THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

MCPB
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MEMORANDUM

TO: Montgomery County Planning Board

VIA: Jeff Zyontz, Chief
County-wide Planning Division

FROM: Richard Hawthorne, Chief
Eric Graye, Supervisor
Tom Harrington, Planner/Coordinator (301-495-4519)
Transportation Planning

SUBJECT: Briefing on Transportation Model Work Program -
Transition to a New Transportation Model Process
Item for information and discussion.

OVERVIEW

This memo serves to inform the Planning Board of a new initiative underway in the Transportation Planning Unit work program. The Planning Director has approved the acquisition of a working copy of the latest (Version 2) Metropolitan Washington Council of Governments (COG) transportation model and software for the purposes of adapting the process to meet the needs for M-NCPPC travel forecasting applications.

The TPR efforts identified the need for a model, such as the COG model, that can produce travel forecasts for all times of the day instead of just the P.M. peak period time frame currently used. The TPR study also highlighted the need for travel forecasts on facilities that extend beyond the borders of Montgomery County such as the Inner Purple Line and Techway. The COG regional model would provide much more detail and accuracy for areas outside of Montgomery County than our current process. The new version of the COG model offers additional capabilities and is applied using state-of-the-art modeling software that is GIS-friendly. This can form the basis for a new generation of Park and Planning Department forecasting tools.

The timing for this move is now ideal, as the Prince Georges County Park and Planning Department is in the process of making a similar acquisition, will be purchasing the software license and has a consultant, BMI, assisting them. This same

consultant is still under contract as part of our TPR team, and can provide us assistance in getting the license for the COG model software, as well as in setting up the model.

Fundamentally, we see the mission of our Transportation Planning staff focused on travel model application, not research and development of new models. The bottom line is that transition to this new process will allow us to focus more of our forecasting resources on applications, while benefiting from the huge investment by the region and USDOT in the COG model development and maintenance.

REVIEW OF KEY ISSUES

The following detailed discussion concerning model transition is provided for your information and reference.

What part of the COG modeling process are we adopting?

It should be noted that what is often referred to as "The Model" is really an analytical process that includes many components such as:

- Software to run the model – we use EMME/2 for model runs, and other GIS and database software for post-processing and analysis. COG is currently using TP+/Viper, the same software used by the Baltimore Metropolitan Council.

- Mathematical parameters and equations (these are the "real" models).

- Inputs to the model. Land use and socioeconomic data come from Research. Network data is currently coded in EMME/2, but we might eventually use a GIS-based network editor at some point.

- Analysts (real people) to develop, maintain, and apply the model, and to analyze the results to answer all of the tough planning questions.

We are proposing adoption of the TP+/Viper software and COG model, with modifications to meet our county-level planning needs. At the same time we recognize the critical role that our own staff have in developing population and job forecasts as inputs to the model, and applying the model for the numerous transportation studies that our agency conducts.

What are the benefits of transitioning to a new model?

The following is a general summary of some of the advantages to switching to a new model based on the COG process:

- *Cost savings and more sharing of resources.* As the MPO of the region, COG is federally-funded and spends a lot more money on forecasting than we can. In FY2000, COG's work program included $1.091 million for forecasting

applications and $1.454 million for travel model development and maintenance. Our FY1999 budget for travel forecasting was $257,000 and this was primarily used for model application. Annual software maintenance fees will be less as well.

- *Consistency with COG, P.G. County, and other neighboring jurisdictions.* One critical benefit is that we will have direct access to regional networks and data prepared for other counties in the region, i.e. we will not have to code the regional CLRP network ourselves. We are frequently being asked to compare our forecasts with COG results. By using the same general assumptions, comparisons will be easier and more useful.

- *More input to COG's process.* As a user of the COG model, we would have more of an opportunity to develop and check inputs to their process, and review results. We would be slightly more reliant on COG for model enhancements. Of course, we could always choose which elements of their model we want to use, and make our own enhancements.

- *Credibility.* COG goes through a very rigorous peer-review process and must meet federal requirements for travel modeling. Relative to the COG model, our model has not received the same level of public review since it was developed in 1993. Recent scrutiny given to TPR results and to AGP results in Fairland/White Oak demonstrated that our model will be "fair game" for politicians and citizens who disagree with our findings. We should adopt a process that is completely defensible, possibly from a liability context. This goes back to the credibility issue – by using the MPO model, we are meeting the national standards.

- *Better integration with GIS.* TP+ has the built-in capability to read ArcView shape files. COG has developed numerous tools and databases that would allow us to more easily exchange data between the travel model and GIS.

- *Base of local users,* including COG, BMC, and Prince George's county staffs would permit the sharing of techniques and knowledge.

How does the COG model compare with our TRAVEL/2 model?

Our staff has compared the capabilities of the M-NCPPC TRAVEL/2 model with the latest COG Version 2 model. In virtually every category, the COG model now meets or exceeds the capabilities of TRAVEL/2, as shown in Table 1 In areas where the TRAVEL/2 model is different, those differences may be more of a liability than an advantage. Also, the COG network appears to have a comparable level of detail.

The different focus of COG and M-NCPPC will somewhat affect how we use the model. COG uses the travel model for testing the regional constrained long-range plan, major investment studies, and air quality conformity analysis. M-NCPPC uses the travel model for implementing the 5-year annual growth policy, supporting master plans and

local sector/CBD plans, the Department of Public Works and Transportation's (DPWT) facility planning, and long-range plans (TPR, etc.). M-NCPPC's more local-level orientation can be addressed by developing a finer-level transportation network and zone system within the COG modeling framework.

One concern with adoption of the revised model is that we might lose some of our ability to forecast and analyze non-motorized trips. TRAVEL/2 does include a sidewalk ratio variable to account for the built environment, although in practice this has been difficult to forecast for future scenarios. The Version 2 model does account for bicycle and walk trips in the trip generation model and can predict the share of non-motorized trips based on employment and household density. It also accounts for land use mix and density in the mode choice model.

The new model will give us the ability to model off-peak travel, including non-work trips that are the fastest growing segment of travel. The COG model performs highway assignments for A.M. peak, P.M. peak, and off-peak periods. Then volumes from the three time periods are added together to get daily traffic. Truck volumes are included in the totals. Transit assignment can either be performed for daily or peak period.

What types of tests or changes will be needed for us to use the COG model?

One of the first steps would be to adapt their process to meet our needs and to validate the model for a county-level focus. The distinction in roles is between model development and calibration versus model validation and application.

Model development and calibration involves conducting surveys of travelers, developing new models and estimating parameters, and calibrating these models to match observed travel patterns. With our focus on application of the model, we would no longer undertake changing the mathematical parameters underlying the model.

We would still do a validation of the model for Montgomery County, which would involve continuing to collect base year data for Montgomery County only, and comparing how well the model results match actual travel patterns in Montgomery County. We would not check results outside of Montgomery County, since COG should properly calibrate the model to match regional travel. One important step will be to add more detail to the COG transportation networks and zone structure within Montgomery County. Any major discrepancies in the networks should be highlighted for COG staff so that we can minimize differences between forecast results. The validation process will give us confidence that the new process is acceptable for forecasting applications within our county.

How are we coordinating with Prince George's County?

We are collaborating with Prince George's County staff in a number of areas as they proceed to use the COG model, including: (1) acquisition of the Version 2 model

and TP+/Viper software; (2) sharing our respective county-specific networks and databases; (3) establishment of a local users' support group and training; (4) validating and testing the model and; (5) funding and staffing issues.

What are the steps in the transition process?

If we made the transition over the next 9 months, we could continue to use TRAVEL/2 to support our forecasting applications work while concurrently working toward the implementation of the new process. There clearly will be a cost associated with training staff and making the transition, but over time this will be more than offset by the savings in model development. *Our work program for the coming year will allow us to make a transition without diminishing our capabilities to produce forecasts for ongoing studies.*

Another schedule consideration is the need to refine the AGP Policy Area Transportation Review procedures as identified in the 2001 Policy Element discussions. Changes to the modeling platform should be coordinated with any changes to the AGP process. Finally, the release of year 2000 Census data in the coming year would allow us to validate the model to a more current base year.

The next steps will include:

- Acquisition of the Version 2 model and TP+/Viper software
- Staff training and model testing
- Network coding refinement within Montgomery County
- Comparisons between the TRAVEL/2 results and COG model results
- Validation of model results against year 2000 observed data including traffic counts, transit ridership, regional surveys, and the year 2000 Census.

We will also begin coordinating with Prince George's county staff to look for opportunities where we can work jointly on this effort. The end result will be a better travel forecasting model and GIS-T capabilities that we can use to support our planning studies.

Table 1: Comparison of M-NCPPC and COG Travel Forecasting Models

Model Element	M-NCPPC TRAVEL/2.4	COG Version 2
Model Region	Washington & Baltimore Regions: DC; MD: Mont, PG, Fred, Howd, Char, AA, Carr, Balt.Co., Harf, Balt.City; VA: Arl, Alex, Fair, PW, Loud	Washington Region: DC; MD: Mont, PG, Fred, Howd, Char, AA, Carr, Calv, StM; VA: Arl, Alex, Fair, PW, KG, Fred City
Traffic Zones	Mont.Co.= 318, External= 13, Total= 677	Mont.Co.= 308, External= 47, Total= 2191
Highway Network	Num. Of Dir Links: Mont.Co.= 3710, Total = 14,036 Lane-Miles: Mont.Co.= 2472, Total = 17,430	Num. Of Dir Links: Mont.Co.= 2071, Total = 16,728 Lane-Miles: Mont.Co.= 2162, Total = 17,957
Network Time Periods	Highway: P.M. Peak Transit: P.M. Peak	Highway: A.M. and P.M. Peak, Off-Peak Transit: A.M. and P.M. Peak, Off-Peak
Demographic Submodels	• Research Division provides base year HH Size, dwelling type, and age cohort data. Future year forecasts available for households by dwelling type at the TAZ level, and age cohorts at the Planning Area level. No method for forecasting HH Size disaggregation. • Auto Ownership: logit model, based on density and access to rail; used in mode choice only	• Household disaggregation models: 4 income levels, 4 HH size groups, 4 vehicle availability groups
Trip Generation	• P.M. peak period per capita trip rates • All trips: motorized & non-motorized • Purposes: Work, Other, Non-home-based by direction • Chained work trips – separate purpose • Productions: cross-class based on dwell type, hh size, and age cohort • Attractions: regression based on population and employment • Truck & external trips	• Daily trip rates per household • Work: motorized and non-motorized, Non-Work: motorized only • Purposes: Work, Shop, Other, Non-home-based • Home-based trip rates are income stratified • Productions: cross class (64 classes) based on hh size, income, and vehicles available. • Attractions: regression based on population and employment • Truck & external trips
Trip Distribution	• Gravity model • Composite time function (highway and transit) • 13 Friction Factor Curves by trip purpose and mode (includes 2 truck curves) • No separate external trip distribution • Outputs P.M. pk period person trip tables by purpose	• Gravity model • Composite time function (highway and transit) • 25 Friction Factor Curves by trip purpose, income-stratification, trucks, internal vs. external • Outputs daily person trip tables by purpose
Mode Choice	• Multinomial logit, 7 work modes: transit-walk, transit-drive, transit-pass. drop-off, auto-1, auto-	• Sequential multinomial logit, 3 primary modes: transit, SOV, and HOV) for four trip purposes

Model Element	M-NCPPC TRAVEL/2.4	COG Version 2
	2, auto-3+, walk/bike; 4 non-work modes: transit, auto-1, auto-2, auto-3+, walk-bike. • No market segmentation. Rail stations selected through matrix convolutions (optimization). • Utility variables: time relative to SOV, cost relative to SOV, vehicle availability, employment density, sidewalk ratio. • Rail vs. bus split determined by transit assignment, not mode choice.	(HBW, HBS, HBO, NHB); carpool submodel (2-occ, 3-occ, 4+-occ. • Sub-mode choice model to split transit into Metrorail and non-Metrorail by access type (walk- and auto- access). • Mode of arrival model used to apportion Metrorail trips by arrival modes (walk, bus, auto-pass., and auto-driver) and stations. • Market segmentation based on vehicle availability, access mode, and walk distance. • Utility variables: in-vehicle time, out-of-vehicle time, cost, vehicles available, auto-access, land use mix and density.
Time-of-Day Model	Departure time choice model to determine peak spreading based on congestion levels. DISABLED during validation study. Currently using peak hour factors for work and non-work (1-hour % of the 3-hour peak period).	Time-of-day factors by purpose, mode, and direction used to create A.M. peak, P.M. peak, and Off-Peak trip tables.
Highway Assignment	• P.M. peak hour vehicle trips, equilibrium assignment, multi-class with separate HOV facilities. • VDF's account for signal delay penalty within Mont.Co.	• 3 time periods A.M. peak, P.M. peak, and Off-peak, equilibrium assignment, multi-class with separate HOV facilities. • VDF's
Transit Assignment	P.M. peak period	A.M. peak and Off-peak
Feedback Loop	• P.M. peak congested times are cycled back to distribution and mode choice. • Method of successive averages used to determine number of iterations.	• A.M. peak and Off-peak congested times are cycled back to distribution and mode choice. • 2 iterations.