

# National Capital Region Transportation Planning Board

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## MEMORANDUM

TO: TPB Scenario Study Task Force

FROM: Ronald F. Kirby  
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SUBJECT: Scenario Planning and Feasibility – A Look at the Assumptions Behind TPB  
Scenario Study Land Use Shifts, and Common Critiques

DATE: October 17, 2007

When appraising the results of the TPB Regional Mobility and Accessibility Scenario Study (RMAS) and their significance for regional transportation and land-use planning, the question often arises of whether the Scenario Study was aggressive enough, or perhaps too aggressive, in shifting land use patterns and expanding supporting transportation infrastructure. This memorandum provides additional detail about how the alternative land-use and transportation scenarios analyzed in the study were developed, and how this methodology fits into the context of a larger discussion occurring increasingly in this region and across the country about scenario planning, especially in relation to carbon emissions and climate change. In particular, recent research has raised questions about how much of an impact changes in land use patterns can have on vehicle CO<sub>2</sub> emissions, and the magnitude of land use change that it is possible to effect through policy initiatives in the coming decades.

Following are a brief overview of the process and assumptions used in developing the Scenario Study and a discussion of the study results and limitations in light of this methodology, and in relation to other literature on regional scenario planning.

### The TPB Regional Mobility and Accessibility Scenario Study: Land Use and Transit Assumptions

#### **Study Background**

The Regional Mobility and Accessibility Study grew out of the dissatisfaction expressed by members of the National Capital Region Transportation Planning Board (TPB) in voting to approve a fiscally Constrained Long-Range Transportation Plan (CLRP) that showed congestion on the region's highway and transit networks continuing to worsen over the next 25 years. The desire of the TPB in authorizing this study was to examine additional transportation improvements beyond those that currently could be included in the region's long-range transportation plan, together with potential changes in future land use.

## **The Baseline**

After identifying CLRP shortcomings against a series of measures of effectiveness, the TPB directed staff to develop a baseline “regional congestion management” scenario focusing on operational and management improvements to maximize the region’s existing and planned investment in transportation infrastructure. This baseline was developed with direction from the RMAS Joint Technical Working Group (JTWG). This baseline scenario, termed the “CLRP+,” consisted of the latest forecast of future growth at the time, the COG Round 6.4 Cooperative growth forecasts, and the 2003 CLRP highway and transit networks. Traffic management and operational enhancements, such as improved signal timing and better incident management, were assumed for the CLRP+ highway network and a significantly increased frequency of rail and bus service was assumed for the CLRP+ transit. The 2003 CLRP+ also notably included in the baseline the planned Dulles Metrorail line extension, the Purple Line Light Rail from Bethesda to Silver Spring, the Corridor Cities Transitway and the Anacostia Light Rail, all of which were already present in the 2003 CLRP. The 2003 CLRP+ did not include the Intercounty Connector or the I-495 HOT lanes, which had not yet been adopted as part of the CLRP.

The most significant assumption for this baseline scenario compared to the 2003 CLRP was the assumption that WMATA would have the necessary funding to accommodate all forecast rail and bus ridership in 2030. In the 2003 CLRP, forecast transit ridership in 2030 for trips to and through the regional core area were reduced to projected 2005 ridership levels. This “transit constraint” was included in the 2003 CLRP because WMATA, prior to the Metro Matters funding agreement, could not identify sources of funding needed for the purchase of additional rail cars and buses that were necessary to accommodate projected regional core area related ridership growth after 2005. In addition to the removal of the “transit constraint” in the core area, a significant increase in long-haul bus service south along the I-395/95 corridor was added. This is notable because many of the transit mode share gains were absorbed into the baseline rather than being reflected in the scenarios.

## **The Scenarios**

Five alternative land use and transportation scenarios were specified for analysis in this study. These scenarios were developed by the members of the JTWG in conjunction with the Planning Directors Technical Advisory Committee (PDTAC), and the active involvement of the TPB Citizens Advisory Committee and the citizen advisory committees to MWAQC and MDPC. All of these scenarios were based on the COG Round 6.4 Cooperative growth forecasts and 2003 CLRP highway and transit networks, which were the current forecasts and transportation plan in effect at the time these scenarios were developed.

Early in the process, the JTWG arrived at some guiding principles to determine the land use changes needed for the scenarios. The first principle was to bring people closer to their jobs, thereby reducing their commuting distance. The second principle was to focus on creating a better balance between the number of workers and the number of employment opportunities available in the region. Thirdly, the PDTAC was asked to go beyond current zoning and comprehensive plan restrictions, while insuring that any changes remained feasible. Lastly, it

was recognized that land use changes needed to be made hand-in-hand with supporting transportation infrastructure. In addition, it was decided that all changes in household and employment development would begin after 2010 since all forecasts prior to that year were determined to be too “far down the pipeline” to be affected.

From these guiding principles the JTWG chose five alternative land use and transportation scenarios:

- Higher Household Growth in Region
- More Households in Inner Areas
- More Jobs in Outer Areas
- Region Undivided
- Transit-Oriented Development

The scenarios are alike in that they begin with these guiding principles, but arrive at satisfying the principles in different ways.

The **Higher Household Growth in Region** scenario increased the 2010 to 2030 future household growth 216,000 households, more than 37% more than the forecast called for. These additional households would serve to balance the number of workers with jobs at a regional level, thus reducing the amount of long-distance commuting. These additional households were allocated to the core area and to the inner suburbs and placed within the Regional Activity Clusters and / or near transit facilities. In addition, the transit network was greatly enhanced with Metrorail extensions from Vienna to Centreville and from Branch Avenue across the Wilson Bridge to Eisenhower Avenue. More than 30 additional miles of commuter rail were included, as well as more than 200 miles of light rail (LRT) and/or bus-rapid transit (BRT).

The **More Household Growth in Inner Areas** scenario was designed to reduce average commuting distances by assuming that more of the region’s forecast household growth could be placed closer to employment centers in the core area and inner suburbs. This scenario assumed 84,000 households, approximately 23% of the forecast growth, would be shifted from the outer suburbs and from areas inside the inner suburbs outside of regional activity clusters. To support the land use in this scenario, the transit network included the previously mentioned Metrorail extensions, as well as an additional 110 miles of LRT / BRT in the core area and inner suburbs.

The **More Jobs in Outer Areas** scenario was designed to reduce average commuting distances by assuming that more of the region’s forecast employment growth could be placed closer to residential areas in the outer suburbs. This scenario assumed 82,000 jobs, approximately 12% of the forecast growth, would be shifted from the core area jurisdictions to the outer suburbs. It was also assumed that these jobs would be concentrated within Regional Activity Clusters in these outer suburban jurisdictions. This scenario included the Metrorail extension along the Orange Line to Centreville, as well as more than 30 miles of commuter rail extensions in Virginia. In addition, nearly 90 miles of LRT / BRT was assumed, primarily connecting outer Regional Activity Clusters to the existing transit network.

The **Region Undivided** scenario was designed to test the transportation impacts of enabling more workers to live closer to their jobs by assuming some shifts in both future job and household growth from the western portion of the region to the eastern portion. This scenario was suggested by the TPB's Citizen Advisory Committee as a way of addressing the social and economic disparities between the two sides of the region pointed out in the Brookings Institution "A Region Divided"<sup>1</sup> report. In this scenario, all of the forecast job growth between 2010 and 2030 as well as much of the household growth outside of Regional Activity Clusters in the western portion of the region were reallocated to the eastern side of the region, primarily in Regional Activity Clusters and transit centers. The job and household growth shifts were designed to achieve equivalent jobs-to-households ratio on both western and eastern sides of the region. This scenario assumed a shift of 114,000 future jobs (17%) and 57,000 future households (16%) would be reallocated. This scenario assumed the Metrorail extension across the Wilson Bridge, and an additional 160 miles of LRT / BRT, the most significant being the extension of the Purple Line from New Carrollton to Branch Avenue, making this scenario the only one to include a full half-circle Purple Line from Bethesda to Alexandria.

The **Transit Oriented Development** scenario was designed to test the transportation impacts of concentrating more of the region's growth in areas that could be efficiently served by an expanded regional transit network. This scenario assumed a shift, to the maximum extent deemed possible, of forecast 2010 to 2030 job and household growth to areas within ½-mile of current or planned Metrorail stations, commuter rail stations, or other current or potential transit centers. In total, shifts of 150,000 future jobs (22%) and 125,000 future households (35%) were assumed for this scenario. Most of these reallocations occurred within each jurisdiction. The transit network assumed for this scenario was the same extensive network as that assumed for the Higher Household Growth in Region scenario.

### Analysis: Key Factors that Influenced TPB Scenario Study Results

Analysis of the scenarios developed for the TPB Scenario Study found that these scenarios could have significant, though relatively modest, impacts on regional transportation indicators such as Transit Use, Average Daily Vehicle Miles Traveled (VMT), and A.M. Peak Period Congestion. The TPB regional transportation models predicted that *versus the 2030 baseline*, the scenarios could have impacts ranging from a **0.1% to 1.3% decrease in VMT**, a range of **1.4% to 6.9% in congestion decreases**, and up to a **nearly 16% increase in transit use**. These percentages did not represent changes in relation to conditions currently being experienced in the region, but rather against a 2030 baseline that already reflected significant changes (and in some cases deterioration) in those conditions.

There are several factors, some of which were briefly touched upon in the study background above, that influenced the study results and merit further discussion:

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<sup>1</sup> "A Region Divided, The State of Growth in Greater Washington, D.C." Brookings Institution, 1999. The report documents a number of disparities in the eastern versus western portions of the region. Among the issues cited by the report are: "The Income Divide"; "The Race Divide"; "The School Divide"; "The Job Divide"; and "The Transportation Divide".

### **1. The RMAS Scenarios Were Developed by Local Planners with Knowledge of Local Challenges to More Concentrated Development**

As opposed to scenario planning activities that treat a metropolitan area as essentially a blank slate, the TPB Scenario Study asked local planners to “push the envelope” in rearranging new growth without being bound by current zoning and comprehensive plans, while still keeping feasibility in mind to create somewhat realistic scenarios. As a result, land use shifts may not have been as radical as for scenarios developed in some other metropolitan areas, but were perhaps more realistic given conditions on the ground.

### **2. Development Slated to Occur Before 2010 Was Taken Off the Table**

Development occurring before 2010 was assumed to be already “in the pipeline” and off-limits. This left only 20 years of growth, or about 15% of all 2030 structures, to “play with” in scenario development. In fact, only about 5% of 2030 households and 4% of 2030 jobs were actually shifted in the TPB scenarios relative to the 2030 baseline. Consequently, while the TPB Scenario Study results predict major reductions in, for example, per capita VMT in some locations where significant land use shifts and transit investments occur, the impact of these results at the scale of the entire metropolitan area is limited by the modest shares of total 2030 households and jobs that were actually shifted.

### **3. The Study Baseline Reflects the Prominent Current and Projected Role of Transit and Transit Oriented Development in the Washington Region**

The Washington Region already has the second-highest share of transit riders of any metropolitan area in the country, and 42% of people who work in the region’s core take transit to work. It is also held up as a national model for transit-oriented development and is particularly well-regarded for success in concentrating density around suburban transit stations. While the alternative scenarios for 2030 call for even more transit and even more density around transit stations, they build off a baseline that already reflects the comparatively high transit use and concentration of development around transit in present-day Washington and the continuation of those policies through 2030. Other metropolitan areas may be able to demonstrate more significant changes simply because their baseline modal shares and land use patterns may be more similar to, say, 1960 Washington, than to the 2030 Washington baseline used in the TPB Scenario Study.

The Comprehensive Plans for many of the region’s jurisdictions already largely conform to the major strategies used in developing the alternative scenarios – getting jobs and housing closer together and concentrating development around transit. The scenarios simply take these strategies further, in a few different directions. For many of the region’s jurisdictions, especially those that are largely “built-out” and have few remaining greenfield development sites, the vast majority of development between now and 2030 will be infill development that has the effect of increasing density and increasing the number of residents close to job centers, even in the baseline.

### **4. The Baseline Already Includes a Package of Transit Enhancements to the CLRP**

The baseline used for comparison in the Scenario Study included a package of transit service enhancements referred to as “CLRP Plus.” These enhancements, primarily expansion of bus service and additional rail cars on Metrorail, were all unfunded in the 2003 CLRP but were

added to the baseline because funding for them, while not already included in the CLRP, was deemed to be a political likelihood. The inclusion of the “CLRP+” transit enhancements had the effect of increasing transit share and decreasing VMT and congestion indicators in the baseline scenario. In turn, this would make the alternative scenarios appear to have less of an impact in comparison with the baseline.

### **5. The TPB Scenario Study Has Not Yet Included a Composite Scenario**

The impact of the strategies used to formulate each of the TPB scenarios may be compounded if included together in one or more composite scenarios. For example, a scenario combining the “Households In” and “Jobs Out” land use shifts may predict reductions in VMT that are greater than the sum of the reductions predicted by each individual scenario.

## The TPB Scenario Study Results in Relation to Other Scenario Studies and Research

Given what appear to be relatively modest, though positive, regional impacts predicted by the TPB scenarios, it is reasonable to ask how these results compare to other scenario studies and research. There are two basic avenues of related research among planners and academics: research into the real estate market conditions and preferences that will shape metropolitan growth patterns in the coming decades, and research into the possibility of influencing climate change through shifts in land use patterns. These two avenues of research are perhaps best exemplified, respectively, by the work of Chris Nelson<sup>2</sup>, and Reid Ewing<sup>3</sup>, both of whom have presented to MWCOG/TPB audiences in the past year about the future of the Washington Region. Nelson has pointed out that shifts in demographics and residential market preferences, coupled with rapid growth and the percentage of the nation’s building stock reaching the end of its usable life, present an opportunity for planners and officials to shape a large portion of the built environment in the coming years.

What is at stake? Up to \$30 trillion will be spent on development between 2000 and 2025. Half the structures I expect in 2025 did not exist in 2000. With so much change coming, now is the time for planners to craft a new template that meets the challenges of the next planning era.<sup>4</sup>

Ewing, writing with coauthors at the Urban Land Institute, Smart Growth America, and the Center for Clean Air Policy, tackles the issue of climate change, asserting that “the United States cannot achieve . . . large reductions in transportation-related CO<sub>2</sub> emissions without sharply

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<sup>2</sup> For a representative example of Nelson’s work on the issue, see “Leadership in a New Era.” Journal of the American Planning Association, Autumn 2006, Vol. 72, No. 4, pg. 393-407 ([www.planning.org/japa/byissue/06autumn.htm](http://www.planning.org/japa/byissue/06autumn.htm)).

<sup>3</sup> Ewing, Reid, Keith Bartholomew, Steve Winkelman, Jerry Walters, and Don Chen. “Growing Cooler: The Evidence on Urban Development and Climate Change.” Urban Land Institute, 2007 ([www.smartgrowthamerica.org/gcindex.html](http://www.smartgrowthamerica.org/gcindex.html)).

<sup>4</sup> Nelson, Arthur C. “Leadership in a New Era.” Journal of the American Planning Association, Autumn 2006, Vol. 72, No. 4, pg. 394.

reducing the growth in miles driven,”<sup>5</sup> and that compared with changes in energy and emissions technologies, changes in land use patterns may be the “low-hanging fruit” in the effort to reduce greenhouse gases.

When viewed in total, the evidence on land use and driving shows that compact development will reduce the need to drive between 20 and 40 percent, as compared with development on the outer suburban edge with isolated homes, workplaces, and other destinations. It is realistic to assume a 30 percent cut in VMT with compact development. Making reasonable assumptions about growth rates, the market share of compact development, and the relationship between CO<sub>2</sub> reduction and VMT reduction, smart growth could, by itself, reduce total transportation related CO<sub>2</sub> emissions from current trends by 7 to 10 percent as of 2050.<sup>6</sup>

In relating the findings of the TPB Scenario Study to this research, the following factors outlined in the above discussion of the study assumptions and results need to be kept in mind:

### **1. Analysis Baseline**

As noted above, the TPB Scenario Study baseline is a 2030 scenario that reflects the continued pursuit of current land use policies in the region along with significant additional investment in transit. By comparison, Ewing et al. appear to be working from a baseline that assumes continuation of existing conditions or even a “worst-case” sprawl scenario rather than the kind of 2030 baseline used in the TPB scenarios.

### **2. Analysis Timeline**

Most of the figures cited by Ewing et al. in regard to possible impacts on VMT and emissions have a 2050 horizon, while the TPB Scenario Study uses a 2030 horizon. This significantly increases the overall impacts possible in Ewing’s scenario range compared to the TPB Scenario Study.

### **3. Aggregation of Localized Impacts to a Regional Level**

In providing evidence for the expectation of significant (20-40%) decreases in VMT at specific locations resulting from pursuit of a strategy of concentrated development, Ewing et al. rely substantially upon analysis of project-level data. Based on “reasonable assumptions,” Ewing et al. conclude that through aggregation of these localized impacts to the regional level, total (regional) CO<sub>2</sub> emissions would be reduced from current trends by 7 to 10 percent by 2050. As described above, the TPB Scenario Study predicts that some areas would have significant reductions in per capita VMT under one or more of the scenarios, and in shifting 4 to 5 percent of regional activity by 2030, these effects add up to a one to two percent regional impact on VMT, and by consequence, CO<sub>2</sub> emissions.

In summary, the difference in results between the TPB Scenario Study and other research can be ascribed largely to differences in baseline and timeline, rather than any significant difference in methodology or in how much the TPB scenarios “push the envelope” in shifting future growth patterns.

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<sup>5</sup> Ewing, et al. (Manuscript has no page numbers.)

<sup>6</sup> Ibid.