Deliverable For:

Gateway Cities Traffic Signal Synchronization and Bus Speed Improvement Project

Atlantic Blvd./ I-710 Corridor

Deliverable 2.1.1
Version 1

Stakeholders' Operational Objectives

Draft

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2.1.1 Version 0	September 14, 2004	
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1. INTRODUCTION

The County of Los Angeles Department of Public Works Traffic Signal Synchronization, Operation and Maintenance (SOM) program has proven successful in creating an institutional infrastructure to coordinate the activities of the agencies responsible for traffic signal operations in the County. A key feature of this infrastructure is the Forums - groups of bordering agencies created to encourage and promote inter-agency cooperation. These Forums have enabled funding to be targeted at infrastructure improvements along arterial and arterial/freeway corridors in the County's sub-regions. Such projects are a critical part of what will eventually be a network of integrated ITS systems in Los Angeles County and in Southern California.

The Atlantic Blvd./I-710 Corridor is one such project which will result in arterial infrastructure improvements on north-south and east-west arterials along I-710 freeway in the South-East LA County (Gateway Cities) Forum.

As shown in Figure 1-1, the Atlantic Blvd./I-710 project area consists of 642 intersections in the following 15 different jurisdictions, comprising 13 cities, the County and Caltrans.

- Los Angeles County
- Caltrans
- City of Bell
- City of Bell Gardens
- City of Commerce
- City of Compton
- City of Cudahy
- City of Huntington Park
- City of Long Beach
- City of Lynwood
- City of Maywood
- City of Paramount
- City of Signal Hill
- City of South Gate
- City of Vernon

The objective of this project is to design, develop and deploy Advanced Traffic Control system(s) (ATMS) in the corridor so that the signals in the Project area can be synchronized across the jurisdictional boundaries. This project concentrates on the needs of the agencies in this corridor with respect to signal synchronization and recommends improvements to field infrastructure (including controllers, loops, detectors, and communications) and central traffic control systems to meet those needs.

When successfully completed, each of the agencies responsible for traffic signal operations in the Atlantic Blvd./I-710 Corridor will have full access to a ATMS that monitors and controls the traffic signals under their jurisdiction. Agencies will be able to synchronize their signals with neighboring agencies, and exchange traffic information in real-time. Agencies will also be able to exchange data with other agencies in the Gateway Cities region. This will allow the agencies to respond to recurrent and non-recurrent congestion in a coordinated fashion across the jurisdictional boundaries.

1.1. Relationship with the Countywide Arterial Management System

The County DPW has developed a system architecture for integrating Advanced Traffic Management Systems (ATMS) for arterial traffic control systems into a regional framework to support the above operational goals. This is the Information Exchange

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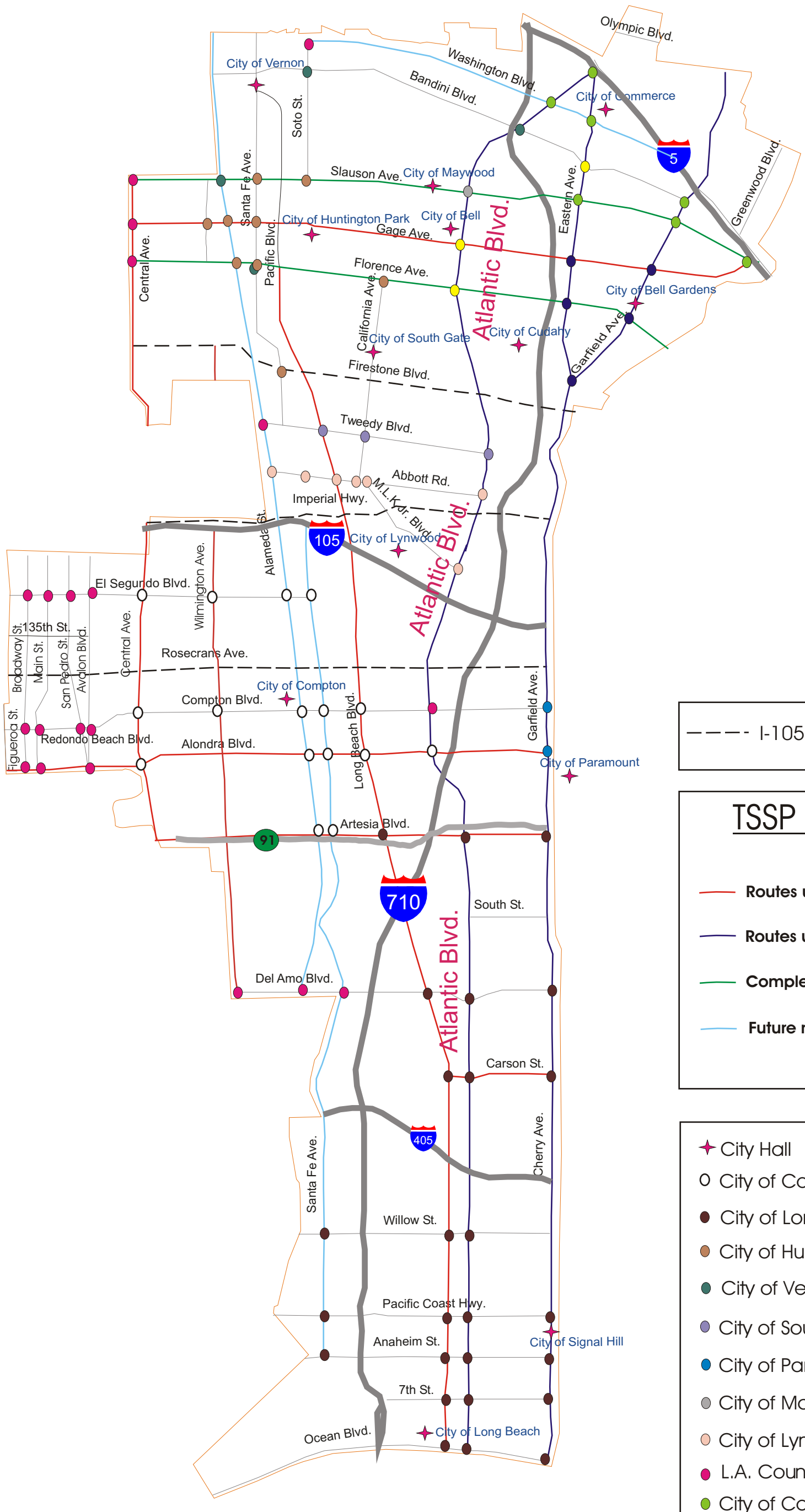
Figure 1-1: Atlantic Blvd. /I-710 Corridor Project Area



I-105 project routes

TSSP Routes

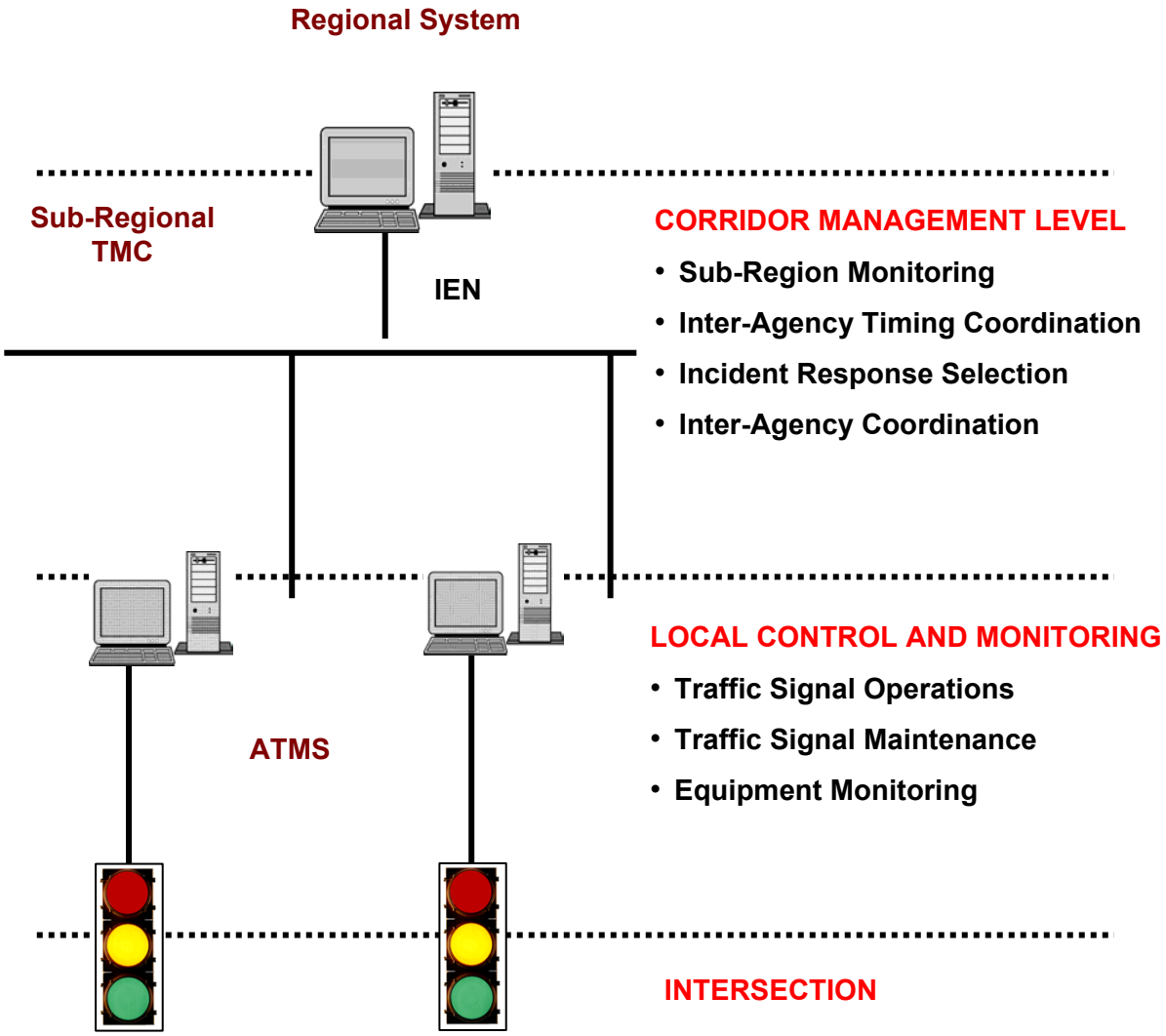
- Routes under design
- Routes under construction
- Completed routes
- Future routes

- City Hall
- City of Compton
- City of Long Beach
- City of Huntington park
- City of Vernon
- City of South Gate
- City of Paramount
- City of Maywood
- City of Lynwood
- L.A. County
- City of Commerce
- City of Bell Garden
- City of Bell

Gateway Cities Traffic Signal Synchronization
Bus Speed Improvement Project – Atlantic Blvd. / I-710 Corridor

Network architecture (IEN) represented in Figure 1-2. This is the architecture that will be followed in the design of the Atlantic Blvd./I-710 Project.

Figure 1-2: The Information Exchange Network Architecture (IEN)



The IEN architecture supports traffic signal operations in three levels. The local level comprises the day-to-day, traffic signal operations carried out by the individual agency – signal timing, maintenance and response to local traffic conditions and events. The Corridor level supports inter-agency coordination and joint signal operations – coordination across jurisdictional boundaries, exchange of local traffic data, and joint response to traffic conditions and events that affect more than one jurisdiction. The final level is the regional level. This permits the arterials of regional significance to be monitored and managed as a single entity (as Caltrans does with the freeway system). Multi-agency, cross-corridor data exchange is supported permitting a countywide response to traffic conditions and major events.The physical elements of the architecture are ATMSs, interfaces between the ATMS and the regional system, workstations to display shared data (which may or may not be combined with the ATMS), and servers for the collection/transfer of data and to support corridor and regional functions. These components are connected via a communications network known as the Information

Exchange Network (IEN). The design of the IEN is being developed as part of the East San Gabriel Valley (ESGV) Pilot Project. The initial application of this structure in the Gateway Cities region is being done under the auspices of the I-105 Corridor Project which has jurisdictions in common with the Atlantic Blvd./I-710 Project.

The Atlantic Blvd./I-710 Project assumes the availability of the IEN at the corridor and regional levels. The project is focused upon the selection of traffic control systems and integration of those systems into the IEN at the local level. The eventual design will include IEN workstations at the local level. These are being defined as part of other projects. The design of the traffic control systems will, however, take into account the interface to the IEN and its requirements at the local level.

1.2. Purpose

This document presents the existing field and central traffic control system infrastructure in the project area and discusses the operational objectives of the agencies in the project area.

1.3. Methodology

In order to compile the information required for this task, representatives of the Siemens ITS team met with the individual agencies. The Siemens ITS team discussed the state of their field infrastructure (controllers, loops, communications) and central software and hardware; agency needs and plans for upgrading the existing equipment. One of the important issues discussed at these meetings was the current and proposed future operation of the signal systems. Appendix A includes minutes from these meetings. The key discussion items and points addressed were as follows:

1. Project Background
    - Project area
    - Countywide arterial management system architecture and location of functionality at the three levels:
        - Regional: Monitoring
        - Corridor: Operational coordination and event response
        - Local: Signal Operations and Management
    - Options for traffic control system configurations:
        - Dedicated ATMS for a City
        - ATMS shared between local agencies
        - City controllers under a regional agency (County or Caltrans) ATMS
    - Project Issues
2. Current Agency Equipment
    - Review of Agency Equipment
    - Collection of information
3. Current Operations
    - Review of staffing and operations
4. Equipment Upgrades
    - Explanation of potential upgrades to the agency's equipment
5. Future Operations

- Discussion of the impact the integration of agency traffic control systems into a regional network could have on agency operations.

Field surveys were conducted to collect the missing data and to confirm the information collected at these meetings.

This report documents each agency's infrastructure in the project area and how agencies plan to operate the signals in the Project area in the future. Based on this information, the report presents recommendations for improvements to each City's traffic control options.

2. EXISTING CONDITIONS

This section presents the existing conditions of the 15 agencies in the Atlantic Blvd./I-710 Corridor area with respect to the traffic signal system operation. This information is divided into the following five categories:

- Traffic Controllers
- System Detection
- Central Traffic Control System
- Communications
- Traffic Signal System Operations and Maintenance

Appendix B presents in detail the information collected for each intersection in the Project Area. Please note that the intersections belonging to cities of Long Beach, Signal Hill and Compton were not included in this task. All signalized intersections in the cities of Long Beach and Signal Hill are equipped with Type 170E controllers and are connected to the central traffic control system located at Long Beach TMC.

The City of Compton is in the process of upgrading traffic controllers at all its intersections. This is part of a large ATMS project which is funded through a Federal grant.

In addition, 18 signals connected to a TCS in the City of Vernon are excluded from this task as these signals have been recently upgraded with ASC/2 controllers.

The inventory task also excluded the intersections on county's TSSP routes. However, this information is included in tables in Appendix B based on the data provided by the county.

Appendix C presents figures depicting controller type/cabinet type and communication infrastructure for project intersections. Table 2-1 summarizes the information collected for each Agency. A discussion then follows the table.

Table 2-1: Project Cities System Inventory

Agency	Total Number of Signals	Number of Signals In the Project Area	Type of Controllers/ Firmware	Responsibility For Maintaining Signals	TCS
Bell	31	26	Type 170 / LACO	PEEK	None
Bell Gardens		32	Type 170/LACO and Econolite ASC/2, ASC 8000		None
Commerce Part of I-5	50	31	Type 170 / Bi Tran 200	PEEK	QuicNet II – not working
Compton Part of I-105	111	92	ASC/2, Type 170/ LACO TMP 90	In-house	None
Cudahy	13	6	5- Type 170 / LACO 1 – ASC/2	PEEK	None

Agency	Total Number of Signals	Number of Signals In the Project Area	Type of Controllers/ Firmware	Responsibility For Maintaining Signals	TCS
Huntington Park	58	43	Type 170 / LACO	In-house	None
Long Beach	435	205 Includes Signal Hill	Type 170 / Bi Tran	In-house	QuicNet IV
Lynwood Part of I-105	52	34	Type 170/LACO	In-house	None
Maywood	17	17	Type 170 / LACO	PEEK	None
Paramount Part of I-105	36	17	Type 170/LACO and Econolite Type 90	Santa Fe Springs	None
South Gate Part of I-105	72	35	Econolite ASC/2 and ASC 8000	In-house	i2 ARIES
Vernon	38	29	Econolite ASC/2 Type 170	PEEK	ARIES
LA County	NA	77	Type 170 / LACO 1R	In-house	KITS (To be installed)

2.1. Traffic Controllers

Most signalized intersections (68%) in the Project area are equipped with Type 170 controllers. The rest are Econolite controllers. The City of Long Beach has newer controllers which communicate to their central system. The cities of Vernon and South Gate also have newer controllers in parts of the Project area. The City of Compton is planning to upgrade all remaining old controllers in the City as part of their federally funded ITS project.

Table 2-2 provides the list of cities and number and type of controllers and their status.

Table 2–2: Controller Status in the Project Area

City	Number and Type of Controllers	Number of Controllers requiring Upgrade	
		170 Upgrade	NEMA Upgrade
Bell	Type 170 - 25 Econolite - 1	15	
Bell Gardens	Type 170 - 8 Econolite - 21 Others - 3	8	11
Commerce	Type 170 - 31	19	
Cudahy	Type 170 - 5 Econolite -1	4	
Huntington Park	Type 170 – 21 EPAC 300 - 1 TMP 390 and others - 21	10	21
Lynwood	Type 170 - 34	24	
Maywood	Type 170 -17	17	

City	Number and Type of Controllers	Number of Controllers requiring Upgrade	
		170 Upgrade	NEMA Upgrade
Paramount	Type 170 – 13 Econolite – 2 EPAC 300 - 2	3	
South Gate	Type 170 – 1 Econolite - 34	1	6
Vernon	Type 170 – 2 Econolite – 25 Others - 2	1	5
L.A. County	Type 170 - 77	48	

The Cities are very interested in upgrade of their traffic controllers, however they want to the upgrade to be consistent with their current equipment. Thus, the cities with Type 170 controllers want to continue using Type 170 controllers and the Cities using Econolite controllers want to continue using Econolite equipment.

2.2. System Detection

Most intersections in the Project area are equipped with advanced detection on major approaches. The advanced loops are placed at a distance of 200 to 300 ft from the stop bar. In some cases (installed as part of older TSSP projects), these loops are tied together across one or more lanes and hence can't be used for system detection. However, if the loops have separate DLCs, they can be used for system detection except in the following situations:

- The traffic backs up to the advanced detection position
- The distance to the upstream intersection is more than 0.5 miles. In such a case mid-block detection may be required.

Most intersections in the project area are equipped with loops. The Cities in general prefer to use loops for detection. Some major intersections in the cities of Long Beach, Lynwood, Paramount, South Gate and Vernon are equipped with video detection.

The Cities want to install advanced /system detection at most major intersections to get better information regarding traffic in the region.

2.3. Central Traffic Control System

The cities of Long Beach, Vernon and South Gate have an operational traffic control system. The City of Long Beach utilizes QuicNet IV System; the City of Vernon recently installed an ARIES system; and the City of South Gate has an ARIES system deployed in most of the City and i2 deployed on about 10 intersections.

All Cities are interested in installing traffic control systems to allow them to remotely monitor and control signals.

2.4. Communications

The cities of Long Beach and Commerce have Twisted Wire Pair along most intersections in their respective cities. Some sections in the City of Long Beach also utilize 900 MHz Spread Spectrum Radios. The City of South Gate has Twisted Wire

Pair on 18 intersections along Firestone Blvd. The City of Vernon has over-head fiber along most major streets. However, over-head fiber is not interconnected to the intersections except for those along Soto St. and Santa Fe Ave.

Most cities do not have a communications media preference except for Maywood and Paramount. These cities would prefer to use wireless or leased solutions that do not require any trenching of the roads.

2.5. Traffic Signal System Operations and Maintenance

The Cities of Bell, Commerce, Cudahy, Maywood, and Vernon contract out the maintenance of their signals to PEEK SMI, a private contractor.

The City of Paramount contracts out maintenance of their signals to the City of Santa Fe Springs.

The City of Signal Hill contracts out maintenance of its signals to the City of Long Beach.

The cities of Compton, Huntington Park, Long Beach, Lynwood, South Gate and the County use their in-house staff to operate and maintain their signals.

As part of Tier 1 improvements, the County works with the Cities to upgrade the signal equipment at the intersections and provide coordinated signal timing on a one-time basis along TSSP routes. This activity is carried out by the County as a regional agency and is independent of the County providing “maintenance” services to the Cities which do not have their own maintenance staff to carry out such activities.

All agencies utilize Time Based Coordination (TBC) method to operate a majority of the signals in coordinated mode during the day and “Free” operation at night. Some intersections are operated only in “Free” mode.

3. OPERATIONAL OBJECTIVES

This section presents the operational objectives of the agencies. Each agency is represented in a separate subsection below:

3.1. City of Bell

The City has limited traffic engineering staff and utilizes the services of a consultant who serves as the City traffic engineer. The City has only 31 signalized intersections within its jurisdictional boundary.

The City contracts out operation and maintenance of its signals to PEEK SMI.

The City is interested in installing cameras at the following locations in the Project area:

- Atlantic Blvd. and Gage Ave.
- Atlantic Blvd. and Florence Ave.
- Atlantic Blvd. and Randolph St.

The City is interested in improving its operation through the installation of a traffic control system, and is flexible about either hosting the system for another City or being a client to another City.

The City is interested in installing an IEN workstation at the City Hall. The City is supportive to the idea of sharing data and images with other agencies in the Region.

The City would like to use the City Hall as the primary LCC Location and would like a workstation for monitoring purposes at the Police Department.

Summary:

Operations: The City of Bell wants to improve its signal operations through the installation of a traffic control system, upgrades to signal equipment, and installation of CCTV cameras. This should be achieved while minimizing impact on the staff resources.

Maintenance: Will continue to use PEEK SMI.

3.2. City of Bell Gardens

The City has limited traffic engineering staff and utilizes the services of a consultant who serves as the City traffic engineer. The City has 32 signalized intersections within the project area.

The City contracts out operation and maintenance of its signals.

The City is interested in improving its operation through the installation of a traffic control system at the city and doesn't wish to be a client to another City.

The City is interested in installing an IEN workstation. The City is supportive to the idea of sharing data and images with other agencies in the Region.

The City would like to use the Public Work building as the primary LCC Location.

Summary:

Operations: The City of Bell Gardens wants to improve its signal operations through the installation of a traffic control system and upgrades its signal equipment. This should be achieved while minimizing impact on the staff resources.

Maintenance: Will continue to use the Contractor.

3.3. City of Commerce

The City of Commerce has limited traffic engineering staff and uses the services of a consultant on an as needed basis to support operations.

The City has about 50 signalized intersections; all are equipped with type 170 controllers using Bi Tran 200 software. The City does not use the current QuicNet II system because the system is obsolete and does not work.

The City Contracts out maintenance of its signals to PEEK SMI.

The City is interested in installing cameras at the following locations in the Project area:

- Atlantic Blvd. and Telegraph Road
- Telegraph Road and Washington Blvd.
- Bandini Blvd. and Garfield Ave.
- Washington Blvd. and I -710

Signal coordination across jurisdictional boundaries is of particular concern to the City. The City wishes to coordinate operations with adjacent agencies (The Los Angeles County, Bell, Bell Gardens and Vernon) and Caltrans.

The City does not want to host signals for another agency.

The City is also participating in the I-5/Telegraph Road Corridor Project. It is expected that as part of this Project, the City's Central Traffic Control System will be upgraded to QuickNet IV and the City will receive an IEN Interface. The City is very interested in participating in the early deployment phase of this project and is looking forward to bringing more intersections on line under the early deployment phase of this project.

Summary:

Operations: The City of Commerce wants to improve mobility through improved signal operations, inter-jurisdictional coordination, CCTV surveillance, and using the traffic control system as a tool to support operations. This should be achieved while minimizing impact on the staff resources.

Maintenance: Will continue to use PEEK SMI.

3.4. City Compton

The City of Compton is pursuing a major ITS implementation project made possible through an earmark federal grant. The project will include, upgrade of all signals in the City, fiber construction on all major roads, advanced detection deployment, TMC construction and implementation of a traffic control system. The City is also participating in the I-105 Corridor Project. Through this project an IEN workstation will be deployed at the City.

Summary:

Operations: The City of Compton is undertaking a large ITS deployment project. The City wants to coordinate its efforts with this project to ensure consistency with the regional objectives.

Maintenance: Will continue to use PEEK SMI.

3.5. City of Cudahy

The City has limited staff resources and has no identified traffic engineering department as such. Currently, a consultant under contract to the City does signal timing. The signal maintenance is contracted out to PEEK SMI.

The City of Cudahy has 13 signalized intersections, all of which are equipped with Type 170 controllers.

The City is interested in installing a CCTV camera at the following locations:

- Atlantic Blvd. and Clara St.
- Atlantic Blvd. and Santa Ana St.
- Atlantic Blvd. and Patata St.

The City is interested in improving its operation through the installation of a traffic control system. Given the small number of intersections in the City, the City understands that it may be more appropriate for them to be a client to another agency's traffic control system. However, they will need the approval of the City Manager before agreeing to this arrangement.

The City is interested in installing an IEN workstation. The City is supportive to the idea of sharing data and images with other agencies in the Region.

The City would like to use the City Manager's office as the primary City LCC.

The City contracts out their Police Department function to the City of Maywood. The City would like the signal status monitoring capability to be available at the police department to help the department address the signal problems after hours.

Summary:

Operations: The City of Cudahy wants to improve its signal operations through the installation of a traffic control system workstation at the City, upgrades to signal equipment, and installation of CCTV cameras. This should be achieved while minimizing impact on the staff resources.

Maintenance: Will continue to use PEEK SMI.

3.6. City of Huntington Park

The City of Huntington Park has about 58 signalized intersections, all are equipped with Type 170 controllers. The City has a full-time traffic engineer and a maintenance director. The City carries out the signal maintenance in-house.

The City is very interested in getting a traffic control system and wants to host the system at their Field Services Department.

The City wants to follow Los Angeles County's specifications for controller upgrades.

The City is interested in installing cameras at the following locations:

- Florence Ave. at State St.

- Slauson Ave. at State St.
- Florence Ave. at Pacific Blvd.
- Gage Ave. at Pacific Blvd.
- Slauson Ave. at Pacific Blvd.
- California Ave, at Florence Ave.
- Alameda St. at Florence Ave.
- Alameda St. at Gage Ave.
- Alameda St. at Pacific Blvd.

The City does not wish to be client to any other Agency's Traffic Control System and would like to host a system of its own. Currently, the City does not like the idea of hosting signals for any other agency. This might change once the City has more information regarding its role and responsibility as a hosting agency.

The City is interested in installing an IEN workstation and is supportive of the idea of sharing data and images with other agencies in the Region.

Summary:

Operations: The City of Huntington Park wants to improve its signal operations through the installation of a traffic control system for the City, upgrades to signal equipment, and installation of CCTV cameras. This should be achieved while minimizing impact on the staff resources.

Maintenance: Will continue to carry out signal maintenance using agency forces

3.7. City of Long Beach

One of the largest cities in the Gateway Cities Region, the City of Long Beach has a well staffed traffic engineering and maintenance department.

The City has a LCC from where it controls and monitors over 500 intersections in the cities of Long Beach, Signal Hill and Hawaiian Gardens. The LCC is staffed on an as needed basis. The City staff responds to alarms as reported by the system.

The City uses Bi Tran's QuicNet IV system for monitoring and controlling its intersections. The City is satisfied with the system functionality and performance and has no plans to upgrade it in the near future.

The existing QuicNet IV system uses 30 masters. Some of the intersections around light rail are controlled using QuicNet II as the QuicNet IV system cannot handle light rail pre-emption. The City wants to eventually use QuicNet IV for all signals in the City.

The City does not use traffic responsive functionality of QuicNet IV as the timings in most of the City intersections are configured to accommodate light rail operations.

The City is interested in installing an IEN Interface and is supportive of its installation in the early Deployment phase of the project. The City is supportive of the idea of sharing data and images with other agencies in the Region.

The City is interested in deploying CCTV cameras.

The City does not wish to host signals for any other agency in the project area but will continue the current arrangement of maintaining and operating signals for Signal Hills.

Summary:

Operations: The City of Long Beach wishes to continue using QuicNet IV system and wishes to enhance their operations by deployment of cameras and improved communications to allow for detection data to be collected at the LCC.

Maintenance: Will continue to carry out signal maintenance using agency forces.

3.8. City of Lynwood

The City of Lynwood has a traffic engineer on staff and signal maintenance is done in-house under the City's Utility Manager. The City has 52 signalized intersections; all equipped with Type 170 controllers using LACO software.

The City is also participating in the I-105 Corridor Project. As part of this project, the City is slated to be a client to another agency's traffic control system and will not get its own traffic control system. As more intersections in the City are expected to on-line as part of the subject project, the City has expressed a desire to host its own system.

The City is interested in deploying cameras at the following locations:

- Atlantic Ave. at M.L.K. Blvd.
- Imperial Hwy. At Bullis St.
- Imperial Hwy. at Long Beach Blvd.
- Imperial Hwy. at California Ave.
- Imperial Hwy. at Alameda St.
- M.L.K. Jr. Blvd. at Long Beach
- M.L.K. Blvd. at Alameda St.
- Tweedy St. a Long Beach Blvd.

The City is interested in installing an IEN workstation and is supportive of the idea of sharing data and images with other agencies in the Region.

The City would like the City Hall annex to be the primary LCC location and maintenance yard as the secondary LCC Location.

3.9. City of Maywood

The City contracts out its traffic engineering function to a consultant and traffic signal maintenance to PEEK SMI. The City has 14 signalized intersections within its jurisdictional boundary.

The City does not wish to deploy any CCTV cameras as part of this project.

The City does not want to host a traffic signal system of its own and would like to be client to a signal system at one of the following agencies in order of preference:

- County
- Vernon
- Huntington Park
- Bell

- Commerce

The City would like the TCS workstation to be hosted at the Police Department.

The City is interested in installing an IEN workstation and is supportive of the idea of sharing data and images with other agencies in the Region.

Summary:

Operations: The City wishes to improve its signal operations through the deployment of a traffic control system workstation and upgrade of signal equipment. This should be achieved while minimizing the impact on the staff sources.

Maintenance: Will continue to use PEEK SMI

3.10. City of Paramount

The City contracts out its traffic engineering function to a consultant and traffic signal maintenance to the City of Santa Fe Springs.

The City has 36 signalized intersections equipped with a combination of Type 90 and Type 170 controllers. The City's preference is to replace Type 90 controllers with Type 170 controllers.

The City does not wish to deploy any CCTV cameras as part of this project.

The City is participating in the I-105 Corridor. As part of this project, the City's signals will be connected to a traffic control system at either the City of Santa Fe Springs or County. The City is in agreement with this decision. The City is supportive of bringing more intersections on line as part of this project in the early deployment phase of the Project.

Summary:

Operations: The City wishes to improve its signal operations through the deployment of a traffic control system workstation and upgrade of signal equipment. This should be achieved while minimizing the impact on the staff sources.

Maintenance: Will continue to use the City of Santa Fe Springs

3.11. City of South Gate

The City of South Gate uses Econolite signal control equipment exclusively, and expressed a desire to continue using Econolite's equipment in the future. The City also uses two traffic control systems, ARIES and i2. 32 intersections in the City are connected to ARIES, and 18 intersections on Firestone are connected to i2. The City would like to eventually connect all intersections to i2. The City operates and maintains its own signal equipment.

The City is in the process of moving their i2 system from City Hall to the City yard for signal maintenance staff, and will have a workstation at City Hall for engineering staff. This will enable the signal staff to be better informed.

The City coordinates signals with the County on Imperial Highway and with the Caltrans along Firestone Blvd. The City also has some experience with incident management as a participating agency in the IMAJINE project.

The City is interested in deploying CCTV cameras.

The City is participating in the I-105 Project. As part of that project the City's LCC (a 10ftx10ft room at the yards) will be equipped with a console and video wall. The City will staff the LCC on an as needed basis during normal working hours. As part of this project, intersections in the project area will be connected to the i2 system. An IEN workstation will also be installed at the yards facility. The City is supportive of connecting signals in the subject project area to the i2 system as part of the early deployment phase.

Summary:

Operations: The City of South Gate wishes to continue enhancements to their signal system and wishes to add more intersections to their traffic control system.

Maintenance: Will continue to carry out signal maintenance using agency forces.

3.12. City of Vernon

The City of Vernon has in-house traffic engineering staff to operate its traffic signals and contracts out maintenance to PEEK SMI. The City has recently completed an ITS improvements project made possible through Federal funding. This included installation of overhead fiber, and upgrading of controllers and a central system (ARIES) for 18 intersections in the City. The City is currently in the process of extending over-head fiber to all major streets in the City.

Of the total 38 intersections in the City, 18 are ASC/2, 15 are older Type ASC-8000 and 5 are Type 170 controllers.

The ARIES system is configured with 2 masters. The City has been using it for two years and is not satisfied with its performance. The City has the following issues with the system:

- Not user friendly
- Does not provide appropriate coordination
- Inability to pull timing charts out of the system

The City does not issue any timing plan changes remotely. All changes are made in the field.

The City has a good working relationship with Caltrans and the Los Angeles County, and coordinates with them for shared signals. The City would like to coordinate with the City of Los Angeles along north-south streets to provide coordination of signals up to the I-110 freeway.

The City is interested in installing CCTV cameras.

The City is interested in getting their traffic control system upgraded, and bringing more intersections on line as part of the early deployment project.

The City is interested in installing an IEN workstation and is supportive of the idea of sharing data and images with other agencies in the Region.

Summary:

Operations: The City of Vernon wishes to improve its signal operation through upgrade of signal equipment, installation of cameras and upgrade of their traffic signal system.

Maintenance: Will continue to use the County.

3.13. Los Angeles County

As a champion of the regional integration and operation of signal systems, the County is wholly supportive of the project and its goals. The County has the intention of installing a traffic control system that would monitor the County's signals in the corridor. It would also, as necessary and approved by the relevant city department, control and monitor any signals that the County operates and maintains under contract.

This traffic control system is being selected as part of another Forum project according to requirements that have already been identified by the County.

Information sharing will be achieved through integration of the County's system into the Countywide Arterial Management System architecture.

Summary:

Operations: Signals in the corridor being operated and maintained by the County will come under the control of the County's future traffic control system.

Maintenance: The traffic control system will support the County's maintenance activity.

4. UPGRADES

The objectives of this project can be summarized as follows: ability to synchronize signals along the project area; provide the Agencies with means to better manage their signals; and to be able to exchange data with other agencies in the region. In order to meet these objectives various changes to traffic signal equipment will be needed. These changes will be in the form of modification, upgrade, and installation of new equipment as categorized below:

- **Central systems**
    - Computer hardware
    - Computer software
    - Communications equipment
        - Central office (local area networks)
        - Field communications termination equipment
        - Central to central (wide-area networks)
- **Field Equipment**
    - Traffic signal controllers
    - Detection
    - CCTV
- **Communications**
    - Communications media between the central and field equipment
    - Communications media between the traffic control systems in the corridor (center-to-center)
    - Communications to the Regional TMC

Justification for Upgrade

Upgrades will be needed in order to meet the project requirements. These requirements have been derived as a result of work in other Forum projects and a comprehensive list has resulted. In the case of **central systems**, the project requires the availability of a system in order to monitor and control the field equipment and collect traffic data. In addition the system must communicate at the corridor level in order to transfer data and receive requests to implement specific timing plans. Thus the project would fund the provision of a central system with these capabilities or the modification or upgrade of an existing system to provide these features. Also to be taken into account would be the support of non-proprietary communications protocols (see the discussion on field equipment, below) and the emerging protocols for communications between central systems (see the discussion on communications equipment, below). The latter is important as it could affect the availability of future Federal funds. Of particular relevance is the protocol for the County's Information Exchange Network (IEN) – the IEN forms the communications network for the Countywide Arterial Management System (CAMS).

Field equipment upgrades under the project would include the necessary modifications to the controllers to support the communications to the central. The project requires that non-proprietary, or open, protocols are used for any ATMS deployment. Two such protocols are currently available for use. The first is the result of the national standards activity sponsored by the FHWA; this is the National Transportation Communications for ITS Protocol (NTCIP).

The implementation of NTCIP has met with mixed success. There are many instances of successful changeable message sign installations which are NTCIP compliant. This

is not the case with the vehicle actuated traffic signal controllers. In the early days of NTCIP deployment, the lack of understanding of NTCIP and its implications for equipment and communications networks led to problems in its specifications in signal system procurement. In such cases, the result was that NTCIP was not deployed and another protocol was used in its place.

The second protocol is the California standard AB3418. This is available in two forms, AB3418, and AB3418 Extended. The State of California has a mandate that if any controllers are replaced within the State, they must support the AB3418 protocol.

The original AB3418 protocol supports only basic signal status monitoring and is often inadequate to support complete traffic signal control. In order for full central monitoring and control to be supported the AB3418 Extended protocol must be used. This is considered to be an open protocol (i.e. not proprietary) and would appear to provide the ability to support the project requirements. The Los Angeles County Department of Public Works has adopted this protocol for its system.

The implementation of an NTCIP compliant system will require upgrades to controllers as well as to the communications infrastructure. These upgrades can prove to be very expensive both in terms of capital costs and on-going maintenance costs for the Agencies.

Under these circumstances, it is recommended that the minimum project requirement for field communications would be the use of AB3418 (Extended). It would then be left to the relevant agency to decide on the use of NTCIP.

The implications of the above discussion on communications protocols on different components of traffic signal systems are as follows:

- The controllers should support the AB3418(E) protocol
- The Central System should support the AB3418(E) protocol and be shown to be capable of supporting NTCIP for field communications in the future.

The **communications** component includes the network to connect the field equipment to the traffic control systems as well as the corridor-wide communications network. Also included are any modifications to an existing communications network to support a change in the communications protocol, if necessary as a resulted from the project. Since the direction of the industry is to move towards NTCIP compliant systems for both field-to-center and center-to-center communications, the communications system should be capable of supporting the relevant NTCIP protocol.

The center-to-center communications protocol resulting from the County's East San Gabriel Valley Pilot project is based upon the Common Object Request Broker (CORBA) standard, as is the SHOWCASE communications network. CORBA is one of the Center-to-Center standards for NTCIP, the others being DATEX and XML. Each protocol defines the methods for the transfer of data between intelligent transportation systems. They differ in their approach. DATEX is the original standard that relies on the use of standard message sets and a common definition of system data (using what is known as a data dictionary). CORBA is based upon an object-oriented approach, where the definition of the data is embedded in the object itself. XML (Extensible Markup Language) uses its own standard encoding rules for identifying each data element. XML has gained attention recently due to its widespread use as a standard data definition language with the Internet.

System detection is an essential component of each ATMS. The installation of suitable detectors to collect traffic data (system detectors) would be funded along with the necessary controller modifications for the transfer of traffic data to the central office. System detection should be capable of collecting volume and occupancy information on a per lane basis and the central systems should be able to derive speeds for each lane.

As part of the TSSP project, many intersections in the project area have been equipped with advanced detection using separate DLCs. Where possible, these detectors will be used as system detectors for the purposes of collecting data. New detection will be recommended for those intersections where traffic conditions warrant and advanced detection does not exist or cannot be used as system detectors.

Note that the choice of the detection system will not determine the need for controller upgrades.

4.1. Controller Upgrade Options

From the above discussion, it can be seen that, at this stage of the project, the ability for the controller to communicate with the central system using AB3418 (E) communication protocols is an important consideration.

The project area has a variety of Type 170 controllers; however, only Type 170E controllers have the capability to support the AB3418(E) protocol. Thus the intersections that are currently equipped with Type 170 controllers will be upgraded to Type 170E controllers.

The cities using NEMA controllers exclusively use Econolite equipment. In order to keep consistency in equipment within cities, it is recommended that older ASC 8000 controllers be upgraded to ASC/2 controllers with AB3418 E protocol support.

4.2. Central System Options

Except for Cities of South Gate, Vernon and Long Beach, none of the agencies have an existing central traffic control system. The County is in the process of deploying a system at their TMC. Four agencies contract out signal maintenance to a contractor; one agency contracts with another local agency for this service; and the rest of the agencies utilize in-house staff to operate and maintain their signals systems.

Figures 4.1 through 4.3 present the architecture options available to the City's for traffic control systems:

- **Controllers under a local system**

  Under this scenario, each City has its own independently operated traffic control system, which interfaces into the IEN. Each City is responsible for maintaining its own system.

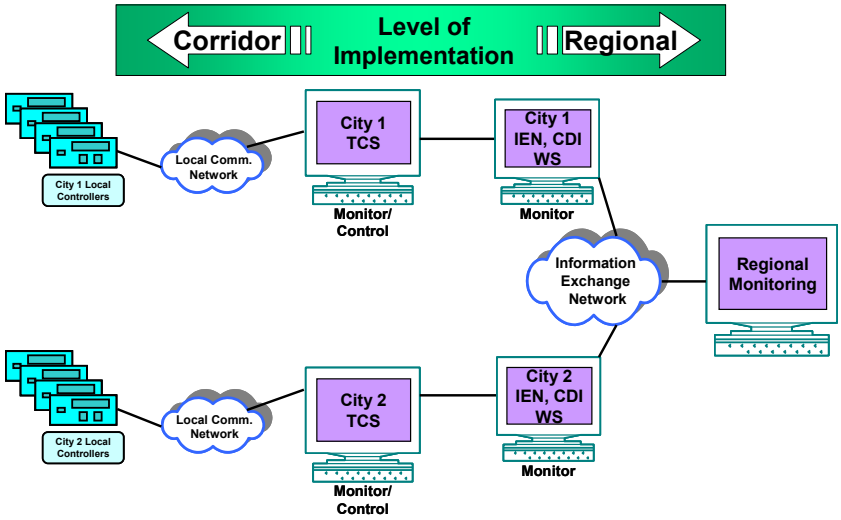


Figure 4-1: Local ATMS Architecture for Controllers Under Local System

- **Controllers under a shared system with other local Cities**

  Under this scenario, two or more Cities' signals are connected to one traffic control system. The system resides in one City's LCC, the other Cities have a remote workstation at their site. Through this workstation, the Cities can monitor and control intersections under their jurisdiction. The City that houses the Traffic Control System is responsible for its administration and maintenance.

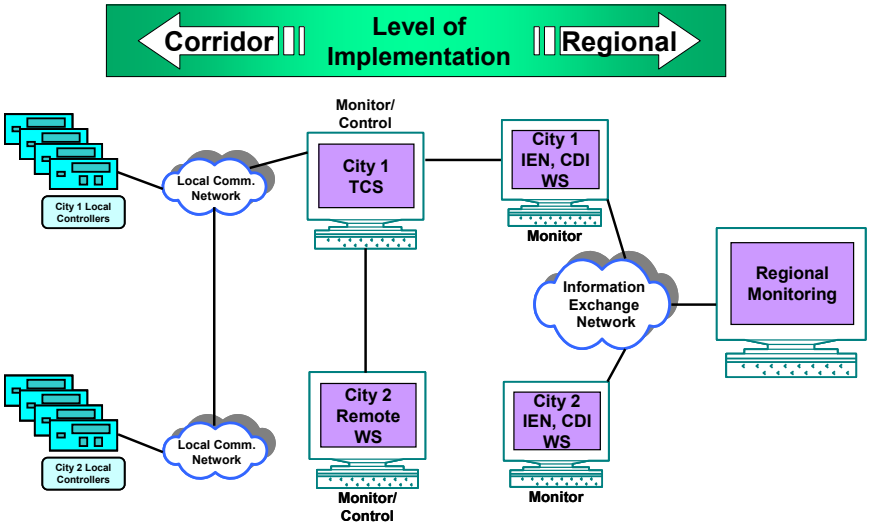


Figure 4-2: Local ATMS Architecture for Controllers Under Shared System (Other Cities)

- **Controllers under a shared system with regional agencies such as County**

  Under this scenario, a local City's signals are connected to a traffic control system of a regional agency such as the County. The system resides at the regional agency's TMC. The local City has a remote workstation at its site. Through this workstation, the local City can monitor and control intersections under its jurisdiction. The regional agency that houses the Traffic Control System is responsible for its administration and maintenance.

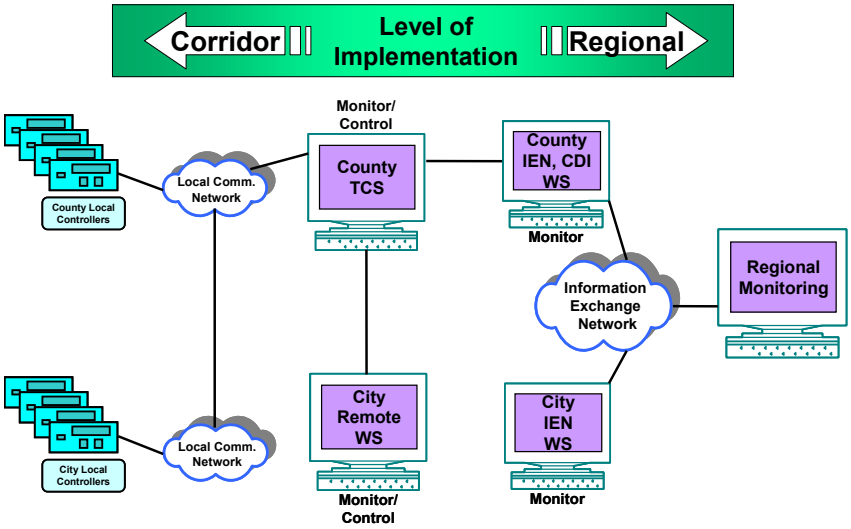


Figure 4-3: Local ATMS Architecture for Controllers Under Shared System (Regional)

Given this and based upon the analysis presented in Section 3, the recommendations for the traffic control system approaches in each agency are as follows:

4.2.1. County

Intersections should be connected to the County's future traffic control system at the County TMC using AB3418E. The controllers should be upgraded to Type 170E.

4.2.2. Bell

The project should result in project intersections being connected to a fully functional traffic control system located at the County. Controllers should be upgraded to 170E. Communications should use AB3418E.

4.2.3. Bell Gardens

The project should result in project intersections being connected to a fully functional traffic control system located at the City of Bell Gardens. Controllers should be upgraded. Communications should use AB3418E.

4.2.4. Commerce

Project intersections should be connected to the QuicNet IV system installed as part of the I-5/Telegrpah Road Corridor Project. The controllers should be upgraded to Type 170E using Bi Tran software supporting AB3418E.

4.2.5. Compton

No controller or traffic control system upgrades to be implemented as part of the project.

4.2.6. Cudahy

The project should result in project intersections being connected to a fully functional traffic control system located at the County. Controllers should be upgraded to 170E. Communications should use AB3418E.

4.2.7. Huntington Park

The project should result in a fully functional traffic control system located in the City of Huntington Park. Controllers should be upgraded to 170E. AB3418E should be used as the communications protocol.

4.2.8. Long Beach

No controllers or traffic control system upgrades are required.

4.2.9. Lynwood

The project should result in a fully functional traffic control system located in the City of Lynwood. Controllers should be upgraded to 170E. AB3418E should be used as the communications protocol.

4.2.10. Maywood

The project should result in project intersections being connected to a fully functional traffic control system located at the City of Huntington Park or County. Controllers should be upgraded to 170E. Communications should use AB3418E.

4.2.11. Paramount

The project should result in project intersections being connected to a fully functional traffic control system located at the City of Santa Fe Springs. Controllers should be upgraded to 170E. Communications should use AB3418E.

4.2.12. South Gate

The project intersections should be connected to the existing i2 system. All controllers in the project area should be upgraded to ASC/2 controllers with AB3418E protocol support.

4.2.13. Vernon

The existing traffic control system should be upgraded. All controllers in the project area should be upgraded to ASC/2 controllers with AB3418E protocol support.

Appendix A: Atlantic Blvd. /I-710 Corridor Interview Meeting Minutes

SIEMENS

Appendix B: Atlantic Blvd. /I-710 Corridor Traffic Signal System Inventory by Intersection

SIEMENS

Appendix C: Figures Depicting Communications Infrastructure for Atlantic Blvd. /I-170 Corridor