



## TPB TRAVEL FORECASTING SUBCOMMITTEE

### HIGHLIGHTS OF THE JANUARY 24, 2020 MEETING

Meeting time & location: 9:30 AM to 12:00 noon, Metropolitan Washington Council of Governments

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### MEETING ATTENDEES

#### MEMBERS, ALTERNATES, AND PARTICIPANTS

- Bill Allen (Bentley Systems Inc) \*
- Trent Berger (Prince William County DOT) \*
- Jim Bunch (Sabra & Associates) \*
- Kevin Chai (Fairfax Co. DOT)
- Nazneen Ferdous (Jacobs) \*
- Joel Freedman (RSG Inc) \*
- Dan Goldfarb (NVTC) \*
- Kyeongsu Kim (Connetics Transportation Group)
- David Kline (Fairfax County DOT)
- Jaesup Lee (M-NCPPC, Montgomery Co.)
- Yuanjun Li (M-NCPPC, Montgomery Co.)
- Feng Liu (Cambridge Systematics) \*
- Atabak Mardan (C&M Associates)
- George Phillips (Prince William Co. DOT) \*
- Maggie Qi (Fairfax County DOT) \*
- Harun Rashid (NVTA) \*
- Amir Shahpar (VDOT)
- Aichong Sun (AECOM)
- Jiaxin Tong (Kimley-Horn & Assoc.)
- Steve Weller (Kimley-Horn & Assoc.)
- Zhuo Yang (Connetics Transportation Group)

#### COG STAFF

- William Bacon
- Anant Choudhary
- Sanghyeon Ko
- James Li \*
- Mark Moran
- Ray Ngo
- Jane Posey
- Meseret Seifu
- Dusan Vuksan
- Feng Xie

\* An asterisk indicates that the person attended the meeting remotely via WebEx.

This meeting of the Travel Forecasting Subcommittee (TFS) was chaired by Mr. Amir Shahpar.

### 1. INTRODUCTIONS AND APPROVAL OF MEETING HIGHLIGHTS FROM THE PREVIOUS MEETING

As noted at the November 2019 meeting, Mr. Shahpar would be serving as the 2020 chair of the TFS. Mr. Moran welcomed Mr. Shahpar as the new subcommittee chair and thanked him for his

willingness to serve the subcommittee. The highlights of the November 15, 2019 meeting of the TFS were approved without changes.

## **2. UPDATES TO TPB'S TRAVEL DEMAND FORECASTING MODEL: GEN2/VER. 2.3.84 MODEL**

This item consisted of two presentations, one by Mr. Xie and one by Ms. Seifu. Both presenters spoke from a set of presentation slides, which were distributed to the subcommittee. Prior to these presentations, Mr. Moran noted that TPB staff has spent about a year trying to improve the Ver. 2.3 Model, especially in the areas of how external travel is handled in trip distribution and the model's treatment of commuter rail travel. He noted that this work paves the path for a new version of the production-use model, which will be named Ver. 2.4, adding that this model will likely be used for the next few years while the Gen3 Model is being developed.

### **A. RECENT CALIBRATION OF NESTED-LOGIT MODE CHOICE MODEL**

This item was presented by Mr. Xie, who spoke from a set of presentation slides, which were distributed to the subcommittee. Mr. Xie discussed the recent calibration of the nested-logit mode choice model conducted by COG/TPB staff as part of the Generation-2/Version 2.3 Model development. The calibration was warranted by the model development activities that TPB staff conducted in the past year, including the updates of transit person trip calibration targets, model refinements related to external auto person trips, and model parameter adjustments to improve the simulation of commuter rail ridership. Mr. Xie discussed the streamlined calibration process, sensitivity testing related to commuter rail, path building parameter adjustment, as well as the final calibration and validation results. In the end, Mr. Xie discussed the areas where the modeling of commuter rail ridership could be improved in the future and the next steps for a comprehensive validation of the re-calibrated Version 2.3.84 Model.

Mr. Sun asked about the number of commuter rail train lines in the modeled region and asked about connecting points for commuters to make transfers. Mr. Xie provided a list of commuter rail train services (VRE, MARC, and Amtrak), and noted that Union Station was the main transfer point in the system. Mr. Vuksan added that, although transfers from commuter rail to Metrorail are quite common, transfers from one commuter rail line to another are quite rare.

Mr. Sun also asked for a confirmation on the use of different targets for calibration and validation. Mr. Xie confirmed that MWCOG's model uses person trips for calibration targets and ridership data or boarding counts for validation targets.

Mr. Sun noted that, in theory, one should be able to match regional commuter rail targets by adjusting the model constants. However, in the current calibration effort, even though there are rarely transfers between commuter rail lines, getting the calibration to behave appeared to have been difficult. Mr. Xie noted that a sensitivity test was run where 50 iterations were used in the mode choice calibration process. However, even with 50 iterations, it was not possible to get a perfect match. Furthermore, the alternative-specific constants grew in size, such that they were too large. Mr. Xie thought that this was because of the way the commuter rail calibration targets were developed, since they did not consider off-peak VRE service. Mr. Vuksan noted that the model was calibrated to year-2007 conditions, adding that the validation to year-2007 conditions worked well, but the validation to year-2014 conditions did not work as well, with one possible factor being the interpolated land use data for 2014.

Ms. Li wondered about the reliability of the data used for calibration and asked about availability of 2017-2018 Regional Travel Survey (RTS) data for calibration. Also, she suggested that there could be a need to collect or obtain more Maryland commuter rail service data, given that the commuter rail mode is the top sub-mode in the pre-established hierarchy of the model. Feng agreed that commuter rail is the highest in the travel mode hierarchy and that any transit trip that has a

commuter rail leg is treated as a commuter rail trip. In terms of the 2017-18 RTS data, he confirmed the that re-calibration or re-validation of the Version 2.3 Model could be considered once the new survey data become available. But he highlighted that the primary focus would be to use the new survey data for the development of the Gen3 Model.

## **B. VALIDATION AND SENSITIVITY TESTING**

This item was presented by Ms. Seifu, who spoke from a set of presentation slides, which were distributed to the subcommittee. Ms. Seifu presented the most recent development activities regarding the Version 2.3.84 Model, including new features and background on the Ver. 2.3 models, the Version 2.3.84 Model's performance and sensitivity test findings. The Version 2.3.84 Travel Demand Model refinements consist of five primary refinements:

1. Updated external trip distribution process;
2. Increased free-flow speed look-up values used in the traffic assignment process (+15%);
3. Removed bridge penalties in the construction of path-building within the traffic assignment process;
4. Removed some trip production rate modification factors (P-mods) used in trip generation; and
5. Re-calibrated nested-logit mode choice (NLMC).

Ms. Seifu indicated that the updated external trip distribution process had been presented in detail at the March 18, 2018 TFS meeting by Ron Milone. She pointed out that the improved treatment of external travel and the mode choice re-calibration were the key changes. The P-mod and free-flow speed changes were meant to address reduced VMT effects caused by updating the treatment of external travel. The bridge penalty change was meant to address under-estimation of Potomac River crossings that have been historically noted in recent models.

Ms. Seifu explained that staff has been examining a few variants of the Ver. 2.3.84 Model for which performance summaries have been prepared. Staff has established that the Version 2.3.84 Model performance, as assessed by jurisdictional VMT, link-level percentage Root-Mean Square Error (RMSE), screenline crossings and regional transit boardings, is largely comparable to that of the existing Version 2.3.75 Model and meets the "acceptable" standard cited in the FHWA, FDOT and VDOT manuals. Ms. Seifu pointed out a few notable performance issues that were detected with the Version 2.3.84 Model. For example, staff noted a substantial over-estimation of VMT for Frederick County, but no modeling-related problems have been identified thus far. In the staff's view, the over-estimation is perhaps attributed to land use problems (e.g., interpolated land activity for 2014). She added that there are incremental improvements with the Version 2.3.84 Model on screenlines relative to the Version 2.3.75 Model, however, many observed counts associated with screenlines are missing, and zone sizes in the outer areas may also be related to the significant over estimation of travel on the outer screenlines.

Ms. Seifu presented and discussed the results of four sensitivity tests conducted by staff. The tests investigated the Version 2.3.84 Model's response to:

- Highway capacity increases (added lanes on a bridge);
- Highway capacity decreases (closing a bridge to automobile traffic);
- Increasing the frequency of a specific inbound VRE line; and
- A global increase in Metrorail fares.

The results of the four sensitivity tests appeared generally reasonable and acceptable in the staff's view. Staff also plans to explore further refinements that might improve the model's overall performance.

Mr. Lee suggested that the observed over-estimation of VMT in the outer jurisdictions (rural and suburban areas) may be the result of improper network coding. In these areas, local streets used by many travelers are not included in the highway network. He recommends recoding the highway networks to include these facilities based on function type codes.

Ms. Li asked whether the same transit and highway networks were used to compare the existing Version 2.3.75 and Version 2.3.84 Travel Models. Ms. Seifu indicated that staff used the exact same highway and transit networks. Ms. Li added that Montgomery County has updated its networks by adding detailed streets to the highway network, based on function type codes obtained from Montgomery County Department of Transportation.

### **3. TRANSPORTATION RESEARCH BOARD (TRB) 99<sup>TH</sup> ANNUAL MEETING: POST MEETING DISCUSSION**

Mr. Shahpar opened the discussion on lessons learned from the Transportation Research Board (TRB) 99<sup>th</sup> Annual Meeting held in Washington D.C. January 12-16, 2020. He thought that new technology was a major theme in many of the sessions. He mentioned a poster session whose focus was on the degree to which travelers rely on roadway information from smartphone applications, such as Google Maps and Waze. He noted that 70% of drivers followed the route and re-route instructions of the apps, even when they could not see any signs of congestion on their original route. He attended a session with a poster about the simulation of driver reaction time, which found that the typical driver's response time (2 to 2.5 seconds) was often too short to stop a collision with one or more simulated pedestrians.

Mr. Xie and Mr. Vuksan co-authored a poster entitled, "Potential Applications of Google-Based Travel Time Data in Transportation Planning Analyses." Mr. Xie noted that many professionals from MPOs and academia expressed interest in the topic. Mr. Xie attended a discussion session about machine learning (ML) and logit-based models. During the session, ML was presented as being good for short-term forecasts, but, for long-term forecasts and scenario analysis, logit-based models could have advantages over ML. This session was also attended by Ms. Li, Mr. Moran, and Mr. Sun.

Mr. Vuksan, Ms. Morrow, and Mr. Moran attended a workshop about VisionEval, a strategic planning tool that can be used for scenario planning, and includes both population synthesis and greenhouse gas (GHG) emission analysis capabilities.

Ms. Li visited the exhibition booth of Citilabs, which was recently purchased by Bentley Systems Inc. She was told that the next version of Cube software, Cube 7, would have faster model run times. Also, she mentioned that Cambridge Systematics, Inc. has recently released a big-data analysis tool called Locus. She also noted that an improved StreetLight Data analysis tool has been released. The new tool may even be able to distinguish travel modes.

Mr. Moran added information about Cube software. Cube 7 will use a new spatial format called Spatialite, which is a kind of spatial database. Spatialite is supposed to render maps and networks in less time than ArcGIS or ArcGIS runtime engine. Mr. Moran also discussed a poster from Portland, Oregon which focused on environmental justice and equity regarding transit service. The trip-based model included 24 one-hour transit assignments.

Mr. Tong attended a workshop about congestion pricing, which covered experience with congestion pricing in several European countries and Singapore. Mr. Lee shared his impressions on the emergence of new technologies and available data sets, and its effects on modeling, including some of the new challenges. Mr. Kim noted that a lot of research now focuses on the use of collected GPS data to identify travel behavior, which represents a shift from the data collection methods discussed at previous TRB conferences.

Mr. Sun asked about COG's experience with big data. Mr. Moran summarized some of the work that Mr. Milone had done using AirSage data and found some problems with the handling of external travel in the trip distribution model. Updates were made to the COG model, which will soon be brought into the production-use model soon.

#### **4. UPDATES TO TPB'S TRAVEL DEMAND FORECASTING MODELS: GEN3 MODEL**

##### **A. INTRODUCTION TO RSG**

This item was presented by Mr. Freedman, who spoke from a set of presentation slides, which were posted on the subcommittee website after the meeting. Mr. Freedman first presented an overview of RSG, covering topics such as office locations and experiences with federal, state, and local government agencies. He discussed research and analytics topics on which RSG has focused over the last 30 years and presented project experience locations across the U.S. He discussed project organization for COG's Gen3 Model development, highlighting the travel demand forecasting experience of the consultant team, which includes the subcontractor Baseline Mobility Group, Inc. (BMG).

##### **B. RECENT DEVELOPMENTS**

This item was presented by Mr. Moran, who spoke from a set of presentation slides, which were distributed to the subcommittee. He noted that the contract between COG and the consultant (RSG) had been signed in November 2019, and a kick-off meeting was held between COG, RSG, and Baseline Mobility Group (the subcontractor) on Dec. 3, 2019. This contract is being implemented using a series of task orders, which are developed collaboratively by COG and RSG. The first task order was developed in late December, with a notice to proceed issued on Dec. 26. Task Order 1 has four tasks (listed below), a budget of \$53k, and a period of performance from Dec. 2019 through the end of FY 20 (6/30/20):

- Task 1: Attend meetings and prepare meeting summaries
- Task 2: Develop project management plan (PMP)
- Task 3: Provide training to COG/TPB staff
- Task 4: Respond to ad-hoc requests not covered under other task orders

The Gen3 Model Development Team has agreed to have bi-weekly (every two week) check-in meetings. One of these was held on Jan. 16. The second is scheduled for Jan. 30. The consultant has prepared a draft PMP, which was shared with TPB staff. TPB staff has shared comments on the PMP with the consultant. The consultant has also developed a draft Task Order 2, which would include an assessment of the current travel model and recommendations for the updated model (Gen3 Model). Staff has reviewed the draft task order and has sent the consultant comments. There were no questions.

##### **C. ASSEMBLY OF LIST OF RECENT TRANSIT ON-BOARD SURVEYS**

This item was presented by Mr. Ngo, who spoke from a set of presentation slides, which were distributed to the subcommittee. Mr. Ngo first discussed the status of the effort to assemble a list of recent transit on-board surveys to be utilized for model development purposes. He reported that staff had sent out information requests to 24 transit agencies in the Washington, D.C. area to request basic survey information and received 13 responses so far. Mr. Ngo said that after the list is finalized, it would be transmitted to RSG, which would recommend which transit on-board surveys to obtain. No questions were asked.

## **5. OTHER BUSINESS**

Mr. Moran reminded the subcommittee to contact him if anyone has a suggested presentation at an upcoming TFS meeting.

Mr. Bunch asked whether the Gen3 Model development will include a review of the various commercial software vendors that produce travel demand forecasting software, such as Bentley/Citilabs, Caliper, INRO, and PTV. Mr. Moran said that RSG will recommend which software package should be used to implement the Gen3 Model but noted that the exact scope of that review is still being considered.

Mr. Shahpar announced that Virginia DOT extended a contract with StreetLight Data and consequently its tool has been renewed and restructured. Mr. Moran asked the duration of the new contract. Mr. Shahpar said that the term of previous contract was three years but was not sure about the new contract. Mr. Lee asked about the geographical boundary of data availability under the VDOT StreetLight Data contract. Mr. Shahpar confirmed that it is within Virginia state.

## **6. ADJOURN**

The meeting adjourned around 12:00 noon. The next meeting is scheduled for Friday, March 20, 2020 at 9:30 A.M.