



BAY AREA **ITS** ARCHITECTURE

Bay Area ITS Architecture 2011 Update

Prepared for:

Metropolitan Transportation Commission

Prepared by:



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1. INTRODUCTION

Intelligent Transportation Systems (ITS) is the application of communication and computing technologies to improve transportation safety, operations, and efficiency. This definition encompasses a broad range of technologies and has created many opportunities for transportation professionals to respond proactively to increasing demand for effective transportation services. Many of these opportunities are predicated upon effective coordination between organizations, at both the institutional and technical level.

The Bay Area ITS Architecture (“Architecture”) is the blueprint for ITS project coordination and integration in the San Francisco Bay Area. One important element of ITS projects is the exchange of data and communication. The ITS Architecture helps coordinate the information exchange on a regional level by bringing together stakeholders across jurisdictional boundaries. It provides a framework for how ITS projects interact and exchange information. The Architecture is also used by stakeholders to facilitate ITS planning and to aid in coordinated ITS project development, procurement, and delivery. The Bay Area ITS Architecture is based on the National ITS Architecture model sponsored by the Department of Transportation (USDOT). An ITS Architecture is required for a region to remain eligible for federal funding.

The Architecture is available as a resource for stakeholders through a fully interactive, hyperlinked web site for more convenient access and usability for project sponsors. The web site is accessible at: <http://mtcfilehost.net/MTC-ITS/index.html>

This report is a printable version of the Architecture web site and has the same topics and information for Bay Area public agencies that wish to consultant the Architecture for guidance in ITS project planning and development. The Architecture web site has been designed to be understandable for non-ITS professionals and as such, acronyms and industry jargon has been avoided wherever possible. Throughout this document are hyperlinks to definitions, resources, and reference material in the Architecture web site. It may be necessary for users to visit the Architecture web site to view certain material referenced in the hyperlinks.

1.1 2011 Architecture Update

This update to the Bay Area ITS Architecture was prepared under the direction of the Metropolitan Transportation Commission (MTC) between May and December of 2011 and focused on updating the 2007 version of the Architecture for changes that have occurred over the last four years. This included changes and additions to projects, stakeholders, and the National ITS Architecture template that it is based on. The process for updating the Architecture was heavily reliant on stakeholder input to ensure the Architecture was truly regional and multi-jurisdictional. The stakeholders represent a cross-section of agencies including regional, local, transit, smart corridor, and emergency service agencies. Comments, input and feedback were elicited in the form of individual and targeted group requests and from an online survey.

The 2011 Update reused sections of the 2007 Architecture. Some sections are updated based on stakeholder input, project status and events that have transpired in the past four years. The 2011 updates to the 2007 Architecture reflected in this project web site is summarized in **Table 1**.

Table 1 – Reuse of the 2007 Architecture in the 2011 Update

2011 Architecture Update	2007 Architecture Section
Paragraphs reused	Bay Area Basics
Renamed section to 'Market Packages'; updated status of the project categories	ITS User Needs
Revised stakeholder list and roles and responsibilities	Stakeholder Information
Revised per the updates to the projects in the Architecture	Functional Requirements
Revised per the updates to the projects in the Architecture	Standards
Project planning and development guidance pages revised; maintenance moved to the 'Send Updates' section	Use and Maintenance

The 2007 Bay Area ITS Architecture was an update by Kimley-Horn and Associates, Inc. to the “Bay Area Regional Intelligent Transportation Systems (ITS) Plan” (June 2004) owned by MTC and prepared by Iteris, Inc. The portions of the 2007 plan that were reused from the 2004 Plan are listed in **Table 2**:

Table 2 – Reuse of the 2004 ITS Plan in the 2007 Architecture Update

2007 Architecture Section	2004 Plan Section	REUSE
ITS Goals and Objectives	Introduction	Some sentences reused
ITS Goals and Objectives	Bay Area ITS Focus	Paragraph reused
Bay Area Basics	Regional Boundaries	Reused and updated
ITS User Needs	ITS User Needs and Services	Sentences reused
Stakeholder Information	Roles and Responsibilities	Some roles and responsibilities reused
Functional Requirements	Functional Requirements	Some requirements reused
Standards	Standards	Paragraphs reused
Stakeholder Information	Agency Agreements	Reused and updated
Use and Maintenance	Use and Maintenance	Some paragraphs reused

1.2 Federal Requirements for Regional ITS Architectures

Agencies in the Bay Area that implement ITS projects using Federal transportation funds are required to be consistent with the Bay Area ITS Architecture (pursuant to 23 CFR 940.9 and 940.11). In addition, ITS projects must comply with system engineering requirements and applicable Federal standards. This Architecture provides all the components required by the FHWA Final Rule and FTA Policy for regional ITS architectures. The website satisfies federal requirements for regional ITS Architecture development and maintenance. **Table 3** documents how the Bay Area ITS Architecture meets the federal requirements.

Table 3 – Compliance with Federal Requirements for Regional ITS Architectures

FHWA Final Rule/FTA Policy Requirements	Bay Area ITS Architecture
(1) A description of the region;	Bay Area Basics
(2) Identification of participating agencies and other stakeholders;	Stakeholder Information
(3) An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture;	Stakeholder Information -> Stakeholder Roles and Responsibilities
(4) Any agreements (existing or new) required for operations, including at a minimum those affecting integration of ITS projects; interoperability of different ITS technologies, utilization of ITS related standards, and the operation of the projects identified in the regional ITS architecture;	Stakeholder Information -> Stakeholder Agreements
(5) System functional requirements;	Functional Requirements
(6) Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture);	Architecture Details
(7) Identification of ITS standards supporting regional and national interoperability;	Standards
(8) The sequence of projects required for implementation of the regional ITS architecture.	How Do I Find My Project? -> Project Sequencing

1.3 Report Organization

This printable version of the Architecture web site is organized into the sections below. **Sections 2** through **Section 7** cover the components in the Architecture that are required by federal requirements for regional ITS architectures. **Section 8** and **Section 9** provide resources on using the Architecture for locating projects and guidance for ITS project planning and development.

- Section 1 – Introduction;
- Section 2 – Bay Area Basics;
- Section 3 – Market Packages
- Section 4 – Stakeholder Information;
- Section 5 – Functional Requirements;
- Section 6 – Architecture Details;
- Section 7 – Standards;
- Section 8 – Finding a Project in the Architecture; and
- Section 9 – Use and Maintenance of the Architecture.

2. BAY AREA BASICS

2.1 Geographic Area

The geographic area covered by this Architecture includes nine counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma. Adjacent jurisdictions were also considered to the extent that there are interactions with Bay Area transportation systems. The Bay Area region is depicted in the **Figure 1** below.



Figure 1 – Bay Area Regional Map

2.2 Time Frame

According to federal guidelines, the regional ITS architecture should look far enough into the future so that the efficient integration of ITS services can be guided over time. The Bay Area ITS Architecture planning horizon is 10 years, which is long enough to include most of the system integration opportunities as anticipated by the regional stakeholders, yet represents a reasonable planning horizon for technologies, given the fast-evolving nature of this industry.

2.3 Stakeholders

The success of the Bay Area ITS Architecture depends on participation by a diverse set of stakeholders. In the context of this project, stakeholders are defined as a core set of public agencies with transportation-related oversight, responsibility, and/or duties in the San Francisco Bay Area.



In addition to the identification of stakeholders, the guidelines for applying the National ITS Architecture to a regional ITS architecture process recommend the identification of the regional ITS architecture champion. The champion is one or more key entities leading the regional ITS architecture development, is also a stakeholder, and is proactive in the field of ITS. The champion must understand the subject at hand, have knowledge of local ITS systems and projects, and have a vision for interconnectivity, partnership, and regional integration. The champion for the Bay Area ITS Architecture is MTC.

3. MARKET PACKAGES

The ITS inventory for the Bay Area consists of existing and planned (near term) ITS projects owned and/or operated by Bay Area ITS stakeholders. Each project uses technology to improve some element of transportation. The services provided by ITS projects, (i.e. traveler information, emergency vehicle preemption or real-time transit arrival information) are organized into Market Packages. A Market Package illustrates how equipment packages, information flows and subsystems are connected for a particular ITS service.

3.1 ITS Project Categories

ITS projects are categorized by Market Packages that implement specific services. **Table 4** shows the entire listing of Market Packages from the National ITS Architecture and summarizes which ITS project categories exist or are planned in the Bay Area, and as such are addressed in the Architecture. The ITS categories are classified as one of the following:

- **"Existing"** is defined as an ITS project category that is currently in place and operating. "Existing" can also mean currently under construction/development, or construction/development is imminent – e.g. a project to implement the ITS category is programmed, budgeted, and being advertised or is about to be advertised for implementation.
- **"Planned"** projects may or may not be programmed and implementation can be up to ten years out (the ITS Architecture planning horizon is ten years).
- **"Not Planned"** is defined as an ITS category for which there is no apparent evidence that a project will be implemented during the ITS planning horizon, or that there was no stakeholder expressing plans within this category. These categories are not included in the Architecture.

Table 4 – ITS Project Categories

Project Categories		Existing	Planned	Not Planned
ARCHIVED DATA MANAGEMENT: <i>Archived Data (AD)</i>				
AD1	ITS Data Mart	X		
AD2	ITS Data Warehouse		X	
AD3	ITS Virtual Data Warehouse		X	
PUBLIC TRANSPORTATION SYSTEMS: <i>Advanced Public Transportation Systems (APTS)</i>				
APTS01	Transit Vehicle Tracking	X		
APTS02	Transit Fixed-Route Operations	X		
APTS03	Demand Response Transit Operations	X		
APTS04	Transit Fare Collection Management	X		
APTS05	Transit Security	X		
APTS06	Transit Fleet Management	X		



Project Categories		Existing	Planned	Not Planned
APTS07	Multi-modal Coordination		X	
APTS08	Transit Traveler Information	X		
APTS09	Transit Signal Priority	X		
APTS10	Transit Passenger Counting	X		
TRAVELER INFORMATION: <i>Advanced Traveler Information Systems (ATIS)</i>				
ATIS01	Broadcast Traveler Information	X		
ATIS02	Interactive Traveler Information	X		
ATIS03	Autonomous Route Guidance			X
ATIS04	Dynamic Route Guidance		X	
ATIS05	ISP Based Trip Planning and Route Guidance	X		
ATIS06	Transportation Operations Data Sharing	X		
ATIS07	Yellow Pages and Reservation	X		
ATIS08	Dynamic Ridesharing		X	
ATIS09	In Vehicle Signing		X	
ATIS10	Connected Vehicles Traveler Information			X
TRAFFIC MANAGEMENT: <i>Advanced Transportation Management Systems (ATMS)</i>				
ATMS01	Network Surveillance	X		
ATMS02	Traffic Probe Surveillance	X		
ATMS03	Surface Street Control	X		
ATMS04	Freeway Control	X		
ATMS05	HOV Lane Management	X		
ATMS06	Traffic Information Dissemination	X		
ATMS07	Regional Traffic Management	X		
ATMS08	Traffic Incident Management System	X		
ATMS09	Traffic Forecast and Demand Management		X	
ATMS10	Electronic Toll Collection	X		
ATMS11	Emissions Monitoring and			X



Project Categories		Existing	Planned	Not Planned
	Management			
ATMS12	Roadside Lighting System Control			X
ATMS13	Standard Railroad Grade Crossing	X		
ATMS14	Advanced Railroad Grade Crossing		X	
ATMS15	Railroad Operations Coordination		X	
ATMS16	Parking Facility Management	X		
ATMS17	Regional Parking Management		X	
ATMS18	Reversible Lane Management			X
ATMS19	Speed Monitoring		X	
ATMS20	Drawbridge Management			X
ATMS21	Roadway Closure Management			X

4. STAKEHOLDER INFORMATION

The stakeholders of the Bay Area ITS Architecture comprise of numerous agencies. This section describes key topics concerning the agreements, roles and responsibilities and projects of the Bay Area ITS Architecture stakeholders. A complete stakeholders list is provided in **Table 5**.

4.1 Stakeholder Agreements

Agreements among the different stakeholder agencies and organizations in the Bay Area may be required to realize the integration proposed in the Architecture. Each connection between (and some connections within) projects in the Architecture represents the need for cooperation between stakeholders and a potential agreement.

4.1.1 *Agreement Focus*

The focus of agreements is usually on the scope-of-service and specific agency responsibilities for various components of the service, rather than on particular technologies. For example, agreements should describe the information that each agency needs to exchange in order to meet the goals and expectations of the other rather than defining how the delivery of that information will occur.

4.1.2 *List of Agreements*

Table 6 summarizes a list of potential agreements categorized by ITS service area. The table was developed based on the regional roles and responsibilities, knowledge of the types of existing or planned ITS projects for implementation by the region, and the information that needs to be exchanged in order to operate those systems. Further information regarding agreements for ITS projects can be found in FHWA's *Regional ITS Architecture Guidance Document*, including definitions of the types of agreements as referenced below.



Table 5 – Bay Area Stakeholders

Category	Stakeholder Name
Air/Water/Ports	Oakland International Airport (OAK)
	Port of Oakland
	Port of San Francisco
	San Francisco International Airport (SFO)
	San Jose International Airport (SJC)
County	Alameda County Transportation Commission (Alameda CTC)
	Contra Costa Transportation Authority (CCTA)
	Marin County Congestion Management Agency
	Napa County Transportation Planning Agency (NCTPA) Congestion Management Agency (CMA)
	San Mateo County Congestion Management Agency (City/County Association of Governments (C/CAG)
	San Mateo County Transportation Authority
	Santa Clara Valley Transportation Authority (VTA)
	Santa Cruz Co. Regional Transportation Commission
	Solano Transportation Authority
	Sonoma County Transportation Authority (SCTA)/Congestion Management Agency (CMA)
	TransPac / Contra Costa Commute Alternative Network (CCCAN)
Emergency	California Highway Patrol (CHP)
	Local Fire Agencies
	Local Police Agencies
Federal	Federal Emergency Management Agency (FEMA)
	Federal Highway Administration (FHWA)
	Federal Railroad Administration (FRA)
	Federal Transit Administration (FTA)
	Golden Gate National Recreation Area (GGNRA)
US Coast Guard	
Local Cities	Alameda
	Albany
	American Canyon
	Antioch
	Belmont
	Belvedere
	Benicia
	Berkeley
	Brentwood
	Brisbane
	Burlingame
	Calistoga
	Campbell
	Clayton



Category	Stakeholder Name
	Cloverdale
	Concord
	Corte Madera
	Cotati
	Cupertino
	Daly City
	Danville
	Dixon
	Dublin
	East Palo Alto
	El Cerrito
	Emeryville
	Fairfax
	Fairfield
	Foster City
	Fremont
	Gilroy
	Half Moon Bay
	Hayward
	Healdsburg
	Hercules
	Hillsborough
	Lafayette
	Larkspur
	Livermore
	Los Altos
	Los Altos Hills
	Los Gatos
	Martinez
	Menlo Park
	Mill Valley
	Millbrae
	Milpitas
	Monte Sereno
	Moraga
	Morgan Hill
	Mountain View
	Napa
	Newark
	Novato
	Oakland
	Oakley
	Orinda



Category	Stakeholder Name
	Pacifica
	Palo Alto
	Petaluma
	Piedmont
	Pinole
	Pittsburg
	Pleasant Hill
	Pleasanton
	Port Angeles
	Portola Valley
	Redwood City
	Richmond
	Rio Vista
	Rohnert Park
	Ross
	San Bruno
	San Carlos
	San Francisco
	San Jose
	San Leandro
	San Mateo
	San Pablo
	San Rafael
	San Ramon
	Santa Clara
	Santa Rosa
	Saratoga
	Sausalito
	Sebastopol
	Sonoma
	South San Francisco
	St. Helena
	Suisun City
	Sunnyvale
	Tiburon
	Union City
	Vacaville
	Vallejo
	Walnut Creek
	Windsor
	Woodside
	Yountville
Regional	Association of Bay Area Governments (ABAG)



Category	Stakeholder Name
	Bay Area Air Quality Management District (BAAQMD)
	Bay Area Toll Authority (BATA)
	Bay Conservation and Development Commission (BCDC)
	Capitol Corridor Joint Powers Authority (CCJPA)
	Golden Gate Bridge , Highway & Transportation District (GGBHTD)
	Metropolitan Transportation Commission (MTC)
	Peninsula Congestion Relief Alliance
	Peninsula Corridor Joint Powers Board
	San Francisco County Transportation Authority/Congestion Management Agency (SFCTA)
Research	California Center for Innovative Transportation (CCIT)
	California PATH, Headquarters
	UC Berkeley
State Agency	California Air Resources Board
	California Transportation Commission
	Caltrans
Transit Agency	AC Transit
	Alameda/Oakland Ferry
	Altamont Commuter Express (ACE)
	American Canyon Transit
	Amtrak / Amtrak California
	Angel Island - Tiburon Ferry
	Bay Area Rapid Transit (BART)
	Benicia Transit
	Blue and Gold Fleet
	Brentwood Dimes-A-Ride
	Broadway Shuttle
	Burlingame Free Bee Shuttle
	Calistoga Handy Van
	Caltrain
	Capitol Corridor Rail Service
	Central Contra Costa Transit Authority (CCCTA)
	Cloverdale Transit
	County Connection
	Dixon Read-Ride
	Dumbarton Express
	Eastern Contra Costa Transit Authority (ECCTA)
	Emery Go-Round
	Fairfield and Suisun Transit (FAST)
	Foster City Sunshine Shuttle
	Golden Gate Ferry
	Golden Gate Transit
	Harbor Bay Ferry



Category	Stakeholder Name
	Healdsburg-In-City Transit
	Intercity Van Go
	Livermore Amador Valley Transit Authority (LAVTA)
	Menlo Park Midday Shuttle
	Monterey-Salinas Transit
	Napa Valley Transit
	Palo Alto Shuttle
	Petaluma Transit
	Rio Vista Transit
	San Francisco Municipal Transportation Agency (SFMTA)
	San Mateo County Transit District (Sam Trans)
	Santa Clara Valley Transportation Authority (VTA)
	Santa Cruz Metropolitan Transit
	Santa Rosa City Bus
	Solano County Transit (SolTrans)
	Sonoma County Transit
	Stanford Marguerite Shuttle
	Tri Delta Transit
	UC Berkeley Campus Shuttle
	Union City Transit
	Vacaville City Coach
	Vallejo Transit
	Valley Intracity Neighborhood Express
	Water Emergency Transportation Authority (WETA)
	Western Contra Costa Transit Authority
	Yountville Shuttle



Table 6 – List of Agreements

ITS Service	Involved Stakeholders	Type of Agreement	Status	Agreement Description	Bay Area Examples, if any
Interjurisdictional Traffic Management	Caltrans D4, other adjacent Caltrans districts, CHP, and other Bay Area TMCs, MTC, SMART corridors	Interagency Agreement; Memorandum of Understanding;	Exists	Provides for data exchange and device control and details jurisdiction-to-jurisdiction operations and regional incident management.	SMART Corridor Agreements; Center-to-Center MOU; Agreement with Caltrans for Deployment of ETC Readers;
Regional Traffic Management and Emergency Services	Caltrans and Local Cities and Counties and Emergency Services Providers	Memorandum of Understanding	Exists	Provides for signal operations and coordination and local incident management.	SMART Corridor Agreements
Emergency Vehicle Signal Pre-emption	Caltrans and/or Local Cities and Counties and Emergency Services Providers	Interagency Agreement	May exist in some form which could be amended	Documents details on roles, responsibilities, and functions for emergency vehicle pre-emption at signalized intersections within a city for police, fire, ambulance, or other agency.	SMART Corridor Agreements; Local agreements by bordering cities;
Transit Signal Priority	Caltrans and/or Local Cities and Counties and Transit Agencies	Interagency Agreement	Exists	Documents details on roles, responsibilities, and functions for transit vehicle priority at signalized intersection within a city for a transit agency.	SMART Corridor Agreements
Freeway Service Patrol	MTC, Caltrans, and CHP	Interagency Agreement	Exists	Documents details on roles, responsibilities, and functions for providing freeway service patrol activities.	MOU for FSP operations; Partnership Operation Procedures for day-to-day responsibilities;
Transit Fare Management	All Transit Agencies (Clipper®)	Interagency Agreement	Exists	Provides details on the usage of a common regional fare card and the cost allocation formulas.	MTC Res. 3866 Revised (Transit Coordination Implementation Plan)
Corridor Agreements	Caltrans and/or Local Cities and Counties and Transit Agencies	Interagency Agreement	Exists	Documents details on roles, responsibilities, and functions for operation, maintenance, data-sharing, and funding of SMART corridors and other corridor projects	SMART Corridor Agreements



ITS Service	Involved Stakeholders	Type of Agreement	Status	Agreement Description	Bay Area Examples, if any
Traveler Information	All Agencies and Information Service Providers (media)	Memorandum of Understanding; Interagency Agreement;	Exists	Documents expectations, roles, and responsibilities for the provision of transportation-related data and information to the traveling public. Also, documents the policy or disclaimer for release of traveler information.	MTC Res. 3866 Revised (Transit Coordination Implementation Plan); Data Disseminator Agreements; API Terms & Conditions;
Archived Data Management	All Agencies and PeMS	Memorandum of Understanding	New, not pre-existing	Documents expectations, roles, and responsibilities for the dissemination of transportation-related data and information for archive purposes.	Data Disseminator Agreements
Cross-Cutting (shared use of fiber infrastructure)	Multiple agencies	Interagency Agreement	New, not pre-existing	Documents provisions for design, development, maintenance, and revenue sharing (if applicable) with regards to shared use of fiber.	Center-to-Center program MOU
Regional Parking Payment	Public and Private sector agencies	Interagency Agreement	New, not pre-existing	Documents provisions for design, development, maintenance, enforcement, price setting, and revenue sharing	Data Disseminator Agreements
Real Time Transit Information	Transit agencies and MTC	Interagency Agreement	Exists	Documents provisions for funding with stipulations for data sharing and maintenance	MTC Res. 3866 Revised (Transit Coordination Implementation Plan)
Congestion Pricing/Express Lanes	Caltrans, MTC, Local Cities and Counties, CHP, and Express Lane Operators	Memorandum of Understanding; Interagency Agreement	New, not pre-existing	Documents provisions for design, development, maintenance, enforcement, price setting, and revenue sharing	Cooperative agreements between BATA and regional agencies for FasTrak® services

5. FUNCTIONAL REQUIREMENTS

In some cases, Bay Area ITS project sponsors have existing documentation of the functional requirements used to design and/or procure their systems or project components. In cases where project sponsors have provided this documentation, it is posted at the Bay Area ITS web site along with a brief description. It is important to note that this documentation does not necessarily represent the 'as-built' list of functionality of these projects, nor does it represent the requirements of future project partners in connecting or coordinating with these projects.

Examples of current Bay Area projects, along with project contacts and sample documentation is provided in **Appendix A**.

5.1 Functions of Typical ITS Projects

Planning and design of ITS projects requires a clear and concise description of what the projects will accomplish when implemented. The sample functional requirements in the Bay Area ITS Architecture can provide stakeholders with a tool to assist in defining high-level goals, objectives, and required functions. The functional requirements provided in this Architecture can be used as a tool to develop actual requirements for projects that meet the specific needs of the project sponsors.

When conducting design and preparation of procurement of documents, stakeholders should refer to the high-level functional requirements and examine the detailed functional description provided by the National ITS Architecture in the context of each project's specific objective to develop specific functional requirements that reflect the needs of the corresponding stakeholders. Project sponsors may choose to add these requirements to their projects in order to further regional goals and supplement the project-level requirements.

The sample functions provided in this section are not requirements to be placed on projects or project sponsors.

More information regarding the development of specific functional requirements for ITS Projects can be found at http://ops.fhwa.dot.gov/its_arch_imp/guidance.htm

Sample functions are provided for project types in the following categories:

5.1.1 *Archived Data Management*

Archived Data Management project sponsors may choose to consider the following functions when defining functional requirements for a specific project. A typical archived data management project is able to:

- Collect data to be archived from one or more data sources.
- Store the archived data in a focused repository that is suited to a particular set of its data users.
- Include capabilities for performing quality checks on the incoming archived data.
- Include capabilities for archive to archive coordination.
- Provide transportation data retrieval interface.



5.1.2 *Public Transportation*

Public Transportation project sponsors may choose to consider the following functions when defining functional requirements for a specific project. A typical project is able to:

- Monitor the locations of all transit vehicles within its network.
- Determine adherence of transit vehicles to their assigned schedules.
- Provide transit operational data (both transit facility and amenity) to traveler information service providers.
- Collect passenger loading and fare statistics data.
- Provide transit fare information to other centers, including traveler information providers upon request.
- Manage, administer, and update a single transit fare collection system for multiple transit agencies providing transit fare products and value useable on all participating transit agency vehicles/systems.
- Provide central clearinghouse for processing and verifying transit fare transactions electronically from participating transit agencies.
- Communicate with Clipper® field equipment to receive and transmit data
- Support non-transit connections to fare collection system such as parking and banking/credit facilities.
- Track transit vehicle and transmit location to dispatch and message signs.
- Support two-way voice communication between the transit vehicle driver and a facility; two-way data communication between the transit vehicles and a facility; and transmission of sensor data from the transit vehicles to a facility.
- Request signal priority from roadside equipment, as appropriate
- Provide the capability to expand real-time transit monitoring and data collection and dissemination.
- Transmit predictive departure time information to traveler information providers.
- Coordinate transit operations with other transit agencies.

5.1.3 *Traveler Information*

Traveler Information project sponsors may choose to consider the following functions when defining functional requirements for a specific project. A typical traveler information project is able to:

- Collect, process, store, and disseminate traffic and highway condition information to travelers, including incident information, detours and road closures, event information, recommended routes, and current speeds on specific routes, among others.
- Collect, process, store, and disseminate maintenance and construction information to travelers, including, but not limited to, scheduled maintenance and construction work activities and work zone activities.
- Collect, process, store, and disseminate transit routes and schedules, transit transfer options, transit fares, and real-time schedule adherence information to travelers.
- Provide traffic, transit and event information from a center and present it to the traveler using website and telephone dissemination.
- Provide users with real-time travel related information en-route to assist the travelers in making decisions about trips.



- Provide interactive traveler information.
- Provide the capability to provide specific pre-trip and en-route directions to travelers (and drivers), including costs, arrival times, and transfer points.
- Provide information tailored for individual users.
- Receive and disseminate data from/to 511 and 511 real-time transit.
- Receive and disseminate data from/to 511 and the regional transit information system.
- Provide information service providers with a transportation data interface.
- Provide transportation data feeds to third party application developers.
- Disseminate real-time parking information on occupancy and pricing information from local parking management systems.
- Disseminate toll schedules and travel time savings information for express lane facilities.
- Provide multi-modal trip planning tools.

5.1.4 *Traffic Management*

Traffic management project sponsors may choose to consider the following functions when defining functional requirements for a specific project. A typical traffic management project is able to:

- Collect, process, digitize, and send traffic sensor data (speed, volume, and occupancy) to the center(s) for further analysis and storage, under center control.
- Collect, process, and send traffic images to the center(s) for further analysis and distribution.
- Return ramp metering controller, mainline meters, and lane control operational status to the controlling center(s).
- Provide operational status for the driver information systems equipment to the center(s).
- Remotely control systems to manage use of the freeways, including ramp meters, mainline metering, lane controls, and variable speed limits.
- Collect operational status from ramp meters, mainline metering, and lane controls and compare against the control information sent by the center.
- Exchange traffic information with other traffic management centers, includes incident information, congestion data, traffic data, signal timing plans, and real-time signal control information.
- Remotely monitor and control traffic signal controllers.
- Implement control plans to coordinate signalized intersections, under control of center personnel, based on data from sensors and surveillance monitoring traffic conditions, incidents, emergency vehicle preemptions, transit signal priority, the passage of commercial vehicles with unusual loads, equipment faults, pedestrian crossings, etc.
- Maintain parking lot information including static information such as hours of operation, rates, location, entrance locations, capacity, type, and constraints; as well as dynamic information such as current state of the lot, occupancy, arrival rates, and departure rates.
- Monitor and diagnose field equipment remotely to detect failures, issue problem reports, and track the repair or replacement of the failed equipment.
- Detect, analyze, reduce, and verify collected data from traffic surveillance equipment.



- Provide transportation information to traffic management centers (TMCs), the Freeway Performance Measurement System (PeMS), or traveler information databases and websites (such as 511).
- Manage reversible lanes.
- Support joint control of field devices.
- Process traffic data for advisory messages.
- Provide traffic broadcast messages to devices such as Changeable Message Signs (CMS) and Highway Advisory Radio (HAR).
- Provide web based traveler information system.
- Provide information service providers with a transportation information data interface.
- Collect tolls electronically from toll tags.
- Coordinate with central toll collection administration (MTC/BATA).
- Operate and maintain toll collection and monitoring equipment.
- Provide the capability to implement variable pricing structures.
- Process electronic toll collection without the customer stopping.
- Provide a confirmation of the toll transaction to each customer and record images of violators.
- Provide the capability to expand real-time traffic management equipment to monitor traffic conditions and incidents.
- Provide real-time ride matching tools.

5.1.5 *Emergency Management*

Emergency Management project sponsors may choose to consider the following functions when defining functional requirements for a specific project. A typical emergency management project is able to:

- Provide the capability to request special traffic control measures, such as signal preemption, from the traffic management center to facilitate emergency vehicle progress along the suggested route.
- Provide the capability for digitized map data to act as the background to the information presented to the emergency system operator.
- Respond to requests for indicator (e.g., signal) preemption requests from emergency vehicles at intersections, pedestrian crossings, and multimodal crossings.
- Notify controlling traffic management center and maintenance center that the signal timing has changed based on a signal preemption/priority request to help those centers determine whether a fault detected at the signal is a true malfunction or due to a signal override.
- Dispatch roadway service patrol vehicles to identified incident locations.
- Provide strategic emergency response capabilities and incident response plans such as that of an Emergency Operations Center for large-scale incidents and disasters.
- Track the availability of resources and assist in the appropriate allocation of resources for a particular incident response.
- Track and manage Freeway Service Patrol (FSP) tow trucks.
- Request alerts on appropriate dissemination devices.
- Maintain and update a web site showing CHP-responded incidents.



- Provide two-way communications to support vehicle tracking.
- Send incident information to computer aided dispatch (CAD) system.
- Coordinate with traffic management for evacuation scenarios.
- Provide the capability to expand real-time emergency management response functions.
- Broadcast area wide alerts and incident information to transit users.
- Collect and disseminate feeds from transit video infrastructure.
- Coordinate with transit agencies to provide transit service as travel alternatives when parts of the transportation system are shut down.

5.1.6 *Maintenance & Construction Management*

Maintenance and Construction Management project sponsors may choose to consider the following functions when defining functional requirements for a specific project. A typical maintenance and construction management project is able to:

- Include environmental sensors that measure weather conditions including temperature, wind, humidity, precipitation, and visibility.
- Collect current and forecast road and weather information from weather service providers (such as the National Weather Service and value-added sector specific meteorological services).
- Assimilate current and forecast road conditions and surface weather information to support incident management.
- Provide status information about scheduled winter maintenance activities including anticipated closures and impact to the roadway, alternate routes, anticipated delays, closure times, and durations. The information is provided to other management centers such as traffic, emergency, transit, traveler information providers, other maintenance centers, and the media.
- Provide work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.
- Provide status information about scheduled maintenance and construction activities including anticipated closures and impact to the roadway, alternate routes, anticipated delays, closure times, and durations. The information is provided to other management centers such as traffic, emergency, transit, traveler information providers, other maintenance centers, multimodal transportation providers, rail operations, and the media.
- Manage maintenance and construction resource needs.
- Receive dispatch and routing information.
- Monitor and diagnose field equipment remotely to detect failures, issue problems reports, and track the repair of failed equipment replacement.
- Provide the capability to expand to include new functions to monitor real-time maintenance and construction activities and provide the data to transportation agencies and traveler information providers.

6. STANDARDS

Establishing regional (and national) standards for exchanging information among ITS deployments is important not only from an interoperability point of view, but it also reduces risk and cost since a region can select among multiple vendors for products and applications. Standards allow competition, create better products, and lower prices. Use of standards can also limit product obsolescence and extend the effective life of ITS investments.

A key to the success of ITS in the Bay Area lies in the ability to exchange information between systems. To be able to do this, however, requires the use of communications protocol that can be understood at each end of the transmission. Common protocols, such as National Transportation Communications for ITS Protocol (NTCIP) and eXtensible Markup Language (XML) are required standards needed to exchange information with major regional projects in the Bay Area. Additionally, other required standards such as those for location referencing where all systems can comprehend each other's location referencing system are necessary.

The Bay Area ITS Architecture includes relevant and recommended standards for information exchange (see Standards by Data Flow below) for most types of ITS projects. The standards in the Architecture serve as a reference for how the interconnections operate for most types of ITS projects. They are not technology specific and are meant to provide a functional overview of the interconnections. However, agency sponsors should be aware that in some instances, there may be funding requirements or regional policies that mandate use of project-specific standards.

6.1 Standards for Major Regional Projects in the Bay Area (Required)

ITS Standards are used to define the information exchange between ITS project elements. The Architecture provides the required and relevant standards for each information exchange for major regional projects.

In reviewing and applying these standards, the following principles need to be kept in mind:

- These standards only need to be applied where there will be an exchange of data or monitoring/control functions between systems or field devices.
- The specific standards listed are not static. As the standards are implemented, changes are being made. In addition, the standards are being changed as technology evolves.

In order to find which standards for regional projects are required for a particular project deployment, stakeholders can refer to the 'Standards for Major Regional Projects in the Bay Area' page of the Architecture web site: http://mtcfilehost.net/MTC-ITS/bay_area_standards.html

Standards will require additional review before they can be used. Specifically, the stakeholder will need to know which technology is being implemented (i.e. Ethernet, point to multipoint, etc.) and which standard center-to-center protocol (i.e. CORBA, DATEX, XML, etc.) for center-field protocol is being implemented to determine specific applicable standards.

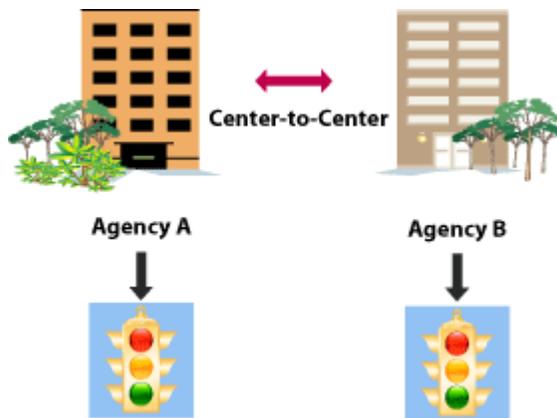
6.1.1 Center-to-Center Standards

Center-to-center communication involves the communication between two or more central management systems. Examples of center-to-center communication applicable to the Bay Area ITS Architecture include:

- Two or more traffic signal management systems exchanging information (including second-by-second status changes) to achieve coordinated operation of traffic signals managed by the different systems and to enable personnel at one center to monitor the status of signals operated from another center.
- Sharing of transportation related information with other Bay Area agencies or systems such as 511.
- Providing real-time information such as transit vehicle predictions.
- Posting a warning message on another agency's changeable message sign.

The NTCIP center-to-center protocols are particularly relevant as they allow agencies to exchange information, to monitor conditions in other agencies' systems, and to implement coordinated responses to incidents and other changes in field conditions when needed. Such data exchange and coordinated response can be implemented either manually or automatically. One agency can monitor, and issue basic commands to field devices (if authorized) operated by another agency, even though those devices may be from a different vendor than those used by the monitoring agency.

Example:



If Agency A wants to control Agency B's traffic signals, Agency A sends a message to Agency B to ask for and be granted permission to control the signals. This is an example of center-to-center communication.

NTCIP Center-to-Center (C2C) protocols are implemented currently though multiple standards. More information on the current status of NTCIP standards can be found at NTCIP.org. The major Center-to-Center projects in the Bay Area use a variety of standards. DATEX ASN (Data Exchange protocol/Abstract Syntax) is used by Silicon Valley-ITS (SV-ITS Program), East Bay SMART Corridors, and the Bay Area Center-to-Center System.

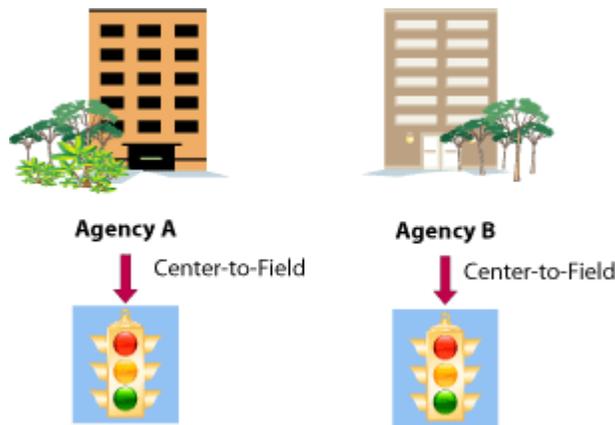
The Bay Area Center-to-Center System includes 511, SV-ITS and SFgo. The SFgo connection to the Center-to-Center system is a DATEX to eXtensible Markup Language (XML) conversion. XML is one of the center-to-center communications protocol standards. It has the advantage of being an industry wide standard (across all Microsoft Windows-based systems regardless of the application) and can be implemented relatively easily with "typical" information systems staff.

6.1.2 Center-to-Field Standards

Center-to-field communication refers to the communication between a management system or center and multiple control or monitoring devices managed by that system or center. This type of communication typically involves roadside devices.

Examples of center-to-field include:

- A traffic signal management system located at a TMC communicating with traffic signal controllers at intersections.
- A traffic management system controlling Pan/Tilt/Zoom Closed Circuit Television cameras and changeable message signs.
- A transit management center polling transit vehicles for their current location.



Agency A and Agency B each have Transportation Management Centers located in their City Halls. The TMC controls the traffic signals throughout the city through center-to-field communication.

NTCIP has a Center-to-Field Standards Group that addresses the communication between a TMC and various field devices. This includes traffic signals, ramp meters, CCTVs, and dynamic message signs. Center-to-Field communications protocols include the actual field device communication, such as NTCIP 1203: Object Definitions for Dynamic Message Signs (DMS). It also includes regional communication requirements such as transferring information over the internet (NTCIP 2202: Internet (TCP/IP and UDP/IP) Transport Profile). Transit center-to-field standards are discussed below.

6.1.2.1 Transit Standards

Standards for transit services were identified as a strong need in the Bay Area. During the stakeholder outreach for the Bay Area ITS Architecture, many stakeholders expressed the need for transit ITS standards to aid integration of projects and to facilitate future equipment procurement. The intent is not to standardize the individual systems themselves, but to develop a standard methodology for sharing vehicle location and other pertinent transit ITS data.

There is a suite of transit ITS standards that are in varying stages of development, approval and update under the NTCIP umbrella. Information on the complete set of standards (transit and non-transit) can be found on the NTCIP website:



<http://www.ntcip.org/>. The standards for Transit Communications Interface Profiles (TCIP) can be used for:

- Passenger Information
- Transit Signal Priority
- Automatic Vehicle Location
- Computer Aided Dispatch
- Scheduling
- Various on-board systems (e.g. Fare Collection)

6.1.3 *Vehicle-to-Field Standards*

Vehicle-to-field communication is the communication between vehicles, whether it is a personal vehicle or a transit bus, and a field device such as a signal system or traffic monitoring station. In the Bay Area, there are two main types of vehicle-to-field deployments. Both are in their infancy as far as ITS standards application and deployment. The first, Connected Vehicles, is an emerging use of personal vehicles or vehicle probes to communicate with roadside field devices to warn drivers of possible hazards or to communicate traffic conditions. The second, Location Referencing Message Specification (LRMS) communicates the location of a vehicle in a standardized message to a center or to the field. One common application for LRMS is in transit Automatic Vehicle Location (AVL) projects

6.1.3.1 Connected Vehicles

Connected Vehicles, formerly Vehicle Infrastructure Integration (VII), is the deployment of vehicle to vehicle and vehicle to field communication to minimize vehicle incidents and to increase efficiency on the network.

The standards most commonly used for Connected Vehicles are the Dedicated Short Range Communication (DSRC) standards developed by ASTM and IEEE. These standards are specifically developed for transferring information from a vehicle to the roadside. The published DSRC and DSRC-related standards include:

- ASTM E2158-01 Standard Specification for DSRC Physical Layer using Microwave in the 902-928 Mhz Band Automatic Vehicle Location
- ASTM E2213-03 – Standard Specification for Telecommunication and Information Exchange Between Roadside and Vehicle Systems
- IEEE 1455-1999 – Standard for Message Sets for Vehicle/Roadside Communications
- IEEE 1609.2-2006 – Standard for Wireless Access in Vehicular Environments (WAVE)
- IEEE 1609.4.2006 – Standard for Wireless Access in Vehicular Environments (WAVE- Multi-Channel)

Connected Vehicle technologies are designed around vehicle-to-vehicle communications and vehicle to roadside communications utilizing newer wireless technologies. It has also evolved where other non-safety applications are being explored.



6.1.3.2 Location Referencing Message Specification

Another important issue for the Bay Area deals with location referencing. A common method of referencing transportation links and nodes is essential for many of the ITS services involving cooperative processing between ITS subsystems. A common frame of reference is needed so that communications between systems can be rationally reduced to an unambiguous reference to the same transportation links, ramps, intersections, etc. A standard method for location referencing is called the Location Referencing Message Specification (LRMS) Information Report. This does not necessarily imply the need to use the same referencing system; rather, conversions are available to convert locations from one system to another.

The Society of Automotive Engineers SAE J2374 – Location Referencing Message Specification (LRMS) Information Report defines a standard mechanism for the exchange of geographic location. These include:

- Address
- Cross Streets
- LinkID
- Longitude, Latitude
- Linear Reference (e.g. Milepost)

Location referencing systems in use in the Bay Area range from simple street address schemes to using TIGER files. Conversion from one to another will be extremely important in the future particularly as electronic connections are made to non-traffic control systems such as computer aided dispatch systems for emergency personnel and transit management systems. The development of a LRMS would be useful for the development of transit automatic vehicle location (AVL) standards for the Bay Area.

The concept of LRMS has not yet been defined for the Bay Area and future discussions will be needed on standardizing the exchange of location based data. A further complication arises from the type of data being exchanged. If the data is from an inductive loop, the location is fixed and a one-time correlation of its location can be made. However, if the data is from a location that may be variable, such as an incident, the conversion of the location to the various location referencing systems will need to be made in real time.

6.2 Standards by Data Flow (All Projects, Recommended)

ITS Standards for specific project elements can be found in the Bay Area ITS Architecture web site. They can be accessed through the ‘Architecture Details’ page: <http://mtcfilehost.net/MTC-ITS/details.htm>

The following is an example of a three-step process to find the communication standards for obtaining data for 511 from roadway sensors.

1. In the ‘Architecture Details’ page, search for the ITS Element (either by stakeholder or by function). 511 is the first element that appears in the search results in the ‘Archived Data Management Subsystem’ category.

ITS ELEMENTS BY FUNCTION	
 (PDF Version)	
Function	Element
Archived Data Management Subsystem	511
	California Highway Performance Monitoring System (HPMS)
	California Statewide Crash Information System
	Caltrain Transit Asset Management System (CTAMS)
	Caltrans D-4 Pavement Management System
	Caltrans D-4 Performance Monitoring System (PeMS)
	Caltrans Statewide Transit Database
	MTC Regional Transportation Management Information System (RTMIS)
	MTC Transportation Asset Management System
	Regional Transit Databases
	Sub-regional and Local City/County Traffic Data Collection
	VTA Transit Data Archive
Commercial Vehicle Administration	CVO Administration (Pre-Pass)
Commercial Vehicle Check	CVO Weigh Stations (Pre-Pass)
Commercial Vehicle Subsystem	Commercial Vehicles
Emergency Management	AC Transit Mobile Command Bus
	AC Transit Operations System
	Alameda County Operational Area

2. After selecting the 511 element, view the list of interfaces that supplies 511 with information from other systems. Find and select the ‘MTC Roadside Equipment’ interface to view how 511 obtain traffic information from MTC operated field devices.



<p>Interfaces:</p> 	<ul style="list-style-type: none">511 Contra Costa511 Regional Real Time Transit System511 Regional Trip Planner511svAC Transit Operations SystemAlameda County Public WorksAlameda County Transportation Management CenterArchived Data UsersBART Station EquipmentBART Transit/Rail Operations SystemBay Area Toll Authority Administration/FasTrak SystemCalifornia Highway Information Network (CHIN)Caltrain Predictive Arrival/Departure System (PADS)Caltrain Rail Operations SystemCaltrans D-4 Maintenance and Construction OperationsCaltrans D-4 Pavement Management SystemCaltrans D-4 Performance Monitoring System (PeMS)Caltrans D-4 Public Information SystemCaltrans D-4 Transportation Management SystemCHP Computer Aided DispatchCHP/MTC Freeway Service Patrol (FSP)City-owned Parking GaragesCombined City/County Emergency Services DispatchCounty Connection Transit OperationsEast Bay SMART Corridor ATMSFerry Information SystemGGNRA Parking SystemGolden Gate Transit Operations SystemI-580 SMART Corridor ATMSI-80 ICM Management CenterKiosks (Transit)LAVTA Transit Operations SystemsLocal City/County Parking Management SystemMediaMTC Regional Transportation Management Information System (RTMIS)MTC Roadside EquipmentMUNI Demand Response Transit OperationsMUNI Fixed Route Transit OperationsMUNI KiosksOakland Maintenance and Construction OperationsOakland Transportation Management SystemOpen Road Tolling System OperationsPrivate Ambulance Provider Dispatch
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3. The 'Architecture Flows' explain the exchange of information between the elements. Selecting one of the flows will give the communications standards for the selected information or architecture flow. In this example, for architecture flows between 511 and MTC's roadside equipment, selecting 'Traffic Flow' leads to the following standards:



ARCHITECTURE FLOW: TRAFFIC FLOW

Description:			
Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.			
Communications Standards:			
NTCIP C2F	AASHTO-17	File Transfer Protocol (FTP) Application Profile	NTCIP 2303
NTCIP C2F	AASHTO-18	Trivial File Transfer Protocol (TFTP) Application Profile	NTCIP 2302
NTCIP C2F	AASHTO-21	Octet Encoding Rules (OER) Base Protocol	NTCIP 1102
NTCIP C2F	AASHTO-28	Ethernet Subnetwork Profile	NTCIP 2104
NTCIP C2F	AASHTO-30	Point-to-Point Protocol Over RS-232 Subnetwork Profile	NTCIP 2103
NTCIP C2F	AASHTO-31	Transportation Transport Profile	NTCIP 2201
NTCIP C2F	AASHTO-38	Transportation Management Protocols (TMP)	NTCIP 1103
NTCIP C2F	AASHTO-47	Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile	NTCIP 2102
NTCIP C2F	NEMA-TS3.p	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	NTCIP 2101
NTCIP C2F	S-85	Simple Transportation Management Framework (STMF) Application Profile	NTCIP 2301
NTCIP C2F	S-88	Internet (TCP/IP and UDP/IP) Transport Profile	NTCIP 2202
Message Standards:			
NEMA TS3.4	NEMA TS3.4	Global Object Definitions	NTCIP 1201
S-30	S-30	Data Element Definitions for Transportation Sensor Systems (TSS)	NTCIP 1209
Data Standards:			
No Data Standards			

7. ARCHITECTURE DETAILS

The Bay Area ITS Plan contains many details regarding Elements that define the Plan. An Element is the name given by stakeholders for a portion of their ITS related operations. Elements fall into four general categories:

- Centers (e.g. the Caltrans District 4 Transportation Management Center or the AC Transit Operations System)
- Field devices (e.g. 511.org Roadside Equipment)
- Vehicles (e.g. MUNI Fixed Route Vehicles)
- Traveler Interface Devices (e.g. Kiosks (transit))

For each Element the following information is provided:

- Description of what it is
- Status in terms of existing, planned or future
- Stakeholder that is the Element owner/operator
- What function that the Element performs (called Mapping on the detail pages) (e.g. Traffic Management)
- Interfaces the Element has with other elements in terms of information shared and exchanged
- ITS Services Diagrams that illustrate how the various subsystems and data flows support the function that the Element performs (listed under Market Packages on the detail page)
- Components of the subsystems in deployable building blocks or processes (called Equipment Packages on the Detail page)

A list of ITS Elements by Stakeholder is provided in **Appendix B**.

A list of ITS Elements by Function is provided in **Appendix C**.

8. FINDING A PROJECT IN THE ARCHITECTURE

8.1 Searching the ITS Architecture Web Site

The Bay Area ITS Architecture web site has four ways for users to find their projects in the ‘How Do I Find My Project?’ page: http://mtcfilehost.net/MTC-ITS/how_do_I_find_project.html

8.1.1 *Projects by Sponsor*

A user of the Architecture web site can find a project by the name of the sponsoring public agency such as BART, Caltrans, or the City of San Jose. A list of the projects by sponsor in the Architecture is provided in **Appendix D**.



A screenshot of a web interface element titled "Project by Sponsor" in a green header. Below the title is a dropdown menu with a white background and a grey border, containing the text "Select" and a small downward-pointing arrow on the right side.

8.1.2 *Projects by Category*

A user of the Architecture web site can find a project by category of project such as traveler information or transit security. A list of the projects by category in the Architecture is provided in **Appendix E**.



A screenshot of a web interface element titled "Project by Category" in a yellow header. Below the title is a dropdown menu with a white background and a grey border, containing the text "Select" and a small downward-pointing arrow on the right side.

8.1.3 *Major Regional ITS Projects*

The third way is to view how individual projects are interrelated with major regional ITS projects such as Clipper®, Express Lanes or 511. Project descriptions, conceptual diagrams and links to resources are provided for agencies seeking to integrate their projects with those programs. Information for regional ITS projects are provided in **Appendix F**.



A screenshot of a web interface element titled "Regional ITS Projects" in a grey header. Below the title is a dropdown menu with a white background and a grey border, containing the text "Select" and a small downward-pointing arrow on the right side.

8.1.4 *Representative ITS Projects*

If a project is not listed by name, it may still be included under a representative project description. The representative projects are projects that exist or planned in the Bay Area based on stakeholder input, but a specific project name is not associated with them. Representative project descriptions can be useful to document for the Federal government that the project is addressed in the regional architecture in order to get funding approval for the project.

A list showing the representative ITS projects is provided in **Appendix G**.

8.2 Project Sequencing

Project sequencing in the ITS Architecture is used to maximize the benefits of ITS projects by building on existing infrastructure and projects to enhance and expand systems. The concept of sequencing projects in multiple layers or tiers is illustrated in **Figure 2**.

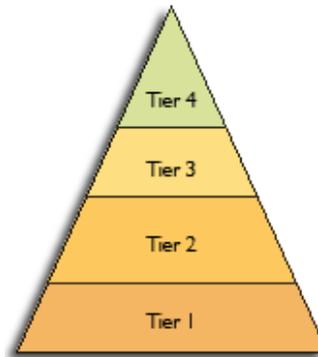


Figure 2 – Tiered Project Sequencing

Projects are sequenced in terms of increasing information exchange with a foundation of base infrastructure. The sequencing can be divided into tiers, with each tier building upon the next to propagate information exchange throughout the region. The project sequencing tiers are:

- Tier 1 – Base infrastructure (e.g., communications, controllers)
- Tier 2 – Centralized systems (e.g., traffic operations system)
- Tier 3 – Multi-modal, multi-jurisdictional systems (e.g., transit priority systems, Smart Corridors)
- Tier 4 – Center to Center, Regional systems (e.g., 511, center-to-center data exchange)

The tiers build upon each other to form regional systems. For instance, in order to have an advanced signal system (Tier 2) the communications infrastructure must be in place first (Tier 1). Multi-jurisdictional signal coordination (Tier 3) requires both base infrastructure (Tier 1) and individual jurisdiction signal systems (Tier 2). The larger regional programs (Tier 4) compile the information from systems all over the region and disseminate it to a wider audience.

Project sequencing is a starting point for ITS integration. They are not hard and fast rules and could vary based on funding availability or project scope. However, before beginning a project, the project sponsor can check the project sequencing to understand what other projects are upcoming in their area and as such, where coordination might be valuable.

The Bay Area has a highly advanced level of ITS deployment. Given that there are projects in place at every tier of deployment (as described above), project sequencing becomes more a matter of phasing deployment within projects themselves or ensuring that lower tiered requirements within projects are addressed adequately. For example, in Concord there is a planned Smart Corridor project, “Concord – Walnut Creek and Pleasant Hill Smart Corridor along I-680.” This project is a Tier 3 project because it involves many jurisdictions. The ITS Architecture shows that the City of Walnut Creek also has a Tier 1 project to upgrade their signal system. This project may need to be completed before the Smart Corridor project. There are also likely additional Tier 1 and 2 components as a part of the larger Smart Corridor project such as additional communications infrastructure that need to be deployed prior to the integration components (Tier 3 components).

When using the project sequencing portion of the Architecture some questions to ask include:

- What tier is my project in?



- Are there other projects in my general geographic region in the tiers below mine? *If so, the project sponsors should coordinate to find out if the lower tier projects should be included first based on dependencies between projects, if applicable.*
- Are there existing projects in the tiers above mine that I can integrate with? For example, a local Traffic Management Center that may benefit from integration into a Smart Corridor.

The sequencing of the project inventory can be found in **Appendix H**.

9. USE AND MAINTENANCE OF THE ARCHITECTURE

The success of the Bay Area ITS Architecture in guiding project development, coordination, and integration is dependent upon effective use of the Architecture. The Architecture provides input into the planning and deployment processes for the region and serves as tool for stakeholders to ensure that their projects support regional goals.

There are three primary uses for the Architecture by project sponsors and transportation professionals in the Bay Area. The first is to assist in the regional transportation planning efforts that occur within the region. The second is in ITS project development (planning, design, implementation, etc.). The third is project procurement by using the functional requirements in the Architecture as a guide for defining the project's specific requirements. The sections below detail how to use the Architecture in transportation planning and for ITS project development and procurement.

9.1 Using the Architecture in Planning

9.1.1 *Regional Planning*

The goal of transportation planning is to make informed decisions on the investment of public funds for regional transportation systems and services. In the Bay Area the planning process and its outcomes are documented in:

- The Regional Transportation Plan (RTP), a 25-year plan that documents the transportation priorities for future investments in the Bay Area; and
- The Transportation Improvement Program (TIP), an annual program that includes comprehensive listing of all Bay Area transportation projects that receive federal funds or that are subject to a federally required action, such as a review for impacts on air quality.

As a tool to inform the RTP, the Architecture can be referenced in terms of regional priorities, objectives, and issues for further discussion that arose in the site's development. The Architecture can be used by regional partners to guide the region in setting policy or related direction for ITS projects and funding. The role of the Architecture in the RTP process depends on the level of resource commitment to updating the Architecture and the extent to which the effort delves into planning and project coordination issues, and not only focused on the project inventory.

The Architecture is a single source summarizing the existing and planned ITS projects in the region. Project sponsors can also use the project information as a starting point in submitting projects of interest to the TIP.

9.1.2 *Project Planning*

For projects receiving Federal transportation funding from the Highway Trust Fund and Mass Transit Account, there are certain planning criteria that must be followed. Mass Transit Account funding applicants should follow the procedures documented in FTA's *Updated Guidance on Implementation of ITS Projects Affected by National ITS Architecture Consistency Policy for Transit Projects*, while other project funding applicants in California should follow the procedures outlined in Chapter 13 of the *Caltrans Local Assistance Program Guidelines (LAPG)*. These procedures are briefly explained for transit projects and non-transit projects in the following sections. ITS projects in California receiving federal



funds have to ensure that systems engineering process is followed in addition to meeting the requirements related to the regional ITS architecture.

9.1.2.1 Transit Projects

Applicants for Mass Transit Account funds need to provide the following information in the required [FTA Transportation Electronic Award and Management \(TEAM\)](#) system:

1) The applicant needs to check the Self-Certification in the TEAM system, certifying compliance with the *FTA National ITS Architecture Consistency Policy for Transit Projects*.

2) In the project description field, the applicant needs to make a statement that an applicable regional ITS architecture exists and that the ITS components in the project are part of the ITS architecture. The statement should also include that a Systems Engineering process was used to develop the ITS components of the project. Here is a sample project description statement:

This bus purchase includes the purchase of automatic vehicle location (AVL) equipment as part of the grant. XYZ transit agencies' implementation of an AVL system is part of the Bay Area ITS Architecture. Detailed information can be found in the Project Sequencing Table in the architecture website. This project is consistent with the Bay Area ITS Architecture. A Systems Engineering process was used in the development of this project.

3) The applicant should use the Non-Add Scope Codes in the project budget field to identify the ITS components of the project. Here are a few examples of the Non-Add Scope Codes for ITS component:

99300 – ITS Fleet Management

99400 – ITS Electronic Fare Management

99500 – ITS Traveler Information

Applicants can prepare itemized budgets with the ITS components separated out.

Taking the three self-certification steps in TEAM is sufficient evidence of compliance with the FTA requirement at the time of grant award. FTA will use its oversight procedures to monitor compliance with the policy.

FTA funded projects are required to undergo a Systems Engineering Analysis (SEA) to achieve compliance with Federal regulation (23 CFR 940). In California, the SEA requirement can be met by completing an updated SEA form as part of the project files. Stakeholders can use information from the Bay Area ITS Architecture to fill out the FTA SERF form as described above for non-transit projects. The FTA assesses compliance by requesting the SEA form during the [project triennial review](#). In most cases, the completed form would be requested during the triennial review; however, the FTA regional program manager can request earlier submission of the form. Applicants may use other means to document their use of the Systems Engineering process as long as it shows that the seven-step process has been followed.



9.1.2.2 Non-Transit Projects

As required by the FHWA/Caltrans guidelines for ITS projects, the local agency must determine the level of risk for the ITS project. There are three types of project risk (“Exempt”, “Low-Risk” and “High Risk”) which determine the process for project funding and development. All federally funded ITS projects must have a Systems Engineering Analysis (SEA) performed to be in compliance with Federal regulation (23 CFR 940).

In California, the SEA requirement is met by completing a System Engineering Review Form (SERF). By answering the seven questions of the SERF, the local agency can determine if the ITS project is Low Risk (formerly “Minor”) or High Risk (formerly “Major”). ITS projects that are deemed “High Risk” requires the preparation of a System Engineering Management Plan (SEMP) and a written Notice to Proceed (NTP) from FHWA before federal funds could be spent on detailed component level design. The SERF is meant to be high-level project information and can be completed by public agency staff. **Table 7** below shows where in this regional ITS architecture documentation information can be found to assist in writing a SERF.

Table 7 – Architecture Resources for the System Engineering Review Form (SERF)

SERF Requirement	Bay Area ITS Architecture Resource
a) Identification of portions of RA being Implemented	Bay Area ITS Project Inventory
b) Identification of participating agencies roles and responsibilities	Stakeholder Roles and Responsibilities
c) Requirements definition	Functional Requirements
d) Analysis of alternative system configurations and technology options to meet requirements	Not Available in the Architecture
e) Procurement options	Not Available in the Architecture
f) Identification of applicable ITS standards and testing procedures	Standards (Testing Procedures not available)
g) Procedures and resources necessary for operations and management of the system	Not Available in the Architecture

Refer to the Roadmap section in chapter 13.4 of the LAPG that describe the steps for maintaining ITS compliance during the planning and implementation of the project.

9.1.2.3 Systems Engineering Process

The System Engineering process is a type of project planning process used for ITS projects. This process is required for major federally-funded ITS projects. The



Systems Engineering Guidebook for ITS, co-sponsored by FHWA and Caltrans, is one resource for the Systems Engineering process. The Guidebook is accessible at the FHWA web site: <http://www.fhwa.dot.gov/cadiv/segb/>

Table 8 outlines the basic System Engineering Process phases and how the Bay Area ITS Architecture can provide resources in each phase.

Table 8 – Architecture Resources for the Systems Engineering Process

Systems Engineering Process	Bay Area ITS Architecture Resource
Phase -1 - Interfacing with Planning and the Regional Architecture	Projects by Category
Phase 0 - Concept Exploration and Benefits Analysis	Bay Area Basics , Stakeholder Information , Market Packages , Projects by Category
Phase 1 - Project Planning and Concept of Operations Development (includes Systems Engineering Management Plan (SEMP))	Stakeholder Information (Roles and Responsibilities and Agreements)
Phase 2 - System Definition and Design	Functional Requirements , Standards , Architecture Details
Phase 3 - System Development and Implementation	Project Sequencing , Stakeholder Information (Roles and Responsibilities and Agreements)
Phase 4 - Validation, Operation & Maintenance, Changes & Upgrades	Stakeholder Information (Roles and Responsibilities and Agreements)
Phase 5 - System Retirement/Replacement	Not Available in the Architecture

9.2 Using the Architecture for Project Development and Design

The Bay Area ITS Architecture assists in defining high-level requirements in ITS design. During project development, stakeholders should incorporate elements of the Architecture, such as roles and responsibilities, standards, and functional requirements in their detailed design documents. This method of defining ITS projects for future deployment is consistent with the National ITS Architecture, it lends credibility to new projects, it limits duplicate efforts by transportation

stakeholders, and it supports a uniform regional approach to both project planning and deployment.

For example, if an agency wanted to build a Traffic Operations Center for their signal system incorporating other ITS devices, such as CCTV cameras and electronic signs, the process would proceed as follows (a similar process would be used if a transit system or a traveler information system or any other ITS project were of interest): Consult the Bay Area ITS Architecture to see if the project had been previously captured in the ITS Project Inventory.

1. Consult the Bay Area ITS Architecture to see if the project had been previously captured in the [ITS Project Inventory](#).
2. If the project has been included, then find the related:
 - [Roles and Responsibilities](#) (for the agencies involved)
 - [Functional Requirements](#)
 - [Project Context Diagrams](#)
 - [Recommended and Required Standards](#)
3. Review these items and decide which connection and data exchanges the current project must accommodate.
4. Contact the stakeholders referenced in the diagrams and coordinate the data to be exchanged and the standards to be used as a starting point.
5. Determine whether an agreement is required for the purpose of system integration and data exchange and other relevant terms.
6. [Submit](#) the project particulars to the Maintenance Team for assessment of consistency with the ITS Architecture and to add the project to the ITS Architecture.
7. Follow [Systems Engineering Process in Project Deployment](#).
8. If this is a transit project, review [Updated Guidance on Implementation of ITS Projects Affected by National ITS Architecture Consistency Policy for Transit Projects](#) and submit required information via FTA's [Transportation Electronic Award and Management \(TEAM\)](#) system. Otherwise, review and submit all appropriate material as directed by [Chapter 13 of the Caltrans Local Assistance Program \(LAP\) Guidelines](#).

9.3 Using the Architecture in Procurement

The Architecture is a necessary and useful tool for project procurement. Compliance with the Architecture is required for ITS projects to receive Federal support from the Highway Trust Fund. One way to prove compliance is to show your project is included in the Architecture. The '[How do I Find My Project?](#)' page in the Architecture web site can help stakeholders determine if their project is included. Stakeholders can submit new projects to the Maintenance Team using the 'Send Updates' page: <http://mtcfilehost.net/MTC-ITS/maintenance.html>

The Architecture is also useful for project procurement as a tool for preliminarily defining a project's functionality, stakeholders, and how information will be communicated. The 'Functional Requirements' page of the web site provides sample lists of requirements that can be used as a starting point for developing requirements specific to an agency's needs for a particular project: http://mtcfilehost.net/MTC-ITS/functional_requirements.html

The project-specific requirements can then be used as the basis for a procurement document to hire a consultant or purchase an off-the-shelf product.

9.4 Maintaining the Architecture

The Bay Area ITS Architecture can be modified as plans and priorities change, ITS projects are implemented, and ITS needs and services evolve in the region. In 2004, the Bay Area ITS Architecture was developed with a ten-year time horizon and has been updated every three years since. The goal of periodically maintaining the Architecture is to keep an up-to-date regional ITS Architecture that is accessible and easily used for deploying ITS in the San Francisco Bay Area.

9.4.1 Responsibility for Maintaining the ITS Architecture

MTC may convene a [Maintenance Committee](#) on an as-needed basis to advise MTC on maintaining the regional architecture and other ITS policy and planning issues. The Maintenance Committee will represent a cross-section of transportation agencies and expertise. MTC will maintain its lead role with overall responsibility and accountability for the Architecture maintenance. Aside from periodic updates to the Architecture initiated by MTC, it is the responsibility of project sponsors to provide updated or new project information to MTC for inclusion in the Architecture. MTC will maintain a list of project updates in between the official update efforts which will be considered part of the Architecture.

The Maintenance Team has adopted a procedure for submitting changes to the Architecture found in the [Method for Submitting and Approving Changes to the Architecture](#) document.



APPENDIX A – EXAMPLES OF CURRENT BAY AREA PROJECTS

Bay Area ITS Project	Project Sponsor/Contact	Email Address	Requirements/Notes
511 Parking	Alysha Nachtigall	ANachtigall@mtc.ca.gov	Functional Requirements are not available at this time.
511 Real Time Transit	Jim Macrae	JMacrae@mtc.ca.gov	This document presents the system requirements for the Bay Area Regional Real-Time Transit Information System. These requirements are based on the evaluation criteria developed for the selection of the architecture, discussions with the MTC, the TAC and Telvent Farradyne (TF), and on the existing procedures and features of the existing real-time system. Download PDF
511 Regional Transit Information System	Thomas Spiekerman	TSpiekerman@mtc.ca.gov	This document details the data interfaces for transmitting static transit data. Download PDF
511 Traffic	Jim Macrae	JMacrae@mtc.ca.gov	This document describes the interfaces used to disseminate the 511 traffic data feed. Download PDF
Bay Area Center-to-Center (C2C) network	Joy Lee	JLee@mtc.ca.gov	This report presents a description of the existing legacy systems that will participate in the Interim Center-to-Center (C2C) System; identifies the functions that are desired by each participating system; and presents a Scope of Work for developing the Interim C2C System. Download PDF
Bay Area FasTrak® Program	Beth Zelinski	bZelinski@mtc.ca.gov	FasTrak® transponders are required to be compatible with the Title 21 specification for transponder interoperability. View the Title 21 compatibility specifications. Download PDF
Call Boxes/Freeway Service Patrol	Joanna Fox	JFox@mtc.ca.gov	Functional Requirements are not available at this time.
Clipper®	Lynn Valdivia	Lvaldivia@mtc.ca.gov	The participation of numerous agencies with various fare structures and rules require close coordination to operate and maintain Clipper. For more information, view the Clipper Operating Rules. Download PDF
East Bay SMART Corridors Program	John Hemiup	jhemiup@accma.ca.gov	This document describes the project requirements for the East Bay SMART Corridors. Download PDF



Bay Area ITS Project	Project Sponsor/Contact	Email Address	Requirements/Notes
Emergency Management	Radiah Victor	RVictor@mtc.ca.gov	The Regional Transportation Emergency Management Plan describes the roles and responsibilities of Bay Area agencies in coordinating information sharing functions. Download PDF
Express Lanes	Lisa Klein	lklein@mtc.ca.gov	The Concept of Operations including a functional overview of the I-680 Smart Lane is provided here for reference. Download PDF
Freeway Performance Initiative	Joy Lee Danielle Stanislaus	JLee@mtc.ca.gov DStanislaus@mtc.ca.gov	The FPI program is supported by several regional ITS projects. Refer to the links to the requirements for the I-80 ICM, East Bay SMART Corridors, Bay Area Center-to-Center (C2C) network, and 511 Traffic projects listed in this matrix.
I-80 Integrated Corridor Mobility (ICM)	Raj Murthy	rmurthy@alamedactc.org	This RFP for Software Development and System Integration Services includes the functional requirements for the project. Download PDF
Incident Management	Radiah Victor	RVictor@mtc.ca.gov	Incident management is supported by several regional ITS projects. Refer to the links to the Bay Area Center-to-Center (C2C) network, Call Boxes/Freeway Service Patrol, I-80 ICM and East Bay SMART Corridors projects listed in this matrix.
San Mateo Smart Corridors	Sandy Wong	slwong@co.sanmateo.ca.us	This document includes the high level requirements and the detailed design requirements for the ITS subsystems. Download PDF
SFpark	Jay Primus	jay.primus@sfmta.com	Information is available for the API to distribute parking availability data from the SFpark data warehouse. Download PDF
Silicon Valley Smart Corridors	Ken Salvail	ken.salvail@sanjoseca.gov	Concept of Operations Report for the SV-ITS West project includes Technical Requirements and Alternatives. Download PDF
Tri-Valley Smart Corridors	John Hemiup	jhemiup@accma.ca.gov	This document describes the software functional requirements for system integration and data sharing. Download PDF



APPENDIX B – ITS ELEMENTS BY STAKEHOLDER

Stakeholder	Element
AC Transit	AC Transit Mobile Command Bus
	AC Transit Operations System
	AC Transit Roadside Systems
	AC Transit Vehicles
	AC Transit Web Site
	AC Transit/BART Demand Response Vehicles
	Dumbarton Express Transit Operations
Alameda County	Alameda County Operational Area
	Alameda County Public Works
	Alameda County Public Works Vehicles
	Alameda County Roadside Equipment
	Alameda County Transportation Management Center
Alameda County Transportation Commission (CTC)	East Bay SMART Corridor ATMS
	East Bay SMART Corridor Roadside Equipment
	I-580 Express Lane Roadside Equipment
	I-580 Toll Operations
	I-80 ICM Management System
Archive Data Users	Archived Data Users
Bay Area Rapid Transit District	BART Fare Collection Central System
	BART Message Station System
	BART Station Equipment
	BART Transit/Rail Operations System
	BART Vehicles
	BART Website (Public)
	Dumbarton Express Transit Operations
	EZ Rider Smart Card
Bay Area Toll Authority	Bay Area Toll Authority Administration/FasTrak® System
California Department of Motor Vehicles (DMV)	CVO Administration (Pre-Pass)
California Emergency Management Agency	California State EOC
	Regional Emergency Operations Center
California Highway Patrol	California Statewide Crash Information System
	CHP Computer Aided Dispatch
	CHP Vehicles
	CHP/MTC Freeway Service Patrol (FSP)
	CHP/MTC FSP Tow Trucks
Caltrain	Caltrain Onboard PTC Component
	Caltrain Predictive Arrival/Departure System (PADS)



Stakeholder	Element
	Caltrain Rail Center Next Train Displays Caltrain Rail Operations System Caltrain Transit Asset Management System (CTAMS) Caltrain Vehicles Caltrain Wayside Signal System Caltrain Website
Caltrans District 4 (Maintenance)	Caltrans D-4 Maintenance Vehicles Caltrans D-4 Pavement Management System
Caltrans District 4 (Traffic Operations)	Bay Area Call Boxes Bay Area Incident Response System (BAIRS) Caltrans D-4 Connected Vehicle Roadside Equipment (RSE) Caltrans D-4 Maintenance and Construction Operations Caltrans D-4 Public Information System Caltrans D-4 TMC Roadside Equipment (TOS) Caltrans D-4 Transportation Management System GGNRA Parking System
Caltrans Headquarters	California Highway Information Network (CHIN) California Highway Performance Monitoring System (HPMS) Caltrans Statewide Transit Database Caltrans Website CVO Weigh Stations (Pre-Pass) Other Caltrans District Maintenance and Construction Operations
Central Contra Costa Transit Authority	County Connection Transit Operations County Connection Transit Vehicles
CHP/MTC	CHP/MTC Freeway Service Patrol (FSP) CHP/MTC FSP Tow Trucks
City of Antioch	SR 4 East SMART Corridor ATMS SR 4 East SMART Corridor Roadside Equipment
City of Oakland	Oakland Emergency Operations Center (EOC) Oakland Maintenance and Construction Operations Oakland Maintenance and Construction Vehicles Oakland TMC Roadside Equipment Oakland Transportation Management System Port of Oakland TMC
City of Pleasanton	I-580 SMART Corridor ATMS I-580 SMART Corridor ATMS Roadside Equipment
City of San Jose	511sv San Jose Emergency Operations Center (EOC) San Jose International Airport Control Center



Stakeholder	Element
	San Jose Maintenance and Construction Operations San Jose Maintenance and Construction Vehicles San Jose TMC Roadside Equipment San Jose Transportation Management System Silicon Valley SMART Corridor ATMS Silicon Valley SMART Corridor Roadside Equipment
City/County of San Francisco	City of San Francisco Street Parking Sensors City-owned Parking Garages Combined City/County Emergency Services Dispatch Combined City/County Emergency Vehicles MUNI Advanced Train Control System Central MUNI BRT Roadside Devices MUNI Demand Response Transit Operations MUNI Demand Response Vehicles MUNI Fare Collection Central System MUNI Faregates MUNI Fixed Route Transit Operations MUNI Fixed Route Vehicles MUNI Kiosks MUNI LRV Transit Vehicles MUNI Non Revenue Vehicles MUNI Passenger Information Signs MUNI Public Address System MUNI Ticket Vending Machines MUNI Trackside Equipment MUNI Transit Garages MUNI Transit Website MUNI Transportation Facilities and Infrastructure MUNI Wayside Equipment San Francisco ADA Trip Planner San Francisco City/County EOC SF Department of Public Works (DPW) SF DPW Vehicles SFgo Roadside Equipment SFgo Transportation Management System SFMTA Parking Data Server
Coast Guard	Coast Guard Command Center
Commercial Vehicle Fleet Operations	Private Fleet Management Systems
Contra Costa Transportation Authority	511 Contra Costa
Contract Transport Companies	Private Ambulance Provider Dispatch



Stakeholder	Element
	Private Ambulance Provider Vehicles
Dumbarton Express	Dumbarton Express Transit Operations
Express Lane JPA	Express Lane Agency Systems
	Express Lane Operations
	Express Lane Roadside Equipment
Financial Institutions	Financial Institutions
Golden Gate Bridge Highway and Transportation District	Golden Gate Transit Fare Collection System
	Golden Gate Transit Operations System
	Golden Gate Transit Vehicles
	Golden Gate Transit Website
Golden Gate National Recreation Area	GGNRA Parking System
Independent School Districts	Independent School District Buses
	Independent School District Dispatch
Livermore Amador Valley Transit Authority (LAVTA)	LAVTA Demand Response Transit Vehicles
	LAVTA Fixed Route Transit Vehicles
	LAVTA On Street Signs
	LAVTA Transit Operations Systems
	LAVTA Transit Web site
Media	Media
Metropolitan Transportation Commission	511
	511 Real Time Transit
	511 Regional Transit Information System (RTIS)
	511 Regional Trip Planner
	Bay Area Toll Collection/FasTrak® Field Equipment
	CHP/MTC Freeway Service Patrol (FSP)
	CHP/MTC FSP Tow Trucks
	Clipper® Central System
	Clipper® Field Equipment
	Clipper® Smart Card
	Clipper® Vendor Network
	Clipper® Website
	GGNRA Parking System
	MTC EOC
	MTC Regional Transportation Management Information System (RTMIS)
	MTC Roadside Equipment
	MTC TIC
	MTC Transportation Asset Management System
Roadside Tolling Equipment	



Stakeholder	Element
	Tolling System Operations
NOAA	National Weather Service
Other Counties	Other County Public Safety Systems
Partners for Advanced Transit and Highways	Caltrans D-4 Performance Monitoring System (PeMS)
Private HAZMAT Providers	Private HAZMAT Response Providers
	Private HAZMAT Vehicles
Private Railroad Operators	Private Rail Operations
	Railroad Wayside Equipment
Private Sector Provider for Fare Collection	Debit Card Central System
	Paratransit Broker System
Private Sector Traveler Information Service Providers	Private Sector Provider (NextBus)
	Private Sector Traveler Information Services
Private Tow/Wrecker Providers	Private Tow/Wrecker Dispatch
	Private Tow/Wrecker Vehicles
Private Transportation Companies	Commercial Vehicles
	In-Taxi Equipment
Private Weather Information Service Provider	Private Weather Information Provider
Regional Event Coordinators	Special Event Coordinators
Regional Ferry Operating Agencies	Regional Ferries
	Regional Ferry Operations
Regional Medical Centers	Regional Medical Centers
Regional/International Airports	Oakland International Airport
	Regional Airports
	San Francisco International Airport
San Mateo City/County Association of Governments	San Mateo County Smart Corridor ATMS
San Mateo County Transit District	Dumbarton Express Transit Operations
	SamTrans Transit Operations System
	SamTrans Vehicles (Buses and Paratransit)
	SamTrans Website
Santa Clara Valley Transportation Authority	Dumbarton Express Transit Operations
	VTA Demand Response Transit Vehicles
	VTA Fixed Route Transit Vehicles
	VTA Light Rail Control System
	VTA LRT Vehicles
	VTA Maintenance and Administrative Systems
VTA Operations Control Center	



Stakeholder	Element
	VTA Station Displays VTA Transit Data Archive VTA Transit Website VTA Traveler Information System
Sub-Regional and Local Cities/Counties	Agency SMART Card GGNRA Parking System Local City/County Parking Management System Regional Parking Garages and Parking Meters Regional Parking Operations Administration Sub-regional and Local City/County Emergency Operations Center (EOC) Sub-regional and Local City/County Fire Department Systems Sub-regional and Local City/County Fire Dept Emergency Vehicles Sub-regional and Local City/County Maintenance and Construction Operations Sub-regional and Local City/County Maintenance and Construction Vehicles Sub-regional and Local City/County Police/Sheriff Department Systems Sub-regional and Local City/County Police/Sheriff Vehicles Sub-regional and Local City/County Roadside Equipment Sub-regional and Local City/County Traffic Data Collection Sub-regional and Local City/County Traffic Operations Systems Sub-regional and Local City/County Transit Operations Systems Sub-regional and Local City/County Transit Vehicles Sub-regional and Local City/County Transit Websites Sub-regional and Local City/County Websites
Transit Agencies	Kiosks (Transit) Regional Transit Databases Regional Transportation Centers Transit Agency Call Centers
Traveling Public (Commuters) At Large	Personal Vehicles with Connected Vehicle On-board Equipment (OBE) Personal Vehicles with toll tags User Personal Computing Devices
Water Emergency Transportation Authority	Ferry Information System WETA Fare Collection System
Western Contra Costa County Transit (WCCTA)	West Cat Transit Operations West Cat Transit Vehicles



APPENDIX C – ITS ELEMENTS BY FUNCTION

Function	Element
Archived Data Management Subsystem	511
	California Highway Performance Monitoring System (HPMS)
	California Statewide Crash Information System
	Caltrain Transit Asset Management System (CTAMS)
	Caltrans D-4 Pavement Management System
	Caltrans D-4 Performance Monitoring System (PeMS)
	Caltrans Statewide Transit Database
	MTC Regional Transportation Management Information System (RTMIS)
	MTC Transportation Asset Management System
	Regional Transit Databases
	Sub-regional and Local City/County Traffic Data Collection
	VTA Transit Data Archive
Commercial Vehicle Administration	CVO Administration (Pre-Pass)
Commercial Vehicle Check	CVO Weigh Stations (Pre-Pass)
Commercial Vehicle Subsystem	Commercial Vehicles
Emergency Management	AC Transit Mobile Command Bus
	AC Transit Operations System
	Alameda County Operational Area
	BART Transit/Rail Operations System
	California State EOC
	Caltrain Rail Operations System
	Caltrans D-4 Transportation Management System
	CHP Computer Aided Dispatch
	CHP/MTC Freeway Service Patrol (FSP)
	Coast Guard Command Center
	Combined City/County Emergency Services Dispatch
	Golden Gate Transit Operations System
	LAVTA Transit Operations Systems
	MTC EOC
	MUNI Demand Response Transit Operations
	MUNI Fixed Route Transit Operations
	Oakland Emergency Operations Center (EOC)
	Private Ambulance Provider Dispatch
	Private HAZMAT Response Providers
	Private Tow/Wrecker Dispatch
	Regional Emergency Operations Center
	SamTrans Transit Operations System
	San Francisco City/County EOC



Function	Element
	San Jose Emergency Operations Center (EOC) San Jose International Airport Control Center Sub-regional and Local City/County Emergency Operations Center (EOC) Sub-regional and Local City/County Fire Department Systems Sub-regional and Local City/County Police/Sheriff Department Systems Sub-regional and Local City/County Traffic Operations Systems Sub-regional and Local City/County Transit Operations Systems VTA Light Rail Control System VTA Operations Control Center
Emergency Vehicle Subsystem	CHP Vehicles CHP/MTC FSP Tow Trucks Combined City/County Emergency Vehicles Private Ambulance Provider Vehicles Private HAZMAT Vehicles Private Tow/Wrecker Vehicles Sub-regional and Local City/County Fire Dept Emergency Vehicles Sub-regional and Local City/County Police/Sheriff Vehicles
Emissions Management	Caltrans D-4 Transportation Management System Silicon Valley SMART Corridor ATMS
Fleet and Freight Management	Private Fleet Management Systems
Information Service Provider	511 511 Contra Costa 511 Real Time Transit 511 Regional Transit Information System (RTIS) 511 Regional Trip Planner 511sv AC Transit Web Site Alameda County Transportation Management Center BART Website (Public) California Highway Information Network (CHIN) Caltrain Predictive Arrival/Departure System (PADS) Caltrain Website Caltrans D-4 Public Information System Caltrans D-4 Transportation Management System Caltrans Website Clipper® Website East Bay SMART Corridor ATMS Ferry Information System Golden Gate Transit Website I-580 SMART Corridor ATMS



Function	Element
	LAVTA Transit Web site MTC TIC MUNI Transit Website Oakland Transportation Management System Private Sector Traveler Information Services SamTrans Website San Francisco ADA Trip Planner San Jose Transportation Management System SFgo Transportation Management System SFMTA Parking Data Server Silicon Valley SMART Corridor ATMS SR 4 East SMART Corridor ATMS Sub-regional and Local City/County Traffic Operations Systems Sub-regional and Local City/County Transit Websites Sub-regional and Local City/County Websites Transit Agency Call Centers VTA Transit Website
Maintenance and Construction Management	Alameda County Public Works Bay Area Incident Response System (BAIRS) Caltrans D-4 Maintenance and Construction Operations Oakland Maintenance and Construction Operations San Jose Maintenance and Construction Operations SF Department of Public Works (DPW) Sub-regional and Local City/County Maintenance and Construction Operations VTA Maintenance and Administrative Systems
Maintenance and Construction Vehicle	Alameda County Public Works Vehicles Caltrans D-4 Maintenance Vehicles Oakland Maintenance and Construction Vehicles San Jose Maintenance and Construction Vehicles SF DPW Vehicles Sub-regional and Local City/County Maintenance and Construction Vehicles
Parking Management	City-owned Parking Garages GGNRA Parking System Local City/County Parking Management System Regional Parking Garages and Parking Meters Regional Parking Operations Administration SFgo Transportation Management System SFMTA Parking Data Server
Personal Information Access	User Personal Computing Devices



Function	Element
	BART Message Station System BART Station Equipment Bay Area Call Boxes Caltrain Rail Center Next Train Displays Clipper® Field Equipment Clipper® Vendor Network Kiosks (Transit) LAVTA On Street Signs MUNI Faregates MUNI Kiosks MUNI Passenger Information Signs MUNI Public Address System MUNI Ticket Vending Machines Regional Transportation Centers VTA Station Displays
Roadway Subsystem	AC Transit Roadside Systems Alameda County Roadside Equipment Caltrans D-4 Connected Vehicle Roadside Equipment (RSE) Caltrans D-4 TMC Roadside Equipment (TOS) City of San Francisco Street Parking Sensors East Bay SMART Corridor Roadside Equipment Express Lane Roadside Equipment I-580 SMART Corridor ATMS Roadside Equipment MTC Roadside Equipment MUNI BRT Roadside Devices MUNI Trackside Equipment MUNI Wayside Equipment Oakland TMC Roadside Equipment San Jose TMC Roadside Equipment SFgo Roadside Equipment Silicon Valley SMART Corridor Roadside Equipment SR 4 East SMART Corridor Roadside Equipment Sub-regional and Local City/County Roadside Equipment
Security Monitoring Subsystem	Caltrans D-4 TMC Roadside Equipment (TOS) MUNI Transportation Facilities and Infrastructure Sub-regional and Local City/County Roadside Equipment
Toll Administration	Bay Area Toll Authority Administration/FasTrak® System Express Lane Agency Systems Express Lane Operations I-580 Toll Operations Tolling System Operations



Function	Element
	Bay Area Toll Collection/FasTrak® Field Equipment Express Lane Roadside Equipment I-580 Express Lane Roadside Equipment Regional Parking Garages and Parking Meters Roadside Tolling Equipment
Traffic Management	511 Alameda County Transportation Management Center Caltrans D-4 Transportation Management System East Bay SMART Corridor ATMS GGNRA Parking System I-580 SMART Corridor ATMS I-80 ICM Management System Local City/County Parking Management System MTC TIC Oakland Transportation Management System Port of Oakland TMC Private Sector Traveler Information Services San Jose Transportation Management System San Mateo County Smart Corridor ATMS SFgo Transportation Management System Silicon Valley SMART Corridor ATMS SR 4 East SMART Corridor ATMS Sub-regional and Local City/County Traffic Operations Systems
Transit Management	511 Real Time Transit 511 Regional Transit Information System (RTIS) AC Transit Operations System BART Fare Collection Central System BART Transit/Rail Operations System Caltrain Predictive Arrival/Departure System (PADS) Caltrain Rail Operations System Clipper® Central System County Connection Transit Operations Debit Card Central System Dumbarton Express Transit Operations Ferry Information System Golden Gate Transit Fare Collection System Golden Gate Transit Operations System Independent School District Dispatch LAVTA Transit Operations Systems MTC TIC MUNI Advanced Train Control System Central



Function	Element
	MUNI Demand Response Transit Operations MUNI Fare Collection Central System MUNI Fixed Route Transit Operations MUNI Transit Garages Paratransit Broker System Private Sector Provider (NextBus) Private Sector Traveler Information Services Regional Ferry Operations SamTrans Transit Operations System Sub-regional and Local City/County Transit Operations Systems VTA Light Rail Control System VTA Maintenance and Administrative Systems VTA Operations Control Center VTA Traveler Information System West Cat Transit Operations WETA Fare Collection System
Transit Vehicle Subsystem	AC Transit Vehicles AC Transit/BART Demand Response Vehicles BART Vehicles Caltrain Onboard PTC Component Caltrain Vehicles County Connection Transit Vehicles Golden Gate Transit Vehicles Independent School District Buses In-Taxi Equipment LAVTA Demand Response Transit Vehicles LAVTA Fixed Route Transit Vehicles MUNI Demand Response Vehicles MUNI Fixed Route Vehicles MUNI LRV Transit Vehicles MUNI Non Revenue Vehicles Regional Ferries SamTrans Vehicles (Buses and Paratransit) Sub-regional and Local City/County Transit Vehicles VTA Demand Response Transit Vehicles VTA Fixed Route Transit Vehicles VTA LRT Vehicles West Cat Transit Vehicles
Vehicle	Personal Vehicles with Connected Vehicle On-board Equipment (OBE) Personal Vehicles with toll tags
Archived Data User Systems	Archived Data Users



Function	Element
	Regional Medical Centers
Enforcement Agency	CHP Computer Aided Dispatch
Event Promoters	Special Event Coordinators
Financial Institution	Financial Institutions
Media	Media
Multimodal Transportation Service Provider	Oakland International Airport
	Regional Airports
	San Francisco International Airport
Other Archives	511
	California Highway Performance Monitoring System (HPMS)
	California Statewide Crash Information System
	Caltrans D-4 Pavement Management System
	Caltrans D-4 Performance Monitoring System (PeMS)
	Caltrans Statewide Transit Database
	MTC Regional Transportation Management Information System (RTMIS)
	Regional Transit Databases
	Sub-regional and Local City/County Traffic Data Collection
Other CVAS	CVO Administration (Pre-Pass)
Other Emergency Management	AC Transit Mobile Command Bus
	AC Transit Operations System
	Alameda County Operational Area
	BART Transit/Rail Operations System
	California State EOC
	Caltrain Rail Operations System
	Caltrans D-4 Transportation Management System
	CHP Computer Aided Dispatch
	CHP/MTC Freeway Service Patrol (FSP)
	Golden Gate Transit Operations System
	MTC EOC
	MUNI Demand Response Transit Operations
	MUNI Fixed Route Transit Operations
	Oakland Emergency Operations Center (EOC)
	Other County Public Safety Systems
	Private Ambulance Provider Dispatch
	Private HAZMAT Response Providers
	Private Tow/Wrecker Dispatch
	Regional Emergency Operations Center
	SamTrans Transit Operations System
	San Francisco City/County EOC



Function	Element
	San Jose Emergency Operations Center (EOC) San Jose International Airport Control Center Sub-regional and Local City/County Emergency Operations Center (EOC) Sub-regional and Local City/County Fire Department Systems Sub-regional and Local City/County Police/Sheriff Department Systems Sub-regional and Local City/County Traffic Operations Systems Sub-regional and Local City/County Transit Operations Systems
Other ISP	511 511sv AC Transit Web Site Alameda County Transportation Management Center BART Website (Public) California Highway Information Network (CHIN) Caltrain Website Caltrans D-4 Public Information System Caltrans D-4 Transportation Management System Caltrans Website East Bay SMART Corridor ATMS Golden Gate Transit Website I-580 SMART Corridor ATMS LAVTA Transit Web site MTC TIC MUNI Transit Website Oakland Transportation Management System Private Sector Traveler Information Services SamTrans Website San Jose Transportation Management System SFgo Transportation Management System SFMTA Parking Data Server Silicon Valley SMART Corridor ATMS Sub-regional and Local City/County Traffic Operations Systems Sub-regional and Local City/County Transit Websites Sub-regional and Local City/County Websites Transit Agency Call Centers VTA Transit Website
Other MCM	Alameda County Public Works Caltrans D-4 Maintenance and Construction Operations Oakland Maintenance and Construction Operations Other Caltrans District Maintenance and Construction Operations San Jose Maintenance and Construction Operations



Function	Element
	SF Department of Public Works (DPW)
	Sub-regional and Local City/County Maintenance and Construction Operations
Other MCV	Alameda County Public Works Vehicles
	Caltrans D-4 Maintenance Vehicles
	Oakland Maintenance and Construction Vehicles
	San Jose Maintenance and Construction Vehicles
	SF DPW Vehicles
	Sub-regional and Local City/County Maintenance and Construction Vehicles
Other Parking	City-owned Parking Garages
	Regional Parking Garages and Parking Meters
	Regional Parking Operations Administration
	SFgo Transportation Management System
	SFMTA Parking Data Server
Other Roadway	AC Transit Roadside Systems
	Caltrans D-4 TMC Roadside Equipment (TOS)
	City of San Francisco Street Parking Sensors
	East Bay SMART Corridor Roadside Equipment
	Express Lane Roadside Equipment
	I-580 SMART Corridor ATMS Roadside Equipment
	MUNI BRT Roadside Devices
	MUNI Trackage Equipment
	MUNI Wayside Equipment
	Oakland TMC Roadside Equipment
	San Jose TMC Roadside Equipment
	SFgo Roadside Equipment
	Silicon Valley SMART Corridor Roadside Equipment
	Sub-regional and Local City/County Roadside Equipment
Other Toll Administration	Bay Area Toll Authority Administration/FasTrak® System
	I-580 Toll Operations
Other Traffic Management	511
	Alameda County Transportation Management Center
	Caltrans D-4 Performance Monitoring System (PeMS)
	Caltrans D-4 Transportation Management System
	East Bay SMART Corridor ATMS
	I-580 SMART Corridor ATMS
	MTC TIC
	Oakland Transportation Management System
	San Jose Transportation Management System
	SFgo Transportation Management System



Function	Element
	Silicon Valley SMART Corridor ATMS SR 4 East SMART Corridor ATMS Sub-regional and Local City/County Traffic Operations Systems
Other Transit Management	511 Real Time Transit 511 Regional Transit Information System (RTIS) AC Transit Operations System BART Fare Collection Central System BART Transit/Rail Operations System Caltrain Rail Operations System Clipper® Central System County Connection Transit Operations Ferry Information System Golden Gate Transit Operations System Independent School District Dispatch MTC TIC MUNI Advanced Train Control System Central MUNI Demand Response Transit Operations MUNI Fare Collection Central System MUNI Fixed Route Transit Operations MUNI Transit Garages Paratransit Broker System Private Sector Provider (NextBus) Regional Ferry Operations Regional Transit Databases SamTrans Transit Operations System Sub-regional and Local City/County Transit Operations Systems VTA Light Rail Control System VTA Operations Control Center VTA Traveler Information System West Cat Transit Operations
Other Vehicle	Personal Vehicles with toll tags
Rail Operations	BART Transit/Rail Operations System Caltrain Rail Operations System Private Rail Operations
Traveler Card	Agency SMART Card Clipper® Smart Card EZ Rider Smart Card
Wayside Equipment	Caltrain Wayside Signal System MUNI Wayside Equipment Railroad Wayside Equipment



Function	Element
	National Weather Service
	Private Weather Information Provider

APPENDIX D – PROJECTS BY SPONSOR

Projects are organized in the table below by project sponsor. The project status is listed as one of the following categories:

- **Existing:** in place and operating.
- **Ongoing:** partly implemented with imminent or ongoing expansion, upgrades, or development.
- **Future:** proposed projects that may or may not be programmed.
- **N/A:** projects that are not reflected in market package diagrams specifically. Primarily these projects are ITS in nature, but do not involve data exchange with other systems.

The ITS Service Diagram for each project is a high-level illustration of the data flows between different systems and equipment packages that provide a desired service such as transit signal priority, traveler information or electronic toll collection. The link to the ITS Service Diagram refers to the ITS Service Package in the National Architecture from which the diagram is based on. The National Architecture web site is accessible at:

<http://www.iteris.com/itsarch/html/mp/mpindex.htm>

Updated 12/28/11

Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
AC Transit	Transit Information	Real-Time Passenger Seat Availability Information	System that identifies real-time vehicle occupancy	Future	APTS10-1
	Transit Management	Automatic Passenger Counters (APC)	Passenger counting system on part of fleet.	Existing	APTS10-1
	Transit Information	Fleetwide Automatic Vehicle Location (AVL) Systems	Transit vehicle automatic location system	Existing	APTS01-1
	Transit Management	Automatic Passenger Counter (APC) Upgrade/Expansion	Upgrade and expand automatic passenger counting system to full fleet.	Ongoing	APTS10-1
	Transit Management	Automated Bus Routing	Automated bus routing system to accommodate real time demand	Future	APTS03-1 APTS02-01
	Transit Management	Integrated Central Dispatch and Emergency Operations	Facility functions as an EOC during emergencies. Agencies would include any agencies that would utilize the EOC during emergencies.	Future	EM09-1 APTS02-01
	Transit Information	Real-time Bus Arrival Information	Real time bus arrival time information	Existing	APTS08-02 APTS08-01
	Transit Information	Voice Annunciator/ Light Emitting Diode (LED) Signs	Transit vehicle information annunciation and signing system	Ongoing	APTS08-02 APTS08-01
	Transit Vehicle Priority	Bus Signal Priority	Allow transit vehicles higher priority at intersections	Ongoing	APTS09-01
	Transit Management	Mobile Command Bus	Transit vehicle communication and control system	Future	APTS05-01
	Transit Management	Enhanced Operations and Data Analysis	Analyzing transit management data for better performance	Future	AD1-4
	Transit Management	Transit Planning Document Archival	Transit operation data archive	Future	AD1-4



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
		and Data Warehouse			
	Transit Management	Transit Signal Priority (TSP) Feedback Capability	Transit Communication	Existing	APTS09-01
	On-Vehicle Safety System	Collision Avoidance and Automated Docking Systems	Vehicle on-board safety system	Future	APTS09-01
	Transit Security	Alternate Emergency Computer Center for Operational Continuity	Transit emergency management	Future	N/A
	Transit Management	Geospatial Information Systems Enhancement	Transit Management with GIS	Future	N/A
	ITS Integration	Interagency Communications Upgrade and Rebuild	Mesh network, enhanced capability, etc.	Future	N/A
	Transit Management	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	High-Level Diagram APTS04-01
Alameda CTC	ITS Integration	Closed Circuit Television (CCTV) Camera Integration	CCTV camera image/data integration	Ongoing	ATMS03-01
	Toll Management	I-580 Demonstration Express Lane	HOV-Toll lane	Ongoing	High-Level Diagram ATMS10-3
	ITS Integration	I-580 and I-238 Intelligent Transportation System (ITS)	ITS integration between multiple corridors	Future	ATMS08-05 ATMS07-04
	ITS Integration	East Bay SMART Corridor Advanced Transportation Management System (ATMS)	ATMS	Existing	High-Level Diagram ATMS03-03 ATMS01-03
	Arterial Traffic Management	Transportation Management Center	Arterial traffic management coordination	Existing	ATMS07-03
	Arterial Traffic Management; Freeway Traffic Management	I-80 Integrated Corridor Management	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Ongoing	High-Level Diagram ATMS07-11
Antioch	Freeway Traffic Management	Highway 4 Corridors Traffic Management Plan	Freeway traffic management coordination	Ongoing	ATMS08-10 ATMS07-09 ATMS06-09
BART	Transit Management	Station Database/E-BART	Bart extension to East Contra Costa County with associated transit management	Existing	AD1-4



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Transit Management	Radio Communications	Transit vehicle radio communication	Existing	APTS02-02
	Transit Management	EZ Rider Smart Card	Parking Payment System	Ongoing	ATMS16-6
	Transit Management	Fare Collection System	Transit fare collection system	Existing	High-Level Diagram APTS04-02
	Arterial Traffic Management	Closed Circuit Television (CCTV) Deployment	Transit system CCTV camera deployment	Existing	APTS05-02
	ITS Integration	Real-Time Information System	Transit system real time information	Existing	APTS08-03
	Transit Management	Train Arrival Signs and Annunciator System	Transit vehicle arrival sign and annunciation system for the travelers	Existing	APTS08-03
	Transit Information	Trip Planning	Transit trip planning and connection information	Existing	APTS08-03
	Transit Information	Website (www.bart.gov) Dynamic Transit Information	Transit information website	Existing	APTS08-03
Benicia	Transit AVL/CAD	Automatic Vehicle Locator	Monitoring bus locations for dispatch purposes	Future	APTS01-6
	Transit Management	Scheduling Software	Scheduling paratransit trips throughout service area	Future	APTS03-5
	Traveler Information	Destination Signs	Public Information	Existing	APTS08-11
	Transit Security	Security Cameras and Control Station	Enhance security on board buses	Future	APTS05-08
	Transit Management	Radios	Improve communications between buses	Future	APTS02-11
	Transit Management	Fareboxes, Probe, and Computer Program	Improve the reliability of data from fareboxes	Future	APTS04-12
Caltrain	Transit Management	Automatic Passenger Counters (APC)	Automatic passenger counting system	Future	APTS10-5
	Transit AVL/CAD	Automatic Vehicle Location (AVL)	Automatic vehicle location system	Ongoing	APTS01-2
	Transit Information	Real-Time Information Collection and Dissemination	Transit real time information collection and dissemination system	Ongoing	APTS08-04 APTS02-03 APTS01-2
	Transit Information	Train Arrival Signs and Annunciator System	Transit vehicle arrival information	Existing	APTS08-04
	Transit Management	Caltrain Transit Asset Management System (CTAMS)	This project will further the development of the Caltrain Transit Asset Management System (CTAMS) with activities that may include, but not be limited to: 1)	Future	AD1-10



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
			Integration of CTAMS into a relational database, 2) continuation of the build-out of the fixed rail asset infrastructure modules within the system, and 3) inclusion of a manual for users that will serve as a guide on how to use CTAMS.		
	Transit Management	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	High-Level Diagram APTS04-04
	Transit Management	Positive Train Control	Implement a positive train control system with an on-board display and automated braking to enhance safety for Caltrain.	Ongoing	APTS01-8
Caltrans	Transit Management	Bay Area Video Upgrade	Transit vehicles/infrastructure surveillance system upgrade	Future	APTS08-04
	Transit Management	El Camino Real Signal Interconnect	With San Mateo C/CAG.	Ongoing	ATMS03-02
	Freeway Traffic Management	I-80 Integrated Corridor Mobility (ICM)	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Ongoing	High-Level Diagram ATMS04-1
	Freeway Traffic Management	Traffic Operations System (TOS) and Traffic Management Center (TMC)	Traffic management center	Existing	ATMS04-1
	Freeway Traffic Management	I-680 Smart Carpool Lane	HOV-Toll lane management system	Existing	High-Level Diagram ATMS10-4
	Freeway Traffic Management	Caltrans Highway Information Network (CHIN)	Telephone traveler information system	Existing	ATIS01-02 ATIS01-01
	Freeway Traffic Management	I-880 Corridor Traffic Operations System Elements and Ramp Metering	Highway ramp metering control	Existing	ATMS04-1
	Freeway Traffic Management	Pre-Pass Project	Statewide effort on Cal Statewide ITS Architecture	Future	CVO03-1
	Freeway Traffic Management	I-680 Corridor Traffic Operations System Elements and Ramp Metering	Highway ramp metering control	Future	ATMS04-1
	Freeway Traffic Management	SR 237 Corridor Traffic Operations System Elements and Ramp Metering	Highway ramp metering control	Future	ATMS04-1
	Freeway Traffic Management	SR 85 Corridor Traffic Operations System	Highway ramp metering control	Existing	ATMS04-1



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
		Elements and Metering			
	Freeway Traffic Management	US 101 Corridor Traffic Operations System Elements and Metering	Highway ramp metering control	Existing	ATMS04-1
	Freeway Traffic Management	Traffic Operations System Field Element Installation: SR 237 and I-880	ITS field devices deployment	Future	ATMS04-1
	Traveler Information	GGNRA - Traveler Information System	Provide traveler information for the Golden Gate National Recreation Area (GGNRA) through the 511 system. 511 users will be able to obtain congestion information on US 101 and Highway 1, as well as real-time transit information for transit service operated by Marin Transit and real-time parking availability.	Future	High-Level Diagram High-Level Diagram ATIS01-03 ATIS01-02 ATIS01-01
	Parking Management	GGNRA - Parking Guidance System	A parking guidance system (PGS) will provide real time parking information for visitors at the Golden Gate National Recreation Area (GGNRA). Information from the PGS will be disseminated through 511, variable message signs and highway advisory radio.	Future	High-Level Diagram ATMS16-5
Campbell	Arterial Traffic Management	Hamilton Avenue Intelligent Transportation System (ITS)	Expand on the ITS infrastructure currently on Hamilton Ave. by linking three signals via wireless interconnect to the Smart Corridor signals to the east. Will include signal retiming of these three signals.	Existing	ATMS03-10
	Arterial Traffic Management	Winchester Blvd Intelligent Transportation System (ITS)	Expand upon existing ITS equipment on Winchester Blvd. by installing new conduit, fiber, and fiber equipment.	Future	ATMS03-10
	Arterial Traffic Management	Reactivation of Existing Traffic Count Stations	Reactivating traffic count stations along arterials such as Hamilton Ave., Winchester Blvd. and Campbell Ave.	Future	ATMS19-1 AD1-8
	Arterial Traffic Management	Traffic Signal System Upgrade	Replace older traffic signal controllers with new controllers and signal system software that is compatible with NTCIP and Silicon Valley-ITS Data Exchange Network Software protocols	Future	ATMS03-10
	Arterial Traffic Management	Installation of Pedestrian Countdown Timers	ITS field devices deployment	Future	ATMS03-10
Central	Transit Management	Automatic Vehicle Location (AVL)	Automatic vehicle location system	Existing	APTS01-6



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
Contra Costa Transit Authority		Vehicle Probe			
	Transit Information	Real Time Passenger Information	Web based real time passenger information system - BusTime	Future	APTS08-14
CHP	Arterial Traffic Management	Computer-Assisted Dispatch (CAD) Upgrade	Computer assisted dispatching system for emergency response	Existing	High-Level Diagram EM01-1
Concord	Arterial Traffic Management	Concord-Walnut Creek and Pleasant Hill Smart Corridor along I-680	Integrated arterial and freeway management system	Future	ATMS06-11 ATMS06-10 ATMS03-10 ATMS01-10
	Arterial Traffic Management	Concord Closed Circuit Television (CCTV)	ITS field devices deployment	Existing	ATMS01-10
	Arterial Traffic Management	Concord Signal System Upgrade and Traffic Management Center (TMC)	Signal upgrade	Existing	ATMS03-10
	Arterial Traffic Management	Concord Kirker Pass Road/Ygnacio Valley Road Arterial Management Plan	Integrated arterial management system	Existing	ATMS03-10
Contra Costa Transportation Authority	Arterial Traffic Management; Freeway Traffic Management	I-80 Integrated Corridor Management	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Ongoing	High-Level Diagram ATMS07-11
	Traveler Information	Real-Time Ridematching	SR 4 Traffic Management Program 3-County Real-Time Ridematching	Future	ATIS08-1
County of Santa Clara	Arterial Traffic Management	Intelligent Transportation System (ITS) Enhancements on Bascom Ave	ITS field devices deployment	Existing	ATMS01-10
	Arterial Traffic Management	Santa Teresa/Hale Corridor TOS Infrastructure Improvements	Add TOS infrastructure on Santa Teresa Blvd between Day Road and Castro Valley Road.	Future	ATMS01-10
	Arterial Traffic Management	Traffic Operations System (TOS) Improvements	Enhance expressway traffic operations systems components and functions, and provide connectivity between Santa Clara County and cities for sharing of ITS data/communications.	Ongoing	ATMS03-10
	Arterial Traffic Management	Expressway Adaptive Pedestrian Timing Project	Adaptive pedestrian timing-dynamic FDW by detecting pedestrians in crosswalks on all expressways.	Ongoing	ATMS03-10
	Traveler Information	SCC Motorist Traffic Information and	Motorists traffic information and advisory systems(electronic	Future	ATMS06-10 ATIS01-26



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
		Advisory Systems	changeable message signs, advisory radio and web page)		ATIS01-25
	Arterial Traffic Management	Expressway Bike Detection and Santa Teresa Corridor	Install bicycle detection on expressway/Santa Teresa shoulders and cross streets as needed at all signalized intersections to support bicycle adaptive signal timing	Future	ATMS03-10
	Arterial Traffic Management	Signal Coordination/Interconnect with Cross Streets	Signal coordination/interconnect between expressway signals and city/Caltrans signals on cross streets	Future	ATMS07-10 ATMS03-10
Cupertino	Arterial Traffic Management	De Anza Blvd. Advanced Traffic Management System	Integrated arterial management system	Existing	ATMS03-10
	Arterial Traffic Management	Interchange Improvements-Ramp Meter Signal/Arterial Traffic Signal Interconnection	Integrated arterial and freeway management system	Existing	ATMS03-10 ATMS01-10
	Arterial Traffic Management	Adaptive Traffic Signal Control System	Signal improvement	Existing	ATMS03-10
	Arterial Traffic Management	Stevens Creek Blvd CCTV Cameras	Locations are at the intersections of Stevens Creek Blvd with the SB-85 ramp, Stelling, Blaney, Wolfe, and Tantau. The project includes engineering, and installing communication equipment and cameras. The existing fiber optic infrastructure will be utilized to bring data from the cameras back to the Cupertino Traffic Operations Center.	Ongoing	ATMS01-10
Daly City	Arterial Traffic Management	Traffic Signal System Upgrade	Signal upgrade	Future	ATMS03-10
	Arterial Traffic Management	Citywide Signal Coordination	Signal Coordination	Future	ATMS03-10
	Arterial Traffic Management	Communications Master Plan	Communication System Upgrade	Future	N/A
ECCTA	Transit Management	Automatic Vehicle Location (AVL) System	Automatic vehicle location system	Ongoing	APTS01-6
Fairfield	Arterial Traffic Management	Central Traffic Signal System with wireless communications	Central Traffic Signal System with wireless communications	Ongoing	ATMS03-10
Fairfield/Suisun Transit	Transit Management	Intelligent Transportation Systems (Automatic Vehicle Location (AVL), Transit Signal Priority (TSP) for City transit operators)	Automatic vehicle location system	Existing	APTS09-07
	Transit	Automatic Vehicle	Automatic vehicle location system	Future	APTS03-5



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Management	Location (AVL) System			APTS02-11 APTS01-6
	Transit Information	Advanced Traveler Information System (ATIS)	Traveler information system	Future	APTS08-11
	Transit Management	Communications Master Plan	Transit management improvement	Future	N/A
Fremont	Arterial Traffic Management	Traffic Management Center (TMC)	Traffic management center	Existing	ATMS03-10
	Arterial Traffic Management	Communication Master Plan	Upgrade all transportation related communications from serial to Ethernet	Ongoing	N/A
	Arterial Traffic Management; Transit Management	Special Events Management Transportation Plan	Adaptive signal control, transit signal priority, traffic monitoring, traveler information system	Future	ATMS06-11 ATMS06-10 ATMS03-10 ATMS01-10 APTS09-07
GGBHTD	Transit Management	Advanced Communication and Information System	Computer Aided Dispatch (CAD)/Automatic Vehicle Location (AVL), RTIS, Transit Signal Priority (TSP), bus telecom system, ATIS, APC, AVM, AVA	Ongoing	APTS10-2 APTS08-06 APTS06-3 APTS02-05 APTS01-3 APTS09-02
	Transit Management	Ferry Automatic Fare Collection (AFC)	Ferry Fare Management with new faregates and TVMs and data system	Future	APTS04-14
	Transit Management	Transit Fare Collection System	Bus fare management with farebox and data system upgrade	Existing	APTS04-05
	Transit Information	Advanced Traveler Information System (ATIS)	Traveler information system	Future	APTS08-06
	Toll Management	FasTrak® Electronic Toll Collection (ETC)	Toll management system	Existing	High-Level Diagram ATMS10-2 ATMS10-1
	Transit Management	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Future	High-Level Diagram APTS04-06
Gilroy	Transit Vehicle Priority	Gilroy Community Bus Signal Priority	Transit Signal Priority	Future	APTS02-11
	Arterial Traffic Management	Adaptive Traffic Signal Control System	Signal improvement	Ongoing	ATMS03-10
	Arterial Traffic Management	Traffic Signal System Upgrade	Upgrade traffic signal controller and communications systems with the current technology, including Interconnect, to replace outdated equipment and provide city with centralized traffic management system.	Future	ATMS03-10



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Parking Management	Downtown Parking Management System	Electronic parking monitoring system	Future	ATMS16-3
	Infrastructure Security / Surveillance	Flood Watch Cameras	Deployment of CCTV cameras to provide real-time video to the City of Gilroy Emergency Operations Center to be used to conduct traffic management and emergency operations activities in times of significant flooding.	Future	EM05-4
	Emergency/Event Management	Event Management System	Develop and deploy CMS, HAR, and information kiosks to provide traveler information system for special events (i.e. the Gilroy Garlic Festival) and incident management in the Gilroy (i.e. flooding in southern part of City). Install 2-CMS on SB US 101, 3-CMS on WB HWY 152 east of Wellington Blvd., City of Gilroy Police station HAR, and a train depot kiosk. Develop a City of Gilroy traveler information website.	Future	ATMS08-11 ATMS06-10 ATIS01-26
	Arterial Traffic Management	10th St. and Downtown Signals Upgrade	Controllers, adaptive, detectors along 10th St. in Gilroy.	Future	ATMS03-10
	Arterial Traffic Management	ITS Enhancements on Santa Teresa Blvd	Signalization modifications along Santa Teresa Blvd.	Future	ATMS03-10
	Arterial Traffic Management	SR 152 Signal System Upgrade	SR 152 Signal System Upgrade	Future	ATMS03-10
	Arterial Traffic Management	Other Signal Upgrades	Other Signal Upgrades	Future	ATMS03-10
	Hayward	Arterial Traffic Management	Citywide Emergency Vehicle Preemption	Signal Improvement	Ongoing
Arterial Traffic Management		Traffic Signal System Upgrade	Signal Upgrade	Ongoing	ATMS03-10
Arterial Traffic Management		Citywide Traffic Signal Coordination	Signal Coordination	Ongoing	ATMS03-10
Arterial Traffic Management		Installation of Pedestrian Countdown Timers	Signal Improvement	Ongoing	ATMS03-10
Arterial Traffic Management		Traffic Operations System (TOS)/Signal Coordination	Signal Improvement	Future	ATMS03-10
Arterial Traffic Management		Adaptive Traffic Signal Program	Signal Improvement	Future	ATMS03-10
Arterial Traffic Management		Adaptive Pedestrian Timing	Signal Improvement	Future	ATMS03-10
Arterial Traffic Management		Adaptive Bicycle Timing	Signal Improvement	Future	ATMS03-10
Arterial Traffic Management		Citywide Transportation Management System	Advanced Traffic Management System for the following corridors: Clawiter Road/880 Reliever Route,	Future	ATMS03-10 ATMS01-10



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
			Hesperian Blvd, Santa Clara St-Harder Road, Huntwood Avenue, Mission Blvd, Foothill Blvd, Second Street, A Street, B Street, D Street-Winton Avenue, Jackson Street, Tennyson Road, Industrial Parkway-Bldv, Whipple Road		
	Arterial Traffic Management	Downtown Hayward CBD Traffic and Parking Improvement Project	Central Business District traffic management	Future	ATMS16-3
LAVTA	Transit Management	Automatic Passenger Counters (APC)	Identifying transit passenger number	Existing	APTS10-2
	Transit AVL/CAD	Automatic Vehicle Location (AVL) System	Transit Automatic Vehicle Location (AVL)	Existing	APTS01-3
	Transit AVL/CAD	LAVTA Computer-Aided Dispatch (CAD)	Transit Automatic Vehicle Location (AVL) and Computer Aided Dispatch (CAD)	Existing	APTS03-2 APTS02-06
	Transit Management	On-Board Communications	Transit vehicle communication system	Existing	APTS02-06
	Transit Information	Web-Based Real-Time Transit Information	Internet transit information	Existing	APTS08-07
	Transit Management	Paratransit Interactive Phone/Web Scheduling Software	paratransit management	Future	APTS03-2
	Transit Management	Farebox Collection System	Transit fare collection	Existing	APTS04-07
	Transit Management	Cameras Vehicle Condition, Detectors and Driver Safety Training	Transit vehicle surveillance	Ongoing	APTS05-05
	Transit Information	Annunciators	Transit information annunciators	Existing	APTS08-07
	Transit Information	On-Street Dynamic Message Signs	Transit info-related on street signs	Ongoing	APTS08-07
	Transit Vehicle Priority	Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Existing	APTS09-03
	Transit Management	Communication Radios	Communication dispatch, operators, road sup.'s	Existing	APTS03-2 APTS02-06
	Transit Management	Onboard Security Cameras	Transit vehicle surveillance. Provide visual coverage of bus (digital storage)	Existing/Ongoing	APTS05-05
	Transit Information	Headsigns	Provide route and directional information	Existing	APTS08-07
	Transit Management	Scheduling Software	Allow for fixed route scheduling and mapping	Existing	APTS02-06
Transit Management	Scheduling Software	Para Transit scheduling and mapping	Existing	APTS03-2	



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Transit Management	Web Interface	Receive, process and track comments	Existing	APTS08-07
	Transit Management	Phone Line Recorder	Record and archive CS phone calls	Existing	AD1-4
	Transit Management	Dispatch Phone Recorder	Record and archive dispatch phone calls	Existing	AD1-4
	Transit Management	Farebox	Fare collection and passenger count reporting	Existing	APTS10-2 APTS04-07
	Transit Management	Engine Monitoring Software	Monitor engine conditions and report as needed	Existing	APTS06-3
	Transit Information	Website	Venue for info., complaints and Web Watch	Existing	APTS08-07
	Transit Information	Regional Tripliner Software	Assist in 511.org trip planning (regional)	Existing	APTS08-07
	Transit Management	Transit Infrastructure Security Cameras	Provide visual coverage of building entrances	Ongoing	APTS05-05
	Transit Information	On Street Signs	Provide real-time bus arrival information (stop)	Existing	APTS08-07
	Transit Management	Mobile Data Terminal	Communicate driver and mechanical info	Existing	APTS06-3 APTS03-2 APTS02-06
	Transit AVL/CAD	In-Vehicle Logic Unit (IVLU)	Process (Automatic Passenger Counters (APC) and Automatic Vehicle Location (AVL) data for wireless upload	Existing	APTS01-3
	Transit Security	In-Vehicle Security Technologies such as Panic Button	Transit security system	Existing	APTS05-05
Livermore	Transit Management	Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Existing	APTS09-07
	Arterial Traffic Management	Traffic Operations Center	TMC	Existing	ATMS03-10 ATMS01-10
	Network Surveillance	Web-Based Real-Time Video Information	Traffic Surveillance	Ongoing	ATMS01-10
	Arterial Traffic Management	Citywide Signal Coordination	Signal Coordination	Ongoing	ATMS03-10
Los Gatos	Arterial Traffic Management	Traffic Signal System Upgrade	Signal Upgrade	Ongoing	ATMS03-10
	ITS Integration	SV-ITS Program network connection to Los Gatos	System integration	Ongoing	ATMS03-10
Menlo Park	Arterial Traffic Management	El Camino Real Adaptive Signal Project	Signal improvement	Existing	ATMS03-10
	Arterial Traffic Management	Willow Rd SR-114, Adaptive Signal Project	Signal improvement	Future	ATMS03-10
	Emergency	Citywide Emergency	Allowing emergency vehicles higher	Ongoing	EM02-6



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Vehicle Preemption	Vehicle Preemption	priorities at intersection		EM02-5 EM02-4
	Arterial Traffic Management	Traffic Signal System	Signal interconnect cable network	Existing	ATMS03-10
Milpitas	Arterial Traffic Management	South Milpitas Blvd SMART Corridor	Arterial traffic management coordination	Future	ATMS03-10 ATMS01-10
	Arterial Traffic Management	Citywide Adaptive Bicycle and Pedestrian Timing	Citywide Adaptive Bicycle and Pedestrian Timing	Future	ATMS03-10
Morgan Hill	Arterial Traffic Management	Citywide Traffic Signal Operation Center	Construct traffic signal operation center.	Future	ATMS03-10
	Arterial Traffic Management	Citywide Wireless Vehicle Detection System Installation	Install wireless vehicle detection system at all signalized intersections within the City.	Future	ATMS03-10
Mountain View	Arterial Traffic Management	Rengstorff Ave Traffic Signal System Improvement	Install signal interconnect & upgrade communication. Consider adaptive signal coordination system"	Future	ATMS03-10
	Arterial Traffic Management	Shoreline Blvd. Adaptive Traffic Signals	Upgrade the existing signal interconnect system to adaptive traffic signals.	Future	ATMS03-10
	Arterial Traffic Management	Citywide Traffic Signal Upgrade and IP Traffic Signal Access	Upgrade the City's existing traffic signal system through the installation of new traffic signal controllers, software and Internet accessible traffic signal communications.	Future	ATMS03-10
	Arterial Traffic Management	Grant Rd. Adaptive Traffic Signal	Upgrade the existing traffic signal interconnect system on Grant Rd. to a new adaptive traffic signal system.	Future	ATMS03-10
MTC	Arterial Traffic Management	S/W Data Repository	Arterial traffic management	Future	N/A
	Transit Management	Clipper® Electronic Fare Collection	Regional electronic fare payment system for transit.	Existing	High-Level Diagram APTS04-14 APTS04-13 APTS04-12 APTS04-09 APTS04-08 APTS04-06 APTS04-04 APTS04-02 APTS04-01
	Traveler Information	511 Traffic Information	Regional traffic information via 511 phone number, 511.org, CMS, etc. and includes traffic speeds, incidents, driving times, predicted travel times, parking, etc.	Existing	High-Level Diagram ATIS01-02 ATIS01-01
	Transit Information	511 Real-time Transit Information	Regional real-time transit arrival information via 511 phone, 511.org, dynamic message signs, etc.	Existing	High-Level Diagram APTS08-12



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Transit Information	511 Regional Trip Planner	Regional trip planner that provides multimodal travel itineraries for 511 transit and traffic via 511 phone number, 511.org, my511 and mobile applications.	Existing	High-Level Diagram ATIS02-3 ATIS02-2 ATIS02-1
	ITS Integration	Center-to-Center Network (Smart Corridors - SFgo, East Bay, Silicon Valley, San Mateo)	System integration	Ongoing	High-Level Diagram ATMS07-08 ATMS07-07 ATMS07-04 ATMS07-03
	Toll Management	FasTrak® Electronic Toll Collection	Regional electronic toll collection system for bridge tolls.	Existing	High-Level Diagram ATMS10-2 ATMS10-1
	Commercial Vehicle Management	Goods Movement Container Reservation System	Freight Management	Future	N/A
	Toll Management	Regional Express Lane Network	HOV-Toll lane	Future	High-Level Diagram ATMS10-3
	Freeway Traffic Management	Freeway Service Patrol	Freeway incident identification and fast response/clearance with roving tow trucks. Telecommunications equipment in trucks relays ops data to CHP Computer Assisted Dispatch (CAD).	Existing	High-Level Diagram EM04-1
	ITS Integration	Integrate 511 with Center to Center	Integrate 511 with neighbor region 511 systems through C-2-C communication	Future	High-Level Diagram ATIS01-03
	Parking Management	Regional Parking Payment (Clipper/FasTrak®)	Enable parking payment at meters and garages with Clipper and/or FasTrak®.	Future	High-Level Diagram High-Level Diagram ATMS16-4
	Toll Management	Open Road Tolling	Open road tolling on Benicia Martinez Bridget using FasTrak® ETC system.	Existing	High-Level Diagram ATMS10-5
	Toll Management	Video Tolling Demonstration	Collecting toll based on license plate image.	Existing	ATMS10-5
	Toll Management	Advanced Toll Collection and Accounting System	Replacement of the toll collection system in lane plaza and central processing enhancement.	Future	High-Level Diagram



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
		(ATCAS 2)			ATMS10-1
	Traveler Information	511 Rideshare/Bicycle Information	Regional rideshare and bicycling information via 511 phone number and 511.org and includes ridematching and bikemapping tools.	Existing	High-Level Diagram ATIS01-03
	Arterial Traffic Management; Freeway Traffic Management	Transportation Asset Management System	Development of transportation asset management system including traffic signal, bus stop, ADA ramp, bike route/path, complete street elements, and any assets within the right of way.	Future	AD1-9
	Parking Management	Real Time Parking - Parking Availability on Web, 511	Parking Management System	Future	High-Level Diagram ATMS17-2
MTC/Caltrans	Freeway Traffic Management	I-880 Integrated Corridor Management (ICM) (I-580/I-80 interchange and SR-237)	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination.	Future	ATMS07-02 ATMS06-12 ATMS04-1
	Connected Vehicles	Connected Vehicle Testbed	Connected vehicle implementation experiments	Ongoing	ATIS10-1 ATIS09-1
	Arterial Traffic Management; Freeway Traffic Management	Regional Integrated Corridor Management Strategy	Planning and coordination activities to implement ICM on corridors throughout the Bay Area.	Future	High-Level Diagram ATMS07-02 ATMS04-1 ATMS03-10
MTC/SAFE	Incident Management	Bay Area Call Box Program	Provides roadside telecommunication services to motorists in the event of an incident.	Existing	High-Level Diagram High-Level Diagram EM03-1
Napa Valley Transit	Transit AVL/CAD	Automatic Vehicle Location (AVL)	Automatic Vehicle Location (AVL)	Existing	APTS01-6
	Transit Vehicle Priority	Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Future	APTS09-07
Oakland	Arterial Traffic Management	Oakland Broadway ITS Project	Close Circuit Television (CCTV) cameras, special event management, arterial Changeable Message Sign (CMS), parking guidance	Future	APTS09-08
	Arterial Traffic Management	Oakland Transportation Management System	Advanced Transportation Management System (ATMS)	Ongoing	ATMS08-06 ATMS06-05 ATMS03-05 ATMS01-05
	Arterial Traffic Management	Oakland Airport Intelligent	Fiber network, signal coordination, CCTV cameras, traffic responsive	Ongoing	ATMS07-05



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
		Transportation System (ITS) Project	plans for Hegenberger and 98th St		
	ITS Integration	Integrated Transportation Network	Integrate TMC with EOC, Police Department, Fire Department, and Maintenance Yard	Future	ATMS08-06
	Arterial Traffic Management	Oakland North Central Business District (CBD) Project	Central Business District traffic management	Ongoing	ATMS03-05
	Arterial Traffic Management	Oakland 12th Street Improvements	Fiber network, signal coordination, CCTV cameras, for 12th Street (Lake Merritt Area) and integration to existing system	Future	ATMS03-10
	ITS Integration	Oakland Video Server Project	Video server to manage video feeds, perhaps with public access	Future	ATMS01-10
Palo Alto	Arterial Traffic Management	Citywide Traffic Signal Retiming & Pedestrian Facility Upgrades	Signal Upgrade	Future	ATMS03-10
	Arterial Traffic Management	Citywide Traffic Signal System Upgrade	Replace outdated traffic signal controllers, cabinets and communication chips including installation of time of day GPS system equipment for each signalized intersection.	Future	ATMS03-10
	Emergency Vehicle Preemption	Citywide Traffic Signal CCTV/Emergency Vehicle Preemption Project	A citywide program to give priority to emergency vehicles via signal timing adjustments.	Future	EM02-5
Petaluma	Transit Management	Paratransit Scheduling & Dispatch Software	Schedule optimal paratransit runs, track rider usage, provide a platform for real-time dispatching (via cell phone/smart phones in vehicles) and data reporting.	Ongoing	APTS03-7
Pleasant Hill	Arterial Traffic Management	Contra Costa Boulevard Traffic Management System	Arterial traffic management coordination	Ongoing	ATMS07-10
Pleasanton	Arterial Traffic Management	I-580 Smart Corridor	Arterial traffic management coordination	Existing	ATMS07-04
	Network Surveillance	Video Detection	Video detection for traffic/incident/road conditions	Existing	ATMS01-10
	Arterial Traffic Management	Traffic Signal System	Signal Upgrade	Existing	ATMS03-10
Redwood City	Arterial Traffic Management	Regional Traffic Signalization/Operation Program 2	Traffic Signalization/Operation Program	Ongoing	ATMS03-10
Rio Vista	Transit AVL/CAD	Automatic Vehicle Tracking	Automatic Vehicle Location (AVL)	Future	APTS01-6
SamTrans	Transit Management	Automatic Passenger Counter (APC) Expansion	Automatically record passenger number	Ongoing	APTS10-3



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Transit AVL/CAD	Automatic Vehicle Location (AVL) System	Automatic Vehicle Location (AVL)	Existing	APTS01-5
	Transit Management	Advanced Communications System	Transit Communication	Existing	APTS03-4 APTS02-10
	Transit AVL/CAD	Computer Assisted Dispatching (CAD) System Upgrade	Computer Assisted Dispatch (CAD) upgrade	Existing	APTS02-10 APTS03-4
	Transit Management	Communications System Upgrade	Transit Communication	Existing	APTS03-4 APTS02-10
	Transit Management	Fare Collection System Replacement	Fare collection	Existing	APTS04-10
	Transit Management	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	APTS04-12
	Transit Information	Predictive Arrivals/Departure System Replacement	Predict transit arrival/departure time	Existing	APTS08-09
	Transit Vehicle Priority	Adaptive Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Ongoing	APTS09-06
	Transit Vehicle Priority	Signal Prioritization (Part of VTA Bus Rapid Transit)	(vehicle to roadside)	Ongoing	APTS09-09
	Transit Management	Manual Pass - Class Counts	Fare collection / passenger counting	Existing	APTS04-10
	On-Vehicle Safety System	Frontal Collision Warning System	Vehicle on-board safety system	Existing	N/A
	Transit Management	EI Camino Real Bus Rapid Transit (BRT)	Coordinated Transit System	Future	APTS07-5
	San Jose	Arterial Traffic Management	King Rd/Story Rd. Area Advanced Traffic Management System	Provides "real time" traffic management for high traffic congestion location.	Existing
Arterial Traffic Management		Monterey Highway Intelligent Transportation System (ITS)	A system of signal upgrade, interconnect, and CCTV cameras throughout the Monterey Highway area.	Future	ATMS03-06 ATMS01-06
Arterial Traffic Management		SVITS Connection to Sunnyvale	A system of CCTV, Signage and the development of a traffic management center in the City of Sunnyvale	Future	ATMS07-06 ATMS03-06 ATMS01-06
Network Surveillance		Mobile Video Surveillance for Emergency Response	video surveillance	Future	ATMS01-06
Arterial Traffic Management		Proactive Signal Retiming Program	A citywide program that will monitor current traffic signals and improve them where necessary.	Existing/ Ongoing	ATMS03-06
Arterial Traffic Management		Replacement of Electronic "No Right" at Light Rail Transit (LRT) Crossings	Signal Upgrade	Existing	ATMS03-06



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Emergency Vehicle Preemption	San Jose Smart Intersection - Traffic Management Center Controls Emergency Vehicle Pre-Emption	Traffic Management Center Controls Emergency Vehicle Pre-Emption	Existing	EM02-6 EM02-5 EM02-4 ATMS03-06
	Traveler Information	Downtown San Jose CMS Upgrades	Upgrades aging changeable message sign infrastructure in Arena area	Ongoing	ATMS06-06
	Incident Management	Construction Incident Management - Transportation and Incident Management Center (TIMC)	Construct Transportation and Incident Management Center to coordinate incident activities with traffic, fire, and police. Includes control center and integrated communications network.	Ongoing	ATMS08-07
	Parking Management	Downtown Parking Guidance System	Parking information/guidance	Existing	ATMS16-1
	Incident Management	Emergency Vehicle Link System - Traffic Incident Management Center (TIMC)	Emergency vehicle communication	Future	EM02-6 EM02-5 EM02-4 EM01-3
	Arterial Traffic Management	San Jose Traffic Signal Management Program	(signal central)	Existing	MC07-4
	Arterial Traffic Management	San Jose Traffic Signal System Upgrades	A citywide program that will look at older signal systems and upgrade them where needed.	Ongoing	ATMS03-06
	Arterial Traffic Management	Red Light Running Enforcement Program	Installation of cameras at various intersections to capture red light runner incidents.	Future	N/A
	ITS Integration	San Jose Traffic Signal Interconnect	San Jose Transportation Communications Network Enhancements	Future	N/A
	Traveler Information	City Hall Traveler Information Center	Traveler information collection, processing, and dissemination	Ongoing	ATIS01-17
	Arterial Traffic Management	Smart Intersections	Arterial traffic management coordination	Existing	EM02-4 ATMS03-06
	Arterial Traffic Management	Brokaw-Airport Area Advanced Traffic Management System	A system of traffic cameras, and signal system upgrades.	Future	ATMS03-06
	ITS Integration	Silicon Valley Smart Corridor Project Phases I, II, and III	System upgrade	Existing	ATMS03-08
	Emergency Vehicle Preemption	San Jose Emergency Vehicle Preemption System	Emergency vehicle preemption system	Future	EM02-6 EM02-5 EM02-4
	Arterial Traffic Management	Almaden/Blossom Hill Area Advanced Traffic Management System	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Future	ATMS03-06
	Network Surveillance	Downtown San Jose Area Freeway Management System	An equipment package that will monitor downtown freeways and provide incident management tools to assist with traffic.	Future	ATMS08-07 ATMS01-06



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Arterial Traffic Management	Downtown San Jose Local Street Advanced Traffic Management System	Expands "real time" traffic management system provided in Arena area.	Future	ATMS03-06
	Arterial Traffic Management	Eastridge/Evergreen Area Advanced Traffic Management System	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Future	ATMS03-06
	Arterial Traffic Management	Saratoga/Moorpark Advanced Traffic Management System	A system of traffic cameras, signal system upgrades.	Future	ATMS03-06
	Freeway Traffic Management	Silicon Valley TiMC - Ramp Metering Integration	Silicon Valley TiMC - Ramp Metering Integration	Future	ATMS04-03
	Arterial Traffic Management	SJ Citywide Count and Speed Monitoring System	Deploy count and monitoring stations at key locations around the City to provide up to date traffic data for real time traffic management and for investment decisions.	Future	ATMS19-2
	Arterial Traffic Management	Winchester /Stevens Creek Area Advanced Traffic Management System	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Future	ATMS03-06
San Leandro	Network Surveillance	San Leandro Closed Circuit Television (CCTV)	CCTV camera installation	Existing	ATMS01-10
	Arterial Traffic Management	San Leandro Signal System and Traffic Management Center (TMC) (Upgrade)	Signal Upgrade	Existing	ATMS03-10
	Emergency Vehicle Preemption	Emergency Vehicle Preemption	EVP	Ongoing	EM02-6 EM02-5 EM02-4
San Mateo City/County Association of Governments (C/CAG)	Arterial Traffic Management	San Mateo C/CAG Roadside Equipment	CCTV cameras, trailblazers, transit signal priority, CMS	Future	ATMS06-11 ATMS06-10 ATMS03-10 ATMS01-10 APTS09-07
	Incident Management	Incident Management Plan for US 101	Incident Management Plan	Existing	N/A
	Arterial Traffic Management	Local Transportation Management Center	TMC- San Mateo Hub at Police Station	Ongoing	ATMS03-10 ATMS01-10
	Incident Management	Integrated Transportation Incident Management	Incident management	Ongoing	ATMS08-11
	Arterial Traffic Management	San Mateo County Smart Corridor	The project will deploy CCTV cameras, trailblazer signs, and signal upgrades on a portion of US 101 and SR82 corridors and major local streets.	Ongoing	High-Level Diagram ATMS08-10a
Santa Clara	Arterial Traffic Management	Capitol Expressway TOS	Install TOS infrastructure on Capitol Expwy. from SR 87 to I-680 including	Future	ATMS03-10 ATMS01-10



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
			fiber optic, trunkline, CCTV, Ethernet-capable controller, battery backup system and system detector loops		
	Arterial Traffic Management	Santa Clara Traffic Signals Upgrade	Citywide traffic signal modifications	Ongoing	ATMS03-10
	Arterial Traffic Management	Santa Clara TMC Upgrade	Convert City's existing traffic operations room to a new Traffic Management Center.	Ongoing	ATMS03-10 ATMS01-10
	Arterial Traffic Management	Santa Clara Communications Network Upgrade	Convert City's existing copper twisted wire pair communication infrastructure to new fiber optic cable network.	Ongoing	N/A
	Arterial Traffic Management	Citywide Bicycle Detection	Install bicycle detection at the stop bar at all of the City's signalized intersections in all approaches.	Future	ATMS03-10
	Emergency Vehicle Preemption	Citywide Emergency Vehicle Preemption for Traffic Signals	Install GPS based emergency vehicle preemption units for fire and police vehicles to provide preemption of traffic signals.	Future	EM02-5
	Arterial Traffic Management	Citywide Pedestrian Signal Upgrades	Install Countdown pedestrian signal indications, ADA pedestrian pushbuttons and Audible pedestrian signals at signalized intersections where none exist.	Future	ATMS03-10
	Arterial Traffic Management	Citywide Traffic Count and Travel time Monitoring System	Install traffic count and travel time monitoring equipment at various locations citywide to provide real-time traffic volumes and travel speed information and integration with City's traffic management system.	Future	ATMS19-1
	Arterial Traffic Management	Citywide Traffic Monitoring Cameras	Install traffic monitoring and incident management cameras on major arterials.	Future	ATMS01-10
	Arterial Traffic Management	Lafayette Street Reversible Lane Control Upgrade	Replacement of Reversible Lane Control system, striping and indications along Lafayette Street.	Future	ATMS18-1
	Event Management	North Santa Clara Event Management System	Installation of ITS elements, DMS, monitoring cameras, communications equipment, and advanced traffic management system throughout northern Santa Clara north of Central Expressway.	Future	ATMS06-10 ATMS03-10 ATMS01-10 ATMS06-11
	Arterial Traffic Management	Santa Clara Adaptive Traffic Signal System	Install Adaptive Traffic Signal system for major arterials.	Future	ATMS03-10
Santa Rosa	Arterial Traffic Management	Traffic Management Center	TMC	Ongoing	ATMS03-10 ATMS01-10
	Arterial Traffic Management	Traffic Signal Synchronization	Signal improvement	Ongoing	ATMS03-10
	Arterial Traffic Management	Adaptive Traffic Signal Controls	Signal improvement	Ongoing	ATMS03-10
	Transit	Automatic Vehicle	Installing Automatic Vehicle Location	Existing	APTS01-6



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	AVL/CAD	Location (AVL)/GPS Tracking	(AVL)/GPS MDT's on a fleet of 2 paratransit vans. Current fleet of 11 paratransit buses are already utilizing MDT's		
Santa Rosa CityBus	Transit AVL/CAD	Automatic Vehicle Location (AVL), Scheduling Software, NextBus Technology, Global Positioning System (GPS) Video System, Transit Signal Priority	Transit real time control system	Ongoing	APTS09-07 APTS08-11 APTS01-6
Saratoga	Arterial Traffic Management	Citywide Signal Upgrade Project Phase II	Signal Upgrade	Future	ATMS03-10
	Arterial Traffic Management	Citywide Accessible Pedestrian Signals	Update city-owned signals with audible signals for the visually impaired.	Future	ATMS03-10
SF Department of Public Works	Traveler Information	Trip Planner for Pedestrians with Disabilities	Web based trip planner for pedestrians with disabilities. Data includes curb ramps, audible signals and blue zone parking.	Future	ATIS02-6
SFCTA	Toll Management	Areawide Pricing (Planning/Feasibility)	Toll management system	Future	N/A
	Transit Vehicle Priority	Doyle Drive Value Pricing	Transit signal priority and varying toll rates	Future	APTS09-04
SFMTA	Transit Management	Automatic Passenger Counter System	Passenger counting system	Ongoing	APTS10-4
	Traveler Information	Automatic Vehicle Location (AVL) and Vehicle Arrival Predictions	Automatic Vehicle Location (AVL) and Vehicle Arrival Predictions	Existing	APTS08-13 APTS01-4
	Transit AVL/CAD	Radio Replacement Communications/Auto Automatic Vehicle Location (AVL)-Global Positioning System (GPS)	Radio Voice and Data Communications, Computer-Aided Dispatch, integration with Automatic Vehicle Location (AVL)	Future	APTS02-08
	Transit Management	Scheduling/Auto-Dispatch Systems	(just fixed route)	Ongoing	APTS02-07
	Arterial Traffic Management	Third Street Corridor	ITS field devices deployment including transit signal priority for light rail vehicles	Ongoing	ATMS03-07 APTS09-04
	Transit Management	Ticket Vending Machine and Subway Fare Gate Replacement	Transit fare collection	Ongoing	APTS04-09 APTS04-08
	Transit Management	Paratransit Debit Card	Transit fare collection	Ongoing	APTS04-15
	Transit Security	Subway & Surface	ITS field devices deployment	Future	APTS05-06



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
		Platform Closed Circuit Television (CCTV) Replacement - Station Related			
	ITS Integration	Integrated Vehicle & Facilities Maint. System Inventory Control	Transit management system	Future	APTS06-6
	Transit Information	Digital Voice Annunciation System, Next stop Announcement	Transit information system	Ongoing	APTS08-08
	Transit Information	Subway Public Address and Platform Display Systems Replacement	Transit information system	Future	APTS08-08
	Transit Information	Subway Station Talking Signs	Transit information system	Future	APTS08-08
	Transit Vehicle Priority	Transit Signal Priority	Allow MUNI transit vehicles priority at intersections	Ongoing	APTS09-04
	Traveler Information	City Services 311 Information System	Traveler information system	Existing	N/A
	ITS Integration	SFgo - Integrated Transportation Management System	Integrated Arterial Management System	Existing	ATMS06-07 ATMS03-07 ATMS01-07
	Parking Management	Real Time Parking - Parking Availability on Web, 511	Parking management system	Future	High-Level Diagram High-Level Diagram ATMS17-1
	Parking Management	On-Street Parking Management – Meters (smart card ready)	Parking management system	Ongoing	High-Level Diagram High-Level Diagram High-Level Diagram ATMS16-2
	Parking Management	Parking Guidance - Dynamic Message Sign (DMS)	Parking management system	Ongoing	ATMS17-1
	Emergency Vehicle Preemption	Emergency Vehicle Preemption	Allowing emergency vehicles higher priorities at the intersections	Ongoing	EM02-3
	ITS Integration	Advanced Train Control System	Transit management system	Existing	APTS02-09 APTS01-4
	ITS Integration	MTA Transit Management Central Control Facility	Transit management center	Future	APTS05-06



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
		Expansion/Replacement			
	ITS Integration	Center-to-Center Network	Traffic management center	Ongoing	High-Level Diagram ATMS07-07
	Transit Management	Geary Bus Rapid Transit (BRT)	Bus rapid transit on Geary	Future	APTS09-04
	Transit Management	Van Ness Bus Rapid Transit (BRT)	Bus rapid transit on Van Ness	Future	APTS09-04
Solano County Transit (SolTrans)	Transit Vehicle Priority	Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Future	APTS09-07
	Transit AVL/CAD	TransTrack	Automatic vehicle location system	Ongoing	APTS01-6
	Transit Management	Solano County Transit Automatic Vehicle Location System	Automatic vehicle location system	Ongoing	APTS01-6
Sunnyvale	Arterial Traffic Management	Closed Circuit Television (CCTV) Camera Deployment	Installation of Closed Circuit Television Cameras for traffic monitoring and incident management on the major arterials.	Future	ATMS01-10
	ITS Integration	Traffic Management Center (TMC) Integration	Implement physical connection to the area-wide data and video information sharing networks to improve the ability to coordinate operations with neighboring transportation management systems.	Future	High-Level Diagram ATMS07-10 ATMS06-11 ATMS06-10 ATMS03-10 ATMS01-10
	Arterial Traffic Management	Traffic Adaptive Signal Controller Update	Expand the City's adaptive traffic signal control system to all major arterials.	Ongoing	ATMS03-10
	Arterial Traffic Management	Traffic Signal Controller Update	Acquire and install new traffic signal controller and cabinets to upgrade City-maintained traffic signals citywide	Ongoing	ATMS03-10
	Arterial Traffic Management	Count and Speed Monitoring Stations	Deploy count and speed monitoring stations at various locations around the City to provide up-to-date/current statistical information regarding vehicular traffic on arterials.	Future	ATMS19-1
	Arterial Traffic Management	Intelligent Transportation System (ITS) Communications Infrastructure	Install fiber optic cables to support ITS implementation, communication, video and data sharing within the City and adjoining municipalities.	Future	N/A
	Arterial Traffic Management	Sunnyvale Downtown Specific Plan Transportation Improvements	Intersection and streetscape enhancements, bikeways, signal improvements, and roadway reconfiguration	Future	ATMS03-10
	Emergency Vehicle	Emergency Preemption Receiver	Provide priority and safe passage to emergency vehicles at signalized	Future	EM02-5



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Preemption	Installation	intersections.		
SV ITS - San Jose Program Manager	ITS Integration	San Jose International Airport - Advanced Transportation Management System (ATMS), multiple phases	Coordination of multi-mode transportation	Existing	ATMS08-07
	ITS Integration	Silicon Valley - ITS Program Upgrades	Upgrades infrastructure for existing countywide ITS system	Future	ATMS03-08
	ITS Integration	www.511sv.org	Traveler information system	Existing	ATIS01-05 ATIS01-04
	ITS Integration	Silicon Valley Intelligent Transportation System (ITS) Milpitas/Fremont Project	Integrated arterial and freeway management system	Existing	ATMS07-08
	Incident Management	Silicon Valley Intelligent Transportation System (ITS) West Project	Arterial SMART Corridor	Existing	ATMS07-08
	Arterial Traffic Management	Silicon Valley TIMC - San Jose Police Department Integration-	San Jose Police Department Integration- Allows for special management of traffic signals for public safety incidents.	Future	ATMS08-09 ATMS07-08 ATMS01-08
	Network Surveillance	SVITS Hybrid Analog/Digital Video System	A video component of a greater traffic management system.	Ongoing	ATMS01-08
	ITS Integration	Wide Area Network Upgrade	communication system upgrade	Ongoing	N/A
	Traveler Information	Silicon Valley - Intelligent Transportation System (SV-ITS) Traveler Information Website Phase I	Traveler information website	Existing	ATIS01-21
Vacaville	Emergency Vehicle Preemption	Traffic Signal Emergency Vehicle Preemption	Installation of GPS emergency traffic signal preemption (EVP) devices which also support a transit signal priority system. Antennas will be installed on existing poles. Supporting electronics will be installed inside the traffic control cabinet.	Existing	EM02-5
Vallejo	Arterial Traffic Management	Traffic Signal Interconnect	Signal improvement	Existing	ATMS03-10
Vallejo Transit	Arterial Traffic Management	Advanced Traveler Information System	Signal improvement	Existing	APTS08-07
VTA	Transit Vehicle	Signal Prioritization	(vehicle to roadside)	Ongoing	APTS09-10



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
	Priority	(Part of VTA Bus Rapid Transit)			
	Toll Management	US 101 & SR 85 Express Lanes - 880/237 Express Lane Interchange	Toll management system	Future	High-Level Diagram ATMS10-5
	Transit AVL/CAD	Automatic Vehicle Location (AVL) and Communication System Upgrade	Automatic vehicle location system	Future	APTS03-6 APTS02-12 APTS01-5
	Transit Information	Dynamic Passenger Information (DPI)	Traveler information system	Ongoing	APTS08-11
	Transit Vehicle Priority	Rapid 522 Bus Signal Priority (BSP)	Allowing transit vehicles higher priority at intersections	Existing	APTS09-10 APTS09-09
	Freeway Traffic Management	Countrywide Ramp Metering Study	Integrated arterial and freeway management system	Existing	N/A
	Transit Vehicle Priority	El Camino Rapid Transit Project	Implement Rapid line 522 improvements in the El Camino Real/The Alameda corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Future	APTS09-10 APTS09-09
	Transit Vehicle Priority	King Road Rapid Transit Project	A new BRT line from Berryessa BART to Santa Clara Caltrain via King Rd/Alum Rock/Santa Clara/The Alameda/ECR. Takes advantage of existing BRT upgrade for SCAR, but also establishes BRT upgrades along King Road, including signal priority. Implement Rapid Transit on the King Road corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Future	APTS09-10 APTS09-09
	Transit Management	Centrally Managed Archive Database	Archive real-time feed from the existing applications, including vehicle status data from orbital database and SCADA database, planning data from Trapeze, maintenance data from FIS/SAP, driver assignment data from FIS/BDT.	Future	AD1-11
	Transit Management	Develop Communications Architecture	The communication architecture will focus on a wide bandwidth communication infrastructure that will meet all transit communication needs and supports an integrated transit ITS system.	Future	N/A
	Transit Management	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	High-Level Diagram



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
					APTS04-13
	Transit Management	Incident reporting for LRT	Develop an incident reporting system for LRT. The LRT incident reporting system should be interfacing with SCADA and incorporate automated report generating features.	Future	APTS05-10 APTS01-5
	Transit Management	Intrusion Detection and Warning	Intrusion detection and warning system at specific locations of the right of the way for light rail. Prevent conflicts between conflicts between left turn and straight moving vehicles	Future	APTS05-10
	Transit Information	Multi-modal Traveler Information	A multi-modal traveler information system with options of using a combination of transportation, including cars, parking, or PnR, transit, and walking for encouraging riders to take public transit.	Future	APTS08-10A
	Infrastructure Security / Surveillance	Networked Video Surveillance System	A networked video security surveillance system for light rail stations and the trains and buses. This project will develop a networked video surveillance infrastructure that includes IP-based video cameras and a video management software system. The video management system includes software tools that manage videos from different sources, perform automatic event detection, and manage data/video.	Future	APTS05-09
	Transit Management	Obtain Real-time Fare Data	Receive the real-time payment data (and potentially O-D data associated with the payment information) in real-time from the Clipper program	Future	High-Level Diagram APTS04-13
	Transit Information	On-train or On-bus Information Service	Combined with broadband service discussed under the WiFi project to offer riders information and entertainment, and the ability to work.	Future	APTS08-10
	Arterial Traffic Management	Regional ITS Maintenance Service	Operations, Management, and Maintenance for regional ITS equipment	Future	MC07-6 MC07-4
	ITS Integration	Regional Transportation Operations Personnel Service (RTOPS)	Sharing of dedicated operations personnel – referred to here as “regional coordinators”. The goal of the regional coordinators is to work with involved agency personnel (to the extent each agency desires) to help get the appropriate response to any and all incidents and inefficiencies and to keep the public fully informed at all times.	Future	N/A
	Parking Management	Smart Parking Management System	Provide drivers with real-time occupancy information of the parking lots at the entrances of the parking	Future	High-Level Diagram



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
			lots along highways, through the traveler information website or PDAs. As a critical component of the parking management system, either FasTrak® or RFID based vehicle identification and payment method will be developed.		ATMS16-4
	Transit Information	Station Information Service	Install LCD monitors with wireless connectivity at light rail stations	Future	APTS08-10
	Transit Management	Traffic Surveillance System for Transit Operations	Bring in the traffic surveillance videos from selected intersections into the Operations and Control Center (OCC) in order for OCC personnel to determine the level of traffic congestion problems at key spots and to make recommendations to bus drivers to reroute the buses if necessary.	Future	APTS02-12
	Transit Management	Updated Light Rail Control System	Upgrade the existing SCADA system with a system that supports advanced train control and monitoring functions.	Future	APTS02-13
	Transit Information	WiFi for Trains and commuter buses	Provide WiFi on individual buses and rail cars using either 3G cellular service or dedicated wireless system	Future	APTS08-10
	Toll Management	Silicon Valley Express Lanes Network- SR17	Convert one lane to express lanes from I-280 to SR85	Future	High-Level Diagram ATMS10-4
	Toll Management	Silicon Valley Express Lanes Network- SR 237	Build new express lanes between Mathilda Ave. and SR 85; Convert existing HOV lanes to express lanes from N. First Street to Mathilda Ave	Future	High-Level Diagram ATMS10-4
	Toll Management	Silicon Valley Express Lanes Network- I-680	Convert/Build express lane from Calaveras Boulevard to Montague Expressway; Convert 1 general purpose lane to express lane between Montague Expressway and US 101	Future	High-Level Diagram ATMS10-4
	Toll Management	Silicon Valley Express Lanes Network- I-880	Convert existing HOV lanes to express lanes from Alameda County line to US 101; Build express lane between US 101 and I-280.	Future	High-Level Diagram ATMS10-4
	Toll Management	Silicon Valley Express Lanes Network- US 101	Build express lanes from Cochrane Rd. to SR 25.	Future	High-Level Diagram ATMS10-4
	Toll Management	Silicon Valley Express Lanes Network- I-280	Convert existing HOV lanes to express lanes from Leland Ave to Magdalena Ave; Convert 1 general purpose lane to express lane in each direction between US 101 and Leland Ave; Build express lane southbound from El Monte Rd. to	Future	High-Level Diagram ATMS10-4



Stakeholder	Category	Project Name	Project Description	Project Status	ITS Service Diagram
			Magdalena Ave.		
	Transit Vehicle Priority	Monterey Hwy Rapid Transit Project	Rapid Transit Project on Monterey Highway	Future	APTS09-10 APTS09-09
	Transit Vehicle Priority	Sunnyvale-Cupertino Rapid Transit Project	Rapid transit Project between Sunnyvale and Cupertino	Future	APTS09-10 APTS09-09
	Transit Vehicle Priority	Santa Clara/Alum Rock Transit Improvement/BRT	Implement Rapid Transit improvements in the Santa Clara/Alum Rock route, including: dedicated guideways, signal prioritization, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Future	APTS09-10 APTS09-09
	Transit Vehicle Priority	Stevens Creek Rapid Transit Project	Implement Rapid Transit improvements in the Stevens Creek corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium BRT stations, real-time information, and specialized vehicles.	Future	APTS09-10 APTS09-09
VTA/Caltrans	Freeway Traffic Management	Countywide Freeway Traffic Operation System and Ramp Metering Improvements	Complete planned installation of monitoring cameras, electronic message signs and ramp metering on freeway system.	Future	ATMS04-1 ATMS01-02
Walnut Creek	Arterial Traffic Management	Traffic Signal System Upgrade	Signal Upgrade	Ongoing	ATMS03-10
Water Emergency Transportation Authority	Transit Management	Electronic Fare Collection	Integration with the regional fare management system (Clipper)	Ongoing	High-Level Diagram APTS04-16
	Emergency Management	Coast Guard Coordination	Communications with the Coast Guard sharing ferry location	Future	APTS05-12
	Traveler Information	Predictive Ferry Arrival and Departure Information	Real-time traveler information	Future	APTS08-16
WestCAT	Transit Management	Automatic Passenger Counters (APC)	Automatic passenger counting system	Future	APTS10-3
	Transit AVL/CAD	Automatic Vehicle Location	Automatic vehicle location system	Existing	APTS01-6
	Transit Management	Electronic Farebox/Collection	Transit fare collection system	Existing	High-Level Diagram APTS04-12
	Transit Security	Security Updates	Transit security monitoring system	Future	APTS05-08
	Transit Information	Real-Time Predictive Arrivals/Departures	Transit arrival and departure information	Ongoing	APTS08-15

APPENDIX E – PROJECTS BY CATEGORY

Projects are organized in the table below by project category. The project status is listed as one of the following categories:

- **Existing:** in place and operating.
- **Ongoing:** partly implemented with imminent or ongoing expansion, upgrades, or development.
- **Future:** proposed projects that may or may not be programmed.
- **N/A:** projects that are not reflected in market package diagrams specifically. Primarily these projects are ITS in nature, but do not involve data exchange with other systems.

The ITS Service Diagram for each project is a high-level illustration of the data flows between different systems and equipment packages that provide a desired service such as transit signal priority, traveler information or electronic toll collection.

Updated 12/28/2011

Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
Arterial Traffic Management	Alameda CTC	Transportation Management Center	Arterial traffic management coordination	Existing	ATMS07-03
	BART	Closed Circuit Television (CCTV) Deployment	Transit system CCTV camera deployment	Existing	APTS05-02
	Campbell	Hamilton Avenue Intelligent Transportation System (ITS)	Expand on the ITS infrastructure currently on Hamilton Ave. by linking three signals via wireless interconnect to the Smart Corridor signals to the east. Will include signal retiming of these three signals.	Existing	ATMS03-10
	Campbell	Installation of Pedestrian Countdown Timers	ITS field devices deployment	Future	ATMS03-10
	Campbell	Reactivation of Existing Traffic Count Stations	Reactivating traffic count stations along arterials such as Hamilton Ave., Winchester Blvd. and Campbell Ave.	Future	AD1-8 ATMS19-1
	Campbell	Traffic Signal System Upgrade	Replace older traffic signal controllers with new controllers and signal system software that is compatible with NTCIP and Silicon Valley-ITS Data Exchange Network Software protocols	Future	ATMS03-10
	Campbell	Winchester Blvd Intelligent Transportation System (ITS)	Expand upon existing ITS equipment on Winchester Blvd. by installing new conduit, fiber, and fiber equipment.	Future	ATMS03-10
	CHP	Computer-Assisted Dispatch (CAD) Upgrade	Computer assisted dispatching system for emergency response	Existing	High-Level Diagram EM01-1
	Concord	Concord Closed Circuit Television (CCTV)	ITS field devices deployment	Existing	ATMS01-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
	Concord	Concord Kirker Pass Road/Ygnacio Valley Road Arterial Management Plan	Integrated arterial management system	Existing	ATMS03-10
	Concord	Concord Signal System Upgrade and Traffic Management Center (TMC)	Signal upgrade	Existing	ATMS03-10
	Concord	Concord-Walnut Creek and Pleasant Hill Smart Corridor along I-680	Integrated arterial and freeway management system	Future	ATMS01-10 ATMS03-10 ATMS06-10 ATMS06-11
	County of Santa Clara	Expressway Adaptive Pedestrian Timing Project	Adaptive pedestrian timing-dynamic FDW by detecting pedestrians in crosswalks on all expressways.	Ongoing	ATMS03-10
	County of Santa Clara	Expressway Bike Detection and Santa Teresa Corridor	Install bicycle detection on expressway/Santa Teresa shoulders and cross streets as needed at all signalized intersections to support bicycle adaptive signal timing	Future	ATMS03-10
	County of Santa Clara	Intelligent Transportation System (ITS) Enhancements on Bascom Ave	ITS field devices deployment	Existing	ATMS01-10
	County of Santa Clara	Santa Teresa/Hale Corridor TOS Infrastructure Improvements	Add TOS infrastructure on Santa Teresa Blvd between Day Road and Castro Valley Road.	Future	ATMS01-10
	County of Santa Clara	Signal Coordination/Interconnect with Cross Streets	Signal coordination/interconnect between expressway signals and city/Caltrans signals on cross streets	Future	ATMS03-10 ATMS07-10
	County of Santa Clara	Traffic Operations System (TOS) Improvements	Enhance expressway traffic operations systems components and functions, and provide connectivity between Santa Clara County and cities for sharing of ITS data/communications.	Ongoing	ATMS03-10
	Cupertino	Adaptive Traffic Signal Control System	Signal improvement	Existing	ATMS03-10
	Cupertino	De Anza Blvd. Advanced Traffic Management System	Integrated arterial management system	Existing	ATMS03-10
	Cupertino	Interchange Improvements-Ramp Meter Signal/Arterial Traffic Signal Interconnection	Integrated arterial and freeway management system	Existing	ATMS01-10 ATMS03-10
	Cupertino	Stevens Creek Blvd CCTV Cameras	Locations are at the intersections of Stevens Creek Blvd with the SB-85 ramp, Stelling, Blaney, Wolfe, and Tantau. The project includes engineering, and	Ongoing	ATMS01-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
			installing communication equipment and cameras. The existing fiber optic infrastructure will be utilized		
	Daly City	Citywide Signal Coordination	Signal Coordination	Future	ATMS03-10
	Daly City	Communications Master Plan	Communication System Upgrade	Future	N/A
	Daly City	Traffic Signal System Upgrade	Signal upgrade	Future	ATMS03-10
	Fairfield	Central Traffic Signal System with wireless communications	Central Traffic Signal System with wireless communications	Ongoing	ATMS03-10
	Fremont	Communication Master Plan	Upgrade all transportation related communications from serial to Ethernet	Ongoing	N/A
	Fremont	Traffic Management Center (TMC)	Traffic management center	Existing	ATMS03-10
	Gilroy	10th St. and Downtown Signals Upgrade	Controllers, adaptive, detectors along 10th St. in Gilroy.	Future	ATMS03-10
	Gilroy	Adaptive Traffic Signal Control System	Signal improvement	Ongoing	ATMS03-10
	Gilroy	ITS Enhancements on Santa Teresa Blvd	Signalization modifications along Santa Teresa Blvd.	Future	ATMS03-10
	Gilroy	Other Signal Upgrades	Other Signal Upgrades	Future	ATMS03-10
	Gilroy	SR 152 Signal System Upgrade	SR 152 Signal System Upgrade	Future	ATMS03-10
	Gilroy	Traffic Signal System Upgrade	Upgrade traffic signal controller and communications systems with the current technology, including Interconnect, to replace outdated equipment and provide city with centralized traffic management system.	Future	ATMS03-10
	Hayward	Adaptive Bicycle Timing	Signal Improvement	Future	ATMS03-10
	Hayward	Adaptive Pedestrian Timing	Signal Improvement	Future	ATMS03-10
	Hayward	Adaptive Traffic Signal Program	Signal Improvement	Future	ATMS03-10
	Hayward	Citywide Emergency Vehicle Preemption	Signal Improvement	Ongoing	EM02-4 EM02-5 EM02-6
	Hayward	Citywide Traffic Signal Coordination	Signal Coordination	Ongoing	ATMS03-10
	Hayward	Citywide Transportation Management System	Advanced Traffic Management System for the following corridors: Clawiter Road/880 Reliever Route, Hesperian Blvd, Santa Clara St-Harder Road, Huntwood Avenue, Mission Blvd, Foothill	Future	ATMS01-10 ATMS03-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
			Blvd, Second Street, A Street, B Street, D Street-Winton Avenue, Jackson		
	Hayward	Downtown Hayward CBD Traffic and Parking Improvement Project	Central Business District traffic management	Future	ATMS16-3
	Hayward	Installation of Pedestrian Countdown Timers	Signal Improvement	Ongoing	ATMS03-10
	Hayward	Traffic Operations System (TOS)/Signal Coordination	Signal Improvement	Future	ATMS03-10
	Hayward	Traffic Signal System Upgrade	Signal Upgrade	Ongoing	ATMS03-10
	Livermore	Citywide Signal Coordination	Signal Coordination	Ongoing	ATMS03-10
	Livermore	Traffic Operations Center	TMC	Existing	ATMS01-10 ATMS03-10
	Los Gatos	Traffic Signal System Upgrade	Signal Upgrade	Ongoing	ATMS03-10
	Menlo Park	El Camino Real Adaptive Signal Project	Signal improvement	Existing	ATMS03-10
	Menlo Park	Traffic Signal System	Signal interconnect cable network	Existing	ATMS03-10
	Menlo Park	Willow Rd SR-114, Adaptive Signal Project	Signal improvement	Future	ATMS03-10
	Milpitas	Citywide Adaptive Bicycle and Pedestrian Timing	Citywide Adaptive Bicycle and Pedestrian Timing	Future	ATMS03-10
	Milpitas	South Milpitas Blvd SMART Corridor	Arterial traffic management coordination	Future	ATMS01-10 ATMS03-10
	Morgan Hill	Citywide Traffic Signal Operation Center	Construct traffic signal operation center.	Future	ATMS03-10
	Morgan Hill	Citywide Wireless Vehicle Detection System Installation	Install wireless vehicle detection system at all signalized intersections within the City.	Future	ATMS03-10
	Mountain View	Citywide Traffic Signal Upgrade and IP Traffic Signal Access	Upgrade the City's existing traffic signal system through the installation of new traffic signal controllers, software and Internet accessible traffic signal communications.	Future	ATMS03-10
	Mountain View	Grant Rd. Adaptive Traffic Signal	Upgrade the existing traffic signal interconnect system on Grant Rd. to a new adaptive traffic signal system.	Future	ATMS03-10
	Mountain View	Rengstorff Ave Traffic Signal System Improvement	Install signal interconnect & upgrade communication. Consider adaptive signal coordination system"	Future	ATMS03-10
	Mountain View	Shoreline Blvd. Adaptive Traffic	Upgrade the existing signal interconnect system to adaptive traffic signals.	Future	ATMS03-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		Signals			
	MTC	S/W Data Repository	Arterial traffic management	Future	N/A
	Oakland	Oakland 12th Street Improvements	Fiber network, signal coordination, CCTV cameras, for 12th Street (Lake Merritt Area) and integration to existing system	Future	ATMS03-10
	Oakland	Oakland Airport Intelligent Transportation System (ITS) Project	Fiber network, signal coordination, CCTV cameras, traffic responsive plans for Hegenberger and 98th St	Ongoing	ATMS07-05
	Oakland	Oakland Broadway ITS Project	Close Circuit Television (CCTV) cameras, special event management, arterial Changeable Message Sign (CMS), parking guidance	Future	APTS09-08
	Oakland	Oakland North Central Business District (CBD) Project	Central Business District traffic management	Ongoing	ATMS03-05
	Oakland	Oakland Transportation Management System	Advanced Transportation Management System (ATMS)	Ongoing	ATMS01-05 ATMS03-05 ATMS06-05 ATMS08-06
	Palo Alto	Citywide Traffic Signal Retiming & Pedestrian Facility Upgrades	Signal Upgrade	Future	ATMS03-10
	Palo Alto	Citywide Traffic Signal System Upgrade	Replace outdated traffic signal controllers, cabinets and communication chips including installation of time of day GPS system equipment for each signalized intersection.	Future	ATMS03-10
	Pleasant Hill	Contra Costa Boulevard Traffic Management System	Arterial traffic management coordination	Ongoing	ATMS07-10
	Pleasanton	I-580 Smart Corridor	Arterial traffic management coordination	Existing	ATMS07-04
	Pleasanton	Traffic Signal System	Signal Upgrade	Existing	ATMS03-10
	Redwood City	Regional Traffic Signalization/Operation Program 2	Traffic Signalization/Operation Program	Ongoing	ATMS03-10
	San Jose	Almaden/Blossom Hill Area Advanced Traffic Management System	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Future	ATMS03-06
	San Jose	Brokaw-Airport Area Advanced Traffic Management System	A system of traffic cameras, and signal system upgrades.	Future	ATMS03-06
	San Jose	Downtown San Jose Local Street Advanced Traffic Management System	Expands "real time" traffic management system provided in Arena area.	Future	ATMS03-06
	San Jose	Eastridge/Evergreen Area Advanced Traffic Management	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Future	ATMS03-06



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		System			
	San Jose	King Rd/Story Rd. Area Advanced Traffic Management System	Provides "real time" traffic management for high traffic congestion location.	Existing	ATMS07-06
	San Jose	Monterey Highway Intelligent Transportation System (ITS)	A system of signal upgrade, interconnect, and CCTV cameras throughout the Monterey Highway area.	Future	ATMS01-06 ATMS03-06
	San Jose	Proactive Signal Retiming Program	A citywide program that will monitor current traffic signals and improve them where necessary.	Existing/ Ongoing	ATMS03-06
	San Jose	Red Light Running Enforcement Program	Installation of cameras at various intersections to capture red light runner incidents.	Future	N/A
	San Jose	Replacement of Electronic "No Right" at Light Rail Transit (LRT) Crossings	Signal Upgrade	Existing	ATMS03-06
	San Jose	San Jose Traffic Signal Management Program	(signal central)	Existing	MC07-4
	San Jose	San Jose Traffic Signal System Upgrades	A citywide program that will look at older signal systems and upgrade them where needed.	Ongoing	ATMS03-06
	San Jose	Saratoga/Moorpark Advanced Traffic Management System	A system of traffic cameras, signal system upgrades.	Future	ATMS03-06
	San Jose	SJ Citywide Count and Speed Monitoring System	Deploy count and monitoring stations at key locations around the City to provide up to date traffic data for real time traffic management and for investment decisions.	Future	ATMS19-2
	San Jose	Smart Intersections	Arterial traffic management coordination	Existing	ATMS03-06 EM02-4
	San Jose	SVITS Connection to Sunnyvale	A system of CCTV, Signage and the development of a traffic management center in the City of Sunnyvale	Future	ATMS01-06 ATMS03-06 ATMS07-06
	San Jose	Winchester /Stevens Creek Area Advanced Traffic Management System	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Future	ATMS03-06
	San Leandro	San Leandro Signal System and Traffic Management Center (TMC) (Upgrade)	Signal Upgrade	Existing	ATMS03-10
	San Mateo City/County Association of Governments (C/CAG)	Local Transportation Management Center	TMC- San Mateo Hub at Police Station	Ongoing	ATMS01-10 ATMS03-10
	San Mateo	San Mateo C/CAG	CCTV cameras, trailblazers, transit signal	Future	APTS09-07



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
	City/County Association of Governments (C/CAG)	Roadside Equipment	priority, CMS		ATMS01-10 ATMS03-10 ATMS06-10 ATMS06-11
	San Mateo City/County Association of Governments (C/CAG)	San Mateo C/CAG Roadside Equipment	CCTV cameras, trailblazers, transit signal priority, CMS	Ongoing	APTS09-07 ATMS01-10 ATMS03-10 ATMS06-10 ATMS06-11
	San Mateo City/County Association of Governments (C/CAG)	San Mateo County Smart Corridor	The project will deploy CCTV cameras, trailblazer signs, and signal upgrades on a portion of US 101 and SR82 corridors and major local streets.	Ongoing	High-Level Diagram ATMS08-10a
	Santa Clara	Capitol Expressway TOS	Install TOS infrastructure on Capitol Expwy. from SR 87 to I-680 including fiber optic, trunkline, CCTV, Ethernet-capable controller, battery backup system and system detector loops	Future	ATMS01-10 ATMS03-10
	Santa Clara	Citywide Bicycle Detection	Install bicycle detection at the stop bar at all of the City's signalized intersections in all approaches.	Future	ATMS03-10
	Santa Clara	Citywide Pedestrian Signal Upgrades	Install Countdown pedestrian signal indications, ADA pedestrian pushbuttons and Audible pedestrian signals at signalized intersections where none exist.	Future	ATMS03-10
	Santa Clara	Citywide Traffic Count and Travel time Monitoring System	Install traffic count and travel time monitoring equipment at various locations citywide to provide real-time traffic volumes and travel speed information and integration with City's traffic management system.	Future	ATMS19-1
	Santa Clara	Citywide Traffic Monitoring Cameras	Install traffic monitoring and incident management cameras on major arterials.	Future	ATMS01-10
	Santa Clara	Lafayette Street Reversible Lane Control Upgrade	Replacement of Reversible Lane Control system, striping and indications along Lafayette Street.	Future	ATMS18-1
	Santa Clara	Santa Clara Adaptive Traffic Signal System	Install Adaptive Traffic Signal system for major arterials.	Future	ATMS03-10
	Santa Clara	Santa Clara Communications Network Upgrade	Convert City's existing copper twisted wire pair communication infrastructure to new fiber optic cable network.	Ongoing	N/A
	Santa Clara	Santa Clara TMC Upgrade	Convert City's existing traffic operations room to a new Traffic Management Center.	Ongoing	ATMS01-10 ATMS03-10
	Santa Clara	Santa Clara Traffic Signals Upgrade	Citywide traffic signal modifications	Ongoing	ATMS03-10
	Santa Rosa	Adaptive Traffic Signal Controls	Signal improvement	Ongoing	ATMS03-10
	Santa Rosa	Traffic Management Center	TMC	Ongoing	ATMS01-10 ATMS03-10
	Santa Rosa	Traffic Signal	Signal improvement	Ongoing	ATMS03-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		Synchronization			
	Saratoga	Citywide Accessible Pedestrian Signals	Update city-owned signals with audible signals for the visually impaired.	Future	ATMS03-10
	Saratoga	Citywide Signal Upgrade Project Phase II	Signal Upgrade	Future	ATMS03-10
	SFMTA	Third Street Corridor	ITS field devices deployment including transit signal priority for light rail vehicles	Ongoing	APTS09-04 ATMS03-07
	Sunnyvale	Closed Circuit Television (CCTV) Camera Deployment	Installation of Closed Circuit Television Cameras for traffic monitoring and incident management on the major arterials.	Future	ATMS01-10
	Sunnyvale	Count and Speed Monitoring Stations	Deploy count and speed monitoring stations at various locations around the City to provide up-to-date/current statistical information regarding vehicular traffic on arterials.	Future	ATMS19-1
	Sunnyvale	Intelligent Transportation System (ITS) Communications Infrastructure	Install fiber optic cables to support ITS implementation, communication, video and data sharing within the City and adjoining municipalities.	Future	N/A
	Sunnyvale	Sunnyvale Downtown Specific Plan Transportation Improvements	Intersection and streetscape enhancements, bikeways, signal improvements, and roadway reconfiguration	Future	ATMS03-10
	Sunnyvale	Traffic Adaptive Signal Controller Update	Expand the City's adaptive traffic signal control system to all major arterials.	Ongoing	ATMS03-10
	Sunnyvale	Traffic Signal Controller Update	Acquire and install new traffic signal controller and cabinets to upgrade City-maintained traffic signals citywide	Ongoing	ATMS03-10
	SV ITS - San Jose Program Manager	Silicon Valley TiMC - San Jose Police Department Integration-	San Jose Police Department Integration- Allows for special management of traffic signals for public safety incidents.	Future	ATMS01-08 ATMS07-08 ATMS08-09
	Vallejo	Traffic Signal Interconnect	Signal improvement	Existing	ATMS03-10
	Vallejo Transit	Advanced Traveler Information System	Signal improvement	Existing	APTS08-07
	VTA	Regional ITS Maintenance Service	Operations, Management, and Maintenance for regional ITS equipment	Future	MC07-4 MC07-6
	Walnut Creek	Traffic Signal System Upgrade	Signal Upgrade	Ongoing	ATMS03-10
Arterial Traffic Management; Freeway Traffic Management	Alameda CTC	I-80 Integrated Corridor Management	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Ongoing	High-Level Diagram ATMS07-11
	Contra Costa	I-80 Integrated	Integrated freeway and arterial	Ongoing	High-Level



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
	Transportation Authority	Corridor Management	coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination		Diagram ATMS07-11
	MTC	Transportation Asset Management System	Development of transportation asset management system including traffic signal, bus stop, ADA ramp, bike route/path, complete street elements, and any assets within the right of way.	Future	AD1-9
	MTC/Caltrans	Regional Integrated Corridor Management Strategy	Planning and coordination activities to implement ICM on corridors throughout the Bay Area.	Future	High-Level Diagram ATMS03-10 ATMS04-1 ATMS07-02
Arterial Traffic Management; Transit Management	Fremont	Special Events Management Transportation Plan	Adaptive signal control, transit signal priority, traffic monitoring, traveler information system	Future	APTS09-07 ATMS01-10 ATMS03-10 ATMS06-10 ATMS06-11
Commercial Vehicle Management	MTC	Goods Movement Container Reservation System	Freight Management	Future	N/A
Connected Vehicles	MTC/Caltrans	Connected Vehicle Testbed	Connected vehicle implementation experiments	Ongoing	ATIS09-1 ATIS10-1
Emergency Management	Water Emergency Transportation Authority	Coast Guard Coordination	Communications with the Coast Guard sharing ferry location	Future	APTS05-12
Emergency Vehicle Preemption	Menlo Park	Citywide Emergency Vehicle Preemption	Allowing emergency vehicles higher priorities at intersection	Ongoing	EM02-4 EM02-5 EM02-6
	Palo Alto	Citywide Traffic Signal CCTV/Emergency Vehicle Preemption Project	A citywide program to give priority to emergency vehicles via signal timing adjustments.	Future	EM02-5
	San Jose	San Jose Emergency Vehicle Preemption System	Emergency vehicle preemption system	Future	EM02-4 EM02-5 EM02-6
	San Jose	San Jose Smart Intersection - Traffic Management Center Controls Emergency Vehicle Pre-Emption	Traffic Management Center Controls Emergency Vehicle Pre-Emption	Existing	ATMS03-06 EM02-4 EM02-5 EM02-6
	San Leandro	Emergency Vehicle Preemption	EVP	Ongoing	EM02-4 EM02-5 EM02-6
	Santa Clara	Citywide Emergency	Install GPS based emergency vehicle	Future	EM02-5



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		Vehicle Preemption for Traffic Signals	preemption units for fire and police vehicles to provide preemption of traffic signals.		
	SFMTA	Emergency Vehicle Preemption	Allowing emergency vehicles higher priorities at the intersections	Ongoing	EM02-3
	Sunnyvale	Emergency Preemption Receiver Installation	Provide priority and safe passage to emergency vehicles at signalized intersections.	Future	EM02-5
	Vacaville	Traffic Signal Emergency Vehicle Preemption	Installation of GPS emergency traffic signal preemption (EVP) devices which also support a transit signal priority system. Antennas will be installed on existing poles. Supporting electronics will be installed inside the traffic control cabinet.	Existing	EM02-5
Emergency/Event Management	Gilroy	Event Management System	Develop and deploy CMS, HAR, and information kiosks to provide traveler information system for special events (i.e. the Gilroy Garlic Festival) and incident management in the Gilroy (i.e. flooding in southern part of City). Install 2-CMS on SB US 101, 3-C	Future	ATIS01-26 ATMS06-10 ATMS08-11
Event Management	Santa Clara	North Santa Clara Event Management System	Installation of ITS elements, DMS, monitoring cameras, communications equipment, and advanced traffic management system throughout northern Santa Clara north of Central Expressway.	Future	ATMS01-10 ATMS03-10 ATMS06-10 ATMS06-11
Freeway Traffic Management	Antioch	Highway 4 Corridors Traffic Management Plan	Freeway traffic management coordination	Ongoing	ATMS06-09 ATMS07-09 ATMS08-10
	Caltrans	Caltrans Highway Information Network (CHIN)	Telephone traveler information system	Existing	ATIS01-01 ATIS01-02
	Caltrans	I-680 Corridor Traffic Operations System Elements and Ramp Metering	Highway ramp metering control	Future	ATMS04-1
	Caltrans	I-680 Smart Carpool Lane	HOV-Toll lane management system	Existing	High-Level Diagram ATMS10-4
	Caltrans	I-80 Integrated Corridor Mobility (ICM)	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Ongoing	High-Level Diagram ATMS04-1
	Caltrans	I-880 Corridor Traffic Operations System Elements and Ramp Metering	Highway ramp metering control	Existing	ATMS04-1
	Caltrans	Pre-Pass Project	Statewide effort on Cal Statewide ITS	Future	CVO03-1



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
			Architecture		
	Caltrans	SR 237 Corridor Traffic Operations System Elements and Ramp Metering	Highway ramp metering control	Future	ATMS04-1
	Caltrans	SR 85 Corridor Traffic Operations System Elements and Metering	Highway ramp metering control	Existing	ATMS04-1
	Caltrans	Traffic Operations System (TOS) and Traffic Management Center (TMC)	Traffic management center	Existing	ATMS04-1
	Caltrans	Traffic Operations System Field Element Installation: SR 237 and I-880	ITS field devices deployment	Future	ATMS04-1
	Caltrans	US 101 Corridor Traffic Operations System Elements and Metering	Highway ramp metering control	Existing	ATMS04-1
	MTC	Freeway Service Patrol	Freeway incident identification and fast response/clearance with roving tow trucks. Telecommunications equipment in trucks relays ops data to CHP Computer Assisted Dispatch (CAD).	Existing	High-Level Diagram EM04-1
	MTC/Caltrans	I-880 Integrated Corridor Management (ICM) (I-580/I-80 interchange and SR-237)	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination.	Future	ATMS04-1 ATMS06-12 ATMS07-02
	San Jose	Silicon Valley TIMC - Ramp Metering Integration	Silicon Valley TIMC - Ramp Metering Integration	Future	ATMS04-03
	VTA	Countrywide Ramp Metering Study	Integrated arterial and freeway management system	Existing	N/A
	VTA/Caltrans	Countywide Freeway Traffic Operation System and Ramp Metering Improvements	Complete planned installation of monitoring cameras, electronic message signs and ramp metering on freeway system.	Future	ATMS01-02 ATMS04-1
Incident Management	MTC/SAFE	Bay Area Call Box Program	Provides roadside telecommunication services to motorists in the event of an incident.	Existing	High-Level Diagram EM03-1
	San Jose	Construction Incident Management - Transportation and Incident Management Center (TIMC)	Construct Transportation and Incident Management Center to coordinate incident activities with traffic, fire, and police. Includes control center and integrated communications network.	Ongoing	ATMS08-07
	San Jose	Emergency Vehicle	Emergency vehicle communication	Future	EM01-3



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		Link System - Traffic Incident Management Center (TIMC)			EM02-4 EM02-5 EM02-6
	San Mateo City/County Association of Governments (C/CAG)	Incident Management Plan for US 101	Incident Management Plan	Existing	N/A
	San Mateo City/County Association of Governments (C/CAG)	Integrated Transportation Incident Management	Incident management	Ongoing	ATMS08-11
	SV ITS - San Jose Program Manager	Silicon Valley Intelligent Transportation System (ITS) West Project	Arterial SMART Corridor	Existing	ATMS07-08
Infrastructure Security / Surveillance	Gilroy	Flood Watch Cameras	Deployment of CCTV cameras to provide real-time video to the City of Gilroy Emergency Operations Center to be used to conduct traffic management and emergency operations activities in times of significant flooding.	Future	EM05-4
	VTA	Networked Video Surveillance System	A networked video security surveillance system for light rail stations and the trains and buses. This project will develop a networked video surveillance infrastructure that includes IP-based video cameras and a video management software system. The video	Future	APTS05-09
ITS Integration	AC Transit	Interagency Communications Upgrade and Rebuild	Mesh network, enhanced capability, etc.	Future	N/A
	Alameda CTC	Closed Circuit Television (CCTV) Camera Integration	CCTV camera image/data integration	Ongoing	ATMS03-01
	Alameda CTC	East Bay SMART Corridor Advanced Transportation Management System (ATMS)	ATMS	Existing	High-Level Diagram ATMS01-03 ATMS03-03
	Alameda CTC	I-580 and I-238 Intelligent Transportation System (ITS)	ITS integration between multiple corridors	Future	ATMS07-04 ATMS08-05
	BART	Real-Time Information System	Transit system real time information	Existing	APTS08-03
	Los Gatos	SV-ITS Program network connection to Los Gatos	System integration	Ongoing	ATMS03-10
	MTC	Center-to-Center	System integration	Ongoing	High-Level



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		Network (Smart Corridors - SFgo, East Bay, Silicon Valley, San Mateo)			Diagram ATMS07-03 ATMS07-04 ATMS07-07 ATMS07-08
	MTC	Integrate 511 with Center to Center	Integrate 511 with neighbor region 511 systems through C-2-C communication	Future	High-Level Diagram ATIS01-03
	Oakland	Integrated Transportation Network	Integrate TMC with EOC, Police Department, Fire Department, and Maintenance Yard	Future	ATMS08-06
	Oakland	Oakland Video Server Project	Video server to manage video feeds, perhaps with public access	Future	ATMS01-10
	San Jose	San Jose Traffic Signal Interconnect	San Jose Transportation Communications Network Enhancements	Future	N/A
	San Jose	Silicon Valley Smart Corridor Project Phases I, II, and III	System upgrade	Existing	ATMS03-08
	SFMTA	Advanced Train Control System	Transit management system	Existing	APTS01-4 APTS02-09
	SFMTA	Center-to-Center Network	Traffic management center	Ongoing	High-Level Diagram ATMS07-07
	SFMTA	Integrated Vehicle & Facilities Maint. System Inventory Control	Transit management system	Future	APTS06-6
	SFMTA	MTA Transit Management Central Control Facility Expansion/Replacement	Transit management center	Future	APTS05-06
	SFMTA	SFgo - Integrated Transportation Management System	Integrated Arterial Management System	Existing	ATMS01-07 ATMS03-07 ATMS06-07
	Sunnyvale	Traffic Management Center (TMC) Integration	Implement physical connection to the area-wide data and video information sharing networks to improve the ability to coordinate operations with neighboring transportation management systems.	Future	High-Level Diagram ATMS01-10 ATMS03-10 ATMS06-10 ATMS06-11 ATMS07-10
	SV ITS - San Jose Program Manager	San Jose International Airport - Advanced Transportation Management System (ATMS), multiple phases	Coordination of multi-mode transportation	Existing	ATMS08-07



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
	SV ITS - San Jose Program Manager	Silicon Valley - ITS Program Upgrades	Upgrades infrastructure for existing countywide ITS system	Future	ATMS03-08
	SV ITS - San Jose Program Manager	Silicon Valley Intelligent Transportation System (ITS) Milpitas/Fremont Project	Integrated arterial and freeway management system	Existing	ATMS07-08
	SV ITS - San Jose Program Manager	Wide Area Network Upgrade	communication system upgrade	Ongoing	N/A
	SV ITS - San Jose Program Manager	www.511sv.org	Traveler information system	Existing	ATIS01-04 ATIS01-05
	VTA	Regional Transportation Operations Personnel Service (RTOPS)	Sharing of dedicated operations personnel – referred to here as “regional coordinators”. The goal of the regional coordinators is to work with involved agency personnel (to the extent each agency desires) to help get the appropriate response to any and a	Future	N/A
Network Surveillance	Livermore	Web-Based Real-Time Video Information	Traffic Surveillance	Ongoing	ATMS01-10
	Pleasanton	Video Detection	Video detection for traffic/incident/road conditions	Existing	ATMS01-10
	San Jose	Downtown San Jose Area Freeway Management System	An equipment package that will monitor downtown freeways and provide incident management tools to assist with traffic.	Future	ATMS01-06 ATMS08-07
	San Jose	Mobile Video Surveillance for Emergency Response	video surveillance	Future	ATMS01-06
	San Leandro	San Leandro Closed Circuit Television (CCTV)	CCTV camera installation	Existing	ATMS01-10
	SV ITS - San Jose Program Manager	SVITS Hybrid Analog/Digital Video System	A video component of a greater traffic management system.	Ongoing	ATMS01-08
On-Vehicle Safety System	AC Transit	Collision Avoidance and Automated Docking Systems	Vehicle on-board safety system	Future	APTS09-01
	SamTrans	Frontal Collision Warning System	Vehicle on-board safety system	Existing	N/A
Parking Management	Caltrans	GGNRA - Parking Guidance System	A parking guidance system (PGS) will provide real time parking information for visitors at the Golden Gate National Recreation Area (GGNRA). Information from the PGS will be disseminated through 511, variable message signs and highway advisory radio.	Future	High-Level Diagram High-Level Diagram ATMS16-5



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
	Gilroy	Downtown Parking Management System	Electronic parking monitoring system	Future	ATMS16-3
	MTC	Real Time Parking - Parking Availability on Web, 511	Parking Management System	Future	High-Level Diagram ATMS17-2
	MTC	Regional Parking Payment (Clipper/FasTrak®)	Enable parking payment at meters and garages with Clipper and/or FasTrak®.	Future	High-Level Diagram High-Level Diagram High-Level Diagram ATMS16-4
	San Jose	Downtown Parking Guidance System	Parking information/guidance	Existing	ATMS16-1
	SFMTA	On-Street Parking Management – Meters (smart card ready)	Parking management system	Ongoing	High-Level Diagram High-Level Diagram High-Level Diagram ATMS16-2
	SFMTA	Parking Guidance - Dynamic Message Sign (DMS)	Parking management system	Ongoing	ATMS17-1
	SFMTA	Real Time Parking - Parking Availability on Web, 511	Parking management system	Future	High-Level Diagram High-Level Diagram ATMS17-1
	VTA	Smart Parking Management System	Provide drivers with real-time occupancy information of the parking lots at the entrances of the parking lots along highways, through the traveler information website or PDAs. As a critical component of the parking management system, either FasTrak® or RF	Future	High-Level Diagram ATMS16-4
Toll Management	Alameda CTC	I-580 Demonstration Express Lane	HOV-Toll lane	Ongoing	High-Level Diagram ATMS10-3
	GGBHTD	FasTrak® Electronic Toll Collection (ETC)	Toll management system	Existing	High-Level Diagram ATMS10-1 ATMS10-2



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
	MTC	Advanced Toll Collection and Accounting System (ATCAS 2)	Replacement of the toll collection system in lane plaza and central processing enhancement.	Future	High-Level Diagram ATMS10-1
	MTC	FasTrak® Electronic Toll Collection	Regional electronic toll collection system for bridge tolls.	Existing	High-Level Diagram ATMS10-1 ATMS10-2
	MTC	Open Road Tolling	Open road tolling on Benicia Martinez Bridget using FasTrak® ETC system.	Existing	High-Level Diagram ATMS10-5
	MTC	Regional Express Lane Network	HOV-Toll lane	Future	High-Level Diagram ATMS10-3
	MTC	Video Tolling Demonstration	Collecting toll based on license plate image.	Existing	ATMS10-5
	SFCTA	Areawide Pricing (Planning/Feasibility)	Toll management system	Future	N/A
	VTA	Silicon Valley Express Lanes Network- I-280	Convert existing HOV lanes to express lanes from Leland Ave to Magdalena Ave; Convert 1 general purpose lane to express lane in each direction between US 101 and Leland Ave; Build express lane southbound from El Monte Rd. to Magdalena Ave.	Future	High-Level Diagram ATMS10-4
	VTA	Silicon Valley Express Lanes Network- I-680	Convert/Build express lane from Calaveras Boulevard to Montague Expressway; Convert 1 general purpose lane to express lane between Montague Expressway and US 101	Future	High-Level Diagram ATMS10-4
	VTA	Silicon Valley Express Lanes Network- I-880	Convert existing HOV lanes to express lanes from Alameda County line to US 101; Build express lane between US 101 and I-280.	Future	High-Level Diagram ATMS10-4
	VTA	Silicon Valley Express Lanes Network- SR 237	Build new express lanes between Mathilda Ave. and SR 85; Convert existing HOV lanes to express lanes from N. First Street to Mathilda Ave	Future	High-Level Diagram ATMS10-4
	VTA	Silicon Valley Express Lanes Network- SR17	Convert one lane to express lanes from I-280 to SR85	Future	High-Level Diagram ATMS10-4
	VTA	Silicon Valley Express Lanes Network- US 101	Build express lanes from Cochrane Rd. to SR 25.	Future	High-Level Diagram ATMS10-4
	VTA	US 101 & SR 85 Express Lanes - 880/237 Express Lane Interchange	Toll management system	Future	High-Level Diagram ATMS10-5



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
AVL/CAD	Benicia	Automatic Vehicle Locator	Monitoring bus locations for dispatch purposes	Future	APTS01-6
	Caltrain	Automatic Vehicle Location (AVL)	Automatic vehicle location system	Ongoing	APTS01-2
	LAVTA	Automatic Vehicle Location (AVL) System	Transit Automatic Vehicle Location (AVL)	Existing	APTS01-3
	LAVTA	In-Vehicle Logic Unit (IVLU)	Process (Automatic Passenger Counters (APC) and Automatic Vehicle Location (AVL) data for wireless upload	Existing	APTS01-3
	LAVTA	LAVTA Computer-Aided Dispatch (CAD)	Transit Automatic Vehicle Location (AVL) and Computer Aided Dispatch (CAD)	Existing	APTS02-06 APTS03-2
	Napa Valley Transit	Automatic Vehicle Location (AVL)	Automatic Vehicle Location (AVL)	Existing	APTS01-6
	Rio Vista	Automatic Vehicle Tracking	Automatic Vehicle Location (AVL)	Future	APTS01-6
	SamTrans	Automatic Vehicle Location (AVL) System	Automatic Vehicle Location (AVL)	Existing	APTS01-5
	SamTrans	Computer Assisted Dispatching (CAD) System Upgrade	Computer Assisted Dispatch (CAD) upgrade	Existing	APTS02-10 APTS03-4
	SamTrans	Computer-Assisted Dispatching (CAD) System Upgrade	Computer Assisted Dispatch (CAD) upgrade	Existing	APTS02-10 APTS03-4
	Santa Rosa	Automatic Vehicle Location (AVL)/GPS Tracking	Installing Automatic Vehicle Location (AVL)/GPS MDT's on a fleet of 2 paratransit vans. Current fleet of 11 paratransit buses are already utilizing MDT's	Existing	APTS01-6
	Santa Rosa CityBus	Automatic Vehicle Location (AVL), Scheduling Software, NextBus Technology, Global Positioning System (GPS) Video System, Transit Signal Priority	Transit real time control system	Ongoing	APTS01-6 APTS08-11 APTS09-07
	SFMTA	Radio Replacement Communications/Automatic Vehicle Location (AVL)-Global Positioning System (GPS)	Radio Voice and Data Communications, Computer-Aided Dispatch, integration with Automatic Vehicle Location (AVL)	Future	APTS02-08
	Solano County Transit (SolTrans)	TransTrack	Automatic vehicle location system	Ongoing	APTS01-6
	VTA	Automatic Vehicle Location (AVL) and Communication	Automatic vehicle location system	Future	APTS01-5 APTS02-12 APTS03-6



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		System Upgrade			
	WestCAT	Automatic Vehicle Location	Automatic vehicle location system	Existing	APTS01-6
Transit Information	AC Transit	Fleetwide Automatic Vehicle Location (AVL) Systems	Transit vehicle automatic location system	Existing	APTS01-1
	AC Transit	Real-time Bus Arrival Information	Real time bus arrival time information	Existing	APTS08-01 APTS08-02
	AC Transit	Real-Time Passenger Seat Availability Information	System that identifies real-time vehicle occupancy	Future	APTS10-1
	AC Transit	Voice Annunciator/ Light Emitting Diode (LED) Signs	Transit vehicle information annunciation and signing system	Ongoing	APTS08-01 APTS08-02
	BART	Trip Planning	Transit trip planning and connection information	Existing	APTS08-03
	BART	Website (www.bart.gov) Dynamic Transit Information	Transit information website	Existing	APTS08-03
	Caltrain	Real-Time Information Collection and Dissemination	Transit real time information collection and dissemination system	Ongoing	APTS01-2 APTS02-03 APTS08-04
	Caltrain	Train Arrival Signs and Annunciator System	Transit vehicle arrival information	Existing	APTS08-04
	Central Contra Costa Transit Authority	Real Time Passenger Information	Web based real time passenger information system - BusTime	Future	APTS08-14
	Fairfield/Suisun Transit	Advanced Traveler Information System (ATIS)	Traveler information system	Future	APTS08-11
	GGBHTD	Advanced Traveler Information System (ATIS)	Traveler information system	Future	APTS08-06
	LAVTA	Annunciators	Transit information annunciators	Existing	APTS08-07
	LAVTA	Headsigns	Provide route and directional information	Existing	APTS08-07
	LAVTA	On Street Signs	Provide real-time bus arrival information (stop)	Existing	APTS08-07
	LAVTA	On-Street Dynamic Message Signs	Transit info-related on street signs	Ongoing	APTS08-07
	LAVTA	Regional Tripliner Software	Assist in 511.org trip planning (regional)	Existing	APTS08-07
	LAVTA	Web-Based Real-Time Transit Information	Internet transit information	Existing	APTS08-07
	LAVTA	Website	Venue for info., complaints and Web	Existing	APTS08-07



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
			Watch		
	MTC	511 Real Time Transit Information	Regional real-time transit arrival information via 511 phone, 511.org, dynamic message signs, etc.	Existing	High-Level Diagram APTS08-12
	MTC	511 Regional Trip Planner	Regional trip planner that provides multimodal travel itineraries for 511 transit and traffic via 511 phone number, 511.org, my511 and mobile applications.	Existing	High-Level Diagram ATIS02-1 ATIS02-2 ATIS02-3
	SamTrans	Predictive Arrivals/Departure System Replacement	Predict transit arrival/departure time	Existing	APTS08-09
	SFMTA	Digital Voice Annunciation System, Next stop Announcement	Transit information system	Ongoing	APTS08-08
	SFMTA	Subway Public Address and Platform Display Systems Replacement	Transit information system	Future	APTS08-08
	SFMTA	Subway Station Talking Signs	Transit information system	Future	APTS08-08
	VTA	Dynamic Passenger Information (DPI)	Traveler information system	Ongoing	APTS08-11
	VTA	Multi-modal Traveler Information	A multi-modal traveler information system with options of using a combination of transportation, including cars, parking, or PnR, transit, and walking for encouraging riders to take public transit.	Future	APTS08-10A
	VTA	On-train or On-bus Information Service	Combined with broadband service discussed under the WiFi project to offer riders information and entertainment, and the ability to work.	Future	APTS08-10
	VTA	Station Information Service	Install LCD monitors with wireless connectivity at light rail stations	Future	APTS08-10
	VTA	WiFi for Trains and commuter buses	Provide WiFi on individual buses and rail cars using either 3G cellular service or dedicated wireless system	Future	APTS08-10
	WestCAT	Real-Time Predictive Arrivals/Departures	Transit arrival and departure information	Ongoing	APTS08-15
Transit Management	AC Transit	Automated Bus Routing	Automated bus routing system to accommodate real time demand	Future	APTS02-01 APTS03-1
	AC Transit	Automatic Passenger Counter (APC) Upgrade/Expansion	Upgrade and expand automatic passenger counting system to full fleet.	Ongoing	APTS10-1
	AC Transit	Automatic Passenger Counters	Passenger counting system on part of fleet.	Existing	APTS10-1



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		(APC)			
	AC Transit	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	High-Level Diagram APTS04-01
	AC Transit	Enhanced Operations and Data Analysis	Analyzing transit management data for better performance	Future	AD1-4
	AC Transit	Geospatial Information Systems Enhancement	Transit Management with GIS	Future	N/A
	AC Transit	Integrated Central Dispatch and Emergency Operations	Facility functions as an EOC during emergencies. Agencies would include any agencies that would utilize the EOC during emergencies.	Future	APTS02-01 EM09-1
	AC Transit	Mobile Command Bus	Transit vehicle communication and control system	Future	APTS05-01
	AC Transit	Transit Planning Document Archival and Data Warehouse	Transit operation data archive	Future	AD1-4
	AC Transit	Transit Signal Priority (TSP) Feedback Capability	Transit Communication	Existing	APTS09-01
	BART	EZ Rider Smart Card	Parking Payment System	Ongoing	ATMS16-6
	BART	Fare Collection System	Transit fare collection system	Existing	High-Level Diagram APTS04-02
	BART	Radio Communications	Transit vehicle radio communication	Existing	APTS02-02
	BART	Station Database/E-BART	Bart extension to East Contra Costa County with associated transit management	Existing	AD1-4
	BART	Train Arrival Signs and Annunciator System	Transit vehicle arrival sign and annunciation system for the travelers	Existing	APTS08-03
	Benicia	Fareboxes, Probe, and Computer Program	Improve the reliability of data from fareboxes	Future	APTS04-12
	Benicia	Radios	Improve communications between buses	Future	APTS02-11
	Benicia	Scheduling Software	Scheduling paratransit trips throughout service area	Future	APTS03-5
	Caltrain	Automatic Passenger Counters (APC)	Automatic passenger counting system	Future	APTS10-5
	Caltrain	Caltrain Transit Asset Management System (CTAMS)	This project will further the development of the Caltrain Transit Asset Management System (CTAMS) with activities that may include, but not be limited to: 1) Integration of CTAMS into a relational database, 2) continuation of the build-out	Future	AD1-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
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	Caltrain	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	High-Level Diagram APTS04-04
	Caltrain	Positive Train Control	Implement a positive train control system with an on-board display and automated braking to enhance safety for Caltrain.	Ongoing	APTS01-8
	Caltrans	Bay Area Video Upgrade	Transit vehicles/infrastructure surveillance system upgrade	Future	APTS08-04
	Caltrans	EI Camino Real Signal Interconnect	With San Mateo C/CAG.	Ongoing	ATMS03-02
	Central Contra Costa Transit Authority	Automatic Vehicle Location (AVL) Vehicle Probe	Automatic vehicle location system	Existing	APTS01-6
	ECCTA	Automatic Vehicle Location (AVL) System	Automatic vehicle location system	Ongoing	APTS01-6
	Fairfield/Suisun Transit	Automatic Vehicle Location (AVL) System	Automatic vehicle location system	Future	APTS01-6 APTS02-11 APTS03-5
	Fairfield/Suisun Transit	Communications Master Plan	Transit management improvement	Future	N/A
	Fairfield/Suisun Transit	Intelligent Transportation Systems (Automatic Vehicle Location (AVL), Transit Signal Priority (TSP) for City transit operators)	Automatic vehicle location system	Existing	APTS09-07
	GGBHTD	Advanced Communication and Information System	Computer Aided Dispatch (CAD)/Automatic Vehicle Location (AVL), RTIS, Transit Signal Priority (TSP), bus telecom system, ATIS, APC, AVM, AVA	Ongoing	APTS01-3 APTS02-05 APTS06-3 APTS08-06 APTS10-2
	GGBHTD	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Future	High-Level Diagram APTS04-06
	GGBHTD	Ferry Automatic Fare Collection (AFC)	Ferry Fare Management with new faregates and TVMs and data system	Future	APTS04-14
	GGBHTD	Transit Fare Collection System	Bus fare management with farebox and data system upgrade	Existing	APTS04-05
	LAVTA	Automatic Passenger Counters (APC)	Identifying transit passenger number	Existing	APTS10-2
	LAVTA	Cameras Vehicle Condition, Detectors and Driver Safety Training	Transit vehicle surveillance	Ongoing	APTS05-05
	LAVTA	Communication	Communication dispatch, operators, road	Existing	APTS02-06



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		Radios	sup.'s		APTS03-2
	LAVTA	Dispatch Phone Recorder	Record and archive dispatch phone calls	Existing	AD1-4
	LAVTA	Engine Monitoring Software	Monitor engine conditions and report as needed	Existing	APTS06-3
	LAVTA	Farebox	Fare collection and passenger count reporting	Existing	APTS04-07 APTS10-2
	LAVTA	Farebox Collection System	Transit fare collection	Existing	APTS04-07
	LAVTA	Mobile Data Terminal	Communicate driver and mechanical info	Existing	APTS02-06 APTS03-2 APTS06-3
	LAVTA	On-Board Communications	Transit vehicle communication system	Existing	APTS02-06
	LAVTA	Onboard Security Cameras	Transit vehicle surveillance. Provide visual coverage of bus (digital storage)	Existing/Ongoing	APTS05-05
	LAVTA	Paratransit Interactive Phone/Web Scheduling Software	paratransit management	Future	APTS03-2
	LAVTA	Phone Line Recorder	Record and archive CS phone calls	Existing	AD1-4
	LAVTA	Scheduling Software	Allow for fixed route scheduling and mapping	Existing	APTS02-06
	LAVTA	Scheduling Software	Para Transit scheduling and mapping	Existing	APTS03-2
	LAVTA	Transit Infrastructure Security Cameras	Provide visual coverage of building entrances	Ongoing	APTS05-05
	LAVTA	Web Interface	Receive, process and track comments	Existing	APTS08-07
	Livermore	Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Existing	APTS09-07
	MTC	Clipper® Electronic Fare Collection	Regional electronic fare payment system for transit.	Existing	High-Level Diagram APTS04-01 APTS04-02 APTS04-04 APTS04-06 APTS04-08 APTS04-09 APTS04-12 APTS04-13 APTS04-14
	Petaluma	Paratransit Scheduling & Dispatch Software	Schedule optimal paratransit runs, track rider usage, provide a platform for real-time dispatching (via cell phone/smart phones in vehicles) and data reporting.	Ongoing	APTS03-7
	SamTrans	Advanced Communications System	Transit Communication	Existing	APTS02-10 APTS03-4
	SamTrans	Automatic Passenger Counter	Automatically record passenger number	Ongoing	APTS10-3



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		(APC) Expansion			
	SamTrans	Communications System Upgrade	Transit Communication	Existing	APTS02-10 APTS03-4
	SamTrans	El Camino Real Bus Rapid Transit (BRT)	Coordinated Transit System	Future	APTS07-5
	SamTrans	Fare Collection System Replacement	Fare collection	Existing	APTS04-10
	SamTrans	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	APTS04-12
	SamTrans	Manual Pass - Class Counts	Fare collection / passenger counting	Existing	APTS04-10
	SFMTA	Automatic Passenger Counter System	Passenger counting system	Ongoing	APTS10-4
	SFMTA	Geary Bus Rapid Transit (BRT)	Bus rapid transit on Geary	Future	APTS09-04
	SFMTA	Paratransit Debit Card	Transit fare collection	Ongoing	APTS04-15
	SFMTA	Scheduling/Auto-Dispatch Systems	(just fixed route)	Ongoing	APTS02-07
	SFMTA	Ticket Vending Machine and Subway Fare Gate Replacement	Transit fare collection	Ongoing	APTS04-08 APTS04-09
	SFMTA	Van Ness Bus Rapid Transit (BRT)	Bus rapid transit on Van Ness	Future	APTS09-04
	Solano County Transit (SolTrans)	Solano County Transit Automatic Vehicle Location System	Automatic vehicle location system	Ongoing	APTS01-6
	VTA	Centrally Managed Archive Database	Archive real-time feed from the existing applications, including vehicle status data from orbital database and SCADA database, planning data from Trapeze, maintenance data from FIS/SAP, driver assignment data from FIS/BDT.	Future	AD1-11
	VTA	Develop Communications Architecture	The communication architecture will focus on a wide bandwidth communication infrastructure that will meet all transit communication needs and supports an integrated transit ITS system.	Future	N/A
	VTA	Electronic Fare Collection System	Electronic fare collection using the Clipper® card	Existing	High-Level Diagram APTS04-13
	VTA	Incident reporting for LRT	Develop an incident reporting system for LRT. The LRT incident reporting system should be interfacing with SCADA and incorporate automated report generating features.	Future	APTS01-5 APTS05-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
	VTA	Intrusion Detection and Warning	Intrusion detection and warning system at specific locations of the right of the way for light rail. Prevent conflicts between conflicts between left turn and straight moving vehicles	Future	APTS05-10
	VTA	Obtain Real-time Fare Data	Receive the real-time payment data (and potentially O-D data associated with the payment information) in real-time from the Clipper program	Future	APTS04-13
	VTA	Traffic Surveillance System for Transit Operations	Bring in the traffic surveillance videos from selected intersections into the Operations and Control Center (OCC) in order for OCC personnel to determine the level of traffic congestion problems at key spots and to make recommendations to bus drivers to r	Future	APTS02-12
	VTA	Updated Light Rail Control System	Upgrade the existing SCADA system with a system that supports advanced train control and monitoring functions.	Future	APTS02-13
	Water Emergency Transportation Authority	Electronic Fare Collection	Integration with the regional fare management system (Clipper)	Ongoing	High-Level Diagram APTS04-16
	WestCAT	Automatic Passenger Counters (APC)	Automatic passenger counting system	Future	APTS10-3
	WestCAT	Electronic Farebox/Collection	Transit fare collection system	Existing	High-Level Diagram APTS04-12
Transit Security	AC Transit	Alternate Emergency Computer Center for Operational Continuity	Transit emergency management	Future	N/A
	Benicia	Security Cameras and Control Station	Enhance security on board buses	Future	APTS05-08
	LAVTA	In-Vehicle Security Technologies such as Panic Button	Transit security system	Existing	APTS05-05
	SFMTA	Subway & Surface Platform Closed Circuit Television (CCTV) Replacement - Station Related	ITS field devices deployment	Future	APTS05-06
	WestCAT	Security Updates	Transit security monitoring system	Future	APTS05-08
Transit Vehicle Priority	AC Transit	Bus Signal Priority	Allow transit vehicles higher priority at intersections	Ongoing	APTS09-01
	Gilroy	Gilroy Community Bus Signal Priority	Transit Signal Priority	Future	APTS02-11
	LAVTA	Transit Signal Priority (Vehicle to	Allowing transit vehicles higher priority at intersections	Existing	APTS09-03



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
		Roadside)			
	Napa Valley Transit	Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Future	APTS09-07
	SamTrans	Adaptive Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Ongoing	APTS09-06
	SamTrans	Signal Prioritization (Part of VTA Bus Rapid Transit)	(vehicle to roadside)	Ongoing	APTS09-09
	SFCTA	Doyle Drive Value Pricing	Transit signal priority and varying toll rates	Future	APTS09-04
	SFMTA	Transit Signal Priority	Allow MUNI transit vehicles priority at intersections	Ongoing	APTS09-04
	Solano County Transit (SolTrans)	Transit Signal Priority (Vehicle to Roadside)	Allowing transit vehicles higher priority at intersections	Future	APTS09-07
	VTA	El Camino Rapid Transit Project	Implement Rapid line 522 improvements in the El Camino Real/The Alameda corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Future	APTS09-09 APTS09-10
	VTA	King Road Rapid Transit Project	A new BRT line from Berryessa BART to Santa Clara Caltrain via King Rd/Alum Rock/Santa Clara/The Alameda/ECR. Takes advantage of existing BRT upgrade for SCAR, but also establishes BRT upgrades along King Road, including signal priority. Implement Rapid T	Future	APTS09-09 APTS09-10
	VTA	Monterey Hwy Rapid Transit Project	Rapid Transit Project on Monterey Highway	Future	APTS09-09 APTS09-10
	VTA	Rapid 522 Bus Signal Priority (BSP)	Allowing transit vehicles higher priority at intersections	Existing	APTS09-09 APTS09-10
	VTA	Santa Clara/Alum Rock Transit Improvement/BRT	Implement Rapid Transit improvements in the Santa Clara/Alum Rock route, including: dedicated guideways, signal prioritization, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Future	APTS09-09 APTS09-10
	VTA	Signal Prioritization (Part of VTA Bus Rapid Transit)	(vehicle to roadside)	Ongoing	APTS09-10
	VTA	Stevens Creek Rapid Transit Project	Implement Rapid Transit improvements in the Stevens Creek corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium BRT stations, real-time information, and specialized	Future	APTS09-09 APTS09-10



Category	Stakeholder	Project Name	Project Description	Project Status	ITS Service Diagram
			vehicles.		
	VTA	Sunnyvale-Cupertino Rapid Transit Project	Rapid transit Project between Sunnyvale and Cupertino	Future	APTS09-09 APTS09-10
Traveler Information	Benicia	Destination Signs	Public Information	Existing	APTS08-11
	Caltrans	GGNRA - Traveler Information System	Provide traveler information for the Golden Gate National Recreation Area (GGNRA) through the 511 system. 511 users will be able to obtain congestion information on US 101 and Highway 1, as well as real-time transit information for transit service operations	Future	High-Level Diagram High-Level Diagram ATIS01-01 ATIS01-02 ATIS01-03
	Contra Costa Transportation Authority	Real-Time Ridematching	SR 4 Traffic Management Program 3-County Real-Time Ridematching	Future	ATIS08-1
	County of Santa Clara	SCC Motorist Traffic Information and Advisory Systems	Motorists traffic information and advisory systems (electronic changeable message signs, advisory radio and web page)	Future	ATIS01-25 ATIS01-26 ATMS06-10
	MTC	511 Rideshare/Bicycle Information	Regional rideshare and bicycling information via 511 phone number and 511.org and includes ridematching and bikemapping tools.	Existing	High-Level Diagram ATIS01-03
	MTC	511 Traffic Information	Regional traffic information via 511 phone number, 511.org, CMS, etc. and includes traffic speeds, incidents, driving times, predicted travel times, parking, etc.	Existing	High-Level Diagram ATIS01-01 ATIS01-02
	San Jose	City Hall Traveler Information Center	Traveler information collection, processing, and dissemination	Ongoing	ATIS01-17
	San Jose	Downtown San Jose CMS Upgrades	Upgrades aging changeable message sign infrastructure in Arena area	Ongoing	ATMS06-06
	SF Department of Public Works	Trip Planner for Pedestrians with Disabilities	Web based trip planner for pedestrians with disabilities. Data includes curb ramps, audible signals and blue zone parking.	Future	ATIS02-6
	SFMTA	Automatic Vehicle Location (AVL) and Vehicle Arrival Predictions	Automatic Vehicle Location (AVL) and Vehicle Arrival Predictions	Existing	APTS01-4 APTS08-13
	SFMTA	City Services 311 Information System	Traveler information system	Existing	N/A
	SV ITS - San Jose Program Manager	Silicon Valley - Intelligent Transportation System (SV-ITS) Traveler Information Website Phase I	Traveler information website	Existing	ATIS01-21
	Water Emergency Transportation Authority	Predictive Ferry Arrival and Departure Information	Real-time traveler information	Future	APTS08-16

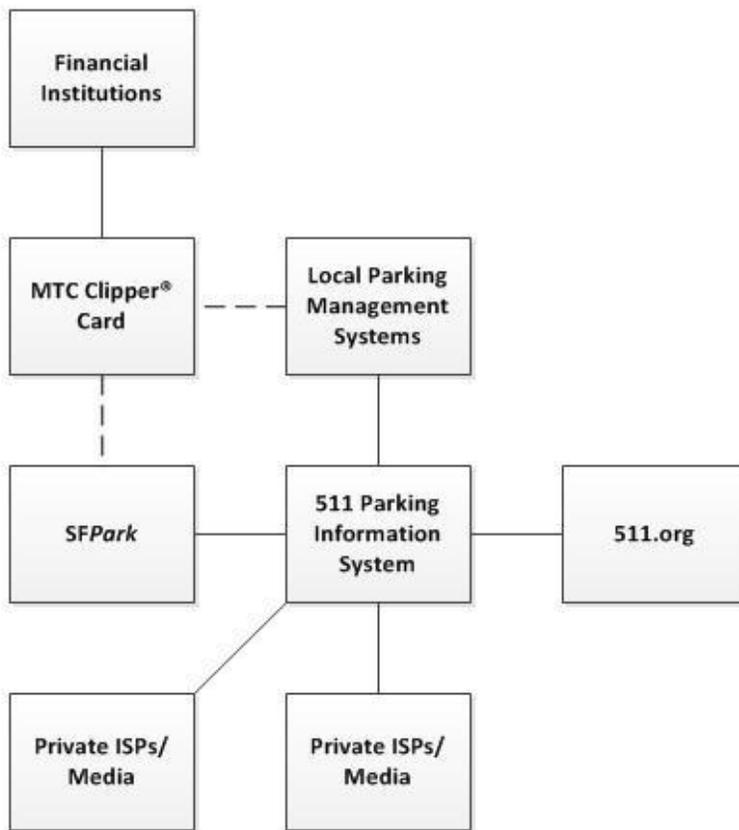
APPENDIX F – REGIONAL ITS PROJECTS

511 - PARKING

Introduction

The following high-level diagram and description are intended as an introduction to this program. An agency interested in integrating their project can access this page as a single source of information for highly complex, regional projects that are:

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[511](#)

[City-owned Parking Garages](#)

[EZ Rider Smart Card](#)

[GGNRA Parking System](#)

[Local City/County Parking Management System](#)

[Regional Parking Garages and Parking Meters](#)

[Regional Parking Operations Administration](#)

[SFgo Transportation Management System](#)

[SFMTA Parking Data Server](#)

[User Personal Computing Devices](#)

Project Overview

Enhancements to the 511 traveler information system through the Bay Area Urban Partnership Program will integrate real-time parking data. The Urban Partnership program is a congestion relief demonstration project in the Bay Area funded by the Department of Transportation (DOT). The project features, SFpark, a parking management system in San Francisco that sets variable parking rates for on and off street parking based on demand. Variable pricing allocates parking supply more efficiently, reducing congestion from drivers searching for spaces and creating incentives for people to use alternative modes of transportation. Real-time pricing and parking availability data will be collected from sensors and parking meters.

The Bay Area 511 system will disseminate real-time parking pricing and occupancy information from SFpark and future parking management systems operated by local jurisdictions. 511 users will be able to access parking information through the 511 phone system, web site and mobile applications. Real-time status updates, i.e. 'Lot Full' or 'Available' will be provided to 511 parking through a data feed that is compatible with the regional parking message standard. The local parking management systems will interface with 511 parking using Java Messaging Services (JMS).

See also the descriptions of the [511 Real-time Transit](#) project, the [511 Traffic](#) project, and the [511 Regional Transit Information System](#) project for more detail about other 511 services.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with 511 parking services, information about 511 data feeds and application programming interfaces (API) are available at:

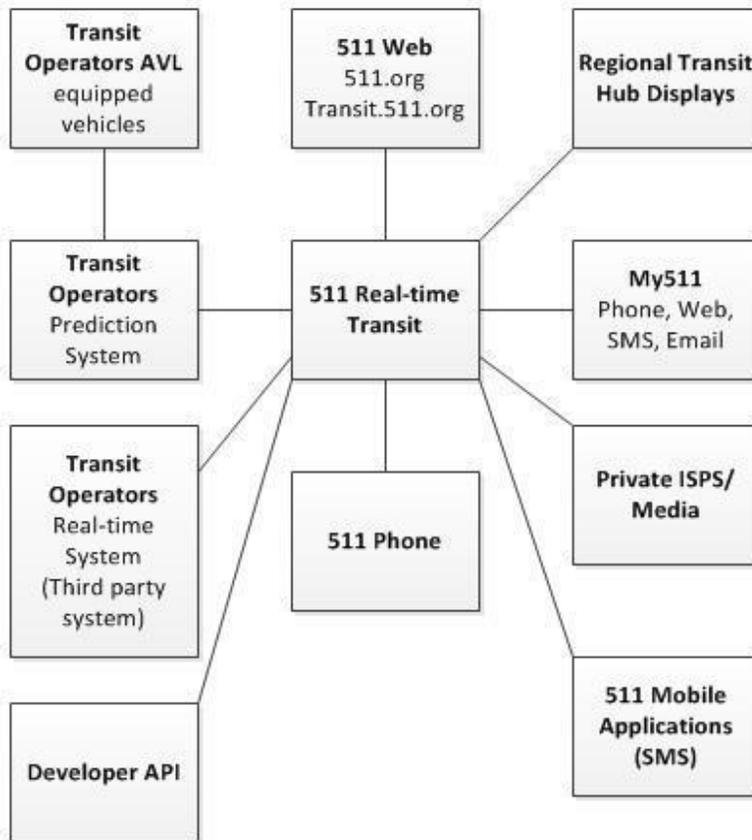
<http://511.org/developer-resources.asp>

511 - REAL-TIME TRANSIT

Introduction

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[511](#)

[511 Regional Real-time Transit](#)

[AC Transit Operations System](#)

[BART Transit/Rail Operations System](#)

[Caltrain Predictive Arrival/Departure System \(PADS\)](#)

[Dumbarton Express Transit Operations](#)

[MUNI Fixed Route Transit Operations](#)

[Private Sector Provider \(NextBus\)](#)

[User Personal Computing Devices](#)

[West Cat Transit Operations](#)

Project Overview

MTC provides static transit data and real-time transit departure information through the 511 web and phone systems and through display signs at regional transit hubs.

511 Real-time Transit provides transit users with predictive departure time information. This information is a valuable service for transit users, allowing for accurate trip planning and reduced uncertainty about the transit schedule. MTC is the funding agency for real-time transit information deployment in the region, working with transit operators to make this information available to the travelling public through the 511 traveler information services. The public can access the real-time departure times for six transit agencies participating in the service by going to 511.org or sending a text message. A system of stop identification numbers has been deployed across the region. Transit agencies are posting stop ID numbers at stops and stations to enable users to easily obtain departure time information.

The transit agencies maintain a connection to the regional system to supply MTC with a XML transit data feed. MTC requires the transit agencies to transfer real-time transit data from their systems using a Java Message Services (JMS) interface or Web Services standards. Transit providers that participate in the Regional System are required to adhere to these technical requirements and their roles and responsibilities defined in agreements with MTC. The agreements and requirements ensure that transit data is provided to the public in a reliable and timely manner. By integrating the transit feeds and connections to the Regional System through the framework of the Bay Area Architecture, data sharing and consistency is maintained.

MTC makes transit data feeds available to the general public, public agencies and 3rd party developers. An Application Programming Interface (API) is available for 511 Real-time Transit Departures, providing developers access to predictive transit arrival information provided by transit agencies in the Bay Area.

See also the descriptions of the [511 Parking](#) project, the [511 Traffic](#) project, and the [511 Regional Transit Information System](#) project for more detail about other 511 services.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with 511 real-time transit data services, information about 511 data feeds and application programming interfaces (API) are available at:

[511 Developer Resources](#)

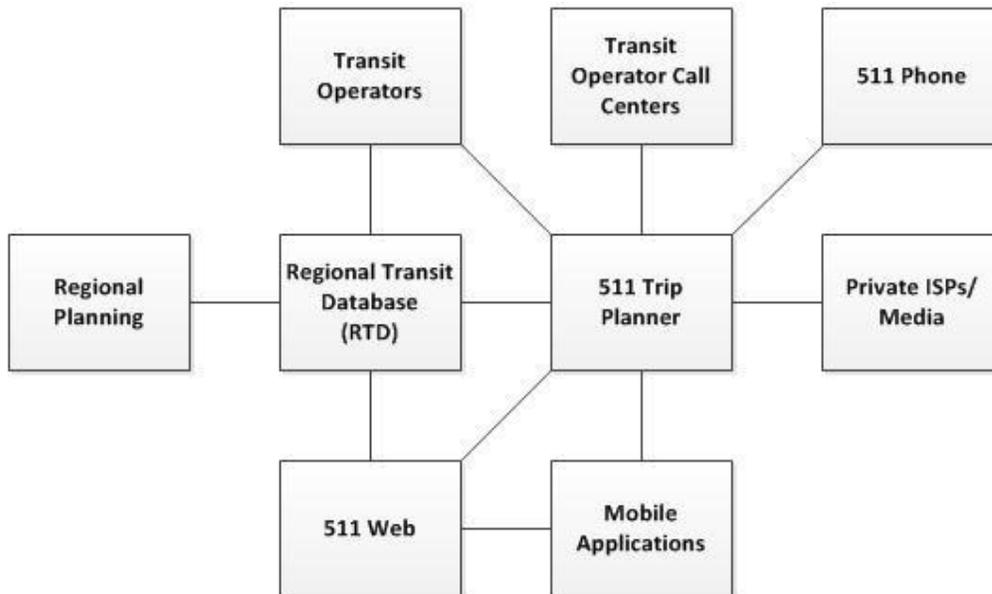
[MTC Transit Coordination Implementation Plan](#)

511 - REGIONAL TRANSIT INFORMATION SYSTEM

Introduction

The following high-level diagram and description are intended as an introduction to this program. An agency interested in integrating their project can access this page as a single source of information for highly complex, regional projects that are:

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The diagram is a non-technical, conceptual illustration of the interconnections and information exchanges between the sub-elements of the overall program. Resource links to the project's available technical documentation such as functional requirements, standards, and concept of operations are provided for more information. More detailed information regarding interconnects and related architecture content can be found in the links to the ITS elements below.

[511](#)

[511 Regional Trip Planner](#)

[Regional Transit Databases](#)

[Sub-regional and Local City/County Transit Operations Systems](#)

[Transit Agency Call Centers](#)

[User Personal Computing Devices](#)

Project Overview

The Regional Transit Information System (RTIS) includes a number of projects designed to provide up-to-date transit information to the public and to MTC's transportation partners. At the heart of the RTIS is the Regional Transit Database (RTD) – a spatially enabled relational database (Oracle/SDE) where current transit data is maintained.

The RTD system design and open architecture is used to extract transit data for use in applications developed by MTC and its transit agency partners. The data exchange process uses a XML schema and data definition to standardize the datasets from each various transit providers. The use of a singular format allows the RTD to import the data in the XML files despite the different scheduling systems used by the transit providers. Smaller transit systems that do not have complex software scheduling systems provide their data in a variety of formats to MTC, which converts them to reside in the RTD. The data in the RTD is used by MTC's Regional Transit Trip Planning applications to generate transit itineraries for transit call center operators and the general public. The RTD also supports MTC's transit information web site that provides schedule, fare, route and map information for all transit services in the region.

Regional transit trip planning, one of MTC's first applications designed to use the RTIS and the RTD, is performed through call centers and over the Internet. Transit call center operators use the trip planning application to provide high quality, personalized, cross-jurisdictional and multi-modal information to the public over the telephone. Over the Internet, the general public can use the 511 Transit Trip Planner – MTC's Internet trip planning interface - to generate many itineraries or revise a single one many times to find the best transit solution. Users input where they are, where they want to go and when they want to get there; they do not need to be familiar with transit providers, routes or schedules. The 511 Transit Trip Planner supplies a customized itinerary and interactive map, based on user-specific variables, such as "fastest time" or "least amount of transfers."

MTC makes transit data feeds available to the general public, public agencies and 3rd party developers. The 511 Transit Static Data feed provides the data user access to the transit information integrated by the 511 system, including schedules, stop locations, and route information for transit agencies and service providers in the region. 511 system, including maps, schedules, and fares for transit agencies and service providers in the region. A separate Application Programming Interface (API) is available for 511 Real-time Transit Departures, providing developers access to predictive transit arrival information provided by transit agencies in the Bay Area.

See also the descriptions of the [511 Parking](#) project, the [511 Traffic](#) project, and the [511 Real-time Transit](#) project for more detail about other 511 services.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with 511 real-time transit data services, information about 511 data feeds and application programming interfaces (API) are available at:

[511 Developer Resources](#)

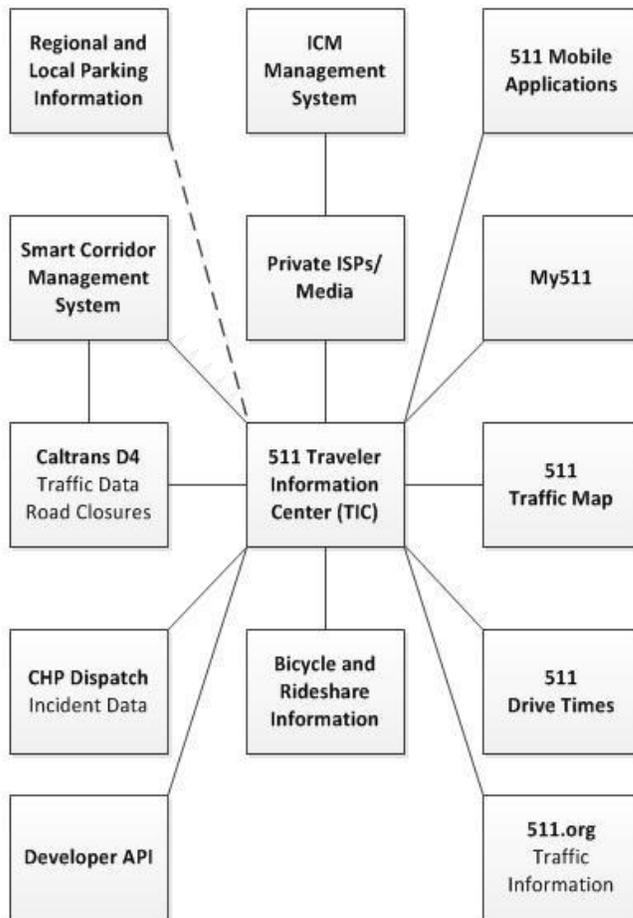
[MTC Transit Coordination Implementation Plan](#)

511 - TRAFFIC

Introduction

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[511](#)

[California Statewide Crash Information System](#)

[Caltrans D-4 Public Information System](#)

[Caltrans D-4 TMC Roadside Equipment \(TOS\)](#)

[Caltrans D-4 Transportation Management System](#)

[CHP Computer Aided Dispatch](#)

[East Bay SMART Corridor ATMS](#)

[I-80 ICM Management Center](#)

[Local City/County Parking Management System](#)

[MTC Roadside Equipment](#)

[MTC TIC](#)

[Private Sector Traveler Information Services](#)

[San Jose Transportation Management System](#)

[San Mateo County Smart Corridor ATMS](#)

[Silicon Valley SMART Corridor ATMS](#)

[SR 4 East SMART Corridor ATMS](#)

[User Personal Computing Devices](#)

Project Overview

The Bay Area 511 system has been providing traveler information services since 2002. The 511 system offers the public a one stop resource for real-time traffic conditions, transit trip planning including transit schedules, real-time transit departure times, ridesharing and bicycle information in the nine-county region. Traveler information is disseminated through 511 phone, web (511.org, tranit.511.org) and mobile applications. Data aggregated by the 511 system is available to third-party web sites and application developers who can use data feeds and Application Programming Interfaces (APIs).

The system is operated by staff at the 511 Traveler Information Center (TIC), which is collocated with the Caltrans TMC. The TIC is staffed 24/7 with operators to on hand to verify incidents and update the traffic and transit incident data in the system. A number of enhancements have been made to Bay Area 511, providing new tools and enhancements to the traveler information services provided to the public:

- Expansion of the transit trip planner to cover rail, bus and ferry services for 34 transit providers in the Bay Area and adjacent counties and enable comparison between transit, driving, and drive-to-transit trips;
- A real-time transit information system that provides predictive departure times for 95% of transit customers;
- Real-time transit departure information to 56 transit hub signs;
A regional database of 35,000 contacts to facilitate the rideshare program;
A data feed disseminate drive times on changeable message signs (CMS);
MY511, a personalized service to customize access to traffic and transit information; and
- Real-time parking pricing and availability data.



Drivers in the Bay Area have access to real-time traffic conditions at traffic.511.org or on a mobile device (m.511.org). Several tools are available to the public including a traffic map, predicted drive times, incident information and planned road closures. Several agencies are partnered with MTC to provide real-traffic data to the 511 system. Loop detector data and CCTV camera images from regional freeways are transmitted to the 511 TIC at the Caltrans District TMC in Oakland. The CHP's computer aided dispatch system provides information to the 511 system on incidents and assists with the dispatch of the Freeway Service Patrol to clear accidents.

MTC makes traffic data feeds available to the general public, public agencies and 3rd party developers. The 511 Traffic Data feed provides the data user access to the traffic information integrated by the 511 system, including real-time travel time and speed data and CHP incident reports. An Application Programming Interface (API) is available for 511 Driving Times', providing developers access to trip planning tools that use the information from the various real-time traffic data sources.

See also the descriptions of the [511 Real-time Transit](#) project, the [511 Parking](#) project, and the [511 Regional Transit Information System](#) project for more detail about other 511 services.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with 511 real-time transit data services, information about 511 data feeds and application programming interfaces (API) are available at:

[511 Developer Resources](#)

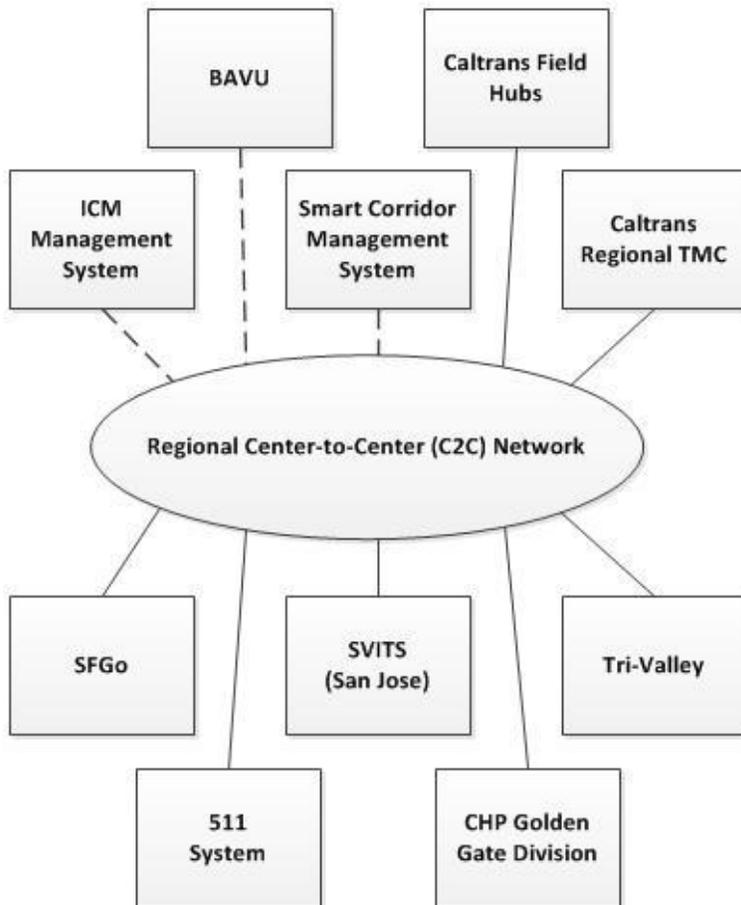
Stakeholders should contact MTC 511 staff about specific project proposals.

BAY AREA CENTER-TO-CENTER NETWORK

Introduction

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[Caltrans D-4 Transportation Management System](#)

[CHP Computer Aided Dispatch](#)

[MTC TIC](#)

[I-80 ICM Management Center](#)

[I-580 SMART Corridor ATMS](#)

[SFgo Transportation Management System](#)

[Silicon Valley SMART Corridor ATMS](#)

[San Mateo County Smart Corridor ATMS](#)

[San Jose Transportation Management System](#)

[SR 4 East SMART Corridor ATMS](#)

Project Overview

The Bay Area Center-to-Center (C2C) network is a project identified in the Freeway Concept of Operations Study completed by the Metropolitan Transportation Commission (MTC), Caltrans District 4 and the California Highway Patrol (CHP). The goal of the C2C network is to facilitate data sharing among Caltrans, Smart Corridor programs, the Integrated Corridor Mobility (ICM) program, CHP, local transportation agencies and traveler information services. The C2C network will support the exchange of real-time traffic data and video to better coordinate freeway operations, incident response and traveler information dissemination. The system will also support the ability to share control of devices during certain operational scenarios. Implementing the C2C network will be accomplished through the following key activities:

- Communications Network – Implementing a physical infrastructure to connect the Caltrans Regional Traffic Management Center (TMC) to other TMCs, Caltrans field hubs and CHP operation centers.
- Software Integration – Developing data interfaces that are compliant with NTCIP standards to support interoperability.
- Data and Video Sharing Policies – Drafting policies that define agency roles, responsibilities and procedures for sharing data.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the Bay Area Center-to-Center network project, the following resources are available describing technology requirements, operational roles and responsibilities and other related information.

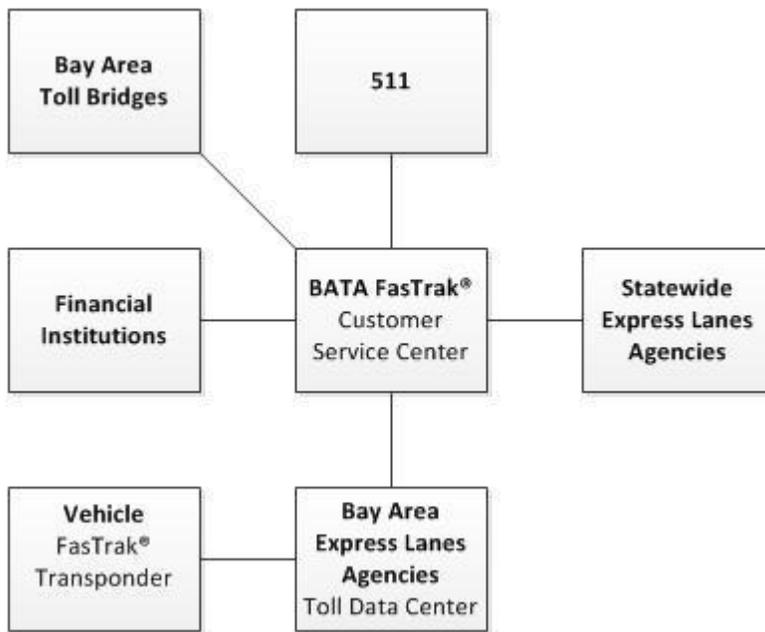
[MTC Arterial Operations Committee - Freeway Concept of Operations Deliverables](#)

BAY AREA EXPRESS LANES NETWORK

Introduction

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[511](#)

[Bay Area Toll Collection/FasTrak Field Equipment](#)

[Bay Area Toll Authority Administration/FasTrak System](#)

[Express Lane Operations](#)

[Express Lane Roadside Equipment](#)

[I-580 HOT Lane Roadside Equipment](#)

[I-580 Toll Operations](#)

[Open Road Tolling Equipment](#)

[Open Road Tolling System Operations](#)

[Personal Vehicles with toll tags](#)

Project Overview

MTC, the Bay Area Toll Authority (BATA), Caltrans, CHP and the county congestion management agencies are working together to develop a network of Express Lanes across the region. Express Lanes offer solo drivers the option of paying a toll to use the lanes to bypass traffic congestion on the freeway. Toll rates depend on the level of traffic congestion, but are set at a level to maintain free flow speeds on the Express Lanes. FasTrak® transponders are used for electronic toll collection, eliminating the need for drivers to pay cash at toll booths on Express Lane facilities.

The first Express Lane facility in the Bay Area opened on September 2010 on a 14-mile segment of I-680 through the Sunol Grade in Alameda and Contra Costa counties. An expanded Express Lane network across the Bay Area was proposed in an application submitted by MTC in September 2011 to the California Transportation Commission (CTC) for authorization to develop and operate Express Lanes in the region. The proposal calls for adding 290 miles to the 280 miles of existing or authorized Express Lanes in the region. The goal of the regional Express Lane network is to close gaps in the existing HOV lane system, support efficient usage of HOV lanes and provide transportation users with a reliable travel option.

In the Bay Area and throughout California, a single transponder can work on any toll bridge and Express Lane facility. Transponders and toll readers are required to meet Title-21 standards, which defines communication and equipment specifications for interoperability. Supporting transponder interoperability is the coordination of back office activities among the toll bridge and express lane operators for account processing, enforcement and payment collection. As vehicles use different Express Lane facilities or cross county boundaries, the Express Lane operators need to exchange information about transponder tags, debit accounts and transmit payments to partner agencies. Agreements among the operating agencies spell out the business rules for the reciprocal exchange of data and the data formats for transmitting and receiving data.

Back office operations to process Bay Area FasTrak® transactions are consolidated under a regional customer services center operated by the Bay Area Toll Authority (BATA). BATA is responsible for FasTrak® account administration for toll bridges, parking at San Francisco International Airport and Express Lanes. Express Lane agencies maintain separate operations centers to track usage on express lane facilities.

The 511 program will collect traffic speed data for Express Lanes where available and could be enhanced to provide travelers with information about travel time savings in Express Lanes, helping to inform travel choices.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the Regional Express Lane network, the following resources are available describing technology requirements, operational roles and responsibilities and other related information.

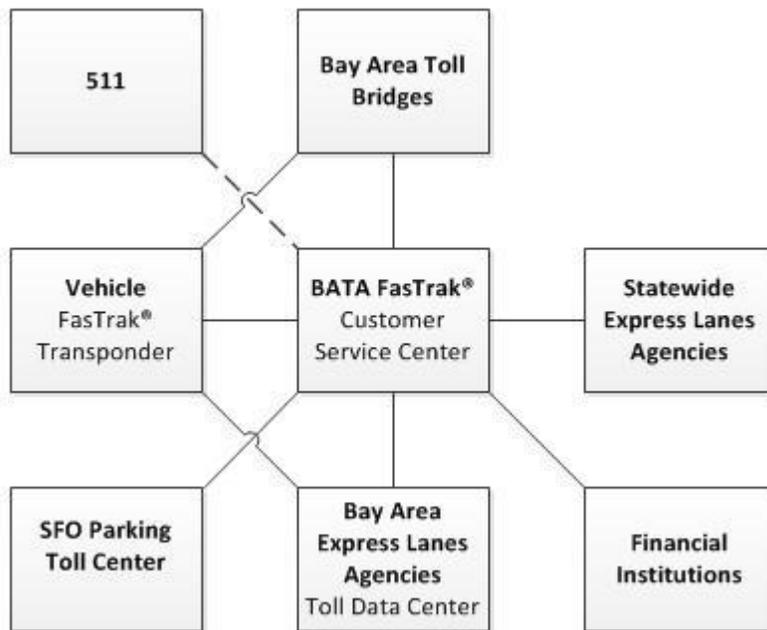
[MTC Planning - Regional Express Lane Network](#)

BAY AREA FASTRAK® PROGRAM

Introduction

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[511](#)

[Bay Area Toll Authority Administration/FasTrak System](#)

[Express Lane Operations](#)

[Express Lane Roadside Equipment](#)

[Financial Institutions](#)

[Open Road Tolling Equipment](#)

[Open Road Tolling System Operations](#)

Project Overview

The Bay Area Toll Authority (BATA) operates under the Metropolitan Transportation Commission (MTC) and is responsible for administering toll revenue generated by the region's seven state-owned toll bridges. BATA collects tolls on behalf of the Express Lane agencies, including the Golden Gate Bridge operated by the Golden Gate Bridge, Highway and Transportation District (GGBHTD). Bay Area bridges and Express Lane facilities use electronic toll collection (ETC) systems that allow drivers to pay tolls automatically with a FasTrak® transponder, eliminating the need to stop and pay cash at a toll booth.

In the Bay Area and throughout California, a single transponder can work on any toll bridge and Express Lane facility. Transponders and toll readers are required to meet Title-21 standards, which defines communication and equipment specifications for interoperability. Supporting transponder interoperability is the coordination of back office activities among the toll bridge and Express Lane operators for account processing, enforcement and payment collection. As vehicles use different Express Lane facilities or cross county boundaries, the Express Lane operators need to exchange information about transponder tags, debit accounts and transmit payments to partner agencies. Agreements among the operating agencies spell out the business rules for the reciprocal exchange of data and the data formats for transmitting and receiving data.

Back office operations to process Bay Area FasTrak® transactions are consolidated under a regional customer services center operated by BATA. BATA is responsible for FasTrak® account administration for toll bridges, parking at San Francisco International Airport and Express Lanes. Express lane agencies maintain separate operations centers to track usage on Express Lane facilities.

The 511 system uses data collected from FasTrak® toll tags (among other data sources) to calculate speed and driving time information provided on the phone, web, and on changeable message signs. Callers to 511 can request a transfer to the FasTrak® customer service center on the phone and links are provided from 511.org websites to the FasTrak® website.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the Bay Area FasTrak® program, the following resources are available describing technology requirements, operational roles and responsibilities and other related information:

[About the Bay Area Toll Authority \(BATA\)](#)

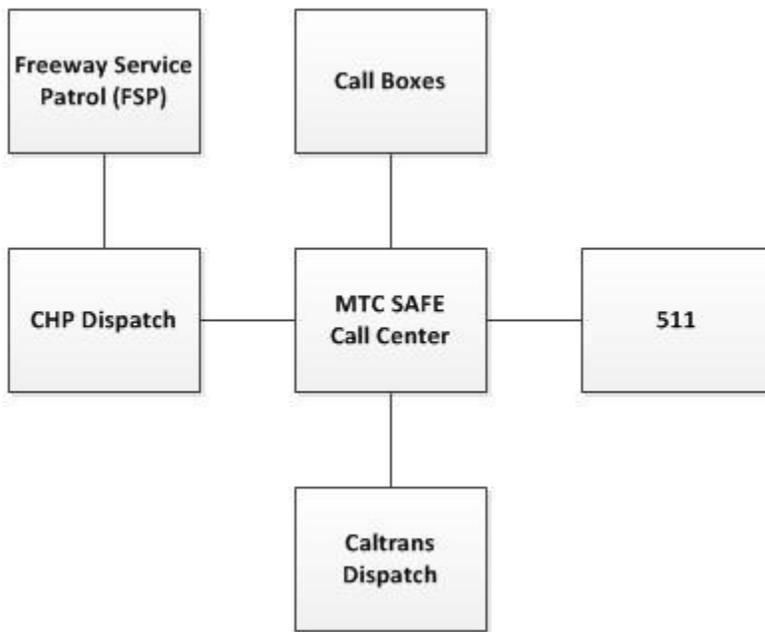
[Compatibility Specifications for Automatic Vehicle Identification Equipment \(Title 21\) Support](#)

CALL BOXES/FREEWAY SERVICE PATROL

Introduction

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[Bay Area Call Boxes](#)

[Bay Area Incident Response System \(BAIRS\)](#)

[Caltrans D-4 Transportation Management System](#)

[CHP Computer Aided Dispatch](#)

[CHP/MTC Freeway Service Patrol \(FSP\)](#)

[CHP/MTC FSP Tow Trucks](#)

Project Overview

The MTC Service Authority for Freeways and Expressways (SAFE) maintain and operate a motorist aid call box system in nine counties of the Bay Area region. The goal of the program is to reduce



congestion on highways by quickly clearing incidents. The program feature integrates MTC SAFE, Caltrans and CHP on incident management and dispatch coordination activities.

MTC SAFE manages a private call center that responds to motorists request for roadside assistance using the call box system or 511 Freeway Aid service. 511 Freeway Aid allow motorists to access call box services by dialing 5-1-1 on a cell phone. The MTC SAFE call center answers calls for regional SAFE programs including Monterey County SAFE, Santa Cruz County Regional Transportation Commission SAFE and the San Luis Obispo SAFE.

The MTC SAFE call center answers all calls and may direct the call to Caltrans or CHP for dispatch to the Freeway Service Patrol (FSP). Calls made from call boxes on regional bridges and tunnels are transferred to Caltrans while calls from freeway call boxes are transferred to CHP. 511 Freeway Aid calls are dispatched to the FSP or transferred to CHP. Emergency calls involving accidents, medical emergencies, road hazards or crimes are transferred to the CHP dispatch centers. Information for non-emergency incidents is reported electronically to CHP via a Remote Agent Terminal.

The FSP trucks have an onboard computerized communications and vehicle location system. The system allows CHP to locate and communicate with trucks to operate the fleet efficiently and to monitor performance. The FSP offers free assistance to motorists during the peak commute hours; during non-peak hours, rotational toll services operated by the CHP offer services at standard rates.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with Freeway Service Patrol (FSP) program, the following resources are available:

[Service Authority for Freeways and Expressways \(SAFE\)](#)

Bay Area Freeway Service Patrol (FSP):

<http://www.mtc.ca.gov/services/fsp/>

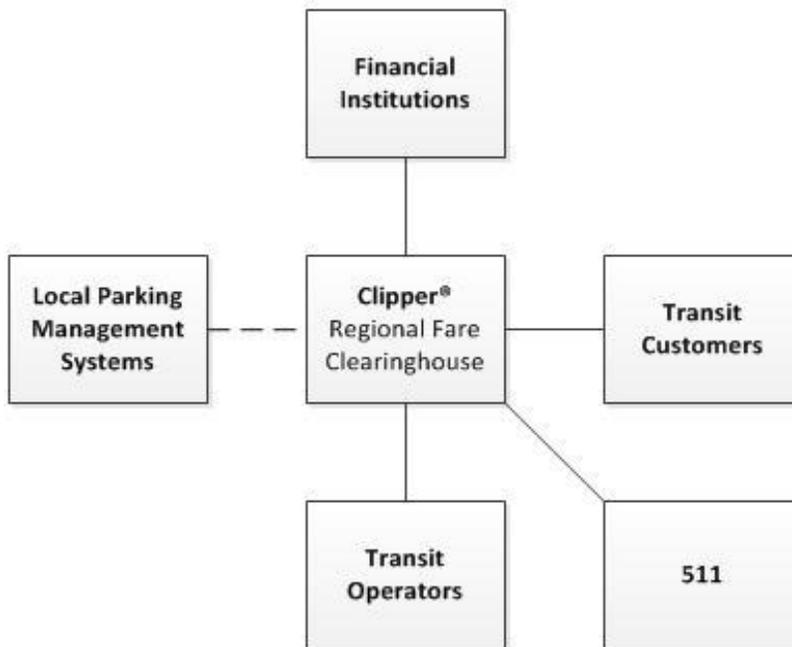
<http://www.fsp-bayarea.org/>

CLIPPER®

Introduction

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[Clipper® Central System](#)

[Clipper® Field Equipment](#)

[Clipper® Smart Card](#)

[Clipper® Vendor Network](#)

[Clipper® Website](#)

Project Overview

Clipper® is the automated fare payment system implemented by MTC and transit service providers in the Bay Area. The program was known as TransLink® until June 2010. The Clipper card is a contact less, fare instrument used to track passes and cash value for rides on any participating transit system. Operating rules and agreements with the transit service providers in Clipper enable the card to apply



fares, discounts and transfer rules for seamless travel from one transit system to another. Clipper is currently used on Muni, BART, AC Transit, VTA, SamTrans, Caltrain and Golden Gate Transit and Ferry. A phone menu option for transferring to the Clipper customer service center is provided on 511, and links to the clippercard.org website and provided from the 511.org websites.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with Clipper program, the following resources are available:

[Clipper Card Web Site](#)

[Clipper Operating Rules](#)

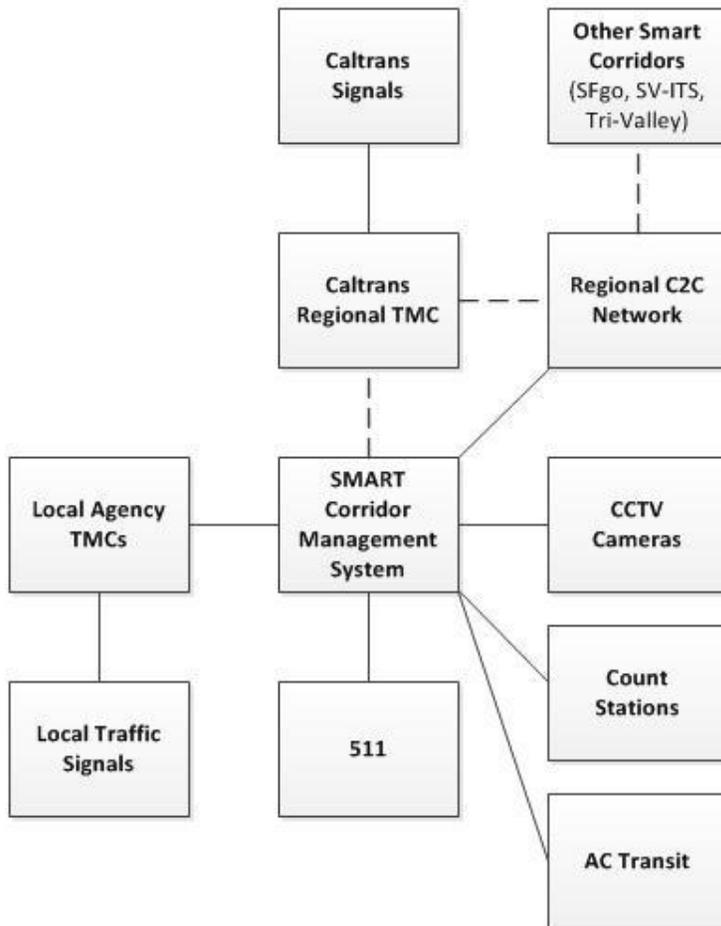
[MTC Transit Coordination Implementation Plan](#)

EAST BAY SMART CORRIDORS

Introduction

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[511](#)

[AC Transit Operations System](#)

[Caltrans D-4 TMC Roadside Equipment \(TOS\)](#)

[Caltrans D-4 Transportation Management System](#)

[East Bay SMART Corridor ATMS](#)

[East Bay SMART Corridor Roadside Equipment](#)

[Sub-regional and Local City/County Traffic Operations Systems](#)

Project Overview

The East Bay SMART Corridors program is a cooperative effort by the Alameda County Transportation Commission (Alameda CTC), Contra Costa County Transportation Authority (CCTA), and twenty-five other agencies to operate a multi-modal advanced transportation management system along the I-80 corridor (San Pablo Avenue); and the I-880 corridor, which includes International Boulevard, East 14th Street, San Leandro Boulevard/Street, Hesperian Boulevard, and Union City Boulevard. The goal of the project is to allow the participating agencies to better manage congestion and incidents along regional routes, to improve transportation mobility, efficiency and safety, and provide timely and multi-modal transportation information to agency transportation managers and to the public.

The East Bay Smart Corridors use a variety of technologies to improve the performance of transportation systems, by promoting efficient use of the existing highway and transit systems, and reducing environmental costs to the public. The following ITS elements support the SMART Corridor transportation system management strategy:

- Signal interconnect – implement traffic responsive timing;
- Communications network – exchange data and video among agencies;
- Field devices – vehicle detection systems and CCTV cameras;
- Traveler information – integration with 511 and transit signal priority; and
- Regional ITS Management – integration with the Caltrans Regional TMC and other TMCs in the region via center-to-center network.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the East Bay Smart Corridor project, the following resources are available describing technology requirements, operational roles and responsibilities and other related information.

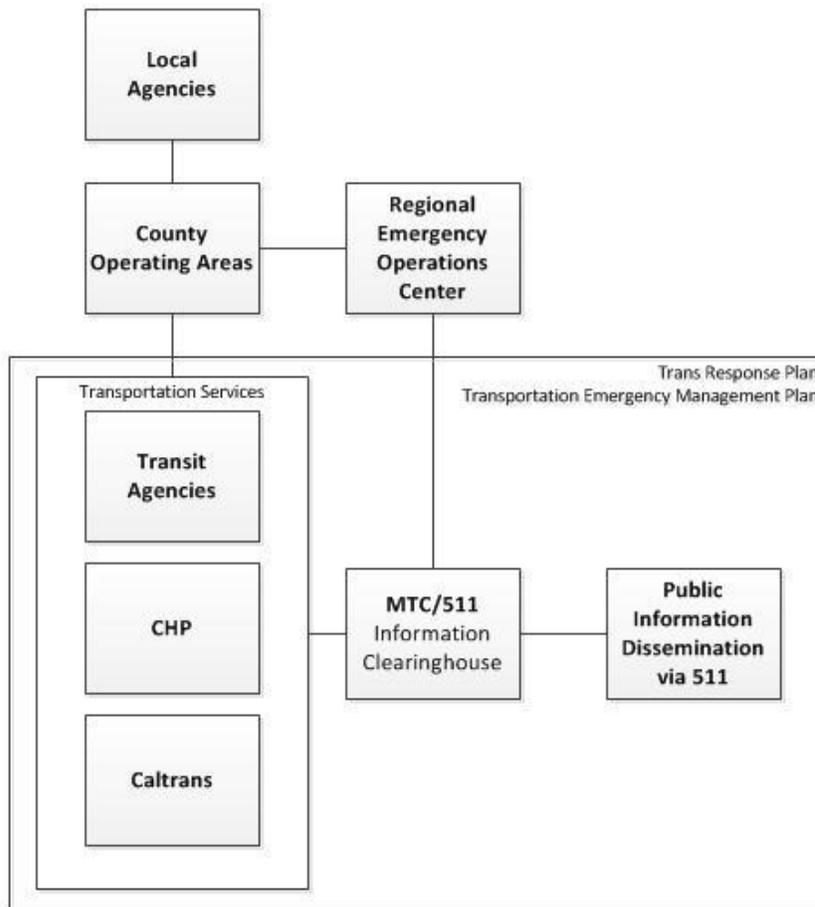
[East Bay SMART Corridors Project Website](#)

EMERGENCY MANAGEMENT

Introduction

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[511](#)

[California State EOC](#)

[Media](#)

[MTC TIC](#)

[Oakland Emergency Operations Center \(EOC\)](#)

[Regional Emergency Operations Center](#)

[San Francisco City/County EOC](#)

[San Jose Emergency Operations Center \(EOC\)](#)

[Sub-regional and Local City/County Emergency Operations Center \(EOC\)](#)

Project Overview

SAFETEA-LU provides a federal mandate that requires MTC to incorporate emergency preparedness and security in regional transportation planning. The region's ITS infrastructure is an important tool in improving the capability of government agencies to protect vital infrastructure and respond effectively to emergencies and disasters. Agencies that plan and develop their projects in accordance with the Bay Area ITS Architecture ensure that individual projects can work together, enhancing the ability for agencies to coordinate response and preparedness by sharing information seamlessly.

MTC has provided leadership in the region in coordinating transportation security and disaster planning with numerous transportation agencies. MTC with the participation of Caltrans, CHP and the Bay Area transit agencies have established plans for securing infrastructure and responding to an emergency event. The TRANS Response Plan Regional outlines the roles and responsibilities of MTC and transportation agencies during an emergency. The plan provides for transportation information clearinghouse functions and the coordination of mass movements of people and supplies. ITS elements of the transportation system have an important role in emergency response and preparedness activities:

- Center-to-center communications will take place to share information and coordinate activities;
- Use CCTV video to provide surveillance of transit facilities, roadways and bridges; and
- Collect and disseminate information to the public through 511.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the East Bay Smart Corridor project, the following resources are available describing technology requirements, operational roles and responsibilities and other related information.

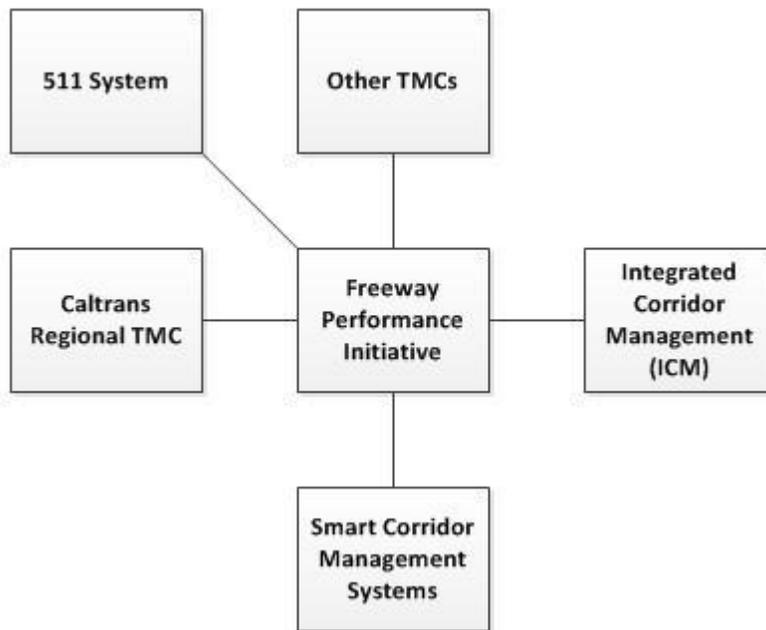
[MTC Planning - Emergency Coordination](#)

FREEWAY PERFORMANCE INITIATIVE

Introduction

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[511](#)

[Archived Data Users](#)

[Bay Area Call Boxes](#)

[Bay Area Incident Response System \(BAIRS\)](#)

[Caltrans D-4 Transportation Management System](#)

[Caltrans D-4 TMC Roadside Equipment \(TOS\)](#)

[Caltrans D-4 Performance Monitoring System \(PeMS\)](#)

[CHP/MTC Freeway Service Patrol \(FSP\)](#)

[I-80 ICM Management Center](#)

[I-580 SMART Corridor ATMS](#)

[MTC TIC](#)

[San Mateo County Smart Corridor ATMS](#)

[SR 4 East SMART Corridor ATMS](#)

[Silicon Valley SMART Corridor ATMS](#)

[Sub-regional and Local City/County Traffic Data Collection](#)

[Sub-regional and Local City/County Traffic Operations Systems](#)

Project Overview

The Freeway Performance Initiative (FPI) is one of the key investment areas in the Transportation 2035 Plan to maximize the efficiency of the existing freeway and highway system. The program is a partnership between MTC, Caltrans and local agencies throughout the region to reduce delay and improve travel reliability and safety on major freeway corridors. FPI looks to achieve greater mobility by investing in projects that address freeway bottlenecks and infrastructure gaps and using system management strategies to improve operations. The system management strategies leverage several Intelligent Transportation Systems (ITS) technologies to provide Bay Area agencies with tools to monitor performance, coordinate traffic management operations, clear incidents and provide traveler information. Technologies to manage system congestion include freeway ramp metering, changeable message signs and signal coordination on adjacent arterials. The following is a list of key ITS elements supporting the FPI program:

- [Traffic Operations System \(TOS\)](#) – The TOS is supported by a network of CCTV cameras, changeable message signs (CMS), ramp metering and vehicle detection stations (VDS) that feed traffic management centers (TMC) throughout the Bay Area with traffic data and video. With the data, personnel at the TMCs can monitor travel conditions, identify bottlenecks and incidents, and proactively manage incident traffic.
- Center-to-Center (C2C) network – A regional communications network that exchanges traffic data and video among different TMCs in the Bay Area. The TMCs are connected using data interfaces that are compliant with NTCIP protocols to maintain interoperability. The interfaces support remote access to control devices and allow centers to jointly operate traffic control devices if needed.
- [Bay Area Regional TMC](#) – The regional TMC is operated by Caltrans and serves as the clearinghouse for disseminating travel information and inter-agency coordination. Several elements such as the Traveler Information Center (TIC), Caltrans maintenance and operations staff and CHP are collocated at the Regional TMC to coordinate system management and emergency response activities.
- [Arterial Operations](#) – The management of the freeway system is done in conjunction with the optimization of major parallel arterials to the freeways. The FPI provides funding for programs that modernize and synchronize signals along major arterials.
- [511](#) – A one-stop shop for the public to access traffic, transit and rideshare/bicycling information. The 511 Traveler Information Center (TIC) is collocated at the Regional TMC, allowing for the timely dissemination of information to the traveling public. 511 supports the FPI by providing real-time traffic speed and incident information to travelers via 511 phone, maps on the 511.org websites, alerts and by providing driving time data to Changeable Message Signs.



- [Call Box Program/Freeway Service Patrol](#) – Freeway call boxes and the 511 telephone system provides CHP and Caltrans with the ability to dispatch tow trucks quickly to reduce non-recurrent congestion due to incidents.
- Performance Monitoring – [The Freeway Performance Monitoring System \(PeMS\)](#) collects and archives real-time performance data gathered from sensors throughout the freeway network. The data is used to calculate various performance metrics such as speed, hours of delay and travel time reliability.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the Freeway Performance Initiative, the following resources are available:

[511.org](#)

[Caltrans Transportation Management System Master Plans](#)

[District 4 Corridor System Management Plans \(CSMP\)](#)

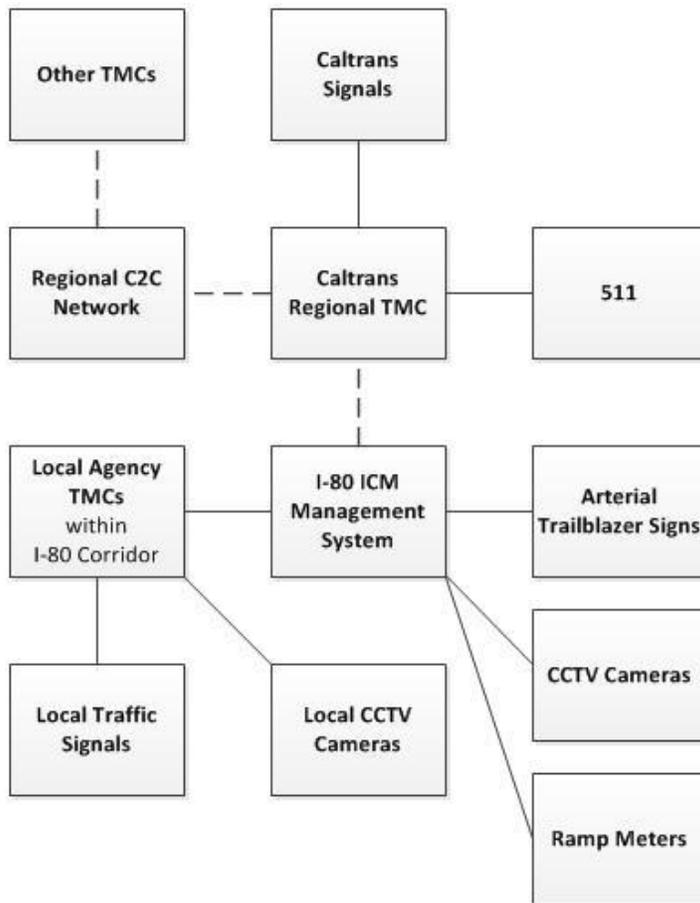
[Freeway Concept of Operations Deliverables](#)

I-80 INTEGRATED CORRIDOR MOBILITY (ICM)

Introduction

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[511](#)

[Caltrans D-4 TMC Roadside Equipment \(TOS\)](#)

[Caltrans D-4 Transportation Management System](#)

[I-80 ICM Management Center](#)

[Sub-regional and Local City/County Traffic Operations Systems](#)

Project Overview

The Interstate 80 corridor is a major freeway corridor through Alameda County and Contra Costa County. The segment of the corridor between the San Francisco-Oakland Bay Bridge and the Carquinez Bridge is the most congested in the region, with traffic volumes exceeding roadway capacity for up to 10 hours a day. The heavy volumes on the I-80 corridor cause a high rate of incidents on both the freeway and adjacent arterials, leading to significant delays for commuters and transit users. The combined effect is persistent congestion throughout the day, unreliable travel times, delays to transit service, and vehicles diverted off the freeway onto local streets.

To address the issues on I-80, the Alameda County Transportation Commission (Alameda CTC) is working in partnership with regional and local agencies on a transportation management strategy using technology to improve mobility and safety. The I-80 ICM project will feature the deployment of field elements, as well as integration of traffic management centers (TMCs) to allow agencies to share real-time traffic information and coordinate traffic and incident management operations.

The ICM project employs the following sub-systems to support system management strategies:

- Freeway Management – adaptive ramp metering;
- Arterial Management – traffic signal coordination, CCTV cameras;
- Incident Management – incident response plans to activate changeable message signs, lane use signs, variable advisory speed signs, trailblazers, and highway advisory radio messages;
- Traffic and Transit Information – transit signal priority, information display boards, variable message signs, transit traveler information and ramp meter bypass, highway advisory radio (HAR) and 511 integration; and
- System Integration – connection of freeway and arterial operations into a central point to optimize traffic management of the entire roadway network.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the I-80 ICM project, the following resources are available describing technology requirements, operational roles and responsibilities and other related information.

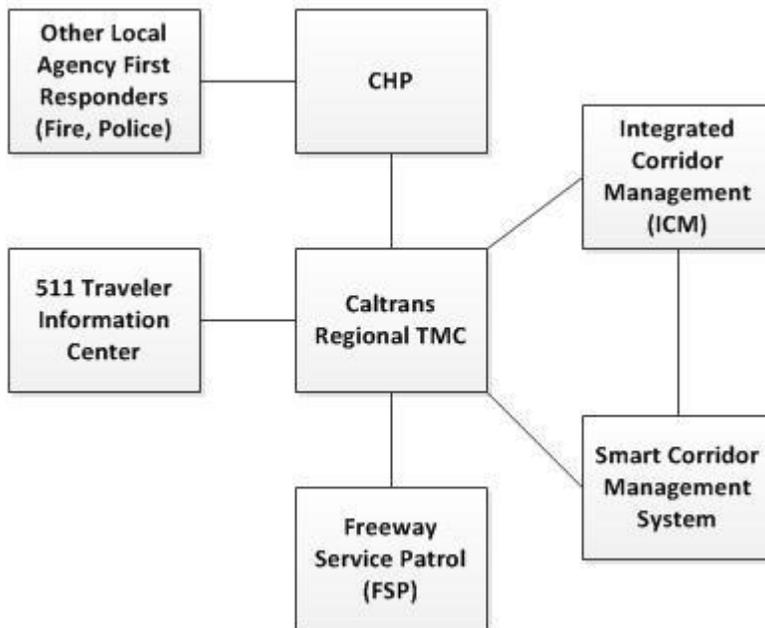
[I-80 ICM Project Website](#)

INCIDENT MANAGEMENT

Introduction

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[Caltrans D-4 Transportation Management System](#)

[CHP Computer Aided Dispatch](#)

[MTC TIC](#)

[I-80 ICM Management Center](#)

[I-580 SMART Corridor ATMS](#)

[SFgo Transportation Management System](#)

[Silicon Valley SMART Corridor ATMS](#)

[San Mateo County Smart Corridor ATMS](#)

[SR 4 East SMART Corridor ATMS](#)

[California Statewide Crash Information System](#)

Project Overview

Incident management is a systematic, planned, and coordinated approach to managing personnel and technical resources to improve the safety of motorists, victims and responders and to reduce the duration and impact of incidents. Traffic incidents, such as stalled vehicles, crashes, spilled loads, hazardous material incidents, or natural disasters, account for approximately 50 to 60 percent of traffic congestion in large metropolitan areas. Although these are non-recurring, unplanned events, advance planning and coordination can significantly reduce the impact to the system and delays in travel time.

MTC works in conjunction with the California Department of Transportation (Caltrans) and the California Highway Patrol (CHP) to facilitate and promote interagency coordination among Bay Area traffic incident management and response personnel as part of a comprehensive Incident Management Program. Traffic incident management provides input into the needs and application of various ITS technologies to support TIM plans and operations. ITS technology currently in place support enhanced procedures for incident detection, verification, response, scene management and clearance. There are several existing ITS projects and programs that play key roles in Bay Area incident management:

- [Freeway Service Patrol](#)
- [Bay Area Call Box Program](#)
- [511 Traveler Information](#)
- [Integrated Corridor Management \(ICM\)](#)
- [Center-to-Center Data Sharing](#)
- [Smart Corridor programs](#)

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with regional incident management services, the following resources are available:

[National Unified Goal for Traffic Incident Management](#)

[National Traffic Incident Management Coalition](#)

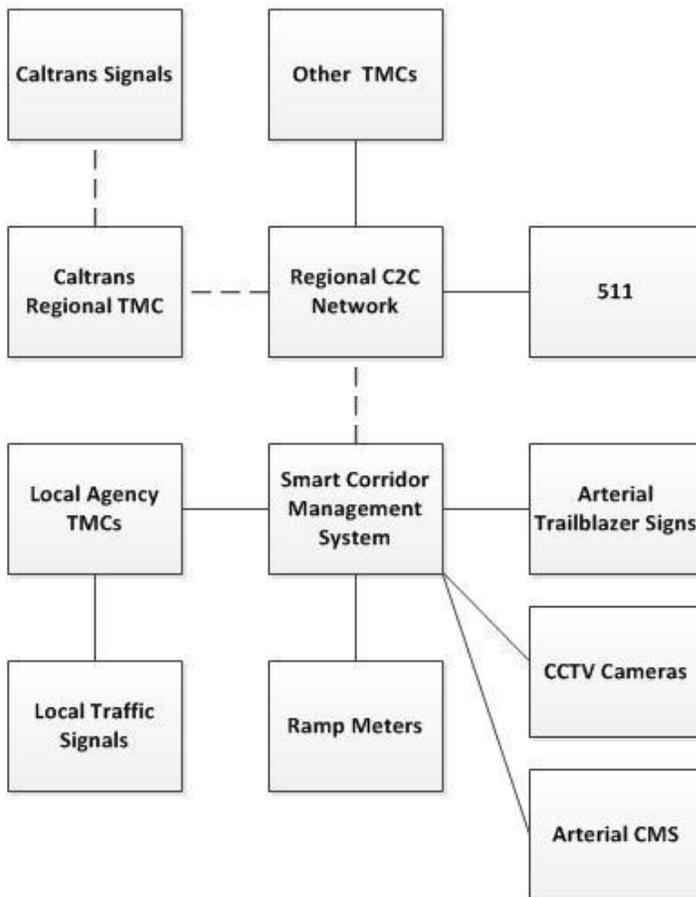
[US DOT FHWA Emergency Transportation Operations](#)

SAN MATEO SMART CORRIDOR

Introduction

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[511](#)

[Caltrans D-4 TMC Roadside Equipment \(TOS\)](#)

[Caltrans D-4 Transportation Management System](#)

[MTC TIC](#)

[San Mateo County Smart Corridor ATMS](#)

[Sub-regional and Local City/County Traffic Operations Systems](#)

Project Overview

The Cities/County Association of Governments (C/CAG) of San Mateo is implementing the Smart Corridor program on a portion of US 101 and SR 82 (El Camino Real) including major arterials identified as local routes. The San Mateo Smart Corridors will implement incident management strategies through the deployment of ITS elements to manage non-recurring traffic congestion. The following ITS elements will be deployed along key corridors and routes:

- Traffic signal improvements to support signal coordination and flush plan development;
- Arterial electronic trailblazer signs for route guidance during freeway incidents;
- CCTV cameras at critical intersections;
- Center-to-Center communications between local cities, Caltrans and other Smart Corridors;
- Arterial vehicle detection system;
- Arterial changeable message signs (CMS).

The following summarizes the goals of the San Mateo Smart Corridors program:

- Traffic Incident Management – Proactive management of traffic diverted from the freeway and minimize impacts on local arterials through proactive signal timing for greater throughput of incident traffic on local streets. This will allow for faster recovery to normal conditions.
- Interagency Coordination – Provide the capability for shared control and operation of traffic control devices in the Smart Corridor. This would be supported by sharing information among agencies and improving communications capability.
- Traffic Operations and Management – Improve traffic flow during normal operation by sharing traffic information between agencies to coordinate and manage traffic.

During normal operations, each agency will own and maintain equipment within its jurisdiction. Data will be shared with other agencies within and outside of the corridor. Upon confirmation of a major incident on US 101, Caltrans will take control of ITS devices on the roadways adjacent to the incident area using a future center-to-center interface between the Regional TMC and the local TMC within San Mateo County (SMCHub). From the Regional TMC, operators will select a predefined alternate route that matches the incident conditions (e.g., location, severity, time of day) and implement signal timing plans on arterial intersections to flush traffic. Once the incident is cleared in coordination with CHP, Caltrans and the local agencies, device control and timing plans will revert to normal control and under local management.

To support inter-agency communications and operations, NTCIP standards are proposed to support interoperable center-to-field and center-to-center communications. The use of standard communication protocols will enable different traffic and center-based subsystems that use devices from different manufacturers to work properly together. Center-to-center communications will be enabled through data interfaces between the Smart Corridor TMC and the Caltrans Regional TMC, as well as other Smart Corridor TMCs to facilitate data exchange.

Resources for Stakeholders



For project stakeholders that want to learn about how to integrate their projects with the San Mateo Smart Corridor program, the following resources are available describing technology requirements, operational roles and responsibilities and other related information:

[Project Report](#)

[Concept of Operations](#)

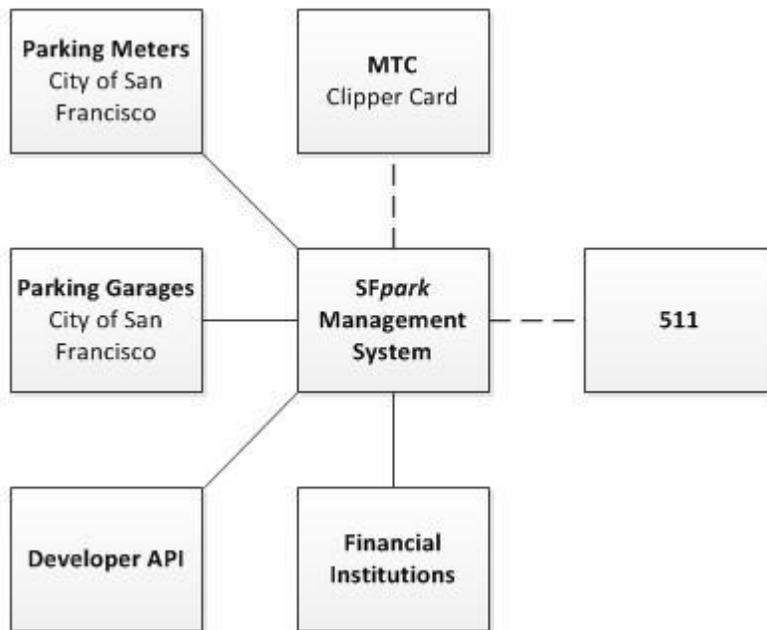
[System Engineering Management Plan \(SEMP\)](#)

SFPARK

Introduction

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[511](#)

[Clipper® Smart Card](#)

[City of San Francisco Street Parking Sensors](#)

[City-owned Parking Garages](#)

[SFgo Transportation Management System](#)

[SFMTA Parking Data Server](#)

Project Overview

The Bay Area Urban Partnership Program is a congestion relief demonstration project in the Bay Area funded by the Department of Transportation (DOT). The project features, *SFpark*, a parking

management system in San Francisco that sets variable parking rates for on and off street parking based on demand. Variable pricing allocates parking supply more efficiently, reducing congestion from drivers searching for spaces and creating incentives for people to use alternative modes of transportation. Real-time pricing and parking availability data will be collected from sensors and parking meters.

The Urban Partnership Program partners include the San Francisco County Transportation Agency (SFCTA), the San Francisco Transportation Authority (SFMTA), and MTC. Other Bay Area agencies participating in the project include Alameda-Contra Costa Transit District, Bay Area Toll Authority, Caltrans, and Golden Gate Bridge Highway and Transportation Authority. The project will be integrated with other regional ITS projects:

- The Bay Area 511 traveler information service will be upgraded to provide parking information through the 511 phone system, 511.org web site, 511 mobile web site and to 3rd parties through a data feed and API;
- The Clipper transit card can be used to pay for parking at SFMTA operated garages; and
- Other upgrades to the 511 system include an enhanced multimodal trip planner and real time transit information.

The Bay Area Architecture update describes how *SFpark* is integrated with other regional ITS projects. High-level architecture diagrams will show the information flows and data connections between the ITS elements for parking management services and the rest of the region. These elements are summarized below:

- Data exchange between the parking management center and the MTC 511 system;
- The 511 internet service provider feed and API disseminating real time parking pricing and availability data to 3rd parties;
- Data interface with the Clipper card to process payments at SFMTA operated garages; and
- Curbside field elements such as smart parking meters, CMS and parking space sensors.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with *SFpark*, the following resources are available describing technology requirements, operational roles and responsibilities and other related information:

[SFpark Availability Service API Reference](#)

[SFpark and Meter Vendor XML Rate Adjustment Protocol](#)

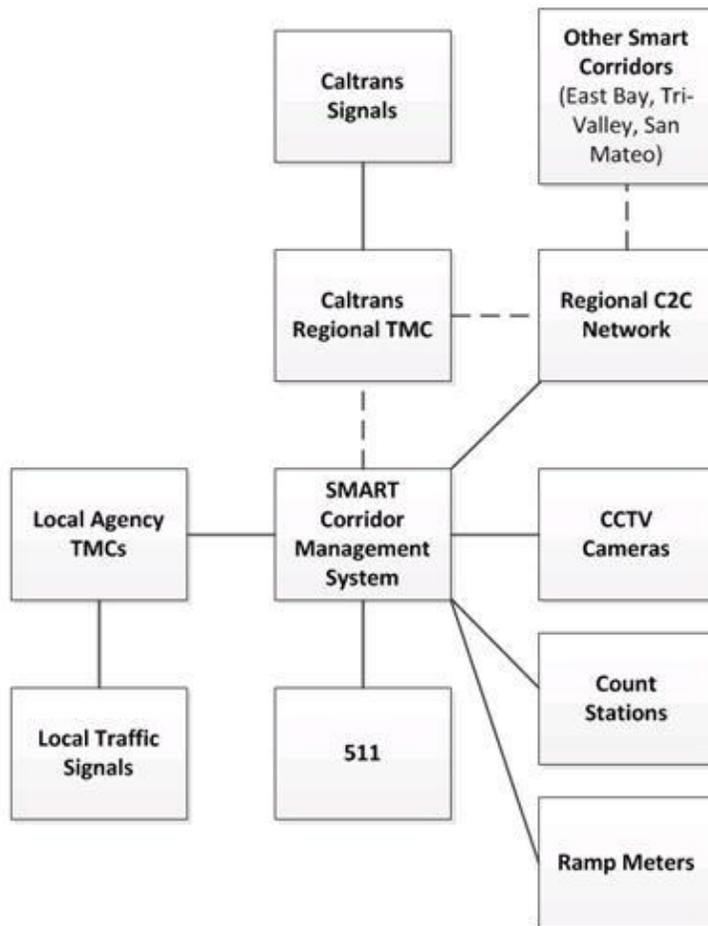
[SFpark Systems Engineering Management Plan \(SEMP\) – Base Document](#)

SILICON VALLEY SMART CORRIDORS

Introduction

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511.org

[Caltrans D-4 TMC Roadside Equipment \(TOS\)](#)

[Caltrans D-4 Transportation Management System](#)

[CHP Computer Aided Dispatch](#)

[MTC TIC](#)

[San Jose Transportation Management System](#)

[Silicon Valley 511](#)

[Silicon Valley SMART Corridor ATMS](#)

[Sub-regional and Local City/County Traffic Operations Systems](#)

Project Overview

The Silicon Valley - ITS partnership (SV-ITS) is a regional effort to coordinate traffic management operations and incident response between local agencies, the County of Santa Clara, Caltrans, CHP, MTC and VTA. The SV-ITS program started in 1997 and has deployed ITS on freeways, expressways and local arterials throughout Santa Clara County. Local agencies participating in the program include the cities of Campbell, Cupertino, Fremont, Milpitas, Santa Clara, San Jose and the town of Los Gatos. To date, Smart Corridor improvements have been implemented along local streets running parallel to I-880/SR-17 from Fremont to Los Gatos; San Jose International Airport; and along Stevens Creek Boulevard from Cupertino to San Jose.

The following are key elements of the SV-ITS program:

- Traffic signal improvements to support signal coordination;
- Changeable message signs to provide travelers with real-time information on incidents, alternative routes and route guidance;
- CCTV cameras at critical intersections;
- Arterial vehicle detection systems; and
- Center-to-Center communications between local cities through a data exchange network over agency owned infrastructure.

Resources for Stakeholders

The City of San Jose is the lead agency for the SV-ITS program. For project stakeholders that want to learn about how to integrate their projects with the SV-ITS program, view the project information at the City of San Jose web site:

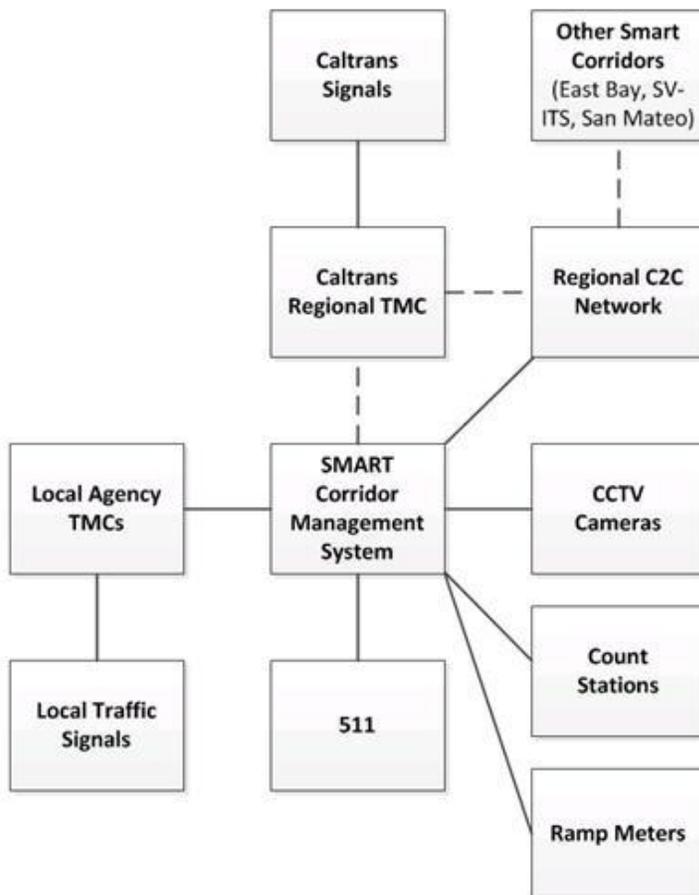
http://www.sanjoseca.gov/transportation/traffic_its.htm

TRI-VALLEY SMART CORRIDORS

Introduction

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[511](#)

[Caltrans D-4 TMC Roadside Equipment \(TOS\)](#)

[Caltrans D-4 Transportation Management System](#)

[CHP Computer Aided Dispatch](#)

[I-580 Express Lane Roadside Equipment](#)

[I-580 Toll Operations](#)

[LAVTA Transit Operations Systems](#)

[MTC TIC](#)

[Sub-regional and Local City/County Traffic Operations Systems](#)

Project Overview

The Alameda County Transportation Commission (Alameda CTC) implemented the Smart Corridor program on a portion of I-580 from Foothill Road to Greenville Road. Alameda CTC worked with the cities of Dublin, Livermore, and Pleasanton, Alameda County, the Livermore Amador Valley Transit Authority (LAVTA), MTC, CHP, and Caltrans to coordinate traffic management operations, incident management and traveler information dissemination.

Local traffic management centers coordinate traffic operations and share data along the I-580 corridor. Coordinated arterial efforts focus on 1st Street, Vasco Road, Greenville Road, Livermore Avenue, Stanley Boulevard, Sunol Boulevard, Santa Rita Road, Stoneridge Drive, Tassajara Road, Bernal Avenue, Altamont Pass Road, Concannon Boulevard, Patterson Pass Road, Dublin Boulevard, and Tesla Road.

The Tri-Valley Smart Corridors coordinates the operations of the following ITS elements along key corridors and routes:

- Vehicle detection systems (VDS) to collect traffic data on freeways and arterials;
- Emergency vehicle preemption (EVP) and transit signal priority (TSP);
- CCTV cameras at critical intersections; and
- Center-to-Center communications between local cities, Caltrans and the East Bay SMART Corridors.

Resources for Stakeholders

For project stakeholders that want to learn about how to integrate their projects with the Tri-Valley Smart Corridor program, visit the I-580 Tri-Valley Corridor Improvement web site to access resources describing technology requirements, operational roles and responsibilities and other related information:

<http://www.i580.info/index.php>

APPENDIX G – REPRESENTATIVE ITS PROJECTS

ITS Service	Representative ITS Project Name	Representative ITS Project Description	ITS Service Diagram
AD1	Archive Data	Projects that provide a focused archive that houses data collected and owned by a single agency.	AD1-8
APTS01	Transit Vehicle Tracking	Projects that monitor current transit vehicle location using an Automated Vehicle Location System.	APTS01-6
APTS02	Transit Fixed Route Operations	Projects that perform automated dispatch and system monitoring for fixed-route and flexible-route transit services.	APTS02-11
APTS03	Demand Response Transit Operations	Projects that perform automated dispatch and system monitoring for demand responsive transit services.	APTS03-7
APTS04	Transit Fare Collection Management	Projects that manage transit fare collection on-board transit vehicles and at transit stops using electronic means.	APTS04-17
APTS05	Transit Security	Projects that provide for the physical security of transit passengers and transit vehicle operators.	APTS05-08
APTS08	Transit Traveler Information	Projects that provide transit users at transit stops and on-board transit vehicles with ready access to transit information.	APTS08-11
ATMS01	Network Surveillance	Projects that install traffic sensors and surveillance (e.g., CCTV) equipment, and remotely monitor and control the sensors and surveillance equipment.	ATMS01-10
ATMS03	Surface Street Control	Projects that provide central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management.	ATMS03-10
ATMS04	Freeway Control	Projects that provide central monitoring and control, communications, and field equipment that support freeway management.	ATMS04-1
ATMS05	HOV Lane Management	Projects that manage HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals.	ATMS05-1
ATMS06	Traffic Information Dissemination	Projects that provide driver information using roadway equipment such as dynamic message signs or highway advisory radio. Also dissemination of traffic information from traffic operations to other centers.	ATMS06-10
ATMS07	Regional Traffic Management	Projects that provide for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies.	ATMS07-10
ATMS08	Traffic Incident Management	Projects that include incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters.	ATMS08-11
ATMS10	Electronic Toll Collection	Projects that provide toll operators with the ability to collect tolls electronically and detect and process violations.	ATMS10-5
ATMS16	Parking Facility Management	Projects that provide enhanced monitoring and management of parking facilities.	ATMS16-3
ATMS17	Regional Parking Management	Projects that support communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems.	ATMS17-2
ATMS19	Speed Monitoring	Projects that monitor the speeds of vehicles traveling through a roadway system.	ATMS19-1

APPENDIX H – PROJECT SEQUENCING

The project sequencing tiers in the table is listed as one of the following categories:

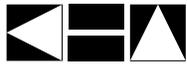
Tier 1 – Base infrastructure (e.g., communications, controllers)

Tier 2 – Centralized systems (e.g., traffic operations system)

Tier 3 – Multi-modal, multi-jurisdictional systems (e.g., transit priority systems, Smart Corridors)

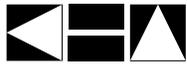
Tier 4 – Center to Center, Regional systems (e.g., 511, center-to-center data exchange)

Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
AC Transit	Real-Time Passenger Seat Availability Information	Future	System that identifies real-time vehicle occupancy	Transit Information	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Automated Passenger Counters (APC)	Existing	Passenger counting system on part of fleet.	Transit Management	Tier 1	Tom O'Neill	TONEill@actransit.org
AC Transit	Fleetwide Automatic Vehicle Location (AVL) Systems	Existing	Transit vehicle automated location system	Transit Information	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Automated Passenger Counter (APC) Upgrade/Expansion	Ongoing	Upgrade and expand automated passenger counting system to full fleet.	Transit Management	Tier 1	Tom O'Neill	TONEill@actransit.org
AC Transit	Automated Bus Routing	Future	Automated bus routing system to accommodate real time demand	Transit Management	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Integrated Central Dispatch and Emergency Operations	Future	Facility functions as an EOC during emergencies. Agencies would include any agencies that would utilize the EOC during emergencies.	Transit Management	Tier 3	Tom O'Neill	TONEill@actransit.org
AC Transit	Real-time Bus Arrival Information	Existing	Real time bus arrival time information	Transit Information	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Voice Annunciator/ Light Emitting Diode (LED) Signs	Ongoing	Transit vehicle information annunciation and signing system	Transit Information	Tier 1	Tom O'Neill	TONEill@actransit.org
AC Transit	Bus Signal Priority	Ongoing	Allow transit vehicles higher priority at intersections	Transit Vehicle Priority	Tier 3	Tom O'Neill	TONEill@actransit.org
AC Transit	Mobile Command Bus	Future	Transit vehicle communication and control system	Transit Management	Tier 2	Tom O'Neill	TONEill@actransit.org

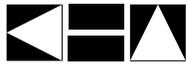


Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
AC Transit	Enhanced Operations and Data Analysis	Future	Analyzing transit management data for better performance	Transit Management	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Transit Planning Document Archival and Data Warehouse	Future	Transit operation data archive	Transit Management	Tier 1	Tom O'Neill	TONEill@actransit.org
AC Transit	Transit Signal Priority (TSP) Feedback Capability	Existing	Transit Communication	Transit Management	Tier 3	Tom O'Neill	TONEill@actransit.org
AC Transit	Collision Avoidance and Automated Docking Systems	Future	Vehicle on-board safety system	On-Vehicle Safety System	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Alternate Emergency Computer Center for Operational Continuity	Future	Transit emergency management	Transit Security	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Geospatial Information Systems Enhancement	Future	Transit Management with GIS	Transit Management	Tier 2	Tom O'Neill	TONEill@actransit.org
AC Transit	Interagency Communications Upgrade and Rebuild	Future	Mesh network, enhanced capability, etc.	ITS Integration	Tier 3	Tom O'Neill	TONEill@actransit.org
AC Transit	Electronic Fare Collection System	Existing	Electronic fare collection using the Clipper® card	Transit Management	Tier 4	Tom O'Neill	TONEill@actransit.org
Alameda CTC	Closed Circuit Television (CCTV) Camera Integration	Ongoing	CCTV camera image/data integration	ITS Integration	Tier 3	John Hemiup	jhemiup@alamedactc.org
Alameda CTC	I-580 Demonstration Express Lane	Ongoing	HOV-Toll lane	Toll Management	Tier 4	John Hemiup	jhemiup@alamedactc.org
Alameda CTC	I-580 and I-238 Intelligent Transportation System (ITS)	Future	ITS integration between multiple corridors	ITS Integration	Tier 3	John Hemiup	jhemiup@alamedactc.org
Alameda CTC	I-580 and I-238 Intelligent Transportation System (ITS)	Future	ITS integration between multiple corridors	ITS Integration	Tier 3	John Hemiup	jhemiup@alamedactc.org

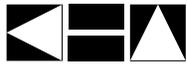
Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Alameda CTC	East Bay SMART Corridor Advanced Transportation Management System (ATMS)	Existing	ATMS	ITS Integration	Tier 4	John Hemiup	jhemiup@alamedactc.org
Alameda CTC	Transportation Management Center	Existing	Arterial traffic management coordination	Arterial Traffic Management	Tier 4	John Hemiup	jhemiup@alamedactc.org
Alameda CTC	I-80 Integrated Corridor Management	Ongoing	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Arterial Traffic Management; Freeway Traffic Management	Tier 4	John Hemiup	jhemiup@alamedactc.org
Antioch	Highway 4 Corridors Traffic Management Plan	Ongoing	Freeway traffic management coordination	Freeway Traffic Management	Tier 4	Ed Franzen	edwfranzen@sbcglobal.net
BART	Station Database/E-BART	Existing	Bart extension to East Contra Costa County with associated transit management	Transit Management	Tier 3	John Slama	JSlama@bart.gov
BART	Radio Communications	Existing	Transit vehicle radio communication	Transit Management	Tier 1	John Slama	JSlama@bart.gov
BART	EZ Rider Smart Card	Ongoing	Parking Payment System	Transit Management	Tier 4	John Slama	JSlama@bart.gov
BART	Fare Collection System	Existing	Transit fare collection system	Transit Management	Tier 4	John Slama	JSlama@bart.gov
BART	Closed Circuit Television (CCTV) Deployment	Existing	Transit system CCTV camera deployment	Arterial Traffic Management	Tier 1	John Slama	JSlama@bart.gov
BART	Real-Time Information System	Existing	Transit system real time information	ITS Integration	Tier 4	John Slama	JSlama@bart.gov
BART	Train Arrival Signs and Annunciator System	Existing	Transit vehicle arrival sign and annunciation system for the travelers	Transit Management	Tier 1	John Slama	JSlama@bart.gov
BART	Trip Planning	Existing	Transit trip planning and connection information	Transit Information	Tier 2	John Slama	JSlama@bart.gov
BART	Website (www.bart.gov) Dynamic Transit Information	Existing	Transit information website	Transit Information	Tier 1	John Slama	JSlama@bart.gov
Benicia	Automated Vehicle Locator	Future	Monitoring bus locations for dispatch purposes	Transit AVL/CAD	Tier 1	John Andoh	jandoh@ci.benicia.ca.us



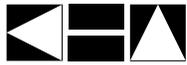
Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Benicia	Scheduling Software	Future	Scheduling paratransit trips throughout service area	Transit Management	Tier 2	John Andoh	jandoh@ci.benicia.ca.us
Benicia	Destination Signs	Existing	Public Information	Traveler Information	Tier 1	John Andoh	jandoh@ci.benicia.ca.us
Benicia	Security Cameras and Control Station	Future	Enhance security on board buses	Transit Security	Tier 1	John Andoh	jandoh@ci.benicia.ca.us
Benicia	Radios	Future	Improve communications between buses	Transit Management	Tier 1	John Andoh	jandoh@ci.benicia.ca.us
Benicia	Fareboxes, Probe, and Computer Program	Future	Improve the reliability of data from fareboxes	Transit Management	Tier 1	John Andoh	jandoh@ci.benicia.ca.us
Caltrain	Automated Passenger Counters (APC)	Future	Automated passenger counting system	Transit Management	Tier 1	Robert Tam	tamr@samtrans.com
Caltrain	Automated Vehicle Location (AVL)	Ongoing	Automated vehicle location system	Transit AVL/CAD	Tier 2	Robert Tam	tamr@samtrans.com
Caltrain	Real-Time Information Collection and Dissemination	Ongoing	Transit real time information collection and dissemination system	Transit Information	Tier 4	Robert Tam	tamr@samtrans.com
Caltrain	Train Arrival Signs and Annunciator System	Existing	Transit vehicle arrival information	Transit Information	Tier 1	Robert Tam	tamr@samtrans.com
Caltrain	Caltrain Transit Asset Management System (CTAMS)	Future	This project will further the development of the Caltrain Transit Asset Management System (CTAMS) with activities that may include, but not be limited to: 1) Integration of CTAMS into a relational database, 2) continuation of the build-out of the fixed rail asset infrastructure modules within the system, and 3) inclusion of a manual for users that will serve as a guide on how to use CTAMS.	Transit Management	Tier 2	Robert Tam	tamr@samtrans.com
Caltrain	Positive Train Control	Ongoing	Implement a positive train control system with an on-board display and automated braking to enhance safety for Caltrain.	Transit Management	Tier 4	Robert Tam	tamr@samtrans.com
Caltrans	Bay Area Video Upgrade	Future	Transit vehicles/infrastructure surveillance system upgrade	Transit Management	Tier 3	Robert Tam	tamr@samtrans.com



Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Caltrans	El Camino Real Signal Interconnect	Ongoing	With San Mateo C/CAG.	Transit Management	Tier 3	Robert Tam	tamr@samtrans.com
Caltrans	I-80 Integrated Corridor Mobility (ICM)	Ongoing	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Freeway Traffic Management	Tier 4	Robert Tam	tamr@samtrans.com
Caltrans	Traffic Operations System (TOS) and Traffic Management Center (TMC)	Existing	Traffic management center	Freeway Traffic Management	Tier 4	Robert Tam	tamr@samtrans.com
Caltrans	I-680 Smart Express Carpool Lane	Existing	HOV-Toll lane management system	Freeway Traffic Management	Tier 4	Robert Tam	tamr@samtrans.com
Caltrans	Caltrans Highway Information Network (CHIN)	Existing	Telephone traveler information system	Freeway Traffic Management	Tier 4	Robert Tam	tamr@samtrans.com
Caltrans	I-880 Corridor Traffic Operations System Elements and Ramp Metering	Existing	Highway ramp metering control	Freeway Traffic Management	Tier 3	Robert Tam	tamr@samtrans.com
Caltrans	Pre-Pass Project	Future	Statewide effort on Cal Statewide ITS Architecture	Freeway Traffic Management	Tier 4	Robert Tam	tamr@samtrans.com
Caltrans	I-680 Corridor Traffic Operations System Elements and Ramp Metering	Future	Highway ramp metering control	Freeway Traffic Management	Tier 3	Robert Tam	tamr@samtrans.com
Caltrans	SR 237 Corridor Traffic Operations System Elements and Ramp Metering	Future	Highway ramp metering control	Freeway Traffic Management	Tier 3	Robert Tam	tamr@samtrans.com
Caltrans	SR 85 Corridor Traffic Operations System Elements and Metering	Existing	Highway ramp metering control	Freeway Traffic Management	Tier 3	Robert Tam	tamr@samtrans.com

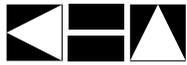


Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Caltrans	US 101 Corridor Traffic Operations System Elements and Metering	Existing	Highway ramp metering control	Freeway Traffic Management	Tier 3	Robert Tam	tamr@samtrans.com
Caltrans	Traffic Operations System Field Element Installation: SR 237 and I-880	Future	ITS field devices deployment	Freeway Traffic Management	Tier 1	Robert Tam	tamr@samtrans.com
Caltrans	GGNRA - Traveler Information System	Future	Provide traveler information for the Golden Gate National Recreation Area (GGNRA) through the 511 system. 511 users will be able to obtain congestion information on US 101 and Highway 1, as well as real-time transit information for transit service operated by Marin Transit and real-time parking availability.	Traveler Information	Tier 4	Robert Tam	tamr@samtrans.com
Caltrans	GGNRA - Parking Guidance System	Future	A parking guidance system (PGS) will provide real time parking information for visitors at the Golden Gate National Recreation Area (GGNRA). Information from the PGS will be disseminated through 511, variable message signs and highway advisory radio.	Parking Management	Tier 4	Robert Tam	tamr@samtrans.com
Campbell	Hamilton Avenue Intelligent Transportation System (ITS)	Existing	Expand on the ITS infrastructure currently on Hamilton Ave. by linking three signals via wireless interconnect to the Smart Corridor signals to the east. Will include signal retiming of these three signals.	Arterial Traffic Management	Tier 3	Matthew Jue	matthewj@cityofcampbell.com
Campbell	Winchester Blvd Intelligent Transportation System (ITS)	Future	Expand upon existing ITS equipment on Winchester Blvd. by installing new conduit, fiber, and fiber equipment.	Arterial Traffic Management	Tier 3	Matthew Jue	matthewj@cityofcampbell.com
Campbell	Reactivation of Existing Traffic Count Stations	Future	Reactivating traffic count stations along arterials such as Hamilton Ave., Winchester Blvd. and Campbell Ave.	Arterial Traffic Management	Tier 1	Matthew Jue	matthewj@cityofcampbell.com

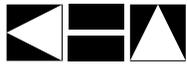


Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Campbell	Traffic Signal System Upgrade	Future	Replace older traffic signal controllers with new controllers and signal system software that is compatible with NTCIP and Silicon Valley-ITS Data Exchange Network Software protocols	Arterial Traffic Management	Tier 1	Matthew Jue	matthewj@cityofcampbell.com
Campbell	Installation of Pedestrian Countdown Timers	Future	ITS field devices deployment	Arterial Traffic Management	Tier 1	Matthew Jue	matthewj@cityofcampbell.com
Central Contra Costa Transit Authority	Automated Vehicle Location (AVL) Vehicle Probe	Existing	Automated vehicle location system	Transit Management	Tier 2		
Central Contra Costa Transit Authority	Real Time Passenger Information	Future	Web based real time passenger information system - BusTime	Transit Information	Tier 2		
Contra Costa Transit Authority	Real-Time Ridematching	Future	SR 4 Traffic Management Program 3-County Real-Time Ridematching	Traveler Information	Tier 4		
Contra Costa Transit Authority	I-80 Integrated Corridor Management	Ongoing	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination	Arterial Traffic Management; Freeway Traffic Management	Tier 4	Martin Engelmann	mre@ccta.net
CHP	Computer-Assisted Dispatch (CAD) Upgrade	Existing	Computer assisted dispatching system for emergency response	Arterial Traffic Management	Tier 1	Jantze Douglas	jdouglas@chp.ca.gov
Concord	Concord-Walnut Creek and Pleasant Hill Smart Corridor along I-680	Future	Integrated arterial and freeway management system	Arterial Traffic Management	Tier 3	John Templeton	joht@ci.concord.ca.us
Concord	Concord Closed Circuit Television (CCTV)	Existing	ITS field devices deployment	Arterial Traffic Management	Tier 1	John Templeton	joht@ci.concord.ca.us
Concord	Concord Signal System Upgrade and Traffic Management Center (TMC)	Existing	Signal upgrade	Arterial Traffic Management	Tier 1	John Templeton	joht@ci.concord.ca.us
Concord	Concord Kirker Pass Road/Ygnacio Valley Road Arterial Management Plan	Existing	Integrated arterial management system	Arterial Traffic Management	Tier 3	John Templeton	joht@ci.concord.ca.us

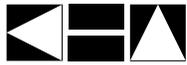
Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
County of Santa Clara	Intelligent Transportation System (ITS) Enhancements on Bascom Ave	Existing	ITS field devices deployment	Arterial Traffic Management	Tier 1	Jamil Salas	jamil.salas@rda.co.santa-clara.ca.us
County of Santa Clara	Santa Teresa/Hale Corridor TOS Infrastructure Improvements	Future	Add TOS infrastructure on Santa Teresa Blvd between Day Road and Castro Valley Road.	Arterial Traffic Management	Tier 1	Jamil Salas	jamil.salas@rda.co.santa-clara.ca.us
County of Santa Clara	Traffic Operations System (TOS) Improvements	Ongoing	Enhance expressway traffic operations systems components and functions, and provide connectivity between Santa Clara County and cities for sharing of ITS data/communications.	Arterial Traffic Management	Tier 3	Jamil Salas	jamil.salas@rda.co.santa-clara.ca.us
County of Santa Clara	Expressway Adaptive Pedestrian Timing Project	Ongoing	Adaptive pedestrian timing-dynamic FDW by detecting pedestrians in crosswalks on all expressways.	Arterial Traffic Management	Tier 1	Jamil Salas	jamil.salas@rda.co.santa-clara.ca.us
County of Santa Clara	SCC Motorist Traffic Information and Advisory Systems	Future	Motorists traffic information and advisory systems(electronic changeable message signs, advisory radio and web page)	Traveler Information	Tier 2	Jamil Salas	jamil.salas@rda.co.santa-clara.ca.us
County of Santa Clara	Expressway Bike Detection and Santa Teresa Corridor	Future	Install bicycle detection on expressway/Santa Teresa shoulders and cross streets as needed at all signalized intersections to support bicycle adaptive signal timing	Arterial Traffic Management	Tier 1	Jamil Salas	jamil.salas@rda.co.santa-clara.ca.us
County of Santa Clara	Signal Coordination/Interconnect with Cross Streets	Future	Signal coordination/interconnect between expressway signals and city/Caltrans signals on cross streets	Arterial Traffic Management	Tier 3	Jamil Salas	jamil.salas@rda.co.santa-clara.ca.us
Cupertino	De Anza Blvd. Advanced Traffic Management System	Existing	Integrated arterial management system	Arterial Traffic Management	Tier 3	Glenn Goepfert	glenn@cupertino.org
Cupertino	Interchange Improvements-Ramp Meter Signal/Arterial Traffic Signal Interconnection	Existing	Integrated arterial and freeway management system	Arterial Traffic Management	Tier 2	Glenn Goepfert	glenn@cupertino.org



Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Cupertino	Adaptive Traffic Signal Control System	Existing	Signal improvement	Arterial Traffic Management	Tier 1	Glenn Goepfert	glennng@cupertino.org
Cupertino	Stevens Creek Blvd CCTV Cameras	Ongoing	locations are at the intersections of Stevens Creek Blvd with the SB-85 ramp, Stelling, Blaney, Wolfe, and Tantau. The project includes engineering, and installing communication equipment and cameras. The existing fiber optic infrastructure will be utilized to bring data from the cameras back to the Cupertino Traffic Operations Center.	Arterial Traffic Management	Tier 1	Glenn Goepfert	glennng@cupertino.org
Daly City	Traffic Signal System Upgrade	Future	Signal upgrade	Arterial Traffic Management	Tier 1	Shirley Chan	schan@dalycity.org
Daly City	Citywide Signal Coordination	Future	Signal Coordination	Arterial Traffic Management	Tier 1	Shirley Chan	schan@dalycity.org
Daly City	Communications Master Plan	Future	Communication System Upgrade	Arterial Traffic Management	Tier 1	Shirley Chan	schan@dalycity.org
ECCTA	Automatic Vehicle Location (AVL) System	Ongoing	Automated vehicle location system	Transit Management	Tier 2	Steve Ponte	sponte@eccta.org
Fairfield	Intelligent Transportation Systems (Automatic Vehicle Location (AVL), Transit Signal Priority (TSP) for City transit operators)	Future	Automated vehicle location system	Transit Management	Tier 3	Kevin Daughton	kdaughton@ci.fairfield.ca.us
Fairfield	Central Traffic Signal System with wireless communications	Ongoing	Central Traffic Signal System with wireless communications	Arterial Traffic Management	Tier 1	Kevin Daughton	kdaughton@ci.fairfield.ca.us
Fairfield/Suisun Transit	Automated Vehicle Location (AVL) System	Future	Automated vehicle location system	Transit Management	Tier 2	Kevin Daughton	kdaughton@ci.fairfield.ca.us
Fairfield/Suisun Transit	Advanced Traveler Information System (ATIS)	Future	Traveler information system	Transit Information	Tier 2	Kevin Daughton	kdaughton@ci.fairfield.ca.us
Fairfield/Suisun Transit	Communications Master Plan	Future	Transit management improvement	Transit Management	Tier 1	Kevin Daughton	kdaughton@ci.fairfield.ca.us

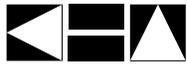


Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Fremont	Traffic Management Center (TMC)	Existing	Traffic management center	Arterial Traffic Management	Tier 2	David Huynh	DHuynh@ci.fremont.ca.us
Fremont	Communication Master Plan	Ongoing	Upgrade all transportation related communications from serial to Ethernet	Arterial Traffic Management	Tier 1	David Huynh	DHuynh@ci.fremont.ca.us
Fremont	Special Events Management Transportation Plan	Future	Adaptive signal control, transit signal priority, traffic monitoring, traveler information system	Arterial Traffic Management; Transit Management	Tier 2	David Huynh	DHuynh@ci.fremont.ca.us
GGBHTD	Advanced Communication and Information System	Ongoing	CAD/AVL, RTIS, TSP, bus telecom system, ATIS, APC, AVM, AVA	Transit Management, Transit Signal Priority, Transit Information, Transit AVL	Tier 2	Ron Downing	RDowning@goldengate.org
GGBHTD	Ferry Automatic Fare Collection (AFC)	Future	Ferry Fare Management with new faregates and TVMs and data system	Transit Management	Tier 1	Ron Downing	RDowning@goldengate.org
GGBHTD	Transit Fare Collection System	Existing	Bus fare management with farebox and data system upgrade	Transit Management	Tier 2	Ron Downing	RDowning@goldengate.org
GGBHTD	Advanced Traveler Information System (ATIS)	Future	Traveler information system	Transit Information	Tier 2	Ron Downing	RDowning@goldengate.org
GGBHTD	FasTrak Electronic Toll Collection (ETC)	Existing	Toll management system	Toll Management	Tier 4	Ron Downing	RDowning@goldengate.org
GGBHTD	Electronic Fare Collection System	Future	Electronic fare collection using the Clipper® card	Transit Management	Tier 4	Ron Downing	RDowning@goldengate.org
Gilroy	Gilroy Community Bus Signal Priority	Future	Transit Signal Priority	Transit Vehicle Priority	Tier 3	Don Dey	ddey@ci.gilroy.ca.us
Gilroy	Adaptive Traffic Signal Control System	Ongoing	Signal improvement	Arterial Traffic Management	Tier 1	Don Dey	ddey@ci.gilroy.ca.us
Gilroy	Traffic Signal System Upgrade	Future	Upgrade traffic signal controller and communications systems with the current technology, including Interconnect, to replace outdated equipment and provide city with centralized traffic management system.	Arterial Traffic Management	Tier 1	Don Dey	ddey@ci.gilroy.ca.us



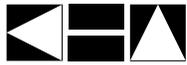
Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Gilroy	Downtown Parking Management System	Future	Electronic parking monitoring system	Parking Management	Tier 2	Don Dey	ddey@ci.gilroy.ca.us
Gilroy	Flood Watch Cameras	Future	Deployment of CCTV cameras to provide real-time video to the City of Gilroy Emergency Operations Center to be used to conduct traffic management and emergency operations activities in times of significant flooding.	Infrastructure Security / Surveillance	Tier 1	Don Dey	ddey@ci.gilroy.ca.us
Gilroy	Event Management System	Future	Develop and deploy CMS, HAR, and information kiosks to provide traveler information system for special events (i.e. the Gilroy Garlic Festival) and incident management in the Gilroy (i.e. flooding in southern part of City). Install 2-CMS on SB US 101, 3-CMS on WB HWY 152 east of Wellington Blvd., City of Gilroy Police station HAR, and a train depot kiosk. Develop a City of Gilroy traveler information website.	Emergency/Event Management	Tier 2	Don Dey	ddey@ci.gilroy.ca.us
Gilroy	10th St. and Downtown Signals Upgrade	Future	Controllers, adaptive, detectors along 10th St. in Gilroy.	Arterial Traffic Management	Tier 1	Don Dey	ddey@ci.gilroy.ca.us
Gilroy	ITS Enhancements on Santa Teresa Blvd	Future	Signalization modifications along Santa Teresa Blvd.	Arterial Traffic Management	Tier 1	Don Dey	ddey@ci.gilroy.ca.us
Gilroy	SR 152 Signal System Upgrade	Future	SR 152 Signal System Upgrade	Arterial Traffic Management	Tier 1	Don Dey	ddey@ci.gilroy.ca.us
Hayward	Citywide Emergency Vehicle Preemption	Ongoing	Signal Improvement	Arterial Traffic Management	Tier 3	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Traffic Signal System Upgrade	Ongoing	Signal Upgrade	Arterial Traffic Management	Tier 1	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Citywide Traffic Signal Coordination	Ongoing	Signal Coordination	Arterial Traffic Management	Tier 1	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Installation of Pedestrian Countdown Timers	Ongoing	Signal Improvement	Arterial Traffic Management	Tier 1	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov

Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Hayward	Traffic Operations System (TOS)/Signal Coordination	Future	Signal Improvement	Arterial Traffic Management	Tier 2	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Adaptive Traffic Signal Program	Future	Signal Improvement	Arterial Traffic Management	Tier 1	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Adaptive Pedestrian Timing	Future	Signal Improvement	Arterial Traffic Management	Tier 1	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Adaptive Bicycle Timing	Future	Signal Improvement	Arterial Traffic Management	Tier 1	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Citywide Transportation Management System	Future	Advanced Traffic Management System for the following corridors: Clawiter Road/880 Reliever Route, Hesperian Blvd, Santa Clara St-Harder Road, Huntwood Avenue, Mission Blvd, Foothill Blvd, Second Street, A Street, B Street, D Street-Winton Avenue, Jackson Street, Tennyson Road, Industrial Parkway-Blvd, Whipple Road	Arterial Traffic Management	Tier 2	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Citywide Transportation Management System	Future	Advanced Traffic Management System for the following corridors: Clawiter Road/880 Reliever Route, Hesperian Blvd, Santa Clara St-Harder Road, Huntwood Avenue, Mission Blvd, Foothill Blvd, Second Street, A Street, B Street, D Street-Winton Avenue, Jackson Street, Tennyson Road, Industrial Parkway-Blvd, Whipple Road	Arterial Traffic Management	Tier 2	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
Hayward	Downtown Hayward CBD Traffic and Parking Improvement Project	Future	Central Business District traffic management	Arterial Traffic Management	Tier 2	Roxy Carmichael-Hart	Roxy.Carmichael-Hart@hayward-ca.gov
LAVTA	Automated Passenger Counters (APC)	Existing	Identifying transit passenger number	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Automated Vehicle Location (AVL) System	Existing	Transit AVL	Transit AVL/CAD	Tier 2	Jeff Flynn	jflynn@lavta.org

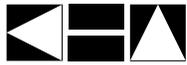


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LAVTA	LAVTA Computer-Aided Dispatch (CAD)	Existing	Transit AVL and CAD	Transit AVL/CAD	Tier 2	Jeff Flynn	jflynn@lavta.org
LAVTA	On-Board Communications	Existing	Transit vehicle communication system	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Web-Based Real-Time Transit Information	Existing	Internet transit information	Transit Information	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Paratransit Interactive Phone/Web Scheduling Software	Future	paratransit management	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Farebox Collection System	Existing	Transit fare collection	Transit Management	Tier 2	Jeff Flynn	jflynn@lavta.org
LAVTA	Cameras Vehicle Condition, Detectors and Driver Safety Training	Ongoing	Transit vehicle surveillance	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Annunciators	Existing	Transit information annunciators	Transit Information	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	On-Street Dynamic Message Signs	Ongoing	Transit info-related on street signs	Transit Information	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Transit Signal Priority (Vehicle to Roadside)	Existing	Allowing transit vehicles higher priority at intersections	Transit Vehicle Priority	Tier 3	Jeff Flynn	jflynn@lavta.org
LAVTA	Communication Radios	Existing	Communication dispatch, operators, road sup.'s	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Onboard Security Cameras	Existing/Ongoing	Transit vehicle surveillance. Provide visual coverage of bus (digital storage)	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Headsigns	Existing	Provide route and directional information	Transit Information	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Scheduling Software	Existing	Allow for fixed route scheduling and mapping	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Scheduling Software	Existing	Para Transit scheduling and mapping	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Web Interface	Existing	Receive, process and track comments	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Phone Line Recorder	Existing	Record and archive CS phone calls	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org

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LAVTA	Dispatch Phone Recorder	Existing	Record and archive dispatch phone calls	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Farebox	Existing	Fare collection and passenger count reporting	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Engine Monitoring Software	Existing	Monitor engine conditions and report as needed	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Website	Existing	Venue for info., complaints and Web Watch	Transit Information	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Regional Tripliner Software	Existing	Assist in 511.org trip planning (regional)	Transit Information	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Transit Infrastructure Security Cameras	Ongoing	Provide visual coverage of building entrances	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	On Street Signs	Existing	Provide real-time bus arrival information (stop)	Transit Information	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	Mobile Data Terminal	Existing	Communicate driver and mechanical info	Transit Management	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	In-Vehicle Logic Unit (IVLU)	Existing	Process APC and AVL data for wireless upload	Transit AVL/CAD	Tier 1	Jeff Flynn	jflynn@lavta.org
LAVTA	In-Vehicle Security Technologies such as Panic Button	Existing	Transit security system	Transit Security	Tier 2	Jeff Flynn	jflynn@lavta.org
Livermore	Transit Signal Priority (Vehicle to Roadside)	Existing	Allowing transit vehicles higher priority at intersections	Transit Management	Tier 3	Mohammad Pournia	mpournia@ci.livermore.ca.us
Livermore	Traffic Operations Center	Existing	TMC	Arterial Traffic Management	Tier 2	Mohammad Pournia	mpournia@ci.livermore.ca.us
Livermore	Web-Based Real-Time Video Information	Ongoing	Traffic Surveillance	Network Surveillance	Tier 1	Mohammad Pournia	mpournia@ci.livermore.ca.us
Livermore	Citywide Signal Coordination	Ongoing	Signal Coordination	Arterial Traffic Management	Tier 1	Mohammad Pournia	mpournia@ci.livermore.ca.us
Los Gatos	Traffic Signal System Upgrade	Ongoing	Signal Upgrade	Arterial Traffic Management	Tier 1	Jessy Pu	jpu@town.los-gatos.ca.us



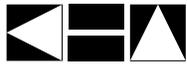
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Los Gatos	SV-ITS Program network connection to Los Gatos	Ongoing	System integration	ITS Integration	Tier 3	Jessy Pu	jpu@town.los-gatos.ca.us
Menlo Park	El Camino Real Adaptive Signal Project	Existing	Signal improvement	Arterial Traffic Management	Tier 1	Righ Angulo	rfangulo@menlopark.org
Menlo Park	Willow Rd SR-114, Adaptive Signal Project	Future	Signal improvement	Arterial Traffic Management	Tier 1	Righ Angulo	rfangulo@menlopark.org
Menlo Park	Citywide Emergency Vehicle Preemption	Ongoing	Allowing emergency vehicles higher priorities at intersection	Emergency Vehicle Preemption	Tier 3	Righ Angulo	rfangulo@menlopark.org
Menlo Park	Traffic Signal System	Existing	Signal interconnect cable network	Arterial Traffic Management	Tier 1	Righ Angulo	rfangulo@menlopark.org
Milpitas	South Milpitas Blvd SMART Corridor	Future	Arterial traffic management coordination	Arterial Traffic Management	Tier 3	Steve Chan	schan@ci.milpitas.ca.gov
Milpitas	Citywide Adaptive Bicycle and Pedestrian Timing	Future	Citywide Adaptive Bicycle and Pedestrian Timing	Arterial Traffic Management	Tier 1	Steve Chan	schan@ci.milpitas.ca.gov
Morgan Hill	Citywide Traffic Signal Operation Center	Future	Construct traffic signal operation center.	Arterial Traffic Management	Tier 2		
Morgan Hill	Citywide Wireless Vehicle Detection System Installation	Future	Install wireless vehicle detection system at all signalized intersections within the City.	Arterial Traffic Management	Tier 1		
Mountain View	Rengstorff Ave Traffic Signal System Improvement	Future	Install signal interconnect & upgrade communication. Consider adaptive signal coordination system"	Arterial Traffic Management	Tier 1	Peter Skinner	peter.skinner@ci.mtnviev.ca.us
Mountain View	Shoreline Blvd. Adaptive Traffic Signals	Future	Upgrade the existing signal interconnect system to adaptive traffic signals.	Arterial Traffic Management	Tier 1	Peter Skinner	peter.skinner@ci.mtnviev.ca.us
Mountain View	Citywide Traffic Signal Upgrade and IP Traffic Signal Access	Future	Upgrade the City's existing traffic signal system through the installation of new traffic signal controllers, software and Internet accessible traffic signal communications.	Arterial Traffic Management	Tier 1	Peter Skinner	peter.skinner@ci.mtnviev.ca.us
Mountain View	Grant Rd. Adaptive Traffic Signal	Future	Upgrade the existing traffic signal interconnect system on Grant Rd. to a new adaptive traffic signal system.	Arterial Traffic Management	Tier 1	Peter Skinner	peter.skinner@ci.mtnviev.ca.us



Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
MTC	S/W Data Repository	Future	Arterial traffic management	Arterial Traffic Management	Tier 1	Sui Tan	stan@mtc.ca.gov
MTC	Clipper® Electronic Fare Collection	Existing	Regional electronic fare payment system for transit.	Transit Management	Tier 4	Lynn Valdivia	Lvaldivia@mtc.ca.gov
MTC	511 Traffic Information	Existing	Regional traffic information via 511 phone number, 511.org, CMS, etc. and includes traffic speeds, incidents, driving times, predicted travel times, parking, etc.	Traveler Information	Tier 4	Jim Macrae	JMacrae@mtc.ca.gov
MTC	511 Real Time Transit Information	Existing	Regional real-time transit arrival information via 511 phone, 511.org, dynamic message signs, etc.	Transit Information	Tier 4	Jim Macrae	JMacrae@mtc.ca.gov
MTC	511 Regional Trip Planner	Existing	Regional trip planner that provides multimodal travel itineraries for 511 transit and traffic via 511 phone number, 511.org, my511 and mobile applications.	Transit Information	Tier 4	Thomas Spiekerman	TSpiekerman@mtc.ca.gov
MTC	Center-to-Center Network (Smart Corridors - SFgo, East Bay, Silicon Valley, San Mateo)	Ongoing	System integration	ITS Integration	Tier 4	Joy Lee	jjlee@mtc.ca.gov
MTC	FasTrak Electronic Toll Collection	Existing	Regional electronic toll collection system for bridge tolls.	Toll Management	Tier 4	Beth Zelinski	bZelinski@mtc.ca.gov
MTC	Goods Movement Container Reservation System	Future	Freight Management	Commercial Vehicle Management	Tier 4	Doug Kimsey	dkimse@mtc.ca.gov
MTC	Regional Express Lane Network	Future	HOV-Toll lane	Toll Management	Tier 4	Lisa Klein	lklein@mtc.ca.gov
MTC	Freeway Service Patrol	Existing	Freeway incident identification and fast response/clearance with roving tow trucks. Telecommunications equipment in trucks relays ops data to CHP CAD.	Freeway Traffic Management	Tier 4	Jaime Maldonado	jmaldonado@mtc.ca.gov
MTC	Integrate 511 with Center to Center	Future	Integrate 511 with neighbor region 511 systems through C-2-C communication	ITS Integration	Tier 4	Joy Lee	jjlee@mtc.ca.gov

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MTC	Regional Parking Payment (Clipper/FasTrak)	Future	Enable parking payment at meters and garages with Clipper and/or FasTrak.	Parking Management	Tier 4	Alysha Nachtigall	ANachtigall@mtc.ca.gov
MTC	Open Road Tolling	Existing	Open road tolling on Benicia Martinez Bridget using FasTrak ETC system.	Toll Management	Tier 4	Beth Zelinski	bZelinski@mtc.ca.gov
MTC	Video Tolling Demonstration	Existing	Collecting toll based on license plate image.	Toll Management	Tier 4	Beth Zelinski	bZelinski@mtc.ca.gov
MTC	Advanced Toll Collection and Accounting System (ATCAS 2)	Future	Replacement of the toll collection system in lane plaza and central processing enhancement.	Toll Management	Tier 2	Beth Zelinski	bZelinski@mtc.ca.gov
MTC	511 Rideshare/Bicycle Information	Existing	Regional rideshare and bicycling information via 511 phone number and 511.org and includes ridematching and bikemapping tools.	Traveler Information	Tier 4	Jim Macrae	JMacrae@mtc.ca.gov
MTC	Transportation Asset Management System	Future	Development of transportation asset management system including traffic signal, bus stop, ADA ramp, bike route/path, complete street elements, and any assets within the right of way.	Arterial Traffic Management, Freeway Traffic Management	Tier 2	Sui Tan	stan@mtc.ca.gov
MTC	Real Time Parking - Parking Availability on Web, 511	Future	Parking Management System	Parking Management	Tier 4	Alysha Nachtigall	ANachtigall@mtc.ca.gov
MTC/Caltrans	I-880 Integrated Corridor Management (ICM) (I-580/I-80 interchange and SR-237)	Future	Integrated freeway and arterial coordination that will include CCTV cameras, Information Display Boards, variable advisory speed signs, ramp metering, trailblazers, vehicle detection, and alternative mode coordination.	Freeway Traffic Management	Tier 4	Radiah Victor	RVictor@mtc.ca.gov
MTC/Caltrans	Connected Vehicles Testbed	Ongoing	Connected Vehicles experiments	Vehicle Infrastructure Integration	Tier 4	Janet Banner	Jbanner@mtc.ca.gov
MTC/Caltrans	Regional Integrated Corridor Management Strategy	Future	Planning and coordination activities to implement ICM on corridors throughout the Bay Area.	Arterial Traffic Management; Freeway Traffic Management	Tier 3	Radiah Victor	RVictor@mtc.ca.gov

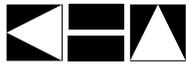
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MTC/SAFE	Bay Area Call Box Program	Existing	Provides roadside telecommunication services to motorists in the event of an incident.	Incident Management	Tier 4	Joanna Fox	JFox@mtc.ca.gov
Napa Valley Transit	Automated Vehicle Location (AVL)	Existing	AVL	Transit AVL/CAD	Tier 2	John Ponte	jponte@co.napa.ca.us
Napa Valley Transit	Transit Signal Priority (Vehicle to Roadside)	Future	Allowing transit vehicles higher priority at intersections	Transit Vehicle Priority	Tier 3	John Ponte	jponte@co.napa.ca.us
Oakland	Oakland Broadway ITS Project	Future	Close Circuit Television (CCTV) cameras, special event management, arterial Changeable Message Sign (CMS), parking guidance	Arterial Traffic Management	Tier 3	Peter Chun	pfchun@oaklandnet.com
Oakland	Oakland Transportation Management System	Ongoing	Advanced Transportation Management System (ATMS)	Arterial Traffic Management	Tier 3	Peter Chun	pfchun@oaklandnet.com
Oakland	Oakland Airport Intelligent Transportation System (ITS) Project	Ongoing	Fiber network, signal coordination, CCTV cameras, traffic responsive plans for Hegenberger and 98th St	Arterial Traffic Management	Tier 3	Peter Chun	pfchun@oaklandnet.com
Oakland	Integrated Transportation Network	Future	Integrate TMC with EOC, Police Department, Fire Department, and Maintenance Yard	ITS Integration	Tier 3	Peter Chun	pfchun@oaklandnet.com
Oakland	Oakland North Central Business District (CBD) Project	Ongoing	Central Business District traffic management	Arterial Traffic Management	Tier 3	Peter Chun	pfchun@oaklandnet.com
Oakland	Oakland 12th Street Improvements	Future	Fiber network, signal coordination, CCTV cameras, for 12th Street (Lake Merritt Area) and integration to existing system	Arterial Traffic Management	Tier 1	Peter Chun	pfchun@oaklandnet.com
Oakland	Oakland Video Server Project	Future	Video server to manage video feeds, perhaps with public access	ITS Integration	Tier 1	Peter Chun	pfchun@oaklandnet.com
Palo Alto	Citywide Traffic Signal Retiming & Pedestrian Facility Upgrades	Future	Signal Upgrade	Arterial Traffic Management	Tier 1	Gayle Likens	gayle.likens@cityofpaloalto.org
Palo Alto	Citywide Traffic Signal System Upgrade	Future	Replace outdated traffic signal controllers, cabinets and communication chips including installation of time of day GPS system equipment for each signalized intersection.	Arterial Traffic Management	Tier 1	Gayle Likens	gayle.likens@cityofpaloalto.org



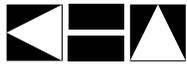
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Palo Alto	Citywide Traffic Signal CCTV/Emergency Vehicle Preemption Project	Future	A citywide program to give priority to emergency vehicles via signal timing adjustments.	Emergency Vehicle Preemption	Tier 3	Gayle Likens	gayle.likens@cityofpaloalto.org
Petaluma	Paratransit Scheduling & Dispatch Software	Ongoing	Schedule optimal paratransit runs, track rider usage, provide a platform for real-time dispatching (via cell phone/smart phones in vehicles) and data reporting.	Transit Management	Tier 1		
Pleasant Hill	Contra Costa Boulevard Traffic Management System	Ongoing	Arterial traffic management coordination	Arterial Traffic Management	Tier 3		
Pleasanton	I-580 Smart Corridor	Existing	Arterial traffic management coordination	Arterial Traffic Management	Tier 4	Mike Tassano	mtassano@ci.pleasanton.ca.us
Pleasanton	Video Detection	Existing	Video detection for traffic/incident/road conditions	Network Surveillance	Tier 1	Mike Tassano	mtassano@ci.pleasanton.ca.us
Pleasanton	Traffic Signal System	Existing	Signal Upgrade	Arterial Traffic Management	Tier 1	Mike Tassano	mtassano@ci.pleasanton.ca.us
Redwood City	Regional Traffic Signalization/Operation Program 2	Ongoing	Traffic Signalization/Operation Program	Arterial Traffic Management	Tier 3	Rich Haygood	rhaygood@redwoodcity.org
Rio Vista	Automated Vehicle Tracking	Future	Automated Vehicle Location (AVL)	Transit AVL/CAD	Tier 2	John Andoh	jandoh@ci.rio-vista.ca.us
SamTrans	Automated Passenger Counter (APC) Expansion	Ongoing	Automatically record passenger number	Transit Management	Tier 1	Rio Kingon	kingonr@samtrans.com
SamTrans	Automatic Vehicle Location (AVL) System	Existing	AVL	Transit AVL/CAD	Tier 2	Rio Kingon	kingonr@samtrans.com
SamTrans	Advanced Communications System	Existing	Transit Communication	Transit Management	Tier 2	Rio Kingon	kingonr@samtrans.com
SamTrans	Computer-Assisted Dispatching (CAD) System Upgrade	Existing	CAD upgrade	Transit AVL/CAD	Tier 2	Rio Kingon	kingonr@samtrans.com
SamTrans	Communications System Upgrade	Existing	Transit Communication	Transit Management	Tier 1	Rio Kingon	kingonr@samtrans.com



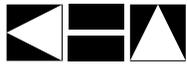
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SamTrans	Fare Collection System Replacement	Existing	Fare collection	Transit Management	Tier 1	Rio Kingon	kingonr@samtrans.com
SamTrans	Predictive Arrivals/Departure System Replacement	Existing	Predict transit arrival/departure time	Transit Information	Tier 2	Rio Kingon	kingonr@samtrans.com
SamTrans	Adaptive Transit Signal Priority (Vehicle to Roadside)	Ongoing	Allowing transit vehicles higher priority at intersections	Transit Vehicle Priority	Tier 3	Rio Kingon	kingonr@samtrans.com
SamTrans	Signal Prioritization (Part of VTA Bus Rapid Transit)	Ongoing	(vehicle to roadside)	Transit Vehicle Priority	Tier 3	Rio Kingon	kingonr@samtrans.com
SamTrans	Manual Pass - Class Counts	Existing	Fare collection / passenger counting	Transit Management	Tier 1	Rio Kingon	kingonr@samtrans.com
SamTrans	Frontal Collision Warning System	Existing	Vehicle on-board safety system	On-Vehicle Safety System	Tier 1	Rio Kingon	kingonr@samtrans.com
SamTrans	El Camino Real Bus Rapid Transit (BRT)	Future	Coordinated Transit System	Transit Management	Tier 3	Rio Kingon	kingonr@samtrans.com
San Jose	King Rd/Story Rd. Area Advanced Traffic Management System	Existing	Provides "real time" traffic management for high traffic congestion location.	Arterial Traffic Management	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Monterey Highway Intelligent Transportation System (ITS)	Future	A system of signal upgrade, interconnect, and CCTV cameras throughout the Monterey Highway area.	Arterial Traffic Management	Tier 2	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	SVITS Connection to Sunnyvale	Future	A system of CCTV, Signage and the development of a traffic management center in the City of Sunnyvale	Arterial Traffic Management	Tier 4	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Mobile Video Surveillance for Emergency Response	Future	video surveillance	Network Surveillance	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Proactive Signal Retiming Program	Existing/Ongoing	A citywide program that will monitor current traffic signals and improve them where necessary.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov



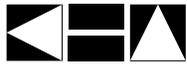
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San Jose	Replacement of Electronic "No Right" at Light Rail Transit (LRT) Crossings	Existing	Signal Upgrade	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	San Jose Smart Intersection - Traffic Management Center Controls Emergency Vehicle Pre-Emption	Existing	Traffic Management Center Controls Emergency Vehicle Pre-Emption	Emergency Vehicle Preemption	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Downtown San Jose CMS Upgrades	Ongoing	Upgrades aging changeable message sign infrastructure in Arena area	Traveler Information	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Construction Incident Management - Transportation and Incident Management Center (TIMC)	Ongoing	Construct Transportation and Incident Management Center to coordinate incident activities with traffic, fire, and police. Includes control center and integrated communications network.	Incident Management	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Downtown Parking Guidance System	Existing	Parking information/guidance	Parking Management	Tier 2	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Emergency Vehicle Link System - Traffic Incident Management Center (TIMC)	Future	Emergency vehicle communication	Incident Management	Tier 4	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	San Jose Traffic Signal Management Program	Existing	(signal central)	Arterial Traffic Management	Tier 2	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	San Jose Traffic Signal System Upgrades	Ongoing	A citywide program that will look at older signal systems and upgrade them where needed.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Red Light Running Enforcement Program	Future	Installation of cameras at various intersections to capture red light runner incidents.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	San Jose Traffic Signal Interconnect	Future	San Jose Transportation Communications Network Enhancements	ITS Integration	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	City Hall Traveler Information Center	Ongoing	Traveler information collection, processing, and dissemination	Traveler Information	Tier 2	Ken Salvail	ken.salvail@sanjoseca.gov



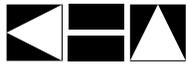
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San Jose	Smart Intersections	Existing	Arterial traffic management coordination	Arterial Traffic Management	Tier 2	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Brokaw-Airport Area Advanced Traffic Management System	Future	A system of traffic cameras, and signal system upgrades.	Arterial Traffic Management	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Silicon Valley Smart Corridor Project Phases I, II, and III	Existing	System upgrade	ITS Integration	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	San Jose Emergency Vehicle Preemption System	Future	Emergency vehicle preemption system	Emergency Vehicle Preemption	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Almaden/Blossom Hill Area Advanced Traffic Management System	Future	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Downtown San Jose Area Freeway Management System	Future	An equipment package that will monitor downtown freeways and provide incident management tools to assist with traffic.	Network Surveillance	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Downtown San Jose Local Street Advanced Traffic Management System	Future	Expands "real time" traffic management system provided in Arena area.	Arterial Traffic Management	Tier 2	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Eastridge/Evergreen Area Advanced Traffic Management System	Future	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Saratoga/Moorpark Advanced Traffic Management System	Future	A system of traffic cameras, signal system upgrades.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	Silicon Valley TiMC - Ramp Metering Integration	Future	Silicon Valley TiMC - Ramp Metering Integration	Freeway Traffic Management	Tier 3	Ken Salvail	ken.salvail@sanjoseca.gov
San Jose	SJ Citywide Count and Speed Monitoring System	Future	Deploy count and monitoring stations at key locations around the City to provide up to date traffic data for real time traffic management and for investment decisions.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov



Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
San Jose	Winchester /Stevens Creek Area Advanced Traffic Management System	Future	A system of traffic cameras, signal timing upgrades and other traffic management tools.	Arterial Traffic Management	Tier 1	Ken Salvail	ken.salvail@sanjoseca.gov
San Leandro	San Leandro Closed Circuit Television (CCTV)	Existing	CCTV camera installation	Network Surveillance	Tier 1	Dean Hsiao	DHsiao@ci.san-leandro.ca.us
San Leandro	San Leandro Signal System and Traffic Management Center (TMC) (Upgrade)	Existing	Signal Upgrade	Arterial Traffic Management	Tier 2	Dean Hsiao	DHsiao@ci.san-leandro.ca.us
San Leandro	Emergency Vehicle Preemption	Ongoing	EVP	Emergency Vehicle Preemption	Tier 3	Dean Hsiao	DHsiao@ci.san-leandro.ca.us
San Mateo City/County Association of Governments (C/CAG)	San Mateo C/CAG Roadside Equipment	Ongoing	CCTV cameras, trailblazers, transit signal priority, CMS	Arterial Traffic Management	Tier 1	Sandy Wong	slwong@co.sanmateo.ca.us
San Mateo City/County Association of Governments (C/CAG)	Incident Management Plan for US 101	Existing	Incident Management Plan	Incident Management	Tier 3	Sandy Wong	slwong@co.sanmateo.ca.us
San Mateo City/County Association of Governments (C/CAG)	Local Transportation Management Center	Ongoing	TMC- San Mateo Hub at Police Station	Arterial Traffic Management	Tier 2	Sandy Wong	slwong@co.sanmateo.ca.us
San Mateo City/County Association of Governments (C/CAG)	Integrated Transportation Incident Management	Ongoing	Incident management	Incident Management	Tier 3	Sandy Wong	slwong@co.sanmateo.ca.us
San Mateo City/County Association of Governments (C/CAG)	San Mateo County Smart Corridor	Ongoing	The project will deploy CCTV cameras, trailblazer signs, and signal upgrades on a portion of US 101 and SR82 corridors and major local streets.	Arterial Traffic Management	Tier 1	Sandy Wong	slwong@co.sanmateo.ca.us

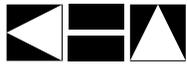


Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Santa Clara	Capitol Expressway TOS	Future	Install TOS infrastructure on Capitol Expwy. from SR 87 to I-680 including fiber optic, trunkline, CCTV, Ethernet-capable controller, battery backup system and system detector loops	Arterial Traffic Management	Tier 2	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Santa Clara Traffic Signals Upgrade	Ongoing	Citywide traffic signal modifications	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Santa Clara TMC Upgrade	Ongoing	Convert City's existing traffic operations room to a new Traffic Management Center.	Arterial Traffic Management	Tier 2	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Santa Clara Communications Network Upgrade	Ongoing	Convert City's existing copper twisted wire pair communication infrastructure to new fiber optic cable network.	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Citywide Bicycle Detection	Future	Install bicycle detection at the stop bar at all of the City's signalized intersections in all approaches.	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Citywide Emergency Vehicle Preemption for Traffic Signals	Future	Install GPS based emergency vehicle preemption units for fire and police vehicles to provide preemption of traffic signals.	Emergency Vehicle Preemption	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Citywide Pedestrian Signal Upgrades	Future	Install Countdown pedestrian signal indications, ADA pedestrian pushbuttons and Audible pedestrian signals at signalized intersections where none exist.	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Citywide Traffic Count and Travel time Monitoring System	Future	Install traffic count and travel time monitoring equipment at various locations citywide to provide real-time traffic volumes and travel speed information and integration with City's traffic management system.	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Citywide Traffic Monitoring Cameras	Future	Install traffic monitoring and incident management cameras on major arterials.	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Lafayette Street Reversible Lane Control Upgrade	Future	Replacement of Reversible Lane Control system, striping and indications along Lafayette Street.	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us

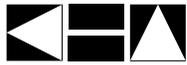


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Santa Clara	North Santa Clara Event Management System	Future	Installation of ITS elements, DMS, monitoring cameras, communications equipment, and advanced traffic management system throughout northern Santa Clara north of Central Expressway.	Event Management	Tier 2	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Clara	Santa Clara Adaptive Traffic Signal System	Future	Install Adaptive Traffic Signal system for major arterials.	Arterial Traffic Management	Tier 1	Dave Pitton	dpitton@ci.santa-clara.ca.us
Santa Rosa	Traffic Management Center	Ongoing	TMC	Arterial Traffic Management	Tier 2	Rob Sprinkle	rsprinkle@ci.santa-rosa.ca.us
Santa Rosa	Traffic Signal Synchronization	Ongoing	Signal improvement	Arterial Traffic Management	Tier 1	Rob Sprinkle	rsprinkle@ci.santa-rosa.ca.us
Santa Rosa	Adaptive Traffic Signal Controls	Ongoing	Signal improvement	Arterial Traffic Management	Tier 1	Rob Sprinkle	rsprinkle@ci.santa-rosa.ca.us
Santa Rosa	AVL/GPS Tracking	Existing	Installing AVL/GPS MDT's on a fleet of 2 paratransit vans. Current fleet of 11 paratransit buses are already utilizing MDT's	Transit AVL/CAD	Tier 1	Rob Sprinkle	rsprinkle@ci.santa-rosa.ca.us
Santa Rosa CityBus	Automated Vehicle Location (AVL), Scheduling Software, NextBus Technology, Global Positioning System (GPS) Video System, Transit Signal Priority	Ongoing	Transit real time control system	Transit AVL/CAD	Tier 2	Scott Allen	swallen@srcity.org
Saratoga	Citywide Signal Upgrade Project Phase II	Future	Signal Upgrade	Arterial Traffic Management	Tier 1	John Cherbone	jcherbone@saratoga.ca.us
Saratoga	Citywide Accessible Pedestrian Signals	Future	Update city-owned signals with audible signals for the visually impaired.	Arterial Traffic Management	Tier 1	John Cherbone	jcherbone@saratoga.ca.us
SF Department of Public Works	Trip Planner for Pedestrians with Disabilities	Future	Web based trip planner for pedestrians with disabilities. Data includes curb ramps, audible signals and blue zone parking.	Traveler Information	Tier 2	Suzanne Levine	

Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
SFCTA	Areawide Pricing (Planning/Feasibility)	Future	Toll management system	Toll Management	Tier 4	Tilly Chang	tilly.chang@sfcta.org
SFCTA	Doyle Drive Value Pricing	Future	Transit signal priority and varying toll rates	Transit Vehicle Priority	Tier 4	Tilly Chang	tilly.chang@sfcta.org
SFMTA	Automatic Passenger Counter System	Ongoing	Passenger counting system	Transit Management	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Automated Vehicle Location (AVL) and Vehicle Arrival Predictions	Existing	AVL and Vehicle Arrival Predictions	Traveler Information	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Radio Replacement Communications/AVL-Global Positioning System (GPS)	Future	Radio Voice and Data Communications, Computer-Aided Dispatch, integration with AVL	Transit AVL/CAD	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Scheduling/Auto-Dispatch Systems	Ongoing	(just fixed route)	Transit Management	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Third Street Corridor	Ongoing	ITS field devices deployment including transit signal priority for light rail vehicles	Arterial Traffic Management	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Ticket Vending Machine and Subway Fare Gate Replacement	Ongoing	Transit fare collection	Transit Management	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Ticket Vending Machine and Subway Fare Gate Replacement	Ongoing	Transit fare collection	Transit Management	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Paratransit Debit Card	Ongoing	Transit fare collection	Transit Management	Tier 2	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Subway & Surface Platform Closed Circuit Television (CCTV) Replacement - Station Related	Future	ITS field devices deployment	Transit Security	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Integrated Vehicle & Facilities Maint. System Inventory Control	Future	Transit management system	ITS Integration	Tier 2	Tim Papandreou	Timothy.Papandreou@sfmta.com

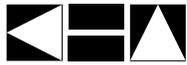


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SFMTA	Digital Voice Annunciation System, Next stop Announcement	Ongoing	Transit information system	Transit Information	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Subway Public Address and Platform Display Systems Replacement	Future	Transit information system	Transit Information	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Subway Station Talking Signs	Future	Transit information system	Transit Information	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Transit Signal Priority	Ongoing	Allow MUNI transit vehicles priority at intersections	Transit Vehicle Priority	Tier 3	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	City Services 311 Information System	Existing	Traveler information system	Traveler Information	Tier 2	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	SFgo - Integrated Transportation Management System	Existing	Integrated Arterial Management System	ITS Integration	Tier 4	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Real Time Parking - Parking Availability on Web, 511	Future	Parking management system	Parking Management	Tier 4	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	On-Street Parking Management – Meters (Clipper (smart card) ready)	Ongoing	Parking management system	Parking Management	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Parking Guidance - Dynamic Message Sign (DMS)	Ongoing	Parking management system	Parking Management	Tier 1	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Emergency Vehicle Preemption	Ongoing	Allowing emergency vehicles higher priorities at the intersections	Emergency Vehicle Preemption	Tier 3	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Advanced Train Control System	Existing	Transit management system	ITS Integration	Tier 2	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	MTA Transit Management Central Control Facility Expansion/Replacement	Future	Transit management center	ITS Integration	Tier 2	Tim Papandreou	Timothy.Papandreou@sfmta.com

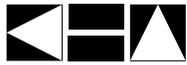


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SFMTA	Center-to-Center Network	Ongoing	Traffic management center	ITS Integration	Tier 4	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Geary Bus Rapid Transit (BRT)	Future	Bus rapid transit on Geary	Transit Management	Tier 3	Tim Papandreou	Timothy.Papandreou@sfmta.com
SFMTA	Van Ness Bus Rapid Transit (BRT)	Future	Bus rapid transit on Van Ness	Transit Management	Tier 3	Tim Papandreou	Timothy.Papandreou@sfmta.com
Solano County	Solano County Transit Automated Vehicle Locator System	Existing	Automated vehicle location system	Transit AVL/CAD	Tier 2	Paul Wiese	pwiese@solanocounty.com
Sonoma County Transit	Transit Signal Priority (Vehicle to Roadside)	Future	Allowing transit vehicles higher priority at intersections	Transit Vehicle Priority	Tier 3	Paul Wiese	pwiese@solanocounty.com
Sonoma County Transit	TransTrack	Ongoing	Automated vehicle location system	Transit AVL/CAD	Tier 2	Paul Wiese	pwiese@solanocounty.com
Sunnyvale	Closed Circuit Television (CCTV) Camera Deployment	Future	Installation of Closed Circuit Television Cameras for traffic monitoring and incident management on the major arterials.	Arterial Traffic Management	Tier 1	Dennis Ng	dng@ci.sunnyvale.ca.us
Sunnyvale	Traffic Management Center (TMC) Integration	Future	Implement physical connection to the area-wide data and video information sharing networks to improve the ability to coordinate operations with neighboring transportation management systems.	ITS Integration	Tier 3	Dennis Ng	dng@ci.sunnyvale.ca.us
Sunnyvale	Traffic Adaptive Signal Controller Update	Ongoing	Expand the City's adaptive traffic signal control system to all major arterials.	Arterial Traffic Management	Tier 1	Dennis Ng	dng@ci.sunnyvale.ca.us
Sunnyvale	Traffic Signal Controller Update	Ongoing	Acquire and install new traffic signal controller and cabinets to upgrade City-maintained traffic signals citywide	Arterial Traffic Management	Tier 1	Dennis Ng	dng@ci.sunnyvale.ca.us
Sunnyvale	Count and Speed Monitoring Stations	Future	Deploy count and speed monitoring stations at various locations around the City to provide up-to-date/current statistical information regarding vehicular traffic on arterials.	Arterial Traffic Management	Tier 1	Dennis Ng	dng@ci.sunnyvale.ca.us

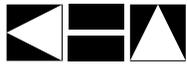
Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
Sunnyvale	Intelligent Transportation System (ITS) Communications Infrastructure	Future	Install fiber optic cables to support ITS implementation, communication, video and data sharing within the City and adjoining municipalities.	Arterial Traffic Management	Tier 1	Dennis Ng	dng@ci.sunnyvale.ca.us
Sunnyvale	Sunnyvale Downtown Specific Plan Transportation Improvements	Future	Intersection and streetscape enhancements, bikeways, signal improvements, and roadway reconfiguration	Arterial Traffic Management	Tier 1	Dennis Ng	dng@ci.sunnyvale.ca.us
Sunnyvale	Emergency Preemption Receiver Installation	Future	Provide priority and safe passage to emergency vehicles at signalized intersections.	Emergency Vehicle Preemption	Tier 1	Dennis Ng	dng@ci.sunnyvale.ca.us
SV ITS - San Jose Program Manager	San Jose International Airport - Advanced Transportation Management System (ATMS), multiple phases	Existing	Coordination of multi-mode transportation	ITS Integration	Tier 3	Brian Nelson	brian.nelson@ci.sj.ca.us
SV ITS - San Jose Program Manager	Silicon Valley - ITS Program Upgrades	Future	Upgrades infrastructure for existing countywide ITS system	ITS Integration	Tier 1	Brian Nelson	brian.nelson@ci.sj.ca.us
SV ITS - San Jose Program Manager	www.511sv.org	Existing	Traveler information system	ITS Integration	Tier 4	Brian Nelson	brian.nelson@ci.sj.ca.us
SV ITS - San Jose Program Manager	Silicon Valley Intelligent Transportation System (ITS) Milpitas/Fremont Project	Existing	Integrated arterial and freeway management system	ITS Integration	Tier 3	Brian Nelson	brian.nelson@ci.sj.ca.us
SV ITS - San Jose Program Manager	Silicon Valley Intelligent Transportation System (ITS) West Project	Existing	Arterial SMART Corridor	Incident Management	Tier 3	Brian Nelson	brian.nelson@ci.sj.ca.us
SV ITS - San Jose Program Manager	Silicon Valley TiMC - San Jose Police Department Integration-	Future	San Jose Police Department Integration- Allows for special management of traffic signals for public safety incidents.	Arterial Traffic Management	Tier 3	Brian Nelson	brian.nelson@ci.sj.ca.us



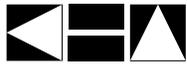
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SV ITS - San Jose Program Manager	SVITS Hybrid Analog/Digital Video System	Ongoing	A video component of a greater traffic management system.	Network Surveillance	Tier 2	Brian Nelson	brian.nelson@ci.sj.ca.us
SV ITS - San Jose Program Manager	Wide Area Network Upgrade	Ongoing	communication system upgrade	ITS Integration	Tier 1	Brian Nelson	brian.nelson@ci.sj.ca.us
SV ITS - San Jose Program Manager	Silicon Valley - Intelligent Transportation System (SV-ITS) Traveler Information Website Phase I	Existing	Traveler information website	Traveler Information	Tier 4	Brian Nelson	brian.nelson@ci.sj.ca.us
Vacaville	Traffic Signal Emergency Vehicle Preemption	Existing	Installation of GPS emergency traffic signal preemption (EVP) devices which also support a transit signal priority system. Antennas will be installed on existing poles. Supporting electronics will be installed inside the traffic control cabinet.	Emergency Vehicle Preemption	Tier 1	Rick Navarro	
Vallejo	Traffic Signal Interconnect	Existing	Signal improvement	Arterial Traffic Management	Tier 1	Gian Aggarwal	gaggarwal@ci.vacaville.ca.us
Vallejo Transit	Advanced Traveler Information System	Existing	Signal improvement	Arterial Traffic Management	Tier 2	Pam Lawrence	plawrence@ci.vallejo.ca.us
VTA	US 101 & SR 85 Express Lanes - 880/237 Express Lane Interchange	Future	Toll management system	Toll Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Automated Vehicle Location (AVL) and Communication System Upgrade	Ongoing	Automated vehicle location system	Transit AVL/CAD	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	Dynamic Passenger Information (DPI)	Ongoing	Traveler information system	Transit Information	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	Rapid 522 Bus Signal Priority (BSP)	Existing	Allowing transit vehicles higher priority at intersections	Transit Vehicle Priority	Tier 3	David Kobayashi	david.kobayashi@vta.org
VTA	Countrywide Ramp Metering Study	Existing	Integrated arterial and freeway management system	Freeway Traffic	Tier 3	David Kobayashi	david.kobayashi@vta.org



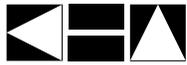
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				Management			
VTA	Silicon Valley Express Lanes Network- SR17	Future	Convert one lane to express lanes from I-280 to SR85	Toll Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Silicon Valley Express Lanes Network- SR 237	Future	Build new express lanes between Mathilda Ave. and SR 85; Convert existing HOV lanes to express lanes from N. First Street to Mathilda Ave	Toll Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Silicon Valley Express Lanes Network- I-680	Future	Convert/Build express lane from Calaveras Boulevard to Montague Expressway; Convert 1 general purpose lane to express lane between Montague Expressway and US 101	Toll Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Silicon Valley Express Lanes Network- I-880	Future	Convert existing HOV lanes to express lanes from Alameda County line to US 101; Build express lane between US 101 and I-280.	Toll Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Silicon Valley Express Lanes Network- US 101	Future	Build express lanes from Cochrane Rd. to SR 25.	Toll Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Silicon Valley Express Lanes Network- I-280	Future	Convert existing HOV lanes to express lanes from Leland Ave to Magdalena Ave; Convert 1 general purpose lane to express lane in each direction between US 101 and Leland Ave; Build express lane southbound from El Monte Rd. to Magdalena Ave.	Toll Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Monterey Hwy Rapid Transit Project	Future	Rapid Transit Project on Monterey Highway	Transit Vehicle Priority	Tier 3	David Kobayashi	david.kobayashi@vta.org
VTA	Sunnyvale-Cupertino Rapid Transit Project	Future	Rapid transit Project between Sunnyvale and Cupertino	Transit Vehicle Priority	Tier 3	David Kobayashi	david.kobayashi@vta.org



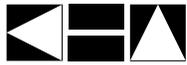
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VTA	Santa Clara/Alum Rock Transit Improvement/BRT	Future	Implement Rapid Transit improvements in the Santa Clara/Alum Rock route, including: dedicated guideways, signal prioritization, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Transit Vehicle Priority	Tier 3	David Kobayashi	david.kobayashi@vta.org
VTA	Stevens Creek Rapid Transit Project	Future	Implement Rapid Transit improvements in the Stevens Creek corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium BRT stations, real-time information, and specialized vehicles.	Transit Vehicle Priority	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	El Camino Rapid Transit Project	Future	Implement Rapid line 522 improvements in the El Camino Real/The Alameda corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Transit Vehicle Priority	Tier 3	David Kobayashi	david.kobayashi@vta.org
VTA	King Road Rapid Transit Project	Future	A new BRT line from Berryessa BART to Santa Clara Caltrain via King Rd/Alum Rock/Santa Clara/The Alameda/ECR. Takes advantage of existing BRT upgrade for SCAR, but also establishes BRT upgrades along King Road, including signal priority. Implement Rapid Transit on the King Road corridor including: dedicated guideways, signal prioritization, low-floor boarding, ticket vending machines, premium stations, real-time information, and specialized vehicles.	Transit Vehicle Priority	Tier 3	David Kobayashi	david.kobayashi@vta.org



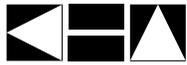
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VTA	Centrally Managed Archive Database	Future	Archive real-time feed from the existing applications, including vehicle status data from orbital database and SCADA database, planning data from Trapeze, maintenance data from FIS/SAP, driver assignment data from FIS/BDT.	Transit Management	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	Develop Communications Architecture	Future	The communication architecture will focus on a wide bandwidth communication infrastructure that will meet all transit communication needs and supports an integrated transit ITS system.	Transit Management	Tier 1	David Kobayashi	david.kobayashi@vta.org
VTA	Electronic Fare Collection System	Existing	Electronic fare collection using the Clipper® card	Transit Management	Tier 4	David Kobayashi	david.kobayashi@vta.org
VTA	Incident reporting for LRT	Future	Develop an incident reporting system for LRT. The LRT incident reporting system should be interfacing with SCADA and incorporate automated report generating features.	Transit Management	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	Intrusion Detection and Warning	Future	Intrusion detection and warning system at specific locations of the right of the way for light rail. Prevent conflicts between conflicts between left turn and straight moving vehicles	Transit Management	Tier 1	David Kobayashi	david.kobayashi@vta.org
VTA	Multi-modal Traveler Information	Future	A multi-modal traveler information system with options of using a combination of transportation, including cars, parking, or PnR, transit, and walking for encouraging riders to take public transit.	Transit Information	Tier 4	David Kobayashi	david.kobayashi@vta.org



Stakeholder Name	Project	Project Status	Project Description	Category	Project Sequencing	Project Contact	Contact Email
VTA	Networked Video Surveillance System	Future	A networked video security surveillance system for light rail stations and the trains and buses. This project will develop a networked video surveillance infrastructure that includes IP-based video cameras and a video management software system. The video management system includes software tools that manage videos from different sources, perform automatic event detection, and manage data/video.	Infrastructure Security / Surveillance	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	Obtain Real-time Fare Data	Future	Receive the real-time payment data (and potentially O-D data associated with the payment information) in real-time from the Clipper program	Transit Management	Tier 3	David Kobayashi	david.kobayashi@vta.org
VTA	On-train or On-bus Information Service	Future	Combined with broadband service discussed under the WiFi project to offer riders information and entertainment, and the ability to work.	Transit Information	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	Regional ITS Maintenance Service	Future	Operations, Management, and Maintenance for regional ITS equipment	Arterial Traffic Management	Tier 3	David Kobayashi	david.kobayashi@vta.org
VTA	Regional Transportation Operations Personnel Service (RTOPS)	Future	Sharing of dedicated operations personnel – referred to here as “regional coordinators”. The goal of the regional coordinators is to work with involved agency personnel (to the extent each agency desires) to help get the appropriate response to any and all incidents and inefficiencies and to keep the public fully informed at all times.	ITS Integration	Tier 3	David Kobayashi	david.kobayashi@vta.org



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VTA	Smart Parking Management System	Future	Provide drivers with real-time occupancy information of the parking lots at the entrances of the parking lots along highways, through the traveler information website or PDAs. As a critical component of the parking management system, either FasTrak or RFID based vehicle identification and payment method will be developed.	Parking Management	Tier 3	David Kobayashi	david.kobayashi@vta.org
VTA	Station Information Service	Future	Install LCD monitors with wireless connectivity at light rail stations	Transit Information	Tier 1	David Kobayashi	david.kobayashi@vta.org
VTA	Traffic Surveillance System for Transit Operations	Future	Bring in the traffic surveillance videos from selected intersections into the Operations and Control Center (OCC) in order for OCC personnel to determine the level of traffic congestion problems at key spots and to make recommendations to bus drivers to reroute the buses if necessary.	Transit Management	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	Updated Light Rail Control System	Future	Upgrade the existing SCADA system with a system that supports advanced train control and monitoring functions.	Transit Management	Tier 2	David Kobayashi	david.kobayashi@vta.org
VTA	WiFi for Trains and commuter buses	Future	Provide WiFi on individual buses and rail cars using either 3G cellular service or dedicated wireless system	Transit Information	Tier 1	David Kobayashi	david.kobayashi@vta.org
VTA/Caltrans	Countywide Freeway Traffic Operation System and Ramp Metering Improvements	Future	Complete planned installation of monitoring cameras, electronic message signs and ramp metering on freeway system.	Freeway Traffic Management	Tier 1	David Kobayashi	david.kobayashi@vta.org
Walnut Creek	Traffic Signal System Upgrade	Ongoing	Signal Upgrade	Arterial Traffic Management	Tier 1	Rafat Raie	Raie@ci.walnut-creek.ca.us
Water Emergency Transportation Authority	Electronic Fare Collection	Ongoing	Integration with the regional fare management system (Clipper)	Transit Management	Tier 3	Mike Gougherty	Gougherty@watertransit.org



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Water Emergency Transportation Authority	Coast Guard Coordination	Future	Communications with the Coast Guard sharing ferry location	Emergency Management	Tier 3	Mike Gougherty	Gougherty@watertransit.org
Water Emergency Transportation Authority	Predictive Ferry Arrival and Departure Information	Future	Real-time traveler information	Traveler Information	Tier 3	Mike Gougherty	Gougherty@watertransit.org
WestCAT	Automated Passenger Counters (APC)	Future	Automated passenger counting system	Transit Management	Tier 1	Rob Thompson	rob@westcat.org
WestCAT	Automated Vehicle Location	Existing	Automated vehicle location system	Transit AVL/CAD	Tier 2	Rob Thompson	rob@westcat.org
WestCAT	Electronic Farebox/Collection	Existing	Transit fare collection system	Transit Management	Tier 1	Rob Thompson	rob@westcat.org
WestCAT	Security Updates	Future	Transit security monitoring system	Transit Security	Tier 2	Rob Thompson	rob@westcat.org
WestCAT	Real-Time Predictive Arrivals/Departures	Ongoing	Transit arrival and departure information	Transit Information	Tier 2	Rob Thompson	rob@westcat.org