massDOT Transportation Innovation CONFERENCE

Insights from Big Data

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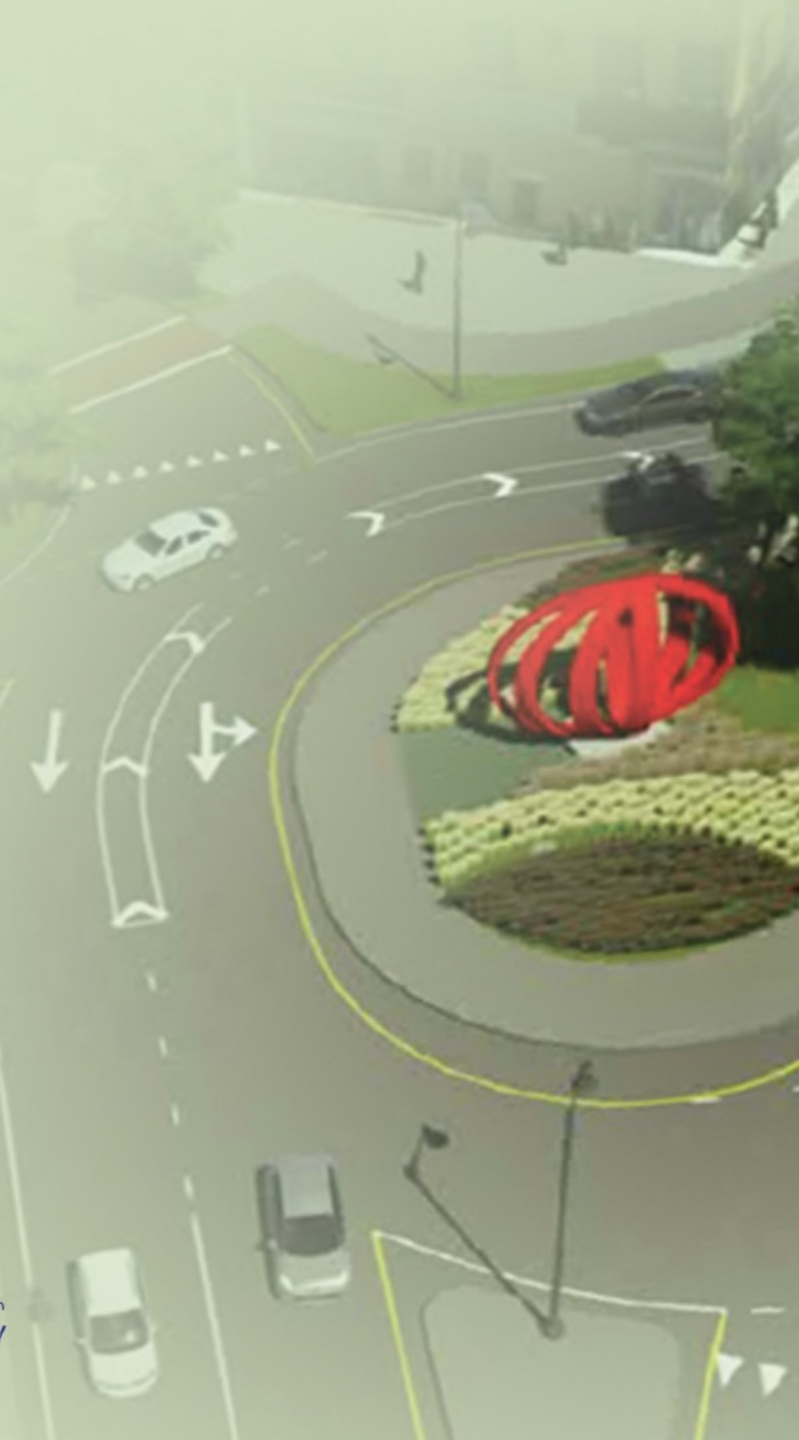
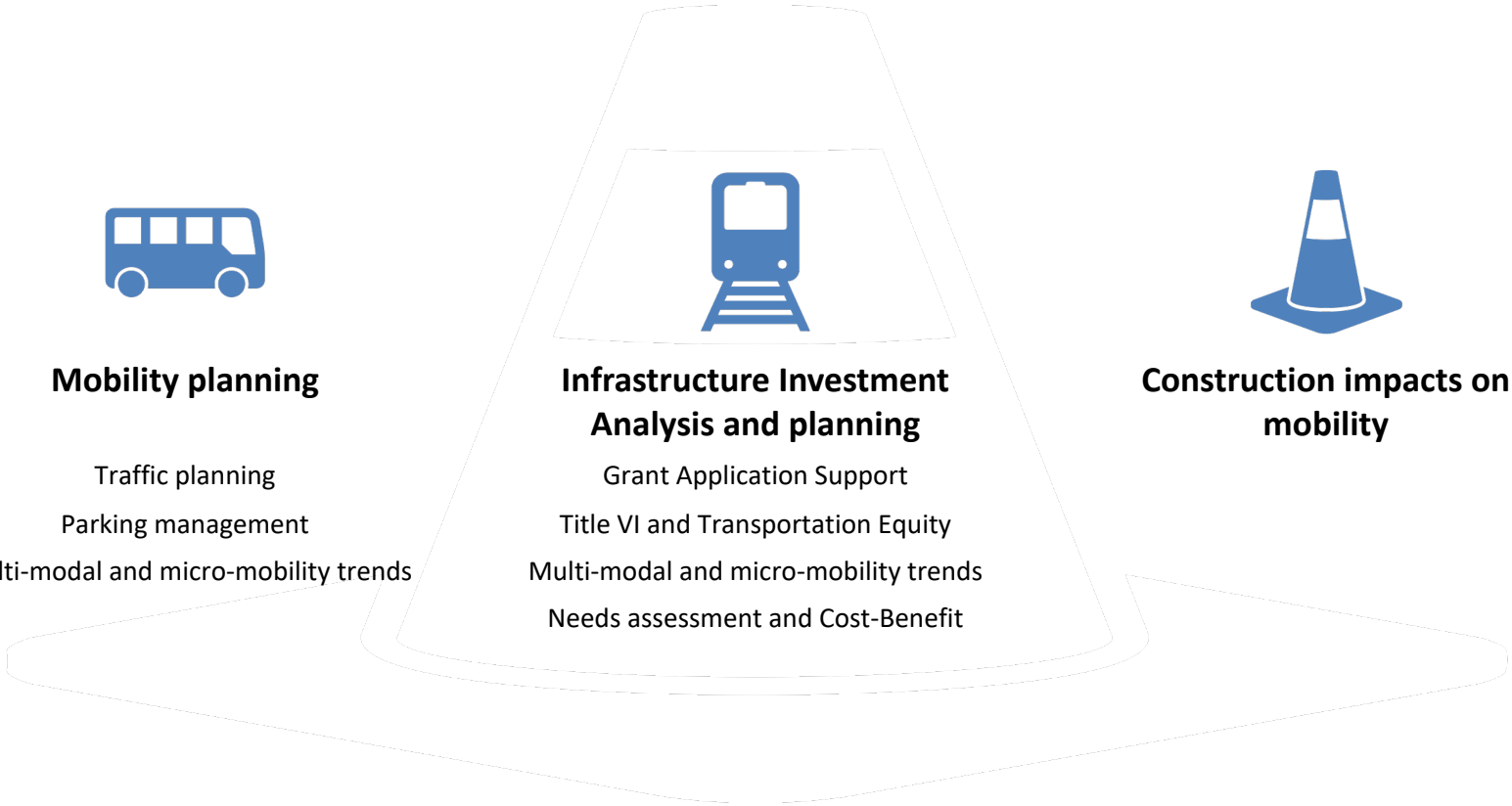


massDOT Massachusetts Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Big Data Analytics and Transportation Use Cases



Mobility planning

Traffic planning

Parking management

Multi-modal and micro-mobility trends

Infrastructure Investment Analysis and planning

Grant Application Support

Title VI and Transportation Equity

Multi-modal and micro-mobility trends

Needs assessment and Cost-Benefit

Construction impacts on mobility

The Replica Approach to Data Transparency + Resiliency

1 DATA PRIVACY

The world of LBS data is hyper volatile:

- Privacy
- Bias to affluent demographic
- Number of devices, halves each year

2 DATA RESILIENCE

Composite approach is key:

- Mitigate risk by minimizing bias
- Protect against source disruption
- Resilience to data quality issues

3 DATA QUALITY

Quality of the final product:

- Quality of input data
- Sophisticated modeling process
- Our Personas based on mobile location data, matched to our synthetic population, assigned to the road network, constrained by traffic counts.

Raw Data Layer

Replica leverages a diverse set of third-party source data to create our models.

This composite approach is both a risk-mitigation strategy and aligned with our objective to show a holistic view of the built environment.

Location Data

Consumer & Resident Data

Built Environment

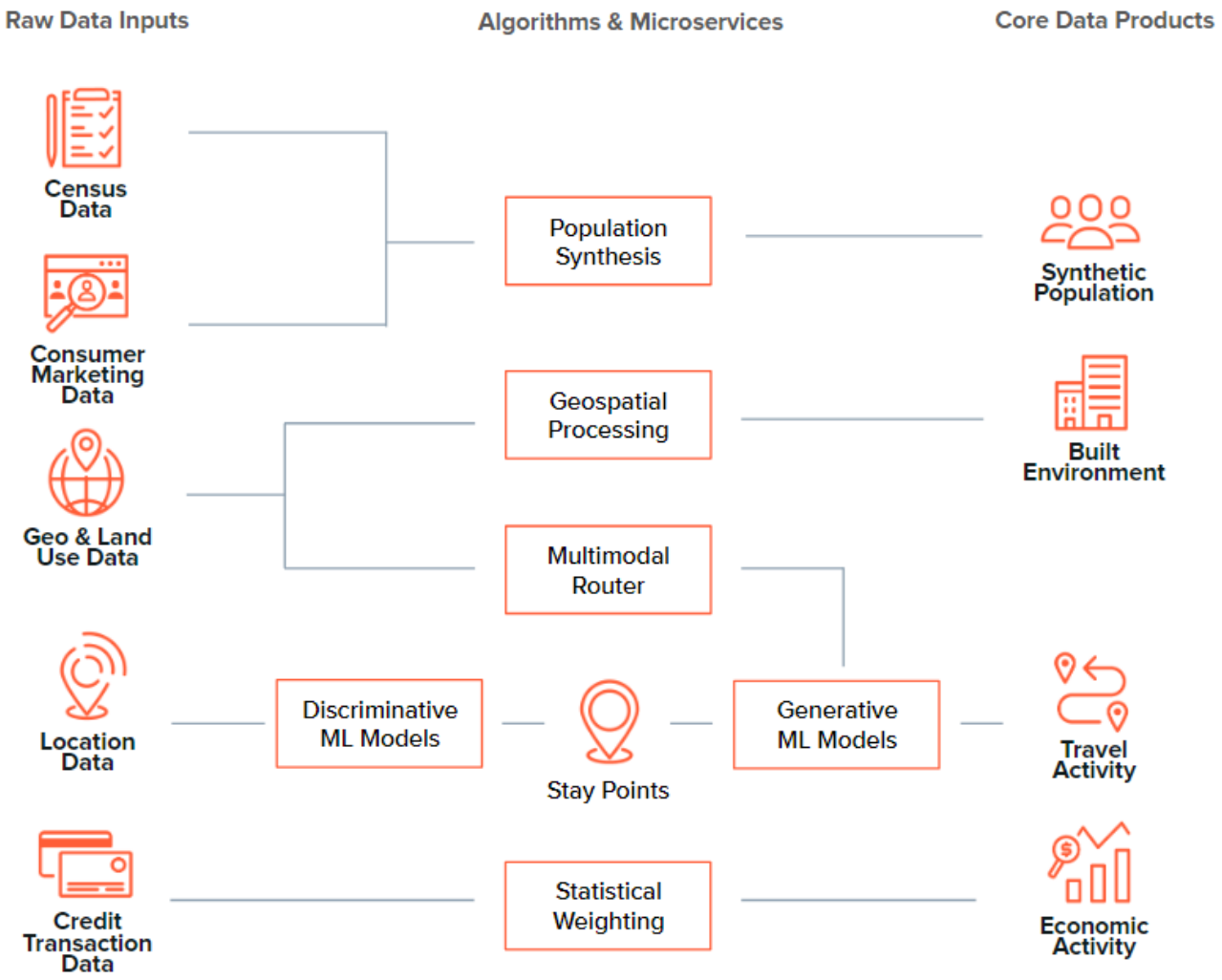
Economic Activity

Ground Truth Data

How it Works:
Algorithms Layer

Replica generates its data by running large scale, computationally-intensive simulations — a "replica" of transportation and economic patterns.

As the quantity and variety of available raw data continues to grow, we introduced a privacy-preserving algorithms layer that produces composite synthetic core data sets in a unified schema.



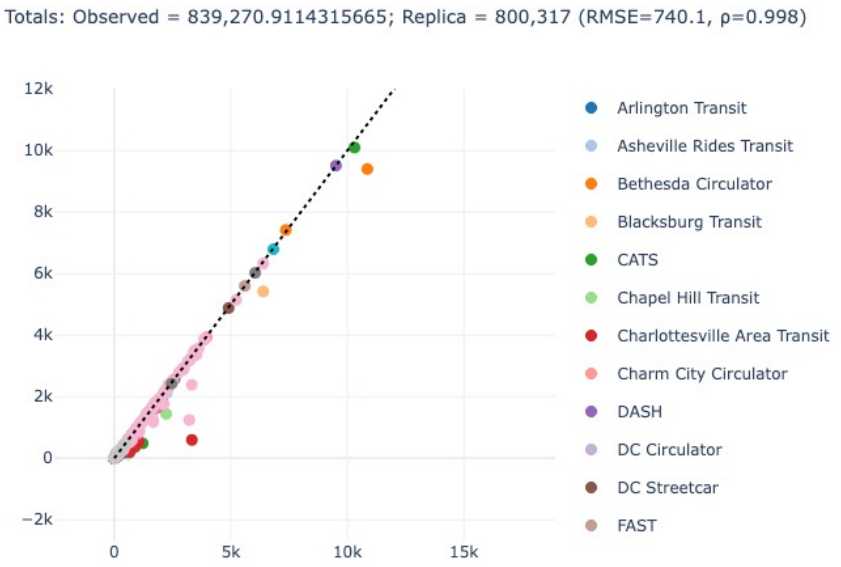
How it Works:
Data Quality

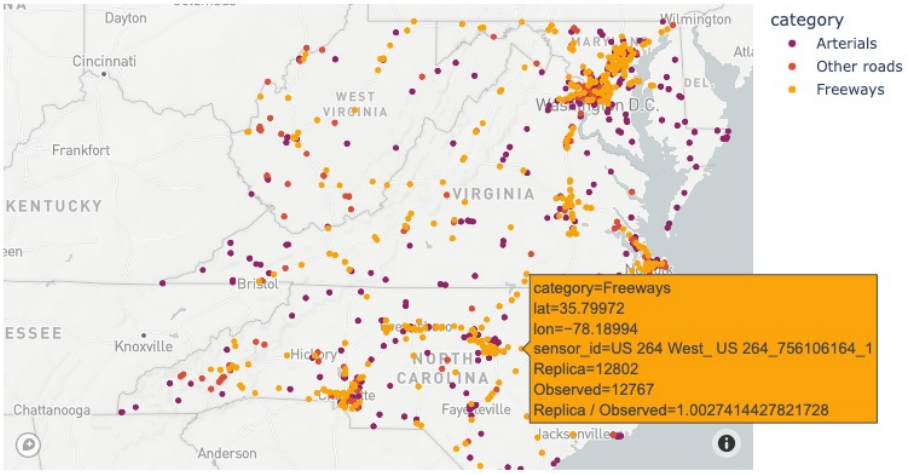
Calibration & Validation

Replica's models are calibrated against both Replica collected and customer-provided ground truth.

Sources include auto sensors, network volumes, transit ridership, and Uber/Lyft data.

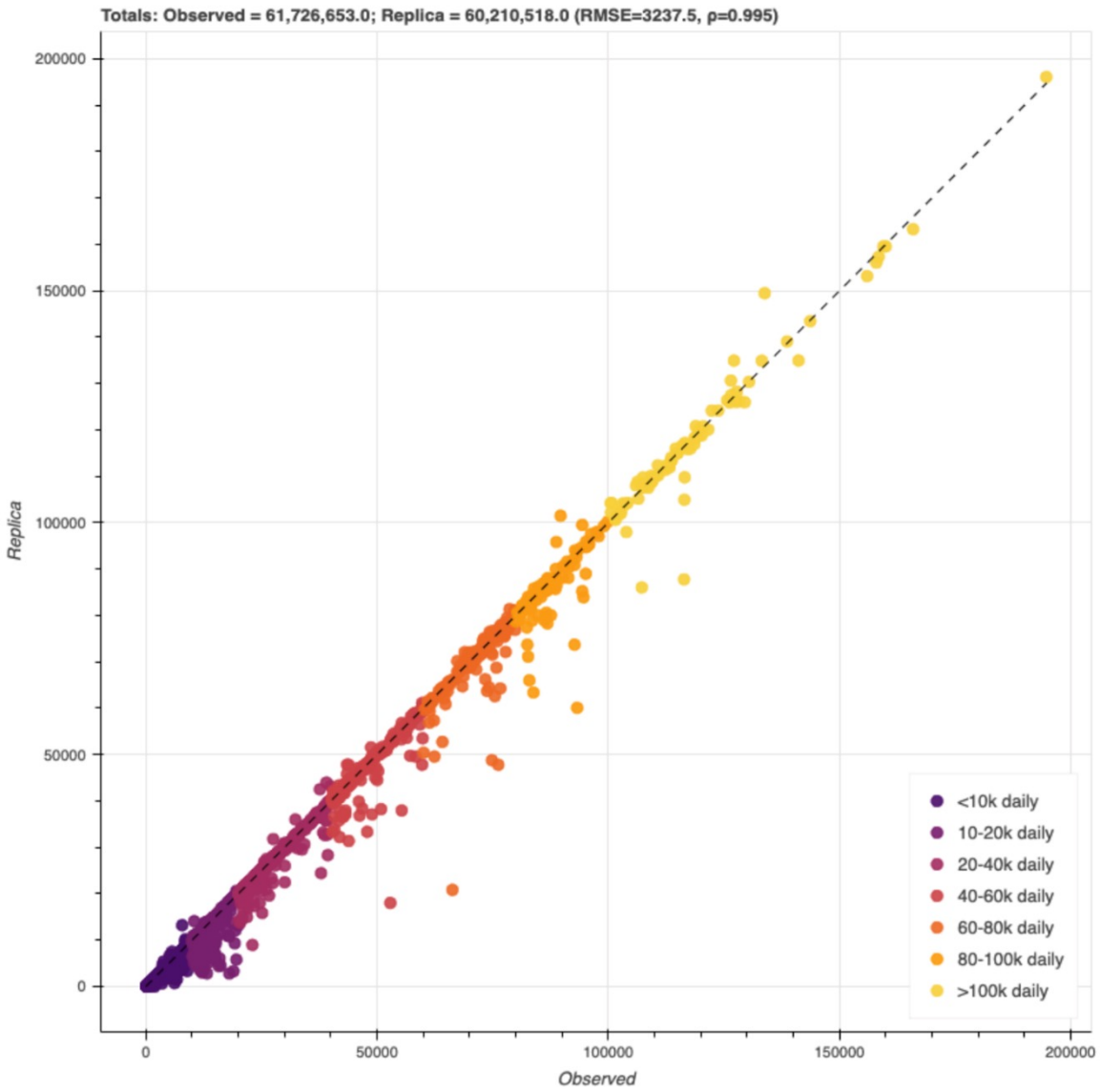
Data comes with an associated quality report, and an extensive list of third-party validation reports can be found on our website.





How it Works:
Data Quality

Bucket	Error	Bound
<10k daily	0.267976	0.500000
10-20k daily	0.196543	0.350000
20-40k daily	0.068614	0.250000
40-60k daily	0.079331	0.200000
60-80k daily	0.077217	0.150000
80-100k daily	0.064627	0.120000
>100k daily	0.040072	0.100000

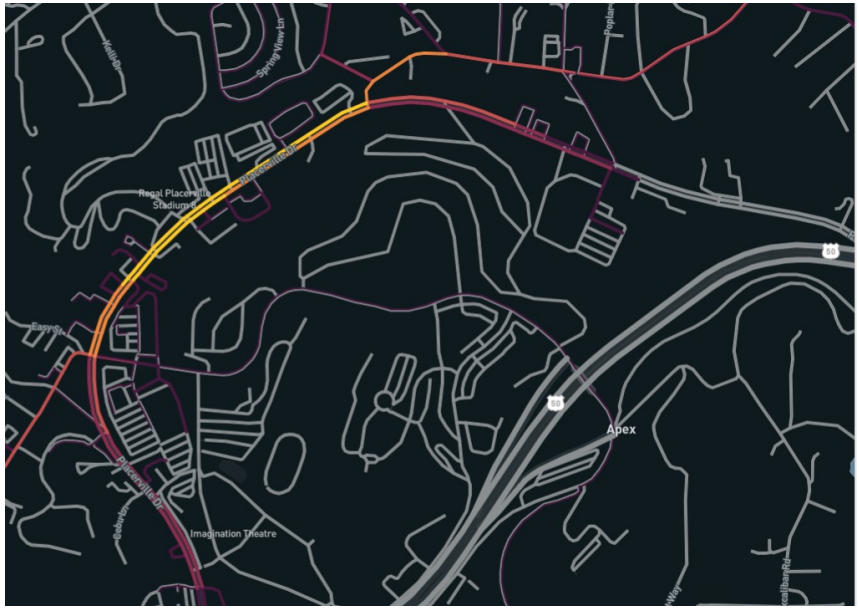


How Reliable is the Data?

- These platforms are tools
- Remember life before google earth?
- Platforms evolve and improve
- Transparency about confidence level
- Requires Common Sense & Good Judgement
- Provides mobility insights faster than with traditional tools
- Provides insights not possible with traditional tools

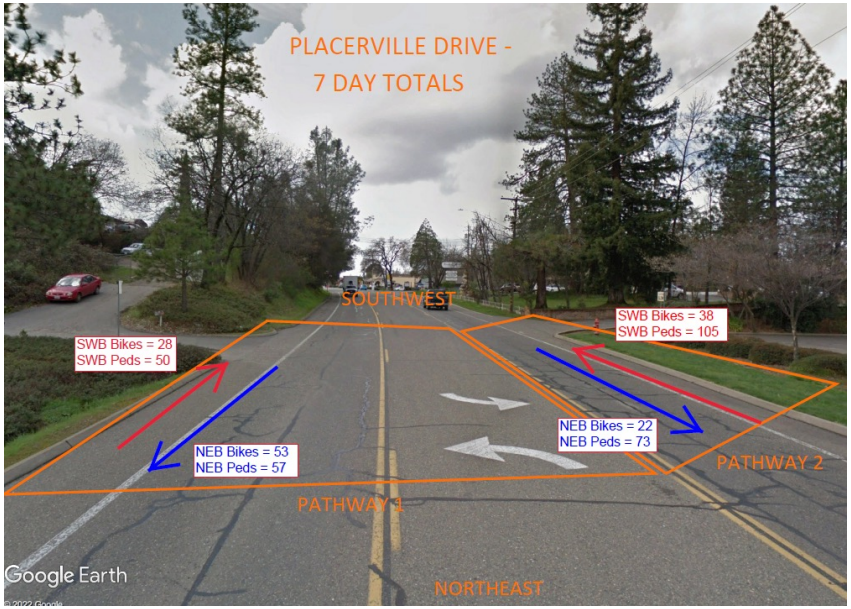
How Reliable is the Data?

Replica Platform



Pedestrians = 37
Cyclists = 23

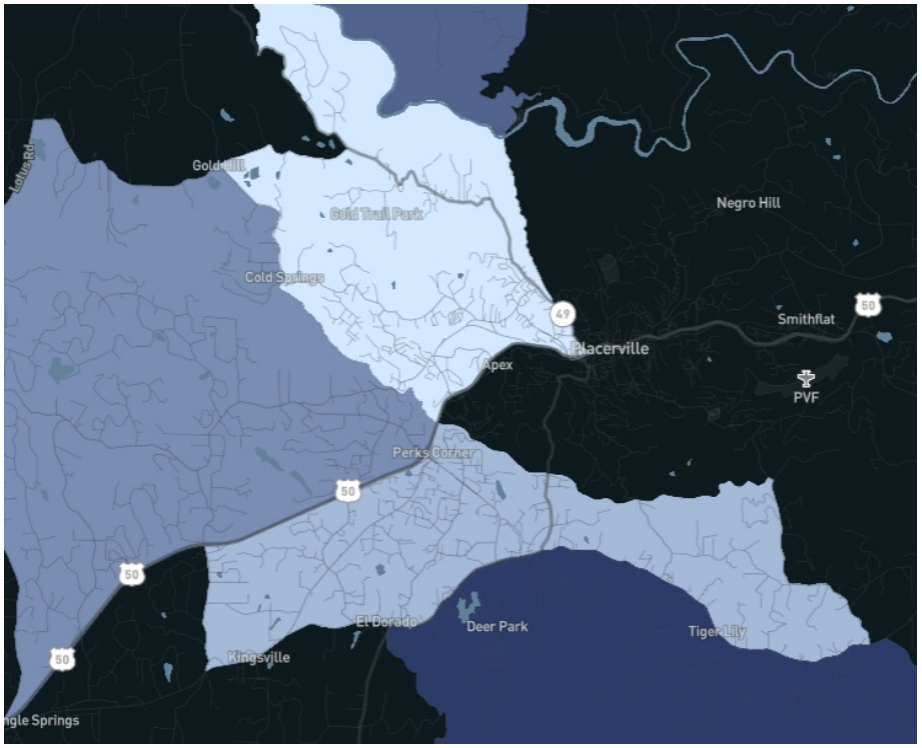
Field Count



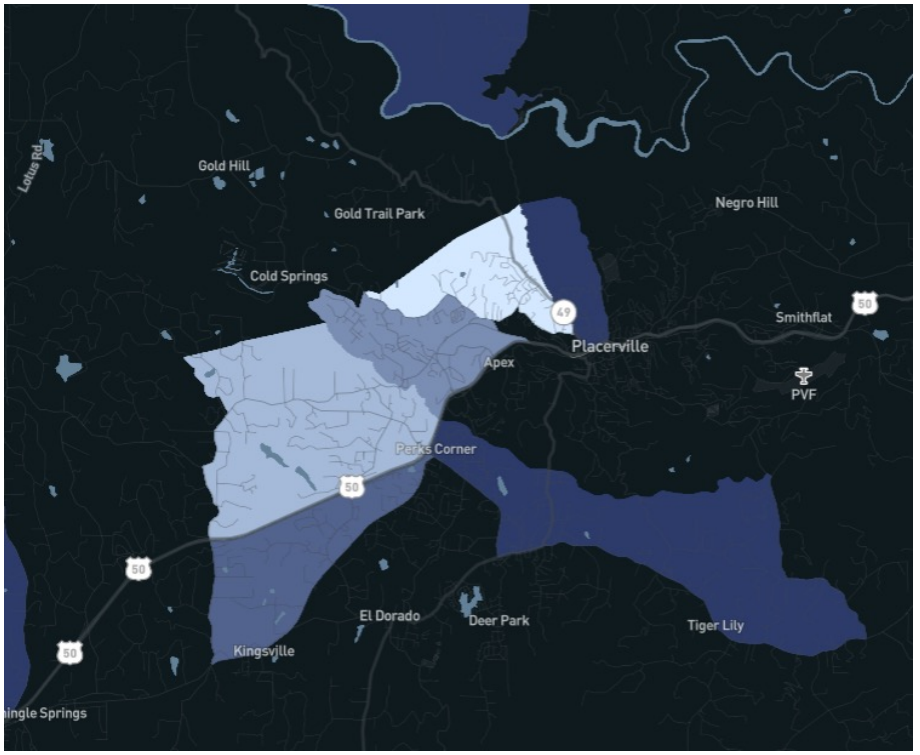
Pedestrians = 41
Cyclists = 20

Data We Can't Get With Traditional Tools

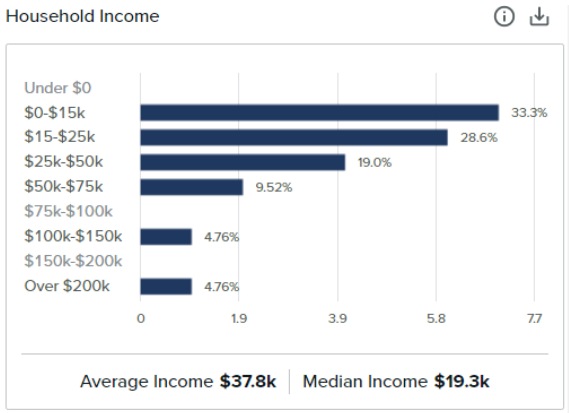
Cyclist Trip Origin

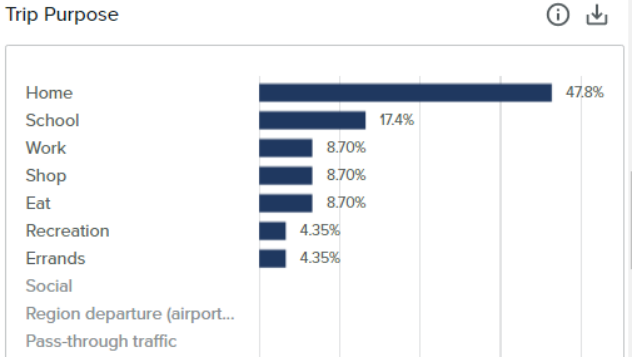


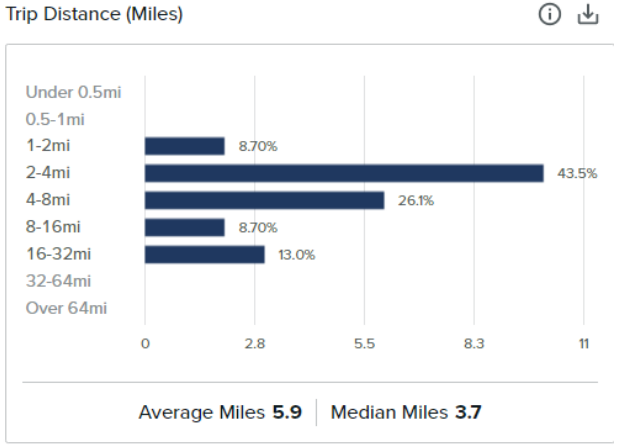
Cyclist Trip Destination

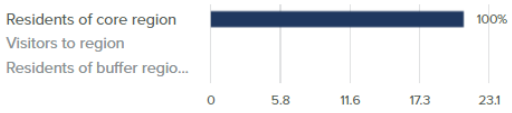


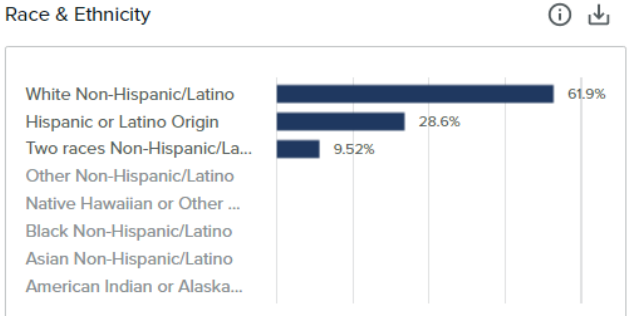
Data We Can't Get With Traditional Tools

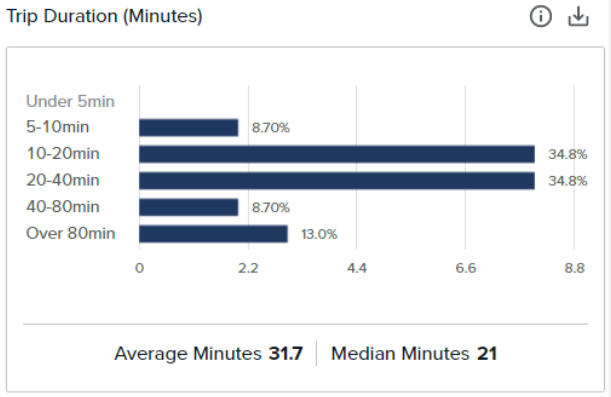






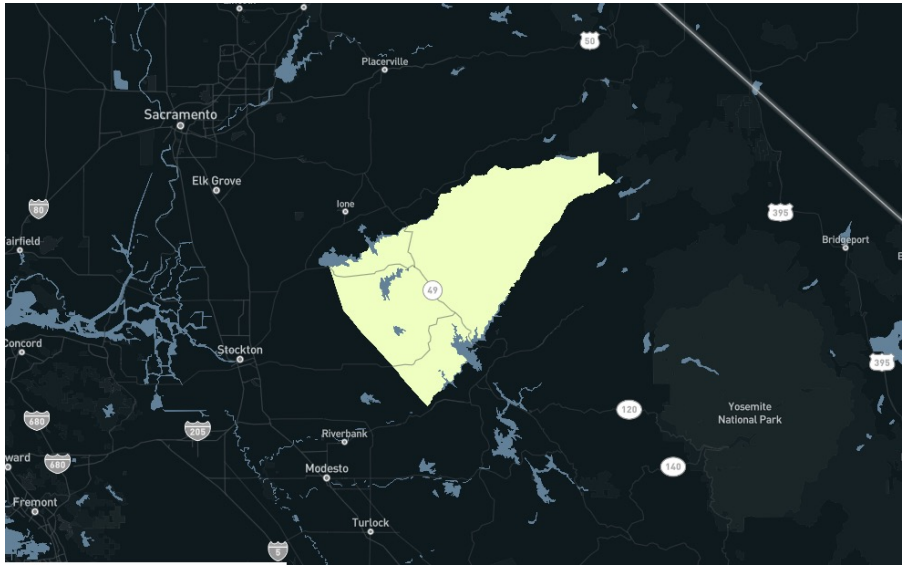




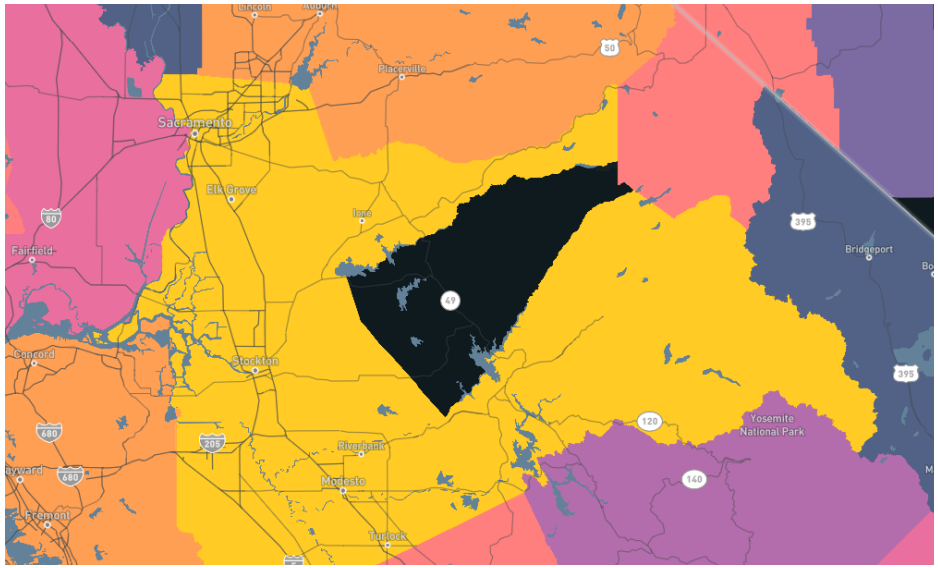


Priority Corridors For Evacuation

Trip Origin



Trip Destination



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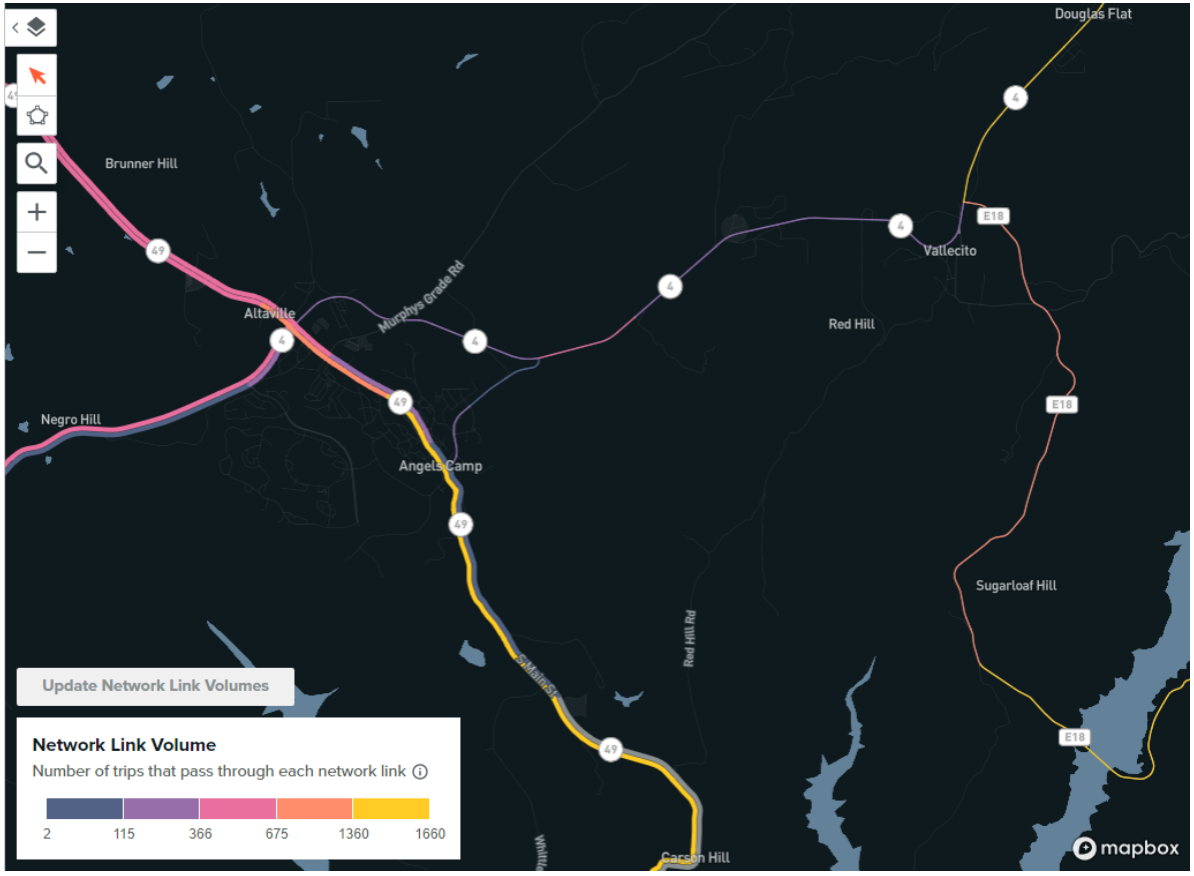
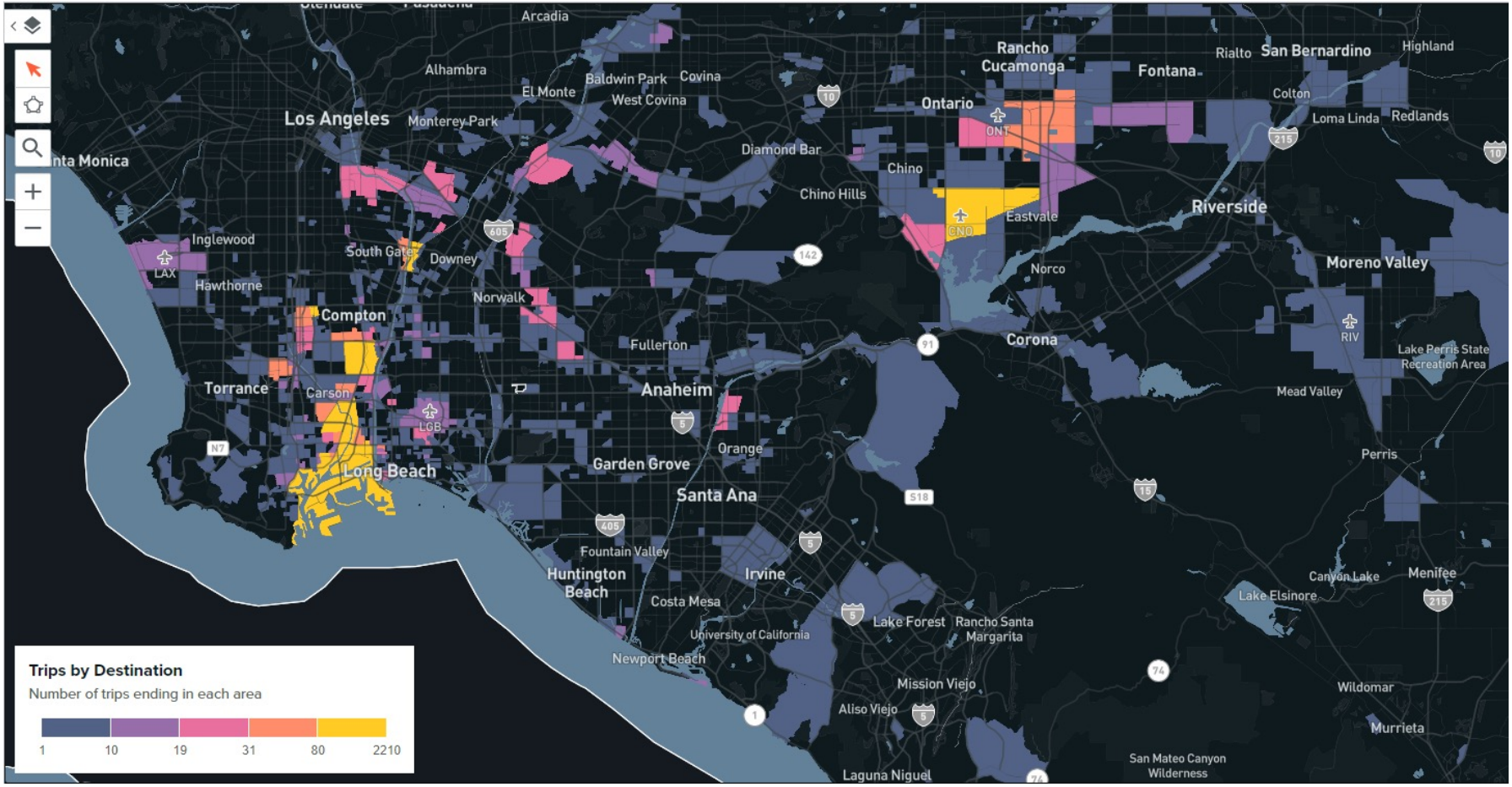
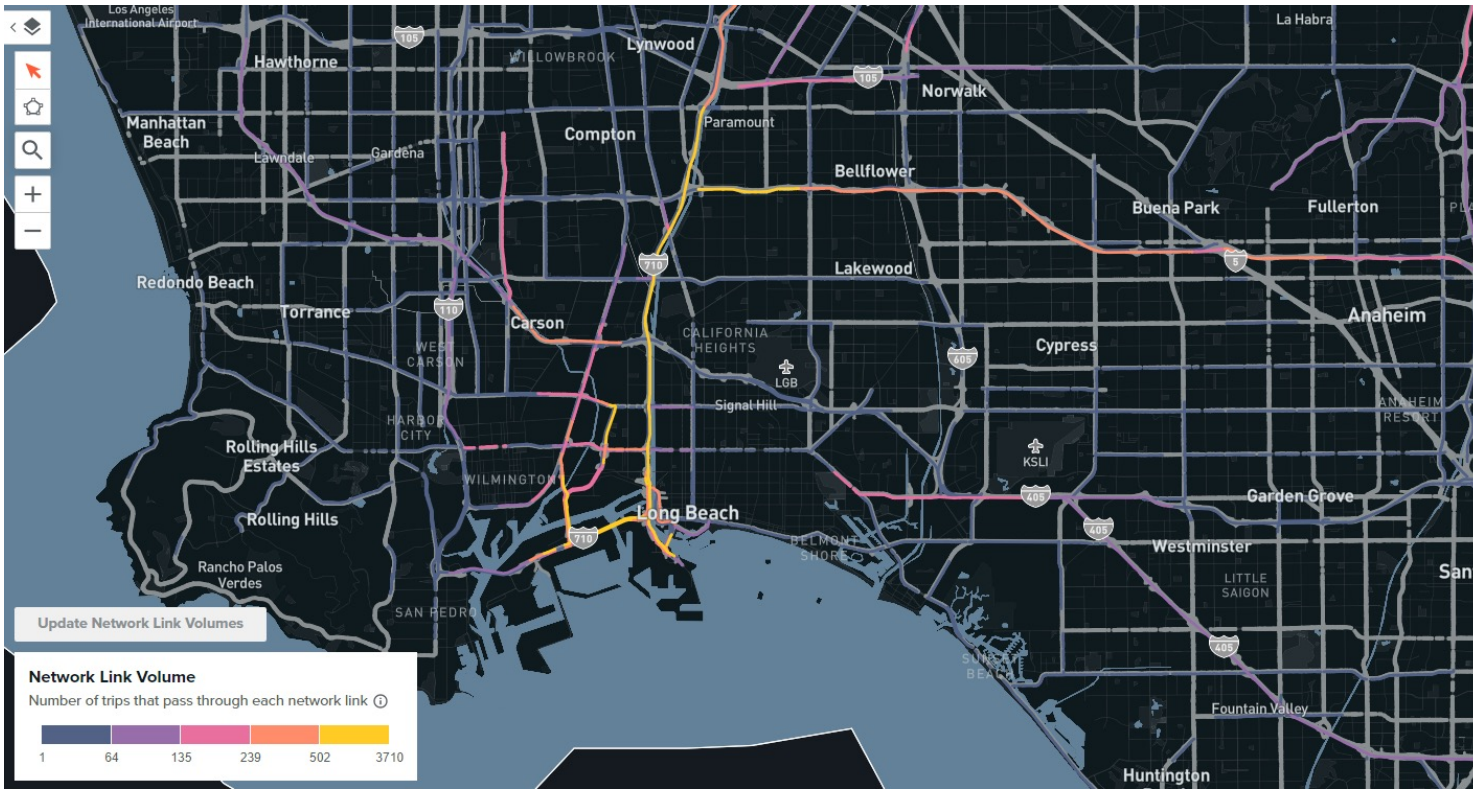


Where Does Freight Traffic Go When it Leaves the Port of Long Beach?



What Roads Does that Freight Traffic Use?



Support for Economic Enhancement:

Do People Who Drive on this Road, Go To Yosemite National Park?

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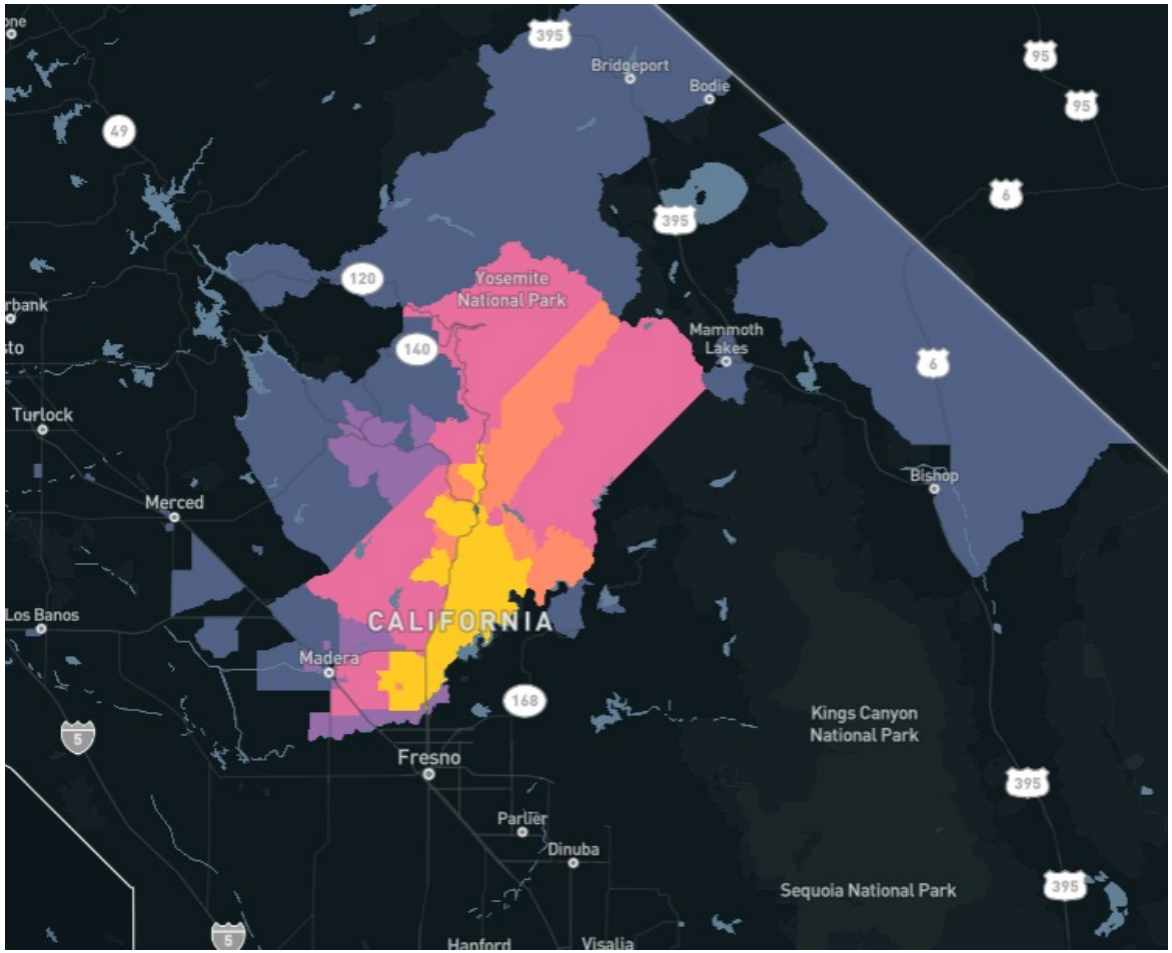


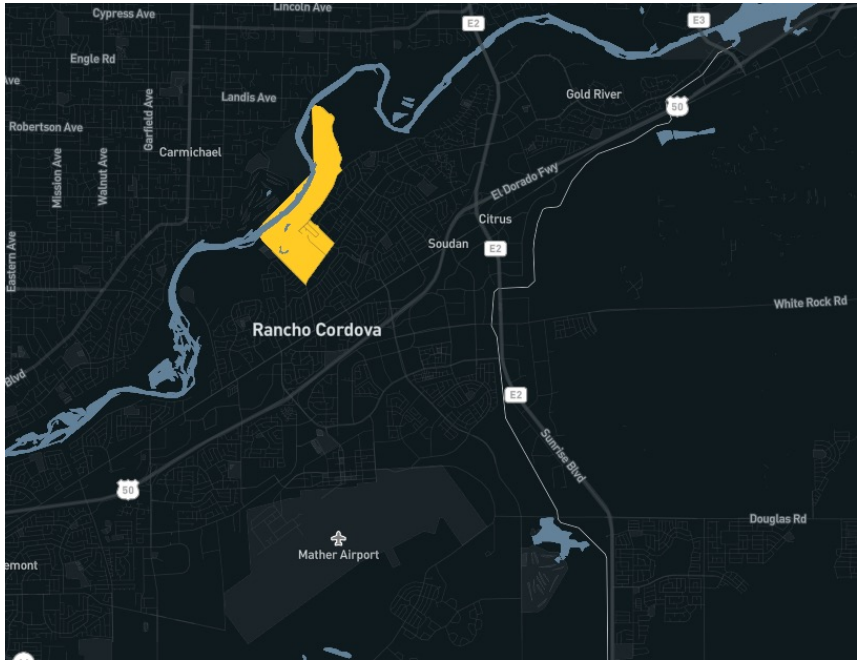
Yes!

33 miles to the park from this project.

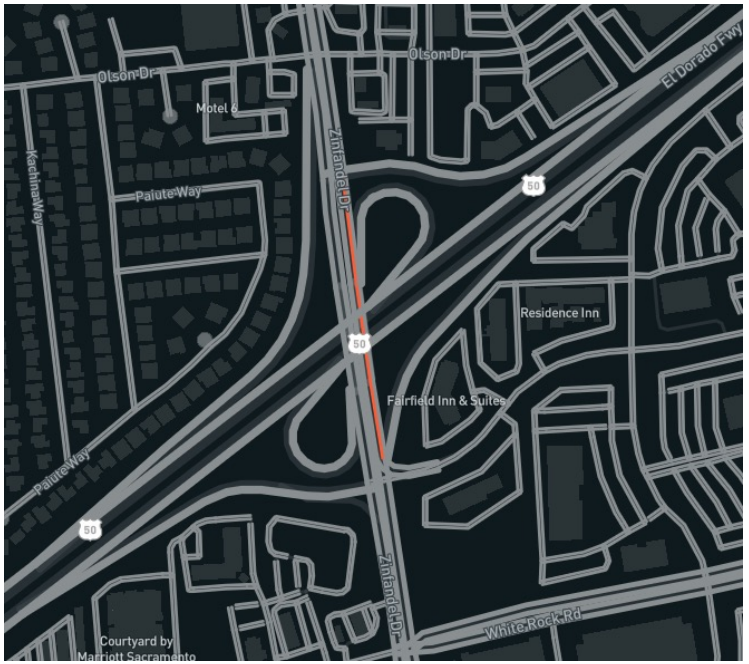
45% of vehicles driving through the project area (near Fresno) traveled to the census block where hotels near the parks main gate are located.

Trips with High Potential for Mode Conversion:

Do Students Walk/Bike or Drive Across the Freeway to get to High School?



Trip Destination



Roadway Segment

Trips with High Potential for Mode Conversion:

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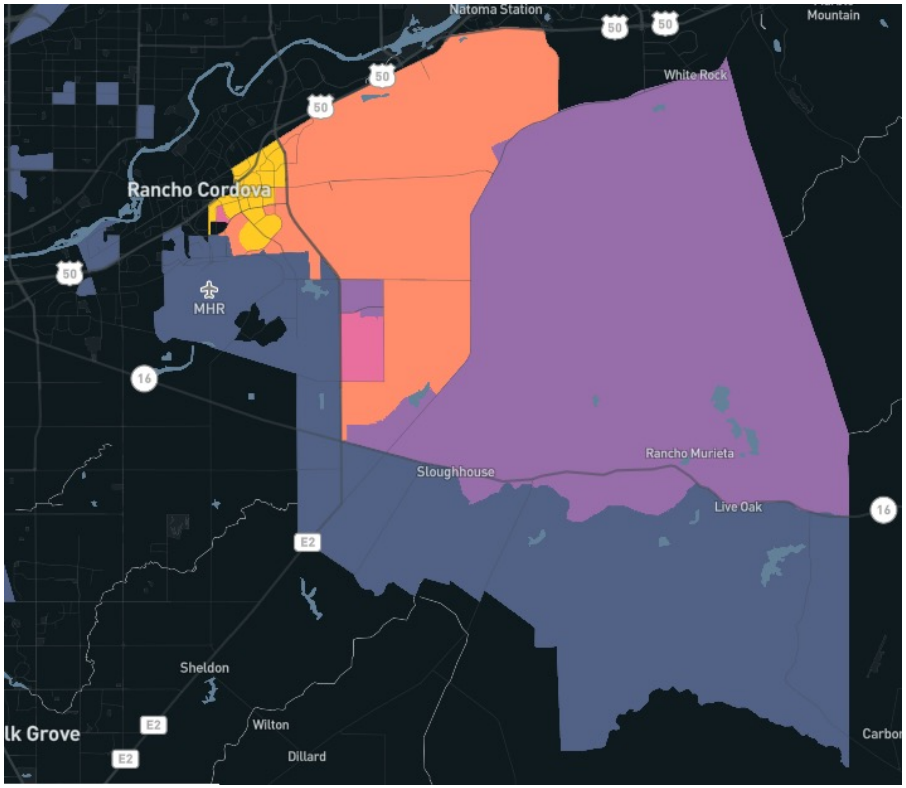


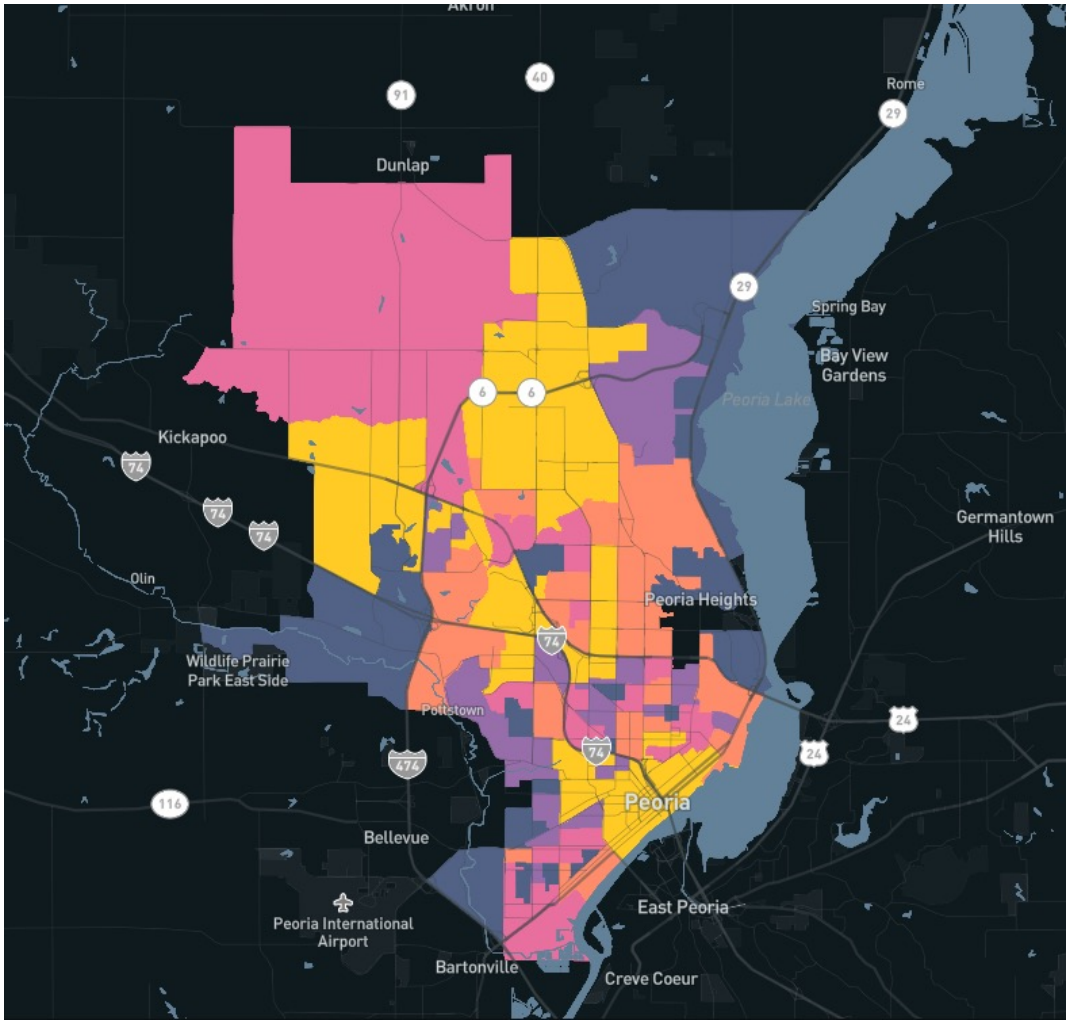
Origins of Students Attending this High School.

Median Trip Distance = 3.7 miles

7% Bike or Walk

93% Drive or are Driven

EV Charging Site Location & EV Plan Deployment



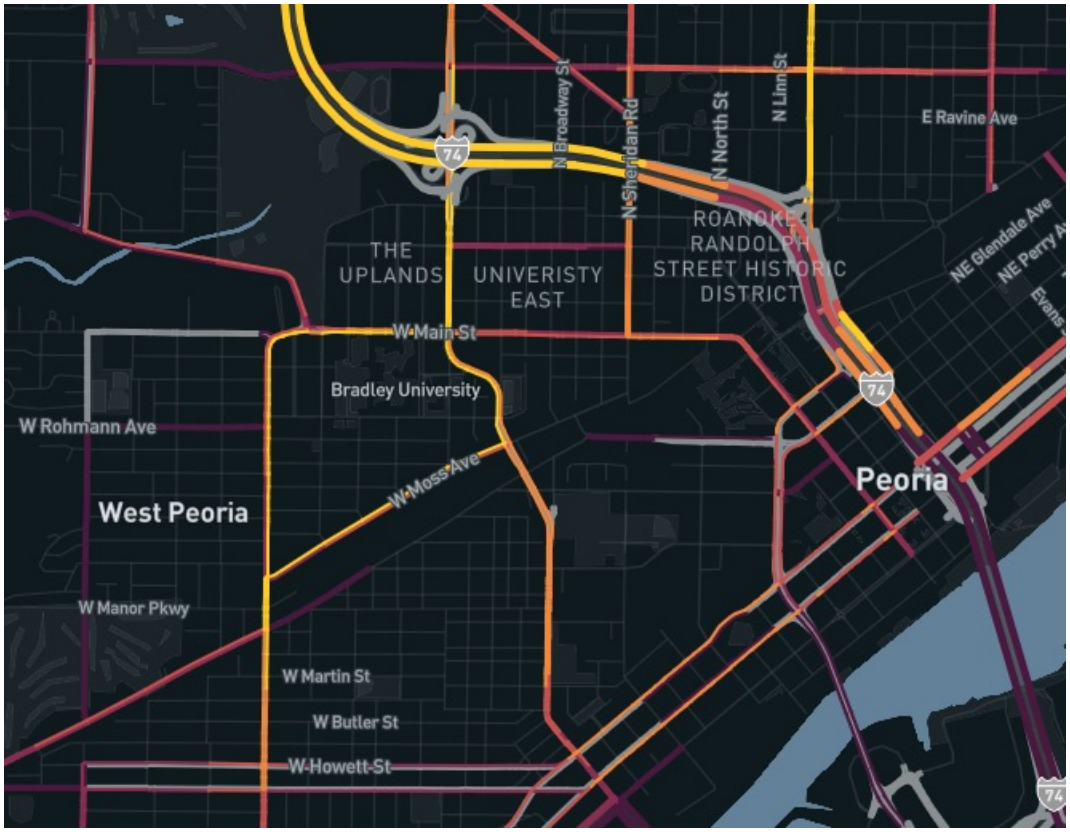
Destinations of:

- Residents of Peoria Illinois
- Trips begin and end in Peoria
- Median Household income less than $50k/year
- Primary travel mode Auto

EV Charging Site Location & EV Plan Deployment

Roadway Volume of this population Group.

Helps to identify Potential EV charging locations



Thank you, Questions?