What is VMT and why is it important?

- VMT = Vehicle Miles Traveled
- Distance traveled by all automobile trips traveling to or from a specific development (per land use)
- New transportation metric for California Environmental Quality Act (CEQA)
  - Replaces LOS as of today
  - Utilizing ratios to negate affect of project size (e.g., VMT per capita and VMT per employee)
- Key input into Air Quality and Greenhouse Gas (GHG) evaluations
How is VMT typically calculated?

- Manual calculations
  - Total of all vehicle trips x average trip length
- Sketch models
  - Accounts for demographics/project characteristics/project location
- Travel demand models
  - Based on mode split and origin/destination projections; calculated trip lengths between O/D pairs
How accurate are VMT calculations using a model?

- **City model**
  - Typically does not contain all zones in the travel shed
  - Need to average/approximate trip percentage and trip lengths for external trips

- **County/regional model**
  - Many not have complete local roadway network
  - Generally larger zones which minimizes localized land use patterns

- **All models**
  - Cannot account for project-specific design features
  - Cannot account for location and surrounding land use context
Why do VMT calculations need to be accurate?

- CEQA purposes
  - Impacts are based on whether a project’s VMT is under the applicable significance threshold
  - VMT over the threshold triggers additional environmental review and need for mitigation
  - Mitigation typically done by implementation of TDM measures, measured in terms of trip reduction (number of vehicle trips)

- Used to determine the applicable VMT thresholds, calculating VMT for individual projects, and assessing benefit of mitigations
What can be done to improve accuracy?

- Utilize Big Data to refine modeling process
  - Include within model to improve validation
  - Apply outside model as part of post-processing process
- Requires review and selection of most appropriate datasets
  - Cost/schedule
  - Ease of use
  - Black box processes
  - Validation targets
  - Sampling size
Can you provide a case study?

- City of Glendale citywide travel demand model
- City model based on larger regional model
- Identified series of internal, border and external zones
- Internal and border zones had modeled trip lengths
- External zones had estimated trip distances (centroid to centroid)
- City wanted to ensure that trip lengths were validated, especially for trips to/from border and external zones
- Used Streetlight Data to review distribution of trips and average trip lengths
What was the validation process?

- Established a series of 12 internal/border origin/destination zones, plus 18 external zones
- Obtained origin/destination data for weekdays for one calendar year
- Established 20 key gateways (main access roadways)
- Used Streetlight Data parameters to determine residential and employment trip ends
- Calculated average distance between O/D zones from actual point-to-point lengths from individual trips
Internal/border zones
External zones
What were the results of the local validation test?

- Compared to current city model:
  - Trips at northwest (1) and southwest (12) corners of the city had trips shorter than projected
    - Model = 17 miles
    - Streetlight = 12 miles
    - Difference of 5 miles = ~30% too high
    - Likely a result of missing roadways in the network
What were the results of the regional validation test?

- Compared to regional model and employer-household Census data:
  - Home-based work trips were concentrated locally instead of spread throughout region
    - Local employment centers: 64% of trips compared to 45% / 26%
    - Regional (external zones): 3% of trips compared to 17% / 17%

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What else can be done with these types of data sources?

- Model validation
  - Trip distribution (percentage of trips between O/Ds)
  - Better approximation of “typical” conditions
- Post-processing model results
  - Seasonality
  - Hourly distribution
- Refine VMT for special cases
  - Unique uses/special generators
  - Synergistic uses
  - Concentrated uses within large zones
What is Big Data best used for?

- Improve the validation of travel demand models
  - Refined OD data
  - More accurate VMT information
  - Determination of impacts
  - Level of mitigation required
- Develop post-processing factors
- Refine VMT estimates for “unique” uses or special cases
- Increase the robustness of the validation counts
- Verify conditions between model updates
What about lessons learned or things to look out for?

- Chained trips are not broken up (e.g., drive-thru or drop-off/pick-up)
  - Stops less than a given duration (4 min) are not a separate trip
- “Hidden” regional uses are overestimated
  - May project longer than anticipated trip lengths for underserved markets (e.g., markets near resorts)
- Can have high margins of errors at a site-specific level
  - Not all driveways/turn-restrictions accounted for
  - Small roads have lower volumes/smaller sample size
What do I do if I have questions?

- Ask them now
- Contact:
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