VMT Calculator - Using TDF Model to Build Sketch Models for Land Use Review
SCAG Modeling Task Force Meeting
March 24, 2021

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Tom Gaul, Fehr & Peers
Outline

• Why VMT?

• What is the LA VMT Calculator?

• How does the VMT Calculator relate to the City of LA travel demand model and the SCAG travel demand model?

• Next steps
California Senate Bill (SB) 743

• State OPR issued final guidance December 2018

• Los Angeles City Council adopted VMT July 30, 2019

• New projects must analyze transportation impacts with VMT and reference the updated LADOT Transportation Assessment Guidelines

• State deadline to comply was July 1, 2020
VMT is Aligned with State & Local Goals

- Reduction in GHGs
- Multimodal mobility networks
- Diversity of land uses
- Mobility Plan 2035 and LA’s Green New Deal goals
New Metric: Vehicle Miles Traveled (VMT)

Number of automobile trips \times \text{Number of miles driven} = \text{Vehicles Miles Traveled}
### Former Metric: Relied on Vehicle Delay

<table>
<thead>
<tr>
<th>Development Review Metric</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Service (LOS)</td>
<td>A (Free Flow)</td>
</tr>
<tr>
<td>Vehicle Miles Traveled (VMT)</td>
<td>High</td>
</tr>
</tbody>
</table>

![Map of residential area with a circular zone marked]
New Metric: VMT Supports Location Efficiency

<table>
<thead>
<tr>
<th>Development Review Metric</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Service (LOS)</td>
<td>F (Delay)</td>
</tr>
<tr>
<td>Vehicle Miles Traveled (VMT)</td>
<td>Low</td>
</tr>
</tbody>
</table>

New development in area with land-use diversity
Los Angeles’ Approach

Developed local VMT thresholds that are lower than the region’s to align with LA Mobility Plan 2035 goals to decrease VMT within the City

<table>
<thead>
<tr>
<th>Geography</th>
<th>VMT per capita</th>
<th>VMT per employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCAG</td>
<td>17.2</td>
<td>21.3</td>
</tr>
<tr>
<td>City of LA</td>
<td>9.3</td>
<td>12.9</td>
</tr>
</tbody>
</table>
Los Angeles’ Approach

Developed local VMT thresholds that are context sensitive

<table>
<thead>
<tr>
<th>Area Planning Commission</th>
<th>VMT per capita</th>
<th>VMT per employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>6.0</td>
<td>7.6</td>
</tr>
<tr>
<td>East LA</td>
<td>7.2</td>
<td>12.7</td>
</tr>
<tr>
<td>Harbor</td>
<td>9.2</td>
<td>12.3</td>
</tr>
<tr>
<td>North Valley</td>
<td>9.2</td>
<td>15.0</td>
</tr>
<tr>
<td>South LA</td>
<td>6.0</td>
<td>11.6</td>
</tr>
<tr>
<td>South Valley</td>
<td>9.4</td>
<td>11.6</td>
</tr>
<tr>
<td>West LA</td>
<td>7.4</td>
<td>11.1</td>
</tr>
</tbody>
</table>
Los Angeles’ Approach

Developed VMT Calculator to analyze project impacts
- Requires address, use and intensity inputs
- Estimates daily trips and VMT
- Reports significant impacts
- Allows selection of VMT-reducing mitigation measures and calculates effectiveness
Affordable housing & mixed use vehicle trip adjustments

Localized trip generation rates & VMT

Travel Demand Forecasting (TDF) Model
VMT Calculator Trip Generation

- Starts with ITE trip generation factors
- Calculator applies US EPA MXD methodology to consider various socioeconomic and built environment factors, including:
  - Relative number of residents and jobs
  - Density of development
  - Walking and driving connectivity
  - Availability of transit
  - Convenient trip destinations within immediate area
  - Vehicle ownership
  - Household size

7Ds That influence Trip Generation (and VMT)
VMT Calculator Trip Generation

- Custom trip rates developed from local vehicle trip data collected for 42 affordable housing sites in the City

- Calculator validated to local vehicle trip data collected at the 42 affordable housing sites plus 51 market-rate housing, office, and mixed-use sites in the City
VMT Calculator Relation to Travel Demand Model

- Calculator obtains the following inputs to the MXD model from the LA travel demand model:
  - Intersections per square mile
  - Population within one mile
  - Employment within one mile
  - Vehicles per household
  - Transit mode splits by trip purpose
VMT Calculator Relation to Travel Demand Model

- Calculator obtains vehicle trip lengths by trip purpose from the LA travel demand model for VMT calculation
  - HBW, HBO & NHB Productions
  - HBW, HBO & NHB Attractions

- Trip length data averaged for the TAZ and TAZs within ⅛ mile of the project
City of LA Travel Demand Model

- Subregional child of SCAG RTP/SCS 2016 model
- Used by City as part of Community Plan update process
- Used by City to evaluate transportation system improvements
- Provides inputs to VMT Calculator
Redefined the model’s network and transportation analysis zones (TAZ)

- Imported the City’s street network file
- Further detailed the transit network
- Redefined SCAG’s TAZ layer based on the City’s arterial network
- Provides more detailed route choice to inform accurate VMT output

<table>
<thead>
<tr>
<th>Zone ID</th>
<th>Zone Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7</td>
<td>Mega region buffers</td>
</tr>
<tr>
<td>8-12</td>
<td>Spare</td>
</tr>
<tr>
<td>13-4029</td>
<td>Focus area</td>
</tr>
<tr>
<td>4030-4109</td>
<td>Spare</td>
</tr>
<tr>
<td>4110-4149</td>
<td>External stations</td>
</tr>
<tr>
<td>4150-4161</td>
<td>Airport</td>
</tr>
<tr>
<td>4162-4192</td>
<td>Seaports</td>
</tr>
</tbody>
</table>
Used big transportation data to validate trip length estimation

- Calibrated trip distribution using empirical origin destination (O-D) data
- Validated with archival 24-hr loop detector data
VMT Mitigation Measures: TDM

**Parking Management**
- Reduce parking supply
- Unbundle parking
- Parking cash-out
- Price workplace parking
- Residential area parking permits

**Transit**
- Reduce transit headways
- Neighborhood shuttle
- Transit subsidies

**Education & Marketing**
- Voluntary travel behavior change program
- Promotions & marketing

**Commute Trip Reductions**
- Required commute trip reduction program
- Alternative work schedules/telecommute
- Vanpool or shuttle
- Rideshare

**Shared Mobility**
- Car share
- Bike share
- School carpool

**Bicycle Infrastructure**
- Improve bicycle facility
- Bike parking
- Secure bike parking & showers

**Neighborhood Enhancement**
- Traffic calming improvements
- Pedestrian improvements
VMT Mitigation Measures: TDM

Quantifying TDM Effectiveness

- TDM effectiveness based primarily on research in CAPCOA’s Quantifying GHG Mitigation Measures report
- Classified the City into four Travel Behavior Zones (TBZ) informed by six factors that inform travel in the built environment
- Aligned with CAPCOA Location Settings

Map Legend

- Metro Fixed Guideway Station

Travel Behavior Zones

- Suburban (15% VMT Reduction Cap)
- Suburban Center (20% VMT Reduction Cap)
- Compact Infill (40% VMT Reduction Cap)
- Urban (75% VMT Reduction Cap)
### VMT Mitigation Measures: TBZ Factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population density</td>
<td>American Community Survey</td>
</tr>
<tr>
<td>Daytime population density</td>
<td>Census &amp; American Community Survey</td>
</tr>
<tr>
<td>Land use diversity score</td>
<td>LA County Assessor tax roll</td>
</tr>
<tr>
<td>Intersection density</td>
<td>LA BOE street centerline</td>
</tr>
<tr>
<td>Distance to nearest fixed guideway bus stop or rail station</td>
<td>Metro</td>
</tr>
<tr>
<td>Distance to nearest major bus stop</td>
<td>Metro</td>
</tr>
</tbody>
</table>

**Suburban**
- Low population density
- Low daytime population density
- Homogenous land uses
- Low intersection density
- Long distance from fixed guideway bus stop or station
- Long distance from nearest major bus stop

**Suburban Center**

**Compact Infill**

**Urban**
- High population density
- High daytime population density
- Heterogenous land uses
- High intersection density
- Short distance from fixed guideway bus stop or station
- Short distance from nearest major bus stop

TBZ = 0.25 * z-pop density + 0.25 * z-daytime pop density + 0.24 * z-lu diversity score + 0.23 * z-int density + -0.5 * z-distance to BRT/rail station + -0.25 * z-distance to major bus stop
VMT Calculator Dashboard

CITY OF LOS ANGELES VMT CALCULATOR Version 1.3

Project Information

- **Project:** Sample Project
- **Scenario:** Sample
- **Address:** 200 N SPRING ST, 90012

TDM Strategies

- **Max Home Based TDM Achieved?**
  - Proposed Project: No
  - With Mitigation: No
- **Max Work Based TDM Achieved?**
  - Proposed Project: No
  - With Mitigation: No

Analysis Results

- **Proposed Project**
  - Daily Vehicle Trips: 3,832
  - Daily VMT: 28,666
  - Household VMT per Capita: 4.0
  - Work VMT per Employee: 9.6

- **With Mitigation**
  - Daily Vehicle Trips: 3,532
  - Daily VMT: 26,259
  - Household VMT per Capita: 3.4
  - Work VMT per Employee: 7.4

Proposed Project Land Use Type

- **Value**
  - Housing | Multi-Family: 450 DU
  - Retail | General Retail: 20 ksf
  - Retail | High-Turnover Sit-Down Restaurant: 20 ksf
  - Office | General Office: 100 ksf
  - Housing | Affordable Housing - Family: 50 DU

Residential Area Parking

- **Permits**
  - Proposed Project: 200
  - Mitigation: cost (dollar) of annual permit

Significant VMT Impact?

- **Household:**
  - No
  - Threshold: 6.0
  - 15% Below APC
- **Work:**
  - Yes
  - Threshold: 7.6
  - 15% Below APC
  - No
  - Threshold: 7.6
  - 15% Below APC
## VMT Calculator Report Sample

### CITY OF LOS ANGELES VMT CALCULATOR
#### Report 4: MXD Methodology

**Date:** July 9, 2019  
**Project Name:** Sample Mixed-Use Project in Panorama  
**Project Scenario:**  
**Project Address:**  
**Version:** 1.0

### MXD Methodology - Existing Without TDM

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted Trips</th>
<th>MXD Adjustment</th>
<th>MXD Trips</th>
<th>Average Trip Length</th>
<th>Unadjusted VMT</th>
<th>MXD VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Based Work Production</td>
<td>677</td>
<td>-21.1%</td>
<td>534</td>
<td>8.7</td>
<td>5,857</td>
<td>4,641</td>
</tr>
<tr>
<td>Home Based Other Production</td>
<td>1,813</td>
<td>-30.2%</td>
<td>1,266</td>
<td>5.6</td>
<td>10,214</td>
<td>7,137</td>
</tr>
<tr>
<td>Non-Home Based Other Production</td>
<td>822</td>
<td>-10.7%</td>
<td>734</td>
<td>7.6</td>
<td>6,248</td>
<td>5,585</td>
</tr>
<tr>
<td>Home-Based Work Attraction</td>
<td>1,305</td>
<td>-16.5%</td>
<td>2,089</td>
<td>14.5</td>
<td>18,936</td>
<td>15,821</td>
</tr>
<tr>
<td>Home-Based Other Attraction</td>
<td>2,137</td>
<td>-30.0%</td>
<td>1,495</td>
<td>5.2</td>
<td>11,027</td>
<td>7,722</td>
</tr>
<tr>
<td>Non-Home Based Other Attraction</td>
<td>1,004</td>
<td>-10.4%</td>
<td>900</td>
<td>9.8</td>
<td>9,808</td>
<td>8,792</td>
</tr>
</tbody>
</table>

### MXD Methodology with TDM Measures

#### Proposed Project

<table>
<thead>
<tr>
<th></th>
<th>TDM Adjustment</th>
<th>Project Trips</th>
<th>Project VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Based Work Production</td>
<td>0.0%</td>
<td>534</td>
<td>4,041</td>
</tr>
<tr>
<td>Home Based Other Production</td>
<td>0.0%</td>
<td>1,266</td>
<td>7,137</td>
</tr>
<tr>
<td>Non-Home Based Other Production</td>
<td>0.0%</td>
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<td>1,495</td>
<td>7,722</td>
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<td>Non-Home Based Other Attraction</td>
<td>0.0%</td>
<td>900</td>
<td>8,792</td>
</tr>
</tbody>
</table>

#### Project with Mitigation Measures

<table>
<thead>
<tr>
<th></th>
<th>TDM Adjustment</th>
<th>Mitigated Trips</th>
<th>Mitigated VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Based Work Production</td>
<td>0.0%</td>
<td>439</td>
<td>3,815</td>
</tr>
<tr>
<td>Home Based Other Production</td>
<td>0.0%</td>
<td>1,040</td>
<td>5,586</td>
</tr>
<tr>
<td>Non-Home Based Other Production</td>
<td>0.0%</td>
<td>666</td>
<td>5,217</td>
</tr>
<tr>
<td>Home-Based Work Attraction</td>
<td>0.0%</td>
<td>871</td>
<td>12,057</td>
</tr>
<tr>
<td>Home-Based Other Attraction</td>
<td>0.0%</td>
<td>1,357</td>
<td>7,213</td>
</tr>
<tr>
<td>Non-Home Based Other Attraction</td>
<td>0.0%</td>
<td>840</td>
<td>5,212</td>
</tr>
</tbody>
</table>

### MXD VMT Methodology Per Capita & Per Employee

- **Total Population:** 1,127
- **Total Employees:** 900
- **APC:** North Valley

<table>
<thead>
<tr>
<th></th>
<th>Proposed Project</th>
<th>Project with Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Home Based Production VMT</td>
<td>11,778</td>
<td>9,681</td>
</tr>
<tr>
<td>Total Home Based Work Attraction VMT</td>
<td>15,821</td>
<td>12,657</td>
</tr>
<tr>
<td>Total Home Based VMT Per Capita</td>
<td>10.5</td>
<td>8.6</td>
</tr>
<tr>
<td>Total Work Based VMT Per Employee</td>
<td>17.6</td>
<td>14.1</td>
</tr>
</tbody>
</table>
Project Example

500 Units
5 ksf Retail
10 ksf High-Turnover Restaurant

Project Outcome: LOS
- 15 impacted intersections
- Lane restriping at two intersections
- 13 intersections remain significant
- TDM Plan required
- Full EIR

Project Outcome: VMT
- Work VMT not significant
- Household VMT above the APC threshold
- Household VMT can be fully mitigated through TDM
- VMT impact does not trigger an EIR

VMT Calculator Analysis Results

<table>
<thead>
<tr>
<th>Proposed Project</th>
<th>With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily Vehicle Trips</td>
</tr>
<tr>
<td>2,858</td>
<td></td>
</tr>
<tr>
<td>18,923</td>
<td>Daily VMT</td>
</tr>
<tr>
<td>9.5</td>
<td>Household VMT per Capita</td>
</tr>
<tr>
<td>7.6</td>
<td>Work VMT per Employee</td>
</tr>
</tbody>
</table>

Significant VMT Impact?

Household: Yes
- Threshold = 7.4
- 15% Below APC

Household: No
- Threshold = 7.4
- 15% Below APC

Work: Yes
- Threshold = 11.1
- 15% Below APC

Work: No
- Threshold = 11.1
- 15% Below APC
Next Steps for Los Angeles

1. TDM Ordinance

2. VMT Research
   - Post-Pandemic Trends
   - Parking
   - Infrastructure
   - Mobility Services
   - Monitor Development TDM Effectiveness

3. Off Site Mitigation
   - Transportation Specific Plans
   - VMT Mitigation Exchange/Bank

4. Leap to ABM Model?
Next Steps for Regional Transition to VMT

Look to MPOs and Council of Governments (COGs)

1. Expand VMT Calculator to other jurisdictions

2. Validate COG-level TDF Models?

3. Establish COG-level Thresholds?
QUESTIONS

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Go to:
https://ladot.lacity.org/businesses/development-review
#transportation-assessment