DATE: June 10, 2011
TO: STA Board Workshop
FROM: Janet Adams, Deputy Executive Director/Director of Projects
RE: Implementation on I-80 Corridor – Express Lanes, Freeway Performance Initiative and Ramp Metering

---

Background:
The I-80 corridor is the back bone for moving people, goods and services through the San Francisco and Sacramento mega-region. I-80 is one of four California priority trade corridors. The I-80 corridor serves as the only direct freeway connection between these two metropolitan regions. The corridor also links the Bay Area with recreational destinations in the Sierra Nevada Mountains and points north via I-505 to I-5. I-80 functions as a transcontinental Interstate facility that is critical to regional and interregional traffic. As a result, I-80 is one of the most congested freeway facilities in the San Francisco and Sacramento mega-region. Addressing operational needs and improvements on the I-80 corridor is vital to commuting, freight and recreational traffic. This comprehensive approach includes integrating investments in goods movement, transit and throughput efficiency and traffic operations system technology.

STA, in partnership with its member agencies, the California Department of Transportation (Caltrans), and the Metropolitan Transportation Commission (MTC), has taken a multimodal approach to meeting current and future transportation demands on the I-80 corridor by integrating investments in the following:

- Goods Movement/Trade Corridor
- Express Lanes Network
- Traffic Operations System Technology
- Transit System
- Corridor Commute Options

This combination of related investments and coordinated planning is dependent on the success of the planning and implementation of each project and serves as a comprehensive I-80 corridor strategy for I-80 within Solano County. STA is currently implementing improvements to the *Goods Movement/Trade Corridor* through the following investments:

I-80/I-680/State Route (SR) 12 Interchange
The I-80/I-680/SR 12 Interchange project encompasses a four-mile section of freeway and highways containing nine separate interchanges. Traffic volumes are projected to grow by 2% per year to 2035, bringing the total daily volume passing through the corridor to 270,000 vehicles. A preferred alternative identified by the STA Board in 2010 would improve roadway geometrics on the mainline and interchanges. Construction will occur as funding is available, with the first construction package fully funded and expected to begin construction by 2012. In addition, the STA is seeking $40 million through savings from Proposition 1B to fund a second construction package. Funding for construction of subsequent packages is needed to complete the system vision for I-80 in Solano County.

Cordelia Truck Scales Relocation

The Cordelia Truck Scales, located along both eastbound and westbound I-80 at I-680 and State Route 12, were built in 1958 and are currently undersized and unable to accommodate existing demand. The Cordelia Truck Scales provide a facility for the California Highway Patrol (CHP) to screen trucks for safety inspections to ensure goods are moved safely through the state and nation. The scales significantly contribute to the congestion on I-80 due to the large number of trucks exiting and entering I-80 and the close proximity of the scales to both the Suisun Valley Road and I-680 interchanges. In 2008, the California Transportation Commission (CTC) allocated $49.8 million from the Proposition 1B Trade Corridor Improvement Funds to match Regional Measure 2 Bridge Toll funds to fully fund the eastbound truck scales upgrade and relocation, including implementation of traffic operations system technology. The eastbound scales will be relocated and expanded approximately one half-mile east of its present location. The relocation project is currently scheduled to begin construction this year. Relocation and upgrade of the existing westbound scales remains a priority planned future investment, is unfunded.

Another key element in this multimodal approach to meeting current and future transportation demands on the I-80 corridor is to implement an *Express Lanes Network*.

I-80 Express Lanes

An opportunity for innovative financing the buildout of this express lane system is to implement Express Lanes on I-80 to construct the remaining segments of the corridor's High Occupancy Vehicle (HOV) network. Potential revenue from the I-80 Express Lanes will assist in providing transit services and improvements to the corridor to maximize the efficiency in moving vehicles throughout the Bay Area and Sacramento mega-region. Attachment A is an Express Lanes overview.

In February 2009, the STA Board took the first step toward implementing the Express Lanes Network on I-80 by approving the concept of the Regional Network as well as identifying the priority segments for implementation on I-80. The first priority segment is the conversion of the existing HOV lanes to Express Lanes as well as the construction of new lanes from Air Base Parkway to I-505.

The purpose of the project is to provide:

- ✓ An option for travelers using the corridor to reduce travel time through payment;
- ✓ Reduce delays for all travelers in the corridor;
- ✓ Improve transit utilization by improving transit travel times in the corridor; and
- ✓ Provide a higher vehicle and passenger throughput.

In September 2010, the I-680 Express Lanes facility opened along the portion of the I-680 corridor that connects Alameda/Santa Clara counties. This facility is the first of many planned facilities in the Bay Area.

In addition, there are current and planned improvements along I-80 for to the *Traffic Operations System Technology* with the following investments through a Program called the Freeway Performance Initiative.

Freeway Performance Initiative

With opportunities for highway expansion limited due to environmental, financial and other factors, STA is supporting investments on I-80 that will squeeze more capacity out of the interstate. The program targets predictable congestion caused by the high volume of

commuters using the freeway during rush hours as well as non-recurrent congestion resulting from unanticipated incidents. The program will improve system efficiency through the deployment of system operations and management strategies. In Solano County, this Program will close key gaps in the freeway system's physical infrastructure for managing the system.

Operating the entire transportation network as a whole, rather than each system in isolation as is done now, is the next leap forward in achieving efficient use and management of our constrained infrastructure. Motorists will have access to traffic condition information before they start their trip, be presented with comparisons of time and cost between driving and taking transit, and get updated traffic condition information en route. When a major accident happens on the freeway, information on detour routes will be provided to motorists, and signals on city streets will be adjusted in real-time. In addition, streaming video from freeway cameras will allow emergency responders to deploy assistance to the scene more quickly.

Key Elements of the Freeway Performance Initiative:
Traffic Operations System (TOS)
To help detect slowdowns and incidents, MTC and Caltrans are installing closed-circuit television cameras, wireless in-pavement sensors and roadside data-relay stations along area freeways. The information gathered will be fed to the Regional Transportation Management Center in downtown Oakland, which will deploy tow trucks and other resources to quickly clear incidents and thereby reduce delays and prevent the occurrence of secondary accidents. The system will alert motorists to incidents through an expanded network of highway advisory radio channels and changeable message signs, along with MTC's 511 Traveler Information System and in-car devices.

The Traffic Operations System data stream will be enriched with data from the FasTrak® transponders that are becoming commonplace on Bay Area windshields and dashboards. The transponders do double duty, allowing for electronic payment of tolls on area bridges while also serving as mobile sensors that relay rich and current (but anonymous) information about traffic speeds to MTC's 511 Traveler Information System. As the Express Lanes Network is built out and as more bridge toll lanes convert to electronic-only toll collection, increasing numbers of vehicles will be equipped with FasTrak® transponders, facilitating the collection of high-quality traffic data.

Ramp Metering
Ramp metering is effectively implemented in conjunction with other freeway management systems such as High Occupancy Vehicle (HOV) lanes, HOV ramp bypass lanes, surveillance camera and incident detection, and arterial management. Studies have shown ramp management benefits include increased safety by improving the flow and mix of vehicle that enter the freeway, improved mobility and reliability, and environmental benefits from reduced vehicle emissions.

On February 20, 2010, the STA Board approved the Solano Highways Operations Study, which recommended this approach to maximize current infrastructure with operational investments, such as ramp metering and other traffic operations system elements. This Study was developed under the guidance of the Solano Highways Partnership (SoHIP), a partnership involving all cities along I-80 as well as MTC, Caltrans, and STA staff.

Discussion:
The purpose of the staff report is to focus on the Express Lanes and Freeway Performance Initiative, including ramp metering portion of the I-80 corridor strategy. While this portion of the strategy encompasses the entire corridor, these improvements will be required to be phased as funding becomes available.

I-80 Express Lanes
Ultimately the entire length of I-80 corridor through the Bay Area is envisioned to be part of the Regional Express Lanes Network. However, phasing will be necessary due to limited funding opportunities. For I-80, the priority phase is made up of two components; the first is the conversion of the new HOV lanes, an 8.7 mile length along I-80 between Red Top Road and Air Base Parkway and new construction extending these lanes to I-505. This first phase will create 18-miles of Express Lanes. The benefit of this first phase is that it will allow the extension of the HOV lanes to Vacaville. To initiate the first phase, $16.4 million in funding has been secured from Regional Measure 2 (RM 2) to complete the Project Approval/Environmental Document (PA/ED). Attachment B is an overview of this Project.

Freeway Performance Initiative
To construct FPI components along I-80 in Solano County, $48 million in Federal Funds for Ramp Metering and other operations improvements has been secured. This funding is in addition to the funding being currently used to construction ramp metering components along I-80 in Fairfield. This federal funding is from the Safe Accountable, Flexible and Efficient Transportation Equity Act (SAFETEA) for Cycle 1, Surface Transportation Program (STP) and Congestion Mitigation and Air Quality Improvement (CMAQ) Program. Initially, $28 million will be used to construct ramp metering at 42 locations and Traffic Operations System (TOS) elements, such as closed circuit television cameras, changeable message signs, and traffic volume loop detection, along I-80 between State Route 37 in Vallejo to I-505 in Vacaville as part of MTC's Freeway Performance Initiative (FPI). Within Cycle 2 federal funds, an additional $20 million for 19 ramp metering locations and 150 TOS elements along I-80 countywide will be constructed. Attachment C is Fact Sheets for Ramp Metering, Closed Circuit Camera's and Changeable Message Signs.

Fairfield I-80 Ramp Metering Under Construction
As part of the I-80 HOV Lanes project in Fairfield, Caltrans is installing ramp metering equipment between Red Top Road and Air Base Parkway. This includes highway-to-highway connector metering projects on connectors within the I-80/I-680/SR 12 Interchange. Construction is estimated to be complete by early 2012.

Authorization to Build Ramp Metering, But Not to Operate Ramp Metering
Caltrans and MTC are working together to fund and build ramp metering and TOS project elements, but they cannot operate ramp metering lights without approval from local agencies. Santa Clara County and San Mateo County entered into Memorandums of Understanding (MOU) to clarify roles & responsibilities and create a framework for how ramp metering would be studied and how ramp metering would be operated in collaboration with local agencies and Caltrans. These MOUs describe how Caltrans meets quarterly with a Ramp Metering Technical Advisory Committee (RMTAC) to discuss and adjust ramp metering signal timing. The next step for Solano County is to study the impacts of Ramp Metering and to develop a MOU for Ramp Metering Operations. Since December 2010, the STA, MTC, Caltrans staff along with Public Works staff from local agencies along I-80 have held monthly Solano Highways Partnership (SoHIP) meetings discussing highway projects in

development, ramp metering study scopes of work, public engagement proposals, and MOU development. SoHIP members routinely focus on issues related to local congestion due to ramp metering, safety related to highway-to-highway connectors, public education and information about ramp metering, and clear modeling data to understand the regional and local benefits of ramp meters prior to beginning ramp meter operations.

STA staff estimates that the SoHIP will review and approve of a ramp metering study by early 2012 and potentially enter into MOUs with local agencies and Caltrans at the same time. Prior to Caltrans completing the construction of the I-80 Ramp Metering project in Fairfield, the SoHIP will have reviewed public information material to inform the public about ramp metering. A draft public information presentation is presented in Attachment D.

Workshop Discussion:

1. What are your perceptions of Ramp Metering?
2. What is the best process to work with local communities to implement Ramp Metering?
3. What role should you play in the development of the MOU with local agencies located in the I-80 Corridor in partnership with Caltrans with Ramp Metering?
4. Should the I-80 Corridor be better connected with the I-80 facilities?
5. What should be the priorities for funding corridors with regional fund sources?

Attachments:

A. Regional Express Lanes Network Overview
B. I-80 Express Lanes Project (Red Top to I-505)
C. Fact Sheets (Ramp Metering, Closed Circuit Camera's and Changeable Message Signs)
D. Draft Ramp Metering Public Outreach Powerpoint

Regional Express Lanes Network

An Express Lane is a toll enacted on single-occupant vehicles who wish to use lanes or entire roads that are designated for the use of High-Occupancy Vehicles (HOVs, also known as carpools). Tolls are collected either by automatic number plate recognition, or electronic toll collection systems. In California, the FasTrak® electronic collection system is used as the primary collection method.

Express Lanes require single-occupant vehicles to pay a toll that varies based on demand, called congestion pricing. The tolls change throughout the day according to real-time traffic conditions to manage the numbers of cars in the lanes and keep them free of congestion, even during rush hour.

The concept is an expansion of HOV lanes and an effort to maximize their efficiency in moving vehicles. HOV lanes are designed to promote vehicle sharing and use public transportation by creating area of lower use as an incentive, but they have been criticized because some are underused. The Express Lanes provide a nobility option for single occupant vehicles to provide reliable travel at a variable price.

Express Lanes are often constructed within the existing road space and provide an option for commuters and non-routine drivers. The Express Lanes benefit drivers by providing the ability to pay to get through traffic quickly; e.g., a family seeking to catch a flight or a plumber wanting to get to his customer quickly may come out ahead financially from using the Express Lane. Funds raised from Express Lanes tolls would be used to pay for the maintenance and operations of the lane(s), payment of debt for the initial construction of the lane(s) and to build out the Express Lanes network in the Bay Area. By policy, additional funds can also be used for supporting transit service in the corridors.

Drivers who do not utilize the lane can also benefit from having it fully utilized, thus taking more traffic out of the mixed flow lanes, in contrast to the sometimes underutilized HOV lanes. By linking together disconnected HOV networks, Express Lanes can allow public transportation vehicles (such as buses) and carpools more reliability to get to destinations on time.

The Metropolitan Transportation Commission (MTC) has proposed the regional Express Lanes Network concept which involves converting existing HOV lanes to Express Lanes and using the revenue generated to finance completion of the HOV/Express system as well as other improvements within the Express corridors.

Potential benefits of a Regional Express Network include:

- Reductions in congestion and emissions, including carbon dioxide, by making more efficient use of the freeway system;
- Providing a reliable travel option for express bus and carpools via the HOV network and use of the Express Lanes for those who choose to pay the toll;
- Completing the HOV/Express Network ten to forty years sooner than if relying upon traditional state and local funding mechanisms.

I-80 EXPRESS LANES

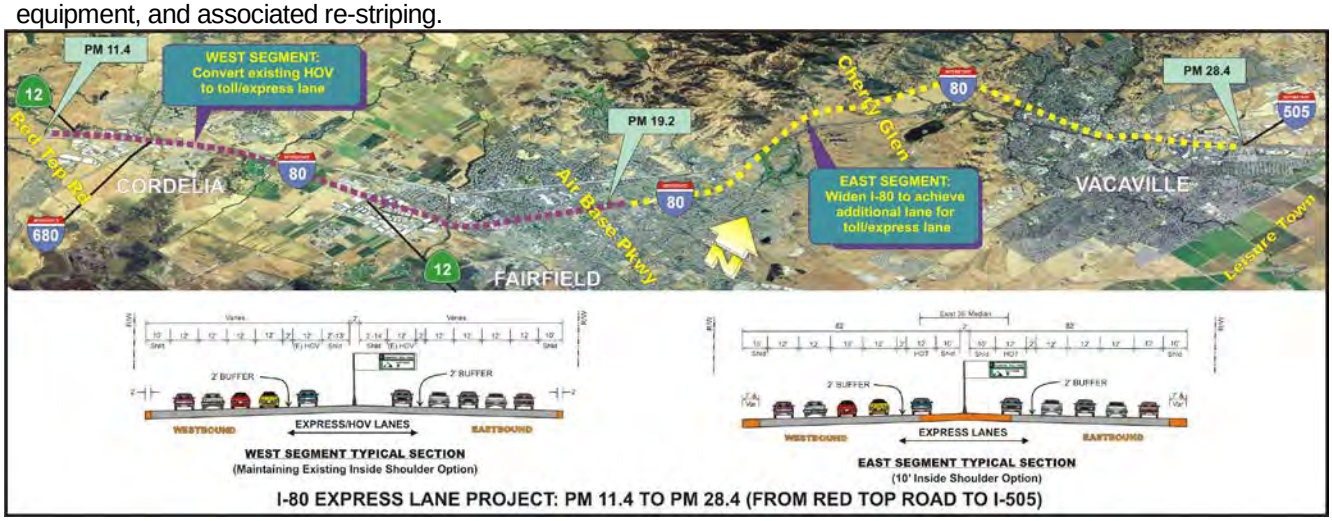
STA Solano Transportation Authority

This segment of I-80 is physically constrained, including right-of-way limitations, sensitive resources, and urban development on either side of the corridor. The purpose of the project is to provide an immediate benefit to traveling individuals by maximizing the use of the existing infrastructure in a limited/constrained right of way to move people and traffic through the corridor efficiently. The project would:

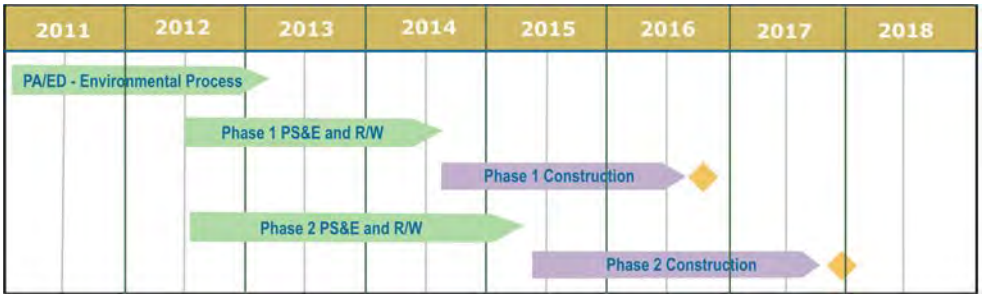
- Provide an option for travelers using the corridor to reduce travel time through payment
- Reduce delays for all travelers in the corridor
- Improve transit utilization by improving transit travel times in the corridor
- Provide a higher vehicle and passenger throughput
    - Optimize capacity with full utilization of HOV lane capacity (Phase 1)
    - Increase capacity to meet existing and future travel demand (Phase 2)
    - Establish a future funding mechanism to defray operational costs and potentially provide revenue for transportation improvement in the corridor
- Reduce greenhouse gas emissions

The I-80 Express Lanes Project begins at Red Top Road in Fairfield and extends to I-505 in Vacaville, an approximate length of 18-miles in Solano County. The project is part of the Bay Area Express Lanes Network that the Metropolitan Transportation Commission (MTC) adopted in their Regional Transportation Plan (RTP), T2035. The I-80 Express Lanes Project intends to utilize the continuous access design approach and is divided into two distinct segments which are described below:

- **West Segment - Red Top Road to Airbase Parkway** – This segment will be a conversion of the High Occupancy Vehicle (HOV) lanes that were opened in late 2009 to Express Lanes. This segment will require the addition of the tolling equipment, and associated re-striping to provide room for the required typical section.
- **East Segment - Airbase Parkway to I-505** – This segment will require the construction of one new lane in each direction that will be used for Express Lanes. This additional lane in each direction will primarily be accomplished with the inside median widening and possibly outside widening to provide room for the required typical section, the addition of the tolling equipment, and associated re-striping.



CURRENT SCHEDULE



Ramp Metering

ATTACHMENT C

Description

Ramp metering is the use of traffic signals at freeway on-ramps to control the rate of vehicles entering the freeway, temporarily storing it on the ramps. Using this technique for operational improvements helps to optimize freeway flow and minimize congestion.

Ramp metering is best used on freeway segments with high volume traffic to manage portal entries so that the freeway can be regulated during peak periods of congestion, typically AM and PM commuter hours. Ramp metering has been a proven operations strategy for improving overall freeway corridor performance and is not meant to work by itself or just in one location of a corridor.

Specific Locations and Conditions

Caltrans is designing and constructing ramp metering along I-80 between State Route 37 in Vallejo to the Yolo County Line. Exact locations and project designs are still under development.

Cost

The cost of the detectors and ramp meter for each entry ranges from $100 to $250 thousand but does not include communications.

PROS	CONS
• Ramp metering reduces the number of acceleration – deceleration cycles and smoothes traffic flow anywhere from 2-55%. • Main line peak period delay is reduced. • Main line average speed can increase 13 -26%. • Reduction in main line crashes by as much as 50%. • Can improve travel time by 15-60%. • Increases main line. • Emission reduction due to reduced delay.	• Wait times at on-ramps can cause significant back up on to arterials. • Arterial signals are sometimes coordinated with ramp meters to prevent traffic queues. • Potential diversion of trips to local roads is sometimes frustrating to residents if the local roads are not designed to manage the additional vehicles. • On-going communication costs. • Public acceptance needed before implementation.

Solano Transportation Authority

Ramp Metering

FREQUENTLY ASKED QUESTIONS ABOUT RAMP METERING

Why use Ramp Metering?

Ramp metering has a proven record for reducing congestion, travel times and accidents. Without ramp meters, multiple cars try to merge simultaneously. Drivers on the freeway slow down to allow the cars to enter and these slower speeds quickly cause backups. They have been used successfully in the Bay area, additionally, they decrease traffic idling on the freeway resulting in fewer vehicle emissions overall.

How does ramp metering work?

They are essentially traffic signals that reduce disruption to the interstate traffic by controlling the flow of merging traffic and alleviating bottlenecks. Slowing down merging traffic reduces accidents that occur when vehicles merge onto the freeway.

Where has it been used in the Bay area?

- Since 2003 Ramp meters have operated on six EB onramps on Ala-580. Peak travel times were reduced by 60%.
- In Pleasanton from Foothill Rd. (west of I-680) to Greenville Road (west of Altamont Pass) decreased travel times by 33%.
- SM-101 from Route 92 to the Santa Clara County Line experienced a 30% reduction in peak period congestion.

Does ramp metering give any benefit to those who are slowed at freeway entrance ramps?

Accidents often occur when multiple vehicles merge on to the freeway at the same time. Ramp metering reduces accidents by up to 30%. A short wait on the ramp allows drivers to increase their average speed on the freeway and shorten their overall freeway travel times.

What are the challenges in successfully implementing Ramp Metering?

One of the single biggest challenges with ramp metering is the possibility for on-ramp traffic queues to extend and impede traffic on adjacent arterials.

In addition to the use of queue detectors, a written agreement between Caltrans and the local agencies on operating parameters will help outline procedures to mitigate potential negative impact. An existing MOU between Caltrans and San Mateo County should be used as an example of a best practice example and similar documents should be a key component of ramp metering implementation.

STA
Solano Transportation Authority

Closed Circuit Television Cameras

Description

CCTV Cameras are video cameras located along the freeway corridors that send video images to the traffic management center where there are monitors and operators, who view them. The traffic images can be used to verify traffic accidents or congestion and can sometimes even assist in determining appropriate resources for incident clearance (i.e., fire trucks, ambulance, tow trucks, etc.).

CCTV cameras are affordable, effective, and are proven to provide valuable information that can save time. The preferable style includes pan, tilt zoom (PTZ) features so that the operator can zoom in on a specific incident or, pan out for a view of the traffic queue. TMC operators can make a visual check of field conditions at a reported site. The operator can move the nearest camera to focus on the area of interest to verify the incident then check the nature of the incident and severity, make recommendations and finally, observe the progress of incident response and clearance. Cameras are often used to check the message displayed on changeable message signs.

CCTV cameras are most effective for use in traffic incident management if they are deployed along corridors or at intersections where there are high volumes of traffic or frequent incidents.

PROS	CONS
• Relatively inexpensive way to verify and monitor traffic congestion. • Assists in traffic incident management by giving the operator visual of an accident. This allows the operator to make decisions regarding deployment of resources (maintenance vehicles, fire, etc.) before valuable resources are dispatched. • PTZ feature allows the operators to zoom in and see detail of incidents or pan out and have an overview of the traffic queue.	• Public opponents of CCTV point out the loss of privacy when CCTV cameras are deployed along corridors that are adjacent to housing, apartments and businesses located nearby. • Fiber communications lines are limited in the area but other forms of communication are used.

STA
Solano Transportation Authority

Closed Circuit Television Cameras

FREQUENTLY ASKED QUESTIONS ABOUT CLOSED CIRCUIT TELEVISIONS CAMERAS (CCTV)

Specific Locations and Conditions

Although there are currently over 500 CCTV cameras installed on the Bay Area freeway system I-680 is the only freeway segment that has a substantial CCTV coverage in Solano County. I-80 has CCTV coverage from the Carquinez Bridge to SR 37.

Cost

CCTV cameras are cost effective ranging from $5,000 - $15,000 each. The cost for purchase of the camera does not include the mounting of the device (i.e., concrete poles, light poles, etc...) or the communications. Mounting costs are based on whether the mounting option exists at the scene or if it has to be built. Communications costs depend on options available (i.e., microwave, hardwire, etc.).

Are the CCTV cameras monitored 24/7?

Video images from the CCTV cameras are sent to the Oakland TMC where TMC operators and the California Highway Patrol have access to them 24 hours a day.

Do the CCTV cameras record accidents and if so, how is the video used by Traffic Management Centers (TMC's)?

Caltrans does not record or archive video images.

Can CCTV cameras be used for "spying" on public homes or, for recording vehicle speeds with license plates to issue citations to the public for speeding?

CCTV cameras are pointed away from private residences. Speeds cannot be legally documented using CCTV cameras for enforcement purposes unless there are posted signs advising the public that the signal is posted as an "enforcement signal".

What are the challenges in successfully implementing appropriate use of CCTV Cameras in the region?

The use of fiber is the preferred communications medium along freeway segments primarily for the transport of video images from CCTV cameras to the TMC in Oakland because it has the greatest data carrying capacity and longest transmission distance. Communications are a challenge because there is sparse coverage of the freeways in the County with fiber; most of the CCTV cameras are communicated with using either a leased ISDN or ADN line. •

STA
Solano Transportation Authority

Changeable Message Signs (CMS)

Description

Changeable Message Signs (CMS) are signs located along the freeway that are connected to the transportation management center (TMC). TMC operators use these signs to distribute timely information to commuters that can assist the traveler in preparing for what is ahead. CMS provide an effective method of broadcasting information about downstream corridor delays, traffic incidents, estimated travel times and tolling information.

CMS are one of the traditional ITS elements deployed for use in Advanced Traffic Management System (ATMS) techniques. The use of changeable message signs is an effective method of providing traveler information immediately to the motorist on the highway system. It is an excellent means to inform motorists of upcoming events like chain control measures, accidents, road closures and amber alerts. CMS are also used for Active Traffic Management strategies including lane management, route management, tolling lane management and traffic incident management.

The Bay area has nicknamed their system MITTENS to display travel times in the Bay Area relying on MTC's 511 system for travel time predictions.

PROS	CONS
• **CMS can help drivers make better route decisions or travel time decisions.** • **CMS help alleviate driver stress by giving them information ahead of time about congestion or assessing traffic.** • **Unlike radio broadcasts, CMS can be placed where they are most useful to drivers and where the most options are located for alternative routing when the freeway is congested.**	• **Public perceptions vary on this ITS element based on perception of people who live in neighborhoods located near the freeway and whether the CMS add to or distract from freeway beautification efforts in the area.** • **Locating CMS where it may make a driver chose to re-route off of the freeway.**

Solano Transportation Authority

Changeable Message Signs (CMS)

FREQUENTLY ASKED QUESTIONS ABOUT CHANGEABLE MESSAGE SIGNS

Specific Locations and Conditions

Caltrans has standards for the CMS sizes and types but a constraint with field deployments is the ability to communicate with the signs using either a leased or non-leased connection. Actual locations for CMS on the Solano corridors will be based on need, roadway structures and distances to strategic decision points in the roadway where motorists need to make travel route decisions.

Cost

CMS signs themselves are not cost prohibitive at $47,000 - $115,000 each for a stationary CMS and, $15,000 to $30,000 for a portable CMS. Caltrans has standards for mounting CMS that could cost another $100,000 for the stationary CMS. These estimates do not consider the cost of operating the CMS or the cost of communications which, depends on availability of hardwire or telephone lines in the desired location. Operating costs (including maintenance) tends to range around $2,000 per year.

Where does the traffic time information come from and how often is it updated?

Data containing information about travel speeds is extracted from vehicle detection system (VDS) devices at or along the state highway system. That information is transmitted to the CMS for travelers. The information is updated at regular intervals.

Why are CMS better than radio broadcasts that I already depend on?

Unlike radio broadcasts, CMS can be placed strategically where they are most useful to drivers for making decisions.

How is it determined where to place the signs?

Locations for signs are chosen based on freeway structure for supporting safe lane transition and options available for travelers to make re-routing decisions. If there are no re-routing options (i.e., roads where travelers can select another route), signs are placed based on when travelers would need specific information that can be displayed on the CMS. •

STA
Solano Transportation Authority

ATTACHMENT D

Implementing Ramp Metering in Solano County

I-80 EB at North Texas St. in Fairfield

Study Overview

- Solano Highways Partnership (SoHIP)

- February 2010, STA Board Adopted Solano Highways Operations Study
  - Operations Improvement Analysis & Implementation Plan
  - Landscape and Hardscape Recommendations
  - Public Outreach Toolbox
- Maximize current infrastructure with operations investments, such as ramp metering and other traffic operations system elements

Ramp Metering is One Part

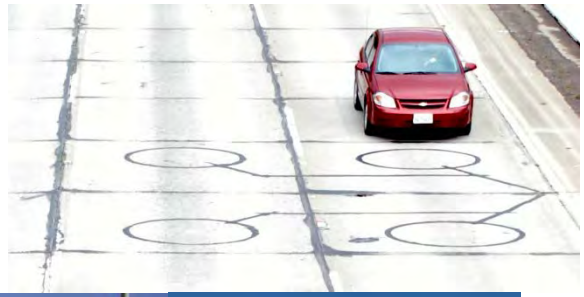
of a Complete Traffic Operations System Strategy

- Ramp Management
- High-Occupancy Vehicle (Carpool) Lanes
- Changeable Message Signs (CMS)
- Closed-Circuit Television Cameras (CCTV)
- Incident Management

Traffic Operations System

- Traffic Monitoring Stations – Used to monitor traffic flow and detect incidents.
- Closed-Circuit Television Cameras (CCTV) – Used to identify/verify incidents & aid in response activities.
- Changeable Message Signs (CMS) – Are used to provide critical real-time traffic advisories to the motorist.

Traffic Monitoring Stations



Freeway Service Patrol

CCTV Cameras

Changeable Message Signs

What is Ramp Metering?

- Ramp meters are traffic signals on freeway onramps that manage ramp flow rate, thus reducing demand for section of freeway mainline downstream and minimizing the possibility of exceeding freeway capacity

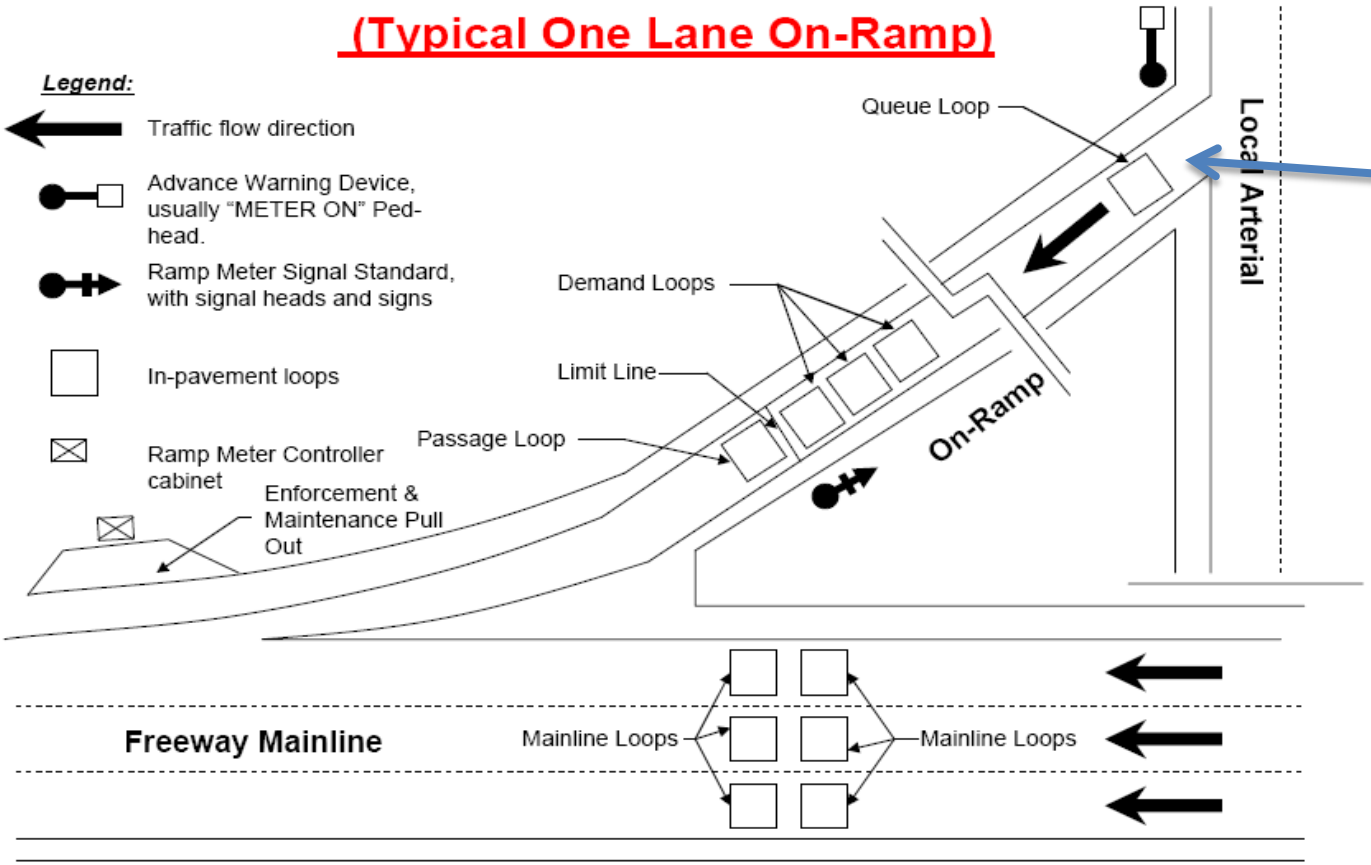
Why Ramp Metering?

- Helps maintain the freeway at maximum performance
- Reduces total travel delay for a driver's entire commute
- Provides consistent travel times for travelers
- Provides Carpool Incentives with Bypass Lanes.
- Breaks up concentrated "Platoons" of cars making merging safer

Typical Ramp Meter Design

Ramp Metering Hardware Example

(Typical One Lane On-Ramp)



End-of-Queue Loop Detector at Entrance of on-ramp

"Spill Back" loops prevent local street congestion by releasing ramp traffic if covered by cars for too long.

Highway-to-Highway Connector Meter Design

- 17 existing connector metering locations in the Bay Area, with most installed during the mid 1990s and as early as 1977.
  - I-880 in Alameda County
  - SR 17, SR 85, SR 87, SR 101, and I-880 in Santa Clara County
- Caltrans installs advanced warning signs based on projected highway congestion (e.g., three signs for NB 85 to NB 101 in San Jose)

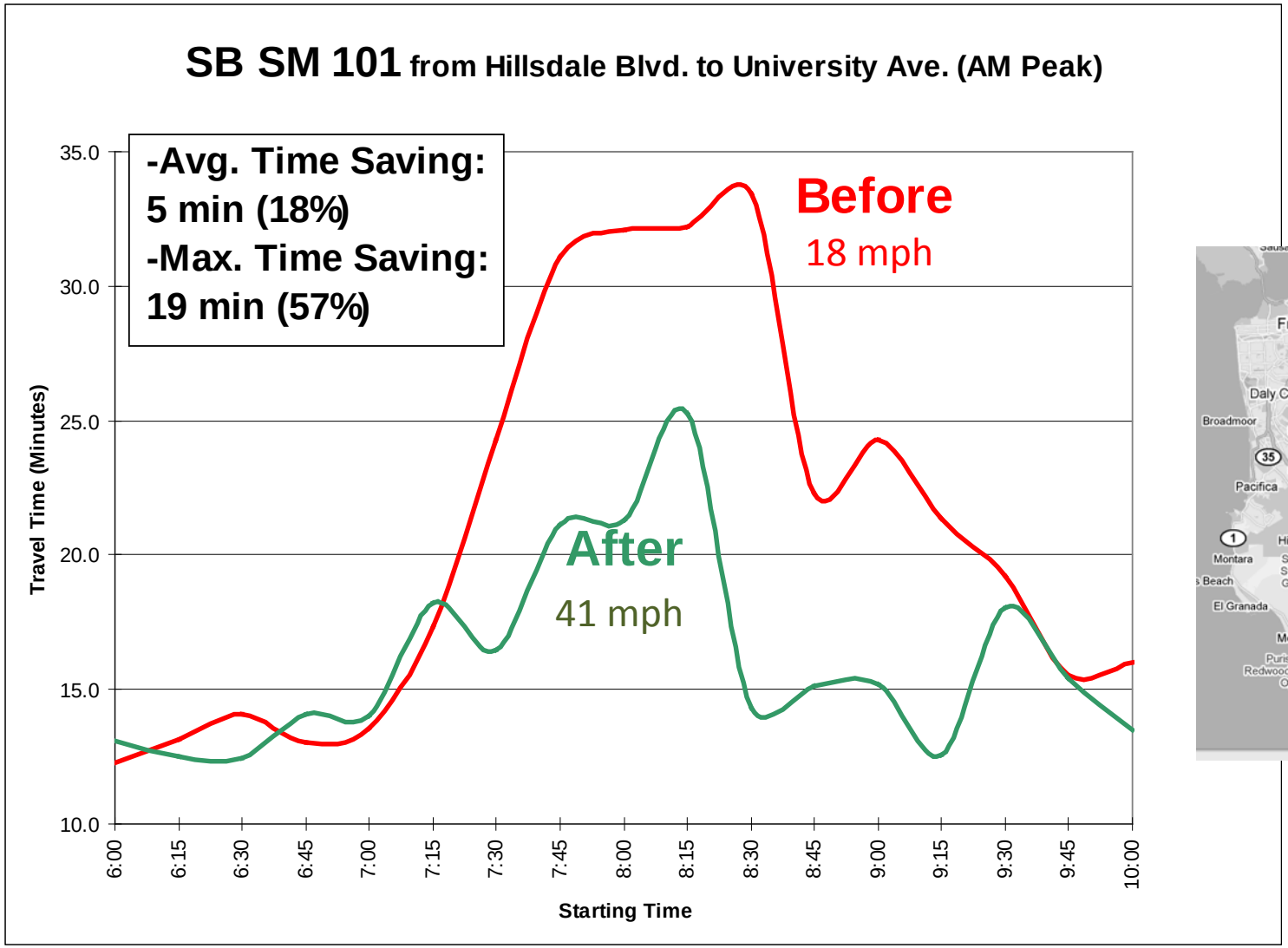
Approach to NB SCL 85 Fwy to Fwy Connector from NB SCL 101, South San Jose

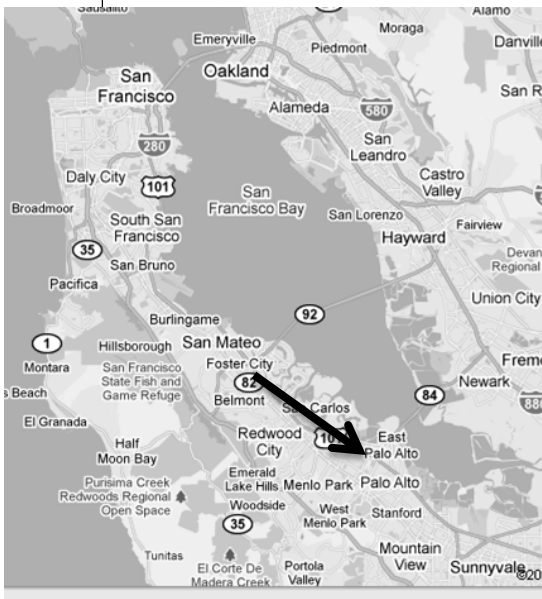
First Advance Warning Sign "Meter On"

Third Advance Warning Sign "Prepare to Stop"

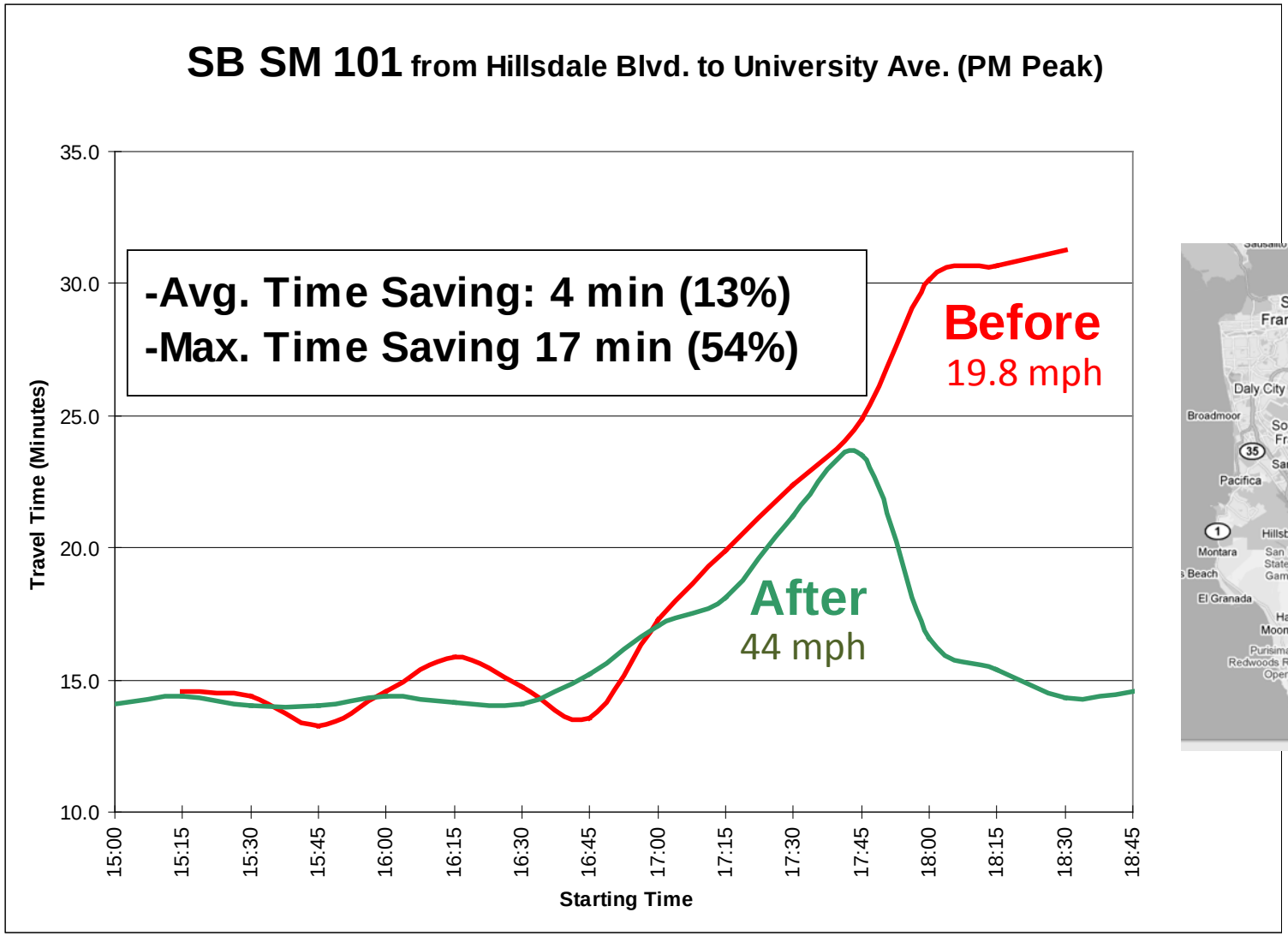
Approaching Metering Signals (Mast Arm)

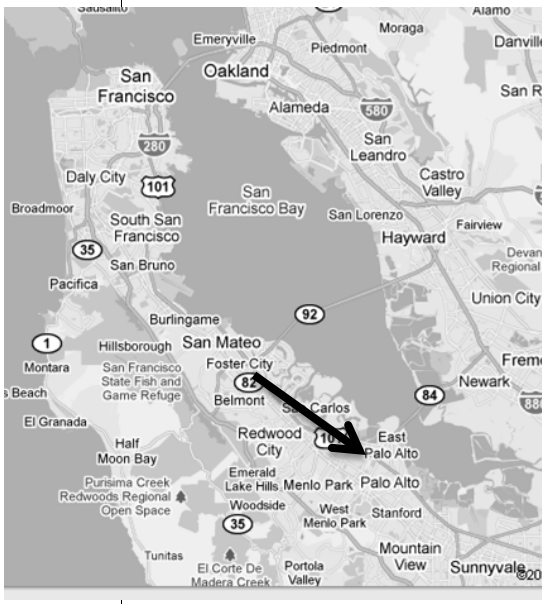
Hwy 101 in San Mateo, Time savings in AM



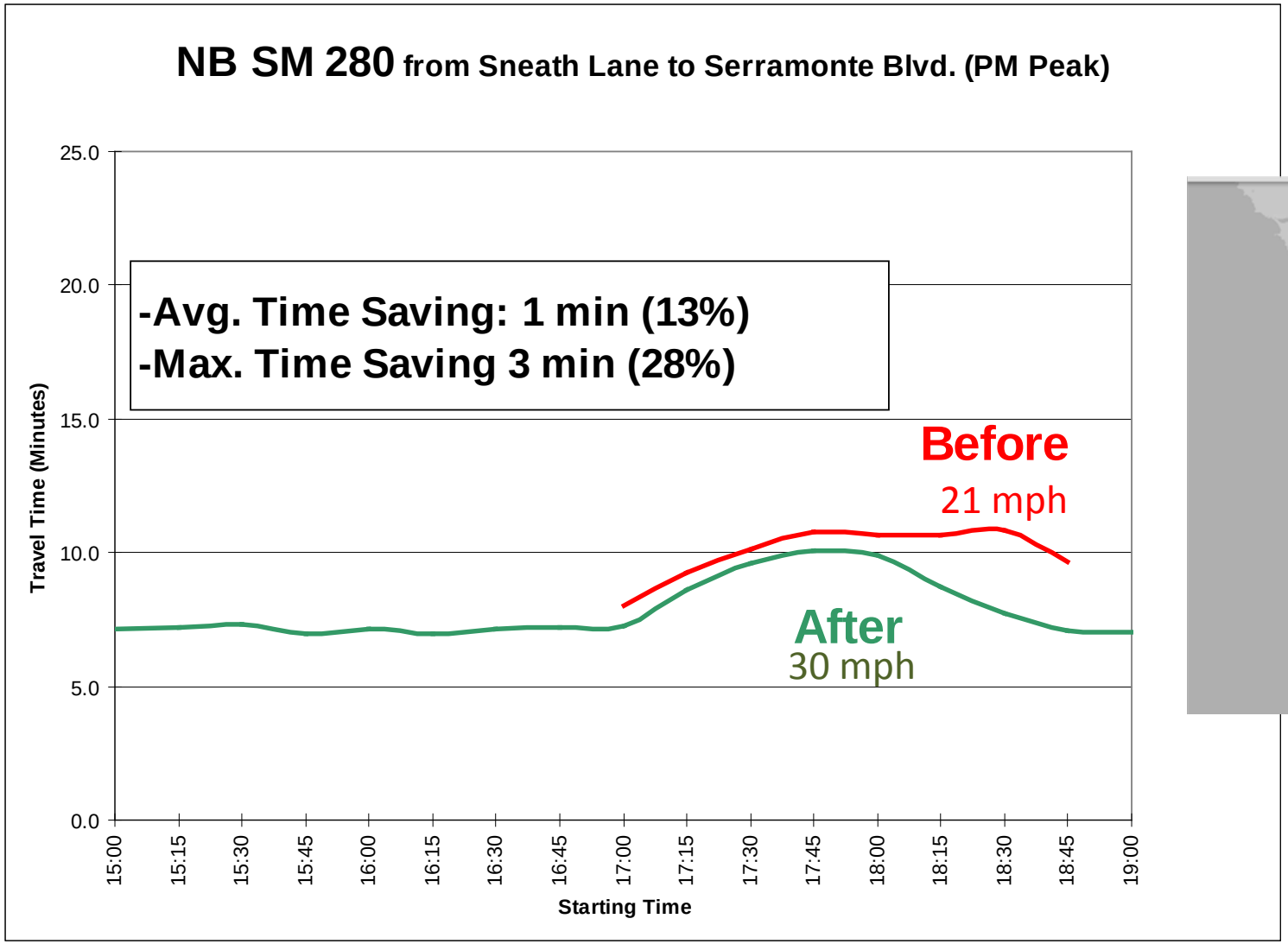


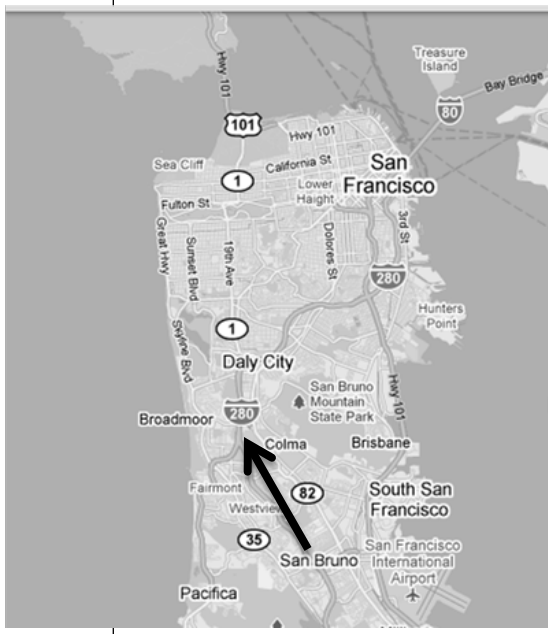
Hwy 101 in San Mateo, Time savings in PM





I-280 in San Bruno,
Benefits for Low Volume Highways

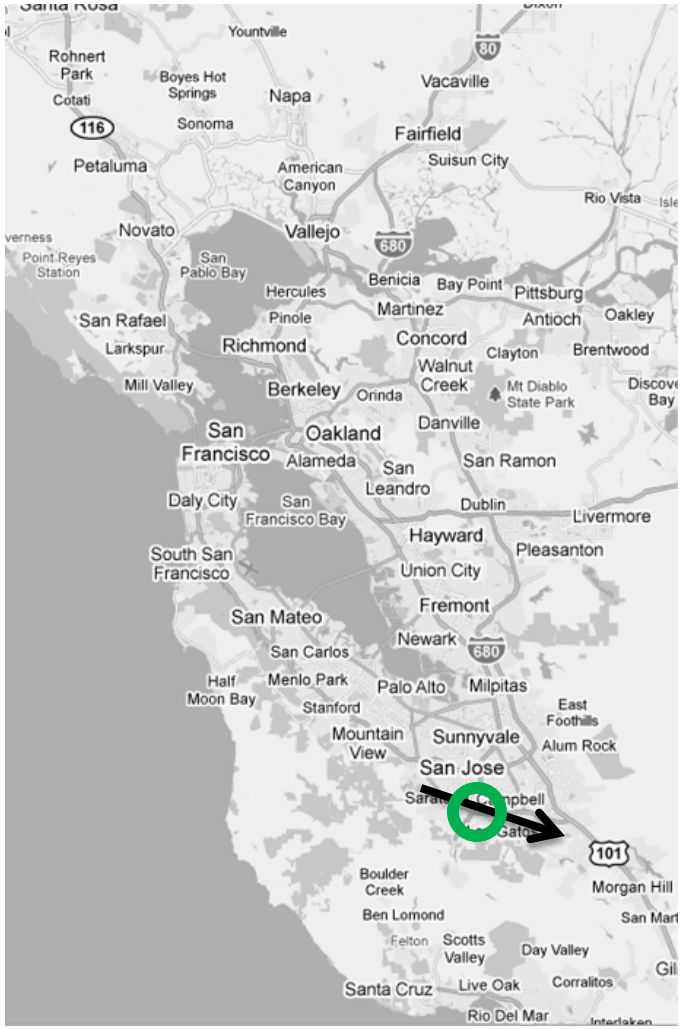




STA Solano Transportation Authority

SR-87 to SR-85 Connector in San Jose, 20 mph faster traffic

Location	Before	After	**Benefit**
Near the connector 5-6pm	30.2	50.6	**+ 20.4 mph**
SR 85 Corridor, 5-6pm	45.0	57.9	**+ 12.9 mph**
SR 85 Corridor, 3-7pm	53.3	61.8	**+ 8.5 mph**



25% Reduction in Accidents

Before & After Studies on I-580 in Alameda

BEFORE OR AFTER	TOTAL ACCIDENTS	FATAL	INJURY	Property Damage Only	% CHANGE IN TOTAL ACCIDENT
Phase I: Hopyard On-ramp to Santa Rita On-ramp					
"BEFORE" (6/1/2002 to 5/30/2003)	248	0	59	189	
"AFTER" (6/1/2003 to 5/30/2004)	205	1	58	146	**-21%**
Phase II: Foothill On-ramp to Greenville On-ramp (Including Phase I)					
"BEFORE" (1/1/2007 to 10/30/2007)	197	0	58	138	
"AFTER" (1/1/2008 to 10/30/2008)	157	0	37	120	**-25%**

*DATA SOURCE: Caltrans – Traffic Accident Surveillance and Analysis Systems (TASAS) ALA 580 EB MAINLINE (FOOTHILL INTERCHANGE TO N. FLYNN) ACCIDENT DATA FOR THE PERIOD OF METERING OPERATION (MON TO FRI, 2:00 PM to 7:00 PM) FOR "BEFORE" & "AFTER" RAMP METERING OPERATION)

Local City Street Benefits

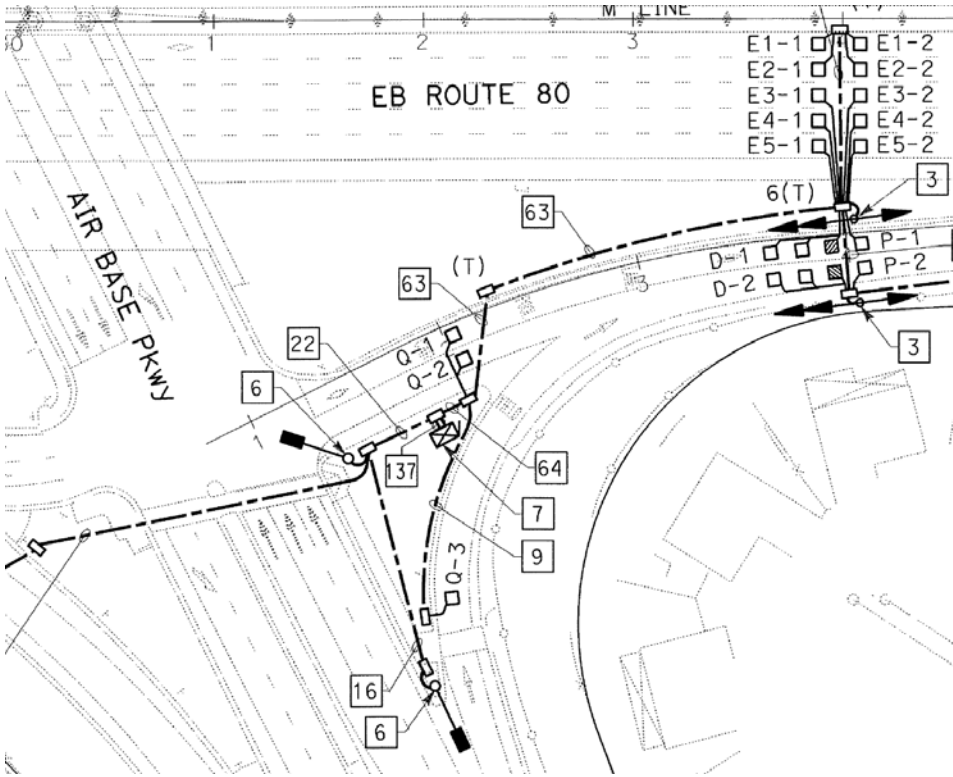
- When ramp metering increases freeway flow and breaks up merging car platoons:
  - Drivers stay on the flowing freeway instead of cutting through on local streets reducing local congestion.
  - On-ramp wait times decrease as less cut-through traffic attempts to reenter the freeway.

Results from EB I-580 in Livermore, Pleasanton and Dublin (2008)

- Ramp metering reduced cut-through traffic on local roads between 6% to 49% and reduced on-ramp volumes between 185 cars to 1375 cars during rush hour.

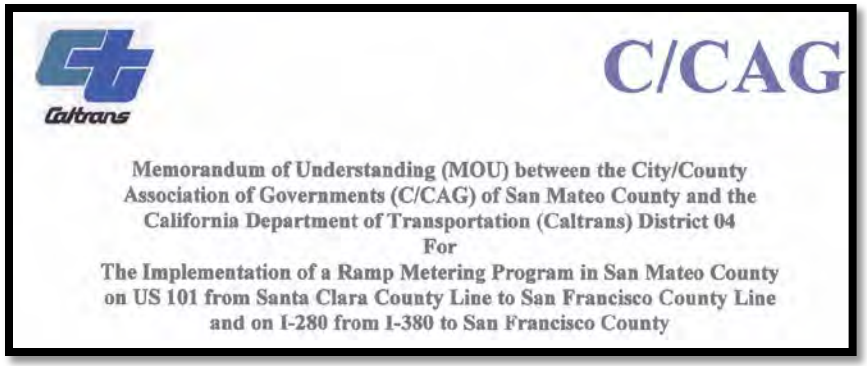
In Design & Under Construction

- North Texas Interchange Ramp Metering
  - Ramp Meters in EB & WB directions (complete)
- $4.9 M, Fairfield I-80 Ramp Metering
  - 14 Ramp meters at ramps between Red Top Road & Air Base Parkway (under construction)
  - Highway-to-Highway connector meters (under construction)
    - EB SR 12 to EB I-80
    - WB SR 12 to WB I-80
    - NB I-680 to EB I-80
- $55 M, Future Ramp Metering projects (in design)
  - 61 ramp meters between SR 37 in Vallejo to Yolo County Line
  - Traffic Operations Systems Countywide



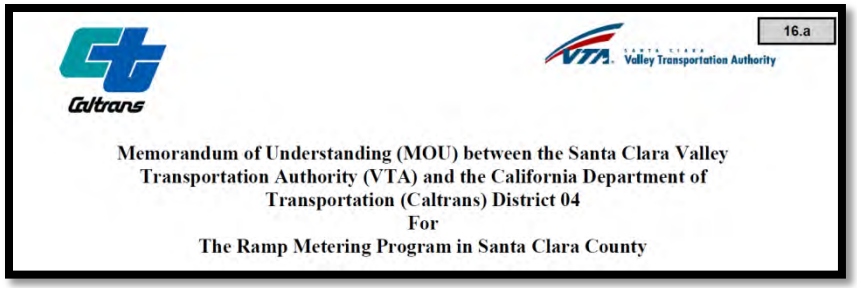
How would meters be turned on?

- Caltrans has Authorization to Build Ramp Metering, <u>But Not</u> to Operate Ramp Metering
- Local cities or counties enter into agreements before Caltrans turns on ramp metering.
- Different examples of operating agreements/memorandums of understanding between Caltrans, local agencies, and transportation authorities:
  - Santa Clara County (Valley Transportation Authority)
  - San Mateo County (City/County Association of Counties)
- Ramp Metering Study
  - modeling data to understand the regional and local benefits of ramp meters prior to beginning ramp meter operations
- Ramp Metering Technical Advisory Committee
  - Public Works staff & Caltrans staff monitor and adjust ramp metering timing quarterly.


Caltrans

C/CAG

Memorandum of Understanding (MOU) between the City/County Association of Governments (C/CAG) of San Mateo County and the California Department of Transportation (Caltrans) District 04
For
The Implementation of a Ramp Metering Program in San Mateo County on US 101 from Santa Clara County Line to San Francisco County Line and on I-280 from I-380 to San Francisco County


16.a

Caltrans

VTA Valley Transportation Authority

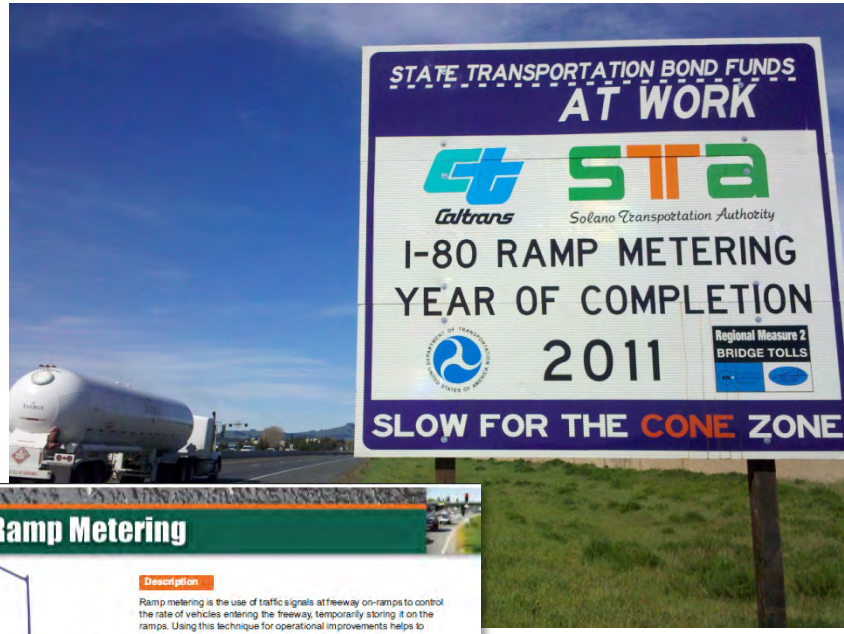
Memorandum of Understanding (MOU) between the Santa Clara Valley Transportation Authority (VTA) and the California Department of Transportation (Caltrans) District 04
For
The Ramp Metering Program in Santa Clara County

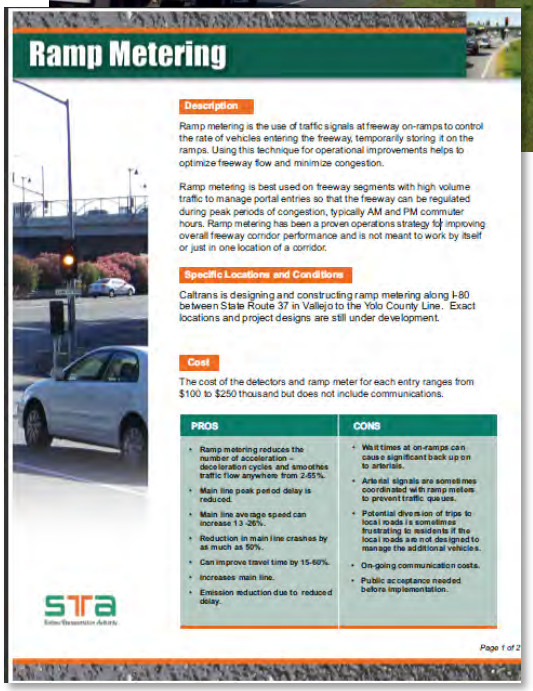
Will Ramp Meters be turned on?

- If local agencies and/or the STA enter into an operating agreement (Memorandum of Understanding, MOU) about how to operate ramp metering, then Caltrans will turn on ramp metering.
- Ramp Metering Development Schedule:
  - Fall 2011, Draft MOU & Preliminary Ramp Metering study results
  - Spring 2012, Fairfield Ramp Metering Project Built
  - Spring 2012, Circulate MOUs and final Ramp Metering Study
  - Summer 2012, potentially begin ramp metering in **Fairfield area** as a first phase
  - Ramp metering in **Dixon, Vacaville, Vallejo, and other areas in Solano County** selected for later dates.

How can the public find out more about ramp metering?

- Presentations for City Councils & Public Groups (e.g., Solano EDC, Service Clubs, Chambers of Commerce, etc.)
- Signs at Ramp Meter locations
- Solano Ramp Metering Webpage, under development by STA in partnership with Caltrans
  - Project Maps
  - Fact Sheets
  - Videos
  - Presentations
- Coordination with Caltrans District 4 Public Affairs staff





Ramp Metering

Description

Ramp metering is the use of traffic signals at freeway on-ramps to control the rate of vehicles entering the freeway, temporarily storing it on the ramps. Using this technique for operational improvements helps to optimize freeway flow and minimize congestion.

Ramp metering is best used on freeway segments with high volume traffic to manage portal entries so that the freeway can be regulated during peak periods of congestion, typically AM and PM commuter hours. Ramp metering has been a proven operations strategy for improving overall freeway corridor performance and is not meant to work by itself or just in one location of a corridor.

Specific Locations and Conditions

Caltrans is designing and constructing ramp metering along I-80 between State Route 37 in Vallejo to the Yolo County Line. Exact locations and project designs are still under development.

Cost

The cost of the detectors and ramp meter for each entry ranges from $100 to $250 thousand but does not include communications.

PROS	CONS
• Ramp metering reduces the number of acceleration – deceleration cycles and smoothes traffic flow anywhere from 2-65%.	• Wait times at on-ramps can cause significant back up on to arterials.
• Main line peak period delay is reduced.	• Arterial signals are sometimes coordinated with ramp meters to prevent traffic queues.
• Main line average speed can increase 13 -26%.	• Potential diversion of trips to local roads is sometimes frustrating to residents if the local roads are not designed to manage the additional vehicles.
• Reduction in main line crashes by as much as 50%.	• On-going communication costs.
• Can improve travel time by 15-60%.	• Public acceptance needed before implementation.
• Increases main line.	
• Emission reduction due to reduced delay.	

STA

Page 1 of 2

70

More Information

Download Fact Sheets & Presentations

www.sta.ca.gov

Video Presentation for

San Mateo Ramp Metering Project

http://www.mtc.ca.gov/about_mtc/awards/video/2010/01.htm

"Our board now is in a position that we can't put ramp metering up fast enough … turn it on as fast as you can."
Richard Napier, Executive Director, C/CAG in San Mateo

Janet Adams

STA Director of Projects

(707) 424-6075

Tracy Ruth

Caltrans District 4, Public Affairs

(510) 286-4444

"As a county, we approached [ramp metering] in a very different way … I'm very proud of what we've done here in [San Mateo] County."
Larry Patterson, San Mateo Public Works Director