Highlights of the TPB Travel Forecasting Subcommittee Meeting
Held on Friday, March 18, 2005

Mona Sutton of Maryland State Highway Administration chaired this meeting.

Item 1: Approval of the November 19, 2004 Meeting Highlights

The highlights were approved as written.

Item 2: Approval of the January 21, 2005 Meeting Highlights

The highlights were approved as written.

Item 3: Montgomery County Travel Forecasting Model Validation – Status Report

Eric Graye distributed a handout entitled "Montgomery County Travel Forecasting Model Validation – Status Report". He explained that Montgomery County adopted the TPB model for several reasons – cost savings and more sharing of TPB resources; consistency with the regional process, particularly with regard to regional networks and data prepared for other jurisdictions; more of an opportunity to develop and review inputs to the TPB process; credibility reflecting the rigorous ongoing review of the TPB model; better integration with GIS using the TPB modeling procedures; and the ability to share techniques and knowledge with other users of the TPB model.

Mr. Graye stated that additional TAZs were added to TPB model for Montgomery County due to the Takoma Park annexation in 1997, Montgomery County and Prince George's County boundary changes, and the need for more detailed information around Metro stations. The highway network was also modified to reflect the need for more links and link attributes in Montgomery County, and transit network modifications were required to accommodate these highway network changes.

He also explained model validation adjustments which included:

- Work trip generation – adjustment factors at Census tract level,
- Work trip distribution – K-factors at "Super District" level (12 in Montgomery County),
- Non-work trip generation – adjustments factors at "Super District" level, and
- More detailed highway network coding.

Anthony Hoffman of Michael Baker Corporation, retained to help adapt the TPB model for use by M-NCPPC, discussed the CTPP 2000 worker to trip conversion process which is based on the CTPP handbook.

The next steps for Montgomery County include mode choice model validation, traffic assignment validation and comparison with the Travel/2 PM peak model. In conclusion, Mr. Graye stated that there are still data issues, and there will be an update to this process in the near future.

Questions and Comments

Ms. Sutton referenced the Montgomery County Screenlines handout and asked if screenlines 10 and 11 will be combined. Eric Graye explained that the screenlines might not be combined although he is interested in seeing what the effects would be if they were.

Mr. Replogle commented on peak period congestion. He asked if Montgomery County's model was validated against the time-of-day traffic counts. Mr. Graye responded no, not as of yet.

Mr. Mann inquired about the time involved to complete this project. Mr. Graye replied that Montgomery County started the process two years ago. The project budget was approximately $55,000 and the project team consisted of a consultant, a project manager and four staff members.

Mr. Goldfarb questioned whether the trip generation factors were adjusted. Mr. Hoffman replied that there are different factors for each Census tract within Montgomery County.

Mr. Replogle asserted that the TPB model systematically overestimates traffic on the low volume links and systematically underestimates traffic on the high volume links. He questioned whether any efforts have been made to address this issue. Mr. Graye commented that this is a work in progress and what is shown is comparable to TPB's process.

Item 4: VMT Tracking Update: Estimated Travel vs. HPMS

Michael Freeman distributed a memorandum entitled "A Review of HPMS VMT Reporting in the Washington Region 1990 to 2003." Mr. Freeman explained that the EPA's January 1992 report, "Section 187 VMT Forecasting and Tracking Guidance", requires that non-attainment areas compare their VMT forecasts with observed data from FHWA's HPMS reports to make any appropriate adjustments, including revisiting SIP's where needed. COG/TPB's most recent VMT tracking report was transmitted to EPA in April 2002, and included comparisons for the years 1993 through 2000. Observed data for Virginia was not available for year 2000.

Recently, VDOT staff transmitted 2000 to 2003 HPMS data. These data, along with data published for the District of Columbia and Maryland were included in tables and graphs distributed to the attendees. Mr. Freeman indicated that there are significant variations in growth rates among states tracked from year to year, particularly after the year 2000. However, at the regional level, the growth rates are more consistent from year to year.

Questions and Comments

Ms. Sutton asked if the Maryland VMT was taken from the HPMS database. Mr. Freeman responded that the Maryland VMT was taken from Maryland's website.

Mr. Replogle questioned if the permanent count stations were the main source of the HPMS data. Mr. Freeman replied that Virginia and Maryland have rotating program counts for large statewide samples involving one third of these counts in any particular year. These counts are typically two-day counts. The permanent count stations exist in the Washington region at only sixty-two locations and do not reflect the majority of counts employed. Mr. Clifford commented that staff

has diligently tried to ensure that Maryland, Virginia and the District of Columbia double check the tabulations for each year for accuracy and consistency which is not a small task.

Item 5: A More Detailed Evaluation of Ground Counts and Model Performance

This item was a report on staff activity to more closely examine the observed ground counts used to validate the model. The objective of this work was to better understand how observed ground counts are developed, to improve the quality of the observed data, and to investigate how the refined ground counts would affect model performance results. Bob Griffiths introduced this item by providing some background on the Highway Performance Monitoring System (HPMS) data which is the primary source of ground count data that is used to validate the regional travel model. Mr. Griffiths distributed a handout entitled, 'Use of Traffic Volume Estimates to Evaluate Model Performance.'

Mr. Griffiths explained that HPMS data is published each year by the State DOTs to satisfy federal requirements to monitor statewide travel demand. HPMS publications contain traffic counts for virtually all highway segments in the state based on a sample of traffic counting locations. The counting locations consist of permanent count stations, where continuous traffic data is collected throughout the year, and program counting locations, where short-term traffic counts are collected on a three year cycle. There are roughly 60 permanent stations and 1,500 program count locations in the Washington region. Currently, MDOT furnishes average annual daily traffic (AADT) figures, while the DDOT and VDOT publish average annual weekday traffic (AAWDT) figures. TPB staff obtains traffic counts from HPMS databases and codes AAWDT counts in the regional highway network (Maryland AADT figures are transformed to AAWDT figures on the basis of a conversion factor). Mr. Griffiths explained that one should expect some degree of error when using HPMS data for the Washington region for several reasons:

- Most of the traffic counts are collected during 24- or 48-hour periods. An adjustment must be made to annualize the count figures. The adjustments are typically made based on permanent count station information throughout the state. Adjustments based on statewide information may not be appropriate for annualizing traffic counts in the Washington area.

- Since one third of the program locations are actually counted for any given year, traffic counts at the remaining locations are estimated by applying a factor to previously collected counts.

- The program traffic counts are furnished as total non-directional figures while directional traffic counts are coded in the highway network. It is assumed that total daily traffic is apportioned evenly in each direction. However, permanent count station data, furnished by direction, indicates that this assumption may not hold true for all counting locations.

- 'Raw' traffic counts are manually adjusted to account for equipment failure or atypical conditions that may have existed during the data collection period.

Given these considerations, Mr. Griffiths suggested that the HPMS data are not 'true' traffic counts, but rather, are essentially annualized estimates of traffic flows.

He pointed out that network coding practices can be problematic and subject to error. For example, a given HPMS traffic count for a particular highway segment may be coded on several contiguous network links. It is not always realistic to expect that the same amount of traffic should occur on contiguous links. TPB network coding has also included interpolation of traffic count values for links for which no count information existed.

Mr. Griffiths explained that TPB staff has recently revisited the year 2000 performance of the Version 2.1D #50 model using refined 'test sets' of observed data. The model performance was originally assessed on the basis of 11,000 directional highway links containing observed counts throughout the modeled area (both inside and outside of the MSA). There were three test sets of observed data that where analyzed (all of which consisted of locations within the MSA only):

Test Set #1) All permanent station and all program counting locations actually counted or synthetically estimated from a prior year (2,953 links).

Test Set #2) All permanent station and program counting locations that were actually counted during 2000 (1,194 links).

Test Set #3) All permanent count stations only (68).

Ron Milone distributed a March 17, 2005 memorandum to the committee documenting the results of the analysis. He stated that the three test sets represent gradations of improved quality and certainty of observed traffic counts compared to the original validation data. The permanent count station data (Test Set #3) reflects the highest quality of data since those locations are continuously monitored throughout the year. The percent root mean square error (RMSE) was found to improve from the original value of 47% to values of 45%, 40%, and 18% for Test Sets #1, 2 and 3, respectively. Mr. Milone also reviewed scatter plots showing observed and estimated values. The scatter plots reflected reasonable comparisons of estimated and observed values that improved with each Test Set. The R-square improved from an original value of 0.84 (based on 11,000 observations) to values of 0.89, 0.92, and 0.96 for Test Sets #1, 2, and 3, respectively. The scatter plots also indicated no clear bias for the various observed volume ranges.

Mr. Milone was impressed with the model performance that resulted with the improvements in observed data quality. He stated that the TPB has historically accepted HPMS data as is and has never stopped to analyze counts more carefully. He suggested that the TPB needs to pay greater attention to the quality of the data used in validating the regional model.

Questions and Comments

Mr. Mann commented that the model cannot be properly validated without good daily and hourly count information. He suggested that TPB staff create a list of what is needed from Maryland, Virginia, and the District of Columbia. He also suggested that the three states come up with the funds to collect additional traffic counts needed to supplement the data that staff already has. Mr. Kirby agreed with Mr. Mann. Mr. Griffiths added that it is extremely important to design a metropolitan area sample.

Mr. Kline asked if manual counts were done to test the accuracy of the permanent count stations. Mr. Griffiths commented that it is good practice to do such an exercise but is not certain if the checks are performed. Bill Mann commented that VDOT has conducted manual checks of the permanent counts and has discovered substantial differences.

Item 6: Transit Capacity Constraint

Tom Harrington distributed a handout entitled "Transit Capacity Constraint". He explained that a Metrorail capacity constraint was introduced in 2000 to address funding shortfalls that restricted future rail fleet expansion. Capacity limits restricted ridership growth beyond the year 2005. The newly-proposed Metrorail capacity constraint will be invoked after 2010 instead of 2005, to reflect the new funding for 182 additional rail cars provided under the "Metro Matters" agreement. The constraint applies to peak period transit trips which are destined to / through the Core.

The core of the Metrorail system serves 60% of customers, 90% of transfer activity and 100% of train trips. The Metrorail Core Capacity Study that was conducted in 2001 forecast ridership through 2025. The study determined when ridership demand will exceed system capacity at various service levels and strategies. It also identified needed improvements to provide necessary system capacity to meet forecasted ridership demand.

Average weekday ridership in June 2004 was 706,600 passenger trips, the first time in Metro history that average weekday ridership exceeded 700,000 passenger trips per weekday. The average 2004 daily ridership was 653,000. Metrorail ridership has grown steadily and has increased by more than 30% over the past eight years for an annual growth of 3.8%. More than 40% of all person trips to the core during the AM peak period use transit.

In 1999, the WMATA Board adopted the goal to double bus and rail ridership by 2025. Metrorail ridership is expected to grow at an average annual rate of approximately 3% based on COG forecasts. More than 70% of ridership occurs in AM and PM peak periods, and peak one-hour ridership accounts for approximately 43% of peak period ridership.

Factors affecting system capacity are:

- Maximum capacity determined by:
    1. Number of trains per hour,
    2. Number of cars per train, and
    3. Number of passengers per car.

- Maximum capacity occurs at the maximum load points on each line and at the peak one hour of each peak period.

- WMATA considers a line to be overcrowded when the average passenger load during the peak hour at a maximum load point exceeds 120 passengers per car.

Mr. Harrington explained that the old capacity constraint was implemented assuming 950 cars which limited ridership growth to 2005, and the new capacity constraint after 2010 reflected the addition of 182 rail cars (includes cars to be ordered with recently improved Metro Matters funding).

The TPB model currently implements a transit capacity constraint on all forecast years beyond 2005 and is applied to all transit trips: Metrorail, bus and commuter rail. It assumes that the core

capacity will not exceed the 2005 level for peak transit trips to/through the core. Daily transit trips are factored to peak trips with temporal, orientation, and trip purpose distribution. Displaced transit trips are re-allocated to the auto modes at the zone level.

Mr. Harrington expressed the following concerns/issues with the transit capacity constraint:

- Methodology:
  -Applies to all transit trips, not just Metrorail
  -Not all transit trips would shift to auto modes during congested conditions

- Constraint should not be used in long-range project planning studies where unconstrained transit demand is used.

Questions and Comments

Mr. Mann asked if the mode split is demand-constrained for the forecast year. Mr. Kirby replied that the output of our conformity work reflects a constraining of transit ridership to and through the core at 2005 levels for the forecast year.

Mr. Harrington commented on modeling capacity. He stated that parking capacity seems to be a little more important than line capacity. Shadow prices should be applied to individual stations as a process to balance the load at each station in order to roughly match the amount of parking available for auto access to transit.

Mr. Replogle expressed concern about constrained trips. He stated that Smart Mobility did an analysis of the TPB model to estimate transit mode shares. Smart Mobility compared the 2000 CTPP data with the transit mode share that comes out of the TPB model and concluded that the model tends to overestimate transit mode share in the suburban areas and underestimate transit to the core. The more important issue should be fixing transit mode share.

Mr. Mann commented that if transit doubles and mode split stays the same, then the District of Columbia employment has to double. Mr. Harrington responded that the current COG Cooperative Forecast shows a 30% increase in core employment.

Mr. Kline asked how close you are to 2010 constraints. Mr. Kirby commented that staff received a letter from WMATA suggesting changes be made due to Metro Matters funding. That was included in the work scope for this year's conformity cycle and is out for public comment right now. The Board will be asked to approve this change on April 20, 2005.

Mr. Replogle asked the Chair's permission to use his laptop computer to display graphical information he had recently developed in support of his comment about the estimation of transit mode shares in the TPB model. He gave a visual comparison of mode shares generated in the TPB model versus those reported by the Census. His conclusion is that the TPB model overestimates transit mode share in the suburbs, while underestimating transit mode share in the Core. Mr. Griffiths responded that the Census data Mr. Replogle was using had not been adjusted for several factors, such as discarding out-of-town workers, and cautioned against making such a conclusion until these adjustments had been made. TPB staff is in the process of making these adjustments prior to checking the performance of the TPB mode choice model.

The next TFS meeting will be held on May 20, 2005.

COG/TPB Travel Forecasting Subcommittee
Sign-In Sheet
Meeting of March 18, 2005

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