Chapter 1

Proposed Project

1.1 Introduction

Interstate 80 (I-80) is an integral part of the San Francisco Bay Area transportation network. The freeway is a major thoroughfare for commuters, is heavily used by transit services, and also provides access for the transport of goods into and out of the region. The proposed project area of the I-80 corridor (hereafter referred to as the project corridor) extends from the San Francisco-Oakland Bay Bridge Toll Plaza (Alameda County I-80 postmile 1.99) to the Carquinez Bridge (Contra Costa County postmile 13.49), and connects to I-880 and I-580. Within the project corridor between the San Francisco-Oakland Bay Bridge toll plaza and the I-80/I-580/I-880 interchange, I-80 is a freeway providing 5 to 16 general-purpose lanes in the westbound direction and 2 to 6 general-purpose lanes in the eastbound direction. Within this segment, there are two high occupancy vehicle (HOV) lanes in the westbound direction and one HOV lane in the eastbound direction. I-80 provides four general-purpose lanes and one HOV lane in each direction between the I-80/I-580/I-880 interchange and I-580. Between I-580 and just south of the Carquinez Bridge, I-80 eastbound provides three general-purpose lanes and an HOV lane. Between I-580 and just north of the Carquinez Bridge, I-80 westbound provides one HOV lane and three general-purpose lanes. The HOV lanes along the project corridor operate on weekdays from 5:00 AM to 10:00 AM and from 3:00 PM to 7:00 PM. The HOV occupancy requirement is three or more persons per vehicle.

Traffic congestion within the project corridor is among the worst in the San Francisco Bay Area due to heavy traffic volumes during the weekday peak commute hours, and this congestion is projected to increase over the next 25 years due to continued population growth. The existing and forecasted congestion affects the efficiency of the movement of people and goods through the I-80 corridor by reducing travel speed and increasing travel time. The frequent traffic congestion also contributes to accidents on both the freeway and local arterials, which in turn can create secondary traffic incidents. The heavy traffic congestion also adversely affects the time it takes for emergency services to respond to accidents and incidents along the corridor. The heavy traffic volumes and frequency of accidents and incidents also impact transit services operating along the project corridor by creating delays and reduced travel time reliability.[1]

Substantial capacity improvements to the existing I-80 freeway are not practicable because the freeway is constrained by San Francisco Bay and existing development throughout much of the corridor. Because of the physical constraints, it is not feasible to widen the freeway or to construct new connecting arterials as a solution to the existing and projected traffic congestion problems. As a result, strategies to reduce

[1] Travel time reliability measures the extent of unexpected delay during a trip. It is defined as the consistency or dependability in travel times, as measured from day-to-day and/or across different times of the day.

congestion, reduce travel time and improve safety along the I-80 corridor must focus on optimizing the use of the existing infrastructure. This can be accomplished through a number of system management strategies, such as adaptive ramp metering[2] and incident management.

The California Department of Transportation (the Department) proposes to implement systems management strategies (adaptive ramp metering and incident management) along a 19.5-mile portion of I-80 from the San Francisco-Oakland Bay Bridge Toll Plaza to the Carquinez Bridge. The system management strategies for the I-80 corridor have been assembled into a single project referred to as the I-80 Integrated Corridor Mobility (ICM) project. **Figure 1-1** depicts the project location within the San Francisco Bay Area.

In addition to system management strategies, the I-80 ICM project would also include monitoring traffic operations through the use of closed circuit television cameras and traffic congestion detection devices. Traffic flow information gathered from the traffic loop detectors [3] would be used to adjust the ramp metering signal rates, so that traffic flows could be managed to reduce congestion. At seven out of the 40 on-ramps where adaptive ramp metering would be implemented, High Occupancy Vehicle (HOV) preferential lanes would also be included in order to minimize delay to carpools and transit. Three out of these seven on-ramps would require widening to accommodate the HOV preferential lanes. Incident-related freeway traffic congestion would also be monitored through information gathered from the closed circuit television cameras and traffic loop detectors. Appropriate tow-truck dispatchers or first incident responders would be quickly dispatched to the site to clear the incident, minimizing the traffic impacts and incident related delays.

The project would be implemented by the Alameda County Transportation Commission (Alameda CTC) and funded by federal, state and local funds. The Department is the lead agency for the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA).

Related Transportation Planning Documents

The project is included in the FY 2010/2011 Metropolitan Transportation Commission's (MTC) Transportation Improvement Program (TIP) as project number ALA070041. MTC approved the financially constrained TIP on October 27, 2010. On December 14, 2010, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) approved the TIP. The project is also included in the MTC's 2009 Regional Transportation Plan (RTP), *Transportation 2035* (project numbers 230402 and 230597).

[2] The term "adaptive" refers to the ability of the ramp metering system to adjust the "green rate" based on traffic flows in the freeway mainline and ramp queuing. For example, if the system detects (through detection loops in the pavement) that the ramp queue is overflowing onto the local streets/arterials, the ramp meters increase the frequency of green lights until the overflow is cleared. See Section 1.3 for additional information.

[3] A loop detector is simply a wire circuit system embedded in the road's surface that can detect when a vehicle passes over the loop's location.

In October 2010, the Department approved the I-80 Corridor System Management Plan (CSMP), a transportation planning document that presents an analysis of existing and future traffic conditions and proposes traffic management strategies and capital improvements to maintain and enhance mobility within the project corridor.[4] The I-80 ICM project is one of the two near-term recommended projects and strategies included in the CSMP.

Related Projects

Several other system management strategies are planned or have been implemented within the project corridor and connecting arterial roadways, as discussed below. Each of these projects, while separate and having independent utility and purpose, would work together and complement the proposed I-80 ICM project, to better manage traffic flow, reduce congestion, and improve safety throughout the project corridor.

- The I-80 Traffic Operations Systems (TOS) project includes the installation of a linked highway advisory radio and changeable message sign system and associated freeway traffic monitoring stations in the project corridor. The I-80 TOS project provides basic real-time travel information to drivers (i.e., travel times and reported accidents). The project construction is anticipated to be completed by May 2012.
- The San Pablo Corridor Arterial and Transit Improvement Project involves the implementation of informational message signs, traffic signal synchronization, emergency vehicle pre-emption, and other components to manage traffic flows that divert from I-80 to San Pablo Avenue as a result of congestion or other incidents on the freeway. The project construction is anticipated to be completed by January 2014.
- The Richmond Parkway Transit Center project involves several improvements to a park-and-ride and bus terminal facility, including construction of a new parking structure, bus bays, new signals at Richmond Parkway and Blume Drive and a parking management system. Information signs for the availability of parking spaces and associated bus schedules will be integrated with the I-80 ICM project to enhance real time traveler information. A completion date for the project has not been determined and will depend on available funding.

1.2 Purpose and Need

1.2.1 Project Purpose

The I-80 corridor is one of the most congested corridors in the San Francisco Bay Area, with traffic volumes reaching 312,000 vehicles per day and an average of 7,500 hours of daily traffic delays. **Figure 1-2** provides a flow diagram of the bi-directional (eastbound and westbound) annual average daily traffic (AADT) volumes on I-80. The highest traffic volumes occur between the I-80/I-580/I-880 interchange (commonly referred to as “The Maze”) and Powell Street. The Department, in cooperation with local

[4] CSMPs are being developed throughout the state for corridors within which funding is being used from the Corridor Mobility Improvement Account (CMIA) and Highway 99 Bond Programs created by the passage of the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, approved by the voters as Proposition 1B in November 2006. The intent is to eventually develop CSMPs for all urban freeway corridors.

transportation agencies, implemented several capacity improvement projects along this freeway to address recurring congestion; however, segments of the corridor remain congested for up to 10 hours on a daily basis.

The purpose of the project is to optimize use of the existing infrastructure within the corridor by implementing system management strategies to reduce congestion, reduce travel time, and improve safety. The project is expected to provide the following benefits:

- Improve travel time within the existing transportation network by optimizing the use of existing lanes
- Improve the safety and operation of the transportation network
- Reduce traffic congestion by decreasing incident recovery time
- Improve travel time reliability.

1.2.2 Project Need

1.2.2.1 Capacity, Transportation Demand, and Safety

Travel Time

Under existing conditions, substantial traffic congestion occurs along westbound I-80 during the morning peak period (6:00 AM to 10:00 AM), due to high travel demand and lack of available capacity at several interchanges including The Maze, Powell Street, I-580, San Pablo Dam Road, and Pinole Valley Road interchanges. Substantial traffic congestion occurs along eastbound I-80 during the evening peak period (2:00 PM to 7:00 PM), especially near the interchanges with I-580, Carlson Boulevard, San Pablo Avenue, and SR-4. Currently, it takes an average of 24 minutes in the morning peak period to travel from SR-4 to The Maze, a distance of approximately 16 miles. In the evening, the eastbound return trip within the same limits takes an average of 25 minutes.

According to population growth forecasts published by the Association of Bay Area Governments (ABAG), the population within the San Francisco Bay Area is expected to increase by two million people within the next 25 years. Portions of the I-80 freeway corridor are expected to experience an increase in traffic volumes of 30 to 45 percent, while connecting arterial roadways are expected to experience an increase in traffic volumes of 20 to 50 percent. A computerized regional traffic model was developed to simulate anticipated changes in travel time resulting from the forecasted population growth. As shown in **Table 1-1**, under 2015 No-Build conditions, travel time from SR-4 to The Maze would increase by approximately 17 percent in the morning peak period, and by more than 70 percent in the evening peak period.

Table 1-1: Average Travel Time between The Maze and SR-4

Peak Hour, Direction	Simulated Results		
	Existing	2015 No-Build	% Change from Existing
AM, Westbound	21.7	25.4	+17%
PM, Eastbound	23.6	40.4	+71%

Traffic Incidents

Congested freeway conditions encourage erratic driver behavior, increasing the potential for rear-end and side-swipe accidents. The information contained in the Department's Traffic Accident Surveillance and Analysis System database indicates there were 6,285 recorded accidents in the project corridor between November 2004 and October 2007. Approximately 60 percent of these accidents occurred in the westbound lanes, while approximately 40 percent occurred in the eastbound lanes. More than half of the accidents occurred between The Maze and the I-580 split. The accident rate on this segment of I-80 is nearly 80 percent higher than the statewide average for similar freeway facilities (see Section 2.2.3 for detailed traffic accident rates). Approximately 76 percent of the accidents involved property damage only, while 24 percent involved injuries (0.5 percent involved fatalities).

No methodology exists that can accurately predict future accident patterns on freeway mainlines[5], but it is generally accepted that as vehicle miles travelled (VMT) increases due to increased volume and congestion, collision rates also will increase. Between the existing year and 2015, VMT is expected to increase by 9 percent, suggesting that incidents will increase by a similar margin.

The combined effect of accidents and traffic congestion also has the effect of hindering emergency response by increasing the amount of time it takes to respond and reach an incident.

Incident Recovery Time

Under existing conditions, when an incident occurs on I-80 within the corridor, substantial congestion occurs, especially during peak traffic periods. The amount of time the freeway is affected (referred to as "recovery time") is directly related to how quickly emergency services, and/or roadside assistance, can reach the incident and clear the blocked lanes. Because emergency response is also hindered by congestion, the recovery time increases as congestion levels increase.

Real-Time Traffic Information

The combination of high rates of traffic incidents and long recovery times leads to an inconsistency and lack of dependability in travel times within the project corridor. Travel time and delays can be unpredictable, and vary greatly during the peak commute times. A trip from the Carquinez Bridge to The Maze during the morning peak period (6:00 AM to 10:00 AM) can range from 20 to 40 minutes. This affects all trips within the project corridor. Drivers want travel time reliability.[6]

Existing changeable message signs within the project corridor provide estimated travel times to popular destinations (i.e., major cities and bridges) within the transportation network. Information on traffic incidents is primarily shared via the Internet and the telephone through the San Francisco Bay Area 511 system. The existing changeable message signs neither provide real-time lane conditions to advise motorists of an incident ahead nor comparable travel times for optional freeway routes or alternative modes of transportation. Real-time traffic information would allow drivers to make better choices regarding route and mode to reach their destination, which in turn would result in more reliable expectations regarding travel times.

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[5] The travel lanes on a freeway are considered the "mainline".

[6] FHWA, 2006. Travel time reliability, making it there on time, all the time. Available at: http://ops.fhwa.dot.gov/publications/tt_reliability/brochure/ttr_brochure.pdf; Last accessed: March 30, 2011.

1.2.3 Logical Termini and Independent Utility

The San Francisco-Oakland Bay Bridge and the Carquinez Bridge are logical termini for the project as they represent the major destinations for the traffic along I-80. These bridges connect the East Bay area with San Francisco, the North Bay, and destinations inland, including the Sacramento metropolitan area. This segment of I-80 also provides access to portions of eight cities located in Alameda and Contra Costa Counties, and provides connection to other major freeways, including I-580, I-880 and SR-4. Many commuters that reside in Contra Costa County and northern Alameda County use this segment of I-80 when traveling to and from work in Oakland, San Francisco, and other employment centers.

Origin and destination data for the project corridor shows that over 55 percent of trips that use the Carquinez Bridge in the AM peak hour westbound continue west to The Maze, and 31 percent continues on to the San Francisco-Oakland Bay Bridge. In the eastbound direction, vehicle trips from The Maze during the PM peak hour primarily end up at four destinations: Albany/Berkeley/Emeryville, I-580, Richmond to Pinole, and east of the Carquinez Bridge. Forty-four percent of the traffic originating from the Maze during the PM peak hour is from the San Francisco Bay Bridge. The San Francisco-Oakland Bay Bridge and the Carquinez Bridge, providing toll facilities and no on- or off-ramps, are in effect the endpoints of the project corridor that would not benefit from the proposed improvements.

Transportation projects must also have independent utility and the project must be a reasonable cost even if no additional transportation improvements are made in the area. The I-80 ICM project considered in this environmental document represents transportation improvements that would meet the project's purpose and need and would not require further improvements that would have additional environmental effects. The project would not restrict considerations of alternatives for other reasonably foreseeable transportation improvements.

1.3 Project Description

The I-80 ICM project proposes the installation of operational improvements and the use of an Intelligent Transportation System (ITS), along a 19.5-mile portion of I-80, from the San Francisco-Oakland Bay Bridge Toll Plaza to the Carquinez Bridge. ITS is a combination of computer and communication technologies that make transportation systems operate more efficiently and safely. The primary components of the project include:

1. Installation of signs and signals to manage traffic during incidents
2. Installation of signs to share traffic and transit information
3. Installation of ramp metering at 40 on-ramps[7]

These components would be controlled via software communication links by the Department's Transportation Management Center (TMC), currently located at the Department's District Office in Oakland. Activities at the TMC include monitoring freeway traffic, incidence response, and coordinating with the California Highway Patrol (CHP) and Bay Area 511 to provide real-time traffic information to motorists. The information gathered through the vehicle detection devices alerts the TMC operator about

[7] There are a total of 44 on-ramps within the project corridor. The I-80 ICM project would install metering equipments on 40 on-ramps.. Three out of the remaining four on-ramps in the project corridor (eastbound SR-4; eastbound Cummings Skyway; and eastbound Willow Avenue) would have ramp metering equipment installed by the I-80 Eastbound HOV Lane Project. Ramp metering equipment already exists at the Willow Avenue westbound on-ramp. The project will activate adaptive ramp metering at all 44 on-ramps.

any traffic incidents and/or congestion. The operator then can monitor the situation via closed-circuit television cameras, activate incident response strategies, and display real-time traveler information to the motorists on the freeway. During any major incidents, the TMC operator would also coordinate the emergency response with local authorities to ensure a coordinated and efficient response.

1.3.1 Alternatives

1.3.1.1 Build Alternative

The Build Alternative involves installation of operational improvements from the San Francisco-Oakland Bay Bridge Toll Plaza (Alameda County I-80 postmile 1.99) to the Carquinez Bridge (Contra Costa County postmile 13.49). The improvements would occur at specific locations along the 19.5-mile corridor.

Table 1-2 lists all of the components of the Build Alternative. Following publication of the Draft IS/EA, the Department received a comment letter (included in Chapter 3) from the Richmond Annex Neighborhood Council (RANC) suggesting revisions to placement of Gantries #9, #10, and #11 to minimize visual impacts for the adjacent residential neighborhoods. Two meetings between the project team and RANC representatives were held on June 16 and June 28, 2011. The following consensus on the revisions was reached: Gantry #9 will be relocated approximately 650 feet south to the south side of the Central Avenue undercrossing; Gantry #10 will remain in the same location as shown in the Draft IS/EA, and Gantry #11 will be relocated approximately 150 feet north to line up with an existing bridge sign in the westbound direction, where it would be screened from view by a row of tall trees that line the highway. This will reduce any potential visual concerns. **Figure 1-3** depicts where the components would be installed (each component is associated with an identification number), including the revised locations for Gantry #9 and Gantry #11. **Appendix C** contains more detail regarding these locations.

Table 1-2: Components of the Build Alternative

Component	Number of Units	Height (feet)
Sign Bridge Structures (Gantries)		
Sign Bridge Structures (Gantries)	11	29
Variable Advisory Speed Signs	33	n/a
Variable Message Signs (Type 2)	4	n/a
Lane Use Signals	52	n/a
Stand-Alone Components		
Variable Advisory Speed Signs [A]	34	14
Information Display Boards	6	32
Variable Message Signs (Type 1)	4	12
Closed-Circuit Television Cameras	19 [B]	40
Adaptive Ramp Metering		
Ramp Metering Equipment [C]	145	21
On-Ramp Loop Detection	237	n/a
System Loop Detection (freeway mainline) [D]	310	n/a

Component	Number of Units	Height (feet)
Ancillary Project Components		
Pull Boxes	379	n/a
Service Enclosures	13	n/a
Controller Cabinets	63	6
Conduit Installation [E]	50,000 lf [F]	n/a
Construction Staging Areas	15 areas	n/a
Ramp Widening for High-Occupancy Vehicles (HOV) Preferential Lanes		
Ashby HOV Lane	1	n/a
University HOV Lane	1	n/a
State Route 4 (SR-4) HOV Lane	1	n/a

Notes:

A. 34 on new poles

B. Installed on 18 new poles; one pole contains two cameras

C. Including ramp meter signals and "meter on" signs

D. Loop detectors and related traffic sensors proposed at 35 locations

E. A 20-foot-wide temporary impacts corridor encompasses impacts from both device and conduit

F. lf = Linear Feet

The operational improvements consist of system management strategies that will make the most efficient use of the existing transportation network to improve travel time and travel reliability through the project corridor. As described below, the system management strategies (known collectively as an intelligent transportation system) include incident management, adaptive ramp metering, and traffic and transit information sharing.

Incident Management

Incident management is the use of signs and signals to provide drivers with advance warning of accidents, construction zones, or other incidents. When one or more travel lanes are blocked, erratic driving behavior increases as drivers attempt to suddenly change lanes and/or exit the freeway. Incident management improves safety and assists emergency responders in reaching those in need.

The Build Alternative includes several types of signs and signals to provide graphic or text messages that warn motorists of downstream conditions and lane closures.

Sign Bridge Structures (Gantries)

Under the Build Alternative, a total of 11 overhead sign bridge structures (gantries) would be constructed above the westbound I-80 travel lanes per the Department's design standards. The maximum gantry height would be 29 feet. Three types of signs would be installed on the gantries, as described below.

- A lane use signal would be installed over each freeway travel lane to show advisory speed signs, queue warnings, lane management instruction, and advisory text. The lane use signals would be used for efficiently managing existing lane capacity during incidents and for work zone management. These signs would be operable 24 hours a day.

- Variable advisory speed signs would only be activated during incidents and lane closures. Variable advisory speed signs would display lower advisory speeds prior to incident-related congestion or lane closures to slow traffic ahead of end of queue, thereby reducing rear-end collisions. This technique is known as "end of queue warning." The speeds displayed are advisory only, and are not enforceable.
- A variable message sign (Type 2) would be installed on every third gantry on the upper right corner of the gantry. Each variable message sign would be full color and would provide driver information regarding incidents, work zones, and lane closures. These signs would operate during incidents and lane closures.

Figure 1-4 provides an illustration of a gantry, including representative display messages for the lane use signals, variable advisory speed signs, and variable message signs.

Incident management helps reduce traffic congestion. Previous studies have found that if drivers are aware of lane-blocking incidents downstream, traffic congestion can be reduced since drivers would be gradually merging into adjacent lanes and avoiding last-second forced merging, which can lead to secondary accidents.[10] The activation of the lane use signals and variable message signs would inform drivers to merge into other lanes prior to an accident scene. . Variable advisory speed signs could also display lower advisory speeds prior to incident-related congestion to slow traffic ahead of time, thereby reducing rear-end collisions.

It is expected that the operation of the signs and signals would result in a reduction in the accident rate along I-80. The benefits of an accident rate reduction include a lower number of injuries and fatalities, a decrease in property damage costs, and a reduction in incident-related traffic congestion. In corridors such as I-80, incident-related traffic congestion is approximately half of the total delay on the freeway. A reduction in the number of incidents can also lead to a reduction in the total hours of delay experienced in the I-80 corridor. Such a reduction would facilitate the project purpose of decreasing traffic incidents, including secondary accidents – thereby improving traffic safety and reducing incident/accident-related delays and congestion.

Installation of the gantries would involve construction of cast-in-drilled-hole concrete foundations to support the sign bridge structures, as well as trenching for the installation of new electrical conduit, in some locations. Where feasible, existing electrical lines would be used to power the signs and signals.

Stand-Alone Components

Variable Advisory Speed Signs

Stand-alone variable advisory speed signs would be installed at 34 locations in both the eastbound and westbound directions on I-80. The maximum height of the variable advisory speed signs would be 14 feet. The operation of these signs would reduce rear-end collisions by warning drivers of slow traffic speeds.

[10] Mercer Island Reporter, April 27, 2010. WSDOT adds electronic signs to manage lanes on regional interstate highways. Available at: http://www.pnwlocalnews.com/east_king/mir/news/92201899.html; Last accessed: March 30, 2011.

Installation of the variable advisory speed signs includes the construction of post foundations, as well as trenching for installation of new electrical conduit in some locations. Solar power may be used in lieu of trenching for a local power source, and wireless communication would be utilized for stand-alone variable advisory speed signs.

Variable Message Signs (Type 1)

Stand-alone variable message signs (Type 1) would be installed at two high-speed westbound I-80 on-ramps at SR-4 (John Muir Parkway) and Ashby Avenue, one sign each on each side of the on-ramp, for a total of four locations. The signs would provide advanced warning to motorists that the ramp meter is in operation, to help reduce rear-end collisions by warning drivers of slow traffic speeds at the ramp meters.

Installation of the variable message signs would include the construction of post foundations, as well as trenching for installation of new electrical conduit in some locations.

Closed-Circuit Television Cameras

A total of 19 closed-circuit television cameras would be installed along the corridor. The maximum closed-circuit television camera pole height would be 40 feet. The closed-circuit television cameras would be used for monitoring traffic conditions. The traffic images would be transmitted to the Department's TMC in Oakland using fiber optic or wireless technology. Electricity to power the camera and the fiber optic line would be contained within a buried conduit.

Installation of closed-circuit television cameras would include the construction of cast-in- drilled-hole concrete foundations, as well as trenching for installation of new electrical conduit in some locations.

Traffic and Transit Information

The Build Alternative would use information display boards to provide motorists with information on traffic conditions and travel time, and parking availability at the Richmond Parkway Transit Center, when constructed. Providing motorists with traffic and transit information would allow individuals to make informed decisions on alternative freeway routes, which in turn would result in reliable expectations regarding travel times.

Up to six full-color graphic information display boards would work in concert with the lane use signals and variable advisory speed signs and related communication infrastructure. The information display boards would provide motorists with information about congestion, work zones, accidents, and travel time.

An illustration of an information display board, together with representative information displayed, is provided in **Figure 1-5.** The maximum height of the pole would be 32 feet. The dimension of the information display board would be approximately 10.5 feet wide by 13 feet high.

A San Francisco Bay Area study has found that up to approximately 8 percent of drivers changed the mode of travel based on transit travel information displayed on freeway signs.[11] When drivers know travel times in advance, they can select the fastest freeway route and/or alternate mode of transportation

[11] California Center for Innovative Transportation, 2009. Travel Times on Changeable Message Signs Volume II – Evaluation of Transit Signs

to avoid the congested route.[12] Information display boards would provide updates on the availability of parking (when the Richmond Parkway Transit Center is constructed) and transit options or alternate freeway routes, which would allow motorists to choose an alternate freeway route or transit mode (Bay Area Rapid Transit (BART) or buses) to complete the trip. Related projects within the project corridor include features, such as the informational message signs along San Pablo Avenue (which runs parallel to I-80), that will help manage traffic flow along arterial roadways in the event of a major incident. Informational message signs would direct motorists to return to the freeway immediately downstream of the incident location.

Adaptive Ramp Metering

Ramp metering is a common freeway traffic management technique and has been implemented throughout the state. Ramp meters are traffic signals located at on-ramps to control the flow of vehicles from the ramp onto the freeway. As one of the few freeway corridor management tools available, ramp meters are usually implemented to achieve two main goals: (1) manage the amount of traffic entering a freeway in an attempt to prevent freeway flows from reaching capacity, while managing ramp demand, and (2) break up dense groups of vehicles entering the freeway from an upstream arterial traffic signal.[13]

Typical ramp metering in California is installed with pre-timed (or fixed-rate) rates, whereby the frequency of the green lights (the “green rates”) throughout the day are pre-determined based on the analysis of historical traffic data. This metering strategy is designed to cope with “typical” traffic conditions and is not able to incorporate real-time variations in freeway conditions. Consequently, the effectiveness of the fixed-time rates deteriorates with large variations in freeway conditions or when non-recurrent conditions (e.g., traffic incidents) occur on freeways. With the enhancement of traffic monitoring technology, this strategy has been replaced by more sophisticated metering algorithms that account for real-time traffic conditions, such as the adaptive ramp metering technology proposed under the Build Alternative.

The term “adaptive” refers to the ability of ramp metering to adjust the “green rate” based on traffic flows in the freeway mainline and ramp queuing. For example, if the ramp queue is approaching the local arterials, loop detectors installed in the pavement automatically advise the ramp meter signals to increase the frequency of green lights to manage the queue. The adaptive ramp metering that would be implemented as part of this project would have the ability to adjust metering rates at all ramps as a corridor-wide system by considering real-time conditions on the freeway and ramps. In order to provide overall network benefits, the ‘green rates’ at some ramps would automatically decrease to compensate for the increase in ‘green rates’ at other ramps at which the queue needed to be shortened. The meters adapt and re-adjust to manage congestion or to help motorists move through traffic incidents better by preventing too many vehicles from entering the freeway simultaneously. This corridor-wide approach to ramp metering will effectively manage the operation of congested portions of the freeway mainline.

[12] Mercer Island Reporter, April 27, 2010. WSDOT adds electronic signs to manage lanes on regional interstate highways. Available at: http://www.pnwlocalnews.com/east_king/mir/news/92201899.html; Last accessed: March 30, 2011.

[13] Transportation Research Board (TRB) of the National Academies, 2009. Empirical Evaluation of Freeway Corridor Performance Before and After System-Wide Adaptive Ramp Metering System Implementation. Submitted for presentation and publication to the 88th Annual Meeting of the Transportation Research Board, January 11–15, 2009. Available online at: http://www.its.pdx.edu/upload_docs/1249575494.pdf; Last accessed: March 30, 2011.

The project will install ramp metering equipment at 40 on-ramps and activate the existing metering at 4 additional on-ramps within the project corridor. Ramp meter equipment on these additional four ramps was installed by other projects. The maximum height for a ramp meter installation across three lanes would be 21 feet. **Table 1-3** presents the locations where the ramp metering equipment would be installed. Electricity for the ramp metering would be provided by an existing source.

Table 1-3: Freeway On-ramps with Proposed Adaptive Ramp Metering Improvements

I-80 Eastbound On-ramps	I-80 Westbound On-ramps
City of Emeryville	
Powell St.	Ashby Ave. & Frontage Rd.*
	Powell St./Frontage Rd.
	Powell St.
City of Berkeley	
Ashby Ave./Potter St.	Gilman St.*
University Ave.	University Ave. (loop)*
Gilman St.	
City of Albany	
Buchanan St.	Buchanan St.*
City of Richmond	
Central Ave.	Westbound Hilltop Dr. (loop ramp)
Carlson Blvd.	Hilltop Dr. (diagonal) *
San Pablo Ave.	Solano Ave.
El Portal Dr.	Barrett Ave.
Eastbound Hilltop Dr. (loop ramp)	Carlson Blvd.
Westbound Hilltop Dr. (diagonal)*	Central Ave.
City of El Cerrito	
Cutting Blvd. (loop ramp)	Potrero Ave.
Cutting Blvd.	
City of San Pablo	
San Pablo Dam Rd.	El Portal Dr.
	San Pablo Dam Rd.
City of Pinole	
Eastbound Fitzgerald/ Richmond Pkwy. (loop ramp)	Pinole Valley Rd.
Westbound Fitzgerald/Richmond Pkwy.	Appian Way
Southbound Appian Way (loop ramp)	Fitzgerald Dr./Richmond Pkwy.
Northbound Appian Way	
Pinole Valley Rd.	
City of Hercules	
	John Muir Pkwy. (SR-4)*
Crockett	
	San Pablo Ave./Pomona St.
	Cummings Skyway

* Ramp locations where HOV Preferential Lanes would be provided.

System Detection Devices

The system detection component of the Build Alternative consists of placing loop detectors and related traffic sensors in the pavement to monitor traffic flow. The devices would be placed within the freeway pavement and would not be visible to motorists. Installation of the system detection components requires making saw cuts into the pavement to install and connect the devices. Once installed, the pavement is sealed. In order to collect and disseminate the traffic data from the loop detectors, controller cabinets would be constructed on concrete pads along the freeway shoulder, adjacent to the loop detectors. The loop detectors and controller cabinets are collectively referred to as freeway vehicle detection stations (aka traffic monitoring stations).

Ancillary Project Components

All of the above-described components would include pull boxes, controller cabinets, and service enclosures. The Build Alternative would require the installation of approximately 50,000 linear (approximately 10 miles) feet of new plastic conduit. The conduit would be 3 inches in diameter and installed either using an open trench or horizontal directional drilling. Pull boxes would be installed in association with the new conduit runs. Exhibits contained in **Appendix C** depict the location of the Build Alternative's conduit runs.

High Occupancy Vehicle (HOV) Preferential Lanes

There would be seven on-ramps with HOV Preferential lanes at the locations shown on **Table 1-3**, above. Existing lanes at four on-ramps within the project corridor would be restriped to include HOV preferential lanes. This involves removal of existing pavement striping and placement of new pavement striping. Three on-ramps within the project corridor would be widened to accommodate HOV preferential lanes. Widening would occur at the University Avenue westbound loop ramp, the SR-4 (John Muir Parkway) on-ramp and the Ashby Avenue westbound on-ramp. The lanes would be 12 feet in width and would be constructed within the existing right-of-way (ROW).

The benefit of including the HOV preferential lanes is to provide preferential treatment of carpools and transit vehicles, wherein the frequency of the green lights would be higher for the HOV preferential lanes. This would encourage drivers to carpool and use transit, thereby reducing the number of vehicles entering I-80.

Ground Disturbance and Construction Staging Areas

Installation of the improvements previously described would result in approximately 38,422 square feet of permanent ground disturbance and approximately 1,037,500 square feet of temporary ground disturbance. The majority of the temporary ground disturbance would be related to the installation of the required electrical and/or fiber optic conduits that would connect the various devices. Approximately 83 percent of this area would occur in developed and/or landscaped areas. All slopes or unpaved areas temporarily affected by the project would be reseeded with native grasses and shrubs to stabilize the slopes and bare ground against erosion. Following construction, native (and non-native if appropriate) plant species would be planted at the disturbed areas.

Table 1-4 provides a breakdown of the ground disturbance areas associated with the Build Alternative.

Table 1-4: Ground Disturbance Area

Structure	Area per Unit (square feet)	Total Area (square feet)
Permanent Ground Disturbance Area		
Sign Bridge Structures (Gantries)	39	432
Variable Advisory Speed Signs [A]	5	137
Information Display Boards	20	118
Closed-Circuit Television Cameras [B]	5	88
Adaptive Ramp Metering Equipment [C]	3	455
Variable Message Signs (Type 1)	6	25
Pull Boxes	5	2,062
Service Enclosures	1	15
Controller Cabinets	38	2,419
Ashby HOV Lane	20,038	20,038
University HOV Lane	2,614	2,614
SR-4 HOV Lane	10,019	10,019
Total Permanent Ground Disturbance Area		*38,422*
Temporary Ground Disturbance Area		
Installation [D]	20	1,000,000 [E]
Staging Areas	2,500	37,500
Total Temporary Ground Disturbance Area		*1,037,500*

Notes:

A. Thirty-four stand-alone installations; remainder installed on gantries

B. Installed on 18 new poles; one pole contains two cameras

C. Including ramp meter signals and meter on signs

D. A 20-foot-wide temporary impacts corridor encompasses impacts from both device and conduit construction

E. Approximately 83 percent would be in developed or landscaped areas

Staging areas to accommodate project construction equipment, materials, and worker parking have been identified at 15 locations within the project corridor (see **Appendix C**). All staging areas would be located within existing paved or landscaped areas. In areas adjacent to salt marsh habitat, all staging areas would be placed east of the frontage road, and traffic cones would be used to prevent opportunistic worker parking in these areas (i.e., westbound on-ramp at Powell Street).

Project Implementation

Implementation of the I-80 ICM Project would involve two projects that would not result in physical changes in the environment. These projects would include:

1. **Software and Systems Integration**– which involves upgrades and improvements to software and computer networks used by the Department to monitor and manage the intelligent transportation system implemented under this project.
2. **Procurement**– which involves the purchasing of the intelligent transportation system equipment such as the variable advisory speed signs, message signs, lane use signals, and full color information display boards

System Management Strategies

System management strategies increase the efficiency of existing facilities without increasing the number of through lanes. Examples of system management strategies include ramp metering, auxiliary lanes, turning lanes, reversible lanes and traffic signal coordination. System management also encourages a unified urban transportation system that integrates multiple forms of transportation modes such as pedestrian, bicycle, automobile, rail, and mass transit. The Build Alternative involves the installation of several types of System management strategies, as described above.

Transportation Demand Management Alternatives

There are several transportation demand management strategies within the San Francisco Bay Area that are used to reduce the number of vehicle trips along the I-80 corridor. Rideshare offers carpoolers reduced bridge tolls as well as access to carpool lanes. There is also a vanpool for larger groups of commuters. Transportation demand management may also involve the provision of contract funds to regional agencies that are actively promoting ridesharing, maintaining rideshare databases, and providing limited rideshare services to employers and individuals. Increased vehicle occupancy reduces traffic volumes during peak commuting periods; however, without the implementation of incident management, active ramp metering, and Traffic and Transit information components described above, successful implementation of a transportation demand management alternative would not reduce incidents, or improve travel time reliability. Accordingly, a transportation demand management alternative would not satisfy the purpose of the project.

Project Cost and Schedule

The estimated cost associated with the Build Alternative is $61,689,000. **Table 1-5** below summarizes the funding sources for the Build Alternative.

Table 1-5: Funding Sources – Build Alternative

Funding Source	Amount
Federal	
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	$3,093,000

Funding Source	Amount
State	
State Transportation Improvement Program – Regional Improvement Program	$954,000
Corridor Mobility Improvement Account (CMIA) Program	$52,834,000
Local	
Contra Costa County Sales Tax Revenue, Measure J	$4,808,000
Total	*$61,689,000*

Project construction is anticipated to begin in 2012 and be completed in 2014.

1.3.1.2 No-Build Alternative

The No-Build Alternative would make no physical or operational improvements to the I-80 mainline. It would not address traffic congestion on the mainline and therefore, would not achieve the project purpose of improving the travel time on the transportation network. Because of the constrained condition of the existing ROW, widening the facility is not an option. Managing the existing congestion caused by high traffic volumes and traffic incidents is the only way to improve travel reliability.

The No-Build Alternative would not achieve the project purpose of improving travel reliability through the I-80 corridor because it would not reduce congestion on the mainline, it would not enhance real time traveler information, and it would not facilitate emergency responder operations. The purpose of improving safety and operation of the transportation network would not be achieved because the No-Build Alternative would not reduce congestion-related accidents.

1.3.2 Planned Projects

It is anticipated that the following currently planned and funded projects for the I-80 corridor between the Carquinez Bridge and the San Francisco-Oakland Bay Bridge would be constructed and operated by the year 2015:

Planned developments:

- New Town Center (City of Hercules)
- Hilltown (City of Hercules)
- Gateway at Emeryville (City of Emeryville).

Planned vehicular transportation improvements:

- I-80/Powell Street eastbound off-ramp widening
- I-80/Gilman interchange reconfiguration
- I-80/Central Avenue interchange modification
- I-80/San Pablo Dam Road interchange modification
- I-80/Pinole Valley Road eastbound on-ramp improvements
- I-80 eastbound HOV lane, SR-4 to Carquinez Bridge (currently under construction)

- Planned pavement maintenance project on I-80, from Alameda County post mile 2.5 to post mile 8.0
- Planned pavement resurfacing on I-80 in Oakland, Emeryville, Berkeley, and Albany.

Planned other alternative mode of transportation improvements:

- Planned bicycle and pedestrian pathways to be located along the south side of I-80 in conjunction with the San Francisco-Oakland Bay Bridge East Span Replacement Project
- Planned bicycle and pedestrian I-80 overcrossing located to the south of Ashby Avenue
- Richmond Parkway transit center
- Central Richmond greenway and Class I bicycle trail
- The Refugio bridge bicycle, pedestrian, and vehicle connectivity project in Hercules
- Planned plant establishment project for shoreline habitat planting in Oakland and Emeryville.

1.3.3 Final Decision-Making Process

After the public circulation period for the Draft IS/EA, the Department considered all comments , made revisions to the proposed project, selected a preferred alternative and made the final determination of the project's effect on the environment. In accordance with CEQA, the Department prepared a Mitigated Negative Declaration (MND). Similarly, as the Department determined the action does not significantly impact the environment, the Department, as assigned by FHWA, issued a Finding of No Significant Impact (FONSI) in accordance with NEPA.

1.4 Identification of a Preferred Alternative

The Department identified the Build Alternative as the preferred alternative after considering comments received from State, regional, and local agencies, and the public. The following summarizes the reasons for choosing the Build Alternative over the No Build Alternative:

- **Improve travel time within the existing transportation network by optimizing the use of existing lanes.** The Build Alternative would include both incident management and adaptive ramp metering facilities and strategies to improve travel conditions.

  The Build Alternative is expected to result in an 8 percent reduction in network-wide vehicle hours of delay during both morning and evening peak periods in 2015. With regard to traffic on the I-80 freeway portion of the transportation network, the Build Alternative would reduce vehicle hours of delay by 22 percent in the morning peak period and by 10 percent in the evening peak period.

- **Improve traffic safety and reduce incident/accident-related delays/congestion.** In corridors such as I-80, incident-related traffic congestion makes up approximately half of the total delay on the freeway. Components of the Build Alternative such as the sign bridge structures and stand alone variable advisory signs will alert drivers to reduce speed, upstream of incidents and therefore, minimize variations in speed in different segments of the I-80 corridor. This strategy will reduce the number of collisions caused by sudden changes in speed and by abrupt lane changes, thereby improving safety. Adaptive ramp metering is expected to reduce traffic collisions in merge areas by spreading out "platoons" of vehicles and managing the entry of vehicles onto the freeway, resulting in fewer side-swipe and merge-related collisions. Ramp metering is also expected to reduce stop-and-go driving behavior along the freeway, resulting in fewer rear-end collisions.

- **Improve travel time reliability.** Implementation of the Build Alternative's intelligent transportation system (incident management, travel information and adaptive ramp metering) would reduce traffic congestion related to recurring traffic conditions and incidents. The combination of intelligent transportation systems implemented with the Build Alternative will provide more reliable travel information for drivers along with information regarding alternative modes and freeway routes resulting in overall improved travel time reliability within the I-80 corridor.

In conclusion, the Build Alternative would satisfy the purpose and need for the project described in Sections 1.2.1 and 1.2.2, while the No-Build Alternative would not satisfy the purpose and need.

1.5 Alternatives Considered but Withdrawn from Further Consideration

The withdrawn alternatives would involve the installation of active traffic management gantries and adaptive ramp metering elements with differing traffic management strategies. A description of each alternative and the reason it was withdrawn is summarized in **Table 1-6**.

The Build Alternative would incorporate several transportation management strategies. As such, the formulation of a separate transportation management strategy alternative is not necessary.

The existing transportation demand management programs are currently in place in the I-80 corridor. While it is possible that the implementation of additional transportation demand management programs and incentives in Alameda and Contra Costa counties (and surrounding communities) would reduce existing and projected future travel demand in the I-80 corridor, the transportation demand management program would not fulfill the project's purpose and need.

Table 1-6: Summary of Alternatives Considered but Withdrawn

Alternative	Summary and Reason for Withdrawal
Full Standard Alternative 1A	Alternative 1A is identical to the Build Alternative with respect to the proposed gantries and ramp metering (detection loops, controller cabinets, and communications). However, Full Standard Alternative 1A would provide an additional 32 HOV preferential lanes, and include CHP enforcement areas at appropriate locations on the eastbound and westbound I-80 on-ramps, meeting the Department's standards. While this alternative would achieve the purpose of the project, it was withdrawn due to the additional cost for ROW acquisition and potential impacts on sensitive biological resources that would occur due to ramp widening for inclusion of HOV preferential lanes and CHP enforcement areas.

Alternative	Summary and Reason for Withdrawal
Full Standard Alternative 1B	Alternative 1B is identical to the Build Alternative with respect to the proposed ramp metering. However, Full Standard Alternative 1B would provide an additional 32 HOV preferential lanes, and include CHP enforcement areas at appropriate locations on the eastbound and westbound I-80 on-ramps, meeting the Department's standards. Alternative 1B would also include the installation of gantries from Cutting Boulevard to The Maze along westbound I-80, and from The Maze to Buchanan Street along eastbound I-80. While this alternative would achieve the purpose of the project, it was withdrawn due to the additional cost for ROW acquisition and potential impacts on sensitive biological resources that would occur due to ramp widening for inclusion of HOV preferential lanes and CHP enforcement areas. Additional visual impacts would occur due to proposed gantries in the eastbound direction.
Full Standard Alternative 2	Alternative 2 is identical to the Build Alternative with respect to the proposed ramp metering. However, Full Standard Alternative 2 would provide an additional 32 HOV preferential lanes, and include CHP enforcement areas at appropriate locations on the eastbound and westbound I-80 on-ramps, meeting the Department's standards. Alternative 2 would not include the installation of stand-alone incident management elements between The Maze and Cutting Boulevard in the eastbound I-80 direction. While this alternative would achieve the purpose of the project, it was withdrawn due to the additional cost for ROW acquisition and potential impacts on sensitive biological resources that would occur due to ramp widening for inclusion of HOV preferential lanes and CHP enforcement areas.
Full Standard Alternative 3	Alternative 3 is identical to the Build Alternative with respect to the proposed ramp metering. However, Full Standard Alternative 3 would provide an additional 32 HOV preferential lanes, and include CHP enforcement areas at appropriate locations on the eastbound and westbound on-ramps. Alternative 3 would not include installation of any active traffic management elements such as gantries and stand-alone incident management elements. In addition to ROW and environmental impacts, the Full Standard Alternative 3 does not include active traffic management elements to reduce incident-related traffic congestion, and would therefore not meet the project purpose. As such, it was withdrawn from further consideration.

1.6 Permits and Approvals Needed

Table 1-7 identifies the permits/approvals that would be required for project construction.

Table 1-7: Permits and Approvals

Agency	Permit/Approval	Status
BCDC	Bay Conservation and Development Commission Permit	To be obtained prior to construction
USFWS	Letter of Concurrence	Obtained on June 30, 2011

Encroachment permits would be obtained from the Cities of Emeryville, Berkeley, Richmond, and Pinole. This will cover installation of conduit, “METER ON” signs, and service connections at various locations. Permits would be obtained prior to construction.

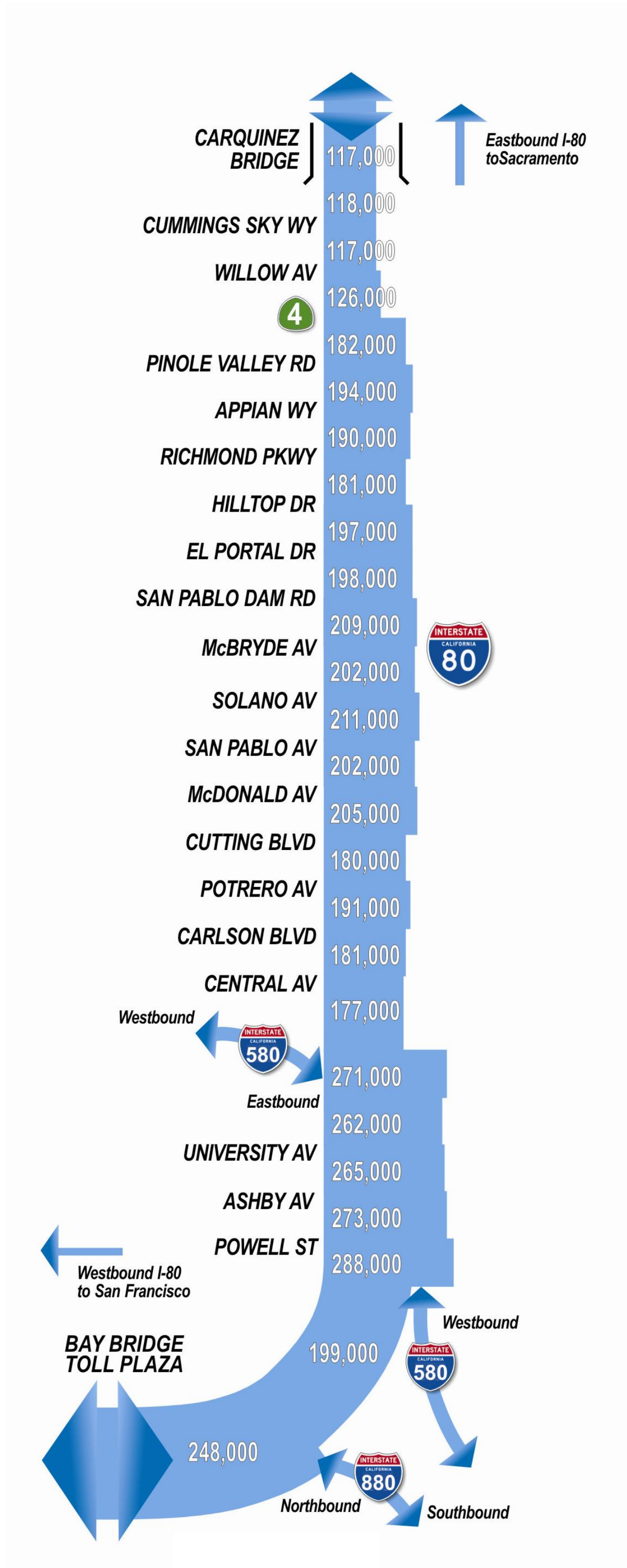
PROJECT LOCATION

SOURCE: ©2004, AERIALS EXPRESS, LLC

FIGURE 1-1

Interstate 80 Integrated Corridor Mobility Project

PROJECT LOCATION



LEGEND

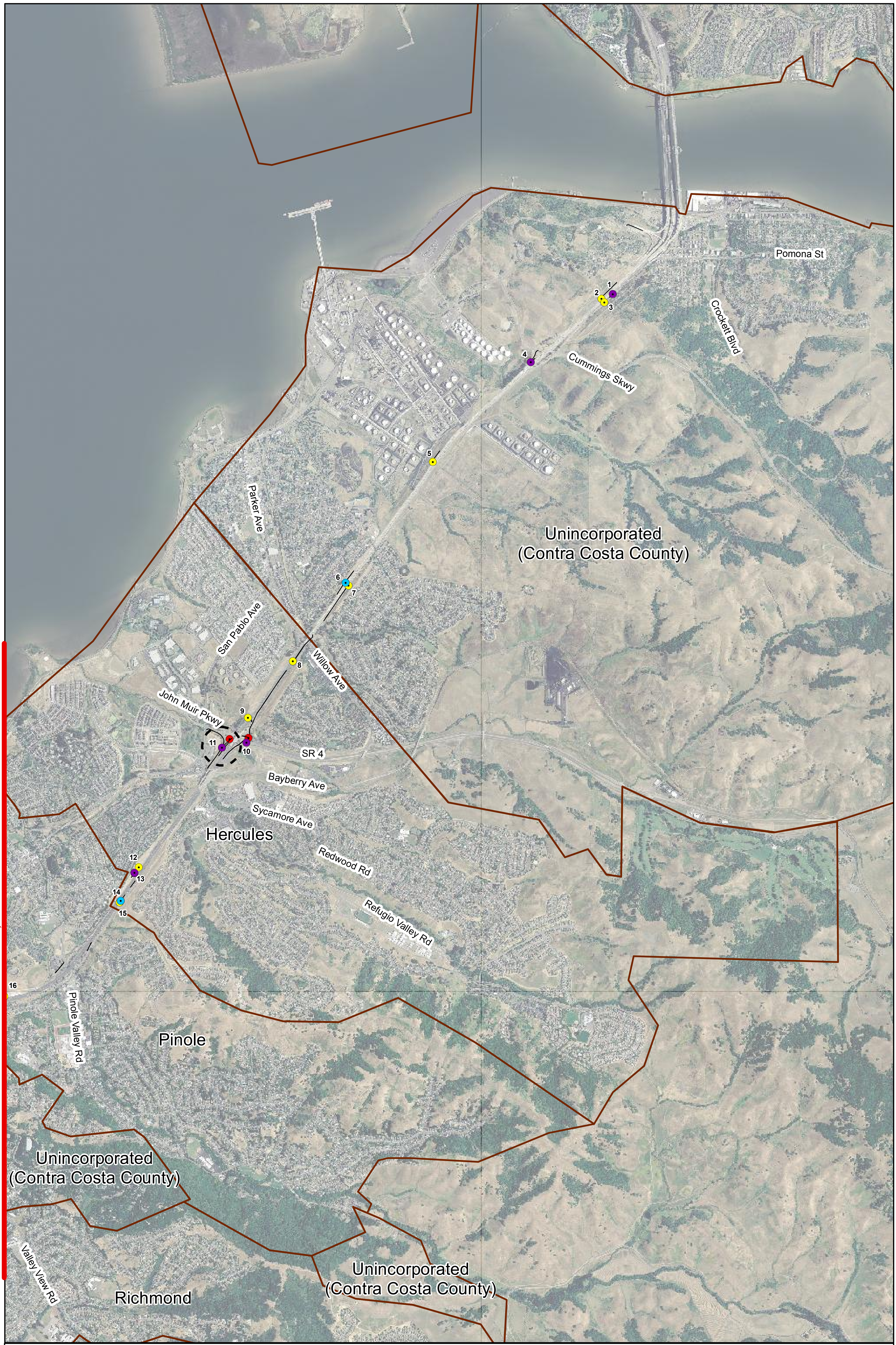
AADT - ANNUAL AVERAGE DAILY TRAFFIC

SOURCE: CALTRANS, 2008

FIGURE 1-2

Interstate 80 Integrated Corridor Mobility Project

I-80 Existing Bi-Directional AADT



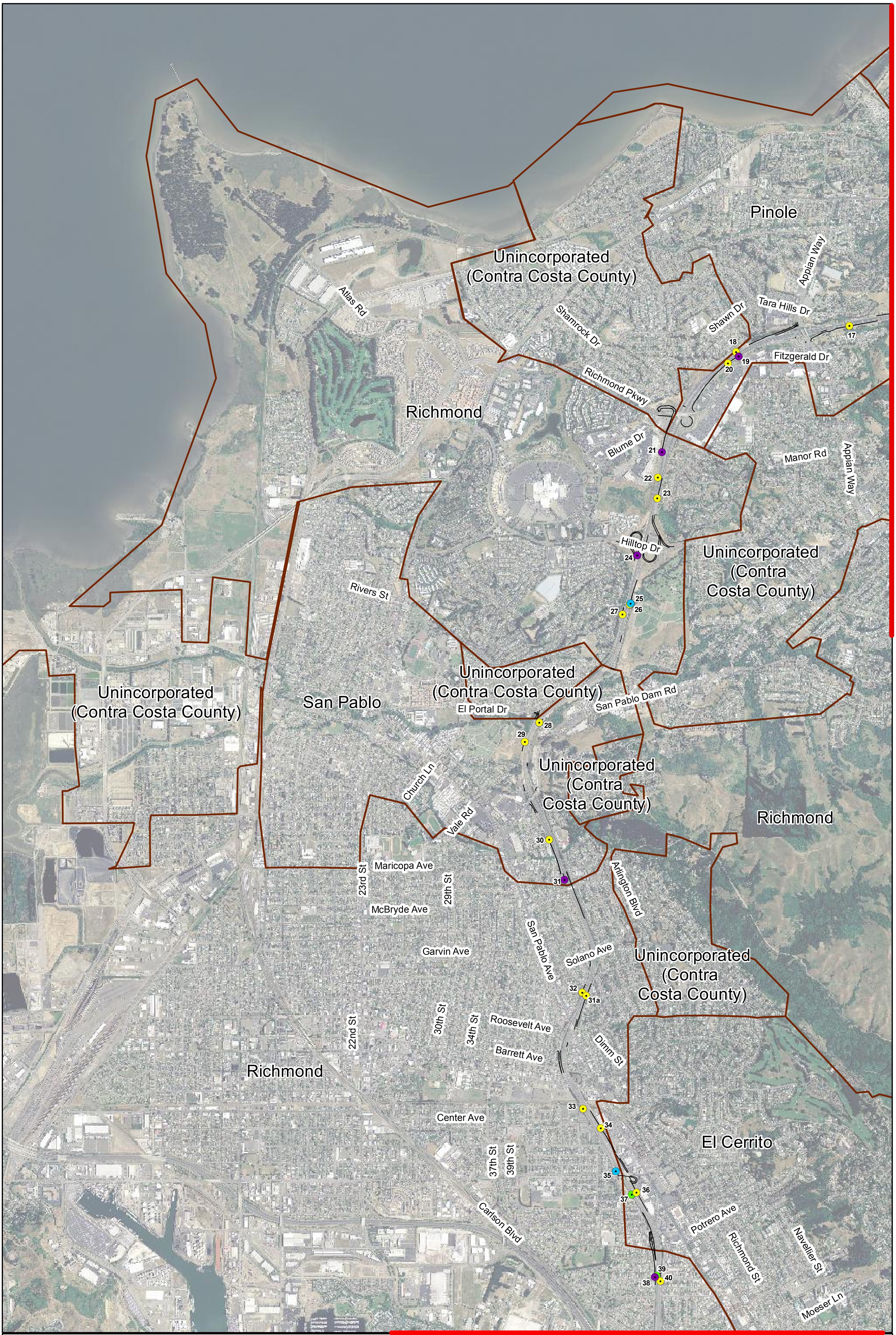
SOURCE: ©2004, Aerial Express Map

- SIGN BRIDGE STRUCTURE (GANTRY)
- INFORMATION DISPLAY BOARD
- VARIABLE ADVISORY SPEED SIGN
- VARIABLE MESSAGE SIGN (TYPE 1)
- CLOSE CIRCUIT TELEVISION CAMERA
- CONDUIT RUN
- CITY BOUNDARY
- LOCATION OF RAMP WIDENING FOR HOV PREFERENTIAL LANE

Figure 1-3
Sheet 1 of 3

Interstate 80 Integrated Corridor Mobility Project

DEVICE AND RAMP DISTURBANCE LOCATIONS



MATCHLINE FIGURE 1-3, Sheet 3

0 500 1,000 2,000 3,000 4,000 Feet

SOURCE: ©2004, Aerial Express Map

SIGN BRIDGE STRUCTURE (GANTRY)
INFORMATION DISPLAY BOARD
VARIABLE ADVISORY SPEED SIGN
VARIABLE MESSAGE SIGN (TYPE 1)
CLOSED CIRCUIT TELEVISION CAMERA
CONDUIT RUN
CITY BOUNDARY
LOCATION OF RAMP WIDENING FOR HOV PREFERENTIAL LANE

Figure 1-3
Sheet 2 of 3

Interstate 80 Integrated Corridor Mobility Project

DEVICE AND RAMP DISTURBANCE LOCATIONS

MATCHLINE FIGURE 1-3, Sheet 2

SOURCE: ©2004, Aerial Express Map

Figure 1-3
Sheet 3 of 3

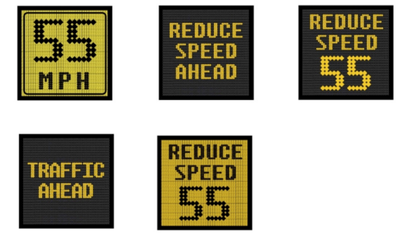
Interstate 80 Integrated Corridor Mobility Project

DEVICE AND RAMP DISTURBANCE LOCATIONS

Lane Use Signal Sign - Sample Displays

Variable Message Sign (Type 2) - Sample Displays

Variable Advisory Speed Sign - Sample Displays



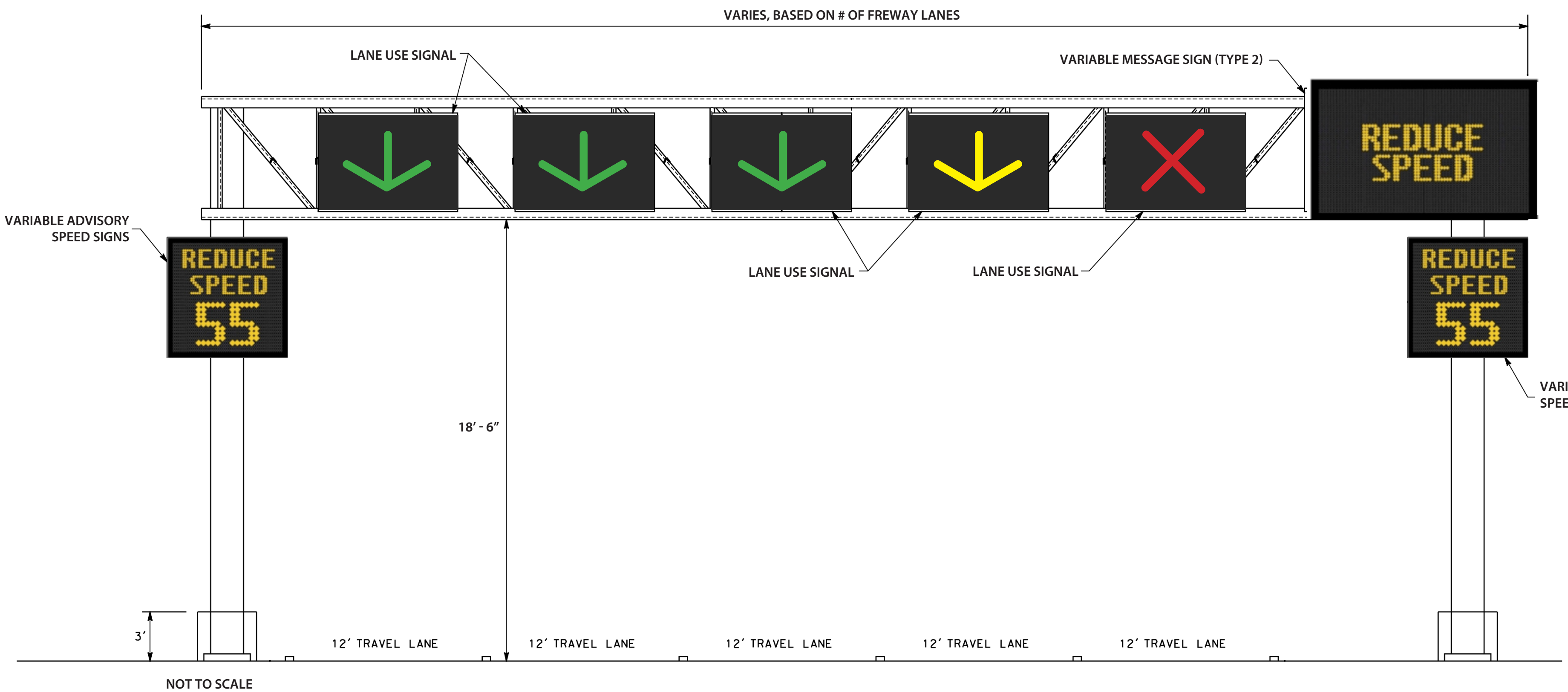


FIGURE 1-4

Interstate 80 Integrated Corridor Mobility Project

SIGN BRIDGE STRUCTURE (GANTRY)

Information Display Board - Sample Displays

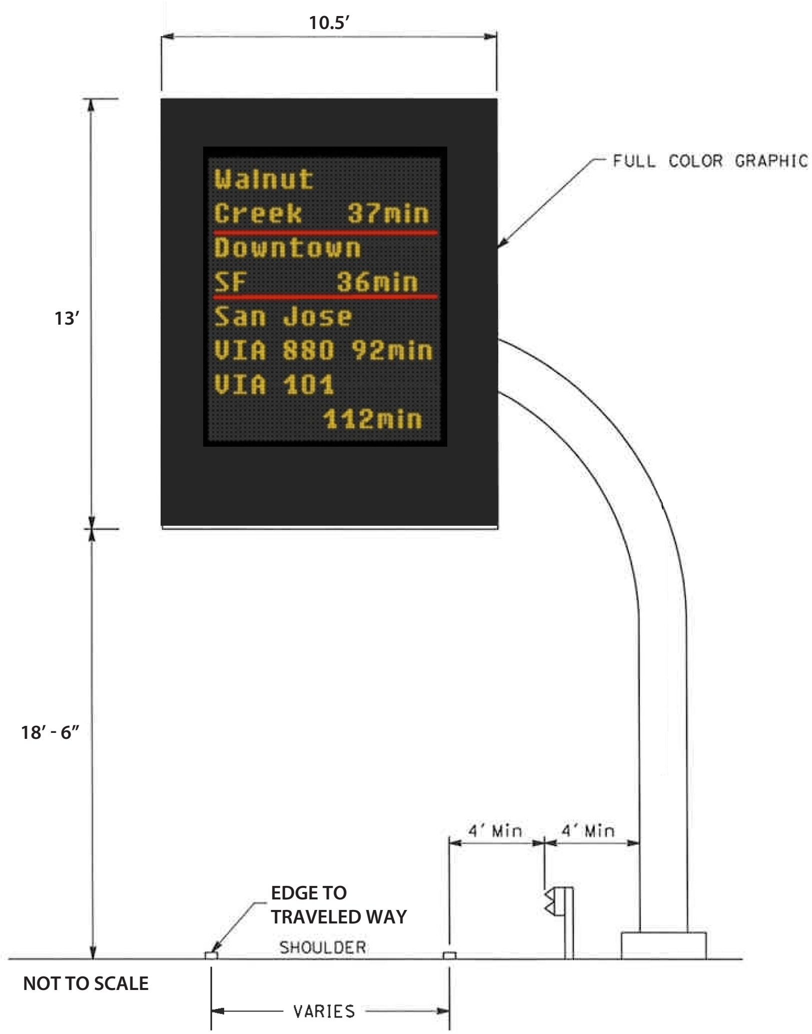


FIGURE 1-5

Interstate 80 Integrated Corridor Mobility Project

INFORMATION DISPLAY BOARD