Fehr & Peers

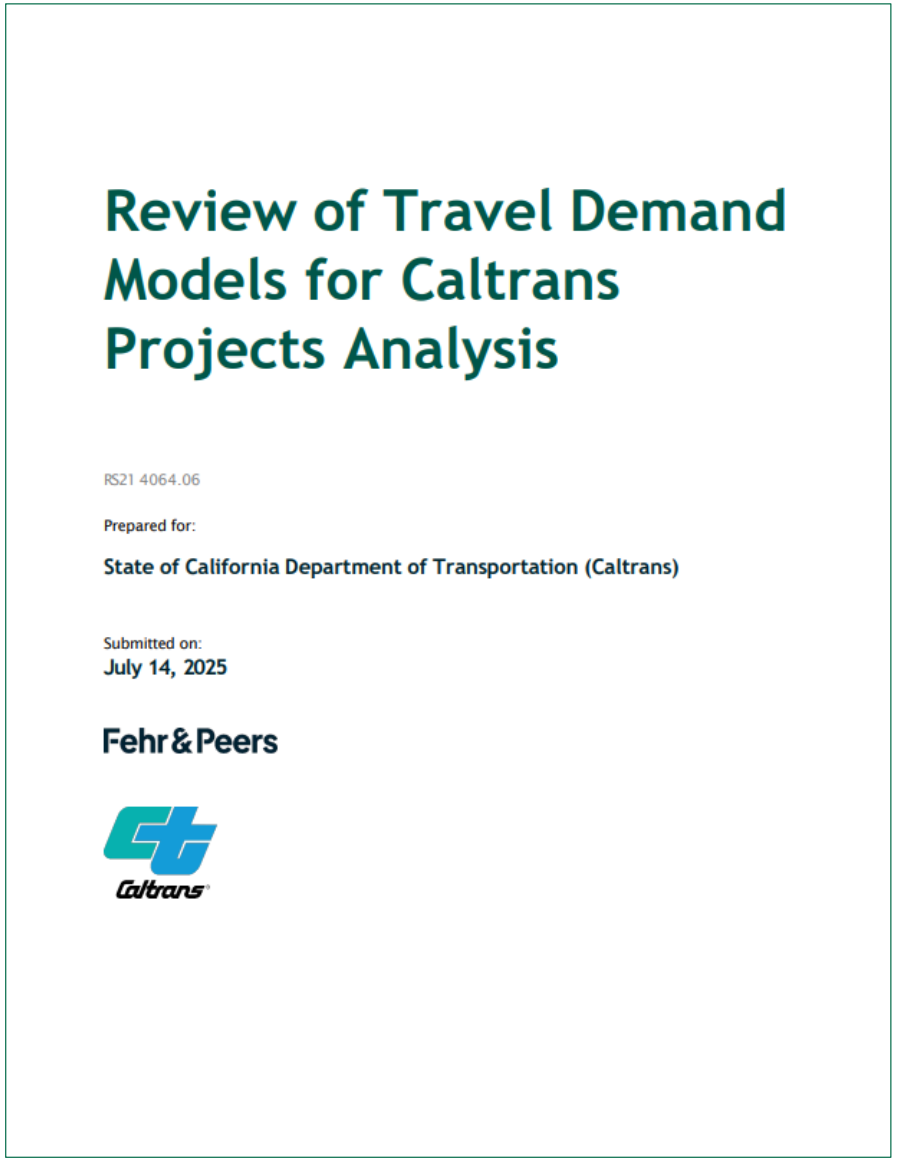
Why Did the Model Do That?

Why Regional Models Sometimes Don't Behave for Project Level Analysis

Kwasi Donkor & Fiona Dunn | September 24, 2026

Source: *Review of Travel Demand Models for Caltrans Projects Analysis* , Fehr & Peers for Caltrans, July 2025

Are Regional Models Appropriate for Caltrans Projects?



Are Regional Models Appropriate for Caltrans Projects?

How do you evaluate?

1. Regulatory review
2. Survey & interviews
3. Model review
4. Project review
5. Findings & Recs

01

Regulatory Review

What do Laws and Regulations Require?

Federal

RTP
Suitable tool — not specified

Clean Air Act
Network-based model required

NCHRP 765
Calibrate at highest resolution

FHWA TMIP
Validate at scale of application

California

SB 375
TDMs forecast regional GHG

CEQA
Substantial evidence, best efforts

CTC (2024 RTP)
Static + dynamic validation

Caltrans TAF / TAC
Follow FHWA TMIP guidance

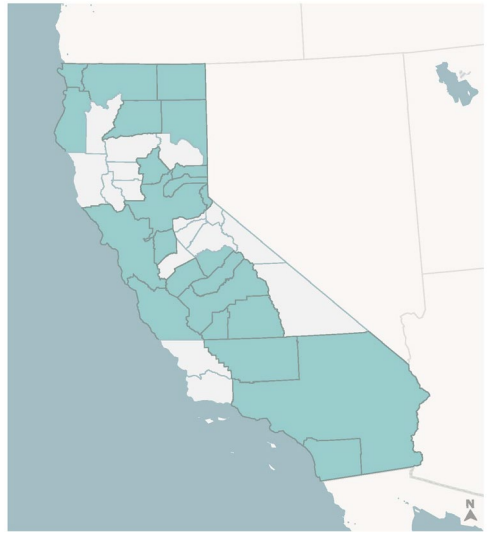
02

Survey and Interview

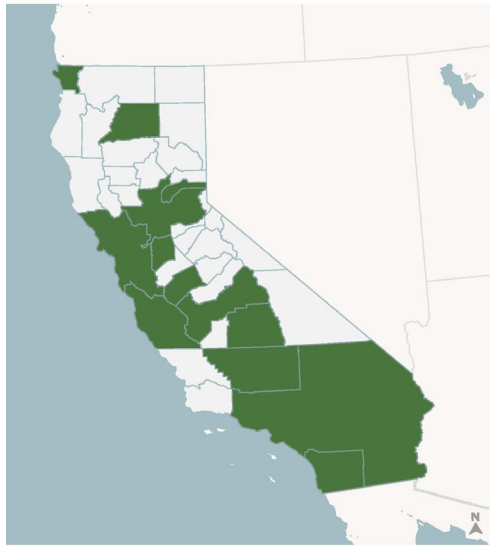
Survey & Interview

Listening to the field

- 44 MPOs and RTPAs surveyed
- 55% response rate
- 14 follow up interviews

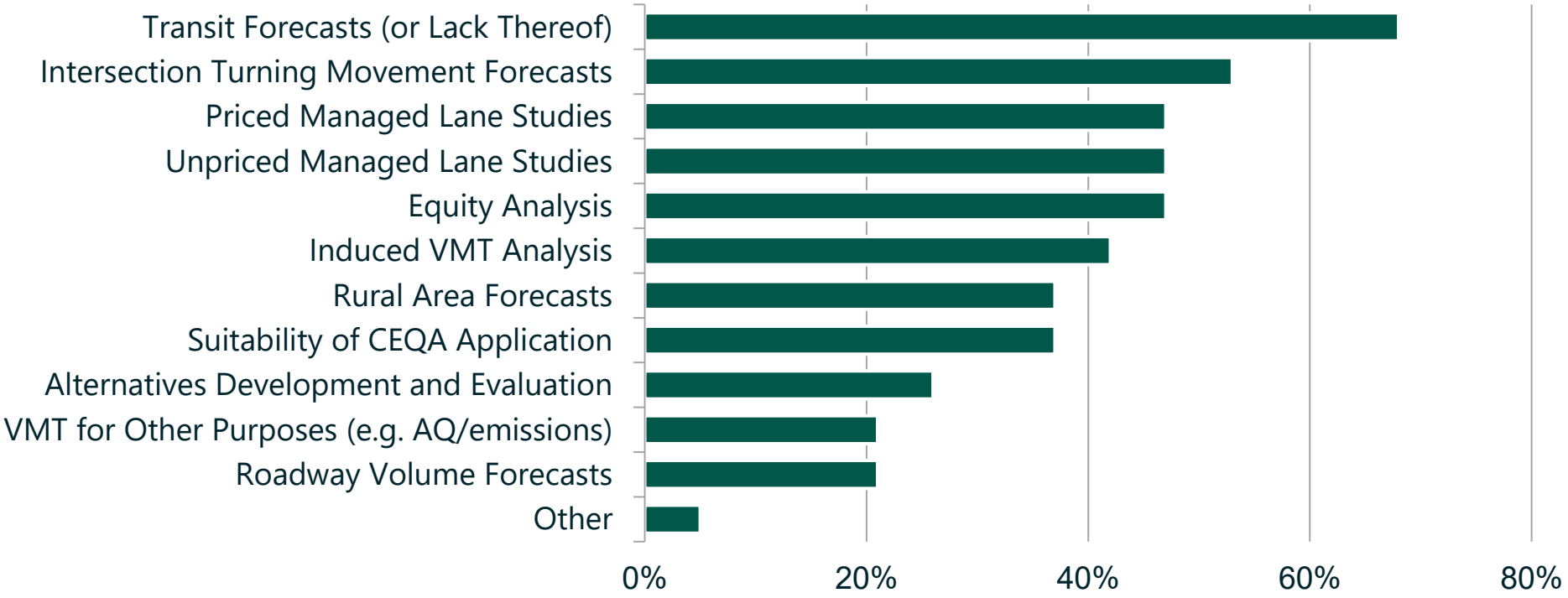


Responded to Survey



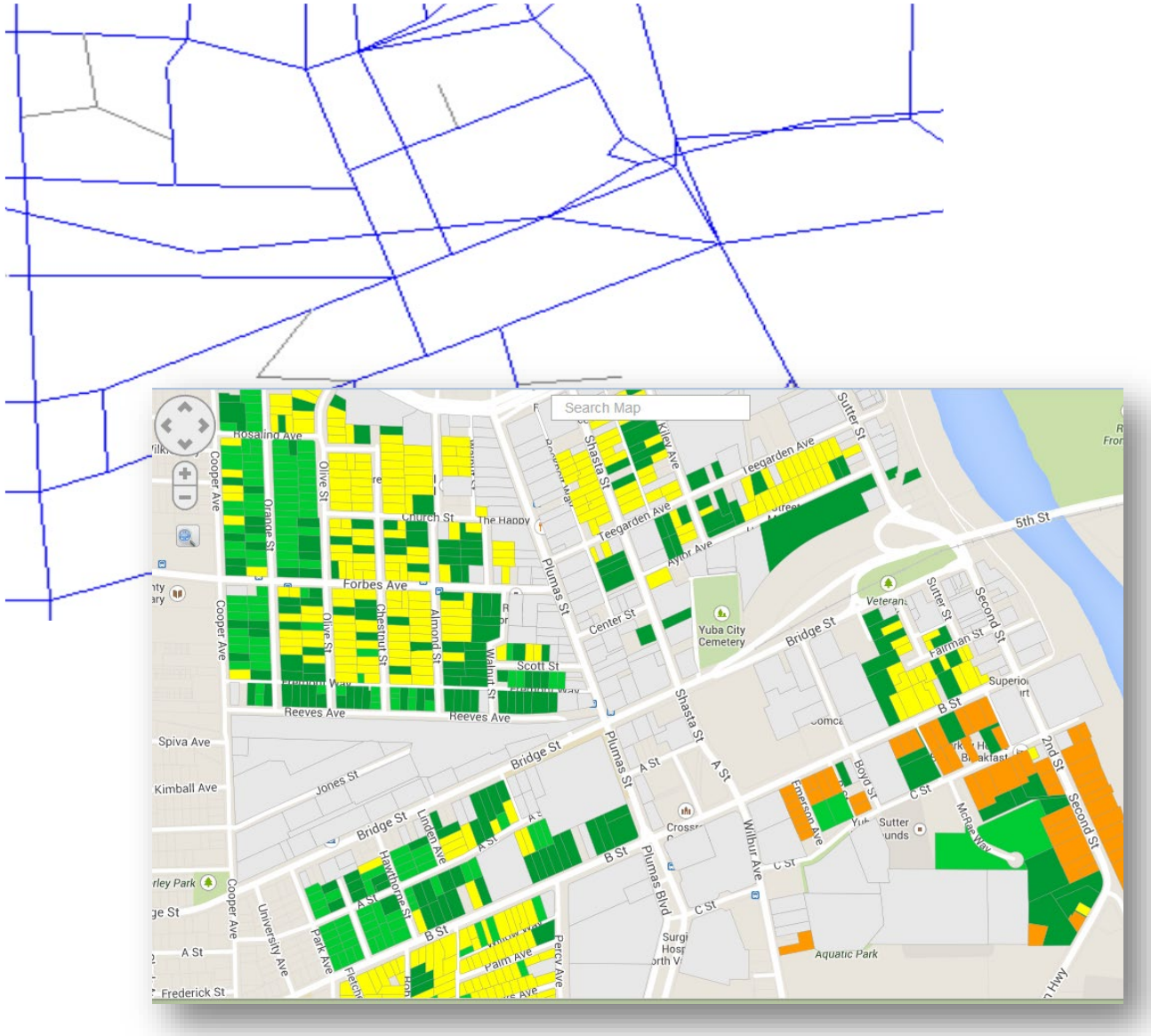
Agencies Interviewed

Reasonableness and Sensitivity Concerns



Key Theme

Regional models are not built for project - level analysis



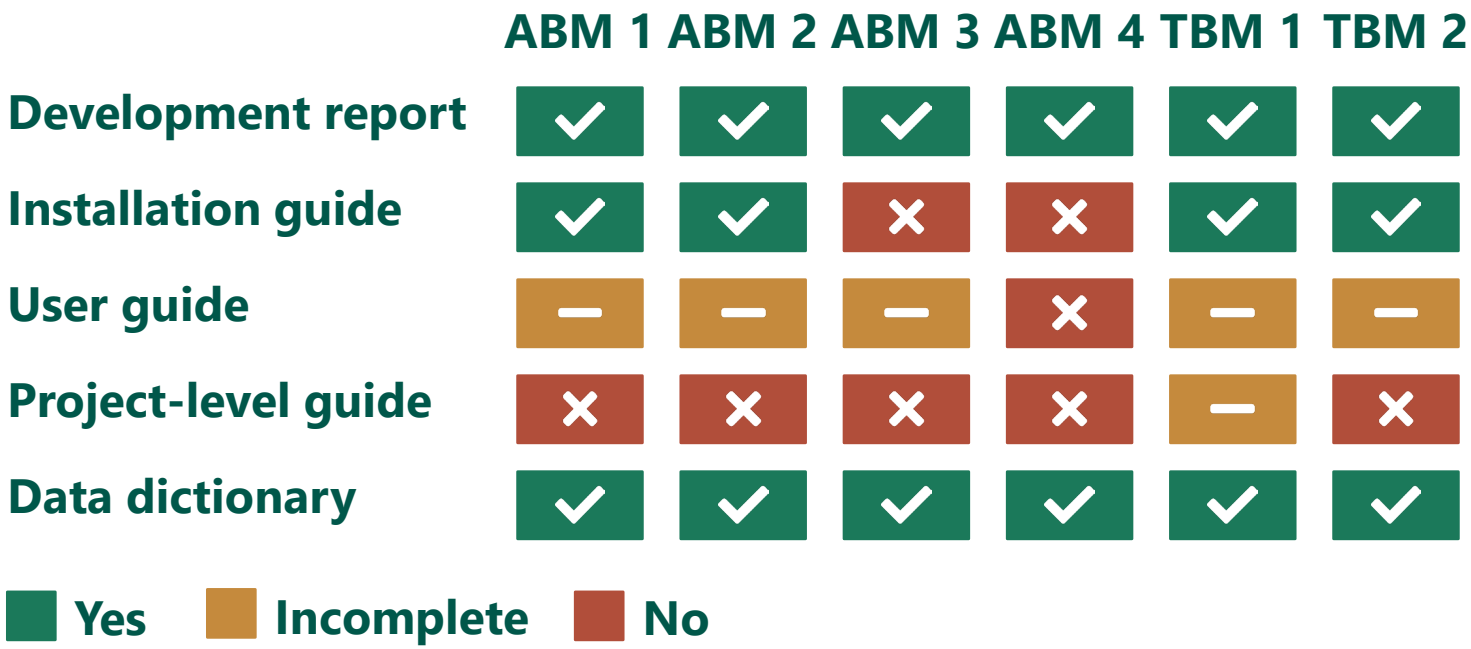
03

Model Review

Six Models, Five Lenses

- **Documentation**
- **Model year alignment**
- **Performance vs. guidance**
- **Modeling detail**
- **Sub-modules**

Scoring Example - Documentation



Key Limitations & Focus for Improvements

- Lack of User Guides
- Outdated base years
- Limited project-scale validation
- Low post-COVID sensitivity
- Induced travel underrepresented
- No DTA/Peak Period Spreading
- Tolling may overstate demand
- Freight / visitor gaps
- ABMs: resident only, noisy

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Project Review

Four Projects

Project Type

- Two projects added managed lanes capacity
- One project widened general-purpose freeway capacity
- One project modified and expanded a freeway interchange

Geography

- One project in Northern California
- One project in Southern California
- Two projects in the Central Valley

Analysis Documents

- One project included a Transportation Operations Analysis Report (TOAR)
- One project included Project Approval and Environmental Document (PA/ED)
- Three projects included Environmental Impact Report (EIR)
- Three projects included induced VMT analyses

What's Missing?

Transparency

Source models & edits unclear

Analysis year

Base / horizon don't match

Purpose alignment

Regional-only validation/ limited sensitivity testing

ABM noise

Stochasticity rarely tested

05

Findings and Recommendations

Recurring Challenges

- Purpose misalignment
- Insufficient documentation
- Lack of DTA
- VMT truncation at boundary
- Error propagation
- Missing sub-area validation
- Year misalignment
- Stochasticity unaveraged
- Inadequate validation
- Induced travel underrep.
- Post-pandemic gaps
- Emerging trends missed
- Fixed sub-models
- Weak legal framework

Near- Term

Coordinate, Document, and Check

Coordinate	**MPO & district staff align on model use**
Document	**Develop application guidance/checklists**
Align	**Design models to match application questions**
Explore	**Automate ABM input prep, Test ABM stochasticity, Develop hybrid Induced VMT methods**

Long- Term

Fund, Train, and Modernize

Assist	**Tech-assistance programs for MPOs + districts**
Update	**Revise RTP & CTC guidelines for documentation and validation**
Fund	**Increase MPO model funding**
Build	**Simpler project-level + district-focused models**
Modernize	**Add DTAs in urban areas and update induced travel calculator for context sensitivity**

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Thoughts for Utah

Utah Scoring

- In comparing Utah's six models against the Caltrans rubric, it was found:
  - **Development Guide:** Utah models have detailed and updated development documentation
  - **Installation Guide:** Caltrans calls for very clear software versioning documentation, which is only partially met
  - **User Guide:** Robust user guides which include instructions on how to edit the model and potential consequences is only partially met
  - **Project Application Guide:** Clear instructions on how to apply the model for sub - area or corridor level efforts is not available
  - **Data Dictionary:** Utah model documentation includes detailed data dictionaries

Sub- Area Model Calibration & Validation

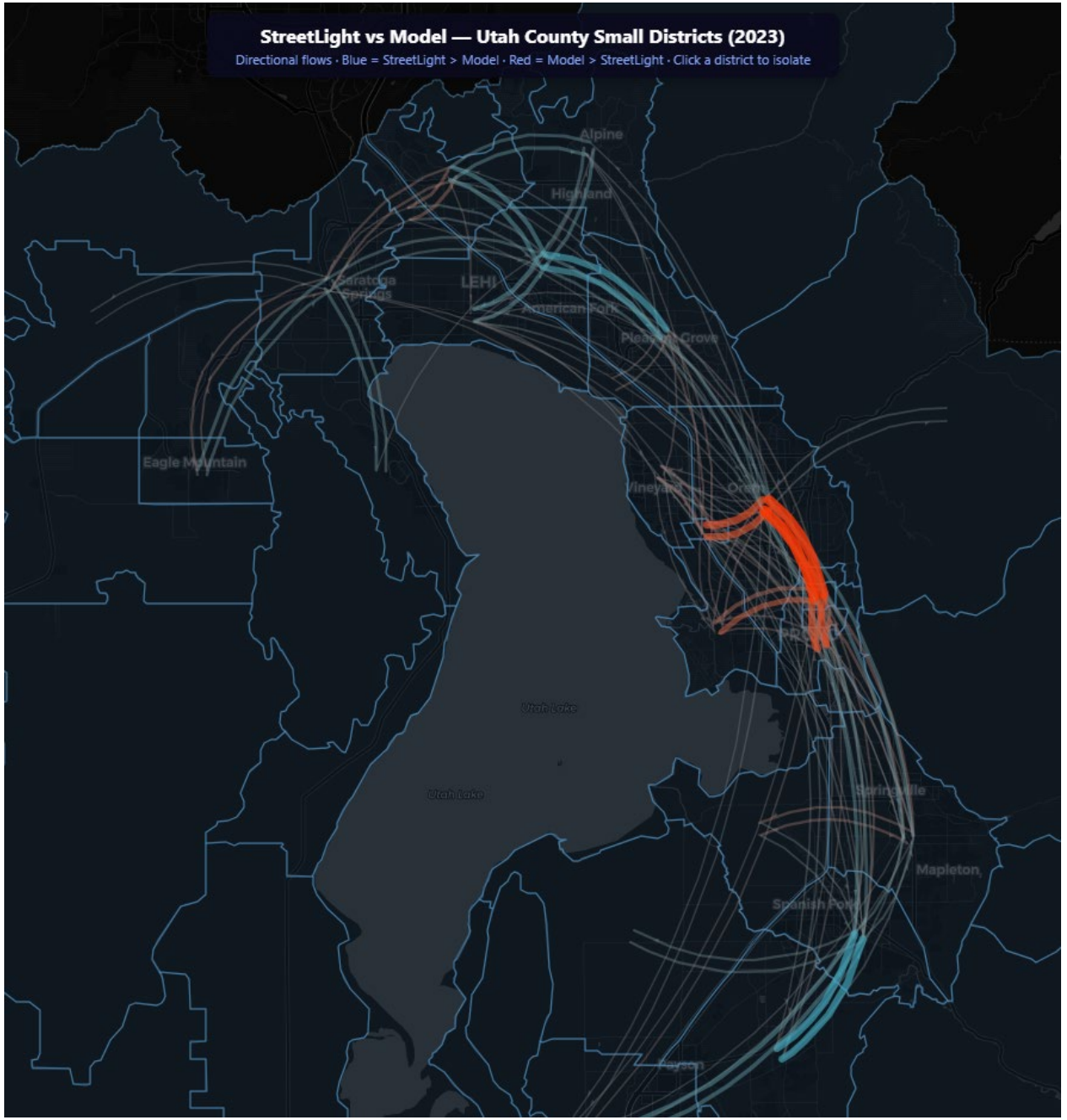
- The WFRC model was utilized for the Northern Utah County Planning and Environmental Linkages
- We had to further refine the model using data from tube counts, CCS, PEMs, ClearGuide, and StreetLight
  - **Speeds:** calibrated FF and congested speeds to better align with observations
  - **Distribution:** validated model to StreetLight OD patterns
  - **Volumes:** validate segment level volumes against local counts
  - **Sensitivity Testing:** performed a series of sensitivity tests to land use, network, and transit changes
- **Result:** Ended up with a sub - area of the model that was validated to recent, locally observed conditions

Free Flow Speed Calibration (Before and After)

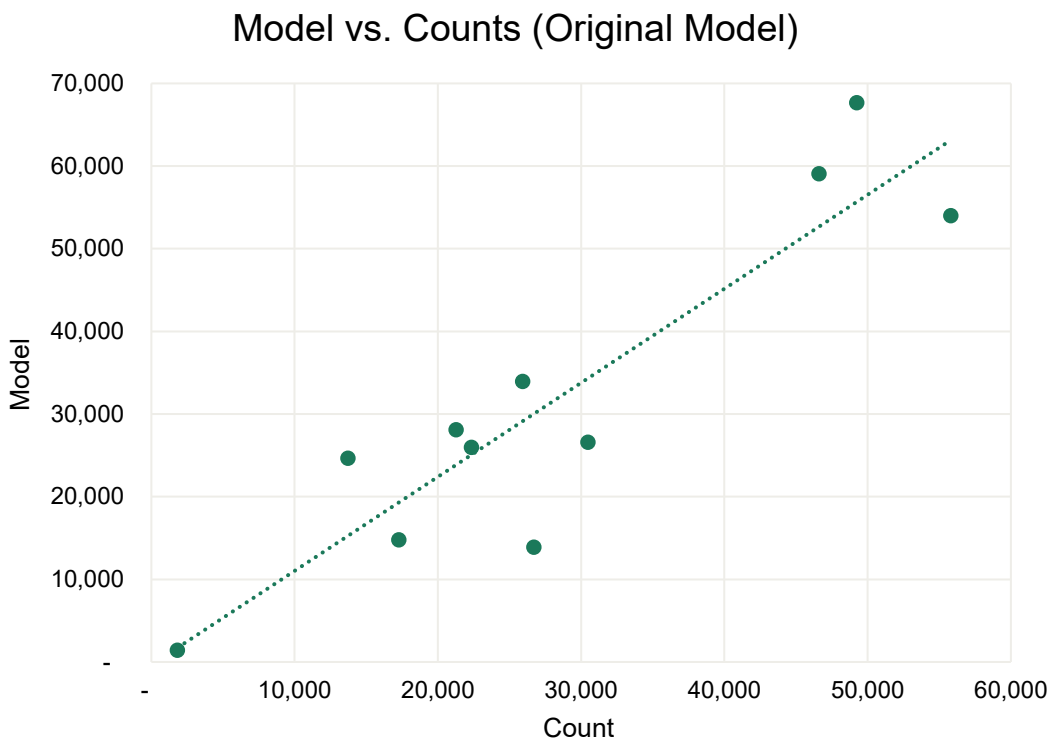
Free Flow Speed Difference
- < -15 mph (Model Low)
- -15 - -10 mph
- -10 - -5 mph
- -5 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- > 15 mph (Model High)

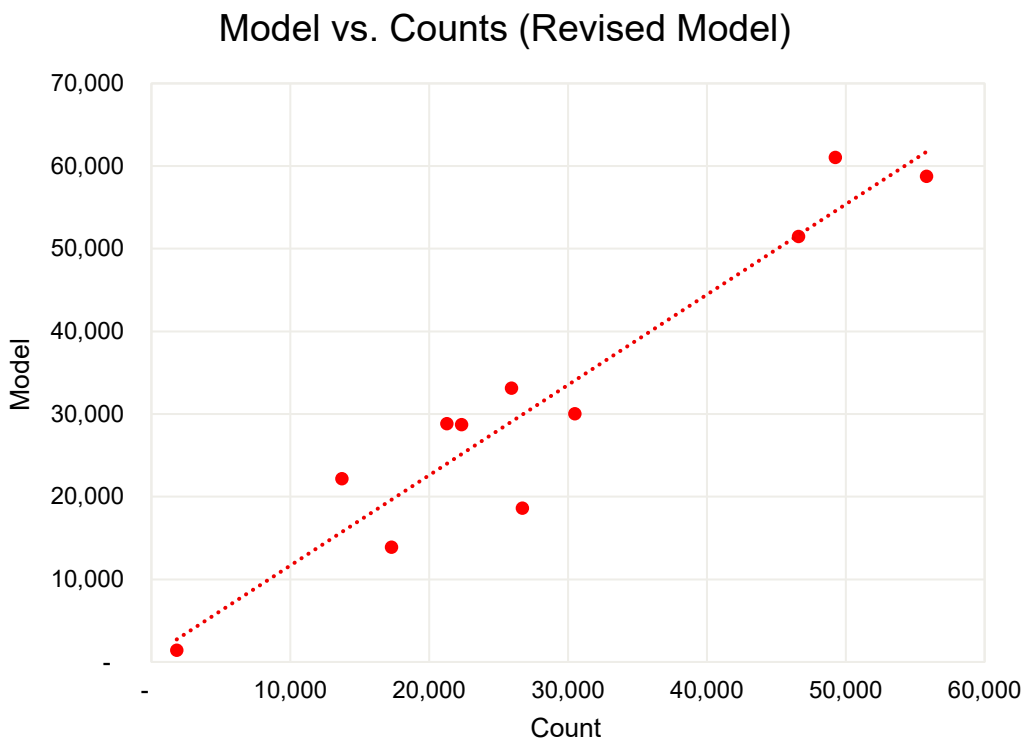
2023 Free Flow Speed Difference
- < -15 mph (Model Low)
- -15 - -10 mph
- -10 - -5 mph
- -5 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- >15 mph (Model High)

StreetLight vs Model Distribution

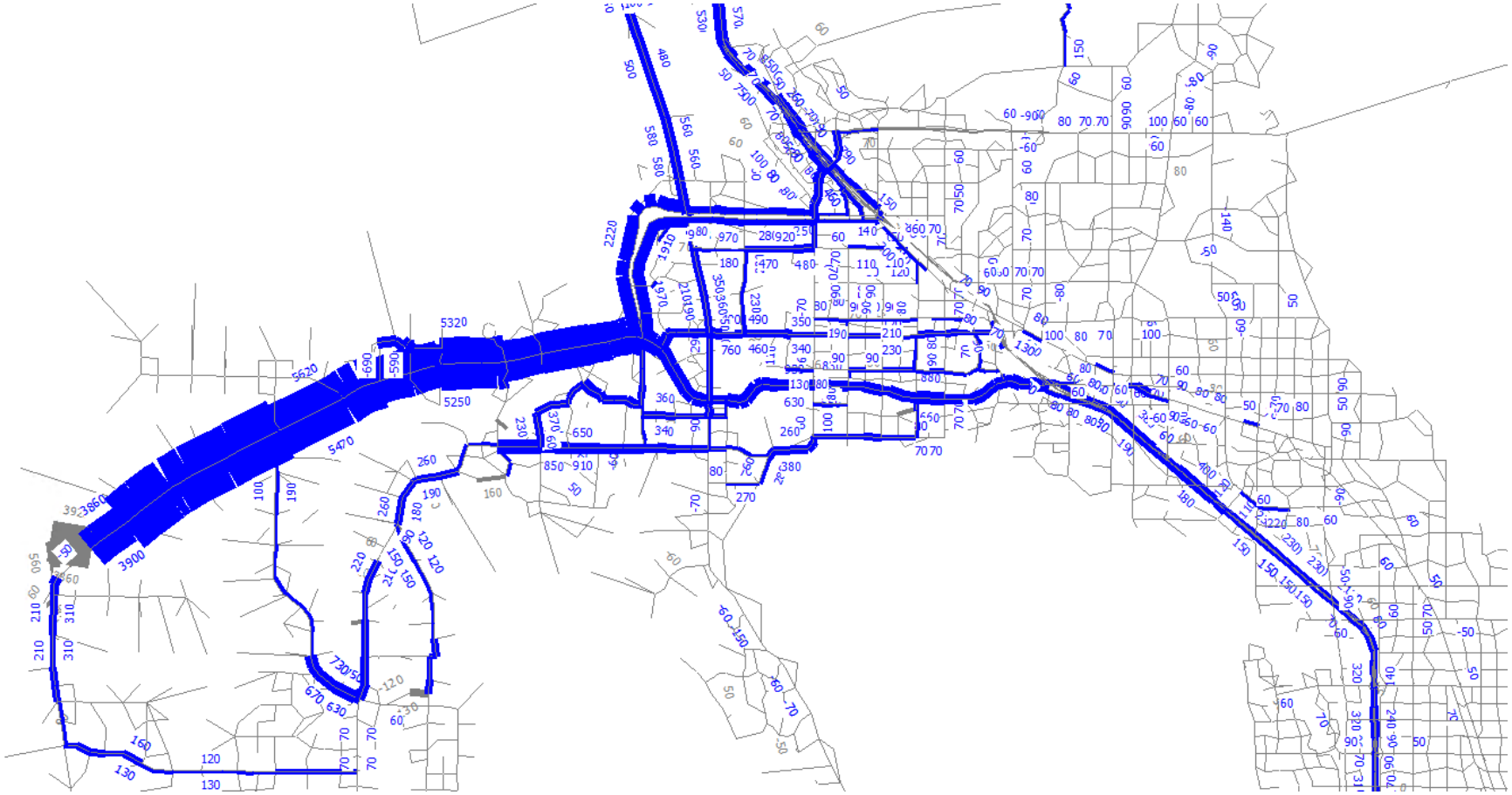


Model vs. Count Comparisons, 2023





Land Use Sensitivity Testing



Takeaways for Utah

- Fewer models to align, and currently in a better spot with base and out year alignments
- Coordination efforts such as MUG are very helpful
- Continue to prioritize documentation and standardizing reporting
- Consistent validation methodologies and criteria
- Criteria for project level application

Thank you!