TPB's Travel Modeling Improvements

End-of-Fiscal Year Status Report

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At this point in time…

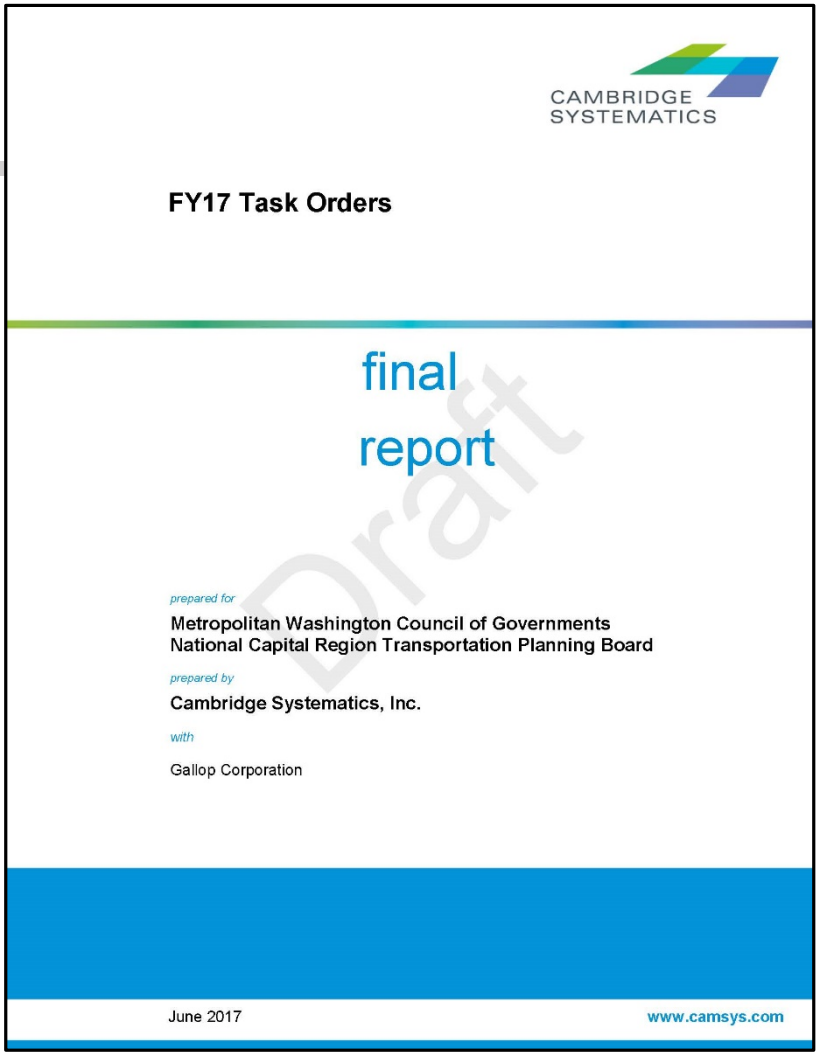
- FY 2017 ended on June 30, 2017
- Three-year contracting period with Cambridge Systematics, Inc. (CS) has ended
- TPB staff is in receipt of final deliverables from CS:
  - FY 2017 Task Orders Report
  - A year-2014 travel model application package
    - CS has integrated modeling improvements into our currently adopted travel demand model **Version 2.3.66**
    - The developmental model is now known as **Version 2.5**
  - Supporting technical information

Milestone accomplishment: A Strategic Models Development Plan

- Inputs to the Plan
  - TPB policy reports
  - Regional stakeholder survey
  - National survey of modeling practice and methods
  - Proactive stakeholder input (WMATA)
- Plan consists of three phases:
  1. Improve existing trip-based model (FY 16-17)
  2. Complete new generation (AB) model with existing data (FY 18-20)
  3. Update AB model with new data (FY 21-22)

Draft 6/30 report

- Is in a 30-day review period
- **TFS comments are welcomed**
- Report location: https://www.mwcog.org/events/2017/7/21/travel-forecasting-subcommittee/



The essential FY17 consultant activities:

1. Fusion of *existing* observed trip data
2. Non-Motorized Model disaggregate estimation
3. Mode Choice Model disaggregate estimation
4. Highway & transit assignment enhancements
5. Aggregate validation of the enhanced models
6. Integration of improvements into a unified, comprehensive travel model application

Merged observed trip data sources

- 2007/08 HTS
- 2011/2012 Geo-Focused HTS
- 2008 Metrorail On-Board Survey
- 2008 Regional Bus On-Board Survey
- 2007/08 MARC On-Board Survey
- 2005 Virginia Rail Express On-Board Survey

Non-Motorized modeling improvements

Model Step(s): Trip Generation

Modeled variable: The "share" of total trips generated that are non-motorized (i.e., bike/ped.)

Improvement: A revised model specification that takes into account land activity density, land activity mix, and urban form variables

Benefits of the improvement: Model will use a more robust set of explanatory variables that will better respond to the connection between land development and non-motorized trip making

Non-Motorized Model Features

- Binary Logit Form (Motorized/Non-motorized)
- Purpose-specific models/ P&A models developed
- "Floating" pop. & emp. density variables
  - 1-mile
  - ¼-mile
- Diversity (LU Mix) variables
  - Simpson's Diversity Index
  - Entropy
- Urban Design variables
  - 3/4 legged intersection densities
  - Cul-de-sac density

Transit ridership modeling improvements

Model Step(s): Mode Choice and Transit Assignment

Modeled variable(s): Transit "share" and transit ridership

Improvements: New transit path-building software; a new Mode Choice model and transit assignment process

Benefits of improvement:

- Improved representation of transit sub-modes (e.g., Metrorail vs. bus vs. streetcar vs. LRT etc.)
- Accomplished in transit assignment, not MC

Transit Modeling Features

- Public Transit (PT) used for LOS matrices and Assignment
- MC Modeling is purpose-specific
- MC Model (MNL) uses simplified choice set:
  - SOV/ HOV2/ HOV3+/ TrnPNR/ TrnKNR/ TrnWLK
- HB Time/Cost coefficients are income based and constrained
- Income mode bias coefficients used
- Transit accessibility mode bias coefficients used
- Diversity (LU Mix) and Design (cul de sacs) variables used

Transit Assignment

- Time period (AM/Off-peak) and Access Mode (walk, PNR, KNR) trip tables are assigned
- Up to 10 transit modes are loaded
- Path weights used to distinguish transit sub-mode use

Managed lane improvements

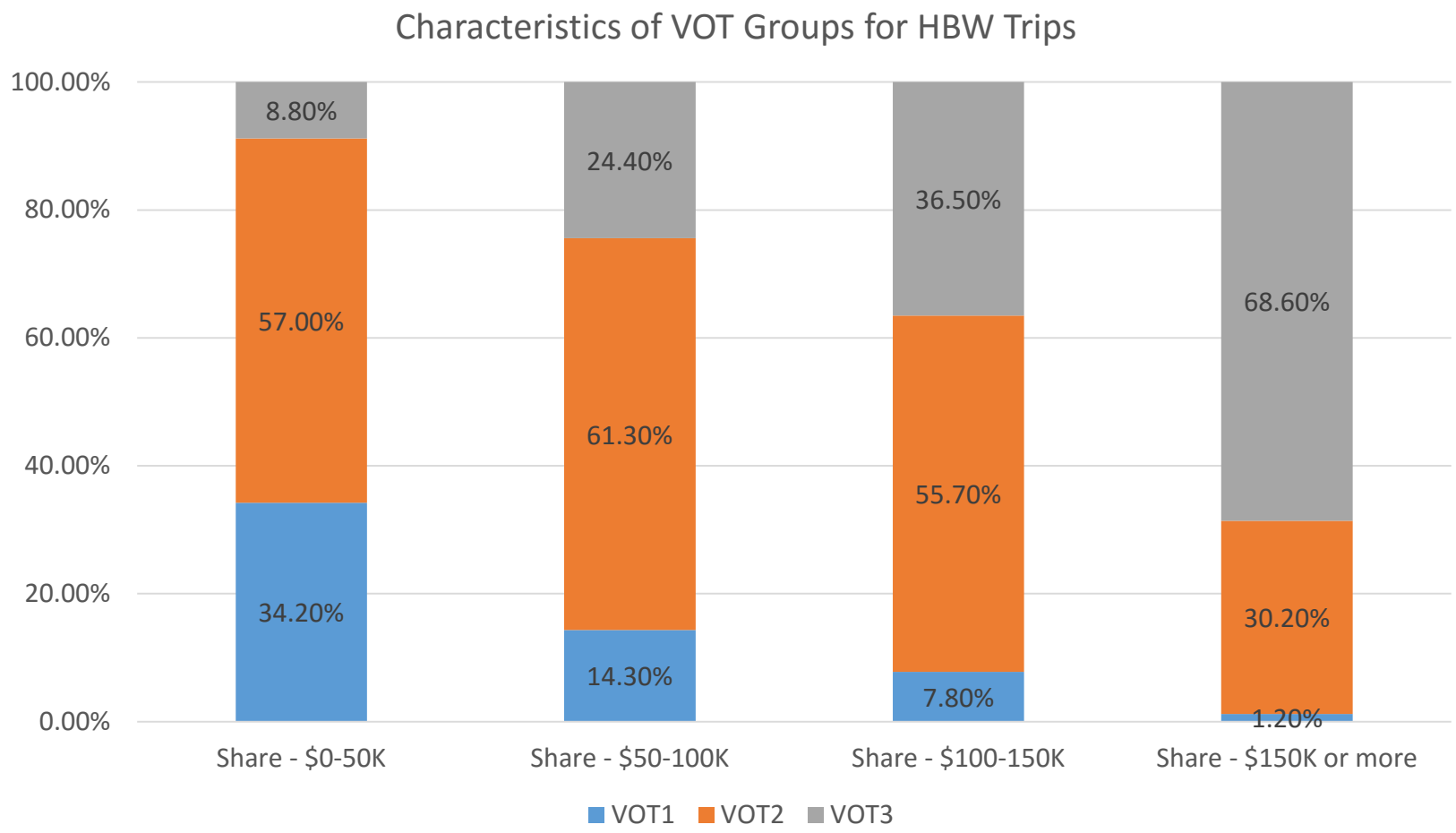
Model Step(s): Highway Assignment

Modeled Variable(s): Highway demand on HOV & HOT lanes

Improvements: Revised highway assignment process that distinguishes vehicles among value-of-time (VOT) markets; Refined volume-delay functions for freeways & expressways

Benefits of improvement: Assignment of vehicles to managed lanes facilities will more explicitly account for driver differences in the willingness to pay for time savings

Value of Time Segmentation for Income Stratified Trips



Highway Assignment

- Highway Assignment is applied by 4 time periods
- “Base” & “Final” assignment construct maintained
- Freeway & Expressway VDFs have been updated
- Market segmentation is increased:
  - From 6 segments: SV, HV2, HV3+, CV, Trk, AP
  - To 12 segments:

  (SV,HV2,HV3+) by 3 VOT groups + CV, Trk, AP

Regional comparison: VMT and Transit Trips

	V2.3.66	V2.5	Observed
2014 VMT	163,114,000	175,441,000	159,420,000
2014 Linked Transit Trips	1,144,600	1,047,700	1,178,300**

** Note: Observed transit trips from 2007 "merged" HTS/TOS File

Challenges

- Increased model complexity
- Increased model run times
  - V2.5 execution time about 1.8 times that of V2.3.66
- Our ability to generate PT transit networks in a production mode is still in process

Image source: Andreas Levers

Next Steps

- TPB staff will review CS's updated model application and documentation
- Staff will evaluate model:
  - Sensitivity testing
  - Comparisons with the existing travel model
  - Performance checks
- Staff will compare the trip distribution model against the "merged" 2007 survey file

Staff appreciates the CS team's efforts

- The completion of the Strategic Plan
- The development of "merged" observed data
- Extremely thorough estimation/validation work
- Assistance the PT network development and path validation
- Preparation of the V2.5 Model application package on schedule

Looking ahead

- Quadrennial update of the LRP
  - It is unclear at this point that the developmental model will be ready in time for the quadrennial update
  - Staff intends to run the developmental model "in parallel" with the existing application model as a means of evaluating its readiness for production
- Phase 2 of the Strategic Plan
  - Development of the ABM
  - Consultant contract for FY 18 will be delayed

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