National Capital Region Transportation Planning Board

Evaluating Alternative Scenarios for a Network of Variably Priced Highway Lanes in the Metropolitan Washington Region

Presented to
The National Capital Region Transportation Planning Board

Item 13

March 19, 2008

Funded under a grant from the Federal Highway Administration's Value Pricing Pilot Program

Preface

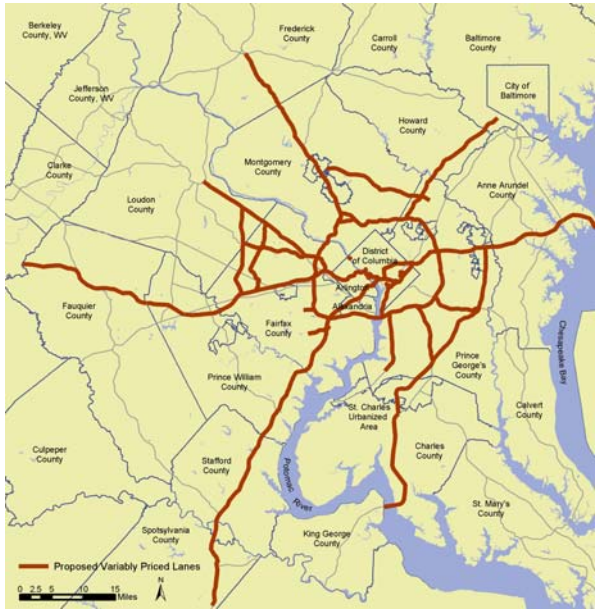
"Under urban conditions we cannot have both free flowing rush hour traffic and the absence of user charges or other constraints on highway use. One or the other of these desiderata must yield."

"Pricing of highway use will thus make it possible to provide at reasonable cost uncongested and speedy transportation anytime, anywhere, and for anyone for whom the occasion is sufficiently urgent to warrant the payment of the corresponding charge. Without pricing, it is very likely that during the rush hours this degree of freedom of movement would not be available to anyone at any price."

William Vickrey, Statement to the Joint Committee on Washington DC Metropolitan Problems, 1959.

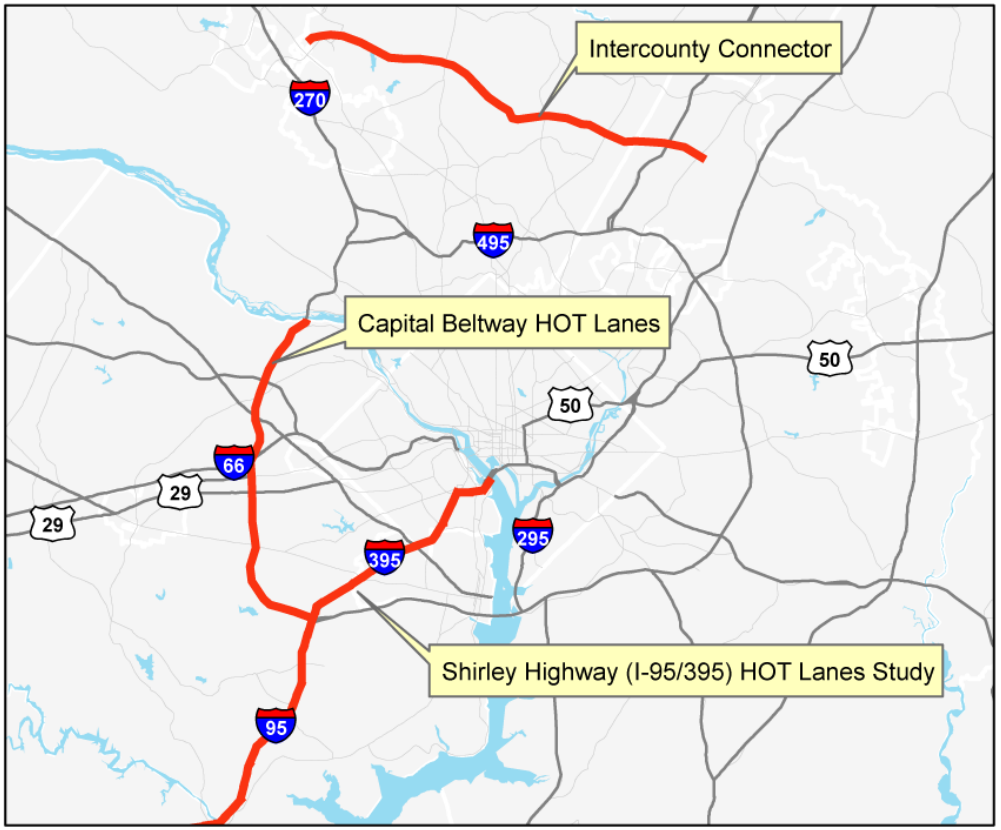
Background

- Regional Conference on Value Pricing, June 2003
- TPB Task Force on Value Pricing for Transportation created Fall 2003
  - Examined the benefits of value pricing for the Washington region
  - Proposed a regional system of variably priced lanes
- Regional Value Pricing Goals approved by TPB, April 2005
  - "To guide the regional development of variably priced lanes that work together as a multi-modal system"
- Study of a Regional Network of Variably Priced Lanes, October 2006 to February 2008



Current Value Pricing Projects in the Plan

- Intercounty Connector (ICC)
  - 2004 CLRP Update*
- Beltway HOT Lanes
  - 2005 CLRP Update*
- I-95/I-395 HOT Lanes
  - 2007 CLRP Update



* Federal Record of Decision approved

Variably Priced Lanes (VPLs):

- *VA: HOT lanes, HOV 3+ free*
- *DC, MD: Express Toll Lanes (ETL), all pay*

Scenario Development

Incremental approach to scenario development

A. "Maximum Capacity" scenario
   - Add two VPLs per direction on regional freeways
   - Add one VPL per direction on arterials outside the Beltway
   - Incorporate existing HOV lanes

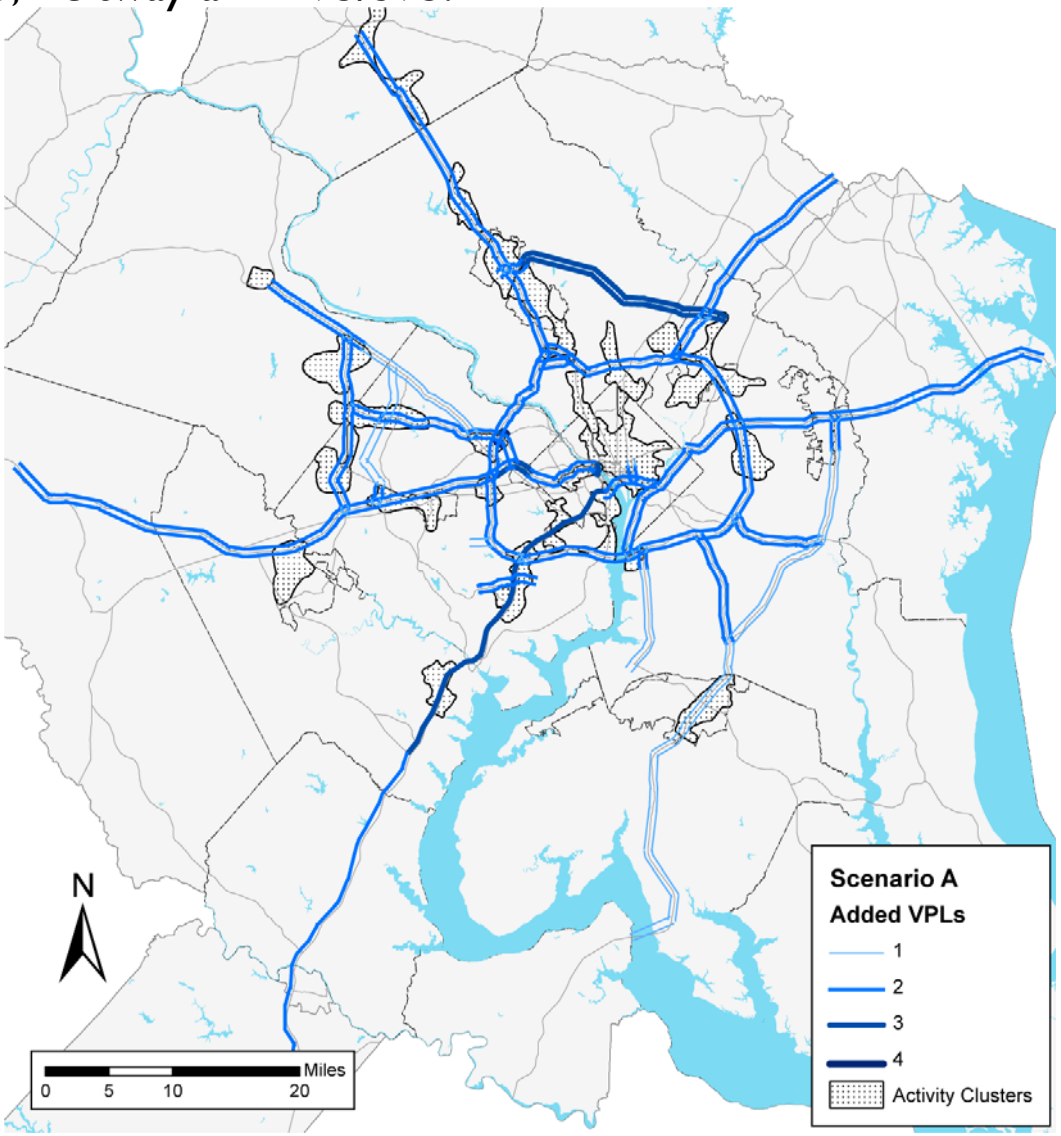
B. "DC Restrained" scenario
   - Remove new capacity in the District added in A
   - Apply variable pricing to existing DC bridges, freeways and select arterials

C. "DC and Parkways Restrained" scenario
   - In addition to B, apply variable pricing to the existing capacity on the region's parkways.

A: Maximum Capacity Scenario

Add **new** capacity, in addition to the ICC, Beltway and I-95/395:

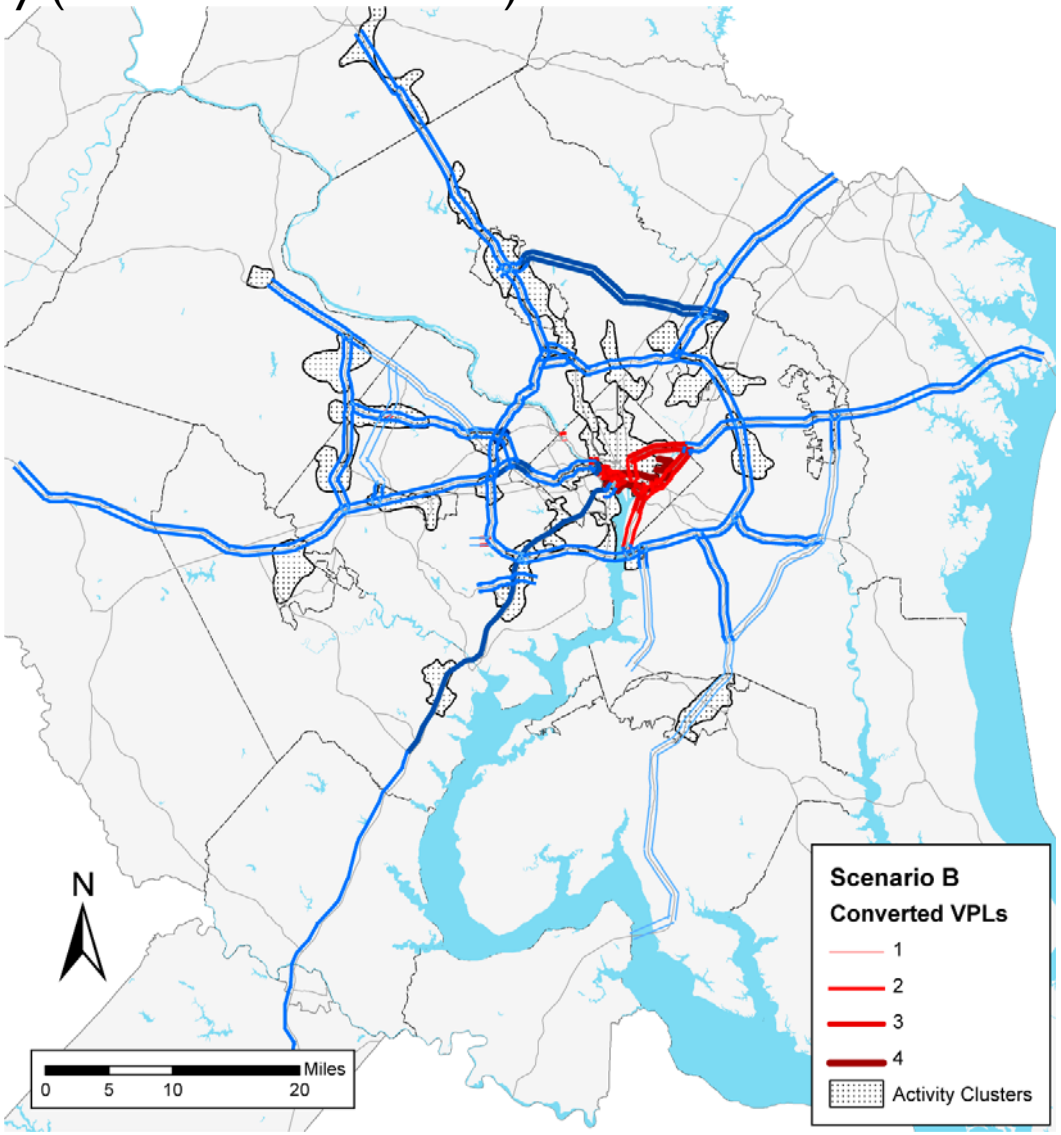
- New variably priced lane miles added to all regional freeways and arterials outside the Beltway.
- New capacity and existing HOV lanes
- Enhanced transit



B: DC Restrained Scenario

New toll lanes and tolled existing capacity (select District facilities)

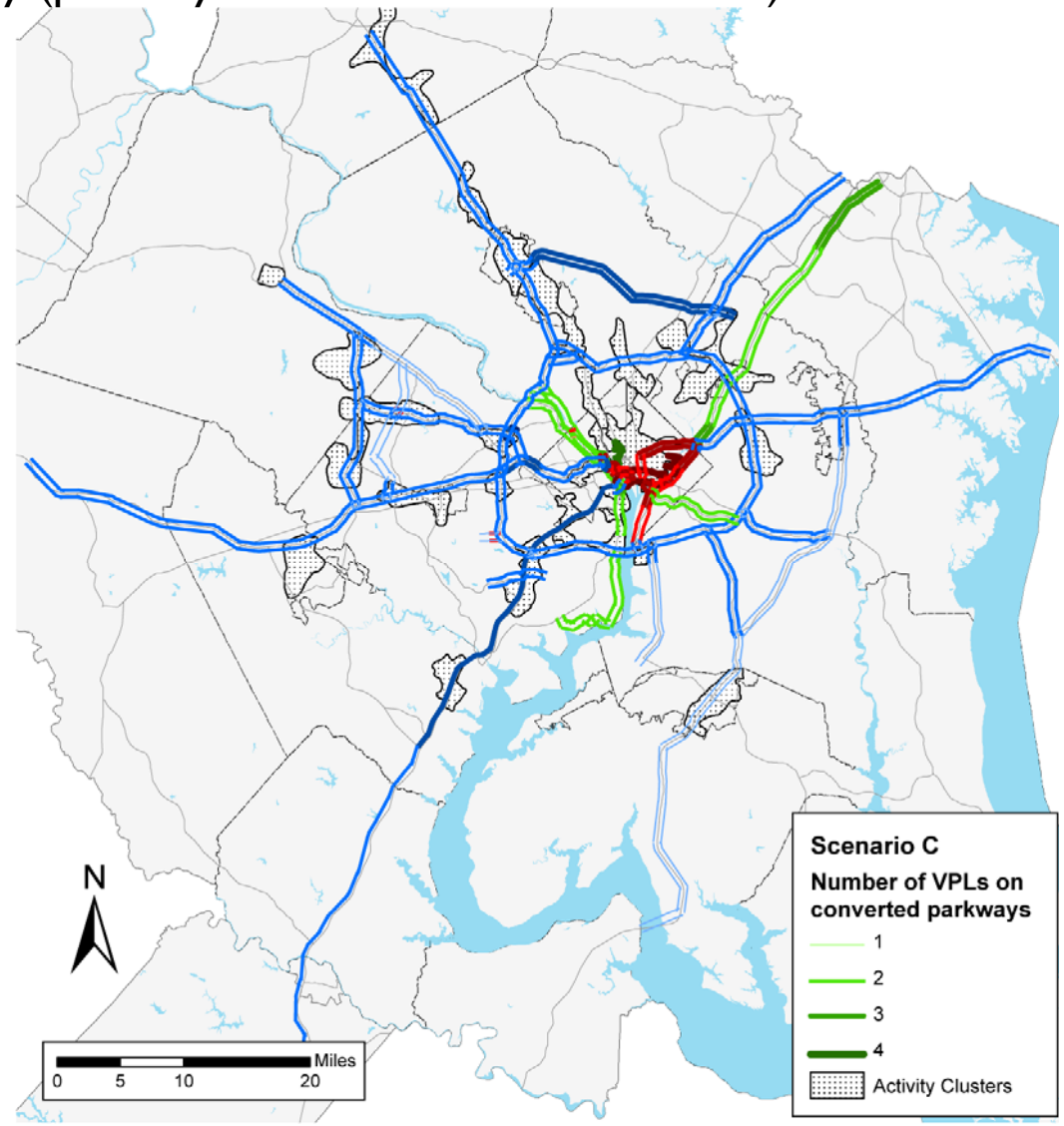
- New VPLs added to freeways outside DC.
- New VPLs added to major arterials outside the Beltway
- Toll DC bridges, freeways, selected arterials
- Enhanced transit



C: DC and Parkways Restrained Scenario

New toll lanes and tolled existing capacity (parkways and select District facilities)

- New VPLs added to freeways outside DC.
- New VPLs added to major arterials outside the Beltway
- Toll DC bridges, freeways, selected arterials
- Toll parkways
- Enhanced transit



Number of Priced and General Purpose Lane Miles in 2030

- General purpose network reduces in size across scenarios.
- Percentage of highway network that is priced reaches 40% in Scenario C.
- Regional network grows by 20 % in Scenario A, 18% in Scenarios B and C.

	2006 CLRP	A	B	C
General Purpose Lane Miles[1]	2891	2891	2738	2400
Variably Priced Lane Miles	155	1208	1291	1629
HOV Lane Miles	337	0	0	0
Total Lane Miles	3,383	4,099	4,029	4,029
Percent Priced Lanes	5%	29%	32%	40%

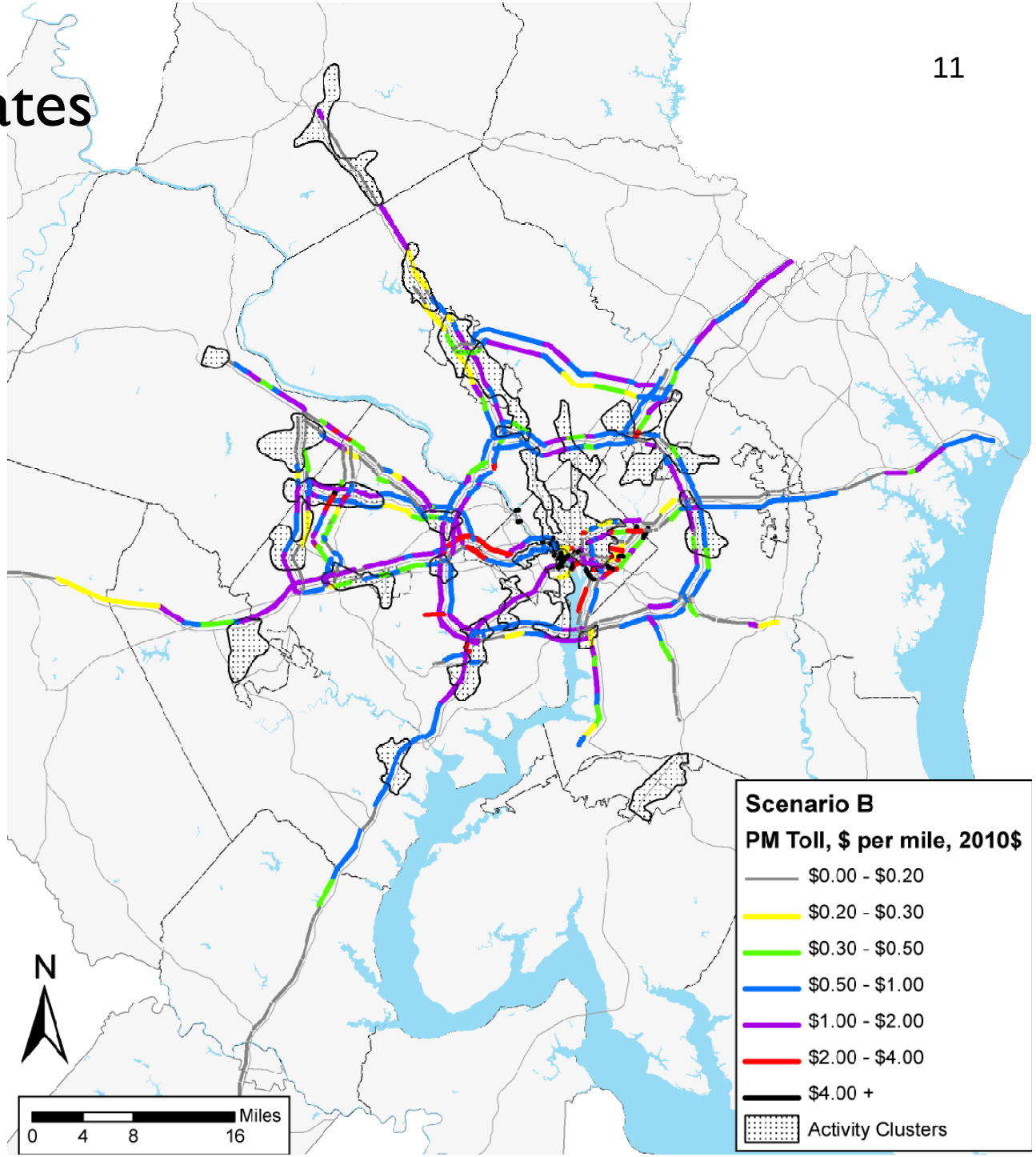
[1] General purpose lane miles include all freeways, major arterials outside the beltway, parkways and selected arterials in the District considered in the scenarios.

Study Methodology

- Base toll rates of $0.20 per mile gradually raised until a "free flowing" volume to capacity ratio was achieved.
- Scenarios were then "prioritized" by removing VPLs with low demand (as indicated by low toll rates).
- Found that toll rates on the VPL network would have to vary significantly by segment, direction and time-of-day in order to maintain free-flowing conditions.

Example Toll Rates

(Scenario B, no transit enhancements)



Analysis Results - Performance

- All scenarios raise VMT, because all add capacity
- HOV use decreases as existing lanes are tolled
- Transit use increases across scenarios

	Scenario A	Scenario B	Scenario C
New PM Priced Lane Miles[1]	1,054	1,136	1,474
% Converted Lane Miles[2]	32%	43%	56%
Regional VMT[3]	2.7%	2.0%	1.2%
HOV Use[3]	20.4%	11.4%	3.6%
Transit Use[3]	3.4%	5.3%	5.9%

[1] The 2006 CLRP for 2030 contains the Beltway HOT Lanes project and the ICC, resulting in 155 existing priced lane miles in the base case not included here.
[2] Percent of new PM priced lane miles that are converted from existing general purpose or HOV lanes
[3] Compared to the base case, 2006 CLRP

Impact of Transit on Performance of the Scenarios

- Increases in transit service along the VPL networks result in:
  - Increases in regional transit use of around 4%
  - Decreases in HOV use between 4% and 15%
  - Small decreases in regional VMT
  - Decreases in total system revenue\
- Results indicate that transit will have significant impacts in a few “high transit” corridors (e.g., I-95/395).

Scenario Cost Estimates

- Unit Costs
  - VDOT costs based on Beltway HOT Lanes project
  - MDOT costs based on West Side and South Side Mobility Studies
  - VDOT and MDOT costs reconciled, adjusted to 2010$

	2010$ (millions)
Cost Per New/Major Interchange	**$220**
Cost Per Modified/Intermediate Interchange	**$132**
Cost Per New Separated VPL Lane Mile	**$33**
Cost Per Converted Lane Mile	**$4**

Scenario Analysis: Financial Feasibility

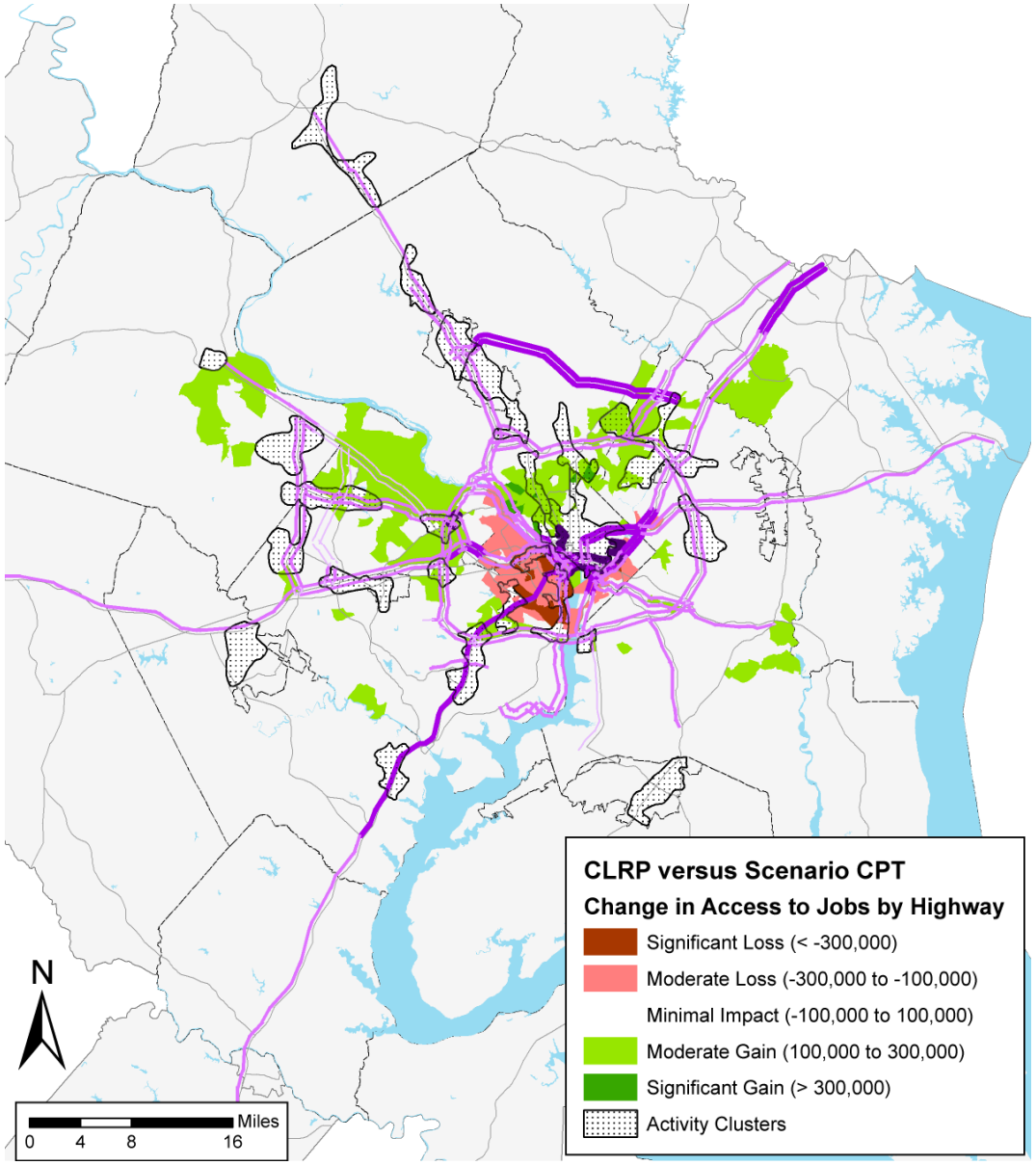
- New lane miles and new interchanges are largest components of costs
- Where existing facilities are tolled, toll revenues are projected to cover and in some cases significantly exceed total costs (including enhanced transit)
- Where new lanes are added, revenues may cover costs on some segments, but on many segments revenues would likely fall well short of covering capital and operating costs

	A	B	C
% Converted Lane Miles	32%	43%	56%
Annual Revenues	$ 1,300	$ 1,900	$ 2,700
Annualized Costs	$ 2,800	$ 2,700	$ 2,700
Cost Recovery Rate	46%	70%	100%

Costs in billions

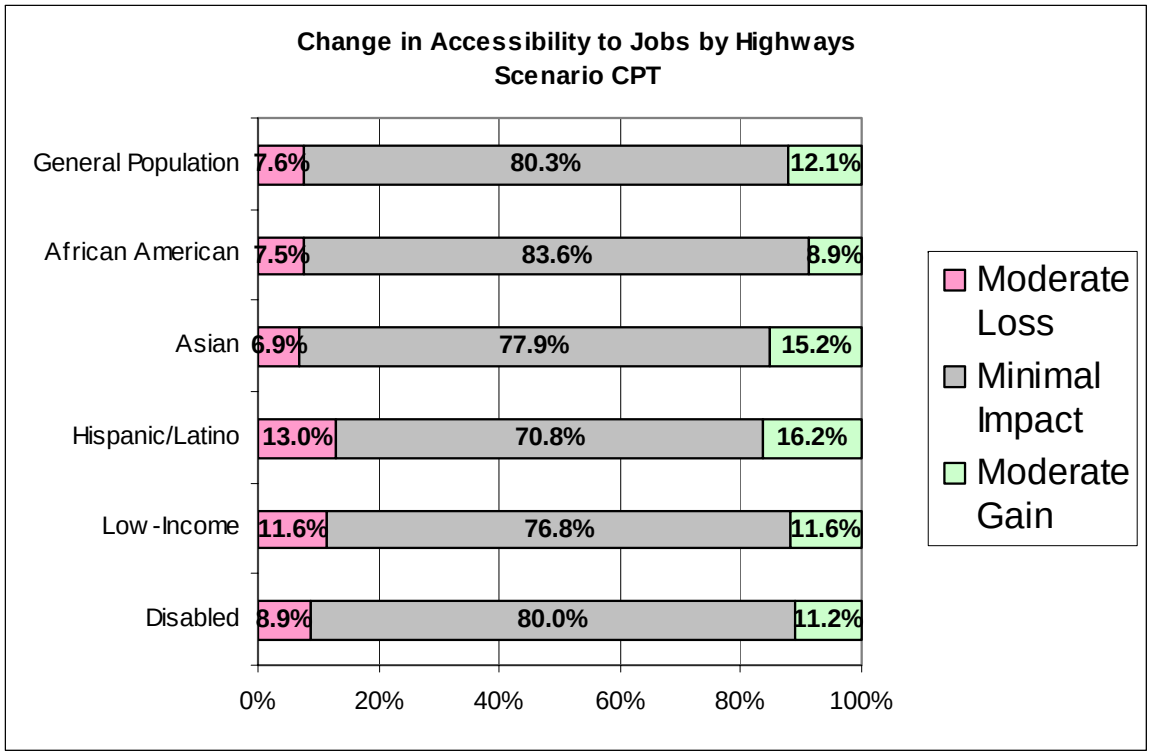
Evaluation of Potential Land Use Impacts

- Access to Jobs:
  - Influences location of households
  - Few zones experience significant changes in accessibility to jobs by highways (pictured)
  - Increases in accessibility to jobs by transit and walk-access transit
- Access to households:
  - Influences location of employers
  - No significant impacts on access to households by highways
  - Increases in accessibility to households by transit and walk-access transit



Impacts of Pricing Scenarios on Different Populations

- Benefits and burdens are fairly evenly distributed across the different population groups.



Assessing the Impact of Tolling Existing Lanes (1)

- Zettel & Carll (1964) note that tolling of existing lanes impacts three groups of people differently:
  - The Tolled: drivers using the newly tolled road who are willing to pay the toll
  - The Tolled-off: Former users of the newly tolled road, who have switched routes, modes or times for their trip, or are no longer making their trip altogether
  - The Un-tolled: Drivers who do not use the road in question but are impacted by the drivers diverted by the tolls

Assessing the Impact of Tolling Existing Lanes (2)

- Zettel and Carll (1964) frame the assessment of pricing strategies as follows:
  - The benefits: "*by reducing traffic flow, 'savings' in travel time, accidents, operating costs, etc., are provided for those who continue to use the highway.*"
  - The costs: "*the loss to users who must be prevented or induced not to use a congested road. The amount of the loss depends on what alternatives are available to those who are diverted.*"
  - The rationale: "*should be drawn up in broad planning terms, involving community amenities and esthetics. This requires a balancing of the total consequences, the adverse as well as the beneficial, not only as they affect users but also as they affect the community-at-large.*"

Topics for Further Consideration

- What Could Future Scenarios Include?
  - Tolling more existing lanes
  - BRT systems on toll lanes
  - Accommodation of commercial vehicles

- What Considerations Affect the Inclusion of VPLs in a Regional Network?
  - Visual Esthetics & Geometries of Parkways
  - Availability of Right-of-Way
  - Effects of Chokepoints on Network Performance

- Coordination with Current Corridor Studies in the Region
  - Southern Mobility Study, Western Mobility Study, 14th Street Bridge EIS, and I-66 Corridor Study

- Public Education about the Impacts and Rationale for Pricing
  - Importance demonstrated in international examples.

Next Steps

- Ongoing work under the Scenario Study provides an opportunity to pursue the key considerations.
- The next phase of the Scenario Study could identify high priority corridors for expanding the VPL network beyond the three facilities in the CLRP.