

Speed and Class Data from a Single Loop Utilizing Inductive Loop Signature (ILS) Technology

2017 Highway Information Seminar (HIS)

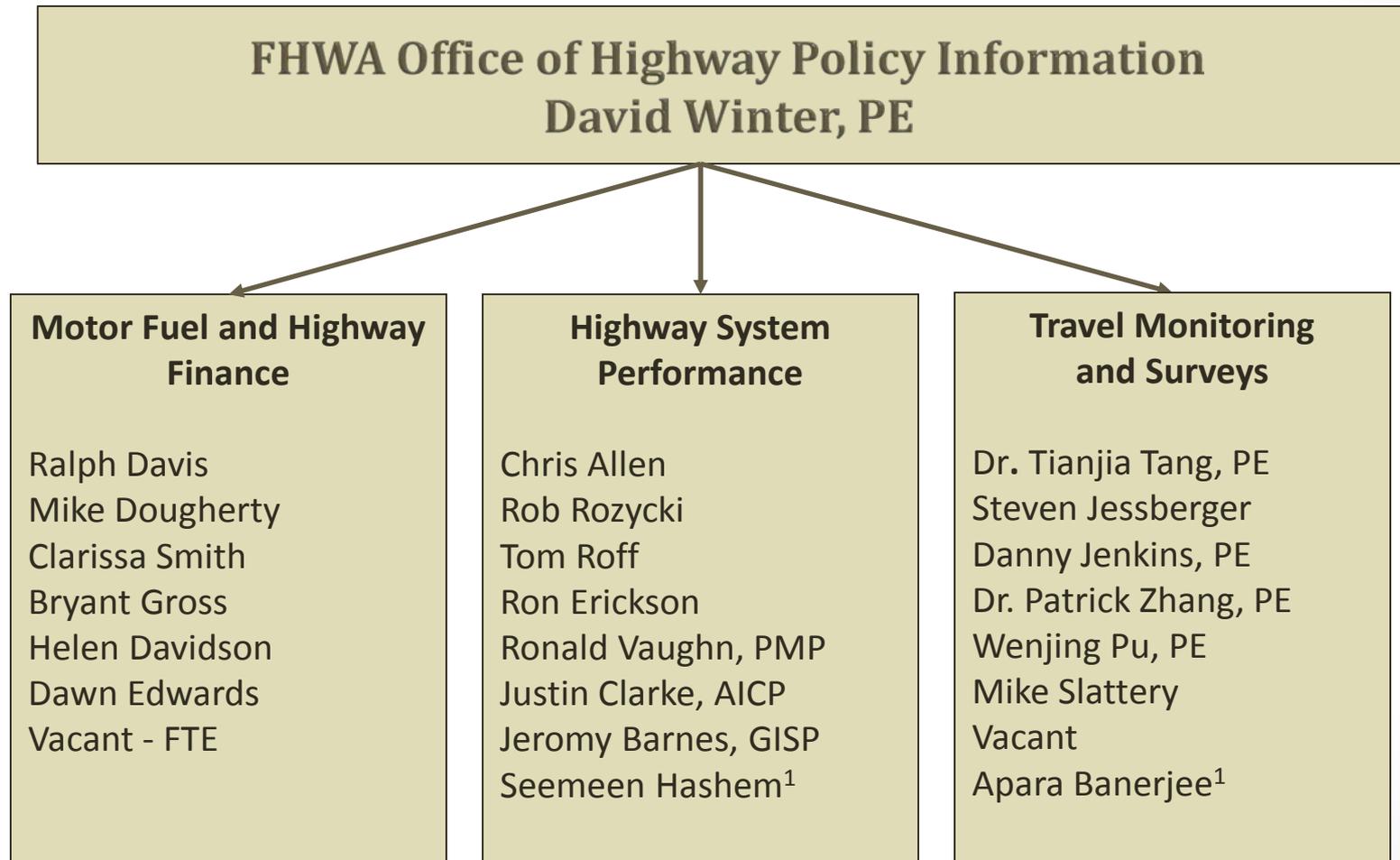
Steven Jessberger

Travel Monitoring and Surveys Section

Wednesday, November 15, 2017



Office Organizational Chart



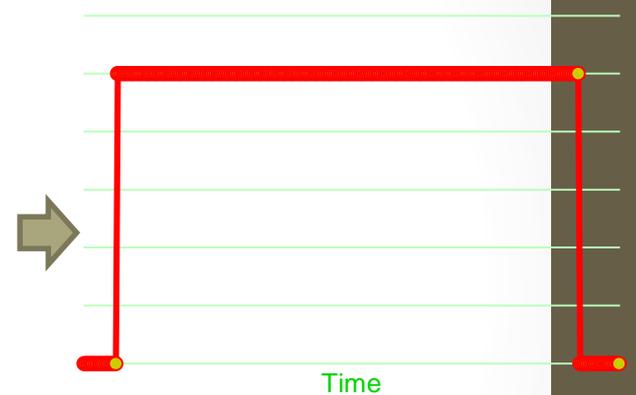
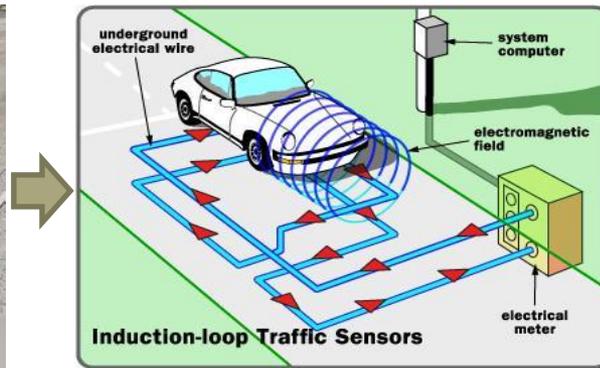
FHWA Small Business Innovation Research (SBIR)

- Phase I and II on developing a new Inductive Signature card (2015)
- Phase I on IS to re-id heavy vehicles – completed in 2014
- Phase II on IS to re-id heavy vehicles – completed Sept. 2017
- ILS websites: CLR Analytics (Lianyu): <http://www.tpmonitor.com>
CARB website (Andre): <http://freight.its.uci.edu/tams>
- Inductive Loop Signature (ILS) research:
 - AK DOT – 2 arterial CVC sites
 - Caltrans SBIR – 21 stations (14 CCSs, 7 WIM stations) under CLR Analytics and CARB – 95 stations (about 20 WIM stations, 10 CVC sites, and 65 CCSs)
 - Minn. DOT – 4 arterial signalized intersections and 2 CVC sites
 - CO DOT – 3 freeway CVC sites
 - KS DOT – 1 site (over 1 year)

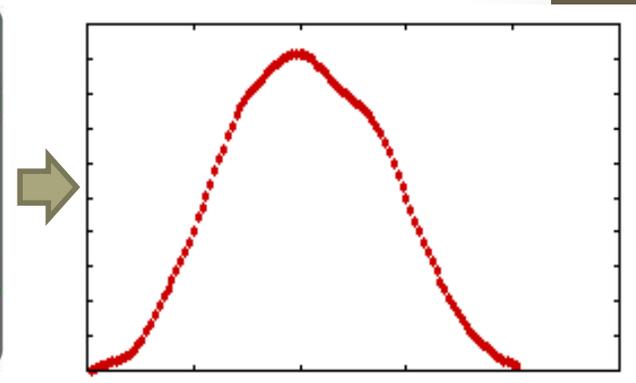
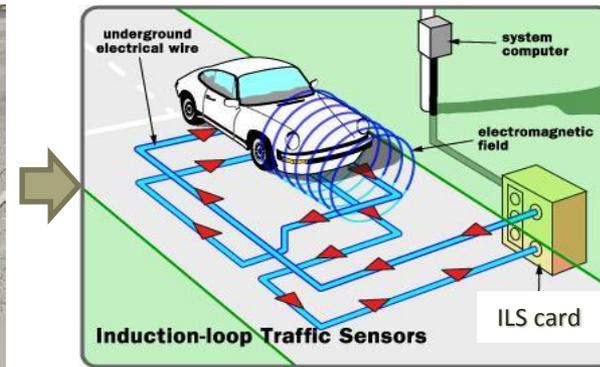


Conventional vs Advanced Loop Detector

- Conventional loop detector



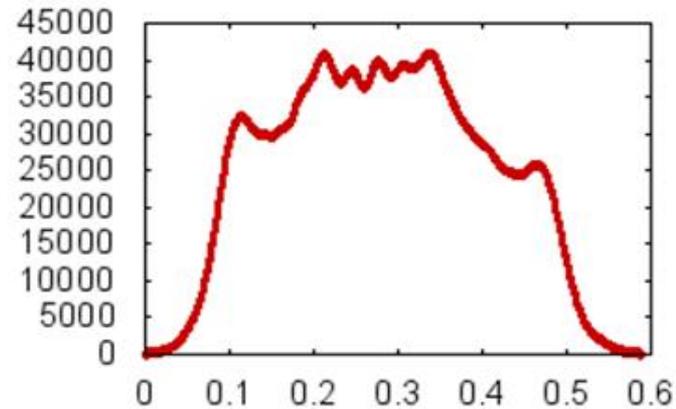
- Advanced loop detector



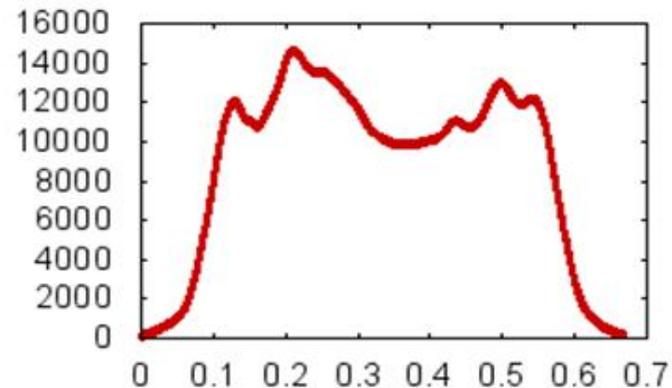
SBIR on Inductive Signatures



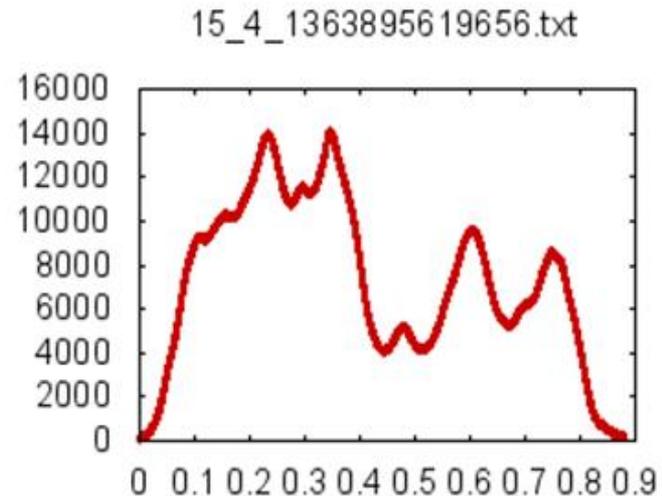
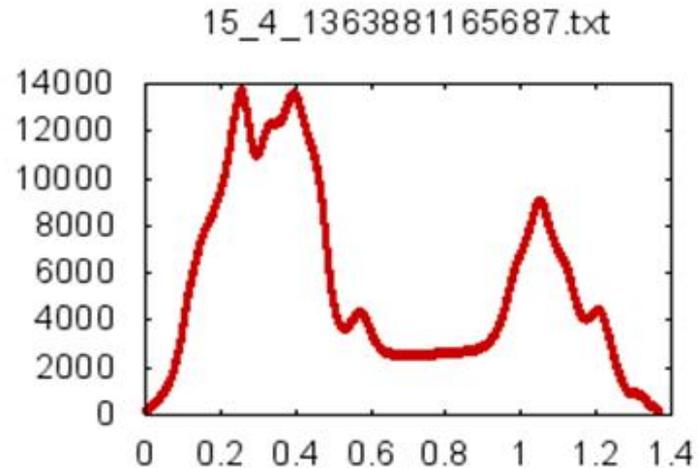
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15_4_1363894178656.txt



SBIR on Inductive Signatures



SBIR – on Inductive Signatures

- Transfer traffic information from site to site:
 - WIM site data – weights, spacings, length, speed and class
 - Axle Class site data – spacings, length (maybe), speed and class
 - Length Class/Speed site data – length, speed and length class
 - Volume site data – volume only (now can be WIM/Class)
- Travel time and travel time reliability – link based
- Speed at nearly any location - works at speeds under 5 mph and only needs one loop per lane for both speed and class
- Origin and destination data for most vehicles
- Travel by 120 unique vehicle types – proven in CA field demonstration



SBIR on Inductive Loop Signature and Re-Identifying Vehicles Utilizing Single Loop Detectors

Objective: Research the suitability of using the newly developed Inductive Signature (IS) card for re-identification of vehicles on a roadway network between volume, class and weight data sites utilizing only a single loop per lane. Use heavy vehicle IS data to determine matching rates, speed, travel time and O & D information unique to the vehicle class data. This field demonstration of over 250 sq. miles involved developing synchronization methods, video processing methods and automatic signature coding of vehicle attributes. Develop from this data a vehicle classification library and IS data set that works with the 2016 TMG.

TMG PVF data - Vehicle Signature or Other Use Field (Columns 29-32) – *Optional*

Enter the vehicle unique loop or magnetic signature using the right-most digits first.

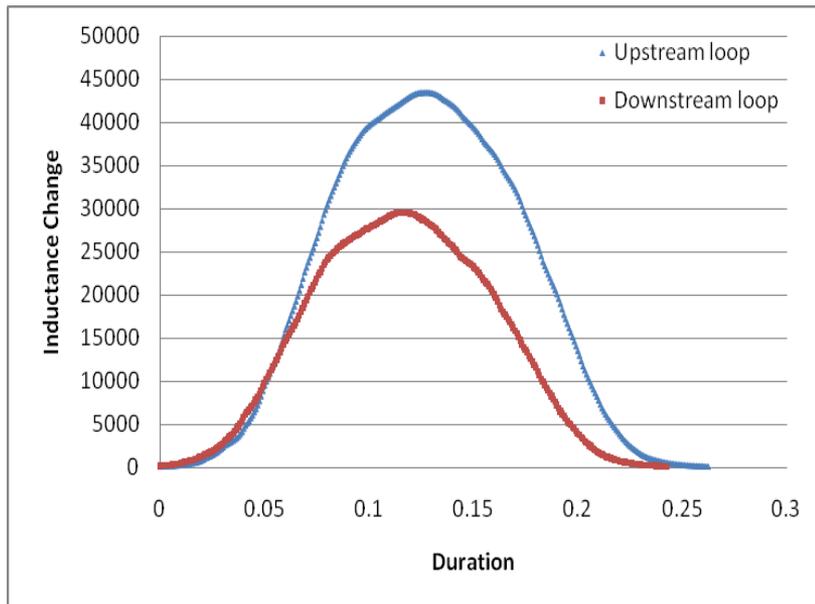
- Digit 1 (Column 29) = contains the vehicle type code: 1, 2, 3, 4, 5 (classes 5-7), 6 (classes 8-10) or 7 (classes 11-13)
- Digit 2 (Column 30) = the # of axles for the vehicle. If more than 9 axles are observed, code alphanumerically, where 10 = A, 11 = B, etc...
- Digit 3 = body style (being defined now)
- Digit 4 = specific body style or trailer attributes (being defined now)

(Note: more details for coding Digits 3 and 4 are currently being determined and will be posted on the FHWA's website when they are completed.)



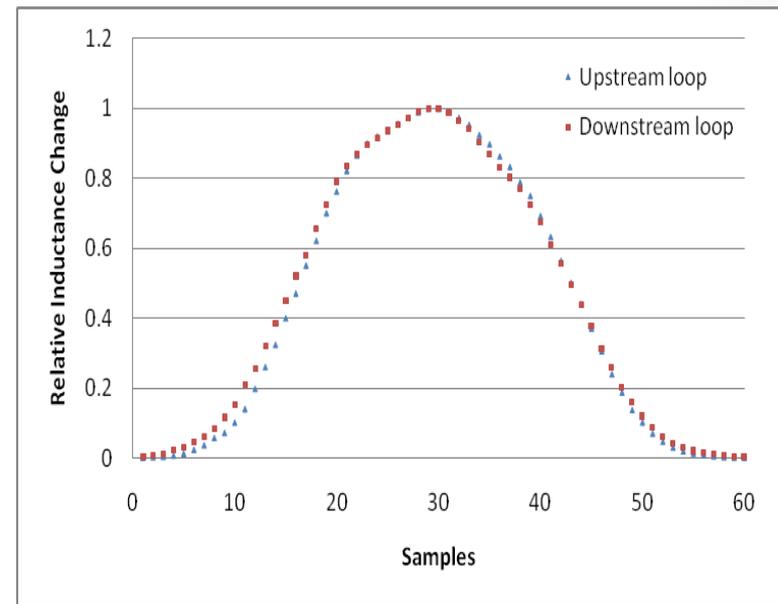
Same Vehicle's Signatures

Very similar but NOT exactly the same, because of different vehicle speed, vehicle offset, loop configuration, loop condition and detection sensitivity settings ...



(a) Raw signature

Upstream: 316 data points;
Downstream: 292 data points.

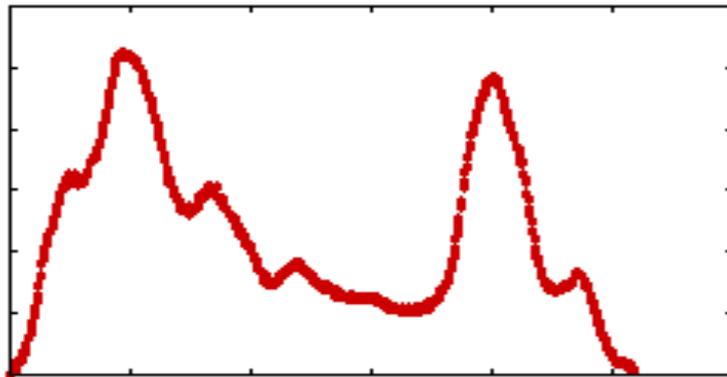


(b) X & Y-axis normalized signature

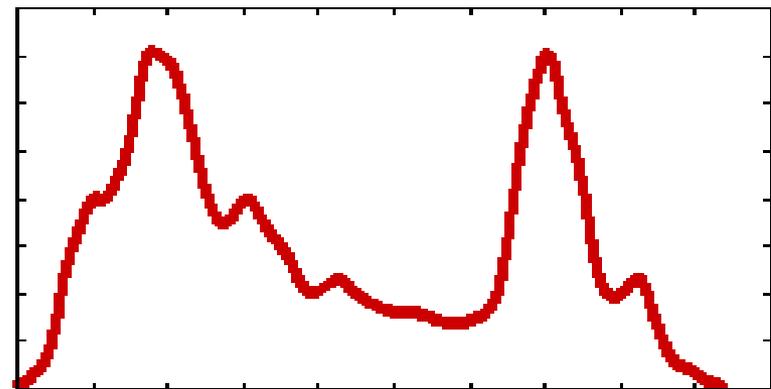
Upstream: 60 data points;
Downstream: 60 data points.



Same Vehicle at Different Detector Stations (19 miles apart)



Upstream: SR-57 SB at Lambert
(WIM station, square loop)

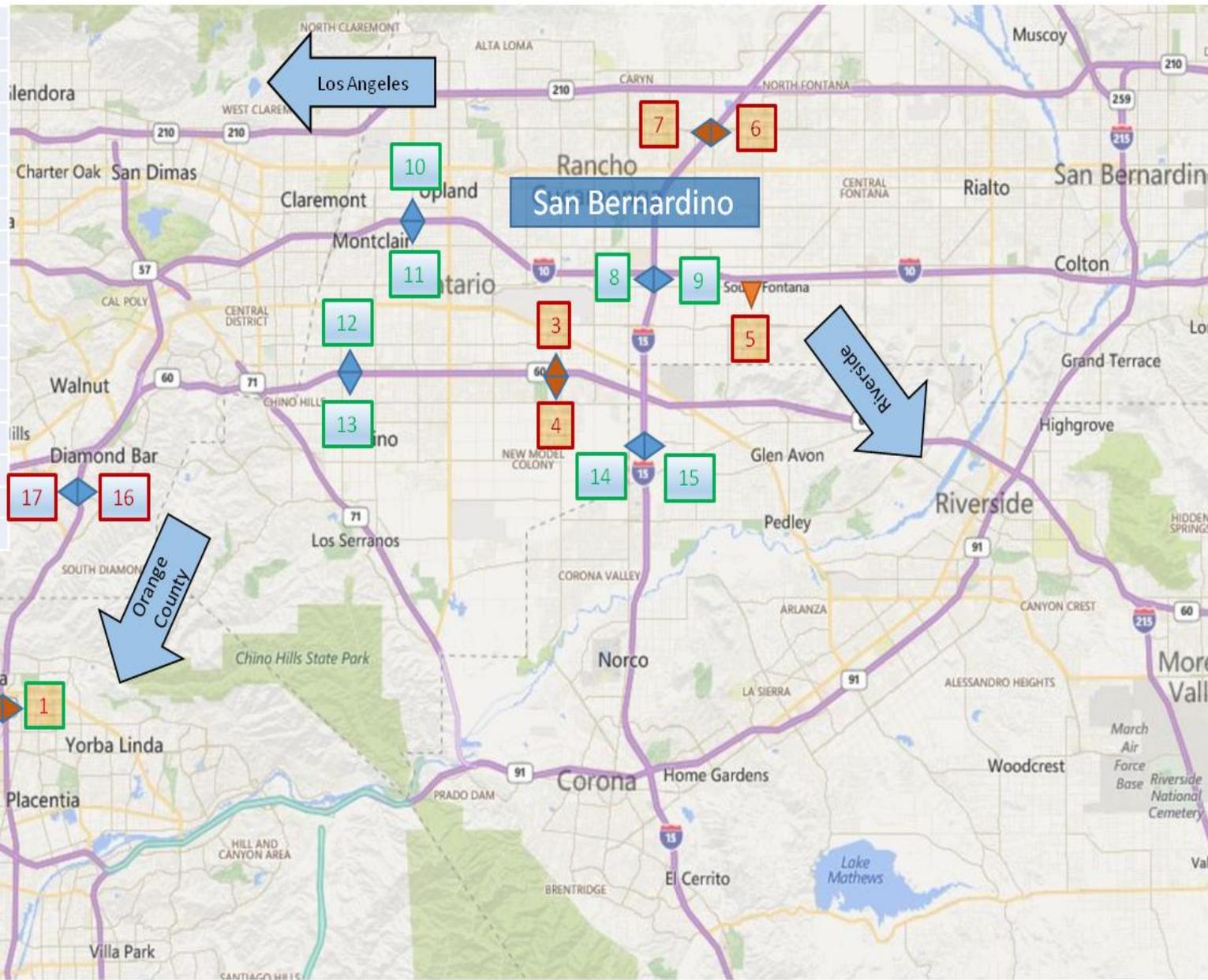


Downstream: I-5 SB at Yale
(counting station, round loop)

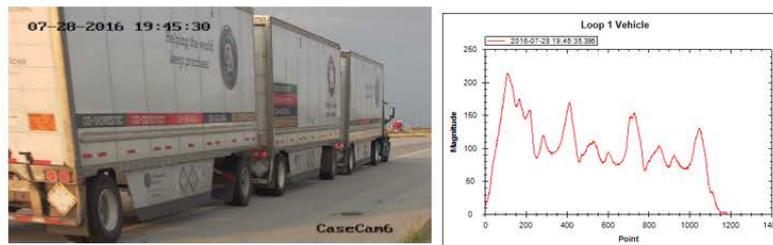


Southern California Study Area

- 1 WIM_SR-57 NB Orange
- 2 WIM_SR-57 SB Orange
- 3 WIM_SR-60 WB Ontario
- 4 WIM_SR-60 EB Ontario
- 5 WIM_I-10 EB Colton
- 6 WIM_I-15 NB Fontana
- 7 WIM_I-15 SB Fontana
- 8 CCS_I-15 SB Airport
- 9 CCS_I-15 NB Airport
- 10 CCS_I-10 WB San Antonio
- 11 CCS_I-10 EB San Antonio
- 12 CCS_SR-60 WB Benson
- 13 CCS_SR-60 EB Benson
- 14 CCS_I-15 SB South SR60
- 15 CCS_I-15 NB South SR60
- 16 CCS_SR-57 NB Pathfinder
- 17 CCS_SR-57 SB Pathfinder



Signature Data for Different Types of Vehicles in Colorado



Questions and Comments

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