

**Highlights of the TPB Travel Forecasting Subcommittee Meeting
Held November 16, 2007**

Item 1 – Approval of September 21, 2007 Meeting Highlights

The highlights were approved as written.

Item 2 – FY07 VHB Task Order Report, Part III

Mr. Roisman noted that this was the final of three presentations covering the FY 07 task order research, and would cover three topics: FTA's Summit software, the application of speed feedback with nested logit mode choice models, and the State of the Art in equilibrium traffic assignment. The final draft written report for the FY 07 task order research was distributed to the committee members.

Summit

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. FTA requires that trip tables and land use be fixed between alternatives for Summit analysis. Summit is also useful for identifying problems in the transit modeling process, such as network coding errors or problems with transit path-building. Summit is not a model but an evaluation tool that works with model results. A new version of Summit is scheduled to be released by FTA by the end of 2007.

Mr. Milone of COG/TPB staff asked about how the “can walk” transit market is developed for Summit: does it include both short walk and long walk catchment areas or is it an arbitrary distinction. Mr. Roisman responded that it was arbitrary. Mr. Milone noted that this was a “gray area” that could be manipulated to achieve more favorable Summit results. Mr. Roisman noted that FTA ultimately must sign off on sponsors' characterization of walk sheds. Mr. Spielberg of VHB added that the walk sheds are defined based on the percentage of the traffic analysis zone that can reach transit via walking, not a long or a short walk, but there is room for “tinkering.” Mr. Shapiro of VHB noted that Summit allows FTA to review the results of sponsors' models and find idiosyncrasies; VHB, as part of its periodic review of models and FTA New Starts applications, has also found some of those idiosyncrasies.

Mr. Milone asked what features would be included in the next version of Summit. Mr. Roisman responded that he did not know, but suggested contacting Mr. Nazrul Islam at FTA, who is the key contact for Summit. Mr. Milone noted that Summit was particularly sensitive to traffic analysis zone size and network coding, and asked if there were any known examples of exemplary network coding (he had heard Denver often cited as one area). Mr. Roisman said that he had also heard Denver cited as a good example as well

as San Diego, although San Diego was usually praised for their Bus Stop Location model rather than their network coding. Mr. Spielberg said that he had not really heard anything good or bad, but he did know that the Baltimore Metropolitan Council (BMC) had learned a lot about the impacts of their network coding conventions on Summit when performing transit analysis using the software. Mr. Milone noted that he was familiar with the BMC experience and that he expected Summit to be an “eye-opener” to such issues.

Mr. Shapiro noted that Summit is generally useful for performing quality assurance / quality checks of the model; in one project he reviewed the new transit facility generated more non-work trips than work trips, which was a counterintuitive result. Further review indicated that the model included a transfer penalty for work trips but not for non-work trips, which needed to be corrected. Mr. Shapiro emphasized careful review of the model chain during Summit reviews.

Mr. Spielberg noted that Summit also shows that the model should use consistent weights in both the pathbuilder and mode choice utility functions; otherwise you could create a situation where the pathbuilder finds an attractive path that looks worse to the mode choice model. This can lead to the transit improvements actually registering disbenefits during Summit analysis, and he has seen this during an actual New Starts review. Mr. Shapiro noted that Summit analysis can illuminate issues in the entire model chain, not just those particular to transit. Mr. Spielberg echoed this comment, saying that *theoretically* Summit could be used to compare highway alternatives.

Mr. Jamei of VDOT asked whether FTA’s requirements of fixed trip tables and land use for New Starts analysis were in conflict with EPA regulations on travel modeling for highway and air quality evaluation. Mr. Roisman responded that this was correct and that FTA had been trying to address the effects of land use and redistribution of trips due to a new transit investment. Right now the evaluation criteria include a factor for changes in land use that is exogenous to Summit.

Speed Feedback

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.

There were neither questions nor comments from the committee on this topic.

Equilibrium Assignment

Ms. Qi from VHB presented this topic. 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 sub-networks 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.

Mr. Moran from COG/TPB staff asked if the reported performance measure for TransCAD was gap or *relative* gap. Ms. Qi responded that it was relative gap. Mr. Moran asked about the performance measure on the previous slide, for VISUM. Ms. Qi responded that it was also relative gap. Ms. Qi noted that Citilabs used only gap prior to Cube 4.0 but now includes relative gap, which is the more meaningful measure.

Mr. Moran asked if the survey agencies using Cube Cluster have their models executed using Cube Application Manager or using a series of batch files (like the TPB model). Ms. Qi responded that the survey did not capture that information. Mr. Moran noted that the information would be useful, as he had heard that implementing Cube Cluster and the subsequent learning curve is much easier with Application Manager-based models rather than batch file implementations (and if the user already knows Application Manager).

Mr. Jamei described VDOT’s experience with Application Manager in Richmond as positive. Mr. Moran noted that multithreading can be more advantageous than clustering since it requires little user setup, and that TPB would like to see multithreading in Citilabs’ software. Mr. Moran asked for clarification on the tests performed by the Albany (NY) MPO; holding user equilibrium iterations constant and varying the number of speed feedback loops is contrary to the way performance tests are typically conducted. Ms. Qi noted that the Albany study was conducted with PTV and designed to test variations in speed feedback implementation specifically.

Mr. Snead of COG/TPB staff asked how many traffic analysis zones were in the Prince George’s County model. Mr. Roisman responded that his understanding was that outside of Prince George’s County the model used the COG/TPB zone system, but inside Prince George’s they had tripled the number of zones over what was previously modeled (in the COG/TPB system), bringing the county total up to roughly 900 zones.

Mr. Milone noted that a highly converged solution is desirable for comparison between scenarios, particularly to reduce modeling “noise”, but then asked if a highly converged solution really yielded better model results using typical performance measures such as

Root Mean Squared Error (RMSEs) or comparison to observed traffic volumes. Ms. Qi responded that a highly converged solution definitely improved comparisons between scenarios. Mr. Shapiro responded that tests to see if highly converged scenarios provided better model validation haven't really been performed. Mr. Roisman noted that many of the research papers don't report RMSEs or other performance measures, or aren't testing the advanced modeling features in a true production environment. Mr. Hogan noted that validation raises its own problems, particularly with the reliability of the observed data set.

Mr. Milone noted that although research is focused on the need for tighter convergence and more iterations in congested conditions, once a high level of congestion is reached, travelers will be more likely to alter their travel based on time of day rather than sitting in congested "equilibrium" conditions, particularly for a 30-year forecast. He added that there seems to be a hyper-focus on the need for tighter convergence instead of looking more generally at traveler behavior, and urged that those priorities be reconsidered – focusing less on 10-17 levels of convergence and more on what people are really going to do in congested conditions.

Mr. Spielberg noted that modelers must look at the specific evaluation measures and the future year networks. What led to the focus on convergence were the difficulties FTA faced when trying to include highway user benefits in Summit and not getting logically explicable results. That exercise was considering network specific measures between two scenarios. Other performance measures such as vehicle-miles of travel (VMT) consistently stabilize after about 20 user equilibrium (UE) iterations. Volumes on a specific link may shift a lot during early iterations, so design forecasts need the precision and specificity of tight convergence, but such precision is not necessary for measures such as regional mode split. Mr. Milone suggested that running a larger number of iterations for project planning studies and fewer for regional plans might be a good solution. Mr. Roisman noted that VHB's survey found that agencies do vary the number of UE and/or speed feedback iterations depending on the time period and area being modeled.

Mr. Mann of VDOT noted that the reality is that location/design forecasts in Virginia don't really look at model results; they look at existing volumes, planned development and trip generation, and other factors. There is a danger of over-sophistication in the planning process. Mr. Shapiro noted that in Maryland project planning studies do use the model results and then refine the raw volumes. He reminded the group that models are just tools, originally designed to compare results and not to produce exact numbers; even traffic counts don't produce exact numbers some of the time.

Mr. Hogan asked the committee to provide comments on the written report to Wanda Hamlin of COG/TPB staff by Friday, December 14, 2007. He also noted that the content of the report will influence work program direction and models development activity.

Item 3 – Recommendations for TPB Work Program from TRB Special Report 288

As part of ongoing work with TPB by VHB, Inc., Frank Spielberg was asked by staff to make recommendations for future TPB work activities in both models development and travel surveys based on information developed in TRB Special Report 288. Mr. Spielberg distributed copies of his slide program entitled, Recommendations from TRB Special Report 288, Metropolitan Travel Forecasting: Current Practice and Future Direction. He described the shortcomings of current modeling practice in general from the report:

- Current models have inherent weaknesses;
- They cannot adequately represent travel behavior of individuals, non-motorized travel, time chosen for travel and time-specific traffic volumes and speeds, and freight and commercial vehicle movements.

He cited other shortcomings documented in SR 288 that are related to model practice:

- Inadequate data, especially for model validation;
- Optimism bias;
- Quality control;
- Validation errors.

On the topic of new forecasting procedures, Mr. Spielberg cited the following from SR288:

“Insufficient evidence exists that advanced models can be implemented for a reasonable cost and will provide significant improvements over current practice.”

Mr. Spielberg then reviewed the summary recommendations from the Special Report 288:

- Need for a research program;
- Need for MPOs to engage in peer reviews;
- Modeling should undergo more sensitivity testing, including forecast year projections, as part of reasonableness checking;
- MPOs experimenting with or fully advancing advanced modeling practices should document their experiences (including costs, advantages, drawbacks, transferable data or model components) – Noted that Ohio is embarking on a program to evaluate their advanced model.

He commented that the report made note that models should be matched to the proper context in which they are being applied. For example, a rapidly growing metropolitan area that is not in attainment, has severe congestion, and is planning to implement dynamic tolling, should have a forecasting process that is sensitive to price, allows analysis of mode choice, time-of-day choice and trip chaining, permits detailed assessment of travel speeds, and supports analysis of impacts to minority and low-income populations.

He noted that Special Report 288 makes recommendations for advancing the state-of-the-practice in 4-step modeling as follows:

- Improved measures of arterial congestion, involving intersection delay and queuing;
- Inclusion of both highway and transit time in trip distribution;
- Implementing a destination choice model in trip distribution;
- Improving the modeling of non-motorized travel; and
- Sensitivity testing.

He commented that Special Report 288 makes recommendations for advanced modeling practices as follows:

- Improving land use modeling;
- Moving to tour-based and/or activity-based models;
- Introducing discrete-choice modeling based on population synthesis; and
- Introducing supply-side models to perform traffic microsimulation (e.g., TRANSIMS).

Mr. Spielberg proceeded to map these recommendations with activities in the TPB work program. He noted that data adequacy, especially for model validation, is a problem in most MPOs, but TPB was making an effort to obtain hourly, directional traffic counts, was conducting a new household travel survey, and had just concluded a freight study for the region. He recommended that TPB actively monitor work by other MPOs in tour-based and/or activity-based modeling each year, as well as supply-side modeling, and noted that effort is underway at AMPO to develop a research program among MPOs. He observed that TPB had undergone a peer review of its modeling process recently, and was routinely conducting sensitivity tests of model forecast year projections. He suggested that TPB consider developing a destination choice model for trip distribution, thereby explicitly including price as a variable in that step, similar to mode choice. He also recommended that TPB explore ways to model income as a variable more explicitly through the model chain. In his view, current software would permit TPB staff to begin testing intersection delay and queuing effects in the modeling process. He acknowledged that TPB does include both transit and highway time in trip distribution. He also recognized that the issue of land use modeling is a sensitive one historically at COG/TPB. He suggested that TPB begin work on discrete-choice modeling, specifically investigating population synthesis.

The discussion that followed Mr. Spielberg's presentation ranged from how best to obtain income information from transportation surveys to the degree to which advanced methods should be implemented even if data were insufficient to validate them. This debate is going on nationally and will continue with the TRB session on Special Report 288 in January.

Special Report 288 – *Metropolitan Travel Forecasting* is available online at:
<http://onlinepubs.trb.org/onlinepubs/sr/sr288.pdf>

The findings of the surveys of metropolitan planning organizations used to develop this report are available online at: <http://onlinepubs.trb.org/onlinepubs/reports/VHB-2007-Final.pdf>

Item 4 – Update on Regional Air Passenger Survey

Mr. Abdul Mohammed, COG/TPB, distributed a hard copy of his presentation slides entitled “*Washington/Baltimore Region, 2007 Air Passenger Survey*”, and a sample copy of the 2007 air passenger survey questionnaire. He began his presentation with a brief overview of the air passenger survey. He noted that the air passenger survey is an element of the CASP programs (Continuous Airport System Planning), and is overseen by the Aviation Technical Subcommittee.

Mr. Mohammed stated that the purpose of the air passenger survey is to collect information about the changing travel patterns and user characteristics of departing air passengers, at the three regional airports, namely BWI, DCA and IAD. He also noted that the 2007 survey was the eighth of its kind conducted in the region. The survey was conducted between Sunday October 7th through Saturday October 20th. Missed flights and/or flights with low response rates were re-surveyed during a two week period starting Sunday October 21st through Saturday November 3rd.

Mr. Mohammed noted that airport managers provided field offices for the duration of the survey period at all airports, and airline managers provided revenue passenger counts of surveyed flights. The survey was an at-gate lobby interview where questionnaires were provided to departing passengers who volunteered. Late arrival departing passengers were also provided with pre-paid mail-back envelopes to mail their questionnaires within the continental United States.

A total of 685 randomly selected flights were surveyed of which 606 were domestic and 79 international destinations. He indicated that to date a total of 19,000 questionnaires were collected representing over 27,000 out of 55,500 revenue passengers counted at all airports. The overall response rate being 49%, the survey was considered a success.

Mr. Mohammed informed the subcommittee that the next step is for the data to be keyed, followed by logic checks anticipated to be completed by late December. In addition, since the Washington-Baltimore Air System Region includes parts of the Baltimore region, the geo-coding process will reflect both MWCOG TAZs and TAZ's in the BMC region, with a total of over 2,600 zones. The survey data will also be factored to observed annual enplanements at the three commercial airports. He also noted that findings and a final report will be completed by June 2008.

Item 5 – Update on Household Travel Survey

The Household Travel Survey is on track to finish the third quarter at the end of November. 68 percent of households have been retrieved at this point, although we expect the completion rate to reach 70 percent by the end of the quarter. The target is 75 percent, so we are very pleased with how close we are to the target. Most jurisdictions are on track, however a few are a little low. Prince Georges County, Anne Arundel County Charles County and Baltimore County in Maryland, and Prince William County, Stafford County, Fredericksburg City, and Spotsylvania County, and Warren County (just added) in Virginia have lower rates due to lower recruitment rates. We plan to compensate for those lower rates in the fourth quarter by increasing the sample size.

We have received interim data deliveries from NuStats. They have a rigorous quality control (QC) process in place utilizing logic and edit checks. The smaller households are more likely to pass QC and be included in the interim data deliveries. Larger households tend to be more problematic and require more research before they can be included. As a result, the trip rates are lower than expected because those larger households are currently missing. As the larger households make it through the QC process, they will be included in the data deliveries. After the data collection is complete, the survey will need to be weighted and expanded to fully represent the region. This process will be an iterative process between NuStats and COG/TPB staff. Data collection should end in early February, but there will be some additional follow up after that. The advantage of the additional follow up is that some of the budgeted money becomes available for the Regional On-Board Bus Survey.

The regional on-board bus survey will be conducted throughout the region and include bus operators other than just WMATA. The survey instrument has not been finalized. There is a trade off in response rates and data quality. A pretest will be conducted to assess the best approach by testing a short version and a long version of the questionnaire. Some of the variables that will be tested in the long version are number of workers in the household, household size, household income, and vehicle availability. It is advised that the FTA requirements be considered when designing the survey instrument. WMATA must have a good response rate for the funding allocations by jurisdiction. There is a draft MOA between WMATA and COG/TPB to do the work and the RFP should be available at the end of November to start work in early January. The pretest will be conducted in early March and the main survey will be in May.

Item 6 – Adjourn

The meeting was adjourned at 11:48AM.

COG/TPB Travel Forecasting Subcommittee

Sign-In Sheet

Meeting of November 16, 2007

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