Overview of the Recent Transportation Modeling Activities at M-NCPPC Prince George's County Planning Department

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PRINCE GEORGE'S COUNTY

Prince George's County Department of Parks and Recreation
Prince George's County Planning Board
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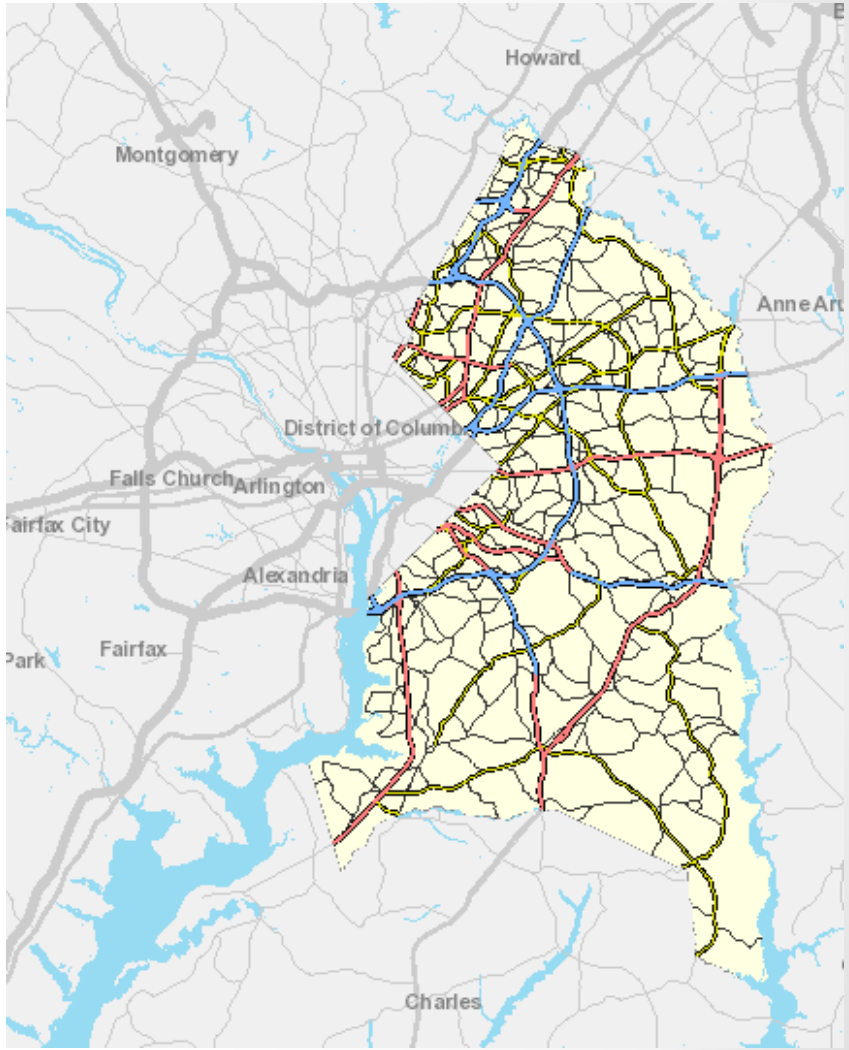
Community Planning Division
Development Review Division
Information Management Division
Countywide Planning Division
Transportation Planning Section
Environmental Planning Section
Special Projects Section
Historic Preservation Section



Source: http://www.pgplanning.org

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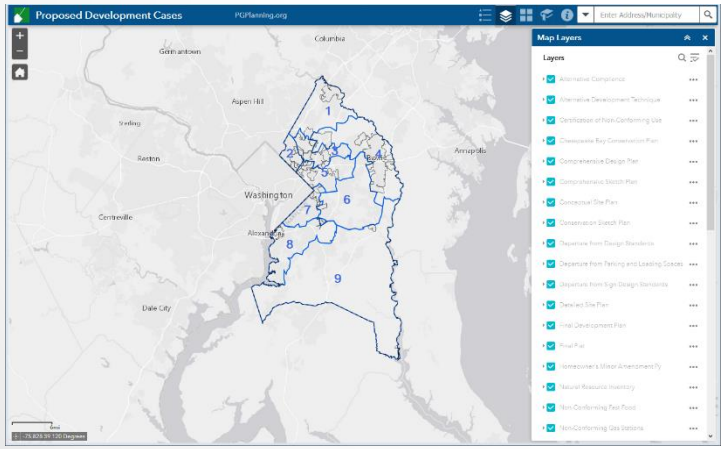
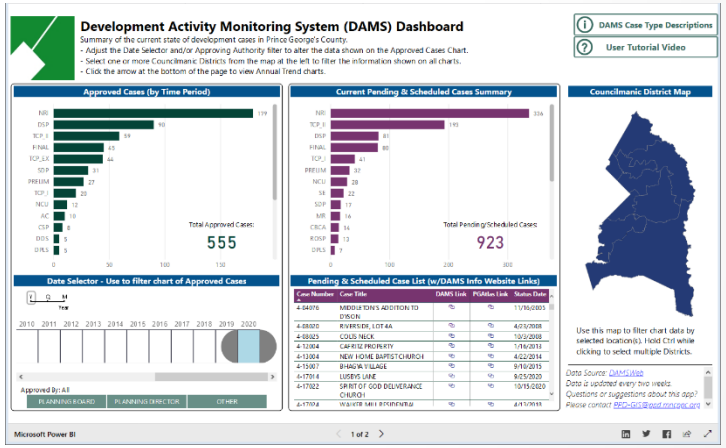
Planning Aides

- PG Atlas
- Development Activity Monitoring System (DAMS)

- Pavement Assessment and Management System (PAMS) – DPW&T (Prince George's County)



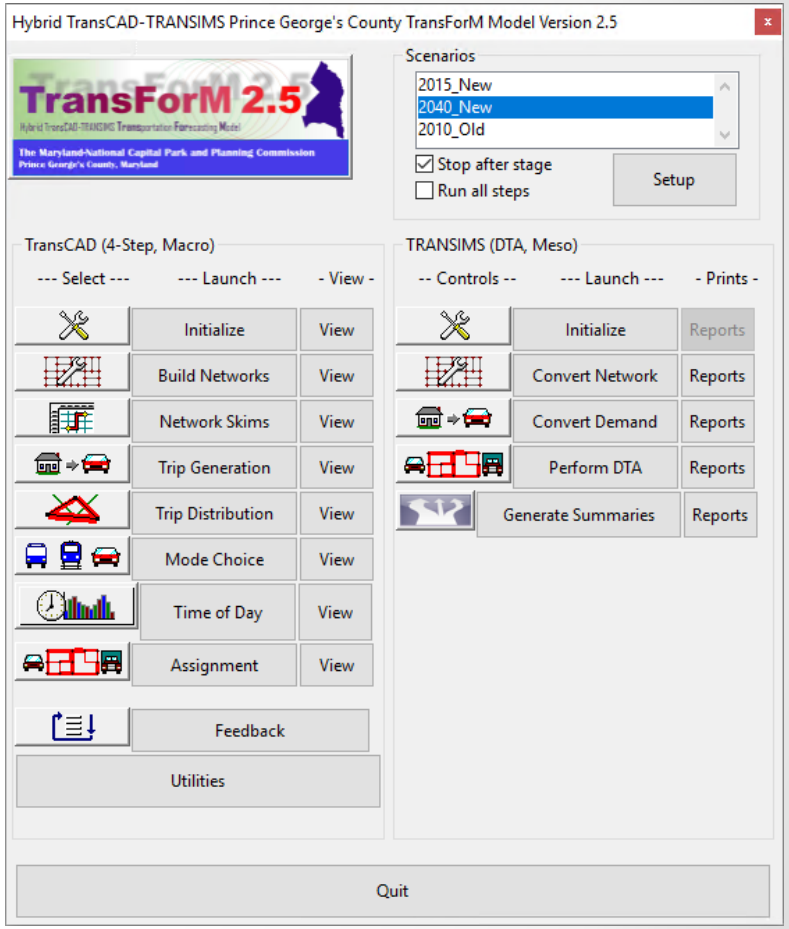


TransForM

- 1990: First model in SYSTEM II Model by JHK & Associates
- 1995: Updated
- 1999: Caliper created TransCAD model from MWCOG 2.1D
- 2011: TransForM 1.4, updates by AECOM
- 2013: TransForM 1.5, calibration year 2010
- 2017: TransForM 2.0, Hybrid: Base year 2015 + Analytical DTA
- 2019: TransForM 2.5, Hybrid: Analytical DTA with Mode choice on Tours

TransForM 2.5

Attribute	MWCOG 2.3	TransForM 2.5
Geographic Area	6,800 sq. mi.	6,800 sq. mi.
Number of Zones	3,722 "TPBTAZ"#	4,366 "PGTAZ"
PG County Zones	635	1,285
Software Platform	Cube	TransCAD + TRANSIMS
Synthetic Population	No	Yes
Freight Model	Yes	No
Assignment	Static	Static in TransCAD, followed by Dynamic in TRANSIMS
Links (2015)	~32,000 (True shapes for non-ramps)	~52,000 with shapes
Nodes (2015)	~13,500	~23,500



See p. 174 of https://www.mwcog.org/assets/1/6/mwcog_tpb_travel_model_v2.3.78_user_guide_v5_full.pdf

Key Recent Modeling Activities

TransForM 3.0 & Beyond TransForM 3.0 projects

1. TransForM 3.0: An Advanced-Practice **Trans**portation Demand **For**ecasting **M**odel
   - Disaggregate the demand model: (lightweight) activity-based model
     - Estimate and calibrate to 2008 using 2007/2008 HTS, apply for 2015 & 2040
   - Disaggregate the supply model: multi-resolution simulation and analytical DTA
     - Increasing level of fidelity going from region into Prince George's County

2. Beyond TransForM 3.0:
   - Calibrate with upcoming 2017/2018 HTS
   - Include emerging technologies:
     - TNCs (Transportation network companies) – Uber, Lyft, etc.
     - CASE (connected, automated, shared, and electric) vehicles – fully or partially automated
   - Develop a tool to assist with preliminary evaluation of development applications (GMSA)

Motivation ("FLEX"=ABM)

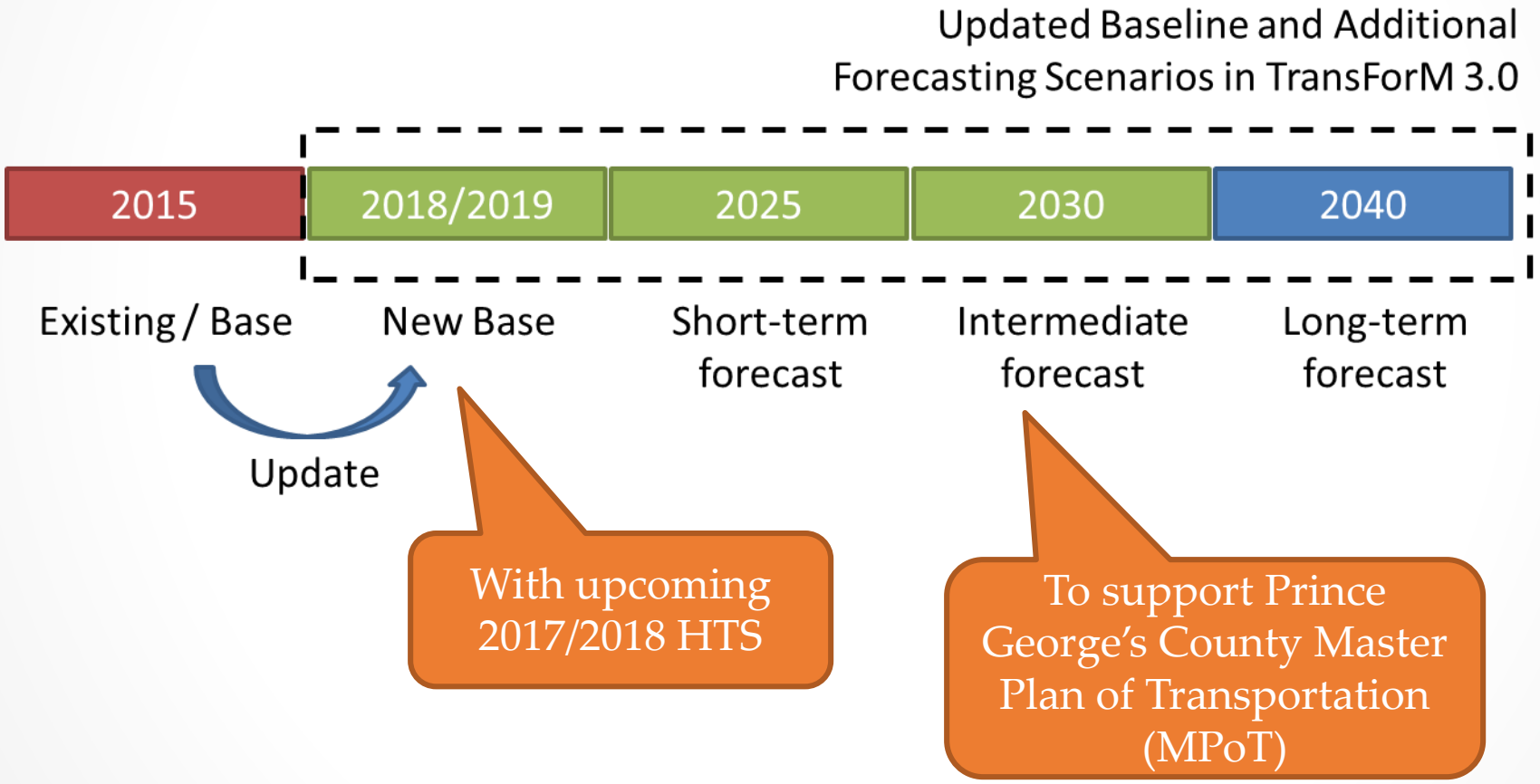
- A "lightweight", but disaggregated (activity-based) demand model would:
  - Allow for more intuitive representation of travel choices that result in trips
  - Enable easier and better modeling of emerging technologies
  - Provide a closer relationship to the HTS
  - Track household persons more effectively
  - Exchange finer time-resolution data with DTA

- Anticipated as an **interim** product, potentially to be replaced/merged with Gen3/Gen4, when available

Motivation (DTA)

- A disaggregated meso-scale supply model (DTA) would:
  - Provide more detailed analysis of proposed infrastructure projects such as the Express Lanes in and around Prince George's County
  - More realistically model the impacts of connected and automated vehicles
  - Provide location and time-specific insights into the source, duration and intensity of congestion
  - Include sensitivity to operational changes
  - Track travelers and segregate impacts
  - Simplify demand data preparation for potential subarea studies with micro models such as VISSIM or Synchro

Modeling Years



FLEX: Considerations

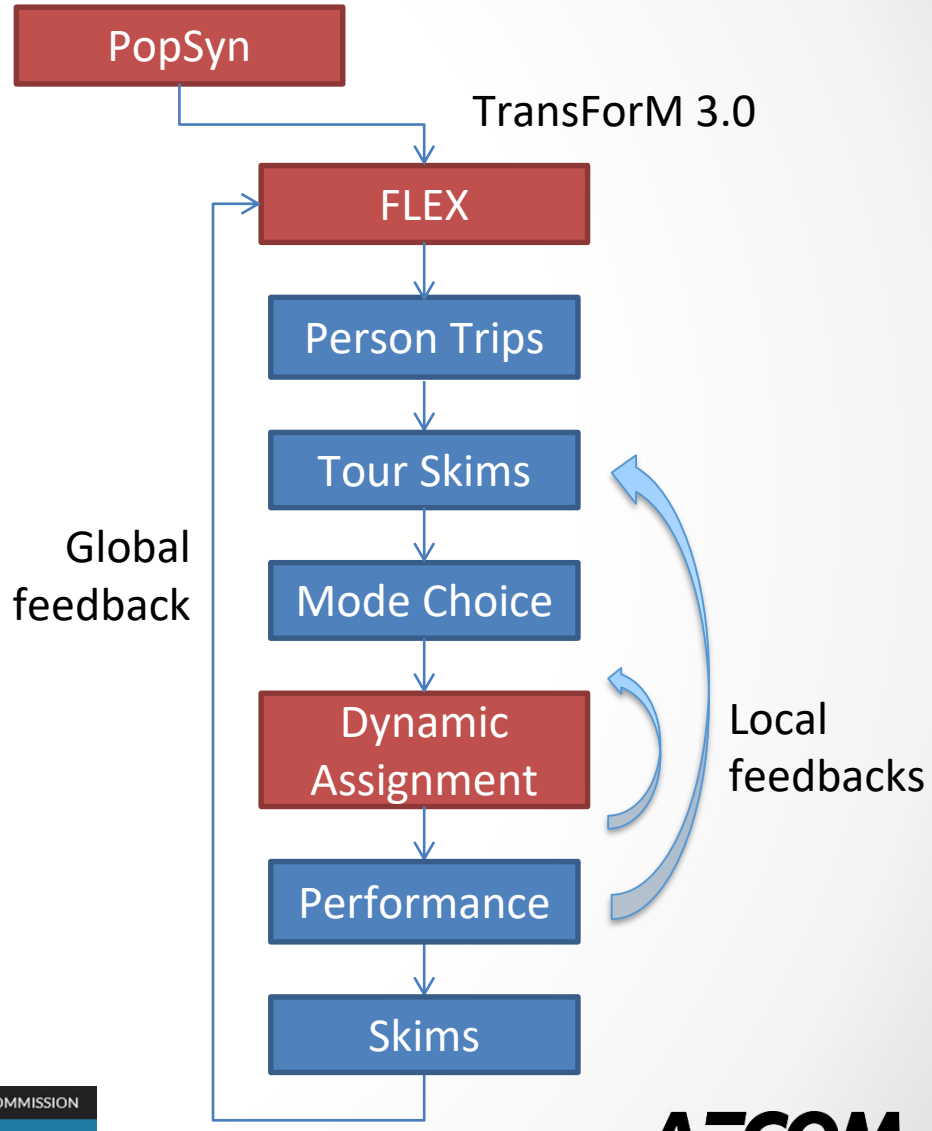
- Working with a "minimalistic" philosophy to skip models with relatively less "return on investment". Examples:
  1. Not considering all intra-household interactions
  2. Operating at the PGTAZ level
  3. Excluding auto ownership (for now)
  4. Keeping mode choice as part of supply feedback
  5. Fewer activity-types

"… One thing we are thinking about is simplifying and removing some detail that we think didn't provide much benefit but did make it run slower and be more complicated. I think we've heard of some other agencies doing this."

- Claire Bozic, Chicago Metropolitan Agency for Planning (CMAP) in an e-mail dated 8/24/20 on Transportation Modeling Improvement Program (TMIP)

TransForM 3.0: Workflow

- Begins with Population Synthesis using the PGTAZ version of Cooperative Land Use
- Global feedback between demand & supply models, local feedbacks for DTA stabilization
- Skimming at PGTAZs

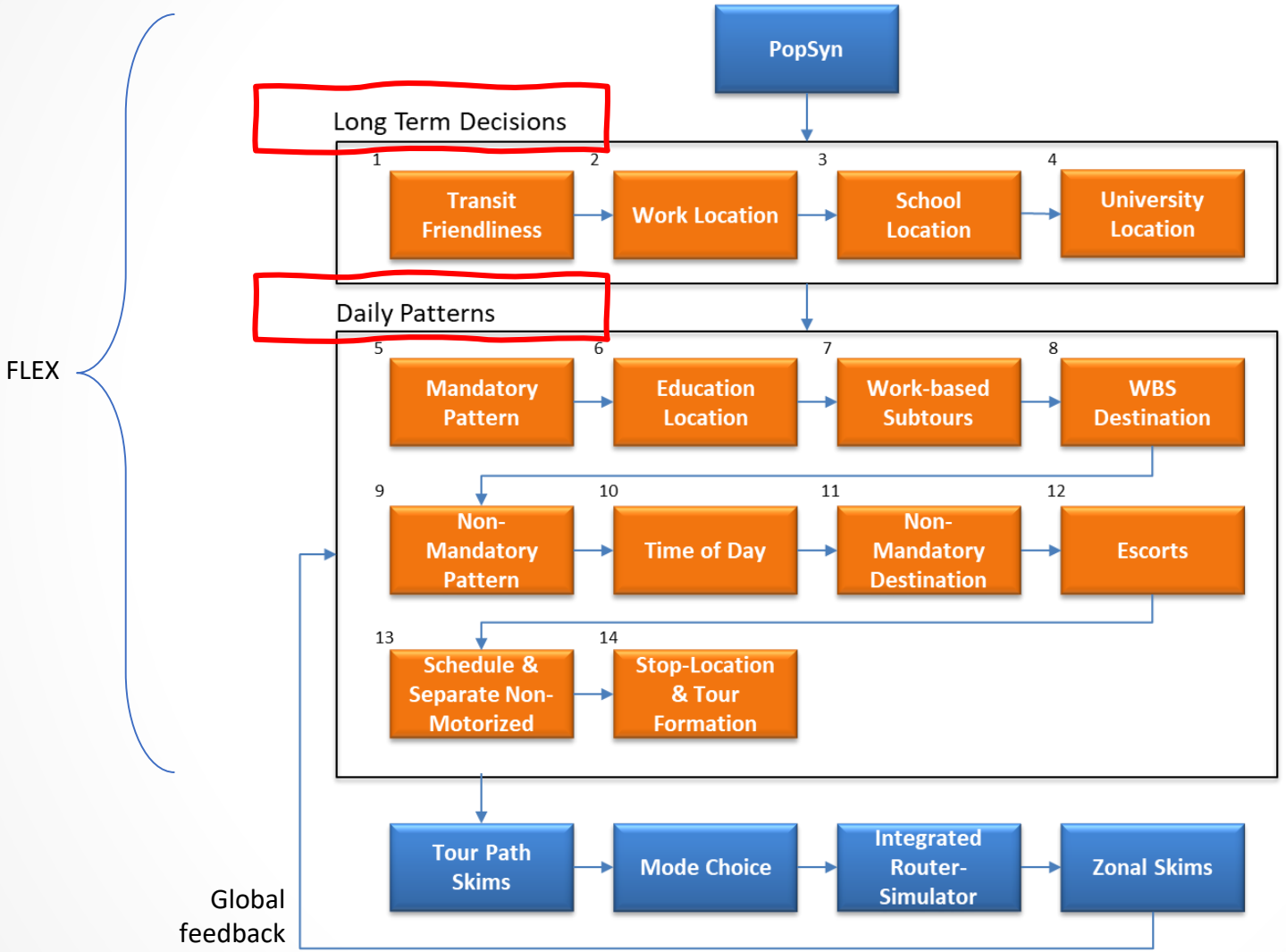


TransForM 3.0: Software

- FLEX: Estimation
  - Python-based Biogeme
  - Primarily multinomial logit models
- FLEX: Application
  - Python 3 (numpy, pandas, multiprocessing)
  - TRANSIMS 7.5 (C++)*
- PopSyn, ModeChoice
  - TRANSIMS 7.5 (C++) *
- DTA (Integrated Router + Simulator, …)
  - TRANSIMS 7.5 (C++) *

* 64-bit and multi-threaded

FLEX: Design



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FLEX: Submodels

1.	Transit Friendliness	: Fragments PERSONS into 3 bins
2.	Work Location	: Find workplace for every PERSON
3.	School Location	: Find schools for every qual. PERSON
4.	University Location	: Find Univs for every qual. PERSON
5.	Mandatory Pattern	: Identify # & order of mandatory activities
6.	Education Location	: Locations of other edu. act. eg: after-school
7.	Work-based Subtours	: Derive # of subtours associated with work
8.	WBS Destination	: Identify the destination of each subtour
9.	Non-Mandatory Pattern	: Identify the # & order of non-mandatory act
10.	Time of Day	: Assign a 15-min interval for start/arrive of act
11.	Non-Mandatory Destination	: Identify the destination of feasible NM acts
12.	Escorts	: Accommodate dependent ride trips
13.	Schedule & Non-motorized	: Separate non-motorized trips & form tours
14.	Stop Location & Form Tours	: Identify dest. TAZs for intermediate stops

Trips are identified by HHOLD-PERSON-TOUR-TRIP combinations

Preliminary Results

Model Results Comparison

Trip Purpose	HTS* (2007/2008)	TransForM (FLEX) (2007/2008)	Difference
Work	3,881,712	3,659,255	-5.7%
Other	8,724,291	8,770,458	0.5%

* See Table 1, Calibration Report for the TPB Travel Forecasting Model, Version 2.3, dated Jan 20, 2012, V2.3_Calibration_Report_v14.pdf. Trips from HTS are shown as half of home-based trips + Non-home trips for comparison with equivalent trips from FLEX.

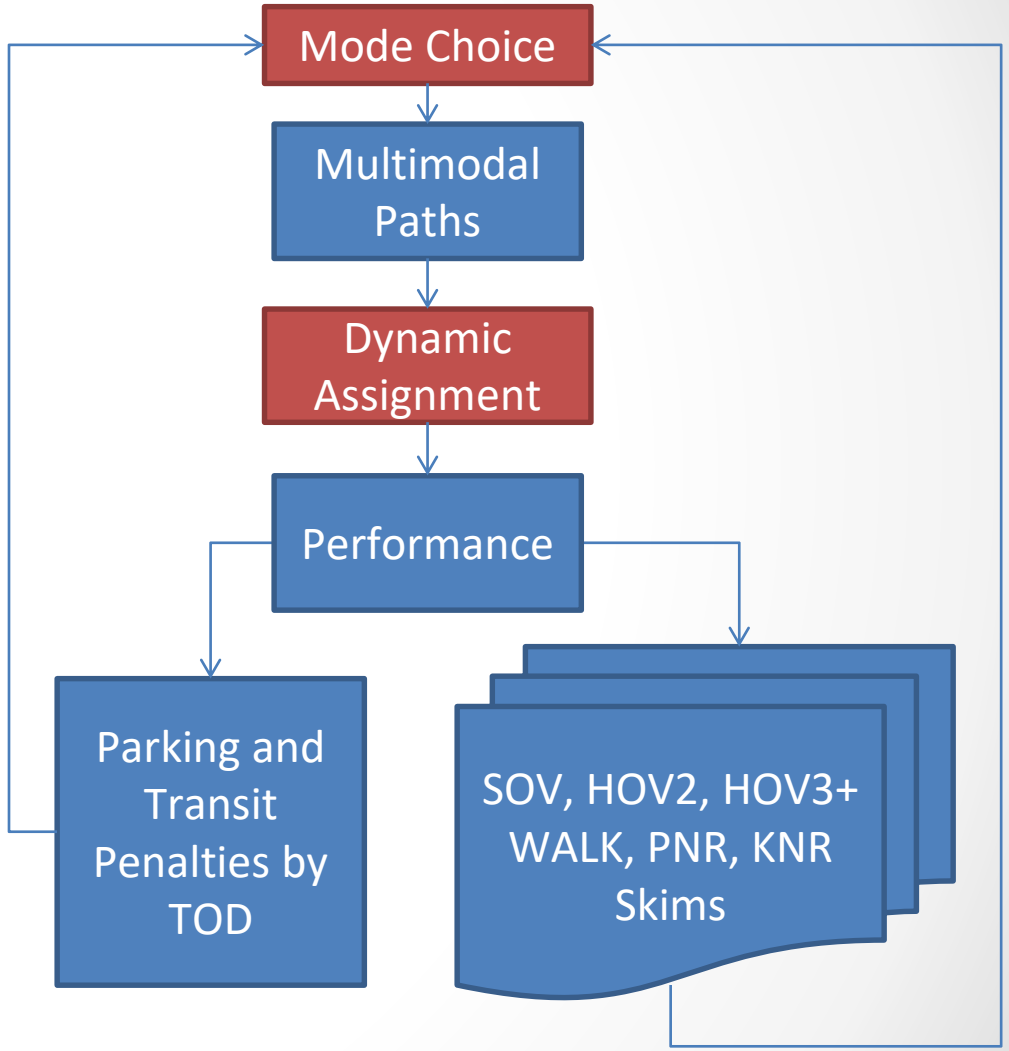
TransForM (FLEX) Results Breakdown

Trip Purpose	Count
Work	3,659,255
Return Trips	9,499,652
School	943,397
Education	39,487
Escort	1,101,947
Non-Mandatory	6,889,267
Work-base Subtours	739,757
TOTAL	**22,872,762**

= DRAFT results, subject to change

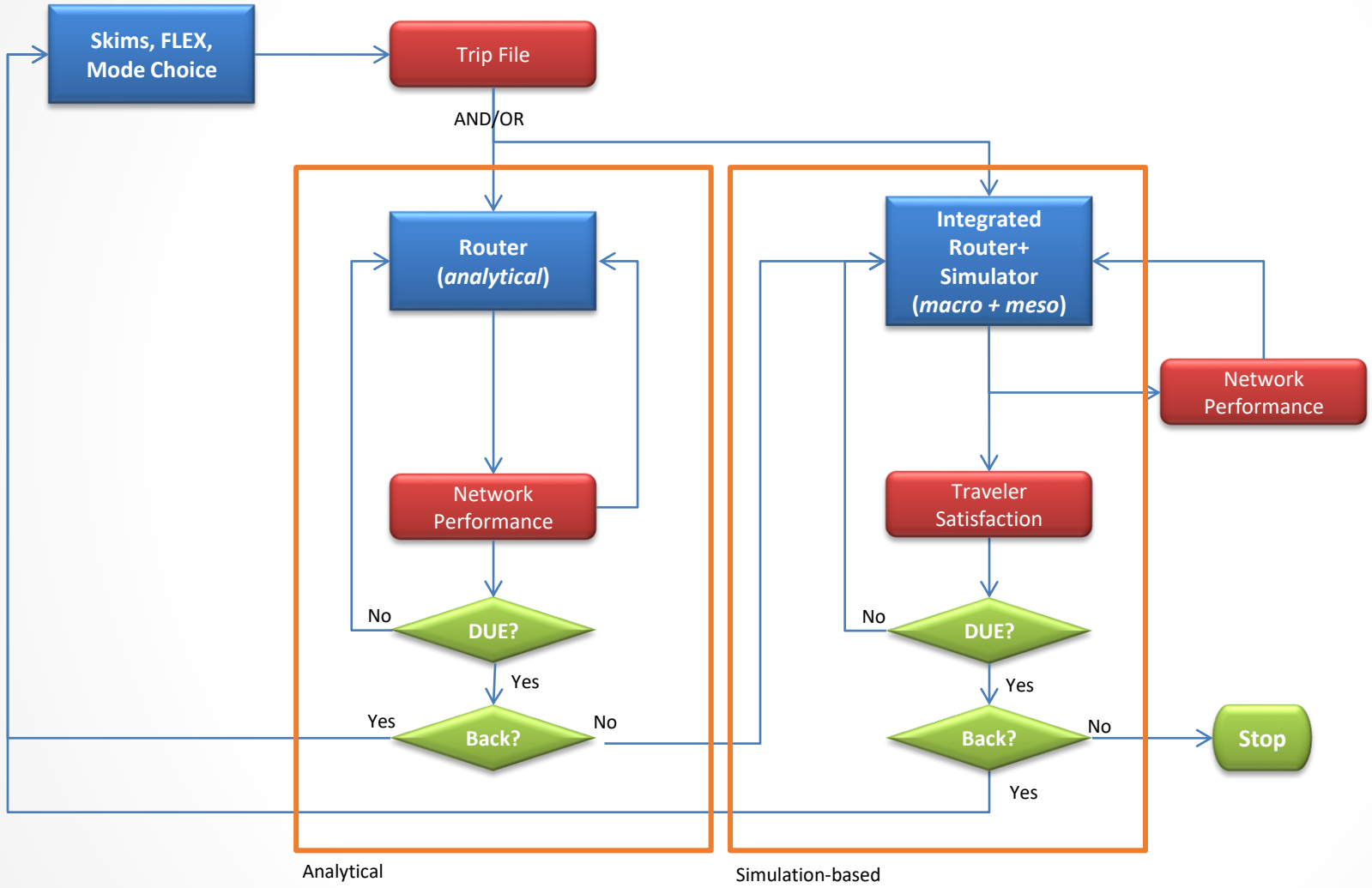
Skimming & Mode Choice

- Individual, time-dependent paths on "loaded network" for all modal alternatives
- 4 income categories for HBW, HBO, HBS tour purposes plus NHW, NHO, and MISC tours (*)
- Nested-logit Tour Mode Choice
  - Primary choice: DRIVE vs TRANSIT
  - DRIVE = SOV, HOV
  - HOV = HOV2, HOV3+
  - TRANSIT = WALK, PNR, KNR



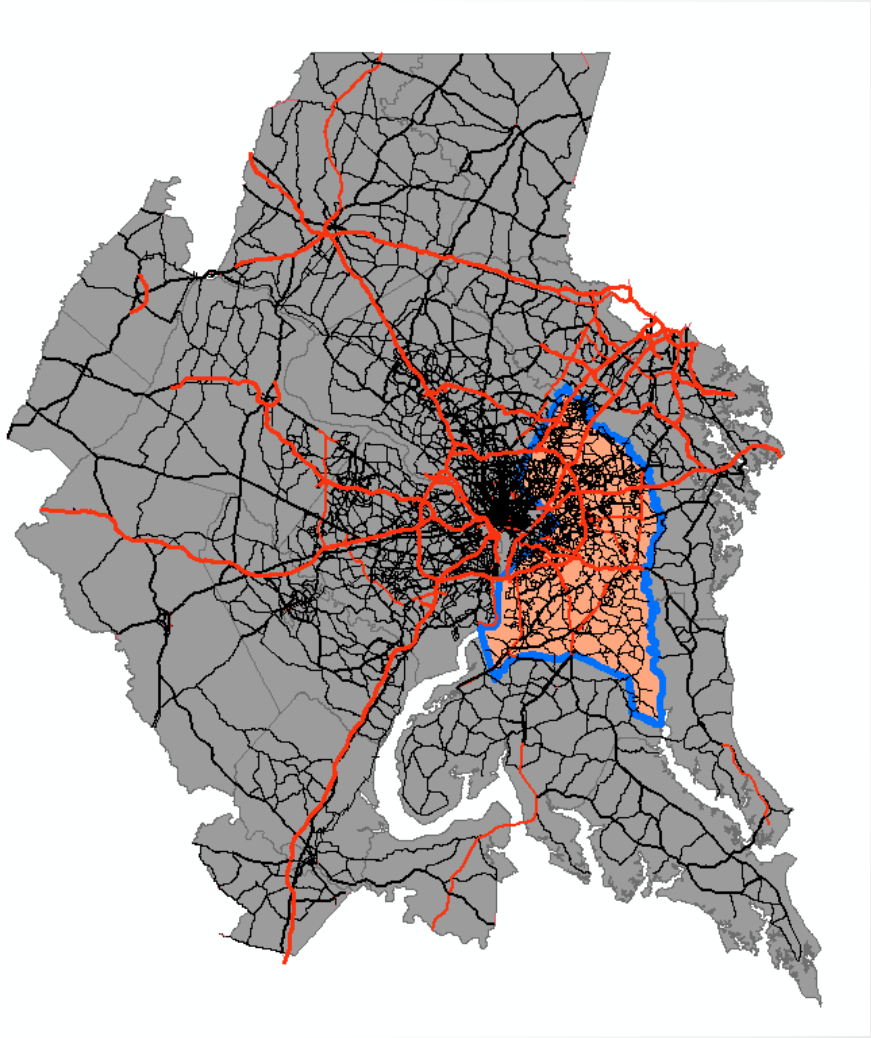
* TransForM 2.5, before integration with FLEX

DTA Application Options



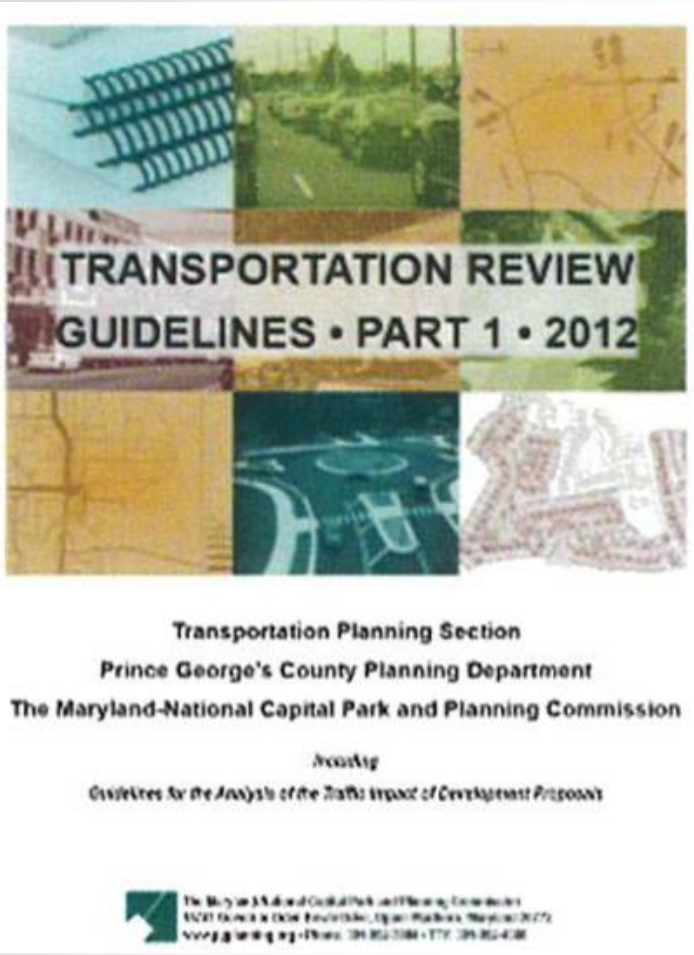
DTA: Multi-resolution Simulation

- Macro-scale simulation: Outside Prince George's County
- Meso-scale simulation: Inside Prince George's County
- Optional Micro-scale simulation: for select corridors or subareas



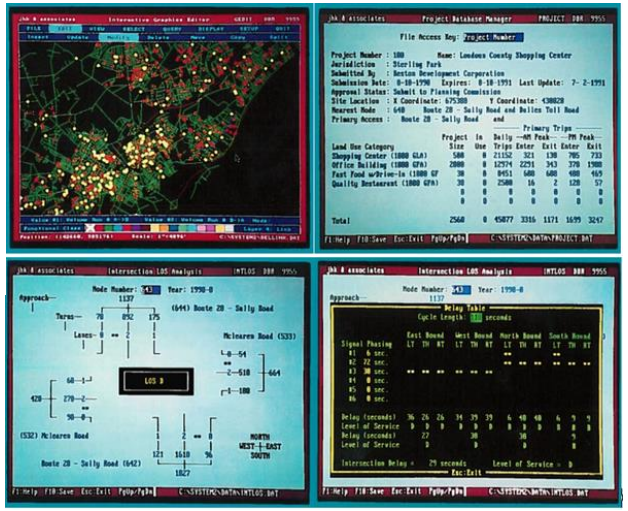
DTA Considerations

- Analytical:
  - 15-minute link, parking and transit capacities
  - 15-minute tolls on dynamically priced facilities
  - Time-of-day link-use restrictions (HOV, reversable lanes, parking/turn restrictions, etc.)
  - Time-constraints
- Simulation-based:
  - Link, parking, and transit capacities
  - Time-constraints
  - Vehicle types: regular and connected & automated
  - Intersection operations
  - Lane-use restrictions



Motivation for a Growth-Management System and Analysis Tool (GMSA)

- Solution to aid and assist staff in the review of transportation impacts from the development proposals

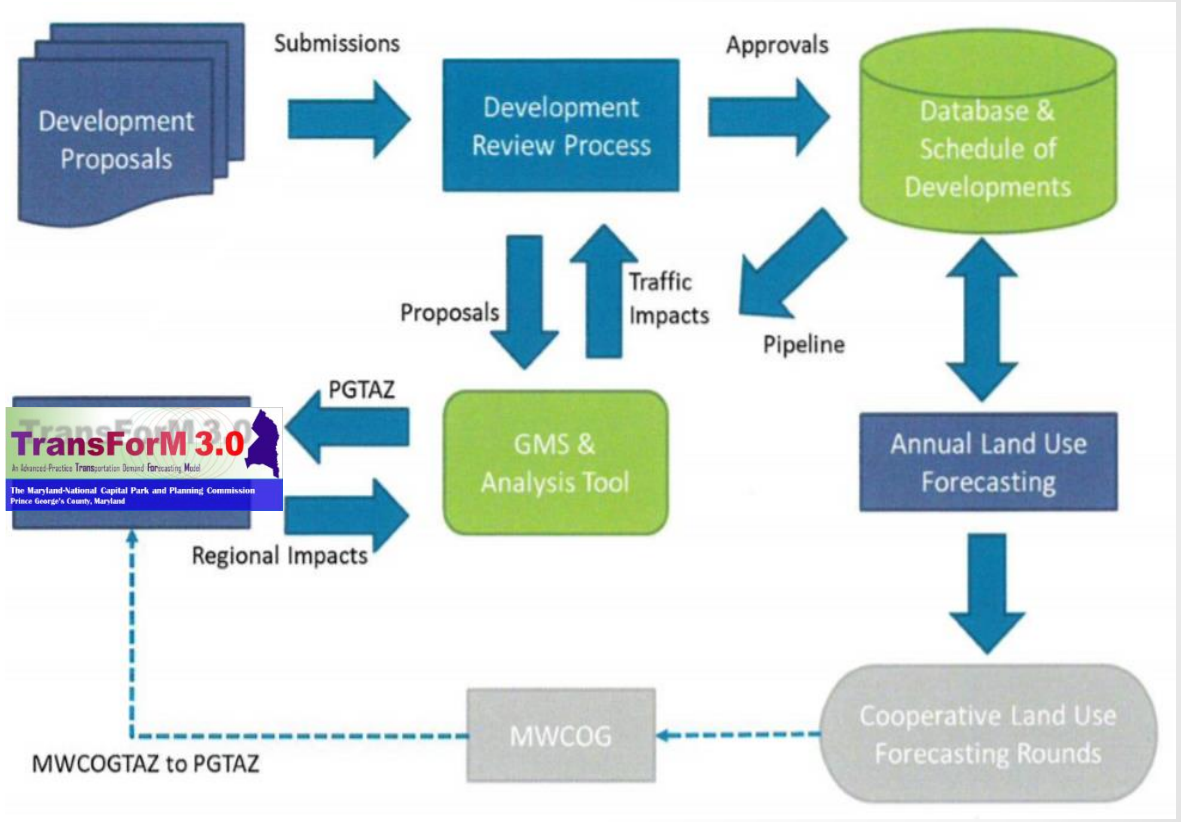


Current challenges include:

- Tracking background development & traffic
- Scoping the impact area
- Identifying distribution of trips at the preliminary evaluation stage
- Concurrent and modified applications

GMSA (contd.)

- Rely on existing systems (PGAtlas, DAMS, PAMS, and GIS layers) to identify background land use and network
- Ideally, development applications can be tracked through construction
- Identify good existing baseline that relates well with cooperative forecasts
  - 2020 Census, etc.



Team

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  - Manfredo Davila, Planner Coordinator / Project Manager
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  - Glen Burton, Planner Coordinator
  - Crystal Hancock, Planner Coordinator

- AECOM
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  - Karteek Allam

- Sub-consultants:
  - MCV & Associates Inc
  - Connetics Transportation Group
  - Gallop Corporation
  - Daniel Consultants, Inc
  - C&M Associates, Inc

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Feedback & Q/A

- Question to TFS:

  Do you have anything you would like to share with us with regards to the growth-management (development impacts) from the experience in your locality that might be helpful to us?

- Any questions for us?