

# DRISI

CALTRANS DIVISION OF RESEARCH,  
INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

# Research

# Notes

Traffic Operations

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Project Title:  
Reimagining Sensor Deployment

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## Reimagining Sensor Deployment

Provide a practical guidance to suggest the best placement of detection stations assuming that third-party speed data are used to achieve wide geographic coverage.

### WHAT IS THE NEED?

California Department of Transportation (Caltrans) collects gigabytes of data every day using dedicated traffic sensing infrastructure. The data provide support for traffic management and system performance monitoring that are crucial for supporting Caltrans mission, vision, and strategic goals to strengthen stewardship and drive efficiency. Operating this vast detection system is becoming unsustainable, as it requires extensive resources in the form of engineering and maintenance support along with millions in capital funds to keep it running. Recently, Caltrans programmed over \$150 million in State Highway Operation and Protection Program (SHOPP) funds to address failed or failing detection stations across the state.

Alternate data collection models utilizing a hybrid approach with purchased or third-party data to augment existing data collection systems may enable a reduction in the number of physical detection stations while maintaining suitable accuracy for Caltrans business purposes. In addition to the potential for cost savings, such an approach with fewer physical sensors would reduce exposure of Caltrans employees to the occupational hazard of maintaining roadside detection stations, in alignment with the strategic goal of safety first.

Most third-party data providers can now provide detailed travel time or speed data on any route. In addition, data quality will continue to improve as mobile devices continue to proliferate.

Recent research has provided practical methods to integrate third-party data into the existing reporting platform and into deliverables such as the Mobility Performance Report (MPR). Based on prior analyses, a hybrid approach provides better estimates of performance measures than using only fixed



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roadside detection stations. These results hold for both freeway-mainline and freeway-freeway connectors, and at different times of day during weekday hours. For almost all tested scenarios, the inclusion of third-party travel-time data reduces the estimation errors. These benefits hold when the number of fixed detectors is reduced.

### WHAT ARE WE DOING?

This project reimagines sensor deployment in the context of a near-term possibility where third-party data is procured to obtain travel times and speed data across the state. In this potential future the role of dedicated roadside detection stations would change. It would no longer be necessary to target the deployment of detection stations at every half-mile. Therefore, a new paradigm is required to guide the decisions on where detection stations should be placed to provide the most informational value.

### WHAT IS OUR GOAL?

The goal of this project would be to achieve the following objectives:

- Providing guidance on roadside detector locations to prioritize in a hybrid data solution
- Offering a menu of sensor deployment targets that will achieve suitable accuracy while reducing the number of sensors in the field.

### WHAT IS THE BENEFIT?

This project aims to provide practical guidance to suggest the best placement of detection stations assuming that third-party speed data are used to achieve wide geographic coverage. Another benefit is to reduce the use of traditional vehicle detection stations, thereby reducing maintenance cost, addressing sustainability and stewardship goals, while limiting exposure of construction, maintenance, and operations personnel to traffic, thus improving worker safety.

### WHAT IS THE PROGRESS TO DATE?

1. Technical Memo: Survey of Data Trends was completed and delivered/approved by Caltrans.
2. Technical Memo: Selected Freeways for Analysis completed and delivered/approved by Caltrans.
3. Research team recommended following corridors for use in subsequent project analyses:
  - San Francisco Bay Area I-880, I-680, I-280
  - Area around Modesto, Tracy, and Stockton I-5, SR-99, I-205
  - Area around Anaheim Triangle I-5, SR-91, SR-55, SR-57

### IMAGES

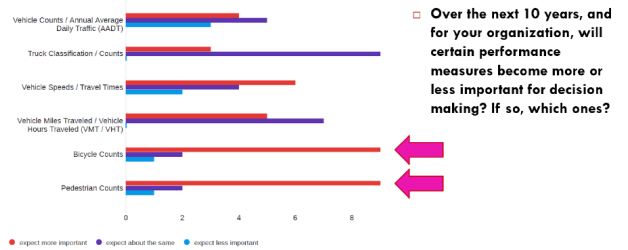


Image 1: Performance measure increase survey results from DOT responses

Milepost	VCS	Name	Weekday			Weekend			Weekday Time Period		
			Spring	Summer	Fall	Spring	Summer	Fall	0-6	6-9	9-16
0.48	400103	McLaughlin									
1.29	400102										
1.39	400789	18th									
1.80	400910	18th									
2.05	400101										
2.25	424178										
2.77	424184										
2.85	400104										
2.97	424177	Blvd Ave									
3.91	424104	Meridian Ave									
4.47	400107										
4.54	400101										
5.33	400710	180th St - CT									
5.38	400100	Beacon									
6.14	400714										
7.47	400104										
9.01	400100	Stevens Creek									
9.80	400489										
10.91	424021										
12.39	400105										
14.28	400106	St. George									
20.04	400118	Contra Rd									
31.27	400119										
37.56	400100	Haynes									
41.15	400103										
43.73	400106										
44.49	400123	Aviation Dr									
45.50	400106	Wendellough Blvd									
45.50	400028										
46.42	400107										
46.67	400703	Hickory Blvd									
47.29	400108										
51.78	404417	Edwin									
51.48	404118										
52.01	400106										
52.60	400076	Monterey Blvd									
53.07	400106										
53.40	400107	Monterey Blvd									
53.83	400102										
55.48	400103	18th / Passajulita									

Image 2: Corridor Analysis Example on I-280 North

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