VMT Estimation

Training Series #2 – 4

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Fehr & Peers

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Caltrans

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Change

- NEW LAWS

SB 743

AB 417

AB 2245

SB 226

AB 1358

SB 375

SB 97

AB 32

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Discussion Topics

- VMT Estimation
  - Methodologies
  - Tools
- VMT Criteria in SB 743/Guideline

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Definition

Vehicle-Miles Traveled = Volume x Distance
or
Trips x Trip Length

1-vehicle trip

50 miles

VMT = 1 x 50 = 50

5-vehicle trip

10 miles

VMT = 5 x 10 = 50

Methods

VMT ESTIMATION

- **Based on Vehicle Inventory/Odometer Data**
  - Directly observe the number of miles driven through periodic odometer readings.
- **Based on Household Travel Survey Data**
  - Estimating mileage using a GPS device or
  - Using self-reported mileage from the respondents
- **Based on Land Use Data**
  - Typically use trip rates to estimate vehicle trips.
  - Multiply the trips by average trip lengths.

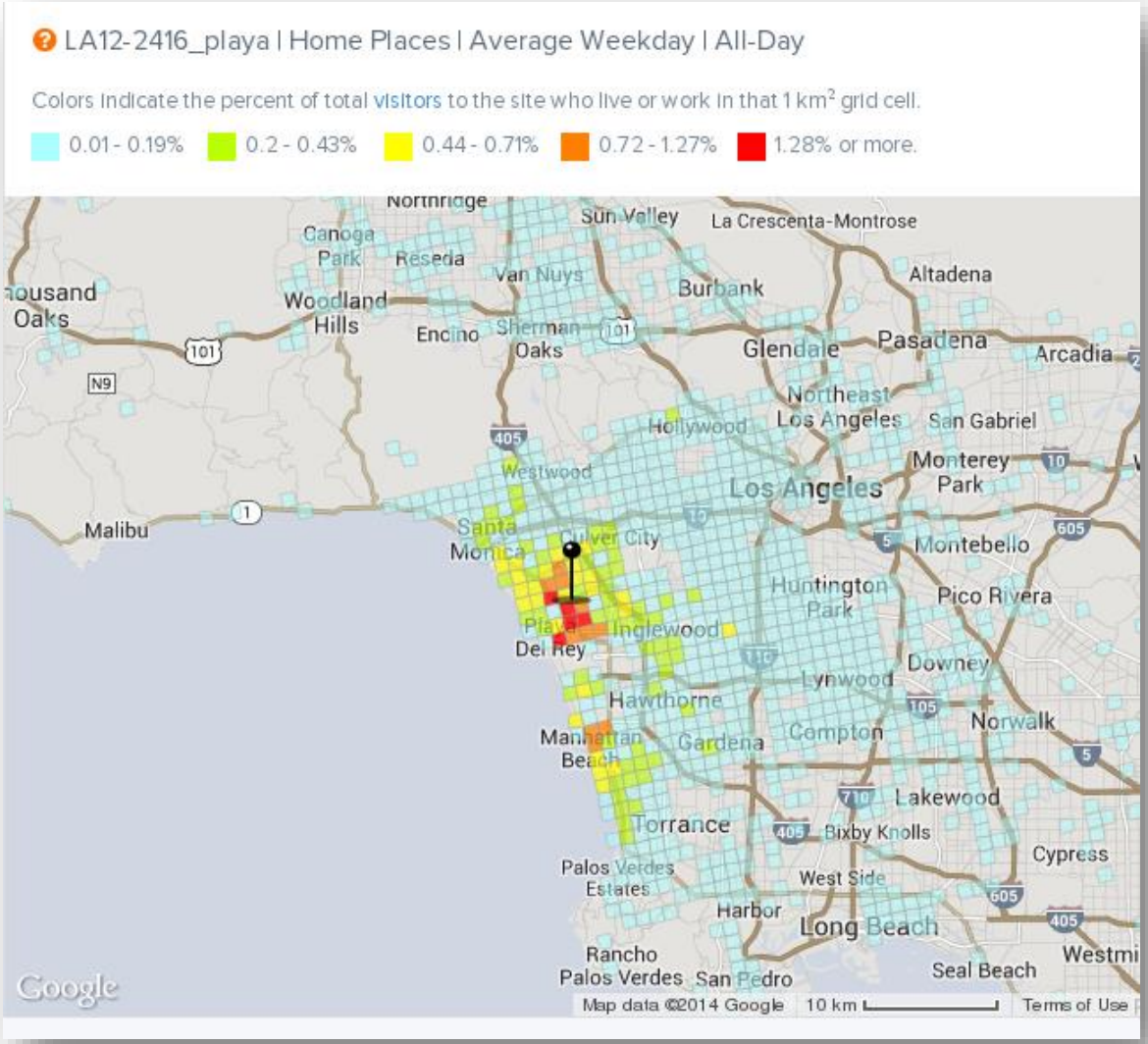
Methods

VMT ESTIMATION

- Based on HPMS
- Based on Travel Demand Model
- Dependent on Project Types
  - Residential projects - all household VMT or home-based VMT by TAZ
  - Office projects - Home-based-work VMT by TAZ
  - Retail projects – Total VMT change
  - Linkages among projects for net VMT change, internalization

Methods

VMT ESTIMATION



- **Big Data**

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Methods

NON-TRAVEL MODEL TOOLS

Tool	Adjustments for Smart Growth-type projects	
	Adjusts	Characteristics on which adjustments are based
URBEMIS	Trips	Diverted trips/ Pass-by trips
VMT+	Trips	Pass-by trips/ On-site trips
California Smart-Growth Trip Generation Adjustment Tool	Trips	Eight smart growth factors (population, location, urban form, parking, and transit-related characteristics)
Clifton, Currans, and Muhs (2015)/ Adjusting ITE Trip Gen. for Urban Context	Trips	Nine built environment factors (population, employment, urban form, and alternative transportation-related characteristics)
Envision Tomorrow Site-Level Model	Trips	Six factors (intersection density, transit presence, central location, nearby employment, employment accessible by transit, vehicle ownership)
Envision Tomorrow District-Scale Model	Trips	11 factors covering five topics (employment, intersections, transit availability, travel speed, district area)
CNT (2015)/Green Trip Connect	VMT	Location (surrounding land use and transportation characteristics, parking spaces/charges, presence of affordable housing/rents, offers of residential transit passes/carshare/bikeshare
VMT Impact Tool/Salon (2014)	VMT	Eight land use and transportation variables (% transit commuters, % non-motorized commuters, gas prices, % single-family homes, road density, activity mix, regional job access, local job access
CalEEMod	VMT	Measures in CAPCOA Quantifying GHG Mitigations Report

- **California Emissions Estimator Model (CalEEMod)**
  - **By CAPCOA**
  - http://www.caleemod.com
- **Urban Emissions (URBEMIS) model**
  - **By CARB**
  - http://www.urbemis.com
- **VMT+ /ASAP (Plan+, MXD+, TDM+)**
  - **By Fehr & Peers**

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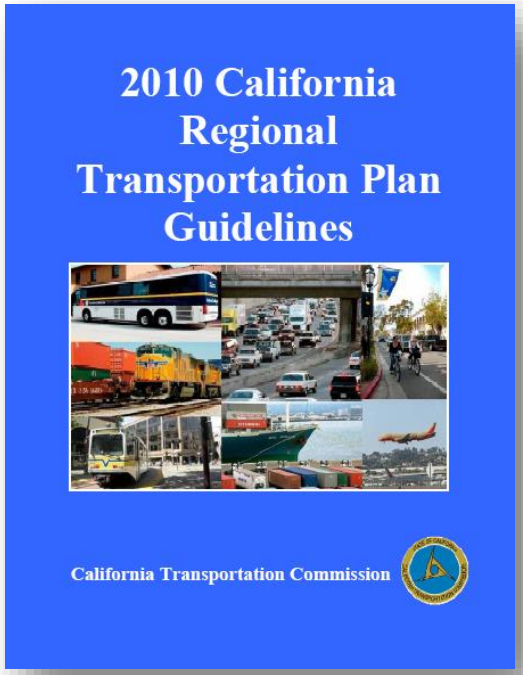
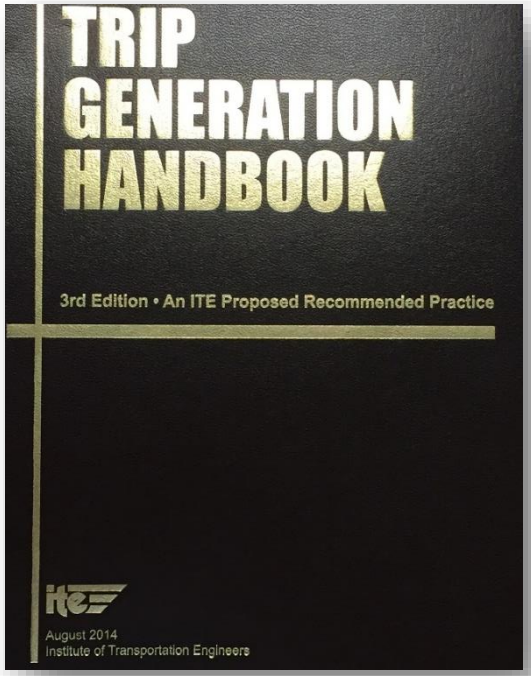
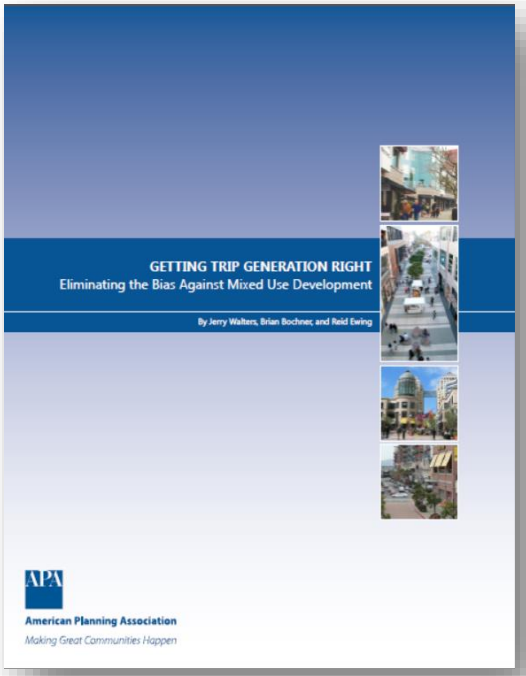
Methods

- TRIP GENERATION







Transportation Analysis Evolution…

New Problem, New Focus

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Methods

TRIP GENERATION

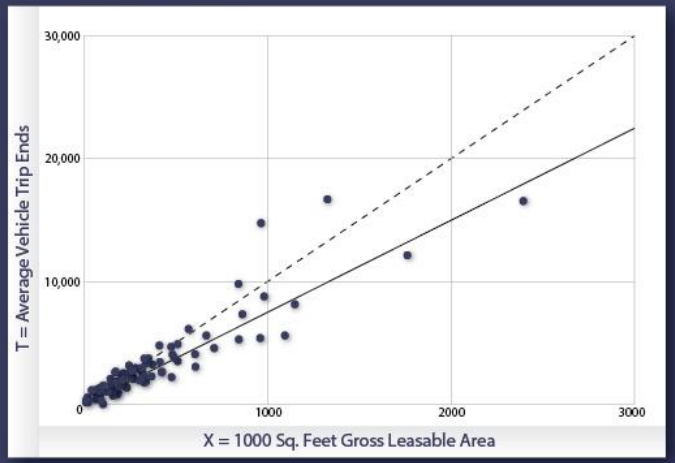
Single-Family Detached Housing (210)

Average Vehicle Trip Ends vs: Dwelling Units (On a Weekday)

Number of Studies: **350**
Avg. Number of Dwelling Units: **197**
Directional Distribution: **50% entering - 50% exiting**

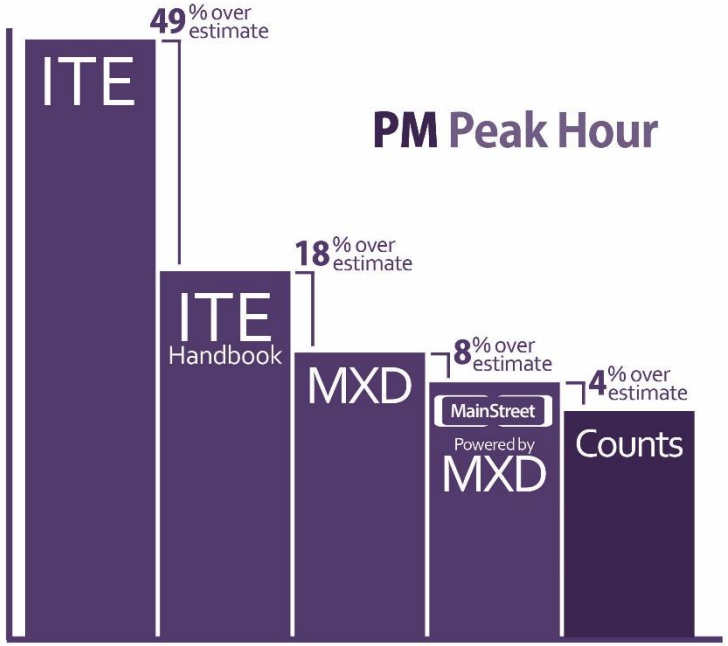
Trip Generation per Dwelling Unit
Average Rate: **9.57** | Range of Rates **4.31** to **21.85** | Standard Deviation **3.69**

Data Plot and Equation



X Actual Data Points — Fitted Curve - - - - Average Rate

Fitted Curve Equation: Ln(T) = 0.65 Ln(X) + 5.83 R2 = 0.78



Focus on Trip Generation...

New Research

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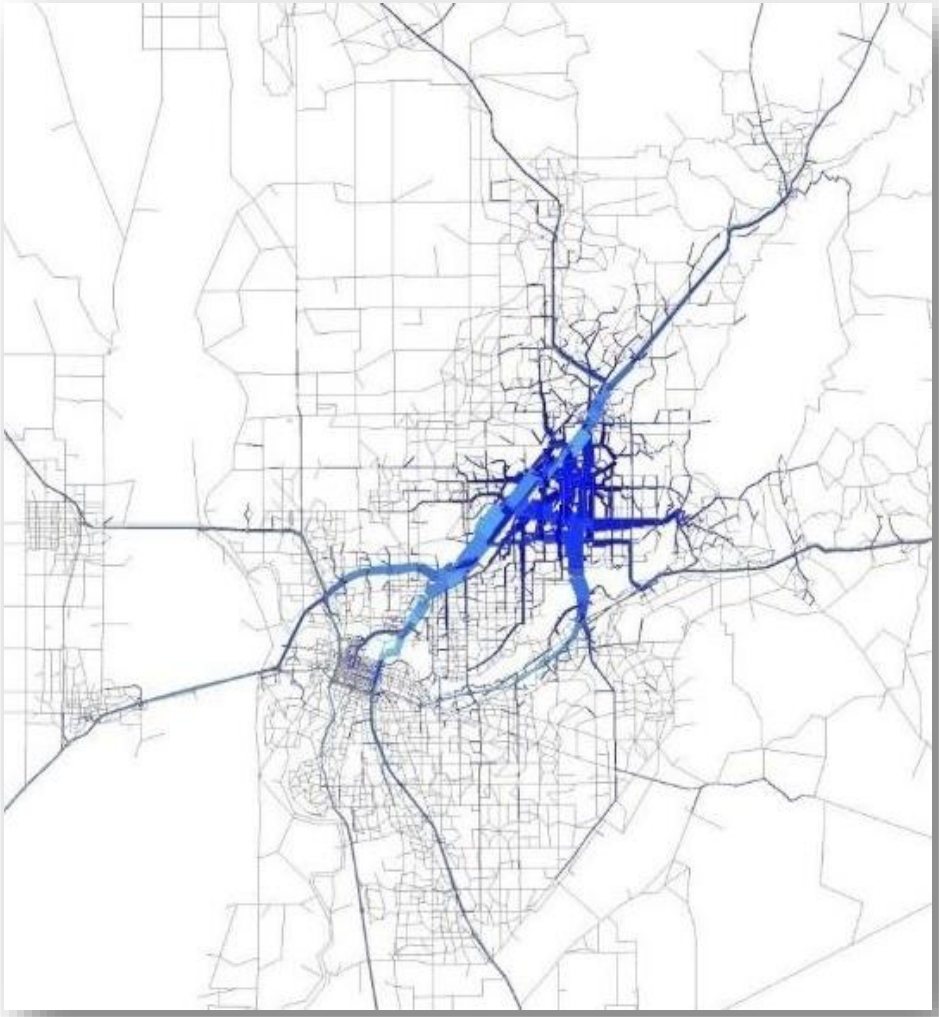
Methods

OD METHOD



- Full Accounting Method
- Estimates VMT based on all trips that have at least one end in a project analysis location
- VMT = SUM of (Trips x Trip Length)
- Used in GHG/Energy analysis (all vehicles)
- Preferred method for SB 375 (passenger vehicles and small trucks)

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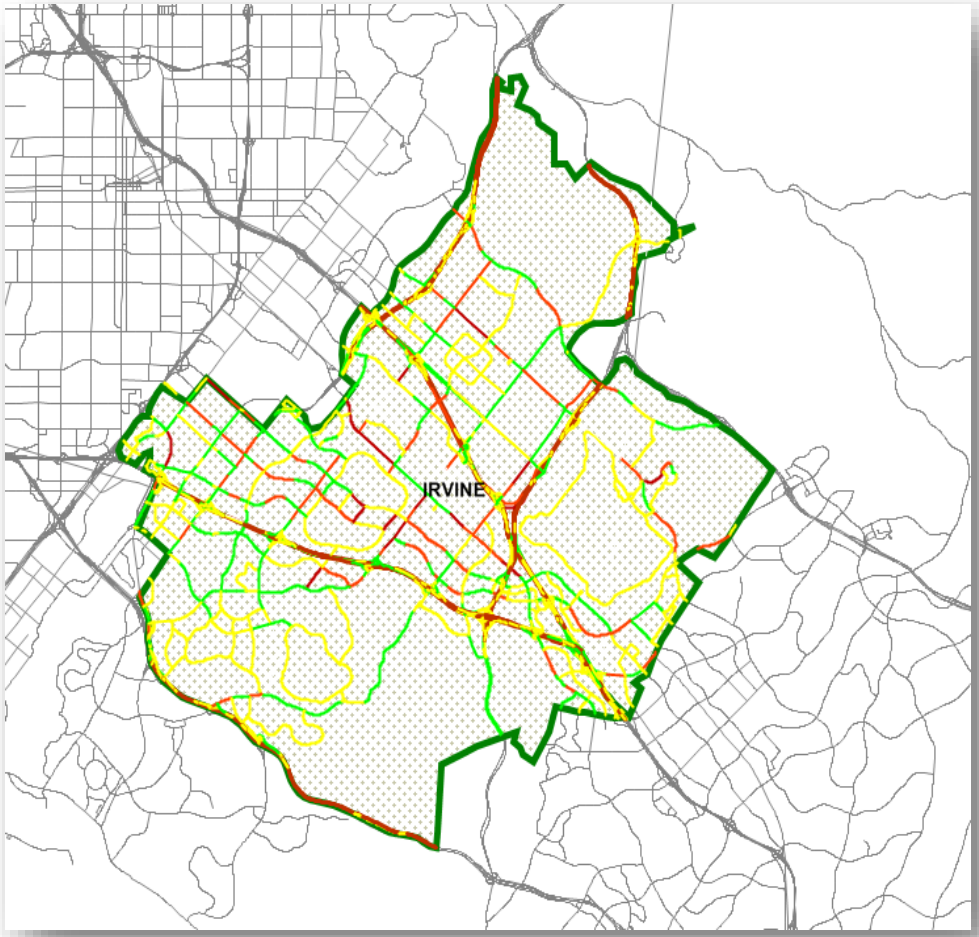
Methods

BOUNDARY METHOD



- Accounts for all VMT within the boundary
- VMT = SUM of (Link Volume x Link Length)
- Used in Air Pollution/Noise analysis (all vehicles)

AIR pollution ≠ GHG

Methods

TRIP LENGTH VARIATION

Trip Length Estimates	Average Trip Length by Trip Purpose		
	HBO	HBS	HBW
CalEEMod	7.50	7.30	10.80
VMT Spreadsheet Model	7.22	7.22	12.54
MPO Travel Forecasting Model	7.26	7.26	5.87

Notes:
HBO = Home-Based Other
HBS = Home-Based Shopping
HBW = Home-Based Work

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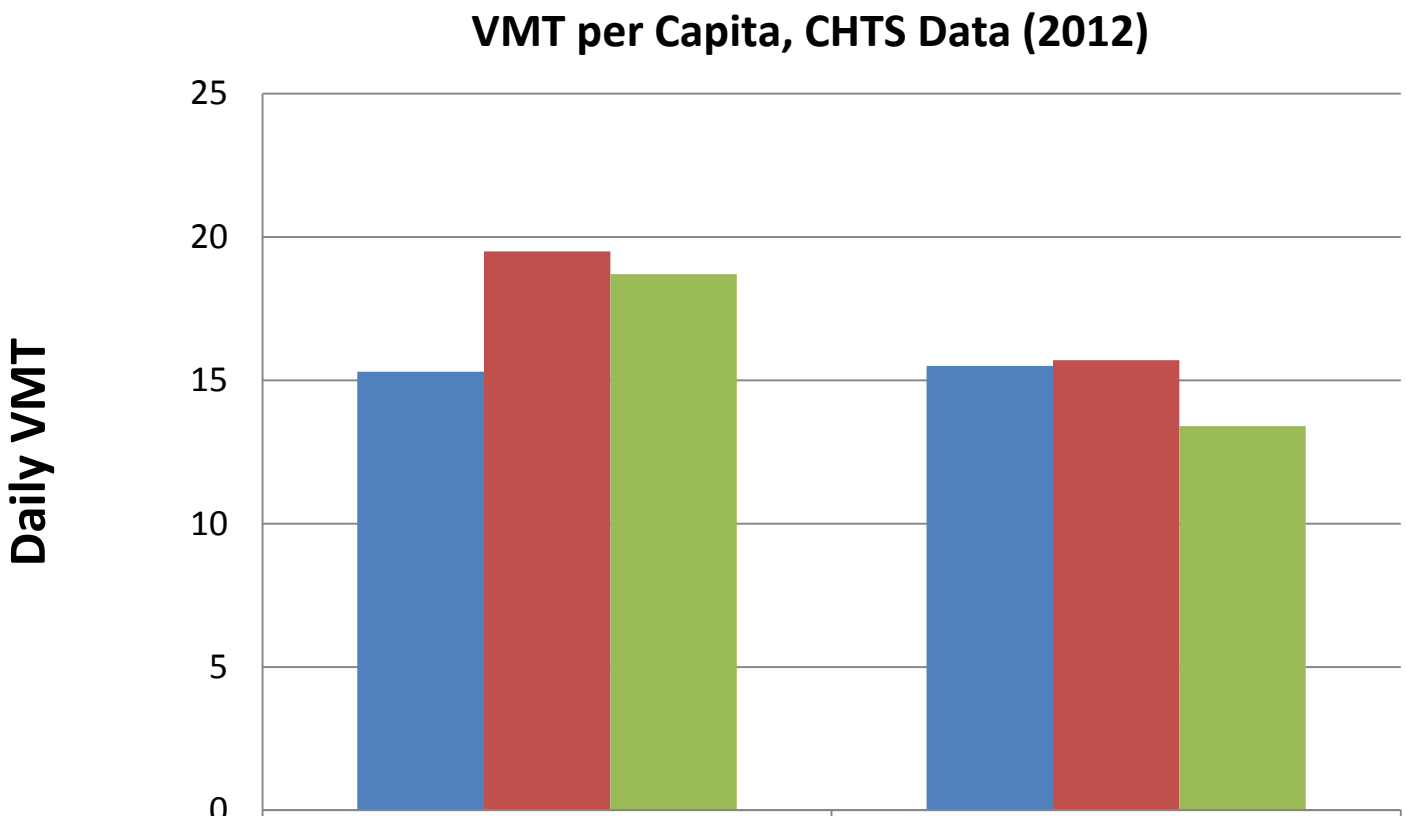
Methods

COMPARISON UNDER DIFFERENT GEOGRAPHICAL SCALE



	VMT per Capita - O/D	VMT per Capita - Boundary
MPO	15.3	15.5
County	19.5	15.7
City	18.7	13.4

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Methods

EXAMPLE APPLICATIONS

- **Congestion Management**
  - VMT in congestion: speed < threshold or v/c > threshold
- **Air Quality/Noise and EMFAC Analysis**
  - VMT by vehicle class, speed range and time of day
- **Impact Fee Study**
  - VMT-based Fee calculation
- **TDM Program**
  - Measured by VMT reduction
- **Climate Action Plan (CAP), etc.**
  - Variation of the OD method, i.e., only count half of the trip length for those trips with only one trip end within the project area

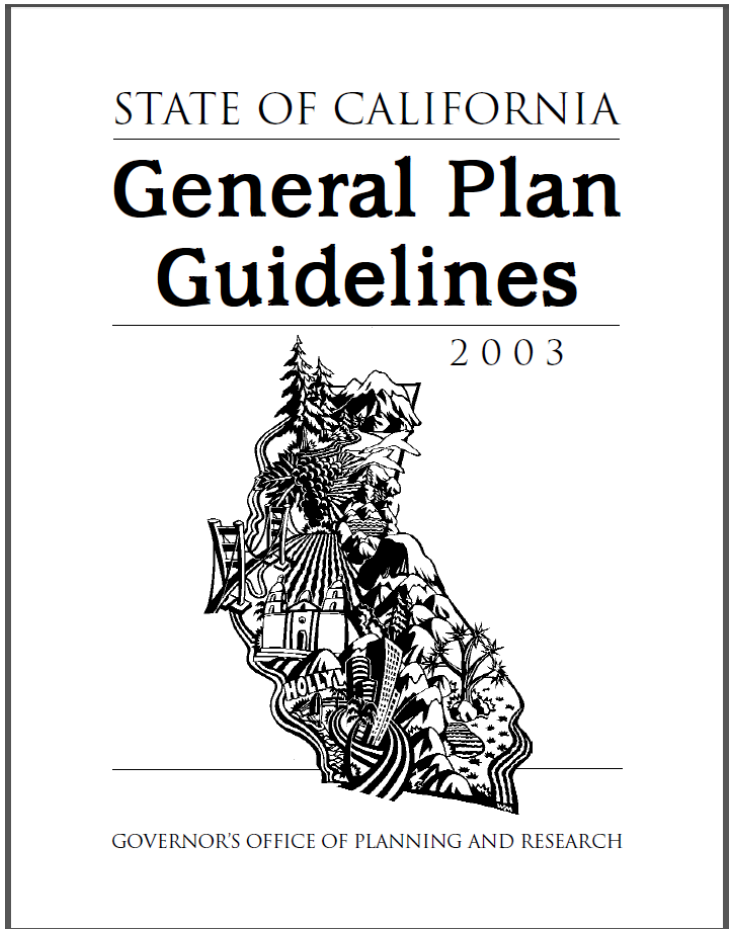
Change. SB 743 LEGISLATIVE INTENT

(1) Ensure that the environmental impacts of traffic, such as noise, air pollution, and safety concerns, continue to be properly addressed and mitigated through the California Environmental Quality Act.

(2) More appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.

SB 743

TRANSPORTATION PLANNING



What SB 743 Does Not Do...

No change to general plans, traffic impact fee programs, State Constitution, subdivision map act, etc.

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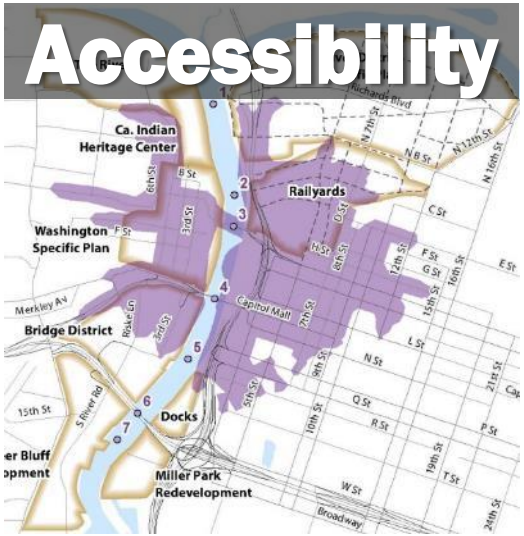
IMPACT ANALYSIS & MITIGATION



What SB 743 Does Do

- Eliminates LOS/Delay
- Adds VMT
- New Emphasis on Safety?
- Methods and Thresholds Guidance

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Guidelines

WHAT'S REMAINS?

- OPR continues to recommend **VMT as the most appropriate measure** of transportation impacts
- OPR continues to recommend that **VMT should be used across the State**
- Land Use Projects **within ½-mile of transit** should be presumed to have a less-than-significant transportation impact
- Transit, bike, and pedestrian projects should still be presumed to have a less-than-significant transportation impact
- Implementation should be phased in over 2 years

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Guidelines

WHAT'S NEW?

- **Technical guidance has been moved to a Technical Advisory section**
  - Intended to clarify what is a requirement vs. recommendation
- **Thresholds have been refined**
  - Better alignment with State's climate policies
  - Recognize the diversity of communities across the State
- **Procedures remain optional for a 2-year period**
  - Provides grace period for agencies to come up to speed on new methodologies
- **Access to data provided on Caltrans website**
  http://www.dot.ca.gov/hq/tpp/offices/omsp/SB743.html

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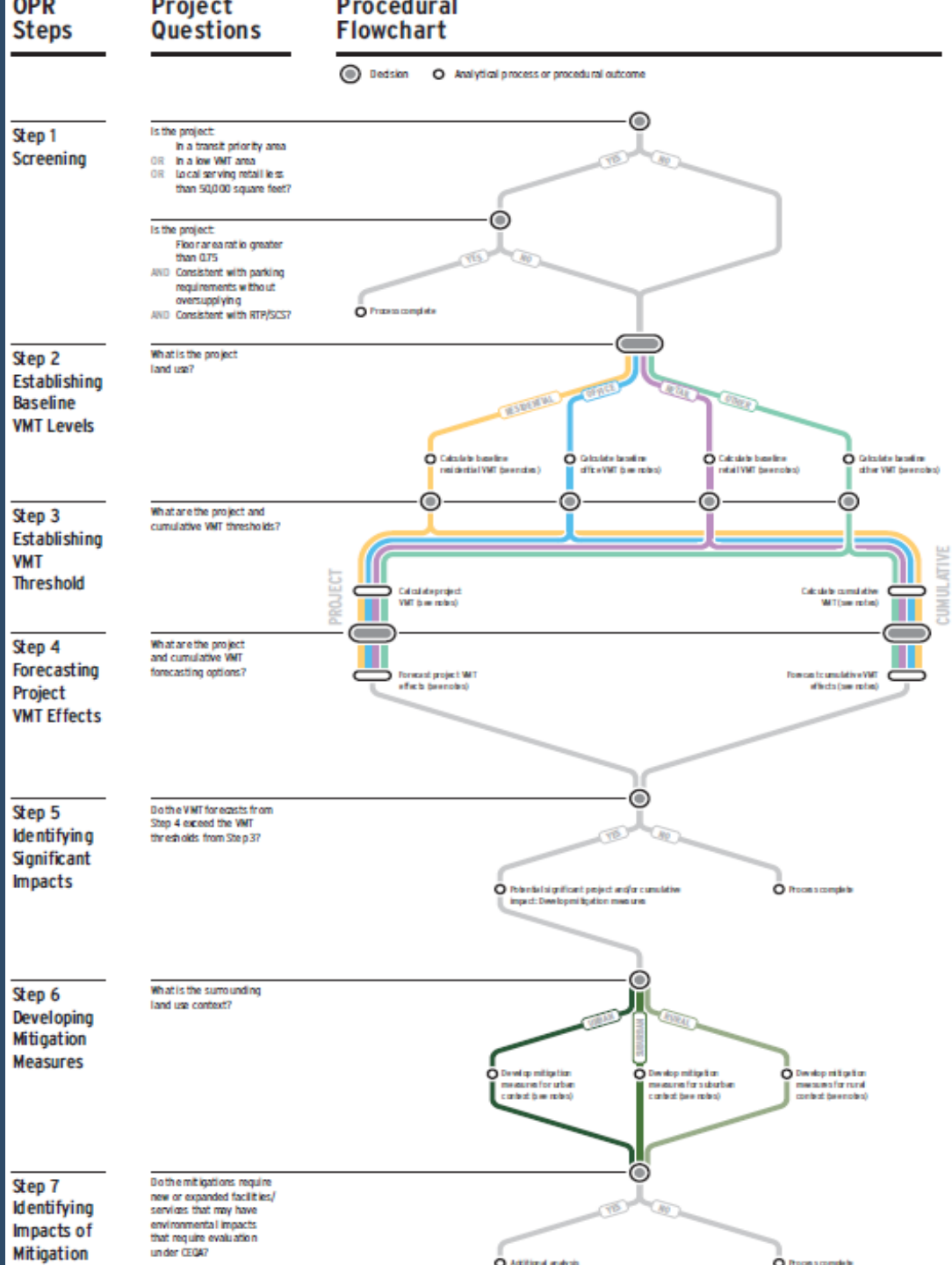
NAVIGATING PROJECTS THROUGH SB 743



Thresholds

VMT

Project's 'Automobile' VMT

- **AB 32**
- **Governor's EOs**
- **SB 375 Targets**
- **SB 743 Objectives**
- **Caltrans SMP Target**

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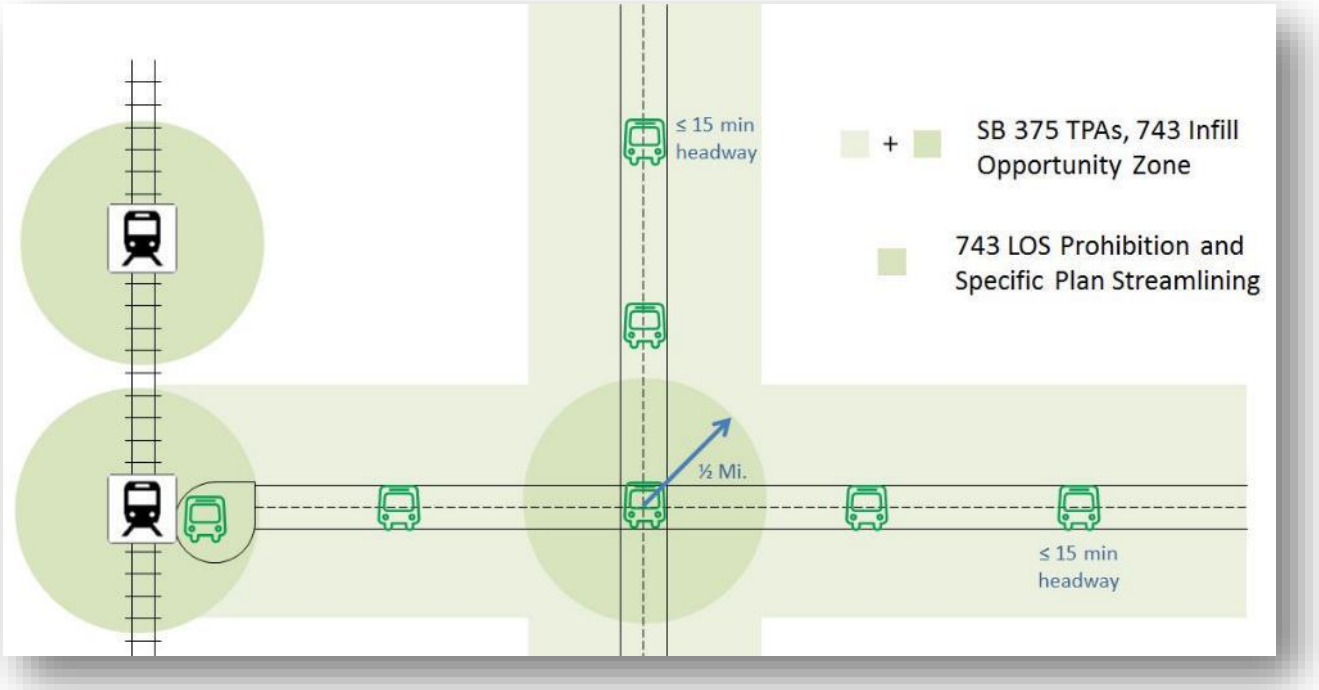
Screening

TPA (TOD) AREAS

- **Residential, retail, office, and mixed-use projects located in transit priority areas (TPAs)**



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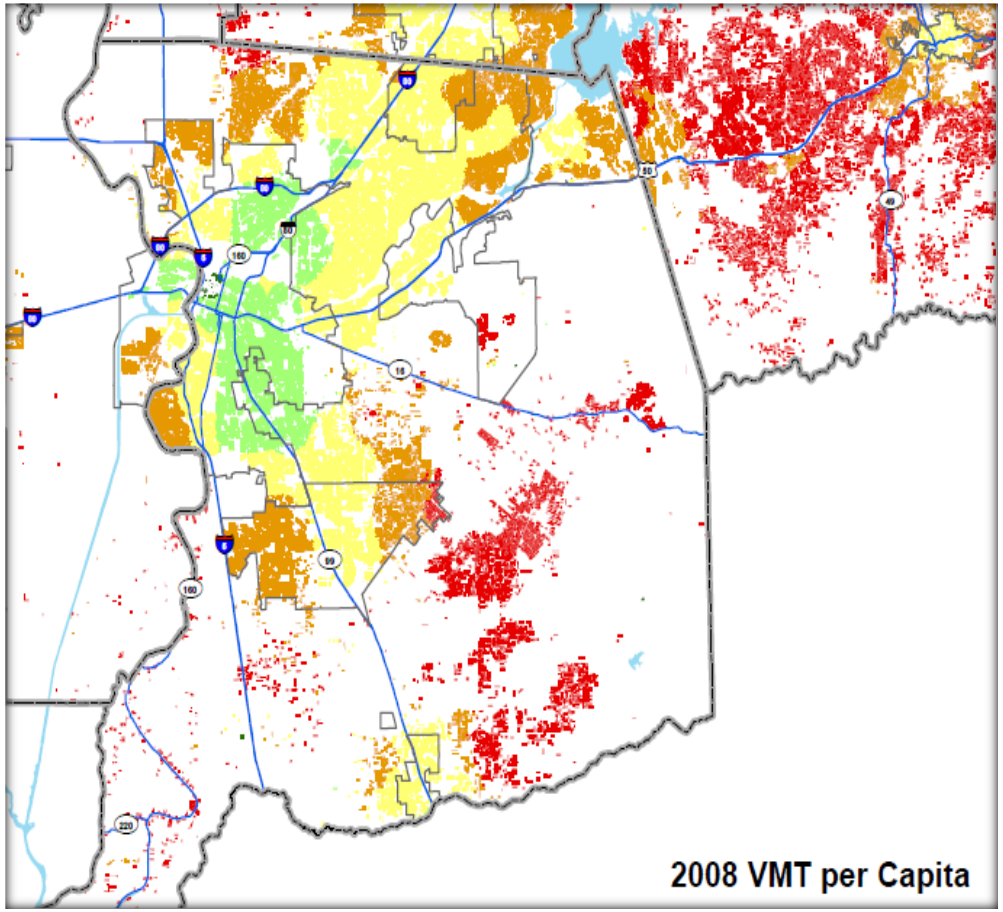
Screening

LOCATION

- **Residential and office projects located in low VMT generating area**



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Thresholds

- VMT

Residential: 15 percent below existing regional and city VMT/capita (household or home-based).

Office: 15 percent below existing regional VMT per employee (work tour or home-based work).

Retail: Local-serving retail presumed less than significant. Retail which increases VMT compared to previous shopping patterns may be considered significant.

Mixed-Use: Evaluate each land use component; account for internalization among individual uses

Thresholds

- VMT

Other Land Uses: Lead agency discretion.

RTP-SCS Consistency: All land use projects and land use plans.

- Included in RTP-SCS and generates VMT that is equal to, or less than, the VMT per capita and VMT per employee of the SCS.

Rural Areas: Case by case.

RTP-SCS: LTS if meeting SB 375 Targets.

Thresholds

VMT

Transportation Projects:

- General purpose, HOV, peak period, and auxiliary lanes require analysis (induced travel)
- Small project screening = LTS if < 2,075,220 VMT/year
- Addition of riders not an impact to transit, disrupting transit service or access may be an impact
- Active transportation projects presumed not to have an impact

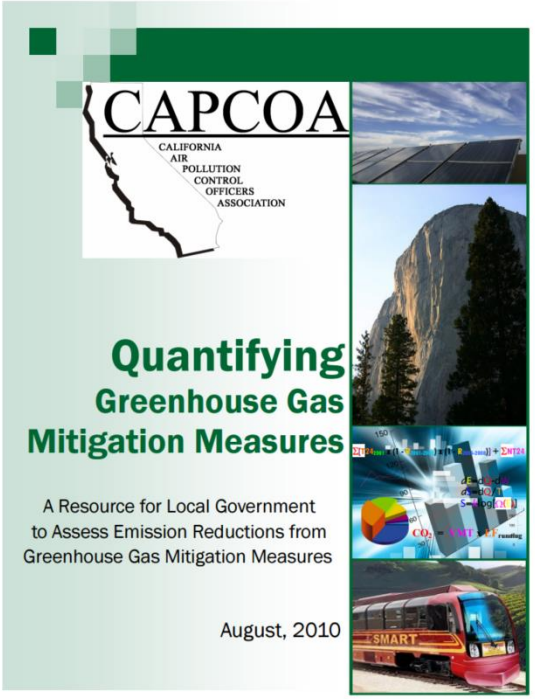
SB 743

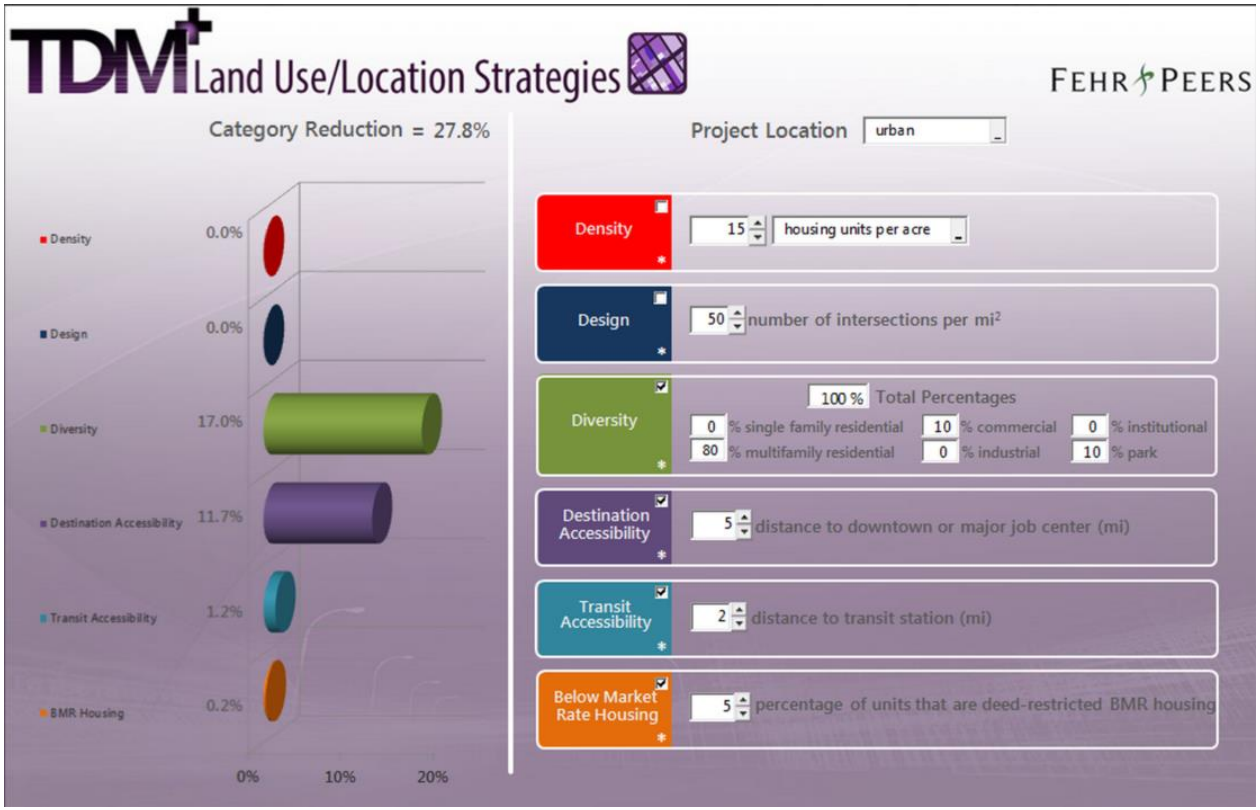
INDUCED TRAVEL

- Induced VMT occurs where roadway capacity is expanded in a congested area
- Change in VMT calculated using a model or elasticities

Mitigation

TRIPS OR TRIP LENGTH





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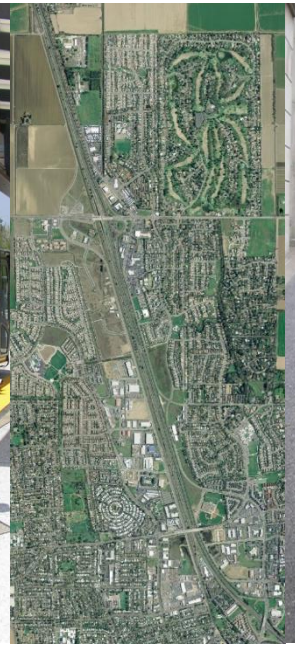
Mitigation

BUILT ENVIRONMENT

Density | Diversity | Design | Destinations | Distance to Transit | Development Scale | Demographics








7Ds

That influence Trip Generation (and VMT)

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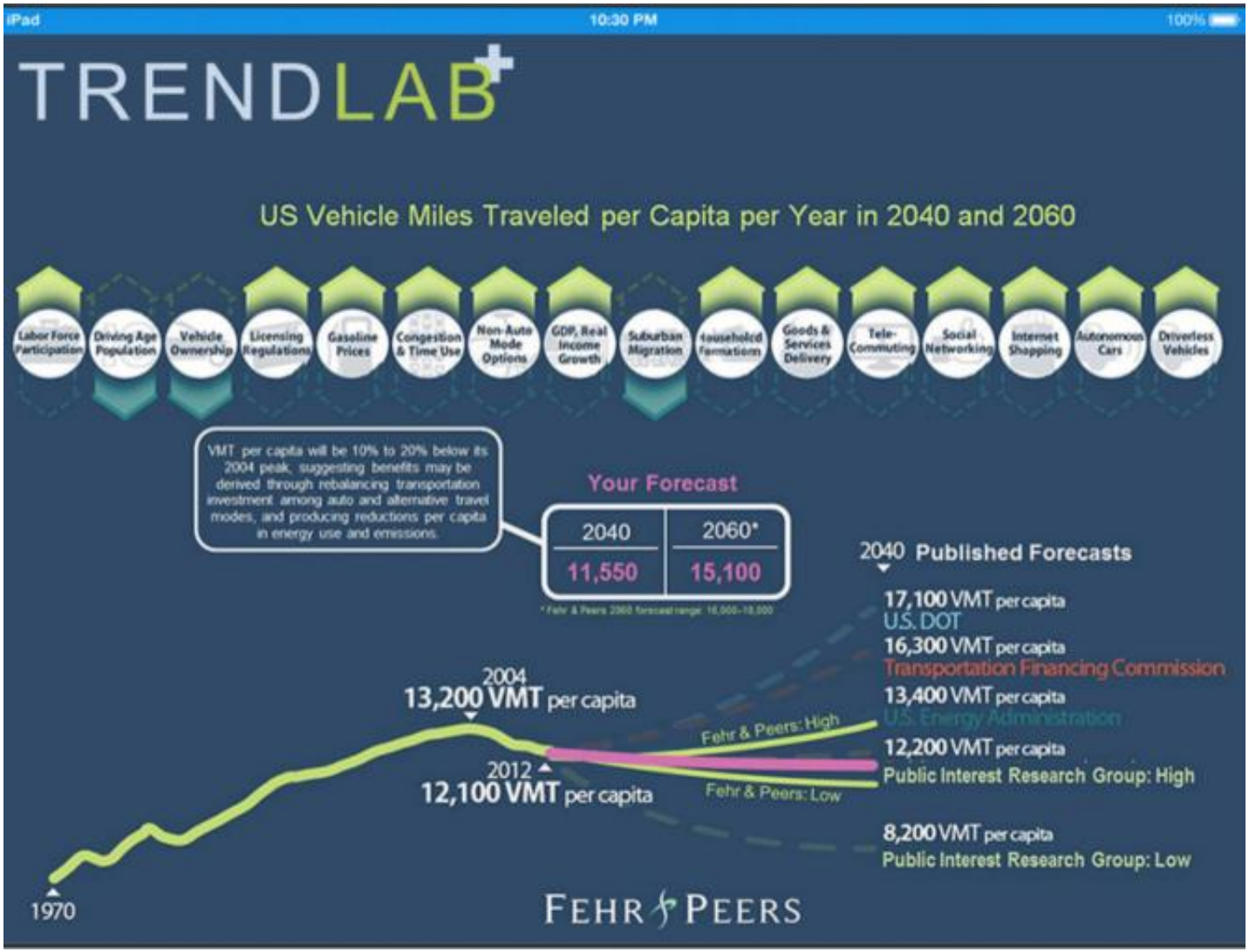
SB 743

- **UNCERTAINTY**



Q & A