Commuters

Relative impact of commute mode, cost and time -

Alternate Mode Commuters

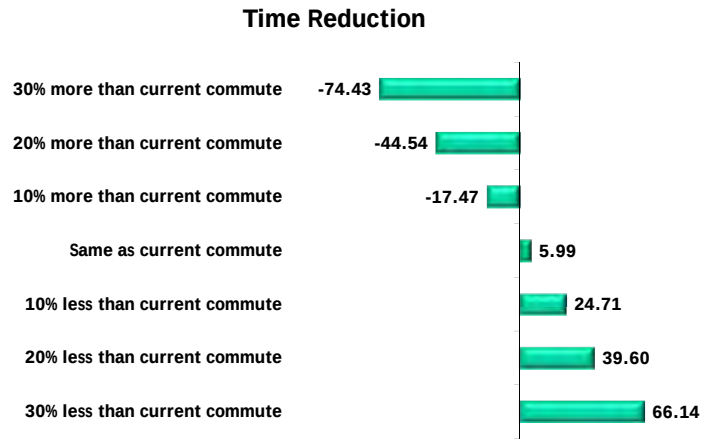
For Those Already Using Alternate Modes, Time Is the Most Important Factor in Their Commute Decision



Impact of time savings - Alternate Mode Commuters

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

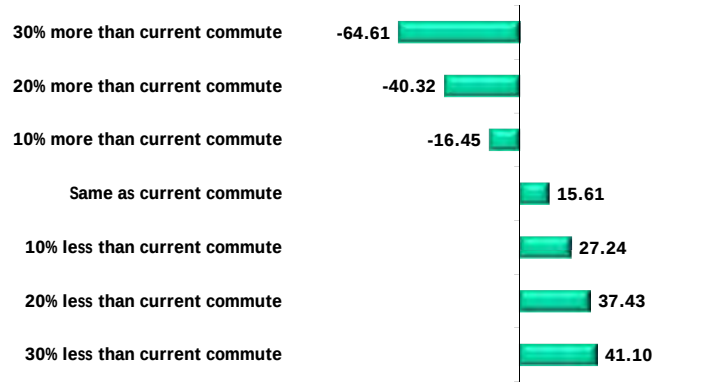
As with Other Respondents, Preference Is Highly Correlated with Time Saved among Those Currently Using Alternate Modes



Impact of cost - Alternate Mode Commuters

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

Likewise, Among Current Alternate Mode Commuters, Preference Is Highly Correlated with Price Such that Lower Prices Are More Preferred

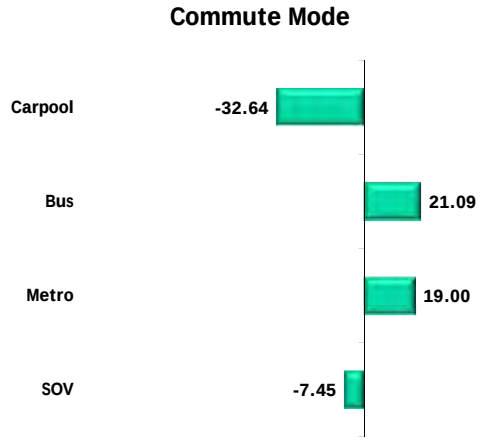


Impact of mode -

Alternate Mode Commuters

The larger the positive value, the more the attribute is preferred. The larger the negative value, the less an attribute is preferred.

Those Currently Using Alternate Modes Show a Preference for Bus and Metro



Detailed Findings

Bikes

Reasons for not riding bike for commute

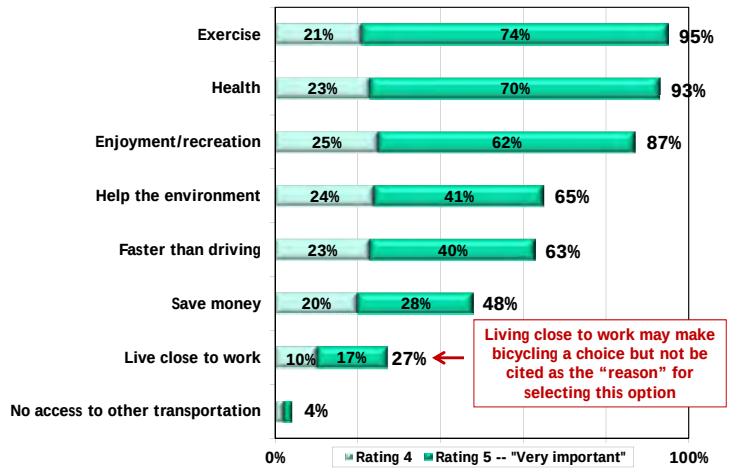
Most Often, Distance Is Cited as a Reason for Not Biking to Work

	SOV - East	SOV - West	Carpool - East	Local bus - East	Express bus - East	Metrorail - East	Metrorail - West	VRE
Too far	71%	70%	75%	73%	78%	62%	62%	79%
Concerns about safety	29%	31%	30%	34%	35%	41%	35%	32%
Too much to carry	26%	26%	26%	25%	31%	30%	31%	22%
Do not have a bike	19%	21%	19%	22%	24%	25%	30%	23%
Get too hot/too cold	19%	19%	21%	23%	22%	26%	22%	23%
Not physically able	8%	7%	7%	6%	6%	5%	8%	8%

Q114. Why do you not currently ride a bike to work?

Reasons for riding bike

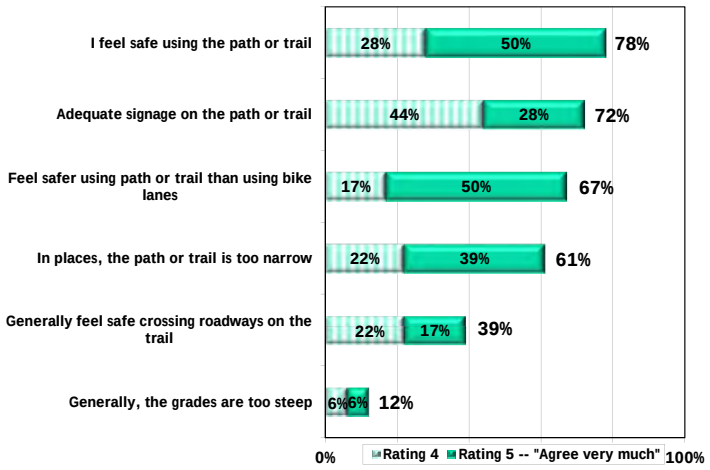
Most Often, Bike Riders Select this Mode for Exercise, Health and Enjoyment



Q108. How important is each of the following as a reason why you ride a bike for at least part of your morning commute? Please use a scale of 1 to 5 for your answers where "1" means "not very important" and "5" "very important."

Opinions of bike path or trail

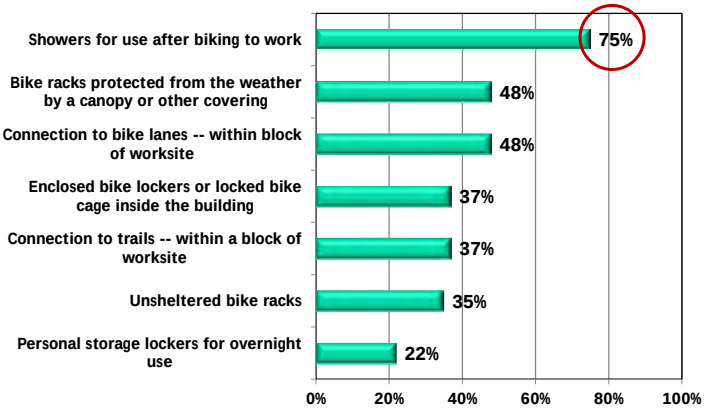
Bikers Tend to Feel Safe on the Paths/Trails and Believe the Signage Is Adequate; In Some Places the Path or Trail Is Too Narrow; But, the Grades Are Not Too Steep



Q109. To what extent do you agree with the following statements about the path or trail you use for the bike part of your trip?

Bike facilities available at workplace

Biking Facilities at Work Most Often Include Showers, Followed by Protected Bike Racks and Connection to Bike Lanes

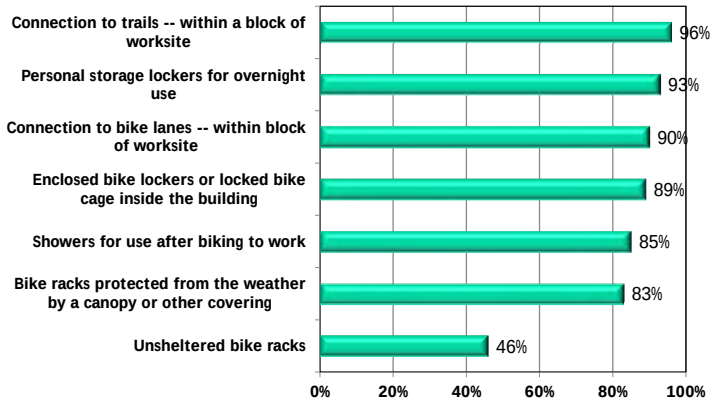


Q110. Which of the following is available at your workplace?

Usage of bike service or facility

Question asked of bikers who currently have this facility or service at work.

With the Exception of Unsheltered Bike Racks, Bike Riders Use the Facilities Available at Work

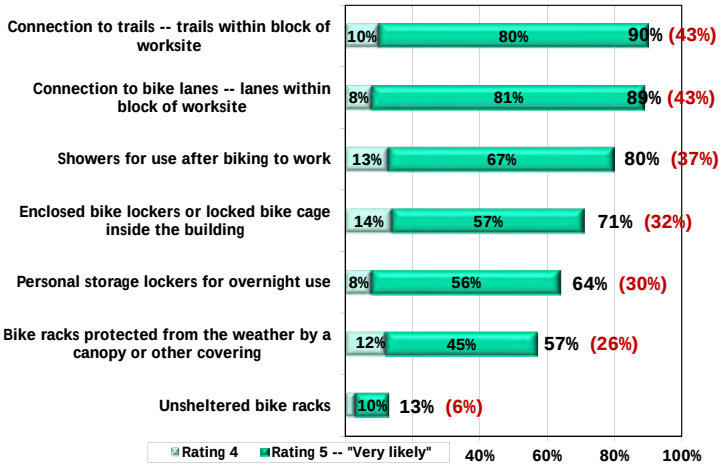


Q111. Do you use this service or facility?

Likelihood of using bike facilities at workplace

Question asked of bikers who do not currently have this facility or service at work.

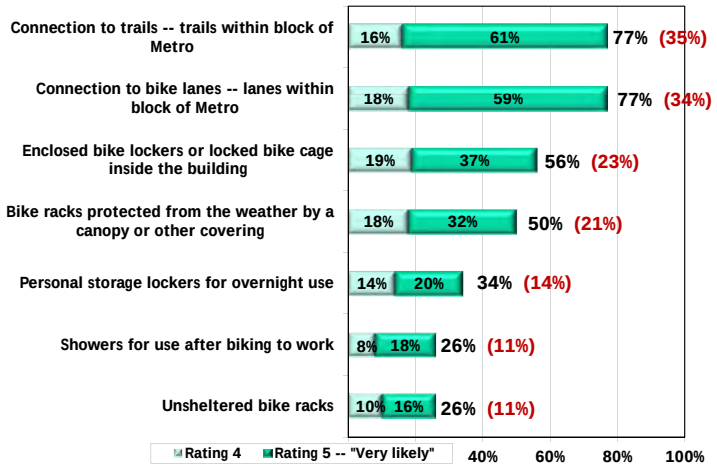
Bike Riders Who Do Not Currently Have Bike Trails or Lanes Close to Their Work Would Use them If Available; Similarly, Bikers Without Showers at Work Would Use them If Available; They Are Not Too Interested in Unsheltered Bike Racks



Q112. How likely would you be to use this service or facility if it was available at your workplace?

Likelihood of using bike facilities at Metro stations

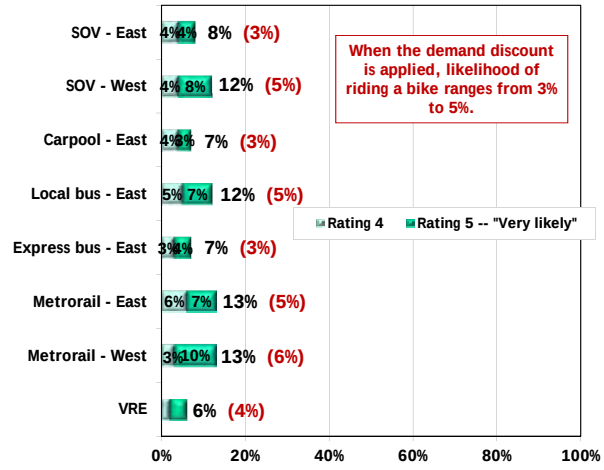
At Metro Stations, Bike Riders Would Be Most Likely to Use Connections to Trails and Lanes; They Would Be Least Likely to Use Unsheltered Bike Racks, Showers and Personal Storage Lockers



Q113. How likely would you be to use this service or facility if it was available at Metro stations?

Likelihood of riding bike for commute

Stated Likelihood of Riding a Bike in the Future Is Fairly Low, Ranging from 13% among Current Metrorail Riders to 6% among Current VRE Riders

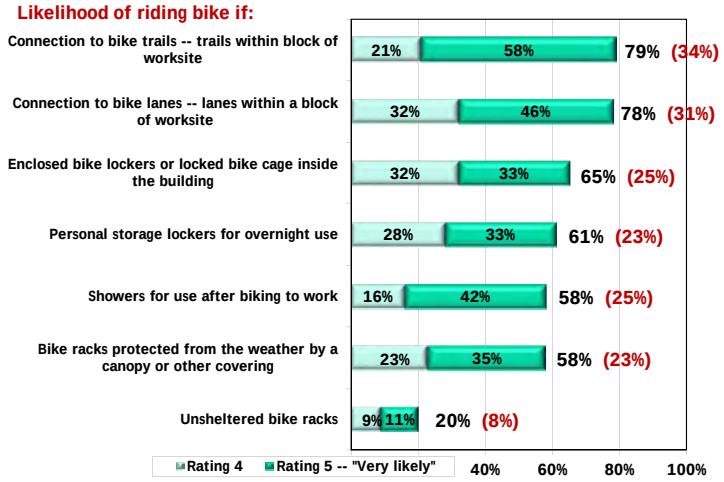


Q115. Regardless of the mode of transportation you use today for your commute, how likely would you be to ride a bike for at least part of your commute in the future?

Likelihood of riding bike if specific facilities at work – Eastbound SOV

Responses shown for Eastbound SOVers who answered "4" or "5" to likelihood of riding bike.

Among Eastbound SOVers Who Are Interested in Riding a Bike, Connections to Bike Trails and Bike Lanes from their Worksite Would Be the Most Persuasive Facility or Service



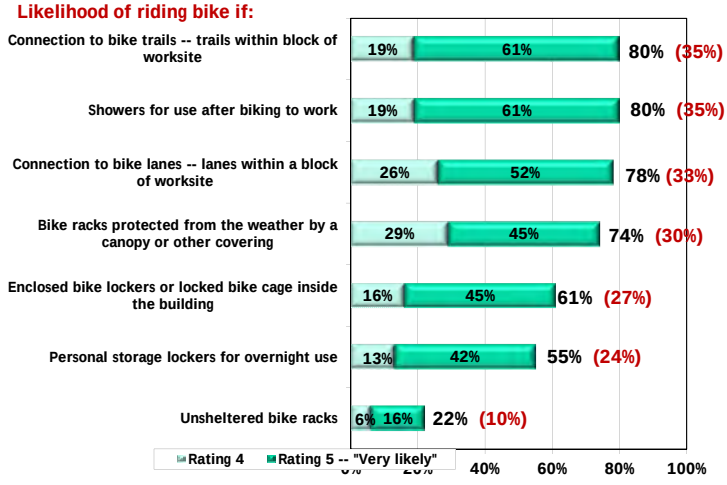
Q116. How likely would you be to ride a bike for at least part of your commute if the following were available at your worksite?

I-66 Multimodal Study

Likelihood of riding bike if specific facilities at work – Westbound SOV

Responses shown for Westbound SOVers who answered "4" or "5" to likelihood of riding bike. Base size is small - interpret with caution.

For Westbound SOVers, Connections to Bike Trails, Showers and Connections to Bike Lanes Are the Most Persuasive Facilities and Services



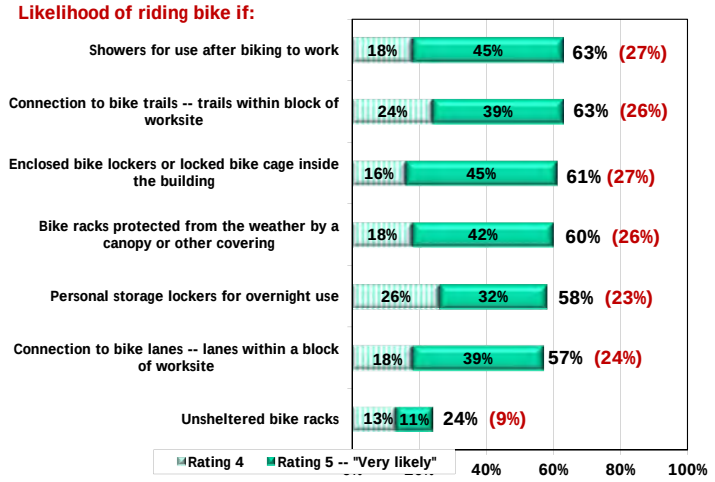
Q116. How likely would you be to ride a bike for at least part of your commute if the following were available at your worksite?

I-66 Multimodal Study

Likelihood of riding bike if specific facilities at work – Eastbound carpool

Responses shown for Eastbound carpoolers who answered "4" or "5" to likelihood of riding bike.

No One Feature Tested Stands Out as a Compelling Facility that Would Attract Carpoolers to Bike, but Unsheltered Bike Racks Are Least Convincing

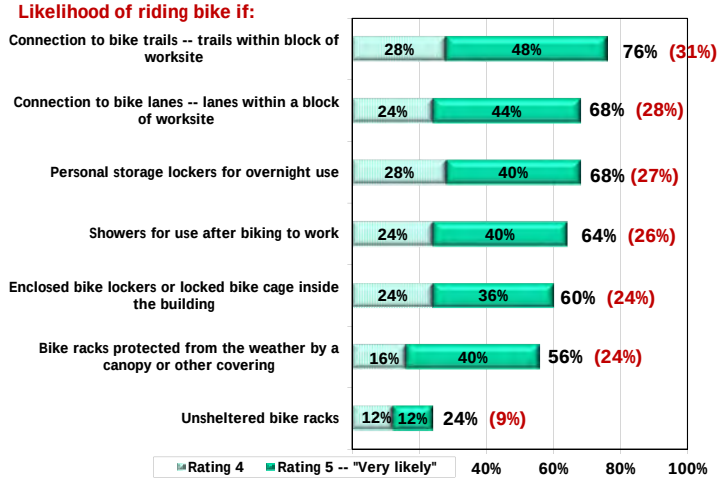


Q116. How likely would you be to ride a bike for at least part of your commute if the following were available at your worksite?

Likelihood of riding bike if specific facilities at work – Eastbound Express bus

Responses shown for Eastbound express bus riders who answered "4" or "5" to likelihood of riding bike. Local bus not shown due to small sample size.

Express Bus Riders Would Be Most Persuaded to Ride a Bike If there Were Bike Trails Close to their Worksite

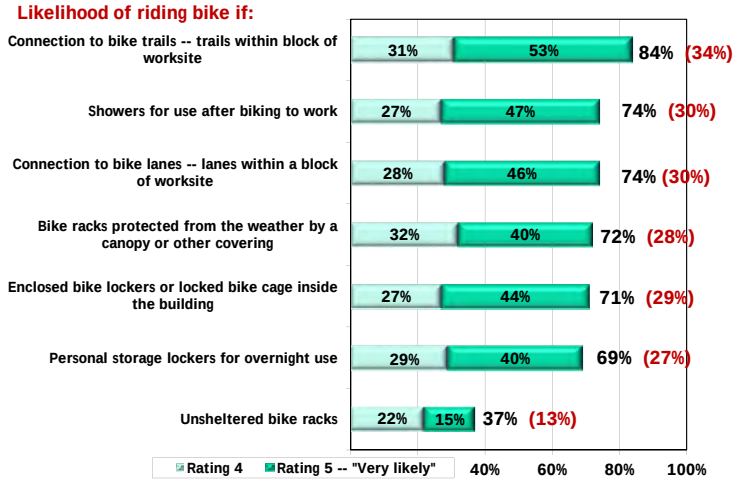


Q116. How likely would you be to ride a bike for at least part of your commute if the following were available at your worksite?

Likelihood of riding bike if specific facilities at work - Eastbound Metrorail

Responses shown for Metrorail riders who answered "4" or "5" to likelihood of riding bike. Westbound Metrorail and VRE not shown due to small base sizes.

With the Exception of Unsheltered Bike Racks, All of the Facilities Tested Could Convert Eastbound Metrorail Riders to Bike Riders



Q116. How likely would you be to ride a bike for at least part of your commute if the following were available at your worksite?

I-66 Multimodal Study

Likelihood of riding bike if specific facilities at Metro stations

The Appeal of Bike Facilities at Metro Stations Is Lower than the Same Facilities at the Worksite; Greatest Interest Is Posted for Metrorail Riders

-- Connections to Bike Lanes and Trails Have the Greatest Appeal --

Likelihood of riding bike if:	SOV - East	SOV - West	Carpool - East	Express bus - East	Metrorail - East
Connection to bike lanes - lanes within a block of Metro	57% (22%)	48% (23%)	53% (19%)	52% (21%)	67% (26%)
Connection to bike trails - trails within a block of Metro	56% (23%)	49% (22%)	56% (22%)	56% (23%)	66% (27%)
Personal storage lockers	30% (11%)	39% (17%)	34% (13%)	44% (17%)	48% (19%)
Showers for use after biking to work	29% (7%)	42% (18%)	24% (9%)	40% (17%)	41% (17%)
Enclosed bike lockers or locked bike cage inside the building	42% (15%)	45% (20%)	50% (19%)	56% (22%)	56% (23%)
Bike racks protected from the weather by a canopy or other covering	44% (15%)	45% (19%)	50% (20%)	52% (21%)	60% (22%)
Unsheltered bike racks	12% (5%)	12% (5%)	14% (6%)	8% (4%)	27% (10%)

Responses shown for those who answered "4" or "5" to likelihood of riding bike. Metrorail West, VRE and local bus not shown due to small base sizes.

Q117. How likely would you be to ride a bike for at least part of your commute if the following were available at Metro Stations?

I-66 Multimodal Study

Likelihood of riding bike if services available

Of the Three Services Below, a Customized Bike Map Is More Appealing than Bike Safety Training or Bike Skills Training

Likelihood of riding bike if:	SOV – East	SOV - West	Carpool - East	Express bus - East	Metrorail - East
Bike safety training	14% (6%)	12% (5%)	16% (5%)	28% (11%)	30% (11%)
Bike skills training	14% (5%)	16% (7%)	21% (7%)	32% (11%)	29% (11%)
A customized bike map	42% (17%)	45% (18%)	37% (16%)	56% (22%)	49% (21%)

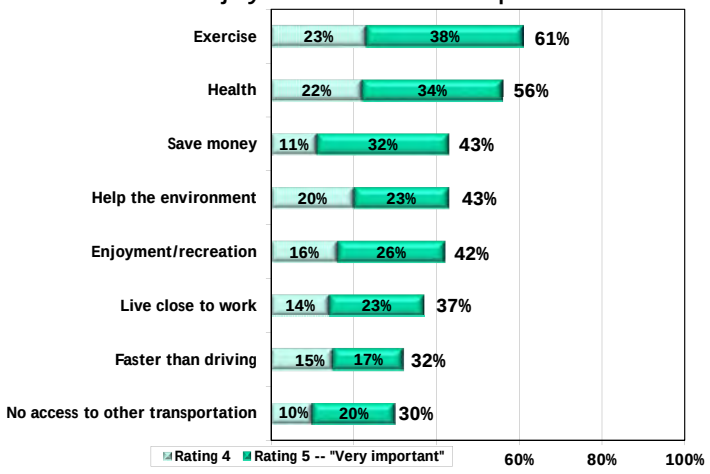
Responses shown for those who answered "4" or "5" to likelihood of riding bike.

Q118. How likely would you be to ride a bike for at least part of your commute if the following were available to you?

I-66 Multimodal Study

Reasons for walking

Pedestrians Chose to Walk Primarily for Exercise and Health; But, Saving Money, Helping the Environment and Enjoyment Are Also Important

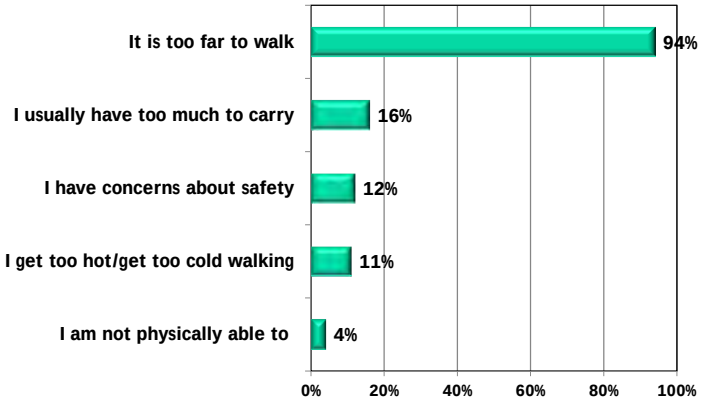


Q119. How important is each of the following as reasons why you walk to work or school? Please use a scale of 1 to 5 for your answers where "1" means "not very important" and "5" is "very important."

I-66 Multimodal Study

Reasons for not walking

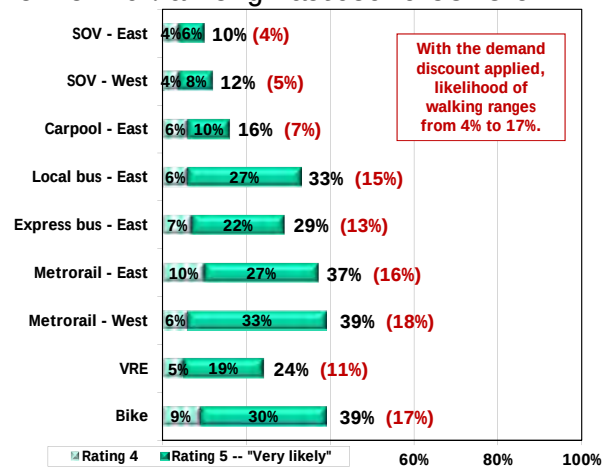
Most Don't Walk Just Because It Is Too Far; After that, Having Too Much to Carry and Concerns about Safety Are Cited as Reasons for Not Walking



Q120. Why do you not currently walk to work? You may select more than one answer.

Likelihood of walking for commute

Stated Likelihood of Walking Ranges from a High of 39% among Current Bike Riders to a Low of 10% among Eastbound SOVers



Q121. Regardless of the mode of transportation you use today for your commute, how likely would you be to walk for at least part of your commute in the future?

Conclusions and Implications

Conclusion and Implication

Conclusion: Many I-66 inside-the-Beltway commuters travel both inside and outside the Beltway on their morning commutes. This pattern suggests that many have long commutes. This, in fact, holds true based on their mileage and the time commitment commutes require. Two-thirds of Metrorail riders, for example, have commutes of 41-90 minutes. Three-fourths of Express Bus riders have commutes of at least one hour.

Implication: As has been reported in numerous commuter studies in Northern Virginia and as commuters frequently tell us, time is important. But, it's not just a matter of saving time. Selecting a specific commute mode on the basis of time is often a decision about quality of life. Selecting a different or "alternative" commute mode can be a decision that enhances or improves the quality of a commuter's life.

Conclusion and Implication

Conclusion: Regardless of their current mode, commuters recognize the challenges of commuting on I-66: difficulty traveling through the corridor and predicting how long a trip will take. Commuters do not believe there are sufficient transportation options in the corridor at present.

Implication: Commuters do not need to be convinced that problems exist in the I-66 corridor nor do they need to be persuaded that something must be done. Thus, communications should not focus on the "negatives" or problems in the corridors. Instead, commuters want options and choices. Introduce and "sell" programs, services, changes and options. Emphasize that these options and choices are ways to be "in control of their commute." Develop a menu of options for the I-66 corridor so commuters can select their commute mode and be in control of their commute.

Conclusion and Implication

Conclusion: Support for HOV lanes varies considerably across mode. SOVers do not always recognize the benefits of the HOV lanes. Even though they are not highly critical of the HOV lanes, they do not necessarily believe that HOV lanes should be added. In contrast, carpoolers and express bus users recognize the benefits of the HOV lanes, particularly in terms of saving time. They believe one or more HOV lanes should be added in each direction.

Implication: If new HOV lanes are to be added inside the Beltway, handle the announcement with care. The largest commuter group – SOVers – may be vocal opponents to the plan. A carefully crafted communications plan that includes early announcement of the planned lanes is essential.

Conclusion and Implication

Conclusion: Although SOVers are not convinced that using the HOV lanes saves time, they would be most convinced to try HOV lanes if they could save time by using the lanes. Additionally, non-SOV commuters who do not use the HOV lanes would also be most convinced to use the lanes if it would save them time.

Implication: In spite of potential criticisms of HOV lanes, adding HOV lanes is a reasonable change for I-66 inside the Beltway if it can be determined that using HOV lanes does save time. This is both a reason to construct new lanes and an important marketing message.

Conclusion and Implication

Conclusion: About a quarter of non-HOV users say they would use the HOV lanes if they could use their smartphone to find a carpool partner. About the same amount say they would use the HOV lanes if it was easier to find a carpool partner.

Implication: To advance carpooling, focus on ways to make it easier to carpool. Explore development of a smartphone app that would make finding a carpool partner or instant carpooling easier. This is a relatively inexpensive way of putting in place a program that makes carpooling possible for some who might not otherwise be able to carpool. Plus, it has the added "glamour" of exciting technology that attracts people and could enhance imagery of carpooling.

Conclusion and Implication

Conclusion: Although the numbers are quite small, some commuters not currently using the HOV lanes would use them if the hours of restriction were changed. The pattern is similar whether the hours in the morning are changed to 5:30 – 9:30 or the hours in the afternoon are changed to 3:00 – 7:00. Current carpoolers who do not use the HOV lanes are the group most likely to start using the lanes with changes to HOV hours of restriction.

Implication: Changing the hours of HOV enforcement would attract some new users. But, the change would not attract many SOVers. It would attract carpoolers not using the lanes currently.

Conclusion and Implication

Conclusion: Support for a toll on I-66 inside the Beltway is low, especially among those who would be paying the toll directly – SOVers and carpoolers. But, support for a toll is also low among transit users. Support for congestion priced tolling is also low.

Implication: Proceed cautiously with tolling on I-66. Actively seek ways to tie a toll to growth of transportation options and choices in the corridor.

Conclusion and Implication

Conclusion: Most commuters in the corridor have heard of HOT lanes, about 80%. Support for HOT lanes is higher than support for a general toll. About a quarter of commuters support HOT lanes on I-66 inside the Beltway.

Implication: While support for HOT lanes is higher than support for a general toll, the level of support does not indicate a mandate for HOT lanes. It does suggest, however, that the introduction of any form of toll on I-66 must identify a reason or reasons for instituting HOT lanes to convert doubters to supporters. That is, there must be a benefit to HOT lanes. If it can be stated that the commuter or the community will benefit from a toll or HOT lanes, use that information to generate support for tolling.

Conclusion and Implication

Conclusion: The benefits of HOT lanes are important in selling HOT lanes to the public. But, although commuters may have heard of HOT lanes, they do not have a high level of familiarity with or understanding of HOT lanes. They often do not recognize the benefits of HOT lanes. Only about 25-35% of commuters recognized each of five benefits tested.

Implication: Introduction of HOT lanes on I-66 will require a fundamental educational component. Commuters just don't know what HOT lanes are and why they should care. They must be educated about the beneficial outcomes of HOT lanes.

Conclusion and Implication

Conclusion: Support for adding new HOV/bus lanes and adding a new bus-only lane varies. Support is highest among bus riders and lowest among SOVers, ranging from 74% to 26%. Support among rail riders, both VRE and Metrorail, falls between these extremes and is closer to the level of bus riders.

Implication: Based on commuter response, consider the addition of new HOV/bus lanes and a new bus-only lane. There is already a level of support among those who recognize how they could benefit from these changes. Build communications around the benefits.

Conclusion and Implication

Conclusion: Support for changing the HOV-2 restriction to HOV-3 is low. It is especially low among SOVers and carpoolers.

Implication: Based on commuter perceptions, change from HOV-2 to HOV-3 is not warranted at this time. If this change is to be made, considerable communication – linking the change with specific benefits – is necessary.

Conclusion and Implication

Conclusion: To attract new riders to Metrorail, it's all about travel time. Commuters would be most attracted to Metrorail if it was faster than their current mode.

Implication: Work to ensure that Metrorail is fast. If it is, say so. If there is actual documentation that Metrorail is faster than other modes – especially driving alone – use that as a cornerstone in communications.

Conclusion and Implication

Conclusion: There is interest in Priority Bus services, and that confirms elements of the baseline approach for this study. Stated likelihood of riding Priority Bus is higher among current transit users: about 75% among local bus, express bus and Metrorail riders. However, about a third of SOVers and carpoolers say they would likely ride a Priority Bus. This translates to a little over 10% when the demand discount is applied. The appeal of Priority Bus is based in speed. It would be selected if it made the commute faster. Perceived speed of Priority Bus is related to having limited stops and running every 10 minutes.

Implication: Increase the transportation options in the I-66 corridor inside the Beltway by offering Priority Bus services. A key attribute to deliver is *speed*. This is also what should be emphasized in communications. However, expect some cannibalization of current transit users who simply switch from their current transit mode to Priority Bus.

Conclusion and Implication

Conclusion: Employer programs make a difference. Transit users tend to work for employers who offer transit assistance. Carpoolers tend to work for employers who offer carpool support. SOVers work where there is free or subsidized parking.

Implication: Continue to emphasize employer outreach. Work with employers to help them understand their role in commute choices and to ensure that strong commuter support programs are in place for employees.

Conclusion and Implication

Conclusion: While "time" and saving time on their commutes are important to SOVers, being "in control" of their commute is more important to SOVers than to commuters using other modes. In fact, 87% of eastbound SOVers said that being in control of their commute is important in their mode choice compared to 92% who said that the time their commute takes is important. In addition, conjoint analysis indicates that time, cost and the specific mode are equally important in mode choice for SOVers. Thus, on any given day, the control a specific mode is perceived to offer may be more important than time to SOVers.

Implication: In the effort to convert SOVers to other modes, saving time (or money) is important. But, being in control of their commute may be a particularly persuasive element or message. In program development – both transportation program development and communications program development – look for ways to incorporate elements of commuter "control" of their commute to appeal to SOVers.

Conclusion and Implication

Conclusion: New transit options in the I-66 corridor inside the Beltway are particularly attractive to current transit users. Given situations when the costs are the same and the travel time is the same, transit users would pick transit over some other mode. If new transit options offer time savings, current transit users are especially likely to switch to the new transit mode.

Implication: New and improved transit services may not attract SOVers to the same extent as current transit users. Expect some cannibalization with new and improved transit services and programs.

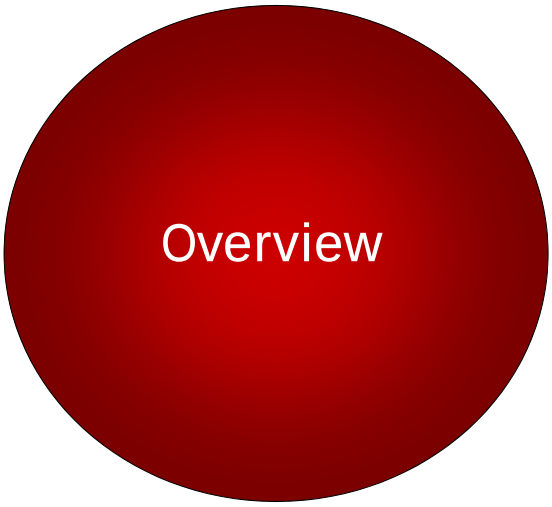
Conclusion and Implication

Conclusion: Overall, likelihood of riding a bike to work is fairly low among current non-riders. But, still, with no programs or services mentioned, about 10% of current non-users say they are likely to ride a bike in the future. Connections to bike trails and paths are the most compelling features and services to attract new bike riders. Enclosed bike lockers and showers at work also help to attract new bike riders. Unsheltered bike racks are not particularly compelling.

Implication: To attract new bike riders, work to establish links to bike paths and lanes from both work and Metro stations. Also, work with employers to make enclosed bike lockers and showers available in the workplace.

I-66 Multimodal Inside The Beltway Market Research Study:
Media Sample

May 4, 2012



Document Overview

- This overall market research project is designed to identify and assess inside the Beltway commuters' perceptions of issues related to transportation, travel and mobility in the I-66 corridor, their willingness to change commute modes and the appeal of specific commute programs and services.
- Data collection consisted of an online survey among regular commuters in the I-66 corridor. Fieldwork was conducted in the Fall 2011.
- Commuters were informed of the survey and invited to participate through the distribution of survey invitation postcards.
- In order to reach VRE riders efficiently, a link to the survey was published in VRE's online newsletter. Some media outlets accessed this link and made it available to their readers/listeners. This distribution was outside the design of the project. Thus, this component of the overall sample may be biased or not meet methodological standards in various ways. Thus, these data have not been included in the overall study report.

Document Overview

- This document examines the data obtained through release of the survey link through the media and compares it to the results of the study overall.
- In this document, the sample used for the basic study is labeled "Base Sample." The sample collected via media distribution is labeled "Media Sample."
- Results are shown for key measures and are broken out by mode. Only modes with sufficient sample size are reported.
- In the report that follows, comparison of the Base Sample with the Media Sample shows results are remarkably similar. Data in the media sample support the overall conclusions of this study. For reference purposes, the key findings of the overall study are summarized on the next three slides. Then, data from the Media Sample and Base Sample are compared.

Key Findings of Overall Study

- Many I-66 inside-the-Beltway commuters travel both inside and outside the Beltway on their morning commutes. This pattern suggests that many have long commutes. This, in fact, holds true based on their mileage and the time commitment commutes require.
- Regardless of their current mode, commuters recognize the challenges of commuting on I-66: difficulty traveling through the corridor and predicting how long a trip will take. Commuters do not believe there are sufficient transportation options in the corridor at present.
- Support for HOV lanes varies considerably across mode. SOVers do not always recognize the benefits of the HOV lanes. Even though they are not highly critical of the HOV lanes, they do not necessarily believe that HOV lanes should be added. In contrast, carpoolers and express bus users recognize the benefits of the HOV lanes, particularly in terms of saving time. They believe one or more HOV lanes should be added in each direction.

Key Findings of Overall Study

- Although SOVers are not convinced that using the HOV lanes saves time, they would be most convinced to try HOV lanes if they could save time by using the lanes. Additionally, non-SOV commuters who do not use the HOV lanes would also be most convinced to use the lanes if it would save them time.
- About a quarter of non-HOV users say they would use the HOV lanes if they could use their smartphone to find a carpool partner. About the same amount say they would use the HOV lanes if it was easier to find a carpool partner.
- Although the numbers are quite small, some commuters not currently using the HOV lanes would use them if the hours of enforcement were changed. The pattern is similar whether the hours in the morning are changed to 5:30 – 9:30 or the hours in the afternoon are changed to 3:00 – 7:00.
- Support for a toll on I-66 inside the Beltway is low. Similarly, support for HOT lanes and congestion priced tolling is low.

Key Findings of Overall Study

- Support for adding new HOV/bus lanes and adding a new bus-only lane varies. Support is highest among bus riders and lowest among SOVers.
- Support for changing the HOV-2 restriction to HOV-3 is low. It is especially low among SOVers and carpoolers.
- To attract new riders to Metrorail, it's all about travel time. Commuters would be most attracted to Metrorail if it was faster than their current mode.
- There is interest in Priority Bus services. Stated likelihood of riding Priority Bus is higher among current transit users. The appeal of Priority Bus is based on speed. It would be selected if it made the commute faster.

Detailed Findings

Travel inside the Beltway

Commuters in the Base Sample and the Media Sample More Often Travel Both Inside the Beltway and Outside the Beltway on their Regular Commutes

- The Primary Difference between the Base Sample and the Media Sample in Regard to Travel Inside the Beltway and Outside: Westbound Metrorail Riders in the Media Sample Are More Likely to Be Traveling Both Inside and Outside the Beltway than Westbound Metrorail Riders in the Base Sample -

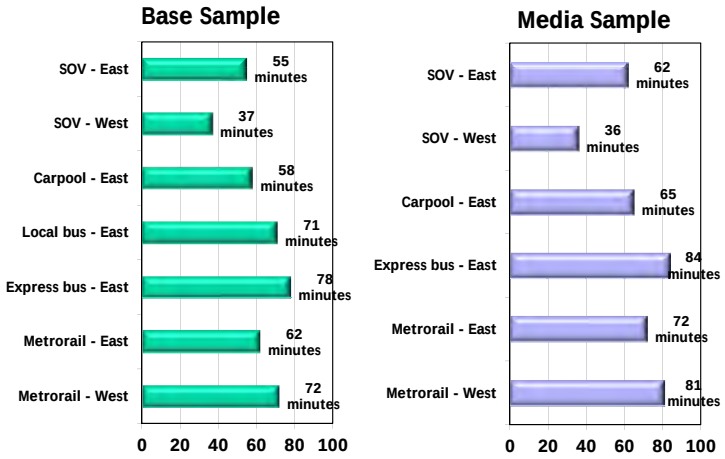
	Base Sample								Media Sample					
	SOV – East	SOV – West	Car-pool – East	Local bus – East	Express bus – East	Metro -rail – East	Metro -rail - West	VRE	SOV - East	SOV - West	Car-pool – East	Express Bus - East	Metro –rail - East	Metro -rail - West
Inside the Beltway only	31%	38%	37%	24%	37%	42%	34%	6%	29%	35%	33%	35%	30%	9%
Both inside and outside the Beltway	69%	62%	63%	76%	63%	58%	66%	94%	71%	65%	67%	65%	70%	91%

Question asked of those who travel on I-66 at least 3 days a week.

Q3a. When you travel on I-66 on your morning commute, do you travel only inside the Beltway or do you travel both inside and outside the Capital Beltway?

Length of commute - minutes
Average

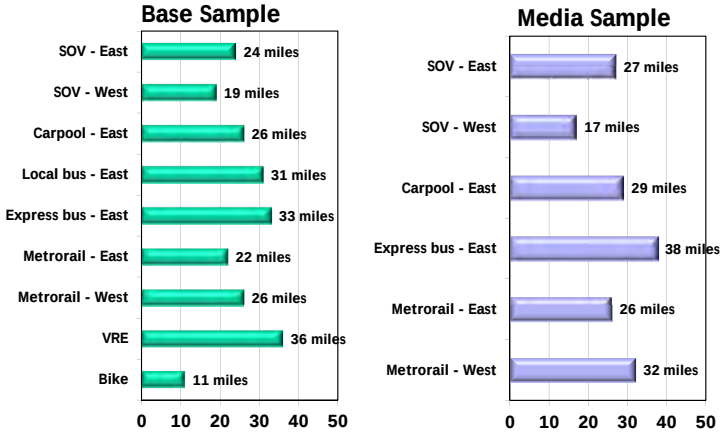
With the Exception of Westbound SOVers, Commuters in the Media Sample Have Slightly Longer Commutes (in minutes)



Q55. On average, about how many minutes long is your **total** morning commute, door-to-door?

Length of commute - miles
Average

Also with the Exception of Westbound SOVers, Commuters in the Media Sample Travel Slightly Longer Distances



Q56. About how many miles long is your **total** morning commute, door to door?

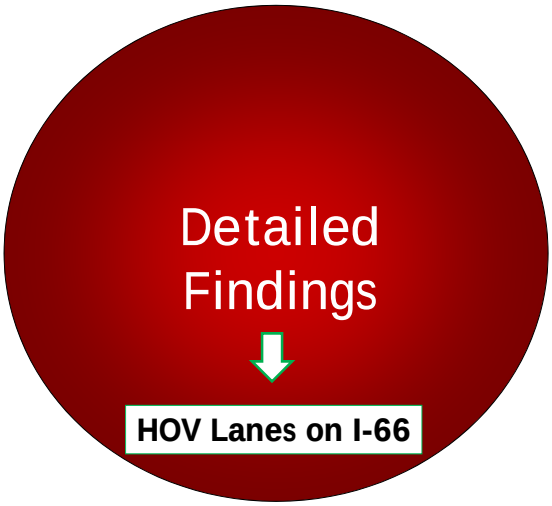
Perceptions of I-66 corridor

Commuters in the Media Sample Share the Same Concerns and Perceptions of I-66 as those in the Base Sample:

It's Difficult to Travel I-66 Due to Congestion, Congestion Makes It Difficult to Predict How Long a Trip Will Take and there Are Not Enough Transportation Options in the Corridor

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro-rail - East	Metro-rail - West
Due to congestion, more difficult to travel I-66 corridor	90%	89%	89%	84%	84%	77%	89%	91%	88%	87%	82%	87%
Traffic congestion makes it difficult to predict how long trip will take	89%	83%	86%	83%	82%	77%	89%	92%	85%	84%	81%	87%
Are enough transportation options in corridor	16%	19%	21%	25%	25%	23%	18%	15%	21%	23%	20%	23%

Q69. To what extent do you agree with each of the following statements about travel in the I-66 corridor? Please use a scale of 1 to 5 for your answers, where "1" means that you "do not agree at all" and "5" means that you "agree very much" that the statement describes travel in the I-66 corridor.



Opinions of HOV on I-66

Commuters in the Media Sample Share the Same Concerns and Perceptions of I-66 as those in the Base Sample

(continued on next slide)

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro-rail - East	Metro-rail - West
Using HOV saves time	48%	NA	71%	73%	NA	NA	49%	NA	71%	74%	NA	NA
HOV makes it difficult to travel through the corridor	44%	28%	14%	19%	26%	23%	52%	45%	12%	22%	23%	33%
Exemption for hybrids should be removed	41%	33%	53%	46%	45%	39%	49%	57%	58%	48%	45%	52%
Using HOV lanes lessens stress	41%	NA	53%	59%	NA	NA	44%	NA	52%	54%	NA	NA
Enforcement of HOV is adequate	38%	28%	30%	30%	28%	30%	32%	19%	30%	32%	26%	26%

Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Opinions of HOV on I-66

Commuters in the Media Sample Share the Same Concerns and Perceptions of I-66 as those in the Base Sample in terms of these Four Statements; They Most Strongly Believe that HOV Lanes Lessen Congestion and that One or More HOV Lanes Should be Added in Each Direction

(continued from previous slide)

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro-rail - East	Metro-rail - West
Should add one or more HOV lanes in each direction	34%	29%	61%	54%	45%	43%	38%	27%	63%	59%	41%	52%
HOV lanes lessen impact of congestion	28%	31%	59%	52%	46%	40%	25%	36%	60%	55%	55%	50%
Concerns about safety of HOV on I-66	15%	11%	11%	14%	14%	14%	21%	13%	12%	12%	13%	20%
Should be changed to HOV-3	12%	12%	13%	29%	22%	20%	14%	9%	16%	31%	24%	9%

Q74. To what extent do you agree with each of the following statements about the HOV lanes on I-66 inside the Beltway? Please use a scale of 1 to 5 for your answers where "1" means that you "do not agree at all" and "5" means that you "agree very much."

Likelihood of using HOV lanes in future (among nonusers) – under various conditions

The "Persuasiveness" of these HOV Benefits Is about the Same for the Media Sample as the Base Sample; Saving Time and Lessening Stress Have the Greatest Appeal

(continued on next slide)

	Base Sample			Media Sample		
	SOV – East	Express bus – East	Metro-rail – East	SOV - East	Express bus – East	Metro-rail - East
Save time	44%	69%	45%	45%	80%	48%
Lessened stress	36%	56%	36%	39%	64%	36%
Easier to find carpool partner	25%	25%	27%	32%	22%	27%
Instant carpooling by smartphone	22%	30%	25%	26%	28%	26%
Informal carpooling at designated locations	20%	22%	20%	24%	19%	23%

Q77. How likely would you be to use the HOV lanes for your commute at least occasionally if:

Likelihood of using HOV lanes in future (among nonusers) – under various conditions

The "Persuasiveness" of these HOV Benefits Is the Same or Slightly Higher for the Media Sample as the Base Sample

(continued from previous slide)

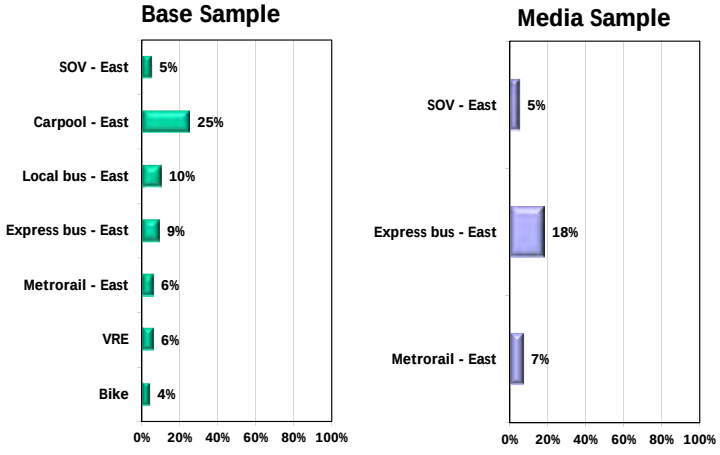
	Base Sample			Media Sample		
	SOV – East	Express bus – East	Metro-rail – East	SOV - East	Express bus – East	Metro-rail - East
One HOV/bus lane added in each direction	15%	58%	31%	21%	72%	40%
Hybrid exemption removed	13%	29%	17%	18%	37%	24%
HOV lanes safer	13%	23%	15%	11%	26%	20%
Changed to HOV-3	5%	25%	11%	7%	28%	10%

Q77. How likely would you be to use the HOV lanes for your commute at least occasionally if:

Impact of changing morning HOV hours

Responses shown for those who do not currently use HOV lanes.

Changing the Morning Hours of HOV Could Attract a Few New HOV Users, in Both the Base Sample and the Media Sample; The Two Groups Do Not Differ Dramatically on this Measure

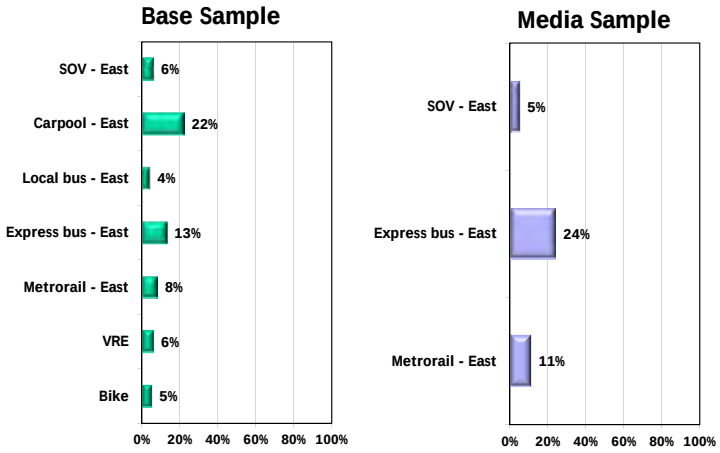


Q78. Assume that the HOV lane restrictions eastbound on I-66 inside the Beltway went into effect at 5:30 a.m. and stayed in effect until 9:30 a.m., instead of going into effect at 6:30 a.m. and staying in effect until 9:00 a.m. as they now do. How likely would you be to use the eastbound HOV lanes inside the Beltway for your morning commute if they went into effect at 5:30 a.m. instead of 6:30 a.m. and stayed in effect until 9:30 a.m. instead of 9:00 a.m.?

Impact of changing afternoon HOV hours

Responses shown for those who do not currently use HOV lanes.

The Media Sample Responds Similarly to the Base Sample to the Idea of Changing the Afternoon Hours of HOV; Changing the Afternoon Hours of HOV Would Attract a Few New HOV Users



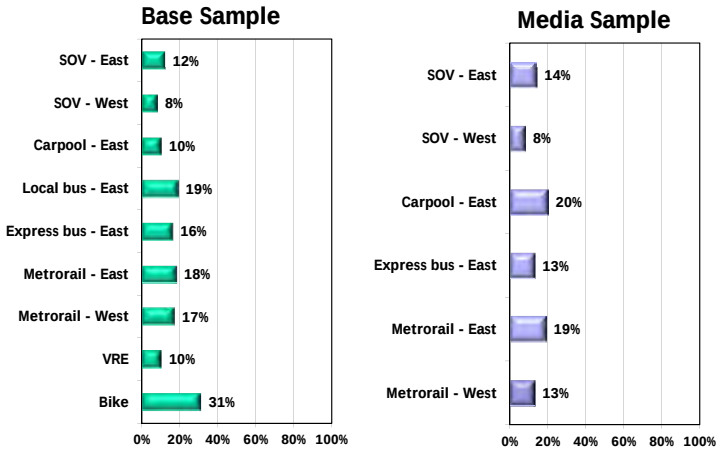
Q79. Assume that the HOV lane restrictions westbound on I-66 inside the Beltway went into effect at 3:00 p.m. and stayed in effect until 7:00 p.m., instead of staying in effect from 4:00 p.m. until 6:30 p.m., as they now do. How likely would you be to use the westbound HOV lanes inside the Beltway for your afternoon commute if they went into effect at 3:00 p.m. and stayed in effect until 7:00 p.m.?

Detailed Findings

Proposed Changes to I-66

Support for toll on I-66

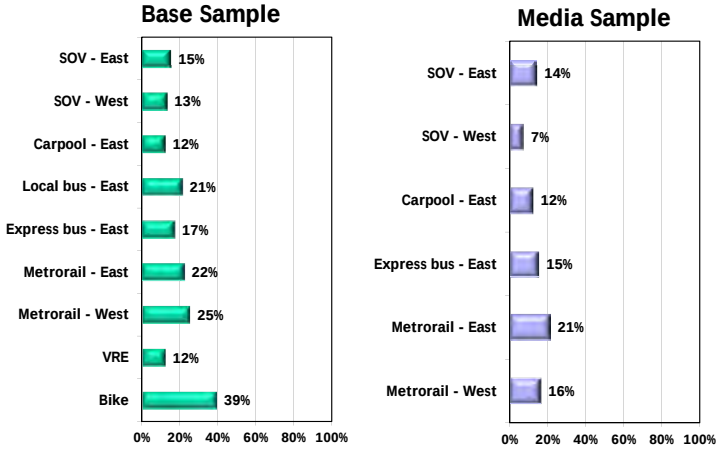
There Is Greater Support for a Toll among Carpoolers in the Media Sample than in the Base Sample; But, for the Most Part, Commuters in Neither Sample Support Implementing a Toll on I-66



Q80. Assume that a toll is put in place for all traffic on I-66. All vehicles would pay a toll to travel on I-66. How supportive would you be of putting a toll on I-66? By supportive, we mean that you believe that tolling should be put in place inside the Beltway on I-66.

Support for congestion priced tolling on I-66

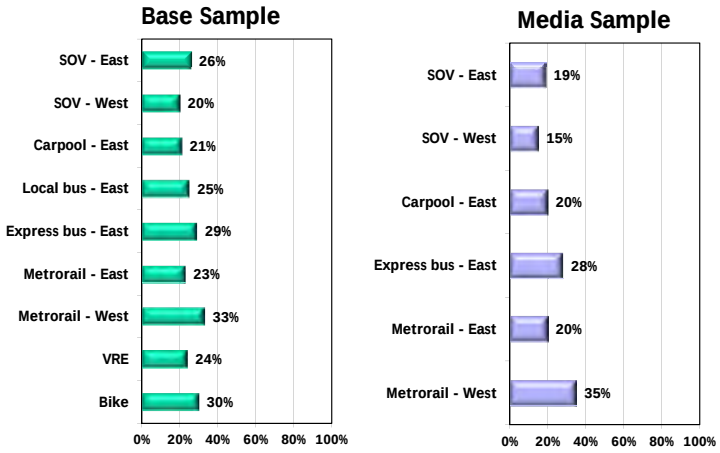
Although Values in the Two Samples Differ Slightly, There Is Little Support for Congestion Priced Tolling on I-66



Q80a. [Description of congestion priced tolling] How supportive would you be of pricing possible tolls on I-66 using a congestion pricing approach? By supportive, we mean that you believe that congestion priced tolling should be put in place for tolls inside the Beltway on I-66.

Support for HOT lanes

Support for HOT Lanes on I-66 Is about the Same in the Media Sample as the Base Sample



Q82. [Explanation of HOT lanes.] How supportive are you of implementing HOT lanes on I-66 inside the Beltway, 7 days a week, 24 hours a day? By supportive, we mean that you believe HOT lanes should be put in place on I-66 inside the Beltway.

Opinions about HOT lanes

SOVers in the Media Sample Are Slightly Less Convinced of these Benefits of HOT Lanes; In General, Recognition of Benefits of HOT Lanes Is Fairly Low in Both Groups

(continued on next slide)

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro-rail - East	Metro-rail - West
HOT lanes would help commuters save time	27%	27%	25%	31%	27%	35%	19%	18%	27%	30%	19%	32%
HOT lanes create new transit, vanpooling, and carpooling opportunities	27%	27%	24%	34%	30%	33%	19%	21%	26%	35%	26%	23%
HOT lanes would help commuters spend less time commuting & more time doing things they enjoy	24%	23%	20%	28%	25%	30%	16%	17%	22%	29%	22%	26%

Q85. Next is a list of statements about potential HOT lanes on I-66. Please indicate the extent to which you agree or disagree with each statement. Use a scale of 1-5 for your answer where "1" means that you "do not agree at all" with the statement and "5" means that you "agree very much" with the statement.

Opinions about HOT lanes

Metrorail West Riders in the Media Sample Are Slightly Less Convinced of these Benefits of HOT Lanes than Are those in the Base Sample
(continued from previous slide)

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro-rail - East	Metro-rail - West
HOT lanes would help traffic flow faster on I-66	24%	24%	22%	29%	25%	35%	20%	19%	25%	28%	21%	20%
HOT lanes would benefit all commuters, even those that do not use them	23%	24%	17%	25%	23%	35%	16%	15%	18%	23%	17%	26%

Q85. Next is a list of statements about potential HOT lanes on I-66. Please indicate the extent to which you agree or disagree with each statement. Use a scale of 1-5 for your answer where "1" means that you "do not agree at all" with the statement and "5" means that you "agree very much" with the statement.

Detailed Findings

Roadway Changes

Support for I-66 changes

Just as with the Base Sample, Commuters in the Media Sample Express the Greatest Support for Adding New HOV/Bus Lanes and Adding a New Bus Only Lane from among 4 Roadway Changes Tested

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro-rail - East	Metro-rail - West
Add new HOV/bus lanes	30%	29%	53%	69%	48%	46%	35%	24%	57%	76%	42%	51%
Add a new bus-only lane	26%	26%	36%	74%	46%	50%	33%	26%	42%	81%	48%	58%
Institute HOV-2 westbound for morning commute	16%	11%	29%	29%	27%	33%	15%	4%	30%	29%	23%	22%
Increase HOV eastbound to HOV-3	12%	14%	13%	36%	25%	29%	17%	12%	15%	36%	24%	23%

Q88. Numerous suggestions have been made by the public and by officials for changes to I-66 to improve the flow of traffic on I-66 inside the Beltway. How supportive are you of each of these possible changes to I-66 inside the Beltway? By supportive, we mean that you believe that this change should be made.

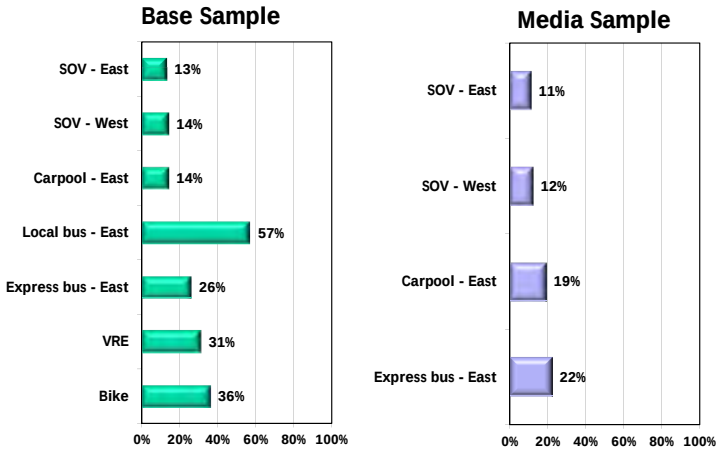
Detailed Findings

Transit

Likelihood of riding Metrorail

Stated Likelihood of Riding Metrorail Is about the Same for Both Samples (Note that there are not enough Local Bus riders in media sample for comparison)

Question asked of those who do not currently ride Metrorail and it is available for their commute.



Q90. Regardless of the mode of transportation you use today for your commute, how likely are you to use Metrorail for at least part of your commute at least 1-2 days a week in the future? Please use a scale of 1 to 5 for your answer, where "1" means that you are not at all likely and "5" means that you are very likely.

Likelihood of riding Metrorail under various conditions

Commuters in the Base Sample and the Media Sample Express about the Same Level of Interest in Riding Metrorail Under Various Conditions and Benefits; Riding Metrorail Is Appealing If Is Faster than Other Commute Modes – Especially among Westbound SOVers in the Media Sample

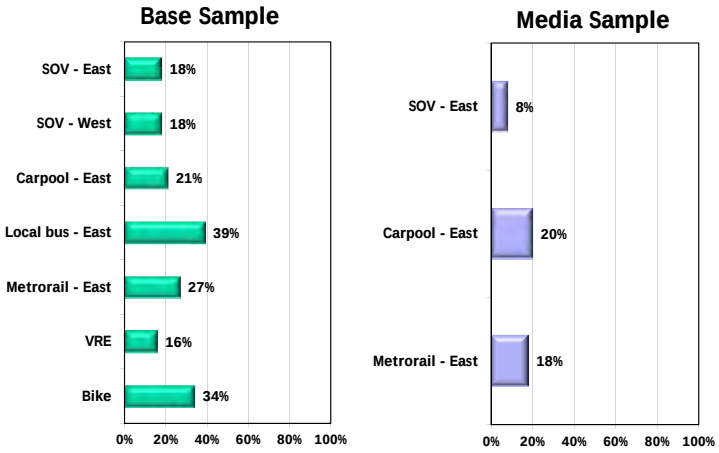
	Base Sample				Media Sample			
	SOV – East	SOV - West	Carpool – East	Express bus – East	SOV - East	SOV - West	Carpool – East	Express bus – East
If riding Metrorail was faster than driving or some other mode	65%	67%	65%	63%	66%	81%	65%	66%
If more parking was available at Metrorail stations	44%	21%	36%	37%	39%	19%	39%	37%
If trains came more often	40%	33%	37%	40%	43%	30%	42%	38%
If trains were less crowded	37%	20%	44%	49%	41%	21%	50%	50%
If the cost to ride Metrorail was reduced by 10%	32%	27%	31%	40%	33%	19%	35%	39%
If congestion lengthened your commute by 15 minutes	27%	25%	23%	35%	21%	25%	26%	31%

Q91. How likely would you be to use Metrorail for at least part of your commute 1-2 days a week under each of the following conditions?

Likelihood of riding express bus

Eastbound Carpoolers in the Media Sample Are as Likely as those in the Base Sample to Say They Will Ride an Express Bus in the Future; Eastbound SOVers and Metrorail Riders in the Media Sample Are Less Likely – But Not Remarkably So

Question asked of those who have express bus service available but do not currently use it.



Q96. Regardless of the mode of transportation you use today for your commute, how likely are you to take an express bus in the future? Please use a scale of 1 to 5 for your answer, where "1" means that you are "not at all likely" and "5" means "very likely."

Importance of express bus features

The Importance of these Features for Express Bus Service Is Similar for Commuters in the Base Sample and the Media Sample; SOVers in the Media Sample Place Less Importance on Shuttle Service to their Pick-up Point than those in the Base Sample

(continued on next slide)

	Base Sample			Media Sample		
	SOV – East	Carpool – East	Metrorail – East	SOV - East	Carpool – East	Metrorail – East
Bus arrives and departs on time	62%	67%	73%	60%	71%	78%
More frequent service	58%	61%	66%	58%	65%	75%
Later evening outbound service	53%	46%	53%	54%	52%	57%
Information available by cell phone or email	50%	51%	63%	43%	59%	60%
Shuttle bus to pick-up point	47%	44%	37%	29%	50%	38%
New P&R convenient to home	46%	41%	39%	43%	44%	50%
Shuttle bus to final destination	42%	39%	28%	35%	43%	26%

Q97. Please indicate how important each improvement would be in helping you choose to continue riding express bus service or to increase your usage. Use a scale of 1-5 for your answer where "1" means "not at all important" and "5" means "very important."

Importance of express bus features

SOVers in the Media Sample Place More Importance on Earlier Afternoon Outbound Service and Less Importance on Bicycle Facilities than Those in the Base Sample; Metrorail Riders in the Media Sample Place More Importance on More Parking Spaces at Lot than Metrorail Riders in the Base Sample

(continued from previous slide)

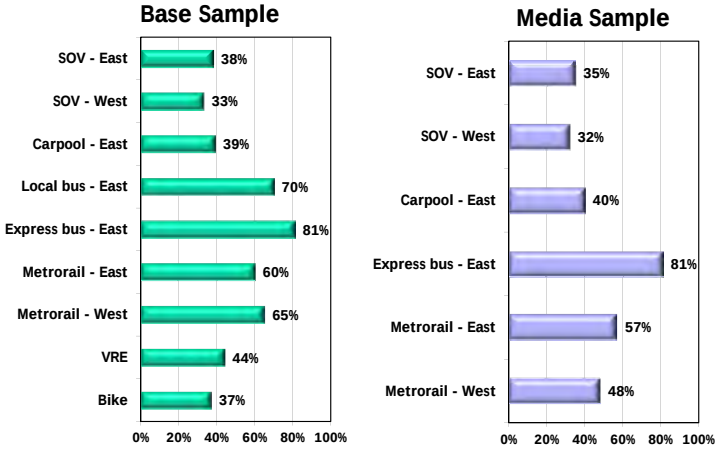
	Base Sample			Media Sample		
	SOV – East	Carpool – East	Metrorail – East	SOV - East	Carpool – East	Metrorail – East
Centralized stations or "hubs"	41%	42%	49%	42%	46%	50%
More parking spaces at lot	40%	44%	38%	38%	48%	60%
Earlier afternoon outbound service	39%	44%	44%	54%	52%	31%
Earlier morning inbound service	36%	35%	36%	27%	37%	35%
More midday inbound service	27%	35%	34%	35%	33%	32%
Bicycle racks at park-and-ride	15%	10%	18%	2%	18%	15%
Bicycle racks on buses	14%	10%	17%	4%	11%	12%

Q97. Please indicate how important each improvement would be in helping you choose to continue riding express bus service or to increase your usage. Use a scale of 1-5 for your answer where "1" means "not at all important" and "5" means "very important."

Likelihood of using Priority Bus service

Question asked of all respond-ents.

Stated Likelihood of Riding Priority Bus Is about the Same for the Media Sample and the Base Sample



Q105. Suppose a Priority Bus service was conveniently accessible from the area where you live to your destination, that is the place where you work or attend school. How likely would you be to use a Priority Bus service for your regular commute to work or school at least 2 days per week?

Likelihood of using Priority Bus based on specific features

Commuters in the Base Sample and the Media Sample Are Remarkably Consistent in What They Find Appealing about Priority Bus

(continued on next slide)

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro–rail - East	Metro -rail - West
Has limited stops	53%	46%	61%	88%	74%	75%	60%	50%	67%	89%	74%	71%
Reduces commute by 15 minutes	50%	52%	58%	90%	76%	74%	54%	52%	58%	89%	71%	71%
Runs every 10 minutes during peak and every 15 minutes during off-peak	50%	45%	55%	86%	72%	75%	56%	44%	59%	84%	72%	75%
Reduces cost of commute by 15%	45%	42%	51%	84%	68%	74%	52%	40%	55%	84%	61%	71%
Provides real-time info on phones, internet and station displays	43%	39%	46%	79%	62%	68%	51%	38%	52%	70%	63%	58%

Q107. How likely would you be to use Priority Bus services based on the following information about this service?

Likelihood of using Priority Bus based on specific features

The Two Groups Also Tend to Agree on the Appeal of these Features of Priority Bus

(continued from previous slide)

	Base Sample						Media Sample					
	SOV – East	SOV - West	Car-pool – East	Express bus – East	Metro-rail – East	Metro-rail - West	SOV - East	SOV - West	Car-pool – East	Express bus – East	Metro–rail - East	Metro -rail - West
Uses advanced tech. to improve reliability	43%	39%	48%	79%	66%	66%	46%	39%	49%	79%	62%	62%
Stations developed as "hubs"	40%	35%	44%	75%	62%	67%	43%	38%	44%	72%	58%	58%
Runs every 15 minute during peak and every 30 minutes during off-peak	33%	30%	35%	72%	49%	56%	33%	20%	40%	73%	46%	61%
Vehicle stops at stations rather than bus shelters	33%	29%	32%	52%	51%	53%	37%	32%	35%	50%	49%	49%

Q107. How likely would you be to use Priority Bus services based on the following information about this service?

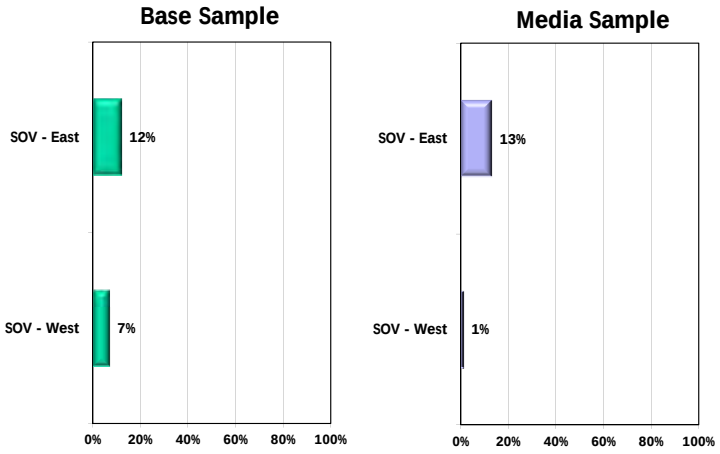
Detailed Findings

TDM

Likelihood of carpooling

Question asked of those who currently commute by SOV.

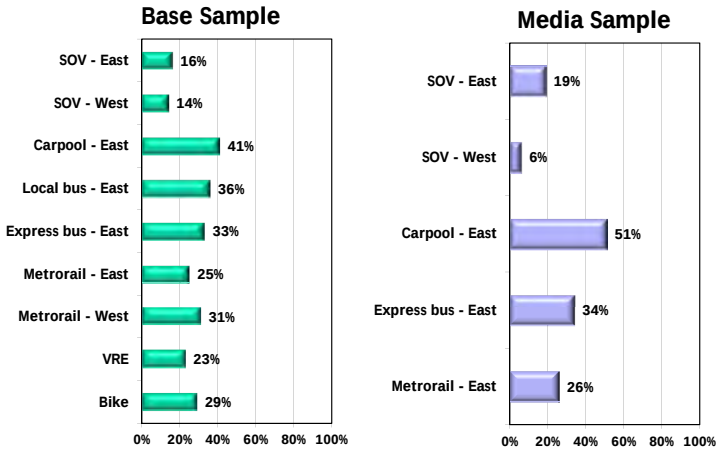
SOVers in the Media Sample Are about as Likely to Carpool in the Future as those in the Base Sample



Q123. Regardless of the mode of transportation you use today for your commute, how likely are you to carpool in the future?

Appeal of incentive rewards program

The Appeal of an Incentive Rewards Program Is about the Same for the Media Sample as the Base Sample



Q133. Assume that you could earn points that could be redeemed toward rewards at various retailers every time you share a ride to work or school. How likely would you be to share a ride if you could earn points that can be redeemed for rewards?

Appendix C

Travel Demand Forecasting Model Validation

Appendix C – Travel Demand Forecasting Model Validation

A travel demand forecasting model is a series of mathematical relationships linked together in a sequential process that simulates expected travel patterns based on a given land use and transportation system scenario. Changes to land use patterns or the transportation system are reflected in the travel patterns forecast by the model. The basic steps in the modeling process answer the following questions:

- Trip Generation: How much travel occurs (and why)?;
- Trip Distribution: Where does travel occur?;
- Mode Choice: What modes will be used? (e.g., automobile, transit, etc.); and
- Trip Assignment: Which path or route is used?

These questions form a serial process that outlines the general structure of the model. Though they apply to all levels of transportation planning studies, the application and simplicity of how these elements are determined vary by focus of the study. Determining how much and where travel occurs is basic to all transportation planning studies. Mode choice addresses the important question of what transportation mode people use. The final question of determining the path taken for each trip is important at all levels of the transportation planning process.

By answering all of these questions, travel demand forecasting models are able to estimate traffic levels on roadways and transit systems. In every level of transportation planning study, the impacts are quantified using some type of measure of effectiveness (MOE). The MOEs used will depend on the type and scale of the study, the desired outcomes of the proposed strategies or projects, and the computational capabilities of the selected tool.

As described in main body of the report, this project used the National Capital Transportation Planning Board's (TPB) Version 2.3.37 travel demand forecasting model to test both the mobility options and the mobility packages. For the testing of the mobility options an abbreviated model process was used. The abbreviated process took the trip tables from the CLRP+ Baseline run and assigned them to the option specific networks.

The regionally adopted travel demand forecasting model for air quality conformity includes a feature that constrains Metrorail ridership into the core. This "transit constraint" allows only a predetermined level of Metrorail ridership into the core, and if the model calculates a higher level of demand, these excess trips are shifted directly to the single-occupancy vehicle mode. This feature is designed to produce a conservative output in terms of air quality and shows a worst case scenario in terms of roadway congestion. It is acknowledged, though, that the actual behavior of Metrorail riders when faced with congested conditions in the Metrorail system may be different than assumed by the transit constraint feature. Travelers who would prefer Metrorail might shift the time of day of their commutes or seek out commuter rail,

commuter bus, local bus, carpool, or TDM alternatives, in addition to some portion choosing to drive instead. It is, therefore, a recommended practice to turn the Metrorail capacity constraint feature "off" when performing planning studies. This has been done in this study, however, it is important to understand that in doing so, the forecast Metrorail ridership might not be achieved without improvements to the carrying capacity of the Metrorail system.

For the testing of the mobility packages the full model process was used with slight modifications in order improve results in the defined study area. These modifications included:

- The HOV skims were calculated using the same highway network as the non-HOV skims;
- The assignment of HOV trips was done with all other trips for the specified time periods; and
- The transit constraint on the trips going to the D.C. Core was not included.

A regional model is calibrated and validated at the regional level. For project planning studies it is good practice to validate the model for the specific study area of interest. For the I-66 Multimodal Study a validation effort was performed to ensure that the model would yield reasonable results for the study area. Validation is the application of the calibrated model for a base year and then the comparison of the results against the observed data. For this study, year 2007 was the base year. The observed data was the 2007/2008 Household Travel Survey (HTS) data collected by the Metropolitan Washington Council of Governments (MWCOG).

There are no national standards for stating a model is validated. However, there are reasonableness guidelines published by the Federal Highway Administration (FHWA). Overall the Version 2.3 model produced reasonable results in the I-66 study corridor. The results were within acceptable tolerance levels as outlined by FHWA. The following figures summarize the results of the validation.

Figure C.1 shows the year 2007 trip distribution for home based work (HBW) trips that are produced in the study area. Figure C.2 shows the year 2007 trip distribution for trip ends that are attracted to the study area. There was a reasonable match in the number and distribution of the home based work trips leaving the study area. For the HBW attracted trip ends, the model was seven percent higher than the observed data. For the HBW production trip ends the model was five percent lower.

Figure C.1 Year 2007 HBW Production Trip Distribution for the Study Area

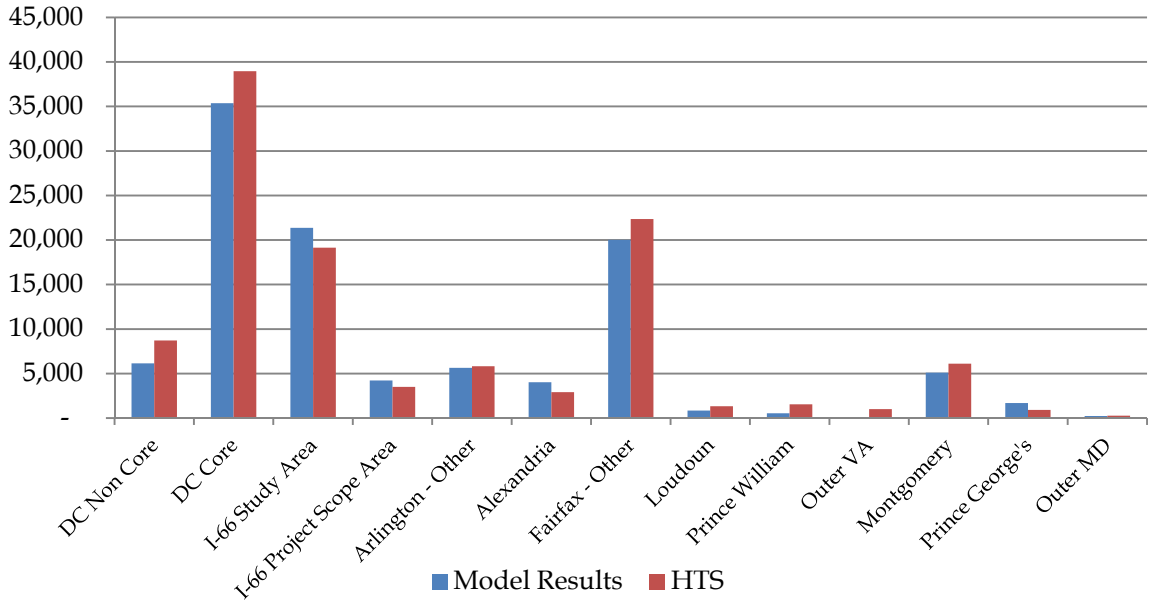
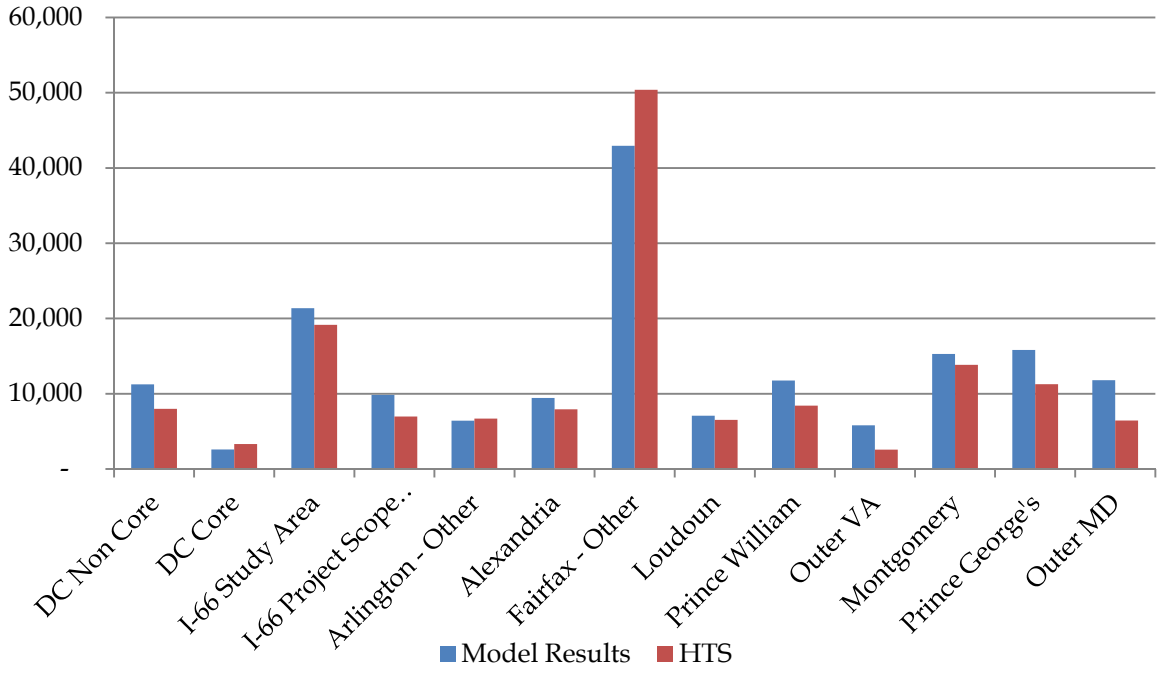


Figure C.2 Year 2007 HBW Attraction Trip Distribution for the Study Area



These two charts show that there is a reasonable match in the distribution of the HBW trips leaving the study corridor, with the D.C. Core being the major destination, and that there is also a reasonable match in the distribution of the HBW trips coming to the study corridor, with the majority of trips coming from Fairfax County.

Figures C.3 and C.4 show the transit mode share results as compared to the observed data by jurisdiction. The share of HBW trip productions for the larger study area within the Study Boundary that were made by transit in the HTS was 33 percent, while the model calculated 35 percent. For HBW attracted to the area within the Study Boundary, the transit mode share observed in the HTS was 22 percent, and the model calculated 29 percent. In the smaller study corridor which is within the Study Boundary, the production transit mode share was observed in the HTS as 43 percent while the model also calculated 43 percent. For the defined study corridor, the HBW transit mode share for the attraction trip ends was observed in the HTS as 27 percent while the model calculated 34 percent.

The HTS data does not explicitly break out HOV 2 or HOV 3+ trips. The data does contain auto passenger and auto driver. The SOV mode shares in the corridor validated well. Although the transit mode shares validated well compared to the HTS data, there is some thought from the results of the highway assignment that the modeled transit mode share is higher than actual and the modeled HOV transit mode is lower than observed data. The SOV is reasonable and matches the HTS and other data sources. The non-SOV mode share matches the HTS and other data sources. The model could be over simulating transit and under simulating HOV.

Figure C.3 Year 2007 HBW Production Transit Mode Share

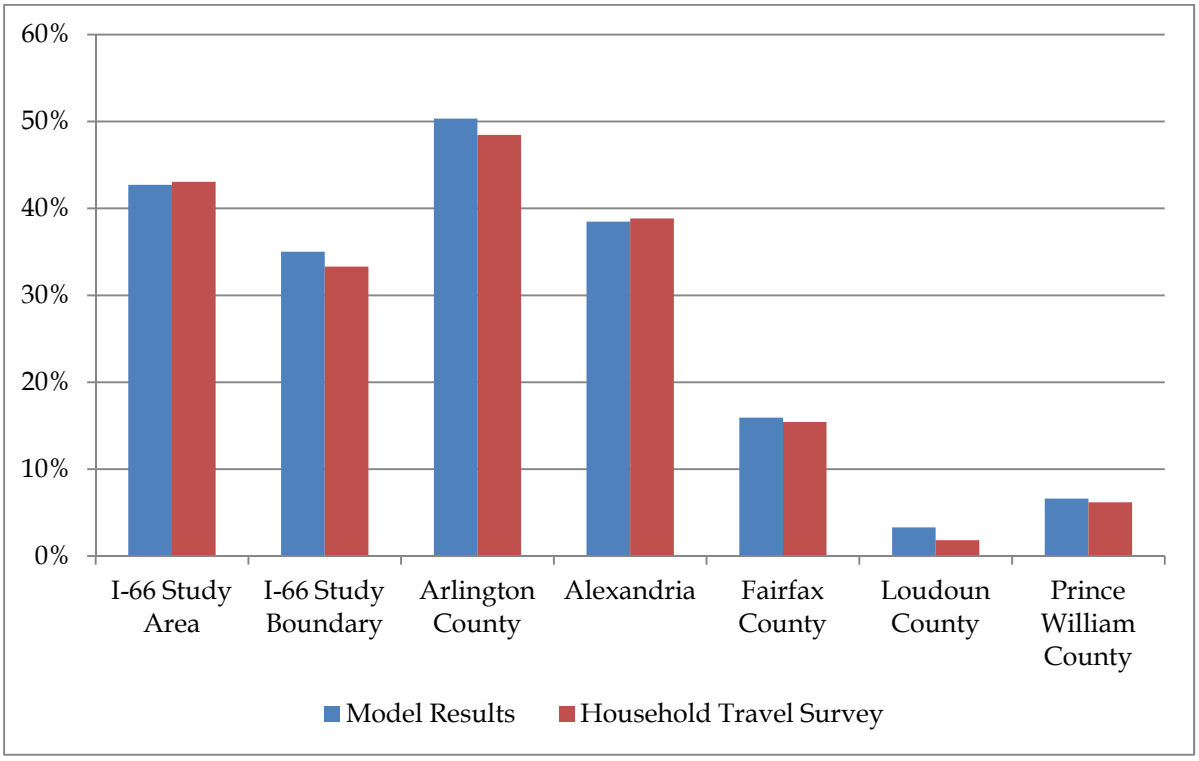
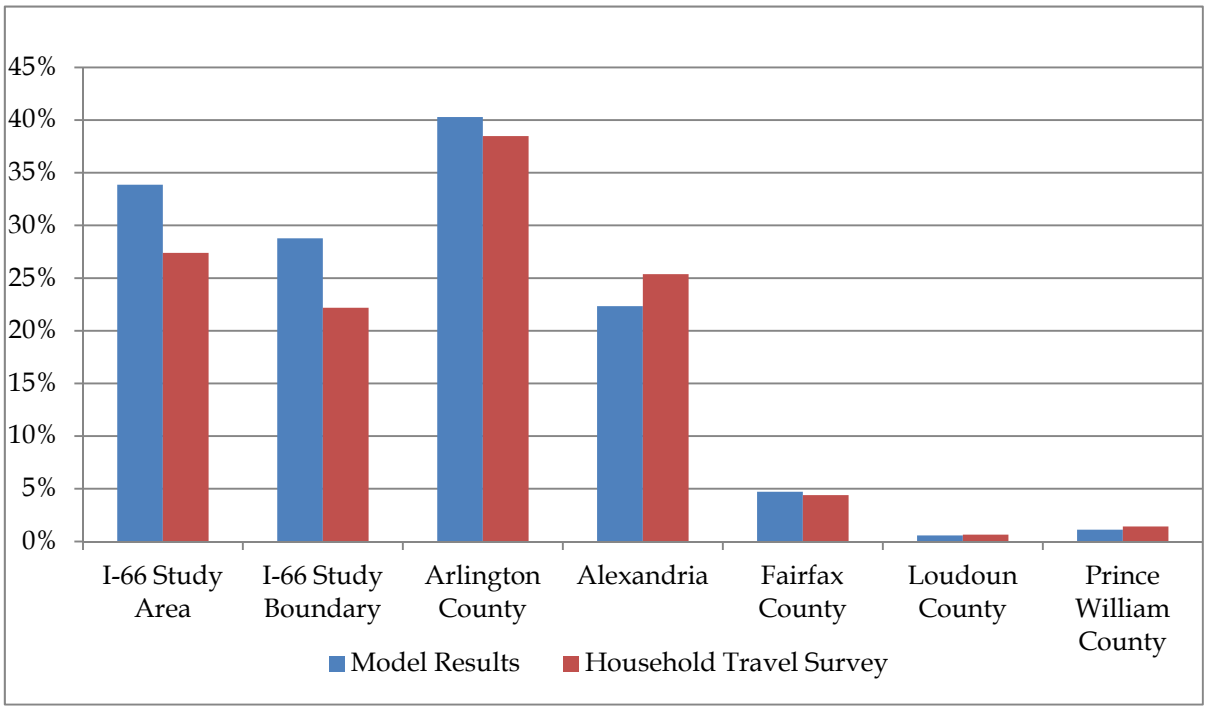


Figure C.4 Year 2007 HBW Attraction Transit Mode Share



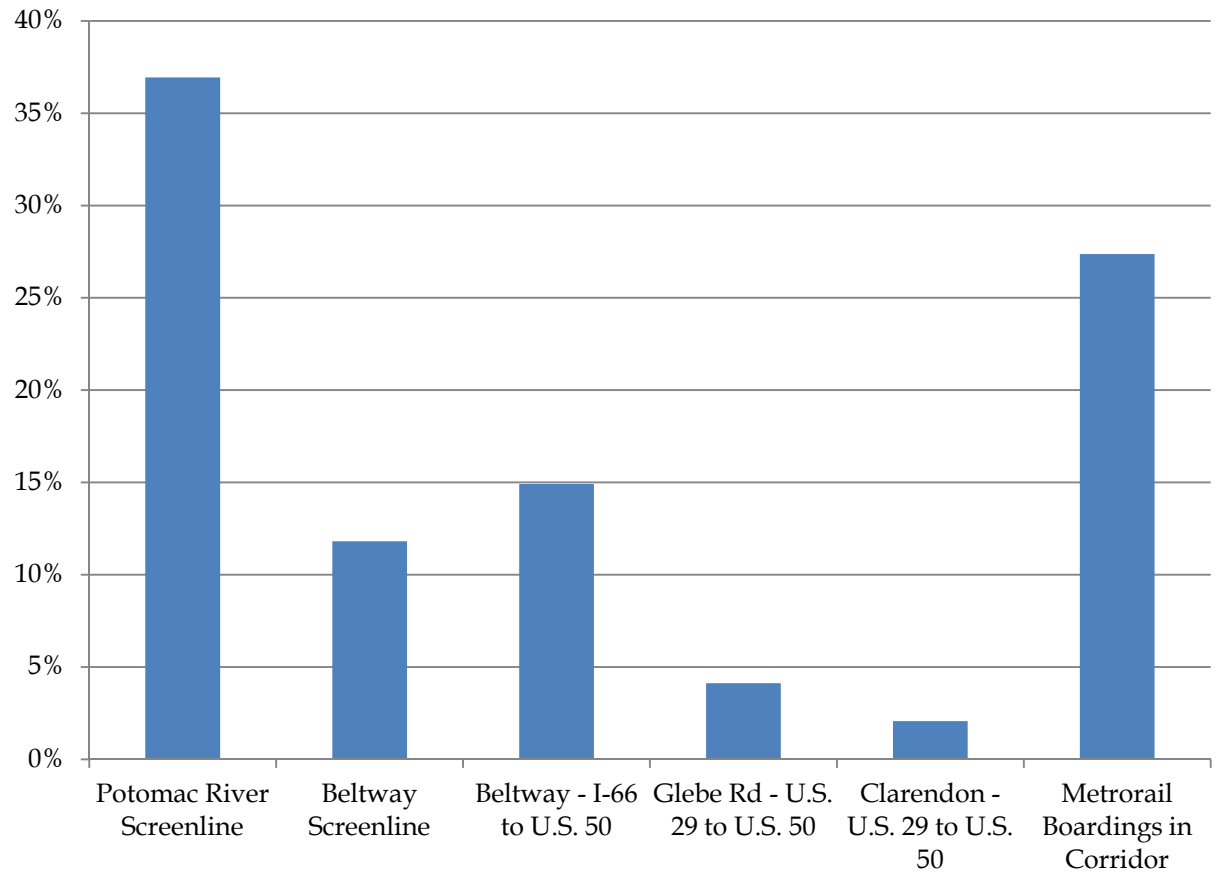
Often the only focus of validation efforts is the highway volumes on the loaded network. Although this is an important measure, it is not the only measure that illustrates the level of error in the model and how well a travel demand forecasting model is replicating travel behavior and predicting demand. As part of this validation effort, average weekday traffic volumes were compared across screenlines and cutlines, as well as the Metrorail boardings in the corridor to see how well the model results matched the observed data.

Figure C.5 shows the results of the screenline and cutline validation. Screenlines and cutlines are related but differ in length. A screenline attempts to catch all traffic moving across a regional boundary, whereas a cutline captures traffic moving across competing routes that are close together and are usually no longer than two to three miles in length. For this study we focused on two key screenlines: the Potomac River and the Capital Beltway (I-495/I-95). There were three cutlines defined for analysis. The cutlines were located at:

- The Capital Beltway between and including I-66 and U.S. 50;
- Glebe Road between and including U.S. 29 to U.S. 50; and
- In the Clarendon neighborhood between and including U.S. 29 and U.S. 50.

The Potomac River Screenline covers all bridges crossing the Potomac River from the Legion Bridge to the Wilson Bridge. This is a common screenline used by TPB staff. This is different than the Potomac River cutline used in the measures of effectiveness reporting in Sections 2.0 and 3.0.

Figure C.5 Percent Difference for Year 2007 Assignment Results as Compared to Observed Data



The model is over predicting highway and transit volumes, but except for the Potomac River the highway and transit data are acceptable. The cutlines in the study corridor perform especially well.

Appendix D

Package Component Costs

Appendix D – Package Component Costs

Appendix D provides cost detail for tolling, roadway, transit, and bicycle and pedestrian mobility options. The detailed costs were utilized to develop cost estimate summaries for the Multimodal Packages 1-4 discussed in the report.

D.1 Tolling

Construction costs for tolling the I-66 corridor for two or three lanes in each direction are shown in Tables D.1 and D.2 below. The costs are based on the following assumptions:

1. Gantry costs include structure, foundation, toll tag readers, detection equipment, enforcement camera, and communications equipment.

2. Cost estimate assumes existing communications networks will be used for HOT lanes.

3. Administrative costs are not included in this estimate. The estimate assumes VDOT or another agency is responsible for tolling collection, processing, and/or enforcement.

4. Enforcement is not included in this estimate.

5. Cost estimate assumes Dynamic Message Signs (DMS) already existing in the corridor will be used for HOT lanes.

6. Right-of-way (ROW) costs are not included.

7. Costs for the three-lane condition are increased by a factor of 40 percent to include structural costs at $150/foot and additional tag readers, communication equipment, and enforcement cameras.

8. For the three-lane condition, DMS signing is assumed to be mounted on overhead cantilever structures at $225,000 per site for six locations.

9. Cost assumes toll processing facility will be integrated with existing facilities along the I-66 corridor.

10. Software cost is based on a study ("Regional HOT Lanes Network Feasibility Study," Task 2) prepared for the San Francisco Bay area MTC (Metropolitan Transportation Commission).

In addition to these construction costs, there will be some additional annual cost associated with operating the electronic tolling system (approximately one to two million dollars annually for back office systems, lane systems maintenance, customer management, and financial reporting). It has been assumed that toll revenue will, at a minimum, completely offset the cost of operating the tolling system.

Table D.1 Tolling Cost for Two Lanes of I-66 in Each Direction

Tolling Component	Unit	Quantity	Unit Cost	Total
Full Span Gantry (EB and WB lanes of I-66)	EA	4	$1,200,000	$4,800,000
Full Span Gantry (EB or WB lanes of I-66)	EA	12	$900,000	$10,800,000
Software Cost	LS	1	$2,500,000	$2,500,000
Toll Processing Facility	LS	1	$1,000,000	$1,000,000
Subtotal				$19,100,000
Design Engineering (10% of subtotal)				$1,910,000
Construction Engineering and Inspection (12%)				$2,292,000
Contingency (30%)	LS	1		$5,430,000
Total				**$28,732,000**

Table D.2 Tolling Cost for Three Lanes of I-66 in Each Direction

Tolling Component	Unit	Quantity	Unit Cost	Total
Full Span Gantry (EB and WB lanes of I-66)	EA	4	$1,680,000	$6,720,000
Full Span Gantry (EB or WB lanes of I-66)	EA	12	$1,260,000	$15,120,000
Software Cost	LS	1	$2,500,000	$2,500,000
Toll Processing Facility	LS	1	$1,000,000	$1,000,000
Subtotal				$24,340,000
Design Engineering (10% of subtotal)				$2,434,000
Construction Engineering and Inspection (12%)				$2,920,800
Contingency (30%)	LS	1		$7,302,000
Total				**$36,996,800**

All Gantries Located on Mainlines of I-66

Gantries across eastbound and westbound I-66:

- East of Rosslyn Tunnel
- East of 21st Street
- East of North Monroe Street
- West of N. Glebe Road

Gantries across eastbound I-66:

- East of N. Ohio Street
- East of N. Williamsburg Boulevard
- East of Dulles Connector Road
- East of West Falls Church Metro
- East of Barbour Road
- East of Beltway

Gantries across westbound I-66:

- West of N. George Mason Drive
- West of N. Westmoreland Street
- West of N. Williamsburg Boulevard
- West of Dulles Connector Road
- East of Barbour Road
- East of Beltway

D.2 Highway

I-66 Additional Lane Costs

Figures D.1 to D.3 provide a visual aide to identify the location of high and moderate cost improvement zones within the study area, as well as areas that may require right-of-way to complete projects under consideration.

Figure D.1 Planning Level Concept – West

Figure D.2 Planning Level Concept – Central

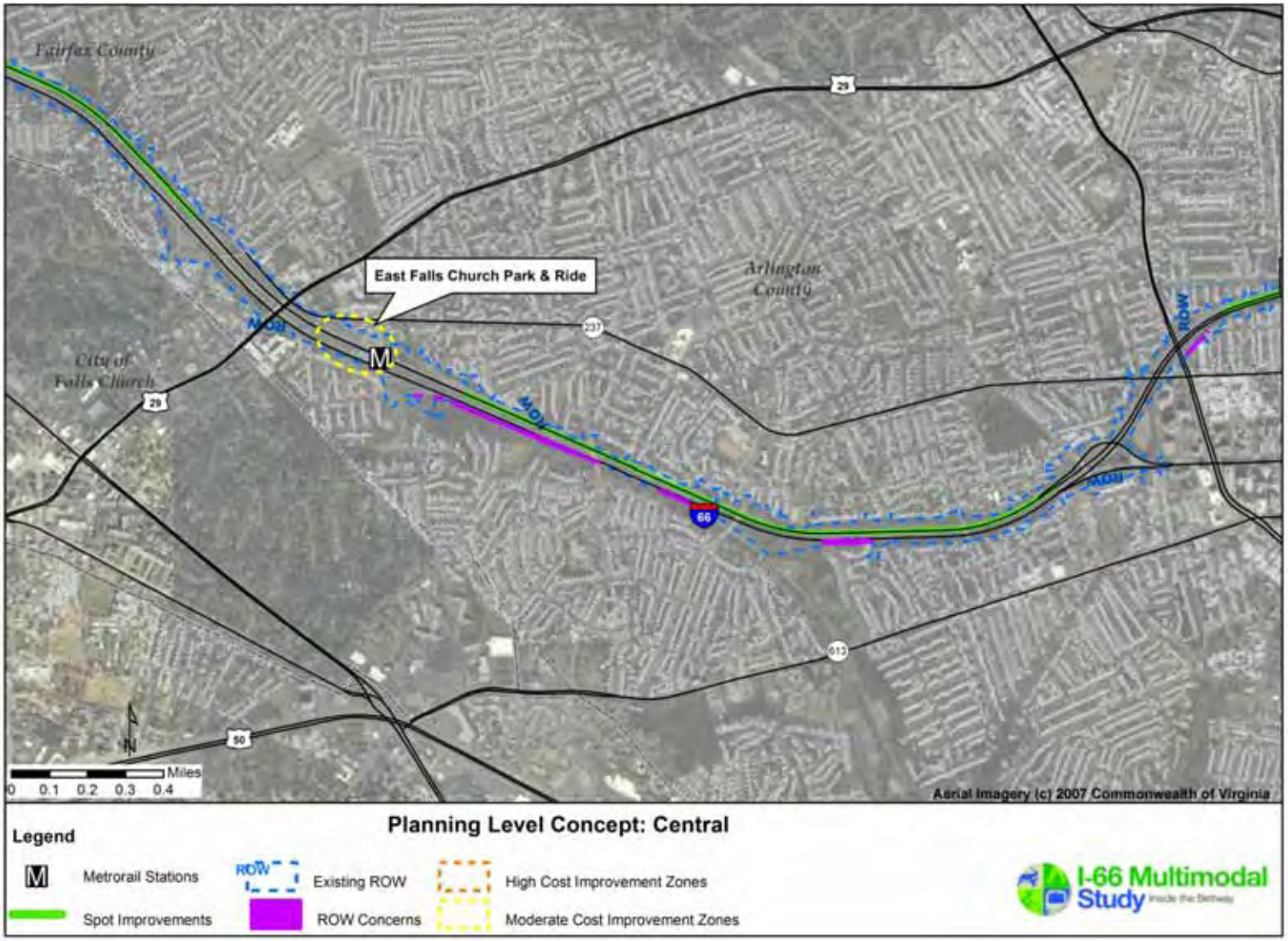
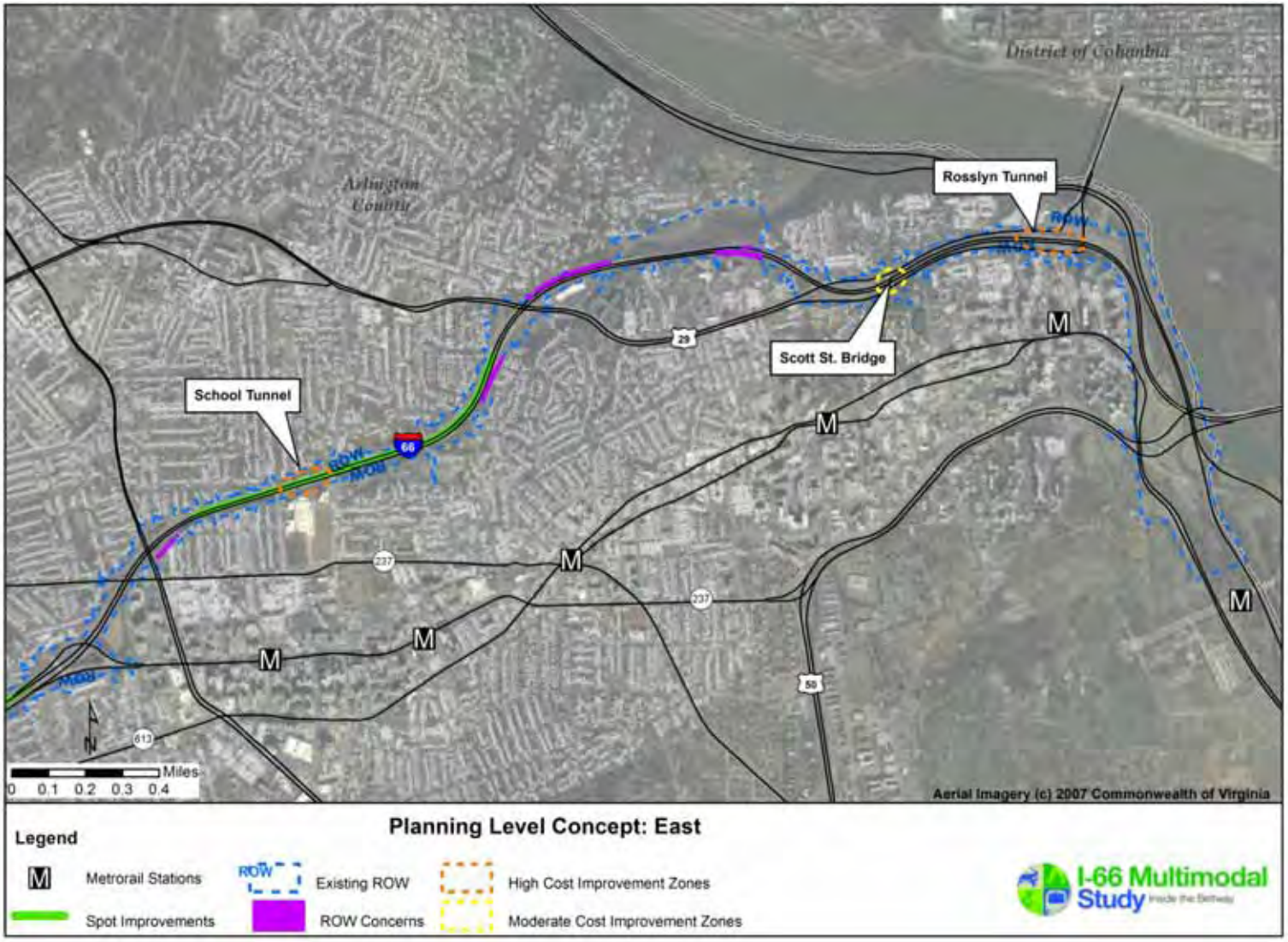


Figure D.3 Planning Level Concept – East



Planning-level cost estimates were prepared for adding a lane to I-66, including cost details for each item required to complete the project. Costs for adding a lane on I-66 were developed for three scenarios – 1) completing the lane addition without designs exceptions, which results in higher costs; 2) completing the lane addition with design exceptions, which limits costs; and 3) completing the lane addition between the Dulles Connector Road and Glebe Road without design exceptions, which reduces costs. Costs and costing assumptions for the three scenarios are shown below.

The following assumptions applied for adding a lane along I-66:

1. The assumed widened section is an additional 12-foot lane, 10-foot shoulder, 2-foot shy line, a barrier, and retaining wall.

2. Widening towards the inside was considered where feasible.

3. WMATA will allow inside widening adjacent to rail tracks.

4. Horizontal clearance for bridge piers is adequate in most cases, in such cases vertical clearance was assumed to be adequate as well.

5. Pier protection using TL-5 standard will be required at locations where bridge pier is close to the proposed roadway.

6. ROW costs were developed in consultation with VDOT.

7. All costs are based on 2011 costs. VDOT average bid prices were used in the determination of cost estimate.

8. Relocation of trail along Spout Run Parkway will be required.

9. All existing retaining walls will be impacted by the widening.

10. Soundwall is provided wherever retaining walls are being provided.

11. Spot improvements #1, #2, and #3 are considered as existing conditions for the proposed improvements.

12. I-66 ATM elements are considered as existing conditions in the proposed improvements.

13. Drainage requirements were based on 2012 Department of Conservation and Recreation (DCR) regulations.

I-66 Additional Lane Option: Without Design Exceptions

Table D.3 presents the planning-level cost estimate summary for providing an additional lane on I-66 without design exceptions. Tables D.4 to D.15 provide detail to support the cost estimate summary shown in Table D.3.

Table D.3 I-66 Additional Lane Costs, Without Design Exceptions

No. Item	Description	Unit	Quantity	Unit Price	Total
	Highway (From I-495 to I-66)				
1	Pavement	LS	1	$13,300,000	$13,300,000
2	Earthwork	LS	1	$8,000,000	$8,000,000
3	Retaining Wall	LS	1	$67,4000,000	$67,400,000
4	Sound Barrier Wall	LS	1	$15,021,000	$15,021,000
5	Median Barrier	LS	1	$9,000,000	$9,000,000
6	Existing Bridge Pier Protection	LS	1	$600,000	$600,000
7	Overhead Signs	LS	1	$20,000,000	$20,000,000
8	Relocation of ITS Elements	LS	1	$4,550,000	$4,550,000
9	**Overpass Improvements**				
	Route 7 Ramp	EA	1	$3,024,000	$3,024,000
	Leesburg Pike	EA	1	$3,864,000	$3,864,000
	Metrorail (West Falls Church)	EA	1	$1,495,200	$1,495,200
	Williamsburg Boulevard	EA	1	$3,528,000	$3,528,000
	Westmoreland Street	EA	1	$4,687,200	$4,687,200
	Sycamore Street	EA	1	$3,166,800	$3,166,800
	Custis Trail	EA	1	$2,032,800	$2,032,800
	Lee Highway	EA	1	$5,308,800	$5,308,800
	Spout Run Parkway	EA	1	$6,372,000	$6,372,000
10	**New Bridges**				
	Haycock Road	EA	1	$17,000,000	$17,000,000
	School Tunnel	EA	1	$36,000,000	$36,000,000
	Scott Street	EA	1	$10,000,000	$10,000,000
	Rosslyn Tunnel	EA	1	$42,300,000	$42,300,000
	Intersection Improvements for Bridges	LS	1	$8,000,000	$8,000,000
11	**Pedestrian Bridges (Reconstruction)**				
	Sycamore Street	EA	1	$3,000,000	$3,000,000
	Patrick Henry Drive	EA	1	$3,000,000	$3,000,000
	Spout Run Parkway	EA	1	$3,000,000	$3,000,000
12	Bike Trail/Shared Use Path	LS	1	$2,200,000	$2,200,000
13	Maintenance Of Traffic	LS	1	$38,000,000	$38,000,000
14	Drainage	LS	1	$44,000,000	$44,000,000
Subtotal					$377,849,800
Survey (2% of subtotal)					$7,556,996
Geotech (2%)					$7,556,996
Utility Cost (15%)					$56677,470
Right-of-way Cost					$38,000,000
Engineering (10%)					$37,784,980
Construction Engineering and Inspection (12%)					$45,341,976
Contingency (25%)					$94,462,450
Total					**$ 665,230,668**

Table D.4 Item 1 Pavement

							Full Depth				Quantities			
Station (From)	**Station (To)**	**Road**	**Side**	**Width (Feet)**	**Length (Feet)**	**Area (Square Feet)**	**SM-9.5D (in)**	**IM-19.0A (in)**	**BM-25.0A (in)**	**No. 21B (in)**	**SM-9.5D (in)**	**IM-19.0A (in)**	**BM-25.0A (in)**	**No. 21B (in)**
Washington, D.C.	I-495	I-66	WB	26	26,885	699,010	2	4	8	10	8,543	17,087	37,902	42,232
Washington, D.C.	I-495	I-66	EB	26	48,740	1,267,240	2	4	8	10	15,488	30,977	68,713	76,562
Widening Ramps		I-66		26	5,200	135,200	2	4	8	10	1,652	3,305	7,331	8,168
Ramp from I-66 to Leesburg Pike		I-66	WB	26	450	11,700	2	4	8	10	143	286	634	707
Ramp from Route 29 to I-66		I-67	WB	26	470	12,220	2	4	8	10	149	299	663	738
										Total	**25,977**	**51,953**	**115,242**	**128,408**

Summary		**Qty.**	**Unit Cost**	**Extension**
Asphalt Concrete Type SM-9.5D	Tons:	25,977	$74	$1,922,279
Asphalt Concrete Type IM-19.0A	Tons:	51,953	$71	$3,688,698
Asphalt Concrete Type BM-25.0A	Tons:	115,242	$36	$4,148,722
Aggregate Base Material Type I No.21B	Tons:	128,408	$27	$3,467,010
Total				$13,226,709
Total (Rounded)				**$13,300,000**

Formulas and Assumptions

Formulas for pavement quantities:

- SM-9.5D =(Area/9) * (110 * Depth)/2000
- IM-19.0A =(Area/9) * (110 * Depth)/2000
- BM-25.0A =(Area/9) * (122 * Depth)/2000
- No.21B =(Area * Depth/12) * 145/2000

Assume the thickness of full depth pavement is as follows:

- Surface: 2 inches
- Intermediate: 4 inches
- Base: 8 inches
- Subbase: 10 inches

Total Project Length: 9.5 miles (50,160 feet)

- Spot Improvement 1: 1.5 miles (7,920 feet)
- Spot Improvement 2: 1.6 miles (8,448 feet)
- Spot Improvement 3: 0.9 miles (4,752 feet)

Table D.5 Item 2 Earthwork

Station (From)	Station (To)	Route	Side	Depth (Feet)	Length (Feet)	Width (Feet)	Volume (cf)	Volume (cy)	Cost ($/cy)	Total
Washington, D.C.	I-495	I-66	WB	2	26,885	28	1,505,560	55,761.48	$21	$1,170,991
Washington, D.C.	I-495	I-66	EB	2	48,740	28	2,729,440	101,090.37	$21	$2,122,898
Widening Ramps		I-66	Ramp	2	5,200	28	291,200	10,785.19	$21	$226,489
Side Slope		I-66	WB	3	26,885	10	806,550	29,872.22	$21	$627,317
		I-66	EB	3	48,740	10	1,462,200	54,155.56	$21	$1,137,267
		I-66	Ramp	10	5,200	28	1,456,000	53,925.93	$21	$1,132,444
Backfill of Bridges		I-66		20	846	25	423,000	15,666.67	$21	$329,000
Retaining Wall		I-66		5	48,454	5	1,211,350	44,864.81	$21	$942,161
Bike Trail		I-66		3	8,704	14	365,558	13,539.18	$21	$284,322
Total										$7,972,899
Total (Rounded)										**$8,000,000**

Table D.6 Item 3 Retaining Wall

Station (From)	Station (To)	Route	Side	Height (Feet)	Length (Feet)	Area (Square Feet)	Cost ($/Square Foot)	Total
Existing Retaining Wall		I-66	WB/EB	15	42,104	631,560	$90	$56,840,400
Washington, D.C.	I-495	I-66	WB	15	3,150	47,250	$90	$4,252,500
Washington, D.C.	I-495	I-66	EB	15	3,200	48,000	$90	$4,320,000
Misc. Retaining Wall (Bike/Slope)		I-66		10	176	21,759	$90	$1,958,346
Total								$67,371,246
Total (Rounded)								**$67,400,000**

Table D.7 Item 4 Sound Barrier Wall

Station (From)	Station (To)	Route	Side	Height (Feet)	Length (Feet)	Area (Square Feet)	Cost ($/Square Foot)	Total
Existing Retaining Wall		I-66	WB/EB	10	42,104	421,040	$31	$13,052,240
Washington, D.C.	I-495	I-66	WB	10	3,150	31,500	$31	$976,500
Washington, D.C.	I-495	I-66	EB	10	3,200	32,000	$31	$992,000
Total								$15,020,740
Total (Rounded)								**$15,021,000**

Table D.8 Item 5 Median Barrier and Overhead Sign Protection

Median Barrier

Station (From)	Station (To)	Route	Side	Length (Feet)	Unit Cost ($/Foot)	Total
Type: MB-7D						
Fairfax Drive	I-495	I-66	WB/EB	15,064	$60	$903,840
Type: MB-7F						
Washington, D.C.	Fairfax Drive	I-66	WB (LT)	13,976	$66	$922,416
			WB (RT)	13,976	$66	$922,416
Washington, D.C.	Fairfax Drive	I-66	EB (LT)	33,993	$66	$2,243,538
			EB (RT)	33,993	$66	$2,243,538
Total						$6,331,908

Overhead Sign Protection

Type	Unit Cost ($/Foot)	Quantity per Sign	EA	Total
Median Barrier MB-7F	$66	50 feet	25	$82,500
Guardrail FOA-2	$2,300 ea	1 each	24	$55,200
Guardrail GR-2	$16	25 feet	24	$9,600
Guardrail GR-9	$2,100	24 feet	24	$1,209,600
Total				$1,356,900

Total

Summary Item	Total
Median Barrier	$6,331,908
Overhead Sign Protection	$1,356,900
Total	$8,592,648
Total (Rounded)	**$9,000,000**

Table D.9 Item 6 Existing Bridge Pier Protection (MB-12B)

Overpass	Route	Width (Feet)	Bridge (Feet)	Length (Feet)	Cost ($/Feet)	Total
Washington Boulevard	I-66	100	76	176	$175	$30,800
Glebe Road	I-66		84	184	$175	$32,200
Utah Street	I-66		43	143	$175	$25,025
Stafford Street	I-66		45	145	$175	$25,375
School Tunnel	I-66		800	900	$175	$157,500
Quincy Street	I-66		75	175	$175	$30,625
Lincoln Street	I-66		55	155	$175	$27,125
21st Street	I-66		53	153	$175	$26,775
Lee Highway	I-66		85	185	$175	$32,375
Scott Street	I-66		60	160	$175	$28,000
Rosslyn Tunnel	I-66		940	1,040	$175	$182,000
Total				3,416	$175	$597,800
Total (Rounded)						**$600,000**

Table D.10 Item 7 Overhead Signs

Sign Types	Route	Side	Unit Price	EA	EA Total	Total
Full Span	I-66	WB	$2,000,000	3	3	$6,000,000
Half Span	I-66	EB	$1,000,000	1	2	$2,000,000
		WB		1		
Cantilever	I-66	EB	$500,000	10	17	$8,500,000
		WB		7		
Detach Bridge Sign	I-66	EB	$500,000	2	2	$1,000,000
		WB		0		
New Signs	I-66		$500,000	5	5	$2,500,000
Total						**$20,000,000**

Table D.11 Item 8 Relocation of ITS Elements

Type	EA	Unit Price	Total
Closed-Circuit Television (CCTV)	21	$100,000	$2,100,000
Detector	31	$30,400	$942,400
Dynamic Message Sign (DMS)	3	$287,500	$862,500
Small DMS	3	$215,000	$645,000
Total			$4,549,900
Total (Rounded)			**$4,550,000**

Table D.12 Item 9 Overpass Improvements

Overpass	Route	Side	Width (Feet)	Length (Feet)	Cost ($/SF)	Total
VA Route 7 Ramp	I-66	WB	28	185	$300	$1,554,000
		EB	28	175	$300	$1,470,000
Leesburg Pike	I-66	WB	28	220	$300	$1,848,000
		EB	28	240	$300	$2,016,000
Metrorail (W.F. Church)	I-66	WB	28	178	$300	$1,495,200
Williamsburg Boulevard	I-66	WB	28	210	$300	$1,764,000
		EB	28	210	$300	$1,764,000
Westmoreland Street	I-66	WB	28	280	$300	$2,352,000
		EB	28	278	$300	$2,335,200
Sycamore Street	I-66	WB	28	177	$300	$1,486,800
		EB	28	200	$300	$1,680,000
Custis Trail	I-66	WB	28	121	$300	$1,016,400
	I-66	EB	28	121	$300	$1,016,400
Lee Highway	I-66	WB	28	315	$300	$2,646,000
		EB	28	317	$300	$2,662,800
Spout Run Parkway	I-66	WB	36	590	$300	$6,372,000
Total						**$33,478,800**

Table D.13 Item 10 New Bridges

New Bridge

Location	Route	Side	Width (Feet)	Length (Feet)	Area (SF)	Unit Cost ($/SF)	Total
Haycock Road	I-66	WB	94	450	42,300	$400	$16,920,000
School Tunnel	I-66	WB	150	800	120,000	$300	$36,000,000
Scott Street	I-66	WB	60	300	18,000	$350	$6,300,000
Rosslyn Tunnel	I-66	WB	150	940	141,000	$300	$42,300,000

Additional Signal and Abutment Cost Elements for Scott Street

Item	Route	Side	Quantity	Unit Cost	Total
Signal	I-66	WB	1	$1,000,000	$1,000,000
Abutment	I-66	WB	1	$2,000,000	$2,000,000

Additional Earthwork Cost Elements for Scott Street

Location	Route	Side	Length (feet)	Volume (cf)[a]	Volume (cy)	Unit Cost ($/cy)	Total
Ramp from U.S. 29 to I-66	I-66	WB	600	234,000	8,667	$21	$182,000
From U.S. 29 to Scott Street	I-66	WB	900	351,000	13,000	$21	$273,000

Intersection Modifications

Assume $2,000,000 at each of the four locations for total of $8,000,000

Table Notes:

[a] Earthwork volume assumes height is 15 feet and width is 26 feet at each location

[b] Rounded Haycock Road estimate is $17,000,000 on summary sheet

[c] Net Scott Street estimate, including additional items, is $10,000,000 on summary sheet

Table D.14 Item 11 Pedestrian Crossing Bridges

Location	Route	Side	Unit Price
Between Sycamore Street and Ohio Street	I-66		$3,000,000
Between Patrick Henry Drive and Harrison Street	I-66		$3,000,000
Between Spout Run Parkway and 21st Street	I-66		$3,000,000
Total			**$9,000,000**

Table D.15 Item 12 Bike Trail/Shared Use Path

Station (From)	Station (To)	Route	Side	Length (Feet)	Cost ($/Mile)	Total
Sycamore Street	Patrick Henry Drive	I-66	EB	3,822	$246	$940,283
Lee Highway	Lee Highway	I-66	EB	I-66	$246	$921,307
Lee Highway	Scott Street	I-66	WB	1,136	$246	$279,535
Total						$2,141,125
Total (Rounded)						**$2,200,000**

Table D.16 Item 13 Maintenance of Traffic

Factor	Amount
7% of Highway Construction Cost	$10,434,970
15% of Overpass Improvement Cost	$5,021,820
20% of New Bridge Construction Cost	$22,660,000
Total	$38,116,790
Total (Rounded)	**$38,000,000**

I-66 Additional Lane Option: With Design Exceptions

Table D.17 presents the planning-level cost estimate summary for providing an additional lane on I-66 with design exceptions. The following differences in assumptions were employed:

1. The assumed widened section is an additional 11-foot lane, 6-foot to 8-foot shoulder, 2-foot shy line, a barrier, and retaining wall;

2. WMATA will allow inside widening adjacent to rail tracks;

3. Horizontal and vertical clearances for some bridge piers and bridges may be tighter than normal standard;

4. Relocation of trail along Spout Run Parkway will not be required;

5. Some (not all) of the existing retaining walls will be impacted by the widening;

6. Possible design exceptions required for: shoulder width; horizontal and vertical clearances; pier protection; side slope; and drainage.

Table D.17 I-66 Additional Lane Costs, With Design Exceptions

No. Item	Description	Unit	Quantity	Unit Price	Total
	Highway (From I-495 to I-66)				
1	Pavement	LS	1	$11,800,000	$11,800,000
2	Earthwork	LS	1	$7,070,000	$7,070,000
3	Retaining Wall	LS	1	$26,700,000	$26,700,000
4	Sound Barrier Wall	LS	1	$8,500,000	$8,500,000
5	Barrier MB-7D	LS	1	$8,600,000	$8,600,000
6	Existing Bridge Pier Protection	LS	1	$600,000	$600,000
7	Overhead Signs	LS	1	$20,000,000	$20,000,000
8	Relocation of ITS Elements	LS	1	$4,550,000	$4,550,000
9	**Overpass Improvements**				
	Route 7 Ramp	EA	1	$3,024,000	$3,024,000
	Leesburg Pike	EA	1	$3,864,000	$3,864,000
	Metrorail (West Falls Church)	EA	1	$1,495,200	$1,495,200
	Williamsburg Boulevard	EA	1	$3,528,000	$ 3,528,000
	Westmoreland Street	EA	1	$4,687,200	$ 4,687,200
	Sycamore Street	EA	1	$3,166,800	$ 3,166,800
	Custis Trail	EA	1	$2,032,800	$2,032,800
	Lee Highway	EA	1	$5,308,800	$5,308,800
	Spout Run Pkwy.	EA	1	$6,372,000	$6,372,000
10	**New Bridges**				
	Scott Street	EA	1	$10,000,000	$10,000,000
	Intersection Improvements	LS	1	$4,000,000	$4,000,000
11	**Pedestrian Bridges (Reconstruction)**				
	Sycamore Street	EA	1	$3,000,000	$ 3,000,000
	Patrick Henry Drive	EA	1	$3,000,000	$ 3,000,000
	Spout Run Parkway	EA	1	$3,000,000	$ 3,000,000
12	Bike Trail/Shared Use Path	LS	1	$2,200,000	$2,200,000
13	Maintenance Of Traffic	LS	1	$15,000,000	$15,000,000
14	Drainage	LS	1	$28,000,000	$28,000,000
Subtotal					$189,498,800
Survey (2%)					$3,789,976
Geotechnical (2%)					$3,789,976
Utility Cost (15%)					$28,424,820
Right-of-way Cost					$25,000,000
Engineering (10%)					$18,949,880
Construction Engineering and Inspection (12%)					$22,739,856
Contingency (25%)					$47,374,700
Total					**$339,568,008**

I-66 Additional Lane Option Between the Dulles Connector Road and Glebe Road: Without Design Exceptions

Table D.18 presents the planning-level cost estimate summary for providing an additional lane on I-66 between the Dulles Connector Road merge and Glebe Road, without design exceptions and utilizing the westbound spot improvements as applicable.

Table D.18 I-66 Additional Lane Between Dulles Connector Road and Glebe Road Costs, Without Design Exceptions

No. Item	Description	Unit	Quantity	Unit Price	Total
	Highway (From VA 267 to Glebe Road)				
1	Pavement	LS	1	$4,600,000	$4,600,000
2	Earthwork	LS	1	$2,000,000	$2,000,000
3	Retaining Wall	LS	1	$30,000,000	$30,000,000
4	Sound Barrier Wall	LS	1	$7,000,000	$7,000,000
5	Median Barrier	LS	1	$4,000,000	$4,000,000
6	Existing Bridge Pier Protections	LS	1	$420,000	$420,000
7	Overhead Signs	LS	1	$6,500,000	$6,500,000
8	Relocation of ITS Elements	LS	1	$1,600,000	$1,600,000
9	**Overpass Improvements**				
	Williamsburg Boulevard	EA	1	$3,528,000	$3,528,000
	Westmoreland Street	EA	1	$4,687,200	$4,687,200
	Sycamore Street	EA	1	$3,166,800	$3,166,800
10	**New Bridges**				
	Haycock Road	EA	1	$17,000,000	$17,000,000
	Intersection Improvements	LS	1	$2,000,000	$2,000,000
11	**Pedestrian Bridges (Reconstruction)**				
	Sycamore Street	EA	1	$3,000,000	$3,000,000
	Patrick Henry Drive	EA	1	$3,000,000	$3,000,000
12	Bike Trail/Shared Use Path			$1,200,000	$1,200,000
13	Maintenance Of Traffic			$10,000,000	$10,000,000
14	Drainage			$20,000,000	$20,000,000
Subtotal					$123,702,000
Survey (2%)					$ 2,474,040
Geotech (2%)					$ 2,474,040
Utility Cost (15%)					$18,555,300
Right-of-way Cost					$16,095,000
Engineering (10%)					$12,370,200
Construction Engineering and Inspection (12%)					$14,844,240
Contingency (25%)					$30,925,500
Total					**$221,440,320**

U.S. 50 Shoulder Bus Lane Costs

Table D.19 summarizes the planning cost estimate for constructing a shoulder bus lane along U.S. 50 as called for in Multimodal Package 4. Tables D.20 to D.23 provide detail to support the cost estimate summary shown in Table D.19.

Table D.19 U.S. 50 Shoulder Bus Lane Improvement

No. Item	Description	Unit	Quantity	Unit Price	Total
	Roadway (From I-495 to I-66)				
1	Pavement	LS	1	$6,800,000	$6,800,000
2	Median Barrier MB-7D	LS	1	$2,508,000	$2,508,000
3	Retaining Wall (10% LF)	LS	1	$3,385,800	$3,385,800
4	Maintenance Of Traffic	LS	1	$18,000,000	$18,000,000
5	Drainage	LS	1	$50,000,000	$50,000,000
6	**Intersection Improvements**				
	Signal Intersection Improvements				
	Jaguar Trail	EA	1	$1,048,000	$1,048,000
	Park Drive	EA	1	$1,048,000	$1,048,000
	Henry Place	EA	1	$1,048,000	$1,048,000
	Pershing Drive	EA	1	$1,048,000	$1,048,000
	Overpass Improvements				
	Four Mile Run Trail	EA	1	$2,500,000	$2,500,000
7	**Interchange Improvements**				
	Modified Interchanges				
	Fairview Park Street	EA	1	$12,000,000	$12,000,000
	Carlin Spring Road	EA	1	$5,000,000	$5,000,000
	George Mason Drive	EA	1	$5,000,000	$5,000,000
	Glebe Road	EA	1	$5,000,000	$5,000,000
	N. Queen Street	EA	1	$5,000,000	$5,000,000
	N. Meade Street	EA	1	$5,000,000	$5,000,000
8	Pedestrian Bridge	EA	1	$3,000,000	$3,000,000
Subtotal					$127,385,800
Survey (2%)					$ 2,547,716
Geotech (2%)					$ 2,547,716
Engineering (10%)					$12,738,580
Construction Engineering and Inspection (12%)					$15,286,296
Utility Cost (15%)					$19,107,870
Contingency (25%)					$31,846,450
Total					**$211,460,428**

Table D.20 Item 1 Pavement

							Full Depth				Quantities			
Station (From)	**Station (To)**	**Route**	**Side**	**Width (Feet)**	**Length (Feet)**	**Area (Square Feet)**	**SM-9.5D (in)**	**IM-19.0A (in)**	**BM-25.0A (in)**	**No.21B (in)**	**SM-9.5D (in)**	**IM-19.0A (in)**	**BM-25.0A (in)**	**No.21B (in)**
Washington, D.C.	I-495	U.S. 50	EB	14	50,160	702,240	1.5	2	8	8	6,437	8,583	38,077	33,942
Washington, D.C.	I-495	U.S. 50	WB	14	50,160	702,240	1.5	2	8	8	6,437	8,583	38,077	33,942
										Total	**12,874**	**17,166**	**76,154**	**67,883**

Summary		**Qty.**	**Unit Cost**	**Extension**
Asphalt Concrete Type SM-9.5D	Tons:	12,874	$74.00	$952,706
Asphalt Concrete Type IM-19.0A	Tons:	17,166	$71.00	$1,218,777
Asphalt Concrete Type BM-25.0A	Tons:	76,154	$36.00	$2,741,545
Aggregate Base Material Type I No.21B	Tons:	67,883	$27.00	$1,832,846
Total				$6,745,873
Total (Rounded)				**$6,800,000**

Table D.21 Item 2 Median Barrier (MB-7B)

Station (From)	Station (To)	Route	Side	Length (Feet)	Unit Cost ($/Foot)	Total
Washington, D.C.	I-495	U.S. 50	RT	50,160	$50	$2,508,000

Table D.22 Item 3 Retaining Wall

Station (From)	Station (To)	Route	Side	Height (Feet)	Length (Feet)	Area (Square Feet)	Unit Cost ($/SF)	Total
Washington, D.C.	I-495	U.S. 50	RT	5	5,016	25,080	$135	$3,385,800

Table D.23 Item 6 Overpass Improvements

Overpass	Route	Side	Width (Feet)	Length (Feet)	Area (Square Feet)	Unit Cost ($/SF)	Total
Four Mile Run Trail	U.S. 50	RT	20	250	5,000	$250	$1,250,000
Four Mile Run Trail	U.S. 50	LT	20	250	5,000	$250	$1,250,000

D.3 Transit Costs

Transit Costs shown in Tables D.24 through D.27 were based on the following assumptions.

Overall Assumptions

1. Used current year 2011 dollars. Used 2010 NTD data with three percent increase (based on CPI).

2. Operating costs were for 2040 cost/benefit analysis. Assume that all new services would be in place by then.

3. Cost estimates based on increase in vehicle revenue hours above the CLRP+ in model. Only estimated cost of improvements beyond CLRP+.

4. Assumed 260 days for priority and express services. Depending on route, used either 260 or 312 days for local bus services (weekdays and one additional day spread across the weekend hours).

5. Speeds assume to be 12 mph for a local bus, 18 mph for skip stop or express services, and 30 mph for the long distance commuter routes.

6. Peak hours per weekday assumed to be 7 hours. Span of service for existing routes based on current. For most new services, assumed 17 hours, 7 peak, and 10 off-peak.

Operating

1. Used a straight cost per hour (rather than a multiple variable cost model). Felt that this level of accuracy was sufficient given that we are developing 2040 cost estimates.

2. Used incremental (operating and maintenance) rather than fully allocated costs.

3. Used cost per vehicle revenue hour from NTD. Used revenue hours rather than vehicle hours since most of the services proposed are bidirectional – deadhead hours will not vary significantly among the services. FY 2011 incremental cost per revenue hour figures (based on 2010 NTD inflated to 2011) include:

   - WMATA = $142.00;
   - Fairfax Connector = $104.00;
   - PRTC = $133.00;
   - ART = $72.00; and
   - No increase in rail operating costs assumed.

Capital Costs

1. Vehicles – Converted to cost per revenue hour based on assumed speed and the following capital costs (and 500,000 revenue miles useful life).

2. ART – Forty-foot Transit Bus with natural gas – 12-year @ $515,000.

3. WMATA – Hybrid Electric Bus – 12-year – 40-foot LF hybrid @ $620,000.

4. PRTC – Standard 45-foot OTRBs Standard Commuter Coach – 12-year @ $535,000.

5. Spare Vehicle – Twenty percent spare ratio.

6. Metrorail interline connection – Not needed but would have used planning level costs from WMATA.

7. Metrorail – Assumed eight car trains but did not cost.

Farebox Revenue

1. Used the farebox recovery ratio (based on incremental cost recovery) that seemed appropriate for each operator and/or type of services – based on NTD data and differences in farebox recovery for local versus commuter services.

2. Commuter Service (PRTC and Fairfax Connector) – assume 50 percent.

3. Metrobus Express Services (WMATA) – 25 percent.

4. Local Services – 20 percent.

Table D.24 Summary of Annual 2040 Transit Costs

	Annual Costs				
	Operating Cost	Capital Costs	Total Costs	Revenue	Deficit
Packages 1 and 2	$23,003,632	$5,229,900	$28,233,531	$8,019,104	$20,214,428
Package 3	$26,069,592	$5,814,808	$31,884,400	$8,798,731	$23,085,669
Package 4	$45,569,219	$8,753,541	$54,322,760	$13,092,002	$41,230,758

Table D.25 Package 1 and 2 Transit Costs

Route	Change	Additional Peak Revenue Hours	Additional Off-Peak Revenue Hours	Additional Total Revenue Hours	Annual Operating Cost	Annual Capital Costs	Total Annual Costs	Assumed Farebox Recovery Rate	Estimated Farebox Revenue	Deficit
PRTC										
I-66 Priority Bus – Haymarket	Add a westbound route from D.C. to Haymarket; increase eastbound peak frequency; add off-peak service	14,560	26,520	41,080	$5,463,640	$1,582,402	$7,046,042	0.50	$2,731,820	$4,314,222
PRTC Total		**14,560**	**26,520**	**41,080**	**$5,463,640**	**$1,582,402**	**$7,046,042**		**$2,731,820**	**$4,314,222**
WMATA										
I-66 Priority Bus – Centreville	Increase frequencies on Centreville routes, improve runtime (outbound only), and add off-peak service	6,491	27,040	33,531	$4,761,449	$1,496,839	$6,258,288	0.50	$2,380,725	$3,877,563
U.S. 29 Priority Bus	Increase bidirectional frequencies	4,186	5,980	10,166	$1,443,572	$272,286	$1,715,858	0.25	$360,893	$1,354,965
U.S. 50 Priority Bus	Increase bidirectional frequencies	5,278	7,540	12,818	$1,820,156	$343,317	$2,163,473	0.25	$455,039	$1,708,434
Metrobus 1X	New route Vienna and Ballston via U.S. 50 and Wilson Blvd.	11,830	14,602	26,432	$3,753,287	$707,944	$4,461,231	0.25	$938,322	$3,522,909
Metrobus 2B, G, H	Restructured	1,881	6,406	8,287	$1,176,763	$147,974	$1,324,737	0.2	$235,353	$1,089,385
Metrobus 3A	Extend routing to NVCC and EFC and increase frequency	-1,608	5,382	3,774	$535,955	$67,394	$603,350	0.2	$107,191	$496,159
Metrobus 3B	Increase frequency (peak and off-peak)	2,700	3,510	6,210	$881,773	$110,880	$992,652	0.2	$176,355	$816,298
Metrobus 3E	Add westbound service and increase eastbound service frequency; add off-peak service	4,095	2,527	6,622	$940,352	$118,246	$1,058,598	0.2	$188,070	$870,528
Metrobus 4A	Reroute to end at Seven Corners	-182	-125	-307	-$43,566	-$5,478	-$49,044	0.2	-$8,713	-$40,331
Metrobus 28E	New route between Skyline Plaza and EFC	2,912	1,674	4,586	$651,269	$81,895	$733,164	0.2	$130,254	$602,910
Metrobus 38B	Increase frequency	2,396	0	2,396	$340,279	$42,789	$383,068	0.2	$68,056	$315,012
WMATA Total		**39,979**	**74,537**	**114,516**	**$16,261,291**	**$3,384,086**	**$19,645,377**		**$5,031,544**	**$14,613,833**

Table D.25 Package 1 and 2 Transit Costs (continued)

Route	Change	Additional Peak Revenue Hours	Additional Off-Peak Revenue Hours	Additional Total Revenue Hours	Annual Operating Cost	Annual Capital Costs	Total Annual Costs	Assumed Farebox Recovery Rate	Estimated Farebox Revenue	Deficit
ART										
ART #75	Extend routing to Shirlington and Virginia Square; add off-peak service	1,335	4,150	5,484	$394,867	$81,343	$476,210	0.2	$78,973	$397,236
ART #77	Extend to Rosslyn and increase frequency	2,245	749	2,993	$215,530	$44,399	$259,929	0.2	$43,106	$216,823
New ART1	Add route between Arlington Hall and Crystal City	2,730	0	2,730	$196,560	$40,491	$237,051	0.2	$39,312	$197,739
New ART2	Add route between Court House and Pentagon City	3,519	3,033	6,552	$471,744	$97,179	$568,923	0.2	$94,349	$474,574
ART Total		**9,828**	**7,932**	**17,760**	**$1,278,701**	**$263,412**	**$1,542,113**		**$255,740**	**$1,286,373**
LC – Cascades	Replace commuter service to D.C. from Cascades with service ending at Herndon-Monroe									
OmniRide Manassas Metro Direct	Run time improved from 130 minutes to 125 minutes									
Metrobus 5A	Run time improved from 60 minutes to 54 minutes (outbound only)									
Total Package		**64,367**	**108,989**	**173,356**	**$23,003,632**	**$5,229,900**	**$28,233,531**		**$8,019,104**	**$20,214,428**

Table D.26 Package 3 Transit Costs

Route	Change	Additional Peak Revenue Hours	Additional Off-Peak Revenue Hours	Additional Total Revenue Hours	Annual Operating Cost	Annual Capital Costs	Total Annual Costs	Assumed Farebox Recovery Rate	Estimated Farebox Revenue	Deficit
PRTC										
I-66 Priority Bus – Haymarket	Add a westbound route from D.C. to Haymarket; increase peak frequency; add off-peak service	14,560	26,520	41,080	$5,463,640	$1,582,402	$7,046,042	0.50	$2,731,820	$4,314,222
PRTC Total		**14,560**	**26,520**	**41,080**	**$5,463,640**	**$1,582,402**	**$7,046,042**	**0.5**	**$2,731,820**	**$4,314,222**
WMATA										
I-66 Priority Bus – Centreville	Increase frequencies on Centreville routes, improve runtime (outbound only), and add off-peak service	6,861	27,040	33,901	$4,813,999	$1,513,358	$6,327,357	0.5	$2,406,999	$3,920,358
U.S. 29 Priority Bus	Increase bidirectional frequencies	4,186	5,980	10,166	$1,443,572	$272,286	$1,715,858	0.25	$360,893	$1,354,965
U.S. 50 Priority Bus – via Ballston	Increase bidirectional frequencies	5,278	7,540	12,818	$1,820,156	$343,317	$2,163,473	0.25	$455,039	$1,708,434
U.S. 50 Priority Bus – Via 50	Add route from fair Lakes to D.C. core along U.S. 50	11,521	0	11,521	$1,635,925	$308,568	$1,944,493	0.25	$408,981	$1,535,512
U.S. 50 Priority Bus – Tysons	Add route from Tysons Corner along U.S. 50 and Wilson Boulevard	9,701	0	9,701	$1,377,485	$259,821	$1,637,306	0.25	$344,371	$1,292,935
Metrobus 1X	New route Vienna and Ballston via U.S. 50 and Wilson Boulevard	11,830	14,602	26,432	$3,753,287	$707,944	$4,461,231	0.25	$938,322	$3,522,909
Metrobus 2B, G, H	Restructured	1,881	6,406	8,287	$1,176,763	$147,974	$1,324,737	0.2	$235,353	$1,089,385
Metrobus 3A	Extend routing to NVCC and EFC and increase frequency	-1,608	5,382	3,774	$535,955	$67,394	$603,350	0.2	$107,191	$496,159
Metrobus 3B	Increase frequency (peak and off-peak)	2,700	3,510	6,210	$881,773	$110,880	$992,652	0.2	$176,355	$816,298
Metrobus 3E	Add westbound service and increase eastbound service frequency; add off-peak service	4,095	2,527	6,622	$940,352	$118,246	$1,058,598	0.2	$188,070	$870,528
Metrobus 4A	Reroute to end at Seven Corners	-182	-125	-307	-$43,566	-$5,478	-$49,044	0.2	-$8,713	-$40,331

Table D.26 Package 3 Transit Costs (continued)

Route	Change	Additional Peak Revenue Hours	Additional Off-Peak Revenue Hours	Additional Total Revenue Hours	Annual Operating Cost	Annual Capital Costs	Total Annual Costs	Assumed Farebox Recovery Rate	Estimated Farebox Revenue	Deficit
WMATA (continued)										
Metrobus 28E	New route between Skyline Plaza and EFC	2,912	1,674	4,586	$651,269	$81,895	$733,164	0.2	$130,254	$602,910
Metrobus 38B	Increase frequency	2,396	0	2,396	$340,279	$42,789	$383,068	0.2	$68,056	$315,012
WMATA Total		**61,571**	**74,537**	**136,107**	**$19,327,251**	**$3,968,994**	**$23,296,245**		**$5,811,171**	**$17,485,074**
ART										
ART #75	Extend routing to Shirlington and Virginia Square; add off-peak service	1,335	4,150	5,484	$394,867	$81,343	$476,210	0.2	$78,973	$397,236
ART #77	Extend to Rosslyn and increase frequency	2,245	749	2,993	$215,530	$44,399	$259,929	0.2	$43,106	$216,823
New ART1	Add route between Arlington Hall and Crystal City	2,730	0	2,730	$196,560	$40,491	$237,051	0.2	$39,312	$197,739
New ART2	Add route between Court House and Pentagon City	3,519	3,033	6,552	$471,744	$97,179	$568,923	0.2	$94,349	$474,574
ART Total		**9,828**	**7,932**	**17760**	**$1,278,701**	**$263,412**	**$1,542,113**		**$255,740**	**$1,286,373**
LC – Cascades	Replace commuter service to D.C. from Cascades with service ending at Herndon-Monroe									
OmniRide Manassas Metro Direct	Run time improved from 130 minutes to 125 minutes									
Metrobus 5A	Run time improved from 60 minutes to 54 minutes (outbound only)									
Total Package		**85,959**	**108,989**	**194,947**	**$26,069,592**	**$5,814,808**	**$31,884,400**		**$8,798,731**	**$23,085,669**

Table D.27 Package 4 Transit Costs

Route	Change	Additional Peak Revenue Hours	Additional Off-Peak Revenue Hours	Additional Total Revenue Hours	Annual Operating Cost	Annual Capital Costs	Total Annual Costs	Assumed Farebox Recovery Rate	Estimated Farebox Revenue	Deficit
PRTC										
I-66 Priority Bus – Haymarket	Add a westbound route from D.C. to Haymarket; increase peak frequency; add off-peak service	14,560	26,520	41,080	$5,463,640	$1,582,402	$7,046,042	0.5	$2,731,820	$4,314,222
PRTC Total		**14,560**	**26,520**	**41,080**	**$5,463,640**	**$1,582,402**	**$7,046,041**	**0.5**	**$2,731,820**	**$4,314,221**
WMATA										
I-66 Priority Bus – Centreville	Increase frequencies on Centreville routes, improve runtime (outbound only), and add off-peak service	7,407	27,040	34,447	$4,891,531	$1,537,732	$6,429,262	0.5	$2,445,765	$3,983,497
I-66 Priority Bus – Stringfellow Road	Add route from Stringfellow Road to D.C. Core	9,246	0	9,246	$1,312,875	$412,724	$1,725,598	0.5	$656,437	$1,069,161
U.S. 29 Priority Bus	Increase bidirectional frequencies	4,186	5,980	10,166	$1,443,572	$272,286	$1,715,858	0.25	$360,893	$1,354,965
U.S. 50 Priority Bus – via Ballston	Increase bidirectional frequencies	3,822	7,540	11,362	$1,613,404	$304,320	$1,917,723	0.25	$403,351	$1,514,372
U.S. 50 Priority Bus – Via 50	Add route from fair Lakes to D.C. core along U.S. 50	10,993	0	10,993	$1,560,978	$294,431	$1,855,408	0.25	$390,244	$1,465,164
U.S. 50 Priority Bus – Tysons	Add route from Tysons Corner along U.S. 50 and Wilson Blvd.	9,246	0	9,246	$1,312,875	$247,634	$1,560,509	0.25	$328,218	$1,232,290
Metrobus 1B	Increase peak-period frequency, improve inbound runtime	5,642	0	5,642	$801,164	$151,115	$952,279	0.2	$160,232	$792,046
Metrobus 1C	Increase peak and off-peak frequencies	2,305	2,132	4,437	$630,101	$118,850	$748,950	0.2	$126,020	$622,930
Metrobus 1E	Improve runtime	-121	0	-121	-$17,229	-$3,250	-$20,479	0.2	-$3,445	-$17,033
Metrobus 1X	New route Vienna and Ballston via U.S. 50 and Wilson Blvd.	10,920	14,602	25,522	$3,624,067	$683,571	$4,307,637	0.25	$906,016	$3,401,620
Metrobus 2B, G, H	Restructured	1,881	6,406	8,287	$1,176,763	$147,974	$1,324,737	0.2	$235,352.	$1,089,384
Metrobus 2C	Increase peak and off-peak frequencies	5,763	4,576	10,339	$1,468,185	$184,619	$1,652,804	0.2	$293,637	$1,359,167
Metrobus 3A	Extend routing to NVCC and EFC and increase frequency	1,056	5,382	6,438	$914,139	$114,950	$1,029,088	0.2	$182,827	$846,261

Table D.27 Package 4 Transit Costs (continued)

Route	Change	Additional Peak Revenue Hours	Additional Off-Peak Revenue Hours	Additional Total Revenue Hours	Annual Operating Cost	Annual Capital Costs	Total Annual Costs	Assumed Farebox Recovery Rate	Estimated Farebox Revenue	Deficit
WMATA (continued)										
Metrobus 3B	Increase frequency (peak and off-peak)	2,700	3,510	6,210	$881,773	$110,880	$992,652	0.2	$176,354	$816,297
Metrobus 3E	Add westbound service and increase eastbound service frequency; add off-peak service	4,095	2,527	6,622	$940,352	$118,246	$1,058,598	0.2	$188,070	$870,527
Metrobus 3T	Increase off-peak-period frequency	0	3,744	3,744	$531,648	$66,853	$598,500	0.2	$106,329	$492,171
Metrobus 3Y	Increase peak-period frequency	4,853	0	4,853	$689,173	$86,661	$775,834	0.2	$137,834	$637,999
Metrobus 4A	Reroute to end at Seven Corners; increase frequency	1,031	1,747	2,779	$394,552	$49,613	$444,165	0.2	$78,910	$365,254
Metrobus 4B	Increase peak and off-peak frequencies	1,820	2,434	4,254	$604,011	$75,952	$679,963	0.2	$120,802	$559,161
Metrobus 4E	Increase peak-period frequency, improve runtime	1,031	0	1,031	$146,449	$18,415	$164,864	0.2	$29,289	$135,574
Metrobus 4H	Improve runtime	-243	0	-243	-$34,459	-$4,333	-$38,791	0.2	-$6,891	-$31,899
Metrobus 10B	Increase peak-period frequency	7,280	0	7,280	$1,033,760	$129,992	$1,163,751	0.2	$206,752	$956,999
Metrobus 15L	Increase peak-period frequency	2,245	0	2,245	$318,743	$40,081	$358,823	0.2	$63,748	$295,074
Metrobus 22A	Increase peak-period frequency	1,850	0	1,850	$262,747	$33,040	$295,786	0.2	$52,549	$243,237
Metrobus 23A	Increase peak-period frequency	10,677	0	10,677	$1,516,181	$190,654	$1,706,835	0.2	$303,236	$1,403,599
Metrobus 23C	Increase peak-period frequency	15,925	0	15,925	$2,261,350	$284,357	$2,545,706	0.2	$452,270	$2,093,436
Metrobus 24T	Increase peak-period frequency	1,759	0	1,759	$249,825	$31,415	$281,239	0.2	$49,965	$231,274
Metrobus 25A	Increase peak and off-peak frequencies	6,127	4,077	10,204	$1,448,987	$182,205	$1,631,191	0.2	$289,797	$1,341,394
Metrobus 25B	Increase Northbound off-peak frequency and peak frequencies in both directions	7,098	2,855	9,953	$1,413,298	$177,717	$1,591,014	0.2	$282,659	$1,308,355
Metrobus 28A	Increase peak-period frequency, improve runtime	8,675	0	8,675	$1,231,897	$154,907	$1,386,804	0.2	$246,379	$1,140,424
Metrobus 28E	New route between Skyline Plaza & EFC	5,824	3,349	9,173	$1,302,538	$163,790	$1,466,327	0.2	$260,507	$1,205,819
Metrobus 28T	Increase eastbound peak-period frequency	1,031	0	1,031	$146,449	$18,415	$164,864	0.2	$29,289	$135,574

Table D.27 Package 4 Transit Costs (continued)

Route	Change	Additional Peak Revenue Hours	Additional Off-Peak Revenue Hours	Additional Total Revenue Hours	Annual Operating Cost	Annual Capital Costs	Total Annual Costs	Assumed Farebox Recovery Rate	Estimated Farebox Revenue	Deficit
WMATA (continued)										
Metrobus 28X	Increase peak-period frequency	2,487	0	2,487	$353,201	$44,414	$397,615	0.2	$70,640	$326,974
Metrobus 38B	Increase frequency	2,396	0	2,396	$340,279	$42,789	$383,068	0.2	$68,055	$315,012
WMATA Total		**161,009**	**97,900**	**258,910**	**$36,765,182**	**$6,483,018**	**$43,248,199**		**$9,692,103**	**$33,556,096**
ART										
ART 42	Increase the WB peak-period frequency	758	0	758	$54,600	$11,248	$65,847	0.2	$10,920	$54,927
ART 45	Increase peak-period frequency, improve runtime	3,094	0	3,094	$222,768	$45,890	$268,658	0.2	$44,553	$224,104
ART 52	Increase peak and off-peak frequencies	3,033	1486	4,520	$325,416	$67,036	$392,451	0.2	$65,083	$327,368
ART 53	Increase peak and off-peak frequencies	3,397	1699	5,096	$366,912	$75,584	$442,495	0.2	$73,382	$369,113
ART 62	Increase peak-period frequency	2,791	0	2,791	$200,928	$41,391	$242,319	0.2	$40,185	$202,133
ART #75	Extend routing to Shirlington and Virginia Square; add off-peak service	5,824	4,150	9,974	$718,099	$147,928	$866,027	0.2	$143,619	$722,407
ART #77	Extend to Rosslyn and increase frequency	4,004	749	4,753	$342,202	$70,494	$412,695	0.2	$68,440	$344,254
New ART1	Add route between Arlington Hall and Crystal City	5,333	0	5,333	$383,947	$79,093	$463,040	0.2	$76,789	$386,250
New ART2	Add route between Court House and Pentagon City	7,043	3,033	10,077	$725,525	$149,458	$874,982	0.2	$145,104	$729,877
ART Total		**35,278**	**11,117**	**46,394**	**$3,340,397**	**$688,122**	**$4,028,518**		**$668,079**	**$3,360,439**
LC – Cascades	Replace commuter service to D.C. from Cascades with service ending at Herndon-Monroe									
Total Package		**210,847**	**135,537**	**346,384**	**$45,569,219**	**$8,753,541**	**$54,322,760**		**$13,092,002**	**$41,230,757**

D.4 Bicycle and Pedestrian Improvement Costs

Tables D.28 through D.29 below provide cost summary and cost detail information about the bicycle and pedestrian improvements considered in this study.

Table D.28 Estimated Bicycle and Pedestrian Improvement Costs

Map ID	Project Name	Revised Description	Project Type	Plan/ Source	LOS 2040 Without Improvements	LOS 2040 With Improvements	Estimated Cost
1	Mount Vernon Trail Widening	Widen the Mount Vernon shared-use trail between the Roosevelt Island Bridge over the George Washington Memorial Parkway and the Four Mile Run Trail	Trail	Arlington MTP	D	C	$2,931,500
2	Roosevelt Bridge to Mount Vernon Trail	Construct a trail to link the sidewalk along the south side of the Roosevelt Bridge directly to the Mount Vernon Trail	Trail	Arlington MTP	N/A	A	$400,000
3	Route 110 South Trail Paving	Pave an existing informal trail that provides access to the Pentagon from Memorial Drive and Memorial Bridge	Trail	Arlington MTP	N/A	B	$347,700
4	Route 110 North Trail Renovation	Upgrade existing trail around Arlington Cemetery between Marshall Drive and Memorial Drive to reduce user conflicts and improve safety	Trail	Arlington MTP	C	B	$258,400
5	Washington Boulevard Trail	Construct sidepath from 110 to Columbia Pike	Trail	Arlington County	N/A	B	$321,300
6	Route 27 (Washington Blvd.) Bridge over South 110	Include bicycle and pedestrian facilities in bridge replacement project	Bridge	Arlington County			$109,000
7	Metrorail Station Bike Parking Enhancement – Rosslyn	Enhance bicycle parking at the Rosslyn Metrorail Station	Bike Parking	Arlington MTP			$9,800
8.1	Capital Bikeshare (East)	Capital bikeshare locations in eastern portion of Rosslyn-Ballston Corridor	Bikeshare	Commuter Connections Program			$513,000
8.2	Capital Bikeshare (West)	Capital bikeshare locations in western portion of Rosslyn-Ballston Corridor	Bikeshare	Commuter Connections Program			$741,000
9.1	Commercial Area Bicycle Parking (East)	Bicycle parking locations in eastern portion of Rosslyn-Ballston Corridor	Bike Parking	Arlington MTP			$4,000
9.2	Commercial Area Bicycle Parking (West)	Bicycle parking locations in western portion of Rosslyn-Ballston Corridor	Bike Parking	Arlington MTP			$4,500

Table D.28 Estimated Bicycle and Pedestrian Improvement Costs (continued)

Map ID	Project Name	Revised Description	Project Type	Plan/ Source	LOS 2040 Without Improvements	LOS 2040 With Improvements	Estimated Cost
10	Rosslyn Circle Area Improvements – Tunnel	Make area improvements consistent with the recommendations in the Rosslyn Circle Study, including the construction of a tunnel under Lynn Street near the intersection of Lee Highway	Intersection improvement	Arlington MTP			$4,200,000
11	Rosslyn Circle Area Improvements – Street Level	Make improvements recommended in the Rosslyn Circle Study, including widening the trail between Oak Street and Fort Myer Drive, and improvements at Fort Myer and N. Lynn Street	Intersection improvement	Arlington MTP			$3,336,200
12	Meade Street Bridge	Incorporate bicycle and pedestrian improvements in bridge replacement project	Bridge	Arlington County			$2,880,600
13	Custis (I-66) Trail Renovation	Renovate trail sections with asphalt cracking and washout, and, where feasible, widen the Custis Trail to 12 feet	Trail	Arlington MTP	D	B	$2,295,000
14	Arlington Boulevard Trail (Taft to Ft. Myer)	Improve trail along Arlington Boulevard from Taft Street to Fort Myer Drive	Trail	Arlington County	D	C	$377,500
15	Arlington Boulevard Trail (10th to Taft)	Improve trail along Arlington Boulevard from 10th Street to Taft	Trail	Arlington County	D	C	$112,400
16	Arlington Boulevard Trail (Pershing to Queen)	Improve trail along east side of Arlington Boulevard from Pershing to Queen Street	Trail	Arlington County	D	C	$426,200
17	Arlington Boulevard Trail North Side Trail Extension	Construct Sidepath on west side of Arlington Boulevard from Washington Boulevard to North Fairfax Drive	Trail	Arlington County	N/A	C	$428,200
18	South Washington Boulevard Trail	Construct sidepath on west side of S. Washington Boulevard from Arlington Boulevard to Columbia Pike	Trail	Arlington County	N/A	B	$464,500
19	Metrorail Station Bike Parking Enhancement – Court House	Enhance bicycle parking at the Court House Metrorail Station	Bike Parking	Arlington MTP			$127,200

Table D.28 Estimated Bicycle and Pedestrian Improvement Costs (continued)

Map ID	Project Name	Revised Description	Project Type	Plan/ Source	LOS 2040 Without Improvements	LOS 2040 With Improvements	Estimated Cost
20	Mount Vernon Trail Extension from N. Randolph Street to the Arlington County Line	Construct a short segment of trail between N. Randolph Street and the Fairfax line, following an existing sanitary sewer easement near Pimmit Run. Extend the Mount Vernon Trail from its current terminus at Theodore Roosevelt Island using existing trails, bike lanes, and proposed bike lanes in Arlington	Trail	Arlington MTP	N/A	C	$68,400
21	Lyon Village-Custis Trail Upgrade	Upgrade switchback behind Lyon Village shopping center to improve bicyclist safety	Trail	Arlington County			$8,900
22	Metrorail Station Bike Parking Enhancement – Clarendon	Enhance bicycle parking at the Clarendon Metrorail Station	Bike Parking	Arlington MTP			$394,800
23	Clarendon Connector	Create an on- and off-street connector of the Fairfax Drive bike lanes to the Wilson and Clarendon Boulevard bike lanes via Clarendon Circle	Intersection improvement	Arlington MTP			$268,300
24	Arlington Boulevard and Irving Street Intersection	Improve bicycle and pedestrian safety and accommodation	Intersection improvement	Arlington County			$198,400
25	Metrorail Station Bike Parking Enhancement – GMU	Enhance bicycle parking at the GMU Metrorail Station	Bike Parking	Arlington MTP			$100,400
26	Metrorail Station Bike Parking Enhancement – Ballston	Enhance bicycle parking at the Ballston Metrorail Station	Bike Parking	Arlington MTP			$282,300
27	Fairfax Drive Trail Connectors	Reconstruct Fairfax Drive west of N. Glebe Road to improve access to the Bluemont Junction and Custis trails, through wider side-walk/trails, and improved ramps and signage	Trail	Arlington MTP	B	B	$76,300
28	Arlington Boulevard/ Glebe Road Interchange	Incorporate bicycle and pedestrian improve-ments in Arlington Boulevard/Glebe Road interchange enhancements	Intersection improvement	Arlington County			$1,628,200
29	Arlington Boulevard trail rehab	from Glebe Road to Park Drive. Northern Va. regional bikeway and trail network study	Trail	NOVA Regional Bikeway and Trail Network Study	D	C	$494,500

Table D.28 Estimated Bicycle and Pedestrian Improvement Costs (continued)

Map ID	Project Name	Revised Description	Project Type	Plan/ Source	LOS 2040 Without Improvements	LOS 2040 With Improvements	Estimated Cost
30	Arlington and Park	Improve bicycle and pedestrian safety and accommodation	Intersection improvement	NOVA Regional Bikeway and Trail Network Study			$233,600
31	Harrison Street Bike Boulevard	Construct bike boulevard from Wilson Boulevard to Williamsburg Boulevard	On-Road Facility	Arlington County	B	N/A	$2,225,500
32	Arlington Boulevard and Manchester intersection improvement	Improve bicycle and pedestrian safety and accommodation	Intersection improvement	NOVA Regional Bikeway and Trail Network Study			$221,500
33	Bluemont Park to Upton Hill Park Trail	Construct a 10-footwide, paved trail adjacent to Wilson Boulevard from the W&OD and Four Mile Run trails in Bluemont Park into Upton Hill Regional Park	Trail	Arlington MTP	N/A	A	$273,200
34	Arlington Boulevard Trail	Construct a 10-footwide sidepath from City of Fairfax to existing Arlington Boulevard trail in Arlington (may include some use of existing frontage roads)	Trail	NOVA Regional Bikeway and Trail Network Study	D	C	$4,304,600
35	Four Mile Run Trail Widening (North)	Widen Four Mile Run Trail to 12 feet and straighten in the East Falls Church Park. The trail widening would reduce trail-user conflicts and reduce pavement damage caused by utility and maintenance vehicles	Trail	Arlington MTP	D	B	$222,200
36	W&OD Realignment at East Falls Church Park	Realign the W&OD Trail to improve safety and comfort	Intersection improvement	City of Falls Church	N/A	C	$109,400
37	Roosevelt Boulevard On-Road Bike Faciltiy	Install on-road bicycle facility from Wilson Boulevard To N Roosevelt Street	On-Road Facility	City of Falls Church	C	C	$6,400
38	Hillwood Avenue/ Lee Hwy Bike Lanes	Install bike lanes from S Maple Avenue to E Broad Street	On-Road Facility	Fairfax County	B	A	$570,200
39	W&OD Realignment at East Falls Church	Realign W&OD from Brandymore Castle to Van Buren (east of Sycamore underpass)	Trail	Arlington MTP			$109,400
40	East Falls Church Metrorail Station Bikeshare	Install bikeshare station at East Falls Church Metro	Bikeshare	City of Falls Church			$57,000

Table D.28 Estimated Bicycle and Pedestrian Improvement Costs (continued)

Map ID	Project Name	Revised Description	Project Type	Plan/ Source	LOS 2040 Without Improvements	LOS 2040 With Improvements	Estimated Cost
41	Metrorail Station Bike Parking Enhancement – East Falls Church	Enhance bicycle parking at the East Falls Church Metrorail Station	Bike Parking	WMATA CIP			$574,800
42	W&OD Trail Crossing at Lee Highway	Improve at-grade crossings, examining alternatives, including under/overpasses, signal timing, etc.	Intersection improvement	Arlington MTP			$226,800
43	S. Washington Street Bike Lanes	Construct on-road bike facility on S. Washington and S/N Maple Avenue from Poplar Drive to Jefferson Street	On-Road Facility	City of Falls Church/Arlington County	C	B	$704,400
44	Falls Church Area Bike Share Stations	Install bikeshare stations at various locations in downtown Falls Church	Bikeshare	City of Falls Church			$228,000
45	W&OD Realignment at West Street	Improve trail/road intersection safety on W&OD at N. West Street	Intersection improvement	City of Falls Church			$179,500
46	Westmoreland Street Bike Lanes	Install bike lanes from Old Chesterbrook Road to 32nd Street	On-Road Facility	Tysons Corner Bicycle Master Plan	C	A	$978,100
47	Great Falls Street Bike Lanes	Install bike lanes from Davis Ct to N West Street	On-Road Facility	Tysons Corner Bicycle Master Plan	C	A	$1,035,300
48	West Street Bike Lanes	Construct bike lanes from Falls Church (Great Falls Street) to Arlington County Line	Bike Lanes	Fairfax Count Bike Plan/Tysons Corner Bike Plan	C	A	$105,600
49	N. Oak Street On-Road Bicycle Facility	Install on-road bike facility from Lee Highway to N West Street	On-Road Facility	City of Falls Church	C	C	$18,400
50	West Street On-Road Bicycle Facility	Install on-road bike facility from Abbot Lane to Great Falls Street	On-Road Facility	City of Falls Church	A	A	$493,900
51	West Falls Church Connector	Construct a trail to connect the Pimmit Run neighborhood to West Falls Church Metrorail Station	Trail	WMATA/Fairfax County	N/A	A	$253,100
52	VA Route 7 Falls Church to Tysons Connector	Install bike lanes from the W&OD Trail to Tysons Corner	On-Road Facility	Tysons Corner Bicycle Master Plan	D	B	$1,043,300
53	Fairwood Lane Shared Roadway	Develop Shared Roadway from Shreive Road to West Street	Shared Roadway	Fairfax County Bike Plan/Tysons Corner Bike Plan	C	C	$11,200

Table D.28 Estimated Bicycle and Pedestrian Improvement Costs (continued)

Map ID	Project Name	Revised Description	Project Type	Plan/ Source	LOS 2040 Without Improvements	LOS 2040 With Improvements	Estimated Cost
54	West Street Shared Roadway	Develop Shared Roadway from Falls Church to U.S. 29	Shared Roadway	Fairfax County Bike Plan/Tysons Corner Bike Plan	A	A	$12,100
55	George C. Marshall Drive/ Los Pueblos Lane Bike Lanes	Install bike lanes from Pimmit Dr to VA Route 7	On-Road Facility	Tysons Corner Bicycle Master Plan	C	B	$283,500
56	I-495 Pedestrian/Bicycle Bridge – Connector Trail	Build bike/ped crossing of Beltway from George C. Marshall Drive to Tysons Executive Court	Trail	Tysons Corner Bicycle Master Plan	N/A	B	$1,113,100
57	Hurst Street/Virginia Lane	Construct on-road connector from Idlwood Road to W&OD Trail	On-Road Facility	Tysons Corner Bicycle Master Plan	A	A	$137,200
58	Sandburg Street Connection	Develop a connection along Sandburg Street from Cottage Street to Kidwell Drive. Comprised of Shared Roadway with Trail Connections as needed	Shared Roadway/ Short Trail	Fairfax County Bike Plan/Tysons Corner Bike Plan	A	A	$29,700
59	Gallows Road Bike Lanes	Construct bike lanes to connect from Tysons Corner to Merrifield	Bicycle Lanes	Tysons Corner Bicycle Master Plan	D	B	$1,395,200
60	Cottage Street Bike Lanes	Install bike lanes from Sandburg Street to Cedar Lane	Bicycle Lanes	Fairfax County Bike Plan/Tysons Corner Bike Plan	A	A	$537,100
					Total		**$41,501,800**

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
1	Mount Vernon Trail Widening					
	Shared Use Path	LF	26,894	$109	$2,931,446	
	Total Estimated Cost				**$2,931,500**	
2	Roosevelt Bridge to Mount Vernon Trail					
	Pedestrian Bridge	EA	2	$200,000	$400,000	Assume switchback trail structure with two ramps to reach Roosevelt Bridge from Mount Vernon Trail level
	Total Estimated Cost				**$400,000**	
3	Route 110 South Trail Paving					
	Shared Use Path	LF	3,189	$109	$347,601	
	Total Estimated Cost				**$347,700**	
4	Route 110 North Trail Renovation					
	Shared Use Path	LF	2,370	$109	$258,330	
	Total Estimated Cost				**$258,400**	
5	Washington Boulevard Trail					
	Shared Use Path	LF	2,947	$109	$321,223	
	Total Estimated Cost				**$321,300**	
6	Route 27 (Washington Boulevard) Bridge over South 110					
	Shared Use Path	LF	1,000	$109	$109,000	
	Total Estimated Cost				**$109,000**	
7	Metrorail Station Bike Parking Enhancement – Rosslyn					
	Station Bike Parking Facilities	LS	1	$9,780	$9,780	Assumes parking equipment, concrete pads, shelters or covers, security features, and landscaping
	Total Estimated Cost				**$9,800**	
8.1	Capital Bikeshare (East)					
	Bike Station	EA	9	$57,000	$513,000	
	Total Estimated Cost				**$513,000**	

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs (continued)

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
8.2	Capital Bikeshare (West)					
	Bike Station	EA	13	$57,000	$741,000	
	Total Estimated Cost				**$741,000**	
9.1	Commercial Area Bicycle Parking (East)					
	Bike Rack	EA	7	$560	$3,920	
	Total Estimated Cost				**$4,000**	
9.2	Commercial Area Bicycle Parking (West)					
	Bike Rack	EA	8	$560	$4,480	
	Total Estimated Cost				**$4,500**	
10	Rosslyn Circle Area Improvements – Tunnel					
	Pedestrian Tunnel	LF	300	$14,000	$4,200,000	
	Total Estimated Cost				**$4,200,000**	
11	Rosslyn Circle Area Improvements – Street Level					
	Pedestrian and Bicycle Improvements	LS	1	$3,336,147	$3,336,147	Cost from TDG Lynn Street Project Estimate, February 2012 (50% Design)
	Total Estimated Cost				**$3,336,200**	
12	Meade Street Bridge					
	Pedestrian and Bicycle Improvements	LS	1	$2,880,591	$2,880,591	Cost from TDG Meade Street Project Estimate, February 2012
	Total Estimated Cost				**$2,880,600**	
13	Custis (I-66) Trail Renovation					
	Shared Use Path	LF	21,055	$109	$2,294,995	
	Total Estimated Cost				**$2,295,000**	
14	Arlington Boulevard Trail (Taft to Ft. Myer)					
	Shared Use Path	LF	3,463	$109	$377,467	
	Total Estimated Cost				**$377,500**	

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs (continued)

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
15	Arlington Boulevard Trail (10th to Taft)					
	Shared Use Path	LF	1,031	$109	$112,379	
	Total Estimated Cost				**$112,400**	
16	Arlington Boulevard Trail (Pershing to Queen)					
	Shared Use Path	LF	3,910	$109	$426,190	
	Total Estimated Cost				**$426,200**	
17	Arlington Boulevard Trail North Side Trail Extension					
	Shared Use Path	LF	3,928	$109	$428,152	
	Total Estimated Cost				**$428,200**	
18	South Washington Boulevard Trail					
	Shared Use Path	LF	4,261	$109	$464,449	
	Total Estimated Cost				**$464,500**	
19	Metrorail Station Bike Parking Enhancement – Court House					
	Station Bike Parking Facilities	LS	1	$127,185	$127,185	Assumes parking equipment, concrete pads, shelters or covers, security features, and landscaping
	Total Estimated Cost				**$127,200**	
20	Mount Vernon Trail Extension from N. Randolph Street to the Arlington County Line					
	Shared Use Path	LF	627	$109	$68,343	
	Total Estimated Cost				**$68,400**	
21	Lyon Village-Custis Trail Upgrade					
	Shared Use Path	LF	50	$109	$5,450	
	Steep Grade Multiplier (Plus Additional 0.8 X Base Cost)	LF	50	$67.20	$3,360	
	Total Estimated Cost				**$8,900**	

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs (continued)

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
22	Metrorail Station Bike Parking Enhancement – Clarendon					
	Station Bike Parking Facilities	LS	1	$394,720	$394,720	Assumes parking equipment, concrete pads, shelters or covers, security features, and landscaping
	Total Estimated Cost				**$394,800**	
23	Clarendon Connector					
	Intersection Calculation	LS	1	$268,300	$268,300	
	Total Estimated Cost				**$268,300**	
24	Arlington Boulevard and Irving Street					
	Intersection Calculation	LS	1	$198,400	$198,400	
	Total Estimated Cost				**$198,400**	
25	Metrorail Station Bike Parking Enhancement – GMU					
	Station Bike Parking Facilities	LS	1	$100,360	$100,360	Assumes parking equipment, concrete pads, shelters or covers, security features, and landscaping
	Total Estimated Cost				**$100,400**	
26	Metrorail Station Bike Parking Enhancement – Ballston					
	Station Bike Parking Facilities	LS	1	$282,275	$282,275	Assumes parking equipment, concrete pads, shelters or covers, security features, and landscaping
	Total Estimated Cost				**$282,300**	
27	Fairfax Drive Trail Connectors					
	Shared Use Path	LF	700	$109	$76,300	
	Total Estimated Cost				**$76,300**	
28	Arlington Boulevard / Glebe Road Interchange					
	Shared Use Path	LF	75	$109	$8,175	
	Bridge Widening	SF	2,700	$600	$1,620,000	Assume 17-foot path and 11-foot sidewalk (see project improvements plan)
	Total Estimated Cost				**$1,628,200**	

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs (continued)

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
29	Arlington Blvd. Trail Rehab					
	Shared Use Path	LF	4,536	$109	$494,424	
	Total Estimated Cost				**$494,500**	
30	Arlington Blvd. and Park St.					
	Intersection Calculation	LS	1	$233,600	$233,600	
	Total Estimated Cost				**$233,600**	
31	Harrison Street Bike Boulevard					
	Bike Boulevard	LF	12,864	$173	$2,225,472	
	Total Estimated Cost				**$2,225,500**	
32	Arlington Boulevard and Manchester Street Intersection					
	Intersection Calculation	LS	1	$221,500	$221,500	
	Total Estimated Cost				**$221,500**	
33	Bluemont Park to Upton Hill Park Trail					
	Shared Use Path	LF	2,506	$109	$273,154	
	Total Estimated Cost				**$273,200**	
34	Arlington Boulevard Trail					
	Shared Use Path	LF	39,491	$109	$4,304,519	
	Total Estimated Cost				**$4,304,600**	
35	Four Mile Run Trail Widening (North)					
	Shared Use Path	LF	2,038	$109	$222,142	
	Total Estimated Cost				**$222,200**	
36	W&OD Realignment at East Falls Church Park					
	Shared Use Path	LF	1,003	$109	$109,327	
	Total Estimated Cost				**$109,400**	
37	Roosevelt Boulevard Sharrows					
	Shared Lane Markings	LF	2,129	$3	$6,387	
	Total Estimated Cost				**$6,400**	
38	Hillwood Avenue/ Lee Hwy Bike Lanes					
	Bike Lanes	LF	6,953	$82	$570,146	
	Total Estimated Cost				**$570,200**	

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs (continued)

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
39	W&OD Realignment at East Falls Church					
	Shared Use Path	LF	1,003	$109	$109,327	
	Total Estimated Cost				**$109,400**	
40	Falls Church Bike Share					
	Bike Station	EA	1	$57,000	$57,000	
	Total Estimated Cost				**$57,000**	
41	Metrorail Station Bike Parking Enhancement – East Falls Church					
	Station Bike Parking Facilities	LS	1	$574,740	$574,740	Assumes parking equipment, concrete pads, shelters or covers, security features, and landscaping
	Total Estimated Cost				**$574,800**	
42	W&OD Trail Crossing at Lee Highway					
	Intersection Calculation	LS	1	$226,800	$226,800	
	Total Estimated Cost				**$226,800**	
43	S Washington Street Bike Lanes					
	Bike Lanes	LF	8,590	$82	$704,380	
	Total Estimated Cost				**$704,400**	
44	Falls Church Bike Share					
	Bike Station	EA	4	$57,000	$228,000	
	Total Estimated Cost				**$228,000**	
45	W&OD Realignment at West Street					
	Shared Use Path	LF	100	$109	$10,900	
	Intersection Calculation	LS	1	$168,600	$168,600	
	Total Estimated Cost				**$179,500**	
46	Westmoreland Street Bike Lanes					
	Bike Lanes	LF	11,927	$82	$978,014	
	Total Estimated Cost				**$978,100**	
47	Great Falls Street Bike Lanes					
	Bike Lanes	LF	12,625	$82	$1,035,250	
	Total Estimated Cost				**$1,035,300**	

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs (continued)

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
48	West Street Bike Lanes					
	Bike Lanes	LF	1,287	$82	$105,534	
	Total Estimated Cost				**$105,600**	
49	N Oak Street Sharrows					
	Shared Lane Markings	LF	6,103	$3	$18,309	
	Total Estimated Cost				**$18,400**	
50	West Street Bike Lanes					
	Bike Lanes	LF	6,023	$82	$493,886	
	Total Estimated Cost				**$493,900**	
51	West Falls Church Connector					
	Shared Use Path	LF	2,322	$109	$253,098	
	Total Estimated Cost				**$253,100**	
52	Route 7 Falls Church to Tysons Connector					
	Bike Lanes	LF	12,723	$82	$1,043,286	
	Total Estimated Cost				**$1,043,300**	
53	Fairwood Lane Shared Roadway					
	Shared Lane Markings	LF	3,719	$3	$11,157	
	Total Estimated Cost				**$11,200**	
54	West Street Shared Roadway					
	Shared Lane Markings	LF	4,011	$3	$12,033	
	Total Estimated Cost				**$12,100**	
55	George C Marshall Drive/ Los Pueblos Lane Bike Lanes					
	Bike Lanes	LF	3,457	$82	$283,474	
	Total Estimated Cost				**$283,500**	
56	I-495 Ped/Bike Bridge – Connector Trail					
	Shared Use Path	LF	1,900	$109	$207,100	
	Path Bridge (14' wide)	LF	600	$1,510	$906,000	
	Total Estimated Cost				**$1,113,100**	

Table D.29 Estimated Bicycle Pedestrian Project Unit Costs (continued)

Map ID	Project Description	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
57	Hurst Street/Virginia Lane					
	Bike Lanes	LF	1,673	$82	$137,186	
	Total Estimated Cost				**$137,200**	
58	Sandburg Street Connection					
	Shared Lane Markings	LF	9,870	$3	$29,610	
	Total Estimated Cost				**$29,700**	
59	Gallows Road Bike Lanes					
	Bike Lanes	LF	17,014	$82	$1,395,148	
	Total Estimated Cost				**$1,395,200**	
60	Cottage Street Bike Lanes					
	Bike Lanes	LF	6,550	$82	$537,100	
	Total Estimated Cost				**$537,100**	

Tables D.30 through D.38 show the facility estimates used to develop project level cost estimates. Tables D.39 and D.40 show cost detail estimates for intersection improvements.

Table D.30 Two Bike Lanes

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Earthwork, Excavation, Grading	CY	2,300	$25	$57,500	Assume 6 feet width and 2 feet depth
Aggregate Base Course for Pavement	CY	1,200	$30	$36,000	Assume 6 feet width and 1 feet depth
Asphalt Surface Course	TON	300	$75	$22,500	Assume 6 feet width and 0.125 feet depth, 13.3 CF in a ton
Asphalt Base Course	TON	1,200	$75	$90,000	Assume 6 feet width and 0.5 feet depth, 13.3 CF in a ton
Thermoplastic Pavement Marking (all widths up to 24")	LF	20,000	$0.75	$15,000	Assume 4 lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$150	$6,000	Assume 1 symbol every 250 feet each side of road
24" Thermoplastic Pavement Marking	LF	200	$3	$600	Assume 1 high visibility crossing every 2,500 feet
New Sign	EA	10	$300	$3,000	Assume 1 sign every 500 feet
Eradication	LF	10,000	$2	$20,000	Assume 2 lines entire length
Lump Sum Items					
Maintenance of Traffic (5%)	LS	1	$12,530	$12,530	
			Subtotal	**$263,130**	
			25% Contingency	$65,783	
		Estimated Construction Cost		**$329,000**	
ROW Acquisition (10%)	LS	1	$32,900	$32,900	
Design Contingency (20%)	LS	1	$65,800	$65,800	
		Total Estimated Cost		**$427,700**	**Per Mile (2 Lanes)**
				$82	**Per Foot**

Table D.31 Shared Lane Markings

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Thermoplastic Pavement Marking Symbol	EA	40	$150	$6,000	Assume 1 symbol every 250 feet per side of the road
New Sign	EA	10	$300	$3,000	Assume 1 sign every 500 feet
Lump Sum Items					
Maintenance of Traffic (5%)	LS	1	$450	$450	
			Subtotal	**$9,450**	
			25% Contingency	$2,363	
		Estimated Construction Cost		**$11,900**	
ROW Acquisition (10%)	LS	1	$1,190	$1,190	
Design Contingency (20%)	LS	1	$2,380	$2,380	
		Total Estimated Cost		**$15,500**	**Per Mile (2 Lanes)**
				$3.00	**Per Foot**

Table D.32 Bike Boulevards[a]

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Curb Extensions	EA	32	$9,300	$297,600	
Speed Humps	EA	16	$5,690	$91,040	
Thermoplastic Pavement Marking (all widths up to 24")	LF	10,560	$0.75	$7,920	Assume 2 lines entire length
Thermoplastic Pavement Marking Symbol	EA	27	$150	$4,050	Assume 2 symbols every block
24" Thermoplastic Pavement Marking	LF	1,584	$3	$4,752	Assume 12 high visibility crossings
New Sign	EA	27	$300	$8,100	Assume 2 signs every block
Traffic Circle	EA	2	$5,690	$11,380	Assume at entrances to bike boulevard
Large Map or Interpretive Sign Panel	EA	2	$3,000	$6,000	Assume at entrances to bike boulevard
Lump Sum Items					
Landscaping (5%)	LS	1	$21,542	$21,542	
Drainage and E&S (10%)	LS	1	$43,084	$43,084	
Maintenance of Traffic (5%)	LS	1	$21,542	$21,542	
Utility Adjustments (10%)	LS	1	$43,084	$43,084	
			Subtotal	**$560,094**	
			25% Contingency	$140,024	
		Estimated Construction Cost		**$700,118**	
ROW Acquisition (10%)	LS	1	$70,012	$70,012	
Design Contingency (20%)	LS	1	$140,024	$140,024	
		Total Estimated Cost		**$910,200**	**Per Mile**
				$173	**Per Foot**

[a] Taken from Cincinnati Bike Boulevard-Hewitt Avenue.

Table D.33 Speed Hump

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Milling	SY	22	$6	$132	Assume 10 long speed bump across 20 feet (travelway space)
Asphalt Surface Course	TON	2	$75	$150	Assume 10 long speed bump, across 20 feet, and 4" high
Thermoplastic Pavement Marking Symbol	EA	12	$150	$1,800	Assume 2 yield markings each speed hump
New Sign	EA	12	$300	$3,600	Assume 2 signs for each speed hump
			Subtotal	**$5,682**	

Table D.34 Traffic Circle

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Earthwork, Excavation, Grading	CY	23	$25	$575	Assume 10-foot radius traffic circle
Curb and Gutter	LF	70	$20	$1,400	
Concrete Unit Pavers	SY	35	$65	$2,275	
Aggregate Base for Sidewalk	CY	6	$40	$240	Assume 0.5-foot depth
New Sign	EA	4	$300	$1,200	Assume 4 signs per circle
			Subtotal	**$5,690**	

Table D.35 Shared Used Path (10-Foot)

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Earthwork, Excavation, Grading	CY	2,100	$25	$52,500	Assume 16-footwide grading
Aggregate Base Course for Pavement	CY	1,100	$30	$33,000	
Asphalt Surface Course	TON	200	$75	$15,000	
Asphalt Base Course	TON	700	$75	$52,500	
Thermoplastic Pavement Marking (all widths up to 24")	LF	2,500	$0.75	$1,875	Assume 50 percent with centerline stripe
24" Thermoplastic Pavement Marking	LF	200	$3	$600	Assume 1 high visibility crossing every 2,500 feet
New Sign	EA	5	$300	$1,584	Assume 1 sign every 1,000 feet
New Signal Heads	EA	1	$5,000	$5,000	Assume new signal head every mile
Pedestrian Bridge	EA	0.5	$200,000	$100,000	Assume every 2 miles
Bollards	EA	2	$300	$634	Assume new bollard every 2,500 feet
Split Rail Fence	LF	100	$25	$2,500	Assume 100 LF of split rail fence every mile
Bench	EA	1	$1,200	$1,200	Assume at wayside, 1 every mile
Bike Rack	EA	1	$560	$560	Assume at wayside, 1 every mile
Trash Can	EA	1	$125	$125	Assume at wayside, 1 every mile
Large Map or Interpretive Sign Panel	EA	1	$3,000	$3,000	Assume at wayside, 1 every mile
Lump Sum Items					
Landscaping (5%)	LS	1	$13,504	$13,504	
Drainage and E&S (10%)	LS	1	$27,008	$27,008	
Maintenance of Traffic (5%)	LS	1	$13,504	$13,504	
Utility Adjustments (10%)	LS	1	$27,008	$27,008	
			Subtotal	**$351,102**	
			25% Contingency	$87,775	
		Estimated Construction Cost		**$438,900**	
ROW Acquisition (10%)	LS	1	$43,890	$43,890	
Design Contingency (20%)	LS	1	$87,780	$87,780	
		Total Estimated Cost		**$570,600**	**Per Mile** **$109** **Per Foot**

Table D.36 Shared Used Path Bridge (14-Foot)

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Path Bridge	SF	73,920	$250	$18,480,000	
Thermoplastic Pavement Marking (all widths up to 24")	LF	2,500	$0.75	$1,875	Assume 50 percent with centerline stripe
New Sign	EA	5	$300	$1,584	Assume 1 sign every 1,000 feet
Lump Sum Items					
Maintenance of Traffic (5%)	LS	1	$924,173	$924,173	
Utility Adjustments (10%)	LS	1	$1,848,346	$1,848,346	
			Subtotal	**$21,255,978**	
			25% Contingency	$5,313,995	
		Estimated Construction Cost		**$26,570,000**	
ROW Acquisition (10%)	LS	1	$2,657,000	$2,657,000	
Design Contingency (20%)	LS	1	$5,314,000	$5,314,000	
		Total Estimated Cost		**$7,971,000**	**Per Mile**

Table D.37 Bridge Widening (per Square Foot)[a]

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Bridge Widening	SF	1	$250	$250	
Lump Sum Items					
Maintenance of Traffic (5%)	LS	1	$13	$13	
Utility Adjustments (10%)	LS	1	$25	$25	
			Subtotal	**$288**	
			25% Contingency	$72	
		Estimated Construction Cost		**$400**	**Per Square Foot**
ROW Acquisition (10%)	LS	1	$40	$40	
Design Contingency (20%)	LS	1	$80	$80	
		Total Estimated Cost		**$600**	**Per Square Foot**

[a] $1,510.00 per foot.

Table D.38 Curb Extension (Two-Sided)

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment	
Earthwork, Excavation, Grading	CY	50	$25	$1,262		
Concrete Curb and Gutter	LF	80	$20	$1,600	From Crossing Island estimate	
Concrete Sidewalk (4" Thickness)	SY	48	$30	$1,433	From DC Pedestrian Plan estimate	
Curb Ramp	EA	2	$2,500	$5,000	From Intersection Calculations, 1 for each side	
					Per 2-sided	**Per 1-sided**
			Total	**$9,295**	**$9,300**	**$4,650**

Table D.39 Intersection Summary

ID	Description	Total
23	**Clarendon Connector** Washington Boulevard width = 68 feet Wilson Blvd./Clarendon Blvd. width = 124 feet	$268,300
24	**Arlington Boulevard and Irving Street** Arlington Boulevard width = 66 feet Irving Street width = 40 feet	$198,400
30	**Arlington Boulevard and Park Drive** Arlington Boulevard width = 100 feet S. Park Drive width = 50 feet	$233,600
32	**Arlington Boulevard and Manchester Street** Arlington Boulevard width = 86 feet Manchester Street width = 50 feet	$221,500
42	**W&OD Trail Crossing at Lee Highway** W&OD trail space width = 65 feet Lee Highway width =76 feet	$226,800
45	**W&OD Realignment at West Street** W&OD trail space width = 30 feet West Street width = 36 feet	$168,600

Table D.40 Sample Intersection Detail

Item	Unit	Quantity	2010 Unit Cost	Total Cost	Comment
Curb Extensions	EA	4	$4,650	$18,600	Assumes extension on one side
Milling	SY	1,253	$6	$7,520	
Surface Asphalt	TON	104	$75	$7,833	
Thermoplastic Pavement Marking (all widths up to 24")	LF	944	$0.75	$708	Assume 4 lines each approach
Thermoplastic Pavement Marking Symbol	EA	12	$150	$1,800	Assume 3 symbols per approach
24" Thermoplastic Pavement Marking	LF	330	$3	$990	Assume 1 high visibility crossing each approach
New Sign	EA	8	$300	$2,400	Assume 2 signs every approach
Curb Ramp	EA	8	$2,500	$20,000	Assume 2 every approach
Signal Timing Adjustment	EA	1	$10,000	$10,000	
Lump Sum Items					
Mobilization (10%)	LS	1	$9,430	$9,430	
Landscaping (5%)	LS	1	$3,493	$3,493	
Drainage and E&S (10%)	LS	1	$6,985	$6,985	
Maintenance of Traffic (10%)	LS	1	$6,985	$6,985	
Utility Adjustments (10%)	LS	1	$6,985	$6,985	
			Subtotal	**$103,729**	
			25% Contingency	$25,932	
			Estimated Construction Cost	**$129,670**	
			10% ROW Acquisition	$12,967	
			20% Design	$25,934	
			Estimated Total Cost	**$168,600**	

D.5 Transportation Demand Management

Table D.41 shows the costing assumptions for transportation demand management (TDM) options discussed in this report.

Table D.41 TDM Costing Assumptions

TDM Strategy	Assumed Value	Description	Source
Enhanced Corridor Marketing	1,273,717	Total daily vehicle-trips originating and/or terminating in corridor	Travel demand model
	$ 843	Existing regional program – annual cost per daily VT reduced	MWCOG 2008 TERM analysis combined with Commuter Connections program budget data
	50%	Marginal benefit per dollar spent vs. existing program	Professional judgment
	10%	Percent affected trips that result in no-trip	Professional judgment
	$ 2,200,000	Annual regional Commuter Connections marketing budget	MWCOG – 2008 budget
	23%	Regional budget % to reach study area commuter pop. (residents and workers)	Arlington-Alexandria-Fairfax Co average share of regional employment and population
Rideshare Program Operational Support	209,596	Affected workers	MWCOG 2008 TERM analysis
	$ 22	Existing regional program – annual cost per daily VT reduced	MWCOG 2008 TERM analysis combined with Commuter Connections program budget data
	$ 200,000	Incremental program budget (versus I-66 baseline)	Program assumption
	50%	Marginal benefit per new dollar spent versus existing program	Professional judgment
Enhanced Telework!VA	1.3	Telecommute average days/week	Professional judgment
	$ 100	Average incentive or cost subsidy per new teleworker	Program assumption (Note: VA now provides up to a $1,200 one-time tax credit per new teleworker)
	2,500	New teleworkers	Calculation
Enhanced Employer Outreach	209,596	Affected workers	MWCOG 2008 TERM analysis
	$ 22	Existing regional program – annual cost per daily VT reduced	MWCOG 2008 TERM analysis combined with Commuter Connections program budget data
	$ 200,000	Incremental program budget (versus I-66 baseline)	Program assumption
	50%	Marginal benefit per new dollar spent versus existing program	Professional judgment

Table D.41 TDM Costing Assumptions (continued)

TDM Strategy	Assumed Value	Description	Source
Vanpool Driver Incentive	$ 250	Annual subsidy per driver	Program assumption from I-66 Transit/TDM Study
	50	Number of existing vanpools in study area	Estimate based on regional registered vanpools and ratio of study area to regional employment
	3	Number of new vanpools formed	Professional judgment (0 in I-66 Transit/ TDM study)
Enhanced Virginia Vanpool Driver Insurance Pool	$ 1,087	Savings per year per van	Calculated from program cost and total existing + new vanpools
	$ 110	Reduction in annual cost per participant	Calculated from savings per van and average vanpool occupancy
	$ 0.23	Reduction in participant cost per trip	Calculated from reduction in cost per participant and trips per participant per year
	12	Implied new vanpools	EPA COMMUTER Model calculation
Capital Assistance for Vanpools	$ 1,087	Capital subsidy per van per year	Calculated from program cost and total existing + new vanpools
	$ 110	Reduction in annual cost per participant	Calculated from savings per van and average vanpool occupancy
	$ 0.23	Reduction in participant cost per trip	Calculated from reduction in cost per participant and trips per participant per year
	12	Implied new vanpools	EPA COMMUTER Model calculation
Van Priority Access	2.0	Average minutes of travel time savings per van trip	Professional judgment
	$ 10,000	Annualized cost of education, signage & enforcement	Professional judgment
	6	Implied new vanpools	EPA COMMUTER Model calculation
Network	10	# of new vanpools formed	Professional judgment
	$ 10,000	Annualized cost to develop and operate program (incremental to vanpool operating cost)	Professional judgment

Table D.41 TDM Costing Assumptions (continued)

TDM Strategy	Assumed Value	Description	Source
I-66 Corridor-Specific Startup Carpool Incentives	$ 150	Incentive per participant	Atlanta Cash for Commuters started at $180 then capped at $100
	1,000	Annual participants awarded incentives	Program assumption
	2.0	Average carpool retention time (years)	Estimate based on retention data from Atlanta Cash for Commuters survey
	4.2	Average days/week carpooling	MWCOG 2010 SOC Report (Fig 52)
Northern Virginia Ongoing Financial Incentive	$ 50	Average annual incentive per participant	Program assumption
	2,000	Annual participants awarded incentives	Program assumption
	53%	Incentive users switching from DA mode	MWCOG 2010 SOC Report – prior mode of travel
	1.0	# trips reduced per day per incentive user	Atlanta Cash for Commuters survey data, per I-66 Transit/TDM Study
Try Transit and/or Direct Transit Subsidy	$ 25.00	Average monthly transit subsidy per participant	Program assumption – per I-66 Transit/TDM Study
	$ 0.63	Cost savings per trip	Calculated from monthly subsidy and trips per month (20*2)
	100%	Prior private vehicle mode share of subsidy recipients	Assume not provided to existing transit users
	13,466	Unconstrained new transit users	Calculated using COMMUTER Model
	4,000	Annual program participant cap	Program assumption
	4.15	Average days/week using transit	MWCOG 2010 SOC Report (Fig 52)
Carsharing at Priority Bus Activity Nodes	10	Number of Priority Bus Activity Nodes	Professional judgment
	3	Number of cars deployed per node	Professional judgment
	20	Members per car	TCRP Report 108
	0.1	Change in daily vehicle-trips per member	MWCOG 2009 Carshare Survey per I-66 study
	$ 0	Public cost per car to support new carshare deployment	Assumed $0 in I-66 Transit/TDM study

Appendix E

Existing and Potential Funding Options

Appendix E – Existing and Potential Funding Options

Appendix E provides a detailed assessment of existing funding (Federal, state, and local) for multimodal transportation investments, and a list of potential revenue and financing options that could be considered to fund the package of multimodal mobility options that will be chosen for implementation. Not all of the potential funding and finance approaches may be equally appropriate for use in Virginia. In addition, the use of some approaches will require legislative action.

E.1 Federal

The Federal Highway Trust Fund (HTF) is the main source of Federal funding for both highway and transit. The money in the Federal HTF is raised by the Federal fuel tax of 18.4 cents per gallon on gasoline, 24.4 cents per gallon of diesel fuel, and other highway-related Federal excise taxes. Project sponsors must provide matching funds to Federal money, generally 20 percent.

According to the Federal Highway Administration (FHWA) Highway Statistics, Virginia received $660.7 million in FY2009 from FHWA for highways. From the Federal Transit Administration (FTA), $447.2 million were apportioned in FY2009.[1]

Overall, Federal funding is generally committed to specific projects through the statewide transportation improvement program (STIP), and the statewide and metropolitan long-range transportation plan(s) (LRTP). The STIP must be fiscally constrained, meaning that funding over the long-term is essentially fully committed to the transportation priorities identified by the state and the Metropolitan Planning Organizations (MPO). The availability of Federal funding for the I-66 Multimodal Study recommendations will depend on whether these are adopted into the statewide LRTP and move up in the list of projects that are considered a priority to the State.

Potential for Additional Federal Funding

The latest transportation authorization bill, Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), expired at the end of September 2009. Congress has continued to extend the authority since then with short-term extensions, seeking to provide a level of "stability" in the availability of Federal funding for transportation. There

[1] It should be noted that FTA apportionments include funding apportioned to multistate urbanized areas, such as the Washington, D.C.-VA-MD metropolitan region.

is a consensus that at the current levels of spending and the anticipated levies from highway user fees, the Highway Trust Fund will not be sustainable over the long-term. Two Congressionally established commissions, including the National Surface Transportation Policy and Revenue Study Commission as well as the National Surface Transportation Infrastructure Financing Commission, both recommended an increase in highway user fees, including an increase to the current motor fuel tax rate. In the current fiscal environment, there is very little, if any, political will to adopt a tax increase. Furthermore, the Congress is facing serious challenges in advancing reauthorization at current levels with relatively small infusions of funding through non-traditional funding sources. Therefore, the prospect for a substantial increase in Federal funding that would provide additional funding to the Commonwealth of Virginia to support unfunded needs, such as the I-66 Multimodal Study recommendations, is low. Although it is not beyond the realm of possibility that the Congress will enact a long-term reauthorization of the surface transportation programs in 2012, it is more likely that whatever funding is provided on an interim basis will be at current levels at best, and delays to a comprehensive legislative action will push the issues of sustainable funding at least into the next session of Congress and the next Administration. The health of the overall economy and the effects of new fuel consumption standards will exert the greatest influence on the long-term downward trend for available revenues.

In the meantime, a limited number of existing Federal discretionary programs continue as a result of appropriation actions and the authorization extensions referred to above. Each has provided much needed transportation funding for a relatively small set of projects on a competitive basis. Included among these is the Value Pricing Pilot Program (VPPP) with an estimated funding level for the U.S. at this time totaling $6.9 million. Solicitations also have been made by U.S. Department of Transportation (DOT) under the Transportation Investment Generating Economic Recovery (TIGER) Program for which a total of $500 million in funding has been appropriated for Fiscal Year (FY) 2012.

Applications in response to the FHWA solicitation under 12 discretionary programs, including the VPPP, were due to the agency January 6, 2012. Each program has its own eligibility criteria, representing a combination of statutory requirements and Administration policy priorities. The VPPP authorizes FHWA to work with up to 15 States under cooperative agreements to advance the use of innovative techniques to reduce congestion and improve system performance through congestion pricing. To date, Virginia has participated in projects with VPPP funding for three studies: 1) in 2006 for a regional network of value priced lanes in metropolitan Washington, D.C. (including Northern Virginia), 2) in 2010 for the Hampton Roads Region, and 3) in 2011 to investigate issues related to the public acceptability of road pricing in the Metropolitan Washington D.C. region.

Since 2009, the U.S. DOT has distributed funding through the TIGER program that was first provided under the Recovery Act. Continuing through the FY2012 appropriations processes, three rounds of competitive grants have been made, totaling just over $2.6 billion for capital investments in surface transportation infrastructure. During the last round, the Virginia Department of Transportation (VDOT) received funding in 2011 of $20 million in the form of a TIGER Transportation Infrastructure Finance and Innovation Act (TIFIA) grant. Payment will help finance the construction high-occupancy tolling (HOT) lanes in Northern Virginia, from

Fairfax to Stafford Counties, as well as a northern portion that will connect with the Capital Beltway HOT lanes that currently are under construction.

The FY2012 Appropriations Act provided another $500 million, requiring that TIGER funds are only available for obligation through September 30, 2013. This time constraint that the Department, among its criteria, will give priority to projects that are ready to proceed. Pre-applications for the FY2012 TIGER Discretionary Grants were due February 20, 2012, with the deadline for subsequent final applications due on March 19, 2012.

A close reading of the Committee bills under consideration by the U.S. House and the U.S. Senate that would reauthorize the current Federal surface transportation programs reveals that discretionary programs as a whole would be eliminated. Thus, the future of discretionary grant programs such as TIGER and VPPP is very uncertain. If they continue, either in the interim or through a change in the positions of the two chambers, it should be recognized that transportation improvements, such as those recommended for I-66, could be potential candidates.

E.2 State

The Commonwealth Transportation Fund (CTF) is the major source of revenues for all Virginia transportation agencies and programs. The CTF is comprised of five funds:

- Highway Maintenance and Operating Fund (HMOF)
- Transportation Trust Fund (TTF)
- Priority Transportation Fund (PTF)
- Federal Fund
- Bond Proceeds

The HMOF and TTF are comprised primarily of revenues from various dedicated taxes, including:

- State motor fuel road tax (gasoline tax) - 17.5-cent-per-gallon tax
- Motor vehicle sales tax – 0.5 percent
- Motor vehicle license fee – $40.75 annual fee
- General state sales and use tax – ½ percent
- Other (e.g., International Registration Plan and recordation tax revenue dedicated to maintenance, bond proceeds)

All the above state tax and fee rates used to fund the HMOF and the TTF are the same today as they were in 1987, except for the vehicle license fee and bonds. The vehicle license fee increased from $38.75 to $40.75 on July 1, 2010.

The HMOF supports highway maintenance, operations, and administration. The TTF is a multimodal fund that is distributed among aviation, ports, highways and public transportation.

The 2011 General Assembly Transportation Bill Package added new transportation funding opportunities, including the creation of the Virginia Transportation Infrastructure Bank (VTIB). Specifics of the package are:

- Accelerates the issuance of $1.8 billion in previously authorized Capital Project Revenue Bonds by increasing the yearly allowable limit from $300 million to $600 million.
- Authorizes the Commonwealth Transportation Board to issue $1.1 billion in Federally backed direct Grant Anticipation Revenue Vehicles (GARVEE) bonds.
- Created the VTIB, funded with $150 million from the FY2010 surplus and $250 million identified during the comprehensive VDOT audit.
- Enables the Governor to dedicate up to two percent of general fund revenue growth over five percent to transportation.
- Authorizes the Governor to dedicate two-thirds of the general fund surplus to the VTIB and gives transportation greater priority in receiving surplus funds.
- Eliminates the $1 million per project and $50 million programmatic limits, as well as the prioritization process for selecting projects, in VDOT's revenue sharing program.
- Creates the Intercity Passenger Rail Capital and Operating Fund.

The actions of the 2012 General Assembly and the Governor have generated a number of new funding opportunities including increasing transportation's share of year-end surpluses, generating revenues from annual naming rights fees and license fees for electric motor vehicles, and providing special allocations for high priority highway projects. To the extent that these potential funding sources provide additional revenue, VDOT could consider using some of the increased revenues to support the implementation of the I-66 Multimodal Study recommendations.

Potential for Additional State Funding

The funding options included in the 2011 transportation bill and those recommended for 2012 provide a starting point for potential additional funding that could be used for the I-66 Multimodal Study recommendations. In addition, other funding options have been identified that have not been proposed in Virginia as noted above (e.g., increase in excise motor fuel tax).

Motor Fuel Tax

Motor fuel taxes at the Federal level and in most states are based on a fixed rate that is dependent on consumption and not changes in price; therefore, inflationary effects have significantly eroded and will continue to erode the purchasing power of this funding source. The current excise motor fuel tax rate in Virginia is 17.5 cents per gallon (CPG). The motor fuel tax rate was increased by 2.5 CPG to the current rate in 1987. A few options to raise motor fuel taxes in Virginia include increasing the excise tax rate, and indexing and dedicating sales taxes on

motor fuel to transportation. There have been several bills in the legislature to increase motor fuel taxes over the last few years, none of which have been enacted.

According to FHWA Highway Statistics data[2], adjusted motor fuel tax receipts in Virginia were estimated at $827.2 million in 2010. At 17.5 CPG (for both gasoline and diesel), the annual motor fuel tax yield per penny is estimated at $47.3 million. An increase in the motor fuel tax rate could generate additional funding that could be used for the I-66 Multimodal Study recommendations.

Indexing state gasoline taxes involves adjusting excise motor fuel tax rates to some measure of inflation, such as the consumer price index (CPI). Other indexing options include indexing state gas taxes to the retail price of gasoline or to an inflation index gauging changes in the highway construction and maintenance costs or state revenue needs. Florida, Kentucky, Nebraska, and North Carolina have either all or a portion of their motor fuel tax indexed to CPI or the wholesale price of fuel. Maine began indexing its excise fuel tax in 2003, but was repealed in 2011. The volatility associated to indexing based on fuel price (due to fluctuations in fuel price) is mitigated by: 1) including a fixed fuel tax rate in additional to the variable fuel tax rate; and 2) establishing a fuel price floor and/or ceiling in the calculation of the variable fuel tax rate. Table E.1 outlines the motor fuel indexing practices of these states compared to Virginia.

Table E.1 Indexed State Motor Fuel Taxes

State	State Gas Excise (CPG)	Other Associated Taxes (CPG)	Total State Gas Tax (CPG)[a]	Description
Florida	4.0	5.5 to 6.6 12.0	21.5 to 22.6	State Comprehensive Enhanced Transportation System (SCETS) tax (ranges from $0.055 to $0.066 per gallon) is indexed to the CPI. State sales tax also indexed to CPI, current rate of $0.12 per gallon.
Kentucky	26.4	0.0	26.4	10 cents of the gas tax is indexed to Average Wholesale Price not to exceed 10 percent of the tax in any year. Variable portion included in the 21.1 CPG rate.
Nebraska	10.3	16.4	26.7	Gas tax is 10.3 CPG and a portion of the variable excise tax rate is levied as a per-cent of the wholesale price, and is set semi-annually by the Department of Roads.

[2] FHWA Highway Statistics, Table MF-1, State Motor Fuel Taxes and Related Receipts.

Table E.1 Indexed State Motor Fuel Taxes (continued)

State	State Gas Excise (CPG)	Other Associated Taxes (CPG)	Total State Gas Tax (CPG)[a]	Description
North Carolina	17.5	21.4	38.9	State gas tax consists of a 17.5 CPG flat rate plus a variable wholesale price component of 17.5 CPG or 7 percent of the Average Wholesale Price for the applicable base period, whichever is greater.
Virginia	17.5	0.0*	17.5	Last 2.5 CPG increase occurred in 1987. * There is a 2.1 percent sales tax on motor fuels levied in the localities that are part of the Northern Virginia Transportation District, and the Potomac and Rappahannock Transportation Commission. These revenues go to transit.

Source: American Petroleum Institute, January 2012 Summary Report.

[a] Excludes local option fuel taxes and other taxes that may be levied at the state level (e.g., underground storage tank fees).

State sales taxes on motor fuels can be included in a state's motor fuel excise tax (e.g., Florida, as shown above) or may be considered as a separate tax. The sales tax can be a significant portion of state motor fuel tax revenue. Given that sales taxes on gasoline are driven primarily by fuel price, they are generally considered to be sensitive to economic cycles. As a result, year-to-year proceeds from this tax vary with the price of fuel.

In some instances, as in the case of Georgia, revenues from motor fuel sales taxes are not fully dedicated for transportation with a portion going to the general fund. In Indiana and New York, none of the motor fuel sales tax receipts are dedicated for transportation.

Table E.2 shows some of sales taxes on motor fuels by state. In Virginia, however, the sales tax is applied at the local level. A few bills including sales taxes on motor fuels were introduced in 2010 and 2011, including a proposal to substitute the motor fuel excise tax with a motor fuel sales tax, but none of the proposals were enacted.

Table E.2 State Motor Fuel Sales Taxes

State	State Gas Excise (CPG)	Other Associated Taxes[a] (CPG)	Total State Gas Tax (CPG)	Description
California	35.7	12.9	48.6	Other associated taxes include a 2.25 percent sales tax plus applicable district taxes.
Georgia	7.5	21.9	29.4	Other associated taxes includes sales taxes of 4 percent applied to average prices published by the State every six months as well as a local sales tax applied to the average prices and that is comprised of county and city CPG taxes. Only 75 percent of the levies from the motor fuel sales tax are dedicated for transportation.
Illinois	19.0	19.9	38.9	Other associated taxes include 6.25 percent sales tax calculated off the retail price less Federal and state excise taxes.
Indiana	18.0	20.9	38.9	Other associated taxes include 7 percent sales tax (which is included on the retail price less Federal and state excise taxes as a 6.54 percent multiplier).
Michigan	19.0	20.4	39.4	Other associated taxes include 6 percent sales tax.
New York	8.1	40.9	49.0	Other associated taxes include a state sales tax adjusted based on population to reflect the Metropolitan Commuter Transportation District region (8.34 CPG) and general region (8 CPG) tax. The local county sales tax can be a CPG or a percent-basis tax. Most counties impose a percent-based tax. Effective 1/1/12, the petroleum business tax increased from 17 CPG to 17.8 CPG.
Virginia	17.5	2.3	19.8	Other associated taxes include a 2.1 percent sales tax on motor fuels in localities that are part of the Northern Virginia Transportation District and the Potomac and Rappahannock Transportation Commission.

Source: American Petroleum Institute, January 2012 Summary Report; NCHRP 20-24 Task 49 Report.

[a] Includes local option fuel taxes and other fees (e.g., underground storage tank fees).

Motor Vehicle Sales and Use Tax

Vehicle sales taxes are often considered to be part of a state's total sales tax since they are commingled in general funds with sales taxes collected on other transactions. However, in some states, the sales tax on motor vehicles is dedicated to transportation purposes. Vehicles sales taxes are normally levied as a percentage of the sales price of a vehicle when it is purchased or

first registered in a state. Currently, some states collect vehicle taxes that are dedicated to transportation, including Iowa, Kansas, Michigan, Missouri, Nebraska, North Carolina, Oklahoma, and South Dakota. Virginia also dedicates a three percent motor vehicle sales tax to transportation, which is distributed between the HMOF (two-thirds) and TTF (one-third). An increase in the current rate could generate additional revenues for the I-66 Multimodal Study recommendations.

Motor Vehicle Registration Fee

A portion of the motor vehicle registration fee is dedicated to the HMOF ($26) and the TTF ($3). The motor vehicle registration fee is anticipated to generate $216.1 million in FY2012 for the HMOF, for a yield of $8.3 million per $1. The last increase in the motor vehicle registration fee was enacted in 2010.

State Sales and Use Tax

The majority of states levy a state sales tax, with revenues generally deposited into the state's general fund. In some cases, levies from state sales taxes are either dedicated to specific uses, or subject to the annual appropriation process for specific uses, such as transit. When funded from general revenue sources, the level of funding allocated to highway or transit spending is less predictable and vulnerable to fluctuations in budget cycles depending on economic conditions as well as local priorities.

In Virginia, the TTF currently receives revenues from 0.5 percent general sales and use tax. Governor McDonnell's 2012 Transportation Plan is proposing an increase from 0.5 percent to 0.75 percent. If approved, the additional revenues could provide funding for the I-66 Multimodal Study recommendations.

Tolling and Pricing

Tolling is a broad term that refers to any kind of direct user fee on a highway facility. Traditional tolling typically involves a flat toll rate by vehicle type, whereas pricing uses tolling to achieve some other objective than generating revenue, usually congestion relief, or reliable traffic flow. As of July 2011, toll facilities in the U.S. accounted for over 5,300 miles of roads, bridges, and tunnels. The most promising candidates for future toll facilities are new roads or the addition of new lanes to existing roads. The revenue potential of a toll facility depends on its ability to attract drivers. Virginia has several toll facilities in Northern and Central Virginia and in the Hampton Roads region. The Dulles Toll Road (operated by the Metropolitan Washington Airports Authority) in Northern Virginia is a 14-mile toll facility providing access between the Capital Beltway and the Dulles airport. The toll rate is $1.50 at the main plaza and $0.75 at the on/off ramps for passenger vehicles. A second facility in the region is the Dulles Greenway, a 14-mile private toll road.

Pricing concepts vary, with some applications generating healthy revenues and others providing more modest returns. Congestion pricing techniques are arguably the most common pricing concept and can be employed flexibly to match agency needs, project-specific circumstances, and political climate. Following are the main ways in which congestion pricing has been applied, with examples shown in Table E..

Variably Priced Lanes – Applying variable tolls[3] to one or more lanes, which can be priced and operated next to general purpose (unpriced) lanes. Applications of variably priced lanes include HOT lanes and express toll lanes (ETL).

Variable Pricing Across the Full Facility – Pricing all lanes of a facility; this can be applied to existing or new toll facilities.

Priced Zones (Cordon or Area Pricing) – Applying either variable or fixed charges for motorists who cross into a set boundary (cordon pricing) or travel within a specified area (area pricing) during certain time periods.

Table E.3 Commonly Applied Congestion Pricing Strategies

Strategy	Description
Variably Priced Lanes	*I-15 Express Lanes in San Diego* – Single-occupant vehicles pay a per-trip fee each time they use the I-15 HOT lanes. Tolls vary "dynamically" with the level of traffic demand on the lanes. Fees vary in 25 cent increments as often as every six minutes to help maintain free-flow traffic conditions on the high-occupancy vehicle (HOV) lanes. The project generates two million in revenue annually, about one-half of which is used to support transit service in the corridor.
Variable Pricing Across the Full Facility	*Variable Pricing On Bridges in Lee County*, *Florida* – Variable pricing on the existing Midpoint and Cape Coral toll bridges offers travelers a 50 percent discount on their toll if they travel during specific discount periods and pay their toll electronically. The discount periods are 6:30 a.m. to 7 a.m., 9 a.m. to 11 a.m., 2 p.m. to 4 p.m., and 6:30 p.m. to 7 p.m. This structure encourages drivers to shift from peak periods to off-peak/discount periods.
Priced Zones (Cordon or Area Pricing)	*Central London Congestion Charging* – The Central London scheme involves a standard per-day charge for vehicles traveling within a zone. The majority of the revenues from the charge are expended on transit improvements and services. Drivers using a vehicle in the central zone pay either in advance or on the day of travel. A network of cameras observes the license plates of vehicles entering or moving within the central zone; there are no tollbooths, gantries, or barriers. License plate numbers are matched against vehicle registration numbers of those who have paid the charge. A number of exemptions from the charging plan are allowed, including a 90 percent discount for residents.

Revenues from tolling and pricing options can be applied to finance new capacity, or, as in the case of the congestion charge in London, to support transit improvements for services that provide alternative transportation to and within the priced area.

[3] Variable toll rates can be fixed on a particular schedule or vary dynamically based on real time traffic conditions.

To the extent that the I-66 multimodal packages include the potential conversion of HOV to HOT lanes in the corridor or added capacity that could be priced (as express or HOT lanes), tolling and congestion pricing can be considered a potential funding source.

Vehicle Rental Taxes and Fees

Rental car taxes and fees have been enacted by localities and states and often either all or a portion is dedicated to transit. For example, beginning in 2008 Allegheny County in Pennsylvania enacted a $2.00-per-day, or any-part-of-a-day, rental car fee to help support transit services provided by Port Authority Transit Services in the Pittsburgh metropolitan region. In 2005, the State of Arkansas passed a 5 percent rental vehicle tax on the gross receipts of all motor vehicle rentals of less than 30 days and prescribed that 75 percent of the tax revenues be dedicated to the Arkansas Public Transit Trust Fund.[4] In North Carolina, vehicle rental fees have been adopted by Triangle Transit in Raleigh/Durham to pay for transit capital. Vehicle rental taxes in Virginia are not dedicated to transportation.

General Fund Allocations

In 2009, $235.1 million in general fund allocations were used for highways in Virginia. Funding from the general fund also can be allocated to the Mass Transit Capital Fund.

As noted earlier, new transportation funding options approved in 2011 included the potential of dedicating up to two percent of general fund revenue growth over five percent to transportation. While this could generate additional funding for Virginia's transportation needs, it would be subject to the economic conditions and whether the Governor approves it. The 2012 Transportation Plan proposed to dedicate one percent of general fund growth above five percent, which would remove some of the uncertainty, although it would still be subject to economic conditions.

Value Capture

Value capture attempts to capture some portion of the value resulting from infrastructure improvements. The application of value capture occurs primarily at the local level, however, the 2012 General Assembly Transportation Package has proposed providing the Commonwealth Transportation Board (CTB) the authority to create transportation improvement districts wherein 25 percent of growth in state tax revenues attributable to a transportation project would go into the Transportation Trust Fund.

E.3 Local

At the local level across the United States, transportation funding generally comes from general funding appropriations, although Virginia and Northern Virginia make greater use of dedicated sources, such as the fuel sales tax, in the jurisdictions under the Northern Virginia Transportation Commission (NVTC) and the Potomac and Rappahannock Transportation

[4] Senate Bill 441.

Commission (PRTC). For Virginia local governments as for local governments in other states, state legislation determines what powers local governments can exercise, including revenue raising authority. State legislation determines what sources may be used and may put ceilings on rates or amounts or may specify that sources cannot be used without a referendum.

Some local governments dedicate local option taxes (generally requiring voters' approval) to transportation; these are widely used in many states to support transit. The use of local option taxes also is subject to state enabling legislation that allows local governments to adopt different types of taxation. They can include mechanisms such as local option sales, income, property, and vehicle taxes and fees.

In 2008, the Federal Highway Administration's Highway Statistics publication provided an estimate that local governments in Virginia spent $1,154.5 million for highways from local sources,[5] most of which came from local general fund appropriations ($868.8 million) and local highway user tax revenues ($131.8 million). About $429 million spent in local roads and streets came from the State, and about $61.1 million came from General Obligation (G.O.) bonds issued by local governments. A high percentage of local expenditures for highways is normally for maintenance purposes. According to FHWA Highway Statistics, of $1,430.1 million spent locally on roads (excluding any debt payments), $1,170.9 million were spent for maintenance, administration, safety and highway police.[6] A 2001 survey of local option transportation taxes by the University of California at Berkeley[7] found that local vehicle license fees, dedicated property taxes, special assessments, local gas taxes, and severance taxes have been used by local governments for transportation.

Some of the local funding options for the I-66 Multimodal Study recommendations include local option taxes that could be applied within the corridor, parking fees, and value capture.

Local option taxes have been widely adopted by local government in most states (including Virginia) to support transportation investments. They include mechanisms such as local option sales, income, property, and vehicle taxes and fees. Its application and level could be at the local or regional level, and are often dedicated to specific transportation projects or programs. The options available in Virginia are described below.

Existing Local Option Taxes

Motor Fuel Taxes

According to the American Association of State Highway and Transportation Officials (AASHTO) Center for Excellence in Project Finance, 15 states authorize local option motor fuel

[5] Excludes bond proceeds (a major exclusion), state, and Federal funding. Data are from FHWA 2009 Highway Statistics (Table LGF-21). Caution in using these local government estimates from Highway Statistics is recommended.

[6] Ibid.

[7] University of California at Berkeley, Institute of Transportation Studies, *Local Option Taxes in the United States*, *Part Two: State-by-State Findings*, March 2001.

taxes, with widespread use in 5 states (Alabama, Florida, Hawaii, Illinois, and Nevada). Virginia legislation allows the adoption of local motor fuel taxes in *(i) any county or city that is a member of any transportation district in which a rapid heavy rail commuter mass transportation system operating on an exclusive right-of-way and a bus commuter mass transportation system are owned, operated or controlled, by an agency or a commission as defined in § 15.2-4502, or (ii) any county or city that is a member of any transportation district that is subject to § 15.2-4515 C and that is contiguous to the Northern Virginia Transportation District*.[8] In Virginia, the jurisdictions under the NVTC and the PRTC levy a 2.1 percent sales tax on gasoline that is used to support transit operations.

Vehicle Taxes

Cities, counties, and towns in Virginia can levy vehicle license taxes up to the State's vehicle registration rate. This fee has been widely adopted and is levied in nearly every county and city in Virginia (in 90 counties out of 95; and in 37 cities out of 39[9]). Table E.4 shows the 2010 motor vehicle license tax for jurisdictions in the study area .

Table E.4 Motor Vehicle Local License Tax, 2010 – Jurisdictions in the Study Area

Jurisdiction	Private Passenger Vehicle Tax
Arlington County	$25.00
Fairfax County	$33.00[a]
City of Falls Church	$25.00

[a] Fairfax County initiated a Local Vehicle License Registration Fee in July, 2010.

Source: Weldon Cooper Center for Public Service, University of Virginia, *2010 Tax Rates: Virginia's Cities*, *Counties and selected Towns*, 29th Edition.

Also, cities, counties, and towns have the authority to levy personal property taxes on vehicles, but revenues generally go into the general fund. Personal property taxes have been adopted by all cities and counties, but are not specifically dedicated to transportation.

Deed Recordation Tax

Real estate transfer/mortgage recording taxes are commonly levied at the state and local level for the transfer, sale, or granting of title to sale of residential, commercial and industrial property. Revenues have been used to fund transit services under the premise that access to public transit enhances the value of real estate; therefore property owners should support public transit. Both the Chicago Transit Authority (CTA) and the Metropolitan Transportation Authority (MTA) in

[8] Code of Virginia §15.1-1720.

[9] Weldon Cooper Center for Public Service, University of Virginia, *2010 Tax Rates: Virginia's Cities*, *Counties and selected Towns*, 29th Edition.

New York levy[10] this type of tax. In Virginia, local governments can levy a deed recordation tax of up to 8.3 cents per $100 of the property value, but revenues go into the general fund. Ninety-one counties and 37 cities in Virginia levy this tax.[11]

Local Sales Tax

In Virginia, cities and counties can impose a 1 percent local sales tax, with revenues going into the general fund, and currently is collected in all counties and cities.

Hotel Taxes – Hotel/motel taxes are common revenue generating mechanism employed by municipal and county governments. They are often only applied on certain days of the week, month, or year, and revenues are often used in the development and operation of tourism-related facilities. The Reno Transportation Access Corridor (ReTRAC) project, a freight rail relocation project, is using a dedicated one percent hotel tax to repay revenue bonds issued for the project. Hotel taxes (known as transient occupancy taxes) in Virginia are levied in 37 cities and 66 counties. The rate is up to 2 percent, although certain counties could levy up to 5 percent, with the levies generated by a rate exceeding the 2 percent limit dedicated to tourism expenses.[12]

"Sin" Taxes – Often referred to as "sin" taxes, these taxes are applied to particular goods and activities, such as alcohol, tobacco, and gambling. These taxes are unique in that their amount is meant to be a disincentive to engaging in certain behavior, yet they have the potential to raise considerable revenue for states and local governments. While lottery proceeds have long been used to support education programs, some states with legalized gambling or a statewide lottery have designated revenues generated through these activities for public transportation services. For example, New Jersey taxes 8 percent of casino gross revenues (roughly $30 million per month in 2007), and dedicates a portion of this fund to supporting paratransit services for elderly and disabled persons.[13] Pennsylvania dedicates a percentage of lottery proceeds to transit programs for the elderly. Oregon's cigarette tax has used revenues to support Portland's MAX (Metropolitan Area Express) light rail transit system.

Tobacco taxes are levied by jurisdictions in Virginia on a limited basis (only two counties collect them, in addition to 30 cities and 48 towns), at a rate of 1.5 cents per cigarette (30 cents per pack of 20 cigarettes).

Fare Revenues

Additional fare revenues resulting from new and improved transit elements within the I-66 corridor can help cover a portion of new operating costs associated with these services.

[10] Metropolitan Transportation Authority Press Office, *MTA Completes $7.9 Million Payment for Hudson Valley Transit and Road*s, February 24, 2010.

[11] Weldon Cooper Center for Public Service, University of Virginia, *2010 Tax Rates: Virginia's Cities, Counties and selected Towns*, 29th Edition.

[12] Ibid.

[13] University Transportation Center for Mobility – Texas Transportation Institute, http://utcm.tamu.edu/tfo/transit/summary.stm.

Generally, however, the incremental fare revenues from incremental transit services are not sufficient to offset completely the added transit operating costs.

Potential Local Option and Other Fees

Payroll and Income Taxes

Employer payroll taxes help to ensure that commuters and businesses performing services in a transit-supportive area contribute to transit in those areas. Portland, Oregon imposes a transit payroll tax directly on employers on the amount of gross payroll for services performed within the Tri-County Metropolitan Transportation District (TriMet), and another transit payroll tax is imposed on employers within the Lane County Mass Transit District (LTD) located in Eugene, Oregon.

In Virginia, the counties of Arlington, Fairfax, Loudoun, and Prince William, and the cities of Alexandria, Fairfax, Falls Church, Manassas, Manassas Park, Norfolk, and Virginia Beach are authorized to levy, if approved by voters, local income taxes of one percent for five years. The revenues can be used for transportation. Local income taxes have not been adopted in Virginia.

Parking Fees

Parking taxes have great potential to generate a substantial amount of revenue and are typically implemented by local governments, especially in areas where the parking supply is tight. Parking taxes are applied in one of two ways: as a commercial tax on parking rental transactions or as a per space tax on actual parking facilities. Examples of commercial parking taxes applied by municipalities around the country are shown in Table E.. In the City of San Francisco, a portion of the revenues from parking taxes goes to public transportation.

Per space parking taxes pertain to the parking space inventory of parking facilities. This tax can applied as a flat fee per space or based on a facility's surface area. Research does not indicate that this tax has been utilized in the U.S., where parking taxes have generally been associated with revenues rather than with parking capacity. However, variations of the per space tax have been employed widely throughout Australia as well as in Canada and in some European Countries.

Table E.5 Example Municipal Parking Taxes

City	Description
San Francisco	Imposes a 25 percent tax on all commercial off-street, nonresidential parking transactions ("any rent or charge required to be paid by the user or occupant of a parking space"). Revenues are divided between the City's general revenue, public transportation, and senior citizen funds.
Pittsburgh	Imposes a 31 percent parking tax (increased to 50 percent in 2005), the highest rate in the U.S.
Miami	Imposes a 20 percent tax on all commercial, nonresidential, off-street parking.

Table E.5 Example Municipal Parking Taxes (continued)

City	Description
Los Angeles	Imposes a tax of 10.6 percent on fee-based parking, excluding on-street and residential parking, with revenues flowing into general funds.
New York	Imposes a tax of 18.5 percent on commercial parking and 10.5 percent on residential parking in Manhattan.
Chicago	Imposes a flat tax (rather than a percentage tax) on daily, weekly, and monthly parking, and contributes to general revenues.

Source: Victoria Transport Policy Institute, Parking Taxes: Evaluating Options and Impacts, May 2006.

Value Capture

Value capture represents a beneficiary-based revenue source. Unlike a user-fee revenue source, such as vehicle miles traveled (VMT) fees, a beneficiary-based revenue source levies fees or taxes on a defined and generally localized group(s) of beneficiaries that are expected to receive a benefit from a particular transportation facility or resource. In other words, value capture attempts to capture some portion of the *value* resulting from infrastructure improvements. For example, the Transbay Transit Center in San Francisco, a $4.2 billion multimodal facility,[14] will be the first application of a TIFIA loan that is secured by value capture revenues from real estate taxes on surrounding transit-oriented development (TOD). Following are some key financing techniques associated with value capture that are widely employed by both municipalities and county governments across the nation.

Impact Fees

Impact fees are a one-time charge to developers on new development. Revenues are used to pay for infrastructure improvements – such as schools, sewers, roads – to support growth generated by development. These fees have been applied by municipalities and county governments. In Virginia, impact fees are levied on new development to pay for road improvements. Only four counties and one city have reported collecting impact fees, since Virginia jurisdictions have utilized proffers, which are submitted and accepted at the time of rezoning.

Special Assessments

Special assessments are levied on special property taxing districts, or are self-imposed by residents and/or business owners to support infrastructure needs. The cost of infrastructure is paid for by the properties that are deemed to benefit from the improvements. There are several

[14] The Transbay Transit Center Project is a transit hub connecting eight Bay Area counties and the State of California through 10 transit systems: AC Transit, BART, Caltrain, Golden Gate Transit, Greyhound, Muni, SamTrans, WestCAT Lynx, Amtrak, and future High-Speed Rail from San Francisco to Los Angeles/Anaheim.

special assessment districts in Virginia that have been created for transportation improvements, including:

- Fairfax County – VA Route 28, the Dulles Rail corridor;
- Loudon County – VA Route 28;
- Prince Williams County – Prince Williams Turnpike Transportation, and VA Route 234 Bypass Transportation District;
- Spotsylvania County – Massaponax Special Service, and Harrison Road; and
- Town of Culpeper – Lafayette Ridge Tax District, and Southridge Tax District.

In Fairfax and Loudon Counties, landowners within the VA Route 28 special assessment district pay 18 cents per $100 of value. The revenues generated by the special assessments are pledged to pay the revenue bonds issued for the improvements on VA Route 28. Given the precedent, a similar funding option could be considered for the multimodal improvements recommended on I-66.

Tax Increment Financing

Tax increment financing (TIF) captures the increase in property value as a result of redevelopment attracted by infrastructure improvements. TIF is a common tool used by local governments to revitalize urban environments. TIFs are allowed in Virginia to finance public infrastructure, including roads.

Development Exactions

In addition to impact fees, development exactions can take the form of land donations or in-kind donations, such as construction of public infrastructure, parks, or the provision of public services. Development exactions are negotiated and agreed upon as part of the permitting process of development, and in Virginia, these take the form of proffers, which are submitted and accepted at the time of rezoning.

Joint Development

Joint development is a formal arrangement between a public entity and a private developer for the development of a specific asset and has been applied extensively to transit. Joint development is widely used by the Washington Metropolitan Area Transit Authority (WMATA) as part of its TOD efforts around rail and bus stations.

E.4 Financing Options

Following are some of the common project finance techniques and project delivery tools used by DOTs and transit agencies to help states advance their transportation priorities and that may be considered for implementing the I-66 Multimodal Study recommendations. Many of these tools already have been used in Virginia to advance transportation projects, and, as such, the State has a precedent and understanding on how to use these tools and the advantages and disadvantages of using them. These financing techniques can be classified into two groups: credit

assistance and bonds. Credit assistance allows project sponsors to borrow money or access credit from the Federal government. Bonds are debt instruments issued by state and local governments, providing access to the capital markets.

Credit Assistance

Transportation Infrastructure Finance and Innovation Act

TIFIA allows the Federal government to provide loans, loan guarantees, and lines of credit directly to public and private sponsors of major surface transportation projects. TIFIA instruments are designed to fill market gaps and leverage limited Federal resources and substantial co-investment by providing projects with supplemental or subordinate debt rather than grants. TIFIA financial assistance has helped to improve access to capital markets and offer flexible repayment terms and potentially more favorable interest rates than can be found in private capital markets for similar instruments.

Any type of project eligible for Federal assistance through existing surface transportation programs (both highways and transit) is eligible for TIFIA assistance. In addition, the following types of projects are eligible: international bridges and tunnels; intercity passenger bus and rail facilities and vehicles; public freight rail facilities or private facilities providing public benefit for highway users; intermodal freight transfer facilities; access to such freight facilities; and service improvements to such facilities, including capital investment for intelligent transportation systems (ITS).

The amount of Federal credit assistance may not exceed 33 percent of total eligible project cost, and the project cost should be no less than $50 million (for ITS projects, the minimum cost is $15 million). TIFIA project sponsors may be public or private entities, including state and local governments, special purpose authorities, transportation improvement districts, and private firms or consortia.

Currently, there are 25 TIFIA agreements, which have leveraged almost $33.1 billion in project investment. A number of projects in Virginia have used TIFIA, including the I-495 Capital Beltway HOT lanes, currently under construction. This project received a TIFIA loan of $589 million, to be repaid with toll revenues from the HOT lanes. The State also has applied for credit assistance to finance other major projects, such as the I-95 HOT lanes and U.S. Route 460 in Hampton Roads.

Toll road projects have benefited from TIFIA credit assistance due to flexibility on repayment terms. TIFIA also has been instrumental in attracting private capital and advancing public-private partnership (P3) projects, as well as transit projects. Selected I-66 Multimodal Study recommendations could be financed with TIFIA if the specific projects exhibit any of these characteristics and meets the criteria established by FHWA, and a stable and reliable repayment source is identified. It should be noted, however, that requests for TIFIA loans far exceed the available resources, making it increasingly competitive and difficult to obtain financing.

State Infrastructure Banks

State Infrastructure Bank (SIB) are an innovative financing mechanism for state governments that allows the creation of a revolving fund providing low-interest, subsidized loans, and bonds to public and private sponsors of Title 23 highway construction projects, and Title 49 transit and rail capital projects. A Federal SIB was established in Virginia in 1996, however its activity has been limited to one loan for the construction of the Pocahontas Parkway in the amount of $18 million. The loan was repaid after the Pocahontas Parkways lease to Transurban in 2006.[15]

In 2011, the General Assembly approved legislation that would allow establishment of a State-capitalized infrastructure bank. The VTIB is a special non-reverting, revolving loan fund created to provide grants, loans, credit enhancement and other financial assistance to advance transportation projects. The VTIB will be maintained as a sub-fund of the Transportation Trust Fund, and was initially capitalized with $282.7 million from the FY2010 general fund surplus ($32.7 million) and the Commonwealth Transportation Fund ($250 million). As authorized by legislation, the Governor may dedicate two-thirds of the general fund surplus to the VTIB. The VTIB is authorized to provide grants, not to exceed 20 percent of the capitalization.

As a new financing tool available to project sponsors in Virginia, the feasibility of using a loan or grant to support the implementation of the I-66 Multimodal Study recommendations will depend on several factors, including the level of demand for financial assistance, and the ability to secure a repayment source.

Debt Instruments

Private Activity Bonds

Private activity bonds (PAB) are a debt instrument that allow private investors to access tax-exempt debt, which typically carry lower interest rates compared to taxable debt, thereby enhancing investment prospects. With approval from the U.S. DOT, PABs are issued by state or local governments on behalf of the private entity undertaking a project. The private entity finances and delivers the project and is responsible for debt service on the PABs.

According to FHWA's Office of Innovative Program Delivery, eight projects with PAB allocations have been approved by the U.S. DOT as of October 2011, with the Capital Beltway/I-495 HOT lanes[16] in Virginia being the first to issue PABs in the amount of $589 million.

PABs could be considered for the I-66 Multimodal Study recommendations if advanced as a P3.

[15] Gifford, Jonathan. *State Infrastructure Banks: A Virginia Perspective.* George Mason University, School of Public Policy, November 2010.

[16] FHWA Office of Innovative Program Delivery, http://www.fhwa.dot.gov/ipd/case_studies/va_capital_beltway.htm.

Grant Anticipation Revenue Vehicles

Grant Anticipation Revenue Vehicles, or GARVEEs, are bonds or any debt instrument secured with future Federal-aid funding. Projects financed by GARVEE must be eligible for Federal-aid assistance under Title 23 of the United States Code. In the past, the CTB has issued indirect GARVEEs (Federal Revenue Anticipation Notes, or FRANs), which are different than GARVEEs. FRANs are not tied to specific projects, do not require Federal approval, and repayment is based on Federal-aid reimbursements received from the construction of eligible projects. VDOT had the authority to issue up to $1.2 billion in FRANs. Recent legislation authorized the CTB to issue GARVEEs, providing that outstanding debt cannot exceed $1.2 billion of both GARVEEs and FRANs at any given time, and no more FRANs can be issued. With $176 million in outstanding FRANs, the CTB has the authority to issue about $1 billion in GARVEEs, provided that Federal-aid highway funds are pledged for repayment of the bonds. There are plans to issue $350 million in GARVEEs in early 2012 to support the Downtown Tunnel/Midtown Tunnel/Martin Luther King Expressway project.

Tax Credit Bonds

Tax credit bonds are taxable instruments that may be issued by state and local governments for many purposes that are otherwise eligible for tax-exempt financing. However, unlike tax-exempt bonds, where the investor is able to exclude tax-exempt interest from gross income of their Federal tax return (and on many state returns), tax credit bonds provide investor compensation in the form of a Federal-income-tax credit.[17] Congress generally authorizes specific amounts of funds for tax credit bond programs; however, the American Recovery and Reinvestment Act of 2009 (ARRA) provided many provisions that enhance financing for issuers. One of the tax credit bond programs related to the energy industry, with potential application to transportation is the Qualified Energy Conservation Bonds (QECB). This program allows governmental issuers to use the proceeds to reduce energy consumption in publicly owned buildings, implement green community programs, produce electricity from renewable energy resources for rural areas, build research facilities and provide grants to support development of "green" technologies, efficiency/energy reduction measures for mass transit, and advance other green technologies and infrastructure. ARRA provided for $3.2 billion under this program, with funds allocated to states by population. There is no deadline to issue QECBs.

Public-Private Partnerships

P3s are contractual agreements between a public agency and a private entity, which allow greater private sector participation in the delivery and operation of transportation projects and facilities. P3s involve a sharing of responsibilities, risks, and rewards between public sector owners of transportation facilities and a private sector partner(s), but the public partner retains full ownership of the facility. In other words, P3s are a procurement strategy that allow for the transfer and/or sharing of risks associated with project delivery.

[17] Government Finance Officers Association, *Issue Brief: Taxable Tax-Credit Bonds Programs*, updated April 2010.

Virginia's Public-Private Transportation Act of 1995 (PPTA) has facilitated private investment in public infrastructure and transportation facilities. The PPTA allows private entities to enter into agreements with VDOT to construct, improve, maintain, and operate transportation facilities. Projects undertaken under the PPTA include the Dulles Greenway, VA Route 28 interchanges, I-495 HOT lanes in Northern Virginia, the Pocahontas Parkway (VA Route 895), Coalfields Expressway (VA Route 121), VA Route 288 in Richmond, and the Dulles Rail. Given Virginia's experience with P3s, during implementation planning, the proposed I-66 Multimodal Study recommendations should be evaluated to determine potential as a P3 candidate.