Review of Transit Modeling

Task Order 15.3

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presented to

COG/TPB Travel Forecasting Subcommittee

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Review Objectives

Evaluate the status of transit modeling in the context of current regulatory environment

Support the development of the Strategic Plan for Model Development

Work Scope

- Review documentation and memos for the latest version of the COG/TPB model
- Review the latest FTA guidance on ridership forecasting for New Starts and Small Starts
- Review the needs of transit agencies such as WMATA
- Evaluate options
- Make recommendations

Review FTA Guidance on Ridership Forecasting

- **Five aspects of the forecasts**
  - **Properties of the forecasting methods**
  - **Adequacy of current ridership data to support useful tests of the methods**
  - **Successful testing of the methods to demonstrate their grasp of current ridership**
  - **Reasonableness of inputs (demographics, service changes) used in the forecasts**
  - **Plausibility of the forecasts for the proposed project**

Source: http://www.fta.dot.gov/grants/15681.html

Review FTA Guidance on Ridership Forecasting (continued)

- **Three approaches to prepare ridership forecasts**
  - **Regionwide travel models**
  - **Incremental data-driven methods**
  - **Simplified Trips-on-Project Software (STOPS)**

Source: http://www.fta.dot.gov/grants/15681.html

Review COG/TPB Model for Transit Modeling

- Recent enhancements are encouraging, but there are still some areas that may need improvement
- Model inputs
  - Transit coding
  - Transit fares – aggregate representation of bus fares
  - Transit speed/run time based on schedule and future degradation

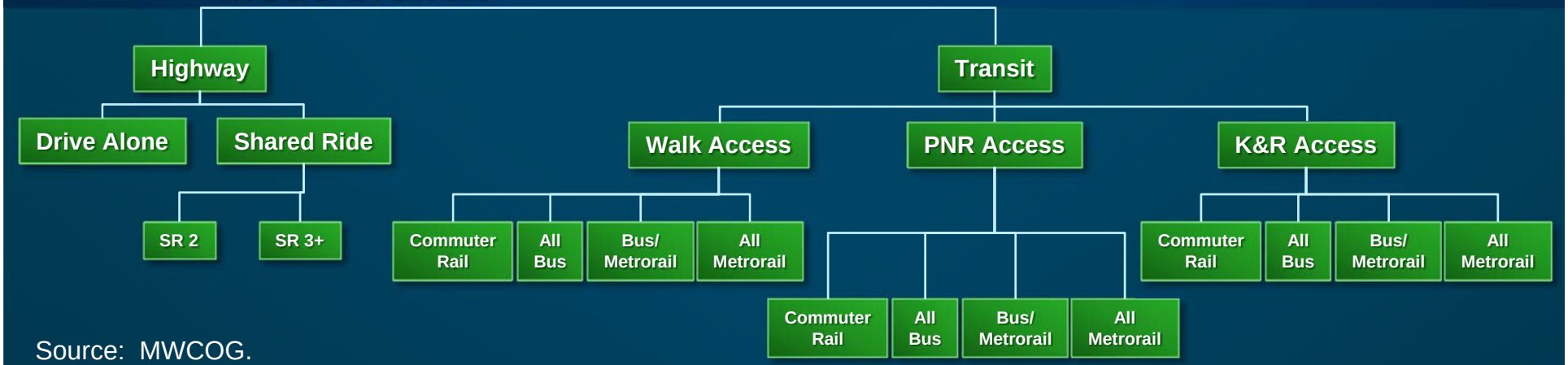
Source: MWCOG.

Review COG/TPB Model for Transit Modeling

- **Trip Distribution**
  - Gravity model with a composite time
  - Ability to replicate the existing markets for travel
  - Options: logsums and destination choice model

Review COG/TPB Model for Transit Modeling (continued)

- **Mode choice model structure**
  - Nested logit model – state of practice
  - Nesting structure – special consideration of Bus-Metrorail
  - Treatment of LRT, BRT, and streetcar
  - Nonmotorized modes: walk access to transit but not a primary mode branch



Source: MWCOG.

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Review COG/TPB Model for Transit Modeling (continued)

- **Market segmentation for Mode Choice**
  - Household income (in four income quartiles)
  - Trip purposes (HBW, HBS, HBO, NHBW, and NHBO)
  - Geographies (in 20 district-to-district interchanges, based on seven superdistricts – D.C. core, VA core, D.C. urban, MD urban, VA urban, MD suburban, VA suburban)
  - Transit access mode (walk, park-and-ride, kiss-and-ride)
  - Transit submodes (all-bus, all-Metrorail, bus plus Metrorail, and commuter rail)

Review COG/TPB Model for Transit Modeling (continued)

- **Mode choice model formulation – coefficients**
  - **Hybrid approach to model formulation**
  - **Coefficient of in-vehicle time (Civtt) – estimated; 0.03 < Civtt < 0.02 for work trips, but lower for nonwork trips**
  - **Coefficient of out-of-vehicle time (Covtt) – asserted; does it satisfy?** $2.0 < \frac{Covtt}{Civtt} < 3.0$
  - **Cost coefficients and implicit value of time – asserted; does it satisfy?** $\frac{AverageWage}{4} < \frac{Civtt}{Ccost} < \frac{AverageWage}{3}$

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Review COG/TPB Model for Transit Modeling (continued)

- Mode choice model formulation – constants
  - Alternative-specific constants
  - Unmeasured attributes

Review COG/TPB Model for Transit Modeling (continued)

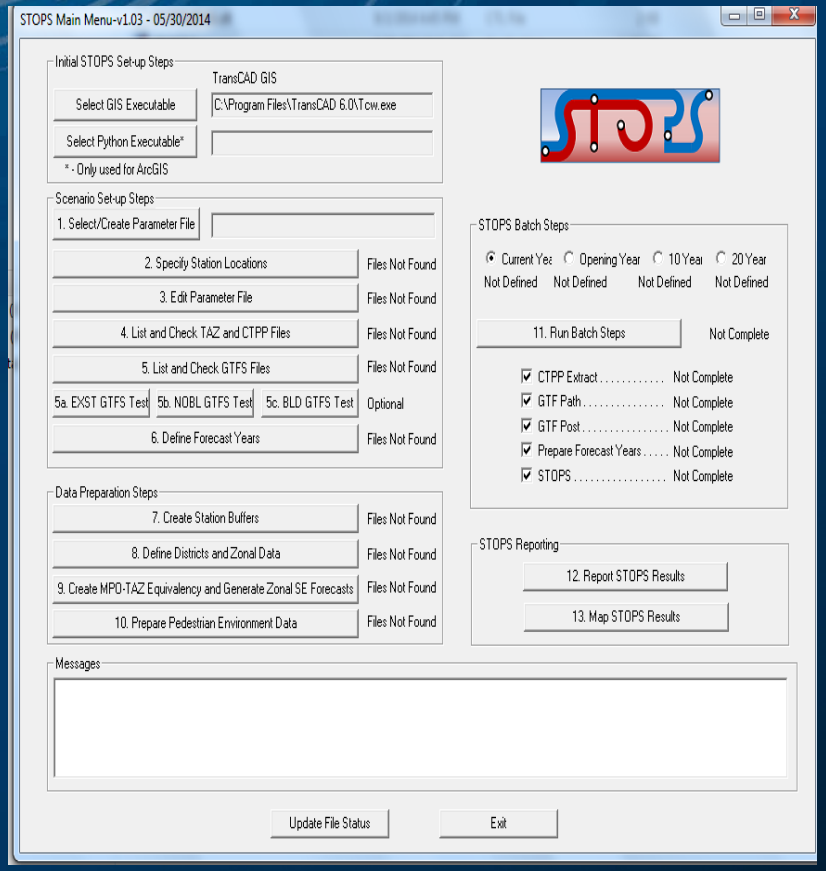
- Coefficient values in mode choice are consistent with weights used in path building
- Drive-access trips to highway network: not assigned to highway network
- HBW is assumed for peak periods, and other trip purposes are assumed for off-peak
- Validation is conducted at regional, jurisdiction, and jurisdiction-to-jurisdiction level, and by Metrorail station groups.

Other FTA-Acceptable Ridership Forecasting Methods

- Incremental data-driven methods
  - Elasticities
  - Pivot-point
- Simplified Trips-on-Project Software (STOPS)

Simplified-Trips-on-Project Software (STOPS)

- **A simplified software package released by FTA**
  - **Quantifies FTA's trips-on-project evaluation measure for FTA major capital funding**
  - **Useful for areas where a regional model or an incremental approach is not currently available or not suitable**
  - **Useful for quality control – to provide a second ridership forecast for comparison to a forecast by other methods**



Source: FTA.

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Simplified-Trips-on-Project Software (STOPS) (continued)

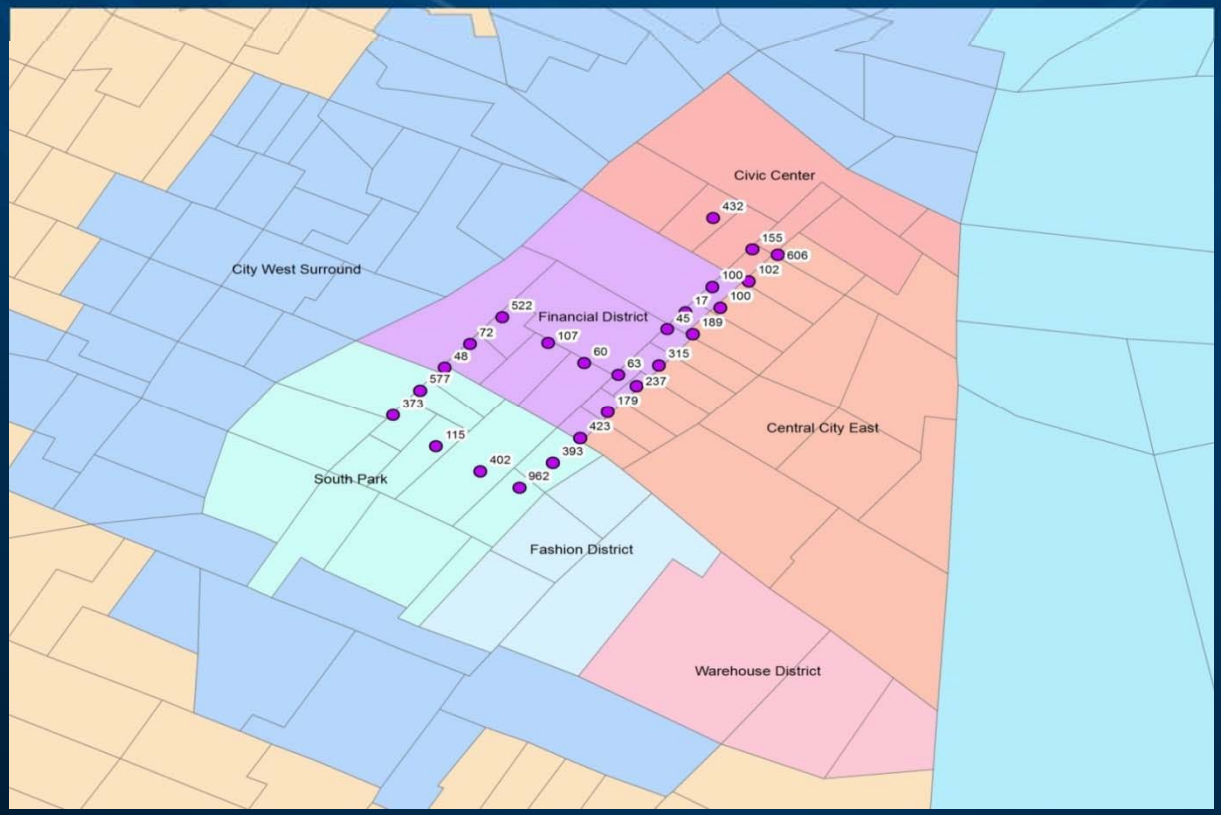
- **Modified four-step model structure; trip based**
  - Census worker flow (CTPP) rather than trip generation and distribution
  - GTFS for transit representation
- **Nationally calibrated; local adjustments**
  - National – against ridership on 24 fixed guideway systems
  - Local transit
    - Against CTPP HBW attraction district-level transit shares
    - Against total transit ridership
  - Local fixed-guideway – against station counts

CTPP = Census Transportation Planning Package (2000)
GTFS = General Transit Feed Specification

Source: FTA.

An Example STOPS Application

- Evaluate a proposed streetcar in a major downtown
- Fine-grained units



Source: Cambridge Systematics, Inc.

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STOPS Capabilities and Limitations

- Need highway skims, usually from a regional model
- Fixed guideways, not local buses and not roadways
- Translation of trip patterns over time based on population and employment, not accessibility
- STOPS considers routine weekday trips by residents, not student or visitor travel
- Improved representation of work-trip markets, less certain for others
- Less time and resources required

Draft Recommendations to COG/TPB

- Eliminate geographic segmentation
- Establish transit peak/off-peak segmentation by trip purposes
- Refine mode choice structure, coefficients, and constants
- Enhance non-motorized modeling

Draft Recommendations to COG/TPB (continued)

- Develop explicit representation of transit fares
- Test an explicit relationship between bus speed and highway speed, along with bus delay
- Assign drive access to highway network
- Enhance transit validation at the sub-regional level
- Consider potential roles of regional model versus project-level forecasting methodologies

QUESTIONS?