Item #3

Consultant contract for assistance with development and application of the TPB travel demand model:

Status of current work activities

Presentation to the TPB Travel Forecasting Subcommittee
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National Capital Region Transportation Planning Board (TPB)
Metropolitan Washington Council of Governments (MWCOG)

Background

- Objective of this multi-year project: To obtain consultant assistance with the development and application of the TPB travel demand model
- Since past work has included scans of modeling practice at other MPOs, the project is sometimes referred to as the "scan of best modeling practice" project
- Current consultant (FY 2012): AECOM

FY 2012 task orders

Task Order	Authorized	Description
1	Yes	Attend relevant meetings, provide written advice on travel demand modeling topics that come up at meetings, and respond to ad-hoc requests from TPB staff on issues related to applying or developing the TPB travel model
2	Yes	Improving mode choice modeling in the TPB Ver. 2.3 Travel Model: Consultant recommendations
3	Not yet	Improving mode choice modeling in the TPB Ver. 2.3 Travel Model: Assistance implementing recommendations
4	Yes	Reducing model run times in the TPB Ver. 2.3 Travel Model

Focus of this presentation: Tasks 2 & 4

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Task 4: Reducing model run times

Task 4: Reducing model run times

- Progress made in November
  - AECOM sent TPB staff
    - A set of modified scripts and batch files that would reduce model run times by adding further "parallelization" to the TPB Travel Model
    - Documentation of the changes
      - A letter of transmittal, dated Nov. 4, 2011, from David Roden
      - A proposed PowerPoint presentation, which was later presented at the Nov. 18 TFS meeting
      - Note: AECOM started with build 28 of the 2.3 Travel Model

Task 4: Reducing model run times

- **Before** AECOM's proposed modifications, the model had the following "parallelization," using Cube Cluster's intra-step distributed processing (IDP):
  - HIGHWAY steps
    - Traffic assignment (Highway_Assignment.s)
  - MATRIX steps
    - Fare development (MFARE2.s)
    - Time of day processing
      - Time-of-Day.s
      - Misc_Time-of-Day.s
    - Preparation for traffic assignment (Prepare_Trip_Tables_for_Assignment.s)

Task 4: Reducing model run times

- AECOM's proposed enhancements:
  - Parallelized, via Cube Cluster's multi-step distributed processing (MDP)
    - Trip distribution
    - Highway assignment
    - Highway skims
  - Parallelized, via separate instances of Windows command window:
    - Transit skims
    - Mode choice
  - MATRIX routines parallelized via Cube Cluster's IDP
    - Trip distribution
  - HIGHWAY routines parallelized via Cube Cluster's IDP
    - Highway Skims
  - Combining the HOV and non-HOV runs for the AM and PM periods

Task 4: Reducing model run times

- In Dec. and January, TPB staff tested the new batch files and scripts
- Issues and successes
  - We experienced some model run crashes, but were ultimately able to run the enhanced scripts
  - After AECOM's enhancements, the model produced different VMT than before. Possible causes
    - Added IDP in highway skims process
    - Combined HOV and non-HOV runs for AM & PM periods
  - The model run time was reduced about 40% (from 26.5 hours to 16.2 hours)
  - The model continues to use four cores/threads for each traffic assignment, but, since two assignments are conducted in parallel, it uses a total of 8 cores/threads

Task 4: Reducing model run times

- Other features of AECOMs proposed enhancements
  - Distributed computing can be turned off with a switch
  - Users with computers having fewer than 8 cores can still use the distributed process and accrue some time savings, provided the CPU has Hyper-Threading turned on
    - But you still need to have Cube Cluster to obtain the aforementioned time savings

Task 4: Reducing model run times

- TPB staff is reviewing the work done by AECOM to determine whether the reduction in model run times is worth the added complexity in the model.
- TPB may choose to parallelize only some of the steps suggested by AECOM
- Staff has yet to evaluate whether combining the HOV and non-HOV runs for AM and PM periods yields reasonable HOV trip numbers
  - In the past, TPB staff had combined HOV and non-HOV in the multiclass assignment, but there were some issues with HOV volumes

Task 2: Improving mode choice

Consultant recommendations

Task 2: Improving mode choice

- Progress made in December
  - On Dec. 1, AECOM transmitted a memo to TPB staff, dated Nov. 15
  - TPB staff sent AECOM a memo containing a series of questions and comments regarding the earlier AECOM memo
  - AECOM staff e-mailed responses to many of the TPB staff questions and comments
- TPB staff is now reviewing AECOM's responses and considering its options

Task 2: Improving mode choice

- Issues that require further thought
  - How similar/different will the AECOM/WMATA travel model be from the updated TPB travel model?
    - E.g., Peak and off-peak for three trip purposes (WMATA)
    - Vs. Peak for HBW and off-peak for four other trip purposes (TPB)
  - How far can/should we move from the seven superdistricts and 20 geographic market segments?
    - To what degree will pedestrian environment factor (PEF) variables, or other similar measures, help us eliminate arbitrarily set superdistricts and geographic market segments?
  - What can be done to account for the fact that travelers in Virginia are less likely to use transit than those in MD and DC?

Task 2: Improving mode choice

- Issues that require further thought (continued)
  - What is the best estimation/calibration technique?
    - Statistical estimation (e.g., Alogit, NLOGIT, Biogeme)
    - Automated calibration, e.g., CALIBMS
      - AECOM is looking into whether CALIBMS can be re-written such that one can constrain parameters estimates
    - Manual calibration techniques (can be cumbersome)
  - AECOM has used a PEF defined as the number of Census blocks in a TAZ divided by the TAZ area in square miles. TPB staff is considering an alternate definition: street segment density.

Task 2: Improving mode choice

- Issues that require further thought (continued)
  - TPB staff is considering the pros and cons of switching the transit path-building software from Citilabs TRNBUILD to Citilabs Public Transport (PT) and AECOM is providing advice in this area.
    - Advantages, such as on-screen transit path tracing and "stop-to-stop processing"
    - Disadvantages
      - Such a switch could involve substantial time and resources
      - AECOM could help, but some work would have to be done by TPB staff, given the limited scope of the "scanning" contract.

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Conclusion

Next steps

- TPB staff needs to finish reviewing what AECOM has proposed
- AECOM and TPB staff to meet on Feb. 1, after the TRB Annual Meeting (Jan. 22-26).

Conclusions

- AECOM has provided very useful information to the TPB staff
- Task 4: Reducing model run times
  - AECOM has proposed a number of changes to the travel model that would speed it up, but TPB staff needs to consider the effect of the added complexity
  - If TPB staff chooses to move forward on some or all of the AECOM enhancements, we will need to apply the changes made to the latest travel model (2.3.38)
- Task 2: Consultant suggestions to improve mode choice
  - There are a lot of issues that are "up in the air," which need further consideration, both by AECOM and TPB staff

Acknowledgements

- AECOM staff, for their suggestions on reducing model run times and improving mode choice modeling
- Mary Martchouk, for testing the parallelized batch files/scripts at COG