

# COG/TPB GEN3 TRAVEL MODEL

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## Status report

Feng Xie  
TPB Transportation Engineer

Travel Forecasting Subcommittee  
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# Overview

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- Status of Gen3 Model, Phase 3, development, which is led by TPB staff with on-call support from RSG and Baseline Mobility Group (BMG):
  - Model enhancements and bug fixes (status update)
  - Usability testing (status update)
- Next Steps



# Model Enhancements and Bug Fixes

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- Streamlined the land use data processing, population synthesis, and school enrollment procedures in one batch script file: **Done**
- Investigated and fixed an issue associated with the mishandling of negative values in the synthetic population files: **Done** – The fix led to a new model version (Ver. 1.0.2).
- Tested the random seed generation function in ActivitySim: **Done**
- Implemented the Cube Subarea Trip Extraction function for both Gen2 and Gen3 Models: **Under review.**
- Removed unused files from the inputs folder: **Done**
- Removed unused “HHINCIDX” and “ADISTTOX” variables in land use input files: **Done**
- Testing the newly released ActivitySim software (Ver. 1.3.1) and Cube software (Cube 2024) in the Gen3 Model: **Ongoing**



# Random Seed Generation in ActivitySim

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- ActivitySim simulates travel-related choices in the standard Monte Carlo fashion. By default, ActivitySim uses a fixed set of random seeds for Monte Carlo simulation, which allows the user to run a model with the same inputs and get exactly the same results.
- ActivitySim includes a built-in function that also allows the user to alter the random seeds. Back in 2022, however, COG staff tested this function and found it not working.
- Recently, our consultant informed us that this function had been fixed in the earlier ActivitySim release Ver. 1.2.1. COG staff performed a test that confirmed this fix in July.
- Staff further examined the variations on model results with different random seeds.
  - At regional level, the variations were marginal: e.g., total VMT/VHT resulting from three different sets of random seeds were within 0.1%; Total VHD within 0.3%.
  - At jurisdictional level, the variations were also small: e.g., % VMT differences resulting from the three random seeds were within 0.4% for all TPB member jurisdictions.
  - Variabilities increased at a finer geographic/demographic level: e.g., for 0-car households living in the Regional Core, max % VMT difference reached 1.3%.



# Random Seed Generation in ActivitySim

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- In theory, one should conduct multiple model runs with the same inputs and average model output to minimize the random effects associated with Monte Carlo simulation.
- In practice, however, it is recommended to perform only one model run because:
  - The ABM runtime is significantly longer than trip-based models.
  - The random effects, as suggested by the testing results discussed earlier, are marginal at the regional and jurisdictional level. For subarea or corridor studies, however, the analyst needs to be mindful that random effects could play a more pronounced role in the variation of model output in different scenarios.



# Subarea Trip Extraction in Cube

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- In July, COG/TPB staff received an inquiry from the City of Fairfax about updating the number of trips originating from, going to, and cutting through the city based on the most recent modeling results. COG/TPB staff did not provide this information for two reasons:
  - COG/TPB staff did not have an established procedure to extract trips cutting through a sub-geography (X-X trips).
  - For this specific request, COG/TPB staff did not think that the regional travel model could provide accurate information for such a small geography.
- In August, staff explored the Subarea Trip Extraction (STE) function in Cube, which enables one to extract I-X, X-I, I-I, and X-X trips for a given subarea network.
- Staff implemented the STE function in a post-processing highway assignment procedure in a similar fashion to the Select Link Analysis (SLA) program. Staff tested it for both small and large geographies.
- This procedure, currently under internal review, can be tailored to work with either Gen2 or Gen3 Models. Once it is quality assured, staff will document it and make it available for future data requests, particularly for larger geographies such as counties or subareas.



# Gen3 Model Usability Testing

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- Staff already started the modeling work for the Air Quality Conformity (AQC) analysis of Visualize 2050 using the Gen2/Ver. 2.4.6 Model in August.
- Staff created the modeling directory for Gen3 Model usability testing, which will use Gen3 Model Ver. 1.0.2, ActivitySim Ver. 1.2.1, Cube Ver. 6.5, Round 10.0 Cooperative LU, and Visualize 2050 project inputs.
- Staff conducted 2018 model run for benchmarking.
- Staff continued to assemble forecast-year model inputs for the usability testing:
  - Staff exported draft 2025 network files in PT and conducted a test run for QA/QC. Modeling staff found network coding issues when reviewing the modeling results; Network staff fixed them in the network database.
  - Network staff is updating the PT transit fare specification for 2025. Staff will repurpose Operator ID #6 to represent bus systems with reduced fare in this region.
  - Modeling staff will update the transit fare input files accordingly.



# Next Steps

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- Staff will develop transit fare input files for the AQC base year (2025) after network staff update the PT fare specification.
- Staff will conduct another test run using the 2025 PT network input files for further QA/QC.
- Staff will then conduct the 2025 model run with toll setting and compare the results to the AQC modeling results for usability evaluation.





# Acknowledgement

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- Special thanks to the project team:
  - COG: Ray Ngo, Meseret Seifu, Bahar Shahverdi, Jim Yin, Wanda Owens, Jane Posey, Mark Moran, Dusan Vuksan, Nazneen, and others.
  - RSG/BMG: Andrew Rohne, Joel Freedman, and Mushtaq Rahman.



## Feng Xie

TPB Program Manager, Model Development

(202) 962-3259

[fxie@mwkog.org](mailto:fxie@mwkog.org)

[mwkog.org](http://mwkog.org)

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777 North Capitol Street NE, Suite 300

Washington, DC 20002



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