

**A Guide to Using the  
Caltrans Performance Measurement System (PeMS)  
in Transportation Concept Reports (TCR's)**

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Office of System Management Planning  
PeMS Branch

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## Introduction

In conjunction with the release of the Transportation Concept Report (TCR) Guidelines, this document will serve as a basic introduction to using the California Department of Transportation (Caltrans) Performance Measurement System (PeMS) for obtaining performance measure data to use in Districts' Transportation Concept Reports (TCR's). This guide is intended to be a resource for District personnel who need assistance navigating and finding data in PeMS. The guide will work best for existing users of PeMS and those that have taken a formal introductory PeMS training course. New users may also find the guide useful, but participation in Caltrans-sponsored PeMS training is recommended. For any questions regarding PeMS, please call the PeMS Coordinator, Jane Berner, in the Headquarters Division of Traffic Operations at 916-654-2843.

Keep in mind that PeMS is just one tool for obtaining performance measure data for TCR's, and it is most useful for obtaining data for urban area freeways. Districts should always consider all of their data sources and choose the best available. This guide focuses on what data are available in PeMS and how to access that data, but it is not meant to discourage the use of other reliable data sources.

For consistency, this guide will use District 3 US-50 TCR segment 6 from Sunrise Avenue to Folsom Blvd. (Caltrans postmiles 12.50 to 17.01 and absolute postmiles 17.80 to 22.58) in most examples.

## A Few Tips Before You Start Using PeMS

### *Absolute Postmiles*

PeMS uses postmiles to identify locations on state highways. The system uses two types of postmiles: jurisdictional (Caltrans) postmiles and absolute postmiles. Caltrans postmiles are assigned to physical boxes and geometric features on freeways when they are built. Caltrans postmiles re-set to zero at every county line. Once these postmiles are assigned, they do not change except in the area where there is an alignment change. This means that when freeways are lengthened or shortened through reconstruction, the postmiles downstream and upstream of the construction area are not changed, even though the distance from the county line has changed. Instead, equations are used, from which true distance can be determined. PeMS converts Caltrans postmiles into **absolute** postmiles. **Absolute postmiles** reflect the actual distance along a freeway from its beginning to its terminus. These postmiles change as the length of the freeway changes. PeMS uses absolute postmiles to compute the distance between detectors. This distance is used to calculate spatial performance measures. As most performance measures for TCR's are obtained on a spatial data level, it's important to remember to **convert Caltrans postmiles to absolute postmiles** in order to produce queries that align correctly with your TCR segments.

The screenshot shows the PeMS interface for 'Performance > Planning Analysis > Spatial AADT'. The 'Postmile Range' field is highlighted with an orange box, showing a range of 17.80 to 22.58. Other fields include 'Starting Month' (Jan 2011), 'Crossings' (None), and 'Station Type' (Mainline selected). The interface also includes buttons for 'DRAW PLOT', 'VIEW TABLE', 'EXPORT TEXT', 'EXPORT to .XLS', and 'EXPORT to .KML'.

To convert Caltrans postmiles to absolute postmiles, click on View Crossings under the Postmile Range field found on most spatial data PeMS reports.

Abs PM	CA PM	Description
<b>US50-E Crossings</b>		
<b>Yolo County Line (Abs PM = 0.00)</b>		
0.64	.639	WB OFF TO EB RTE 80
0.72	.724	EB ON FROM WB RTE 80
1.19	1.185	EB OFF TO HARBOR BLVD
1.34	1.342	EB ON FR HARBOR BLVD
2.15	2.148	DUM EB OFF TO 275 & 84
2.66	2.658	EB ON FR RTE 84
2.82	2.824	EB ON FROM RIVER RD
<b>Sacramento County Line (Abs PM = 3.16)</b>		
3.30	L.147	EB OFF TO RTE 5
3.55	L.398	EB OFF TO 5TH & X ST
3.77	L.617	EB ON FR RTE 5
4.35	L1.192	EB OFF TO 15 & X ST
4.58	L1.427	EB ON FR 11TH & X ST
4.79	L1.636	EB ON FR 16TH & X ST
5.54	L2.385	EB ON FROM X ST
5.89	R.256	EB OFF TO 34TH ST
6.35	R.711	EB ON FROM STOCKTON BVD
7.48	R1.846	EB OFF TO 59TH
8.10	R2.469	EB OFF TO 65TH
9.03	R3.396	EB OFF TO COLLEGE & HOWE
9.17	R3.532	SEG EBOFF TO COLLEGE
9.17	R3.533	SEG EB OFF TO HOWE
10.69	R5.054	EB OFF TO WATT AVE
11.27	R5.631	EB ON FR WATT AVE
13.14	R7.509	EB OFF TO BRADSHAW RD
14.94	R9.301	EB OFF TO MATHER FLD RD
16.36	R10.726	EB OFF TO ZINFANDEL DR
17.80	R12.167	EB OFF TO SUNRISE BLVD
18.44	12.769	EB ON FR SUNRISE BLVD
21.23	15.562	EB OFF TO HAZEL AVE
21.64	15.969	EB ON FR HAZEL AVE
21.75	16.084	EB OFF TO AEROJET RD
22.40	16.729	EB OFF TO FOLSOM BL
22.58	16.913	EB ON FR FOLSOM BL
24.72	19.053	EB OFF TO PRAIRIE CITY
26.88	21.21	EB OFF E BIDWELL /SCOTT

When the View Crossing window appears, find the Caltrans postmile under CA PM and find the corresponding Absolute postmile under Abs PM. In this example, the TCR segment limits are Sunrise Blvd to Folsom Blvd in Sacramento County, so the Abs postmiles of 17.80 to 22.58 will be used.

## The "About This Report" Link

When users access PeMS to obtain summary statistics, there is a link next to the title of the data being shown called **About This Report**. This link provides details about how the data in that specific report page are calculated.

The screenshot shows the PeMS Performance > Aggregates > Time Series report page. The page includes navigation tabs for Facilities & Devices, Performance, Data Quality, Configuration, and Events. The main content area displays the report title "Performance > Aggregates > Time Series" and a link "ABOUT THIS REPORT" with an arrow pointing to it. The report parameters are set to "From" Jan 1, 2011 0 and "To" Dec 31, 2011 23. The "Time of Day" is set to "All". The "Include Days" section is checked for all days of the week and "Holidays". The "Postmile Range" is set to "0.03 - 107.98". The "View Crossings..." link is visible. The "EXPORT to XLS" button is also present. The "About This Report: Aggregates" dialog box is open, providing detailed information about the aggregate detector data plots and the quantities available to users.

**About This Report: Aggregates**

The aggregate detector data plots are the cornerstone of PeMS. These plots allow the user to examine the detector data at many different levels of spatial and temporal aggregation as well as averages over the time of day and days of the week.

There are a number of different quantities which we let users view. The quantities available to the users are a function of the geographic level. At the lowest level, the individual station, users can see all of the quantities. When we aggregate spatially across a region, like for a district, some of the quantities no longer make sense, like flow, occupancy and speed. Hence when looking at a geographic region (instead of a single station) we don't allow users to make plots of these quantities. Below we list all of the quantities here and specify whether they can be plotted at each geographic level. For a detailed explanation of the calculations please look at the **Calculations** page in the Help system. The quantities are:

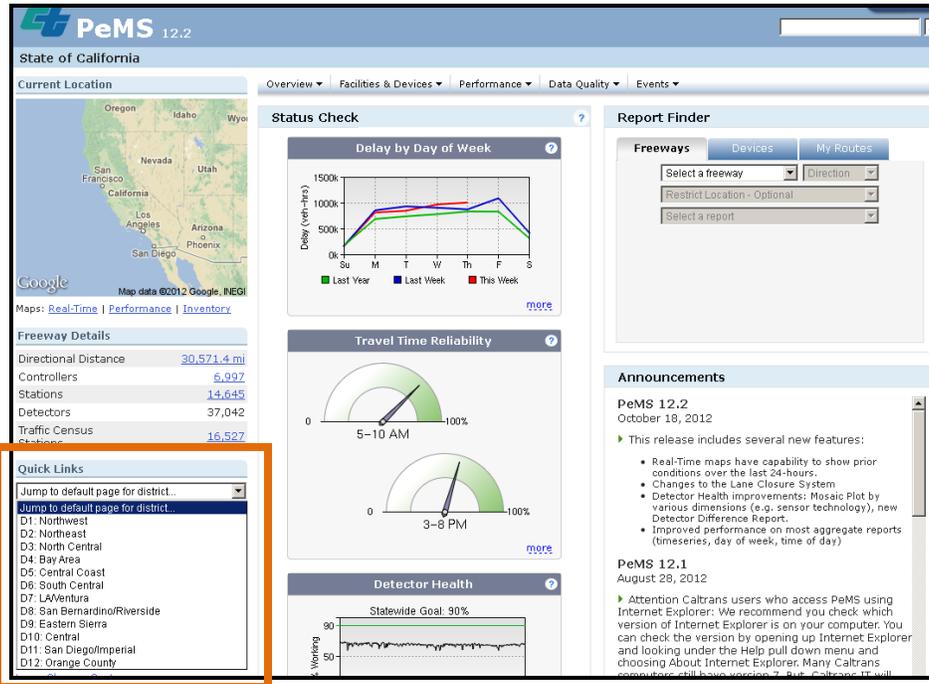
- **Flow:** This is the number of vehicles per time period of granularity. The granularity is user selectable and ranges from 5 minutes to 1 month. The flow values plotted are the sum over the unit of granularity. The flow is available only at the station level.
- **Occupancy:** The percentage of time that the detector is on. This is only available at the station level.
- **Speed:** The speed at the detector. This is only available at the station

Files Traveled (VMT) (Veh-Miles)

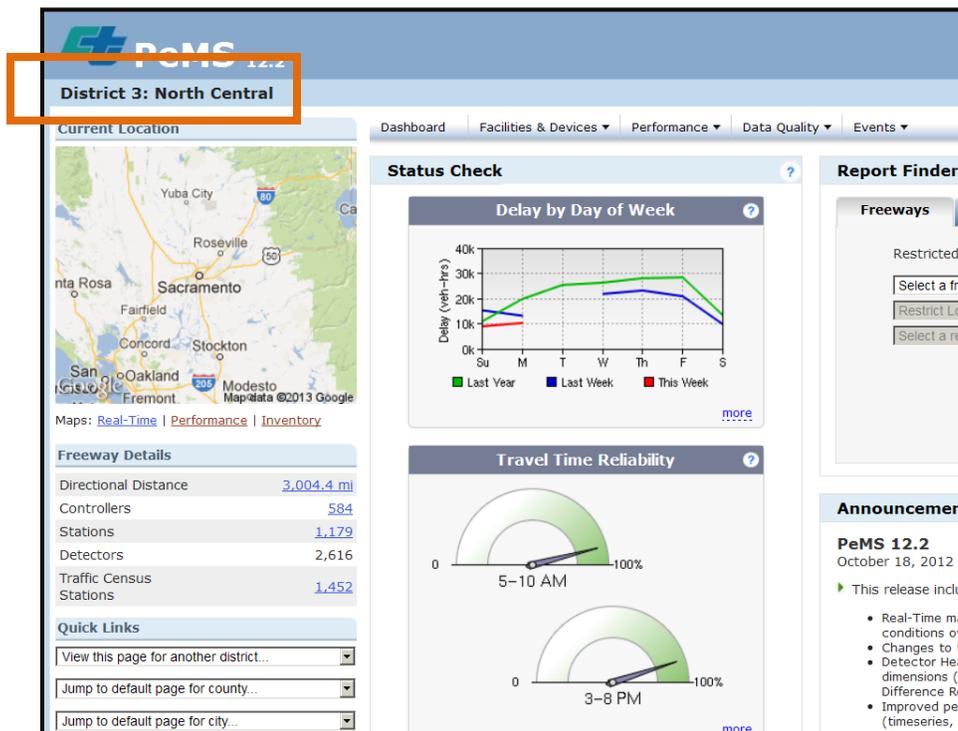
Postmile Range (0.03 - 107.98)  
17.80 - 22.58  
[View Crossings...](#)  
EXPORT to XLS  
23:59:59

# Navigation in PeMS for TCR Performance Measures

Most TCR performance measures are found by first navigating to the district and freeway page for the freeway being analyzed. To do this, start on the PeMS statewide home page and click on the **Jump to default district** under the **Quick Links** section on the left panel of page and select your district.

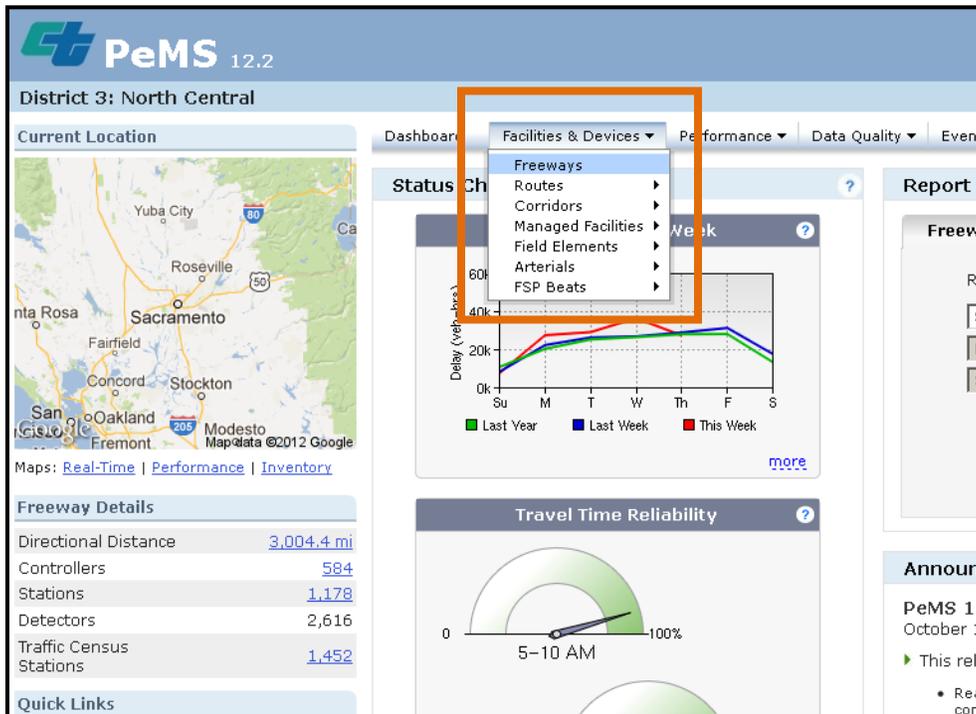


This will take you to your district's home page.



You can see from these screenshots that the statewide home page and district home pages look almost exactly alike. You know you are on your District home page when you see the name of your district in the upper left of the screen, below the CT PeMS logo, and the map image is centered on your District. You are on the statewide home page when you see State of California underneath the CT PeMS logo, and the map shows the entire state.

Once on your district's home page, hold your mouse over the Facilities & Devices pull-down menu and click on Freeways.



On the Facilities & Devices > Freeways page, find the freeway to be analyzed. Note that PeMS only allows you to view data for one freeway direction at a time. In this example, we will analyze US-50 in the eastbound direction, and then do the same analysis for the westbound direction. Clicking on the #VDSs (VDS stands for Vehicle Detector Station) link under the Detection header takes you to a page that is the jumping off point for doing both spatial-level and detector-level analysis. In this example, the #VDSs number ("101") for US50-E is selected.

Facilities & Devices > Freeways ABOUT THIS REPORT

Fwy	Detection			Mainline Facilities Detection Coverage				HOV Facilities Detection Coverage				
	# LDS	# VDSs	# Detectors	Total Miles	# VDSs	Miles	Lane Miles	Miles	Lane Miles	# VDSs	Miles	Lane Miles
I5-N	5	20	209	34.6	52	34.6	98.0	0	0.0	0	0	0.0
I5-S	48	79	203	34.6	52	34.6	99.5	0	0.0	0	0	0.0
I80-E	32	75	181	17.6	32	17.6	60.8	8.2	8.2	17	8.2	10.7
I80-W	25	66	159	17.6	30	17.6	60.7	8.2	8.2	16	8.2	11.0
SR12-E	0	0	0	6.2	0	0	0.0	0	0.0	0	0	0.0
SR12-W	0	0	0	6.2	0	0	0.0	0	0.0	0	0	0.0
SR16-E	0	0	0	22.3	0	0	0.0	0	0.0	0	0	0.0
SR16-W	0	0	0	22.3	0	0	0.0	0	0.0	0	0	0.0
SR51-N	17	45	104	8.9	21	8.8	29.2	0	0.0	1	0.0	2.6
SR51-S	15	41	88	8.8	17	8.9	29.3	0	0.0	2	0.0	3.6
SR99-N	43	104	195	29.0	46	29.0	68.3	12.4	12.4	28	12.4	16.3
SR99-S	36	86	154	29.0	39	29.0	68.8	12.4	12.4	21	12.4	16.4
SR104-E	0	0	0	17.7	0	0	0.0	0	0.0	0	0	0.0
SR104-W	0	0	0	17.7	0	0	0.0	0	0.0	0	0	0.0
SR160-N	1	3	5	48.3	1	3.6	7.1	0	0.0	0	0	0.0
SR160-S	0	4	5	48.3	1	3.5	7.0	0	0.0	0	0	0.0
SR220-E	0	0	0	3.1	0	0	0.0	0	0.0	0	0	0.0
SR220-W	0	0	0	3.1	0	0	0.0	0	0.0	0	0	0.0
SR244-E	0	0	0	1.1	0	0	0.0	0	0.0	0	0	0.0
SR244-W	0	0	0	1.1	0	0	0.0	0	0.0	0	0	0.0
SR275-E	0	0	0	0.7	0	0	0.0	0	0.0	0	0	0.0
SR275-W	0	0	0	0.7	0	0	0.0	0	0.0	0	0	0.0
US50-E	46	101	240	25.7	43	25.7	88.9	11.4	11.4	28	11.4	20.0
US50-W	50	116	266	25.7	46	25.7	88.6	11.4	11.4	28	11.4	20.0

This will bring up the Facilities & Devices > Field Elements > Stations page for the district and freeway-direction selected.

PeMS 1.2.2

Freeway US50-E in District 3

Facilities & Devices > Field Elements > Stations

Day: Dec 21 2012

Owner: All

Sensor Technology: Any Sensor Technology

Station Types:
 

- Coll/Dist
- HOV
- Off Ramp
- Fwy-Fwy
- Mainline
- On Ramp

Postmile Range (0.03 - 107.98): 0.03 - 107.98  Show Crossings

VIEW TABLE EXPORT TEXT EXPORT TO XLS

Show All 335 Results

Fwy	Dist	County	City	CA PM	Abs PM	Length	ID	Name	Lanes	Stn. Type	Sensor Type	HOV M
US50-E	3	Yolo	West Sacramento	.036	0.04	0.295	318135	E of Enterprise BL	4	Mainline	Loop	No
				.037	0.04	0.000	318736	50EB->80EB	2	Fwy-Fwy	Loop	No
				.554	0.55	0.649	313824	50/80 I.C.	4	Mainline	MVDS (Radar)	No
<i>WB OFF TO EB RTE 80 (.639)</i>												
<i>EB ON FROM WB RTE 80 (.724)</i>												
US50-E	3	Yolo	West Sacramento	1.062	1.06	0.000	318356	Harbor Blvd	2	Off Ramp	Loop	No
<i>EB OFF TO HARBOR BLVD (1.185)</i>												

Most data queries can be started from this page and it will be the starting point for most examples in this guide. From this Facilities & Devices > Field Elements > Stations page, we will be using the pull-down toolbar that runs across the top of the page to access data reports. The “Performance” pull-down menu is where performance measure reports are located.

The screenshot shows the PeMS 12.2 interface for 'Freeway US50-E in District 3'. The 'Performance' menu is open, showing options like Spatial Analysis, Aggregates, Congestion Pie, Bottlenecks, Planning Analysis, Modeling, Level of Service, and TMG Report. The 'Facilities & Devices' section is active, showing a map of the Sacramento area and a table of freeway details.

Fwy	Dist	County	City	CA PM	Abs PM	Length	ID	Name	Lanes	Stn. T
US50-E	3	Yolo	West Sacramento	.036	0.04	0.295	318135	E of Enterprise BL	4	Mainlin
				.037	0.04	0.000	318736	50EB->80EB	2	Fwy-F

## Finding Detection

Before extracting any data from PeMS, it is a good idea to first understand if and where automated detection is located on your TCR freeway, and to explore the health of that detection. There are several ways to find the location of detection on a TCR segment. The first method is to view a *list* of vehicle detector stations (VDS).

### Viewing a List of Vehicle Detector Stations

The screenshot shows the PeMS interface for Freeway US50-E in District 3. The 'Facilities & Devices > Field Elements > Stations' page is active. The search filters are set to Day: Jun 1, 2011; Postmile Range: 17.80 - 22.58; Station Types: Coll/Dist, HOV, Fwy-Fwy, Mainline, Off Ramp, On Ramp. The 'VIEW TABLE' button is highlighted. The table below shows the list of detector stations.

Fwy	Dist	County	City	CA PM	Abs PM	Length ID	Name	Lanes	Stn. Type	Sensor Type	HOV	MS ID
<i>EB OFF TO SUNRISE BLVD (R12.167)</i>												
US50-E	3	Sacramento		12.4	18.07	0.718	314042	3	Mainline	Loop	No	TA-224
				12.4	18.07	2.600	315894	1	HOV	Loop	24H	TA-224
				12.6	18.27	0.550	314036	3	Mainline	Loop	No	TA-225
				12.6	18.27	0.550	315895	1	HOV	Loop	24H	TA-225
<i>EB ON FR SUNRISE BLVD (12.769)</i>												
US50-E	3	Sacramento		R13.5	19.17	0.800	313631	3	Mainline	MVDS (Radar)	No	R182
				R13.5	19.17	0.800	315896	1	HOV	MVDS (Radar)	24H	R182
				R14.2	19.87	0.760	313912	3	Mainline		No	R184
				R14.2	19.87	0.760	315897	1	HOV		24H	R184
				R15.021	20.69	0.800	313618	3	Mainline	MVDS (Radar)	No	R186
				R15.021	20.69	0.942	315898	1	HOV	MVDS (Radar)	24H	R186
<i>EB OFF TO HAZEL AVE (15.562)</i>												
US50-E	3	Sacramento		R15.8	21.47	0.531	313055	2	Mainline	Loop	No	TA-150
<i>EB ON FR HAZEL AVE (15.969)</i>												
US50-E	3	Sacramento		16.084	21.75	1.250	316271	4	Mainline	Loop	No	
				16.084	21.75	1.639	316280	1	HOV	Loop	24H	
<i>EB OFF TO AEROJET RD (16.084)</i>												
<i>EB OFF TO FOLSOM BL (16.729)</i>												

- The list of VDSs on a freeway-direction is found on our jumping off page described in the previous section: the [Facilities & Devices > Field Elements > Stations page](#). By default, the Postmile Range is set as the maximum range within the district. To narrow the search to a specific TCR segment being analyzed, enter the segment absolute postmiles into the Postmile Range fields.
- In the Station Types field, select only HOV and Mainline detection as these are the detector stations that will be used to calculate performance measures. However, if you have an interest in looking at ramp data or connector data, note that you can also determine where those types of detector stations are located by checking those boxes.
- Click View Table to refresh the report to show only the detection that meets the new parameters you entered.
- Which Day should you enter when running this report? This depends on the time range for which you want to extract data. Data from these automated detectors are brought into PeMS in real-time, so data will be available up to about five minutes ago. Therefore, you can use very recent data for your TCRs. You may want to begin by looking at this report with the Day = today's date. Since PeMS has data available for every day of the year, in many cases you may want to extract data from the past year or even multiple years (depending on if there are certain factors like economic trends or construction activities that will influence the time range in which

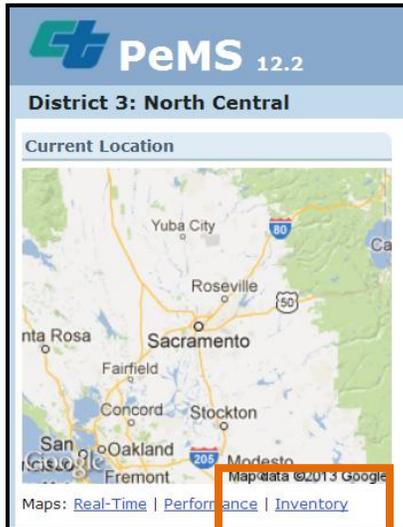
you want to analyze data). Therefore, you can also view the list of VDSs that were present at the beginning of the period for which you will be extracting data. In our example here, we chose June 1, 2011. If you notice a large difference in the number of VDSs present from your oldest date to today, you may want to select a few random dates in between, to get an idea of how and when VDSs were deployed over the period of your analysis. Remember, every time you change the Day, click on View Table to refresh the report.

### Viewing Vehicle Detector Stations on a Map

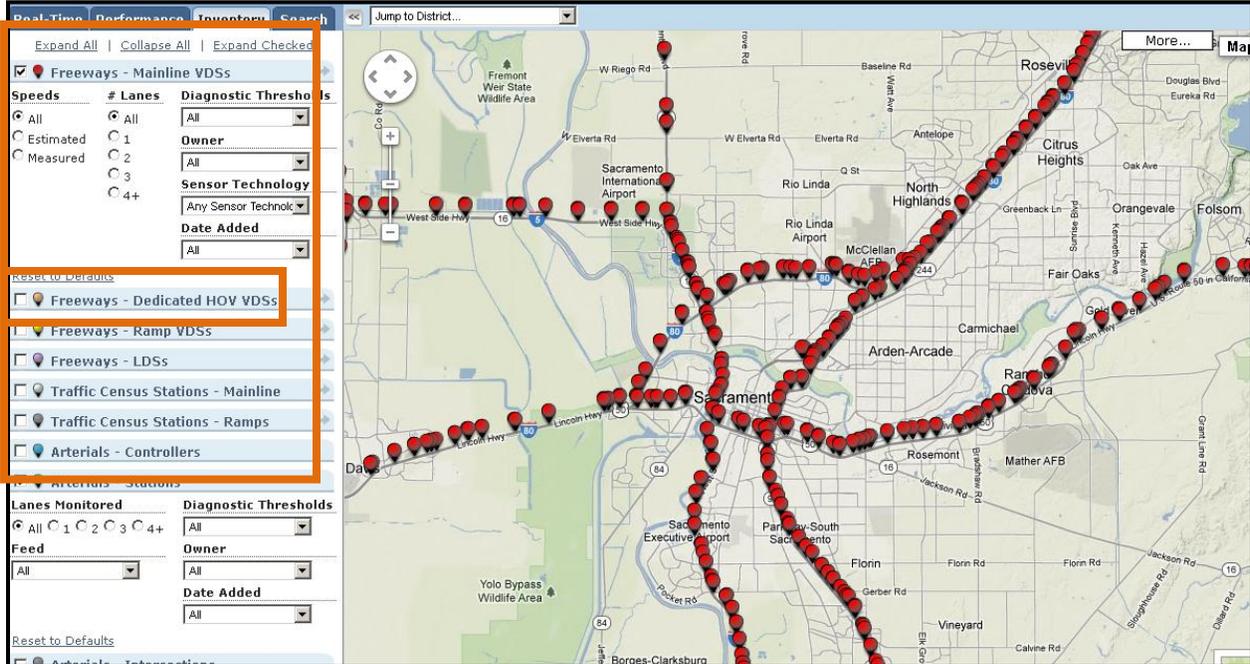
Another method for viewing detection is in the Inventory Map, which is a useful method for getting a quick idea of where different types of detection (mainline, HOV, ramps) are located spatially.

To arrive at the Inventory Map page:

- From the PeMS home page, use the Quick Links to go to the default page for your District
- From the District home page, click on the inventory link located underneath the map image on the upper left of the page to be taken to the Inventory Map centered on your district



This is the Inventory Map:



- Use the section on the left side of the Inventory Map page to select types of detection to display. Here only mainline detection is selected (the red icons). For TCR analysis, HOV detectors may also be considered and you can determine where HOV detection is located by turning on the HOV VDSs (orange icons).
- To navigate within the page to the area or segment being analyzed, use the standard Google methods for panning and zooming.
- Note that Traffic Census Stations can also be viewed on the Inventory Map, and choosing a Traffic Census station from the Inventory Map is a good starting point from which to evaluate Traffic Census volumes and AADTs.

Both the map and the list of VDSs are good tools for understanding what data are available in PeMS for your TCR. If you see that there is no detection on some of your TCR segments, you know right away that there will not be automated data available in those areas and you will need to rely on Traffic Census data or other data sources for your TCR. If you see there is detection present, you will know that you should continue using PeMS to analyze the data from those detectors.

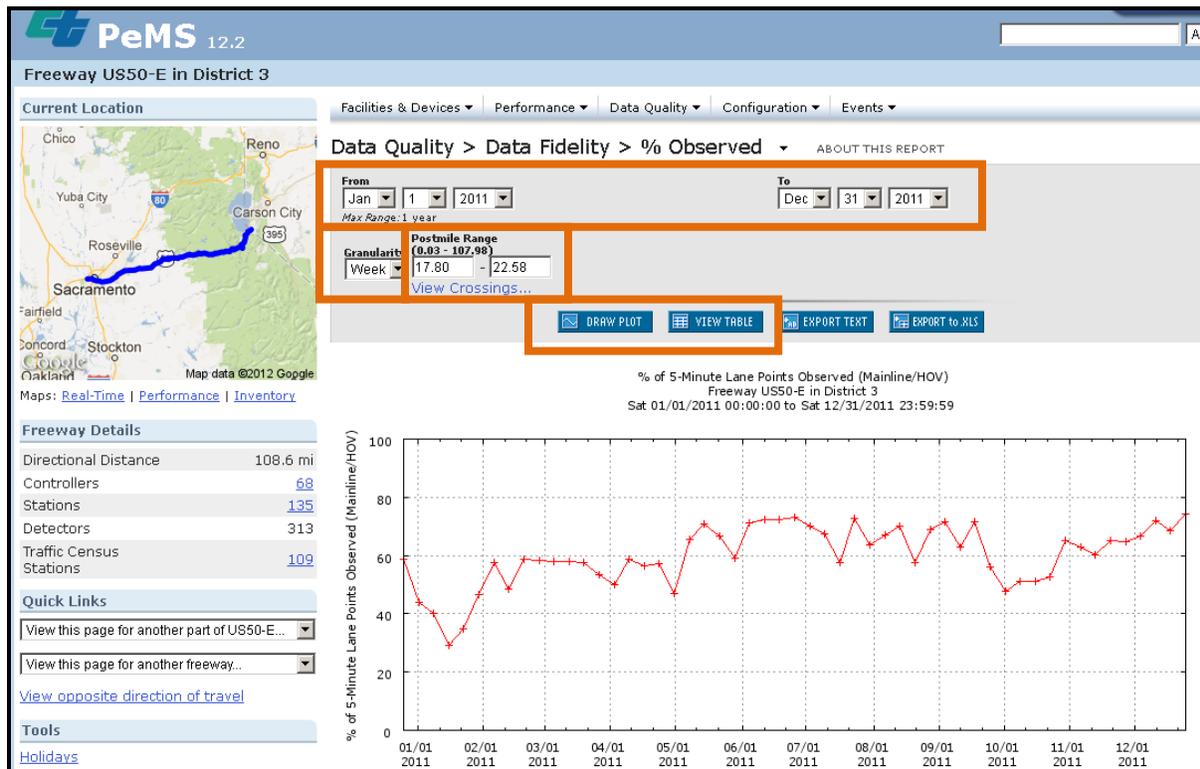
## Data Quality (% Observed)

It is important to analyze the quality of the detector data available on your TCR segments. PeMS runs diagnostics on all of the detector data it receives and calls the data either “good” or “bad.” For any data that are deemed “bad” (either no data are received or the values fall outside of reasonable expectations), PeMS removes that data and replaces them with estimated, or imputed data. When you see the % Observed value for a data report, it refers to the amount of good data – the data directly observed by the detectors. The remaining percentage is imputed. So, if the % Observed is 100, all of the data were deemed good and you are viewing only data directly from the detectors. If the % Observed is 0, all of the data were deemed bad and the data are all imputed.

Caltrans does not have a standard rule of thumb regarding what percentage of data needs to be “good” in order to use it. Certainly, anything over 90% is quite reliable. In the range of 60% - 90%, the data are probably still relatively accurate, but some additional scrutiny is a good idea. Below this level, your professional judgment as to the likely accuracy of the data is very important, and you may want to discard any data below 50% or 60% or some other threshold that you feel is reasonable. Because data are collected every day of the year from these real-time detectors, even if data quality is poor for a certain period of time, there could still be more good data than one would get from doing manual data collection or using Traffic Census data (although these are also valuable resources).

When analyzing data in PeMS, it is always important to think about if the values you are analyzing make logical sense and if they are close to what you expected, with your knowledge of the facility. If you see any data that are quite different from your expectations, please share your findings with Jane Berner (jane\_berner@dot.ca.gov), the PeMS Coordinator in HQ. She can help you investigate anomalies.

PeMS has a number of reporting tools for assessing data quality and we will review some of them here.



To arrive at this page:

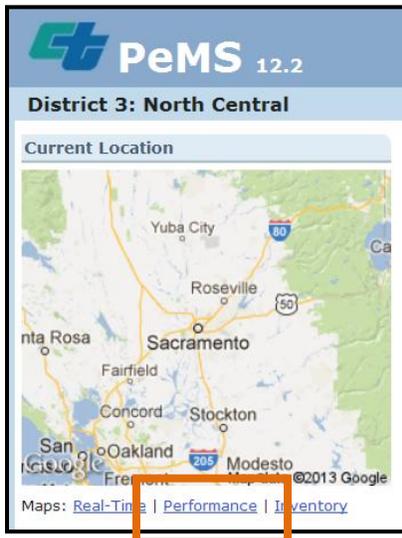
- [From the Facilities & Devices > Field Elements > Stations page](#) click on Data Quality > Data Fidelity > % Observed
- Change Granularity from Day to Week
- Enter a date range in the From and To Fields (maximum 1 year). Start by looking at the two most recent years (i.e., run the report for 2011 and then for 2012).
- Enter the absolute postmiles in the Postmile Range field
- Click on Draw Plot to view a graph of data quality or click View Table to view in table form.

This report gives you a quick picture of how well the detectors on your TCR segment have been functioning in recent years. You may see certain weeks/months where the % Observed was low (meaning that detector health was bad and PeMS had to impute, or estimate, a large percentage of data). Make note of those time periods. It will be wise to exclude them from your analysis.

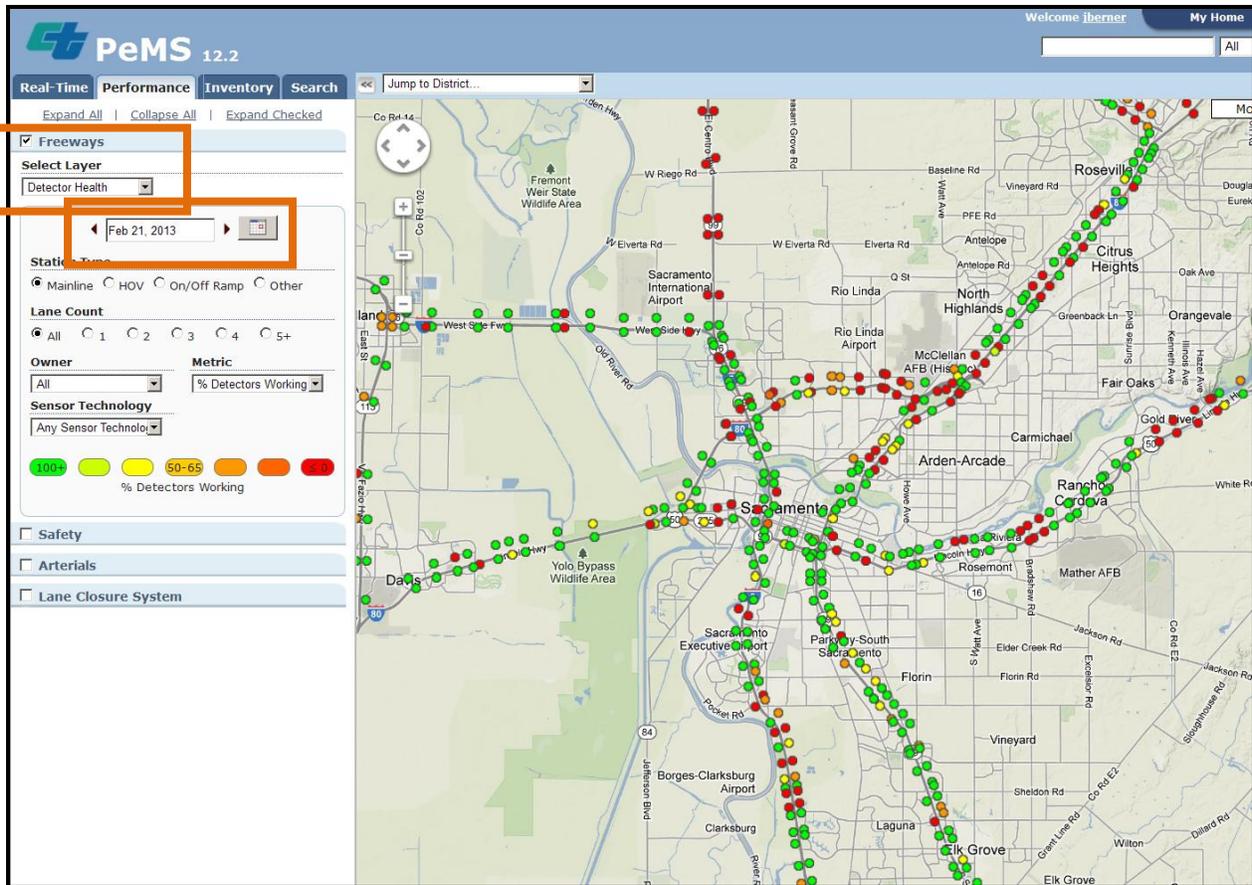
Another method for obtaining a quick picture of detector health is to use the Performance Map.

To arrive at the Performance Map page:

- From the PeMS home page, use the Quick Links to go to the default page for your District
- From the District home page, click on the Performance link located underneath the map image on the upper left of the page to be taken to the Performance Map centered on your district



This is the Performance Map:



Under Freeways, you can choose Detector Health from the Select Layer pull-down menu. This will color-code the VDSs in the map display according to their health. You can change the date on the report to view detector health at different points in time. Green means the detector health is good, red means it is bad, and yellow/orange mean some good data and some bad data are being received from the station.

# Annual Average Daily Traffic (AADT)

PeMS calculates Annual Average Daily Traffic (AADT) by freeway-direction and by station type (Mainline, HOV, etc.). The Caltrans Volumes Book is a commonly used resource for obtaining AADTs. PeMS can supplement the Volumes Book in that it can typically provide more recent AADTs than the Volumes Book. This is because the VDS data are available in real-time and PeMS calculates AADTs for the most recent 12 months at the end of every month.

Analyzing both the Volumes Book and PeMS will provide the richest picture of AADT. Note that the AADTs in the Volumes Book are presented for the whole freeway (both directions), while PeMS calculates AADTs one direction at a time. It is necessary to add the PeMS AADTs from both freeway-directions (and, if there is an HOV lane present, add that AADT as well) to get the value that can be compared to the Volumes Book.

**Performance > Planning Analysis > Spatial AADT**

Starting Month: Jan 2011 | Crossings: None | Station Type: Mainline | Postmile Range: 17.80 - 22.58

Abs PM	CA PM	VDS	Lanes	Arithmetic Mean	ASTM Std 1442	Conv. AASHTO	Prov. AASHTO	Sum of 24 Annual Avg Hours	Mod. ASTM Std	Mod. Conv. AASHTO	Me
18.07	12.4	314042	3	44,807				45,382	45,221		
19.17	R13.5	313631	3	55,247	55,458	55,458	55,608	55,527	55,458	55,458	
20.69	R15.021	313618	3	51,689				52,590			
21.47	R15.8	313055	2	33,337	33,444	33,444	33,620	33,618	33,444	33,444	

View opposite direction of travel

To arrive at this page:

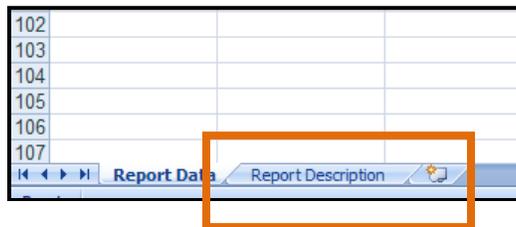
- Review the “Navigating in PeMS for TCR Performance Measures” section of this guide to learn how to get to the [Facilities & Devices > Field Elements > Stations page](#). From that page, select **Performance > Planning Analysis > Spatial AADT** from the pull-down tool bar.
- Enter the starting month to query one year of AADT data. In our example, we picked the Starting Month of Jan 2011, meaning that the results will be the AADT from Jan 2011 – December 2011. You may want to pick a few Starting Months (for instance, Jan 2011 to get the AADT for calendar year 2011 and Jan 2012 to get the AADT for calendar year 2012) to see how AADT has changed over time
- Enter absolute postmiles in the Postmile Range fields
- Click the blue “View Table” button to view AADT values in the segment. Note that PeMS calculates AADTs in a variety of ways, per AASHTO guidelines. Read the “About This Report”

information for details about each calculation. The Arithmetic Mean is the most straightforward calculation, but it is also one of the least stringent in terms of data quality. We recommend you compare the various values for each location and use your judgment as to the best value for your overall segment. You will also see that some of the fields are blank in this report. If a field is blank, the data from that VDS did not meet the data quality standards required for the particular calculation.

- Note that, any time to change the report parameters (e.g., the Starting Month, Station Type, or the Postmile Range), you must click “View Table” or “Draw Plot” to refresh the report data.
- Click on “View opposite direction of travel” on the left panel of the page to get AADT values for the same freeway segment in the opposite direction (*Tip: make sure your postmile range is still correct once you are on the opposite direction report*).
- Make the Station Type be HOV instead of Mainline to get the AADT for the HOV lane (if present)
- We recommend using the blue “Export to .XLS” button to download data you will use in your TCR’s.



- Downloading your data to Excel enables you to have the data on your desktop or a shared server without having to retrieve the data through the Internet again. We recommend creating an electronic file folder for all of the PeMS (and other) data you use in your TCR’s so that you can find it all in one place and have it for future reference.

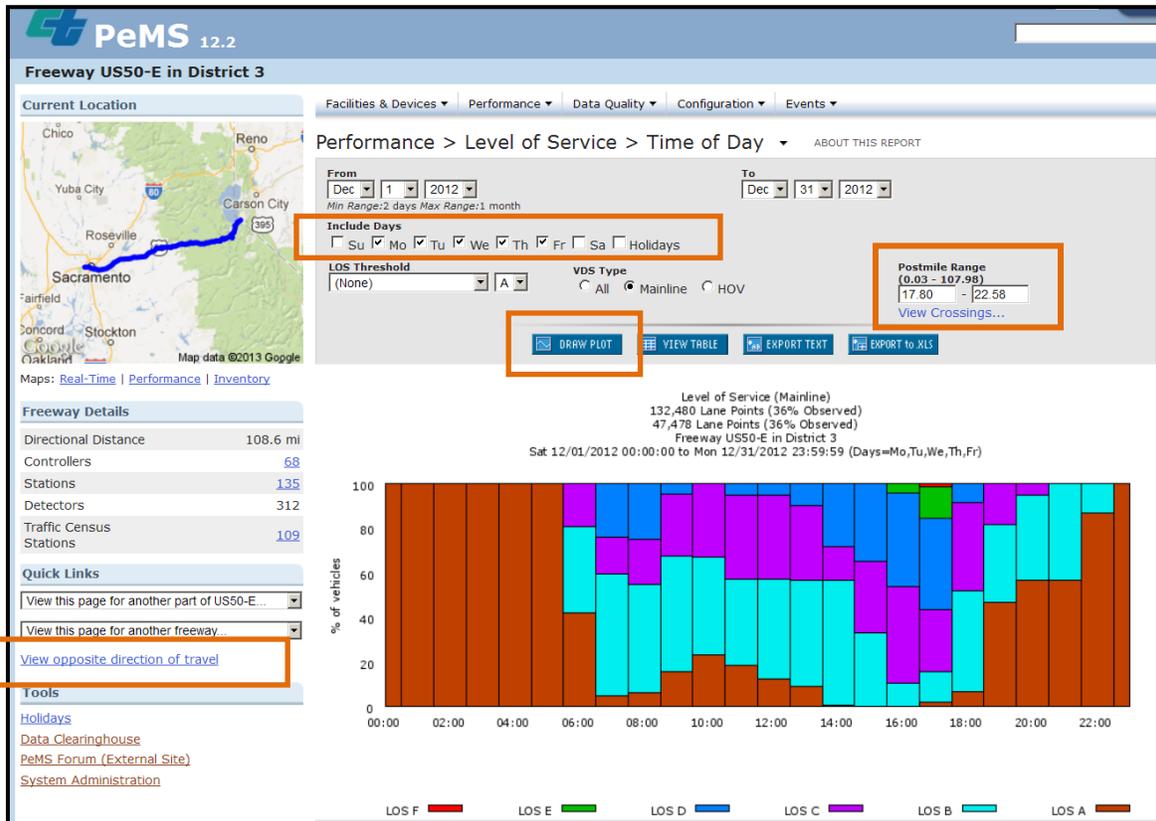


- You will find that downloading PeMS data to Excel can also help you remember how you obtained the data, should you find the data months or years later. PeMS downloads make two Excel worksheets, one with the actual Report Data, and one that says Report Description. The Report Description worksheet tells you about the report you ran in PeMS, what parameters you used, and provides a URL that will take you back to that report page.

PeMS Report Description		
Report	Level of Service>Time of Day	
Report link	<a href="http://pems.dot.ca.gov/?report_form=1&amp;dnode=Freeway&amp;content=los&amp;tab=los_tod&amp;fwy=50&amp;">http://pems.dot.ca.gov/?report_form=1&amp;dnode=Freeway&amp;content=los&amp;tab=los_tod&amp;fwy=50&amp;</a>	
Report generated	2/22/2013 17:09	
PeMS version	caltrans_pems-12.2.1	
Report Parameters		
Parameter	Value	
Data	132,480 Lane Points	
Data Quality	35.8% Observed	
Segment Type	Freeway	
Segment Name	US50-E	
Absolute PM Start		17.8
Absolute PM End		22.58
Start Date	12/1/2012 0:00	
End Date	12/31/2012 0:00	

## Level of Service (LOS)

PeMS calculates Level of Service (LOS) but please note that PeMS does not incorporate the corrections needed for heavy truck flow as specified in the Highway Capacity Manual. PeMS does not have the metadata about the freeway available to make those computations. PeMS does create a Level of Service–Time of Day Report that is useful in order to view a graphical representation of LOS along a particular TCR segment by hour of day. For this report, it is probably best to look at weekdays only (uncheck Sunday, Saturday, and Holidays) to get an idea of LOS on weekdays without having the weekend data influence the results.



To arrive at this page:

- [From the Facilities & Devices > Field Elements > Stations page](#) click **Performance > Level of Service > Time of Day**
- Enter From and To dates for the query. This report allows a maximum date range of one month. You might evaluate a few different months over the last year.
- Select the days of week to query in the Include Days section.
- Enter absolute postmiles in the Postmile Range field.
- Click Draw Plot. We can see that, in this example, in the peak afternoon hours of 4pm and 5pm, LOS D (dark blue) seems to be the most common LOS. To view the data behind this table and confirm the percentage of vehicles experiencing each LOS by hour, click View Table.
- You may view LOS for the Mainline (i.e., mixed flow lanes) and for the HOV lane separately or together (to view them together, choose VDS Type: All)
- Click “View opposite direction of travel” to view the same report for the same freeway in the opposite direction.

# Vehicle Miles Traveled (VMT)

**PeMS 12.2**  
Freeway US50-E in District 3

Performance > Aggregates > Time Series

From: Jan 1 2011 0 To: Dec 31 2011 23  
Max Range: 1 year

Time of Day: All (00:00 to 00:59)

Include Days:  Su  Mo  Tu  We  Th  Fr  Sa  Holidays

Quantity: Vehicle Miles Traveled (VMT)  
Granularity: Month  
Postmile Range: 0.03 - 107.98 (17.80 - 22.58)

Buttons: DRAW PLOT, VIEW TABLE, EXPORT TEXT, EXPORT TO XLS

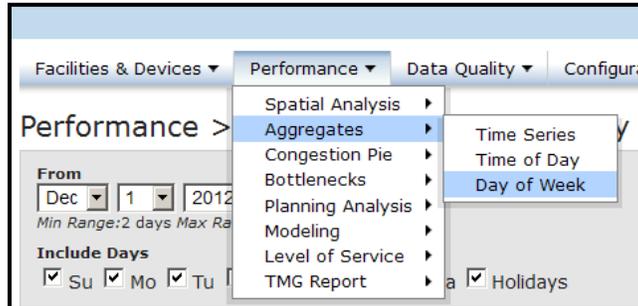
Month	VMT	Data Quality	
		# Lane Points	% Observed
01/01/2011	9,903,643.28	241,056	38.0
02/01/2011	9,170,525.67	217,728	54.0
03/01/2011	10,122,797.31	240,732	57.0
04/01/2011	9,974,841.20	233,280	55.0
05/01/2011	9,834,876.33	241,056	63.0
06/01/2011	9,730,928.34	233,280	70.0
07/01/2011	9,882,444.35	241,056	68.0
08/01/2011	8,663,497.79	241,056	64.0
09/01/2011	8,373,541.69	233,280	67.0
10/01/2011	8,819,924.16	241,056	51.0
11/01/2011	7,978,064.20	233,280	64.0
12/01/2011	8,482,452.77	241,056	70.0
<b>Total</b>	<b>110,937,537.09</b>	<b>2,837,916.00</b>	<b>60.1</b>

To arrive at this page:

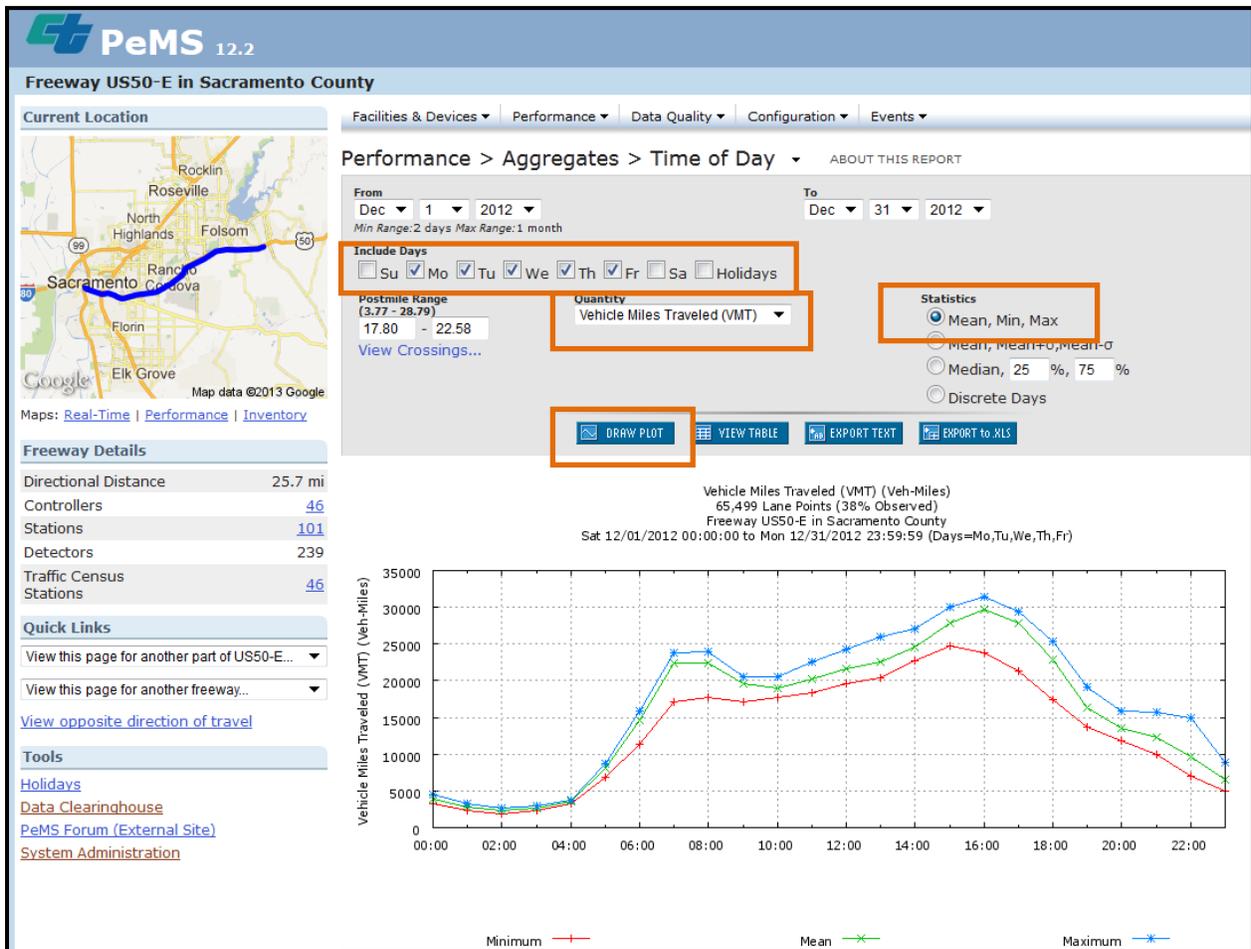
- From the [Facilities & Devices > Field Elements > Stations](#) page click **Performance > Aggregates > Time Series**
- Enter month in the Granularity drop down box (this report can also be run at a daily, hourly or weekly level). Daily, weekly and monthly reports can be run for a maximum of one year. Hourly reports can be run for a maximum of one month.
- Enter From and To dates for the data query. We will look at a full calendar year.
- Enter absolute postmiles in the Postmile Range fields
- Confirm the Quantity drop down is on Vehicle Miles Traveled (VMT)
- Click Draw Plot to see VMT graphically or View Table (shown) to view the data in tabular form. The table shows you the annual total VMT in addition to each month's value.
- Click Export to .XLS to download the data to Excel
- Click "View opposite direction of travel" to run the same report in the opposite direction.

## Peak Hour / Peak Period VMT

For Peak hour and Peak Period VMT, change the report to **Performance > Aggregates > Time of Day** by using the Performance pull-down menu.



This report enables you to evaluate minimum, average (mean), and maximum VMT by hour of day over a month. You may want to evaluate a few different months of year and review weekday versus all days of the week VMT.



# Daily Vehicle Hours of Delay (DVHD) at 35 and 60 mph

**Performance > Aggregates > Time Series**

From: Jan 1, 2011 0 To: Dec 31, 2011 23  
 Time of Day: All (00:00 to 00:59)  
 Include Days:  Su  Mo  Tu  We  Th  Fr  Sa  Holidays  
 Quantity: Delay (V\_t=35) Granularity: Day Postmile Range: (0.03 - 107.98) 17.80 - 22.58  
 Second Quantity: Delay (V\_t=60)  
 Buttons: DRAW PLOT, VIEW TABLE, EXPORT TEXT, EXPORT to XLS

Day	Delay (V_t=35)	Delay (V_t=60)	# Lane Points	% Observed
01/03/2011	0.00	29.60	7,776	38.0
01/04/2011	57.30	241.00	7,776	44.0
01/05/2011	19.40	174.20	7,776	44.0
01/06/2011	84.50	276.20	7,776	44.0
01/07/2011	0.20	57.70	7,776	44.0
01/10/2011	16.40	150.70	7,776	33.0
01/11/2011	1.20	45.80	7,776	44.0
01/12/2011	244.10	484.50	7,776	30.0
01/13/2011	34.30	123.70	7,776	44.0
01/14/2011	0.00	36.00	7,776	44.0
01/18/2011	14.20	88.80	7,776	29.0
01/19/2011	14.90	143.00	7,776	19.0
01/20/2011	0.00	81.60	7,776	15.0
01/21/2011	0.00	27.40	7,776	30.0

To arrive at this page:

- From the [Facilities & Devices > Field Elements > Stations page](#) click **Performance > Aggregates > Time Series**
- Enter Day in the Granularity drop down box. This report can also be run at an hourly, weekly, and monthly level. Daily, weekly, and monthly reports can be run for a maximum of one year. Hourly reports can be run for a maximum of one month.
- Enter From and To dates for the data query
- Enter absolute postmiles in the Postmile Range fields
- Select days to include in report. For this report, Weekends and Holidays are deselected.
- There are two Quantity drop down boxes. Select Delay (V\_t=35) and Delay (V\_t=60).
- Click Draw Plot to view data graphically or View Table.
- In order to calculate average daily vehicle hours of delay (DVHD), click the Export to .XLS button. An Excel spreadsheet will be produced that lists all the individual DVHD's over the selected date range. To find the average DVHD value for the facility, calculate the average of all of the values.

Day	Delay (V_t=35)	Delay (V_t=60)	# Lane Points	% Observed
241 12/15/2011	34.2	237.6	7776	74
242 12/16/2011	0	41.7	7776	74
243 12/19/2011	0.6	71.8	7776	74
244 12/20/2011	66.8	160.8	7776	64
245 12/21/2011	0	42.2	7776	59
246 12/22/2011	0	33.5	7776	59
247 12/23/2011	42.5	121.7	7776	74
248 12/27/2011	0	18.8	7776	74
249 12/28/2011	0	18.4	7776	74
250 12/29/2011	0	21	7776	74
251 12/30/2011	0	20.6	7776	74
<b>252</b>	<b>25.28</b>	<b>114.965</b>		

- Back in the PeMS webpage, Click "View opposite direction of travel" to analyze the opposite direction of the freeway.

# Bottlenecks

peMS 12.2

US50-E in District 3

Performance > Bottlenecks > Top Bottlenecks

From: Jan 1, 2011 To: Dec 31, 2011

Include Days:  Su  Mo  Tu  We  Th  Fr  Sa  Holidays

Number of Bottlenecks to Show: 50

Time Period:  AM  PM  Noon

Postmile Range (0.03 - 107.98): 17.80 - 22.58

VIEW TABLE EXPORT TEXT EXPORT to XLS

Location										Bottleneck Characteristics			
VDS	Name	Type	Shift	Fwy	Abs	CA	PM	Latitude	Longitude	# Days Active	Avg Extent (Miles)	Total Delay (veh-hrs)	Total Duration (mins)
315896	Pyrites Way	HV	PM	US50-E	19.170	R13.5		38.615211	-121.25363	1	0.8	9	35
315898	W. of Hazel	HV	PM	US50-E	20.691	R15.021		38.624844	-121.228324	1	0.9	3	25
316271	Aerojet Rd	ML	NOON	US50-E	21.754	16.084		38.633436	-121.21189	1	0.6	36	70
316280	Aerojet Rd	HV	NOON	US50-E	21.754	16.084		38.633436	-121.21189	1	0.9	37	85
316280	Aerojet Rd	HV	PM	US50-E	21.754	16.084		38.633436	-121.21189	3	0.9	35	100
313618	W. of Hazel	ML	PM	US50-E	20.691	R15.021		38.624844	-121.228324	9	0.8	521	405
314042	SB Sunrise Blvd.	ML	PM	US50-E	18.070	12.4		38.60825	-121.271899	19	0.7	360	510
315895	NB Sunrise Blvd.	HV	PM	US50-E	18.270	12.6		38.609583	-121.268647	2	1.9	143	245
316271	Aerojet Rd	ML	PM	US50-E	21.754	16.084		38.633436	-121.21189	64	1.5	4,621	2,185
313055	NB Hazel Ave.	ML	PM	US50-E	21.470	R15.8		38.631141	-121.216351	51	0.5	453	1,000
314036	NB Sunrise Blvd.	ML	PM	US50-E	18.270	12.6		38.609583	-121.268647	19	1.3	907	595
313631	Pyrites Way	ML	PM	US50-E	19.170	R13.5		38.615211	-121.25363	15	1.6	1,552	690

To arrive at this page:

- [From the Facilities & Devices > Field Elements > Stations page](#) click **Performance > Bottlenecks > Top Bottlenecks**
- Use the drop down menus to choose From and To dates. The maximum range for this report is one year.
- Select the days to include in the Include Days section. For this report, we recommend deselecting Weekends and Holidays.
- This report can be run for the AM peak, PM peak, or the middle of the day. For this example, all time periods are selected.
- Enter absolute postmiles in the Postmile Range field.
- Click View Table
- The Blue column headings under Bottleneck Characteristics can be sorted. We recommend sorting by the # Days Active to have the most frequently occurring bottleneck locations listed first.
- The “Avg. Extent (Miles)” column provides the average queue length of the bottleneck.
- Traffic Operations staff who prepare the [Mobility Performance Report](#) (MPR, formerly the HICOMP) do bottleneck analysis and do their analysis in the following way:
  - Run the report, as shown above, for one calendar year
  - Sort by # Days Active and download the data to Excel
  - Only consider bottlenecks active at least 20% of the time (or 50 days out of 250 weekdays during the year)
  - Only consider bottlenecks that are active at least 15 minutes on average, and result in at least 100 VHD on average.

- Note that the only information PeMS has for determining bottleneck locations is the locations of the detectors. It looks for large speed drops of at least 20 mph between two stations, with the lower speed being below 40 mph, to identify bottlenecks. But, the true starting point of the bottleneck might be between two detector stations. Therefore, sometimes PeMS will declare a bottleneck starting at one detector station, and other times it might declare the bottleneck starting at the next upstream or next downstream detector station. If you see bottlenecks on the list that are very close together (very similar postmiles), these might really be the same bottleneck. Use your local judgment to analyze the list and combine bottlenecks as appropriate. Also, notice that HOV stations appear on the list. These will typically have fewer active days than Mainline stations, but they demonstrate that sometimes bottlenecks result in congestion across all lanes, even the HOV lane. You may also want to analyze the HOV bottlenecks in relationship to their Mainline counterparts.
- Click View opposite direction of travel located under Quick Links at the bottom left of the page to analyze the opposite direction.

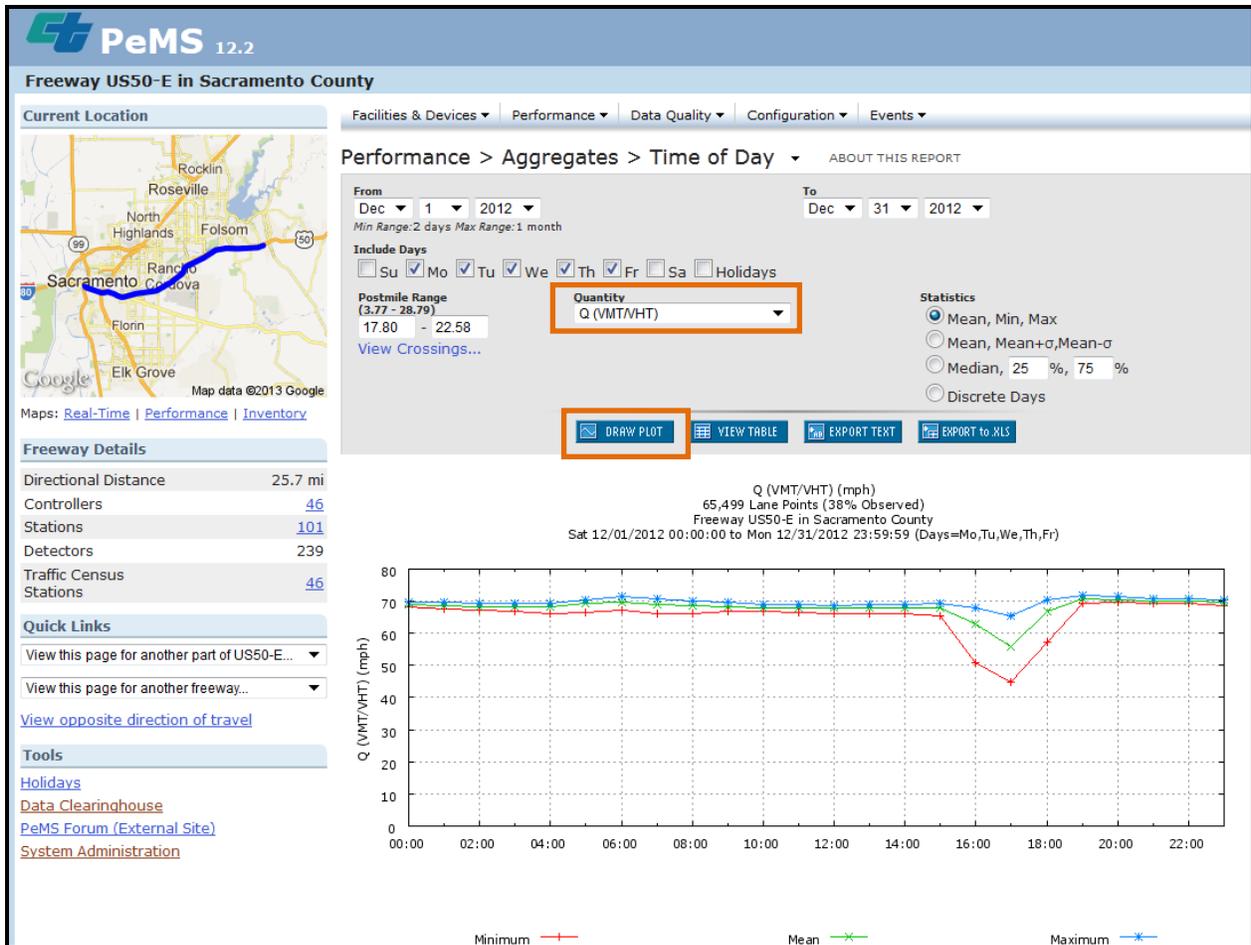
## Peak Hour/Peak Period

The PeMS software does not calculate the peak hour or peak period for freeway segments, but the flow and speed data found in PeMS can be analyzed so that you can estimate when the peak hour or peak period occurs.

There are a couple of PeMS reports that can help you in this analysis. To start, you may want to review the Performance > Aggregates > Time of Day report for your TCR segment.

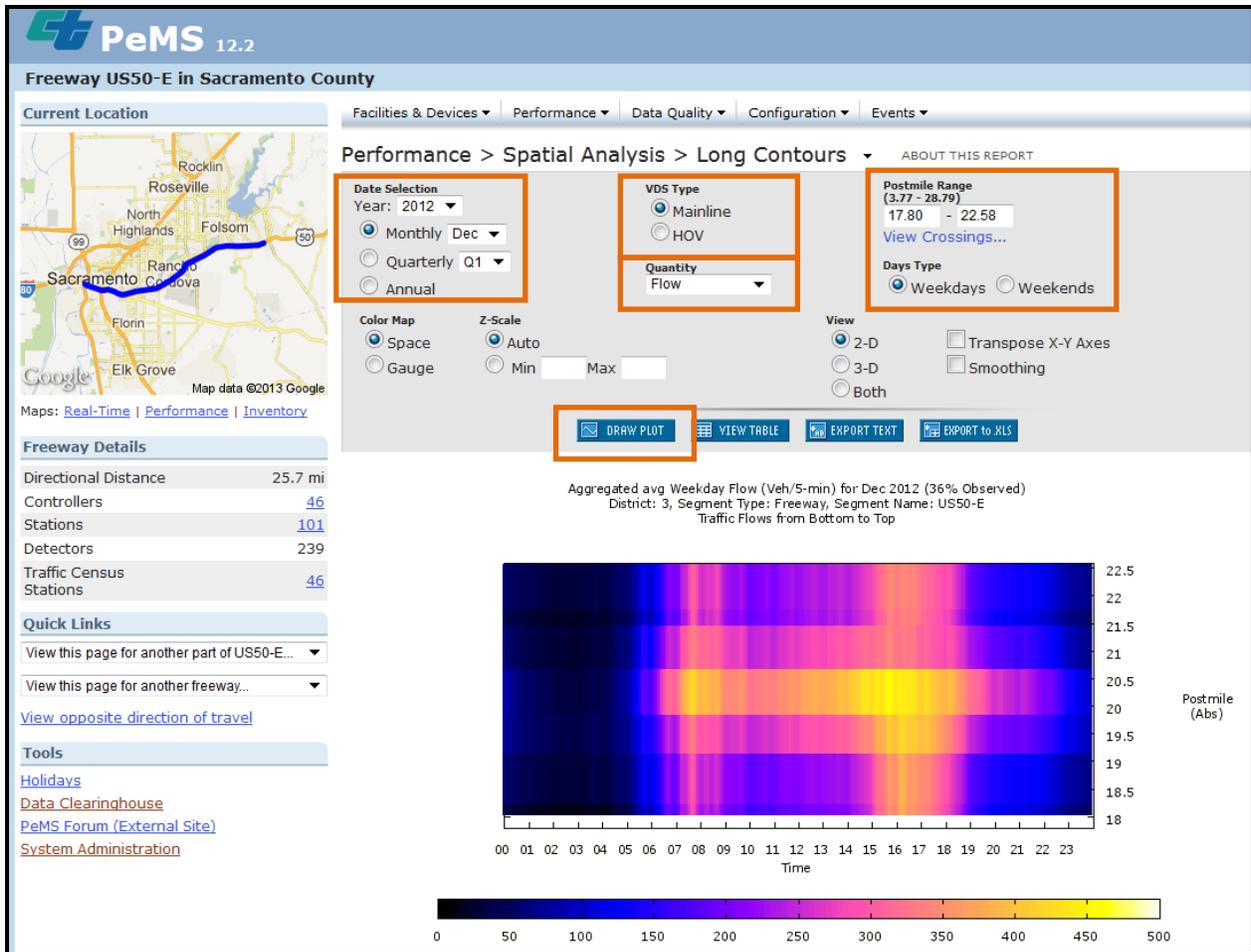
To arrive at this page:

- [From the Facilities & Devices > Field Elements > Stations page](#) click on **Performance > Aggregates > Time of Day**
- Select a date range of up to a month in duration to query.
- For the days of week to include in your analysis, you may want to look at weekdays only, or compare how weekdays only differs from all days of the week.
- Enter absolute postmiles in Postmile Range fields
- Under Quantity select VMT. Because this is a spatial aggregate report, flow is not a quantity that is available because the flow differs across each station. VMT is basically the spatial flow – it is the flow multiplied by the distance assigned to each station.
- Click Draw Plot or View Table.
- This is the same report we recommend for finding [peak hour/peak period VMT](#). By following this hyperlink, we see that for the month of December 2012, the peak hour in terms of VMT (flow) was, on average, the hour starting at 4 p.m. (16:00).
- Now, you can also run this report for the Quantity of Q (VMT/VHT). Q is what PeMS calls speed when it is spatially aggregated across stations. We recommend viewing speed data in addition to flow/VMT data because, as we know, when there is severe congestion, flow (or throughput) decreases per unit time because vehicles are traveling more slowly. However, this does not mean demand has fallen. On the contrary, demand is so high that it has caused the system to break down. Looking at speed can help reveal when the freeway is congested. Delay can also be viewed for this purpose.
- Click Draw Plot to refresh the plot and view what the average (as well as the minimum and maximum) Q was by hour over the time range we chose.



Looking at the plot of Q, we see that on average, speeds were lower during the 5 p.m. (17:00) hour on weekdays in December 2012. So, we can infer that demand is exceeding capacity at this time, resulting in congestion. Therefore, even though flow is peaking around 4 p.m., the truer peak hour in terms of demand is probably closer to 5 p.m. As usual, you may use the View opposite direction of travel link to generate the same report for your freeway segment in the other direction.

Another report that is useful for exploring the peak hour or peak period of your TCR segment is the Long Contours report. This provides a spatial context, instead of just an aggregated context, of flow and speed on your segment.

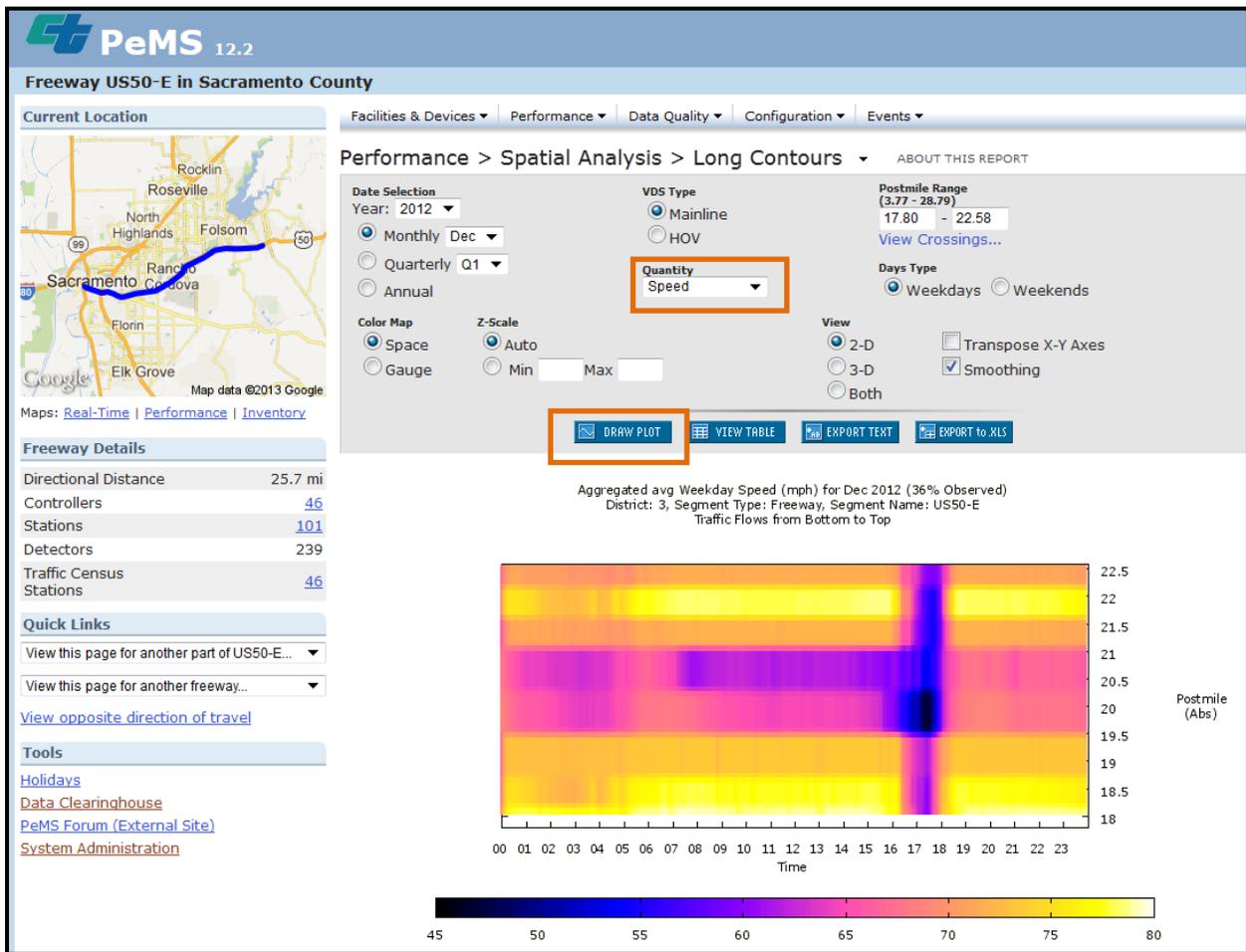


To arrive at this page:

- From the [Facilities & Devices > Field Elements > Stations page](#) click on **Performance > Spatial Analysis > Long Contours**
- Select the year and either month or quarter to query. This report is best run at a monthly or quarterly level.
- Select Mainline or HOV under VDS type
- Enter absolute postmiles in Postmile Range fields
- Under Quantity select Flow
- Under Days type select Weekdays
- Click Draw Plot. This provides a picture of flow by hour of day by postmile. We can see that flow still appears to peak around 4 p.m. (16:00), but now we also know that the highest flow values are seen in the vicinity of absolute postmile 20 on this segment.

Postmile (Abs)	Postmile (CA)	VDS	% Observed	00:00	00:05	00:10	00:15	00:20	00:25	00:30	00:35	00:40	00:45	00:50	00:55	01:00
22.571	16.901	318551	98.9	29	26	28	29	26	24	23	21	21	21	21	21	20
21.754	16.084	316271	74.8	49	46	47	48	46	44	43	42	42	37	37	37	38
21.47	R15.8	313055	99.7	20	20	21	21	20	18	18	17	17	14	13	14	14
20.691	R15.021	313618	99.6	31	32	31	31	30	27	27	26	26	23	20	21	20
19.87	R14.2	313912	0.0	61	62	61	60	59	58	57	58	57	53	52	52	52
19.17	R13.5	313631	99.7	26	29	24	23	23	22	20	22	20	15	14	14	16
18.27	12.6	314036	33.2	32	34	34	32	31	31	29	29	27	26	25	26	26
18.07	12.4	314042	99.7	26	27	27	25	26	25	22	24	20	19	17	18	18

- For the same report, click View Table.
- A table with values in five-minute increments is displayed. Move the slider bar at the bottom of the screen to the right to view the full 24 hours. The values are the arithmetic average of the selected quantity over the selected month or quarter or year. This example shows average Flow values. Low flows are in red and higher flows are in green.
- Click Export to .XLS to download to an Excel spreadsheet for data processing.
- This report can also be run for Speed and Delay at 35 mph and/or 60 mph by changing the search in the Quantity drop down field. Here we have changed the Quantity to Speed. Similar to the Performance > Aggregates > Time of Day report, this shows speeds falling around the 5 p.m. (17:00) hour. You may also want to download this report to Excel so that you can view the actual speed values by five-minute period in more detail.



- Click View opposite direction of travel located under Quick Links at the bottom left of the page to analyze the opposite direction.

Special note: the Long Contours report is one of the most data intensive reports in PeMS. Sometimes the report can time out when you run it. If you ever get a time out error message, try running the same report again by clicking Draw Plot or View Table again. PeMS will remember the query and continue running it from where it left off. It may take a couple of tries but the report should ultimately generate.

## AADT and LOS for Managed Lanes

Facilities & Devices ▾ Performance ▾ Data Quality ▾ Configuration ▾ Events ▾

Performance > Planning Analysis > Spatial AADT ▾ ABOUT THIS REPORT

Starting Month: Jan 2011  
 Crossings: None  
 Station Type:  HOV (highlighted)  
 Mainline  Fwy-Fwy  
 Coll/Dist  On Ramp  Off Ramp  
 Postmile Range (0.03 - 107.98): 17.80 - 22.58  
[View Crossings...](#)

Abs PM	CA PM	VDS	Lanes	Arithmetic Mean	ASTM Std 1442	Conv. AASHTO	Prov. AASHTO	Sum of 24 Annual Avg Hours	Mod. ASTM Std	Mod. Conv. AASHTO
18.07	12.4	315894	1	2,933				2,870	2,816	
18.27	12.6	315895	1	3,073	3,153			3,026	3,153	
19.17	R13.5	315896	1	5,083	4,958			5,070	4,958	4,980
20.69	R15.021	315898	1	5,850				5,934		
21.75	16.084	316280	1	5,937	5,970		5,890	5,979	5,970	5,961

AADT and LOS for Managed Lanes can be obtained by referring to the previous sections on [Annual Average Daily Traffic \(AADT\)](#) and [Level of Service \(LOS\)](#). Simply change the Station Type selection from Mainline to HOV.

## VMT and DVHD at 30 and 60 mph for Managed Lanes

VMT and DVHD for Managed Lanes can only be obtained for a pre-defined route and not a user-defined freeway segment.

To start: Use the Quick Links to select a District. From the District homepage click on **Facilities & Devices > Managed Facilities > Listing**.

The screenshot displays the District 3: North Central dashboard. On the left, there is a map of the Sacramento area and a 'Freeway Details' table. The 'Quick Links' section at the bottom left is highlighted with an orange box, showing a dropdown menu with the option 'View this page for another district...'. The main navigation bar at the top includes 'Dashboard', 'Facilities & Devices', 'Performance', 'Data Quality', and 'Events'. The 'Facilities & Devices' dropdown menu is open, showing options like 'Freeways', 'Routes', 'Corridors', 'Managed Facilities', 'Field Elements', 'Arterials', and 'FSP Beats'. The 'Managed Facilities' sub-menu is also open, listing 'Dashboard', 'Facility Comparison', 'Facility Segment Comparison', 'Aggregates', 'Time Series', 'Travel Times', and 'Listing'. A line chart titled 'Status Ch' shows 'Delay (veh-hrs)' on the y-axis (0k to 60k) and days of the week on the x-axis. It compares 'Last Year' (green), 'Last Week' (blue), and 'This Week' (red). Below the chart is a 'Travel Time Reliability' gauge showing a needle pointing to approximately 80% for the 5-10 AM period. An 'Announcements' section on the right mentions 'PeMS 12.2' released on October 18, 2010.

From the Facilities & Devices > Managed Facilities > Listing page, click on the route to analyze.

**District 3: North Central**

Current Location: [Dashboard](#) | [Facilities & Devices](#) | [Performance](#) | [Data Quality](#) | [Events](#)

**Facilities & Devices > Managed Facilities > Listing** ABOUT THIS REPORT

[Export to Xls](#) | [View on Map](#) | [All Facilities](#)

**Lane-Miles**

District	Open	Construction	Proposed	Total
D3 - North Central	64.1	11.2	135.7	211.0

Freeway Details

Directional Distance: 3,004.4 mi  
 Controllers: 584  
 Stations: 1,178  
 Detectors: 2,616  
 Traffic Census Stations: 1,452

Quick Links

- View this page for another district...
- View this page for county...
- Jump to default page for city...
- Jump to default page for freeway...

Featured Sections

- [Mobility Performance Report](#)
- [Detector Health](#)
- [CHP Incidents](#)
- [Lane Closure System](#)
- [Corridors](#)

**All D3 Facilities**

Facility	Dist	State	Fwy-Dir	From	To	Description
D03: 1-5	3	Proposed	15-N	SAC	SAC	Elk Grove Blvd to Q St
				9.7	22.6	
				SAC	SAC	Q St to Garden Highway
				22.6	25.3	
				SAC	SAC	Garden Highway to I-80
				25.3	26.7	
				SAC	SAC	I-80 to Airport Blvd
				26.7	32.7	
				SAC	SAC	Airport Blvd to I-80
				32.7	26.7	
				SAC	SAC	I-80 to Garden Highway
				26.7	25.3	
				SAC	SAC	Garden Highway to Q St
				25.3	22.6	
				SAC	SAC	Q St to Elk Grove Blvd
				22.6	9.7	
				SAC	SAC	Jct SR-99 to Watt Avenue
				2.5	5.3	
				SAC	SAC	Watt Ave to Sunrise Blvd
				5.1	12.5	
				SAC	SAC	Sunrise Blvd to Prairie City Rd to El Dorado Hills Blvd/Latrobe Rd
				12.5	0.8	
				SAC	SAC	El Dorado Hills Blvd/Latrobe Rd to Bass Lake
				0.8		

From the Summary > Dashboard page, click **Performance > Aggregates**, which brings up the Performance > Aggregates > Time Series Sum page.

Caltrans PeMS > Managed Facility D03: US50 > Performance > Aggregates > Time Series Sum - Mozilla Firefox

pe.ms.dot.ca.gov/?report\_form=1&dnode=mfac&content=loops&export=&mfid=30008&time\_id=1293840000&s\_nm=1&s\_dd=1&s\_yy=2011&e\_time\_id=1325375999&e\_nm=

Welcome kshart630 My Home Help Logout

**Managed Facility D03: US50**

Current Location: [Summary](#) | [Field Elements](#) | [Performance](#) | [Data Quality](#) | [Events](#)

**Performance > Aggregates > Time Series Sum** ABOUT THIS REPORT

From: Jan 1 2011 To: Dec 31 2011  
 Max Range: 10 years

Include Days:  Su  Mo  Tu  We  Th  Fr  Sa  Holidays

Route: D03: US50 Eastbound (Primary) Lane Type: HOV/HOT Time Period: Total Quantity: Delay (V\_t=35) Granularity: Day

Lane Type: HOV/HOT Time Period: Total Quantity: Delay (V\_t=60)

DRAW PLOT VIEW TABLE EXPORT TEXT EXPORT TO XLS

Day	HOV/HOT Total	
	Delay (V_t=35)	Delay (V_t=60)
01/03/2011	0	11
01/04/2011	10	39
01/05/2011	6	42
01/06/2011	54	130
01/07/2011	132	200
01/10/2011	14	68
01/11/2011	6	33
01/12/2011	67	121
01/13/2011	13	46
01/14/2011	59	96
01/18/2011	16	57
01/19/2011	25	91
01/20/2011	8	57
01/21/2011	0	13
01/24/2011	0	6
01/25/2011	14	52
01/26/2011	2	23
01/27/2011	1	33
01/28/2011	15	61
01/31/2011	3	28
02/01/2011	34	88
02/02/2011	3	29
02/03/2011	0	12

From the Performance > Aggregates > Time Series Sum page:

- Enter the From and To dates
- Under Granularity, select Day
- Select the Include Days. Here weekends and holidays were deselected
- Under Lane Type select HOV/HOT
- Under Time Period select Total. AM peak hour/peak period or PM peak hour/peak period can also be selected.
- Use the Quantity drop down boxes to analyze either VMT or Delay. The default is VMT, but for this example the Delay (V\_t=35) and Delay (V\_t=60) are selected. When analyzing VMT, only one dropdown box is needed.
- Click on View Table and/or Export to .XLS for data processing
- View and analyze the opposite direction by clicking in the Route dropdown box and selecting the opposite direction. In PeMS, Eastbound and Northbound are Primary directions. Westbound and Southbound are Secondary directions. For managed lanes, the Primary and Secondary facilities are broken down into segments, also called associated routes. To understand the locations of these segments, click on Summary > Route Listing and search for the associated routes and see if there are any that match well to your TCR segments.

The screenshot shows the PeMS 12.2 interface for Managed Facility D03: US50. The 'Route Listing' dropdown menu is open, showing options: Summary, Dashboard, Configuration, Route Listing, and List of Routes. The 'Route Listing' option is selected. Below the dropdown, the 'Keyword(s)' field is set to 'Associated', and the 'Type' is set to 'All'. The 'Roadway' dropdown is set to 'Freeway'. The table below displays the following data:

Dist	Name	Start	End	Roadway	Length (Miles)	HOV (Miles)	# Stations
D3	D03: US50 Eastbound - Segment 1	Abs PM 18.17	Abs PM 21.981	Freeway	3.8	3.8	11
D3	D03: US50 Eastbound - Segment 2	Abs PM 21.982	Abs PM 25.793	Freeway	3.8		8
D3	D03: US50 Eastbound - Segment 3	Abs PM 25.794	Abs PM 29.606	Freeway	3.8	3.8	14
D3	D03: US50 Westbound - Segment 1	Abs PM 29.606	Abs PM 25.795	Freeway	3.8	3.8	14
D3	D03: US50 Westbound - Segment 2	Abs PM 25.794	Abs PM 21.983	Freeway	3.8		8
D3	D03: US50 Westbound - Segment 3	Abs PM 21.982	Abs PM 18.17	Freeway	3.8	3.8	13

Note that, if you do not find the managed facility routes or segments (associated routes) to be of use, you can also try analyzing an individual HOV VDS to represent conditions on the HOV lane in a particular TCR segment. To do this, visit the [Inventory Map](#) and select the HOV VDS you want to analyze. Click on its icon in the map to pull up the VDS pop-up window. Click on the Aggregates link to be taken to the **Performance > Aggregates > Time Series** report. Here, you can view VMT and Delay for the particular station over a date range of your choice and you could apply the appropriate length multiplier (by comparing the length of your segment to the length of this VDS, which is found on its Change Log page) to extrapolate the results to the full TCR segment.

# Reliability

Performance measures for travel time reliability cannot be obtained by the standard method of entering absolute postmiles into a PeMS report. Reliability can be obtained by one of two methods: Either searching for a route previously created by a PeMS user that corresponds with the TCR segment being analyzed, or by creating a route in PeMS using intersections that correspond closely with the TCR segment.

**To search for a route previously created by a PeMS user:**

From the PeMS homepage select a District from the pull-down menu under Quick Links. From the District homepage select **Facilities & Devices > Routes > Listing**.

Dist	Name	Start	End	Roadway	Length (Miles)	HOV (Miles)	# Stat
D3	CAL EMA Region IV 5S	5-S/Colusa County Hwy P9	5-S/Sullivan /State Hwy 140	Freeway	141.0		
D3	CMIA D3 50E El Dorado Co.	50-E/Latrobe Rd	50-E/Carson /Eight Mile Rd	Freeway	24.4		
D3	CMIA D3 50E Sacramento Co.	50-E/2nd/P St	50-E/Bidwell /Scott Rd	Freeway	23.0	8.7	

From the Facilities & Devices > Routes > Listing page search for an existing route either by the search boxes or by scrolling to the bottom of the page and searching through pages.

Dist	Name	Start	End	Roadway	Length (Miles)	HOV (Miles)	# Stat
D3	D03: SR-99/SR-51 Southbound - Segment 1	Abs PM 298.745	Abs PM 294.612	Freeway	4.1		4.1
D3	D03: SR-99/SR-51 Southbound - Segment 2	Abs PM 294.613	Abs PM 290.479	Freeway	4.1		
D3	D03: SR-99/SR-51 Southbound - Segment 3	S of Elk Grove Blvd	Mack Road	Freeway	4.1		4.1
D3	D03: US50 Eastbound	Sunrise Blvd	Prairie City Road	Freeway	11.4		11.4
D3	D03: US50 Eastbound - Segment 1	Abs PM 18.17	Abs PM 21.981	Freeway	3.8		3.8
D3	D03: US50 Eastbound - Segment 2	Abs PM 21.982	Abs PM 25.793	Freeway	3.8		
D3	D03: US50 Eastbound - Segment 3	Abs PM 25.794	Abs PM 29.606	Freeway	3.8		3.8
D3	D03: US50 Westbound	El Dorado Hills Blvd/Latrobe Rd	Prairie City Road	Freeway	11.4		11.4
D3	D03: US50 Westbound - Segment 1	Abs PM 29.606	Abs PM 25.795	Freeway	3.8		3.8
D3	D03: US50 Westbound - Segment 2	Abs PM 25.794	Abs PM 21.982	Freeway	3.8		
D3	D03: US50 Westbound - Segment 3	Abs PM 21.982	Abs PM 18.17	Freeway	3.8		3.8
D3	From Downtown	50-E/X St	50-E/Watt Ave	Freeway	6.0		

For this example, District 3 US 50 TCR segment 6 is Sunrise Blvd to Folsom Blvd with absolute postmiles 17.80 to 22.58. Page 5 shows a previously created route using approximately the same postmiles. The same section is analyzed in the opposite direction so this may be considered sufficient. The decision to use a previously created route is at the discretion of District staff. After clicking on the route, the Summary > Configuration page will appear. From the Summary > Configuration page, click on

**Performance > Travel Time > Time of Day**, then [click here](#) for the steps to query Reliability Performance Measures.

### Creating a New Route

If there are no previously created routes sufficient for the segment being analyzed, a new route can be created. However, it should be noted that when creating a new route, data will only be available from the date the route was created and forward. **No data prior to the route creation date are available.**

**To create a new route:**

- From the PeMS home page, click on **Facilities & Devices > Routes > Create.**
- Select a district from the pull-down menu and click next
- Select a freeway direction and click next
- Use the on-ramp pull-down menu to select a starting intersection for the segment and click next
- Use the off-ramp pull-down menu to select an ending intersection for the segment and click next.
- PeMS will show a map with the newly created route outlined and give the option to choose a previously created overlapping route to use. Click on the overlapping route or name the newly created route, enter a keyword, click the share box (optional but recommended, especially if you want co-workers to be able to view the route you create), and click save.

**Freeway Details**

Directional Distance	<a href="#">30,571.4 mi</a>
Controllers	<a href="#">6,997</a>
Stations	<a href="#">14,646</a>
Detectors	<a href="#">37,042</a>
Traffic Census Stations	<a href="#">16,527</a>

**Quick Links**

- Jump to default page for district...
- Jump to default page for county...
- Jump to default page for city...
- Jump to default page for freeway...

**Featured Sections**

- [Mobility Performance Report](#)
- [Detector Health](#)
- [CHP Incidents](#)
- [Lane Closure System](#)
- [Corridors](#)
- [Photolog Viewer](#)

**There are routes in the system that overlap part of the route you are about to make. Please consider using one of these instead. They already have some amount of historical data that can be accessed immediately. The top overlapping routes are listed below.**

- CMIA D3 50E Yolo Co. (.5 mile overlap) (Map)
- D03 Davis-Sacramento (.5 mile overlap) (Map)
- Corridor: 21: US-50 - Primary (.5 mile overlap) (Map)
- CS 29 - US50 I80 to I5 (.5 mile overlap) (Map)

**Route Creation**

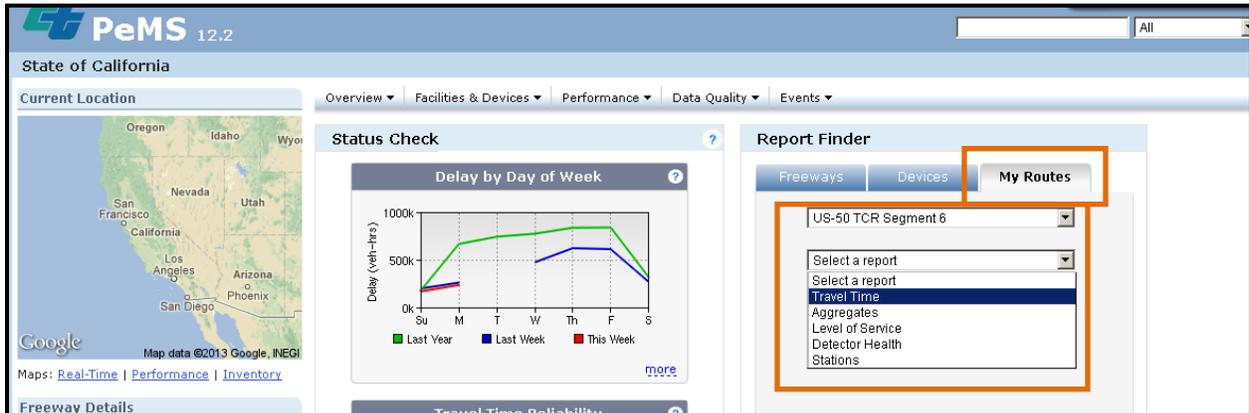
Name:

Keyword(s):

(Enter keywords that describe this route. Separate different keywords phrases with a comma.)

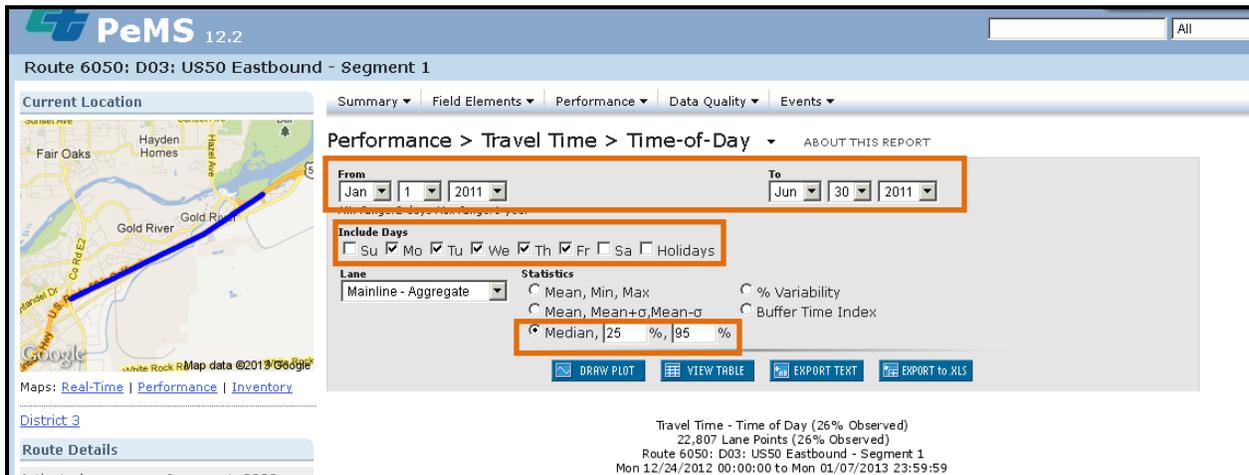
Share

To view the newly created route: From the PeMS home page under Report Finder, click My Routes, use the pull-down menu to select the route created, and the report drop-down menu to select the Travel Time report. **As mentioned previously, no data are available prior to the route creation date, so a predetermined time period, weeks or months per District discretion, should elapse before using reports for newly created routes.**



### Calculating Reliability in terms of the Buffer Time Index

From the Performance > Travel Time > Time Series page, click **Performance > Travel Time > Time of Day**.



The Performance > Travel Time > Time of Day page is the page from which to run reports for Travel Time Reliability performance measures, whether using existing routes or newly created routes. All the reliability reports can be run for up to one year. Below are instructions for calculating reliability based on the Buffer Time Index, which is calculated as:

$$[(95^{\text{th}} \text{ Percentile Travel Time} - \text{Median Travel Time}) / \text{Median Travel Time}] \times 100\%$$

- From the Performance > Travel Time > Time of Day page, select a date range from the From and To drop down menus
- Under Include Days, in this example, weekends and holidays are deselected
- Under Statistics, Median is selected and one of the % fields should be changed to 95%.

- Click View Table or Draw Plot (the plot is useful for looking at travel time patterns over the course of the day, but the table is more useful for making actual calculations).

Route 6050: D03: US50 Eastbound - Segment 1

Performance > Travel Time > Time-of-Day

From: Jan 1 2011 To: Jun 30 2011

Include Days:  Su  Mo  Tu  We  Th  Fr  Sa  Holidays

Lane: Mainline - Aggregate

Statistics:  Mean, Min, Max  % Variability  Mean, Mean+σ, Mean-σ  Buffer Time Index  Median, 25%, 95%

Time	Data Quality				
	25th	Median	95th	# Lane Pts	% Observed
00:00	3.4	3.48	3.5	2,898	49.0
00:05	3.4	3.47	3.5	2,898	49.0
00:10	3.4	3.45	3.5	2,898	49.0
00:15	3.4	3.45	3.5	2,898	49.0
00:20	3.4	3.45	3.5	2,898	49.0
00:25	3.4	3.45	3.5	2,898	49.0
00:30	3.4	3.45	3.5	2,898	49.0

The report allows manual calculation of the Buffer Time Index by scrolling through the list to find the highest 95<sup>th</sup> percentile value in a 24 hour period. This example finds the highest value at 17:20 with a 95<sup>th</sup> percentile value of 6.4. To calculate the Buffer Time Index, subtract the median value in the third column from the 95<sup>th</sup> percentile value and then divide by the median. In this example:  $(6.4 - 4.17) \div 4.17 = 0.53$  (or, expressed as a percentage, 53%).

Time	Data Quality				
	25th	Median	95th	# Lane Pts	% Observed
16:45	3.7	3.78	4.5	2,151	43.0
16:50	3.7	3.80	4.9	2,158	43.0
16:55	3.7	3.82	5.0	2,163	44.0
17:00	3.7	3.82	5.2	2,174	44.0
17:05	3.7	3.85	5.3	2,174	44.0
17:10	3.7	3.90	5.5	2,183	44.0
17:15	3.7	4.03	6.0	2,202	44.0
17:20	3.8	4.17	6.4	2,217	44.0
17:25	3.8	4.28	6.3	2,231	44.0
17:30	3.8	4.27	6.3	2,234	44.0
17:35	3.8	4.20	6.2	2,232	45.0
17:40	3.8	4.12	5.9	2,232	44.0

The Reliability Performance Measures for the example TCR segment are:

Reliability %: 53  
 95<sup>th</sup> Percentile Travel Time: 6.4  
 Median Travel Time: 4.17

We recommend this method of determining the Buffer Time Index because it enables staff to analyze the 95<sup>th</sup> percentile and median travel times and make professional judgment about the appropriate time period at which to calculate the Buffer Time Index. However, note that this report can also be run by selecting Buffer Time Index from the Statistics options. With this selection, PeMS will calculate the Buffer Time Index for each five-minute period of the day. This can be useful for determining the least reliable five-minute period of the day (which can be at a different point in time than the peak 95<sup>th</sup> percentile value), but it is less useful if one wants to do a more thorough analysis of reliability during the peak periods by viewing the 95<sup>th</sup> percentile and median travel time during those hours.

Remember to analyze the opposite direction.

# Photolog Interface

The link to the Photolog viewer is located under Featured Sections on the left panel of the PeMS home page or any district home page. Users can view any freeway photolog by finding the desired freeway location on the map, with the car pointed in the direction of travel being analyzed. Doing this will trigger the photolog application for the location of the car on the map. The county and absolute postmiles can be viewed at the top of the photolog window and there are standard operating buttons at the bottom of the video window. The forward and reverse buttons move the video in 0.1 mile increments.

**PeMS Homepage Statewide Dashboard**

State of California

**Photolog Viewer link**

**Photolog location and date**

**Photolog play/pause, forward/reverse control**

**Click, drag, and place red car icon on any freeway, pointing car in desired direction**

**Select District to find desired freeway location**

**Districts**

**Click on arrow to expand/collapse photo**

**Click on arrow to expand/collapse roadway description**

PeMS 11.1

Photolog Viewer

Drag the car icon to a freeway location.

Use **←** and **→** in the Photolog pane to step in .01mi increments.

15-N - 56.51 (abs pm 502.00)  
04/14/2009

15-N - 6.71 (abs pm 502.00)

Lane Count	2
Road Width (ft)	24
Lane Width (ft)	12
Inner Shoulder Width (ft)	5
Inner Shoulder Treated Width (ft)	5
Outer Shoulder Width (ft)	10
Outer Shoulder Treated Width (ft)	10
Design Speed Limit (mph)	70
Functional Class	Principal Arterial W/ C/L
Inner Median Type	Separate Structure
Inner Median Width (ft)	84
Terrain	Flat
Population	Rural
Barrier	No Barriers
Surface	Concrete
Roadway Use	No Special Features