

**Highlights of the TPB Travel Forecasting Subcommittee Meeting
Held on July 22, 2005**

Item 1: Approval of the March 18, 2005 Meeting Highlights

The highlights were approved as written.

Item 2: Regional HOV Monitoring Report

Mr. Zilliacus distributed draft copies of a report entitled "2004 Performance of Regional High-Occupancy Vehicles Facilities on Freeways in the Washington Region." He explained that the report contains a summary of data collected from high-occupancy vehicle (HOV) facilities located along Interstate highways and one toll road in the Washington, D.C. metropolitan region. He further explained that the information presented in the report was developed from data collected in Spring 2004 along five operational HOV corridors in the Washington region. Data were collected from 5 A.M. to 10 A.M. during the inbound peak-flow direction and 3 P.M. to 8 P.M. during the outbound peak-flow direction. HOV lanes were operational in the following corridors as of Spring 2004:

- I-95/I-395 (Shirley Highway) in Northern Virginia (fully-barrier-separated HOV lanes);
- I-66 inside the Capital Beltway in Fairfax and Arlington Counties (exclusive HOV facility in the peak commute direction during the peak commute period);
- I-66 outside the Beltway in Fairfax and Prince William Counties (concurrent-flow HOV lanes);
- I-270 (and the I-270 Spur) in Montgomery County, Maryland (concurrent-flow HOV lanes);
- VA. 267 (Dulles Toll Road), which has a new concurrent-flow HOV lane; and
- U.S. 50 (John Hanson Highway) in Prince George's County, Maryland (concurrent-flow HOV lane).

He also explained that most comparisons are made with results obtained from the previous Regional HOV Facilities Monitoring reports for 1997, 1998, and 1999. Trends and changes are emphasized for the HOV-restricted periods inbound and outbound. The following major trends were observed:

- All of the HOV lanes in Spring 2004 were observed to carry more persons per lane during the HOV-restricted periods than adjacent non-HOV lanes, with the exceptions of the new concurrent-flow HOV lane on U.S. 50 John Hanson Highway, where per-lane person movements were found to be approximately the same in the HOV and non-HOV lanes, and the concurrent-flow HOV lane on I-270 at Md. 187 during the P.M. peak period.
- All of the HOV lanes provide savings in travel times when compared to non-HOV alternatives, especially the barrier-separated HOV lanes in the I-95/I-395 corridor in Northern Virginia.
- There generally has been a decline in average occupancy on the HOV facilities in Northern Virginia, particularly in the barrier-separated lanes, due in part to the hybrid vehicle exemption.

Questions and Comments

Mr. Mann asked if the HOV volumes were growing or were they flat, meaning no growth from the previous monitoring studies. Mr. Zilliagus replied that the volumes are flat.

Item 3: Network Development Report

Bob Snead distributed a handout entitled “FY 2005 Network Development Program for TPB Travel Forecasting” along with a draft report entitled “FY-2005 Network Documentation: Highway and Transit Network Development”. He explained that the report documents work activities completed by COG/TPB staff in accordance with the transportation network development element identified in the FY-2005 Unified Planning Work Program (UPWP). This work program represents a continuation of a multi-year network and models development plan that was formulated in FY 1993 under the direction of the Travel Forecasting Subcommittee.

The draft report describes the development of highway and transit networks that represent the ground transportation system of the Washington, D.C. metropolitan area for the purposes of travel demand modeling. Network development activities are designed to support the regional forecasting procedure known as the Version 2.1 D #50 travel model. GIS has been employed to pre-process and manage network components and is used to link the transportation network development process to other TPB planning activities including cooperative forecasting, corridor studies, models development, congestion monitoring and the regional transportation data clearinghouse.

Network development activities primarily support transportation modeling that the TPB undertakes each year to ascertain how well the Transportation Improvement Plan (TIP) and Constrained Long Range Plan (CLRP) meet air quality objectives in accordance with federal requirements. The upcoming conformity assessment will address the FY 2006-2011 and 2005 CLRP. As part of these activities, base year transit and highway networks are updated with information provided by the regional transit providers by state and local government highway agencies. After base year networks are refreshed, forecast year networks are subsequently developed from the refreshed base year files for specific horizon years. During FY 2005, network files were prepared for the years 2004, 2010, 2020, and 2030.

Mr. Snead explained that the FY 2005 updates that pertain to network development include:

- Revision of network node numbering system to include ranges for HOT (high occupancy toll) lanes, light rail and transitway systems;
- Increased tolls on the Dulles Toll Road (VA 267);
- Addition of HOT lanes on I-495 (Capital Beltway) in Virginia to the networks for 2010 and beyond;
- Changed the “runtime” parameter for priority lanes. Previously, priority lanes were specified with special “speeds” parameters coded in transit line files; and
- Increased VRE fares in the summer of 2005 precipitated an update of the bus fare matrix for use in the conformity analysis of the 2005 CLRP and 2006-2011 TIP.

Questions and Comments

Mr. Graye asked if the FY 2005 network files for years 2004, 2010, 2020 and 2030 were available. Mr. Snead replied that these files are not available at this time. Conformity networks and inputs are completed but have not been run through the model. Statistics shown in the network report reflect the previous year. Once the FY 2005 conformity is approved by the TPB, the report will be revised to reflect updated statistics.

Mr. Graye asked what was the rationale for updating the node numbering system. Mr. Snead replied that the update was made to include node ranges for HOT lanes on I-495 in Virginia and for light rail and transitways for the Regional Mobility Study.

Mr. Mann asked what ground counts are in the network. Mr. Milone replied 2000 ground counts are coded in the year 2000 network.

Item 4: Models Development Report

Ron Milone distributed a handout entitled “FY-2005 Models Development Report” along with a draft report entitled “FY-2005 Development Program for TPB Travel Forecasting Models”. He began with a brief overview of the multi-track nature of models development work program. The TPB presently uses a conventional four-step travel modeling process known as the Version 2.1D #50 model which was released last November. He stated that the report addresses activities that occurred subsequent to the #50 model release. The activities were described.

1.) Traffic Count Discussion and Analysis

This activity involved an examination of the Highway Performance Monitoring System (HPMS) data used to validate modeled link volumes, and to investigate the effect of observed count quality on travel model performance. He noted that HPMS data is collected by each state to provide national highway information to Congress. It has inherent limitations when used for the purposes of a particular metropolitan area. Considering that the sampled traffic counts must be expanded to arrive at the total universe of statewide VMT, the HPMS figures are actually *estimates* of annualized traffic flows. He then described an analysis where he computed modeled highway performance using low, medium, and high quality HPMS counts. The high quality counts were those collected at permanent counting stations while the low and medium included combinations of permanent and program (short-term) counts. He found that the modeled performance improved markedly as the observed traffic count quality improved. He suggested that traffic count quality is critical in assessing modeled performance. He further suggested that the TPB should work with local agencies to develop a metropolitan area traffic count sample instead of continuing the reliance on HPMS-based counts, which are sampled to represent the entire state.

2.) Status of Commercial Vehicle Model Development

The ability to explicitly model commercial and business travel is a planned improvement in the Models Development program. Commercial travel is currently ‘folded into’ the Non-Home-Based (NHB) trip purpose in the Version 2.1D #50 travel model. It is not desirable to include commercial travel within the NHB purpose because commercial vehicles exhibit rather unique trip making characteristics in relation to residential NHB travel. William Allen has been retained to support the TPB in developing a commercial vehicle model, as he has advanced an innovative and cost effective approach for

modeling commercial travel. Mr. Allen's approach for modeling commercial travel differs from the traditional approach where O-D survey data is used to statistically estimate trip generation and trip distribution parameters. Instead, Mr. Allen uses an approach that 'works backward' from observed commercial vehicle link volumes, which are used to develop a synthetic 'observed' commercial vehicle trip table. The approach involves using an initial simulated trip table that is adjusted to better reflect the 'observed' trip O-D pattern. A survey to collect commercial vehicle counts has begun during late FY-2005 and is, at the present time, nearing completion. As of June 30, 116 of the planned 177 count locations have been surveyed (66%). Given constraints in time and budget, the originally planned number of 177 locations is being scaled back to approximately 130 count locations. Data collection activity will cease at the end of July. The commercial vehicle model will be completed by the end of FY-2006. Integrating the commercial vehicle model into the regional travel model will involve an adjustment of the existing NHB model.

3.) Status of Nested Logit Mode Choice Model Implementation

Another planned improvement in the models development program is an implementation of a nested logit (NL) mode choice model into the regional travel model. The current TPB mode choice model is a *sequential* multinomial logit (SMNL). The nested logit model is desirable because it is more consistent with best practice and it enables greater forecasting accuracy for transit access modes and transit sub-modes. TPB has received guidance from AECOM Consult, Inc. during FY-2005. AECOM guidance will continue during FY-2006. It is not yet clear whether the NL model implementation will be completed by the end of FY-2006, but substantial progress will be made.

4.) Status of Airport Access Model

Trips produced by or attracted to airports can be modeled in a number of different ways. Ideally, for a region with more than one commercial airport, one would have both an "airport choice" model and an "airport ground access" model. However, the Version 2.1D #50 model includes neither of these two models, due to the difficulty of estimating these types of models. Instead, a series of year-specific trip tables were developed, representing airport passenger auto driver trips on an average weekday.

Work is currently in progress to update the air passenger auto driver trip tables as part of the airport system planning work. Some of the proposed revisions include:

- Moving the base year from 1998 to 2000 (using the 2000 Air Passenger Survey).
- Moving from three categories to four categories (resident home-based, resident non-home based, non-resident home-based and non-resident non-home based).
- Moving from 83 aviation analysis zones to 160.

Given the complexity and extensive resource requirements of developing airport ground access models, it is unlikely that such a model will be developed for the Washington area in the next fiscal year (FY 2006). Nonetheless, TPB staff will keep abreast of airport choice modeling research and will monitor modeling efforts at other MPOs. One example of recent research is the work conducted by two academics, Hess and Polak, in 2004, where a three-way choice – airport, airline, and access mode – is modeled using multinomial logit and nested logit models. This work and similar work will be monitored by TPB staff.

5.) 2000 CTPP Demographic Summaries

During FY-2005, staff has spent a great amount of time summarizing demographic information from the 2000 CTPP. Staff has compiled household size, household income, and vehicle availability data which will be used to adjust the current demographic sub-models used in the Version 2.1D #50 travel model. Summaries have been made at the jurisdiction and CTPP zone level. The updating of demographic submodels will occur during FY-2006.

6.) Review of Best Practices

The TRB held its 84th Annual Meeting in January 2005 and the topics of interest included:

- Tour-based models, activity based models, and microsimulation.
- Urban commercial vehicle movement model for Calgary.

In a tour-based model, the unit of travel is the tour, which is a series of connected trips. Tours typically begin and end at home. An activity-based model simulates the activities conducted by household and individuals, which, in turn, give way to the travel needed to carry out those activities. Most, if not all activity-based models are tour-based, but not all tour-based models are activity-based. Most activity-based models use “micro-simulation,” either household microsimulation, traffic microsimulation, or both. “Household microsimulation” involves generating a synthetic population to mimic the real population of a metropolitan area. “Traffic simulation” involves simulating the movement of individual vehicles through a network, typically with a time-step approaching continuous time. Reasons for using household microsimulation include:

- In some cases, it is the best or only way to generate the detailed inputs needed by some disaggregate models.
- Many of the emerging road network assignment procedures are themselves microsimulation-based.
- It can be more computationally efficient than matrix-based methods.

Commercial vehicle traffic accounts for about 10% to 15% of all trips. A system for modeling commercial vehicle traffic has been developed for Calgary, Alberta, Canada using both an agent-based microsimulation approach and a tour-based approach. The primary source of data for this model is a survey of the business establishments responsible for making the commercial vehicle trips. In 2001, a 24-hour survey was conducted on over 3,000 business establishments. The survey cost about 700,000 Canadian dollars (roughly 560,000 USD). After inclusion of the commercial vehicle model into the regional travel model, it was possible to stop using a global factor of 1.25 applied to non-work trips.

The 10th TRB Transportation Planning Applications Conference was held in Portland, Oregon in April 2005. The conference included 19 sessions. Two topics of particular interest were travel simulation models and conventional trip-based models. Atlanta Regional Council (ARC) is in its 5th year of exploration of activity-based models and is currently working on a population synthesizer. Citilabs is developing an activity-based

microsimulation tool, implemented in Cube Voyager. The motivations behind developing such a tool were:

- A learning tool for (potential) model users
- A forecasting tool for small/medium MPOs
- A “test bed” for model developers.

Bill Allen gave a presentation entitled, “Using Your Model Effectively”. He mentioned that lots of advanced features are being added to travel models, including:

- Speed feedback to auto ownership and trip generation
- Mode choice-based composite impedance in distribution
- Bucket rounding (for integer trip tables)
- Equilibrium highway assignment.

He cautioned that these advance features can cause problems if not used carefully, and offered some advice for how to use these features with care.

Andres Rabinowicz, of Caliper Corporation, gave a presentation entitled, “Experiments with Alternative Traffic Assignment Methods”, which focused on algorithms used to solve the user equilibrium (UE) traffic assignment problem. The most common algorithm used today to solve user equilibrium traffic assignment is the Frank and Wolfe algorithm. This study compared the time needed for convergence of traffic assignment when conducted with Frank-Wolfe and several newer algorithms.

Staff plans to continue to participate in various MPO groups and conferences. And staff plans to continue to provide documentation and training.

Questions and Comments

Mr. Graye asked if the observed traffic count files are available. Mr. Milone replied that the latest year 2000 traffic counts exist in a binary network file that will be made available to any agency upon request.

Mr. Jamei felt that in the next five years, many metropolitan areas will install some type of activity based model.

Item 5. CTPP Update

Mr. Griffiths reported that he was nearing completion of work to adjust the CTPP to reflect an average weekday condition. He has been doing research on the adjustment to make for occasional transit usage. A region-wide adjustment factor was applied in the last census. This time, effort is being made to distinguish between occasional mode shifts in the suburbs and mode shifts for travel between the suburbs and the regional core. He is examining the 2004 State of the Commute Survey to help with this adjustment, since it has sufficient reporting by day of week and at a jurisdiction-to-jurisdiction interchange level. He is going to determine from this whether or not separate adjustment factors are needed for these two markets.

Mr. Milone stated that TPB has been investigating the observation made in an earlier meeting that the simulated year 2000 mode choice percentages were high in relation to 2000 CTPP (trip-end) estimates, particularly with respect to the Tyson’s Corner area. Staff has discovered that the headway coding of a single bus route, the WMATA #14 Smart Mover, was overstated (a 20

minute headway was coded as 2 minutes). This type of miscode will contribute to an overestimation of the transit percentage. He further noted that one should be careful about using CTPP information to cross-check model results because the CTPP trip definition is inconsistent with a home interview survey trip definition. Also, the suburban-to-suburban transit trip is not well represented in any regional survey. He suggested that the CTPP trip flows (part-3) should be checked against available on-board transit surveys (the 2002 Metrorail Survey and the 2000 WMATA Bus On-Board Survey) as points of reference. As of this meeting, the CTPP part-3 flows have not yet been released.

Item 6. FY-2006 Priorities in the Travel Forecasting Work Program

Jim Hogan distributed a handout entitled, "FY-2006 Priorities in the Travel Forecasting Work Program". He stated that during FY-2005, TPB staff completed the development of the Version 2.1D #50 travel demand model, which has addressed most of the recommendations of the TRB Committee. Also undertaken was a review of traffic counts in the Washington region, an examination of the products flowing from the 2000 CTPP, and a project to gather data on commercial vehicle trips.

Assuming increased funding for planning in the transportation reauthorization, activities in FY-2006 will focus on the following:

- Completing data collection and starting development of a commercial vehicle model;
- Beginning development of a nested logit mode choice model;
- Getting started on data collection (to be completed in FY-2007) of a new household travel survey;
- Undertaking a new external auto survey at the expanded cordon boundary;
- Beginning development of a new set of transportation analysis zones to provide more detail in activity centers, emerging growth areas, and other areas as appropriate;
- As changes are made to the modeling process, continue reviewing opportunities to further reduce the use of and/or dampen adjustment factors;
- Planning for a transition to tour-based and/or activity-based models as new data becomes available from the household survey;
- Continue monitoring developments in airport choice/ground access modeling;
- Developing a metropolitan HPMS data sample with the three state DOTs;
- Gaining familiarity with the capabilities of the Cube Voyager software; and
- Disseminating knowledge of the TPB modeling process through more extensive training sessions.

Questions and Comments

Mr. Harrington commented that under the data collection program, there seems to be some interest right now at WMATA to do a new Metrorail passenger and onboard bus surveys as early as spring 2006.

The chair requested subcommittee members around the table to provide an update on regional studies. Maryland State Highway Administration, Virginia Department of Transportation, WMATA, Fairfax County, and Montgomery County reported updates on their projects.

The next scheduled meeting of the TFS is September 23, 2005.