SANDAG

Transportation Modeling Forum

December 12, 2018

Forum Agenda

External Model Assumptions

Analyzing Observed VMT

Series 14 Preview

External Model Assumptions

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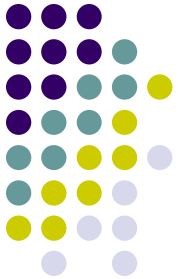

- Population Forecasts
- General Plans
- Circulation Elements
- Freight Forecasts
- Airport Forecasts
- Auto Operating Costs

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Dept of Finance

- The California Department of Finance produces an annual statewide population forecast
  - Regional Housing Needs Assessment (RHNA)
  - MPO's are mandated to be within ±3%
  - AB 1086 (2017) updates the mandate to be within ±1.5%

Growth Forecast	DoF Source	DoF 2050 POP Forecast	SANDAG 2050 POP forecast	Percent Difference
Series 13	2014	3,989,654	4,068,759	2.0%
Series 14	2018	3,953,511	4,011,150	1.5%

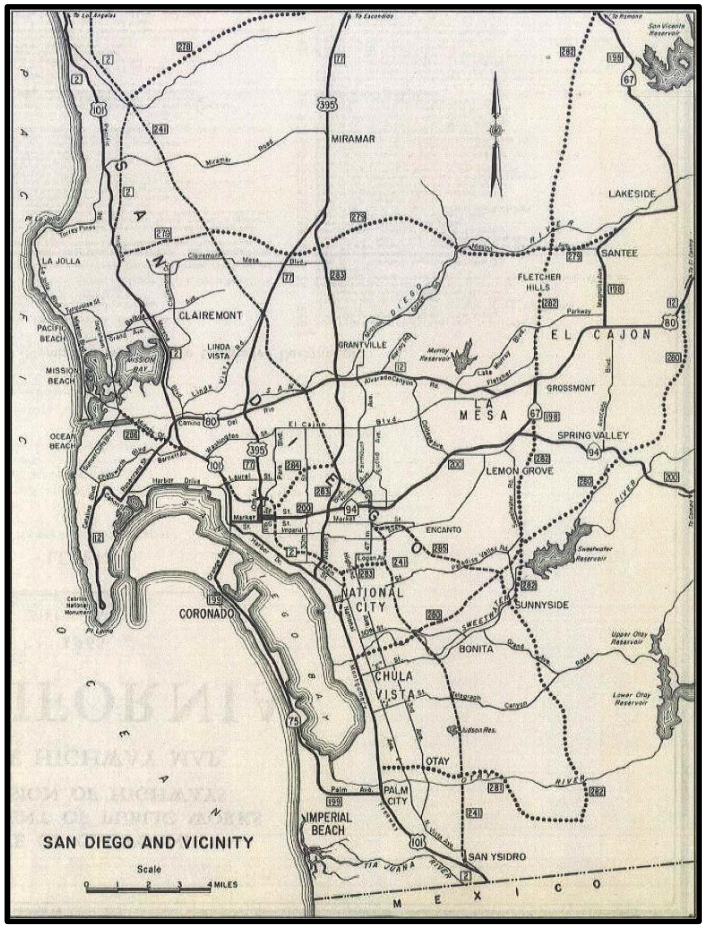
General Plans

- The region's General Plans (Land Use) have changed significantly over time
  - A broad planning and policy guideline for future development within all jurisdictions
  - Recommended to be updated every 15-20 years
  - Used by SANDAG to define regionwide Housing Capacity as an input into the Growth Forecasts

Growth Forecast	General Plan Year	Regionwide Dwelling Unit Capacity
Series 12	2008	435,885
Series 13	2012	395,042
Series 14	2016	381,984

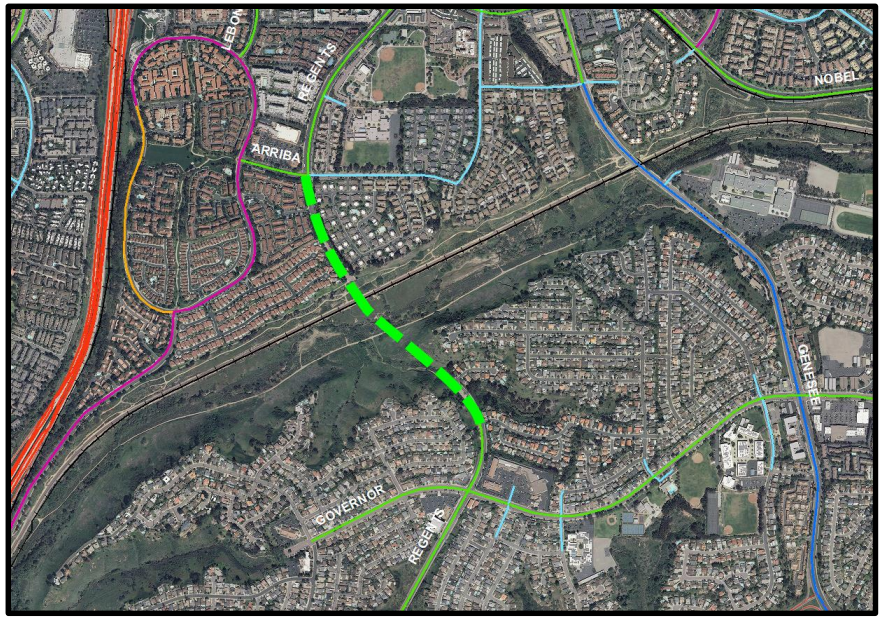
Circulation Element

- The region's Circulation Element (network) has changed significantly over time
  - Historical
    - SR-125
    - I-805
    - SR-54
    - SA-680



Circulation Element

- The region's Circulation Element (network) has changed significantly over time
  - Recent
    - Rancho Del Oro
    - Regents Rd Bridge
    - Fenton Pkwy
    - Alta Rd

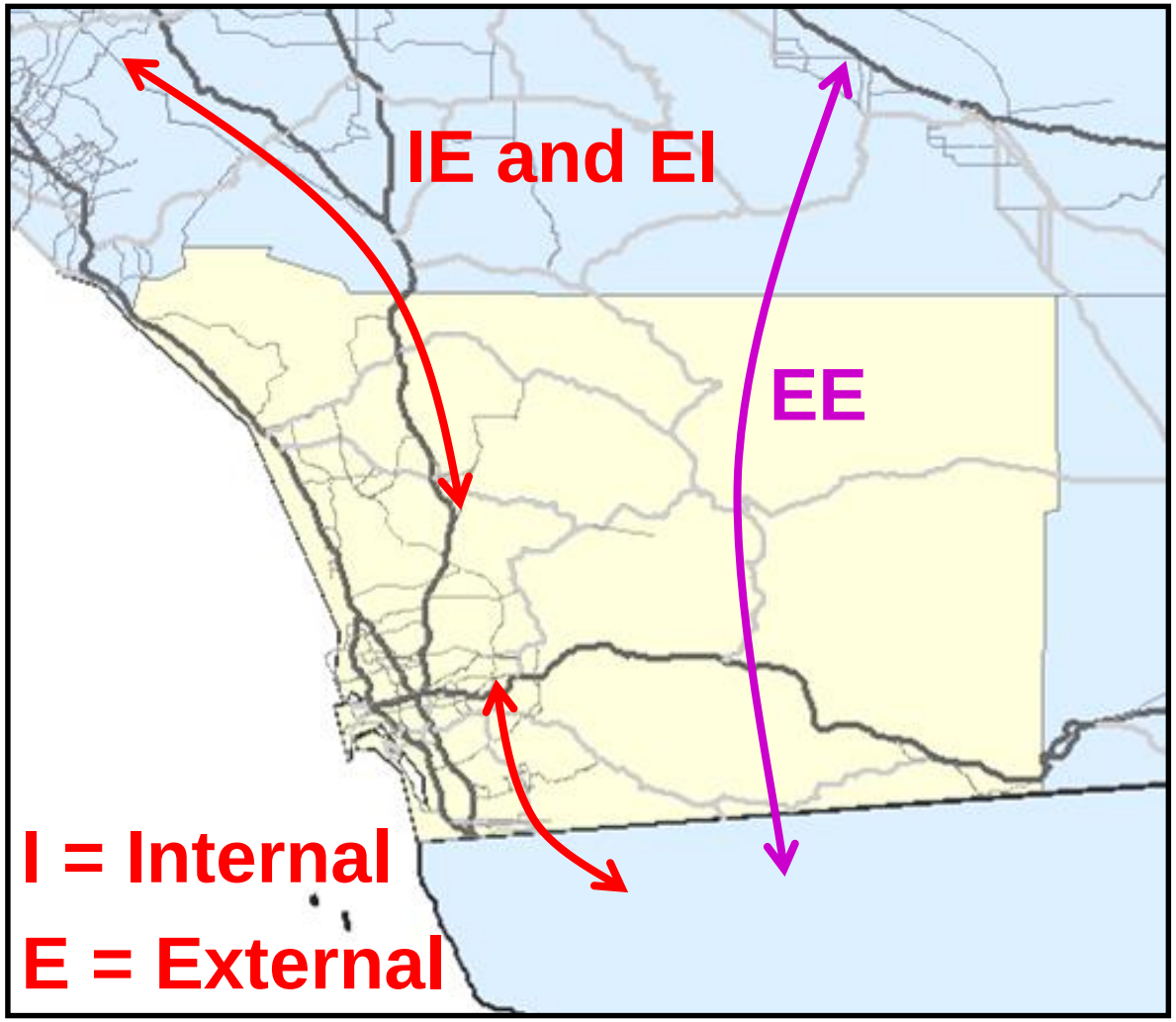


Freight Analysis Forecast (FAF)

- Produced by:
  - Bureau of Transportation Statistics
  - Federal Highways Administration
- Version 4 estimates tonnage and value by:
  - Regions of origin and destination
  - Commodity type
  - Mode
- Data are available for:
  - 2012 – 2016
  - 2020 to 2045 in 5-year intervals
- https://faf.ornl.gov/fafweb/

Freight Analysis Forecast (FAF)

- The Truck Model uses the FAF Forecast for Truck Flows into and out of the San Diego Region



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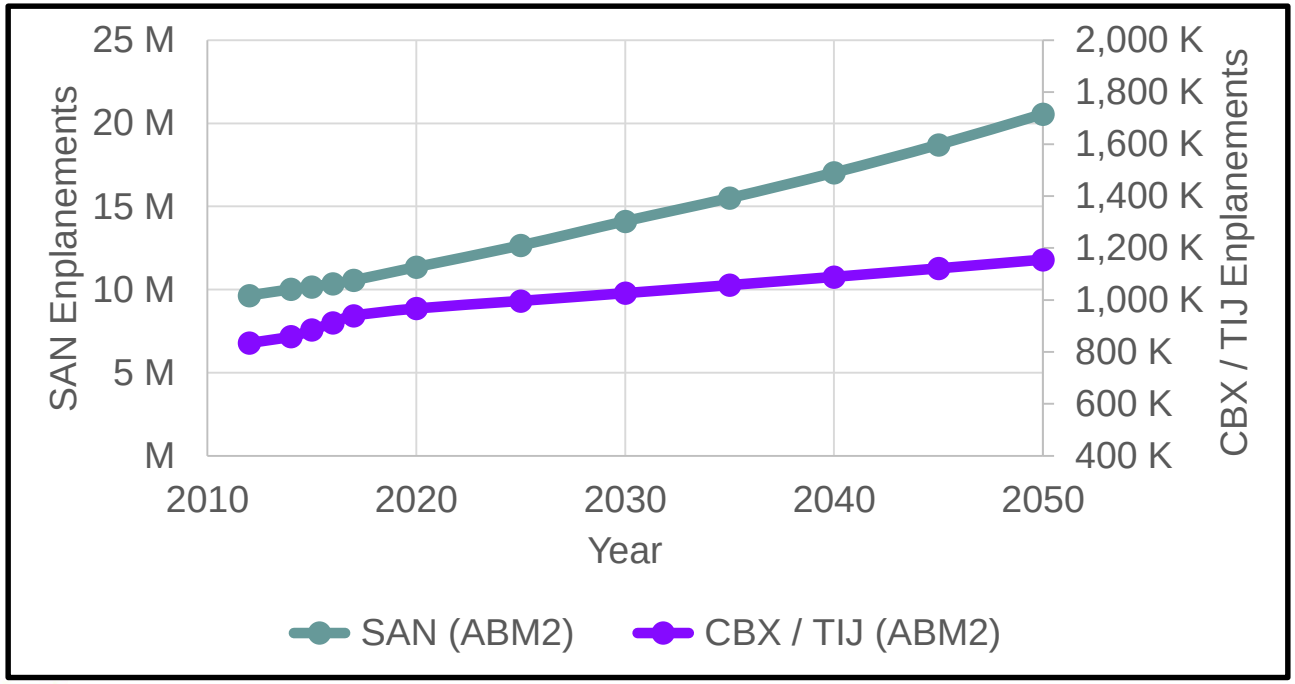
Airport Forecasts

- Weekday Annual Enplanement Forecasts
  - San Diego International Airport (SAN)
  - Cross Border Express (CBX) for Tijuana International Airport (TIJ)

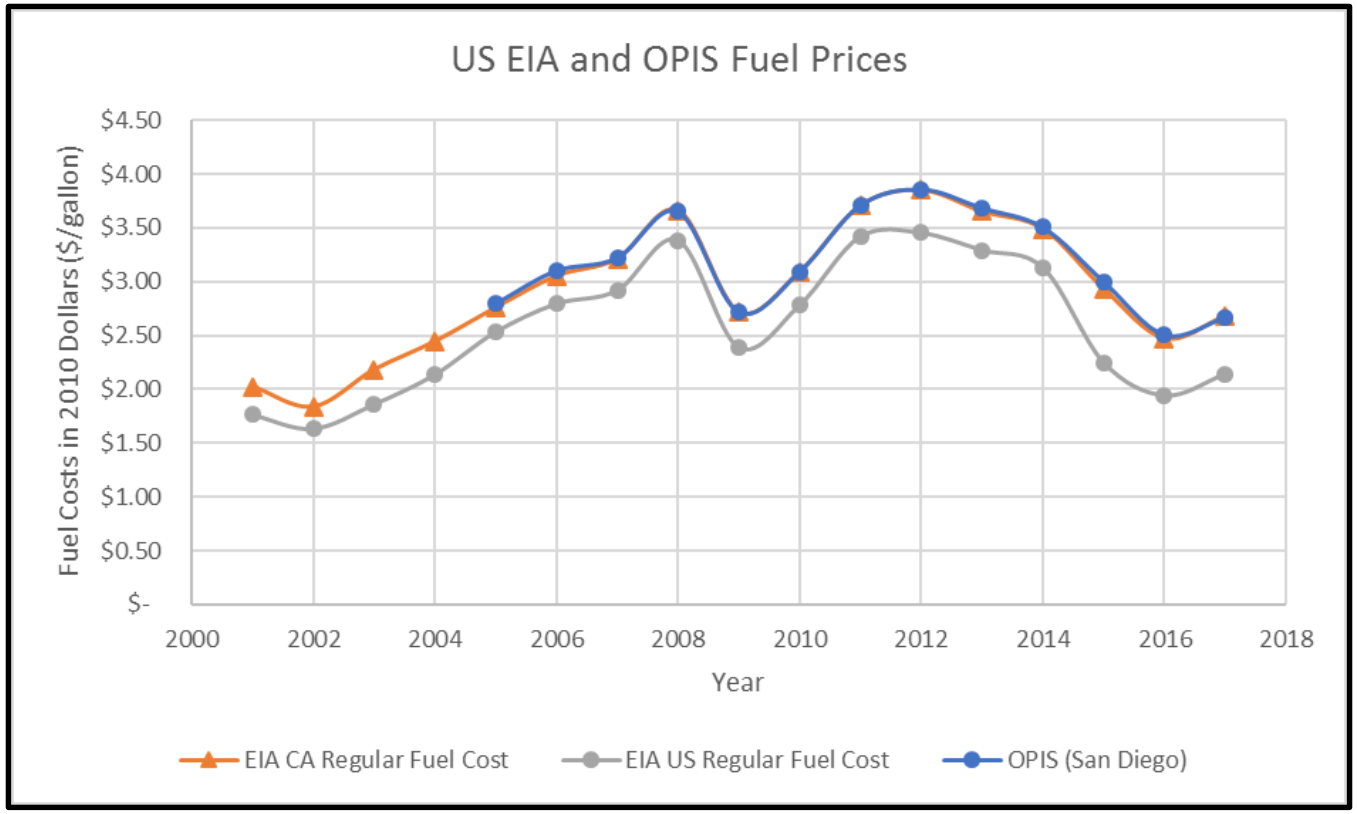


Auto Operating Costs (AOC)

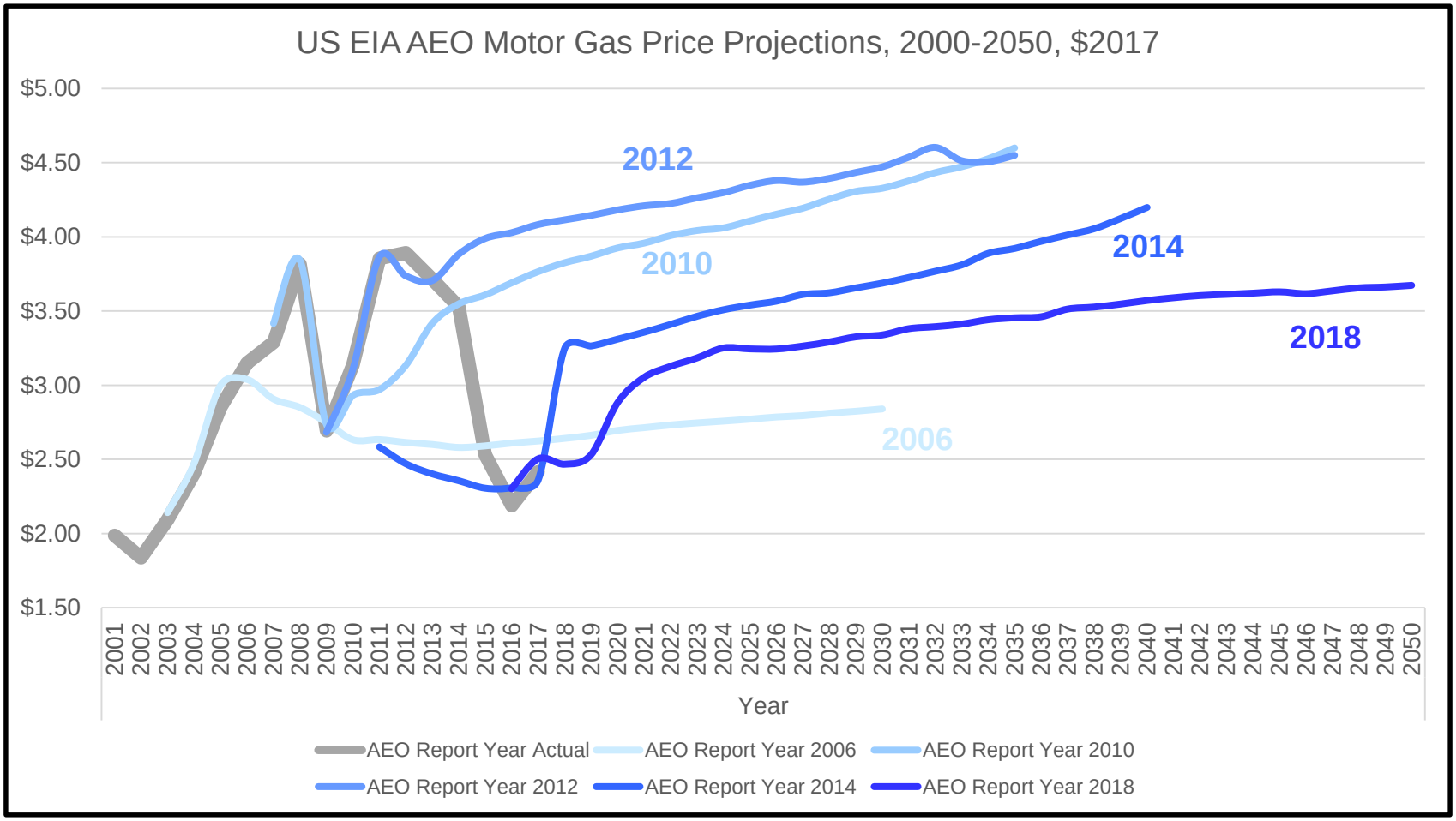
- AOC is the Average Driving Cost Per Mile
  - Function of:
    - Fuel costs
      - US Energy Information Administration (EIA) for gas
      - CA Energy Commission (CEC) for Diesel, Electric, Hydrogen, PHEV/Gas, & PHEV/Electric
    - Fuel efficiency
      - CA Air Resources Board (CARB)
    - Maintenance costs
      - American Automobile Association (AAA)
  - Converted to ABM Cost Year ($2010)
  - ABM AOC Elasticity
    - 10% increase in AOC results in a 1% decrease in VMT

Historical Fuel Costs

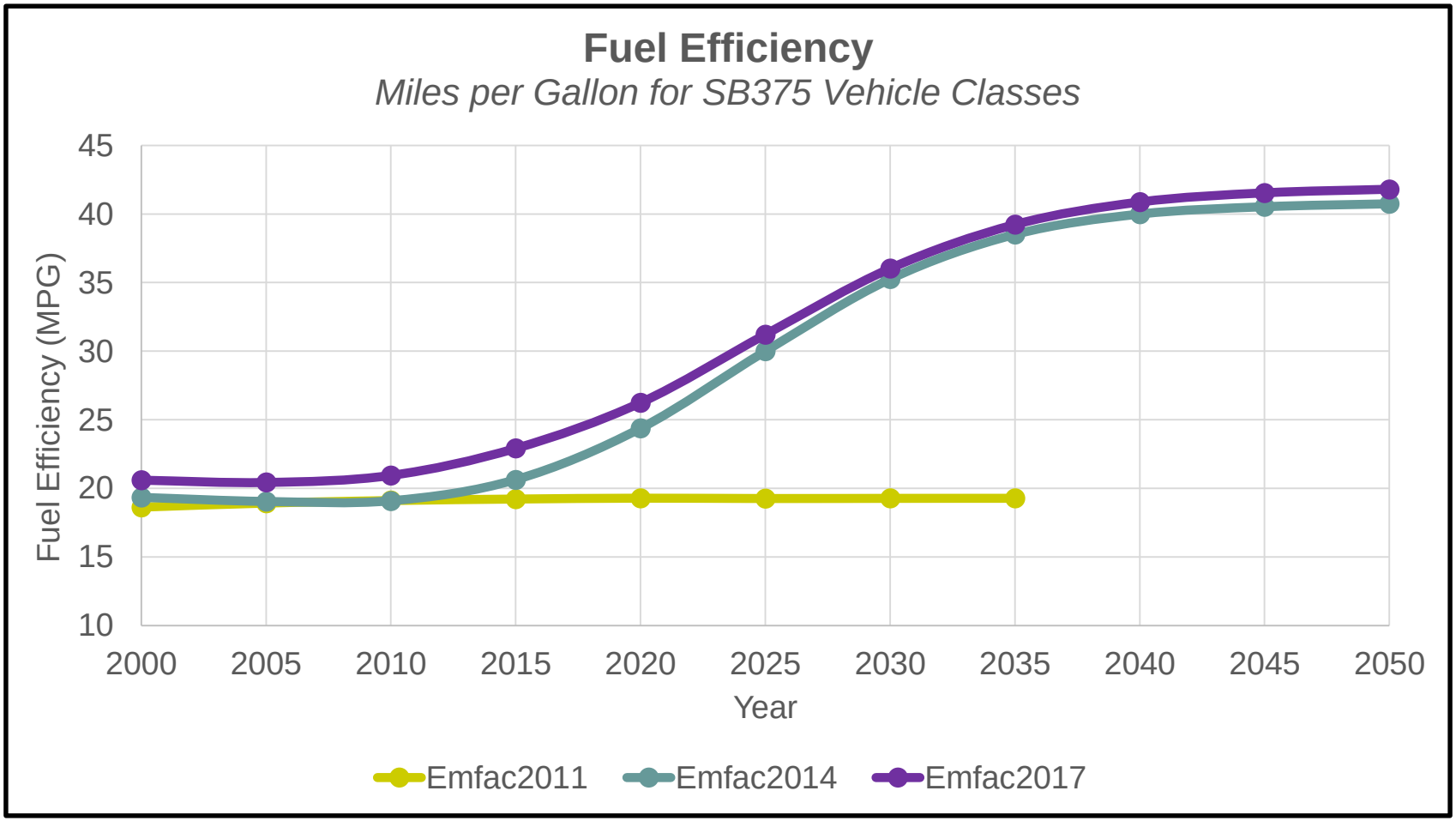
- Sources:
  - National & CA: US EIA
  - San Diego: Oil Price Information Service (OPIS)



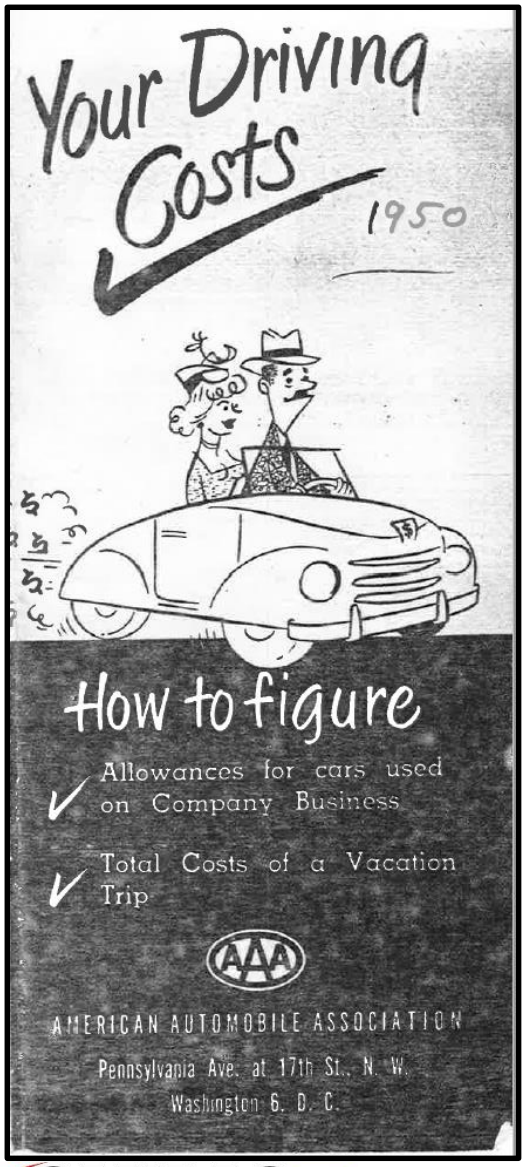
US EIA Annual Energy Outlook (AEO) Fuel Forecasts



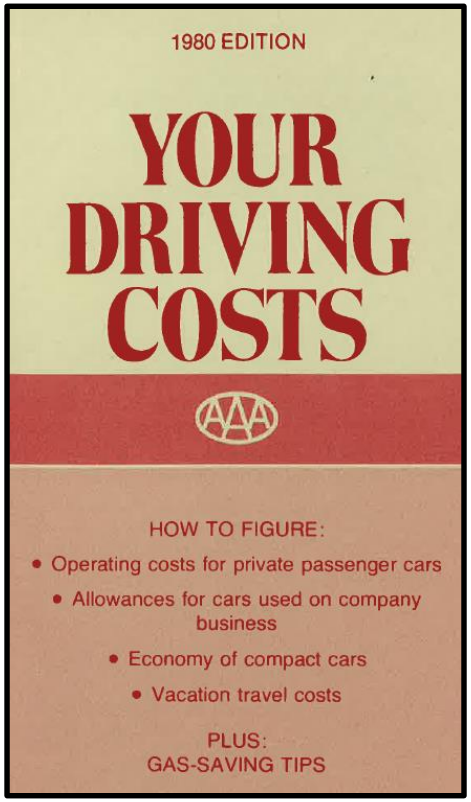
Fuel Efficiency

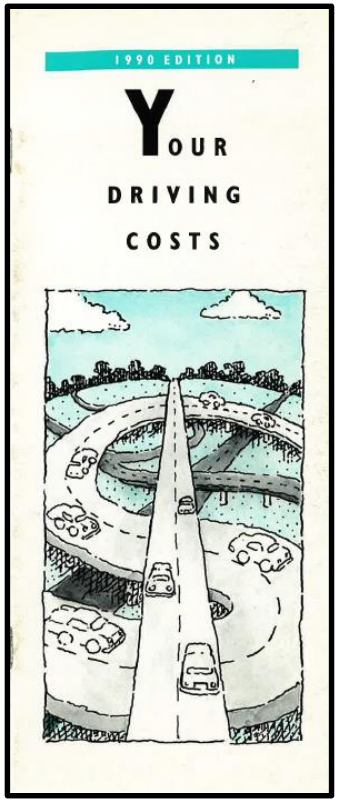


Maintenance Costs - AAA

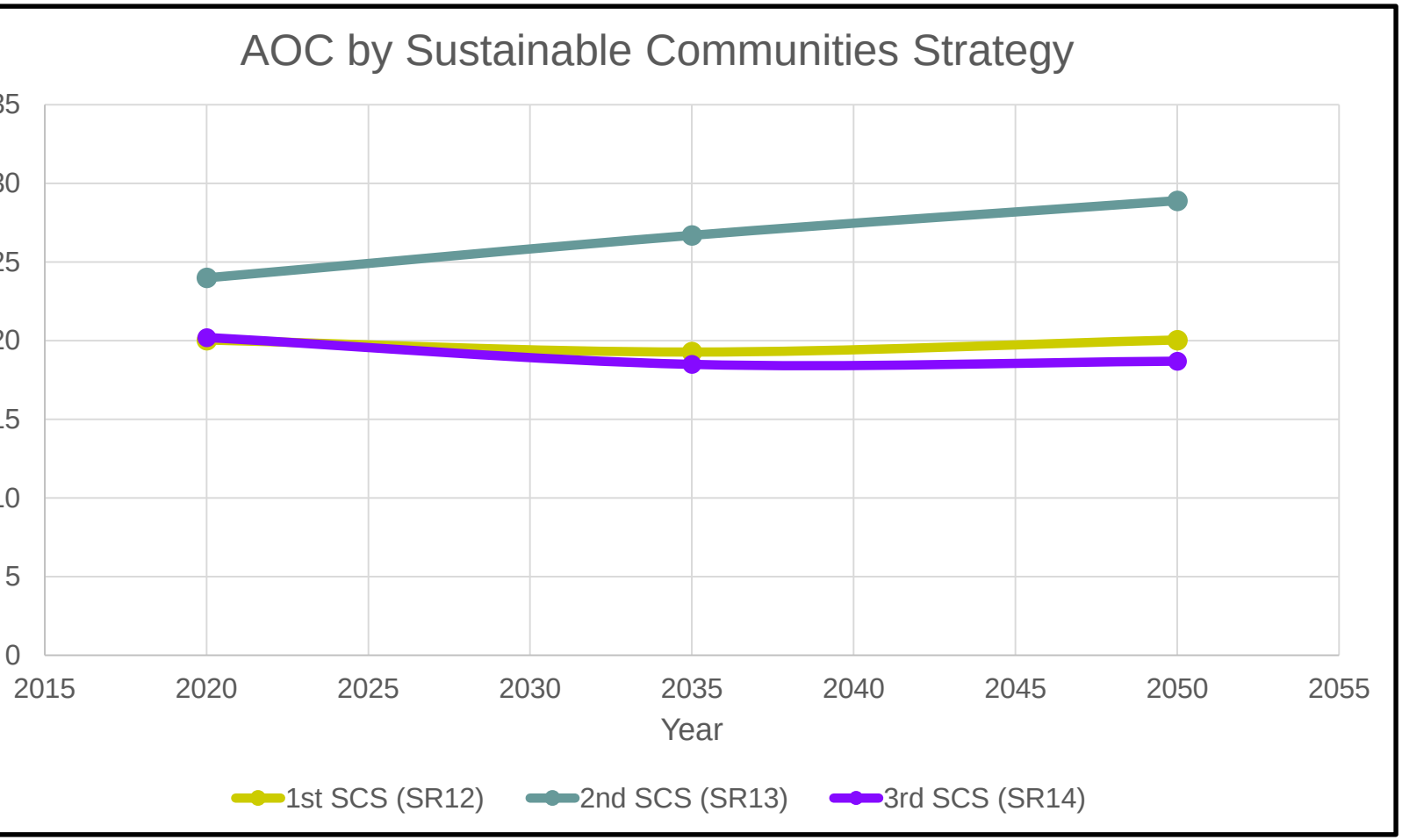


- Maintenance
- Repair
- Tires





AOC by Regional Plan



Analyzing Observed VMT

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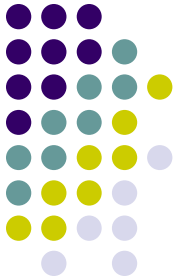
Analyzing Observed VMT

- VMT Defined
  - **V**ehicle **M**iles of **T**ravel
  - A metric used in transportation planning, design, policy-making and revenue estimation
  - Measures the amount of travel for all vehicles in a geographic area over a period of time
  - A straightforward calculation:

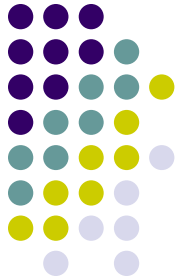
Roadway Centerline Length ✖ **Observed Traffic Count** = **VMT**

VMT Calculation Considerations



- Travel behavior patterns
- Demographic characteristics
- Land use
  - Mix of uses
  - Road (intersection) density
- Accessibilities
  - Employment within a travel shed

VMT Calculation Considerations



- Economic conditions
- Out-of-pocket costs
  - Fuel tax
- Weather and seasons

- Methods of Observation
- Methods of Analysis

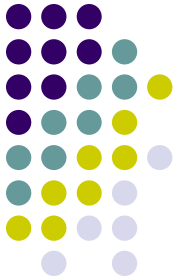
Methods of Observation

- Short Counts
  - Pneumatic tube counts
  - Manual counts
- Continuous Counts
  - Loop detectors
  - Radar / Microwave / Laser
- Others
  - Travel Surveys
  - Fuel sales
  - Auto registration

Observation Method Limitations

- Short Counts
  - Cost prohibitive
    - Time: sample size
    - Space: distance between count locations
- Continuous Counts
  - Device calibration & mechanical failure
- Others
  - Sample size & inaccurate responses
  - Seasonal variations
  - Odometer calibration, rollover & tampering

Regulatory Environment



- AB 32
  - Reduce Green House Gas (GHG) emissions
- SB 375
  - Set regional targets for GHG reduction
- SB 743
  - VMT replaces LOS as an “impact” for EIRs
    - VMT per Capita & VMT per Employee
- Climate Action Plans
  - Reduction in VMT equates to reduction in GHG
    - Disaggregated VMT by jurisdiction

VMT Data Sources

- HPMS
  - Short count collection submitted by jurisdictions
- ARB EMFAC Software
  - Fuel sales data & BAR smog data
- Third party
  - INRIX & HERE
- PeMS
  - Continuous collection for State Routes

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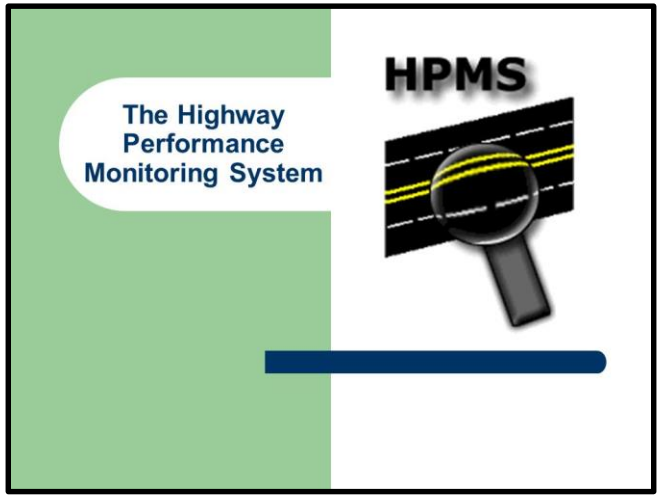
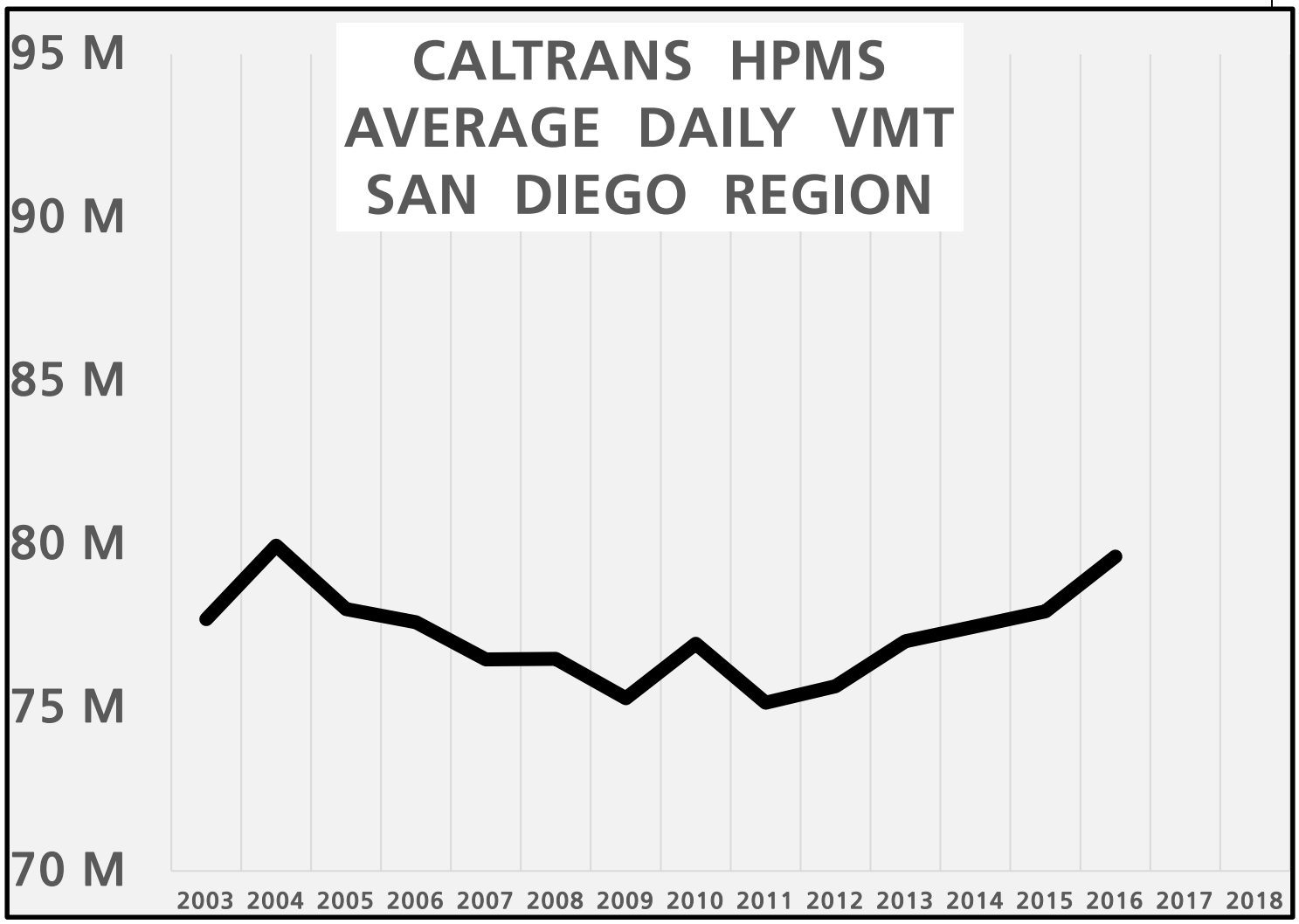
Caltrans HPMS

- Annual Public Road Data publication
  - 2001-2016 Annual average daily VMT inventory
  - VMT for all facility types
  - VMT by jurisdiction
  - Data library for all CA counties
  - http://www.dot.ca.gov/hq/tsip/hpms/index.php



Caltrans HPMS



ARB EMFAC Software

- Three versions released since 2011
  - Annual average daily VMT inventory
  - Estimates & future forecasts for VMT
  - By vehicle type
  - Fuel sales & BAR smog check data
  - Data library for all CA counties/MPOs
  - https://www.arb.ca.gov/emfac/

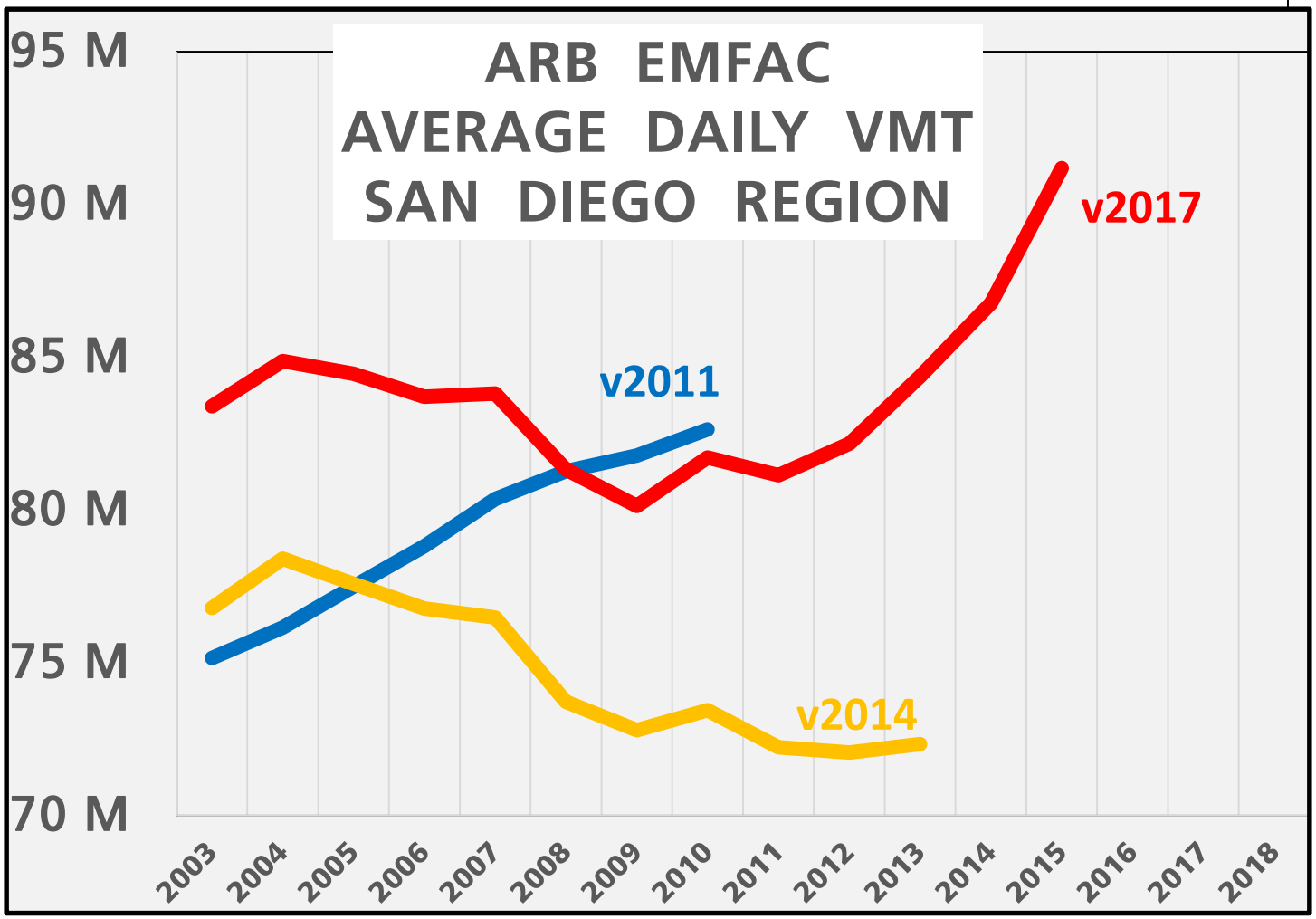
ARB EMFAC Software

- EMFAC estimates for past years vary by version

San Diego County estimated average weekday VMT - All roads

	EMFAC VERSION		
	v2011	**v2014**	**v2017**
2000 VMT	72,291,135	71,507,511	77,607,593
2005 VMT	77,498,458	77,583,134	84,454,198
2010 VMT	82,630,299	73,443,967	81,717,627

ARB EMFAC Software



INRIX/TAMU Data

- 2015 Urban Mobility Report
  - 1982-2014 Annual average daily VMT inventory
  - FHWA Seasonally Adjusted VMT
  - INRIX proprietary methodology
  - Data library for 101 US metro areas
  - https://mobility.tamu.edu/ums/

INRIX

Texas A&M Transportation Institute

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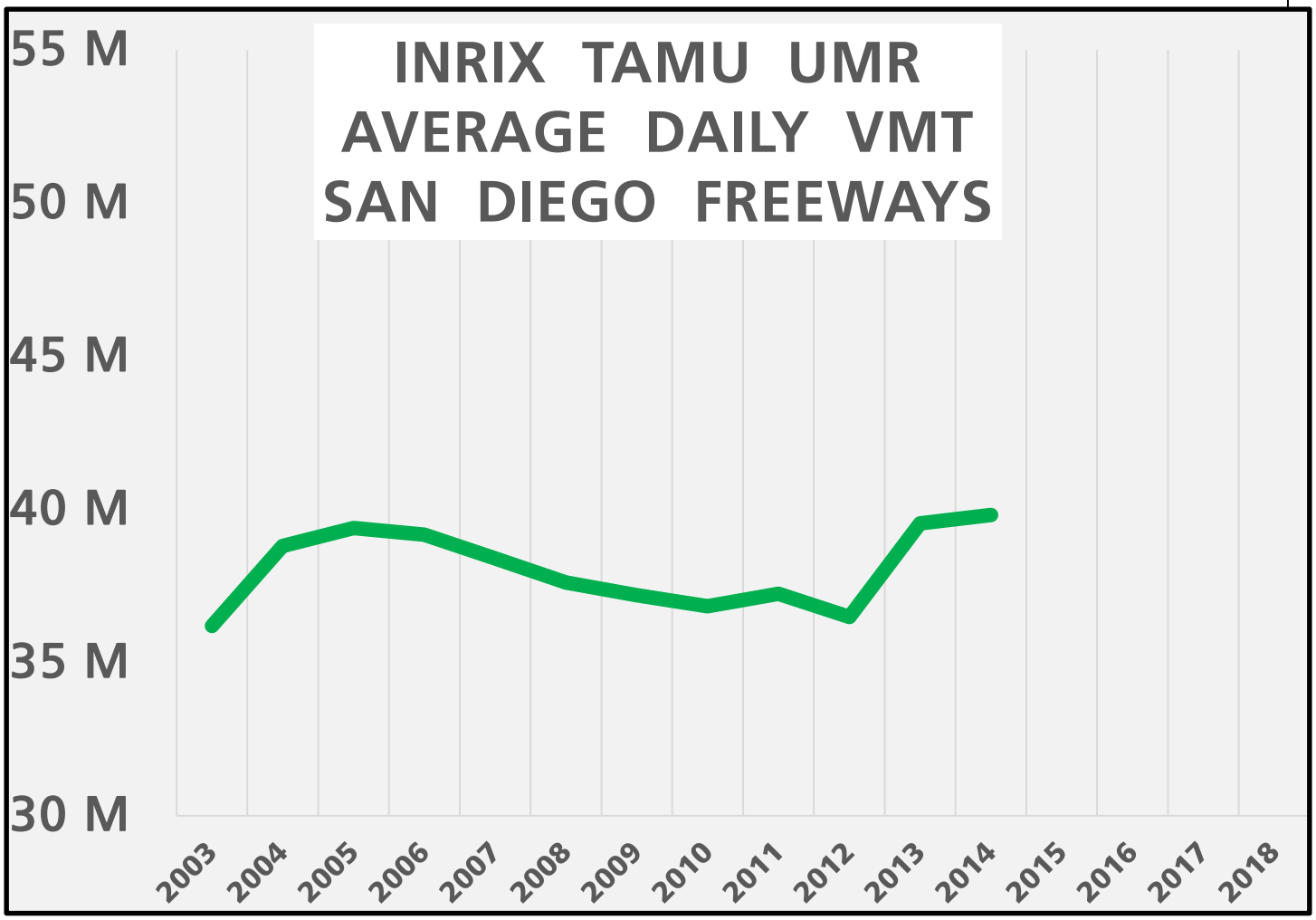
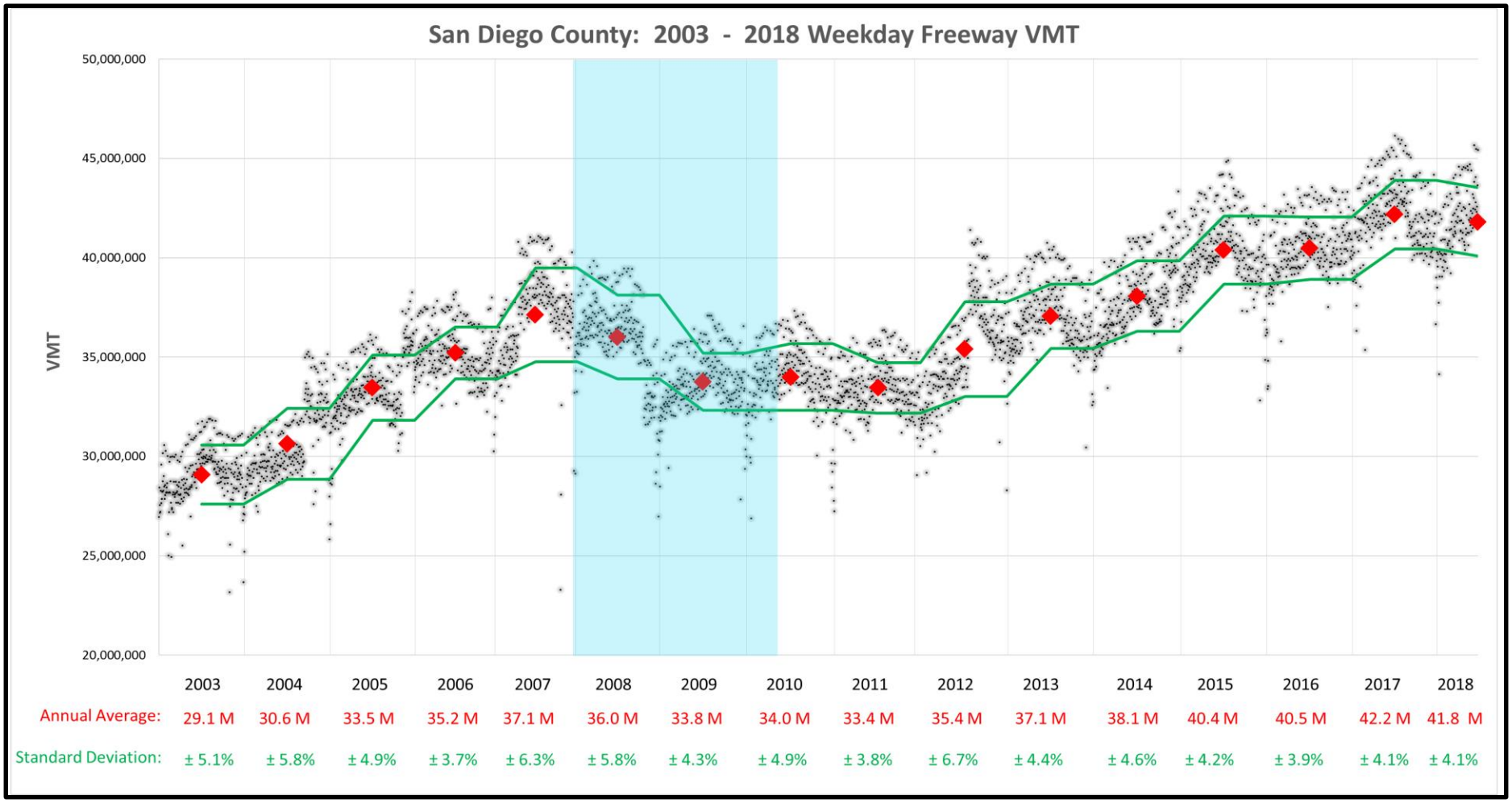
INRIX/TAMU Data



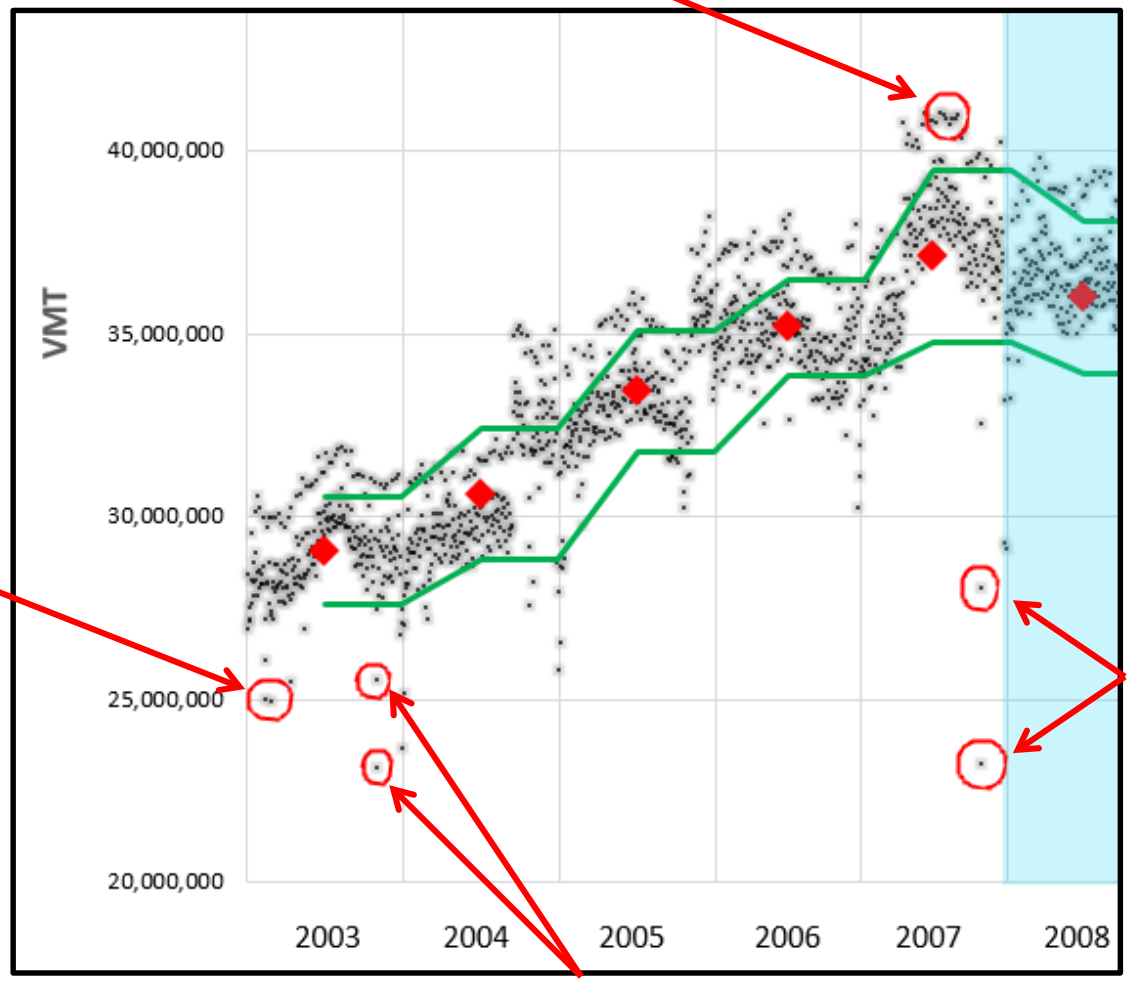
PeMS VMT Data

- Galaxy of San Diego VMT
  - All State freeways & highways with loop detectors
    - Samples filtered for San Diego County
    - Samples filtered for >85% detector health
  - All weekdays - holidays excluded
  - January 1, 2003 - June 30, 2018
  - Average daily variation ± 5%
  - http://pems.dot.ca.gov/

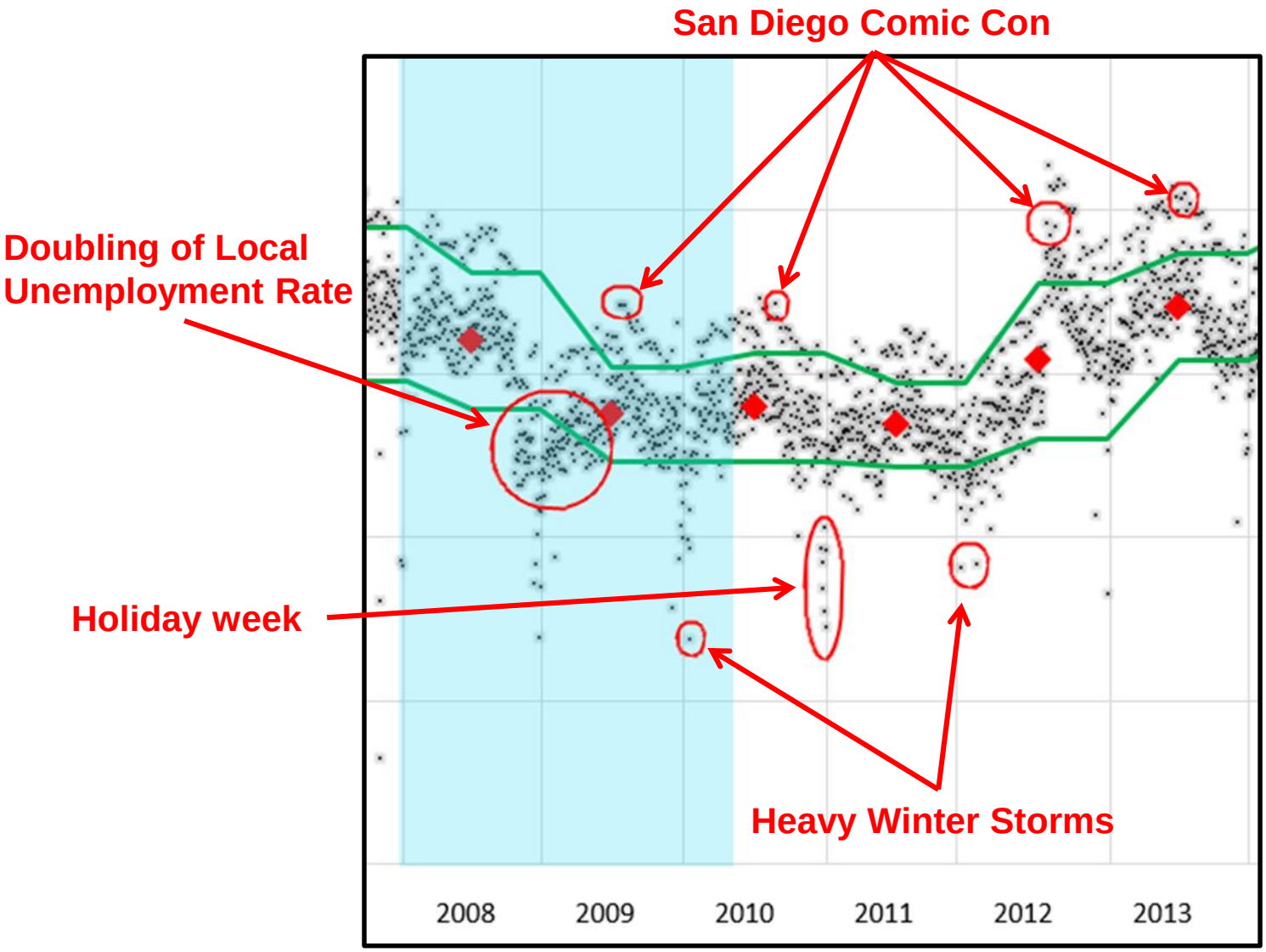
Galaxy of San Diego VMT



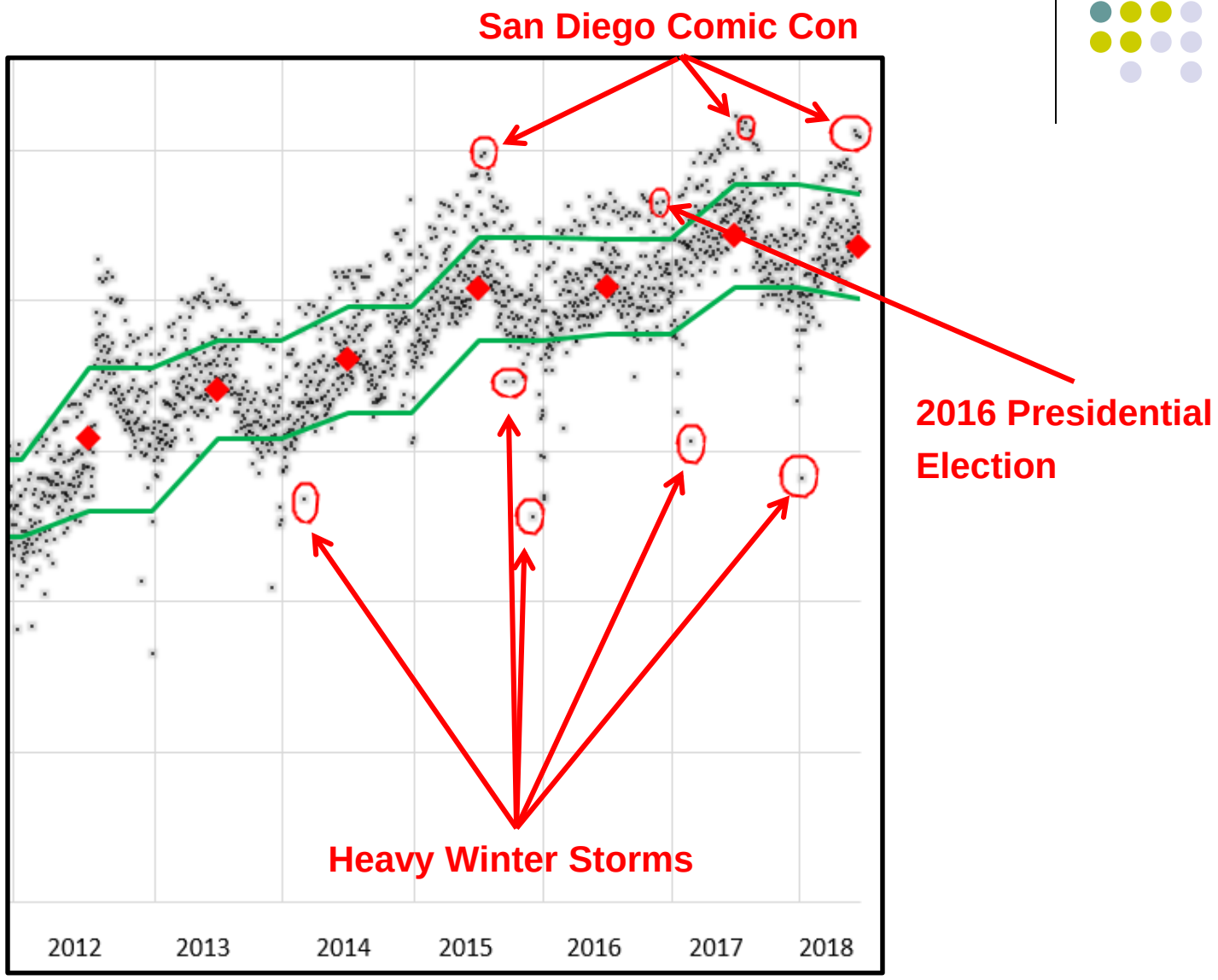
Observed Outliers



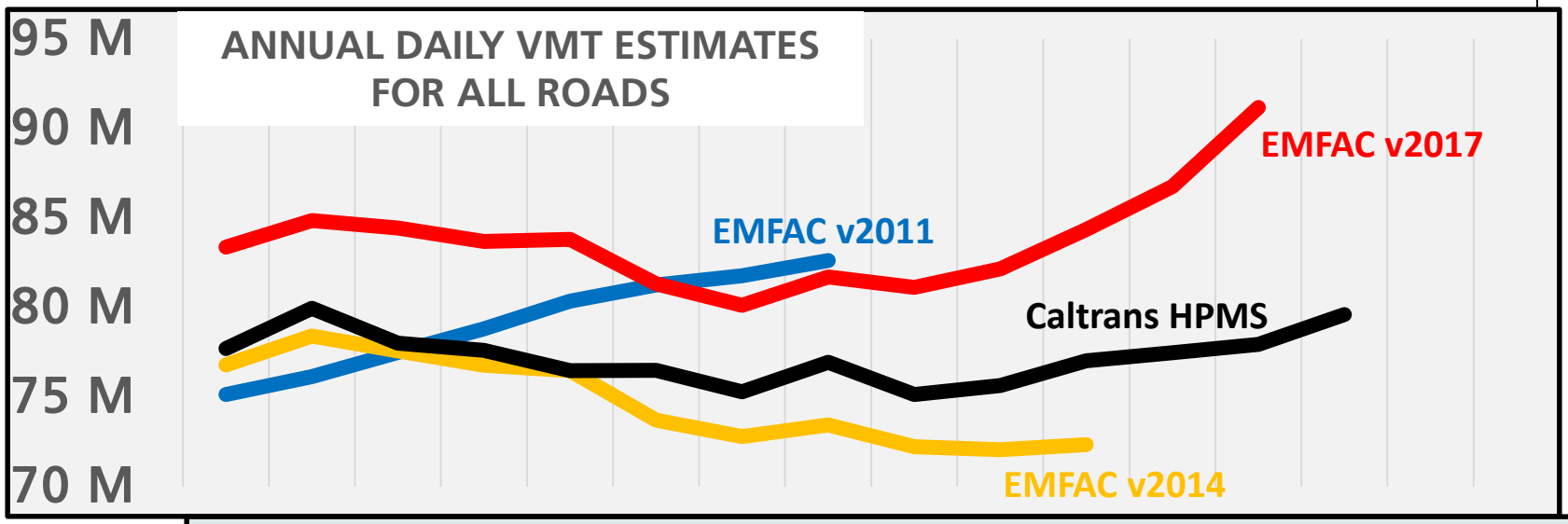
Observed Outliers

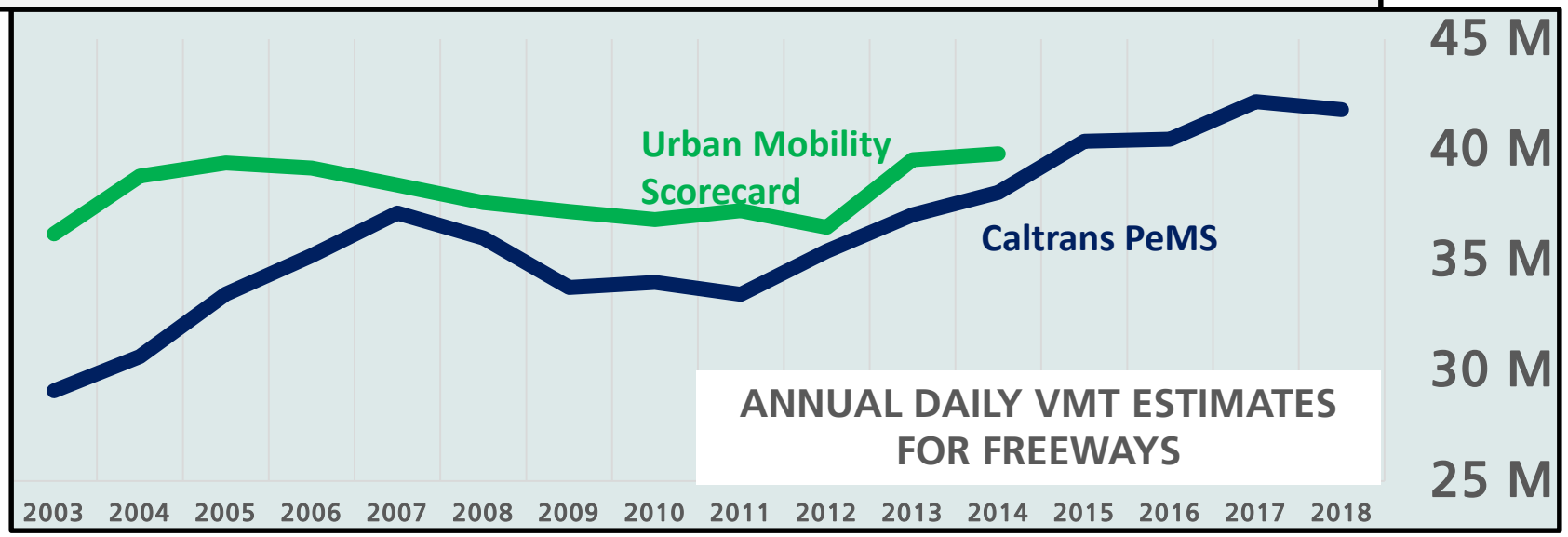


Observed Outliers

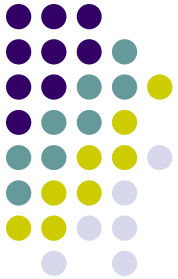


VMT Analysis Conclusions





VMT Analysis Conclusions



- Further Steps
  - Educate stakeholders on the variety of VMT sources and estimation methods
  - Methods will improve with advances in telemetry technology
  - Accessibly to data, metadata, and documentation

  - **Statewide collaboration to create a consistent VMT estimation methodology or data library for regulatory analysis and compliance!**

VMT Analysis Conclusions

- Fifteen years of observed VMT data
  - State Routes
    - Freeways and highways with loop detection
      - Covers about 46% of the system
      - Provides enough data points for statistical analysis
  - Arterials
    - Arterials with short (hose) counts
      - Covers about 5% of the system
      - Do not provide enough data points for statistical analysis

VMT Analysis Conclusions

- Fifteen years of observed VMT data
  - Weekday VMT fluctuates daily by ± 5%
    - Methods of observation and analysis
    - Weather, special events, natural disasters and holidays amplify weekday variation
    - Correlates with economic conditions
  - Third-party data is helpful for VMT estimation
  - **VMT is an estimation, not an empirical calculation!**

Series 14 Preview

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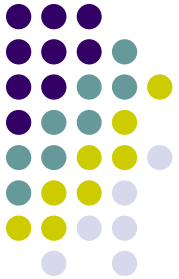
Series 14 Preview



- ABM2
- EMME Conversion
- Regional Plan

ABM2

A Suite of Travel Models

- Core model
  - San Diego resident model
- Special market models:
  - Airport passenger models: (San Diego International Airport (SAN) and Tijuana International Airport (TIJ))
  - Visitor model
  - Cross border model
  - Tour-based commercial travel model (CTM)
  - External models
  - Truck model

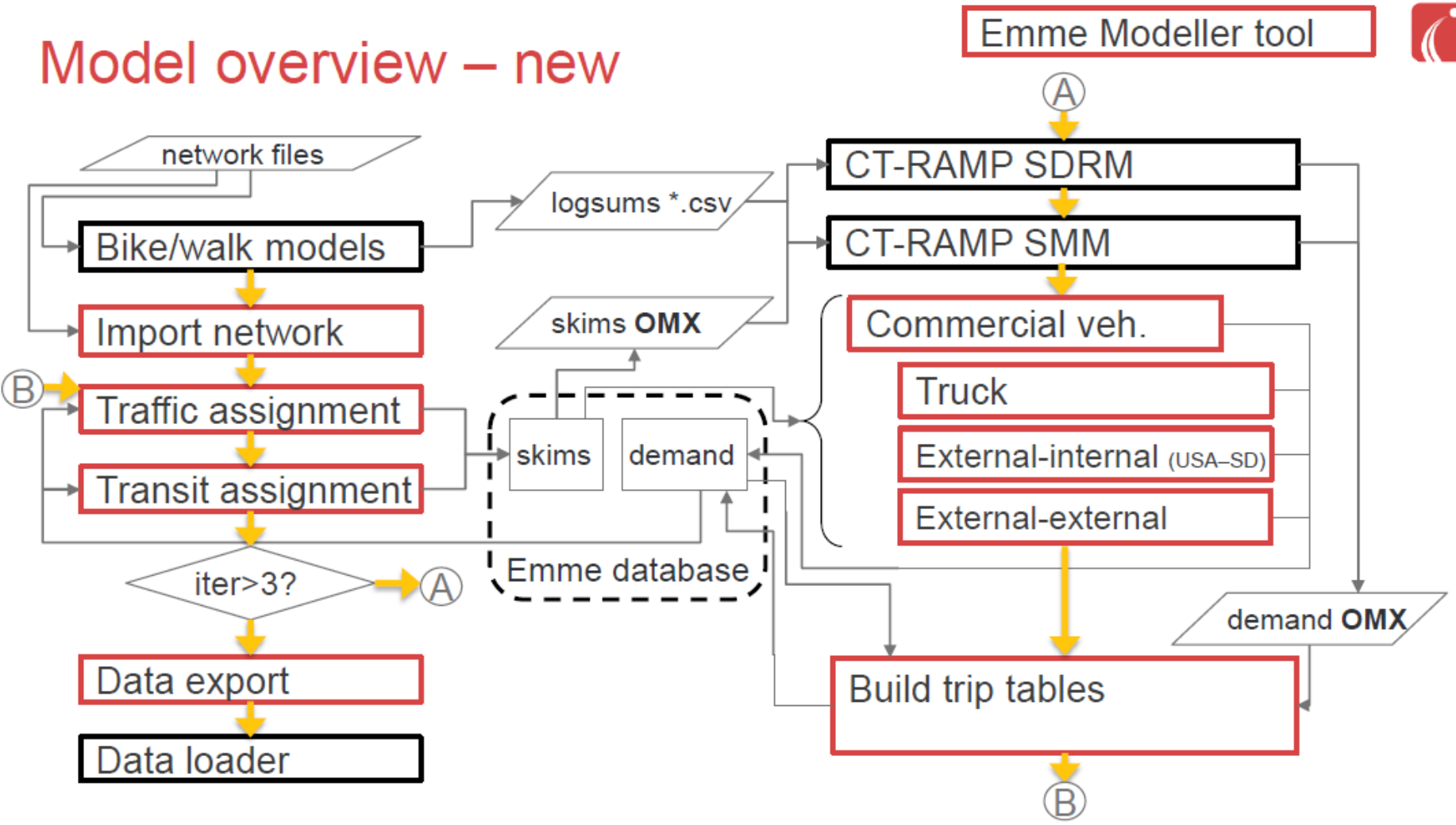
ABM2

Differences between ABM1 and ABM2

	ABM1	ABM2
Base Year	2012	2016
Household Travel Survey	2006	2016/2017
Transit On-Bound Survey	2009	2015
Airport Model	SAN	SAN and TIJ
Commercial Travel	Trip-Based	Tour-Based
Travel Time Reliability	No	Yes
Escort Model	No	Yes
Truck Model	FAF3	FAF4
Assignment/Skimming	TransCAD	EMME

EMME Conversion

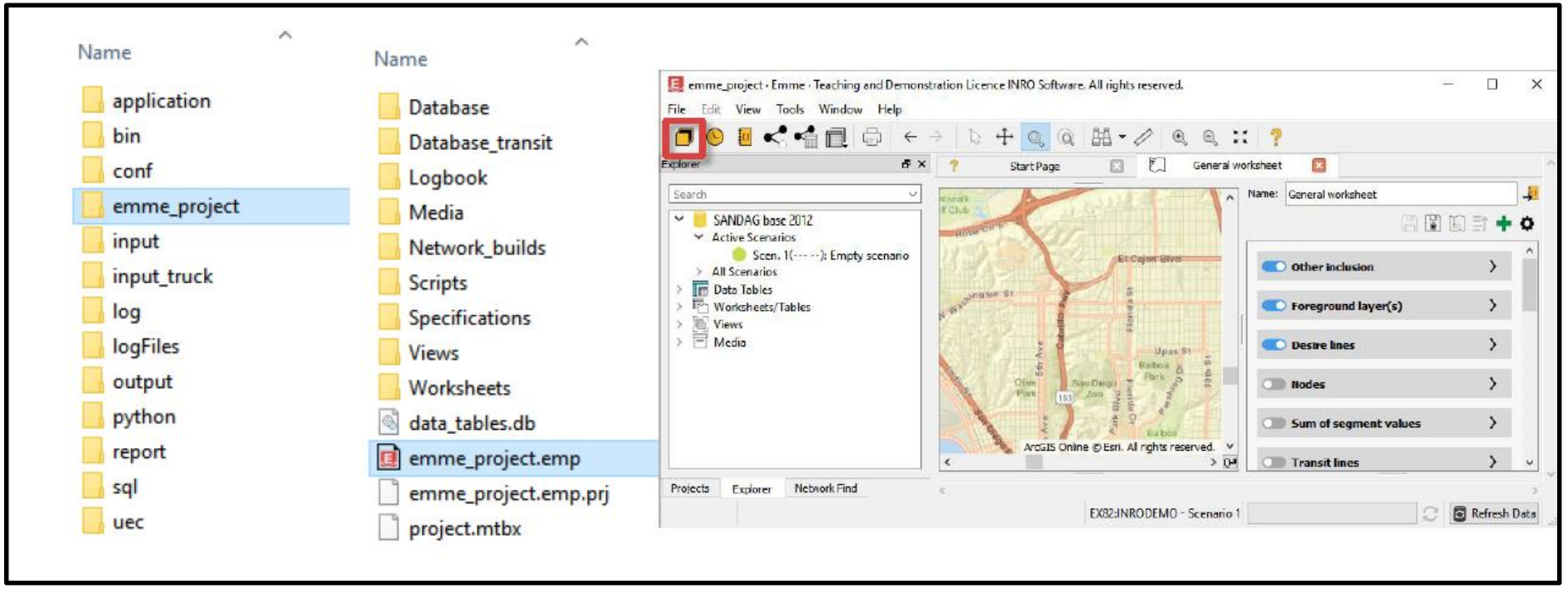
Model overview – new



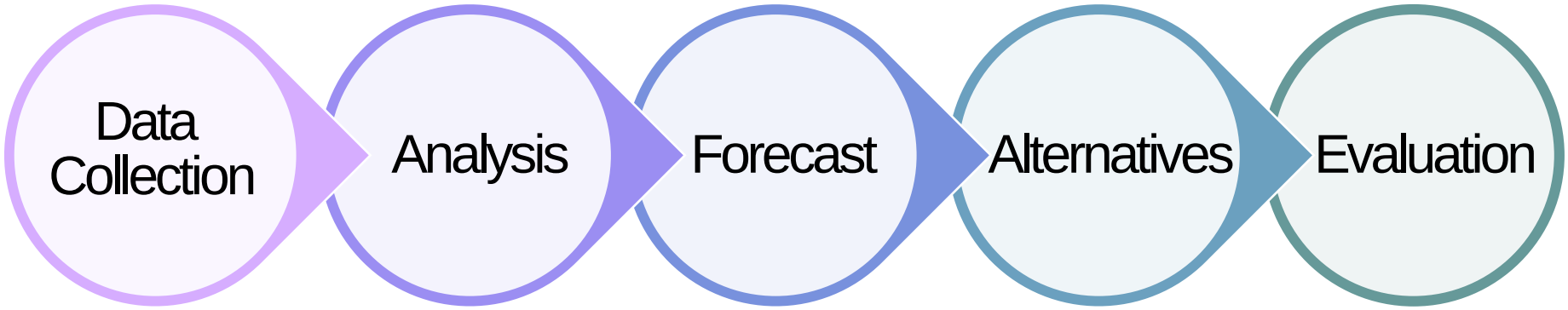
EMME Conversion

Project Structure

- emme_project folder with Emme data



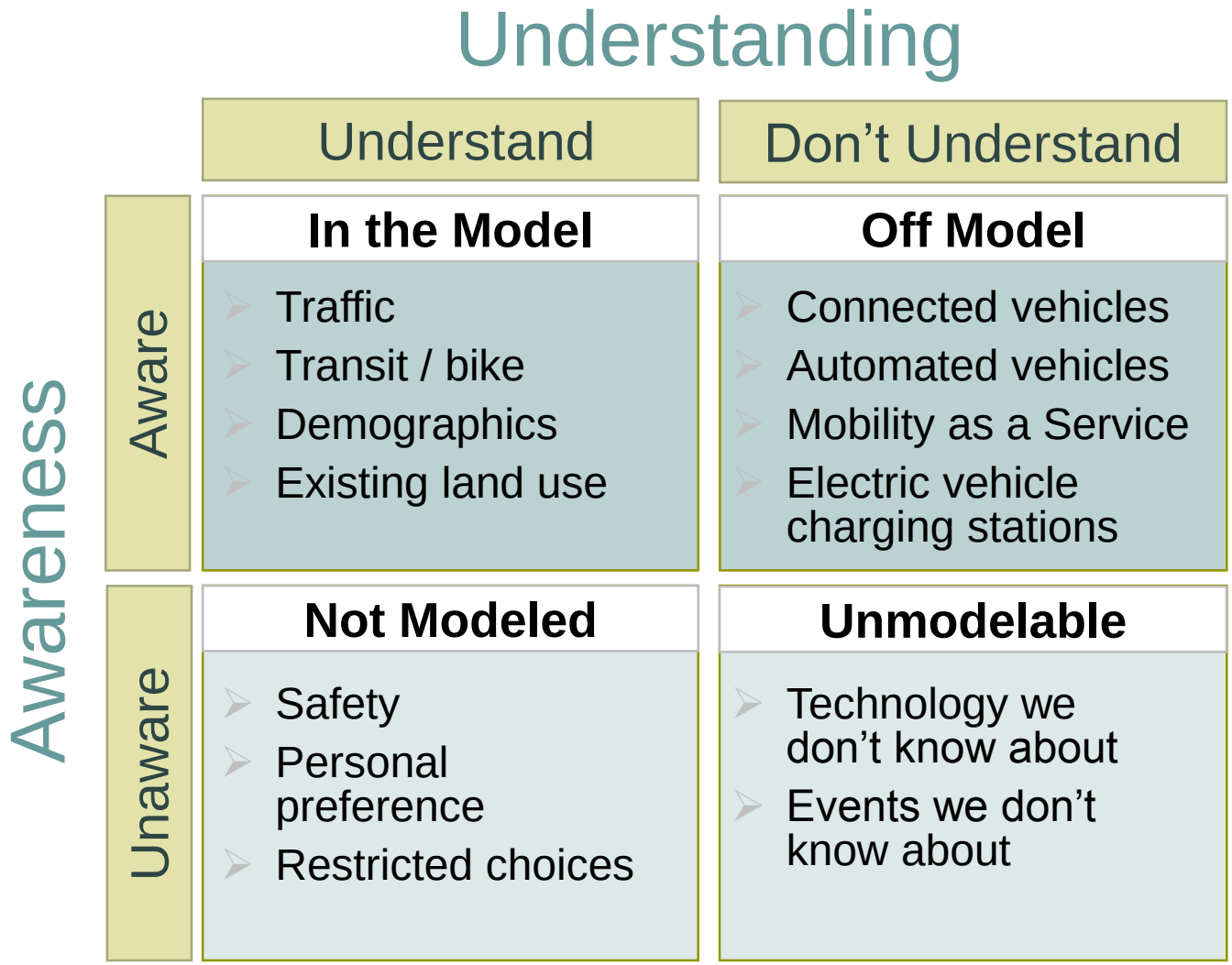
Regional Plan Process



SB 375 Regional Plan Climate Targets

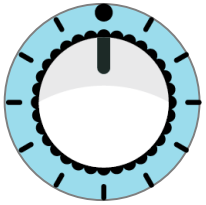
	2020	2035
Targets through September 30, 2018	-7%	-13%
Targets beginning October 1, 2018	-15%	-19%

Limitations of the Model



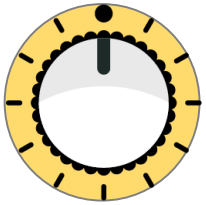
Dials

Technology



- Connected and automated vehicles (On)
- Smart signals (On)
- ATDM reliability (On)
- Electric Vehicle charging stations (Off)

Economic (Cost)

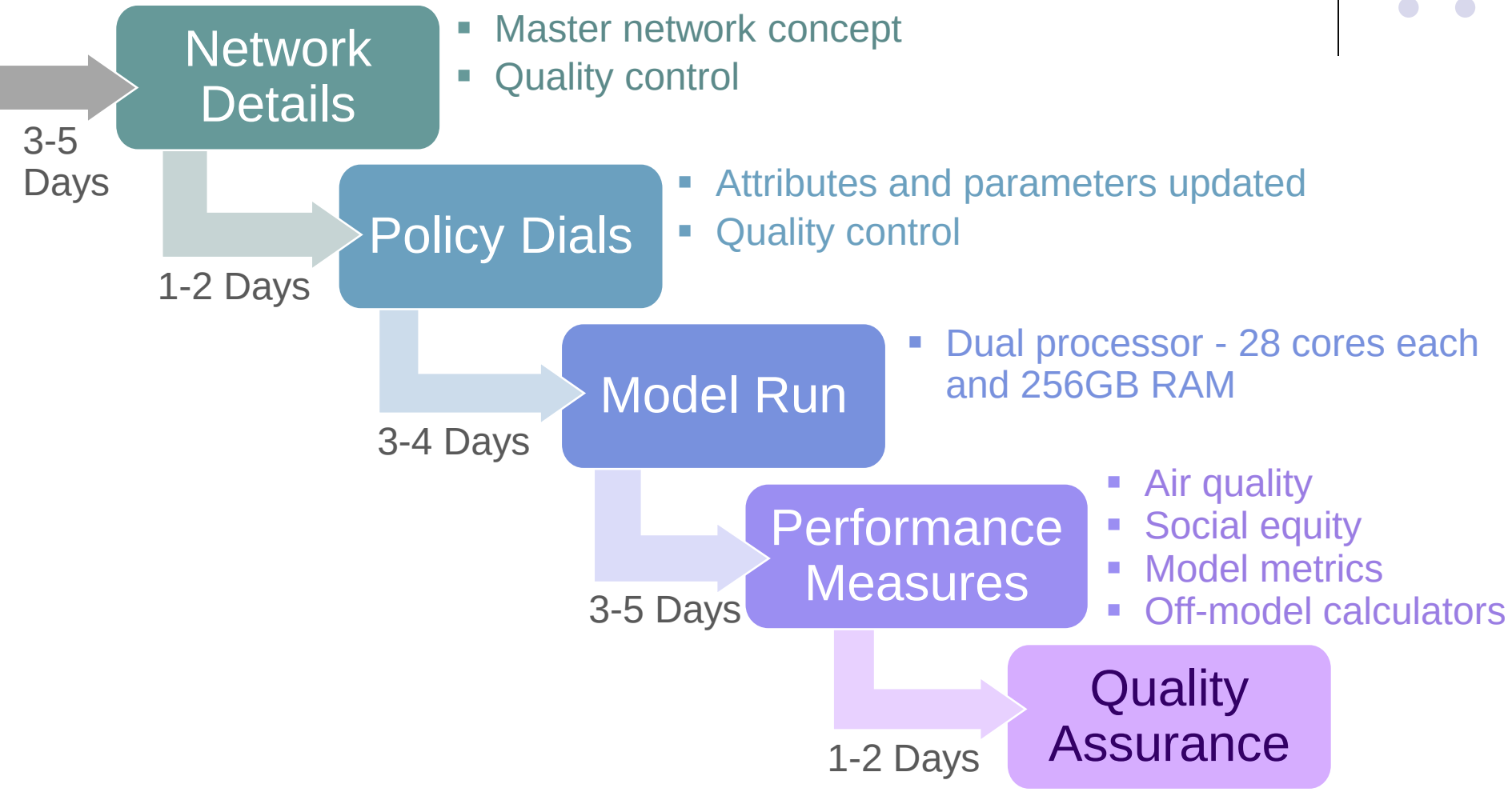


- Managed Lanes/High Occupancy toll rates (On)
- Mileage based user fee (On)
- Parking rates (On)
- Transit fares (On)

Travel Choice

- HOV/Managed Lane occupancy (On)
- Community based transportation plan (Off)
- Vanpool (Off)
- Bikeshare (Off)
- Microtransit (Off)
- Pooled rides (Off)

Model Run Timeframes



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Next Transportation Model Forum:

June 13, 2019

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December 12, 2018