**ITEM 11 - Information**
September 15, 2010

Briefing on the "CLRP Aspirations" Scenario, Major Corridor Studies Considering Managed/Priced Lanes in the Washington region, and a new Federal Highway Administration (FHWA) Grant to Study Public Acceptability of Pricing Major Roadways

**Staff Recommendation:** Receive briefing on the three attached documents:

- Final report on the “CLRP Aspirations” Scenario;
- summary of major corridor studies considering managed /priced lanes in the Washington region; and
- new FHWA grant to study the public acceptability of pricing major roadways in the Washington region.

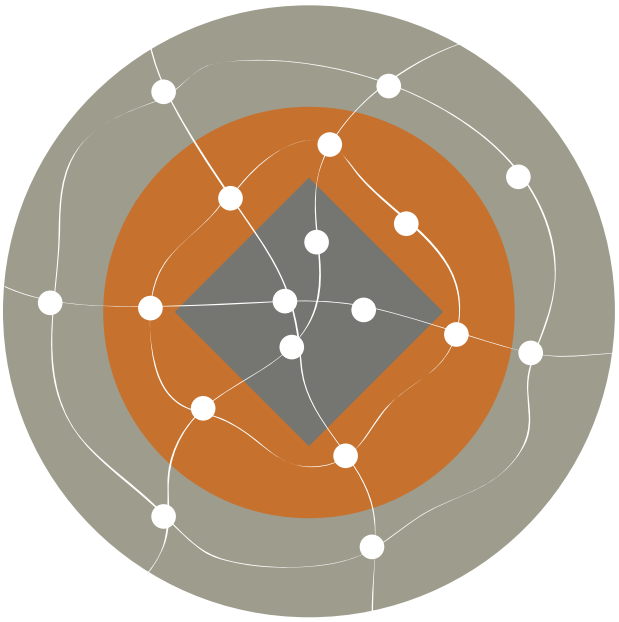
**Issues:** None

**Background:** At its January 20, 2010 meeting, the TPB was briefed on initial analysis results for the “CLRP Aspirations” Scenario, which combines more concentrated growth in the region’s activity centers with a regional high-quality bus rapid transit (BRT) network operating on an extensive network of variably priced lanes. At its October 21, 2009 meeting, the TPB approved the submission of the enclosed Value Pricing Grant Proposal to the FHWA to study public acceptability of pricing roadways in the Washington

Metropolitan Area.

# TPB Scenario Study

# CLRP Aspirations Scenario



# Final Report

September 8, 2010

National Capital Region Transportation Planning Board

| **TITLE:**<br>Final Report,<br>"CLRP Aspirations" Scenario, TPB Scenario Study | **Date:** September 2010<br><br>**Number of Pages:** 46 |
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**AGENCY:**
The Metropolitan Washington Council of Governments (COG) is the regional organization of the Washington area's major local governments and their governing officials. COG works toward solutions to such regional problems as growth, transportation, the environment, economic development, and public safety. The National Capital Region Transportation Planning Board (TPB) conducts the continuing, comprehensive transportation planning process for the National Capital Region under the authority of the Federal-Aid Highway Act of 1962, as amended, in cooperation with the states and local governments.

**ABSTRACT:**
This document provides a summary of the development, analysis and results of the "CLRP Aspirations" scenario, which is one of two scenarios in the TPB Scenario Study. This scenario examines the effects of a long-range land use and transportation vision for the National Capital Region out to horizon year 2030. This report includes a summary of past scenario studies and how this scenario fills a gap, an overview of the scenario development and methodology, and an analysis of how the integrated land use and transportation scenario meets TPB Vision goals. The scenario consists of a smart growth land use strategy, a network of variably priced lanes, and an extensive BRT network running on priced lanes.

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## Technical Oversight

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## Acknowledgements

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Jinchul (JC) Park, Senior Transportation Engineer
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and all others who provided input to this document.

# Table of Contents

# Introduction

The National Capital Region has been blessed for decades with continued growth and prosperity, manifested by consistent population growth, growing commercial investment, and steady growth in jobs, despite the recent economic downturn. As more people come to the region to live and work, the region has also provided vibrant, livable centers and neighborhoods. In the past few decades, the region has become home to many national models for sustainable development, including a wide range of transit-oriented developments (TODs), mixed-use walkable communities, and infill developments that have revitalized neighborhoods in the region's core. These types of developments can be seen throughout the region, from the Rosslyn-Ballston corridor in Arlington County and the Columbia Heights neighborhood in the District of Columbia, to the City of Rockville in Suburban Maryland and the Town of Reston in Fairfax County, Virginia.

These national models also serve as models for other communities within the region, because although the National Capital Region has seen significant growth and prosperity, development has not been geographically balanced, equitable, or sustainable in all cases. For instance, while this region has some of the best examples of TOD, affordable housing for all income levels around transit and major employment centers remains a major challenge. As a result, the geographic separation between where people work and where they live continues to grow larger and the mobility needs of commuters strains the region's highway and transit systems. The region thus finds itself dealing with what ranks among the worst congestion in the country (on both roads and transit) and continuing challenges in meeting federal air and water quality standards.

Of course, these problems have complexities that are unique to the region and difficult to address. Local jurisdictions were able to come together to regionally build the Metrorail system and develop a mature road network that anticipated some future growth. But the growth that came was uneven, with much higher concentrations of commercial investment on the west side of the region than the east. In addition to creating some level of socio-geographic stratification, this uneven growth has had implications for transportation efficiency. It has created problems of directional congestion where some portions of the system are cripplingly overburdened and some are underutilized.

At the same time there is a growing discrepancy between the overall demand for travel within and through the Washington Region and the capacity of the region's transportation networks to meet that demand; the resultant congestion is a major threat to the economic vitality of the region and the quality of life its residents enjoy. Regional strategies to address these challenges must recognize a context of severely constrained resources for transportation operations, maintenance, and investment. But regional approaches to these challenges offer the potential to realize the efficiencies and benefits

of multi-jurisdictional coordination and multi-sectoral integration.

The TPB has tackled these issues of land use growth and transportation for years, testing potential solutions to the many problems discussed above, and collecting and disseminating information on successful local strategies. The CLRP Aspirations Scenario work described in this report is built on a foundation of previous TPB study of alternative regional scenarios and strategies, which are noted in brief in this report.

It became clear after studying previous, distinct land use and transportation growth scenarios, that it was time to develop a more comprehensive approach to meeting long-standing regional transportation goals that not only tackled transportation investment, but land use development as well. The CLRP Aspirations scenario is the next step in the TPB's history of building awareness of regional problems, like congestion, air pollution, unbalanced investment and development, and dwindling funding resources.

# Why Do a New Scenario?

Although previous TPB scenario work resulted in meaningful conclusions about effective regional strategies for improving future travel conditions, there had not yet been an effort to pull together the best alternatives into a comprehensive scenario that could provide a clear path forward for the region. Such an undertaking could also help clarify the linkage between the TPB's scenario work and implementation of scenario findings via prioritization of projects in the region's Constrained Long-Range Transportation Plan (CLRP) or through ongoing initiatives such as the TPB's Transportation/Land-Use Connections (TLC) Program.

This section briefly describes previous scenario work and demonstrates how it provided the underpinnings for the CLRP Aspirations Scenario, as well as questions for which a new scenario was needed to answer.

## 1. The Regional Mobility and Accessibility Study (RMAS), 2000-2007

The TPB in 2000 launched the Regional Mobility and Accessibility Study (RMAS) to look at land use and transportation scenarios that were not part of current regional plans. A key purpose of the study was to see if there were actions the region's leaders might take to better meet the objectives of the TPB Vision, the regional transportation policy framework adopted in 1998.

Among its many goals and objectives, the TPB Vision calls for an increase in transit use and a reduction in VMT per capita. The Vision also stresses the need for better coordination between land use and transportation, with an emphasis on regional activity centers - places that are intended to be focal points for jobs and housing, and nodes for transportation linkages. The RMAS focused on those elements of the Vision.

The land use scenarios for the study were initiated by a number of "what if" questions, such as: What if more people who work within the Washington Region also lived here, rather than commuting from far-flung exurban areas like West Virginia and Pennsylvania? What if there was more development on the eastern side of the region? What if more people lived and worked close to transit?

Based on such "what if" questions, five land use scenarios were developed, based on the concept of changing where growth projected for 2030 would be located:

- **More Households** would increase, relative to projections, the total number of households in the region to more closely balance projected jobs to be located in the inner jurisdictions of the region.
- **Households In** would move some of projected household growth from outer jurisdictions into inner jurisdictions.
- **Jobs Out** would shift some of projected job growth from inner jurisdictions into

outer jurisdictions.

- **Region Undivided** would move some of projected job and household growth from the west to the region's eastern side.
- **Transit-Oriented Development** would put more of projected job and household growth close to transit.

These land use alternatives all promote concentrated land use patterns by shifting a significant portion of future growth into or close to regional activity centers. All five scenarios used different means to achieve the same objectives of bringing people and jobs closer together, and improving the transportation connections between them. The scenarios were not mutually exclusive, and in many ways were similar and complementary.

TPB staff analyzed the five land use scenarios, combined with additional transit projects not already included in regional plans, using the TPB's travel forecasting model. The analysis focused on the transportation effects of the various alternatives, including changes in congestion, transit use, and vehicle miles of travel. And on these measures, the scenarios produced positive results. When compared to the 2030 baseline, all five alternatives would slow the anticipated growth in congestion and driving, and in most cases would increase transit use.

The analysis has already inspired new regional programs. The TPB's Transportation/ Land-Use Connections (TLC) Program, begun in 2006, promotes models for implementing regional policies by funding community planning activities. These projects help facilitate concentrated growth in the region's activity centers and near transit, and address some of the micro-level issues raised during the RMAS outreach effort.

The next question was how the study could feed back into planning decisions and influence development policy. The 2006 TPB Chairman Michael Knapp is quoted in the 2007 edition of The Region saying, "[RMAS] has confirmed that we can make a positive impact on future transportation conditions by locating housing and jobs closer together, approving development closer to transit stations, and expanding our network of public transit lines to support regional activity center." Although the RMAS provides general policy direction, more work is needed to translate those lessons into implementation and policy.

To determine specific next steps, TPB staff worked in conjunction with the TPB's Citizens Advisory Committee to conduct dozens of public forums on the scenario results, called "What if the Washington Region Grew Differently?" The outreach forums highlighted a common desire for comprehensive land use and transportation strategies that take into account multiple factors and regional causes of congestion, and incorporate elements from more than one of the scenarios studied in RMAS. Overall the reactions to RMAS highlighted a significant amount of further work to be done in this area.

## 2. Study of a Regional Network of Variably Priced Lanes - 2006-2008

The TPB has had an active interest in variably priced highway lanes as a possible method of managing congestion and raising revenue to provide much needed transit service. In 2003, in conjunction with the Federal Highway Administration (FHWA) and the region's three state departments of transportation, TPB sponsored a conference on value pricing that catalyzed regional discussion on the opportunities for developing variably priced lanes and implementing other pricing strategies. Following the conference, the TPB created its Task Force on Value Pricing to examine how value pricing could benefit the region.

Beginning in 2006, this Task Force oversaw the development of a study funded by the FHWA to analyze the potential effects of pricing highway use in the Washington Region and outline several different scenarios for adding new priced lanes, pricing existing highways, and enhancing bus services.

Three different scenarios of variably priced lane networks were developed and analyzed:

A. The **"Maximum Capacity"** scenario added two variably priced lanes (VPLs) to each direction of most of the region's freeways. One VPL was added to each direction of major arterials outside the Capital Beltway. Existing high-occupancy vehicle (HOV) lanes were converted to VPLs, and direct access/egress ramps were added at key interchanges in the VPL network.
B. The **"DC Restrained"** scenario applied variable pricing to existing freeways and selected arterial lanes in the District of Columbia instead of adding new VPL capacity as in the "Maximum Capacity" scenario. Outside DC, this scenario would add the same new capacity as in the "Maximum Capacity" scenario.
C. The **"DC and Parkways Restrained"** scenario further enhances the "DC Restrained" scenario by applying variable pricing to the existing capacity on the region's parkways (Baltimore-Washington, George Washington Memorial, Rock Creek, Clara Barton, and Suitland).

The results of the analysis demonstrated that toll rates would need to vary significantly by segment, direction, and time-of-day in order to maintain free-flowing conditions on the networks of toll lanes. Toll rates would range from a low of 20 cents per mile to more than $2.00 per mile on the "Maximum Capacity" scenario, where all of the VPLs were either newly added lanes or conversions of existing HOV lanes. In the "DC Restrained" and "DC and Parkways Restrained" scenarios, toll rates were significantly higher on some segments, which was due in part to the fact that a significant percentage of lane miles in those scenarios were existing lanes as opposed to newly added lanes (43 percent and 56 percent, respectively).

The analysis was designed to elicit discussion, not to provide conclusive answers. "This

is not a proposal, it's a 'what if' study that provides very interesting insight into the implications of tolling for our region," said Arlington County Board Member Chris Zimmerman, 2008 Chairman of the TPB Value Pricing Task Force.

High-quality public transit was integral to the scenario analysis, as was emphasized by many Task Force and TPB members. The ability to run buses on value-priced lanes that are designed to be free-flowing allows for greater schedule predictability and more cost-efficient service, and is a key way to ensuring that value-priced lanes benefit not just those who can afford to pay the tolls.

While individual variably-priced facility projects such as the I-495 HOT Lanes in Virginia and the Intercounty Connector in Maryland have progressed and are currently under construction, with other projects in planning stages, the TPB study provided the first look at a region-wide network. The Value Pricing Task Force acknowledged early on that while VPL projects were likely to become more prevalent in the region, they would come online gradually on a project-by-project basis, not as part of a comprehensive regional initiative to implement an entire network. But it is possible and perhaps likely that individual toll projects and studies would eventually connect to form a network very similar to the one studied and the study allowed for quantification of the congestion benefits and cost estimates for such a network. The study also showed that there would be significant regional benefits, but that feasibility and equity concerns would be major hurdles to implementing an integrated regional network of VPLs.

## The TPB Scenario Study

The RMAS and the VPL Study yielded several important insights that can, and have, informed decision-making in the region. Moving forward, the TPB sought to fill in the gaps of the studies through new research and outreach opportunities that would eventually lead to a meaningful integration of study results into TPB planning processes and initiatives.

At its September 19, 2007 meeting, the TPB established the Scenario Study Task Force, chaired by TPB member Michael Knapp. The mission of the Task Force was to provide policy-level stewardship for the continuation of the Scenario Study and related TPB activities (such as the RMAS and VPL Study) and to move from "what if" to "how to."

The Scenario Study Task Force, the TPB Citizens Advisory Committee (CAC), and others identified several factors that limited the relevance and impact of the Scenario Study results. First, the RMAS and VPL scenarios had been essentially one-dimensional in approach; each scenario employs a distinct strategy for addressing regional challenges, but no scenarios had been studied that combined multiple strategies. While cost analysis was performed for the original RMAS scenarios, and costs were analyzed as part of the VPL scenarios, the Scenario Study had focused only limited attention on consideration of financial constraints. In addition, the study assessed the impacts of certain land-use and transportation strategies on regional transportation indicators, but

only touched upon non-transportation related indicators such as environmental and other quality-of-life measures.

In February 2007, the CAC issued recommendations to the TPB calling for "development of refined, new, or composite scenarios that will identify packages of transportation projects and land-use strategies that produce positive, synergistic results," and for the process to "draw upon information developed from existing scenarios and from public feedback.

With those issues in mind, the Scenario Study Task Force proposed development of two new scenarios: a "What Would It Take?" Scenario that would start with a 2030 goal such as a level of mobile-source greenhouse gas emissions reduction and see what would be necessary to meet that goal; and the "CLRP Aspirations" Scenario described in this report.

The CLRP Aspirations Scenario represents a combination of land-use strategies from the RMAS scenarios along with a slate of transportation improvements that builds off of the 2008 CLRP and incorporates elements from the transportation networks analyzed in the RMAS and VPL scenarios; however, the land-use shifts and added transportation facilities included in the scenario were not limited to those already included in the previous studies. The scenario was intended to remain generally within the realm of affordability for the region given expected availability of funds, including the incorporation of VPL facilities as a revenue source. Analysis of the scenario relies entirely on the regional travel demand model and thus adheres to the representations of travel behavior reflected in the model.

# Goals of the Scenario Exercise

The CLRP Aspirations Scenario represents the first time that the TPB has developed an alternative land use and transportation scenario whose purpose is not just to explore a single regional challenge or experiment with a single strategy, but instead to take a holistic, comprehensive approach to achieving a long-range regional outcome that is as preferable as possible to the business-as-usual baseline.

More specifically, the scenario seeks to better align land use and transportation planning with the goals of the TPB Vision and of the previous RMAS initiative. These goals include creating "economically strong regional activity centers with a mix of jobs, housing, services, and recreation in a walkable environment", "a web of multi-modal transportation connections which provide convenient access", "a user-friendly, seamless system", and a combination of land use and transportation options that result in the "reduction of per capita VMT." In addition, the scenario seeks to maintain the principles of RMAS, such as capitalizing on existing transit infrastructure through transit-oriented development, addressing geographic imbalances in development, and reducing congestion and commute times by getting jobs and housing closer together. The scenario in its completed form is intended to achieve these goals to the extent possible by creating highly accessible and developed activity centers served by an extensive transit network.

The determination was made that in constructing the scenario, goal-oriented rules would serve as the basis for land-use shifts and corresponding transportation investments and interventions. The process for developing the scenario is described in further detail in subsequent sections, but it is important to note that rather than simply being a composite of previous scenarios, the CLRP Aspirations Scenario arose from a fresh process that was strongly informed by, but not constrained by, previous scenario work.

## Land Use

One way in which previous scenario work informed the CLRP Aspirations Scenario was by providing evidence, courtesy of the regional Travel Demand Model, that bringing jobs and housing closer together and closer to transit enhances mobility, access, and transportation choice for residents of the region. Analysis of the RMAS scenarios - all of which were variations on that common theme, showed that even pursing a concentrated, transit-oriented land use pattern incrementally could result in VMT decreases.

While the presence of transit infrastructure facilitates the concentrated land-use that is desired, the concentrated land-use also facilitates transit by providing transit-supportive density—a sufficient demand for transit service within a small enough space that transit investment is cost-effective. A certain level of density and a mix of land uses are also

helpful in ensuring that activity centers are walkable. In order for people to want to walk, they must feel safe - a quality that is enhanced by both activity and design. Dense, mixed-use development provides destinations that attract both day and evening activity. And permitting a certain level of density can also help local jurisdictions give developers the incentive to provide well-designed and well-constructed sidewalks, plazas, and other enhancements to the pedestrian experience.

Achieving more concentrated development also helps attain other regional benefits not related to transportation. It can slow down the rate of greenfield and agricultural land consumption, and can make it more affordable for localities to provide public utilities and other services.

## Transportation

The provision and maximization of complementary transportation infrastructure is just as crucial as achieving desired land-use patterns in this chicken and egg relationship. "Which comes first?" is an oft-debated question, but is largely irrelevant to the CLRP Aspirations Scenario, which is grounded in the knowledge that both are necessary to achieve regional goals.

The outreach effort that followed the development of the RMAS scenarios captured the extent to which members of the public appeal for more and better transit service when presented with the prospect of more concentrated development and communities with greater density. The region's residents want transit that facilitates circulation with the region's activity centers and that connects activity centers to each other—for both work and non-work trips.

But while there is certainly under-utilized transit capacity in the region, which is addressed by the Aspirations scenario, the demand created by growth and more concentrated development cannot likely be accommodated without some level of additional investment. That requires revenue, which is currently scarce and not expected to become abundant any time before the scenario horizon. The earlier TPB analysis on options for implementing variable pricing in the Washington region was seen as a possible scenario input to deal with revenue issues, as well as other transportation challenges.

Across the country and the globe, metropolitan areas facing revenue constraints for transportation are turning to variable pricing of both new and existing travel lanes as a way of funding both highway and transit improvements, while simultaneously decreasing congestion and improving bus service by providing free-flowing lanes. Including a network of VPL facilities throughout the region, along with a network of enhanced bus service utilizing those facilities, was viewed as the most promising way to make the CLRP Aspirations scenario financially feasible.

The scenario was designed to represent a realistic alternative future for the region that could be implemented via TPB planning processes and a collaborative regional effort led by the TPB and COG. As such, it was developed within the limits of two key constraints. The first is that land use shifts should be able to realistically accommodate proposed densities while maintaining the existing or planned neighborhood character so that it can be considered for possible inclusion in the Cooperative Forecasts. The second is that transportation projects proposed for development under this scenario should be financially within reach, by assuming realistic funding sources. Possible funding sources include local and/or regional tax revenues, financial contributions from developers and increased land values around transit stations, revenue streams from pricing selected facilities, and new federal funding available for transit or possibly metropolitan areas through climate change legislation and federal transportation legislation reauthorization.

The CLRP Aspirations Scenario was intentionally designed to reflect the current procedures of the CLRP, such as the same representations of travel behavior used in the current TPB travel demand model and the same procedural guidelines required for federal air quality conformity analysis. This method preserves the possibility that the CLRP Aspirations Scenario could eventually serve as a de facto 'unconstrained' regional long-range transportation plan, following regional dialogue and outreach about the study findings. As updates are made to the TPB travel demand model through the inclusion, for example, of more recent household travel survey data both the CLRP and the scenario analyses will be updated to reflect the latest technical data and methods available.

# Scenario Baseline

It is impossible to gauge the value and effectiveness of an alternative scenario without an accurate and well-understood baseline. The TPB and COG are tasked with regularly producing a long-range transportation and land-use baseline, in the form of the Constrained Long-Range Transportation Plan (CLRP) and the Cooperative Land-Use Forecasts, respectively. The combination of the most recent cooperative forecast and the current CLRP serves as the input for the regional Travel Demand Model, which in turn produces long-term forecasts for travel conditions and air quality. The CLRP Aspirations Scenario was analyzed in relation to a baseline comprised of the Round 7.2 Cooperative Land-Use Forecasts for 2030, approved by the COG Board on October 14, 2009, and the 2030 CLRP as of the updates approved by the TPB at its July 16, 2008 meeting. Each aspect of the baseline is discussed below:

## The Cooperative Land-Use Forecasts

The Cooperative Forecasting Program, established in 1975 and administered by COG, enables local, regional, and federal agencies to coordinate planning using common assumptions about future growth and development in the region. Each series of forecasts, or a "Round," provides land use activity forecasts of employment, population, and households by five-year increments. Each round covers a period of 20 to 30 years.

The Cooperative Forecast is a multi-stage, "top-down/bottom-up" process undertaken by COG's Planning Directors Technical Advisory Committee and the Cooperative Forecasting and Data Subcommittee. It employs a regional econometric model and local jurisdictional forecasts. The model projects employment, population, and households for the metropolitan Washington area based on national economic trends and local demographic factors. Concurrently, local jurisdictions develop independent projections of population, households, and employment based on in-the-pipeline development, market conditions, planned transportation improvements, and adopted land use plans and zoning. The Cooperative Forecasting and Data Subcommittee, which is comprised of local government planners, economists, and demographers, reviews and reconciles the two sets of projections.

Recognizing that market conditions and policies may change, the subcommittee reviews the forecasts annually, and allows local governments to make minor adjustments. The forecasts are also adjusted to reflect local governments' assessments of the likely housing and employment impacts due to major new transportation facilities.

The Cooperative Forecasts are approved by the COG Board concurrently with the National Capital Region Transportation Planning Board's (TPB) approval of the results of the annual air quality conformity analysis of the Transportation Improvement Program (TIP) and the Financially-Constrained Long Range Plan (CLRP).

The Round 7.2 Forecasts reveal dramatic increases in employment, households, and population by 2040, the end of the forecast period. According to the forecast, regional employment would total more than 4.6 million jobs by 2040, a 49 percent increase over the 2005 employment base of 3.1 million jobs. Households would reach more than 2.7 million, a 44 percent increase. The Round 7.2 Forecasts reflect the recommendations of the 2005 Base Realignment Closure (BRAC) Commission, as of June 2009.

## The Regional Activity Centers

The concept of "Regional Activity Centers" has been a part of the cooperative forecasting process since 2002, but how exactly is a "regional activity center" defined, and what power does this framework have as a tool for developing, analyzing, and implementing transportation and land-use scenarios?

As part of its 1998 Vision, the TPB adopted a series of goals, objectives and strategies, including the following objective seeking better interjurisdictional coordination of transportation and land use planning: "…A composite general land use and transportation map of the region that identifies the key elements needed for regional transportation planning—regional activity centers, principal transportation corridors and facilities, and designated green space."

In 2002, the COG Board of Directors and the TPB approved the final Regional Activity Centers and Clusters maps based on the Round 6.1 Cooperative Forecasts as a tool to help guide land use and transportation planning decisions. The 58 Regional Activity Centers, which are based upon current local comprehensive plans and zoning, contained slightly more than half of the region's current and future employment, but only about 10 percent of the region's households. They are classified into one of five typologies according to their concentration of employment and housing. The Regional Activity Clusters were developed to portray a more stylized, conceptual depiction of development in the transportation corridors, much like the maps prepared for the Northern Virginia 2020 Plan. They depict groupings of Regional Activity Centers as well as the concentrations of housing and jobs immediately surrounding the Centers and along major transportation facilities. These Regional Activity Clusters contained nearly 70 percent of the region's current and future jobs and approximately 31 percent of the region's current and projected households.

In approving the maps of Regional Activity Centers and Clusters, the COG Board and the TPB also approved Resolution R13-02 which recommended that COG review and amend the regional activity centers maps following the adoption by the COG Board of each major round of its cooperative forecasts, i.e., Round 7.0, Round 8.0, etc. In addition, local and regional planning and policy goals may recommend working to increase either the amount of employment or housing in the Centers and Clusters.

The Regional Activity Centers and Clusters have been used extensively as a technical and

policy tool to analyze the likely effects of growth and change in the region. For instance, the Regional Activity Clusters served as the basis for reallocating future household and job growth for each of the five alternative land use scenarios in RMAS. TPB staff has also used the Regional Activity Clusters to identify how transportation projects/ proposals support the regional core and regional activity centers, as stated in Goal 2, Strategy 4 of the TPB Vision: "...Give high priority to regional planning and funding for transportation facilities that serve the regional core and regional activity centers, including expanded rail service and transit centers where passengers can switch easily from one transportation mode to another."

In the most recent TPB Regional Household Travel Survey (2007/2008), the results indicated that placing priority on activity centers would not be without significant benefits. Among the survey findings are important differences in travel behavior between activity centers and non-activity centers. First, it was found that residents of the larger Regional Activity Centers/Clusters made two to three times more daily transit and walking trips than persons living elsewhere in the region. Correlated to this finding is that residents of inner area Regional Activity Centers/Clusters make fewer daily auto trips and travel fewer vehicle miles per household than persons living elsewhere in the region. It is likely that the density, walkability, and often-transit oriented nature of the activity centers provides enough alternative options to driving to enable a more balanced mode choice distribution across auto, transit, and walk/bike, which in turn has environmental, equity, and travel efficiency benefits.

The benefits of concentrating growth in activity centers make them an important potential policy tool; however, they are not fully utilized to date. By 2030, the Regional Activity Centers are forecast to capture approximately 2.05 million jobs, or 50 percent of all jobs in the region. Excluding the Mixed-Use Centers, the Regional Activity Centers are defined in terms of concentrations of employment. As a result, by 2030, the Regional Activity Centers are forecast to capture approximately 427,000 households, which is only 18 percent of all households.

The Round 7.2 Forecasts show that only about 45% of new jobs between 2015 and 2030 and about 30% of new households will be added to activity centers. Therefore, there is significant growth that can be better managed and concentrated to achieve the region's development goals. The forecasts also show a continued mismatch between the areas of concentrated development and the region's transit infrastructure. The Regional Activity Centers and Clusters contain 62 Metrorail Stations, eight Maryland Commuter Rail (MARC) stations, and seven Virginia Railway Express (VRE) stations. However, within the COG/TPB member jurisdictions, there are 24 Metrorail stations, 12 MARC, and eight VRE stations that are not located within Activity Center or Cluster boundaries.

While the Regional Activity Centers and Clusters are clearly descriptive of future growth anticipated in the region, a more important question has been whether or not the Centers and Clusters would or could be used as a prescriptive tool to guide future residential and commercial growth. The TPB Regional Mobility and Accessibility Study

(RMAS) land use and transportation scenarios demonstrated the positive benefits which would result from alternative future land use growth patterns. Discussion of other possible steps toward implementation has included the idea of identifying specific regional and local numeric targets for land-use density and mix in each center and overall.

The five typologies for Regional Activity Centers were established in 2002, with land-use criteria and descriptions of the differing character of the urban environment in the different types of centers:

- **DC Core**—Primary focal point of Metropolitan Washington. Comprises major centers within the District of Columbia. Contains the major governmental, cultural and tourism activities of the region, as well as significant business and commercial activity. Center of the region's transit system. Pedestrian-oriented sidewalk network with an organized street grid/block configuration.
- **Mixed Use Centers**—Generally urban in character, areas up to two square miles (1,280 acres) that contain either a dense mix of retail, employment, and residential activity or significant levels of employment and housing. Accessible by transit or commuter rail and by major highways. Employment Criteria: Greater than 15,000 jobs and greater than 25 jobs/acre in 2030. Residential Criteria: Greater than 10 units per acre.
- **Employment Centers**—Higher density areas up to 3.5 square miles (2,240 acres) that contain significant concentrations of employment. Generally urban or becoming more urban in character. Employment Criteria: Greater than 20,000 jobs and greater than 30 jobs/acre in 2030.
- **Suburban Employment Centers**—More dispersed, lower-density areas, less than six square miles (3,840 acres). Employment Criteria: Greater than 15,000 jobs and greater than 10 jobs/acre in 2030.
- **Emerging Employment Centers**—Rapidly developing "campus-style" suburban employment areas less than six square miles (3,840 acres) in total area. Employment Criteria: Greater than 15,000 jobs in 2030, and greater than 50 percent job growth between 2005 and 2030 OR less than 50 percent commercial buildout in 2030.

The Regional Activity Centers provide a useful framework to guide a land use and transportation vision for the region and is used as a primary basis for the CLRP Aspirations Scenario.

## The CLRP and its Performance

The transportation component of the baseline for the CLRP Aspirations Scenario analysis is provided by the CLRP as adopted in November 2008. The performance analysis of the 2008 CLRP showed trends that run counter to the goals for the CLRP Aspirations Scenario. On the land-use side, metropolitan growth was projected to be most rapid in outer jurisdictions and outside regional activity centers. Additionally,

there would continue to be areas of concentrated development with no transit service, as well as areas with high quality transit capacity but no concentrated development.

As a result of the land-use trends and a slate of transportation improvements highly constrained by available revenues, it is no surprise that the performance analysis indicated large increases in congestion by 2030 on both the road and transit networks. With population and employment increases throughout the region, both VMT and transit ridership are expected to rise considerably. Lane miles of congestion in the region are projected to increase 43% between 2007 and 2030, though there is some improvement around planned HOT lane facilities. Similarly, the entire Metrorail system is expected to approach full capacity by 2030 absent additional, currently unforeseen funding.

# Developing the Scenario

The CLRP Aspirations scenario is intended to provide guidance for the Washington region to better meet the goals of the TPB Vision and RMAS. Meeting these goals requires changes to both the transportation system and also where residential and commercial development is forecast to be located. As such, two components of the scenario were developed in concert: a transportation component and a land use component. Both components were developed separately using different inputs and tools, as discussed below; however, the development of each component was informed by the other in order to create a transportation system that fully supports the land use, which in turn was modified to best take advantage of the region's existing transportation assets.

## Land Use

The primary purpose of the scenario's land use component is to make the transportation system more efficient by concentrating growth in mixed use activity centers around existing and planned transit, which is expected to enable shorter trips made by transit, walk, or bicycle. However, this general approach is expected to more than just achieve transportation efficiencies. The land use component seeks to recreate the region's 58 activity centers and additional transit station areas into economically vibrant, walkable, and transit supportive places.

As described in the previous "Baseline" section, regional forecasts of residential and commercial growth indicate a more sprawling, less efficient future than what is described in the goals of the Aspirations Scenario. Therefore, the land use component strategically redirects projected jobs and household growth, which factors in both new development and also projected redevelopment, into activity centers and around existing or planned transit infrastructure.

The concept of shifting projected land use growth for the purposes of this study has practical limitations that can inform how long-range integrated transportation and land use planning should be undertaken. As evidenced by RMAS, the amount of growth available to shift into existing activity centers is limited. In this study, it is assumed that all residential and commercial development planned before 2015 is in the pipeline and therefore unchangeable, leaving only 15% of 2030 jobs and households to be physically redirected to create more concentrated, smart growth oriented land use development. This becomes further constrained because 28% of the 2015-2030 growth is already forecast to occur in targeted growth areas, ultimately leaving only 11% as movable growth. While this may be true, adopting a strategic framework for shifting projected land use growth makes it possible to improve the urban form and achieve densities high enough to increase transportation options for much more of the population than is represented by the 2015-2030 growth.

The development of the land use component is comprised of a series of goal-oriented "rules" for shifting growth. All activity centers and transportation analysis zones (TAZs) with current/planned transit infrastructure received the necessary amount of residential and employment growth to be (1) transit supportive, (2) walkable, and (3) mixed use. These areas are the scenario's "targeted growth areas."

**(1) Transit Supportive**

In order for transit to be successful and financially feasible, it must be easily accessible to critical threshold of potential users. Currently, many of the region's activity centers do not possess high enough densities to fully support even low frequency, lower cost transit services. Therefore, all targeted growth areas have varying residential and employment density goals that reflect what is realistic given their current urban form, but that are high enough to support varying levels of transit service, from local bus service with 30 minute or more headways to rapid transit with 5 minute or less headways. These assessments were based on research linking density and urban form to transit service:

Table 1: ITE Relationships between Transit Frequency and Land-Use Density

| Transit Mode | Frequency of Service | Density Threshold |
|---|---|---|
| Bus | 60 Minute Headway | 4-5 du/acre |
| | 30 Minute Headway | 7 du/acre |
| | 10 Minute Headway | 15 du/acre |
| Light Rail | 5 Minute Peak Headway | 9 du/acre |
| Rapid Transit | 5 Minute (or Less) Peak Headway | 12 du/acre |
| Commuter Rail | 20 trains/day | 1-2 du/acre |

**(2) Walkable**

The targeted growth area density goals were also determined based on regional criteria for walkability. This region has several models of walkable urban centers, each with varying levels of density and scale of development. Two representative models were used to frame density goals, one for higher density activity centers and another for lower density activity centers. The Rosslyn-Ballston Corridor has high densities of 20 du/acre or more and was thus used to inform walkable density goals for existing high density activity centers. Old Town Alexandria has lower, but walkable densities of 7-10 du/acre and was thus used as a model for lower density centers. Of course, achieving walkable centers requires more than just high densities; it also requires pedestrian infrastructure, such as sidewalks, sufficient crosswalks, adequate lighting, and inviting and engaging streetscapes. The scenario analysis depends entirely on the regional travel demand model, which makes "area type" assumptions based on density. As such, specific assumptions regarding pedestrian infrastructure are not included in the scenario and instead are assumed to be implicit in areas of higher density.

**(3) Mixed Use**
Lastly, creating options for short trips requires some level of concentration of a variety of uses to ensure that origins (a home, for example) are relatively close to destinations (office, retail, entertainment, etc). Therefore, all targeted growth areas have varying goals for jobs/housing balance that, like with the density goals, reflect what is realistic given their current urban form.

Of the five different types of activity centers (DC Core, Mixed Use, Employment Center, Suburban Employment Center, and Emerging Employment Center) only Mixed Use centers have a residential density requirement in addition to an employment density requirement. The three types of employment centers have varying levels of density, but in some instances the residential density can be very low, such as less than one unit per acre, indicating an inability for residents to live near their work in these job centers. Therefore, the goal for these types of activity centers is to approach a balance of housing, employment and services. For other centers where the current densities are higher, the goal is to create a truly balanced mix of uses, enabling a resident to walk to a myriad of destinations.

The jobs/housing balance for the region is also improved by using the strategy of the More Households RMAS scenario, where additional households, and in this case some jobs, were added to the region's 2030 forecast. Specifically, a 3.5% increase in households and a 1% increase in jobs was assumed to be attracted into the region from outer jurisdictions beyond the TPB member area, which translates into a reduction in external trips coming into and leaving the region within the regional travel demand model. Jobs/housing balances were also maintained at the jurisdictional level to guide the inter-jurisdictional shifts of housing and jobs.

It is worth repeating that the density and jobs/housing goals for each targeted growth area will vary according to existing or planned conditions. Some activity centers that currently have lower densities cannot support the density of the DC Core or the Rosslyn-Ballston Corridor, nor is there enough projected growth between 2015 and 2030 to bring the densities of the 58 regional activity centers to those levels. Therefore, the concept of the targeted growth area was disaggregated further into seven "typologies," each with a residential density goal, an employment density goal, and a jobs/housing balance goal that reflects what is realistic. These typologies include the five types of activity centers, as well as transit station areas not in an activity center (either metrorail/transitway or commuter rail), each with different, realistic density and jobs/housing balance goals.

By concentrating growth strategically in these different types of areas, it is expected that the goals of the TPB Vision as well as the principles of RMAS can be better achieved. Directing future growth into activity centers can allow them to be more walkable and amenable to high quality transit infrastructure. Additionally, because growth is directed to areas with current transit infrastructure, progress is made toward geographically balancing development across the region, such as in the eastern portion of the region

where development opportunities around transit stations are not fully utilized.

## Transportation Component

It is understood that just as transportation cannot single-handedly solve the region's development problem, neither can land use planning. The scenario's transportation component focuses on supporting the land use component by providing increased accessibility to the targeted growth areas, specifically for transit riders, carpools and those willing to pay tolls to drive low-occupant vehicles on variably priced lanes and facilities.

Although it is expected that concentrating land use around particularly underutilized transit stations can improve the efficiency of the current system, it is likely that new, more extensive services will be necessary to support increased population and commercial growth. The transportation component includes highway and transit improvements with major improvements to the baseline forecast coming from 3 major sources: TPB's 2008 study of variably priced highway lanes, a new regional network of bus rapid transit (BRT) operating on the network of variably priced highway lanes, and the RMAS transit network.

Pairing the priced lanes with BRT service provides the potential for great synergy: variably priced toll lanes provide free-flowing running-way for bus rapid transit vehicles and toll revenue offsets the cost of BRT facilities and service. BRT services reduce the demand for the priced lanes, allowing them to operate more smoothly and preventing congestion. Both the BRT and priced lanes should provide mode-shift incentives, providing congestion relief to the existing general purpose lanes.

**1. Regional Network of Variably Priced Highway Lanes**
In February, 2008, the TPB completed an 18-month study of networks of variably priced lanes for the Washington region. The study evaluated the demand and revenue forecasts for different combinations of pricing of newly constructed and existing lanes. One such network included new lanes on all freeways outside the District and selected urban arterials outside the Capital Beltway in addition to the tolling of selected existing facilities: US National Park Service Parkways and all freeways and river crossings in the District. The revenue forecasts for this network approached the estimated cost of constructing and operating the toll facilities.

This regional network of variably priced lanes is the basis for the CLRP Aspirations scenario.

**2. Regional Bus Rapid Transit Network Operating on Toll Lanes**
A high-quality network of bus rapid transit (BRT) service was then layered onto the regional network of priced lanes. The BRT is intended to be high quality, rail-like service that would integrate with the existing Metrorail system. It uses the relatively free-flowing priced lanes as running-way, allowing for rail-like travel speeds and

levels of service. The BRT network provides service to BRT stations in the regional activity centers as well as connections to Metrorail stations and existing park-and-ride lots via dedicated access ramps, which correspond with the targeted growth areas of the land use component. The extensive reach of the BRT network provides critical, new circumferential transit service and also provides important redundancies to the Metrorail system, which should relieve projected transit congestion.

The BRT service consists of varying bus transit service levels that depend on the goal densities specified in the Land Use Component. Lines connecting to the core have peak headways between 10 and 12 minutes (5 or 6 trips per hour) and off-peak headways of 30 minutes. Lines connecting less-dense activity centers operate less frequently.

Although the BRT would be running on the freeway, service would be provided to bus stations in activity centers via dedicated access ramps. In most cases existing infrastructure, such as transit stations and park-and-ride lots were used as BRT stations. In cases where there were no existing transit stations or lots, new stations were created in the regional travel demand model. In order to provide a high quality service, all stations are assumed to include BRT design standards and technologies (off-board fare payment), level-boarding, multi-door access) to reduce the dwell time. This reduced dwell time, dedicated access ramps and pseudo-dedicated right-of-way should result in an average BRT operating speed of approximately 45 mph where the transit service operates on freeway lanes.

Within the urban core, where few priced lanes will be evaluated, the bus transit service will operate in mixed traffic lanes along selected priority corridors as identified by WMATA in its Priority Corridor Network plan. Technologies and techniques such as transit signal priority, queue jump lanes and selective dedicated bus lanes are being considered for these Metrobus corridors. Along these corridors, an approximate average speed of 15 mph was assumed.

The BRT system is largely designed to facilitate longer trips utilizing the region's freeway network. Accessing transit in certain activity center neighborhoods would likely require neighborhood circulator services, which were provided in the scenario. For transportation analysis zones that were within targeted growth areas but did not have high frequency bus service (10 minute or less headways), circulator services were provided to connect one or more BRT stations with targeted growth areas. Fifteen activity center circulator systems with 10-minute headways were added to the scenario.

### 3. Selected RMAS Projects

The BRT and priced lane network provides access to nearly all of the targeted growth areas and would also overlap with and connect many transit projects considered under the RMAS effort. A few RMAS projects that would provide additional transit service particularly to and within activity centers not connected to the BRT and priced lane network were included in the scenario transit network. These projects include:

A. Purple Line Extension from Silver Spring to New Carrollton
B. Georgia Avenue Transitway, from Glenmont to the Intercounty Connector (ICC)
C. US 1 Transitway, from King Street Metrorail station to Potomac Mills via Fort Belvoir and Woodbridge.
D. VRE Extension from Manassas to Haymarket, via "Innovation" and Gainesville.

**Local Outreach**

A major factor in the development of the CLRP Aspirations scenario was to somewhat limit the land use and transportation components using the concept of being "within reach." This does not mean that the components have been rigorously tested for technical or political feasibility; however, extensive outreach to local planners was conducted to reflect local-level realities at a high level. After developing the basic framework for both the land use and transportation elements of the CLRP Aspirations Scenario and applying a rules-based approach, TPB staff met with planning and transportation staff from the local jurisdictions in the TPB planning area. These jurisdictional meetings were held with:

A. District of Columbia
B. Prince William County
C. Prince George's County
D. City of Alexandria
E. Montgomery County
F. Arlington County
G. Frederick County and City of Frederick (joint meeting)
H. Loudoun County
I. Fairfax County
J. Virginia Department of Transportation

At each meeting technical details regarding both the land use and transportation components were discussed and comments were collected for incorporation into the final scenario. These comments included broad changes, such as a request to use the COG Cooperative Forecast Round 7.2 rather than Round 7.1, which included outdated assumptions and that targeted growth areas should only have growth shifted into them and not out even if they were already beyond the density goal. Other major comments included: modifications to the targeted growth areas to deemphasize some regional activity centers and/or to concentrate growth in up-and-coming local centers, such as Westphalia, Fort Belvoir, and others; changes to specific BRT routing, particularly when circulating through targeted growth areas; and changes to BRT station number and placement.

Additionally, the scenario received review throughout the development process from the TPB Regional Bus Subcommittee and the COG Planning Directors Technical Advisory Committee, as well as broader review from the TPB Technical Committee and Scenario

Study Task Force.

In addition to some degree of technical feasibility, the "within reach" concept also attempted to consider financial feasibility of the transportation component. The reality that funding for new transportation infrastructure is severely limited and is becoming more limited every year was a primary driver of the inclusion of the pricing component. The regional priced lane network is roughly estimated to generate $2.5 billion in revenue annually. Although the costs of the tolled network are also high, with costs and revenues not equally distributed across the region, it is expected that the toll revenue could be used to partially finance transit, which is a necessary component of a pricing strategy in order to insure some level of social equity. According to revenue estimations completed for the 2008 TPB Study "Evaluating Alternative Scenarios for a Network of Variably Priced Highway Lanes in the Metropolitan Washington Region," for the "CPT Scenario," which provides the foundation for the CLRP Aspirations Transportation Component, 20-year revenues from tolls are expected to achieve a 96% cost recovery rate on the construction of the new priced lanes and associated interchanges providing access to the tolled network. The cost for the tolled network is estimated at roughly $51.5 billion. More information on the priced network and the cost assumptions, please see the aforementioned 2008 study here: http://www.mwcog.org/TPB/VPTF/docs/RVPS_Final_Report.pdf. It should be noted that these estimates assume a high number of costly interchanges that provide access to the tolled network. This is discussed further in the "future work" section.

The scenario also includes other transit services that do not operate on tolled lanes, such as BRT and circulator service assumed to operate on local streets, as well as rail projects. These services are assumed to be funded by various sources, such as special tax districts, tax-increment financing or developer proffers, as it is well understood that public funding for such projects is in short supply.

## The Final CLRP Aspirations Scenario

Following the process outlined above, the developed scenario consists of three distinct, but connected layers: land use, roads and pricing, and transit. The scenario redirected a substantial amount of residential and commercial growth projected to come into the region between 2015 and 2030 and added substantial new transportation infrastructure to the current road and transit networks.

### Layer 1: Land Use

Of the 11% of jobs and households projected for 2030 to be "movable," 60% was actually shifted. This translates into 7% of 2030 jobs and households being shifted into targeted growth areas.

Jobs and households projected to be in targeted growth areas increased significantly under the scenario with an 11% increase in the number of jobs and a 42% increase

in the number of households. Under baseline conditions 58% of jobs and only 26% of households are forecast to be in targeted growth areas. Under the scenario, these numbers jump to 64% of jobs and 36% of households.

On the succeeding four pages are two sets of land use maps illustrating the major changes studied in the land use component. Figure 1 shows the land use growth in the scenario in terms of households and employment for 2030. For comparison, Figure 2 shows the same data for the baseline. The scenario growth maps clearly show a much more concentrated growth pattern than the forecast baseline. Figure 3 shows the density of the scenario land use, which, when compared with Figure 4 showing forecast land use density, shows particularly higher household densities in targeted growth areas, as expected. Higher household densities coupled with high employment densities in targeted growth areas implies that a more even jobs/housing balance within activity centers was achieved, as desired.

Layer 2: Roads and Pricing

The scenario creates a 1,650-mile regional priced lane network with 150 priced lane miles that are currently in the baseline CLRP (9% of the total network), 350 lanes miles converted from HOV lanes (21% of the total network), 650 new priced lane miles (40% of the total network), and 500 priced lane miles converted from general purpose lanes in the District of Columbia and on the region's national parkways (30% of the total network). This priced lane network provides new, priced capacity for auto users and creates relatively free-flowing right of way for bus transit. A map of this network is provided in Figure 5 on page 28.

Layer 3: Transit

The scenario creates a 500-mile regional BRT system with 138 BRT stations located in activity centers and existing parking facilities. To support the BRT system, 140 miles of circulator service is also provided. This is in addition to three RMAS rail projects and one transitway on Georgia Avenue that connect to the regional BRT system. In total, the transit system creates a system that provides critical new service (particularly circumferential connections between activity centers), redundancies to the Metrorail system to relieve current and forecast congestion, and connections to the existing transit system. A map of this network is provided in Figure 6 on page 29.

# 2030 Scenario Growth by TAZ

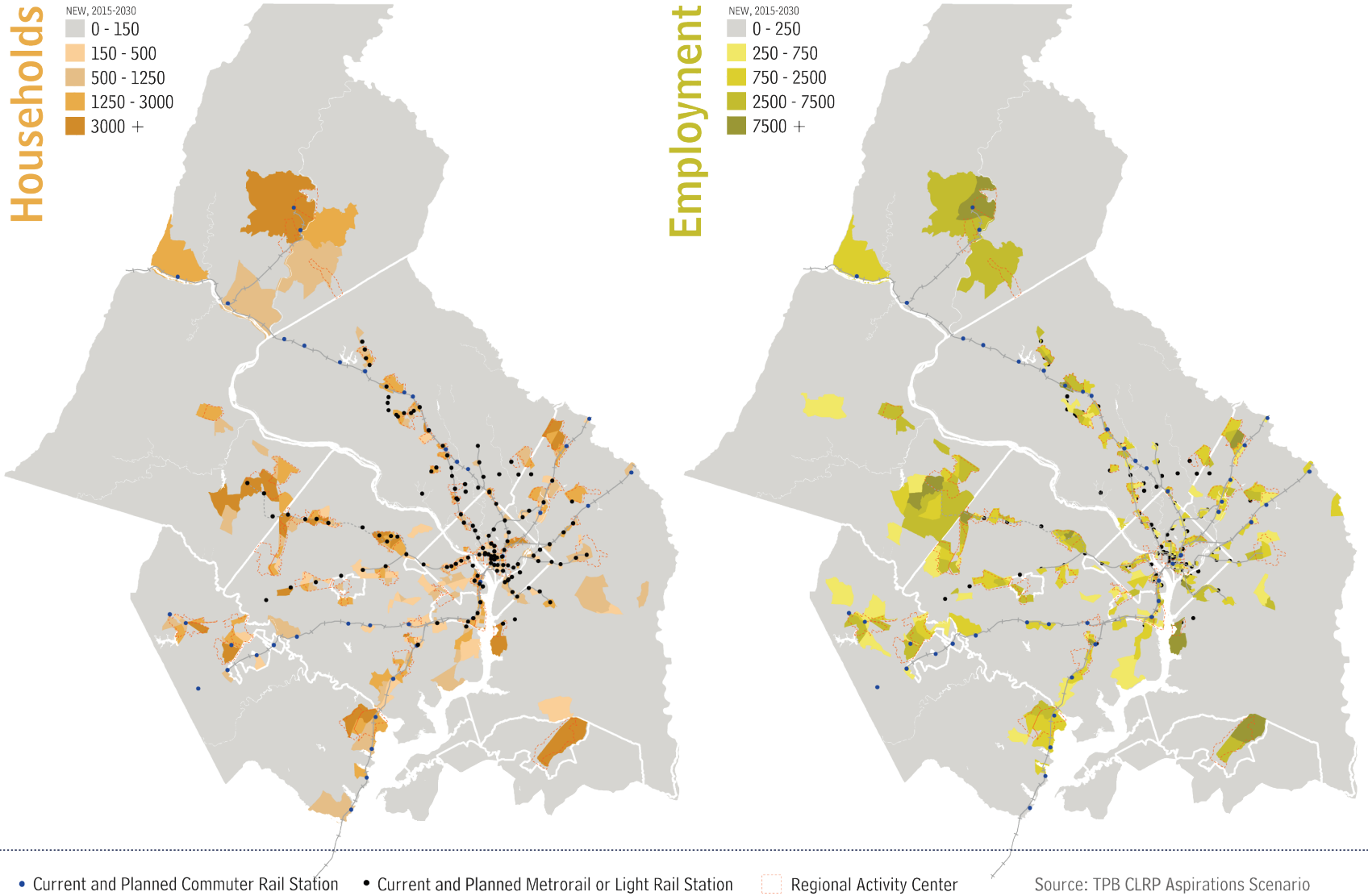
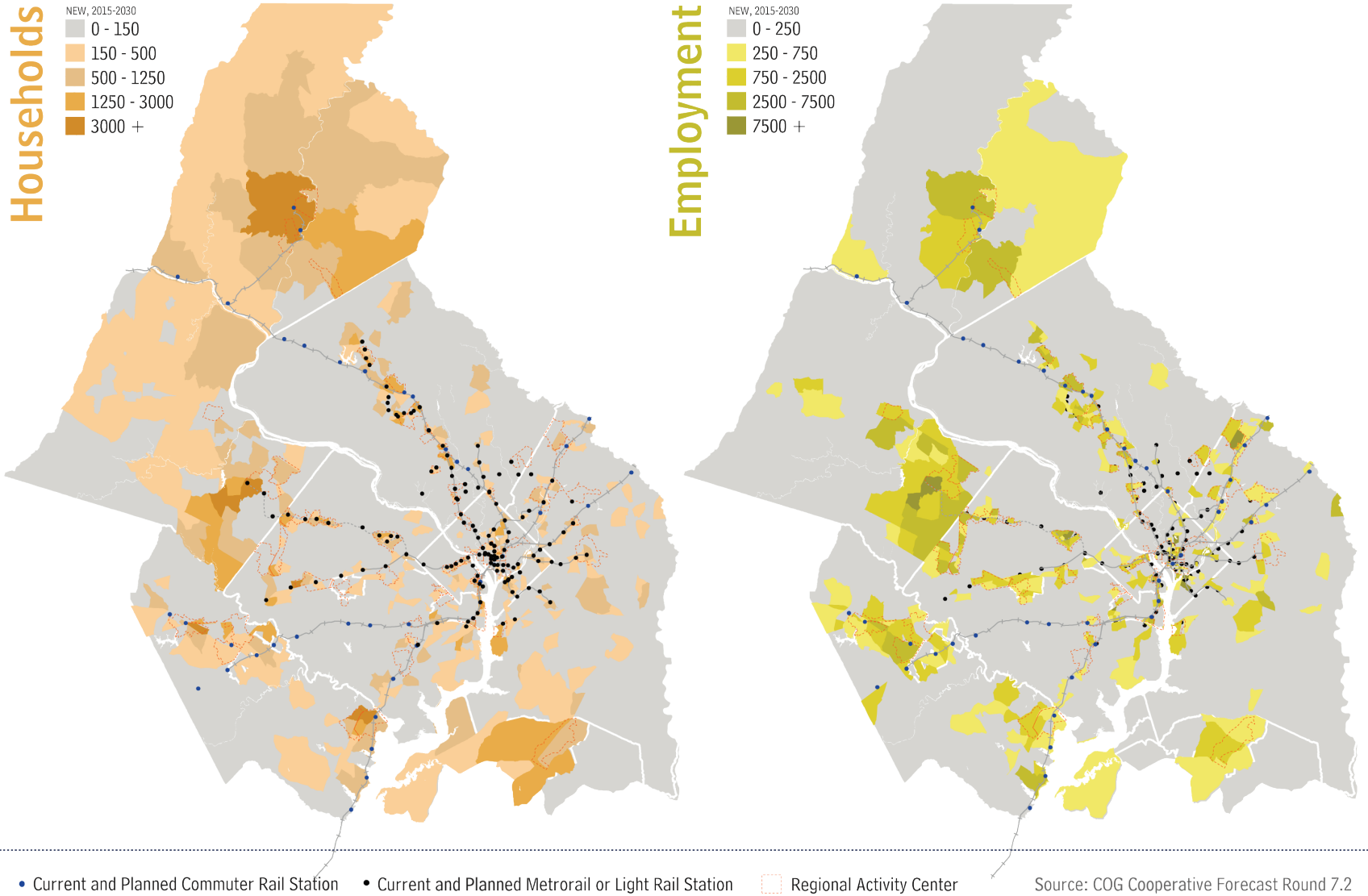



Figure 1: Scenario Growth by TAZ, 2015-2030

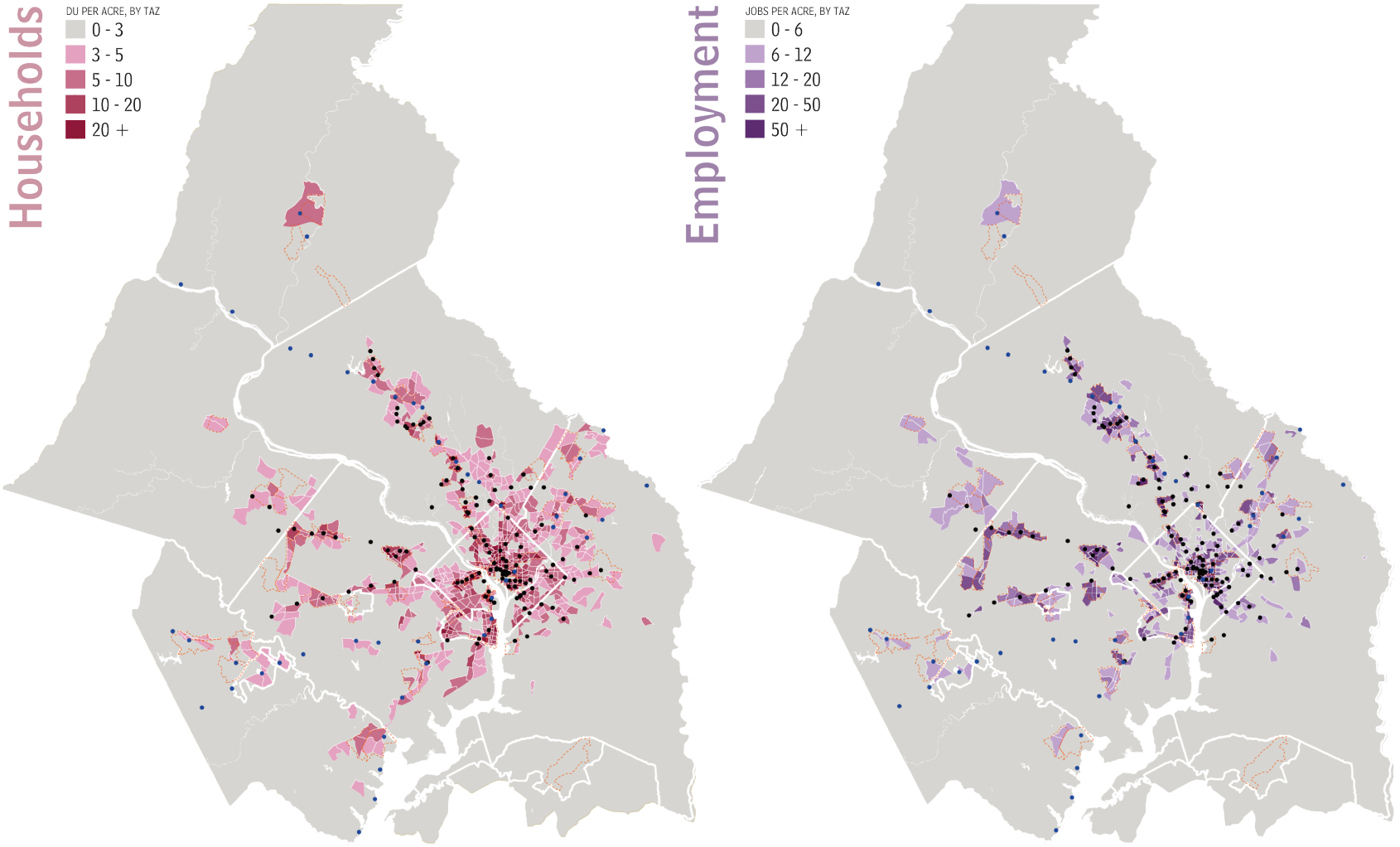
# 2030 Forecast Growth by TAZ




Source: COG Cooperative Forecast Round 7.2

Figure 2: Forecast Growth by TAZ, 2015-2030

# 2030 Scenario Density by TAZ

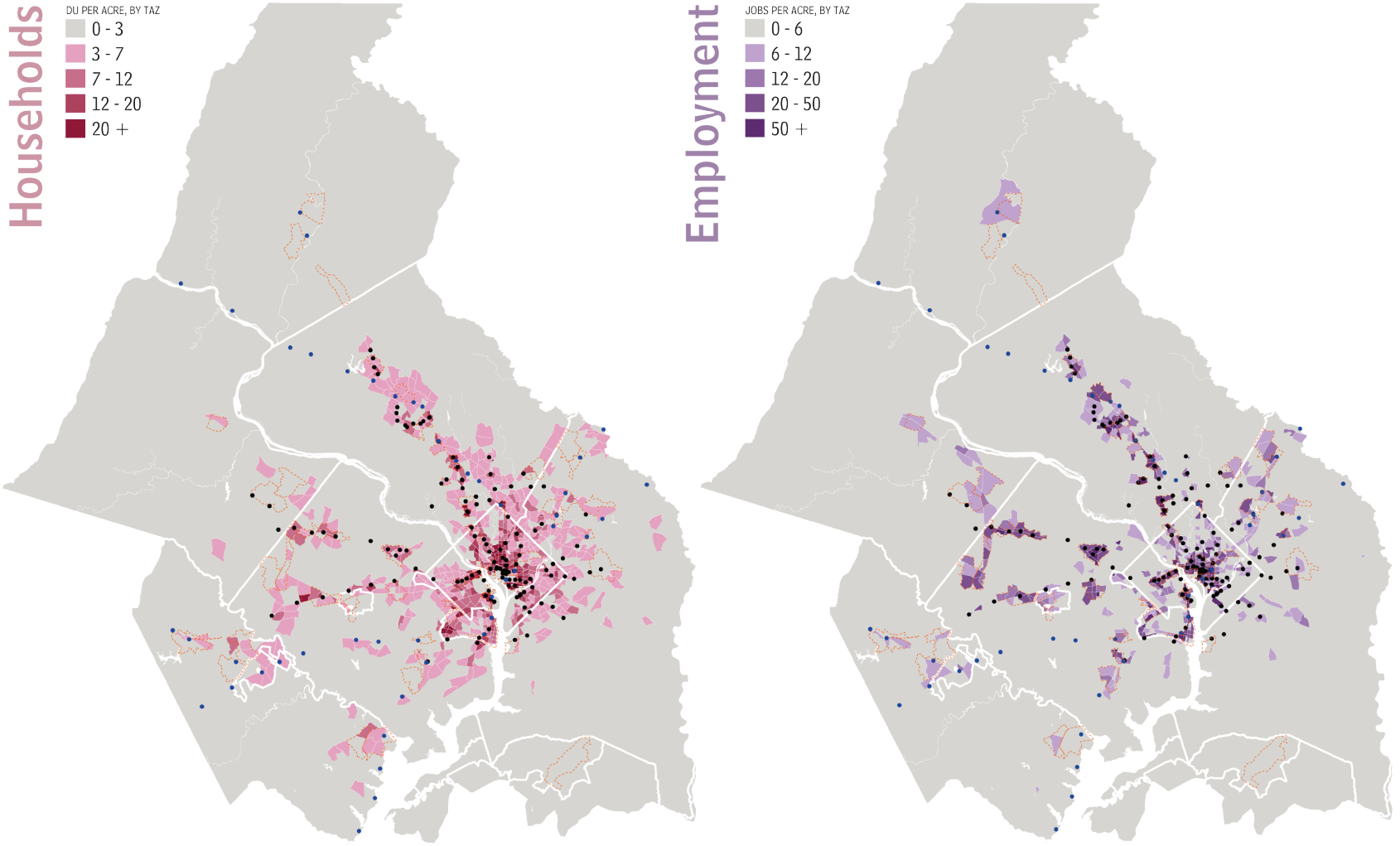



• Current and Planned Commuter Rail Station • Current and Planned Metrorail or Light Rail Station Regional Activity Center

Source: TPB CLRP Aspirations Scenario

Figure 3: 2030 Scenario Density by TAZ

# 2030 Forecast Density by TAZ




• Current and Planned Commuter Rail Station • Current and Planned Metrorail or Light Rail Station Regional Activity Center

Source: COG Cooperative Forecast Round 7.2

Figure 4: 2030 Forecast Density by TAZ

Figure 5: Value Priced Lanes Network in Scenario

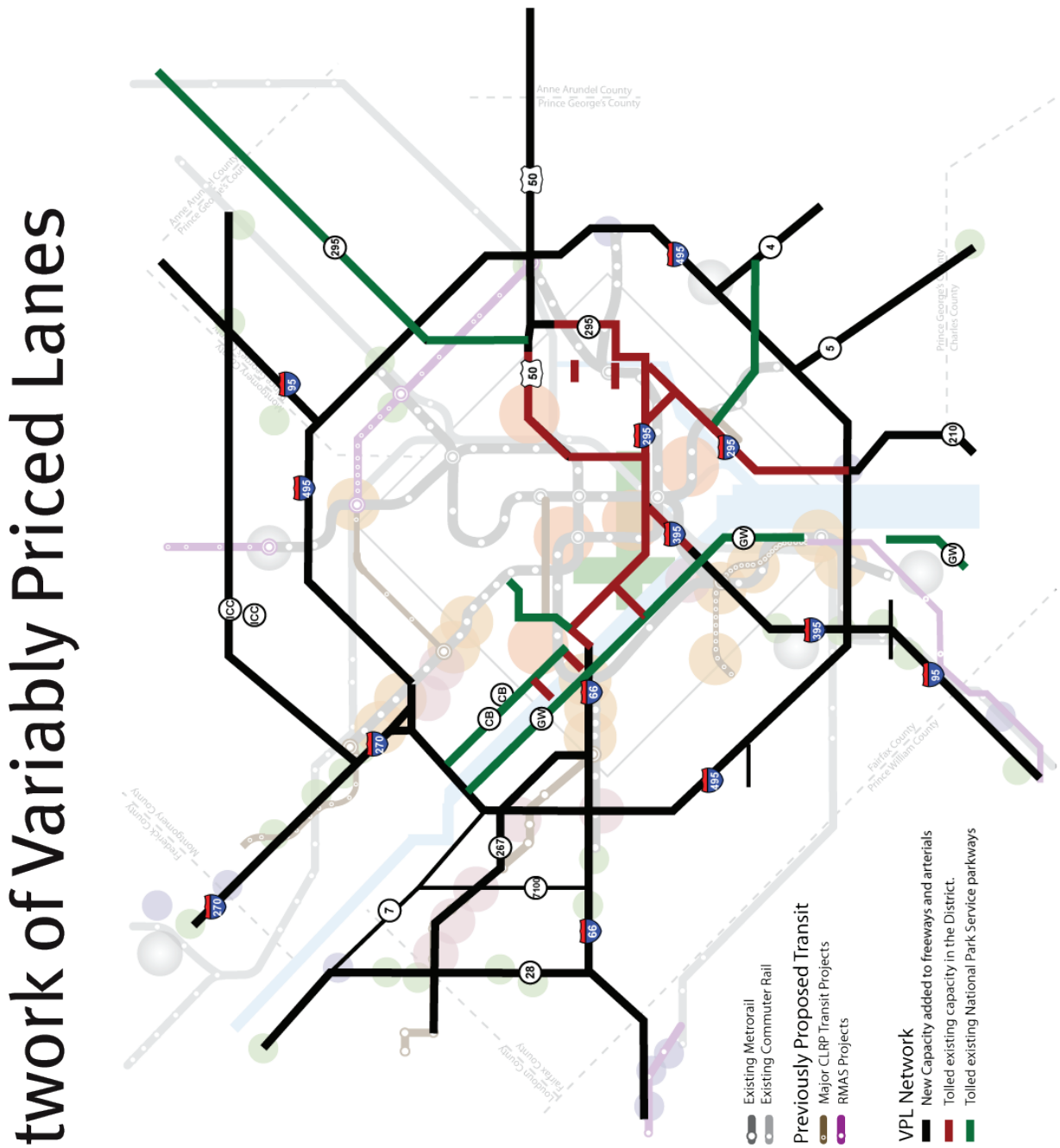
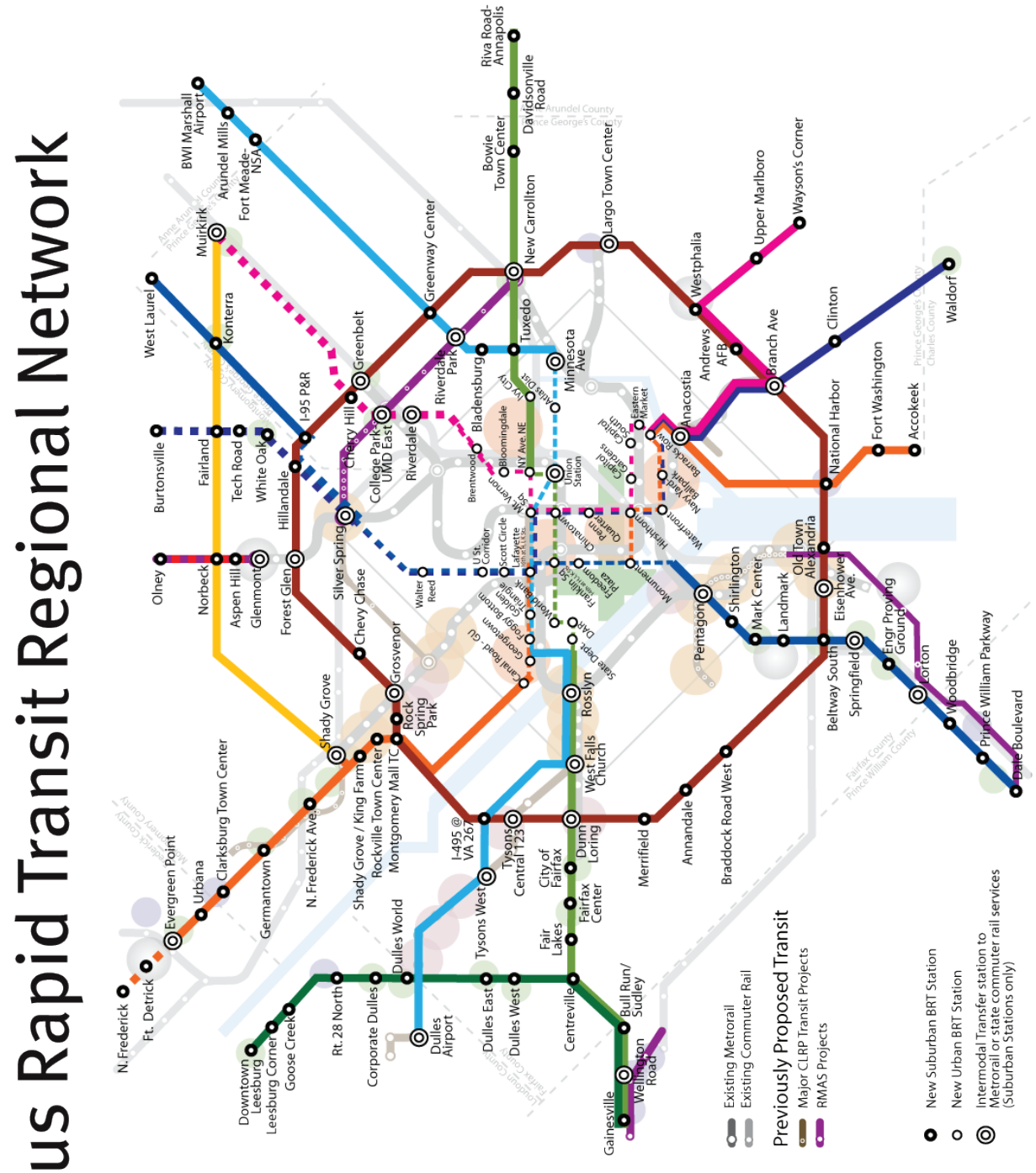


Figure 6: Bus Rapid Transit Network in Scenario



# Results

This section presents the results of the analysis of the CLRP Aspirations scenario as compared to the study baseline, the 2008 CLRP and land use growth assumptions from the COG Cooperative Forecast Round 7.2. Additionally, results are presented of the analysis of a land use sensitivity scenario consisting of only the smart growth assumptions contained in the full CLRP Aspirations Scenario. This sensitivity scenario was run in order to control for land use changes and better understand their potential effects on travel demand.

The following indicators were measured based on the regional travel demand modeling results of the baseline forecast, the full CLRP Aspirations scenario, and the land use sensitivity scenario:

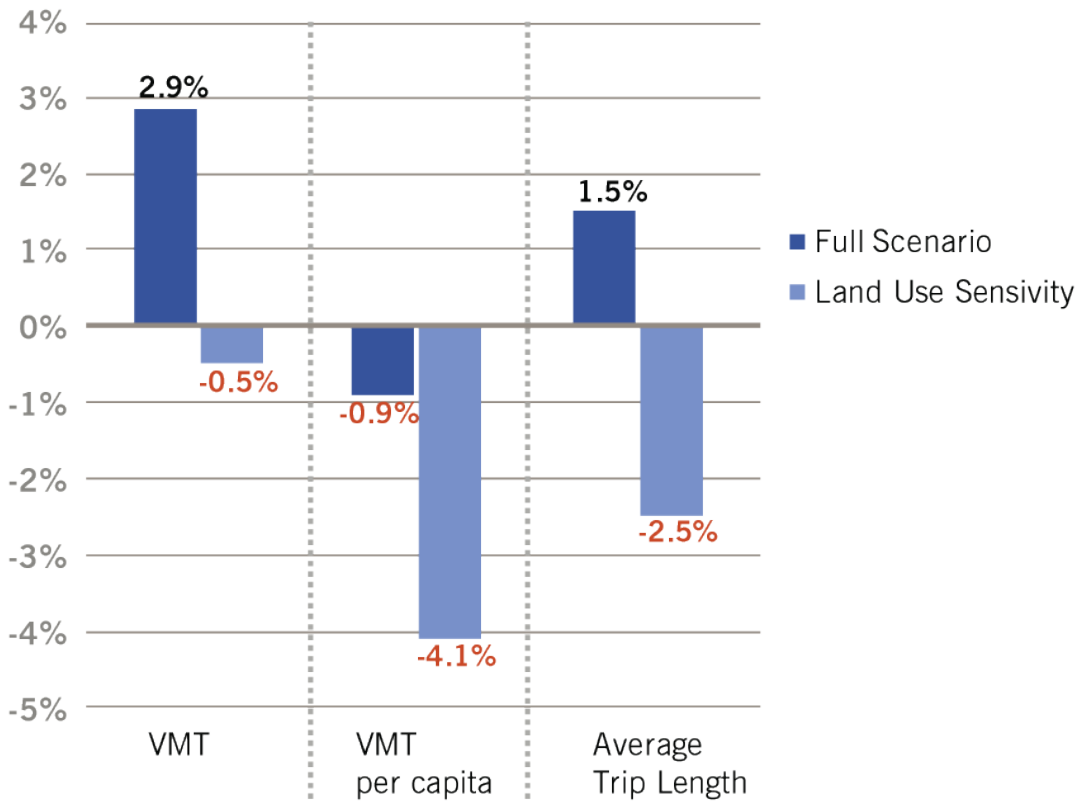
1. **Vehicle miles traveled (VMT):** Provides an overall picture of how much travel by automobile is occurring in the region, which can be a direct or indirect indicator for meeting various regional goals, such as reducing air pollutant emissions and providing a wide range of transportation choices.
2. **VMT per capita:** Indicates how much driving is occurring per person and therefore controls for population growth.
3. **Average auto trip length:** Provides detail into how far travelers live from work and other destinations.
4. **Average daily speed:** Provides an overall picture of the level of roadway congestion.
5. **Vehicle hours of delay (VHD):** A more detailed indicator of congestion, which provides information on the amount of time spent on the road because of roadway delays.
6. **Transit trips:** Trip count that can be used to determine mode shifts across scenarios.
7. **Bicycle and pedestrian trips:** Trip count that can be used to determine mode shifts across scenarios.
8. **External auto trips:** Trips that originate outside of the TPB planning area, which generally represent commuters living outside of the region but working within the region.
9. **Jobs accessible by auto/transit within 45 minutes:** TAZ-level analysis that determines how many jobs are accessible to households in a specific TAZ with a 45 minute or less commute via auto, transit, or walk-access transit. This factors in roadway congestion for auto accessibility, proximity to transit and quality of service for transit accessibility, and proximity to transit for walk-access transit.
10. **Air pollutant emissions:** Emissions, largely based on the travel demand indicators already described, for criteria air pollutants and greenhouse gas emissions (GHGs). Criteria air pollutants are nitrogen oxides (NOx), fine particulate matter (PM2.5), PM2.5 precursor NOx, and volatile organic compounds (VOCs). NOx,

VOCs, and PM2.5 precursor NOx all contribute to ground level ozone formation, which poses serious human health risks. PM2.5 also poses similar health risks, such as respiratory illness and heart disease. The primary GHG of concern in this scenario is carbon dioxide (CO2), which is the largest contributor to human-induced global warming from the transportation sector.

The CLRP Aspirations scenario consists of significant land use and transportation changes to the baseline forecast for the region, such as aggressive smart growth assumptions, extensive BRT serving new and existing mixed use centers, new priced road capacity, and pricing of some existing roadways to ensure efficient road use. As expected, these changes in growth assumptions and in transportation investment resulted in measured changes to travel demand projections.
A land use sensitivity scenario was also run in order to control for the effects of the land use portion of the full scenario. The sensitivity is the land use component of the Aspirations scenario, but with no change in transportation assumptions beyond the 2008 CLRP. It does not contain any of the new pricing, road capacity, or the BRT system that are in the full scenario. This sensitivity enables a more nuanced analysis and helps determine possible causes for a variety of travel demand effects.

## 1. Driving increases in the full scenario, but decreases in the land use sensitivity.

Figure 7: Change in Driving Indicators between the Scenarios and Baseline



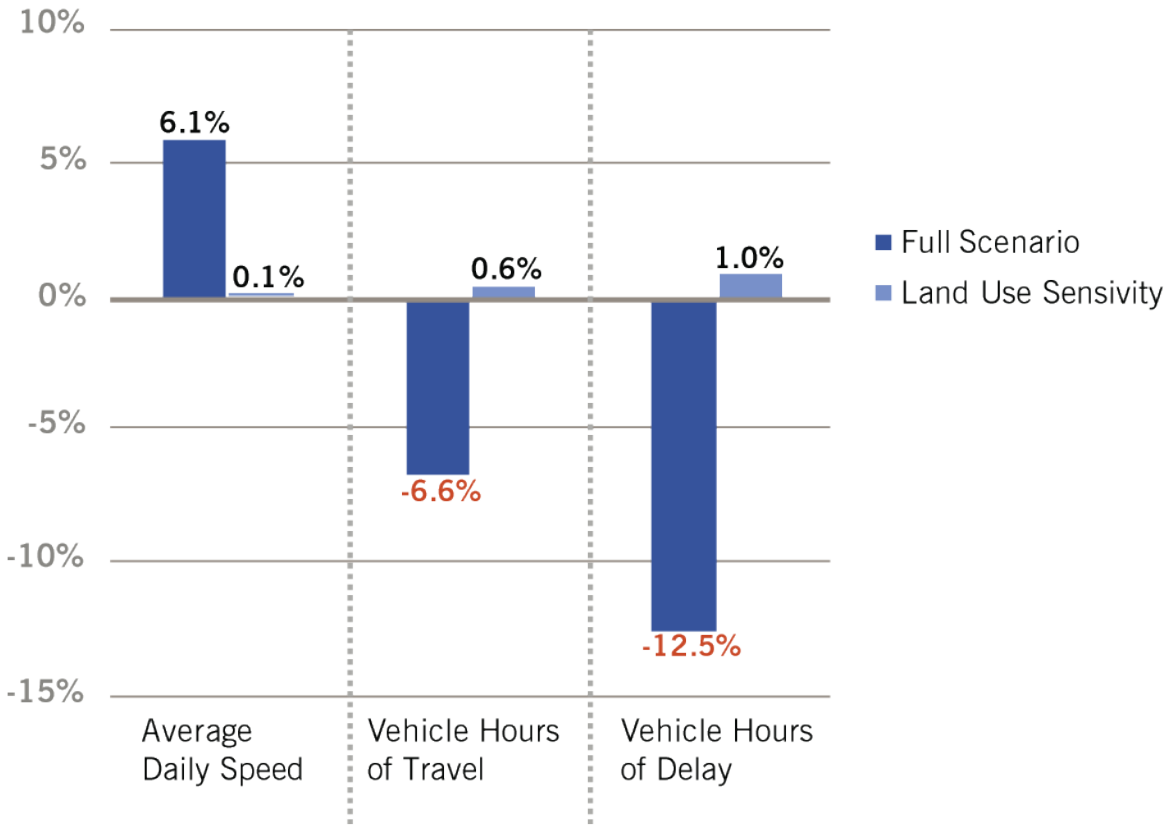
**Full scenario:**
Regionally, the full scenario increases baseline VMT projections by 2.9%, motorized trips by 2.0%, and average auto trip length by 1.5%. Despite these increases, VMT per capita decreases by 0.9%, indicating that the increase in population under the land use component is higher than the regional increase in VMT. Additionally, because it is assumed that the increase in jobs and households in the land use component would be attracted from just outside of the region, external auto trips decrease by 6.5%. It is likely the reduction of these trips reduced the increase in average auto trip length.

**Land use sensitivity:**
In the land use sensitivity, VMT decreases slightly by 0.5%, auto trip lengths decrease by 2.5%, and VMT per capita decreases by 4.1%. Despite these decreases, the number of motorized trips increases by 2.3%.

When compared to the full scenario, the land use sensitivity has 3.2% fewer VMT, 3.2% fewer VMT per capita, 4.0% shorter auto trip lengths, and 0.4% more motorized person trips. External auto trips decrease by 6.5% in the land use sensitivity and therefore did not change across the two scenarios.

## 2. Congestion decreases in the full scenario, but remains stable in the land use sensitivity.

Figure 8: Changes in Congestion Indicators between Scenarios and Baseline



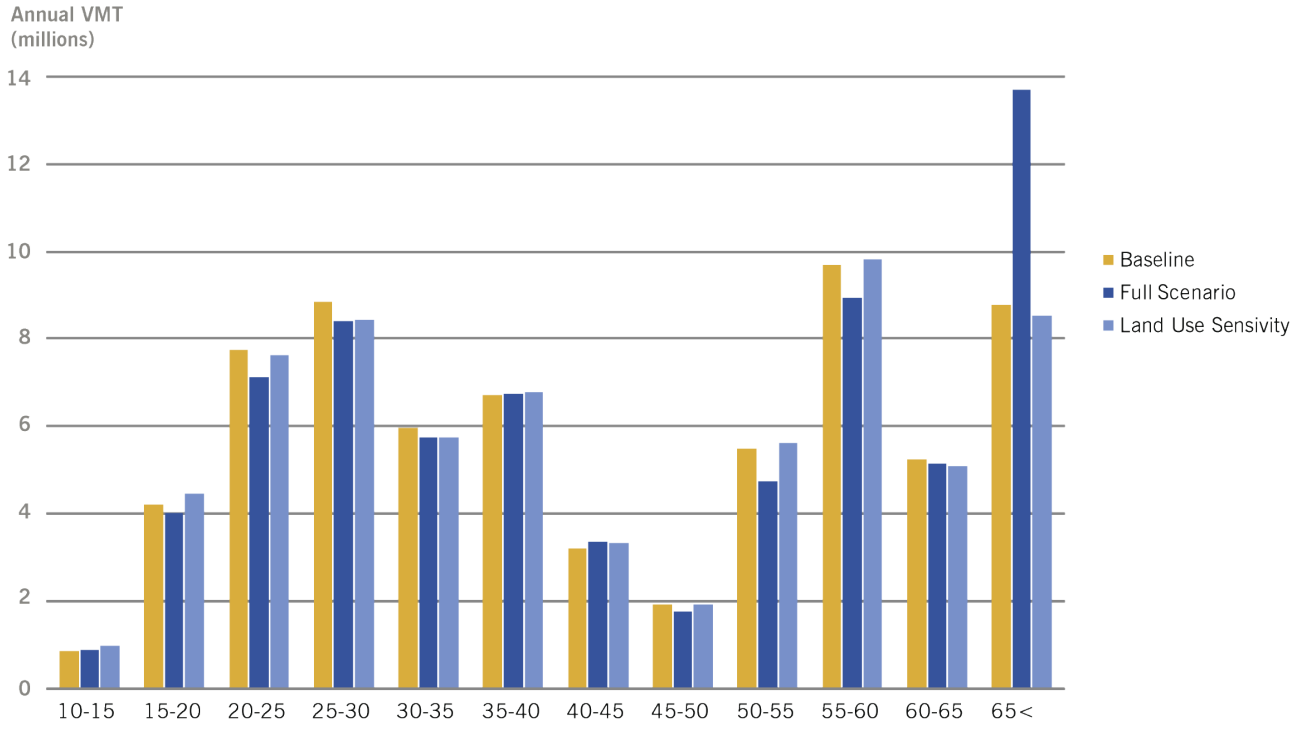
**Full scenario:**
Overall average speeds across the region increase significantly by 6.1% and vehicle hours of delay decrease dramatically by 12.5%, signaling significant decreases in congestion.

**Land use sensitivity:**
Average speeds across the region stay relatively the same in the land use sensitivity compared to the baseline. Vehicle hours of delay increase slightly by 1.0%.

The land use sensitivity does not produce any of the congestion reduction benefits of the full scenario, as expected. Average speed is 5.8% higher in the full scenario than in the land use sensitivity and vehicle hours of delay are 15.4% lower.

Figure 9 below shows a more nuanced picture of how congestion levels are changing between the baseline and the two scenarios.

Figure 9: Changes in VMT by Speed between Scenarios and Baseline



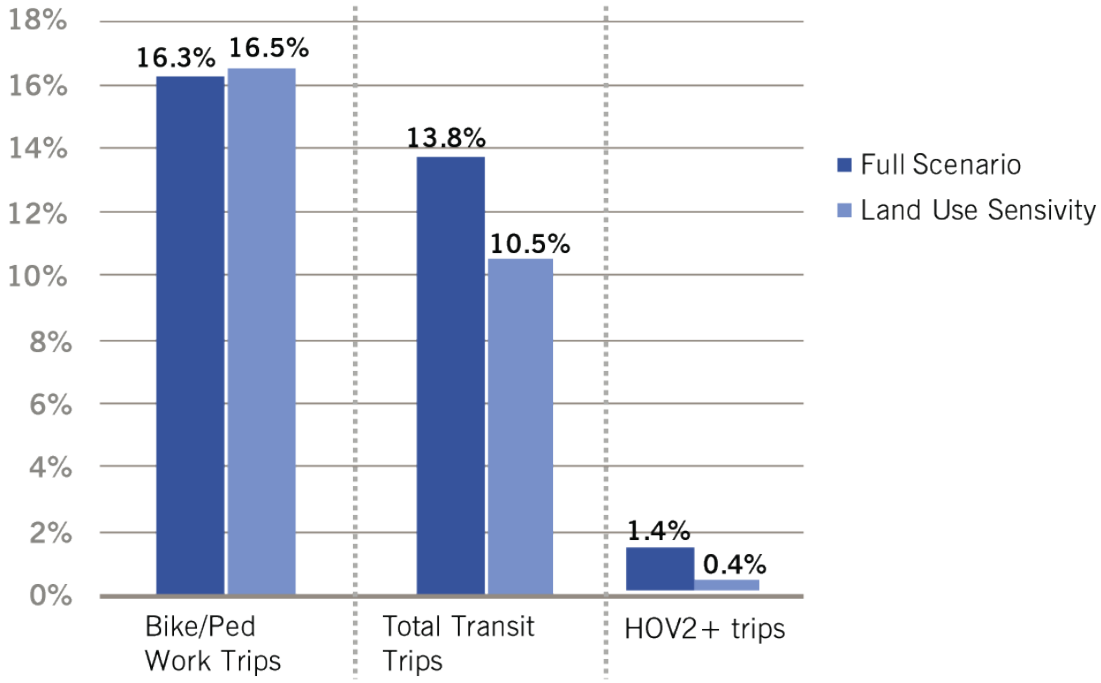

Under the full scenario, average speed clearly increases because of the 56% increase in VMT at speeds 65 mph and above. It also shows a 3% increase in VMT emissions from the 10-15 mph speed category, highlighting increases in congestion in some parts of the road system. This could point to dramatic congestion reduction on priced freeways and higher congestion on local roads, particularly around activity centers that have new access points to the priced network.

The land use scenario produces relatively small increases in VMT at slower speeds (10-

20 mph), but also shows increases in VMT at middle range speeds (35-60 mph). VMT at very high speeds (60+ mph) decreases under the land use scenario. Similar to the full scenario, this could point to higher congestion levels on local roads in activity centers, which received a significant influx of jobs and housing under the land use component.

## 3. Use of sustainable modes increases

Figure 10: Change in Sustainable Mode Trips between Scenarios and Baseline




**Full scenario:**
Transit use increases, with total transit trips increasing significantly by 13.8%, which increases the overall transit mode share 11.6% to 5.6% of all trips.

Under the full scenario, bicycle and pedestrian use also increases significantly, with total bicycle and pedestrian work trips rising by 16.3%. It should be noted that only non-motorized work trips can be measured using the regional travel demand model. Given that a significantly higher portion of baseline non-work auto trips than work auto trips are projected to be less than three miles, it is conceivable that even greater increases would be seen if all non-motorized trips could be measured.

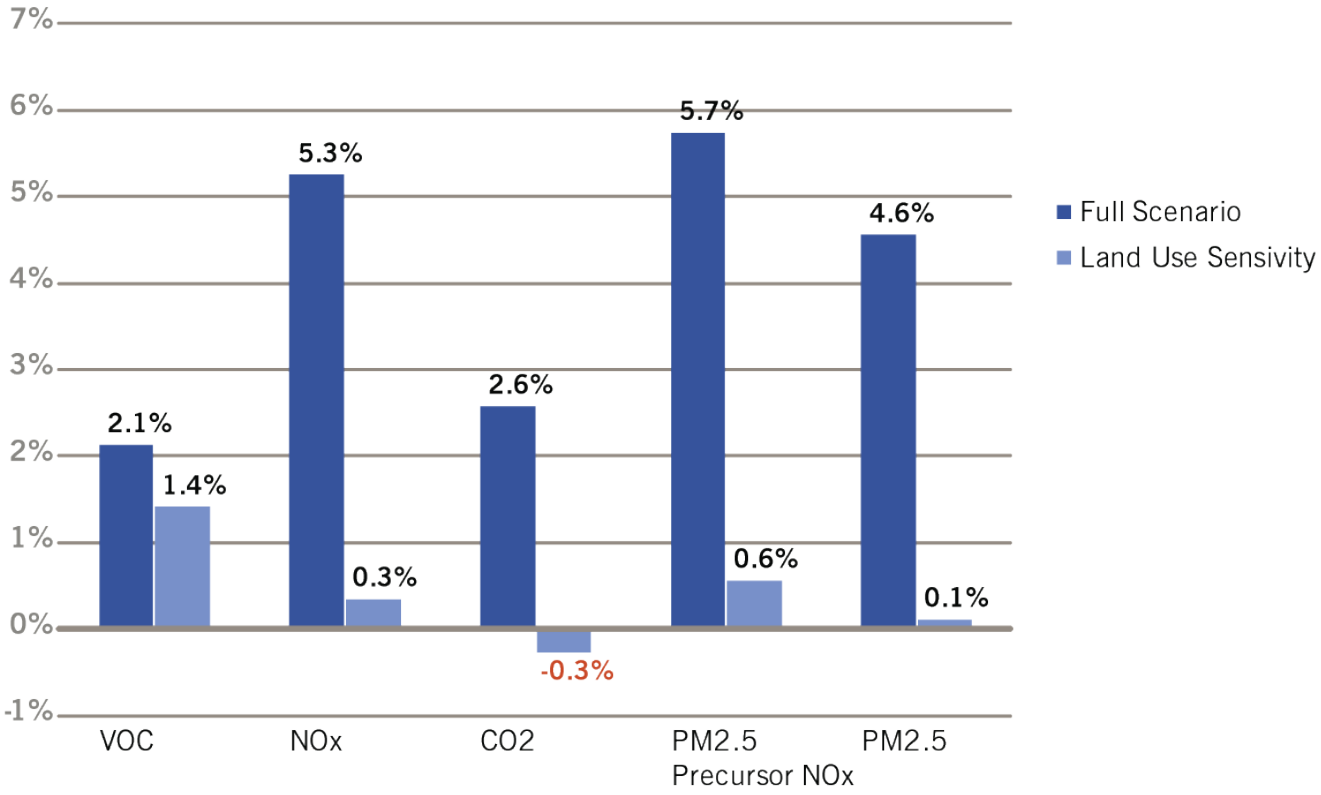
**Land use sensitivity:**
As in the full scenario, transit use increases, with total transit trips increasing significantly by 10.5% over the baseline projections. This increases the overall transit mode share 8.0% to 5.4% of all trips.

The full scenario produces 2.8% more transit trips than the land use alone, indicating that a majority of the transit increase in the full scenario is on the existing transit system rather than the extensive new BRT system.

As in the full scenario, bicycle and pedestrian use also increases significantly. Total bicycle and pedestrian work trips rise by 16.5% in the land use sensitivity, which is roughly the same as in the full scenario.

## 4. Air pollution increases in the full scenario, but remains the same in the land use scenario.

Figure 11: Change in Emissions of Air Pollutants between Scenarios and Baseline




**Full scenario:**
Emissions of NOx, VOCs, PM2.5, PM2.5 precursor NOx, and CO2 all increase significantly. NOx, PM2.5 precursor NOx, and PM2.5 increase most significantly at 5.3%, 5.7%, and 4.6%, respectively. VOCs increase by 2.1% and CO2 increases by 2.6%.

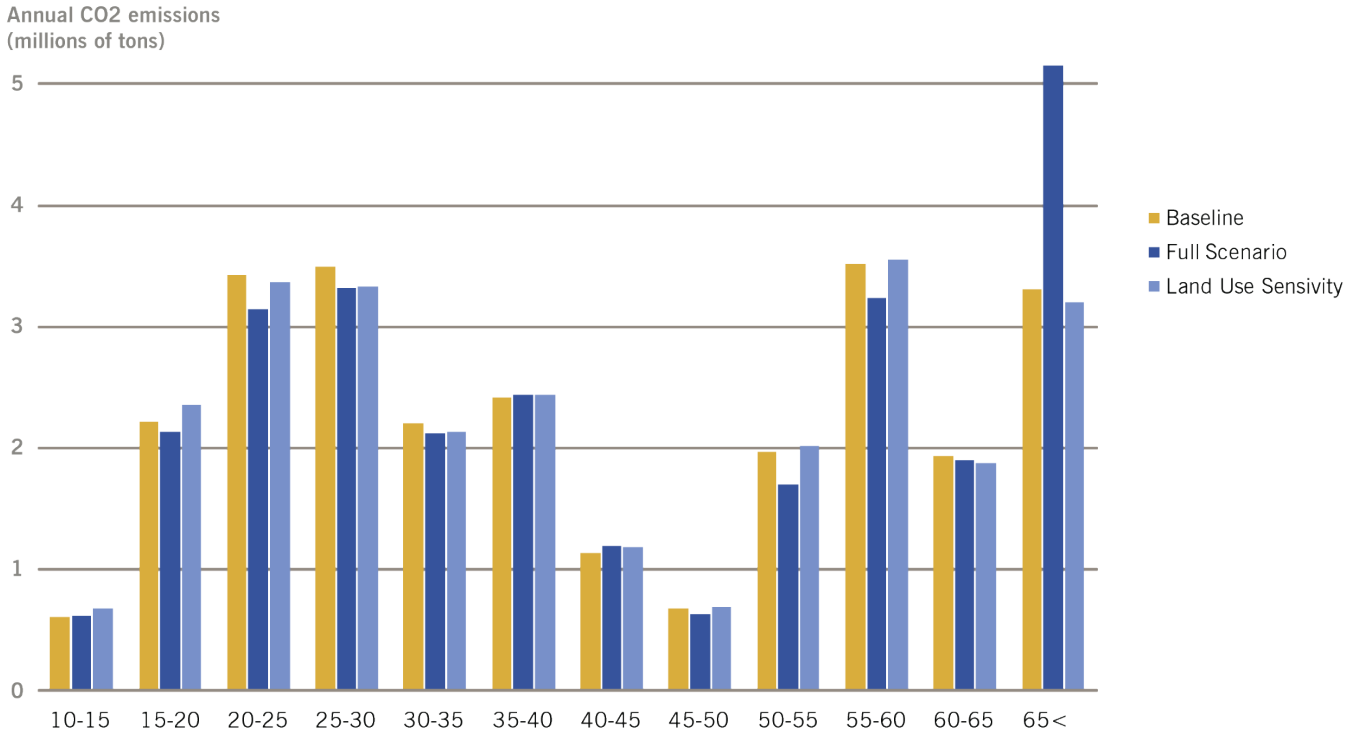
**Land use sensitivity:**
All emissions for the land use sensitivity have only slight decreases or increases and thus overall are relatively similar to the baseline forecast. Emissions of VOCs increase the most significantly at 1.4%. NOx and PM2.5 precursor NOx increase very slightly at 0.3% and 0.6% respectively. PM2.5 does not change. CO2 decreases by 0.3%.

Emissions of each pollutant can vary according to unique sets of factors, such as number of trips, VMT, and speed. For instance, VOCs are highly sensitive to number of trips, while CO2 is highly sensitive to speed. CO2 emissions rates per mile vary with speed according to a U-curve, where very low speeds and very high speeds produce significantly higher per-mile emissions rates than the middle speed range of 30-60 mph. NOx and VOC also vary by speed, but exhibit much flatter curves than CO2. This is further discussed in the next section of this report.

Variations in emissions rates are modeled in Mobile 6 (the current EPA emissions model used for conformity purposes) for NOx and VOCs, but are not yet for CO2. As a result, off-model calculations were completed to determine CO2 emissions by speed. In order to better understand the changes in CO2 emissions between the scenario and the baseline, the graph below shows the difference in CO2 emissions by speed for both the full scenario and the land use sensitivity.

Figure 12 (on the next page) clearly shows how changes in speed have contributed to higher CO2 emissions in the full scenario as compared to the baseline, particularly when compared with Figure 9 on VMT by speed. The full scenario shows a 56% increase in CO2 emissions from the 65+ mph speed category. There is also a relatively small increase in emissions from the 10-15 mph category, which are largely offset by decreases in emissions from the 15-35 mph categories. The increase in very high speeds with only small decreases in low-range speeds, as well as significant decreases in emissions in the middle range (50-60 mph), which have the lowest CO2 emissions rate, translate into higher overall CO2 emissions. The land use sensitivity tracks more closely with the baseline because there is little change in speeds throughout the system. The most significant change is a 12% increase in baseline CO2 emissions from the 10-15 mph speed category, which results in lower CO2 reductions than VMT reductions from the land use sensitivity.

Figure 12: Changes in CO2 Emissions by Speed between Scenarios and Baseline



# Discussion

Ultimately, the results described in the previous section were driven by five major effects produced by the CLRP Aspirations scenario.

## 1. More road capacity + pricing

The provision of new priced road capacity resulted in significantly higher speeds and less delay throughout the region. The congestion reduction benefits are substantial, indicating that implementing a pricing strategy can be highly effective at relieving ever-worsening regional congestion. Although the major congestion reduction benefits are clearly a result of the extensive, new priced network, the land use sensitivity indicates that to some degree, concentrating land use to allow for shorter trips also serves reduce congestion. Under the land use sensitivity, population increased 3.5% while congestion levels remained relatively flat.

However, the congestion reduction indicators of higher speeds and less delay also led to negative impacts that move the region further away from meeting transportation goals. More road capacity and priced lanes mean that more people can drive longer and faster, which resulted in more driving and longer trips. The VMT increase produced by the full scenario over the baseline is in part caused by a rise in population, but is also caused by more road capacity and faster auto travel options. The increased trip lengths in the full scenario also occur because people can drive longer faster. The provision of priced lanes extending into the outer suburbs and beyond make longer trips more convenient, which has the potential to encourage people to live further out, far from work sites. In this way, the land use and pricing components of the scenario can be seen as being at odds with one another, where the latter encourages dense, concentrated development and the former encourages a more sprawling development pattern.

The increases in driving and higher speeds combine to also produce higher emissions of harmful air pollutants. High increases of 5% or higher are produced by the full scenario for NOx¬ and PM2.5 precursor NOx. Higher VMT and much higher speeds than the baseline cause this increase in pollution. Similarly, increases in CO2 occur for this reason. As previously mentioned, CO2 calculations were done off-model because of current emissions model constraints, but used outputs from the regional travel demand model, which currently only models speeds 65 mph and below. This inability to model speeds higher than 65 mph (which constitute 19% of total scenario VMT) largely underestimates CO2 emissions because CO2 emissions rates rise rapidly as speeds beyond 65 mph increase. VOCs also increase, but to a lesser degree because it is more sensitive to the number of trips (resulting from starting the vehicle) than to VMT. The full scenario produces a higher increase in VMT than trips, indicating longer trip lengths.

## 2. More population and employment

In order to meet density and jobs/housing balance goals, a 3.5% increase in households and a 1% increase in jobs were included under the land use component of the scenario. Higher population clearly results in more people traveling. Under the full scenario VMT rose, but VMT per capita decreased, signaling that the overall VMT rise is due in part to increased population. On the other hand, the land use sensitivity, which also included the same population and employment increase, resulted in a slight VMT decrease. The increased density clearly led to higher transit, bicycle, and pedestrian mode shares, which reduced VMT. Therefore, it is possible that the smart growth orientation of the land use actually limited the growth in VMT in the full scenario rather than caused it. Without the densification and mixed use land use the results indicate that increases in bicycle and pedestrian use and a majority of the transit increase would not occur, which counteracted the increases in driving that the priced road network allowed.

## 3. Less people commuting into the region from outside of the region

The aforementioned regional increase in population and employment was assumed to result from the moving of jobs and households in the jurisdictions just outside of the TPB region but within the much larger modeled area. The effect of this land use change is the reduction in "super-commuting," which are very long trips made largely for work from households well outside of the region to jobs inside of the region, or vice versa. The elimination of these trips was expected to result in shorter trip lengths, which likely happened, but was offset by the mobility afforded by faster speeds on the value priced lanes.

## 4. More concentration of development around existing transit

The analysis of the land use sensitivity versus the full scenario indicates that the higher transit use produced in both scenarios may occur mostly on the existing system rather than the extensive new BRT system. The land use sensitivity scenario results in a transit increase only slightly lower than the full scenario, indicating that even with a constraint on Metrorail capacity from 2025 beyond there may be efficiencies that can be gained on the existing transit system by concentrating land use around transit infrastructure, particularly around underutilized stations. Creating mixed use centers and transit-accessible jobs throughout the region would likely balance transit usage geographically, allowing for less directional congestion, more reverse commuting, and increased transit use without new infrastructure. Regional travel demand model results do not provide enough information to determine transit congestion levels; however, it is likely that the land use sensitivity, which includes no new transit services, would increase transit congestion, possibly quite significantly.

### 5. Higher density, mixed use activity centers

It is clear from the analysis of the land use sensitivity model tests that the scenario's higher density, mixed use activity centers created conditions where jobs and housing were much closer together, allowing for more walking and biking to make short work trips. The land use sensitivity and the full scenario produced the same substantial increase in bicycle and walk trips, implying that all of the walking and biking gains are from the land use changes. That being said, the increased transit service and road capacity cannot be diminished as they provide important regional connections that impact the decisions of residents and businesses to locate in concentrated activity centers by making them more convenient overall.

## Does the CLRP Aspirations Scenario Meet Regional Goals?

The CLRP Aspirations Scenario set out to better meet the goals of the TPB Vision than is currently projected under the 2008 CLRP and land use forecasts. In many ways the scenario does provide an aspirational growth and development path for the region, providing solutions to long-standing problems, such as congestion reduction and revenue generation. In other ways, the scenario falls short and contributes to the many problems that the region has been attempting to move beyond, such as poor air quality and future sprawl development.

The scenario is remarkably effective at reducing congestion, which is the one of two major benefits of creating a regional priced lane network. The second of these two is the ability to raise needed revenue for services to maintain equitable mobility and accessibility if lanes are to be priced. Under the scenario, it is assumed that toll revenues would be used to facilitate provision of the BRT network, which does produce an increase in transit use. The scenario also includes a land use vision that produces several note-worthy benefits that directly correspond with the TPB Vision. Creation of walkable, transit-oriented, and mixed use activity centers directly allows for substantial bicycle and pedestrian trip increases and major transit use increases on the existing system, as well as on the BRT system, which would likely be necessary in some form to relieve existing and projected transit congestion. Additionally, the land use shows that significant population growth can be accommodated smartly, without increasing road congestion, air pollution, or VMT.

It is unlikely that a large-scale regional plan can be created to have only positive impacts and no unintended negative consequences. The CLRP Aspirations scenario produces some results that counter the goals set forth in the TPB Vision and in RMAS, such as improving environmental quality and producing shorter trips that result in a reduction of VMT. For example, reducing congestion increases auto accessibility in many parts of the region causing driving and trip lengths to increase, allowing for faster and longer trips and higher VMT. This effect likely counteracts the concentrated growth patterns the land use component attempts to reinforce. Of course, the major negative result of

more auto trips, more VMT, and much faster speeds (above 65 mph) is that air pollution increases.

Overall, the CLRP Aspirations scenario set out meet goals such as creating: "economically strong regional activity centers with a mix of jobs, housing, services, and recreation in a walkable environment", "a web of multi-modal transportation connections which provide convenient access", "a user-friendly, seamless system", and a combination of land use and transportation options that result in the "reduction of per capita VMT." It also sought to capitalize on existing transit infrastructure through transit-oriented development, address geographic imbalances in development, and reduce congestion and commute times by getting jobs and housing closer together.

The CLRP Aspirations Scenario largely achieved these things. Although VMT rises in the full scenario, VMT per capita decreases. Geographic imbalances are evened out to an extent because of the heavy concentration of future growth around existing transit stations, particularly around Metrorail stations in Prince George's County that do not currently have mixed use, walkable, and in some cases even transit supportive densities. These stations on the eastern portion of the region received a great deal of growth to make the surrounding station areas more walkable and mixed use. Although trip lengths increase, jobs and households are closer together allowing for substantial increases in bike and walk trips. Lastly, the BRT system provides new, high quality transit connections allowing for more convenient access. Although the specific use of the new system is not known from the information available, it is likely the BRT system helps reduce transit congestion, especially on the Metrorail system, and particularly supports circumferential activity center connections.

The scenario highlights the difficulty in combining strategies that, when implemented on their own, produce positive results. There are clear synergies when combining the land use and transportation strategies, but as may be expected, there are also conflicts and unexpected results that can inform future analysis.

## Future Work

There are certain limitations of the scenario that can be used to drive future work. For instance, it is possible that the land use component and the pricing component exerted forces that work against one another by both encouraging short trips and long trips at once. This, along with model limitations, made analysis of the efficacy of the BRT network difficult. As a result, it would be beneficial in the future to examine the BRT network in the absence of pricing and additional road capacity in addition to examining the combination. The BRT routes would likely need some level of redesign to reflect what is physically feasible if new priced capacity cannot be used as pseudo-dedicated running-way. This issue reflects the complexity involved in combining the one-dimensional strategies tested in previous TPB scenarios. Interactions between strategies can clearly have unexpected consequences that necessitate further study.

Similarly, the value priced network could be modified in future analysis to test the impacts of pricing less new capacity and to increase the amount of existing capacity that is priced. The priced network was originally formed based on policy inputs from the state DOTs and FHWA, which included pricing of only new capacity in Maryland and Virginia, and only existing capacity in D.C. and on national parkways. It is clear that the extensive new priced road capacity contributed heavily toward lengthening trips and increasing VMT; therefore, it is possible that studying the increased pricing of existing lanes could better reinforce use of the extensive transit network. This analysis would not be without significant political and technical hurdles; however, this study highlights the importance of adequately studying a variety of combined pricing-transit-land use options to ensure that the region's goals and objectives are met.

Additional modifications to the scenario could also be pursued. The priced network in the full scenario, which was taken from the 2008 TPB variably priced lanes study, included many interchanges between the toll lanes and perpendicular roads, many of which are arguably unnecessary. Interchanges are extremely costly at $132 million per interchange. For future studies, the transit and toll lane network could be modified to focus accessibility gains in the targeted growth areas by limiting access to the tolled network only at activity centers and other targeted growth areas. Preliminary assessment indicates that 96 interchanges could be converted to slip ramps, which are significantly less costly. Focusing access in this way is not only expected to reinforce concentration of growth in these areas, but also to reduce the total construction costs of the toll network.

Future work can also be done to account for behavioral changes that are currently not reflected in the regional travel demand model. For example, the TPB recently completed the 2007/2008 Regional Household Travel Survey, which highlights significant behavioral changes toward increased walking, biking, and transit use. In general, there has been a greater willingness in recent years to use alternative modes of transportation for a wide range of trip purposes, beyond just recreation. Therefore, it is likely that with the new survey results incorporated into the regional travel demand model, increases in transit, bicycle and pedestrian trips would be more pronounced. In 2011, the TPB will begin using a new travel demand model version 2.3, which will incorporate numerous improvements on the current model version 2.2. Among these improvements are a longer analysis period with a horizon year of 2040, which will be particularly useful in analyzing the potential impacts of changes in land use forecasts; use of the 2007/2008 Household Travel Survey; a near doubling of the transportation analysis zones, which allows for finer-grained analysis of travel demand impacts particularly in activity centers; the generation of non-motorized trips for all purposes, which will improve sensitivity to impacts in bicycling and walking since the current model only forecasts work trips; and an updated truck model, which will allow further integration of freight impacts into scenario work.

The CLRP Aspirations Scenario did not and to be fair could not address all of the questions and issues that emerged from the extensive RMAS outreach efforts. In

particular, the outreach efforts clearly shed light on the collective skepticism about the capacity of leaders to implement a regional strategy of concentrated development and transportation investment without causing negative impacts at the local level. Further analysis could be done to determine what the localized impacts of the pricing and BRT system would be, particularly when combined with an aggressive land use strategy.

In a similar vein, more detailed analysis could be done to determine what the effects of the land use component would be on the existing transit system specifically. The sensitivity shows that even without adding transit service, land use changes alone could induce substantial increases in transit use to be accommodated on the existing system. It is possible that since the land use creates transit-oriented mixed use centers across the region, the existing system could handle more riders because of increased efficiency. Instead of traveling uni-directionally from one end of the system to the center core area, which results in directional transit congestion, transit users would be boarding the system at any of the activity centers and traveling to job sites that also are in any of these centers. It is also possible that shorter transit trips are encouraged as housing and job opportunities are concentrated in each of the over 60 centers, so that as one passenger exits to his/her destination, another could be boarding. Each center thus serves as both an origin and a destination, allowing the transit system to work most efficiently. On the other hand, given current issues with the Metrorail system, which is projected to suffer from increasing levels of congestion, more analysis would need to be done to truly understand the effects on the existing system from concentrating significant amounts of households and jobs around transit. It is possible that more balanced transit use occurs, allowing the transit system to operate more efficiently with greater ridership; however, it is also possible that this type of development would lead to crippling transit congestion in the absence of significant capacity-increasing investment. More analysis is necessary to illuminate this issue.

The results of this study do not form a simple story with an entirely positive outcome, but rather are nuanced and reflect the difficulty in meeting multiple, sometimes competing objectives. The scenario results in drastic reduction in congestion. It also increases transit, bicycle, and pedestrian use, as well as driving and air pollution at the same time. No plan can ever please everyone and as such there must be a method of balancing the costs and benefits to determine whether it is worth doing. The TPB has recent experience in developing comprehensive cost-benefit analysis for transportation projects through its two recent TIGER applications and this methodology could be adapted and applied to this scenario in the future. A comprehensive cost-benefit analysis would provide a layer of analysis to put the scenario's impacts in perspective and make better sense of the results.

# National Capital Region Transportation Planning Board

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**M E M O R A N D U M**

**TO:** Transportation Planning Board

**FROM:** Ron Kirby
Department of Transportation Planning

**SUBJECT:** Summary of Major Corridor Studies Considering Managed/Value-Priced Lanes

**DATE:** September 15, 2010

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## Background

This memo summarizes publicly available information on projects and studies that have included consideration of highway value pricing (including both High-Occupancy/Toll (HOT) and Express Toll Lane (ETL) concepts) in the National Capital Region. Besides the Capital Beltway in Virginia HOT Lanes and Intercounty Connector projects now under construction, State DOTs and other project leaders have conducted several studies of highway value pricing at the corridor level. Some of these studies have identified other preferred alternatives or are on hold; however, taken together they indicate the comprehensive consideration of managed lanes and value pricing that has taken place in the region. In addition, the National Capital Region Transportation Planning Board (TPB) has made considerable progress in examining highway value pricing concepts for the region through various scenario and alternatives analyses for long-range planning and eventual inclusion in the region's constrained long-range transportation plan (CLRP).

## Current Projects

There are two construction projects underway that will provide the first value-priced highway systems in the region,

### 1. Capital Beltway in Virginia HOT Lane Project

The Virginia HOT lane system will add two HOT lanes in each direction extending along I-495 from the Springfield (I-95 / I-395) interchange to just north of the Dulles Toll Road. Buses, vanpools and HOV-3 vehicles will travel at no charge; HOV-2 and SOV users will pay a variable toll, collected through electronic-toll collection and based on congestion in order to keep traffic free-flowing.

*Status: Construction began in 2008; facility expected to open in 2013.*
There will be two HOT lanes in each direction, operating along the median of the corridor. The HOT lanes will be separated by a barrier from the four general purpose lanes of the highway, with dedicated on and off-ramps at major interchanges.

### 2. Intercounty Connector (ICC) Project

The (ICC) project will link the I-270 and I-95/US 1 corridors and their activity centers within central and eastern Montgomery County and northwestern Prince George's County.

*Status: Construction began in November 2007. First phase will open in early 2011 and the full facility is expected to open in early 2012.*
The facility will be the eighth toll facility in Maryland managed by the Maryland Transportation Authority (MdTA). All travel on the road will be tolled; users will pay through electronic toll collection, with no toll booths or cash collection. Tolls will be variably priced to keep traffic flowing, increasing with user demand in order to prevent congestion.

**Included in Constrained Long Range Plan (CLRP)**
In addition to the two projects under construction, a third project with variable pricing is in the CLRP.

**3. I-95/395 HOV/Bus/HOT Lanes Plan**
The planned project begins in the vicinity of the Pentagon in Arlington and ends in Spotsylvania County below the Massapponax exit. Project would be built by a public-private partnership between VDOT and Fluor-Transurban.

*Status: Project was initially proposed in June 2005 in response to a Request for Proposals issued by VDOT. Currently under legal and environmental review.*
The project would expand the existing HOV system from two to three lanes between Eads Street in Arlington to Dumfries, and would construct two new lanes south to Spotsylvania. All of these lanes will become HOV/Bus/HOT lanes. The Northern Section will begin at Eads Street in Arlington and end near the Garrisonville Road area, adding a third lane to the existing 28 miles of HOV lanes between Arlington and Dumfries. The Southern Section would include building two new HOV lanes for an additional 28 miles south to Spotsylvania County. The Northern Section component is under legal and environmental review, while the Southern Section is still in the planning stage.

**Corridor Studies with Value Pricing**

**4. 14th Street Bridge Corridor** (I-395 and US 1 Bridges)
The 14th Street Bridge system (with three spans: Arland D. Williams inbound, George Mason outbound, and the Rochambeau span with two lanes in each direction) is being analyzed by the Federal Highway Administration (FHWA). The entire study area is the four mile section of I-395 between VA Route 27 (Washington Boulevard) in Arlington, Virginia and the New York Avenue tunnel entrance at the National Mall in southeast DC.

*Status: Draft EIS release anticipated October 2010.*
A previous alternatives analysis (August 2009) considered conversion of the existing two general purpose lanes (GPL) in each direction to HOV/HOT, plus potential addition of a third lane, on the Rochambeau span. Options included: (1) construct one reversible shared bus/HOT lane in the median across Rochambeau Bridge; convert existing GPLs to HOT in the peak direction with connections to 14th Street and to I-395 Expressway; and (2) extend congestion pricing across Rochambeau Bridge by constructing two reversible shared HOT/bus lanes in median; maintain existing GPLs; HOT lanes continue up 14th Street. Both options were recommended for further analysis in the ongoing DEIS.

**5. South Side Mobility Study** (I-95 between the Springfield Interchange and Branch Avenue)
The Phase 2 Market Analysis analyzed the potential for transit and/or HOV facilities across the Woodrow Wilson Bridge (WWB) as one of two parts of the joint mobility study for the section of I-95/I-495/Capital Beltway from the Springfield Interchange in Virginia to MD 5 (Branch Avenue) in Maryland.

*Status: Study completed February 2009.*

The South Side study identified a need for transit and HOV lanes across the Woodrow Wilson Bridge to meet transportation demand. Two transit routes from National Harbor to Alexandria and Fairfax were determined to be viable, but the study did not go further in considering managed lane concepts, postponing study of the physical characteristics and management strategies for potential HOT and/or ETL facilities on or near the bridge.

**6. West Side Mobility Study** (I-270 and Legion Bridge)
The West Side Mobility Study was led by the Maryland State Highway Administration (SHA) and supported by the Virginia Department of Transportation (VDOT). The 14-mile long study area extended from the Capital Beltway in Virginia HOT Lane Project north across the American Legion Bridge, along the west side of the Capital Beltway in Maryland, along the I-270 West Spur, along I-270, to the I-370 Interchange south of Gaithersburg.

*Status: Study completed Fall 2008.*
The study evaluated seven long-term alternatives, all involving managed lanes along with improvements to traffic operations, and advanced five of them as worthwhile for further study. The managed lane (HOV, HOT, or ETL) system would consist of one or two managed lanes in each direction and would connect the VDOT HOT lanes with the Express Toll (ETL) planned for I-270 and the Intercounty Connector. The study also considered widening for one lane per direction on the American Legion Bridge and in Maryland, though the widening is constrained by the limited right-of-way and proximity to sensitive environmental features and adjacent residences.

**7. Capital Beltway Study** (I-495 in Maryland)
The Full Beltway Study limits includes Maryland's entire portion of the Beltway, 42 miles, which extends from the American Legion Bridge to the Woodrow Wilson Bridge. The study area lies within Montgomery and Prince George's counties.

*Status: Study on hold.*
The State Highway Administration recommends further study on two alternatives for I-495 in Maryland with Express Toll Lanes: 1) an Express Toll Lane (one tolled concurrent flow (no barrier separation) lane per direction) and 2) two Express Toll Lanes (one additional, tolled lane per direction and conversion of one existing general-purpose lane per direction into a tolled lane).

**8. I-270/US 15 Multi-Modal Corridor Study Alternatives Analysis/Environmental Assessment**
The I-270/US 15 Multi-Modal project evaluated several combinations of transit and highway strategies to address congestion, improve safety, and increase mobility along the I-270/US 15 Corridor from the Shady Grove Metrorail Station (Montgomery County) to north of Biggs Ford Road (Frederick County). The study area included the Corridor Cities Transitway project from the Shady Grove Metrorail Station to the COMSAT facility just south of Clarksburg.

*Status: Alternatives Analysis Study completed May 2009.*
This AA/EA study continued on from a 2002 Draft Environmental Impact Statement (DEIS), updating models and data and adding analysis of two Express Toll Lane (ETL) alternatives. The ETL alternatives would continue the system proposed in the West Side Mobility Study (*see above*), with two ETL lanes in each direction in Montgomery Country and one or two ETL lanes in Frederick County. Each alternative also included evaluation of two transit alternatives for the Corridor Cities Transitway (Light Rail and BRT respectively). Public hearings were held in June 2009, and this input will go into development of the Final EIS.

**9. Interstate 66 Studies**
Several studies of I-66 have taken place, some considering value pricing.

I-66 Inside The Beltway Feasibility Study
*Status: Conducted July 2004 to June 2005.*
The study analyzed the impacts of converting the existing HOV system to HOT lanes with fixed and variable pricing. Recommended a combination of Roadway Widening with a new managed lane (HOT/HOV) and further detailed study of managed lane concepts.

I-66 Transit/Transportation Demand Management Study
*Status: Conducted May to December 2009. Final report issued December 2009.*
Examined Transit/TDM options for the I-66 corridor from U.S. 15 in Haymarket, Virginia, east to the District of Columbia border. Did not consider tolls or managed lanes. Study options to be reviewed in new Multimodal Study.

I-66 Multimodal Transportation and Environmental Study
*Status: Began 2002. New focus announced June 21, 2010 by Governor McDonnell.*
Previously focused on the 24-mile portion of I-66 from the Capital Beltway west to Haymarket (US 15), including consideration of HOT lanes. New multimodal study will identify and evaluate options to address the overall needs of the corridor, specifically including the portion of the corridor from the Capital Beltway (I-495) east to the Virginia/District of Columbia border. The study will examine a wide range of options including bus, transportation demand management (TDM), High Occupancy Vehicle (HOV), High Occupancy Toll (HOT), congestion pricing, managed lanes and road improvements. The study will build on the I-66 Transit/TDM study completed by the Virginia Department of Rail and Public Transportation in 2009.

**10. MD 5 Corridor Transportation Study**
The study is evaluating MD 5 (Branch Avenue) from south of US 301/ MD 5 (Brandywine) to north of I-95/I-495 (Capital Beltway) in Prince George's County.

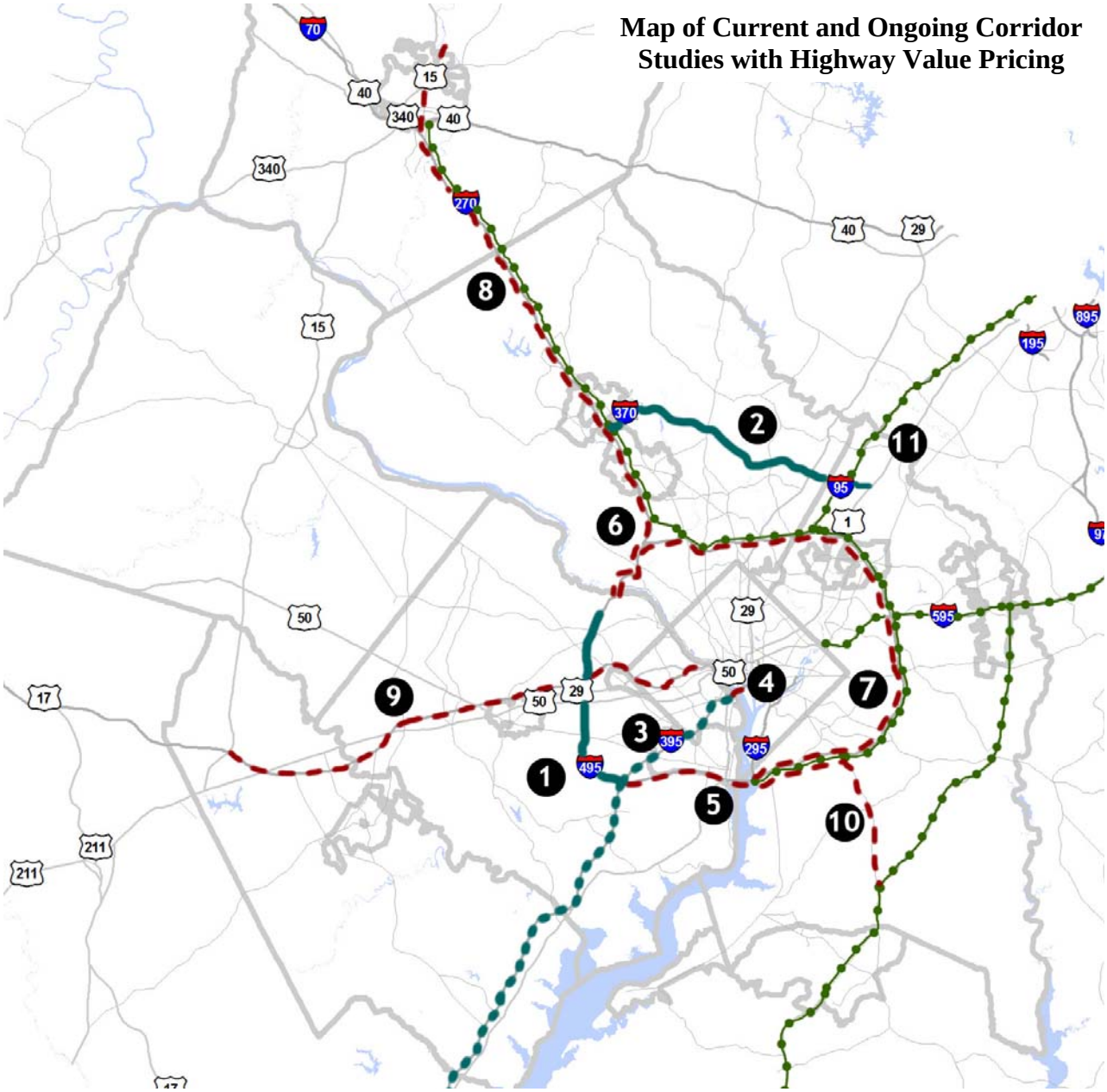
*Status: Began 2005. New environmental analysis to be completed in 2011.*
Options studied included three managed lanes alternatives, two with pricing. Priced managed lanes alternatives include: 1) adding two new reversible lanes in the median, and 2) adding one priced lane in each direction throughout the corridor, and converting one general purpose lane in each direction to a managed lane north of MD 223 (Woodyard Road).

**11. MDOT Maryland Managed Lanes Study**
This is an ongoing study conducted by TPB staff as part of the Maryland Technical Assistance program within the Unified Planning Work Program. Study is evaluating the impact of a managed lane network on travel for a hypothetical network including I-270 (HOV conversion and / or lane addition), the Capital Beltway (lane addition), I-95 (lane addition), US 50 (HOV conversion and lane addition), and US 301 (lane addition), as well as the planned managed lanes network (e.g., ICC and Virginia Capital Beltway HOT Lanes.).

*Status: Ongoing.*
The study is examining managed or variably priced lanes designed to respond efficiently to changes in demand by varying tolls in order to maximize throughput. Over the course of the study, the focus has shifted from electronic toll lanes to high occupancy toll (HOT) lanes. The model results for the studied corridors show that switching from general purpose lanes to HOT lanes would increase speeds by

anywhere between 15 and 20 mph on average, leading to decreases in congestion as throughput improves. The model also shows that managed lanes can relieve congestion and decrease vehicle hours of delay not only on the improved facilities, but also on parallel roadways.

**Map of Current and Ongoing Corridor Studies with Highway Value Pricing**




**Under Construction**

1. Capital Beltway in Virginia HOT Lane Project
2. Intercounty Connector (ICC)

**Included in CLRP**

3. I-95/395 HOV/Bus/HOT Lanes Plan

**Corridor Studies**

4. 14th Street Bridge Corridor
5. South Side Mobility Study
6. West Side Mobility Study
7. Capital Beltway Study
8. I-270/US 15 Multi-Modal Corridor Study
9. Interstate 66 Studies
10. MD 5 Corridor Transportation Study

**Network Analysis Study**

11. MDOT Maryland Managed Lanes Study

**PUBLIC ACCEPTABILITY OF REGIONAL ROAD-USE PRICING:**
**CAN IT BE DESIGNED TO GARNER PUBLIC SUPPORT?**

Grant Proposal for US DOT- FHWA Value Pricing Pilot Program

Submitted by the Virginia Department of Transportation
On behalf of the National Capital Region Transportation Planning Board (TPB)
Working in Partnership with the Brookings Institution

November 3, 2009

## I. OVERVIEW

While distance-based road pricing has become technologically feasible, questions of public acceptability remain largely unanswered. Is it possible to make road-use pricing politically viable, and if so, how? Can decision makers effectively address concerns about privacy and equity? Under what circumstances do voters believe that road-use pricing is "worth it"? What would it take to convince political leaders that it's worth supporting such a policy?

The National Capital Region Transportation Planning Board in partnership with the Brookings Institution is submitting this application for a study that would investigate these concerns in a comprehensive and objective manner. Using the metropolitan Washington region as a case study, the project will employ focus groups and public opinion surveys to test a variety of pricing options and assess opportunities and obstacles to implementation.

## II. BACKGROUND

### *About the Transportation Planning Board*

The National Capital Region Transportation Planning Board (TPB) is the Metropolitan Planning Organization (MPO) for the Washington metropolitan region. As an MPO, the TPB is responsible for coordinating transportation planning at the regional level and developing the long-range (20-25 year) financially constrained transportation plan for the region.

The TPB brings together key decision maker to coordinate planning and funding for the region's transportation system. Members of the TPB include representatives of local governments, the departments of transportation for the District of Columbia, Maryland and Virginia, the Washington Metropolitan Area Transit Authority (WMATA), the Maryland and Virginia General Assemblies, and non-voting members from the Metropolitan Washington Airports Authority and federal agencies.

The TPB was created in 1965 by local and state governments in the Washington region. The TPB has been associated with the Metropolitan Washington Council of Governments (MWCOG) since 1966. Although the TPB is an independent body, its staff is provided by COG's Department of Transportation Planning.

***About Greater Washington Research at Brookings***

Greater Washington Research at Brookings, founded in 2000, is housed within the Brookings Metropolitan Policy Program. Its mission is to improve public policy in the region by identifying policy issues, presenting data and analysis of policy options, and convening leaders for focused dialogue. The program serves as both a research resource and catalyst for action. Greater Washington Research focuses on a variety of economic, demographic and social policy issues affecting the region and the city of Washington, DC.

Recent and ongoing work includes analyses of how the region is faring in the context of a national recession; assessments of demographic trends and changes in the region; and options to improve post-secondary educational and job training opportunities for Washington, DC residents. Upcoming work includes identifying financing strategies to support the DC Water and Sewer Authority in making legally required infrastructure improvements and assessing the likely effects of various policy options, such as mixed-income housing and transit-oriented development, in reducing regional disparities in economic development, earnings and poverty.

Because of its small size, Greater Washington Research at Brookings conducts much of its work in partnership with other organizations such as the TPB. The program also collaborates with colleagues in the nationally-focused Metropolitan Policy Program on a variety of issues. Alice M. Rivlin is director of Greater Washington Research at Brookings; Dr. Rivlin is an economist and also has an appointment as Senior Fellow in the Brookings Economic Studies program.

## III. PROPOSAL

**Problem Statement:** ***Increasing Congestion, Tightening Revenues, Political Sensitivities***

The Washington region's pattern of rapid growth is forecast to continue in the coming decades. The Metropolitan Washington Council of Governments projects that the metropolitan area will add 1.6 million new residents and 1.2 million new jobs by 2030. These new people and new jobs will increase the stress on an already burdened transportation system. At the same time, transportation funding is tight and future funding forecasts are bleak. Revenue sources have simply not kept up with needs, in large part because fuel taxes have not been increased with inflation, nor have they taken into account improvements in vehicle fuel efficiency. Costs have also increased faster than inflation, including operation and maintenance expenses and construction costs.

TPB travel demand forecasts reveal a disturbing mismatch between demand and capacity. Between 2008 and 2030, vehicle miles of travel (VMT) are anticipated to increase 23 percent, while freeway and arterial lane miles will only increase 13 percent increase. The number of lane miles of peak-hour congestion will grow by 41 percent in the same period. The growth in transit capacity will also not keep up with demand. Without additional funding, ridership demand on the Metrorail system is expected to exceed capacity "to and through" the regional core by 2030.

As congestion grows and funding shrinks, decision makers have increasingly turned to transportation pricing mechanisms. Today, three out of the five most expensive projects planned in the National Capital Region for the next six years are toll projects—Virginia's two HOT lanes projects (on the Beltway and I-95/39) and Maryland's Intercounty Connector. Toll revenues are also a key funding component for the Dulles rail project. The TPB's 2006 long-range financial analysis found that tolls and private sources can be expected to provide seven percent of anticipated revenues between now and 2030. A similar analysis in 2003 found that toll and private money accounted for just one percent of anticipated revenues.

Although decision makers in the Washington region and across the nation have increasingly responded to the transportation funding shortfall with toll-lane projects, anticipated revenues still fall far short of needs. Therefore, the national debate has focused in recent years on the inadequacies of the gas tax as a transportation funding mechanism. Many leading experts have called for the gas tax to be replaced by a system of user fees based on vehicle miles of travel (VMT). If fees could further be based on location and time of day of vehicle travel, such a system could increase revenues and improve system performance by reducing congestion and emissions, including greenhouse gases.

In February 2009, the National Surface Transportation Infrastructure Financing Commission issued its final report to Congress. The report recommended moving to a VMT charge within a decade because the fuel tax is "likely to erode more quickly than previously thought." Distance-based road pricing has been the subject of numerous public discussions and reports, including a study released in June 2009 by the Rand Corporation on behalf of the American Association of State Highway and Transportation Officials (AASHTO), which evaluated the effectiveness and practicality of nine different VMT fee mechanisms.

Also in June, the Brookings Institution issued a report titled *"Road-use Pricing: How Would You Like to Spend Less Time in Traffic?"* The Brookings proposal called for an area-wide demonstration project that would replace state gas taxes in the D.C. region with a system of GPS-based road pricing. (See Section IV for more information on the Brookings proposal.)

National transportation policy makers expressed interest earlier this year in further investigation of a VMT tax, but political leaders on Capitol Hill and within the Administration have stopped short of an outright endorsement of such a major policy shift. Indeed, public acceptability appears to have emerged as the biggest obstacle to implementation. However,

research on public attitudes is notably lacking. While proponents have articulated a persuasive case in support of pricing policies, our understanding of the public acceptability of such policies often seems to be based upon limited information and poorly grounded assumptions.

**Project Description: *Testing Public Acceptability of Pricing Scenarios***

The National Capital Region Transportation Planning Board at the Metropolitan Washington Council of Governments (MWCOG), in partnership with the Brookings Institution, is submitting this application for a project that will seek to answer key questions related to the public acceptability of VMT fees or other forms of road-use pricing. In an iterative process, the project will gather and analyze data regarding the public acceptability of pricing programs based on social, economic, and equity effects. An initial technical assessment will be made of several viable options for regional road-use pricing and the various ways in which they could be implemented. A telephone survey will be used to evaluate public attitudes toward a menu of pricing options. Focus groups will explore how strategies, which will have been explored in the survey and elaborated with input from the expert panel, address public concerns and political challenges. Briefings will be presented to the TPB at key stages throughout the process. Upon completion of the study, findings will be summarized and presented to the TPB.

The project will proceed according to the following phases:

<u>Task 1: Develop a menu of implementation options</u>

The TPB and Brookings and will convene an expert panel of 10-14 regional experts on transportation and road-use pricing. Over the course of three months and through a series of intensive meetings, this expert panel will develop a menu of implementation options for comprehensive regional road-use pricing. These options will fall under four main categories: geography, technology, and pricing strategy and revenue uses. For example, the geographic area priced could be determined by relative proximity to transit and/or level of congestion; the technology used to assign prices to motorists could be GPS-, cell phone tower-, or camera-based; fees might vary by time of day or ability to pay; and revenues might be used to fund transit and/or roads, or to offset negative effects on low-income motorists.

Also during this initial period, the TPB will procure consultant assistance from a public opinion research firm to work with the expert panel to develop a public opinion survey that will be based upon the menu of implementation options. This firm will take the lead in designing, conducting and analyzing the public opinion survey (Task 2) and focus groups (Task 5).

Task 2: Conduct public opinion survey

The opinion research consultant firm will conduct a telephone survey that presents respondents with a basic set of menu options for road-use pricing and then asks them to rate each of the pricing menu items based upon the respondents' attitudes regarding a number of factors including anticipated benefits and disbenefits, concerns about privacy and equity, use of new revenues, and a variety of other issues. . The TPB will identify a consultant with an extensive level of expertise in both objective, non-partisan public opinion research and public policy. Preference will be given to firms with experience in transportation planning or policy. COG's recent survey for its Greater Washington 2050 initiative may provide a model to consider in the development of this project's survey.

Task 3: Identify scenarios

The TPB, Brookings and the expert panel will develop a series of alternate road-use pricing scenarios, with an emphasis on different combinations of those menu items most likely to garner public support based on an analysis of survey responses. These scenarios will then be used to provide focus group participants with clear alternative choices among various features, such as varying levels of geographic coverage, different technologies for pricing, and various innovative pricing strategies to affect transportation behavior, travel patterns and mode choice.

Task 4: Conduct focus groups

The TPB will contract with a private consultant to convene focus groups to discuss, evaluate, and refine the pricing scenarios. Focus groups will include randomly selected groups of individuals and may also comprise stakeholder groups, including representatives of business, environmental and civic groups.

Task 5: Conduct further analysis

The scenarios produced by the focus groups will be subjected to a deeper technical and benefit/cost analysis performed with the assistance of an outside contractor. This analysis will focus on engineering feasibility and cost, effect on congestion, economic impact including productivity, and impact on equity, including spatial equity and equity as it pertains to low-income or other transportation–disadvantaged groups.

Task 6: Summarize findings and present to TPB

Based on the survey and focus group findings, and additional analytic work, the expert panel will summarize public feedback on pricing options and scenarios. The results will be presented to the TPB.

**Project Goals:**
***Provide Information for Decision Makers, Contribute to Long-Term Policy Objectives***

As an immediate goal, this project aims to identify the challenges and opportunities that decision makers would face if they were to move forward with the implementation of distance-based road pricing or other forms of value pricing. This is a practical and useful goal, which we believe will make an important contribution to our region's transportation planning activities, as well as playing a key role in the emerging national conversation about transportation funding and planning policy.

Underlying this study, however, is a set of broader goals articulated in the TPB Vision, the Washington region's transportation policy framework. Adopted in 1998, the Vision calls for reductions in VMT per capita and lane miles of congestion. The Vision also urged regional leaders to provide a range of transportation choices, plan land use more efficiently, promote environmental sustainability, and use technology to obtain more efficient use of our existing transportation capacity.

Our region has made progress on many of the goals embodied in the Vision, although successes have been incremental and sometimes uneven. But one Vision goal has remained more elusive than others – sustainable funding. Transportation revenues remain tight, and transportation capacity in our growing region is not keeping up with demand. Many regional leaders agree that until this funding shortfall is addressed, progress on the Vision's other goals will remain limited.

Although regional leaders have increasingly accepted tolling for new road capacity, consensus on more ambitious pricing concepts is still quite distant. However, as displayed in this grant proposal, regional leaders on the TPB have agreed that at the very least they need to investigate innovative approaches that could reduce congestion, raise revenue, make investments in a variety of modes, enhance economic competitiveness, create livable communities and use technology to obtain more efficient use of our existing transportation capacity. Road pricing presents opportunities that could help to achieve these ambitious long-term goals, but our region cannot seize such opportunities if we do not more fully understand public perceptions of pricing policies.

**Key Elements for Inclusion in the Study**

In preparation for the development of this proposal, the TPB members and staff have engaged in extensive discussions with elected officials, planning staff at partner agencies, citizens and other key stakeholders. Based upon this input, as well as the TPB's past activities related to value pricing, the project scope will be constructed to include the following key aspects:

- *Facilities to be included.* As described above, the project will study several scenarios for broad-scale area-wide or region-wide pricing that will be examined in surveys and focus groups. Because at least one of the scenarios will be based upon vehicle-based pricing technologies, travel on all regional facilities will be covered in at least one of the scenarios. Other scenarios may include looking at zones within the region or subsets of the region's road network.

- *Pricing variability.* To provide useful comparisons, scenarios will look at variable pricing as well as flat pricing systems. Public perceptions of the differences between these approaches will be extensively probed through the study's survey and focus group analysis. The public will be asked opinions about details such as pricing levels and formulas, technologies, enforcement and operating details.

- *Anticipated benefits of pricing.* Research on public opinion will include discussion and analysis of the following questions, among others, related to the potential benefits of pricing:
    - How should additional revenue be used? The public will be asked about a variety of options for the use of revenues, such as dedication to alternative modes, investment in roads, gas tax relief and funding for local jurisdictions.
    - From the public's perspective, how valuable is the potential reduction in congestion resulting from road pricing?
    - Would the public welcome benefits for other modes, including more capacity and funding for public transit, as well as increased opportunities for bicycling and walking?

- *Concerns about privacy.* This research project will investigate public concerns about privacy issues related to vehicle-based pricing. Topics may include public attitudes regarding the comparative intrusiveness of various technologies, opportunities to mitigate concerns about privacy, and public attitudes toward the relative benefits of new technologies (such as transponders that also provide real-time traffic information) that might outweigh privacy concerns.

- *Distributional implications of pricing.* The project will probe public attitudes related to equity and fairness, such as:
    - When comparing several pricing scenarios, do citizens perceive some options to be more or less fair?
    - What would it take to adequately mitigate negative impacts on low-income, minority, or other communities?
    - How can a pricing scenario be equitably structure to take into account transportation-disadvantaged groups?

- *Role of alternate modes.* The study will examine whether the public believes that other modes, like transit, can serve as adequate alternatives to travel in a priced area. Answers to this and other questions will be disaggregated according to jurisdiction.

Public perceptions regarding the role of alternate modes will also be correlated with land use patterns.

- *Importance of thorough and objective analysis.* It is important that the study's findings are defensible and robust. The project will be largely guided by an expert panel reflecting a spectrum of professional and academic backgrounds. Members of the panel may include transportation economists, land use experts and representatives of key stakeholder interests. Transportation agency representatives will participate in an ex-officio capacity. In addition, care will be taken to ensure the public opinion research is based on samples that are large enough to stand up to scrutiny and available for disaggregation along individual jurisdictional lines.

**Responsiveness to the Federal Solicitation**

This proposal responds specifically to the Federal Register solicitation of August 5, 2009 for proposals for the FHWA Value Pricing Pilot Program in the following ways:

- *Project type.* This application seeks funding for a "pre-implementation study," which, as defined in the solicitation, will "support efforts to identify and evaluate congestion pricing project alternatives, and to prepare the necessary groundwork for relatively near-term implementation" (page 39141, column 1). The guiding premise of our study is that a significant challenge to implementing value pricing programs is the question of public acceptance. Therefore we can best lay the groundwork for potential new pricing programs by conducting an objective and comprehensive investigation of public opinion, and providing this information to decision makers.

- *Regionwide scenarios.* The solicitation indicates that FHWA will consider project proposals to "Perform a rigorous areawide or regionwide congestion pricing scenario study around one or more scenarios that are comprehensive and potentially acceptable to the public" (page 39140, column 1). Our project will craft several scenarios that will be presented to the public for discussion. At least one, if not all, of the scenarios will cover the entire region, and all the scenarios will be analyzed from a regional perspective. At least one of the scenarios will be based upon regionwide vehicle-based pricing technologies.

- *Political support.* The solicitation states that "For pre-implementation projects, applicants should demonstrate that there is already sufficient political support for their implementation, or that the project is designed to bring about such support." The TPB, which includes elected officials from throughout the Washington region, has already demonstrated its support for this project when it voted to approve the submission of this application on October 21, 2009. More broadly, the entire proposal is centered on questions related to political support. We believe this project will meet the fundamental challenge of the FHWA solicitation by launching an intensive investigation

that asks objective questions about how and whether a "high probability" of public support can be achieved.

- *Pragmatic and focused study.* The solicitation states that "FHWA will not fund purely academic studies of congestion pricing or studies that involve major expansions of existing facilities or area-wide or regionwide planning studies covering many topics besides pricing and incorporating congestion pricing only as one of a number of options"(page 39141, column 1). This project would conduct a focused and objective investigation of the issue of public acceptability of pricing. This is an issue that our agency is not likely to otherwise study through our ongoing work program activities. The project will be designed to be highly informative and useful for decision makers.

- *Potential impacts on low-income drivers and other transportation disadvantaged groups.* The solicitation states that "Projects should be designed to reflect the needs of low-income or other transportation-disadvantaged groups" (page 39141, column 1). The concerns of these drivers would be essential to our study. As noted in the Brookings recent report in support of road-use charging, "Higher-income drivers are most able to afford the peak charges, and the time saved is more valuable to those drivers with higher incomes (because their hourly wage is higher). Lower income drivers are more likely to have to change their behavior so that they drive when charges are less, or switch to other modes of travel. Low-income motorist are also more likely to own less-fuel efficient vehicles, so any congestion pricing policy that takes vehicle type into consideration will fall upon them disproportionately" (Brookings paper, page 3) Our project will explicitly set out to research how individuals from such groups believe they might be negatively affected by pricing programs, and whether mitigation measures, such an increased transit options, reduced toll rates or monetary credits, will be an adequate and acceptable mitigation of negative consequences.

- *Consideration of innovative techniques.* The solicitation states that "As part of broad, areawide or regionwide pricing scenario studies, the inclusion of new, innovative congestion pricing approaches is encouraged" (page 39140, column 3). Our proposed study will respond to this challenge. Through a survey and focus groups, the project will break new ground by explaining and discussing innovative techniques – some of which have not yet been extensively applied anywhere in the world, including GPS-based pricing schemes. These concepts are new to most people and therefore the study will need to provide basic education on different technologies and their purposes.

- *Discussion of sustainability and livability.* The solicitation states that "FHWA in particular seeks tests of non-toll pricing strategies that will substantially improve livability in an area and advance environmental sustainability in a major way…" (page 39140, column 2). The proposed survey and focus groups would encourage citizens to understand how pricing policies might convey environmental benefits and explore how citizens value such benefits.

- *Comparisons with the regional long-range plan.* Areawide or regionwide transportation pricing studies are encouraged to include evaluation of benefits, costs, revenues, environmental impacts, distributional impacts, and financial feasibility of each alternative package of transportation improvements, in comparison with the region's currently adopted long-range transportation plan "(page 39140, column 3). An analysis of the TPB's Constrained Long-Range Plan will provide a baseline of current and future conditions that will be essential to a public dialogue about the relative impacts of road pricing. This baseline will provide a view of the future given current trends that will be a starting point for discussion about the possibility of alternative pricing scenarios.

- *Inclusion of stakeholder groups.* The solicitation states that "Development of alternative packages may involve stakeholder groups, including (among others) business groups, environmental groups, and advocates for social equity" (page 39140, column 3). While this project will rely upon the use of an expert panel to guide its development, the gathering of public opinion will include outreach to stakeholder groups, including the categories identified above. These groups are regular participants in the TPB's planning process and their inclusion will be essential to the work of this study. Input from elected officials, including those on the TPB, will also be sought.

- *Encouraging the use of alternate modes.* The solicitation emphasizes the importance of promoting alternative modes. The TPB currently has a variety of programs and policies promoting alternatives to driving. This proposed study will identify the public's views on whether these alternatives are adequate. It will also explore if and how these alternatives may need to be enhanced in any given pricing scenarios.

- *Next steps and implementation.* The solicitation stresses the federal interest in near-term implementation. The proposed study will be constructed to provide useful data for immediate use by policy makers while also establishing a reservoir of information to potentially inform longer-term change. We anticipate that the results of this study will lead to a more comprehensive understanding of public opinion on various forms of road pricing. This, in turn, will better inform regional decision makers on how to solve some of the transportation challenges facing the metropolitan Washington region.

- *Comprehensiveness.* The solicitation notes that proposals will be evaluated based upon "The degree to which the proposed pricing scenarios are comprehensive involving synergistic combinations of multimodal investment strategies, Intelligent Transportation System technologies and travel demand management strategies" (page 39143, column 1). The expert panel that constructs the scenarios for this project will comprehensively consider a range of elements designed to improve system efficiency, including those noted above.

**Funding**

Given the 80:20 match requirement, this application's funding request from FHWA is $320,000. Total funding for the project will be $400,000. The Metropolitan Washington Council of Governments Board of Directors on October 14 approved the required 20% match in the amount of $80,000.

The FHWA Value Pricing Program is the only external funding source being solicited for this pre-implementation study.

**Schedule and Budget**

The project is anticipated to last a period of 12 months. The six tasks of the project will be scheduled and budgeted as follows:

| | |
|---|---|
| Task 1: Develop a menu of implementation options, months 1-3 | 50,000 |
| Task 2: Conduct public opinion survey, months 4-5 | 100,000 |
| Task 3: Identify scenarios based upon survey, months 6-7 | 75,000 |
| Task 4: Test scenarios in focus groups, months 8-9 | 50,000 |
| Task 5: Conduct further analysis, months 10-11 | 75,000 |
| Task 6: Summarize findings and present to TPB, month 12 | 50,000 |
| Total | $400,000 |

Funds will be divided as follows:

| | |
|---|---|
| COG/TPB | 180,000 |
| Subcontractors: | |
| Brookings Greater Washington | 60,000 |
| Public opinion research consultant | 150,000 |
| Additional technical consultant support | 10,000 |
| Total | $400,000 |

**Point of Contact**

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**Implementation Responsibilities**

The Transportation Planning Board at COG will act as lead agency responsible for grant implementation. TPB staff will be responsible for project management and oversight, technical analysis, and outreach with stakeholders in the region. The Virginia Department of Transportation (VDOT) will be the direct recipient of the grant. Greater Washington Research at Brookings will provide support in convening experts, conducting project research, and providing project guidance. The TPB staff and Brookings will jointly develop the final research report, including the articulation of findings. Consultant support will be procured to develop, conduct and analyze a public opinion survey and a series of focus groups, as well as for additional technical analysis.

## IV. ADDITIONAL INFORMATION

**Overview of Previous Work on Value Pricing**

- ***COG/TPB Activities on Value Pricing, 2001-2009***

The TPB initiated the Regional Mobility and Accessibility Scenario Study ("the scenario study") in 2001 to evaluate additional highway and transit options beyond those that are currently funded, and to examine the interaction of these transportation options with various land use alternatives. The first phase of the scenario study, summarized in a final report dated November 17, 2006, included the development and analysis of five alternative land use and transportation scenarios.

In 2003, the TPB convened more than 200 elected officials, community leaders, planners and academics for a conference that was the region's first major public event to discuss value pricing. The conference helped to galvanize regional interest in pricing as a solution to the region's perpetual transportation funding shortfall. Later in 2003, the TPB formed its Task Force for Value Pricing in Transportation, which developed a set of regional goals for variably priced projects in the region. This task force also provided oversight for the second phase of the TPB Scenario Study, which was an in-depth analysis of a regional network of variably priced lanes funded under a grant from the FHWA's Value Pricing Pilot Program. This study evaluated the demand, potential revenue, transit viability and land use impacts of a regional network of variably priced lanes, and documented its findings in a February 2008 report, which garnered wide interest throughout the region. The final report, which includes the TPB's Policy Principles on Variably Priced Lanes, can be found at: http://www.mwcog.org/TPB/VPTF/docs/RVPS_Final_Report.pdf.

The current phase of the scenario study, initiated in January 2008, is evaluating two new, second-generation scenarios. The "What Would It Take?" scenario is an analysis of the interventions that should be taken in order to meet regional climate change goals, while the

"CLRP Aspirations" scenario combines the previous two phases of the scenario study, pairing land use shifts with pricing and transit projects.

- ***Brookings Paper Proposing a Road-use Pricing Strategy, June 2009***

In June 2009, the Brookings Institution linked the concept of distance-based pricing to the Washington region with a bold proposal for an area-wide demonstration project that would replace state gas taxes in our region with a system of road pricing. The proposal, titled *"Road-use Pricing: How Would You Like to Spend Less Time in Traffic?"* called for a GPS-based pricing system to replace the gas tax and raise new revenues from vehicle travel while simultaneously providing a means to reduce traffic congestion and pollution and improve public transportation.

The final report and associated op-ed can be found at:
http://www.brookings.edu/papers/2009/0625_transportation_rivlin_orr.aspx
http://www.brookings.edu/opinions/2009/0501_congestion_pricing_rivlin.aspx

**Project Staff**

The following staff members are expected to be involved in this project:

- ***Ronald F. Kirby,*** who will provide project oversight, is director of transportation planning for the National Capital Region Transportation Planning Board (TPB) at the Metropolitan Washington Council of Governments (COG) where he is responsible for long-range planning for highway and public transportation systems in the Washington metropolitan region, assessment of the air quality implications of transportation plans, and a variety of programs designed to promote multi-modal planning and transportation/land-use coordination. Previously, he directed the transportation program at the Urban Institute, a non-profit policy research organization in Washington, D.C. Dr. Kirby is a national leader on metropolitan transportation planning issues and in the past decade has worked extensively to promote consideration of value pricing in the Washington region.

- ***Alice M. Rivlin***, a Brookings Senior Fellow and the head of Greater Washington Research at Brookings, will provide strategic guidance for the study. Dr. Rivlin previously directed the financial control board that oversaw the District of Columbia's emergence from bankruptcy. She also was Vice Chair of the Federal Reserve Board, director of the U.S. Office of Management and Budget during the Clinton Administration, and founding director of the Congressional Budget Office. Along with Benjamin Orr, she is the co-author of the Brookings Report "*Road-use Pricing: How Would You Like to Spend Less Time in Traffic?"*

- ***John Swanson*** will serve as project manager for the study. Mr. Swanson is a Senior Transportation Planner at COG responsible for public involvement activities and programs designed to promote better coordination between land use and transportation. In 2008 and 2009, Mr. Swanson conducted research on congestion charging experiences in London, Stockholm, and Manchester, England under a German Marshall Fund fellowship. His report, "Gaining Public Support for Congestion Charging: Notes from Europe on the Implementation of Bold Transportation Policies," can be found at: www.gmfus.org/galleries/cdp-tcn/Swanson_Final_Report_September_2009.pdf

- Benjamin Orr, Research Analyst at Brookings, will coordinate research activities on behalf of Greater Washington Research at Brookings. Mr. Orr is the co-author of the Brookings paper *"Road-use Pricing: How Would You Like to Spend Less Time in Traffic?"* which will provide the starting point for research under this proposed study. ***Martha Ross***, Deputy Director of Greater Washington Research at Brookings, will also provide assistance with the project. Ms. Ross works on a variety of issues, primarily those affecting low-income residents and families in Washington, D.C. and the metropolitan area.

- Additional COG/TPB staff working on this project will likely include ***Gerald Miller,*** Program Coordination Director, who oversees financial analysis activities for the region's transportation plans; ***Robert Griffiths*** ,Technical Services Directors, who manages the TPB's Household Travel Survey and led analysis activities for the TPB's Scenario Study; ***Michael Eichler***, Transportation Planner III, who conducted research under the TPB's value pricing grant completed in2008, and ***Darren Smith*** and ***Deborah Kerson Bilek***, both Transportation Planners III, who work on public outreach activities and transportation/land-use coordination activities.