



**iteris**<sup>®</sup>

## Answering Tough Mobility Questions with iPeMS Analytics

July 25, 2018

# Big Data in Transportation

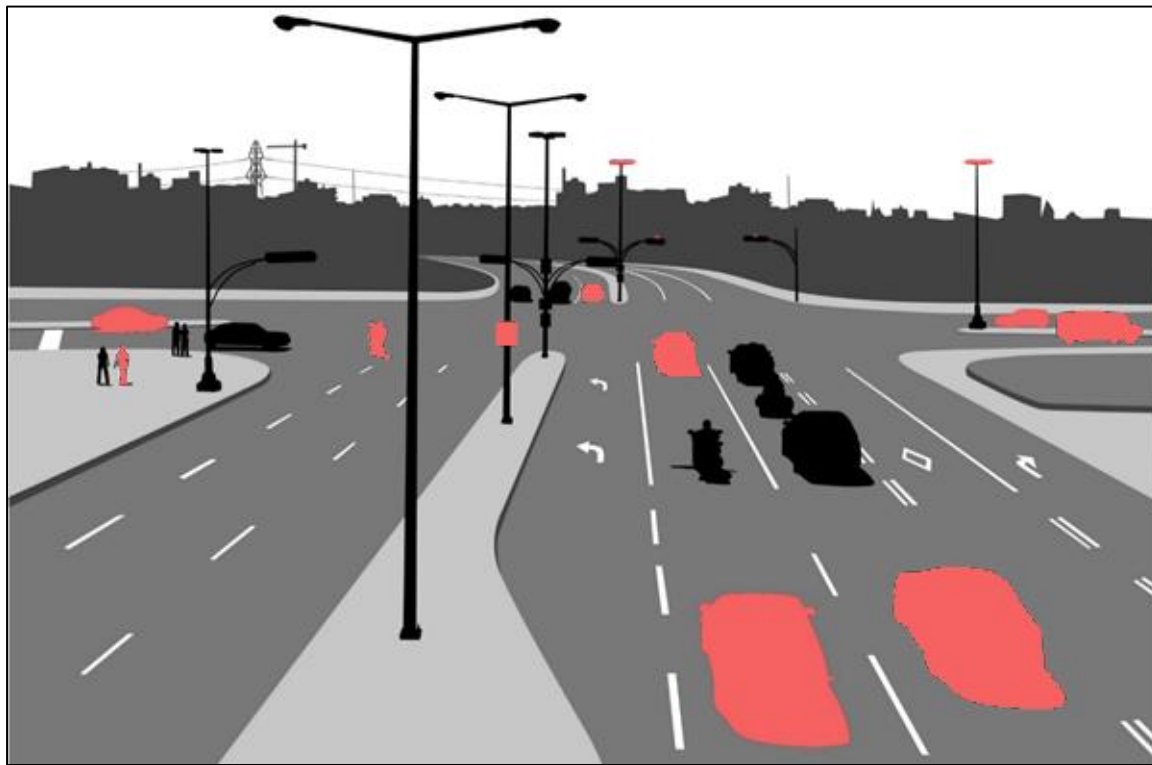
A nighttime photograph of a city street intersection. In the foreground, a black traffic light pole stands on the left, with two traffic light heads. To the right, a crosswalk with white stripes leads across the road. In the background, several cars are visible, their headlights and taillights creating long, horizontal light trails due to a long exposure. The sky is a deep blue, and streetlights illuminate the scene. The overall atmosphere is quiet yet active, representing the flow of data in a transportation system.

# Manual Data Collection



# Big Data Collection

- Probe Data
- Sensor Data
- Historical Data
- Social Data
- Weather Data
- Camera Data
- Transit Data

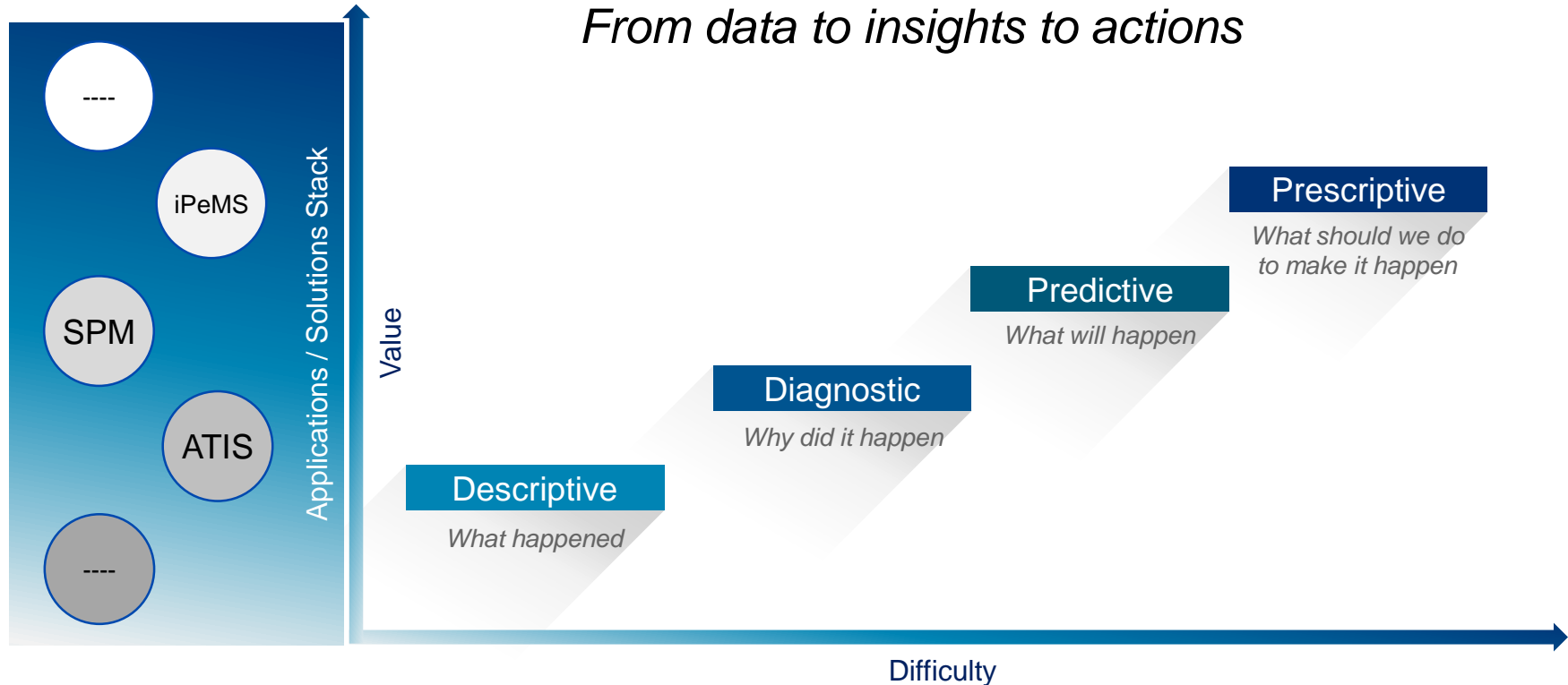


# Iteris and Big Data



# Transportation Analytics

*From data to insights to actions*



# iPeMS Overview



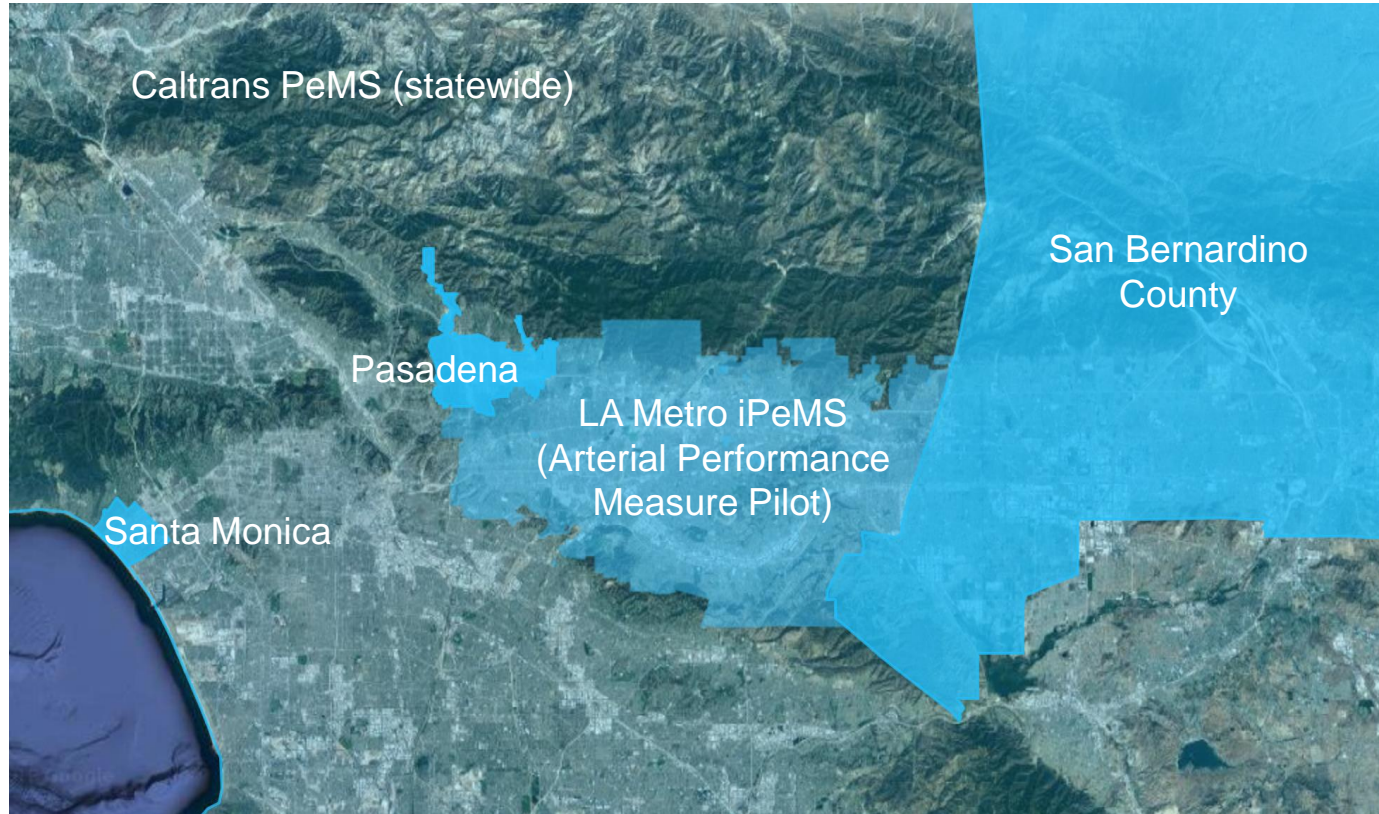
# iPeMS<sup>®</sup> Solution

iPeMS collects, analyzes, and visualizes Smart Transportation data in the cloud





# iPeMS in Southern California



# iPeMS in Southern California

- Caltrans PeMS
  - Kitchen sink of data sets, mostly on freeways (1999-current)
  - NPMRDS data on National Highway System for MAP-21 reporting
  - Specialized multimodal ICM features for I-15 (SANDAG)
- Pasadena iPeMS
  - HERE 3<sup>rd</sup> party probe data (2013 – current)
- Santa Monica iPeMS
  - HERE 3<sup>rd</sup> party probe data (2013 – current)
- SBCTA iPeMS
  - HERE 3<sup>rd</sup> party probe data (purchased by Caltrans D8, 2014 – current)
- LA Metro iPeMS (San Gabriel Valley Pilot Region)
  - INRIX 3<sup>rd</sup> party probe data (July 2014 – Dec 2016)
  - Traffic volume profiles from 48-hour counts on key arterials

# iPeMS Southern California Case Studies

A nighttime photograph of a city street intersection. In the foreground, a black traffic light pole stands on the left, with two traffic light heads. To the right, a street lamp pole has a single traffic light head. The street is illuminated by various lights, creating a mix of warm yellow and cool blue tones. Light trails from moving vehicles are visible in the distance. A crosswalk with white stripes is in the lower right. The sky is a deep, dark blue.

# LOS Monitoring for CMPs

- SBCTA transitioned from manual traffic counts and floating car runs to 3<sup>rd</sup> party probe data

iPeMS produces LOS results for all corridors in a few clicks

**PeMS** Real Time and Historical Traffic Data for Fresno County

Home System Administration Help Logout Welcome admin

Fresno

Current Location Overview

Overview > Third Party Data > Route Performance

1d 7d 1m 3m 6m YTD 1y From 03/01/2017 To 04/30/2017

Keyword  Owner All Road Type All

Tags

Time of Day 07:00 - 08:59 Include Days: Tue, Wed, Thu SHOW MORE

VIEW TABLE EXPORT TXT EXPORT XLS EXPORT PDF

Route ID	Route Name	Average Speed (mph)	Travel Time (min)	Travel Time Index	Length (mi)	Road Type	LOS	Owner	Tags
185	SR 41:Shields-Shaw-NB	58.2	2.08	1.14	2	Freeway	B	Shared Routes	freeway, nb, shaw, shields, sr 41
186	SR 41:Shields-Shaw-SB	55.8	2.01	1.22	1.8	Freeway	B	Shared Routes	freeway, sb, shaw, shields, sr 41
187	SR 41:Shaw-Herndon-NB	61.8	1.97	1.06	2	Freeway	A	Shared Routes	freeway, herndon, nb, shaw, sr 41
188	SR 41:Shaw-Herndon-SB	52.4	2.6	1.48	1.9	Freeway	C	Shared Routes	freeway, herndon, sb, shaw, sr 41
193	SR 99:SR 180-Shaw-NB	63	6.15	1.03	6.4	Freeway	A	Shared Routes	freeway, nb, shaw, sr 180, sr 99
194	SR 99:SR 180-Shaw-SB	51.5	8.19	1.37	6.4	Freeway	C	Shared Routes	freeway, sb, shaw, sr 180, sr 99
195	SR 99:Shaw-Herndon-NB	64.7	1.95	1.02	2.1	Freeway	A	Shared Routes	freeway, herndon, nb, shaw, sr 99
196	SR 99:Shaw-Herndon-SB	62.9	2.01	1.05	2.1	Freeway	A	Shared Routes	freeway, herndon, sb, shaw, sr 99
199	SR 168:SR 180-Shaw-EB	63.4	3.52	1.03	3.7	Freeway	A	Shared Routes	eb, freeway, shaw, sr 168, sr 180
200	SR 168:SR 180-Shaw-WB	57	4.22	1.21	3.7	Freeway	B	Shared Routes	freeway, shaw, sr 168, sr 180, wb
201	SR 168:Shaw-Herndon-EB	64.7	2.39	1.02	2.6	Freeway	A	Shared Routes	eb, freeway, herndon, shaw, sr 168
202	SR 168:Shaw-Herndon-WB	66.4	2.51	1.02	2.8	Freeway	A	Shared Routes	freeway, herndon, shaw, sr 168, wb

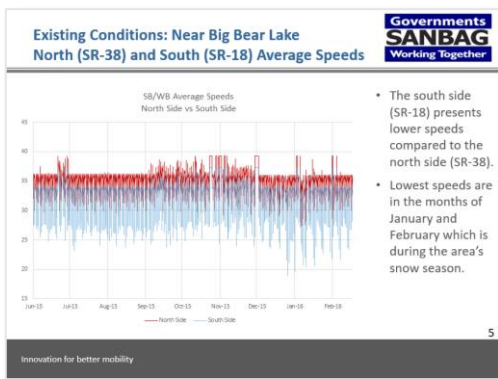
## Benefits

- Higher sample size
- Less money (\$40k savings)
- Less staff time
- iPeMS + probe data can support many other agency projects

# Mountain Area Transportation Planning Study

The Big Bear/Lake Arrowhead area is characterized with strong weekend / holiday traffic

- The model was not set up to deal with these non-commute traffic patterns
- The team reviewed 1 years' worth of data between May 2015 & April 2016



## The Team Used iPeMS to:

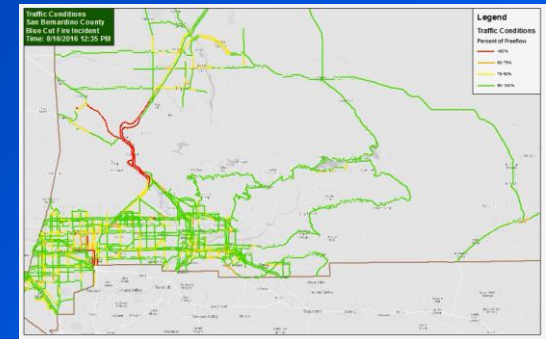
- Review 24/7 data to identify the peak periods on typical weekends, summer weekends & holiday weekends
- Understand seasonal trends
- Review the impact of inclement weather i.e. snow
- Write an existing conditions report

# Incident Management

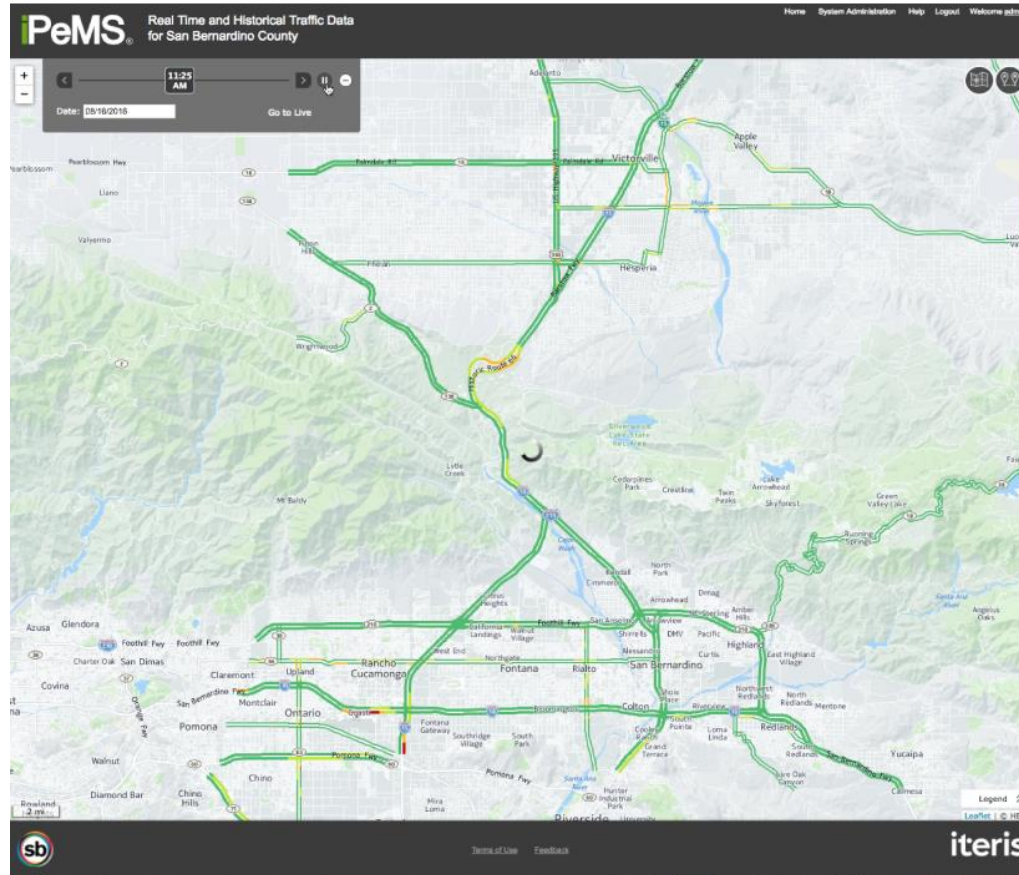
On 8/16/2016, the Blue Cut Fire began just west of I-15 in Cajon Pass. Later that day, the I-15 and other roads were closed. The I-15 reopened two days later. 89% of the fire was contained by 8/22.



SBCTA monitored conditions region-wide including the performance of the detour routes.



# Incident Management



# Signal Synchronization

SBCTA uses customized routes to review and to rank the need for resynchronization

## Method

1. Define signal synchronization corridors in iPeMS Third Party
2. Extract the performance for each route in the AM, Midday, PM and Midnight time periods
3. Fuse with model volumes to calculate the vehicle-hours of delay
4. Review and rank the delay

**PeMS** Real Time and Historical Traffic Data for San Bernardino County

San Bernardino County

Current Location: Overview

Overview > Third Party Data > Route Report Card

1d 7d 1m 3m 6m YTD 1y From 06/01/2017 To 06/30/2017

Keyword: Owner: All Road Type: All

Tags: signal sync

Include Days: Mon, Tue, Wed, Thu, Fri

VIEW TABLE EXPORT TXT EXPORT XLS EXPORT PDF

Route ID	Route Name	Direction	Length (mi)	Travel Time AM (min)	Travel Time MD (min)	Travel Time PM (min)	Average Speed AM (mph)	Average Speed MD (mph)	Average Speed PM (mph)	Owner	Tags
961	Milliken Ave NB: I-10 to SR-210	N	4.8	11.67	12.68	13.06	24.66	22.57	21.9	Shared Routes	freeway, signal sync
1,001	Foothill Blvd EB: County Line to I-15	E	9.5	21.98	25.64	26.38	26.32	22.39	21.79	Shared Routes	arterial, signal sync
1,002	Foothill Blvd WB: I-15 to County Line	W	9.9	22.31	26.27	26.79	26.88	22.67	22.2	Shared Routes	arterial, signal sync
1,003	Sierra Ave NB: I-10 to SR-210	N	4.6	11.15	13.79	14.46	25.06	20.26	19.27	Shared Routes	arterial, signal sync
1,004	Sierra Ave SB: SR-210 to I-10	S	4.8	11.45	13.67	14.27	25.48	21.32	20.36	Shared Routes	arterial, signal sync



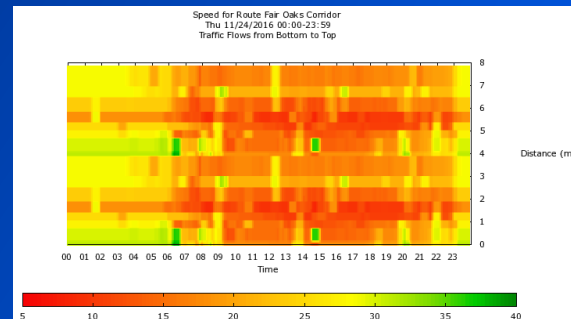
# Congestion Patterns

The City of Pasadena uses Monthly Contours to study traffic trends around holidays across their busy corridor



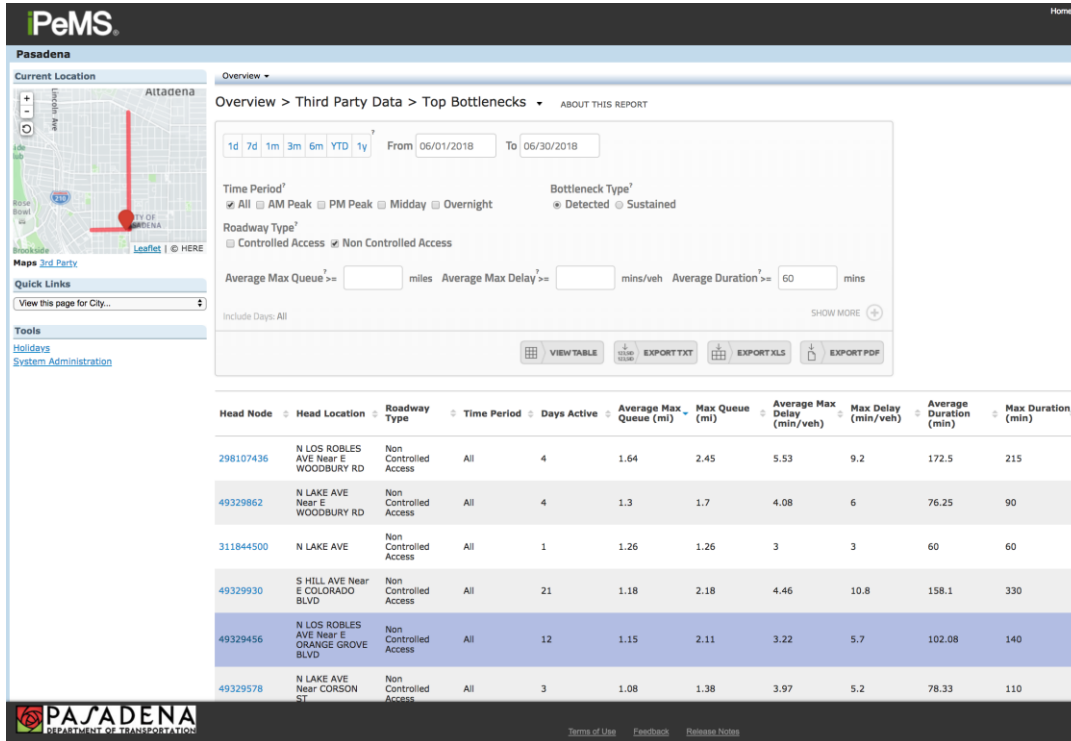
November Month Contour

## Daily Contour

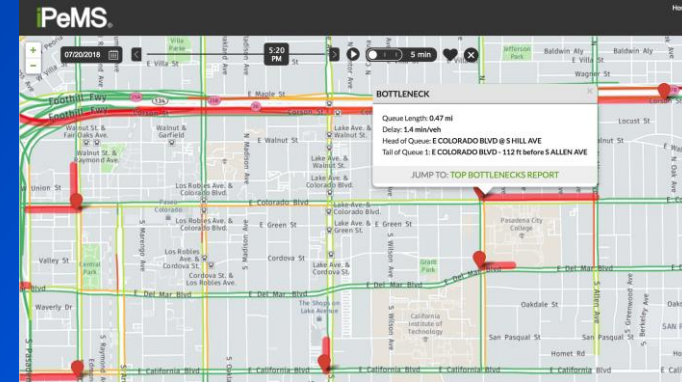


- Daily and Monthly Contours help users see monthly and seasonal trends
- Contours are auto generated across a user defined corridor

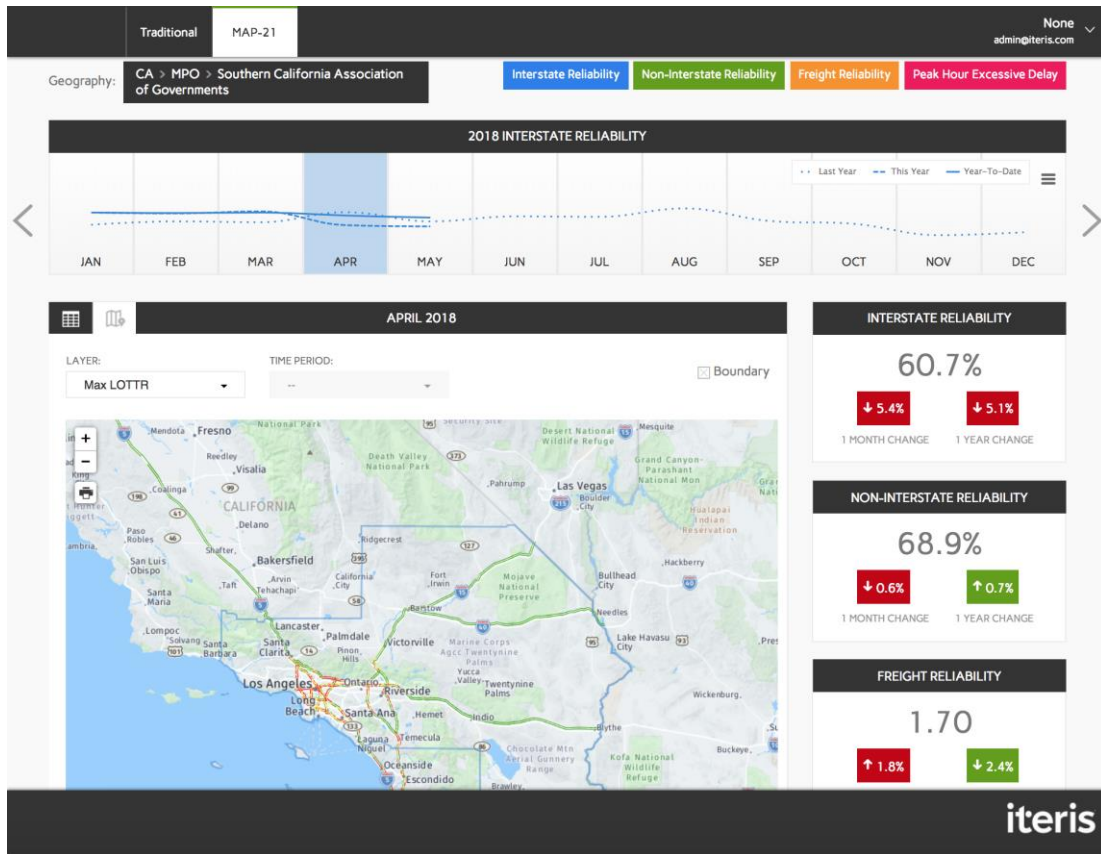
# Arterial Queue Lengths



Pasadena testing new arterial bottlenecks feature for real-time operations and evaluating congested intersections over time



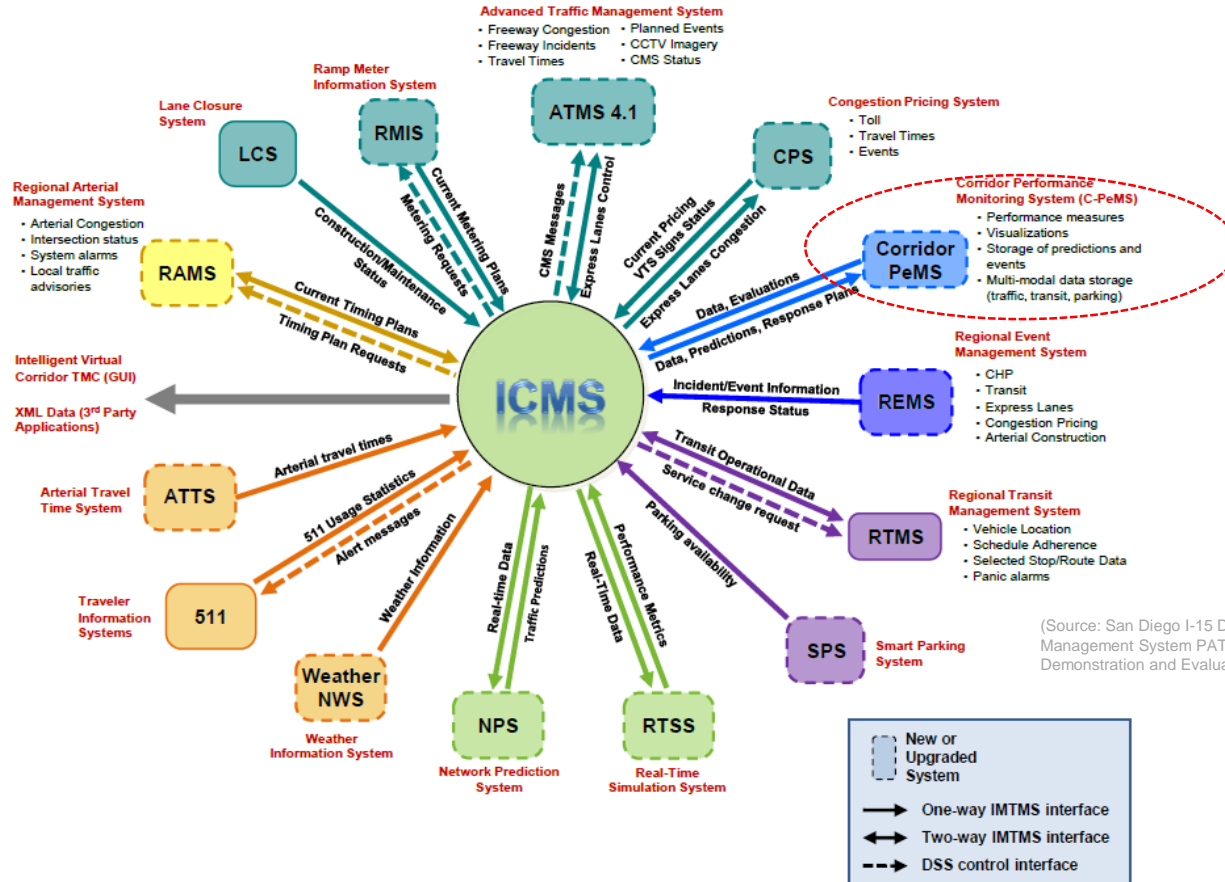
# MAP-21 Reporting



## Caltrans PeMS NPMRDS module automates MAP-21 system performance measure calculations

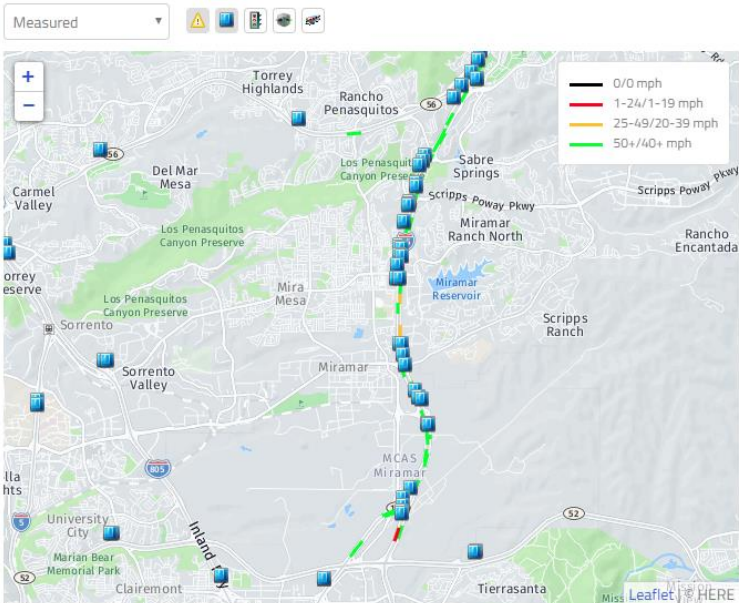
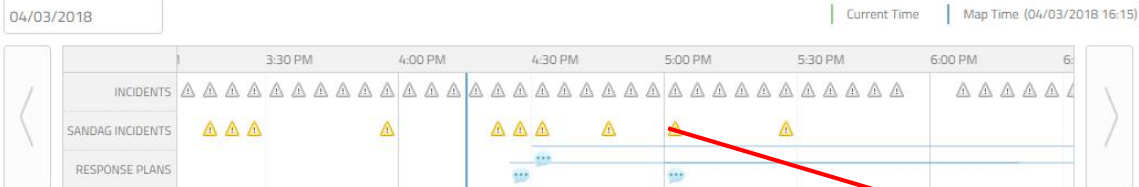
- Compare performance month-to-month and year-to-year for target setting
- Access to same UI/measures statewide for MPO/statewide collaboration on target setting

# ICM Performance Measurement



(Source: San Diego I-15 Demonstration Integrated Corridor Management System PATH Report on Stage 3: Site Demonstration and Evaluation, UCB-ITS-PRR-2015-03)

# ICM Decision Support Visualizations



### Details

Event type: incident

Source: SANDAG ICMS

First Seen: 04/03/2018 16:17

Last Seen: 04/03/2018 16:29

Feed: California

Agency: CHP-SD

Source Type: government

Source: SANDAG ICMS

Location: I15 N / Sr78 So (hov)

Status: ended

link\_id: 1396743

comment: 04/03/18 16:15:00 [1] [1] BLK LANDROVER DISCOVERY OOG ON LHS OF HOV [Shared] 04/03/18 16:18:01 Unit Assigned 04/03/18 16:18:02 Unit Enroute

status: ended

link\_designator: I-15

cross\_street: I15 N / Sr78 So (hov)

- User can pick a date
- Incidents and response plans for the selected day are displayed on a timeline
- Signals, ramp meters, DMS and incidents can be toggled for display on map
- Clicking on incident, response plan or ITS element icons shows more information

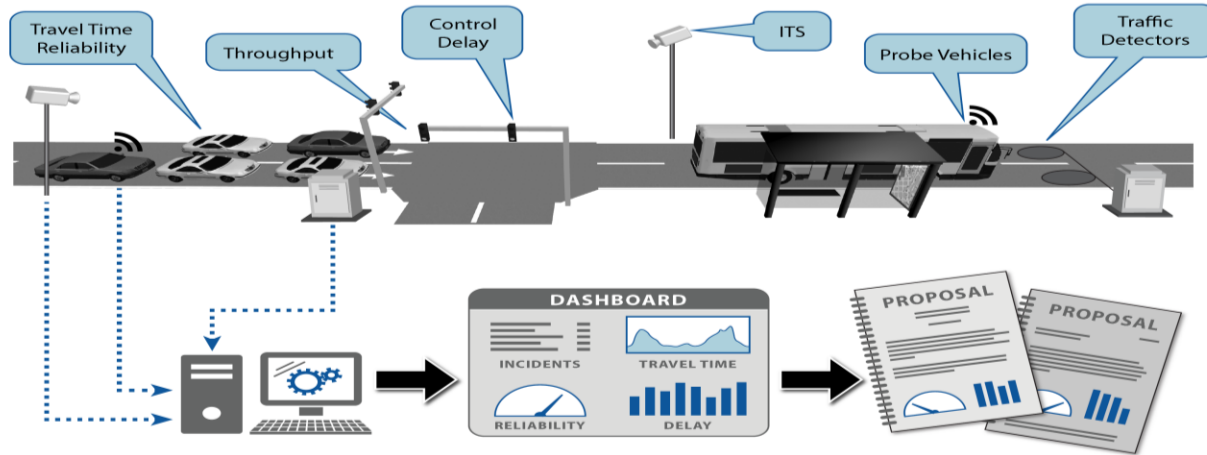
# Metro Arterial Performance Measure Pilot

## 1. List of Performance Measures

Transportation System Management (TSM) projects make up a large portion of LA Metro's investments. As these are often focused on improving arterial traffic flow, the performance metrics that LA Metro gathers must also be applicable to arterials. Example metrics include travel time reliability, vehicle throughput, transit on-time performance, and control delay.

## 2. Data Collection/Sources

There are a variety of sources available to LA Metro that have the data needed for calculation of arterial performance metrics. These sources are both public and private, and include detector data, transit vehicle location data, probe vehicle data, and Intelligent Transportation Systems (ITS) data (e.g., CCTV).



## 3. Data Management

Integrating data into a single, coherent system requires working with different vendors/owners, interfacing with various database systems, and accommodating a range of data formats and types. Data quality validation tools will need to be developed, and strategies for bridging gaps in the data will need to be identified.

## 4. Performance Measurement Tool

When the backend data management system is complete, a performance measurement tool or dashboard is then implemented to generate usable, actionable information from the data. Summary reports on performance are among the outputs provided by this tool.

## 5. Input to Planning Processes

Data-driven planning processes are made possible by performance measurement tools. In this step, internal business processes are updated to take advantage of the new performance measurement tool; projects are prioritized and evaluated based on quantifiable performance metrics and outcomes.

Source: Metro Arterial Performance Measurement Pilot Program

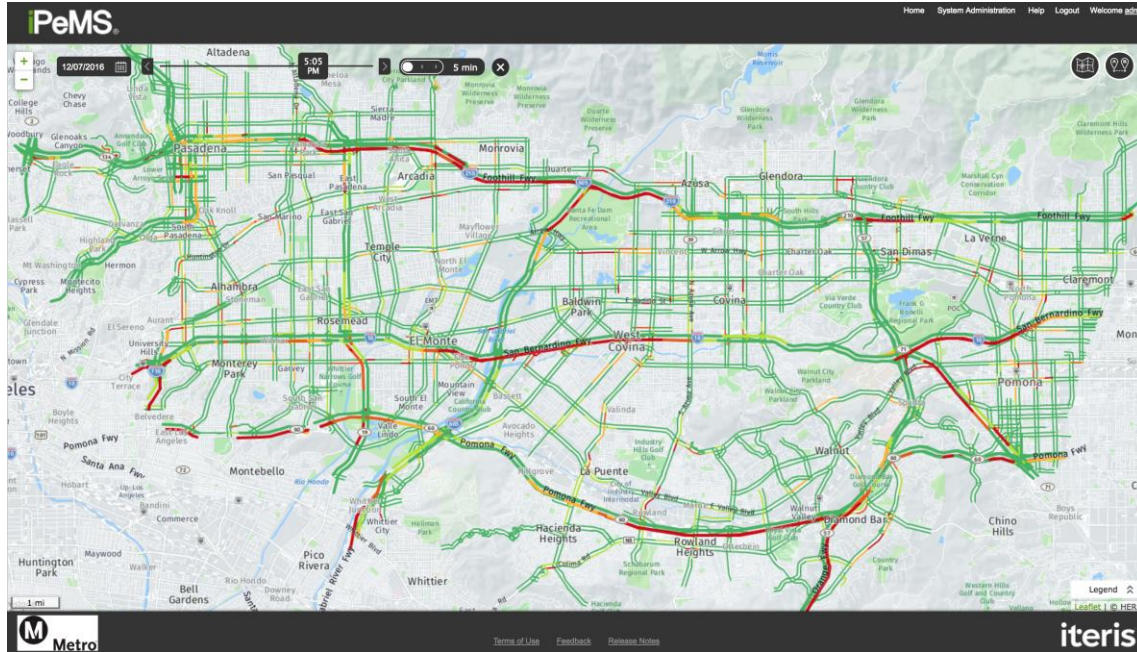
# Metro Arterial Performance Measure Pilot

- Evaluate and test an Arterial Performance Monitoring Tool to assess arterial network performance
- Conduct a pilot test based on a subregion in LA County
- Utilize comprehensive arterial volume and travel time data
- Collect user group input and assessment
- Demonstrate application for other subregions



Source: Metro Arterial Performance Measurement Pilot Program

# Metro iPeMS



## San Gabriel Valley Subregion

31 cities/neighborhoods

- Survey results of key applications
  - Internal reporting
  - Staff reports to council
  - Grant applications
  - Project development
  - Public meetings



# Thank You!

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