Travel Model Improvement Program (TMIP)
Report on the Findings of the First Peer Review Panel of the Baltimore Metropolitan Council

Location:	Baltimore, MD
Date:	September 23-24, 2004
Peer Review	
Host Agencies Contact:	Charles Baber, *Baltimore Metropolitan Council (BMC)*
Peer Review Panelists:	Frank Spielberg, P.E., *BMI-SG, Chair* Thomas Rossi, *Cambridge Systematics* Keith Killough, *KLK Consulting* Jeffrey May, *Denver Regional Council of Governments (DRCOG)* Ken Cervenka, *North Central Texas Council of Governments (NCTCOG)* Eric Miller, *University of Toronto* Bruce Spear, *FHWA, U.S. Department of Transportation* Eric Pihl, *FTA, U.S. Department of Transportation* Christopher Forinash, *U.S. Environmental Protection Agency*

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I. EXECUTIVE SUMMARY

The following report summarizes the results of a Peer Review Panel held through the Travel Model Improvement Program (TMIP), a program sponsored by the Federal Highway Administration (FHWA) that helps agencies improve their planning analysis techniques. The Baltimore Metropolitan Council (BMC) hosted the two-day Peer Review. The primary focus of the Peer Review was to review the status of the BMC travel model improvement process and to provide guidance on near-term and long-term model development issues.

The Peer Review covered a variety of topics, including:

- Population and Employment Forecasting
- Data
- Time of Day/Feedback on Related Issues
- Long-term Model Issues
- Mode Choice
- Pricing and Managed Lanes

After preparing the recommendation in a closed session, the Peer Panelists presented their feedback to BMC staff for clarification and discussion. Meeting notes and the Peer Review Panel's final recommendations are contained in this report. The Peer Review was held September 23-24, 2004 in Baltimore, Maryland.

II. BACKGROUND

The last review of the Baltimore model was performed in 1992, before there was a need for policy related to issues concerning toll pricing, induced/latent demand, non-motorized trips, and tourist trips. In recent years, advances in information technology have made it feasible to incorporate a number of more sophisticated analysis capabilities into travel demand models. Many areas have commissioned studies to investigate how to best incorporate these capabilities into existing models, or, in some cases, to develop new models that have these capabilities. As a result, decision makers would like the Baltimore model reviewed by an expert panel to ascertain how the model can be improved to meet future policy needs.

Specifically in the Baltimore Region, the decision makers (Coordinating Committee and the public) are looking to the travel model to address these policy needs:

1. Meeting transit New Starts criteria for the Baltimore Regional Transit Plan
2. Modeling various managed lane options, for example variable pricing and toll scenarios for major freeways in the Baltimore Region
3. Modeling non-household trips, including tourists, taxis, trucks, etc., in the Baltimore Region
4. Modeling truck traffic along I-95 and to/from the Port of Baltimore

5. Performing microsimulation and sub-area analysis to support state and local planning efforts
6. Accounting for emerging demographic needs, such as households with/without workers and with/without children.
7. Continuing to meet Air Quality Conformity regulations
8. Interest in understanding and forecasting the effects of mixed-use, compact land development.

As a result, BMC technical professionals are looking for expert advice on the best approaches to use to improve the model's capability in these areas. Expert panel recommendations could be incorporated into the model as part of the next scheduled update in 2007.

Existing BMC Model

The Baltimore model utilizes the traditional four-step process of travel demand forecasting (Trip Generation, Trip Distribution, Mode Choice, and Trip Assignment). TP+ software (version 3.0) is used for running the model, except for the transit path-building mode TRNBUILD, which utilizes a debugged version 3.0.6.

The first step in the procedure is **trip generation**, which utilizes various socioeconomic data to calculate motorized (automobile and transit) person trips, commercial vehicle, and truck trips produced and attracted by each zone. A process to generate non-motorized (bicycle and walk) trips has also been incorporated.

The second step, **trip distribution**, links the trip attractions and productions between zones. A gravity model is used which has been calibrated using barrier penalties. Following distribution, trips for three of the home-based purposes are stratified by income. Two passes of trip distribution are made. In the first pass, all trip purposes are distributed based on the free flow network travel times. The second pass occurs after completing the four-step process. This second pass begins with distribution, as Home-Base Work (HBW), Home-Based Other (HBO), Home-Based School (HBSch), and Work-Based Other (WBO) trips are redistributed based on a congested network.

The third phase of the modeling chain, **mode choice**, takes the data on the number of persons traveling between zones and computes how many are single-occupant automobile drivers, multiple-occupant automobile users, or transit riders. The process is repeated for HBW, HBO, HBSch, and WBO trips, with congested highway and transit skims (zone-to-zone travel times) used as an input. Automobile users are converted to the vehicle trip table.

Trip assignment is the final step in the procedure. The vehicle trip table is assigned to the regional network to produce a simulation of link volumes, vehicle miles of travel, and volume-to-capacity ratios. There are two passes: the first one produces an AM peak period (6 AM to 10 AM) assignment used for feedback into the second pass. The second pass produces assignments for five time periods. Finally, a reasonable simulation or regional travel is achieved.

III. PEER REVIEW PANEL: OBJECTIVES, PRESENTATIONS, AND DISCUSSION

BMC continues its rich history of active and analytical planning. Yet BMC and planning agencies across the country are being asked to consider a wider range of transportation planning activities, such as sub-area corridor planning, major transit investment studies, HOV and HOT (High Occupancy Toll) lane analysis, and regional emission analysis. The design of travel demand models needs to be sensitive to this increased level of planning analysis. At the same time, however, a travel model cannot be so complicated that it is unusable by local agencies.

The two main questions to be addressed by the BMC Peer Review are:

1) What are the output/data needs of the users of the model?
2) How are the needs of the public (i.e., non-motorized transportation, transit) addressed by the model?

Specifically, the BMC Peer Review Panel is being asked to: 1) evaluate the effectiveness of the current model, 2) identify enhancements to the model that can reasonably be made in the short-term, 3) identify possible long-term enhancements to the model, 4) provide feedback on the current BMC model, and 5) provide suggestions about the future direction of BMC model improvement.

The following presentations provide an overview of the major components of BMC's model and the current improvement process. BMC staff presented on these different components throughout Day 1 of the Peer Review. Discussion took place during and after each presentation. Recommendations were identified at the end of second day, and are listed at the end of this report.

A. User Applications for the Model and Key Issues

Charles Baber, Baltimore Metropolitan Council
Gene Bandy, Baltimore Metropolitan Council
Paul Gilliam, Baltimore Metropolitan Council

The Baltimore Metropolitan Council (BMC) is the staffing component of the Baltimore Regional Transportation Board (BRTB), which serves as the Metropolitan Planning Organization (MPO) for metropolitan Baltimore. The BRTB has members from Anne Arundel, Baltimore, Carroll, Harford, and Howard Counties, as well as representatives from the Cities of Baltimore and Annapolis and the State of Maryland.

The close proximity of the Baltimore and Washington, DC metropolitan areas has significant implications for the Baltimore model. The MPOs for both regions recognize the need to coordinate planning functions but both also serve different clients. While both Baltimore and Washington, DC use TP+ as their model platform, each MPO uses different definitions for capacity, zone size, and variables used to project demographic

data. BMC models portions of the Washington, DC region. The Washington, DC region portion was added to lesson the impact of external stations along the southern border. The interactions between the two models are important to understand.

A major impetus for the BMC model update is to support the development of a State Implementation Plan (SIP) that implements the 8-hour ozone national ambient air quality standard (NAAQS). Like other MPOs in non-attainment areas, the BMC is required to transition from the 1-hour NAAQS standard and identify and implement strategies in the SIP that will achieve air quality goals based on the new 8-hour standard. The 8-hour ozone SIP is due June 15, 2004.

To assist in defining the important issues for the travel forecasting models, BMC established an 11-member Coordination Committee, representing local and state users of the BMC model. This group met once during the summer of 2004. A public meeting was also held to solicit general comments. This process identified key policy issues that the model should address:

1. Model should meet Federal, state, and local requirements related to air quality conformity and SUMMIT requirements for transit planning
2. Model should track inter-regional traffic given intense interaction between Baltimore and Washington DC
3. Model should accommodate finer traffic analysis zones (TAZ) and should be flexible enough to add zones easily.

There are additional policy areas where more analysis is required:

1. Question of whether the model should recognize special generators such as Baltimore Washington/International Airport (BWI)
2. The impact of tourist areas in Baltimore and Annapolis on travel patterns and demand
3. Question of which travel demand management techniques, such as managed lanes, to employ in the region
4. The question of how land use affects travel demand and non-motorized transportation, and how this is accounted for in the model
5. Question about model validation and at what point does the model become “good enough”
6. Special concerns about truck traffic modeling and freight planning

Panelists offered the following comments:

1. There is an inherent conflict in modeling between making models that are easy to use and transferable to the local level but that are complex enough to capture all travel behavior desired.
2. The focus of the Coordination Committee is on transportation analysis and the impact of changes to transportation infrastructure. These priorities are reflected in the design of the model, which favors technical analysis over land use analysis. The Citizens Advisory Committee to the BMC, though interested in the issue of land use, accepts that most decisions about land use issues are left to local

jurisdictions. The BMC aggregates and makes use of land use data obtained from local jurisdictions.

1. Anne Arundel County
   George Cardwell, Anne Arundel County, MD

The structure of the Anne Arundel countywide model is based on a sub-regional focus of the December 2003 BMC model. The focus of the model is on growth areas in the county, which creates a platform for the use of small area models (SAM). The county performs additional validation and traffic counts for the SAMs because high growth in the county necessitates the need for frequent and reliable traffic count data.

Anne Arundel County uses its countywide model to standardize its forecasting processes across the following areas:

1. Demographics—the model is used to evaluate changes in travel demand based on changes in jobs and housing
2. Land use—the model is used to evaluate the impact of changes in land uses on travel demand
3. Capital planning projects—the model is used to identify the need for capital projects
4. Travel mode—the model is used to evaluate changes in travel demand due to modifications to the network or changes in travel modes

Mr. Cardwell presented short- and long-term issues that will likely influence the countywide model:

1. The need for the model to forecast travel demand in the high-growth Maryland Eastern Shore region. The development in this part of the state affects traffic conditions in Baltimore and Annapolis. Currently the BMC model does not reach into this area of the state.
2. The need for more than external station counts.
3. The need for the model to capture travel demand associated with special generators, such as major shopping malls, office parks, and employment centers (Ft. Mead currently employs 50,000 people, with an additional 30,000 jobs expected over the next 10 years).
4. The need to forecast travel demand in the City of Annapolis. Although the City is a tourist destination, it behaves in a manner that is unlike a traditional tourist site. The tourist model is, therefore, not the appropriate travel demand model to use.
5. The need to improve modeling of HOV lanes.

The Peer Review Panel commented that special generators are not always “special.” It is important to identify which sites are truly unique and warrant a special generator classification. Often, designating sites as special generators in a model yields no real benefit because these sites are not greatly affecting travel behavior.

2. Howard County
   Benjamin Pickar, Howard County, MD

Mr. Pickar expressed his concerns about the adding complexity to travel demand models while not ensuring the quality of the basic data that feed the model. He believed that there has been a loss of accuracy in data collection overall, and that any process that could improve data collection techniques and procedures would be helpful. Finally, Mr. Pickar stated that it was critical that agencies add to models only those variables that render the most useful information.

3. Maryland Department of Transportation
Ron Spalding, Maryland Department of Transportation

Mr. Spalding stated that the Maryland DOT is under continuous scrutiny on a number of fronts (particularly environmental issues related to air quality non-attainment) and that the BMC model must provide data that withstands legal challenges. He continued to make the following points about the BMC model:

1. The DOT's primary concern is that the BMC model meets the state of the practice and addresses key transportation and environmental concerns, such as air quality attainment.
2. The models should support SUMMIT analysis and provide data needed for FTA's New Starts Program.
3. The model should support decision-making on a number of travel demand alternatives, such as HOT lanes and peak-hour pricing.

Mr. Spalding was asked if the State of Maryland had ever considered a statewide travel demand model. He responded by saying that the state once considered such an effort but decided against a statewide model because it would be too expensive to produce and that it would likely fail to capture the differences (demographic, land use in urban, suburban, and rural areas, high-growth areas versus no-growth areas). Mr. Spalding did comment that a statewide model for commodity movement would be beneficial and could be used to inform the BMC model on roadway freight movements.

B. BMC Demographic Forecasting Process and Trends

Paul Gilliam, Baltimore Metropolitan Council

Mr. Gilliam provided an overview of the process used for the forecasts, and the current trends that greatly affect the forecasting process. BMC uses a 13-cell table to forecast the number of vehicles, based on household size. Forecasting of households is segmented only by size and vehicle availability. Other components of the process include:

- Assumption that the TAZ 1990 auto ownership level rates by cell/demographic group is true for present
- Assumption that auto ownership will remain the same though household income increases.
- The Baltimore and DC models rely on the same labor pool to fill anticipated jobs. The Peer Review Panel pointed out that this could be construed as double-counting, and should therefore be carefully evaluated.

- The Maryland Department of Planning provides demographic data (e.g., households, population, and employment at the Jurisdiction level.
- Local Jurisdictions provide forecasts of demographic data at the TAZ level using the state jurisdiction totals as a guide.

Land use issues are a major factor affecting the BMC forecasts. The region's private developers are advocating greater development, creating impetus for local jurisdictions to develop holding capacities. Currently, a holding capacity analysis has been undertaken, and will be completed by June 2005. In addition to the high growth occurring in Northern Virginia and in light of growing developer pressures, redevelopment of developed areas such as in Howard County, along with infill issues such as those associated with the expansion of the Baltimore rail line, are serious considerations for the model update. Alternative land use scenarios are being tested.

Aside from land use issues, the Inter-County Connector (ICC) is another major trend affecting BMC forecasts. The ICC is a major priority for the Governor of Maryland, and is on fast-track approval. BMC believes that the ICC will benefit the Port of Baltimore, and Baltimore/Washington International (BWI) Airport, which will affect population and employment forecasts for Montgomery and Prince Georges Counties, and Washington, DC.

C. BMC Current Modeling Practice

Charles Baber, Baltimore Metropolitan Council

BMC uses a traditional four-step travel demand model. The Baltimore modeling region includes 1,151 TAZs within the Baltimore region and 270 TAZs in the Washington Region, with over 32,000 highway and transit links. Average weekday trip tables are generated and factored into five time periods before the assignment phase (midnight – 6AM, 6-10 AM, 10-3 PM, 3-7 PM, and 7-midnight). The initial model run assigns AM period trip table, and highway/transit skims are rebuilt from the AM period network.

Land use is forecasted at the TAZ level. One of four land use density codes (city center, urban, suburban, and rural) is used to account for urban form. BMC is looking for a land use model that can be used with the transportation model. BMC is testing TRANUS in providing information to stakeholders on transportation land use interactions.

The transportation network consists of the highway network, and the transit network, representing base year 2000 facilities, routes, frequencies, and stop/station locations. The MARC heavy and light rail drive shed is a major facet of the transit network. The network also includes walk access, which is generated by TP+, then filtered through a MapBasic process and a spreadsheet process.

Another major component of BMC's travel demand model is its truck/commercial vehicle model. Truck types are split into heavy, medium, and commercial, based on classified truck counts for heavy and medium trucks, and manual observation for

commercial vehicles. BMC began its truck model by borrowing a linear regression from Lehigh Valley, PA. The model bases its truck trips on employment by type (industrial, office, and retail) and households, and adjusts for special truck zones, jurisdiction, and density.

For trip generation, both motorized and non-motorized non-truck trips are generated and classified into six trip purposes. The model also cross classifies household size, vehicle availability and density code, but makes no distinction between internal-internal and internal-external trips. Trip attractions are identified only for motorized trips, and were developed from a 1993 home interviews. For trip distribution, BMC uses a double constrained gravity model, which is executed twice: once with uncongested skims and another time with peak skims. Home based trip purposes of work, shop, and others are stratified by household income after trip distribution.

The BMC's mode choice model utilizes a nested structure and accounts for ten modes. Recent enhancements to the mode are in preparation for FTA's SUMMIT implementation. Different coefficients on transit and auto travel time are sometimes used in the utility functions in mode choice models since it has been found empirically that they generate better fitting models. As auto and transit travel time are, in fact, different variables, some analysts consider it an artificial constraint to force them to have the same coefficient. Other time variables (e.g. run time, walk time, wait time) are treated separately in mode choice models. At least three difficulties with this approach exist, however. First, different time coefficients imply that different values of time are used (by the same trip-maker) when evaluating the utility of transit and auto (although two different ways of spending the time are being considered). Second, an alternative that reduces travel time on transit will have a different impact on transit and auto mode choices than an alternative that increases auto travel time by the same amount. It is not clear that either of these assumptions is behaviorally correct, and they both create difficulties in the use of the model choice model to evaluate alternative transportation policies. Third, FTA has recently developed guidance recommending against separate coefficients for auto and transit in-vehicle time. Maintaining the BMC with different coefficients for transit and highway time would introduce added complexity when applying the FTA SUMMIT procedures for New Starts project analysis.

Trip assignment is done for each of five time periods using an equilibrium assignment process. Drive access to transit trips and BWI special generator trips are also assigned.

D. Model Validation Results

Matthew de Rouville, Baltimore Metropolitan Council

Mr. de Rouville provided an overview of the BMC model validation results for trip generation, trip distribution, mode choice, and trip assignment, which are presented in the appendix. Features of the model enhancements include:

- New base year of 2000, including 2000 demographic data and TAZ structure
- Coding of transportation network into GIS

- New truck and commercial vehicle model
- Equilibrium assignment methodology, including BWI special generator and drive access to transit trips
- Updates to speed and capacity
- Addition of home-based other, home-based school, and work-based other to distribution feedback loop
- Mode choice for internal-external/external-internal trips

BMC has a major challenge regarding accurate traffic counts. Model validation such as might be required to support an application for New Starts funding requires more accurate traffic counts from Baltimore City. EPA requires BMC to calibrate to HPMS data. Yet, because the City of Baltimore does not contain any state highways, the Maryland DOT conducts a limited number of traffic counts within Baltimore City.

E. Emissions Modeling

Charles Baber, Baltimore Metropolitan Council

Baltimore is currently classified as a non-attainment area for ozone. BMC collaborates with Maryland Department of the Environment (MDE) for all emissions estimations. In particular, BMC is responsible for vehicle operating characteristics, vehicle operating assumptions, and emissions post-processing software.

Off network mobile emission estimates are conducted through commercial software, and are used to estimate changes in travel behavior. On network mobile emissions are estimated through commercial software used to post-process travel demand. These estimates summarize demand and emissions (i.e., jurisdiction, facility type, vehicle type, emission type, etc.) Highlights of BMC's process for creating MOBILE 6 inputs include:

- Adjusting simulated vehicle miles traveled (VMT) to HPMS average
- Converting link 24 hour total and truck volume into each hour of the day
- Converting hourly volume and truck volume to four vehicle types (i.e., cars, motorcycles, Heavy-Duty Vehicles (HDV), and bus)
- BMC is developing a MOBILE 6 database and standard report for each county, urban/rural category and functional type. The MOBILE6 database output is being used to estimate VMT totals for 28 vehicle types, and to estimate emissions for VOC, CO, and NOx.

IV. PEER PANEL RECOMMENDATIONS

The Peer Review Panel convened in a private discussion to review the information from the BMC model presentation provided during the previous day, to explore the various issues and to reach consensus on specific recommendations. The recommendations were then presented to BMC staff and others attending the meetings. The following section outlines the recommendations of the Peer Review Panel under the following categories:

- Population and Employment Forecasting

- Data
- Time of Day/Feedback on Related Issues
- Long-term Model Issues
- Mode Choice

A. Population and Employment Forecasting

1. **Establish an independent process to develop regional employment control details.** There were significant concerns regarding the population and employment forecasting procedures, in particular the fact that there are no employment control totals for the Baltimore-Washington Region. Employment and job projections need to be addressed by both Baltimore and Washington, DC. planning agencies because the projected labor pool in the combined regions cannot possibly fill the projected number of new jobs. Both agencies project new jobs that far outstrip the number of individuals in the labor pool.

   The MWCOG (TPB) and BRTB planning boards comprise local government officials with specific agendas, making it more difficult for these two agencies to coordinate a comprehensive population and employment forecasting procedure for the entire region. The regional control totals are particularly important due to the expected increase in interaction between the two regions in the future.

2. **A better approach would be to develop statewide and regional totals** (for the BMC region plus Prince George, Montgomery, and Frederick Counties).

3. **The best approach would be to develop related and consistent population and employment controls for the combined areas of the BMC and the Washington COG regions.** Other regions have successfully used a range of techniques–including substantive cooperative forecasting, expert-panel input, and statistical models—to explore likely future development patterns and forecast alternatives.

B. Data

1. **Conduct an external survey.** There is a need to know more about external travel purpose, destination, time period, and occupancy instead of just volumes. It is recommended that external to external trip data be collected in a manner that includes the entire Baltimore-Washington region due to the degree of interaction between the two sub regions. An external trip survey would need to be developed and administered, though an origin-destination survey could also be explored as a potential process to obtain this data. External data for Baltimore should include information concerning travelers on the bridges into and out of Washington, DC.

2. **Conduct external and port-related truck surveys**. The Port of Baltimore generates heavy truck traffic. The model does not use an external or separate

treatment. The development of a "ports" models based on a commercial vehicle survey would be helpful. Regional and Port of Baltimore truck surveys are needed to obtain better data on commercial truck and freight movement. The Port of Baltimore may be able to help with either existing data sources or with a partnership approach to surveying.

3. **Treat trips to the airport (BWI) as person trips**. Better person trip data is needed at the BWI airport terminals. Ensure that person trips destined to the terminal have a transit option in the model.

4. **Improve traffic counts in city (without adequate data, validation is not possible).** The BMC should consider leading efforts to collect accurate traffic counts on City arterials. This should include data to adequately replicate the highway-transit speed relationship throughout the region (e.g., by facility type, mode, and area type). This will be particularly important for major transit alternatives evaluations of rail and BRT. Potential partners could be the City and the State of Maryland. The State of Maryland is encouraged to fulfill its responsibility to provide required traffic count data.

C. Time of Day/Feedback on Related Issues

1. **Reconsider 4-hour peak periods to reflect better the current traffic congestion in the Baltimore area.** The current peak periods may be too long for appropriate representation of congestion. A review of the temporal traffic volume distribution with respect to roadway capacities on freeways and major arterials would be one way to clarify the peak periods. Additionally, there may be a need to include more feedback loops within the model process.

   The peak period should also reflect how transit level of service varies during the period to ensure appropriate mode choice modeling. Additionally, the highway-transit relationship should ensure that a reasonable approximation of the current relationships (mode, facility type, time of day) exists in the model.

2. **Include all trip purposes in feedback loops, develop convergence criteria, and loop back after assignment to distribution until convergence is achieved**. Concerning convergence and equilibrium assignment, a criterion should be developed to determine the number of model runs that would be required to give the most accurate assignments. This would require a significant amount of testing and review of highway and transit assignments. Additionally, a logsum or some other multimodal impedance measure should be used to account for the effect that transit (and particularly rail transit) has on travel patterns.

3. **Try more iterations of equilibrium assignment to identify whether changes and/or additional iterations achieve better results.**

D. Long-term Model Issues

1. **No immediate action is needed by the BMC on the issues of managed lanes.** There is currently a great amount of nationwide research and interest in the managed lane concept. However, the panel does not view pricing and managed lane schemes as a pressing issue for the BMC, particularly given that there is no consensus on appropriate or valid methods for implementing managed lanes. Instead, the panel suggested that the BMC consider developing a series of model runs to better approximate specific managed lane concepts and the impact of incidents on these lanes. Potential model runs include a run that represents truck only lanes, HOT lanes with recurring congestion, and HOT lanes with non-recurring congestion on key links.

2. **Need more consistent market segmentation between model components, which would obviate the need for the current, convoluted process in mode choice.** A long-term recommendation was to introduce consistent market segmentation throughout the model chain to maintain consistency from trip generation through assignment. A review of the overall model chain with respect to market segmentation would be required before modifying the model chain. Eventually, population synthesis could be introduced into the model.

3. **Validate the mode choice catchment area process**. Currently, a team lead by Parsons-Brinckerhoff (PB), a consultant for MTA, is reviewing the mode choice model for Red/Green line studies. A detailed review of the current mode choice model with regards to both PB's and the Peer Review Panel's comments would need to be conducted to develop a long term course of action to update the mode choice model. Consideration should be given to long-standing FTA guidance on the use of generic IVTT coefficients, relationships between OVTT and IVTT coefficients, and more recent FTA guidance on model calibration approaches that avoid reliance on overly precise calibration targets. These targets have been observed to produce constants for which it is difficult to tell a coherent story.

   There was also discussion that the BMC could improve its understanding of the regional commuter market. The model compensates by adding coefficients and variables that add to its overall complexity but reveal little about travel behavior. While the proposed nesting structures suggest that IIA (Independence of Irrelevant Alternatives) violations may be avoided, estimated nesting coefficients suggest that the model structure is basically MNL (Multinomial Logit) for all trip purposes at all levels of the nest. This may present challenges for major transit investment planning as the model may produce unrealistic elasticities at the highest levels of the choice hierarchy. In order to improve the model, the BMC must go back and validate the source data. The source data could be supplemented with more recent National Household Travel Survey add-in data.

Other discussion on mode choice included considering model modifications to estimate directly the various line-haul transit services such as LRT, HRT, and BRT within the transit nest.

V. APPENDICES

Participants

Baltimore Expert Peer Review Panel Members

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Handouts

Agenda

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Meeting Notice
Baltimore Peer Review
Expert Peer Panel Meetings: September 23-24, 2004

Time:	**9/23: 8:30 AM to 5 PM**
	9/24: 8:30 AM to 2:30 PM
Location:	**BMC, Third Floor, 2700 Lighthouse Point East**
Meeting Room:	**Conference Rooms A & B**

Agenda

Thursday, September 23

8:30 **Welcome and Introductions – Harvey S. Bloom**

8:45 **Overview of the Peer Review Process – Gene Bandy**

9:00 **Purpose of the Meetings and Charge to the Panel – Frank Spielberg**

9:15 **User Applications for the Model and Key Issues – Charles Baber**

- **Coordinating Committee**
  - **Local/State Users**
    - **Anne Arundel County: George Cardwell**
    - **Howard County: Benjamin Pickar**
    - **Maryland Dept. of Transportation: Ron Spalding**
  - **Citizen Advisory Committee/Public**
  - **BMC Staff**

10:00 **BREAK**

10:15 **Demographic Forecasting Process and Trends – Paul Gilliam**

10:30 **Current Modeling Practice – BMC Staff**

Model Overview – (20 minutes)
Transportation Network – (20 minutes)
Truck/Commercial Vehicle Model (20 minutes)
Trip Generation – (15 minutes)

12:00 **LUNCH**

12:30 **Current Modeling Practice (Continued)**
Trip Distribution – (10 minutes)
Post Distribution Stratification – (10 minutes)
Mode Choice –(25 minutes)
Trip Assignment – (15 minutes)

1:30 **Questions from Panel**

1:45 **Overview of Model Validation Results – Matthew de Rouville**

2:30 **BREAK**

2:45 **Overview of Emissions Modeling Process – Charles Baber**

3:15 **Current Model Development Work Plan – BMC Staff**

4:00 **Question/Answer Session between Panel, BMC Staff and Others**

5:00 **Adjournment**

Friday, September 24

8:30 **Panel Deliberation (Executive Session)**

11:00 **Presentation of Panel Recommendations**

12:15 **LUNCH**

1:00 **Open Forum/Exchange of Ideas**

2:30 **Adjournment**