Metro

Multi – Resolution Modeling To Evaluate Express Lane Pricing Strategies

VIRTUAL
2020 ^ Annual Meeting
Joint Western & Mountain Districts
Broadcast to you June 28 - July 1
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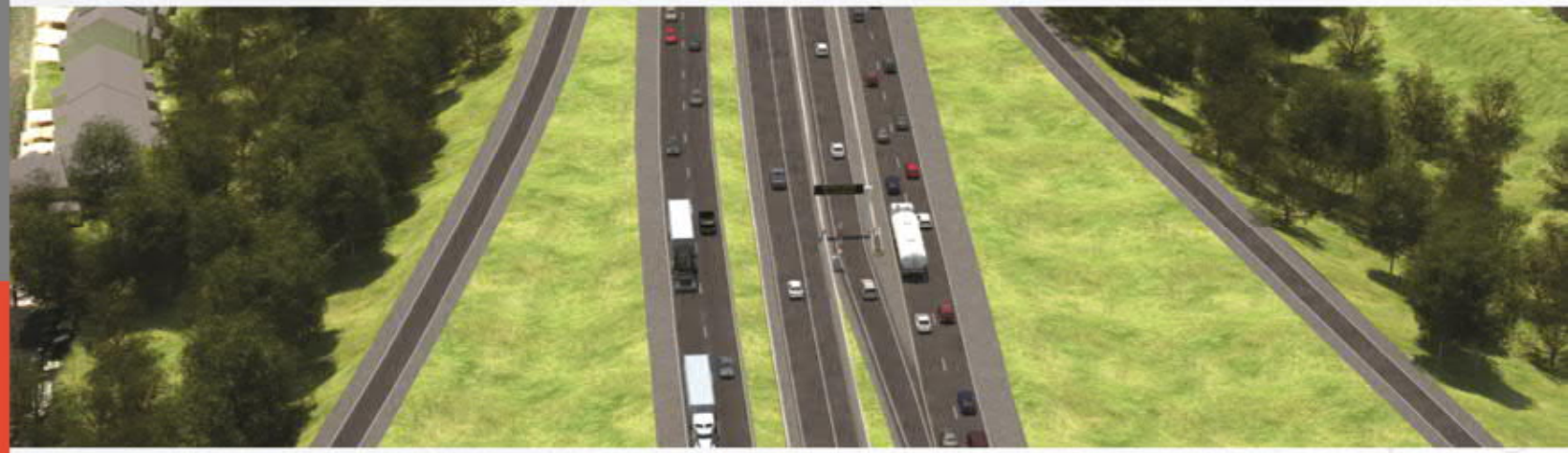


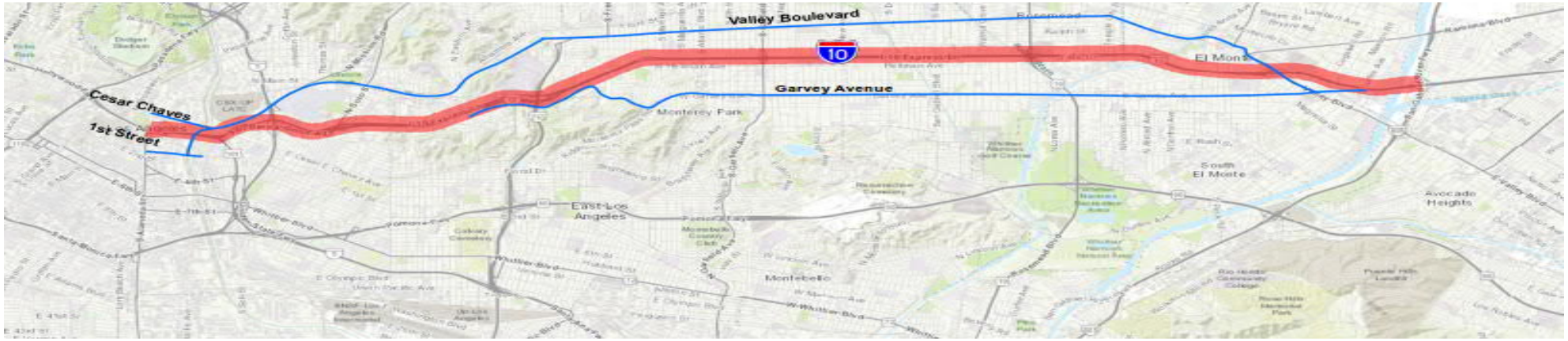
Presentation Overview

- Project background
- I-10 Corridor Study Area
- Analysis Framework
- Data Collection and Information Gathering
- Multi Resolution Modeling
- Benefits and Potential Applications

Project Background

- Los Angeles Metro currently operates two High Occupancy Toll (HOT) corridors in Los Angeles on I-10 and I-110, wherein vehicles that meet certain occupancy thresholds (i.e., High Occupancy Vehicles or HOVs) are granted free travel and all other vehicles pay tolls for access
- Metro is considering a pilot program wherein the occupancy requirements for toll-free travel would be increased. Potential conversion of HOT lanes to Express Toll Lanes (ETL) to address congestion on I-10
- Perform Multi-Resolution Modeling coupled with a custom Toll Optimization Model (TOM) to understand the potential impacts and outcomes associated with the conversion of the I-10 ExpressLanes to ETL

I-10 Corridor Study Area

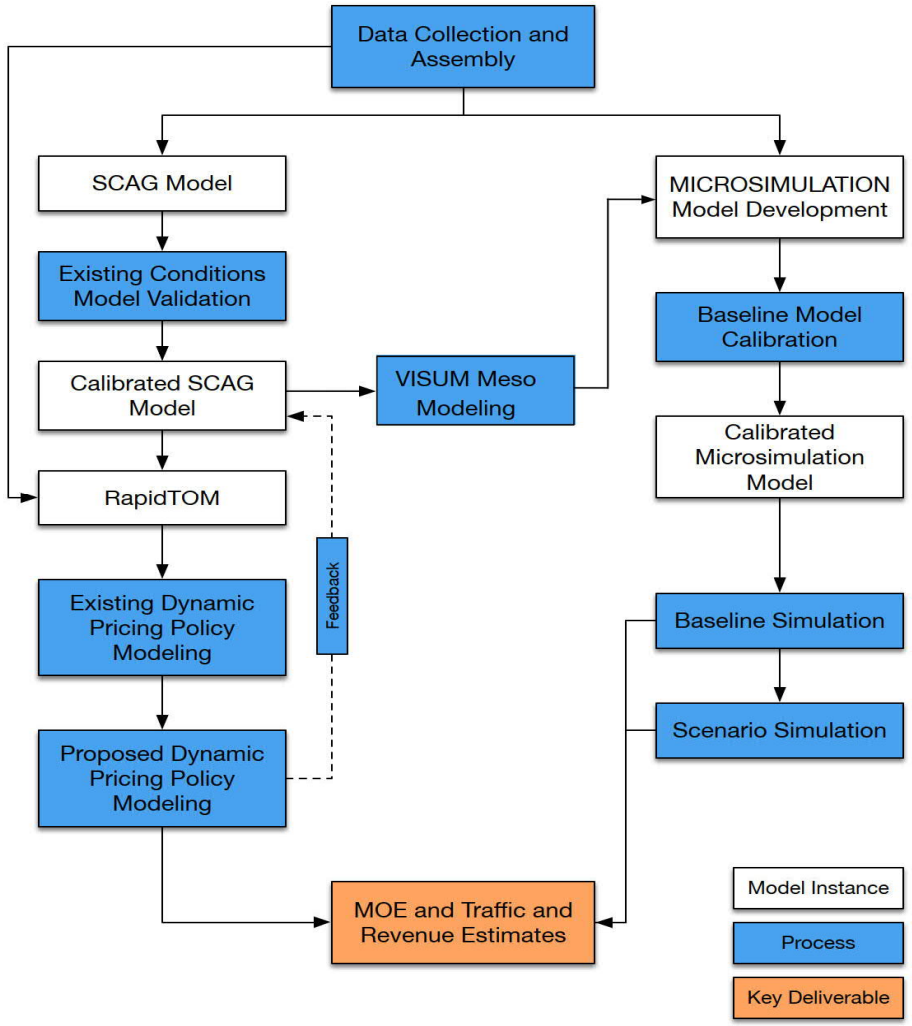


San Bernardino freeway & El Monte Busway between Alameda St and I-605 (14.2 miles) include:

- Four freeway interchanges - US 101, I-5, I-710, and I-605
- Valley Blvd/Mission Rd between 1st St. and Garvey Ave
- Garvey Ave/Ramona Rd between Eastern Ave and Durfee Ave
- Cesar Chaves Ave and 1st St between Mission Rd and Alameda St
- All arterials that connect the freeway entrances/exits to the above three arterials

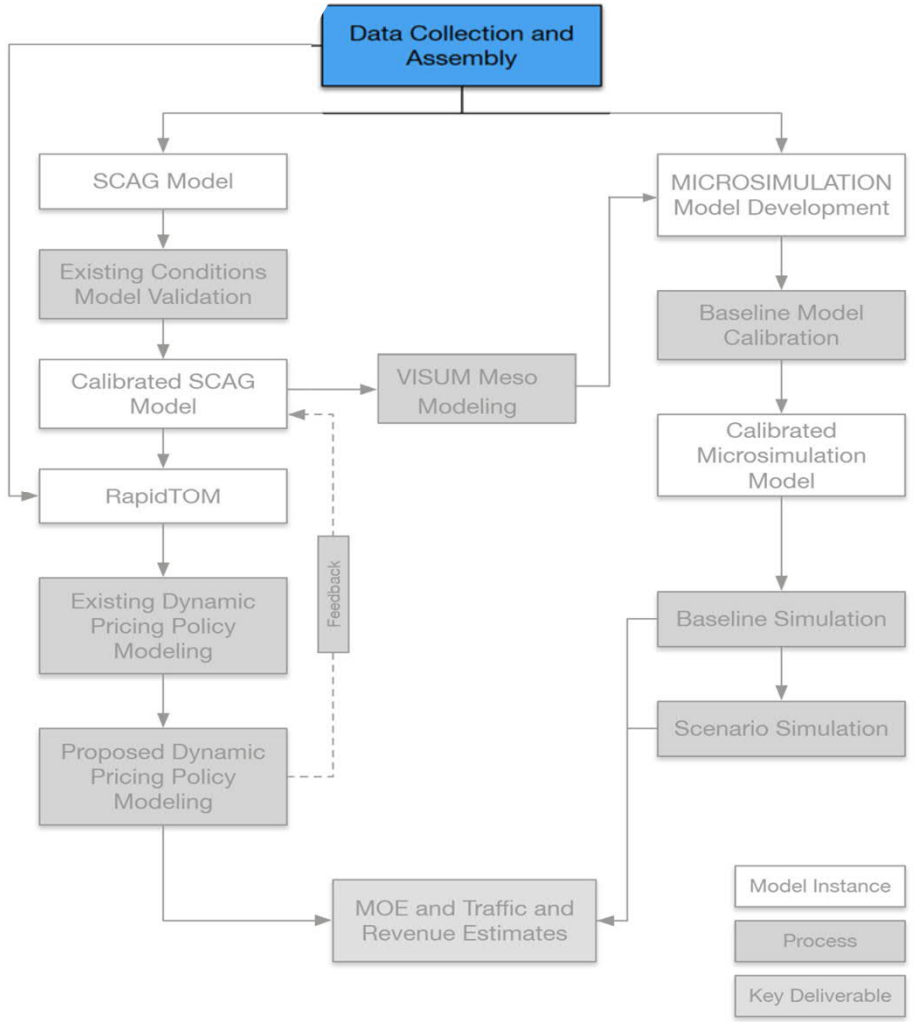
Analysis Framework

- Step 1: Calibration of mainline models to mimic current operations
- Step 2: Compare mainline response for baseline vs. new toll policy
- Step 3: Multi resolution modeling of I-10 corridor to generate and compare MOEs for Baseline vs. New Toll Policy



Data Collection and Information Gathering

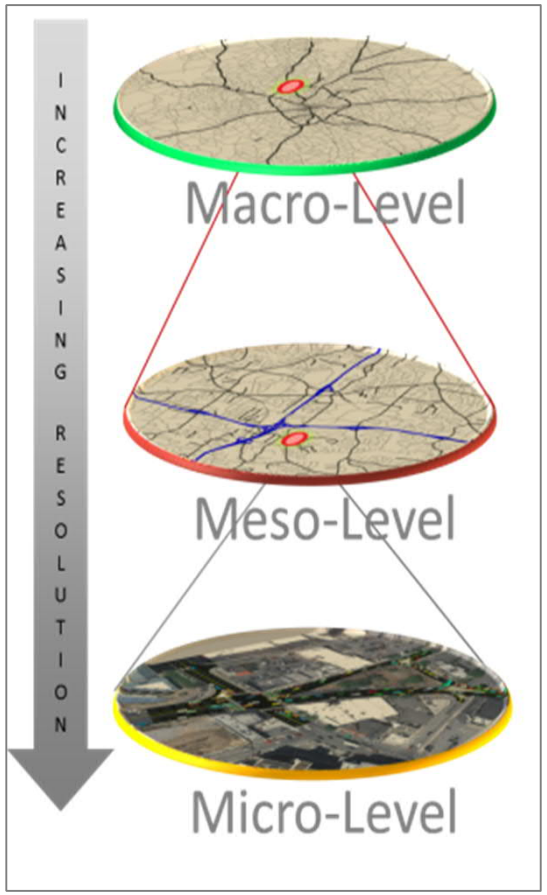
- Freeways
  - Volume and Speed data – (Caltrans & PeMs)
  - Mode Split Data – from 2016 Managed Lane Annual Report (Caltrans)
  - As-builts – (Metro)
- Ramps
  - Ramp meter Timing Plans – (Metro)
- Arterials
  - Volume and Speed Data – (Metro)
- Other Data Sources
  - Origin-Destination – (SCAG 2016 RTP/SCS Travel Demand Model)
  - Probe Vehicle Travel Time Data – (Metro)
  - Toll Data – (Metro)
  - Dynamic Pricing Data – (Metro)



Multi-Resolution Modeling

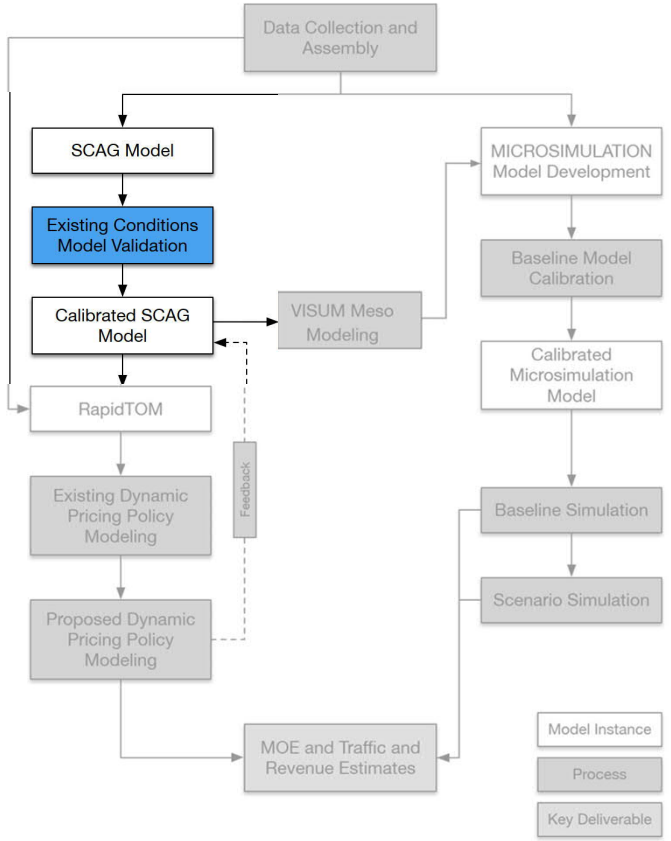
A multi-tier approach modeling allows for more efficient and realistic traffic modeling by combining the strengths of each individual model type:

- Macroscopic model layer allows for mode choice modeling and accounts for traffic diversion at a macro level outside the microsimulation model zone
- Mesoscopic model layer enables more rapid modeling of dynamic traffic assignment than a conventional microsimulation model, with minimal loss of accuracy
- Microscopic model layer provides the precise modeling fidelity necessary to capture effects of operational performance



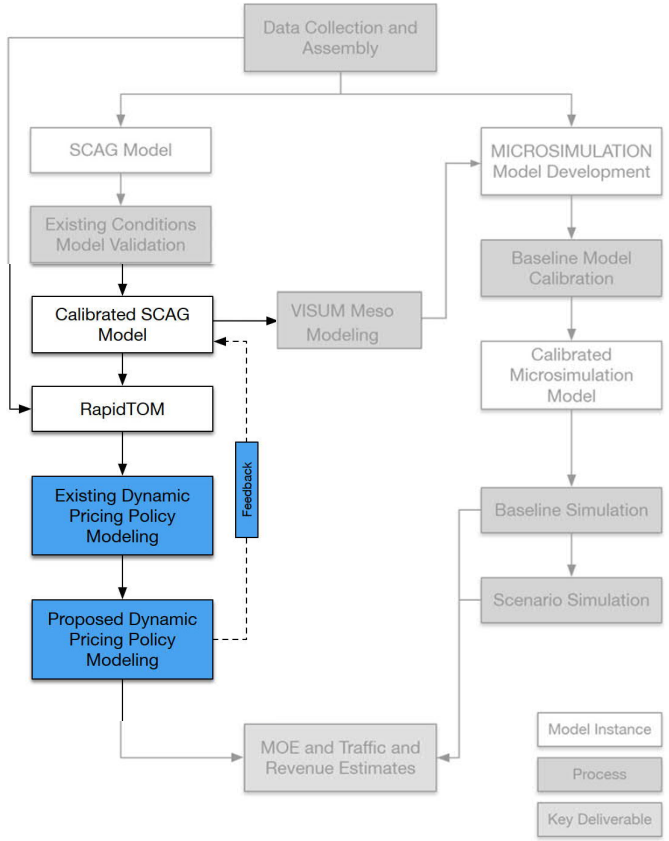
SCAG Travel Demand Model

- Ran SCAG Regional Model 2018
- Subarea analysis
  - Identified network links to be included in subarea
  - Ran multi-modal subarea analysis to extract subarea networks and matrices
- Subarea model validation to match observed data
- Applied partitioning factors to validated matrices to get matrices for each 30-min interval



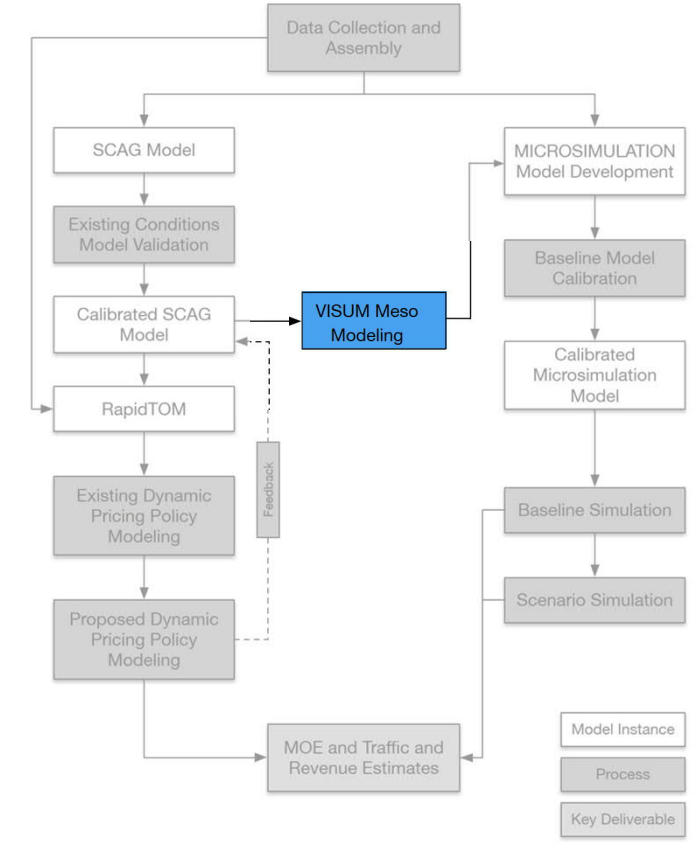
Toll Optimization Model (TOM)

- TOM traffic and revenue model was calibrated to existing operating conditions
- The new toll policies were then implemented in TOM, which involved changing the eligibility of previously-exempt vehicles classes
- The tolls solved after application of the new tolling policy parameters in TOM were fed back, by link, to the SCAG Model
- The SCAG Model was then rerun, yielding new demand estimates for the affected links
- The new demand estimates were applied to the mainline corridor links and re-run through the TOM process



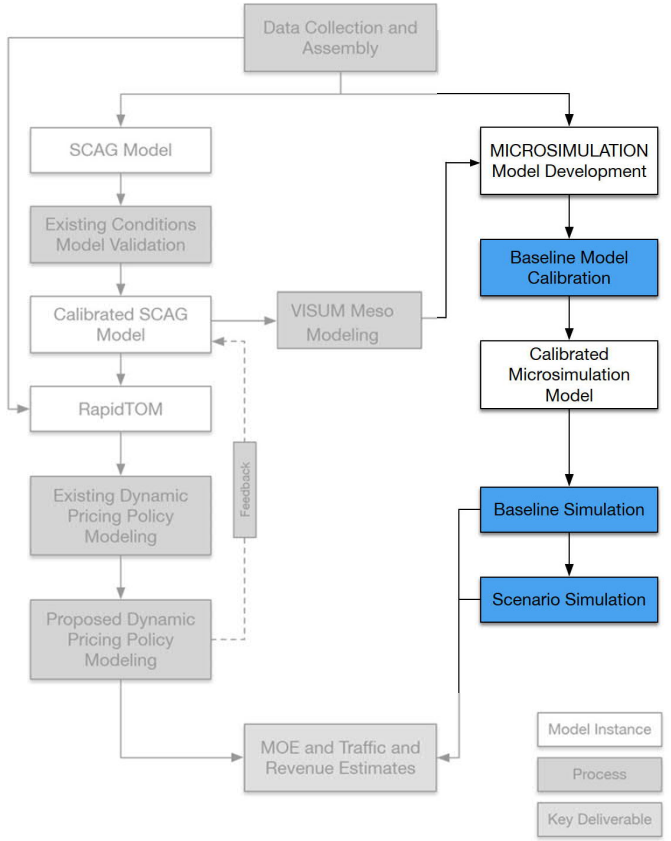
Visum Subarea DTA Modeling

- PeMS Traffic volume data were entered into the Visum DTA model
- Origin Destination trip tables at 30 minutes interval derived from the SCAG travel demand model and toll rates were fed into the Visum model
- The trip tables within Visum were then adjusted based on the PeMS volumes
- Simulation based dynamic traffic assignment was then performed in Visum to determine the shortest paths by vehicle class
- These paths by vehicle class were then translated from Visum to Vissim to perform existing conditions and new toll policy change scenario simulations



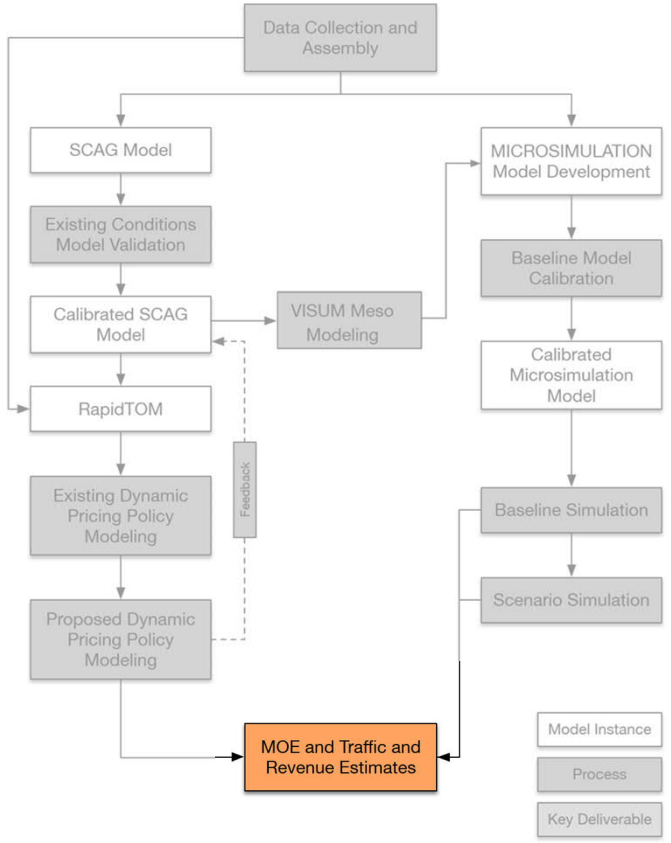
Vissim Microsimulation Modeling

- In order to calibrate the baseline conditions Vissim model, data was assembled from two, key sources:
  - Traffic volume and speeds data from PeMS counter data at 30-minute intervals, by segment
  - OD data and paths by vehicle class in 30-minute increments from Visum DTA modeling
- The calibrated baseline model was then used as a base to develop the Vissim model for the new toll policy
- Performance metrics were then utilized to compare and assess impacts of the potential new toll policy scenario on the I-10 corridor



Measures of Effectiveness (MOEs)

- MOEs included both vehicle-related MOEs and person-related MOEs as follows:
  - Travel Times
  - Speeds
  - Vehicle miles traveled
  - Vehicle hours traveled
  - Vehicle hours of delay
  - Emissions
  - Fuel Consumption
  - Person Miles Traveled
  - Person Hours Travelled
  - Person Hours of Delay
  - ExpressLanes Person Throughput
- TOM modeling analysis results included:
  - Annual Gross Revenue Estimates
  - Annual Aggregate User Cost Estimate



Benefits and Potential Applications

WSP team has demonstrated the value and feasibility of this framework through this project for Metro's pilot analysis.

- Benefits of this approach
  - This approach allowed for rapid evaluation of policy outcomes while maintaining a high degree of precision, and established a framework that may be transferrable to similar types of analyses on other corridors in the future
  - Links a demand-responsive pricing model to the simulation
  - Significantly shortens time required to run simulation by relying on mesoscopic model for dynamic traffic assignment and microscopic model for high-resolution performance assessment

- Ideal applications
  - Projects involving congestion pricing or demand-responsive pricing
  - Projects where mode shift is anticipated (for example, increasing carpool occupancy requirements)
  - Projects where results are needed in months, not years (for example, prioritized or accelerated projects)

Questions

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Thank You

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