COMMUNITY DEVELOPMENT AGENCY
LONG RANGE PLANNING

2850 Fairlane Court, Placerville, CA 95667
Phone (530) 621-4650, Fax (530) 642-0508

METHODOLOGY USED TO CALCULATE LEVEL OF SERVICE FOR COUNTY ROADS AND STATE HIGHWAYS

Department: Community Development Agency | Contact: Claudia Wade

Date: September 19, 2016 | Phone#: (530) 621-5977

(Placerville, CA)–At the August 30, 2016 Board of Supervisors meeting, Item 32 discussed proposed interim guidelines for interpreting Measure E, a voter initiative passed on June 7, 2016. Also included in this item was a discussion of the methodology used for calculating level of service (LOS) for county roads and state highways. LOS is used in developing the County's Transportation Capital Improvement Program. County staff provided the Board with information on the County's Travel Demand Model and LOS which is attached to Legistar File No. 14-1054, Attachment 5B (TDM and LOS 8-30-16). This document was updated with data supplied by Caltrans in September 2016. The revised document is attached.

###

1. Travel Demand Model (TDM) Overview

TDMs are a series of mathematical equations that are used to forecast future trips (vehicular, transit, bicycle and pedestrian) on transportation facilities (e.g., roadways). TDMs provide an objective look at the transportation system, and help policy-makers, planners, engineers and other stakeholders make informed transportation investment decisions. TDMs are one of many tools used by El Dorado County (EDC) and others to generate information that helps inform the Board of Supervisors (Board) in the decision-making process.

TDMs estimate the future traffic volumes on roadways based on the projected future land use and roadway network. Land use is the type and quantity of development (e.g., single-family dwelling unit, office employment, students, etc.) in a specific geographical location. For residential land use, TDMs also incorporate socio-economic data, such as people per household, workers per household and the income classification. TDMs estimate the number of trips that will be generated from each land use and assigns those trips to the roadway network based on travel time.

Traffic modeling dates back to the 1950's. Since that time, TDMs have become sophisticated analytical tools used at all levels of government, by educational and research organizations, and by the private sector. Modern TDMs forecast future traffic volumes, which are used to:

- Show effects of road improvements (i.e., road widening, etc.), the addition of new roads, and intersection and interchange improvements on traffic patterns and overall transportation system performance.
- Show impacts of proposed land development projects.
- Estimate traffic patterns and impacts based on alternative land use plans.
- Provide inputs for micro-simulation analysis which can show individual vehicle movements at intersections and roadway segments.
- Provide inputs for California Environmental Quality Act (CEQA) analysis, such as air quality and noise impacts resulting from traffic.

The underlying assumptions for any TDM include:

- Models are a statistical estimation of human behavior that assumes:
    - Travel behavior in aggregate is predictable
    - Demographic forecasts are reasonable
    - Existing conditions are accurately reflected
    - External factors are known and under our control
    - As things change model will be updated
- TDMs do not take into account personal values, the political process, and other non-mathematical considerations.

TDMs are not static - they must be maintained, updated, and improved over time to maintain their usefulness and relevance as planning tools. For example, they must be routinely updated to incorporate new traffic volumes, roadway conditions (such as improvements and new facilities) and land uses. The TDM software itself is also regularly updated to improve performance and add additional features and capabilities.

El Dorado County's TDM

Background

On December 19, 2011, the Board received a TDM Needs Assessment that reviewed the prior TDM and highlighted areas where it could be improved. The Needs Assessment determined that an updated TDM was required because:

- The former TDM was originally created in 1998 and was becoming dated. The TDM software used was no longer available, and therefore software updates were no longer available.
- New software packages have many updated features, including the opportunity to more easily model modal split (e.g., public transit vs. vehicle vs. bicycle), Geographic Information Systems (GIS) capabilities, and thematic mapping. Thematic mapping takes advantage of GIS and can provide graphical representations of roadway volume forecasts, future housing densities, etc., which are useful for public information and illustrations.
- The former TDM had a 2025 planning horizon. A 2035 horizon is currently necessary to meet the need of a 20-Year CIP.
- Both County staff and the public voiced concern regarding the age of the former TDM baseline model and the need to update necessary data in several key areas of the County.

Project Initiation and Implementation

On January 24, 2012, the Board of Supervisors authorized the TDM update and a contract with Kimley-Horn and Associates, Inc. (KHA). As part of this contract, KHA was directed to decline traffic analysis contracts for land development projects in EDC in order to ensure there would be no conflict of interest in the development of the TDM.

Several meetings were held with Caltrans, the Sacramento Area Council of Governments (SACOG), and other groups, such as the engineering subcommittee of the Community and Economic Development Advisory Committee (CEDAC), to review the draft scope of work. Members of the public raised additional concerns related to the appropriate growth forecast scenarios. KHA's scope of work was amended on March 5, 2013 to include additional work regarding growth forecast scenarios.

KHA began developing the TDM in early 2012. The basic steps to update the TDM were as follows:

1. Collect 2010 land use and socio-economic data.
2. Update the roadway network to include changes through 2010.
3. Update the Traffic Analysis Zone (TAZ) boundaries (A TAZ is a geographical area in which land use is aggregated for input into the TDM. Each TAZ contains information related to land use, such as employment, population, socio-economic, and other data.)
4. Collect traffic count and transit ridership data.
5. Determine trip generation and trip distribution.
6. Develop the modal choice component (vehicular, bicycle, pedestrian, and transit) throughout EDC.
7. Model calibration and validation.
8. Development of future growth forecast scenarios.

As development of the TDM progressed, various updates were brought before the Board to get input during this process. From 2011-2014, approximately 12 presentations and regular updates were given to the Board of Supervisors at their scheduled public meetings, including requests for input and direction on major assumptions of the model. The Board provided input and direction on the roadway network, the TAZ boundaries, and the growth forecast scenarios (see Legistar numbers: 12-0475, six different meetings; 12-1578; 13-1218, five different meetings; 13-1219; 14-0245). Throughout the update process, information was also made available to the public via the County's TDM webpage. SACOG and Caltrans were involved

throughout the entire TDM update process, and provided comments during the major steps, including finalizing the 2010 baseline scenario, analyzing the roadway network, revising the TAZs, and determining the basic methodology used in the development of the forecast.

Before it was finalized, the model went through an extensive validation and calibration process. The process is intended to establish a reasonable level of confidence that the model can be used as a forecasting tool for the analysis of future conditions. Model validation is a measure of how closely the 2010 baseline model matches the 2010 traffic counts. Model calibration refers to the changes made to the model in order to improve the validation. The TDM was validated for all time periods (daily, peak hour, and peak period), all roadway classifications (e.g. freeways, arterials, collectors), and geographic screenlines (e.g. the County Line or north of US 50). The County's TDM meets or exceeds the validation criteria established by the Federal Highway Administration (FHWA), the California Transportation Commission (CTC), and Caltrans.

In April 2013, the County contracted with Kittelson & Associates, Inc. (Kittelson) to provide a peer review of the EDC's TDM. Kittelson does not perform developer-related traffic engineering within El Dorado County, and as such, was identified as the most neutral third party available to conduct an impartial peer review. The purpose of the peer review was to provide an independent expert review of model inputs, assumptions, methodology, and outputs to verify the model performs its intended function. County staff also provided comments on their documentation and coordinated with Kittelson and Kimley-Horn to address the comments and incorporate the necessary changes to the TDM.

Both SACOG and Caltrans also reviewed the model and provided comments that were incorporated into the TDM. As a result of close coordination with SACOG and Caltrans throughout the TDM update process, both agencies have provided letters concurring with the methodology used to develop EDC's TDM. The County received a letter from SACOG dated February 3, 2014 (Exhibit A), which states that they concur that the EDC TDM conforms to state-of-practice in subarea travel demand modeling, meets traffic assignment validations standards suggested by FHWA and Caltrans, and it is an appropriate tool for staff to analyze and forecast traffic for the County's long-range transportation planning. The County received an initial letter of concurrence from Caltrans on February 14, 2014 (see Exhibit B) and continued to work with Caltrans through the aforementioned meetings, email exchanges and letters to obtain the final concurrency letter dated September 22, 2014 (see Exhibit C).

In June 2015, Caltrans held a 3-day internal training on the software platform for the County's TDM and used the County's TDM as the example. County staff attended this training. Caltrans has also commented on a number of traffic studies completed using the County's TDM. The latest Caltrans comment letter was received on July 5, 2016 regarding the County's CIP and TIM Fee Update (Exhibit D). This letter states:

> "We agree with the traffic analysis methodology, traffic analysis assumptions, and associated analysis results for US 50 for the existing and future scenarios."

Exhibit E includes a chronological summary of key dates related to the development of the new TDM and supporting documentation.

2. Level of Service Methodology and the County's TDM

The section below describes the procedures and methodologies used to calculate Level of Service (LOS) for the County's intersections and freeways for existing conditions and future conditions. Additionally, it describes how the County's TDM is used in the process. The intent of the discussion is to explain the separate roles of the County's TDM and calculation of LOS. The TDM provides future volumes based on land use and projected growth. The volume information (existing and future) is only one of the inputs required to calculate LOS. Several factors (i.e. type of terrain, number of lanes, lane widths, etc.), as listed in Table 1, are required to calculate LOS.

Table 1 – LOS Calculations
Based on the Highway Capacity Manual 2010

	Intersections	Freeways
Input Data	• Peak hour volumes (for vehicles, bicycles, and pedestrians) • Traffic control • Peaking characteristics • Heavy vehicles • Traffic signal timings • Turn lanes and the length of each lane • Lane utilization • Pedestrian crossings • Driver characteristics • Special conditions (e.g. a Right-Turn on Red restriction) • Any other factor that could affect the flow or capacity of the intersection	• Traffic volumes (on-ramps, off-ramps, and mainline volumes) • Peaking characteristics • Number and type of lanes • Lane widths • Shoulder widths • Merge/diverge distance • Terrain • Free-flow speed • Heavy vehicles • Driver characteristics
LOS is based on:	Average Control Delay	Vehicle Density
LOS E is defined as:	• 55 – 80 sec/veh for signalized intersections • 35 – 50 sec/veh for unsignalized intersections	35 – 45 pc/mi/lane (basic segment)
Notes: sec/veh = seconds per vehicle of average control delay, pc/mi/ln = passenger cars per mile per lane		

Existing LOS Calculations

The County's TDM plays no role in calculating existing LOS. As specified by General Plan Policy TC-Xd, weekday peak hour LOS calculations use the procedures and methodologies specified in the latest edition of the Highway Capacity Manual (HCM) (Transportation Research Board, National Research Council). The latest edition of the HCM used for the update of the TDM is the HCM 2010. This is the state-of-the-practice methodology for LOS calculations. The HCM allows for planning-level analysis and operations-level analysis. Planning level analysis uses default values for many of the inputs. This analysis is most appropriate for planning studies or studies with a large number of study locations (i.e. county-wide).

Operational level analysis uses site-specific data for most of the inputs. This level of analysis is most appropriate for a project-specific impact study or to inform the design of a roadway improvement.

The HCM calls for different methodology for intersections and freeway segments. Each methodology is described in general below and summarized in Table 1.

Intersections
Traffic counts are collected by turning movement during the AM and PM peak periods, generally 6:00 – 9:00 AM and 4:00 – 7:00 PM. The County may add additional peak periods for projects near schools or other land uses that generate significant traffic during off-peak times. The HCM methodology is based on a variety of inputs, as listed in Table 1.

LOS for intersections is based on the average control delay. That is delay experienced as a result of a traffic signal or stop sign. The LOS categories (LOS A – LOS F) are defined by the HCM and based on drivers' expectations. Intersection LOS is based on the worst 15-minute period within the peak hour for a typical weekday condition. For example, if the average control delay at a signalized intersection is between 55 and 80 seconds, the intersection operates at LOS E. LOS is based on the average control delay, meaning some motorists experience less delay and some experience more. For unsignalized intersections, with stop signs only on the side street, the LOS is evaluated separately for each individual movement with delay and LOS reported for the critical (i.e., worst case) turning movement.

Freeway Segments
US Highway 50 is analyzed using the HCM methodology for freeway facilities. Traffic volumes are collected from the Caltrans Performance Measurement System (PeMS), which consists of sensors in the pavement that count each vehicle. Traffic volumes are collected for the peak periods, in order to identify the peak hour. LOS is defined separately for each direction, as well as for each location (i.e. the LOS near an off-ramp or on-ramp is calculated differently than the area between interchanges). The input data for freeway segments is listed in Table 1.

LOS for freeway facilities is based on the density of vehicles on that section, which is measured in passenger cars per mile per lane (pc/mi/ln). Heavy vehicles, such as trucks and RV's, are converted to "passenger car equivalents" for the purposes of calculating the density. For a basic freeway segment with a density of 35 – 45 pc/mi/lane operates at LOS E.

<u>Future LOS Calculations</u>
LOS calculations for future conditions follow the same methodology as existing conditions. Adjustments are made for inputs that will change in the future. For example, the Transportation Division regularly adjusts traffic signal timings based on traffic volumes. Therefore, we assume that the traffic signal timings for future conditions will be optimized based on the future volumes. The numbers of lanes, turn pocket lengths, traffic control, or other geometric features are updated based on the projects identified in the County's Capital Improvement Program (CIP).

Future traffic forecasts (volume estimates) are developed using the County's TDM, as described below.

<u>County's Travel Demand Model</u>
The TDM is a tool used to estimate future traffic volumes on County roadways. The TDM does <u>not</u> calculate LOS. The TDM is <u>not</u> used to calculate the existing LOS for any facility.

The TDM estimates the future traffic volumes on roadways based on the projected future land use and roadway network. The TDM estimates the number of trips that will be generated from each land use and assigns those trips to the roadway network based on travel time. The County uses the HCM methodology to calculate future LOS based on the traffic volumes estimated by the TDM.

Public Comment Regarding Directional Volumes

Public comment was received at the September 9, 2016 Board of Supervisors meeting claiming that the County uses an average of directional volumes to determine LOS. This is incorrect. This comment, as well as many other comments on the TDM, have been posed and responded to many times. As was stated at the podium at the September 2, 2015 Planning Commission meeting on the Targeted General Plan Amendment, volumes for two-lane roads are not averaged. The directional volumes are added together and used in the analysis. This is consistent with a planning level analysis for two-lane roadways, as stated in the HCM. For the operational level of analysis of two-lane roadways, LOS is calculated separately for each direction. The directional volumes are not averaged for either type of analysis.

The LOS for freeways (i.e. US Highway 50) is calculated directionally for both the planning level and operational level of analysis. The volumes on US Highway 50 are directional and are reported as such, and the LOS calculations are reported for each direction. The directional volumes are not averaged for either type of analysis.

3. Comparison of US Highway 50 Westbound LOS Results

The following summarizes the source data and assumptions used to calculate LOS for US Highway 50 at the El Dorado County/Sacramento County line. Caltrans' *Transportation Concept Report and Corridor System Management Plan, United States Route 50 (TCR/CSMP)*, dated June 2014, states that westbound Highway 50 currently operates at LOS F in the AM peak hour at the County Line. County staff disagrees with this conclusion. County staff has worked with Caltrans staff to identify and correct the errors in their analysis. This section documents Caltrans' incorrect assumptions and provides evidence of the actual LOS on Highway 50.

<u>Caltrans Transportation Concept Report and Corridor System Management Plan, United States Route 50</u>
Caltrans regularly produces a report regarding Highway 50 LOS. Caltrans' Highway 50 TCR/CSMP is generally used to prioritize state and federal funding for Caltrans transportation facilities. The report contains this disclaimer (emphasis added):

> Disclaimer: The information and data contained in this document are for planning purposes only and should not be relied upon for final design of any project. Any information in this Transportation Concept Report (TCR) and Corridor System Management Plan (CSMP) is subject to modification as conditions change and new information is obtained. Although planning information is dynamic and continually changing, the District 3 Office of System and Freight Planning makes every effort to ensure the accuracy and timeliness of the information contained in the TCR/CSMP. **The information in the TCR/CSMP does not constitute a standard, specification, or regulation, nor is it intended to address design policies and procedures.**

The TCR/CSMP shows Highway 50 from the Sacramento/El Dorado County line to El Dorado Hills Boulevard as LOS F under existing conditions. This conclusion is contrary to the County's findings and traffic counts collected through Caltrans' PeMS system. PeMS displays real-time traffic data collected from a series of over 39,000 individual detectors (inductive loops, magnetometers and radar) along the state's freeway system.

<u>Caltrans' LOS Determination</u>
On Friday, April 3, 2015, Caltrans staff provided the Highway Capacity Software (HCS) output (see Exhibit F, page 2) with the various inputs and assumptions used by Caltrans in the Highway 50 TCR/CSMP. The Caltrans analysis uses unsubstantiated traffic volumes and incorrectly assumes the peak direction of travel.

For the Highway 50 TCR/CSMP, Caltrans staff analyzed LOS based on the traffic volume contained in the Caltrans *Traffic Volumes on California State Highways* document, also known as the "Count Book". Caltrans' Count Book indicates that the peak hour two-way volume at the County line is **8,600 vehicles**. The Caltrans Count Book for this segment of Highway 50 has not changed in seven years; **the Count Book's volume number has remained at 8,600 vehicles from 2008-2014**, although observed traffic counts have fluctuated significantly over that time. The Count Book does not indicate which direction (eastbound or westbound) is the peak direction or which peak hour (AM or PM) is the peak hour. According to the data resources cited in the report's Appendix C, the base year used for the report was 2011.

Based on the table below, which the County received from Caltrans staff on April 3, 2015, Caltrans assumed that 65% of all traffic is travelling in the peak direction and approximately 1,000 vehicles are travelling in the High Occupancy Vehicle (HOV) lane. **According to these assumptions, the peak hour volume would be 4,590 vehicles** in the peak direction in the general purpose lanes.

Mode Description and Location	Peak Hour Volume[1]	D%[2]	HOV Flow Adjustment[3]	HCS Directional Input Volume[4]	T%[5]	T% Used[6]
Sacramento/El Dorado County Line to Latrobe Road	8,600	65%	-1000	4590	6.4%	4%

1 Source: 2011 Caltrans Traffic Volumes on California State Highways Book
2 Source: PeMS
3 HOV Volume deduction
4 PHV * D% - HOV Volume = Mixed Flow Volume
5 2011 Annual Average Daily Traffic on California State Highways Book
6 Peak Hour Truck % = Approx. 2/3 Daily T%

Caltrans staff had stated that they use the highest peak hour volume from the Count Book in the analysis for the TCR/CSMP. The traffic volume Caltrans used to calculate LOS on Highway 50 is approximately 50% higher than the single highest hourly volume observed by Caltrans' PeMS system in spring or fall of 2014, which was the most recent data available at the time (4,590 trips vs. 3,012 trips respectively). If Caltrans' analysis conducted for the TCR/CSMP is replicated precisely, only changing the volume to reflect observed traffic counts, this analysis would conclude that **Highway 50 operates at LOS C in the AM peak hour** (see discussion below for more detail).

Furthermore, Caltrans staff assumed that the peak hour is westbound in the morning. Therefore, their LOS analysis assumes only two general purpose lanes, resulting in LOS F (see Table 2 below). However, Caltrans PeMS data and subsequent count data indicates that the peak hour for this location is eastbound in the evening. The eastbound direction has three general purpose lanes. If Caltrans' analysis conducted for the TCR/CSMP is replicated precisely, only changing the peak direction and peak hour to eastbound in the evening, this section of **Highway 50 operates at LOS C in the PM peak hour** (see Table 2 below).

<u>County LOS Determination</u>

In a letter dated May 5, 2015, Caltrans supplied the Spring (March – May)/Fall (September – October) 2010 and 2012 peak hour volumes from PeMS for the westbound direction of the segment of U.S. Highway 50 between El Dorado Hills Blvd./Latrobe Road and the County line. In September 2016, Caltrans staff provided PeMS volumes from Spring 2015 for the same segment of US 50. Using the information provided, County staff ran the Highway Capacity Software (HCS) 2010 for the Basic Freeway Segment Operational Analysis with **inputs and assumptions identical to those used by Caltrans for the 2014 TCR/CSMP, changing only the volume input**. The results from the various volumes are summarized in the table below.

If Caltrans' analysis conducted for the TCR/CSMP is replicated precisely, only changing the volume to reflect observed traffic counts, this analysis would conclude that **Highway 50 operates at LOS C or D in 2010 and 2011 and LOS E in Spring 2015** (see Exhibit F for analysis details). The only scenario that leads to LOS F is using the volume derived from the Caltrans Count Book and the incorrect peak hour and direction assumptions. The Caltrans Count Book volume of 4,590 is substantially different from (i.e. 50% higher than) other volumes observed and calculated for this segment. Furthermore, the Count Book volume is less reliable because the Count Book does not specify the direction of travel or peak hour that this volume represents.

Table 2 - Results of Basic Freeway Segment LOS Operational Analysis U.S. Highway 50 Westbound - El Dorado Hills Blvd./Latrobe Road to County line					
Year	**Peak Hour Volume**	**Source[1]**	**Density**	**LOS**	**Notes**
2010	2,860	PeMS (March 2010)	23.7	C	(E. of Scott Road mainline Station 316993) Initial volumes used in RDEIR[2] (total of general purpose lanes and HOV lane volume)
2010	2,955	PeMS	24.7	D	Updated volume used in FEIR[3] based on Caltrans comment letter
Unknown	3,200	Unknown	27.4	D	Caltrans recommended volume for segment (Caltrans' May 5, 2015 letter)
2010	3,348	PeMS (4-15-10)	29.3	D	Caltrans supplied PeMS data (highest 2010 Spring/Fall volume)
2012	3,393	PeMS (5-15-12)	29.8	D	Caltrans supplied PeMS data (highest 2012 Spring/Fall volume)
2015	3,806	PeMS	36.0	E	Caltrans supplied PeMS data (Average 2015 Spring volume, E. of Scott Road mainline Station 316993)
2011	4,590	Caltrans 2011 Count Book	54.3	F	Caltrans volume used in various State Reports. Count Book does not specify direction or peak hour. Analysis **assumes westbound AM peak hour.**
2011	4,590	Caltrans 2011 Count Book	25.8	C	Caltrans volume used in various State Reports. Count Book does not specify direction or peak hour. Analysis **assumes eastbound PM peak hour.**

Notes: All calculations used the same peak hour factor, terrain type, % trucks, Driver Population factor, and flow rate as the Caltrans analysis.

[1] All PeMS data came from the "W. of Latrobe" Mainline Station 316653 for the general purpose lanes during the AM Peak Hour (7:00 AM – 7:59 AM), consistent with Caltrans methodology, unless otherwise noted.

[2] Recirculated Draft Environmental Impact Report (RDEIR) for the Targeted General Plan Amendment – Zoning Ordinance Update (TGPA-ZOU).

[3] Final Environmental Impact Report (FEIR) for the TGPA-ZOU.

Knowing that the volume input used for the TCR/CSMP is far higher than can be substantiated by observed traffic counts, and therefore resulting in conclusions that are overstated, the County cannot rely on the TCR/CSMP's LOS determinations for the Major Capital Improvement Program (CIP) and Traffic Impact Mitigation (TIM) Fee Program Update or to condition proposed projects. First, relying on information that is demonstrably inaccurate as the basis for the TIM Fee nexus study would significantly jeopardize the County's ability to establish a legally-justifiable nexus pursuant to Government Code 66000 (cited as the "Mitigation Fee Act"). If the TIM Fee program were built on the unfounded assumption that Highway 50 is at LOS F, additional road improvement projects (new auxiliary lanes and/or mixed flow lanes on Highway 50) would need to be included in the TIM Fee program. This would increase TIM Fee rates substantially without a clear nexus demonstrating the need for these improvements to accommodate new development.

Similarly, conditioning projects to mitigate a LOS F condition on Highway 50 that cannot be substantiated leaves the County vulnerable to claims of excessive mitigation requirements above what are allowed by law (i.e. that exceed “rough proportionality” and “nexus” doctrines).

EXHIBIT A

Sacramento Area
Council of
Governments

1415 L Street,
Suite 300
Sacramento, CA
95814

tel: 916.321.9000
fax: 916.321.9551
tdd: 916.321.9550
www.sacog.org

SACOG

February 3, 2014

Kimberly A. Kerr
Acting Community Development Agency Director
Community Development Agency
2850 Fairlane Court
Placerville, CA 95667

Dear Ms. Kerr:

This is in response to your letter of November 7, 2013 regarding the El Dorado County Travel Demand Model. We appreciated the collegial spirit in which your agency engaged with SACOG over the course of the EDCTDM development. SACOG's involvement over the course of the development has been: providing parcel-level base year and future year land use data; providing documentation, data files, and programs from SACOG's pre-2007 travel demand model, SACMET07; and periodic staff check-ins opportunities to review and comment on the project.

We understand that all of the base year data and other files provided by SACOG have been thoroughly reviewed and revised by your agency staff and your consultant for the project. The land use data was for all intents and purposes rebuilt entirely over the course of the project, and the future year land use data will be based on "achievable development" at "reasonably expected intensity" based on the County General Plan land use categories. Significant detail was added to the base year highway network and zone system, to allow for trip generation, distribution and assignment to be assessed for very small land areas. Also, the SACMET07 programs were revised to include a "5D's" post-processing adjustment, among other things.

We understand that the EDCTDM is intended primarily for County staff to analyze and forecast traffic for the County long-range transportation plan, the transportation improvement program, and other local studies. We appreciate that your agency understands that other travel demand models, such as SACOG's SACSIM regional travel demand model, are needed for planning studies and analyses which cover a larger area than the EDCTDM does, and that those models will be used for those studies and analyses instead of the EDCTDM. Good examples of such plans and studies are the Metropolitan Transportation Plan/Sustainable Community Strategy, and the emissions and air quality analysis which goes along with that. For all base year land use and network data for El Dorado County in SACOG models, we will continue to share and coordinate with your staff to ensure that the representation of the county in both models is consistent.

Auburn
Citrus Heights
Colfax
Davis
El Dorado County
Elk Grove
Folsom
Galt
Isleton
Lincoln
Live Oak
Loomis
Marysville
Placer County
Placerville
Rancho Cordova
Rocklin
Roseville
Sacramento
Sacramento County
Sutter County
West Sacramento
Wheatland
Winters
Woodland
Yolo County
Yuba City
Yuba County

EXHIBIT A

With all this in mind, we concur that:

- The EDCTDM conforms to state-of-practice in subarea travel demand modeling
- The EDCTDM model meets traffic assignment validation standards suggested by FHWA and Caltrans
- The EDCTDM is an appropriate tool for the County's intended purposes

This concurrence is based on the ongoing dialog we have had with County staff, and review of the published documentation.

We also firmly believe that all TDM's, including the EDCTDM, are not static, unchanging, fixed tools—they are not "set-it-and-forget-it" in any way. TDM's must be maintained, updated, and improved over time to remain useful and relevant planning tools. In that regard: One of the significant improvements of the current EDCTDM over the prior version was the inclusion of a "buffer area" to the west of El Dorado County, including Folsom and parts of Orangevale and Rancho Cordova. This buffer area allows for better modeling of the dynamic relationship between El Dorado County and areas outside the County. SACOG periodically updates both its base year and future year land use data, and hopes that those updates are incorporated into the buffer area over time. Additionally, because so much of the region is external to the EDCTDM, travel demands at the gateways (i.e. the edges of the model area) should be periodically updated, and we would like to be consulted when updates occur.

Sincerely

Mike McKeever
Chief Executive Officer

MM:BG:pm

S:/Projects 13-14/Long-RangeTranspoPlan/Ltr to Kimberly Kerr 2-3-14

DEPARTMENT OF TRANSPORTATION
DISTRICT 3
703 B STREET
MARYSVILLE, CA 95901
PHONE (530) 741-4233
FAX (530) 741-4245
TTY 711
www.dot.ca.gov/dist3

Flex your power!
Be energy efficient!

February 14, 2014

Kimberly A. Kerr, Acting Director
El Dorado County Community Development Agency
2850 Fairlane Court
Placerville, CA 95667-4197

Dear Ms. Kerr:

Thank you for the opportunity to review and comment on the El Dorado County (County) Travel Demand Model Update. Caltrans appreciates the cooperative relationship that El Dorado County has extended throughout the update process.

Over the past year, we have been involved closely in the review process of the draft base year model. The County incorporated several suggestions made by Caltrans staff that included adding a peer review process for independent validation of the model and adding a "buffer area" to the west to allow for more dynamic modeling between the County and other areas outside of their boundaries. At this point in the process, Caltrans concurs that the model validation and calibration largely follows the standards suggested by the Federal Highway Administration Calibration and Adjustment of System Planning Models (1990) and the 2010 California Regional Transportation Plan (RTP) Guidelines, with the exception of the vehicle miles traveled (VMT) calculations, as described below.

Per the RTP Guidelines, the County is considered to be in group "E" for travel model requirements. Most of the requirements for this grouping have been followed. Requirement 10 states that VMT shall be used as part of the calibration tools for the travel demand model. The Highway Performance Monitoring System or locally developed counts may be used to develop VMT. However, the VMT calibration is not documented in any of the technical memorandums, therefore, we are unable to determine if this requirement has been met. In addition, Caltrans encourages the County to pursue RTP Guideline recommendations to develop formal microeconomic land use model and a tour/activity-based travel model in future updates of this model.

Again, thank you for your continued coordination with Caltrans throughout this iterative process. We understand that the County will continue to improve the model and address the comments documented in this letter in future updates. In the meantime, we look forward to the opportunity to review the final draft base year model and documentation that incorporates our

EXHIBIT B

comments sent on February 5, 2014, as well as the final draft future year model. In the meantime, if you have any questions, please contact Susan Zanchi, Chief, Office of Travel Forecasting and Modeling at (530) 741-4199 or via email at susan.zanchi@dot.ca.gov.

Sincerely,

Jody Jones

JODY JONES
District Director

c: Dave Defanti, Assistant Director of Community Development Agency
Claudia Wade, CDA Long Range Planning Division
Natalie Porter, CDA Long Range Planning Division
Marlon Flournoy, Caltrans
Sharon Scherzinger, EDCTC
Bruce Griesenbeck, SACOG

DEPARTMENT OF TRANSPORTATION
DISTRICT 3
703 B STREET
MARYSVILLE, CA 95901
PHONE (530) 741-4337
FAX (530) 741-4245
TTY 711
www.dot.ca.gov/dist3

Serious drought.
Help save water!

September 22, 2014

Steve Pedretti, Director
El Dorado County Community Development Agency
2850 Fairlane Court
Placerville, CA 95667

Dear Mr. Pedretti:

Thank you for addressing our concerns regarding the El Dorado County Travel Demand Model (EDCTDM). With the recent modifications, the EDCTDM conforms to the state-of-practice in travel demand modeling; meets overall traffic assignment validation standards suggested by FHWA and Caltrans; and is an appropriate tool for the County's long range planning purposes.

While the EDCTDM as a whole is acceptable and meets industry standards, please keep in mind when used for future specific projects, a subarea validation will be necessary for approval of traffic impact studies. Additionally, some areas of the model may exceed validation standards and/or generate unexpected outputs, which will require further model improvements and post processing to achieve acceptable results.

If you have any questions, please contact Nicholas Deal, Chief, Office of Travel Forecasting and Modeling at (530) 741-5151 or via email at nicholas.deal@dot.ca.gov.

Sincerely,

for MARLON A. FLOURNOY
Deputy District Director
Planning & Local Assistance

c: Dave Defanti, Assistant Director of Community Development Agency
Claudia Wade, CDA Long Range Planning Division
Natalie Porter, CDA Long Range Planning Division
Amarjeet S. Benipal, District 3 Director, Caltrans
Sharon Scherzinger, EDCTC
Mike McKeever, SACOG

EXHIBIT D

DEPARTMENT OF TRANSPORTATION
DISTRICT 3 – SACRAMENTO AREA OFFICE
2379 GATEWAY OAKS DRIVE, STE 150 - MS 19
SACRAMENTO, CA 95833
PHONE (916) 274-0635
FAX (916) 263-1796
TTY 711
www.dot.ca.gov/dist3

Serious drought.
Help save water!

July 5, 2016

032016-ELD-0024
03-ELD-Various

Ms. Claudia Wade
County of El Dorado
Community Development Agency
Planning Services
2850 Fairlane Court
Placerville, CA 95667

Western Slope Capital Improvement Plan (CIP) and Traffic Impact Mitigation (TIM) Fee Program – Draft Environmental Impact Report (DEIR)

Dear Ms. Wade:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review for the project referenced above. Caltrans' new mission, vision, and goals signal a modernization of our approach to California's transportation system. We review this project for impacts to the State Highway System (SHS) in keeping with our mission, vision and goals for sustainability/livability economy, and safety/health. We provide these comments consistent with the state's smart mobility goals that support a vibrant economy, and build communities, not sprawl.

The proposed project includes the major five-year update of the CIP and TIM Fee Program. The CIP identifies and prioritizes future transportation investments that will be required to meet the County's existing and future transportation needs for the next twenty-years. The TIM Fee Program collects development fees to offset the costs of impacts to the transportation system created by new development. The TIM Fee update ensures that the TIM Fees are appropriate and reasonable based on current market conditions and costs of construction/investment. The project compasses the Western Slope of El Dorado County. The following comments are based on the DEIR.

Transportation and Circulation

The Transportation and Circulation section of the EIR relies heavily on the Memo 2-3 Caltrans previously reviewed and commented on.

EXHIBIT D

1. We understand that the Missouri Flat Master Circulation & Financing Plan Phase II (MC&FP II) is in progress and that it will address circulation issues in the area. However, the MC&FP II relies heavily on the Diamond Springs Parkway study, and we anticipate that is going to show the same results.
2. Subsequent analysis to Memo 2-3 has been completed (Diamond Springs Parkway Phase 1B, April 2016) for the Missouri Flat Interchange area. The analysis indicates that improvements will be needed at the interchange area to prevent ramp traffic from interfering with mainline traffic. These improvements should be incorporated into the CIP. The study also shows excessive southbound queuing north of Plaza Drive and Forni Road could have impacts on the operations of the interchange. These impacts should be addressed.
3. Are the proposed revisions to the General Plan (Table 2-2, page 2-11), to reduce some of the four-lane and six-lane future facilities shown on Table 2-4 (page 2-14) to major two-lane facilities? If so, have the traffic impacts been analyzed?
4. Please indicate the scope of improvements included in the United States Highway 50 (US 50)/Bass Lake Road Interchange Improvements – Phase 1 and Phase 2 project, (No. 58, Table 2-1, page 2-9) listed in the Proposed CIP Project List.
5. We would like to see the County find a method to preserve the ultimate footprint of the Bass Lake Road interchange, especially should the major development projects in the vicinity of the interchange be approved.

Travel Forecasting and Modeling

The use of a comparison between the previous model and current model outputs to eliminate potential projects, such as Missouri Flat Road Interchange, is not the most effective way to analyze future deficiencies.

We agree with the traffic analysis methodology, traffic analysis assumptions, and associated analysis results for US 50 for the existing and future scenarios.

Please provide our office with copies of any further actions regarding this project.

If you have any questions regarding these comments or require additional information, please contact Eileen Cunningham, Intergovernmental Review Coordinator, at (916) 274-0639 or eileen.cunningham@dot.ca.gov.

Sincerely,

ERIC FREDERICKS, Chief
Transportation Planning – South Branch

c: Scott Morgan, State Clearinghouse

Chronological summary of key dates related to the development of the new TDM.

- **October 27, 2011**

  Contract executed with Kimley-Horn and Associates, Inc. (KHA) for the Traffic Demand Model Needs Assessment

- **December 19, 2011**
  Draft Traffic Demand Model Needs Assessment presented to the Board. The assessment highlighted areas where the existing model could be improved. The final needs assessment was completed in January 2012.

- **January 24, 2012**
  Board authorized execution of a two-year contract with KHA to update the County's existing TDM with current traffic and population data, and the revised land use forecast.

- **April 16 and May 1, 2012**
  Board review and comment on the Traffic Model Update major assumptions to be used to establish Achievable Development, 2025 No-Project, and 2035 Project/No Project land use forecasts for use in updating the TDM as described in Kimley-Horn & Associates, Inc.'s Technical Memorandum #10: Land Use Assumptions.

- **June 26 and July 24, 2012**
  Board review and comment on the Roadway Network Map and Traffic Analysis Zone Map for use in updating the TDM.

- **June 27, 2012**
  Traffic Analysis Zone Design: An Overview presentation – presented to the Engineering Subcommittee for the County's Economic Development Advisory Committee (EDAC)/TIM Fee Working Group.

- **June 28, 2012**
  Public workshop on the TDM was held at 7:00 PM in the Planning Commission Hearing Room located at 2850 Fairlane Court, Building C, in Placerville. The workshop provided the public with an opportunity to learn what a TDM is and how it is an essential tool to help determine the county's future transportation infrastructure needs. The workshop was presented by county staff and KHA.

- **September 25, 2012**
  Board provided staff with direction on roadway parameters to be analyzed with the TDM.

- **March 5, 2013**
  Board authorized Amendment I to the contract with KHA, revising the scope of services to add Component 4 which includes Task 4.1 - Rural Area Land Use Forecast, Optional Task 4.2 - Land Use Forecast Revision and Model Analysis, Optional Task 4.3 - Meetings and Documentation, and Optional task 4.4 - Additional Presentations.

- **July 30, 2013**
  Board workshop to begin the preparation of the 2014 Capital Improvement Program (CIP) and the Board's preferred growth projection option for the CIP and TIM Fee Program updates. Growth projection used as part of the land use forecast for the TDM update.

- **October 22, 2013**
  Board authorized Amendment II to the contract with Kimley-Horn & Associates, revising the scope of services to add two additional tasks under Component 2 - Environmental Impact Analysis for

Targeted General Plan Amendment (TGPA) and Zoning Ordinance Update and adding one additional task under Component 4 - Rural Area Land Use and extending the term through July 31, 2014.

- **February 3, 2014**
  SACOG provided a letter to EDC concurring with the model methodology and validation results.
- **February 24, 2014**
  Board directed staff to provide the Board with cost and timeline estimates for three growth forecast scenarios with the same baseline assumption as the starting point for initiating the Major 5-Year CIP and TIM Fee Program updates.
- **March 18, 2014**
  Board authorized Amendment III to Agreement with Kimley-Horn and Associates, Inc., expanding the scope of work and extending the term to December 31, 2015.
- **April 8, 2014**
  Board approved Scenario 3 growth forecast as the starting point for initiating the Major 5-Year CIP and TIM Fee Program updates. The growth forecast is used as part of the land use forecast for the TDM update.
- **September 22, 2014**
  Caltrans provided a letter to EDC concurring with the model methodology and validation results.

Supporting Documents

Travel Demand Model Assumptions, Methodology, and Reports

- TDM 2012 Update - Model Documentation Final Report
- TDM 2012 Update - Land Use Final Report
- TDM 2012 Update - Final User's Manual
- KHA Tech Memo #1: Existing Land Use and Socio Economic Data & Tech Memo #6: Trip Generation and Distribution
- KHA Tech Memo #2: Model Sensitivity & Tech Memo #7: Mode Choice
- KHA Tech Memo #3: Revised Roadway Network
- KHA Tech Memo #4: TAZ Development and Considerations
- KHA Tech Memo #5: Traffic Count and Transit Ridership Data
- BAE Urban Economics Memo: 2035 Growth Projections
- KHA Tech Memo #8: Assignment and Model Validation/Calibration
- KHA Tech Memo #9: Software Automation and Administration
- KHA Tech Memo #10: Land Use Assumptions
- KHA Tech Memo A: Peak Hour Assignment

Other Related Documents

- Traffic Analysis Macro Micro Flow Chart
- Travel Demand Model Flowchart
- Traffic Demand Model Needs Assessment December 2011
- Kimley-Horn Traffic Demand Model Needs Assessment Contract Executed 10-27-2011
- KHA Contract Executed 2-29-2012
- KHA Contract Amendment I Executed 3-5-2013

EXHIBIT E

- KHA Contract Amendment II Executed 10-28-2013
- KHA Contract Amendment III Executed 3-18-2014
- 9-1-2015 Staff Memo to the Planning Commission
- TDM Workshop Presentation 2-24-2014
- Travel Demand Modeling Presentation Public Workshop 6-28-2012
- Traffic Analysis Zone Design Presentation EDAC Travel Demand Working Group 6-27-2012
- Executive Summary Draft TDM Results for 5-Year CIP Update 08-15-2013
- AAA Effective Speed Zoning, Why and How booklet
- Caltrans Transportation Concept Report and Corridor System Management Plan for US Route 50 - June 2014
- Caltrans Concurrence Letter 9-22-2014
- SACOG Concurrence Letter 2-3-2014

EXHIBIT F

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Jas
Agency or Company:	Caltrans
Date Performed:	3/11/2014
Analysis Time Period:	
Freeway/Direction:	US 50
From/To:	SEG 8R
Jurisdiction:	ED County
Analysis Year:	2012 Base
Description:	CSMP/TCR 50

Flow Inputs and Adjustments

Volume, V	4590	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	1221	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2588	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	2588	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	47.7	mi/h
Number of lanes, N	2	
Density, D	54.3	pc/mi/ln
Level of service, LOS	F	

EXHIBIT F

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	NKP
Agency or Company:	CDA
Date Performed:	4/16/2015
Analysis Time Period:	AM Peak Hr
Freeway/Direction:	US 50 WB
From/To:	EDH-Latrobe/Countyline
Jurisdiction:	EDC
Analysis Year:	2010
Description:	EDC 2010 General Purpose with HOV lanes

Yellow highlighting indicates input variables

Flow Inputs and Adjustments

Volume, V	2860	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	761	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1613	pc/h/ln

Blue highlighting indicates output values (calculated by HCS software)

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	1613	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	68.0	mi/h
Number of lanes, N	2	
Density, D	23.7	pc/mi/ln
Level of service, LOS	C	

EXHIBIT F

HCS 2010: Basic Freeway Segments Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	NKP
Agency or Company:	CDA
Date Performed:	4/16/2015
Analysis Time Period:	AM Peak Hr
Freeway/Direction:	US 50 WB
From/To:	EDH-Latrobe/Countyline
Jurisdiction:	EDC
Analysis Year:	2010

Description: EDC 2010 average between 30th and 200th highest hours

Flow Inputs and Adjustments

Volume, V	2955	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	786	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1666	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	1666	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	67.5	mi/h
Number of lanes, N	2	
Density, D	24.7	pc/mi/ln
Level of service, LOS	C	

EXHIBIT F

HCS 2010: Basic Freeway Segments Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	NKP
Agency or Company:	CDA
Date Performed:	6/12/2015
Analysis Time Period:	AM Peak Hr
Freeway/Direction:	US 50 WB
From/To:	EDH-Latrobe/Countyline
Jurisdiction:	EDC
Analysis Year:	
Description:	Caltrans recommended volume

Flow Inputs and Adjustments

Volume, V	3200	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	851	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1804	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	1804	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	65.8	mi/h
Number of lanes, N	2	
Density, D	27.4	pc/mi/ln
Level of service, LOS	D	

EXHIBIT F

HCS 2010: Basic Freeway Segments Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	NKP
Agency or Company:	CDA
Date Performed:	4/16/2015
Analysis Time Period:	AM Peak Hr
Freeway/Direction:	US 50 WB
From/To:	EDH-Latrobe/Countyline
Jurisdiction:	EDC
Analysis Year:	2010

Description: Caltrans Highest PeMS (Spring/Fall)

Flow Inputs and Adjustments

Volume, V	3348	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	890	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.980	
Driver population factor, fp	1.00	
Flow rate, vp	1816	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	1816	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	65.6	mi/h
Number of lanes, N	2	
Density, D	27.7	pc/mi/ln
Level of service, LOS	D	

EXHIBIT F

HCS 2010: Basic Freeway Segments Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	NKP
Agency or Company:	CDA
Date Performed:	4/13/2015
Analysis Time Period:	AM Peak Hr
Freeway/Direction:	US 50 WB
From/To:	EDH-Latrobe/Countyline
Jurisdiction:	EDC
Analysis Year:	2012

Description: Caltrans Highest PeMs (Spring/Fall 2012)

Flow Inputs and Adjustments

Volume, V	3393	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	902	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1913	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	1913	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	64.1	mi/h
Number of lanes, N	2	
Density, D	29.8	pc/mi/ln
Level of service, LOS	D	

EXHIBIT F

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	KAJ
Agency or Company:	CDA
Date Performed:	08/11/16
Analysis Time Period:	AM Peak Hr
Freeway/Direction:	US 50 WB
From/To:	EDH-Latrobe/Countyline
Jurisdiction:	EDC
Analysis Year:	2015

Description: Average of Spring 2015 PeMS data from VDS 316993

Flow Inputs and Adjustments

Volume, V	3806	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	1012	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2146	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	2146	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	59.6	mi/h
Number of lanes, N	2	
Density, D	36.0	pc/mi/ln
Level of service, LOS	E	

EXHIBIT F

HCS 2010: Basic Freeway Segments Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	NKP
Agency or Company:	CDA
Date Performed:	4/6/2015
Analysis Time Period:	
Freeway/Direction:	US 50
From/To:	EDH-Latrobe/Countyline
Jurisdiction:	EDC
Analysis Year:	2011
Description:	Caltrans info using EB number of lanes

Flow Inputs and Adjustments

Volume, V	4590	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	1221	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1725	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	1725	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	66.8	mi/h
Number of lanes, N	3	
Density, D	25.8	pc/mi/ln
Level of service, LOS	C	

EXHIBIT F

This analysis replicates Caltrans' original analysis precisely, including their volume number and assumed peak direction, using the HCS 2010 Release 6.5 (whereas Caltrans used Release 6.1). The results from the two Release versions are identical.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	NKP replicating Jas
Agency or Company:	CDA
Date Performed:	8/4/16
Analysis Time Period:	
Freeway/Direction:	US 50
From/To:	SEG 8R
Jurisdiction:	ED County
Analysis Year:	2012 Base
Description:	CSMP/TCR 50

Flow Inputs and Adjustments

Volume, V	4590	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	1221	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2588	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	2588	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	47.7	mi/h
Number of lanes, N	2	
Density, D	54.3	pc/mi/ln
Level of service, LOS	F	