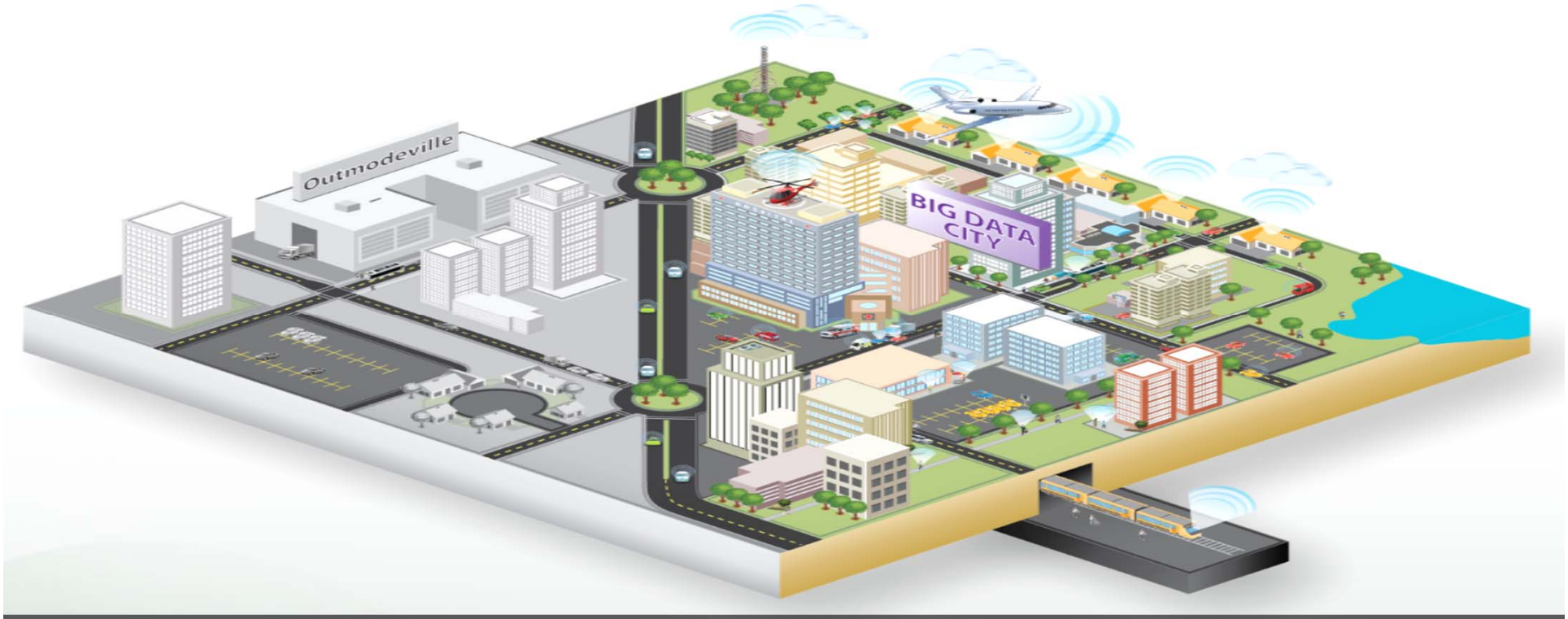


Better Decisions Through Better Data

The Impact of Big Data on Transportation Planning and Engineering

Mike Wallace, PTP

Jinghua Xu, Ph.D, PE

FEHR & PEERS

Jan 27, 2016

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS
50 YEARS

BIG DATA

Does Bigger Data Necessarily Mean Better Data?

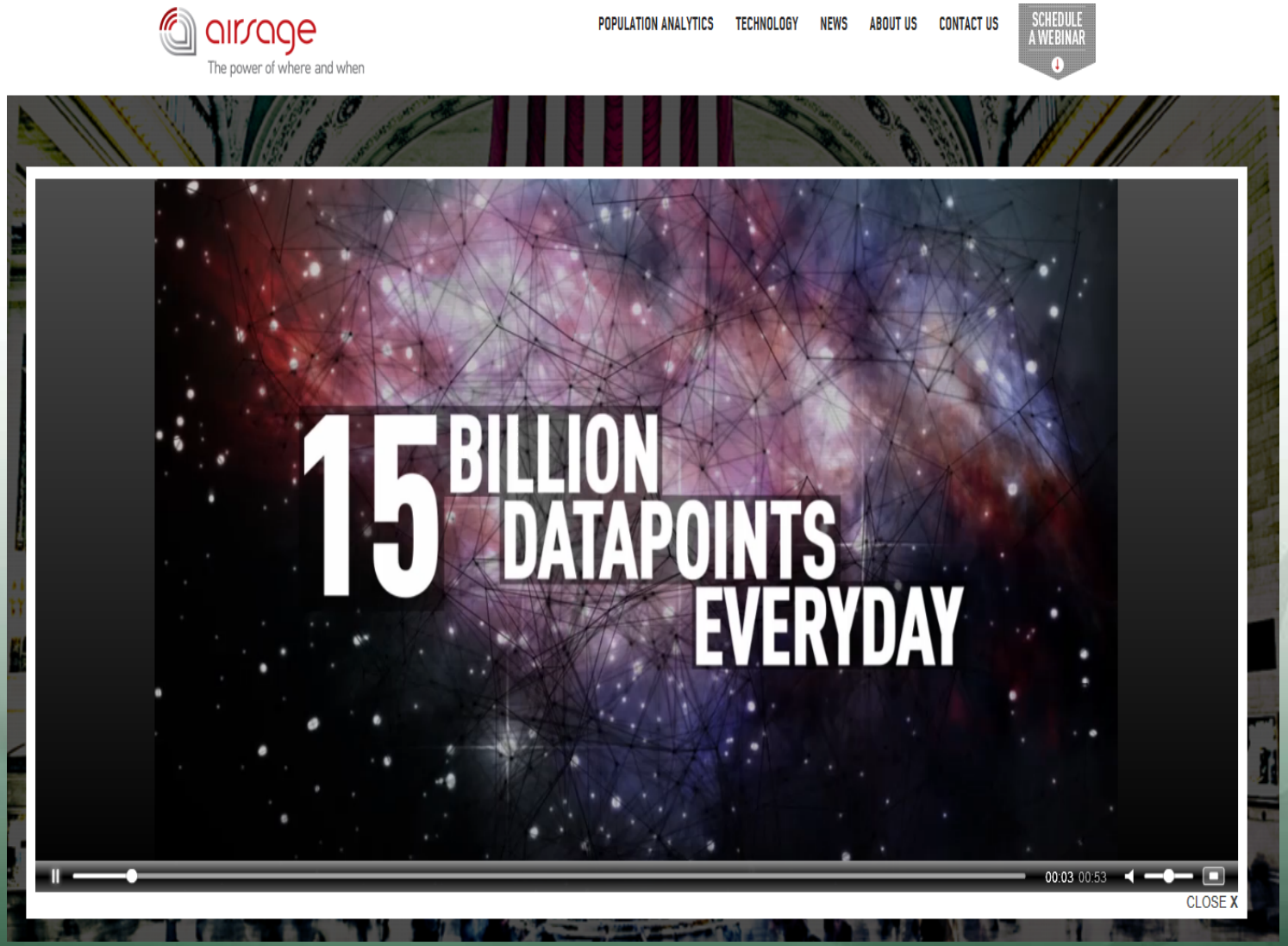
A First Penguin Perspective

BIG DATA ■ Definition

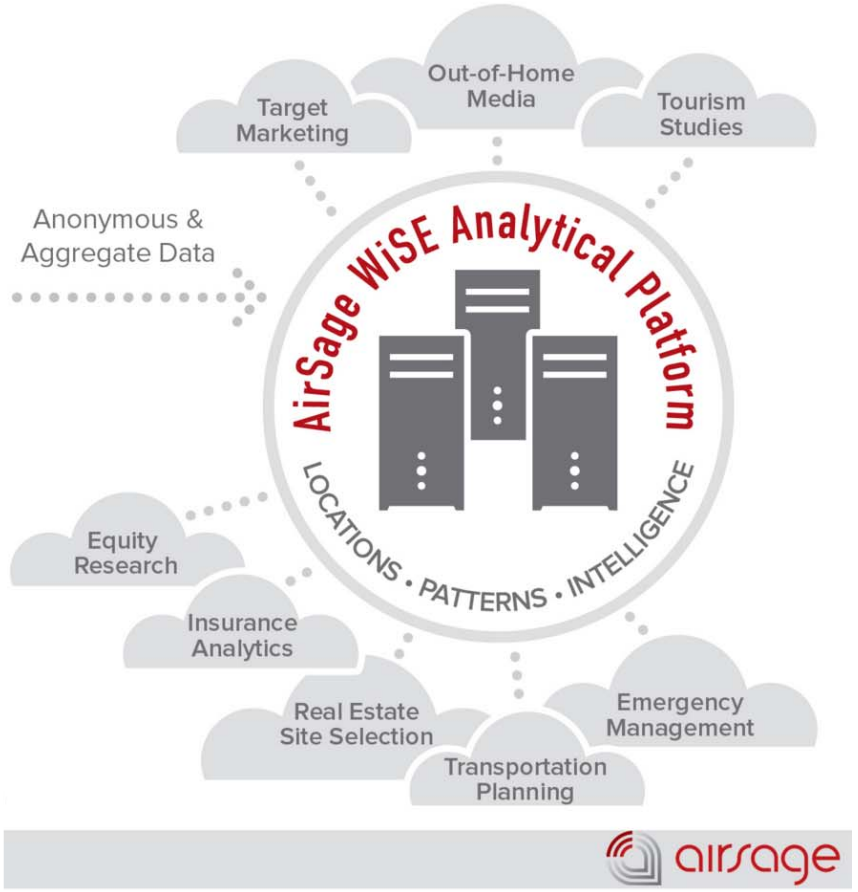
(1) Too big to fit into a spreadsheet.

BIG DATA ■ Need for Filtering

BIG DATA ■ AirSage



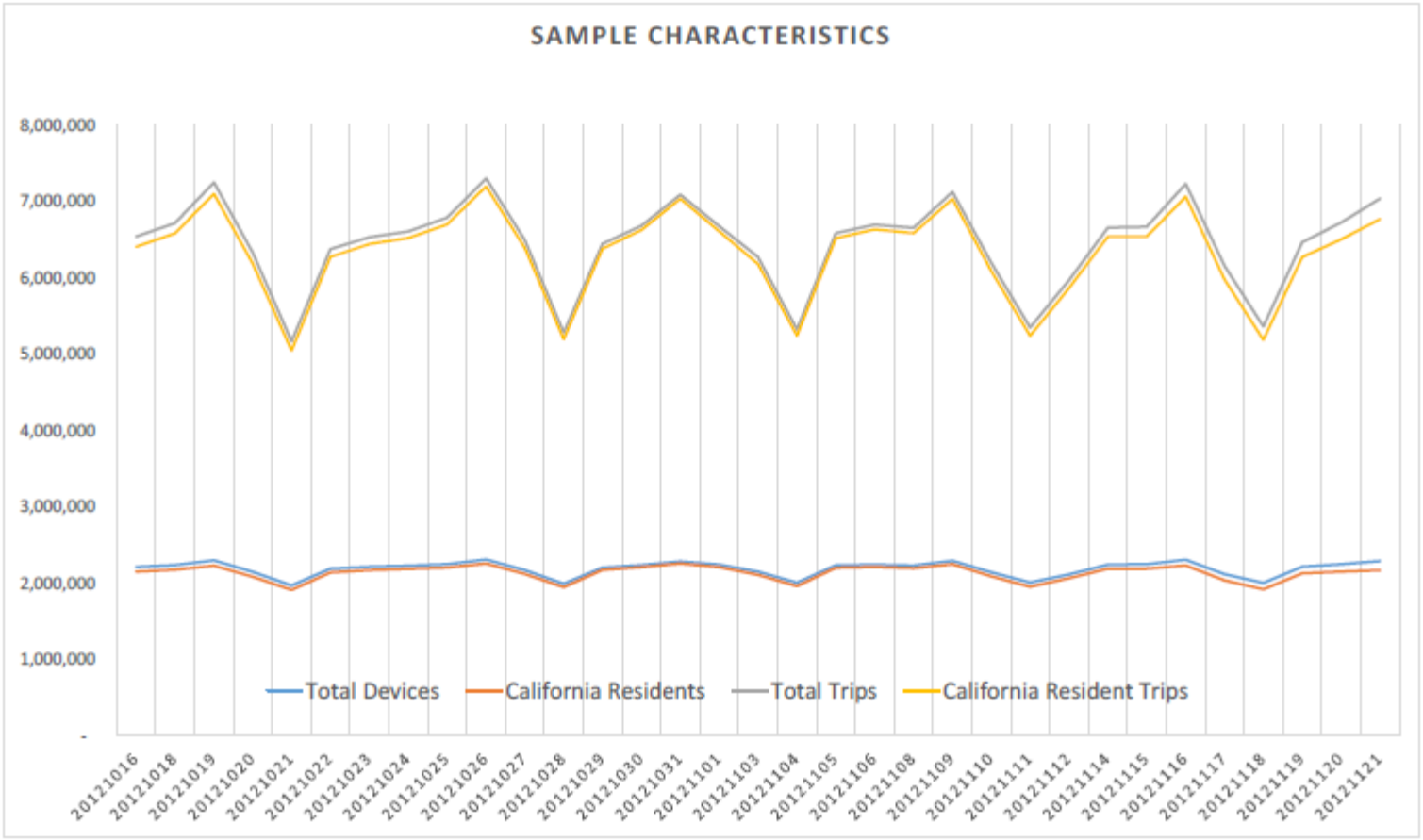
BIG DATA ■ AirSage Filtering



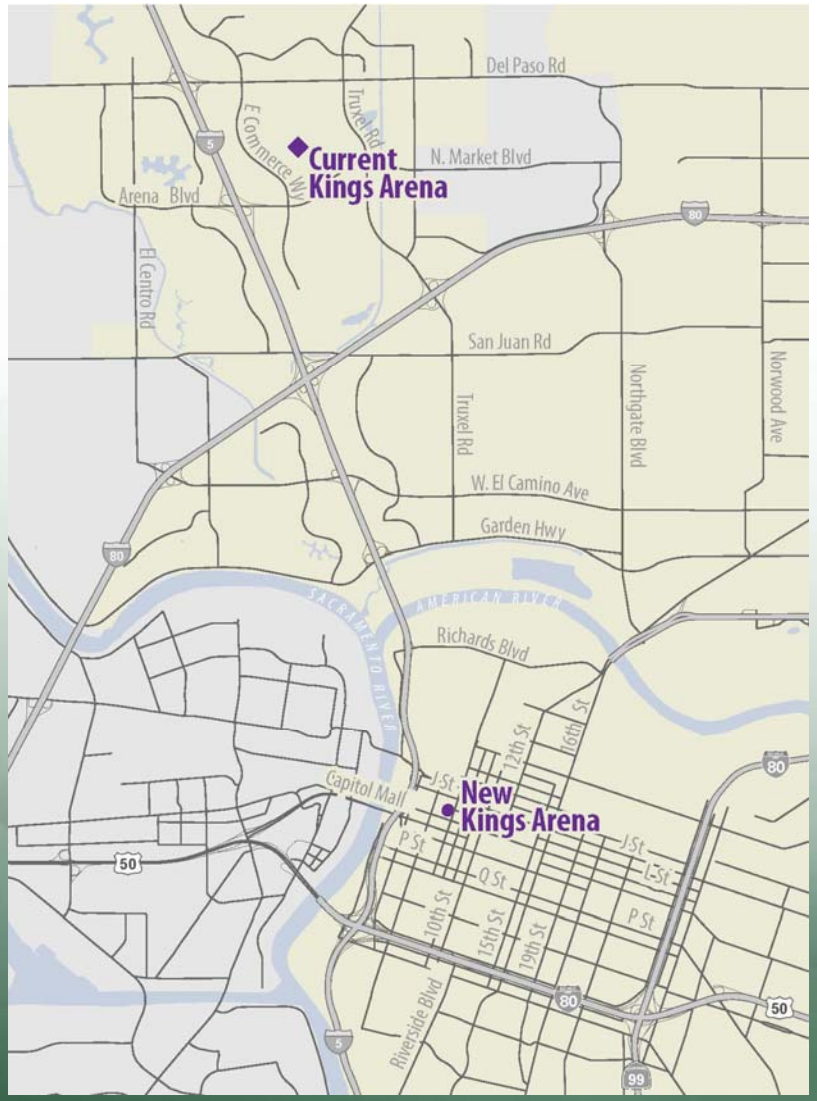
FEHR PEERS

BIG DATA ▪ Still a Sample

Figure 2 Sample Characteristics



BIG DATA ■ The Challenge - CEQA

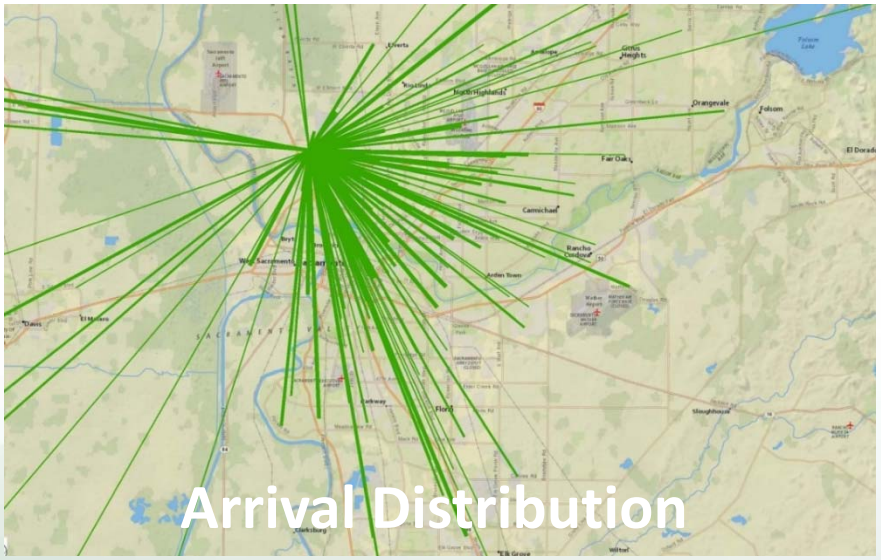


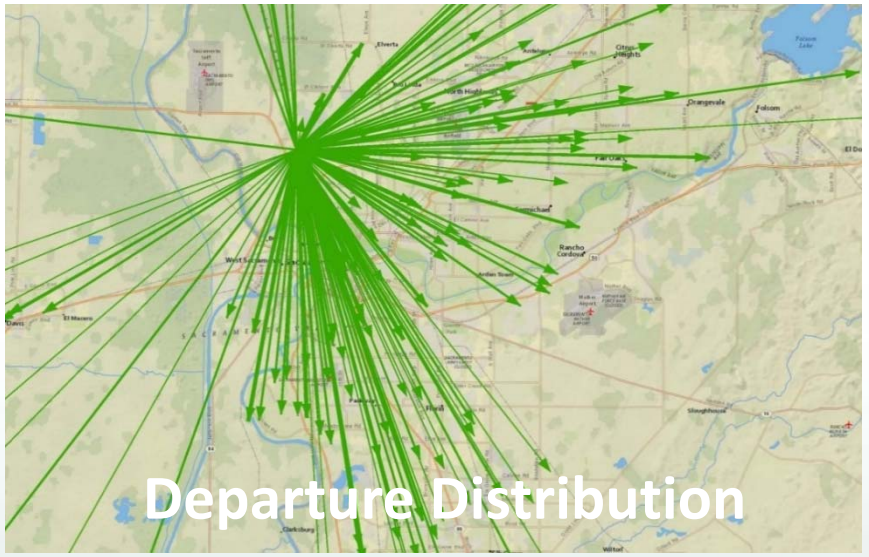
Sacramento Kings

Create a *legally defensible* analysis that…

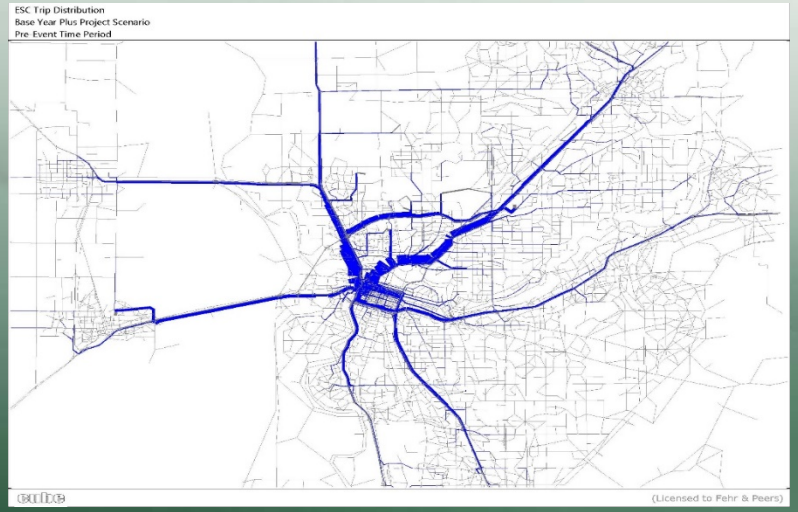
- **Accurately identifies impacts**
- **Determines if new arena achieves VMT reduction targets**

BIG DATA ■ Pattern Visualization

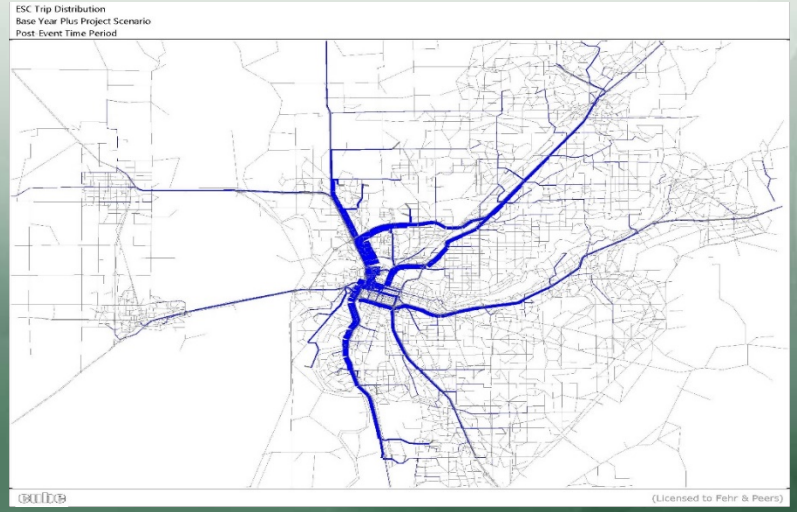




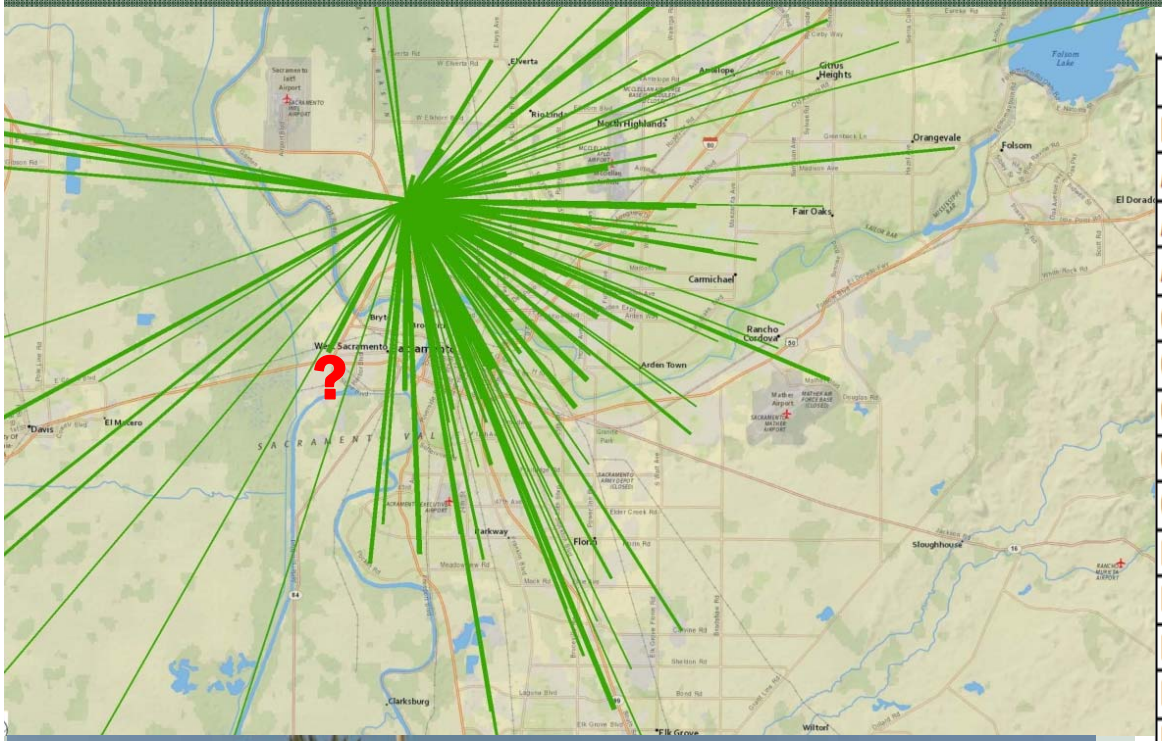
Arrivals



Departures



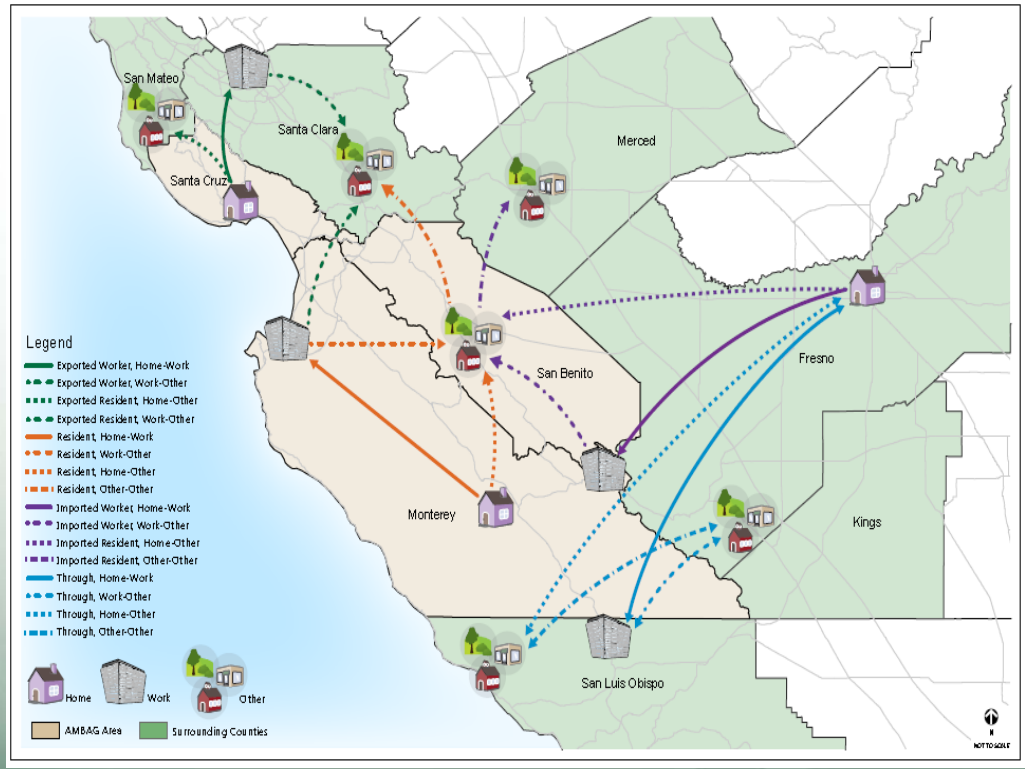
BIG DATA ■ Sacramento KINGS



Origin of Airsage trips arriving at current project site: 3-7 PM		
Regional Analysis District	Trips	Percentage
Antelope	11.19	1%
Arden Arcade	133.36	9%
Auburn	1.96	0%
Cameron Park - Shingle Springs	2.72	0%
Carmichael	26	2%
Citrus Heights	22.42	1%
Colfax	0.21	0%
Coloma - Lotus	1.11	0%
Davis	23.66	2%
Delta	0.2	0%
Downtown	147.59	10%
East Placerville	0.82	0%
East Sacramento	137.17	9%
El Dorado High Country	0.3	0%
Vineyard	9.72	1%
West Sacramento	119.25	8%
Winters	2.64	0%
Woodland	62.53	4%
Yuba City	24.43	2%
Total	1532.48	100%

NEEDS For Practitioners

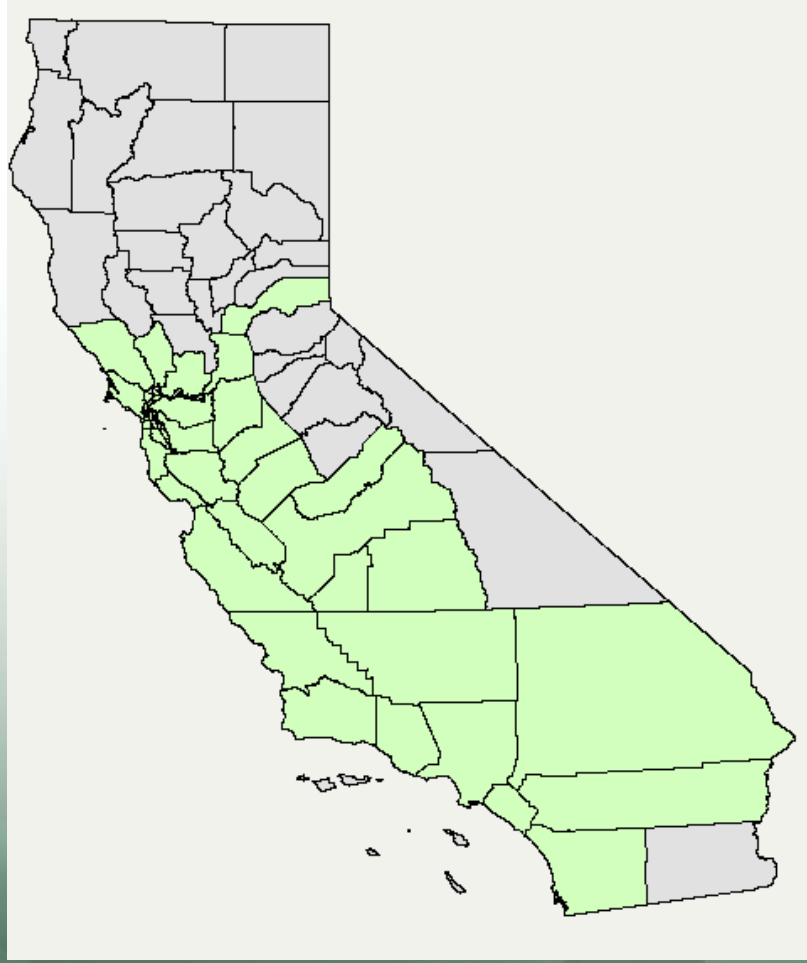
- A Common Lexicon
- Understanding of Data Filtering and Limitations
- Authoritative Guidance
- Recognition of Data Evolution



BIG DATA

County Level Experience

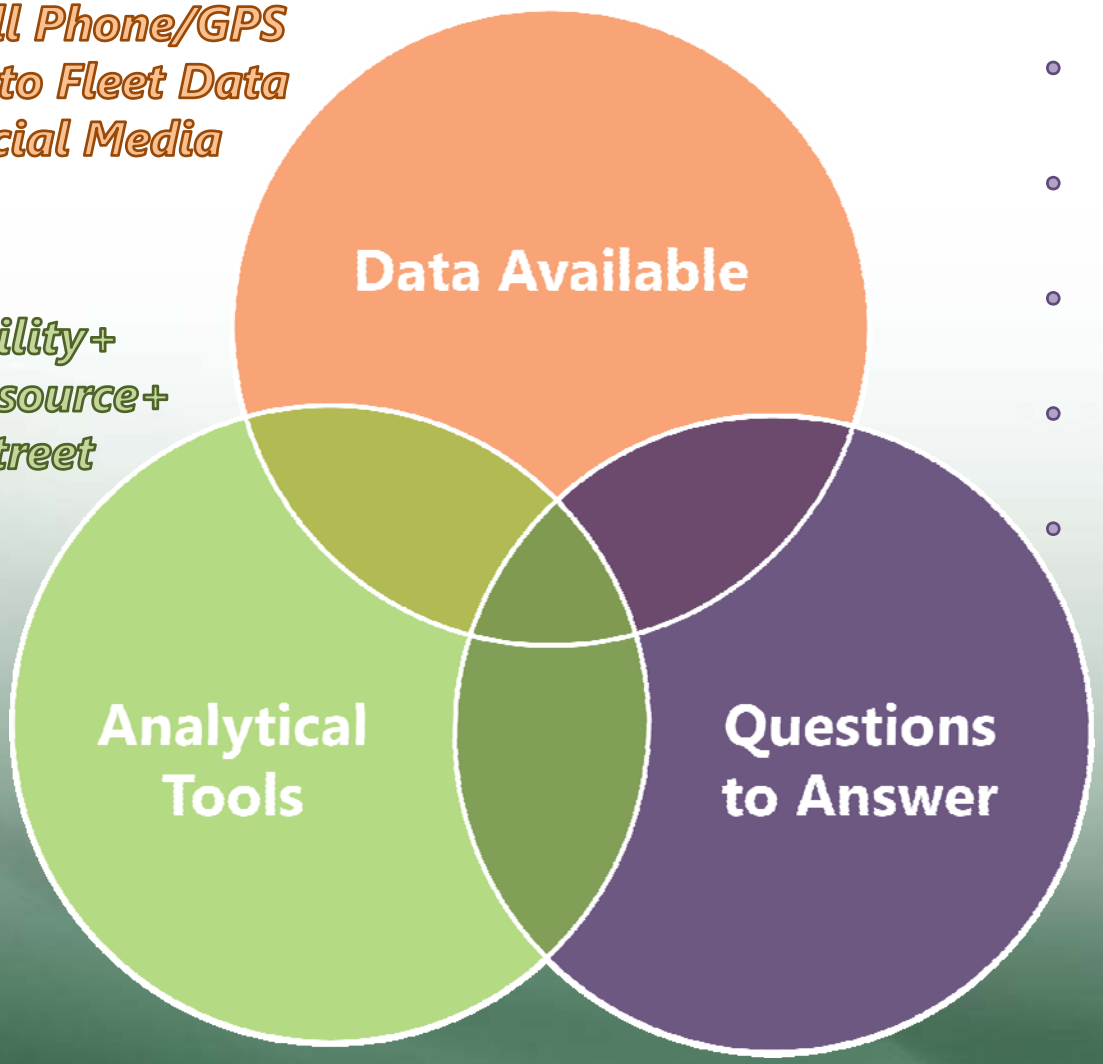
airsage
esri
Google
INRIX
CITY SOURCED
miovision technologies
Mygistics
STREETLIGHTDATA
Berkeley UNIVERSITY OF CALIFORNIA
TOMTOM
PTV/NUSTATS



BIG DATA

- *Transit AVL/APC*
- *Cell Phone/GPS*
- *Auto Fleet Data*
- *Social Media*

- *Reliability+*
- *Crowdsource+*
- *Mainstreet*
- *TDM+*



- *When/where are issues occurring?*
- *How to prioritize investments?*
- *How to better engage the community?*
- *How effective is this treatment?*
- *How do pricing changes impact decisions?*
- *Other typical applications*

BIG DATA ■ Reliability

5 Fulton Reliability

PM period (4 PM to 7 PM)

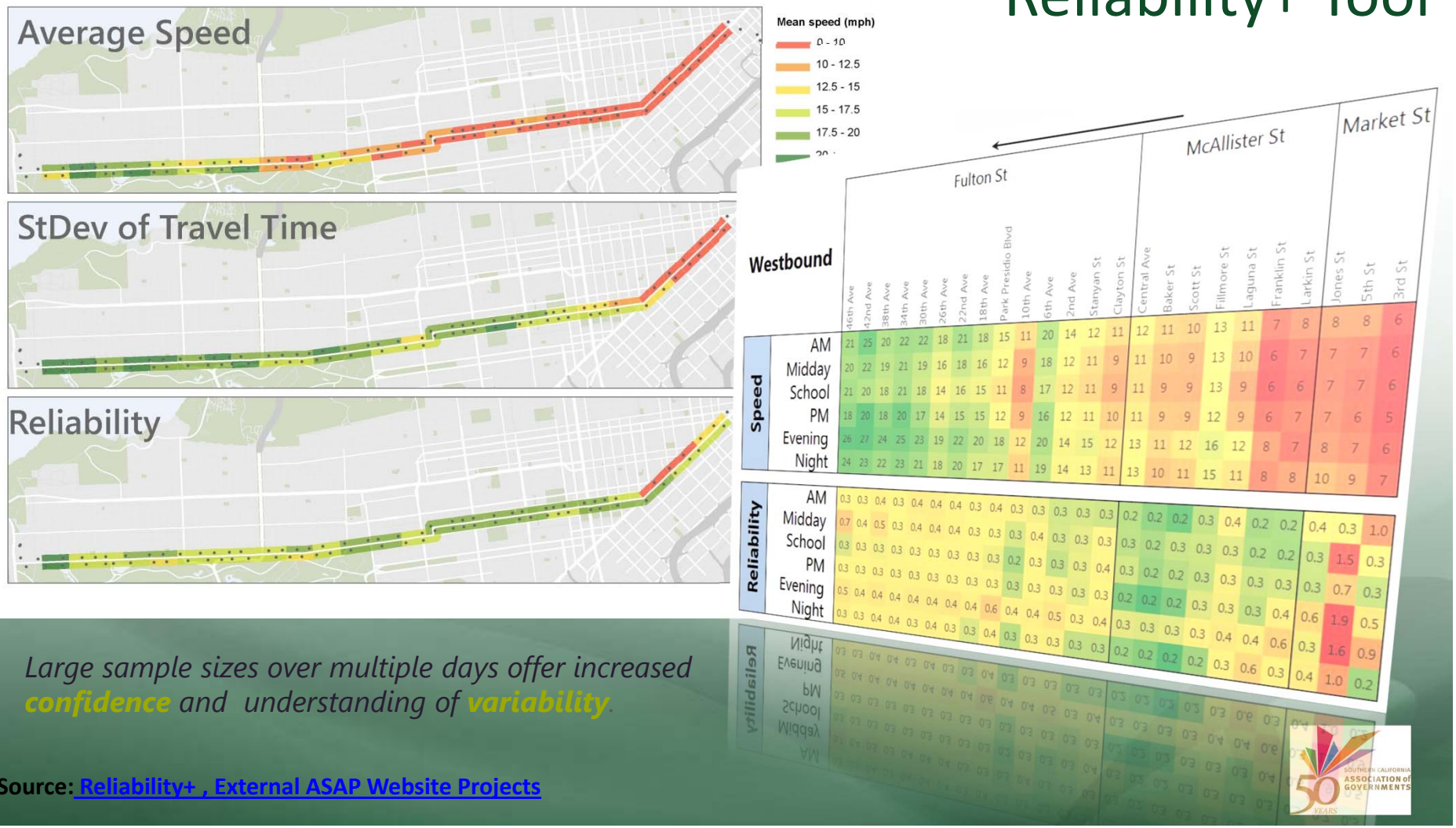
Source: SFMTA bus AVL data from May 2012. GIS analysis tool developed by Fehr & Peers

FEHR PEERS

SFMTA

Moving Forward Together

SFMTA Reliability+ Tool

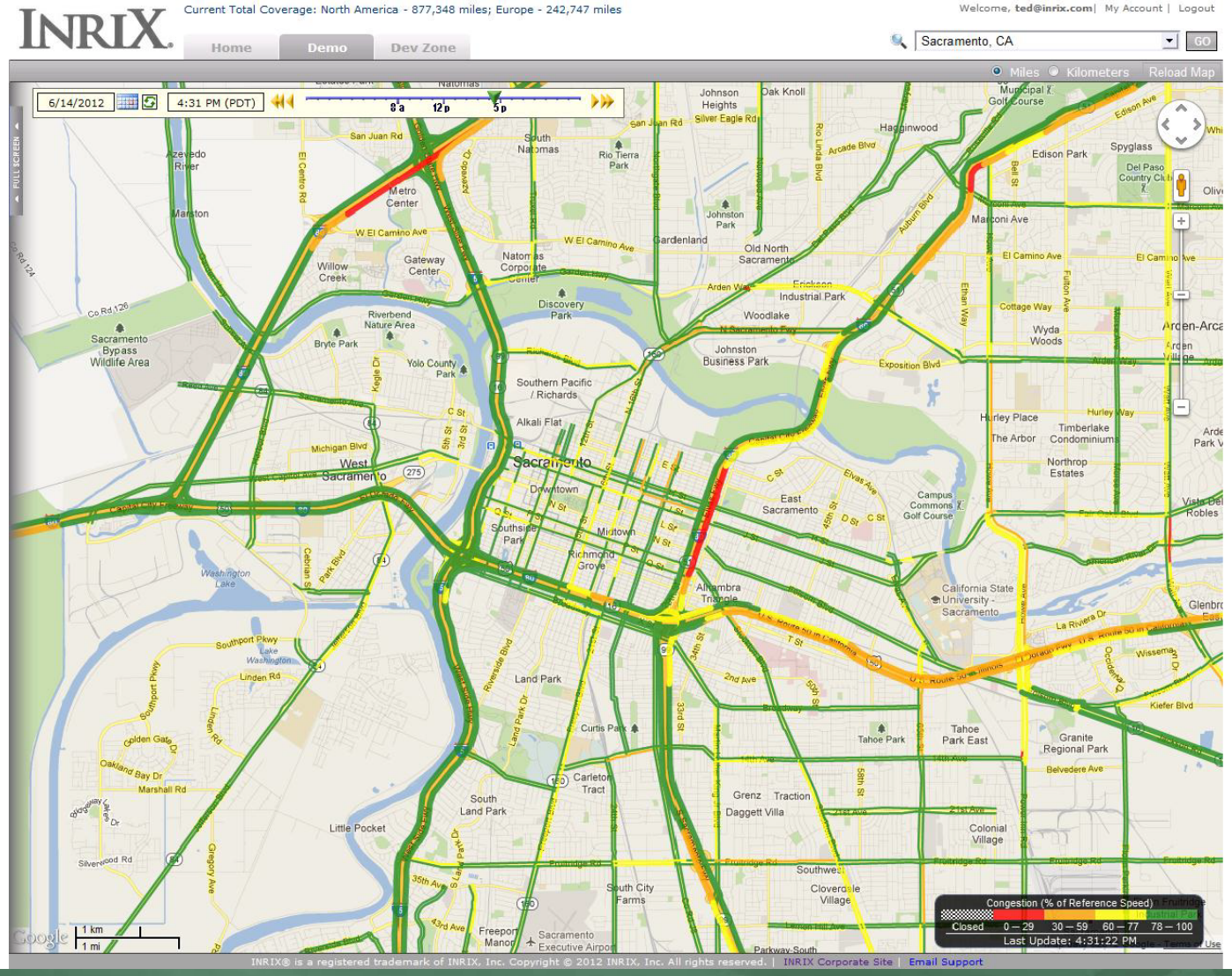


*Large sample sizes over multiple days offer increased **confidence** and understanding of **variability**.*

Source: [Reliability+ , External ASAP Website Projects]

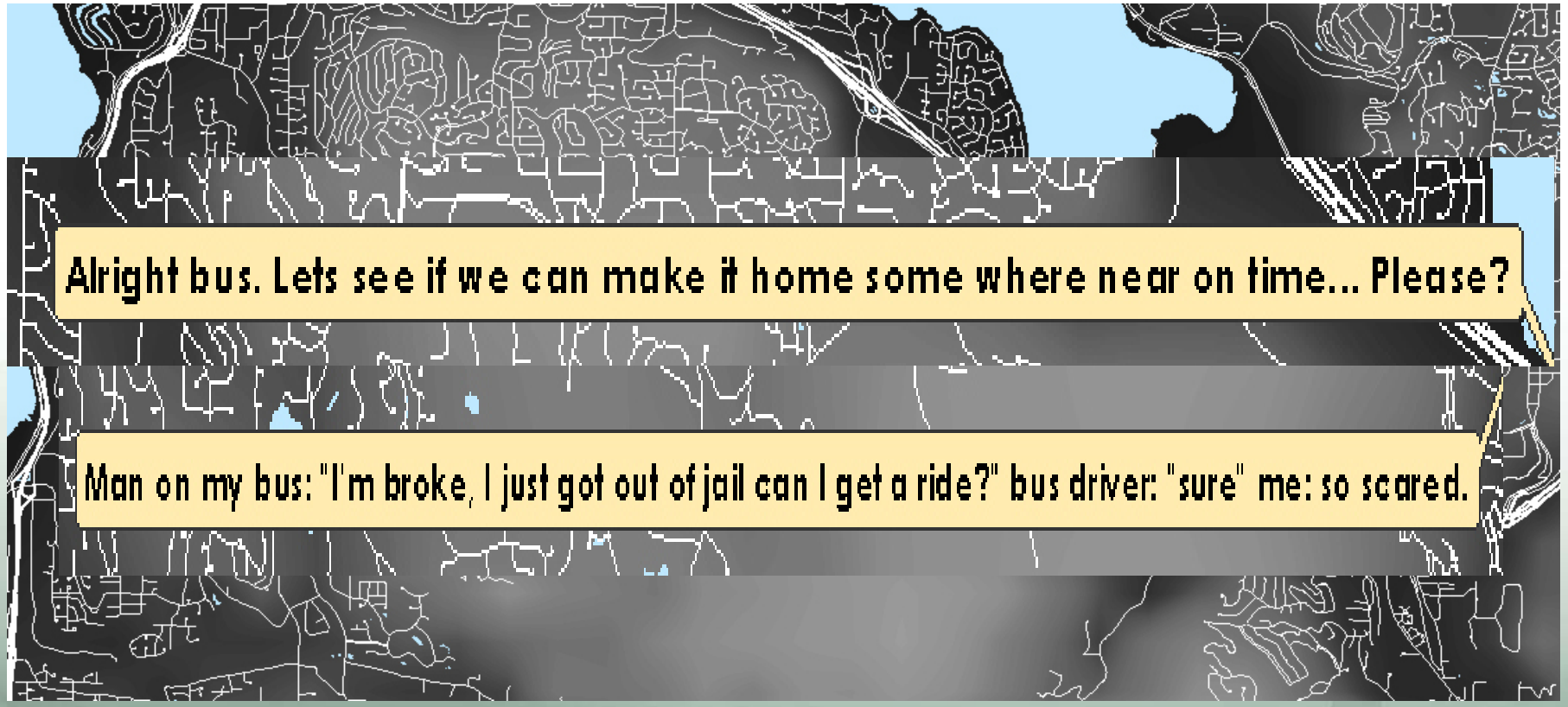
BIG DATA

Synthesizing Data from GPS, Cell, Detector, etc.



BIG DATA

Synthesizing Data from Social Media



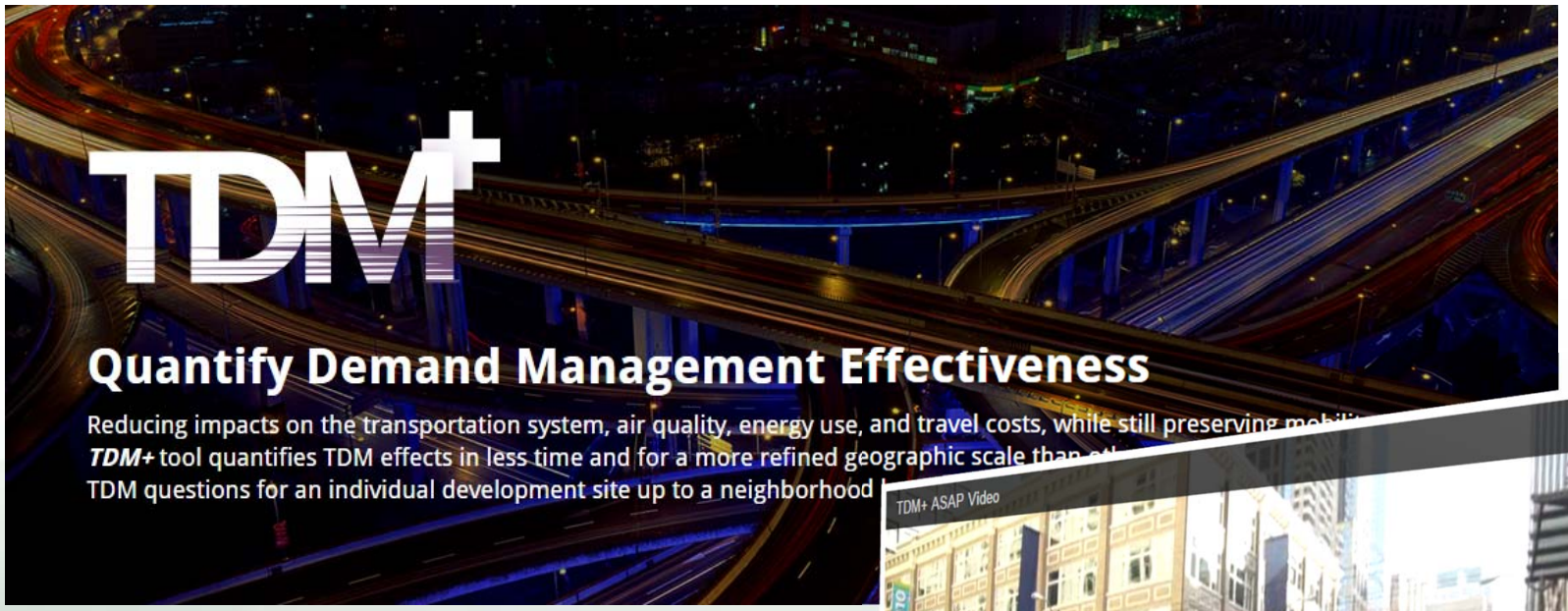
BIG DATA ■ CrowdSources

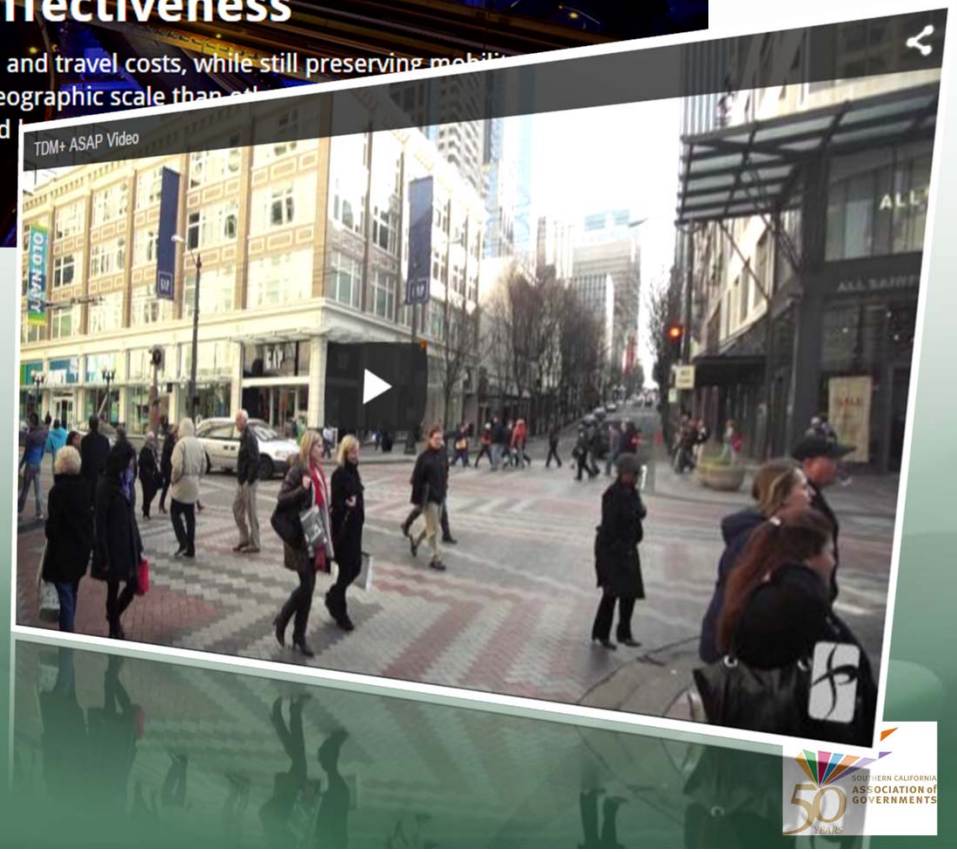
CrowdSource+

CrowdSource+ is our custom tool for empowering citizens to contribute their feedback for the improvement of their community, with commonly available technology.

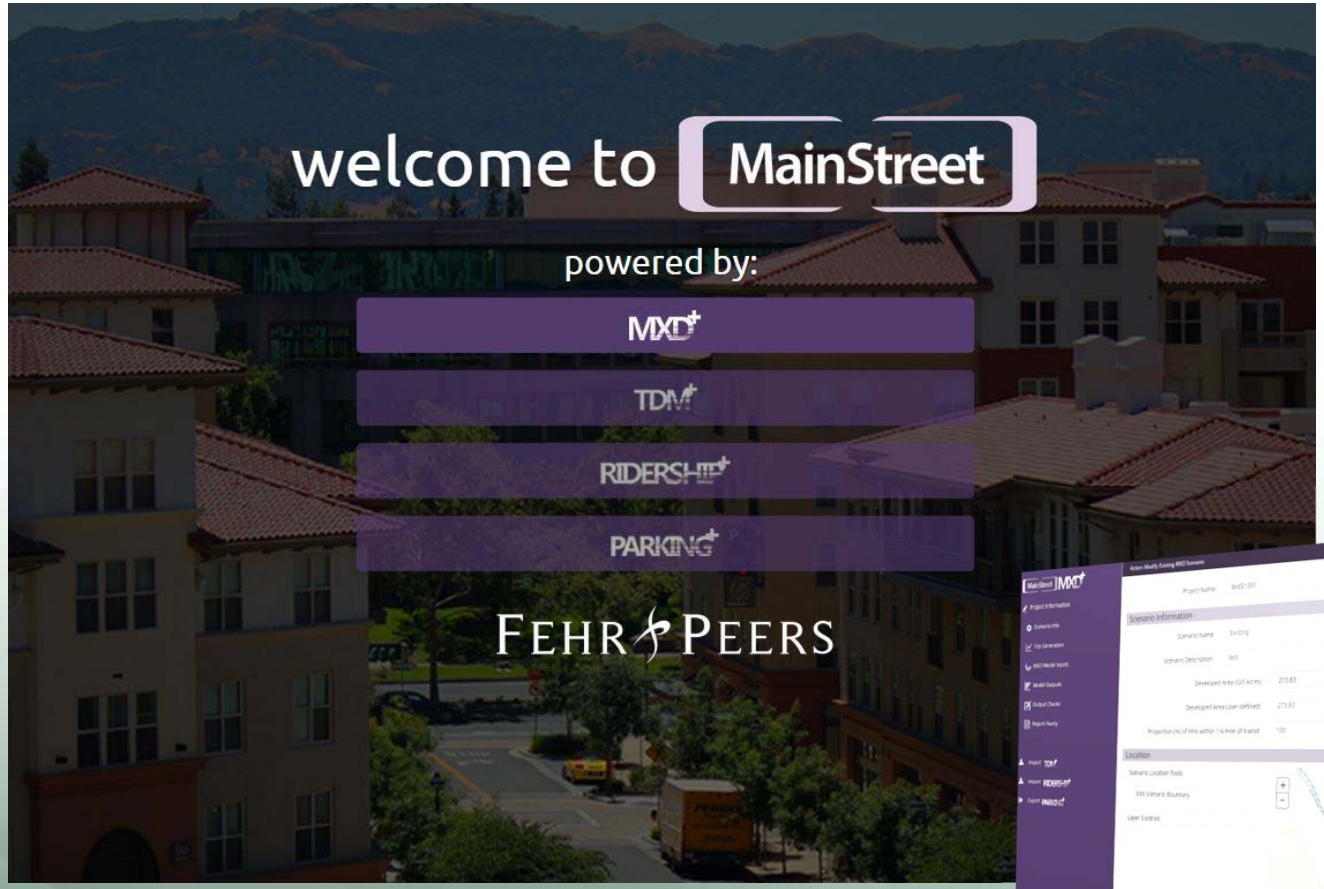
We employ CrowdSource+ to host custom web-based mapping platforms and online surveying strategies that gather public comments, and can clearly communicate the analysis of that data. It also enables comment collection over a longer period of time than traditional in-person public meetings, and allows for sustained engagement from a wider sample of stakeholders.

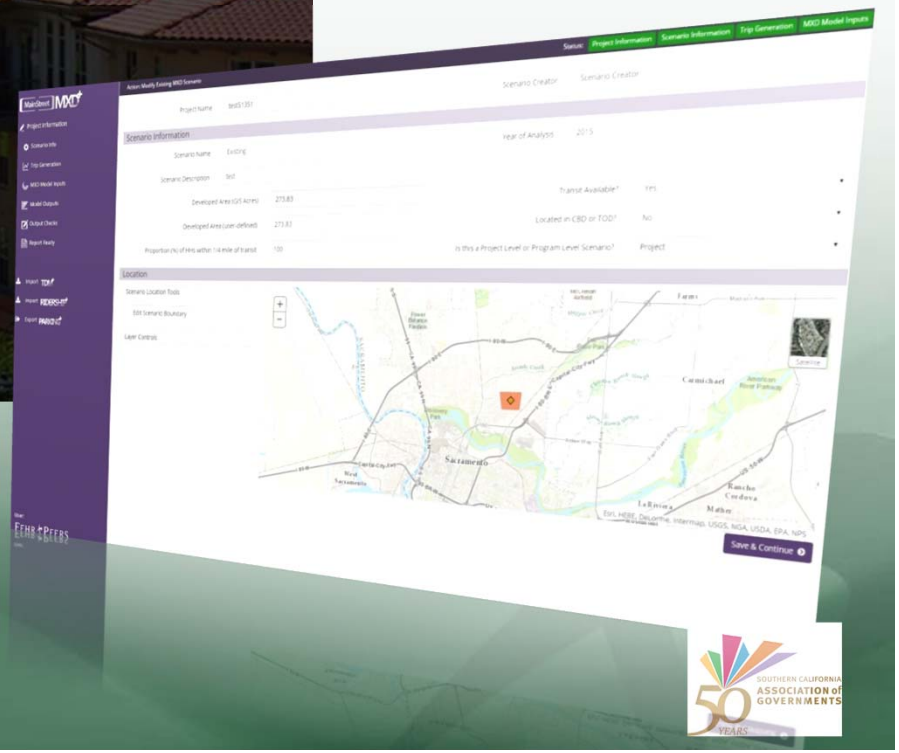
BIG DATA ■ TDM+


TDM+
Quantify Demand Management Effectiveness
Reducing impacts on the transportation system, air quality, energy use, and travel costs, while still preserving mobil
TDM+ tool quantifies TDM effects in less time and for a more refined geographic scale than
TDM questions for an individual development site up to a neighborhood

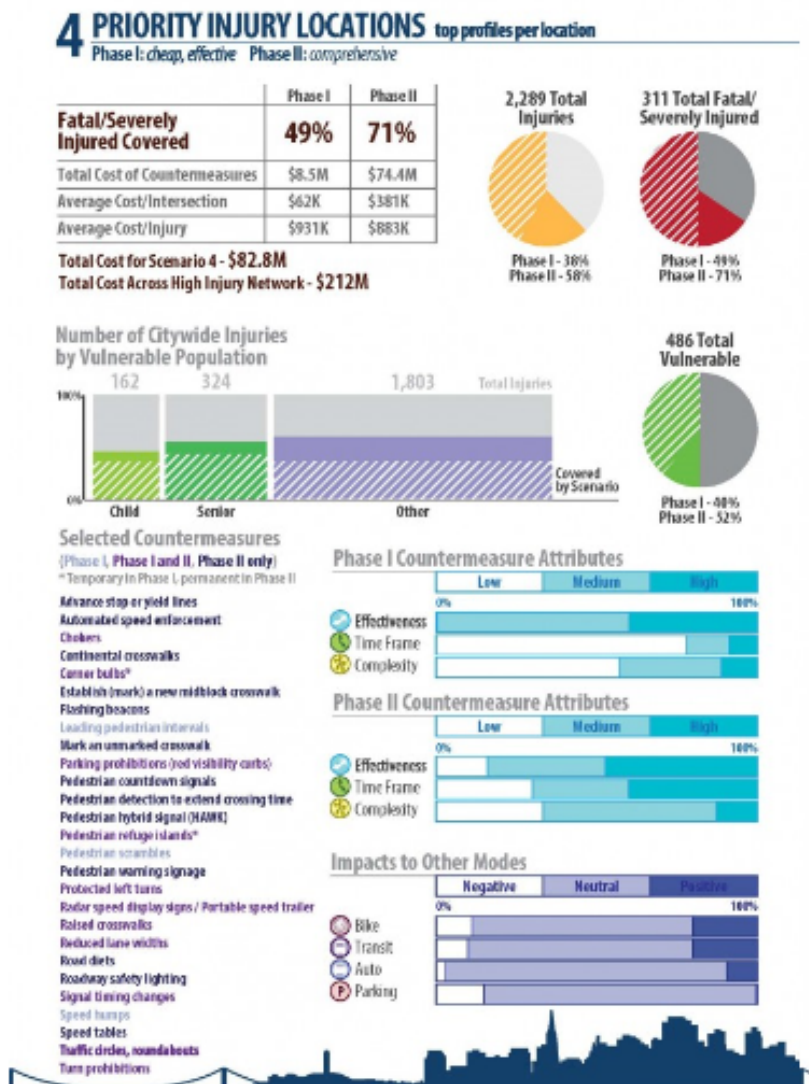

TDM+ ASAP Video

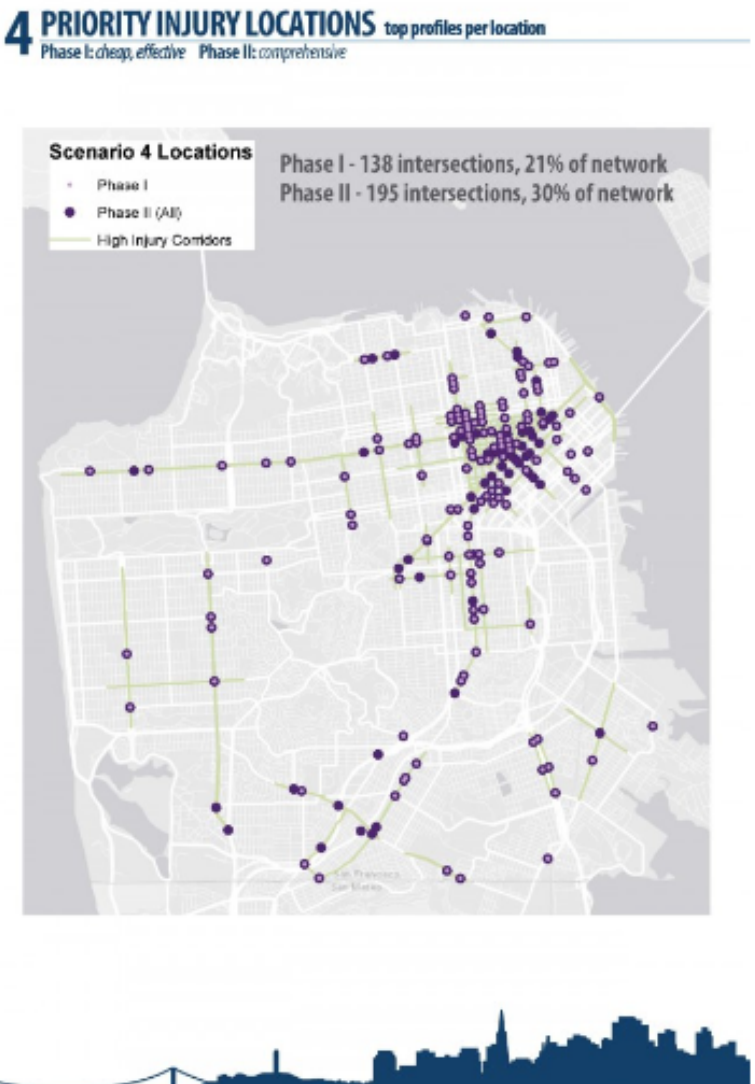
BIG DATA ▪ Mainstreet



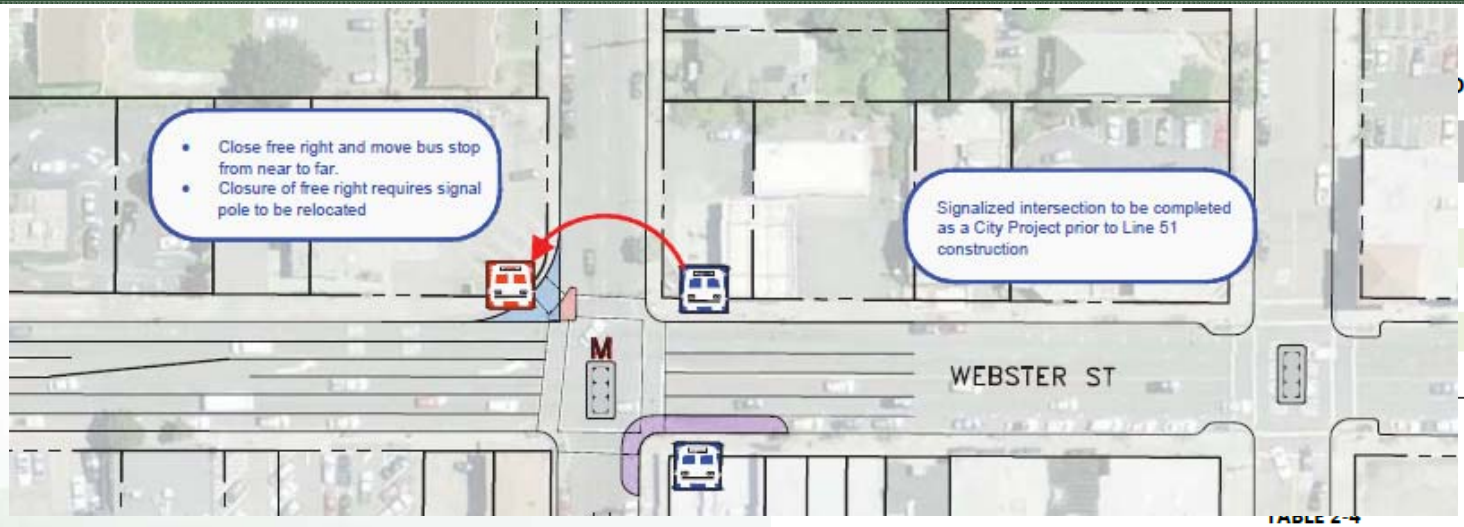


BIG DATA ■ WalkFirst SF





BIG DATA ■ Line 51 Study



) FAR-SIDE STOP

	Near-side In Lane to Far-side Stop
	15 – 25
	15 – 20
	10 – 15
	0 – 5
	0 – 5

TABLE 2-4
TRANSIT TRAVEL TIME SAVINGS: QUEUE JUMP

Approach Volume (vphpl)	Near-side Curbside Stop	Near-side In Lane Stop
X > 630	40 – 50	25 – 30
630 > X > 550	20 – 25	15 – 20
550 > X > 400	15 – 20	10 – 15
400 > X > 300	5 – 10	0 – 5
X < 300	0 – 5	0 – 5

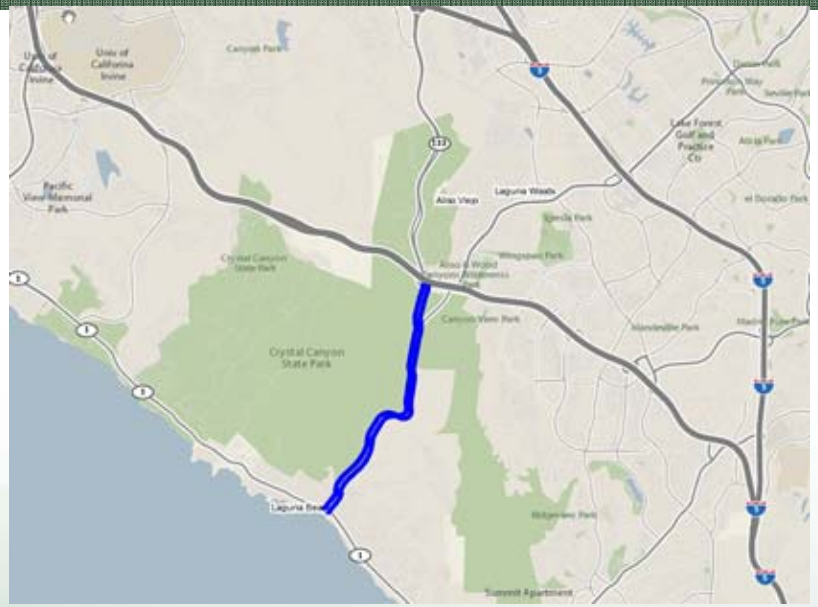
Fehr & Peers, 2013

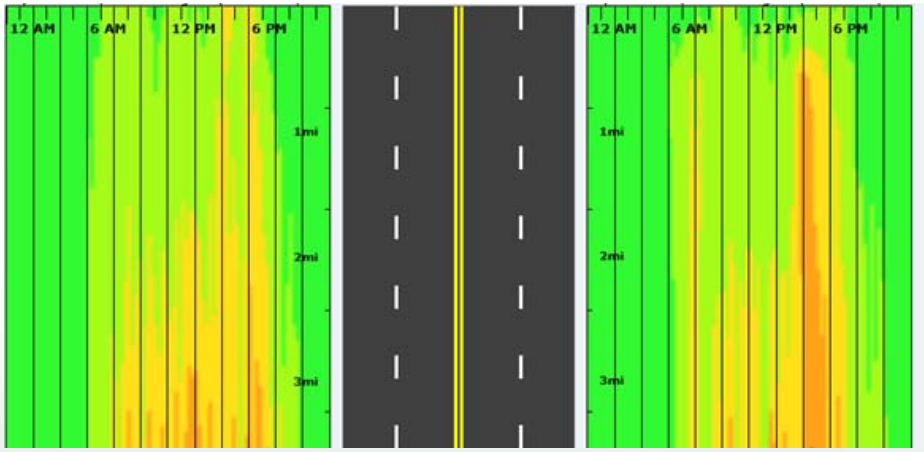
TABLE 2-5
TRANSIT TRAVEL TIME SAVINGS: TRANSIT SIGNAL PRIORITY (TSP)[1]

Approach Percent Green Time	Bus Time Savings (seconds)
40% Green Time	4 – 6
50% Green Time	3 – 4
60% Green Time	0 – 3

Notes:
1. TSP is not additive with queue jump savings, as the queue jump phase is typically not called until passengers have boarded and alighted. TSP can however be additive with queue bypass savings.
Fehr & Peers, 2013

BIG DATA ▪ HAWK Effectiveness





Speed (mph)

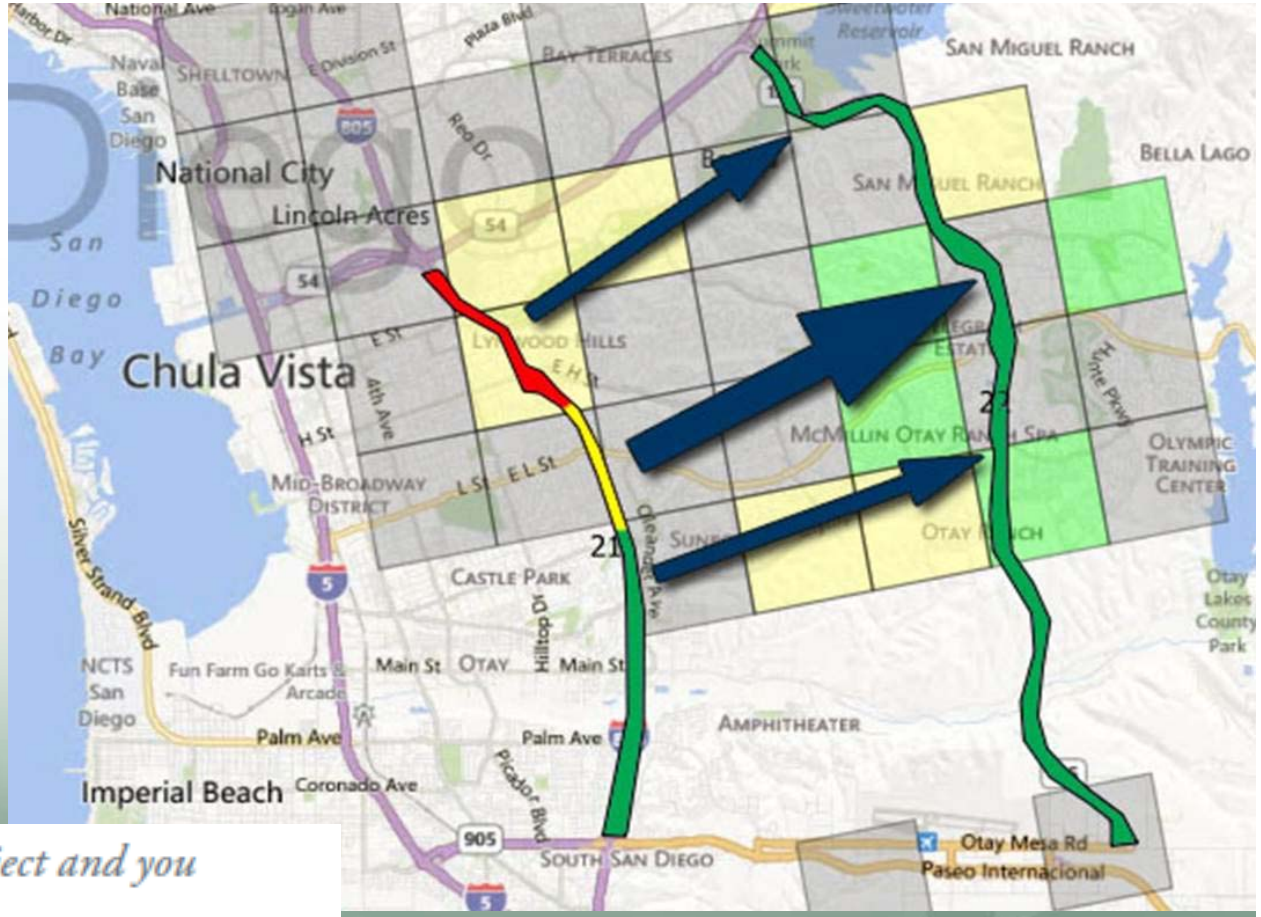
	6:00 AM - 8:00 AM	4:00 PM - 6:00 PM
Monday	37.88	34.2
Tuesday	35.21	32.29
Wednesday	36.33	29.42
Thursday	35.68	32.48
Friday	36.65	26.2
Saturday	38.57	32.5
Sunday	38.34	35.2
Weekends	38.46	33.79
Weekdays	36.35	30.87
All Days	36.89	31.6

Travel time (minutes)

	6:00 AM - 8:00 AM	4:00 PM - 6:00 PM
Monday	6.43	7.12
Tuesday	6.92	7.55
Wednesday	6.71	8.28
Thursday	6.83	7.5
Friday	6.65	9.3
Saturday	6.32	7.5
Sunday	6.36	6.92
Weekends	6.34	7.21
Weekdays	6.7	7.89
All Days	6.6	7.71

BIG DATA

SANDAG SR-125 **before/after study**



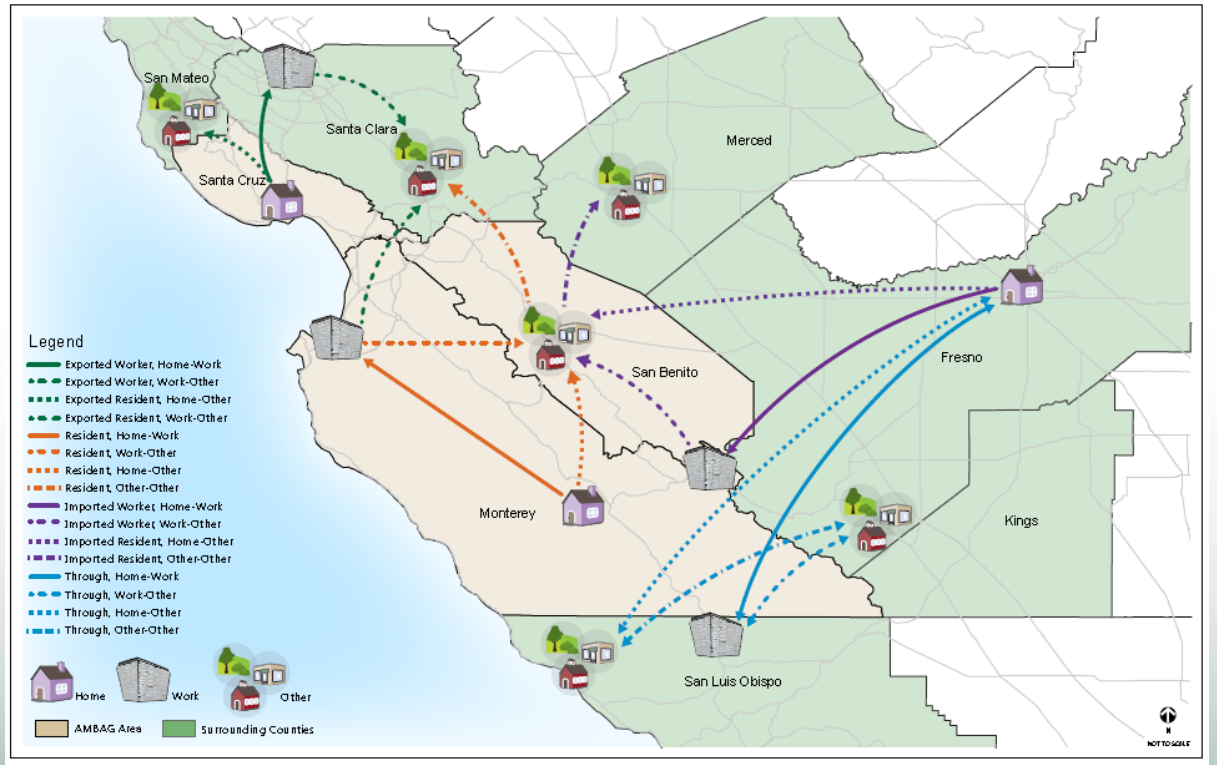
"We know we gave you a tough project and you delivered. Thanks you!" – Clint Daniels, Manager of Regional Models and SANDAG SR 125 Before/After Project Manager

BIG DATA

Monterey Bay

od study

*Combining Big and small data lead to understanding not only the **what** but also the **why** of travel behavior.*



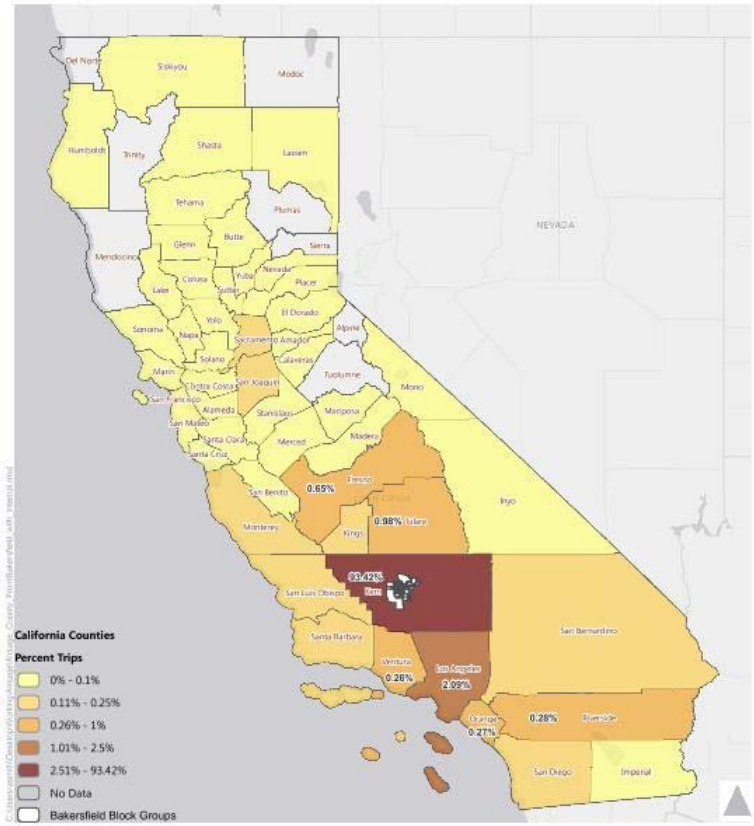
> "The accuracy and additional data collected with the new license plate video technology alone increases the value of the survey. The ability to also collect cell phone data over 30 days and combine with Census data to infer the household demographics has great potential but has not yet been done. Combining both approaches on the same study is very exciting. We are looking forward to the advances the project can bring to data collection, travel modeling, and transportation planning."
>
> - Anais Schenk, Planner and AMBAG Project Manager

Source: [ASAP External Website, Projects]

BIG DATA

regional travel

*Distribution **patterns** can be obtained in a more **cost effective** way than many other methods.*



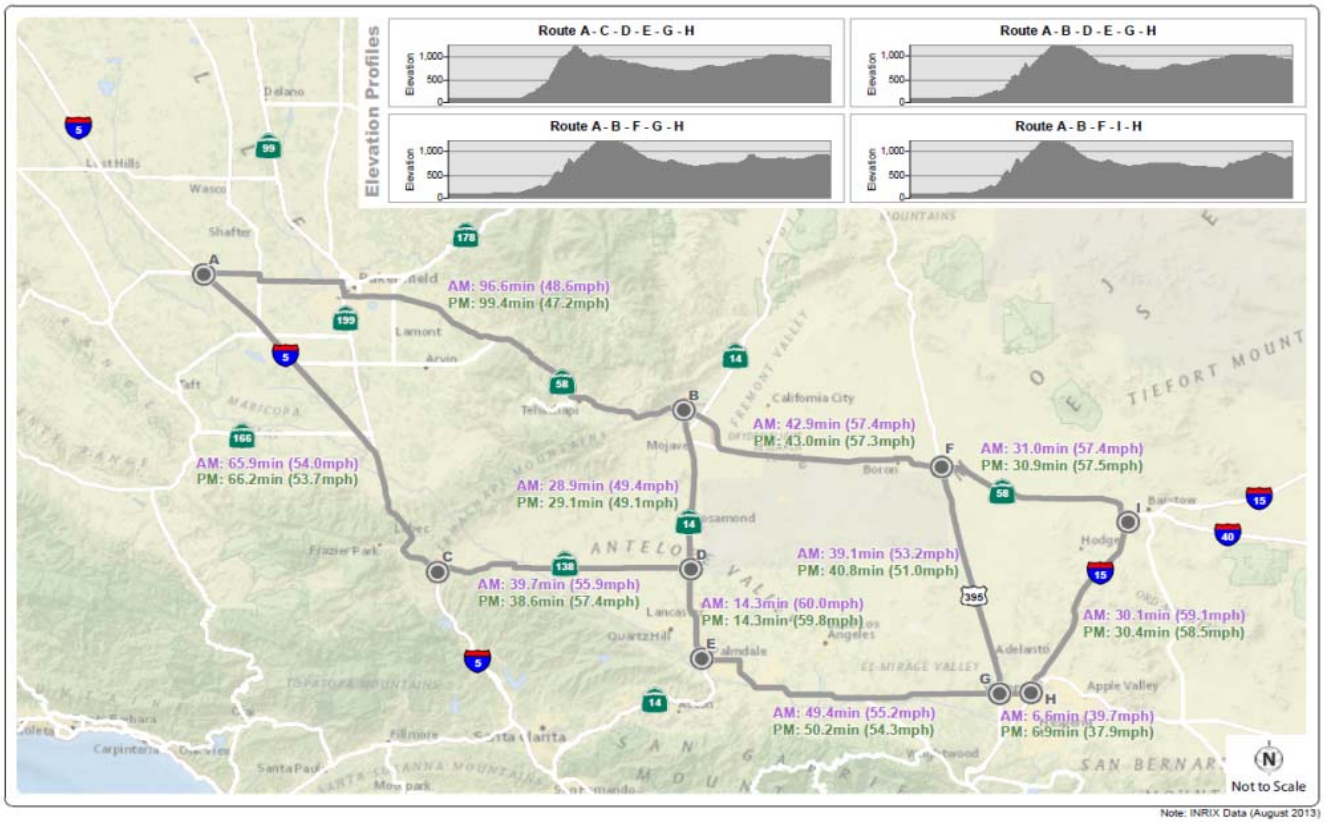
Percent Total Trips from Bakersfield
Internal Trips Included

BIG DATA

gps speed

*Roadway travel speed collected from in vehicle GPS devices or smart phone applications. The speed can be separated for **passenger** and **commercial vehicles**.*

*This example highlights the influence of **elevation** on **truck speeds**.*



FEHR PEERS

Path: N:\Jobs\Active\2500s\2599 - SR 138\Graphics\GIS\FromRoseville_8_13_13\GIS\MXD\ComparativeAnalysis.mxd

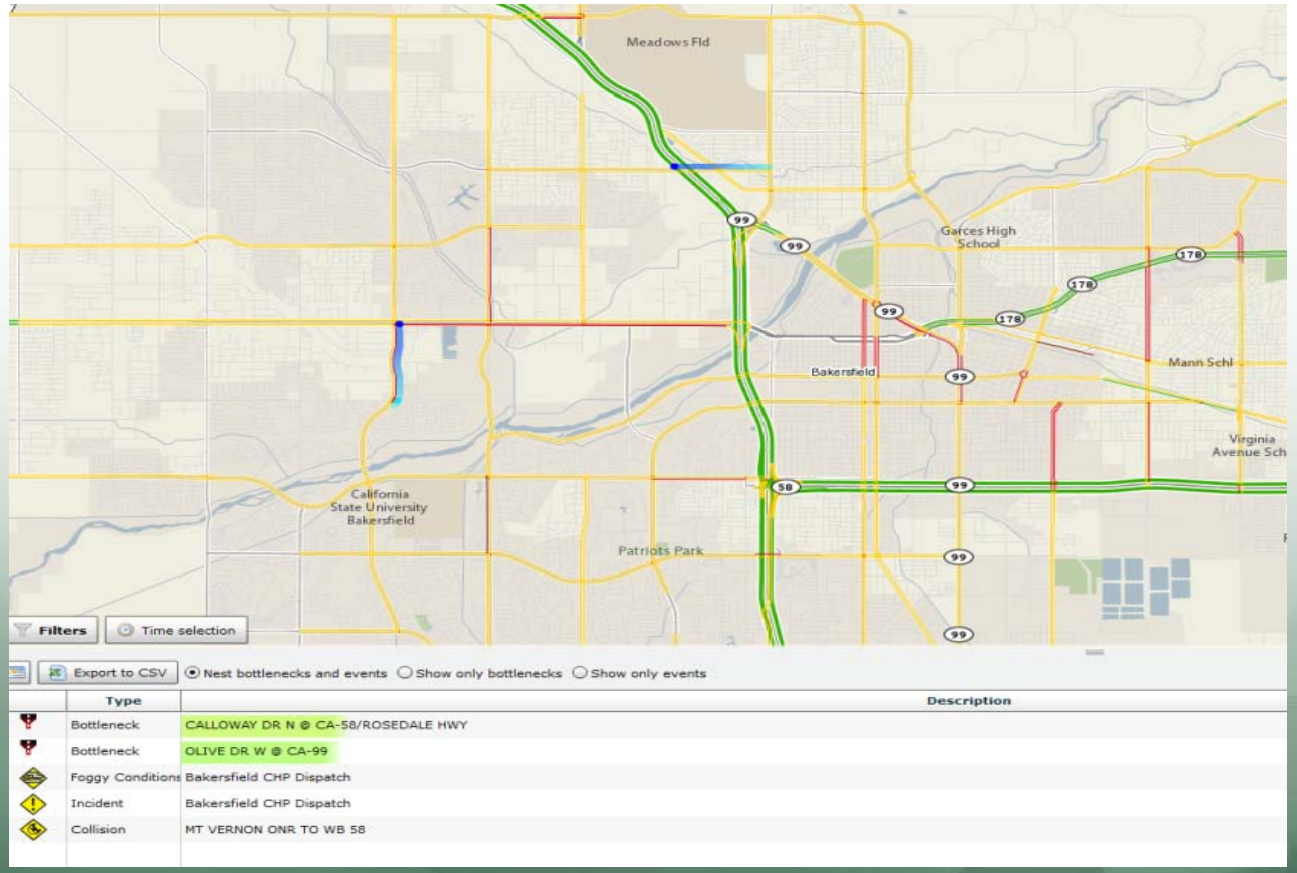
2013 Existing Conditions
AM & PM Peak Hour Comparative Analysis:
SR 138 and SR 58

BIG DATA

gps traffic flow

Bottlenecks *and other speed metrics can be viewed and summarized at the* ***segment*** *or* ***corridor*** *level.*

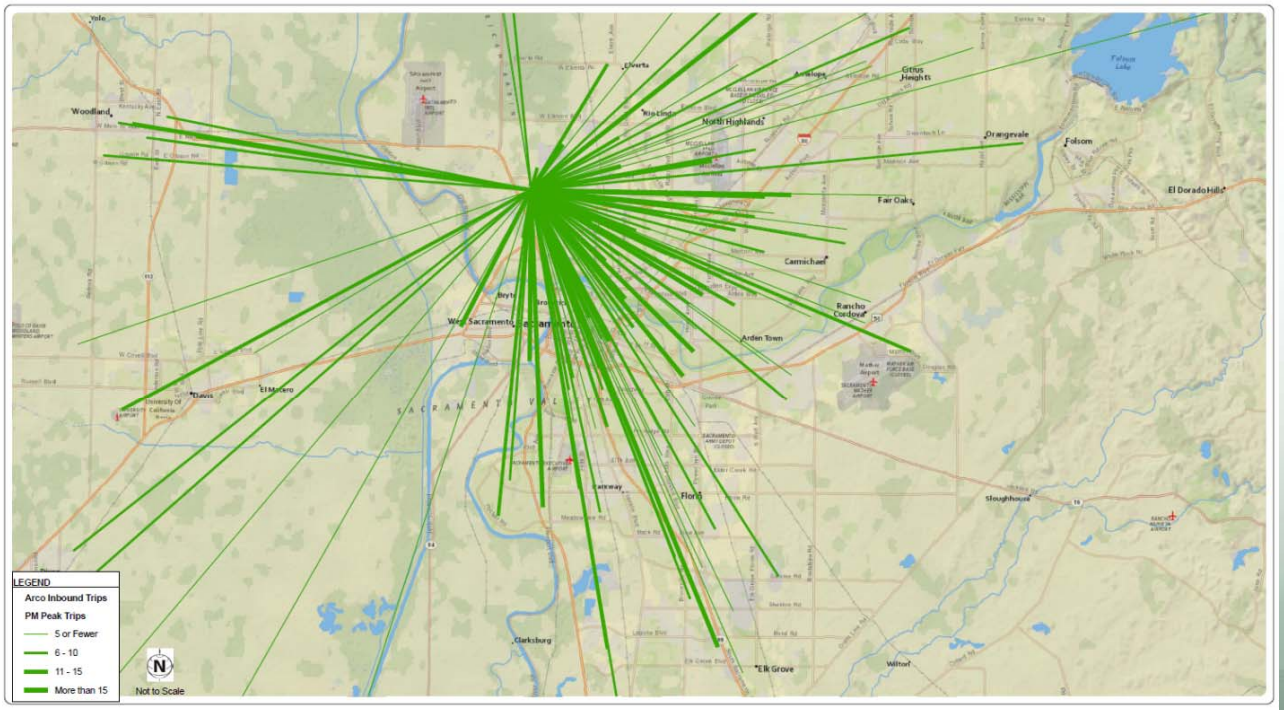
Weather, collision, and construction notifications are also included so ***non-recurring congestion*** *can be identified.*



BIG DATA

project travel

Due to the geographic detail, GPS data can be used to identify project ***distribution*** *and* ***routes****.*



Source: [Sacramento Kings Entertainment Sports & Complex, External ASAP website projects]

BIG DATA

walk access

Demand data were used to evaluate ***overpass location scenarios*** *resulting in the* ***walkshed*** *maps.*

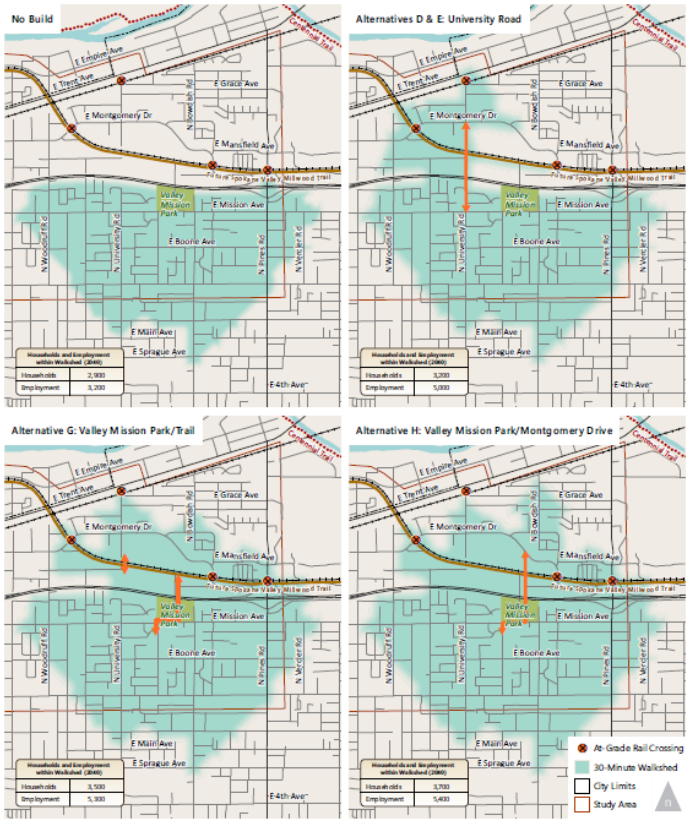


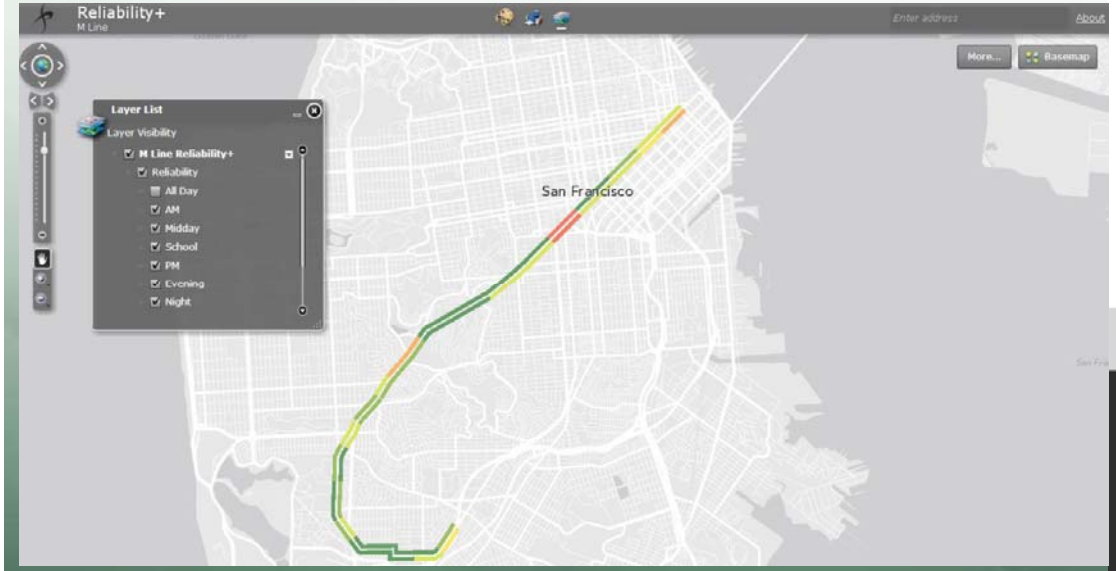
Figure 25.

30-Minute Walkshed from Valley Mission Park

FEHR PEERS

Data Sharing ■ GIS Application

web-based mapping and data sharing



Source: External FP VisCom website

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J.Xu@fehrandpeers.com
714-941-8774

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