

# Texas Statewide Vehicle Miles of Travel Scenario Calculation Tool

Transportation Research Board:  
Use of Scenario Planning in Transportation  
Planning

August 14–17, 2016

Presented By:  
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Associate Research Scientist



*“An approximate answer to the right problem is worth a good deal more than an exact answer to an approximate problem.” –*

John Tukey 



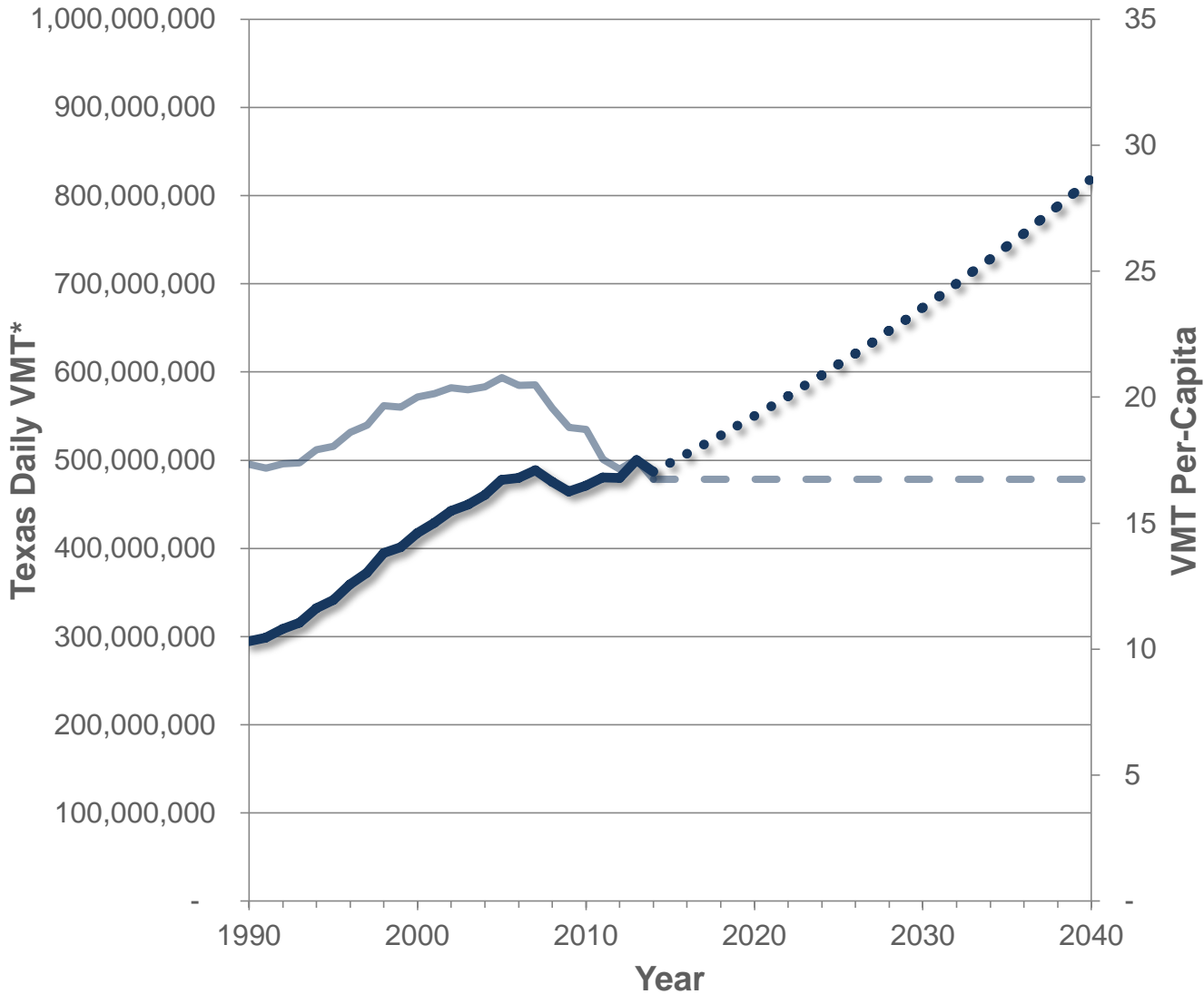
Jackson Pollock Lavender Mist #1

# Why Vehicle Miles of Travel (VMT)?



- **Tax revenue forecast**
- **Funding formulas and allocation**
- **Transportation system usage – who is growing and who is not**
- **Project Selection**
- **Performance Measures**
- **Scenario Planning**
- **Air Quality**

# VMT Daily & Per Capita



## Line Legend

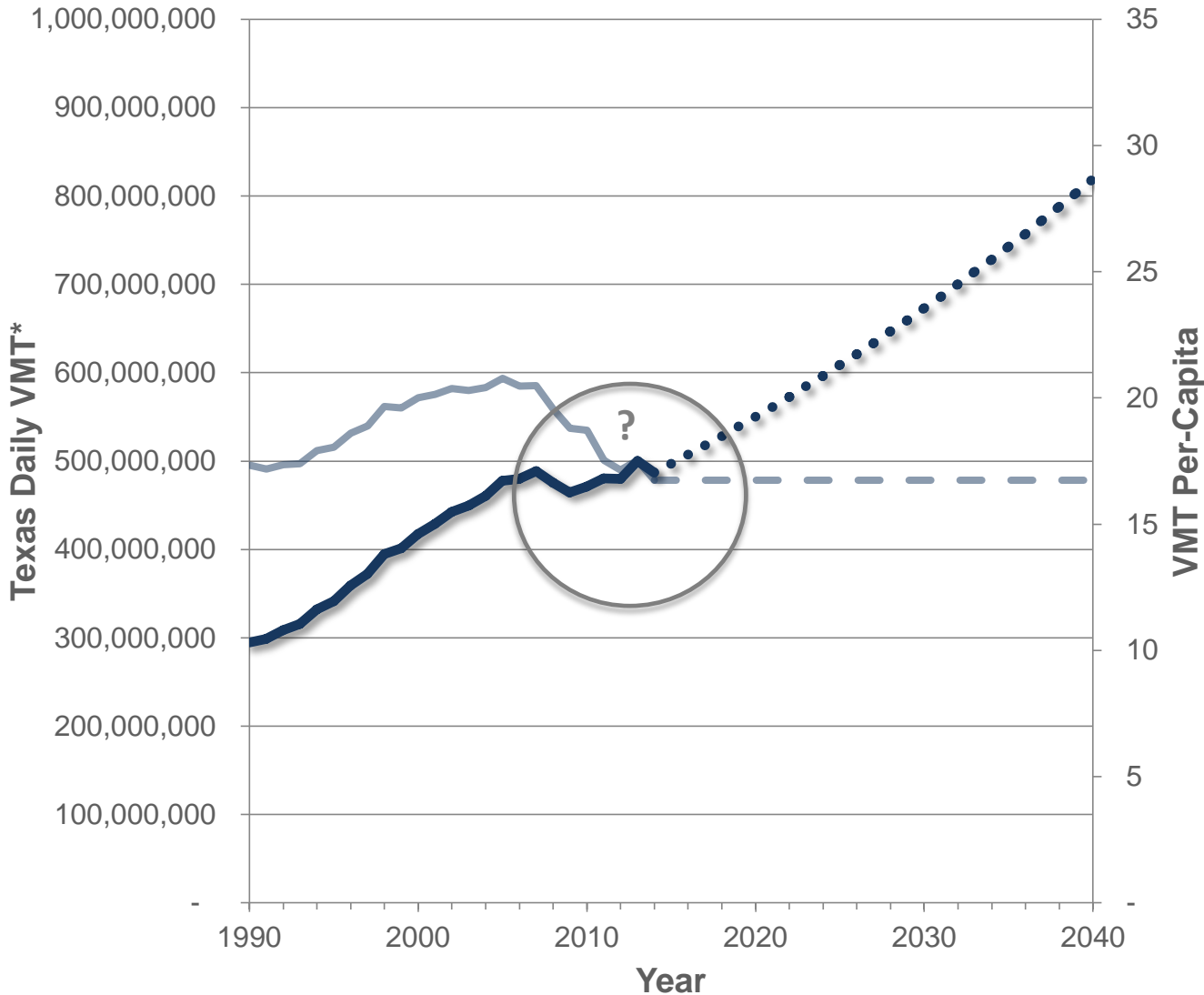
- 1. Daily VMT
- 2. Daily VMT Per-Capita Trend Forecast
- 3. VMT Per-Capita
- 4. VMT Per-Capita Forecast

## Sources

- 1. TxDOT; TLOG Database
- 2. VMT Forecast is based on average VMT per-Capita
- 3. Daily VMT/Population
- \*VMT is State Maintained Roads (i.e. On System) Only.
- 4. US Census/Texas State Demographer



# Why the Decline?



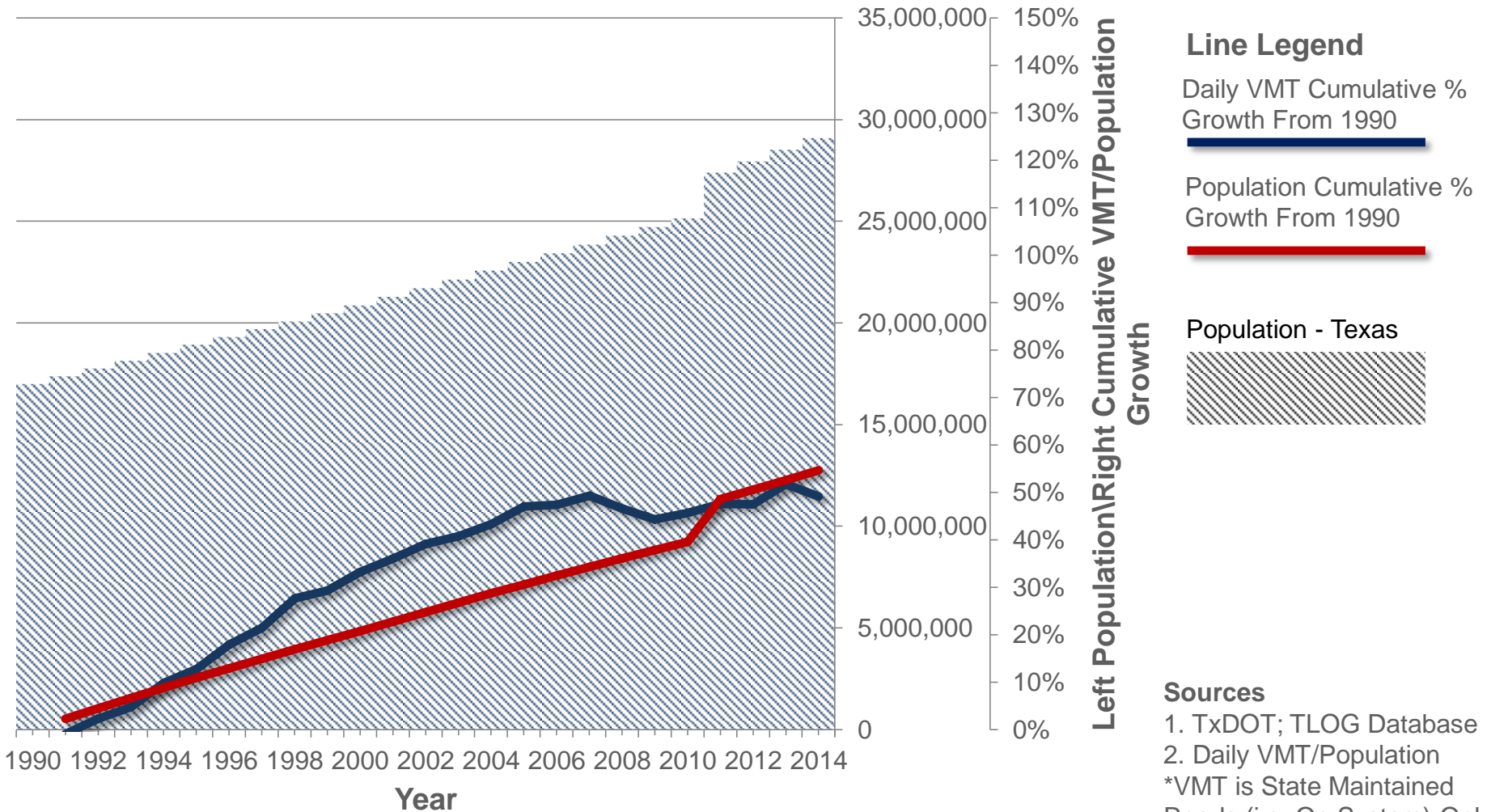
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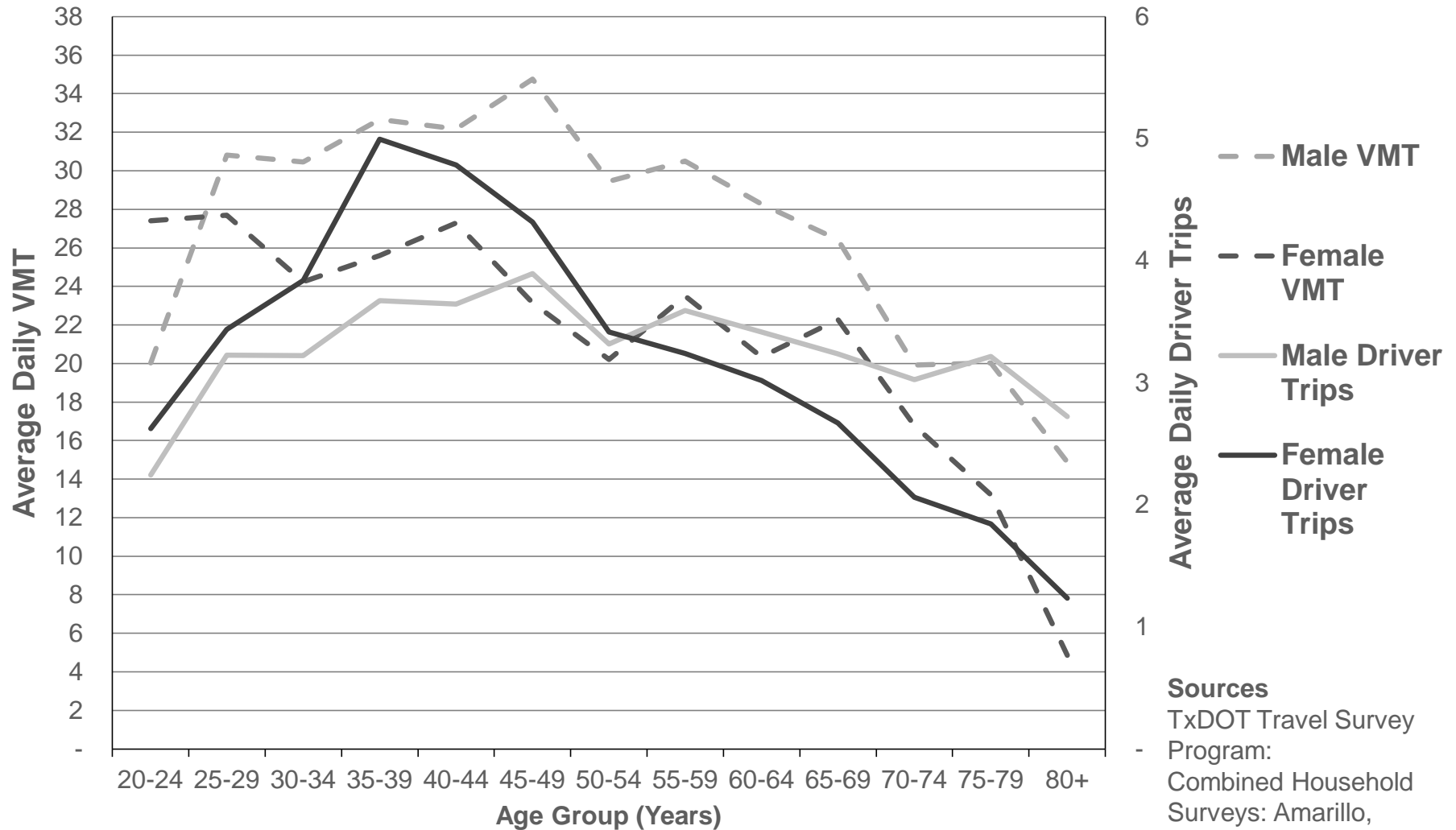
# Population



- Sources**
1. TxDOT; TLOG Database
  2. Daily VMT/Population  
\*VMT is State Maintained Roads (i.e. On System) Only.
  3. US Census/Texas State Demographer

# Demographics

## TxDOT Surveys

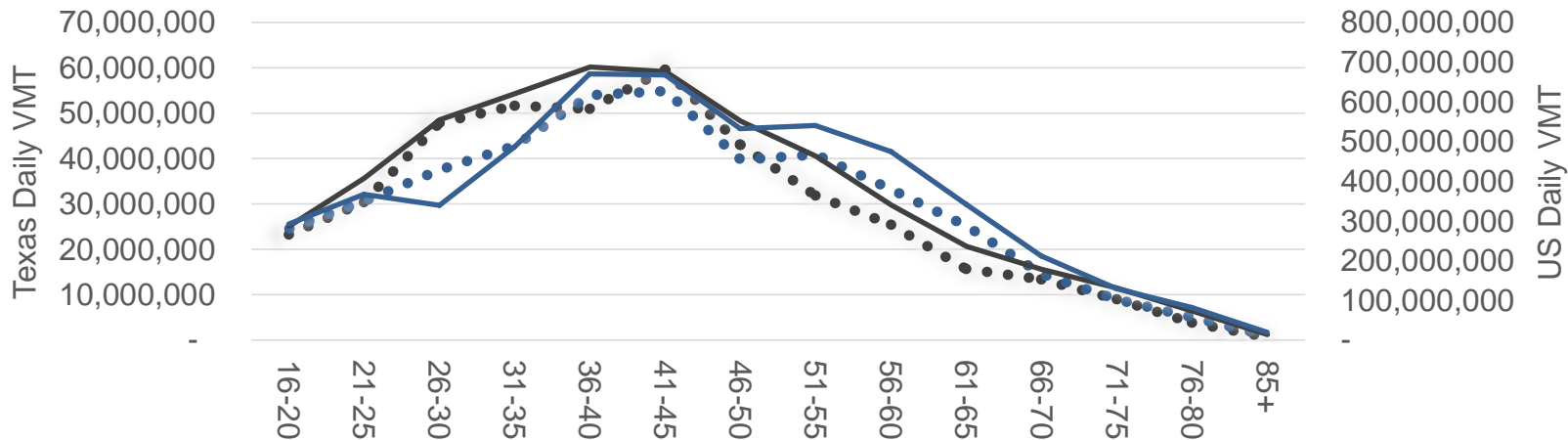
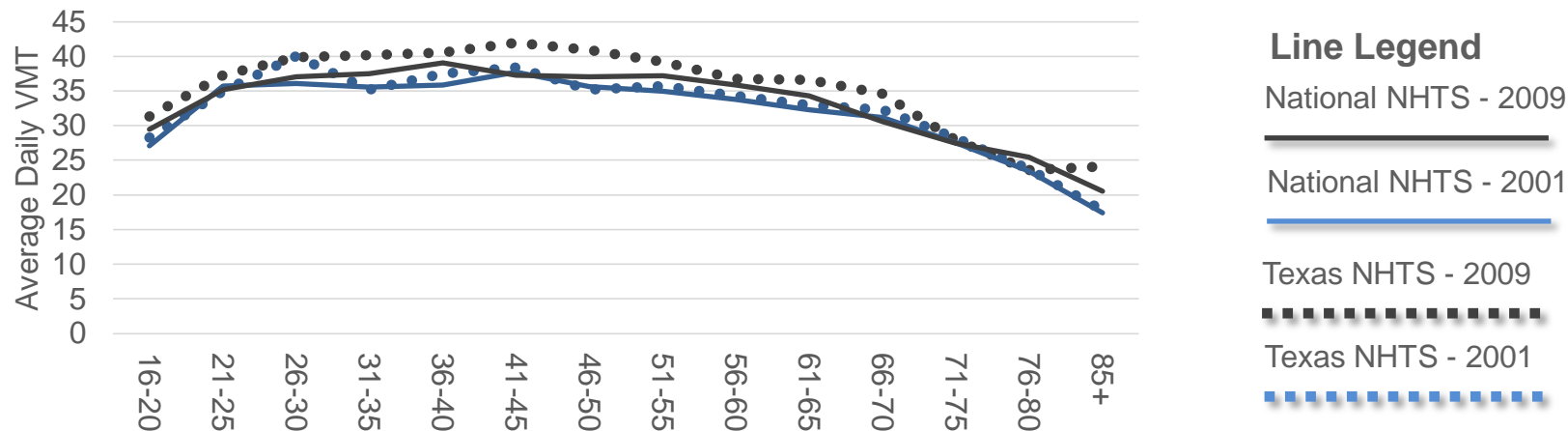


### Sources

TxDOT Travel Survey  
- Program:  
Combined Household Surveys: Amarillo, Lubbock, Victoria, Austin, Houston, San Antonio

# Demographics

## NHTS

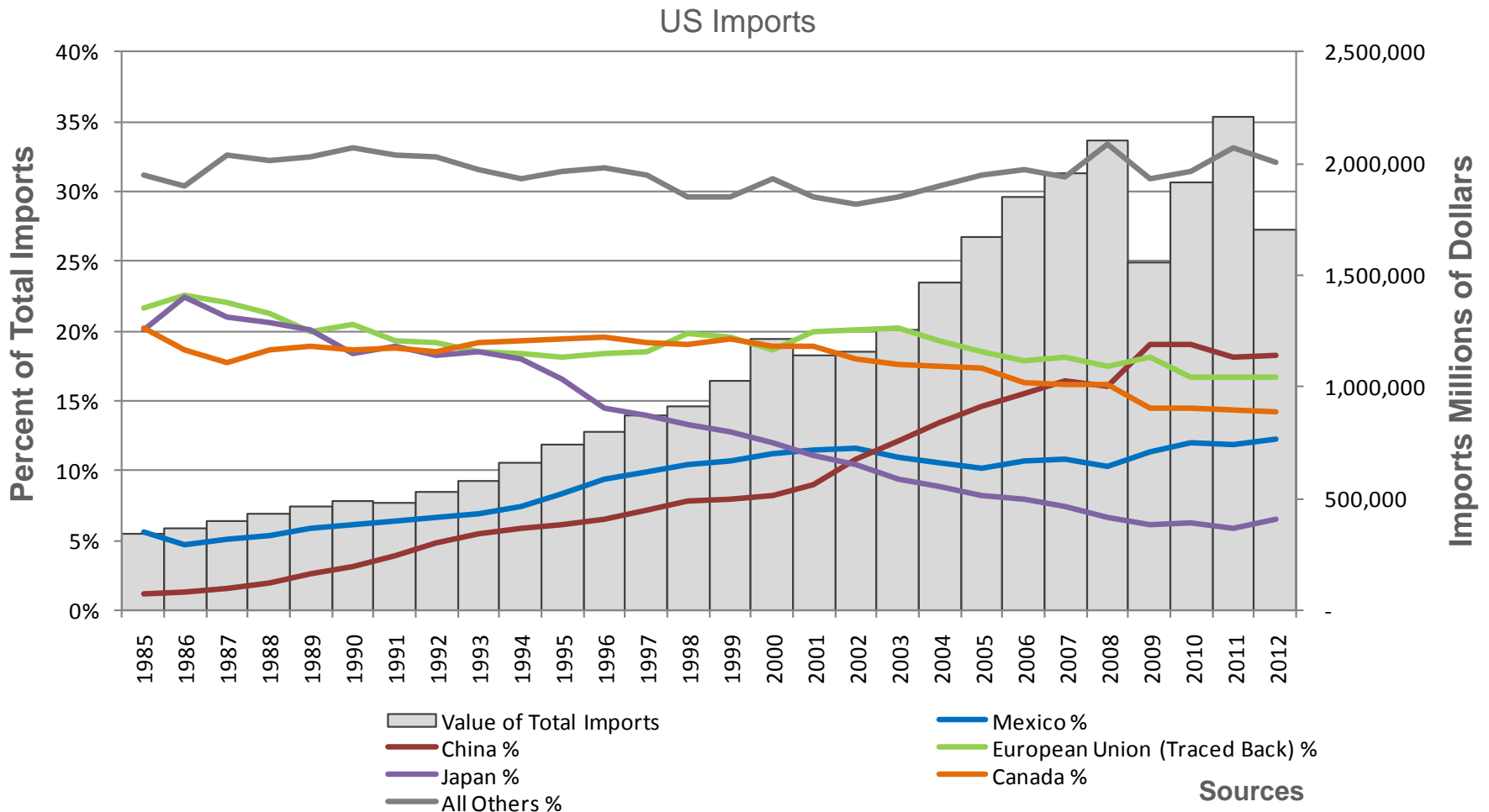


### Sources

National Household Travel Survey – 2009 & 2001  
 Data is for Vehicle Driver Trips > 0 Length

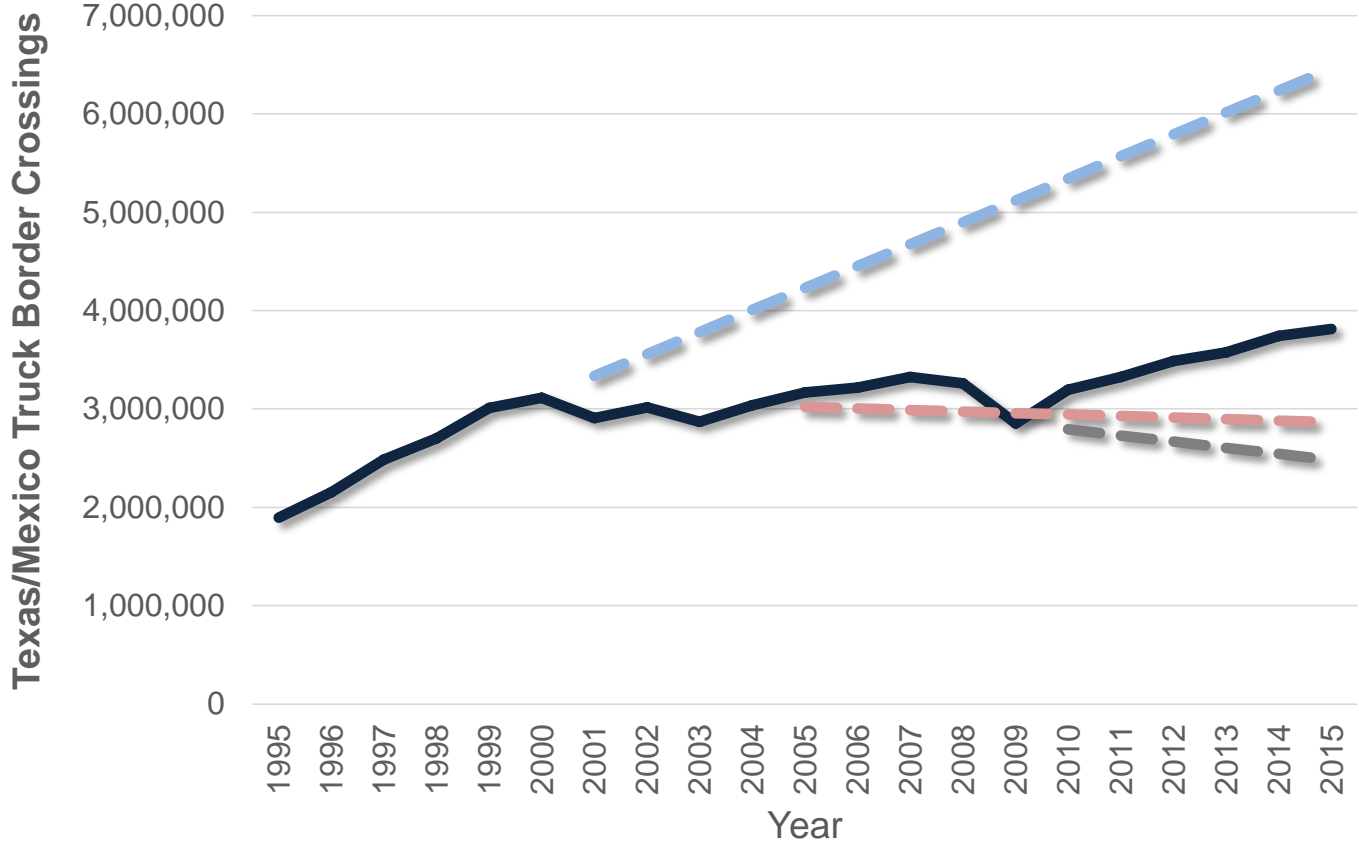


# Freight/Trade



**Sources**  
 US Census Transborder data  
<http://www.census.gov/foreign-trade/data/index.html>

# Freight/Trade



## Line Legend

Annual Border Crossings

Estimated Border Crossings  
1995-2000 Trend

Estimated Border Crossings  
2000-2005 Trend

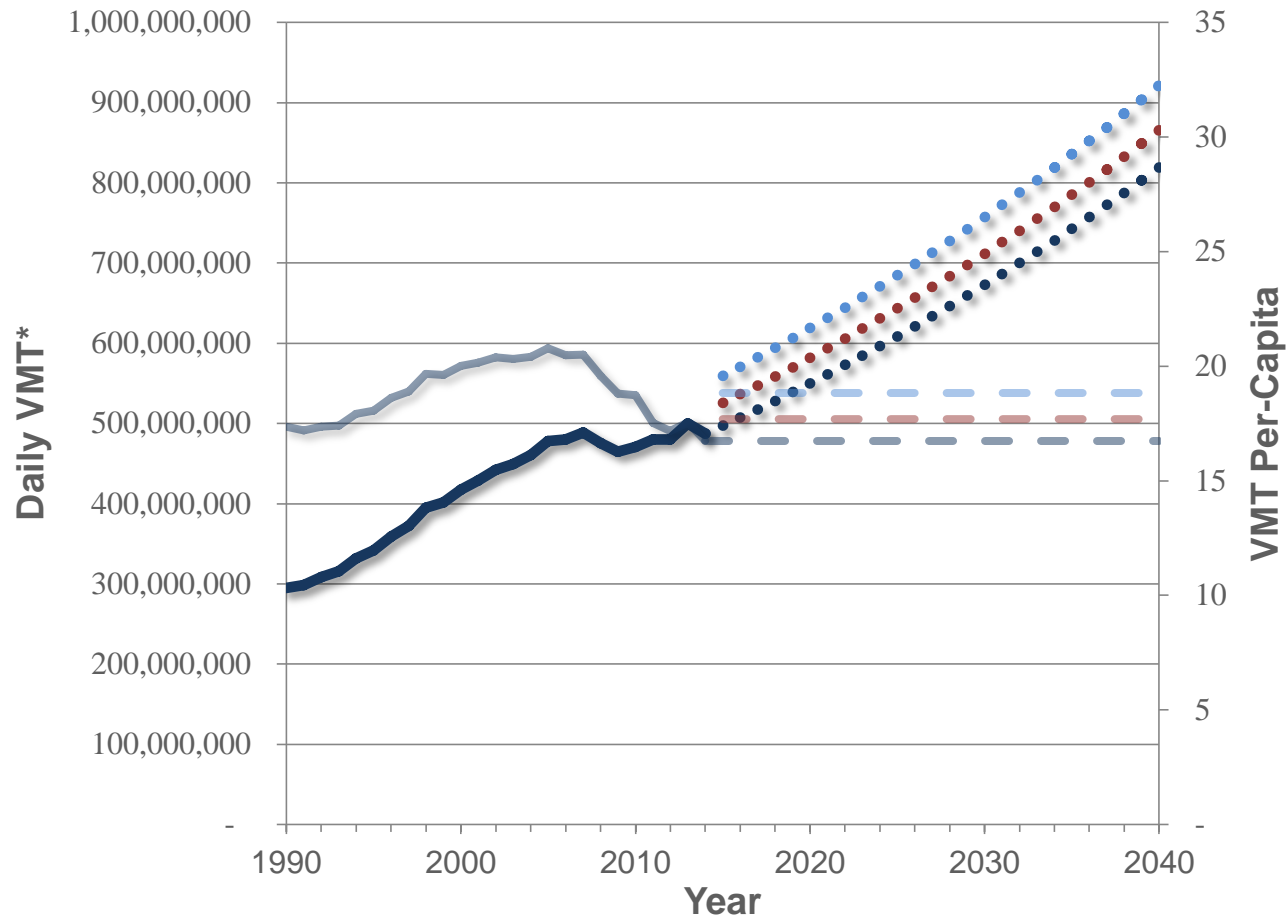
Estimated Border Crossings  
2005-2010 Trend

## Sources

Bureau of Transportation  
Statistics: Border Crossing  
Entry Data

<http://www.transtats.bts.gov/>

# VMT Per-Capita Forecast



## Line Legend

1. Daily VMT

2. VMT Per-Capita

3. Daily VMT Forecast

4. VMT 2014 Per-Capita Forecast

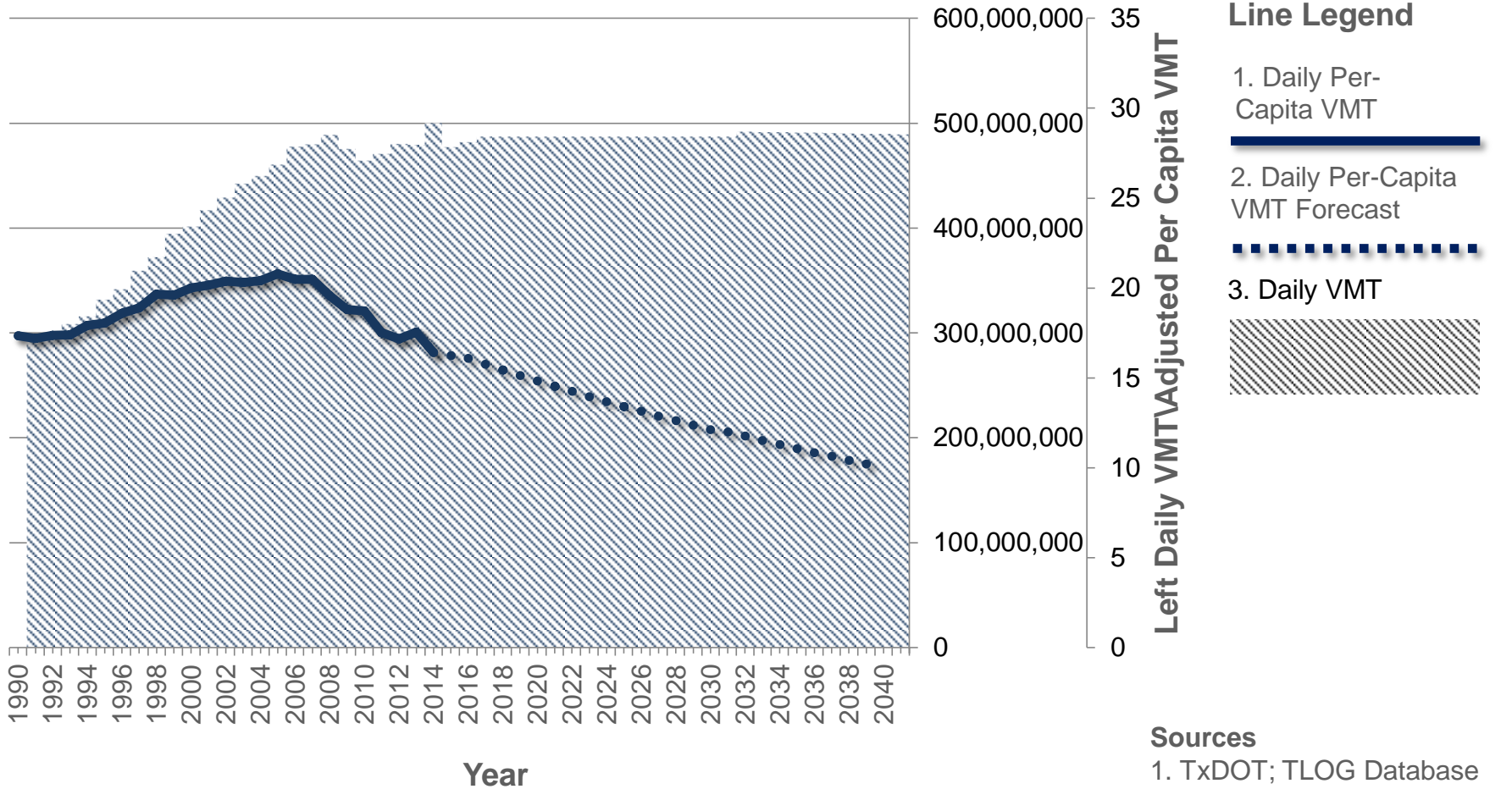
5. VMT 1990-2014 Per-Capita Forecast

6. VMT 2009-2014 Per-Capita Forecast

## Sources

1. TxDOT; TLOG Database
  2. VMT Forecast is based on average VMT per-Capita
  3. Daily VMT/Population
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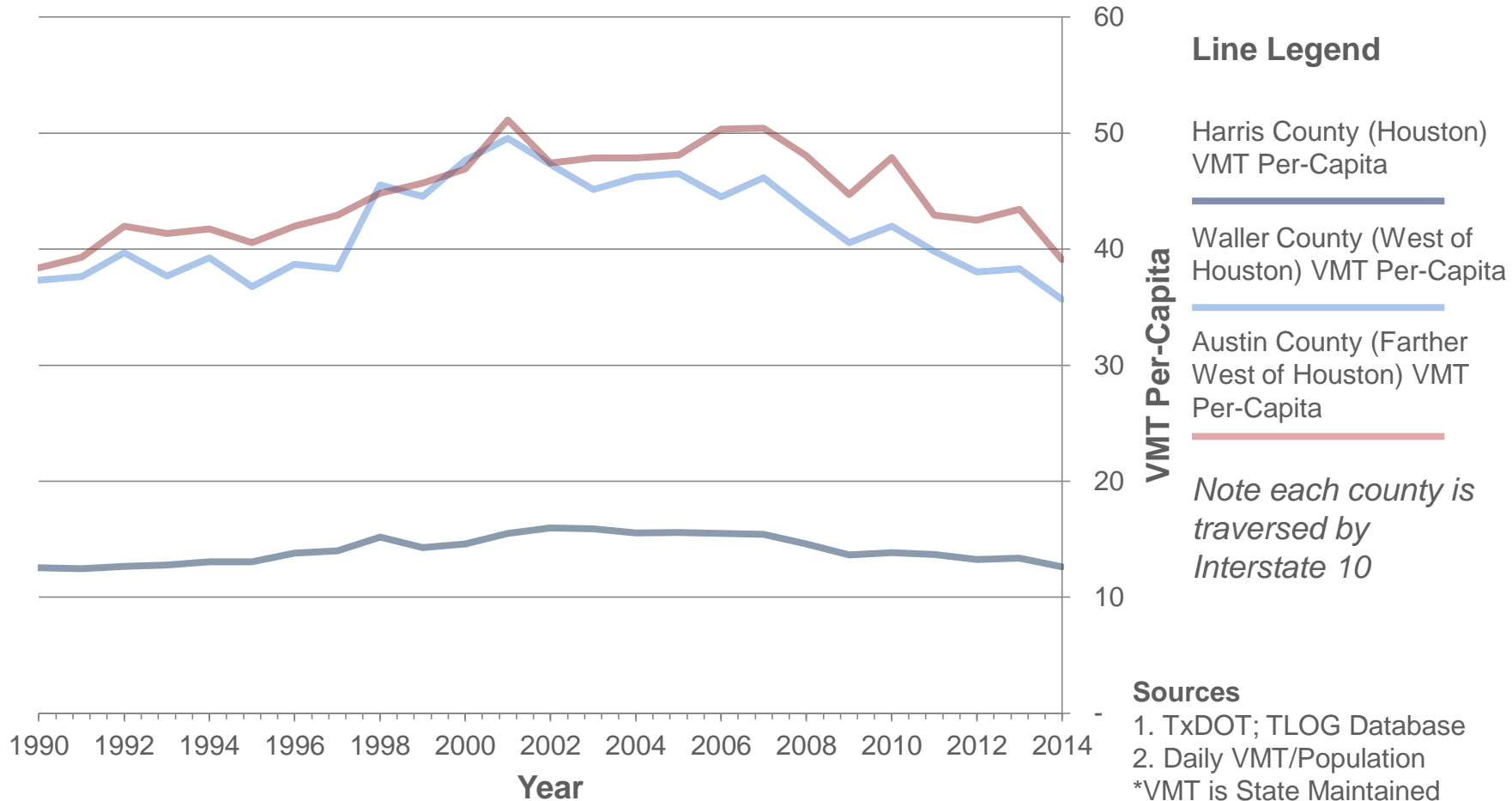
# How Low Can it Go?



### Sources

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- \*VMT is State Maintained Roads (i.e. On System) Only.

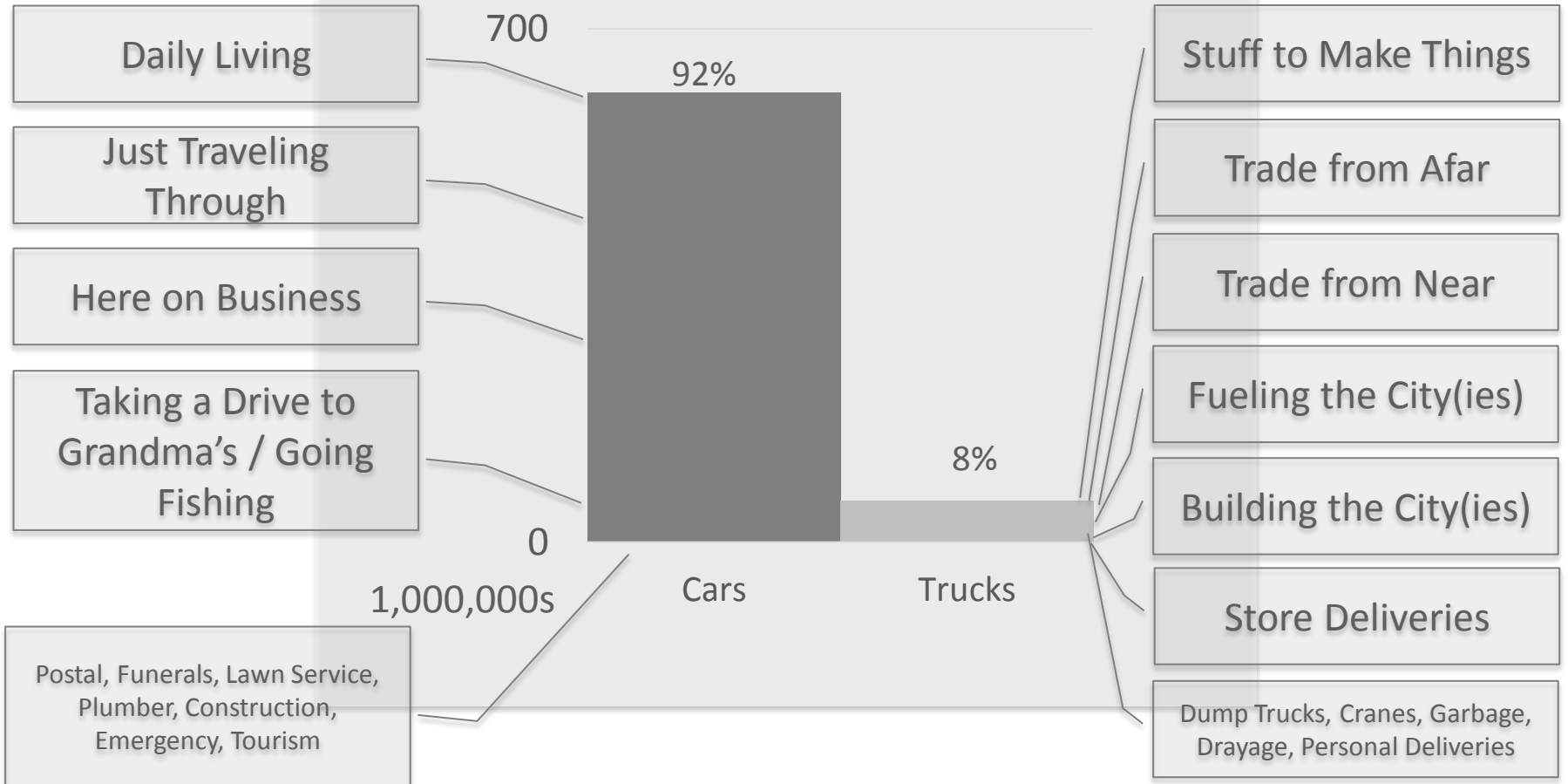
# Urban and Rural VMT



# VMT Composition



## Texas Daily VMT - 2014



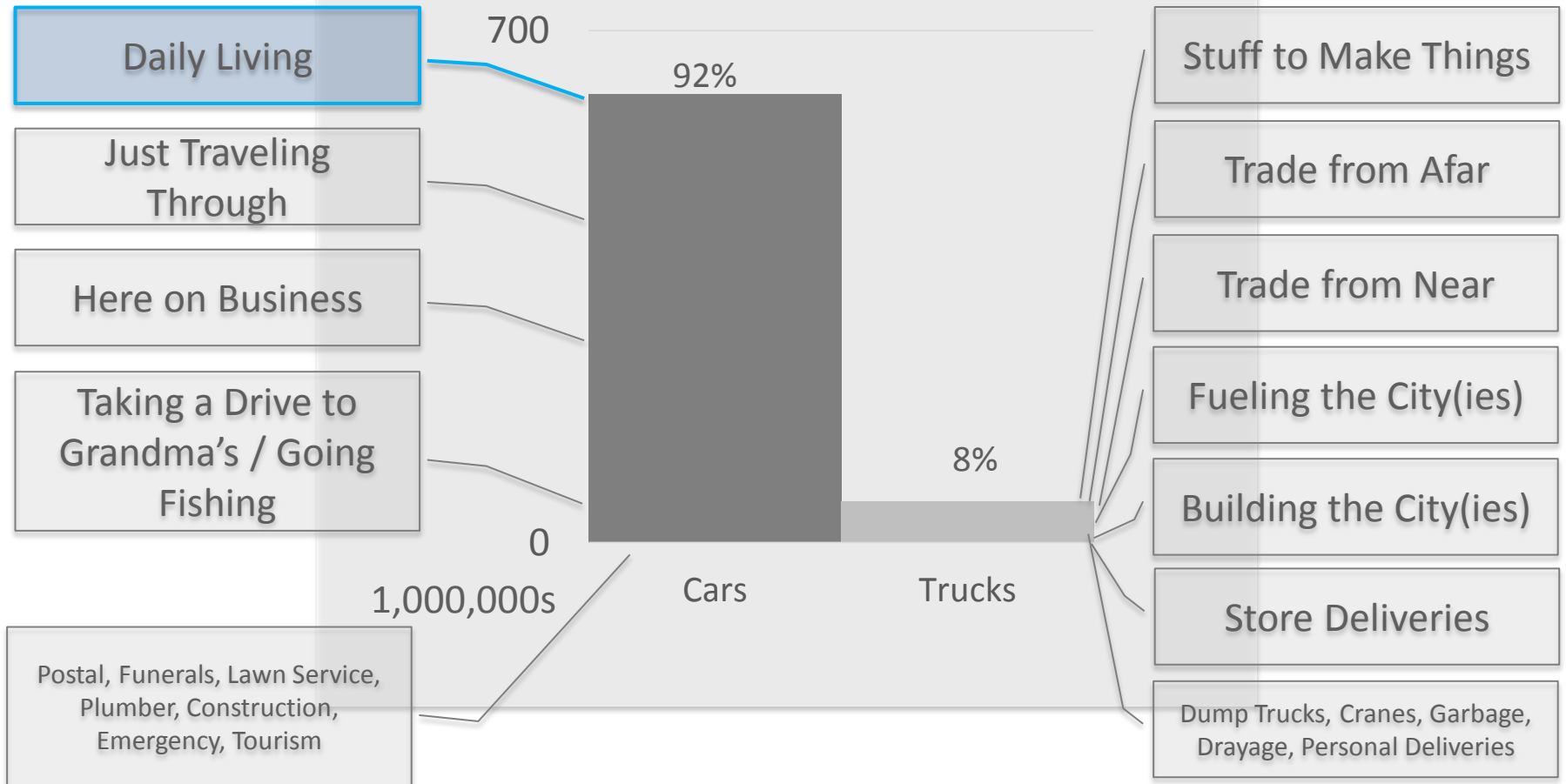


# VMT Composition

NHTS covers only a component – and one side of it

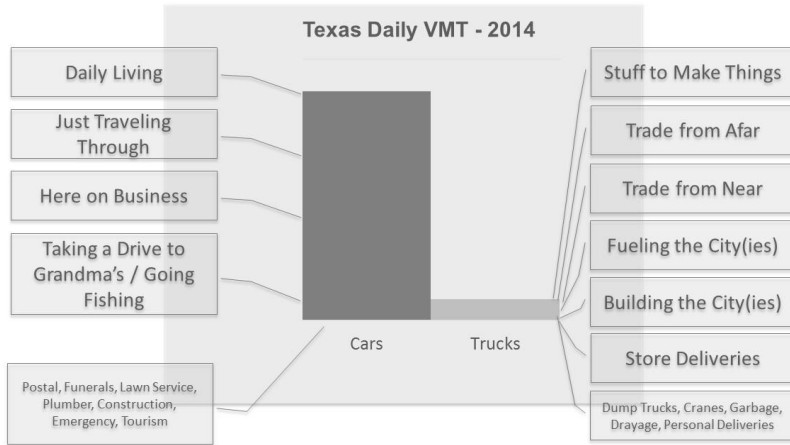


### Texas Daily VMT - 2014



# VMT Composition

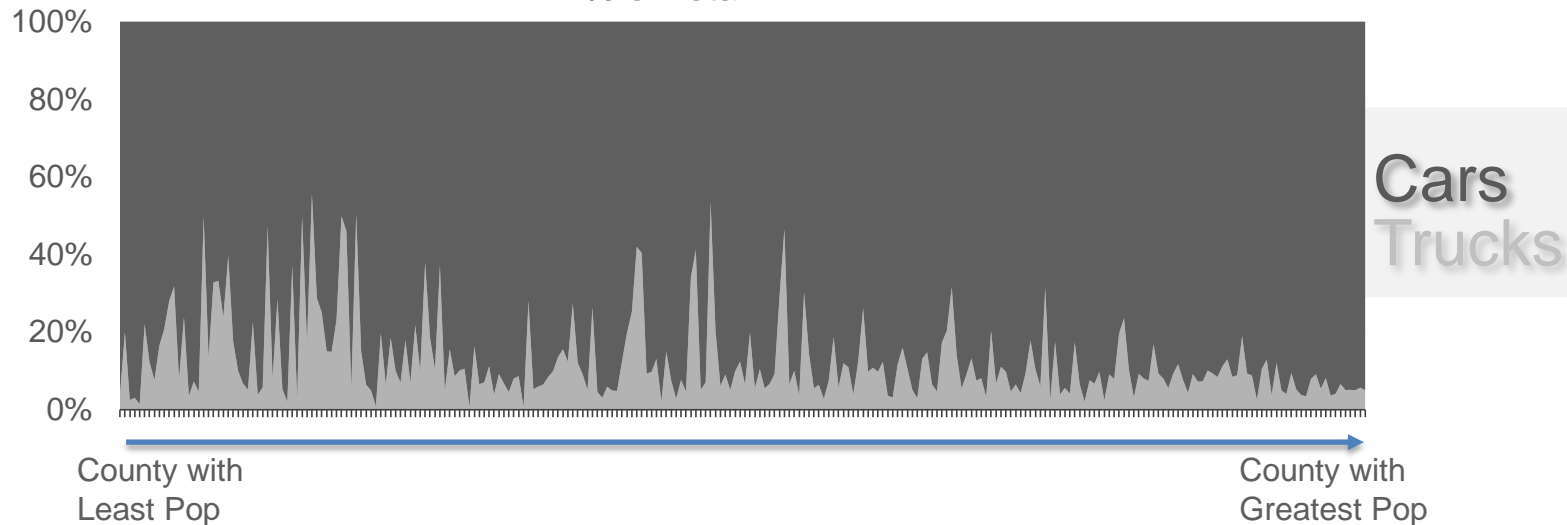
Not one size fits all



X



% of Total VMT



# Daily VMT Calculator

Or a Deconstructed Statewide Analysis Model



Introduction to Scenario Planning:

<https://youtu.be/yVgxZnRT54E>



# Daily VMT Calculator

- **ON** and **OFF** System VMT estimates for 254 counties
- Estimates are for current year plus forecast year out to 2050.
- 3 Population Scenarios
- VMT Estimates are county level, discrete estimates of intra, internal-external, and through trips.
- Ability to adjust internal trip generation and vehicle occupancy rates **X 5** County Types
- Ability to adjust growth in internal-external and through trips.
- Redistribute regional attractions
- Adjust national and Mexico flows

▲ ▬ ▼	Increase Auto Occupancy by	20 %	▲ ▬ ▼	Decrease HBW Trip Rate	4 %
▲ ▬ ▼	US/Mexico Truck Annual Growth Rate	6 %	▲ ▬ ▼	Decrease Non-Work Trip Rate	0 %
▲ ▬ ▼	US/Mexico Auto Annual Growth Rate	2 %	▲ ▬ ▼	Decrease Truck Trip Rate	0 %
▲ ▬ ▼	US/Texas Truck Annual Growth Rate	5 %	<input type="button" value="Refresh Calculations"/>		
▲ ▬ ▼	US/Texas Auto Annual Growth Rate	2 %			

# Daily VMT Calculator



- Results are estimates of county level, intra, internal-external, and through trips

## By:

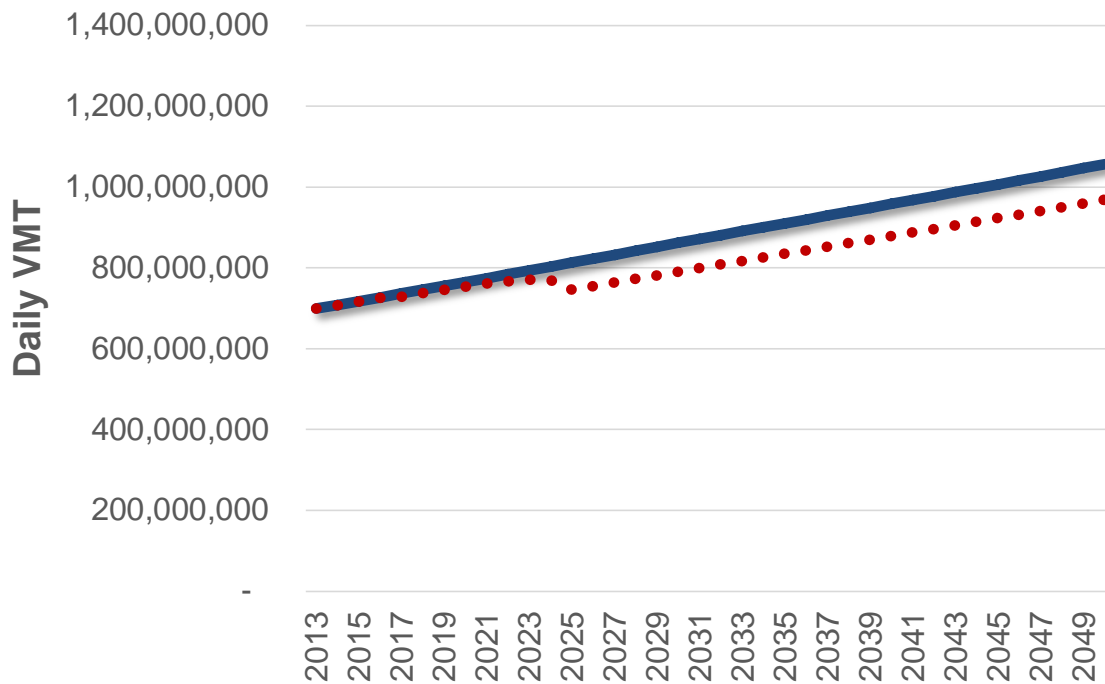
- Passenger work trips
- Passenger other Trips
- Trucks

X 3 geographic regions – within Texas, to/from all other states, to/from Mexico

X 3 geographic regions – within Texas, to/from all other states, to/from Mexico

# Example

## Increase Vehicle Occupancy



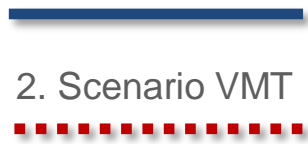
### Cumulative Change in Trips -6.3%

- Increase Auto Occupancy by 10%
- US/Mexico Truck Annual Growth Rate 0%
- US/Mexico Auto Annual Growth Rate 0%
- US/Texas Truck Annual Growth Rate 0%
- US/Texas Auto Annual Growth Rate 0%
- Decrease HBW Trip Rate 0%
- Decrease Non-Work Trip Rate 0%
- Decrease Non-Work Trip Rate 0%
- Decrease Truck Trip Rate 0%
- Decrease Truck Trip Rate 0%

### Line Legend

1. Baseline VMT

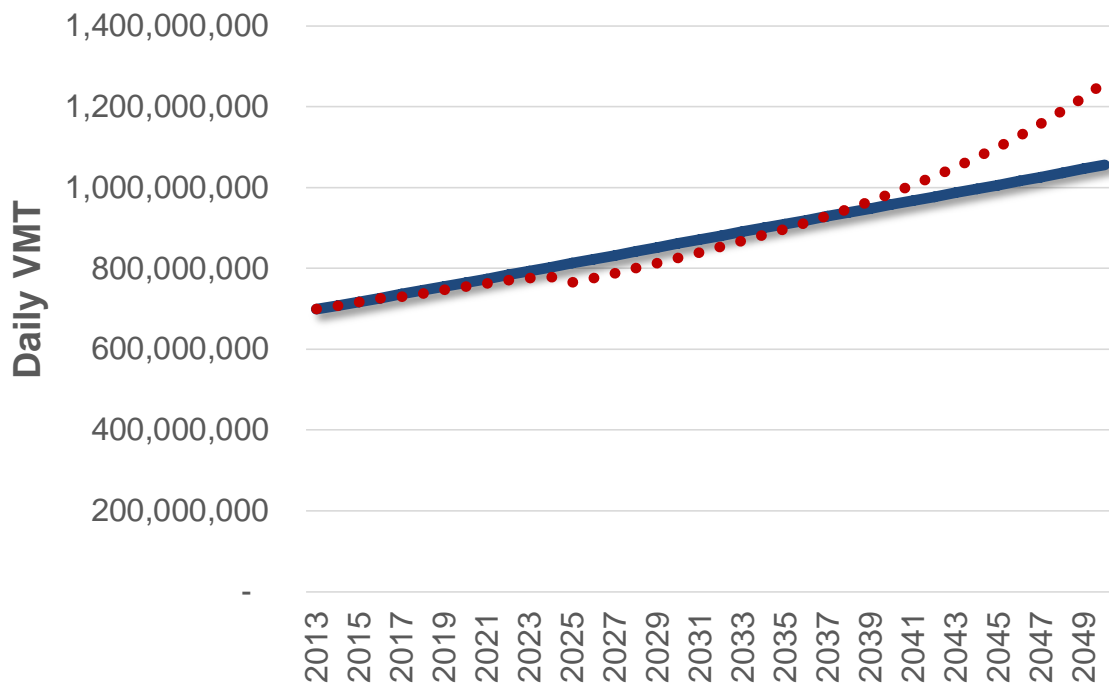
2. Scenario VMT





# Example

## Increase Vehicle Occupancy and Truck Trade



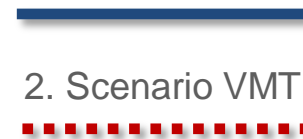
### Cumulative Change in Trips 2.1%

- Increase Auto Occupancy by 10%
- US/Mexico Truck Annual Growth Rate 10%
- US/Mexico Auto Annual Growth Rate 0%
- US/Texas Truck Annual Growth Rate 10%
- US/Texas Auto Annual Growth Rate 0%
- Decrease HBW Trip Rate 0%
- Decrease Non-Work Trip Rate 0%
- Decrease Non-Work Trip Rate 0%
- Decrease Truck Trip Rate 0%
- Decrease Truck Trip Rate 0%

### Line Legend

1. Baseline VMT

2. Scenario VMT



# Inside the Box



- Daily VMT from the SAM is adjusted by county to estimates from HPMS.
- Person trip rates (number of trips per person) are calculated using the SAM trips and population for each county's internal to internal trips.
- External travel is estimated individually for each county based on its proportion of external traffic from all other counties, the US, and Mexico.
- An estimate of trip length for each county's internal trips is calculated by dividing each county's internal VMT by its total estimated trips.

# Inside the Box



- Internal-county trips are segregated into trip types by drive-alone or shared ride modes, using an average auto occupancy factor
- Growth rates are assumed for Mexico and US oriented trips, since no population projections for Mexico or other US states are included in the model.
- Urban form can be tested by modifying the % of surrounding county share of jobs. A greater % share of surrounding jobs by a central county leads to more cross-county commuting, thereby increasing Home Based Work VMT.

# Acknowledgments and Special Thanks



Fellow TTI Researchers:

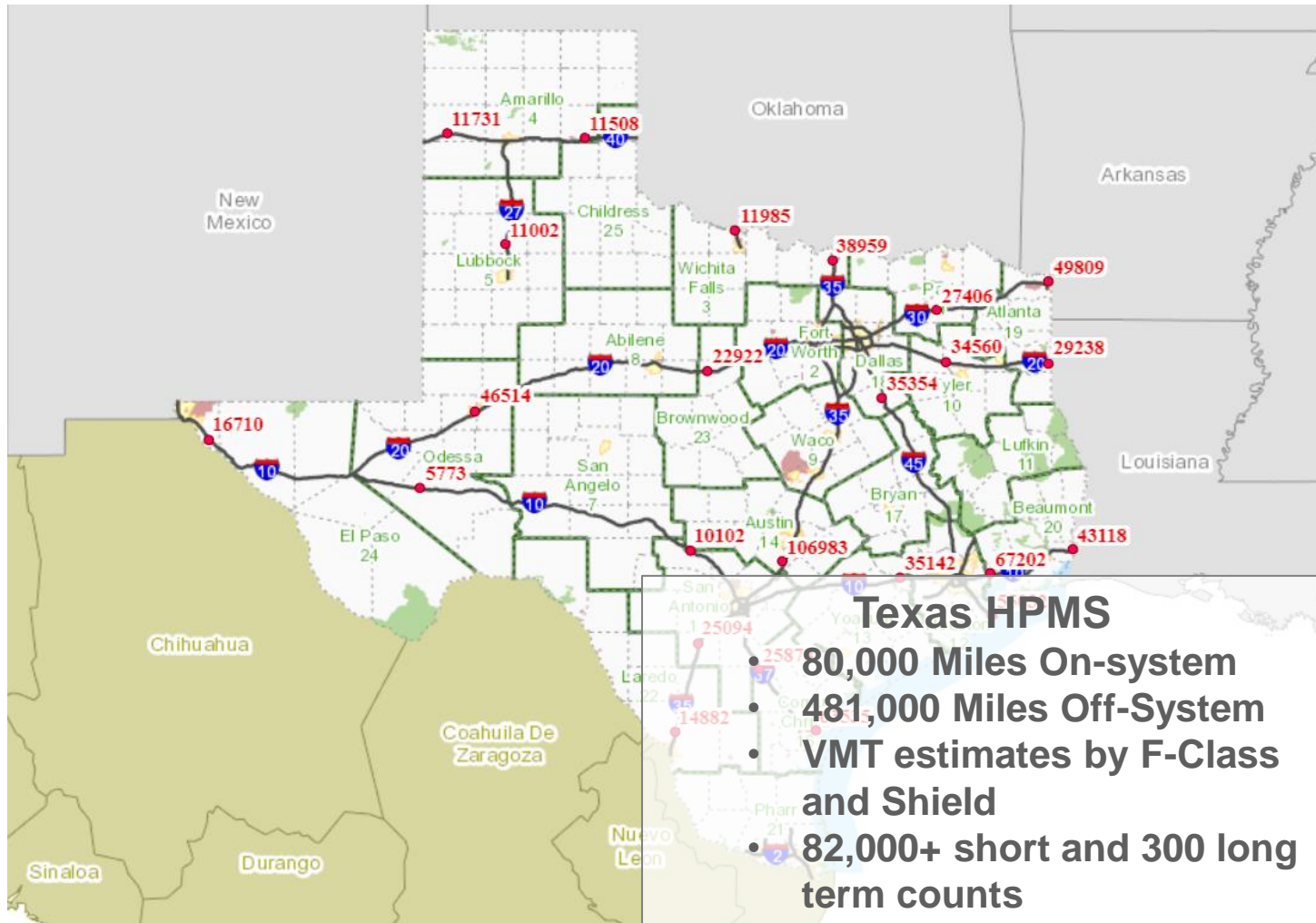
Brianne Glover, J.D.

Thomas Williams, AICP

Hao Pang

# Baseline Data

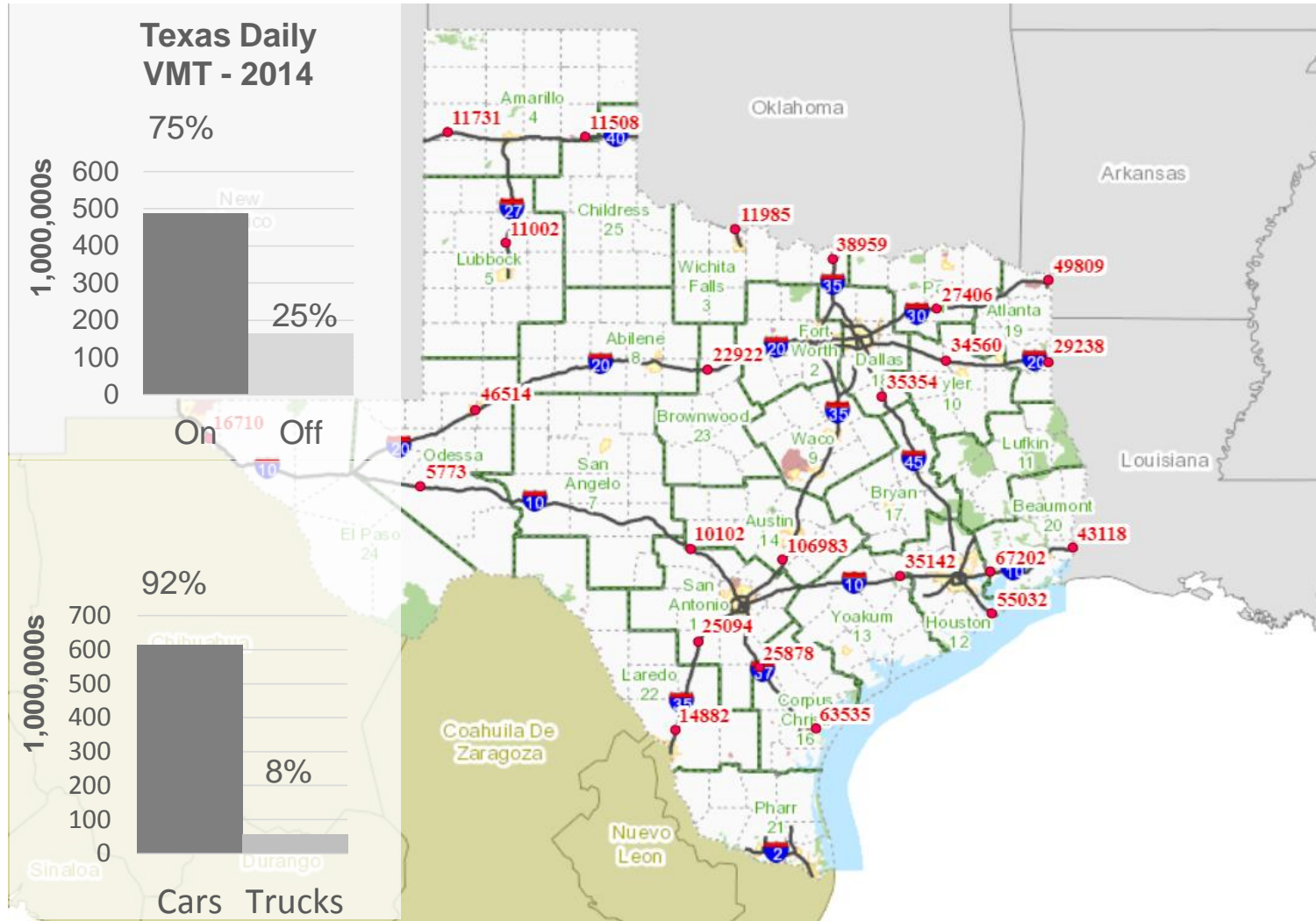
## Highway Performance Monitoring System (HPMS)



Texas Statewide Planning Map:

[http://www.txdot.gov/apps/statewide\\_mapping/StatewidePlanningMap.html](http://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html)

# Baseline Data



Texas Statewide Planning Map:

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# Estimation Data

