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Project Title:

TPF-5(520), Improving Traffic Detection Through New Innovative i-LST Technology Demonstration Pilot

Task Number: 4508

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TPF-5(520), Improving Traffic Detection Through New Innovative i-LST Technology Demonstration Pilot

A demonstration of inductive Loop Signature Technology (i-LST) in various corridors to show new, effective, and comprehensive data collection methods.

WHAT IS THE NEED?

The need is to gain first-hand experience, knowledge, and practices in utilizing signature technology to improve the California Department of Transportation (Caltrans') traffic monitoring program. This research provides the ability to model and project vehicle routing and demand.

Current traffic monitoring practices primarily focus on counting the number of vehicles, classifying vehicles by length or axle arrangement, and weighing vehicles. Additional critical information such as body type (tractor and/or trailer) is not readily captured due to technology limitations. However, body type data and information are vital for goods movement and freight analysis as different commodities are transported by different vehicles. For example, perishables and other temperature-sensitive goods are carried by the so-called reefer, a sealed trailer with a refrigerated unit to keep the truck contents at a cooled temperature. Liquids and gases are typically transported by tanker trucks. Flatbed trailers have open decks with no roofs or sides, offer the greatest flexibility to carry not only oversized goods but also a wide range of other freight. Intermodal trucks carry standardized ocean containers. Dry freight trailers provide significant protection to the freight being moved from both inclement weather and other detrimental effects. In addition to the body type identification challenge from current traffic monitoring technologies, current practices also miss the highly desired data regarding the travel time and on/off points where vehicles enter or exit a roadway network, such as where and when a given truck enters or exits a particular highway. Information like this is vital to modeling and projecting vehicle routing associated with demand analysis.



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WHAT ARE WE DOING?

Caltrans, in partnership with the Federal Highway Administration (FHWA), is conducting a traffic monitoring technology demonstration project. The project will enable participating agencies to gain additional data and information (e.g., detailed 100+ vehicle classifications and trailer body types, freight network travel characteristics) on top of the traditional counts and axle-based classification information. No physical roadway activities are needed. Caltrans is an agency with networks and freight corridors covering both Interstate and other functional class roadways where inductive loop sensors are used as the existing traffic monitoring method.

This new technology relies on capturing high-resolution inductive loop signals from existing inductive loop sensors and then characterizing these high-resolution signals (signature) to obtain vehicle class, vehicle speed, vehicle and trailer body type, and on/off highway network point identifications. Corridors will include both Interstates and interconnected roadways to ascertain the full picture of travel patterns along routes and between routes.

WHAT IS OUR GOAL?

Caltrans' goal is to obtain a product which is a demonstration of a software application technology that provides new data about freight vehicles. Caltrans looks to see a demonstration of loop signature technology (inductive Loop Signature Technology: i-LST) over various corridors across the US to show the application of new, effective, and comprehensive data collection methods.

The conclusion of this research will provide additional options for enhancing the current detection sensors for truck data by improving quality and accuracy of identifying truck types and classes. Implementation will include a distribution of the information gathered from this research that can be used at the district level. The dissemination of information may be completed within one year after research is

completed.

WHAT IS THE BENEFIT?

Benefits include the following-

- New Data – in addition to gaining all the traditional loop data items, new data such as these listed below will also be provided:
 - Specific vehicle class data – meeting the needs of freight analysis.
 - Travel time – true corridor level reliability by vehicle type.
 - Vehicle on and off points for roadway systems – benchmarking data for travel demand modeling and analysis.
 - Slow speed scenario data (congestion) – gaining information otherwise not collected.
- Gaining first-hand experience, knowledge, and practices in utilizing signature technology
- Showcasing California's transportation practices to other agencies throughout the nation with peer-exchanges

WHAT IS THE PROGRESS TO DATE?

All funding from members of the Technical Advisory Committee (TAC) has been received. A draft Memorandum of Understanding (MOU) has been prepared and presented to the TAC. This MOU outlines the use of Inductive Loop Signature Technology (i-LST) at selected locations that will be included in the study. Feedback on the MOU has been received from all participating states. The final selection of study corridors has been completed, enabling the project to move forward with the next steps: equipment installation and data collection. Data collection is scheduled to begin at two to four test locations by June 30, 2025.

Caltrans has agreed to include one test site along the Interstate 40 (I-40) corridor, located near Exit 1 at the California-Arizona border, close to Needles, California. Discussions are ongoing regarding Texas's

ability to participate in the I-40 corridor. If Texas is unable to participate, additional sites in Arizona may be added to compensate for the two originally planned Texas locations. Equipment installation at the Caltrans cabinet is scheduled for the last week of October 2025 with a cooperative effort between Caltrans and the vendor selected by the project consulting team.

Outside of California, the project team has continued work across all six designated corridors: Interstate 20 (I-20), I-40, Interstate 65 (I-65), Interstate 76/Interstate 80 (I-76/I-80), Interstate 70 (I-70), and Interstate 90 (I-90). Coordination with state agencies is ongoing to gather detailed information about potential detector sites along each corridor. This information has been used to finalize Sensor Location Agreements (SLAs) and to assist in selecting the most appropriate detector locations. SLAs have been distributed to each state agency for signature. Draft cost estimates for equipment have been completed and approved by the Federal Highway Administration (FHWA), allowing the procurement process to begin. Following equipment installation, data collection will be conducted over a 365-day period.

IMAGES

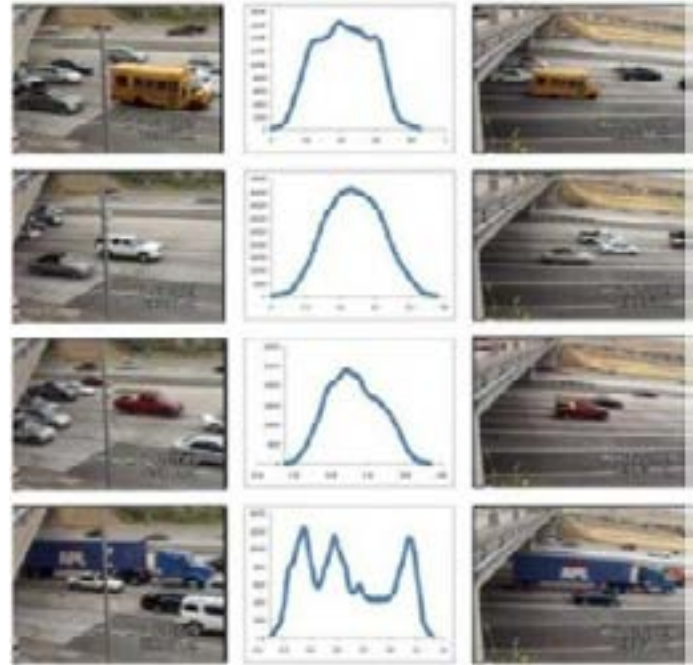


Image 1: Representative view of an electronic signature by vehicle type.