National Capital Region Transportation Planning Board
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MEMORANDUM

TO: TPB Scenario Study Task Force

FROM: Ronald F. Kirby
Director, Department of
Transportation Planning

SUBJECT: Development of New Scenarios for the TPB Regional Mobility and Accessibility Scenario Study

DATE: April 16, 2008

Review of the Proposed New Scenarios

As discussed at previous task force meetings, two new scenarios have been proposed for development. The first scenario will be a "CLRP Aspirations" Scenario that would adhere to the traditional constraints of the TPB procedures and modeling process for air quality conformity analysis, with the exception of the fiscal constraint and the use of formally adopted land use forecasts. The second scenario will be a "What Would It Take?" Scenario that would take as a starting point one or more goals desired for achievement in 2030 and beyond, such as a specific reduction in mobile-source CO_2 emissions, and examine how such goals might be achieved through different combinations of interventions including some that are not normally reflected in the TPB travel demand modeling process, such as significant changes in individual behavior.

2007 CLRP Performance Analysis

Although the Round 7.1 Cooperative Land-Use Forecasts and the 2008 CLRP will serve as the official baseline for both the "CLRP Aspirations" scenario and the "What Would it Take" scenario, the performance analysis recently completed for the adopted 2007 CLRP can serve as the starting point for development of both of these scenarios. This analysis examines how the 2007 CLRP performs in terms of metropolitan growth and travel demand, congestion, accessibility, air quality, and activity cluster analysis. The projected performance in these areas based on the current plan can be used to frame the goals and strategies of the scenarios.

While the performance analysis for the 2007 CLRP reflects growth forecasts that have been fairly consistent for several years, it clarifies several trends that are location-specific and may drive land-use decisions in the scenario development. For instance, the metropolitan growth and

travel demand forecast clearly show the most rapid growth in outer jurisdictions, both in population and employment, but also in lane miles of congestion. Also, while growth is moving further away from the core, it is not necessarily concentrating in current activity clusters, which is an objective identified in the TPB Vision. It is clear that activity clusters still remain highly accessible employment hubs, as 75% of employment is and remains in the activity clusters by 2030 and 90% of transit work trips are to jobs within the activity clusters, with 70% of transit work trips going to the core. However, the percentage of employment and households concentrated in the activity clusters generally remains the same between 2008 and 2030.

Regional trends that have previously been noted have also been reinforced by the 2007 analysis and can help direct the development of the scenarios. Population, VMT and congestion are all rising rapidly between 2008 and 2030. However, while overall lane miles of congestion are projected to increase 43%, there are a few specific areas of improvement, which can provide useful information for the scenario development. For instance, some congestion relief is evident on I-95 south of the Beltway in Virginia, which is attributable to the HOT lanes project currently underway. In conjunction with the completed Value Pricing study, this analysis could serve to inform the use and benefits of pricing in the new scenarios.

Another regional trend arising from the 2007 performance analysis is that transit work trips are expected to rise faster than vehicle work trips, and vehicle miles of travel per capita are expected to decline somewhat. These findings can serve as the basis for goal setting and for setting priority land use and transportation strategies in the scenarios.

Developing the CLRP Aspirations Scenario

The first of the two scenario study activities is the development of the CLRP Aspirations Scenario. The intent of this exercise is to draw from the strategies explored in the previously studied scenarios, including the variably priced lanes scenarios, and other possible strategies to develop a scenario that is within reach fiscally and administratively, but also pushes the envelope of what might be possible to improve the conditions of the 2030 baseline.

This scenario will adhere to two primary criteria intended to root the transportation and land use decisions in financial and political reality. The first is that land use shifts should be within reach for possible inclusion in the Cooperative Forecasts. This means that areas should be able to realistically accommodate proposed densities, which should also be compatible with existing or planned neighborhood character. The second is that transportation projects proposed for development under this scenario should be financially within reach. This means assuming realistic funding sources, such as through local and/or regional tax revenues, financial contributions from development 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 will intentionally be 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 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.

Scenario Study Schedule

The scenarios are expected to be fully developed by June 30, 2008, with technical analysis to be completed by February 28, 2009. Public outreach and comment on the completed scenarios will then follow until June 30, 2009. The end of this scenario timeline aligns with the four-year CLRP update cycle required under SAFETEA-LU, which will occur next in 2010. This 2010 update will include several major changes to the CLRP; the plan horizon will move out from 2030 to 2040; the system of transportation analysis zones will be finer grained, particularly in the suburban areas; and new surveys will be incorporated into forecasting models, including new regional household travel and on-board bus surveys. This update will provide a timely opportunity to incorporate the results produced by the scenario study and associated public comment in the regional long-range transportation plan.

Proposed Measures of Effectiveness

There are several measures of effectiveness that can direct the proposed transportation projects and land use shifts, all of which focus on broader goals of the scenarios, such as improved environmental quality, greater mode choice and improved efficiency in transportation systems, and greater accessibility for all. These measures of effectiveness are intended to structure the scenario around the common guiding principles adopted in the 1998 TPB Vision, and to provide a basis for analysis of the scenario during and after development. These measures are not intended to be a comprehensive list, but rather a starting point for deeper development of goals and measures.

The first set of measures is to assess the scenario for a variety of environmental impacts. These broad measures can serve as proxies for a variety of other environmental issues that contribute to overall environmental quality. The proposed environmental measures include air quality analysis, which adheres to current CLRP procedures and can serve as a proxy for various health concerns; water quality analysis, such as examination of storm water runoff from increased impervious surfaces; and general adherence to stay away zones and highly sensitive areas, which can address issues of land conservation.

The second set of measures addresses issues concerning mode choice and travel patterns. These measures reflect analysis currently done for the CLRP, but can be expanded for this scenario. For instance, to assess the efficiency of the region's transportation systems under hopefully improved conditions in the scenario, lane miles of congestion and transit congestion can serve as simple measures. An additional measure affecting system efficiency is the availability and use of alternative modal choices. The latter can be addressed directly through transit, bicycle and walk shares of trips. The former can be addressed through a measure of accessibility to jobs and housing by highways, transit, and walk-access transit. Accessibility can also serve to address environmental justice concerns by assessing access to jobs by different modes and by demographic group.

Possible Strategies

There are several strategies that can be employed to meet the principles outlined via the measures of effectiveness and to meet the targeted goal of creating highly accessible and highly developed areas. Broad strategies include implementing high-quality transit services on varying geographic levels, such as circulator systems for intra-cluster travel and larger enhancements to the regional (rail and bus) transit networks, with an emphasis on currently underserved areas. In order to capitalize on planned and existing transit infrastructure and to encourage geographically balanced development, another broad strategy could be to concentrate jobs and housing near new and underutilized transit stations and to generally promote non-greenfield development. Lastly, in order to promote a more efficient transportation network and to raise revenue for transit projects, another strategy could be to implement regional tolling networks to manage freeway congestion. New revenues from the tolling networks could possibly address public concern regarding the availability of funding for high quality transit projects.

Working within these broad strategies, scenario development activities could include mining the original scenarios for information about which transportation projects and land-use shifts produce the most "bang for the buck." This includes sensitivity analysis at both the regional and local scales, demonstrating that while the original scenarios may have seemingly modest regional impact, they can have a large impact on predicted travel behavior in small areas where concentrated land use and transit accommodation converge. This sensitivity analysis can also serve to address public concern about our ability to implement a regional strategy of concentrated development without causing negative impacts at the local level.

The 'menu' of transportation projects and land use strategies

These strategies will draw from the 'menu' of transportation projects and land use strategies compiled from past scenario studies and public input. The original scenarios, each of which took a different approach to land-use shifts and complementary transportation investments, along with the recently completed variably priced lanes scenarios, provide an excellent starting point for constructing the new scenario. The scenarios available to draw upon include the following:

- More Households Scenario
- Households In Scenario
- Jobs Out Scenario
- Region Undivided Scenario
- Transit-Oriented Development Scenario
- Variably Priced Lanes Scenario – "DC Restrained"
- Variably Priced Lanes Scenario – "DC and Parkways Restrained"

In addition to this menu are a host of other sources of information, such as results of the Scenario Study outreach program conducted by TPB staff in 2006 and 2007. This outreach effort yielded several ideas from the public for projects or approaches not included in the original scenarios. For instance, many outreach participants cited a need for more circumferential transportation infrastructure, especially transit. While the original scenarios included some circumferential

links, more possibilities could be studied. Other members of the public highlighted specific rights-of-way they consider to be underutilized as possibilities for added transportation capacity.

In addition to the feedback summary report, the recommendations by the TPB CAC on next steps and additional scenario considerations is a valuable source of ideas for overall approaches that may differ from the strategies used in developing the original scenarios. Other TPB committees such as the Regional Bus Subcommittee can also provide valuable input on priority projects, such as BRT networks.

Developing the "What Would It Take?" Scenario

The second new scenario differs significantly from the first scenario and provides the flexibility to assess strategies and assumptions beyond those used to date. Rather than building a new scenario and then testing its performance against the 2030 baseline, the "What Would It Take?" Scenario will begin with one or more performance objectives and determine the different scales and combinations of interventions necessary to achieve those objectives. The scenario will be designed to facilitate regional dialogue with the public and among decision-makers about the steps necessary to implement a desired regional future, in a way that moves beyond the typical constraints of the TPB analysis process.

The first step in developing this scenario is to identify the performance objectives. While there are many possible goals, beginning with a single carbon dioxide (CO_2) emissions reduction goal provides several broad-reaching benefits. For instance, many strategies that specifically seek to reduce CO_2 emissions also provide ancillary transportation, environmental, health and possible economic benefits, such as reduced congestion and reduced fuel consumption.

At its January 23, 2008 meeting, the COG Climate Change Steering Committee (CCSC) discussed a proposed regional goal of reducing overall regional CO_2 emissions to 20% below 2005 levels by 2020, and 70-80% below 2005 levels by 2050. These goals are based on the scientific conclusions of the Intergovernmental Panel on Climate Change (IPCC), and are consistent with the reduction goals in the Warner-Lieberman bill currently under consideration in the U.S. Senate. Mobile-source emissions are roughly 30% of overall regional CO_2 emissions, making the transportation sector an integral factor in the region's ability to meet such goals.

Possible Interventions

The possible interventions available to the transportation sector are typically grouped into three possible areas: fuel efficiency, greenhouse gas emissions from fuel, and reductions in vehicle travel. When addressing reductions in transportation emissions specifically, the particular interventions will fall into these broad categories. However, it is within the scope of this scenario to examine the general opportunities provided by global mechanisms, which can allow for more cost-effective methods of emissions reductions outside of the transportation sector, such as those afforded by a global carbon market.

The first group of implementation strategies that could be proposed under this scenario falls under the general strategy of **increasing the fuel efficiency of vehicles**. This could be done in a

variety of ways, but most directly through the imposition of stricter CAFE standards and/or incentives to purchase highly fuel-efficient vehicles. For instance, the recent passage of new "35 mpg by 2020" CAFE standards will have a significant impact on the mobile-source component of CO_2 emissions, but falls far short of achieving the proposed regional goal of 20% below 2005 levels by 2020. It is clear that overall fuel efficiency would have to far exceed this modest standard in order to begin reducing emissions rather than simply reducing the rate of growth of emissions. It is also worth noting that CAFE standards apply only to light duty vehicles, which account for about 80% of regional CO_2 emissions; heavy duty vehicles, which contribute the remaining 20%, are unaffected by CAFE. This could provide another focal point on which to direct a fuel efficiency intervention for this scenario.

The second group of implementation strategies aims to **reduce the carbon intensity of the fuel** combusted by motor vehicles, which directly reduces mobile emissions. These strategies primarily revolve around the increased use of alternative-fuel vehicles, such as biofuel-, electric-, and hydrogen-powered vehicles. In assuming increased use of these technologies, it will be necessary to account for life cycle costs and benefits associated with them. Therefore, this scenario would simplify the analysis by using an "average lifecycle fuel carbon intensity" value to accommodate for different technologies, which would account for total CO2 emissions of the fuel from production, distribution and combustion. This value would represent the carbon intensity required to meet the goal in each of the combinations of strategies resulting from this scenario.

The third group on implementation strategies works to **reduce vehicle travel**, thereby reducing fuel consumption and possibly congestion-related idling, which contributes to excess CO_2 emissions. Vehicle travel is a function of several different factors, including land use patterns, fuel prices, other driving costs, congestion, the availability of non-SOV alternatives, and individual lifestyles and behavior. Therefore, this scenario could address changes in each of these areas. For instance, in order to reduce regional vehicle travel further than the original scenarios more infill development, transit-oriented development and other land use shifts to ideal areas could be assumed. These shifts could be tailored to induce the necessary **changes in travel behavior**, such as increased transit and HOV mode share, more bike and walk trips, greater walk-access transit, increased ability for trip chaining, and increased telecommuting and/or carpooling, such as through Commuter Connections. Other strategies include setting price signals to encourage use of other modes than SOV. This could be accomplished through increased fuel costs, parking costs, and road or congestion pricing.

Another possibility to consider in this scenario is the development of **cap and trade programs**, which can provide several opportunities for this region to deliver more cost-effective emissions reductions. The first opportunity could arise through the creation of a global market for CO_2. A global market will necessarily set a cost per ton of CO_2, which, if priced correctly, can provide a cost effectiveness benchmark for reduction strategies. Another possibility afforded through a carbon market is the possible sale of emissions allowances to fund further emissions reduction strategies, such as those noted above. Another opportunity arises from possible national legislation, which currently calls for the direct provision of additional funding for mass transit, as well as other energy efficiency and VMT reduction strategies.

Time-frame and Cost-effectiveness of Possible Interventions

In producing useful guidance for addressing climate change in this region, it will be important to assess the interventions included in this scenario for cost-effectiveness and the time-frames for implementation and realization of climate change benefits. Some possible interventions can serve as "low-hanging fruit" and provide relatively cheap, fast, and substantial benefits, such as energy efficiency retrofits, as opposed to longer-term strategies, such as major changes to current land use patterns. A report released in December 2007 by McKinsey and Company, "Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?" outlines the menu of options currently available in the U.S. market and creates a cost-effectiveness ranking chart on which each abatement strategy falls. For instance, residential building efficiency through lighting retrofits and fuel efficiency for light trucks produce a savings of around $80 per ton of CO_2 abated; while at the other end of the chart coal-to-gas shifts for existing plants and car hybridization produce costs of between $75 and $90 per ton. (Our initial estimates show the TPB Commuter Connections program to have a cost-effectiveness of $17 per ton, which falls in the center of the McKinsey ranking).

The Products of the this Scenario

The resulting product of this "What Would It Take?" exercise would be an array of "sliders" representing the variables discussed above. The scale for each "slider" would run from a minimum represented by the 2030 baseline, to a maximum represented by what it would take to reach the 2030 emissions reduction goal through a change *in that variable alone*, if possible. It is unlikely that one intervention alone could reach the goal, as is evidenced by the CAFE standards. Therefore, the ultimate contribution of this study is to assess the different combinations of changes in the variables that would achieve the reduction goal. These combinations could then be assessed for their financial, administrative, and technological feasibility and prioritized according to their short-, medium- and long-term costs and benefits.

This scenario could serve as a guide for the region in identifying low-hanging fruit for mobile-source CO_2 emissions reductions and prioritizing strategies with varying degrees of cost and benefit across varying implementation timeframes.