ESTIMATING INDUCED VMT: EMPIRICAL TOOLS VS. TRIP & ACTIVITY-BASED TRAVEL DEMAND MODELS

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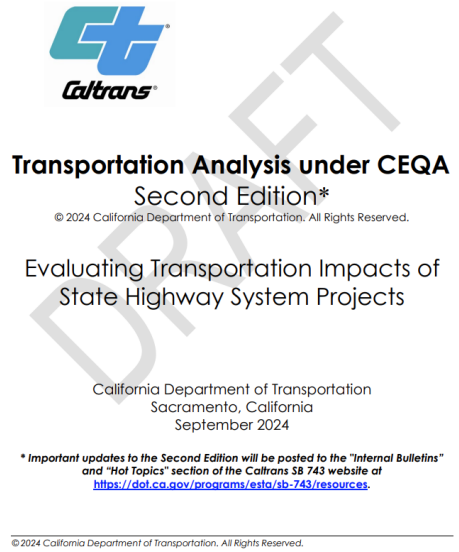
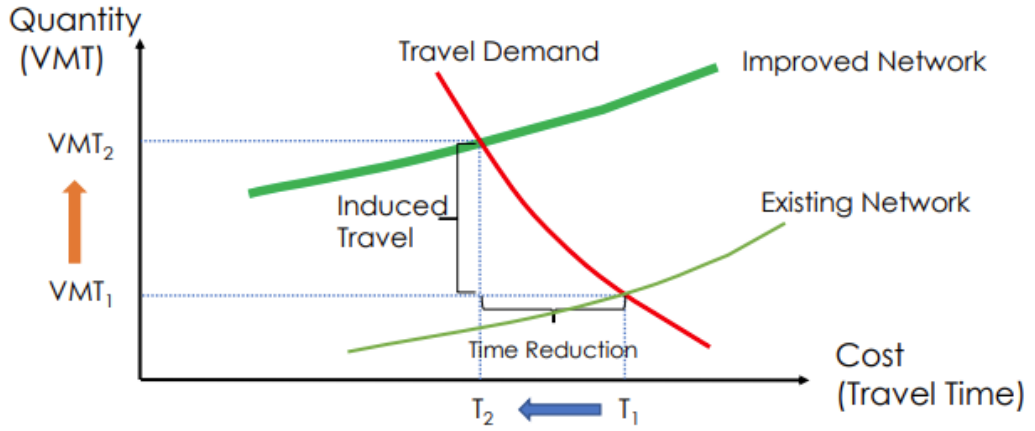
POLICY CONTEXT: SB 743

- Senate Bill 743 in 2013 (implemented July 2020) shifted impact metric from LOS to VMT.
- Caltrans requires VMT evaluation for State Highway System capacity increasing projects.
- Policy goals are to reduce GHG emissions and promote multimodal choices (Climate Action Plan for Transportation Infrastructure)

INDUCED VMT

- Additional travel due to increased capacity.
- Short Term vs. Long Term Induced VMT.
  - **Short Term Effect** - immediate behavioral adjustments - route shifts, trip timing, modal changes.
  - **Long Term Effect** - long-run land use, migration, and development effects.
- Estimation tools include elasticity-based calculators or travel demand model (with some caveats).





ELASTICITY BASED CALCULATORS

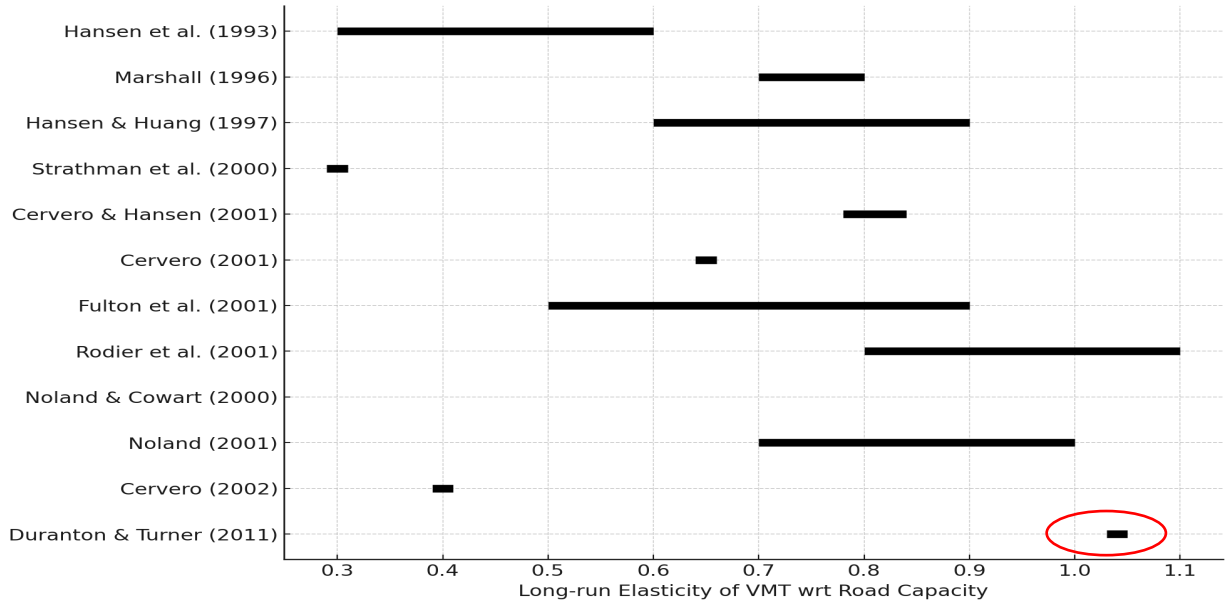
- National Center for Sustainable Transportation (NCST) Calculator
- SHIFT Calculator
- Colorado Induced Travel Calculator
- New Zealand indued VMT tool
- **Research based elasticities range from 0.3 to 1.03**

National Center for Sustainable Transportation
A USDOT University Transportation Center

RMI
SHIFT Calculator
State Highway Induced Frequency of Travel

Assessing induced road traffic demand in New Zealand

April 2024



NCST CALCULATOR

- National Center for Sustainable Transportation (NCST) Calculator.
- Estimates induced VMT based on addition of lane miles and historic baseline VMT.
  - 1.0 for Interstate facilities (10% more lane miles ~10% more induced VMT).
  - 0.75 for Class II & Class III facilities (10% more lane miles ~7.5% more induced VMT).
- Limitations
  - **Not context sensitive** - Results may vary by corridor conditions (e.g., travel time, latent demand).
  - **Over-simplification** - Reduces induced travel to a single-variable relationship.
  - **Lane-miles an imperfect proxy** - Lane-mile expansion doesn't always directly translate into travel time savings.

National Center for Sustainable Transportation
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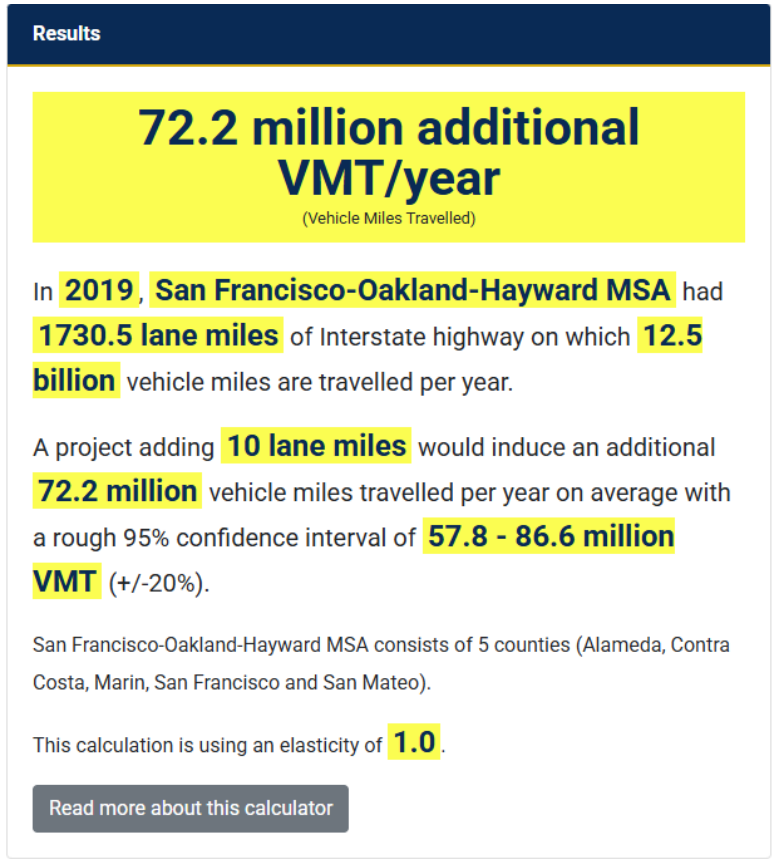


NCST CALCULATOR

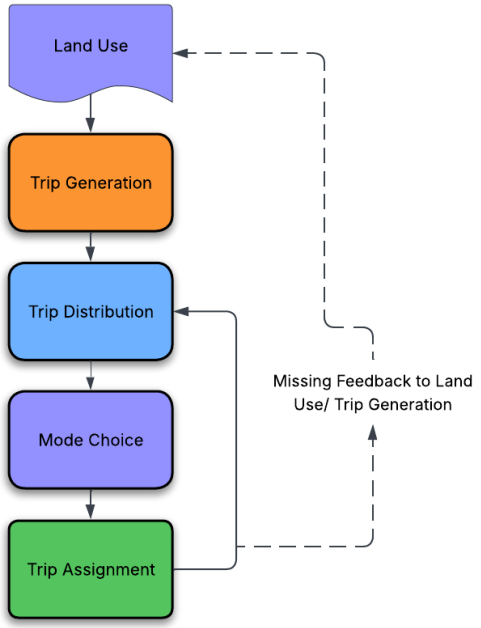
NCST Induced Travel Calculator, components of 1.0 elasticity for induced VMT are:

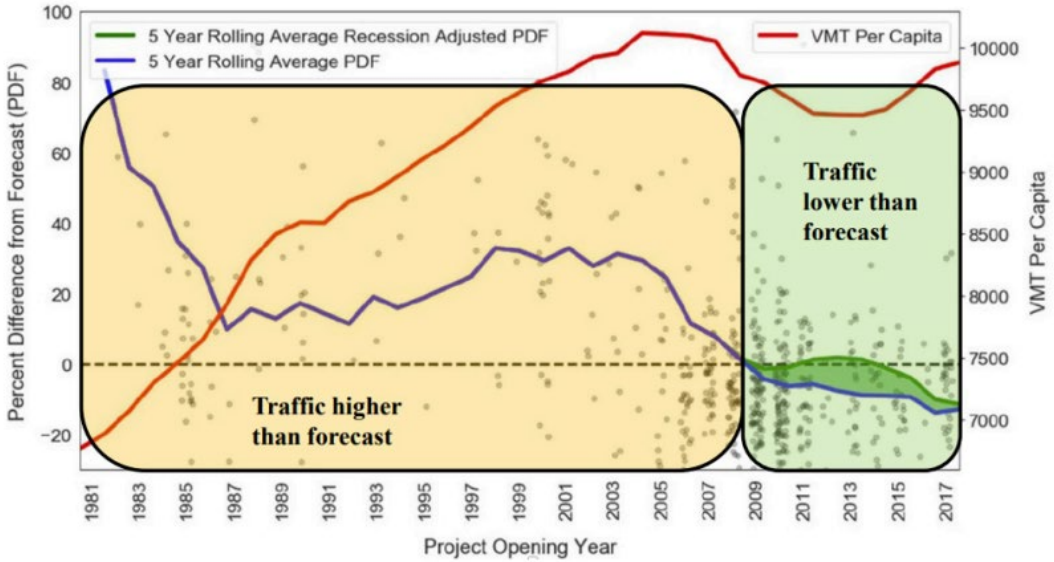
- Changes in commercial driving = 19 to 29%
  - Exempt under CEQA and SB 375
- Changes in individual or household driving = 9 to 39%
  - Short-Term Effect
- Diversion of traffic = 0 to 10%
  - Short-Term Effect
- Changes in Land Use Patterns (including migration) = 5 to 21%
  - Long-Term Effect

Duranton, G., & M. A. Turner (2011). The Fundamental Law of Road Congestion: Evidence from US Cities. American Economic Review, 101(6), 2616-2652. Retrieved from https://www.aeaweb.org/articles?id=10.1257/aer.101.6.2616.

TRAVEL DEMAND MODELS

- Simulates who travels, where they go, how they travel, and when they travel.
- Incorporates diversion effects and changes in origin–destination patterns.
- Capture shifts in travel timing and route choice.
- Sensitive to the region and corridor context.
- Limitations
  - **Lack sensitivity to land use responses** to network changes
  - **Time/resource intensive**.

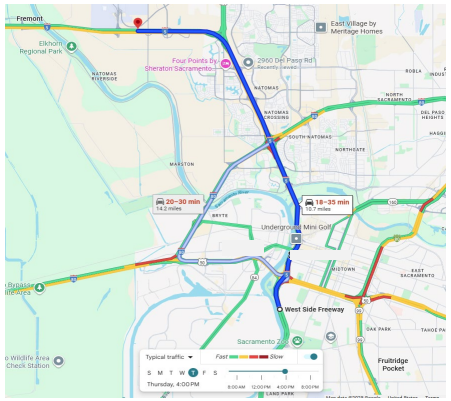




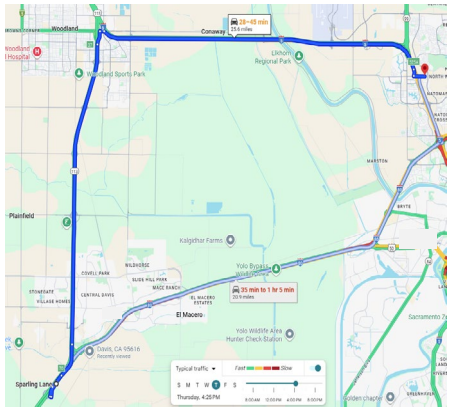
Source: Hoque, et al. The Changing Accuracy of Traffic Forecasts. Transportation, 2021.

PROJECT LEVEL APPLICATION – CASE STUDIES

- Analyzed three projects in the same MSA, each with distinct travel characteristics.
- Comparison of NCST tool estimates against travel demand model results.
- The travel demand model includes feedback between trip assignment and trip distribution; calibrated to corridor travel times.



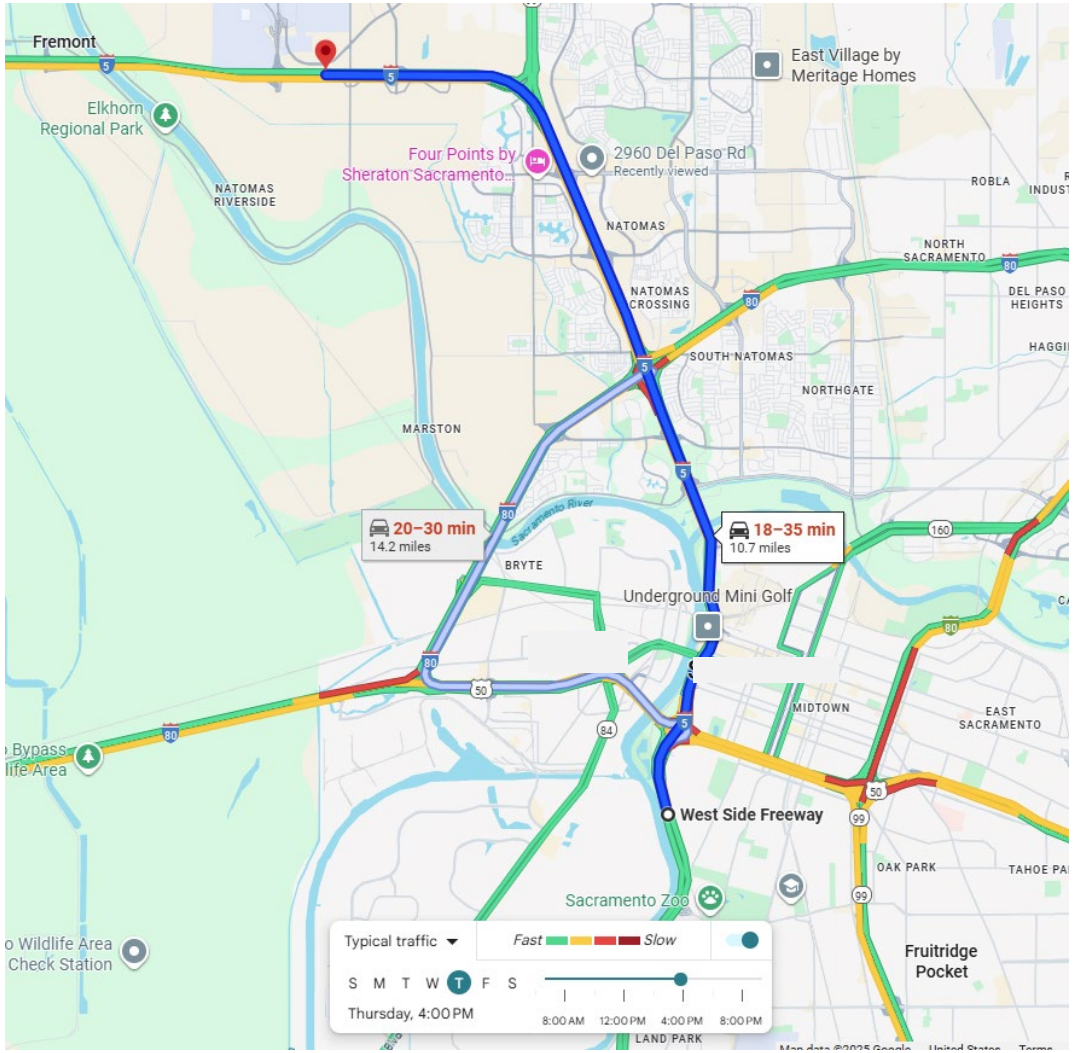
PROJECT A



PROJECT B

PROJECT C

PROJECT A

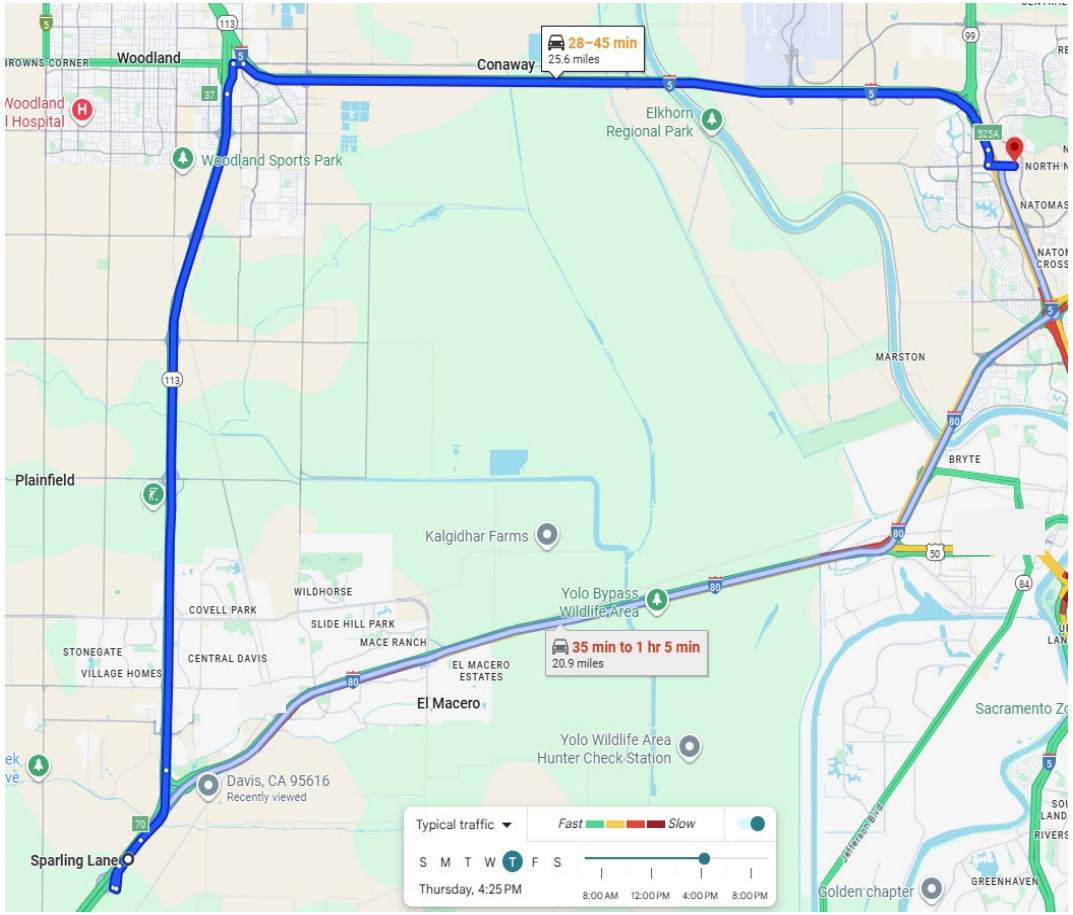


- Serves as a major regional and interregional commuter and freight route.
- Alternative routes offer similar travel times but often have their own congestion constraints.
- High peak-period demand, frequent bottlenecks near downtown interchanges, and recurring queuing from merges and ramps.
- 12 miles of additional capacity in each direction.

NCST Calculator	Travel Demand Model
• 125 million VMT annually	• 47 million VMT annually
• Solely based on lane miles	• Accounts for short term induced VMT
	• Does not account for long term induced effect

Does long-term effect amount to ~ 80 million annual VMT?

PROJECT B



- Highly congested commuter corridor, with long alternative routes that are less direct.
- Added lanes improve trip efficiency by reducing reliance on circuitous detours and providing faster, more direct travel
- Alternate route is 5 miles longer and about 15 minutes faster.
- About 17 miles of added capacity

NCST Calculator

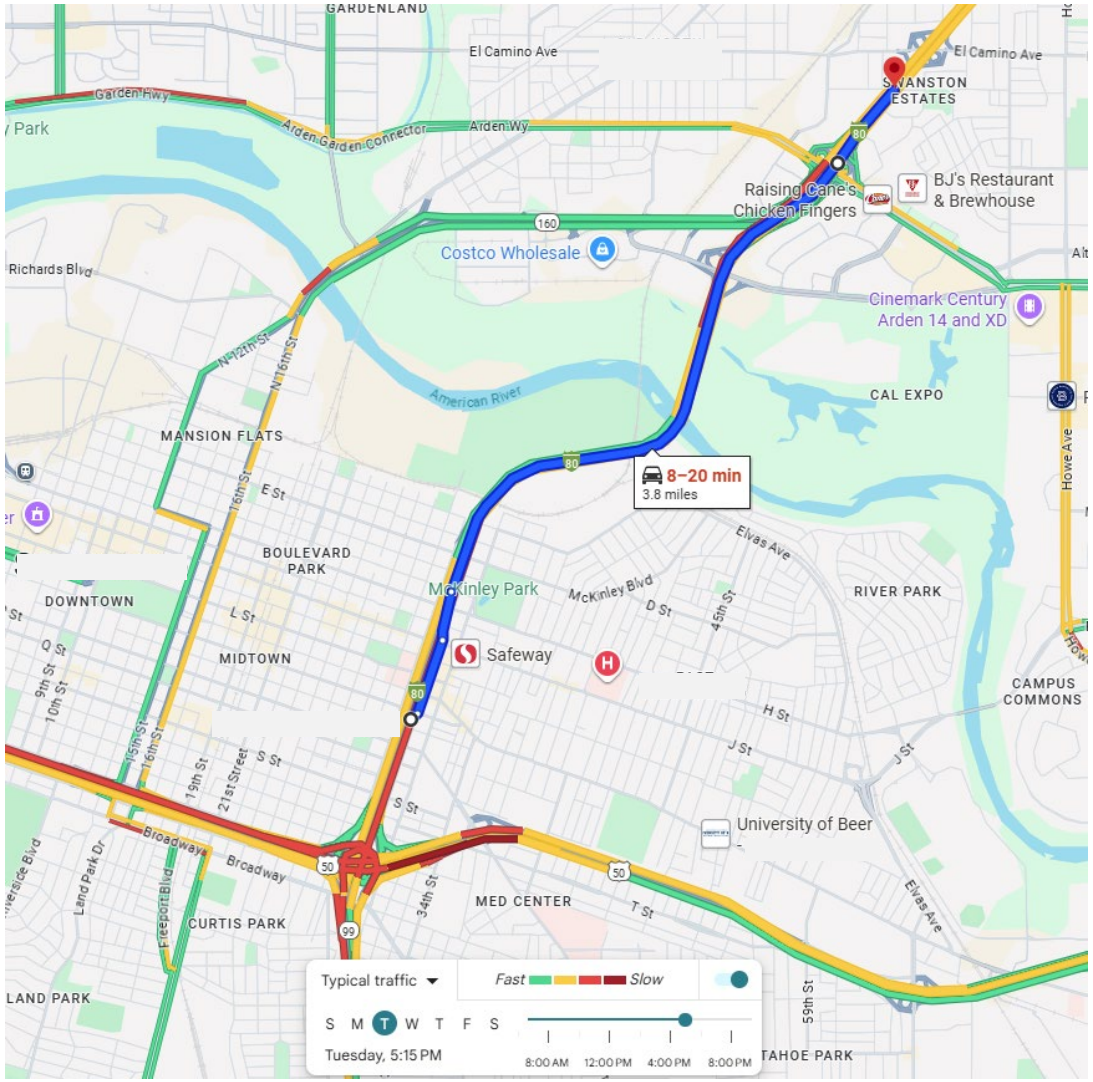
- Significant induced VMT
- Solely based on lane miles

Travel Demand Model

- Marginal change in regional VMT accounting for direct routes.
- Does not account for long term effect.

Project will result in inducing VMT but to what extent?

PROJECT C



- 4.5 miles of capacity expansion improvements through the heavily constrained corridor.
- Adds capacity across a constrained river crossing, a critical chokepoint for commuters and regional trips.

NCST Calculator

- Understates induced VMT
- Solely based on lane miles

Travel Demand Model

- Higher induced VMT than the NCST tool.
- Better reflects how drivers divert or reassign trips.

Using consistent methodology for induced VMT

PROS AND CONS

ELASTICITY BASED TOOLS (NCST)

- Based on empirical research and peer-reviewed studies
- Simple, low resource needs compared to complex models
- Useful for high-level screening of projects
- Easy to apply and communicate results

Limitations

- Over-simplified (single-variable approach)
- Corridor/context sensitive may not reflect local conditions
- Too generic for detailed project-level analysis

TRAVEL DEMAND MODELS

- Provide a comprehensive understanding of travel demand
- Capture route choice, mode choice, and destination choice
- Sensitive to accessibility and network changes
- Potential to integrate with land use models for project level analysis.

Limitations

- Resource intensive (data, expertise, calibration required)
- Lack strong feedback between trip assignment and trip generation

TAKEAWAYS

- Calibrated four-step and activity-based demand models are better set up for estimating short-term induced VMT, capturing effects such as route diversion and mode shift.
- Research-backed elasticities are valuable for estimating long-term induced demand, especially where regional models lack sensitivity.
- Hybrid approach
  - Combine travel demand models with elasticity-based methods to capture both short- and long-term induced VMT. Long-term induced VMT (typically 5–21% of full elasticity).
  - Full feedback models (assignment to land use) - not always feasible for project-level CEQA due to cost and complexity.
  - Flexible interface for NCST tool to allow adjusting shorting term elasticity component based on evidence.

THANK YOU

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