National Capital Region
Transportation Planning Board

MEMORANDUM

TO: COG/TPB Travel Forecasting Subcommittee

FROM: Mark S. Moran, Program Director, Travel Forecasting & Emissions Analysis, COG/TPB
Feng Xie, Manager, Model Development Group, COG/TPB
Joel Freedman, Senior Director, RSG

SUBJECT: COG/TPB staff and RSG responses to questions and comments received from the
Travel Forecasting Subcommittee regarding the Gen3 Model Design Plan draft report

DATE: June 30, 2020

CC:

1   Purpose

The purpose of this memo is to provide the COG/TPB staff response and RSG response to questions and comments received from the Travel Forecasting Subcommittee (TFS) regarding RSG's draft report, "Gen3 Model Design Plan," dated June 10, 2020.

2   Background

The National Capital Region Transportation Planning Board (NCRTPB or TPB) is the federally designated Metropolitan Planning Organization (MPO) for the Washington, D.C. metropolitan area. The TPB is also one of several policy boards that operate at the Metropolitan Washington Council of Governments (MWCOG or COG). COG is the administrative agent for the TPB, and the TPB is staffed by COG's Department of Transportation Planning (DTP). The TPB staff, with some consultant assistance, develops, maintains, applies, and improves a series of regional travel demand forecasting models, which are used for regional, long-range transportation planning in the metropolitan Washington region. These regional travel demand models are developed under the guidance of the Travel Forecasting Subcommittee (TFS), a subcommittee of TPB's Technical Committee. At any given time, the TPB staff maintains at least two models: 1) The adopted, production-use travel model and 2) One or more developmental travel models, which may become a production-use model in the future. The current, adopted, production-use travel model, known as the Generation-2 (Gen2), Version 2.3.78 Model, is an aggregate, trip-based travel demand model.

Resource Systems Group, Inc. (RSG) is currently under contract with COG to develop the TPB's next-generation travel demand model, known as the Generation-3 (Gen3) Model. This model development contract is a $900k, three-year (FY 20 to FY 23) contract that is executed through a series of task orders. RSG is working with its subcontractor, Baseline Mobility Group (BMG). To date there have been two task orders, which have resulted in several deliverables, most notably:

- RSG. "Project Management Plan, Gen3 Model Development Project (Version 3.0)." Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, February 11, 2020.
- RSG training to MWCOG staff regarding theory of activity-based models (ABMs), May 12-14, 2020.

- RSG, and Baseline Mobility Group, Inc. "Gen3 Model Design Plan." Draft Report, Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board May 4, 2020.

This draft report on the Gen3 Model Design Plan received an initial review from TPB staff, which resulted in an updated draft report, dated June 10, 2020. Following the TPB staff review, the TPB Travel Forecasting Subcommittee (TFS) was also given the opportunity to review the draft report. TPB staff received comments from the following three people/agencies:

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3 TFS comments

In total, there were over 40 questions/comments from the three TFS members. The rest of the memo is divided into sections (one for each person commenting).

3.1 Nazneen Ferdous, Jacobs

Comment #1: Joint tours: Rather than accommodating all joint tours, the Gen3 seems to model joint tours only when they are defined very narrowly. To illustrate, let's consider a two-person two-worker household with different work locations. Let's further assume that the household members plan to dine out after work. The current Gen3 structure would be able to model this joint activity accurately only if the household members decide to go home after work, then go out again together. However, the Gen3 model would not be able to capture this joint activity accurately if the household members decide to meet for dinner after work before going home together (a very likely scenario). It would be interesting to look at the most recent household travel survey data to find out the percentage of household tours that are fully joint and the percentage of household tours that include at least one joint trip.

COG/TPB staff response #1: We agree that, as currently planned, the Gen3 Model would explicitly represent only fully joint tours, not partially joint tours, in the Daily Activity Pattern (DAP) model. RSG's proposal is that the Gen3 Model would be a simplified ABM, built upon a simplified CT-RAMP platform. As such, it would not implement the more advanced CT-RAMP features such as the explicit modeling of in-household activity coordination that forms partially joint tours in the DAP.

The mode choice model of the Gen3 Model will be calibrated to the observed data: specifically, the 2017-2018 COG/TPB Regional Travel Survey (RTS) and on-board transit survey data. This means that, although partially joint tours (such as picking up or dropping off household member) are not explicitly modeled in the DAP model, the shared-ride travel associated with those activities will be modeled in Gen3 (we just would not know if a shared ride coming out of the mode choice model comes from the carpooling of household members on a fully or partially joint tour or from an outside-the-home carpool arrangement, such as from a slug line, with a non-household member).

It is a great suggestion to look at the ratio of household tours that are fully joint to household tours that include at least one joint trip in the RTS data, which RSG will probably examine during the Gen3 Model development.

RSG response #1: Nothing to add.

Comment #2: In-home activities: In-home activities are difficult to model because of lack of available data. However, the type and the duration of in-home activities have changed in recent years as a result of accelerated developments in the fields of e-commerce and social media. These changes in in-home activities have a direct impact on out-of-home activities such as activity duration (longer in-home activities mean less time available for out-of-home activities and vice versa) and activity type (for instance, a person is less likely to make a shopping trip if s/he has just shopped on-line). So, perhaps, in-home activities could be considered in future. For now, it might be a good idea not to bundle in-home activities and out-of-town trips together.

COG/TPB staff response #2: You are right to point out that in-home activities are not modeled explicitly in the Gen3 Model. This is another characteristic of a "simpler" activity-based model. We do plan to develop a telework model in Gen3 but work at home or telework at home and other in-home activities will not be differentiated.

RSG response #2: Nothing to add.

3.2   Lisa Shemer, MDOT SHA

Comment #1: We are generally supportive of this effort to move towards an activity-based model platform for MWCOG.

COG/TPB staff response #1: Great!

RSG response #1: Nothing to add.

Comment #2: We are thinking that, even with the new Gen 3 model, our current approach at MDOT SHA of using the "best model for the project" will continue. For example, MD projects within the MWCOG region would use the MWCOG model; whereas projects which may overlap MPO boundaries may use either the MSTM or one of the MPO models, whichever best represents the situation.

COG/TPB staff response #2: That seems reasonable to us.

RSG response #2: Nothing to add.

Comment #3: We echo the importance of freight planning as one of the policies that is important to be addressed in the Gen 3 model, but we did not see a lot of explanation on how the Gen 3 model will handle freight and commercial vehicles.

COG/TPB staff response #3: We recognize that MDOT has put tremendous effort into developing the freight model in the Maryland Statewide Transportation Model (MSTM). Our product requirements for the Gen3 Model were described in a Product Requirements Document (PRD).[1] This document was offered to public-sector members of the COG/TPB Travel Forecasting Subcommittee, including MDOT SHA, for review. We received comments from the following five agencies:[2]

- WMATA
- Arlington DES
- Fairfax Co. DOT
- NVTA
- M-NCPPC, Montgomery Co.

Although the topic of freight is discussed in the PRD, the summary table of requested model updates (Table 8, p. 47) does not include freight as an area slated for improvement in the Gen3 Model. According to the current plans, the Gen3 Model will continue to use the freight and commercial vehicle modeling methodology used in the Gen2/Ver. 2.3 Model. Perhaps we could revisit this topic for the Gen4 Model?

RSG response #3: Nothing to add.

Comment #4: Currently the MSTM uses the C-20 model developed by RSG, which includes a national supply chain model, a tour-based truck model with a commercial vehicle component, covering also the MWCOG region. Since this work has already been done and is already being used and maintained as part of MSTM, we would encourage any possibility to utilize this models' data or provide linkages to the C-20 model to maintain consistency in freight planning in the region. Are there any plans for MWCOG to fold RSG's C-20 model into MWCOG's freight planning/forecasting process?

COG/TPB staff response #4: This is an interesting idea. It is possible that in the future, we could use the data from the C20 model[3] to update our truck- and commercial vehicle- related models or model inputs (e.g., Inputs\Ext_PsAs.dbf and ..\Support\Truck_Com_Trip_Rates.DBF). Currently, RSG's scope of work for the Gen3 Model does not include freight modeling, but the freight model could be revisited after the Gen3 Model is completed. We may request documentation on the C20 model

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[1] Mark S. Moran, "Product Requirements Document for the TPB Travel Demand Forecasting Model, Generation 3, the Next-Generation Model" (Washington, D.C.: National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, May 25, 2018), https://www.mwcog.org/assets/1/25/Product_Requirements.pdf.

[2] Mark S. Moran to Catherine Vanderwaart et al., "COG/TPB Staff Responses to Comments Raised by Public-Sector Reviewers of the Draft Product Requirements Document (PRD) for the TPB Travel Demand Forecasting Model, Generation 3," Memorandum, May 30, 2018.

[3] "SHRP2 Solutions: A Strategic Roadmap for Making Better Freight Investments. Freight Demand Modeling and Data Improvement (C20)," Federal Highway Administration, 2020, https://www.fhwa.dot.gov/goshrp2/Solutions/Available/C20/Freight_Demand_Modeling_and_Data_Improvement.

(perhaps the model itself and/or modeling output) from MDOT SHA in the future to support that effort.

RSG response #4: Nothing to add.

Comment #5: How will the Gen 3 model handle the integration of tolling policies throughout the region? For example, there are several pricing projects on the horizon, and other priced corridors in MD which ideally should be consistently modeled and compared.

COG/TPB staff response #5: The Gen2 Model has a heuristic toll-setting process in place that can handle different tolling policies that are seen in this region. The Gen3 Model will adopt this toll setting approach, but with some major refinements in its implementation, based on recommendations from RSG. Keep in mind that that there are many different toll facilities in our region, with different tolling operators, each using different algorithms (which are typically proprietary), so, even with an ABM, it will be challenging to estimate tolls and the traffic levels associated with those tolls. The toll estimates (both toll rates and volumes on tolled facilities) in our model are generated primarily for the purpose of air quality conformity modeling. Although they generally reflect the variations in tolling policies throughout the region, the toll estimates have not been validated to the observed data in the Gen2 Model and we are unlikely to be able to do that in Gen3, for the reasons you mentioned above.

RSG response #5: We propose to integrate the toll adjustment algorithm in the production version of the Gen3 Model so that it can be more easily used by partner agencies. We also propose to test the runtime implications of value-of-time segmentation in Gen3; however, we note that previous research indicates unacceptable runtimes with minimal improvements in accuracy. Note that the disaggregate nature of the ABM outputs provides a lot more flexibility in toll analyses (with respect to both assignment segmentation and analysis of equity impacts) than current aggregate trip-based model outputs.

Comment #6: How will the long-distance passenger component be handled with the Gen3 Model?

COG/TPB staff response #6: External travel will be represented as a special travel market in Gen3. We plan to model external transit travel explicitly in Gen3. It should be noted that, all the external travel in Gen3 will originate from or be destined to external stations, and their origins/destinations on the external end will not be explicitly modeled.

RSG response #6: Nothing to add.

Comment #7: How will the Gen3 Model leverage other data and model tools that overlap within the region (mainly BMC model and MSTM), especially with regard to freight and long distance travel? For example, BMC coordinates freight and long-distance data with MSTM; could MWCOG Gen3 Model be handled the same way? We feel that more integration and coordination will be important for consistency across the region.

COG/TPB staff response #7: It is our current plan to leverage the BMC and MSTM modeling data for the development of the external transit travel model in Gen3.

RSG response #7: Nothing to add.

Comment #8: Will there be any changes in the current socio-economic data or zone structure (i.e. employment categories) anytime soon?

COG/TPB staff response #8: This is not planned for the Gen3 Model, but could be considered for the Gen4 Model.

RSG response #8: There are only minor changes suggested to current socio-economic data. For example, we recommend the use of enrollment data by TAZ for school and university destination choice models. We will develop a set of population synthesis controls from Census data that can either be held constant (proportional to household/population forecasts) into the future or adjusted to reflect assumed changes in socio-demographic groups into the future.

Comment #9: Has the effort considered the potential implications of lack of expertise in activity-based modeling at state/local agencies, the consultant community, at management levels, etc.?

COG/TPB staff response #9: The current plan is that the trip-based Gen2 Model and the activity-based Gen3 Model will both be supported by COG/TPB for the foreseeable future. The Gen3 Model will be well documented. With the roll out of the Gen3 Model, we would plan to offer training on the use and application of the model.

RSG response #9: Nothing to add.

3.3   YuanJun LI, M-NCPPC MCPD

Comment #1: Page 7 rail-hailing > ride-hailing ?

COG/TPB staff response #1: Fixed in the updated draft report (MWCOG_GEN3_Model_Design_Draft_v9.docx).

RSG response #1: Nothing to add.

Comment #2: Page 7 "MWCOG region" need to define for the statistics/data. Is it differentiated with "the metropolitan Washington region"?

COG/TPB staff response #2: Generally, when not specified, "MWCOG region" would refer to the MWCOG modeled region, which is shown in Figure 1.

RSG response #2: Nothing to add.

Comment #3: Page 8, Table 1 Major universities missed Catholic University of America (6,521 students) and Gallaudet U. (800 Florida Ave NE, DC 20002). Gallaudet is small with 1,111 undergraduate enrollment 2017-18, but there is a Metro station named for it. Howard U student number in Table 1 is undergraduate only. It should be around 10k (9,399 for Fall 2019, as listed by Wikipedia), see the list at the end of this message). Some major Universities such as Johns Hopkins U. has a campus in Montgomery and Howard Counties. UMBC also has a campus at Shady Grove in Montgomery Co. Of course, they don't have to be all listed in Table 1, but may need to keep in mind in modeling. University trips have a significant impact on traffic and should be considered in the model as I suggested many years ago. I'm glad that the new model will be considering this.

COG/TPB staff response #3: We consider Table 1 to be illustrative, but not all inclusive. We hope that RSG will be mindful of these comments when the special travel markets work is performed.

RSG response #3: We'll need to populate the TAZ data file with college/university enrollment. Thank you for the clarifications. I suggest we circle back with all partner agencies before finalizing the input data.

Comment #4: Page 8 (e.g., bus versus light rail) - This may not be the best example, since COG's model now separates the two. Maybe list BRT vs Bus, and Light rail vs. Metro modes? Also, the use

of HOT/HOV lanes by express bus. The directional peak period services by bus are also not reflected in the current model that weakened the ability of transit modeling.

COG/TPB staff response #4: We believe the current wording to be correct and are comfortable with it being left as is. Regarding the statement about directional peak-period bus service not being reflected in the current model, we disagree, since there are many examples of peak-period bus service in the current model. In some cases, both inbound and outbound peak-period bus routes are represented as one two-way route. But, in cases where the is a large differential between the inbound and outbound service, the service is represented as two one-way routes, each with their distinctive run time (speed) and headway.

RSG response #4: We can differentiate between different "flavors" of transit in mode choice by skimming in-vehicle time by mode rather than making each technology a separate nest in the model.

Comment #5: Page 9 may add travel connectivity such as first/last-mile travel, transit access and transfer etc. (FYI - in emission estimate, BMC model also counted the drive part of the drive-access to transit trips into vehicle trips.)

COG/TPB staff response #5: We have added a bullet item, at the end of the list (p. 10), to address your comment. Regarding mobile emissions estimates, we are currently assessing ways to include drive-access VMT into these calculations.

RSG response #5: Nothing to add.

Comment #6: Page 10 may also list parking needs and impacts (by IoT and env requirement, etc. also for PNR for transit), which is an important policy measure, not just parking pricing. (FYI – in the County General Plan Update "Thrive Montgomery 2050, the proposed policies are aimed for greatly reducing auto trips, reduce parking including converting the current parking lots and PNR lots in urban area, etc. There is a debate about PNR – some said should not encourage accessing to transit by cars...)

COG/TPB staff response #6: See RSG response.

RSG response #6: We have added a bullet item on p. 10 to address this issue.

Comment #7: Page 11 "The explanatory variables include total employment, retail employment, office employment, other employment" - Does it include Industrial emp?

COG/TPB staff response #7: The statement as written is correct, since the word "include" is not necessarily collectively exhaustive. But, in answer to your question, industrial employment is also included in the trip attraction equations, indirectly, since one of the terms in the trip attractions equations, "non-retail employment," would include industrial employment.

RSG response #7: Nothing to add.

Comment #8: Page 18, item #5: "The differentiation of transit by technology (bus-only, Metrorail-only, bus + Metrorail, and commuter rail) is a good compromise" - The treatments of BRT and LRT are weak for transit planning alternative analysis, especially the BRT coding does not differentiate mixed-traffic and dedicated lanes.

COG/TPB staff response #8: We note your comment, but we also note that, in the case of BRT, the differentiation of mixed-traffic sections from dedicated-lane sections may not really make a difference, since we are not using dynamic traffic assignment (DTA) or dynamic transit assignment, where there would be an interplay between transit vehicles and private motor vehicle traffic. A more

important distinction for BRT under the current modeling practice would be the coded speed for each segment (e.g., BRT will travel faster when it is on separated-right-of-way segments). Such speed differentiation is possible to do in Cube TRNBUILD and Cube Public Transport (PT), although it has not become the dominant practice yet at COG.

RSG response #8: See response to #4, above. Please keep in mind that differentiation by explicit transit modes in the mode choice model is only useful to the extent that the modes compete for the same origin/destination pairs. Such explicit treatment then "forces" the mode choice model to distinguish between them. Even in cases where the competition in the model is explicit, it is rare to use separate modes for BRT operating in mixed traffic versus BRT operating in exclusive right-of-way - especially since the same route often operates in both conditions along its route! Such differences are best handled by careful network coding and the use of alternative-specific constants which reasonably capture the relative non-included attributes of the service, rather than through the use of complicated nesting structures.

Comment #9: Page 21 Key weaknesses – Micro-mobility is not considered, e.g., e-bike, e-scooter; - new tech and life style impacts, such as shared auto ownership, IoT, 3-D printing, delivery trucks street parking, distribution centers, delivery by drone, high spend rail, maglev, monorail, tube-rail, etc., at least to person travel generation rate and mode choice.

COG/TPB staff response #9: We have added an item to the end of the list on p. 21 in response to your comment.

RSG response #9: Nothing to add.

Comment #10: Page 22 Model sensitivity – may add some metrics for social equity in this section explicitly.

COG/TPB staff response #10: Added a sub-bullet at the end of the "Model Sensitivity" bullet.

RSG response #10: Nothing to add.

Comment #11: Page 22 "transit ridership on certain lines and modes is under-estimated" – Transit is not validated for all modes and not by route/line, except for Metro and Marc. So the model is not suitable for transit planning alternative analysis.

COG/TPB staff response #11: It depends on the study. The model has been calibrated to the regional level and should be generally suitable for most regional transportation planning studies. For sub-area studies, however, it is recommended that the regional model be re-validated at the sub-area level, which is a common practice followed by many consultants who use the regional model.

RSG response #11: Nothing to add.

Comment #12: Page 26 "We propose to add a telework frequency model in Phase II" It's a good idea to add a telework frequency model in Phase II. I hope that the RTS 2017/8 can provide more data for that. If not, then there may be a need for an additional workplace/employer survey.

COG/TPB staff response #12: Noted.

RSG response #12: Nothing to add.

Comment #13: Page 32 How about the TNC (Uber/Lyft) drivers?

COG/TPB staff response #13: We do not fully understand this comment. What text on the page is this referring to?

RSG response #13: We have the same question.

Comment #14: Page 33, Table 3 Q: University type includes community colleges?

COG/TPB staff response #14: We will defer to RSG.

RSG response #14: Yes.

Comment #15: Page 35 "time windows" definition?

COG/TPB staff response #15: We believe that "time windows" means "time periods."

RSG response #15: Probably should revise to say "residual time windows". These are time periods which are not already scheduled for travel/activity episodes.

Comment #16: Page 36: MAZ is a good idea and very necessary especially for walk trips. To consider model run time, it may need to be a stand-alone part, then, for the projects that do not need a non-motorized mode analysis, it can be skipped to save run time.

COG/TPB staff response #16: Noted.

RSG response #16: Nothing to add.

Comment #17: Page 36/37, Modes – As noted earlier, transit modes need to be re-considered for transit panning needs, especially for BRT. Can any sub-modes be considered? (e.g., Montgomery Co. I-270 transit corridor planning will need to compare five alternatives such as extend the Red Line, extend Purple LRT line, new LRT, BRT to connect from Fredrick Co. to Tyson's Corner. Steer Group has been chosen as the contractor, but they only do the economic analysis and alternative recommendation, not the modeling work... I don't know how it's going to work. Our modeling technical group has just noticed about the requesting to run the current model for the analysis two days ago...) As you know, MoCo has planned for 6+ BRT lines and US 29 BRT will be open next year.

COG/TPB staff response #17: You are right to point out that the trip modes coming out of the Gen3 trip mode choice model, as described in Table 5, consists of four transit sub-modes: Metrorail Only (including LRT), Commuter Rail, Bus + Metrorail and All Bus ("Bus" includes BRT). When the trip tables are assigned onto the transit network in the supply model (specifically, transit assignment model), however, ridership for a specific line (such as a BRT or LRT line), a specific mode (the transit network currently has 10 transit modes; e.g., Mode=10 for BRT and streetcars) or a specific project (such as the Red Line extension project in Montgomery Co.) can then be extracted for transit planning purposes. Please note that this model design (four transit modes for mode choice and more specific transit modes for transit assignment) is consistent with the current mode design in the TPB Ver. 2.3 Model.

RSG response #17: See previous response to similar comment.

Comment #18: Page 37: Bike to transit mode – Similar to Phoenix, Metrobus and Metrorail allow bike to be loaded on board so it can be use at egress and used to travel to the destination, and the same for inbound travel. Bike planning is a hot topic in Montgomery Co., and there is a Countywide bike plan. Shared bike may be different: it can be used only at one end.

COG/TPB staff response #18: There are also cases where shared bike can be used at both ends of the transit trip.

RSG response #18: Nothing to add.

Comment #19: Page 38, Table 5, #3 Auto 3+ "Where occupancy=3" - Is this 3+ or average occupancy (HOV3+ occ=3.5 in current COG model)? Again, BRT needs to be distinguished from Bus.

COG/TPB staff response #19: We presume that the correct text is "Where occupancy = 3+". We have updated the text in the report.

RSG response #19: Nothing to add.

Comment #20: Page 39: Consider Transit Centers case, all modes are at the same place, so travelers walk to a transit center / transfer on site / PNR access are different from other locations.

Other micro-mobility, e-scooter and e-bike modes access modes?

COG/TPB staff response #20: In our region, there are transit centers that are accessible to multiple transit modes. For example, the Paul S. Sarbanes Transit Center in Silver Spring is located next to Silver Spring Red Line Metrorail station and features more than 30 bus bays serving Metrobus, Montgomery County Ride-On, VanGo and the University of Maryland shuttle. In the Gen3 Model, walk-access, drive-access and transfer links to and from each station/stop in such a transit center will be coded separately, except that some bus routes may share the same stop. You are right to point out that the coding of access links to such transit centers will be different and more complicated than transit stations/stops serving an individual mode.

We agree that other transit access modes (such as micro-mobility, e-scooter and e-bike) are not mentioned in Table 5. It is possible that, either those access modes will not be considered in the Gen3 Model, or they will be combined with walk- or bike- access modes. We would defer this question to RSG.

RSG response #20: I would reserve judgment on this question until we review the on-board survey data to determine the size of the market. We have implemented methods in the SANDAG ABM to address micro-mobility access to transit using a longer walk distance and a generalized walk time, but this approach has its limitations.

Comment #21: Page 41 where... Gamma sign, not y

COG/TPB staff response #21: We changed the "y" character at the beginning of the line to a lower-case gamma (γ), but it still looks similar to a "y".

RSG response #21: Nothing to add.

Comment #22: Page 42 (outbound 8-9 A.M. and return 2-3 P.M.) – In DMV area, grade school time different by grade, most travel start before 8 am and class starts 8 or 8:30 am, right? High school students may stay school for activities in PM.

COG/TPB staff response #22: Defer to RSG.

RSG response #22: Representative time periods for mandatory location choice will be chosen based on an analysis of the regional travel survey. Note that these are only the periods used to find the usual work and school locations. The participation in after-school activities is probably not significant for choice of school location. Also note that the actual time-of-day model will predict

departure/arrival times according to a probability distribution which replicates the probability distribution found in the data. I suggest reviewing the AB model presentations for more details.

Comment #23: Page 43 "The free parking eligibility model determines whether a worker has free parking at their workplace. The explanatory variables include workplace location (currently based on county), household size, household income, and auto ownership." - Free parking eligibility is based on County? Is free parking related more to land value, density, urban form such as CBD? How would HH size would affect the free parking?

COG/TPB staff response #23: Defer to RSG.

RSG response #23: The current model is relative simple, but we suggest to re-estimate the model based on available MWCOG data and test other explanatory variables such as the ones listed above.

Comment #24: Page 44-45 "the first five household members by priority" – Just curious: What priority?

COG/TPB staff response #24: Defer to RSG.

RSG response #24: The rules by which members are selected for inclusion in the main model are that first priority is given to any full-time workers (up to two), then to any part-time workers (up to two), then to children, youngest to oldest (up to three).

Comment #25: Page 50 "If the person is does not correspond to" – remove word "is"

COG/TPB staff response #25: We have corrected the text.

RSG response #25: Nothing to add.

Comment #26: Page 51, The adult travel in a fully join tour is usually not a worker during regular work hours, unless off from work, right? Model is for weekday only, right?

COG/TPB staff response #26: We agree. A fully joint tour that involves a worker during regular work hours is possible only in cases like two workers in the household working in the same place or an adult worker bringing his or her child(ren) to the workplace, which are extremely rare. This is one of the tradeoffs of using a simplified ABM. We also agree that the model would represent weekday travel only.

RSG response #26: Nothing to add.

Comment #27: Page 62, Figure 7, If Ride Hail is a parallel choice with transit, then missing a link to top level in the chart. Again, transit modes/alternatives of LRT & BRT for future transit planning need to be considered, maybe also e-bike?

COG/TPB staff response #27: We agree with your first comment, but we cannot edit this figure. We defer to RSG on your second comment.

RSG response #27: See previous responses to similar questions.

Comment #28: Page 63 "An additional constraint placed on intermediate stop models is that no stops are allowed on drive-transit tours. This is enforced to ensure that drivers who drive to transit pick up their cars at the end of the tour." And on page 65 "In particular, symmetry is enforced for drive-transit tours, by excluding intermediate stops from drive-transit tours." Don't quite understand this constraint. If a complete tour is until drive back home, then there is possible to stop by some place on the way home after pick the car at PNR, as I often do, e.g., stop for grocery shopping mostly

(I rarely make a trip just for grocery shopping). :-) Some people may pick up kids from daycare. If you meant stop during a transit-ride leg, then I agree, but not for the drive leg.

COG/TPB staff response #28: Your understanding is correct: The Gen3 Model enforces mode symmetry for drive-transit tours. For example, if a person parks his/her car at a PNR lot on the outbound half-tour, the Gen3 Model design ensures that the person will pick up the car at the same PNR lot and drive home on the return half-tour. As a cost, the Gen3 Model will not be able to model the intermediate stops on the drive-access and drive-egress legs between home and the PNR lot, such as grocery shopping and picking up kids on the way home. This is one of the limitations of the Gen3 Model as a simplified activity-based model.

RSG response #28: Nothing to add.

Comment #29: Page 64 "The stop location choice model" fits in where of the choice model? Is there a full chart to demonstrate the model steps and relations?

COG/TPB staff response #29: In Figure 3, the fourth box to the bottom, indicates the trip stop location choice model, although it is labeled as "Destination" rather than "stop location". Figure 3 serves as the flowchart that demonstrates all the model steps relations in the proposed Gen3 Model.

RSG response #29: Nothing to add.

Comment #30: Page 66, Table 8, Why Shr2 and Shr3+ cells do not have an X on the row of Drv Alone? also Shr3+ … Sch bus cells on Shr2 row, missed or only consider column? Then Shr2 allows Drv Alone?

COG/TPB staff response #30: In Table 8, an "X" means that a trip mode is NOT allowed in a tour mode. A blank means that a trip mode IS allowed in a tour mode. For example, for a tour whose mode is shared ride 2-person, this tour can have trips with modes of drive alone, shared ride 2-person, and walk. Similarly, for a tour whose mode is shared ride 3-plus-person, this tour can have trips with modes of drive alone, shared ride 2-person, shared ride 3-plus-person, and walk. Also, if the tour mode is school bus, then the trips composing that tour may have modes of shared ride 2-person, shared ride 3-plus-person, walk, and school bus.

RSG response #30: Nothing to add.

Comment #31: Page 67 "parking location choice model" Is it only for auto travel or also transit?

COG/TPB staff response #31: We assume the parking location choice model is only for auto trips, not drive-access to transit. Parking location choice for PNR-access transit trips is made as part of transit path-building.

RSG response #31: Nothing to add.

Comment #32: Page 69-70 - Data for transit pass ownership model may also be obtained from WMATA and MTA commuter programs.

COG/TPB staff response #32: Ok, thanks!

RSG response #32: Nothing to add.

Comment #33: Page 70-71 - Yes, it's very necessary to have a telework model, especially for the life post COVID-19 pandemic.

COG/TPB staff response #33: Ok.

RSG response #33: Nothing to add.

Comment #34: Page 71: I-E and E-I Travel - may consider how to relate the model with Baltimore Metropolitan model area?

COG/TPB staff response #34: That makes sense, provided we are able to obtain it from the Baltimore Metropolitan Council.

RSG response #34: Nothing to add.

Comment #35: Page 72 AV: Yes, it's a must! AV allows 0-occ, and may affect hh vehicle ownership (needs and affordability), parking, AV delivery, etc. May also set a "switch" - what if assuming all autos are AVs.

COG/TPB staff response #35: Noted. Defer to RSG regarding setting a switch.

RSG response #35: In other models, we have allowed the user to specify the percent of the private fleet that is AV. Alternative-specific constants are "turned on" or "turned off" in the auto ownership model that replicates this percentage. If the user sets the percentage to 100%, then alternatives with human-driven vehicles are unavailable.

Comment #36: Page 75 Mode Choice Enhancements – "AV Tour Availability model" Table 10, May also consider adding a factor that reflects that operating cost increases due to CBD/VMT tax (When parking is not needed, longer driving distances will occur.) If terminal time is eliminated, it would exclude the cases that a user may just park the AV at work location and assume the travel distance of AV is always longer than the distance to the destination. Then a person tour will result in 1.5 or 2 tours for AV.

COG/TPB staff response #36: Defer to RSG.

RSG response #36: It should be possible to modify the auto operating cost to reflect a VMT tax in the model. It is also possible to introduce a new cost matrix in the model by modifying the utility expression files - recompiling code would not be necessary.

Comment #37: Page 76-81, "Airport ground access model (Optional)" If project budget and time are limited, this can be omitted, or wait until later to get a separate model.

COG/TPB staff response #37: Noted.

RSG response #37: Nothing to add.

Comment #38: Page 81-85 "Overnight Visitor Model (Optional)" - It's better to have this, even just a simplified one.

COG/TPB staff response #38: Noted.

RSG response #38: Nothing to add.

Comment #39: Page 85, "University student residential location choice model (Optional)" – Not sure if this is necessary. Things are changing... There are so many universities in DMV area. It's better to put more efforts to get the college travel modeled and validated, since there is a lot of impact on traffic patterns in DMV area.

COG/TPB staff response #39: TPB staff also found this optional enhancement to be a lower priority than some others.

RSG response #39: I tend to agree. However, for large universities, the residential location of university students drives the ability of the model to replicate travel patterns. We need to keep this in mind as we analyze university travel patterns.

Comment #40: Page 86 "Model Input Checker (Optional)" – COG staff may decide whether need.

COG/TPB staff response #40: We like the model input checker.

RSG response #40: So do we.

Comment #41: Page 102-104 Synthetic person data - No age info. for older people travel (equity metric)

COG/TPB staff response #41: Not sure of your point. Age is a variable in the table.

RSG response #41: Nothing to add.

Comment #42: Page 107 Network Data – Transit network coding issue – How BRT should be coded to reflect dedicated lanes and on street with mixed traffic? Signal control by bus. Bike facilities are only on street? How about bike trails? Ped/Bike environment impact such as slopes (there are surely a lot in SF City :)

COG/TPB staff response #42: Since the Gen3 Model is not planned to have dynamic traffic or transit assignment, the key issue in coding BRT is to make sure that the coded speeds and run times are correct. For example, when BRT is running down its own right-of-way, it will likely have a faster speed, and, when traveling in a congested area in mixed traffic, it will have a lower speed, Both Cube TRNBUILD and Cube Public Transport (PT) allow one to specify speed on a link-by-link basis. Although this coding option has not be actively used in current COG practices, it would not be too difficult to update coding practices. Will defer to RSG on bike issues raised.

RSG response #42: It is possible to calculate a bicycle generalized time that takes into account bicycle lane availability and/or slope. However, this would require an accurately coded regional bicycle network, it would require COG staff to maintain the network, and, given the regional nature of the model, there would probably be many bicycle lanes on facilities that are not included in the network. Therefore, we suggest potentially including bike infrastructure in the Gen4 Model, along with microzone and all-streets network development.

Comment #43: K-12 schools include both public and private, so need enrollment data from all.

COG/TPB staff response #43: Defer to RSG.

RSG response #43: Correct.

Comment #44: How could square footage of retail can be considered in the model for trip generation?

COG/TPB staff response #44: Defer to RSG.

RSG response #44: We assume that the model will use retail employment rather than square footage of retail space. If retail space is desired, we recommend using a conversion factor that varies by type of space and area type or density. Such factors are commonly used in cases where regional travel demand models are used for traffic impact studies.

Comment #45: Peak spreading?

COG/TPB staff response #45: Because of the aggregate level of temporal resolution, a trip-based model (like the TPB Ver. 2.3 Model) usually relies on post processing procedures for peak spreading. It is widely recognized that ABMs, with a finer level of temporal resolution (e.g., 30 minutes or 60 minutes) have an important advantage with respect to time-of-day choice, which enables the endogenous modeling of peak spreading effects.

RSG response #45: Nothing to add.

Comment #46: What about EV? (operation cost, charging stations)

COG/TPB staff response #46: Defer to RSG.

RSG response #46: In the absence of a vehicle fleet model, I would recommend modifying the auto operating cost assumptions used in the travel model to reflect an average operating cost that includes a larger EV proportion of the fleet. I would argue that the availability of charging stations will respond to demand and the burden of maintaining and forecasting the location of EV charging station locations is not justified for most uses of the regional model.

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Ref: https://study.com/washington_dc_area_universities.html (not sure which year's data they are.)

- George Washington University (26,212 students; 11,157 undergraduates)
- Georgetown University (18,459 students; 7,562 undergraduates)
- American University (13,198 students; 7,909 undergraduates)
- Howard University (10,002 students; 6,883 undergraduates)
- Catholic University of America (6,521 students; 3,480 undergraduates)620 Michigan Ave NE, Washington, DC 20064

Consortium of Universities of the Washington Metropolitan Area

- American University
- The Catholic University of America
- Gallaudet University
- Georgetown University
- George Mason University
- George Washington University
- Howard University
- Marymount University
- National Defense University
- National Intelligence University
- Trinity Washington University
- University of the District of Columbia
- University of Maryland, College Park

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