

# Status report on the Version 2.3 Travel Model updates and application schedule

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# Presentation Overview

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- Recent updates to the TPB Version 2.3 Travel Model
- Application schedule for the air quality conformity assessment of the 2013 CLRP and FY 2013-2018 TIP
- Conclusions and next steps



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# Section 1

Recent updates to the TPB Version 2.3 Travel Model



# Overview of model updates

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- Production model: Build 39 of Ver. 2.3 (i.e., 2.3.39)
- Current development model: Build 47 of Ver. 2.3 (i.e., 2.3.47)
  - ▣ Cube Voyager : 5.1.3 for production model; 6.0.2 for current devel. model
- Major updates
  - ▣ With the help of AECOM, we have added further parallelization, resulting in shorter run times
    - 27 hours => 18 hours (33% reduction in run time)
    - Launch model by 2 PM for result by 8 AM the next day
  - ▣ Three types of parallelization
    - Native Windows techniques, implemented via batch files
    - Cube Cluster
      - Intra-step distributed processing (IDP)
      - Multi-step distributed processing (MDP)
  - ▣ Model inputs: Definitional change regarding treatment of LRT in the calculation of zonal percent-walk-to-transit values (used by mode choice)



# Trip distribution

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- K-factor files are created in and stored in the output folder (e.g., “2007”), instead of the “support” folder, to reduce the likelihood of sharing violations when running concurrent model runs in the same root folder



# Highway skimming (1)

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- The TPB's highway skimming is done twice
  - ▣ First, to develop zone-to-zone (3722 x 3722) skim matrices
    - Highway\_skims.s
  - ▣ Second, to develop zone/PNR lot-to-zone/PNR lot (7999 x 7999) skim matrices. This latter set enables restrained highway speeds and distances to be calculated between zones and PNR lots, thus allowing transit auto-access links to be built.
    - Highway\_skims\_mod.s



# Highway skimming (2)

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- To improve model stability, the highway skimming script (Highway\_skims.s) was split into two scripts:
  - AM period: Highway\_skims\_am.s
  - Midday period: Highway\_skims\_md.s
- ▣ Reason:
  - The original script contained a loop for two time-of-day periods (AM and midday). In some cases, Cube Voyager would crash in the second (midday) loop
- This change is analogous to a change that was made about a year ago (Ver. 2.3.37) when highway\_skims\_mod.s was split into two scripts:
  - AM period: Highway\_skims\_mod\_am.s
  - Midday period: Highway\_skims\_mod\_md.s



# Transit skimming

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- Parallelization, via native Windows techniques, for the four major transit modes
  - AB: All bus
  - MR: Metrorail
  - CR: Commuter rail
  - MB: Metrorail and bus together
- However, we have turned off IDP to prevent model from using 16 threads at once
  - We could run 16 threads on our hardware (a server with two six-core CPUs and Hyper-Threading = 24 virtual cores to the O/S), but we realize that many other users could not





# Transit fare development

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- MFARE2.s continues to use IDP



# Mode choice

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- Parallelization, via native Windows techniques, for the five trip purposes
  - HBW
  - HBS
  - HBO
  - NHW
  - NHO



# Highway assignment

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- Added MDP (in addition to the IDP that was already in use)
- Standardized the names of the relative gap report files, e.g., for speed feedback iteration 4:
  - ue\_iteration\_report\_i4\_AM\_nonHov.txt
  - ue\_iteration\_report\_i4\_AM\_hov.txt
  - ue\_iteration\_report\_i4\_PM\_nonHov.txt
  - ue\_iteration\_report\_i4\_PM\_hov.txt
  - ue\_iteration\_report\_i4\_MD.txt
  - ue\_iteration\_report\_i4\_NT.txt



# Transit assignment

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- Parallelization, via native Windows techniques, for the four major transit modes
  - ▣ AB: All bus
  - ▣ MR: Metrorail
  - ▣ CR: Commuter rail
  - ▣ MB: Metrorail and bus together
- IDP used for combining transit assignment tables
  - ▣ Combine\_Tables\_For\_TrAssign\_Parallel.s



# Transit assignment summary

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- LineSum, the program that summarize the transit assignment results
  - ▣ Switched from ver. 1.8 to ver. 5.0.17
- We no longer use the LineVol program to merge transit assignment loaded link files into consolidated AM and OP files, since the new version of LineSum can now perform this function



# Miscellaneous

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- Cube Cluster nodes are started just before needed and closed just after they are used
  - ▣ In the past, when model runs used up to four cores, all four Cube Cluster nodes would sit open during the whole model run, whether they were needed or not
- Increased the numeric precision used by the mode choice summary script (MC\_NL\_Summary.s)
  - ▣ Now the precision used in its resultant summaries (e.g., i4\_mc\_NL\_SUMMARY.tab) match the precision used in summaries for the “transit constraint through the regional core” (e.g., i4\_mc\_NL\_CONSUMMARY.tab)
  - ▣ Previously, there was a small rounding difference between the two summaries, due to the different precisions used



# Inputs: Percent walk to transit (1)

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- When developing transit walksheds and calculating resultant zonal percent-walk-to-transit (PWT) values needed by the mode choice model, the model has always differentiated between
  - Distance
    - Short walk to transit:  $\leq 0.5$  mile
    - Long walk to transit:  $> 0.5$  mile and  $\leq 1$  mile
  - Type of transit
    - Metrorail
    - All transit (including Metrorail)



# Inputs: Percent walk to transit (2)

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- This resulted in six PWT values
  - ▣ Pct of zone w/in a short walk to Metrorail (Mode 3)
  - ▣ Pct of zone w/in a long walk to Metrorail (Mode 3)
  - ▣ Pct of zone w/in a short walk to any transit, AM peak per.
  - ▣ Pct of zone w/in a long walk to any transit, AM peak per.
  - ▣ Pct of zone w/in a short walk to any transit, off-peak per.
  - ▣ Pct of zone w/in a long walk to any transit, off-peak per.





# Inputs: Percent walk to transit (3)

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- Based on recent tests done by Dusan Vuksan and Feng Xie for multimodal project planning work for MDOT, it appeared that estimated ridership for mode 5 (LRT) was lower than expected
- Ultimately, it was determined that the PWT definitions were incomplete
- Specifically, given this current modeling assumption:
  - ▣ For transit path building/skimming, mode choice, and transit assignment
    - Mode 5 (LRT) is treated like Mode 3 (Metrorail)
    - Mode 10 (BRT or streetcar) is treated like Mode 1 (local bus)
- **It was determined that, when calculating PWT values, since Mode 5 is treated like Mode 3, then one must include both Modes 3 and 5 in the first two PWT values (as shown on the next slide)**



# Inputs: Percent walk to transit (4)

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- New PWT definitions
  - ▣ Pct of zone w/in a short walk to Metrorail (Mode 3) **or LRT (Mode 5)**
  - ▣ Pct of zone w/in a long walk to Metrorail (Mode 3) **or LRT (Mode 5)**
  - ▣ Pct of zone w/in a short walk to any transit, AM peak per.
  - ▣ Pct of zone w/in a long walk to any transit, AM peak per.
  - ▣ Pct of zone w/in a short walk to any transit, off-peak per.
  - ▣ Pct of zone w/in a long walk to any transit, off-peak per.
- This change has an effect for years/scenarios that include LRT, but **it does not affect**
  - ▣ Base year (2007) that was used for model calibration
  - ▣ 2010 scenario used for validation work
- We have revised two the memos that document the PWT process used by COG staff (both now dated 11/16/12)



# Inputs: Percent walk to transit (5)

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- These six PWT values are used in the mode choice model to develop seven transit-access markets used by the mode choice model (AEMS)

	<b>Maj. Mkt</b>		<b>Sub-Market</b>
1	Can walk	WM	Trips that can use Metrorail/LRT at both ends of the trip
2	Can walk	W1	Trips that can use “other transit” at production end and Metrorail/LRT at attraction end of the trip
3	Can walk	W2	Trips that cannot walk to Metrorail/LRT at either end of the trip (i.e., can use “other transit” at both ends of the trip)
4	Can walk	W3	Trips that can use Metrorail/LRT at production end and “other transit” at attraction end of the trip
5	Must drive	M1	Trips that must drive (to any transit) at the production, but can walk to Metrorail/LRT at the attraction
6	Must drive	M2	Trips that must drive (to any transit) at the production, but cannot walk to Metrorail/LRT at the attraction (i.e., must use “other transit” at the attraction)
7	No transit	M3	Trips with no access to transit at the attraction end (thus, no access to transit for this zone-to-zone interchange)



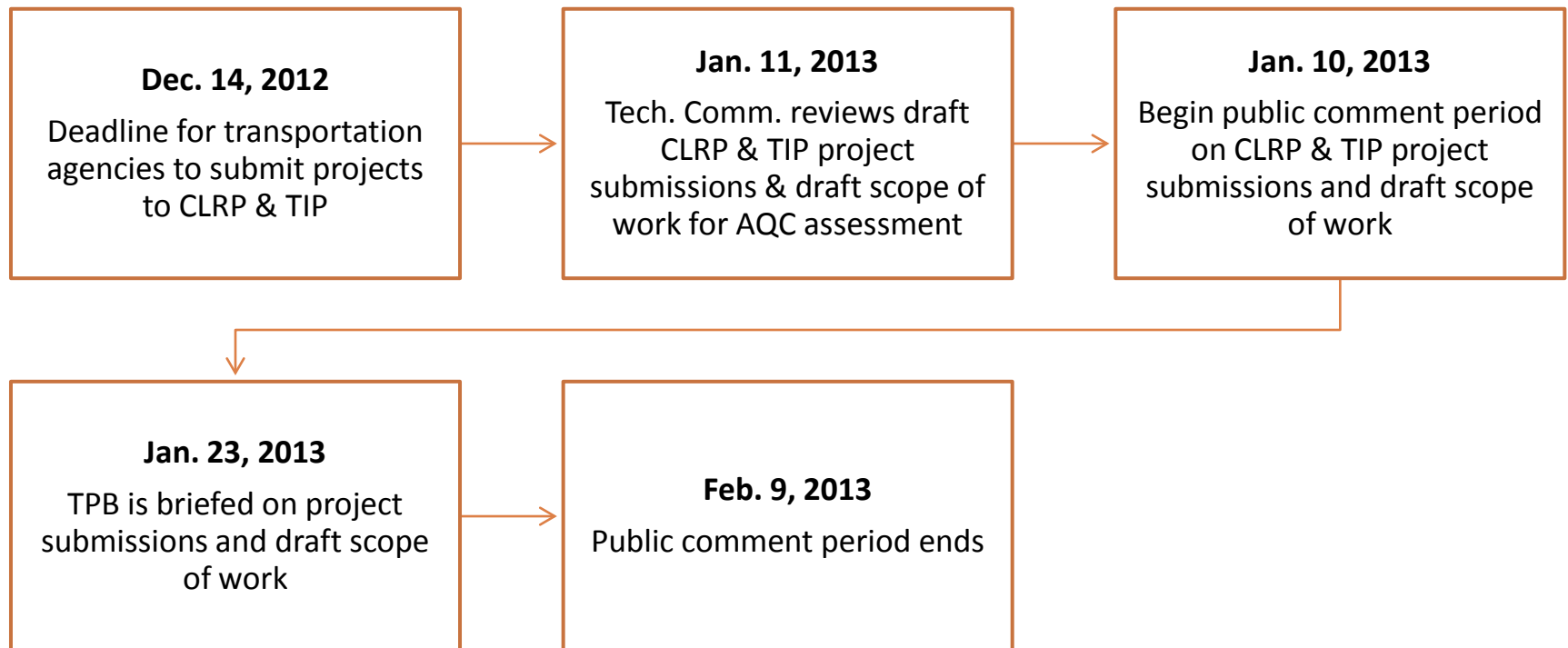
## Section 2

Application schedule for the air quality conformity assessment of the 2013 CLRP and FY 2013-2018 TIP



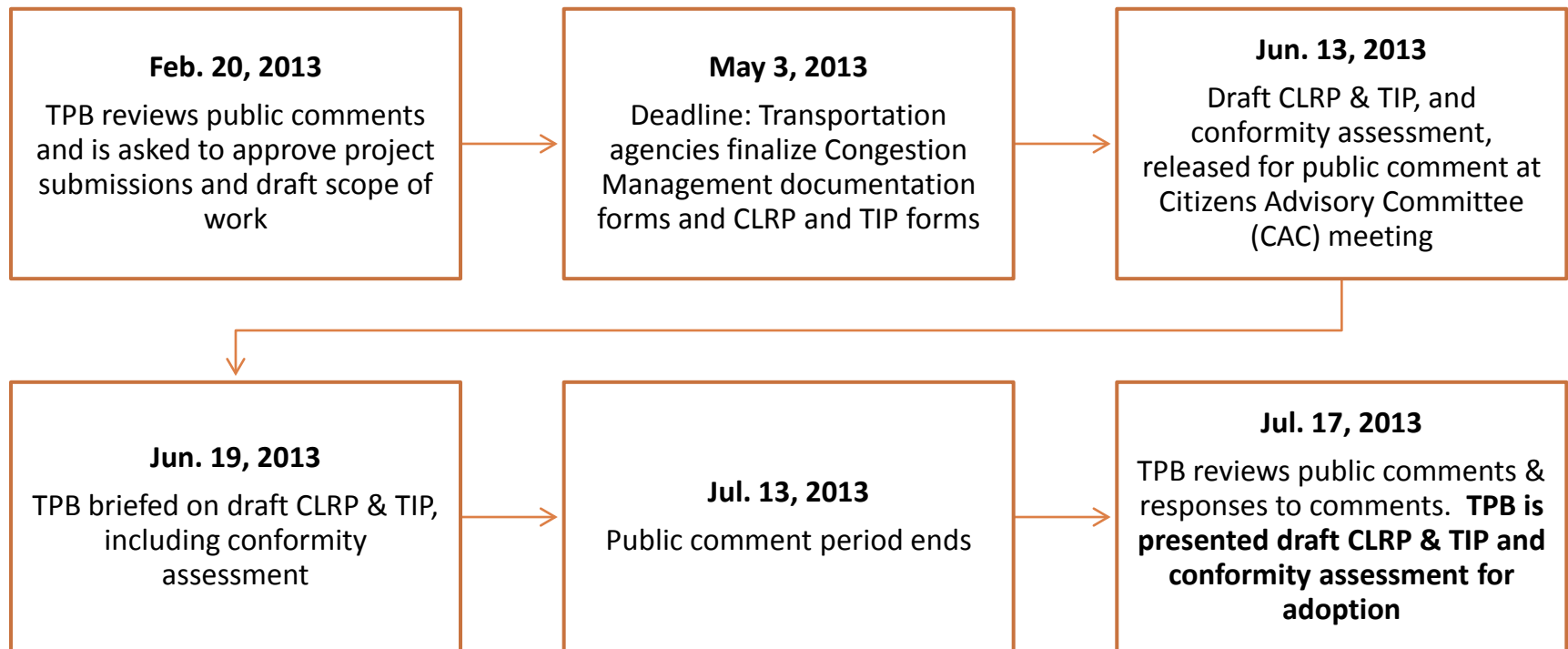
# Schedule for AQC assessment of the 2013 CLRP and FY 2013-2018 TIP (1)

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# Schedule for AQC assessment of the 2013 CLRP and FY 2013-2018 TIP (2)

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Travel demand modeling work to be conducted in spring and summer 2013



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## Section 3

### Conclusions and next steps



# Conclusions (1 of 2)

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- We have made a number of updates to the regional travel model over the last few months, such as
  - ▣ Added parallelization (in transit skimming, mode choice, highway assignment, and transit assignment) which reduces run times by 33% (27 hours => 18 hours)
  - ▣ Updated version of LineSum, used to summarize transit assignment results
    - New version fixes some past bugs and has more capabilities
  - ▣ Cube Cluster nodes are opened only when needed
- Process used to calculate percent-walk-to-transit (PWT) values has be revised
  - ▣ LRT is now given the same treatment as Metrorail





# Conclusions (2 of 2)

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- Air quality conformity assessment
  - Now underway (transportation agencies are currently submitting projects for CLRP and TIP)
  - Scope of work will be released in January
  - Model runs will be conducted in spring and summer 2013, using the latest version of the Ver. 2.3 Travel Model
  - TPB adoption scheduled for July 2013



# Next steps

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- The upcoming AQ conformity work will use the latest model version that is available (i.e., 2.3.47 or later)
- We are in the process of updating model documentation
- We realize that model outputs are voluminous (ca. 25 GB)
  - We are in the process of developing a batch file that will help users remove some of the temporary files



# Acknowledgements

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- AECOM for help with
  - ▣ Adding further parallelization to the travel model
  - ▣ Support of the transit assignment summary program (LineSum)
- Mary Martchouk for help with model runs
- Dusan Vuksan and Feng Xie for discovering the need to add LRT to the Metrorail service, when calculating zonal percent-walk-to-transit values
- Jane Posey for her review of AQC schedule
- Ron Milone for review and oversight of the models development program

