



Caltrans Division of Research,  
Innovation and System Information

# Research



# Notes



Traffic  
Operations

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Project Title:  
Alternative Data Detections

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## Better use of Caltrans Performance Measurement System (PeMS) for Census and Highway Performance Monitoring System (HPMS) Reporting

A tool to provide a listing of Census Stations and matched PeMS freeway mainline and ramp Vehicle Detection Stations (VDS) with Census to PeMS volumes and calibration/validation statistics.

### WHAT IS THE NEED?

Caltrans PeMS is currently underutilized by Caltrans in their accumulations of traffic counts for Census and HPMS reporting purposes. The primary reason being that the PeMS traffic volumes do not match those obtained by manually collected traffic counts (e.g., mobile pneumatic tube counters and/or Miovision cameras with video detection software). Several factors contribute to PeMS volumes not matching Census counts:

- The annual published Census counts may have been collected several years back with annual growth factors applied. Whereas, PeMS volumes are and can be readily obtained for each year.
- The annual published Census counts are collected over a short period of time (e.g., three or six days; typically, consecutive Tu-We-Thu for one or two weeks), then factored to "annual" using seasonality and day-of-week factors. Whereas, more robust annual estimates are readily available using PeMS volumes.
- Inherent and random inaccuracies in traffic count technologies: No traffic counting technology provides 100% accurate traffic data.
- The VDS locations that are in PeMS are the location of the controller station and not the location of the actual in-pavement induction loops. With this and random inaccuracies in the PeMS VDS locations makes it difficult to match the actual location of the PeMS VDS with Census count locations.



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## WHAT ARE WE DOING?

Previous research identified 882 locations (state-wide) where PeMS freeway vehicle detector stations could most probably be utilized to meet HPMS and Census data requirements, and an additional 164 plausible locations. There are lane discrepancies between the PeMS and Census data at these additional 164 locations that would need to be resolved. This research will build on the previous research by applying a multi-step process that will result in calibrated PeMS traffic volumes suitable for use in the Caltrans Census and HPMS programs:

1. Researchers will perform careful observations using Google Earth to visually locate the in-pavement loops and their relative location as compared to on-ramp and off-ramp merge and diverge points, in consultation with Caltrans staff. This allows researchers to determine the precise location of the PeMS VDS and ascertain whether PeMS ramp volumes need to be combined with the PeMS mainline volumes to be compatible with the Census count locations.
2. Once this manual observation task has been completed, a listing of Census locations and matching PeMS VDS locations can be produced.
3. Using the PeMS-Census listing, annual PeMS traffic volumes can be directly compared to published Census volumes. If necessary, PeMS calibration factors will be estimated.
4. Prepare a final report for the project describing in detail the work performed and presenting the key findings and recommendations for implementation. Conduct a workshop for Caltrans staff.

Additionally, researchers will track the PeMS "Percent Observed" at each PeMS VDS to provide additional information on whether the imputed PeMS volumes provide reasonable and comparable traffic volume estimates suitable for Census/HPMS reporting purposes.

## WHAT IS OUR GOAL?

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

- Provide a recommendations and an implementation plan for using PeMS data for Census and HPMS reporting purposes

## WHAT IS THE BENEFIT?

This research project will produce results that have immediate and pragmatic value to Caltrans. It will provide a listing of a listing of Census Stations and matched PeMS freeway mainline and ramp VDS stations with Census to PeMS volumes and calibration/validation statistics. Caltrans can review and validate the PeMS volumes for each of the listed locations. Subsequently, Caltrans can discontinue manual traffic collection for all Census locations that pass Caltrans validation criteria – and automate the process of using the PeMS volumes for their Census/HPMS reporting efforts.

The cost savings from the research could save on personnel cost over several years. Reduction in a manual process. In addition, better reporting, would be more accurate data and higher reliability.

## WHAT IS THE PROGRESS TO DATE?

Contract waiting to be executed.