

July 20, 2007 TFS Highlights

Item 1: Approval of May 18, 2007 Meeting Highlights

The highlights were approved as written.

Item 2: Version 2.2 Travel Demand Model Sensitivity Analysis

Ron Milone distributed a presentation handout entitled, "Version 2.2 Travel Model Sensitivity Analysis." He informed the subcommittee that the sensitivity analysis of the Version 2.2 model has continued during the past two months. This work involved revisiting the three tests presented at the last meeting, specifically:

- 1) The removal of the John Phillip Sousa Bridge (year 2000);
- 2) A reduction in directional lanes, from 4 to 3, on the American Legion (Capital Beltway) Bridge (year 2000); and
- 3) Altering the standard escalation assumption that fares will rise directly with inflation, to the assumption that fares will rise at *one-half* of the inflation rate (year 2030).

At the last (May) TFS meeting, some members desired to review more detailed trip distribution and mode choice results of the tests. There was also a desire expressed to see how well the model performed with respect to historical cordon count data.

Mr. Milone informed the TFS about refinements made to the Version 2.2 model in recent weeks, which were implemented before sensitivity tests were executed. Round 7.1 Cooperative land use inputs were used (prior work involved the used of Round 7.0a). The assumed annual traffic growth assumption used at the I-95 external station in Virginia was increased from 2.7% to 3.0%. This was judged appropriate given HOT lane plans now assumed in the current CLRP. Finally, procedures were added to disqualify some freeway links from the queuing delay time function now used in Version 2.2's traffic assignment. TPB staff has recently discovered that the potential for overstating queuing delay time exists because the TPB highway networks contain a number of special network nodes in the freeway system (the nodes are used to better represent the facility's 'true' alignment). The added nodes result in two or more links on a freeway segment that could otherwise be represented as a single link. Because the queuing function is related to the V/C ratio, on a link by link basis, the existence of multiple links on a congested freeway segment could potentially overstate queuing delay time on the segment. The added procedures serve to disqualify the added links from the queuing delay process.

Mr. Milone presented area-wide comparisons of HPMS-based VMT and simulated VMT results for the Washington, D.C. Metropolitan Statistical Area (MSA). The comparison was very reasonable. He also presented estimated and observed screenline comparisons based on 2000 and 2005 ground counts. (The 2005 counts represented a partial sample for the region and were most heavy concentrated in Maryland.) The 2000 screenline performance was very similar to that presented previously to the TFS. The Root Mean Square Error (RMSE) for the 2000 counts was 48% (based on 3,188 directional counts). The 2005 RMSE was 41.71 (1,569 counts). TPB is presently working to more comprehensively populate the 2005 highway network with traffic counts.

Using the Version 2.2 model, with the above-mentioned refinements, the results of the sensitivity tests were generally similar in direction and in magnitude to the results presented at the May TFS

meeting. The Sousa bridge closure resulted in a regional VMT decrease of 50,000 (from a base of 143 million vehicle miles) and an increase of 7,100 transit trips (from a base of 981,000 total transit trips). The most significant trip distribution change at the jurisdiction level was a decrease in 5,100 auto driver trips between Prince George's County and the District, as one would expect. Accordingly, transit trips for the same interchange increased by 5,600 trips. The American Legion Bridge lane reduction resulted in a decrease of 211,000 vehicle miles, with no significant difference in transit trips at the jurisdiction level. The auto driver trip patterns reflected diminished interaction between Montgomery County and Fairfax County (-12,400) as well as in the reverse direction (-10,600). Accordingly, auto driver trips within Montgomery County increased by 16,000. These are results that one would expect. Bandwidth volume-difference plots indicated that shifts in travel patterns were reasonable.

When assuming that 2030 transit fares will grow at one-half the rate of inflation, as opposed to the standard assumption that fares will escalate directly with the rate of inflation, regional transit trips increased by 284,000, from 1.535 million to 1.819 million daily trips. Furthermore, the regional VMT decreased by about 300,000, from 199.9 million to 199.6 million. Again, these results were deemed reasonable. The HBW fare elasticity implied by this test was -0.29, which is close to the commonly cited elasticity value of -0.30.

Finally, Mr. Milone also presented comparisons of estimated and observed crossings of the Metro Core Cordon and Beltway Cordon counts over time. Observed counts are collected in the inbound direction during the AM-peak period and in the outbound direction during the PM peak period. Generally, the 2000 and 2005 model results trended reasonably in all cases, except for the Metro Core Cordon in the PM/outbound direction, where the model over-estimated traffic crossings by over 30%. It should be noted, however, that the counts are based on one-day observations.

Comments and Questions:

In reviewing the Metro Core and Beltway Cordon comparisons, Mr. Replogle noted that the Metro Core PM/outbound counts are over-estimated by the model while there is a reasonable match between estimated and observed PM/outbound crossings for the Beltway Cordon. He asked if staff has considered adjusting the time-of-day model to account for geographic differences that might exist in temporal travel patterns. He suggested that land use or accessibility variables might be considered to address special time-of-day differences that might exist between areas. Mr. Kirby commented that the staggered work hour schedule used by the federal agencies will tend to spread the peak travel pattern. We are aware of this issue and have commented on it previously. At the same time, the TPB should be wary about adding special adjustment factors when we have been working to remove such factors. An adjustment may help a validation statistic in the short term but may not be stable over time.

Item 3: FY-2007 Network Development and Models Development Reports

The FY-2007 models development and network development reports were distributed and were briefly reviewed by Ron Milone and Robert Snead. Mr. Milone highlighted staff work on the nested logit (NL) model during FY-2007. He stated much progress has been made in integrating the NL into the regional 4-step process, but the calibration work has not yet been completed. Staff has also noted that the running times of the NL application are substantially longer than that of the current Version 2.2 model. The TPB is also investigating the use of distributed processing (DP) to shorten running times. Mr. Milone also stated that the TPB's truck models will be updated

during FY-2008. In support of this, staff has processed the 2003 External Truck Survey during FY-2007. The file resulting from this survey effort is currently under review by TPB's consultant working on the truck models (William Allen).

Mr. Snead presented an overview of the network development report that included descriptions of the network development program and work activities completed by network development staff. He also described changes to network development and transit fare building procedures that are now included in the Version 2.2 Travel Model. Also discussed were planned GIS-related activities that included the release on June 8, 2007, of a RFP #18-07 entitled, "Improving GIS Based Applications and Protocols Used to Develop and Manage Transportation Networks". Mr. Snead concluded his presentation by reporting that TPB will revisit the transportation analysis zone system (TAZ) over the next two years and will likely increase the number of TAZ's that are employed in the networks.

Comments from TFS members regarding the content of these reports are welcomed.

Item 4: FY-2007 VHB Task Order Report – Overview

Chairman Rawlings introduced Phil Shapiro of VHB. Jim Hogan of TPB reminded the group that VHB is under a task order contract to provide travel forecasting research and support, and VHB was appearing before the subcommittee today to provide a summary, overview presentation of their FY07 research. More detailed presentations on individual FY07 research topics are expected from VHB at the next two subcommittee meetings. Subcommittee members and others in attendance received a hard copy of VHB's PowerPoint slides.

Mr. Shapiro introduced the rest of the VHB staff in attendance: Paul Gilliam, Maggie Qi, and Rich Roisman. Mr. Shapiro reiterated Mr. Hogan's remarks that today's presentation would be a summary and detailed presentations would follow at upcoming TFS meetings. Mr. Shapiro then discussed the FY07 research on FTA's Summit software. Summit is a matrix squeezing program that calculates a measure known as user benefits that is used to compare between a baseline alternative and a fixed-guideway transit alternative. Summit is required for FTA New Starts analysis. It uses mode choice outputs and accessibility information to produce a summary report, information on user benefits, and GIS files for mapping changes in user benefits. Summit is also useful for identifying problems in the transit modeling process, such as network coding errors or problems with transit path-building. Mr. Shapiro emphasized that Summit is not a model but an evaluation tool that works with model results.

Mr. Roisman discussed the next three research topics: feedback and nested logit mode choice, the state of the art in equilibrium assignment, and the use of cutlines for model validation. The use of feedback with nested logit mode choice was shown to be state of the practice based on the recent TRB survey of MPOs. Furthermore, a review of recent literature showed that the use of feedback loops is considered to be good modeling practice; however, anecdotal evidence suggests that feedback creates model results that are difficult to explain. Three of the 13 MPOs surveyed by VHB reported issues with feedback; however, MPOs may be guarded in their survey responses.

VHB's FY06 research documented the known problems with the Frank-Wolfe algorithm commonly used for equilibrium traffic assignment. The FY07 research focused on alternatives to Frank-Wolfe and the state of the art in equilibrium assignment. Path-based or route-based assignment was first proposed in the 1960s, but its application was limited by computing power. Current implementations reach convergence faster than Frank-Wolfe and store all path and

turning detail information, which is useful for select link analysis. Origin-based assignments use subnetworks to solve assignment faster than Frank-Wolfe. Origin-based assignments are also less computationally intensive than both path-based assignments and Frank-Wolfe; they also contain a “warm starts” feature that computes a new assignment solution based on a previous solution to a similar problem. This feature is useful for testing multiple scenarios. Different travel demand forecasting software packages include different new assignment algorithms and advanced computing features such as distributed processing and hardware clustering. A few agencies are using these advanced features and have invested varying amounts of monies in both hardware and software for upgrades.

Screenlines is a generic term often used for three distinct types of lines: cutlines capture major flows through a corridor, screenlines capture cross-regional flows, and cordons are polygons enclosing a study area. The primary guidance for the placement and use of screenlines is NCHRP #255, which is followed by most MPOs. As part of the research, VHB recommended new screenlines for use with the TPB model. The methodology recommended was to review the existing screenlines, consider changes in travel markets, overlay the existing screenline system on the CLRP, and check the new screenlines against the NCHRP 255 guidelines. Most results from a 2005 model run using the new screenlines were within acceptable levels, but some locations need more observed data for comparison.

Mr. Gilliam presented the final two research topics: a review of the use of traffic simulation and dynamic traffic assignment (DTA) models among MPOs, and the state of the practice and state of the art with regards to modeling peak spreading at the MPO level. DTA models provide a richer representation of traffic conditions than regional models, and can utilize the networks from regional models. DTA models can evaluate a wide range of scenarios and transportation capacity and operational improvements.

The state of the practice for modeling peak spreading is to apply time-of-day factors to daily trip tables coming out of mode choice. These factors are typically derived from household surveys and validated using traffic counts. This is the method currently used by TPB. However, there are limitations to the state of the practice: regional time-of-day factors do not capture spatial-temporal variations in travel demand. Also, since the factors are applied to the entire peak period, they don't capture the variation of demand within the peak period. Finally, the time-of-day factors are not adjusted based on congestion levels, and the impacts of traffic control and network constraints are not considered in the volume-delay functions used in the model.

Several agencies are applying techniques for modeling peak spreading that are considered state of the art. These include modeling peak spreading outside of the peak period, a trip-based peak spreading logit model, and an activity-based model that addresses peak spreading.

One potential approach to modeling peak spreading for TPB would begin with the validated base year model and hourly traffic counts at screenlines. Origin-destination tables for the 2, 3, 4, and 5 hour peak periods would then be prepared using the Cube Matrix Estimator. The resulting peak period tables would then be divided by the regional daily origin-destination table. The resulting new peak period tables would then be assigned to the network. The duration of the peak period would then be reviewed based on the results of the assignment.

Mr. Gilliam showed illustrations of peak spreading conditions along I-270 at the Montgomery County / Frederick County line based on 2005 traffic counts.

Comments and Questions:

Mr. Mahapatra of SHA asked if TPB would be performing a sensitivity static assignment test. Mr. Kirby of TPB asked for clarification and if the question was about the use of DTA. Mr. Kirby then asked how many software vendors offer DTA and if anyone is actively using DTA. Mr. Gilliam replied that although several vendors offer DTA, the only active use to date in the U.S. was in El Paso, Texas; however, many other agencies are beginning early tests of DTA. Mr. Replogle of Environmental Defense noted that Portland (Oregon) Metro had used VISSIM as part of its travel forecasting process, and that getting accurate signal timing information is important. Mr. Mahapatra noted that many of the microsimulation and DTA packages are simple to use but require a lot of advance preparation for items such as network coding.

On an unrelated topic, Mr. Sanders of the Action Committee for Transit asked about the status of TPB and MDOT coordination for travel forecasting on the proposed Purple Line (Bi-County Transitway). Mr. Clifford of TPB replied that there is a lot of ongoing work and coordination taking place.

Item 5: Status Report on the Enhanced Arterial Highway Congestion Monitoring Program

Daivamani Sivasailam provided an update on the status of the arterial congestion monitoring pilot program. He distributed a copy of a recruitment letter sent to 60 potential volunteers who are members of the Commuter Connections ridesharing data base. Also distributed was a package containing instructions, a liability waiver form, and the daily log to be kept by volunteer drivers. Mr. Sivasailam presented the analysis results of the data collected by five volunteers. The lessons learned from the pilot program were discussed, and he outlined the other activities associated with the program that staff is involved with such as the web page design, database design, etc. Mr. Sivasailam concluded by asking subcommittee members to contact staff if they or someone they know might be interested in volunteering in the data collection effort.

Comments and Questions:

Mr. Mahapatra from Maryland SHA wondered whether staff had looked into obtaining speed information from the CHART program. Mr. Sivasailam replied that speed information available from CHART is for freeways, and is based on spot speeds collected by sensors. It can be used to supplement or corroborate the data collected by volunteers. Mr. Roisman of VHB, Inc. volunteered to be a driver. He wanted to know how driving variations among volunteer drivers will be handled. Mr. Sivasailam replied that no specific driving instructions are provided to volunteers. If multiple drivers drive the same facility, the variations will be smoothed by the calculated average speed which will be the final product.

Item 6: Update on Household Travel Survey

Bob Griffiths reported that staff and the contractor are approximately half way through the data collection process. 4,500 households throughout the region have been recruited out of a goal of 10,000 households. The second quarter effort is nearing completion, with the third quarter getting underway in August. Work is beginning on the non-respondent follow-up survey also.

TPB Staff is contemplating adding Warren County in Virginia to the household survey, even though it is not part of the TPB modeled area. Warren County is included in the latest metropolitan area definition (due to 25% of Warren's workers being employed in the central part of the MSA which includes Fairfax County). Including this jurisdiction in the household survey would make the data more comparable with other data sets such as the American Community Survey. Adding 100 samples for Warren County will not have budget implications. It would be nice to add both Rappahannock and Culpepper counties as well, but there could be budget implications if those two were added to the survey. The subcommittee concurred with Mr. Griffiths' recommendation to add Warren County as part of the Household Travel Survey.

Item 7: TRB Report on Metropolitan Travel Forecasting

Ron Kirby distributed materials from the TRB panel's report describing the following:

- statement of task;
- background on the origin of the study; and
- a list of committee members.

He thanked the staff of VHB, Inc. for their work in conducting the national survey of MPOs, culminating in the technical report on the state of modeling practice that was furnished to the TRB committee. He also indicated that the subcommittee would receive a briefing on the full TRB report at a future meeting.

Mr. Kirby observed that there are a number of points of view with respect to modeling practice that appear in the TRB committee's report. He noted that one area of agreement is that there has been a dearth of funding for research in transportation modeling, with the exception of TRANSIMS. He feels that added research funding needs to be addressed in the next transportation authorization by Congress. For the present, MPOs are on their own. TPB is making an effort to share documentation with other MPOs, including the recent task order research undertaken for TPB by VHB, Inc. Mr. Kirby urged other MPOs to document more of their own research and share it with others. In the longer run, Congress needs to provide more funding.

Comments and Questions:

Mr. Replogle commented that he agreed that there is a need for more funding in research and development in this area. There may soon be some opportunities in the upcoming climate legislation, with discussion on how to better address climate issues in the transportation arena serving to push for this type of funding. He encouraged cooperation between MPOs, state DOTs and environmental groups to work together with AASHTO for some pooled funding.

Mr. Kirby noted that AASHTO is a major player in travel demand modeling, with several statewide modeling efforts underway at present. He concurred that we should explore opportunities for pooled funding.

The meeting was adjourned at 11:58 A.M.

**COG/TPB Travel Forecasting Subcommittee
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Meeting of July 20, 2007**

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