SAN GABRIEL VALLEY TRAFFIC FORUM

COMMUNICATIONS CONCEPTUAL DESIGN REPORT
(Deliverable 2.6.2.1)

DRAFT

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

The San Gabriel Valley Traffic Forum (SGVTF) is one of the planned Intelligent Transportation Systems (ITS) improvement projects that the Los Angeles County Department of Public Works (County) is developing as part of the Traffic System Management (TSM) program. The overall purpose of this program is to improve traffic flow and enhance arterial capacity in a cost-effective way where roadway widening is not possible. The purpose of the SGVTF project is to design, develop, and deploy Advanced Transportation Management Systems (ATMS) that can be tailored to each Agency's operational needs so that traffic signals can be synchronized and ITS systems integrated across jurisdictional boundaries. The SGVTF project focuses on the specific needs of each Agency, and recommends improvements to field infrastructure (e.g., controllers, detection systems, communications, etc.) and centralized Traffic Control Systems (TCSs) and/or Traffic Management Centers (TMCs) to meet those needs. When the SGVTF is completed, each of the Agencies responsible for traffic signal operations will have access to an ATMS that monitors and controls the traffic signals within their jurisdiction. In addition, Agencies will be able to synchronize their signals and exchange traffic information in real-time with neighboring Agencies. This will allow the Agencies to respond to recurrent and non-recurrent congestion in a coordinated fashion across jurisdictional boundaries.

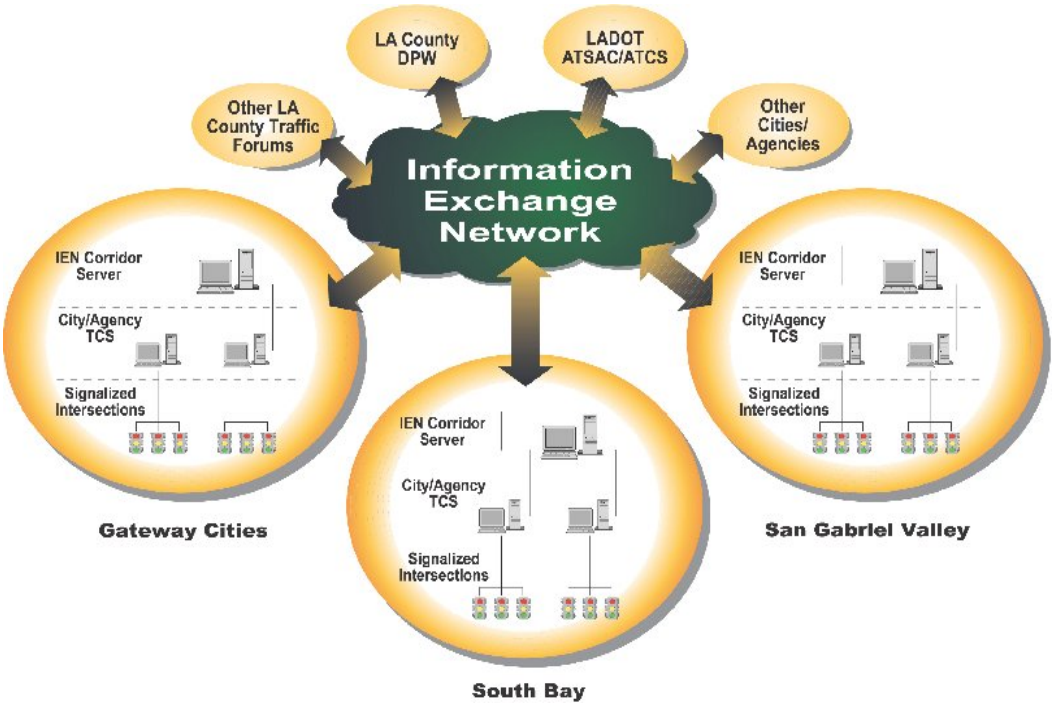
The SGVTF project area borders the California State Route (CA SR) 110 and I-710 freeways to the west, I-210 freeway to the north, CA SR 57 freeway to the east, and the CA SR 60 freeway to the south. It encompasses 24 municipalities as well as unincorporated portions of Los Angeles County. The traffic signals in this region are operated by many of the individual Agencies, LA County, and Caltrans District 7.

Developed by the County, the Information Exchange Network (IEN) is the integrated system framework that connects participating Agency ATMSs into a regional network to support the operational goals identified above. The IEN supports traffic signal operations at the local level, Corridor level, and regional level. The SGVTF assumes the availability of the IEN at the corridor and regional levels. Therefore, the SGVTF project is focused on the selection of TCSs and the integration of those systems to the IEN at the local level. The eventual ATMS design for the SGVTF will take into account the interface to the IEN and its requirements at the local level and encompass the following six (6) core components:

- ATMS and/or TCS (Individual Agency)
- Detection and Surveillance
- TMC and/or Workstation Layouts (ATMS and/or IEN)
- Communications Network
- SGVTF Participation/Coordination (City-specific and/or SGVTF-Regional integration)
- Operations and Maintenance (O&M)

The IEN comprises a series of computer servers, communication networks, and software applications that integrates these components for the collection and transfer of data to support Corridor and Regional functions throughout Los Angeles County. Exhibit 1.1 provides a high-level graphical representation of the Countywide IEN framework.

Exhibit 1.1 – Countywide IEN



1.2 PURPOSE OF THE DOCUMENT

This document provides the Communications System Alternatives Analysis Report (Deliverable 2.5.2.1), which is a deliverable related to the Alternatives Analysis Task of the SGVTF Project. This document will address the fundamentals of the communications technologies that are related to this project. In addition, it will utilize the needs and objectives of the Stakeholders, and incorporate the technology capabilities in order to provide recommendations for an economically robust communication system for the SGVTF.

This document will also provide an overview and quantity of the existing and planned ITS field devices in order to provide an accurate estimate of the bandwidth required to communicate with the field equipment as well as to support center-to-center (C2C) communication.

1.3 REPORT ORGANIZATION

This document is organized into the following sections:

- **Section 1: Introduction**

  This section presents the project overview, background, and introduces the document. It also presents a brief history of the project highlighting on past communications-related work. In addition, it provides different levels of the Countywide IEN and how it supports Agency traffic signal operations.

- **Section 2: Related Project And Coordination**

  This section identifies any related projects that are related to SGVTF project. In addition, it also discusses coordination with other projects.

- **Section 3: Field Devices**

  This section presents different segments of communication system and also the bandwidth requirements for each field device. In addition, it provides a brief description of each field device and the quantity.

- **Section 4: Communication Architecture**

  This section provides a brief description of the field-to-center and center-to-center communication network.

- **Section 5: Conceptual Design**

  This section presents the proposed system architecture for each Agency; it will include a detail maps with the associated equipment list and the cost estimate.

- **Section 6: Configuration Management Plan**

  This section presents the purpose and objective of the configuration management plan for SGVTF project. In addition, it will provide the authorities responsible for coordinating and maintaining the communication network.

- **Section 7: Construction Staging Plan**

  This section describes the phases of the construction stage. The phases will provide guidance and be an integral part of the scheduling and maximizing the resources.

1.4 METHODOLOGY

The methodology of compiling the information required for providing the communication conceptual design for both the Field-to-Center (F2C) and C2C included the following activities:

- Assessment of existing and planned ITS field devices
- Assessment of existing communication networks
- Assessment of needs and objectives of the SGVTF Stakeholders
- Assessment and engineering of the most economical communications alternative network
- Identify technologies that can be used for each field device
- Identify location of all field devices related to communication system
- Develop detailed field device inventory for each Agency

In addition to compiling the required information to provide the most economical and robust communication network there were also a variety of assumptions that were made during the conceptual design and the field visits. These assumptions, listed below, have an impact on the over all design philosophy and the resultant conceptual design.

- A conservative approach was taken during the conceptual design. Each separate direction extending out from a base location was assumed to be a separate communications channel with maximum of eight (8) field devices per channel. This approach was taken in order to provide a conservative estimate of the conceptual communications network. During the field visits, several locations were identified where the network configuration may be further optimized and those locations should be re-visited during the final design phase in order to provide the most cost effective approach based on technologies available at that time.
- In order to minimize the latency through out the network a maximum of three backbone links was used for the network in each individual agency.

- SGVTF project area has several portable changeable message signs. These devices will not be integrated in the Agency-owned wireless network since the final location of the portable devices is not known.
- The cost estimate provided in this document includes ten (10) year maintenance cost. This approach is consistent with previously submitted documents.
- Caltrans recommended that this design not consider the interconnection to their traffic signal locations. Caltrans has projects coming up to interconnect their traffic signals to their TMC.

1.5 REFERENCED DOCUMENTS

The following documents have been used as reference material in the preparation of this report:

- San Gabriel Valley Traffic Forum Project
  - Deliverable 2.1.1: Operational Objectives
  - Deliverable 2.2.1: System Needs
  - Deliverable 2.3.1.1: Concept-of-Operations
  - Deliverable 2.3.2.1: ATMS User Requirements
  - Deliverable 2.3.3.1: ATMS Functional Requirements
  - Deliverable 2.3.4.1: LCCS System Requirements
  - Deliverable 2.3.5.1: Sub-Regional TMC Requirements
  - Deliverable 2.3.8.1: Communications System Requirements
  - Deliverable 2.5.2.1: Communications Systems Alternatives Analysis Report
- I-105 Corridor Project
  - TSMACS User Requirements Report (Final)
  - Functional Requirements Report (Draft)
- San Gabriel Valley Pilot Project
  - System Design Report, Final Version 1.0
  - Communications Report, 2003 Update (Final)
- Pomona Valley ITS Project
  - Sub-Regional TMC Report

1.6 ACRONYMS AND ABBREVIATIONS

ATMS	Advanced Transportation Management System
Bps	bytes per second
C2C	Center-to-Center
CA SR	California State Route
CCTV	Closed Circuit Television
CIR	Committed Information Rate
CM	Configuration Management
CMS	Changeable Message Sign
CSP	Construction Staging Plan
DPW	Department of Public Works
F2C	Field-to-Center
Fps	Frames Per Second
GHz	Giga Hertz
IEN	Information Exchange Network
ITS	Intelligent Transportation System(s)
LA	Los Angeles
LACDPW	Los Angeles County Department of Public Works
LAN	Local Area Network
LCCS	Local City Control Site
LOS	Line of Site
MOU	Memorandum of Understanding
O&M	Operations and Maintenance
PVITS	Pomona Valley Intelligent Transportation System
SGVTF	San Gabriel Valley Traffic Forum
TCS	Traffic Control System
TMC	Transportation Management Center
TSM	Traffic System Management
USSR	Unlicensed Spread Spectrum Radio
VDS	Video Detection System

2. RELATED PROJECTS AND COORDINATION

The San Gabriel Traffic Forum is one of multiple traffic forum projects being conducted by Los Angeles County. As part of a much larger program there is benefit to be derived by developing a coordinated approach to common issues and problems. This coordination may come in the form of technology applications, especially for equipment that is maintained by County forces. Coordination of project schedules should also be evaluated to identify opportunities for expedited deployment, or to eliminate overlap in projects. This section discusses projects that are related to the San Gabriel Valley Traffic Forum (SGVTF) project. In addition, the consultant coordination section discusses the approach and design process that other firms are using to transfer data and video images from field devices to the Sub-Regional TMC.

2.1 RELATED PROJECT

Currently the following Agencies have communication related projects that will be in progress with the SGVTF project.

- City of San Marino - The City is planning to deploy a signal pre-emption project for various signals on Los Robles, but the schedule has not been finalized.
- City of South Pasadena - The City is coordinating its fiber optic cable infrastructure project from Columbia Ave to Huntington Blvd with LA County. The design service contract has been awarded to AZTEC. Currently AZTEC is completing the design improvements for the corridor which includes:
    - Widening the current SR-110 off ramp from two to four lanes;
    - Constructing a new northbound to westbound on ramp for the interchange;
    - Selective widening of the Fair Oaks Ave corridor;
    - Improving the circulation related to business access along the corridor;
    - Implementing an ITS for signal synchronization; and
    - Construction of replacement parking to mitigate the loss in parking along the corridor.
- City of Arcadia - The City is in the process of installing fiber optic cable infrastructure below ground north of Duarte Ave. The fiber optic cable infrastructure will have several uses and it will also be utilized to connect all field devices north of Duarte Ave to the LCCS.

2.2 TRAFIC FORUM COORDINATION

Several informal meetings were held with consultants developing other forum projects on their approach to providing communications and transfer data and video from the field devices to LCCS and also from LCCS to Sub-Regional TMC. Generally, the approach being proposed by TransCore in this document is consistent with the work being performed for other traffic forums.

The major difference between the projects is that other traffic forums have much more existing communication infrastructure, which will be utilized to transfer data and video, but the overall concept and approach on how to communicate with field devices and transfer data and video back to the Sub-Regional TMC is similar. The main goal of all the traffic forum projects is to provide the most economical and robust system architecture available to meet the requirements of the respective forums.

3. FIELD DEVICES

To develop the concept design for the communications network it is necessary to have an understanding of the different types of devices that the network will need to support and their distribution. The SGVTF encompasses approximately 990 traffic signal controllers, 40 CCTV cameras, and 11 CMS's (portable). These field devices provide traffic information and video images to LCCS. With the collection of this information, LCCS is capable of providing the public the necessary information to ease the traffic flow and provide quicker response time in case of emergency situations.

3.1 BANDWIDTH REQUIREMENTS

Each of the different types of field devices has it own communications, or bandwidth requirements. The bandwidth is the "size" of the communication pipe that is necessary to transfer data signals or video images. The higher the bandwidth required, the larger the pipe is needed to transfer the information. Exhibit 3.1 presents the bandwidth requirement for all field devices.

Exhibit 3.1 – Bandwidth Requirement

Field Devices	Bandwidth Requirements (Typical)
Traffic Signal Controller*	1.2 Kbps to 19.2 Kbps
CCTV** (less than 2fps)	128 Kbps
CCTV** (less than 10fps)	512 Kbps
CCTV** (less than 25fps)	1.54 Mbps
CMS***	9.6 Kbps

*Note: Traffic Signal Controllers will be connected in a multi-drop topology with no more than eight (8) controllers on a circuit.

**Note: 128 Kbps will provide low-resolution compressed digital video images up to 2 fps (Frames per second. In order to increase the number of frames per second to less than 10 with low-resolution compressed digital video images, the bandwidth has to be increased to 512 Kbps. Furthermore, in order to increase the number of frames per second to less than 25 with medium-resolution compressed digital video images the bandwidth has to be increased to 1.5 Mbps.

*** Note: CMS can be configured with multiple devices on the same communications channel when using an agency-owned communications network (wireline or wireless)

3.2 TRAFFIC SIGNAL SYSTEM

As part of the SGVTF Project, the traffic signal systems are used to manage the traffic flow. These systems will be connected to the IEN, which shares information with the Sub-Regional TMC and also with other Agencies on demand. Exhibit 3.2 provides a list of Agencies with the total number of traffic signals that are currently in operation or being maintained by the Agency.

Exhibit 3.2 – Traffic Signal Controllers

Agency	# Of Controllers
City of Arcadia	71
City of Alhambra	96
City of Azusa	45
City of Baldwin Park	51
City of Covina	63
City of Duarte	14
City of El Monte	78
City of Glendora	40
City of Irwindale	32
City of La Puente	13
City of Monrovia	34
City of Montebello	73
City of Monterey Park	62
City of Rosemead	49
City of San Gabriel	34
City of San Marino	18
City of South El Monte	20
City of South Pasadena	29
City of Temple City	29
City of West Covina	91

3.3 CCTV CAMERA SYSTEM

CCTV cameras are used to transmit images from high occupancy intersections for traffic conditions and also for incident verification. The CCTV images are transferred to the LCCS via the existing infrastructure, new communication network or leased facilities. The video signal from the CCTV camera will be encoded at the assigned consolidation point. The encoded video image will be transmitted to the LCCS via Agency-owned wireless network or leased DSL circuit. The transmitted signal received by the LCCS will have to be decoded in order to view the images on the monitors. The frames per second per CCTV camera will determine the bandwidth required per site. Exhibit 3.3 provides a list of Agencies that are planning to deploy CCTV cameras.

Exhibit 3.3 – CCTV Cameras

Agency	# of Cameras
City of Arcadia	6
City of Alhambra	7
City of Azusa	4
City of Covina	5
City of Irwindale	6
City of Monrovia	6
City of Rosemead	8

3.4 CHANGEABLE MESSAGE SIGN (CMS) SYSTEM

CMS system provides traveler information to the traveling public. CMS system is capable of providing advance warnings, special event information and Amber Alerts to both fixed and portable CMS's. There are a total of 11 portable CMS signs in the SGVTF project area. Exhibit 3.4 presents a list of Agencies with the total number of portable CMS existing or planning to deploy in the city.

Exhibit 3.4 – Changeable Message Sign

Agency	Quantity
City of Arcadia	2
City of Irwindale	2
City of Monrovia	3
City of Montebello	2
City of San Gabriel	2

3.5 VEHICLE DETECTION SYSTEM (VDS)

The Video Detection System (VDS) collects traffic information such as volume, occupancy, and speed. This system typically interfaces with the local traffic signal controllers, and data collected by the VDS is transmitted as part of the traffic control system information. Because the VDS are integrated with the traffic signals and the signal system they do not add to the bandwidth requirements of the wide area communications network. The communications between the detector and the traffic signal controller is a local to the intersection and that communications link will be addressed during the detailed design phase as the detection technology is finalized.

4. COMMUNICATION ARCHITECTURE

The communications architecture is divided into two components; a Field-to-Center (F2C) component and a Center-to-Center (C2C) component. Each of these components performs a unique function and has different requirements and solutions.

4.1 FIELD-TO-CENTER (F2C) COMMUNICATION ARCHITECHTURE

The F2C communications network will allow a central system (traffic control, signal control or video control) located either at the Agency LCCS or "host" Agency LCCS to have control and/or monitoring capabilities of the ITS field devices. The communications network must be designed to accommodate the bandwidth for the individual field device.

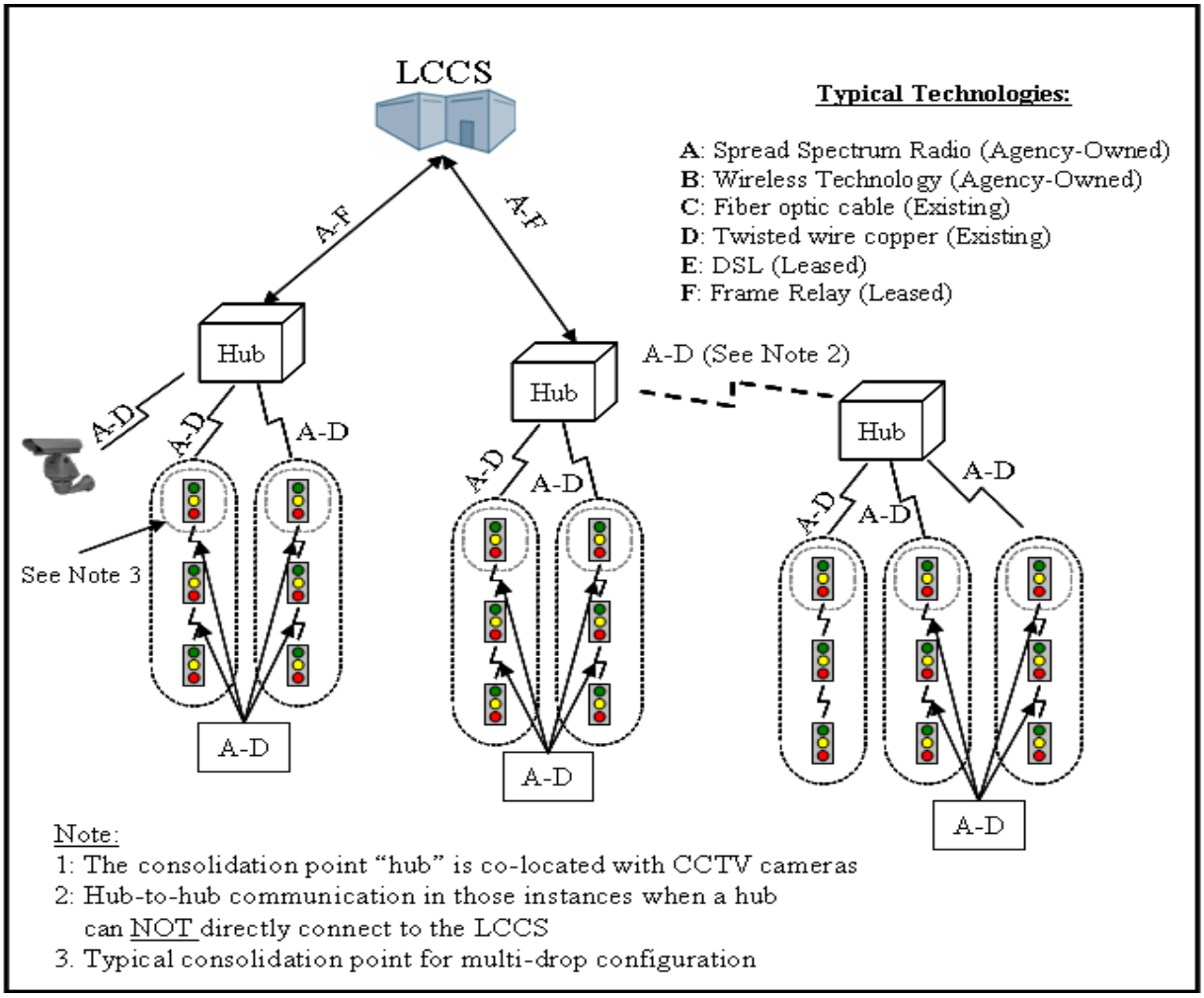
The F2C communications network has been divided into two (2) segments: local-to-consolidation point and consolidation point-to-LCCS. The local-to-consolidation point is described as communication link to and from field device to a consolidation point or hub. A consolidation point is an information collection point for the field devices that are connected to common location. The devices may be connected to this point through wireless communications links, or where available through existing wireline communications links. The field devices that are not located within close proximity or do not have Line of Site (LOS) from the LCCS will be connected to a consolidation point. The consolidation point will combine the data from traffic signal controllers and/or CCTV camera location in order to transfer data back to the LCCS via a single communications link. This link can be a wireless connection, or in some instances leased services may need to be utilized.

Exhibit 4.1 presents a typical F2C communication architecture. The letters next to each communication link presents the type of technology that can be used to create the communication link. The technologies were discussed in Communications systems Alternatives Analysis Report (Deliverable 2.5.2.1). An important element of this type of communications architecture is the communications for the local field devices be routed back to the LCCS, even if the agency is a Level 1 or 2A Agency that will not be controlling its own equipment. From the LCCS, the field device data can be routed to the sub-regional TMC along with IEN data.

The field devices except CCTV Cameras will be grouped together into channels with no more than eight (8) devices in a multi-drop configuration. Typically a consolidation point will serve a single channel, but this is not a limitation, and if the layout of the signals dictates, multiple channels can be tied into a consolidation point. The CCTV camera locations and strategically selected traffic signal controllers will serve as the consolidation points so as to minimize new equipment (i.e. additional cabinets) that needs to be installed. This approach also allows for the maximum bandwidth, and thus highest quality video, to be cost effectively provided.

Since most of the Agencies do not have any existing communication infrastructure in place nor have any future plans, the most economical and technologically sound recommendation for F2C would be the use of Agency owned USSR and/or wireless LAN technologies, and leased services such as DSL and/or Frame Relay technologies for the second segment of F2C communication.

Exhibit 4.1 – F2C Communication Architecture



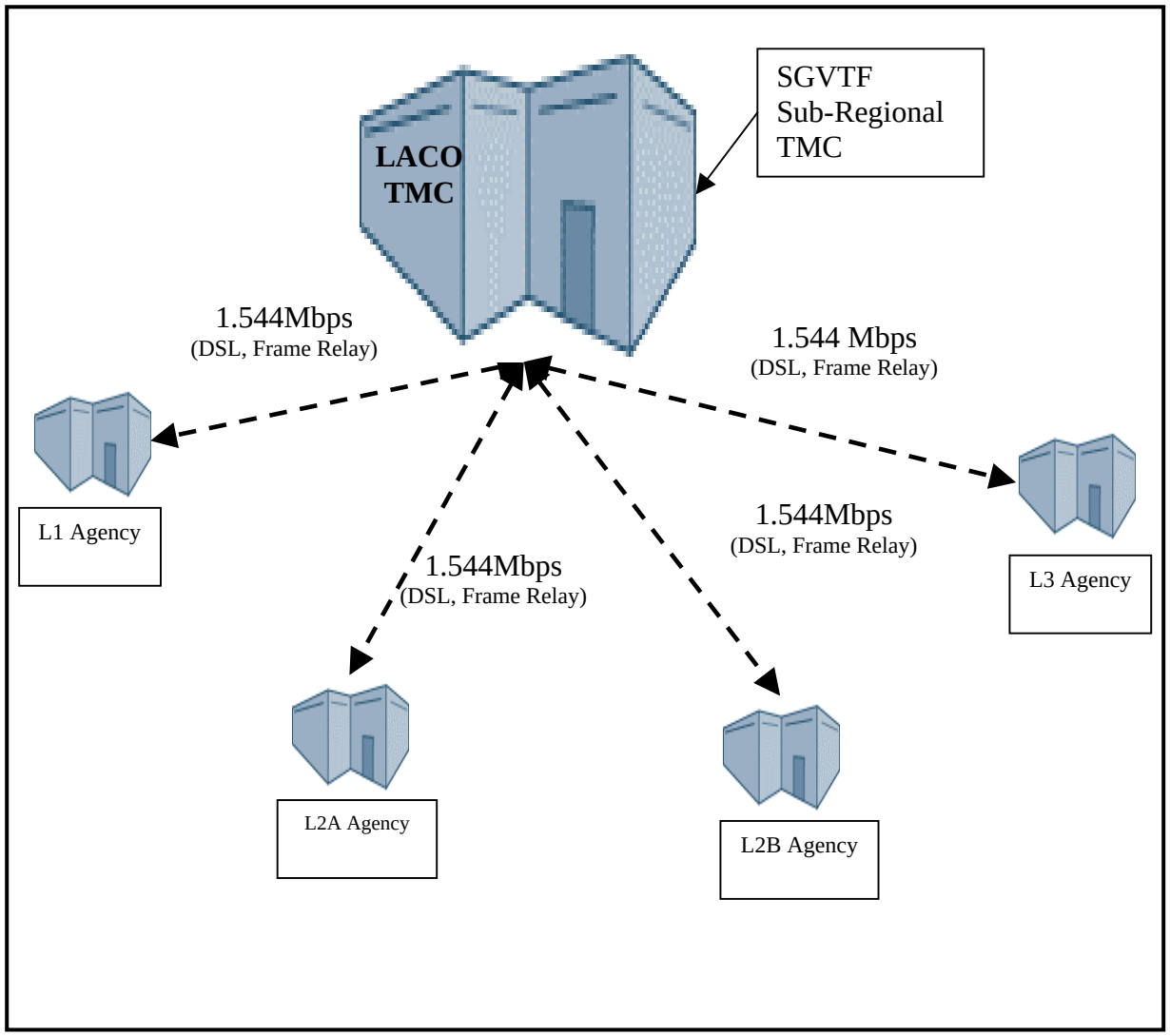
4.2 CENTER-TO-CENTER (C2C) COMMUNICATION ARCHITECHTURE

The C2C communications network will provide the means of transferring ATMS data, and video images to/from an Agency LCCS to the SGVTF Sub-Regional TMC. The communication network shall be able to support the aggregate sum of all bandwidth required for each field device from the Agency LCCS to the LA County TMC. The second level of C2C communication is the connection between a Local Agency IEN W/S with the SGV IEN Corridor Server.

Exhibit 4.2 presents a typical C2C communication architecture. In order to eliminate multiple communication links entering the Sub-Regional TMC from each Agency LCCS's, it is envisioned that C2C communication would be an addition onto the IEN network link. The current Committed Information Rate (CIR) for an IEN Workstation to/from the SGVTF Sub-Regional TMC is 384 Kbps. It is our recommendation for the link to be upgraded to 1.544 Mbps in order to have adequate bandwidth to communicate and transfer data between the Agency LCCS and the SGVTF Sub-Regional TMC (aka the LACO TMC) to better support the Agency's field devices and IEN Workstation. In addition, this recommendation will ensure that there is only one (1) communications link between the Agency LCCS and the SGVTF Sub-Regional

TMC. This recommendation will be the most cost effective and much more manageable solution for C2C communication.

Exhibit 4.2 – C2C Communication Architecture



5. CONCEPTUAL DESIGN

This section presents a conceptual design for F2C and C2C communication networks. This section is divided into sub-sections in order to group each level of Agency together and provide comprehensive information for each level including a brief description of the Agency's current communication infrastructure, quantity of consolidation points, list of equipment, cost estimate and a map presenting the proposed conceptual design.

The equipment configuration that will be at each location is mentioned in the equipment list. Appendix A provides a typical block diagrams for each type of equipment configuration.

At this time City of Pasadena will not be included in the SGVTF communication conceptual design, since the City's communications network is already 100% "built-out". The City of Pasadena will only be involved during the integration phase and only if any system detection units effects the communication in their city.

The City of San Dimas also will not be involved in the SGVTF project. The City of San Dimas is part of Pomona Valley ITS Forum, and as TransCore understands that all the City's conceptual designs will be developed under the PVITS project.

5.1 LEVEL 1 AGENCIES

A Level one (1) Agency is defined in the ATMS Alternative Analysis Report (Deliverable 2.5.1.1). As an Agency that:

- Does NOT operate its traffic signals
    - Agency wants to be "Agency B" on another Agency's ATMS
    - Another Agency operates its traffic signals (e.g., LA County DPW)
- Is provided with an IEN W/S to monitor traffic signals and incident management activities.
- Does NOT have a separate ATMS workstation provided. Their only access to the traffic control system is through an IEN workstation.

5.1.1 City of Duarte

There are total of fourteen (14) traffic signals located in the City of Duarte, which includes five (5) traffic signals that are shared with Caltrans and three (3) with City of Monrovia. These intersections are located primarily along the Huntington Blvd, Mountain Ave and Buena Vista Ave. In addition to the traffic signals the City of Duarte is planning to install three (3) system detectors along Huntington Blvd.

In order to simplify the communication design for the City of Duarte the following traffic signals will be assigned to City of Monrovia:

- Mountain Ave and Huntington Dr
- Mountain Ave and Duarte Rd
- Mountain Ave and Wal-Mart/Home Depot

The following five (5) traffic signals are shared with Caltrans and communications to these intersections will be performed by Caltrans under a separate future program:

- Mountain Ave and Central Ave
- Mountain Ave and Evergreen Ave

- Huntington Dr. and Mt. Olive Dr.
- Buena Vista St. and Central Ave
- Buena Vista St. and Evergreen St,

The remaining six (6) traffic signals that are owned by City of Duarte will be connected to LCCS via two (2) consolidation points. The City of Duarte does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based network. In addition to the traffic signals there will be total of three (3) system detectors that will be located along Huntington Blvd.

Exhibit 5.1 presents the location of all traffic signals, serial repeater, system detectors, consolidation points and location of the LCCS.

The City of Duarte will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.1 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and the maintenance for 10 years. As shown, the estimated cost for F2C is $91,860 and for the C2C communication is $39,158.70.

Exhibit 5.1 – City Map of Duarte

Table 5.1 – City of Duarte Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	1	0	1	1	1	0	0	1	1	
CP1	CP1	Huntington Dr.	Highland Ave(***)	21A	2	1	3	3	1					
	Channel 1	Huntington Dr.	Crestfield Dr.	SR		2	2	2						
		Huntington Dr.	Las Lomas Rd.(***)	A		1	1	1						
CP2	CP2	Huntington Dr.	Buena Vista St.	12A	1	2	3	3	1					
	Channel 1	Huntington Dr.	Mtn. Vista Plaza(***)	A		1	1	1						
	Channel 2	Buena Vista St.	Duarte Rd.	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	4	8	12	12	3	0	0	1	1	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$6,000.00	$12,000.00	$4,800.00	$3,000.00	$4,800.00	$0.00	$0.00	$300.00	$300.00	$31,200.00
Total Installation	$4,000.00	$8,000.00								$12,000.00
Total Integration	$2,000.00	$4,000.00								$6,000.00
SUB TOTAL	$12,000.00	$24,000.00	$4,800.00	$3,000.00	$4,800.00	$0.00	$0.00	$300.00	$300.00	**$49,200.00**
Design (20% of Sub Total)										$9,840.00
Escalation (15% of Sub Total)										$7,380.00
Contingency (20% of Sub Total)										$9,840.00
									Grand Total	**$76,260.00**
									Yearly Maintenance 5%	**$1,560.00**
									10 Year Maintenance cost	**$15,600.00**
									10 year Grand Total cost	**$91,860.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Duarte	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.1.2 City of La Puente

The City of La Puente has total of thirteen (13) traffic signals that are being maintained by LA County Department of Public Works. The City of La Puente does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of three (3) consolidation points not including the LCCS. Consolidation point number two (2) and three (3) will need to be connected to LCCS directly via leased DSL circuits, since there is no LOS between any consolidation point and the LCCS.

Exhibit 5.2 presents the location of all traffic signals, serial repeaters, consolidation points and location of the LCCS.

The City of La Puente will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.2 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $189,180 and for the C2C communication is $39,158.70.

Exhibit 5.2 – City Map of La Puente

Table 5.2 – City of La Puente Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	0	0	1	1	
CP1	CP1	Temple Ave	Glendora Ave	VPN13A	1	3	4	4	1		1	1	1	
	Channel 1	Temple Ave	Stimson Ave	A		1	1	1						
		Temple Ave	Del Valle Ave	A		1	1	1						
	Channel 2	Temple Ave	Hacienda Ave	A		1	1	1						
	Channel 3	Glendora Ave	Hacienda Ave	SR		2	2	2						
		Amar Ave	Hacienda Ave	SR		2	2	2						
		Amar Ave	Del Valle Ave	A		1	1	1						
CP2	CP2	Temple Ave	Orange Ave	11A	1	1	2	2	1					
	Channel 1	Temple Ave	Willow Ave	A		1	1	1						
		Temple Ave	Ardilla Ave	SR		2	2	2						
		Amar Ave	Ardilla Ave	A		1	1	1						
CP3	CP3	Valley Blvd	Ferreo Lane	VPN01A		1	1	1	1		1	1	1	
	Channel 1	Valley Blvd	Wickford Ave	A		1	1	1						

F2C Equipment/Installation/Integration Cost										
	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	2	18	20	20	3	0	2	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$3,000.00	$27,000.00	$8,000.00	$5,000.00	$4,800.00	$0.00	$20,000.00	$900.00	$900.00	$69,600.00
Total Installation	$2,000.00	$18,000.00								$20,000.00
Total Integration	$1,000.00	$9,000.00								$10,000.00
SUB TOTAL	$6,000.00	$54,000.00	$8,000.00	$5,000.00	$4,800.00	$0.00	$20,000.00	$900.00	$900.00	**$99,600.00**
Design (20% of Sub Total)										$19,920.00
Escalation (15% of Sub Total)										$14,940.00
Contingency (20% of Sub Total)										$19,920.00
									Grand Total	**$154,380.00**
									Yearly Maintenance 5%	**$3,480.00**
									10 Year Maintenance cost	**$34,800.00**
									10 year Grand Total cost	**$189,180.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion					
Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of La Puente	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.1.3 City of San Marino

There are a total of eighteen (18) signalized intersections in the City of San Marino, which includes two (2) traffic signals shared with LA County. These intersections are located along Huntington Blvd, California Ave and San Gabriel Ave. The City of San Marino does not have any existing signal interconnect; therefore the F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of five (5) consolidation points not including the LCCS. All consolidation points except consolidation point five (5) will be interconnected to consolidation point one (1) and there will be a direct fiber optic connection from this location to the LCCS. The fiber optic will provide adequate bandwidth to support the other consolidation points and provide a more robust communications link.

Consolidation point five (5) will be connected to the LCCS via leased DSL circuits, since there is no LOS between this consolidation point and the LCCS.

Exhibit 5.3 presents the location of all traffic signals, serial repeaters, consolidation points and location of the LCCS.

In City of San Marino there are two (2) locations that require signal strength testing. The first location is between the intersections of Huntington Blvd/San Gabriel Ave and California Ave/San Gabriel Ave; and the second location is between the intersections of Huntington Blvd/San Gabriel Ave and Duarte Ave/San Gabriel Ave. Both locations have an uphill/downhill curve towards the closest consolidation point. The combination of the curve, hill and the trees obstructing the LOS, dictate the need for further field testing to ensure additional repeaters are not required. The intersections to be tested are located north and south of consolidation point four (4). This testing should be done as part of the detailed design to ensure that it factors in the latest design considerations as well as local conditions.

The City of San Marino will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.3 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $266,582.50, and for the C2C communication is $40,314.96.

Exhibit 5.3 – City Map of San Marino

Table 5.3 – City of San Marino Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	150	0	1	1	
CP1	CP1	Huntington Blvd	San Marino Ave	VPN22A	2	2	4	4	1		0	1	1	Fiber optic Connetion to LCCS
	Channel 1	Huntington Blvd	Del Mar Ave(***)	A		1	1	1						
	Channel 2	Huntington Blvd	Cambridge Rd	A		1	1	1						
CP2	CP2	Huntington Blvd	Virginia Rd	11A	1	1	2	2	1					
	Channel 1	Huntington Blvd	Saint Albans Rd.(***)	SR		2	2	2						
		Huntington Blvd	Oak Knoll Ave	A		1	1	1						
		Huntington Blvd	Grenada Ave	A		1	1	1						
CP3	CP3	Huntington Blvd	Gainsborough Dr.	20A	2	0	2	2	1					
CP4	CP4	Huntington Blvd	San Gabriel Blvd(***)	12A	1	2	3	3	1					
	Channel 1	San Gabriel Blvd	Duarte Blvd (***)	A		1	1	1						
	Channel 2	San Gabriel Blvd	California	SR		2	2	2						
		California Blvd	Santa Anita Ave	A		1	1	1						
		California Blvd	Sierra Madre Blvd	SR		2	2	2						
		California Blvd	San Marino Blvd	A		1	1	1						
		California Blvd	Allen Ave	A		1	1	1						
CP5	CP5	Los Robles Ave	Monterey Rd.	VPN02A		2	2	2	1		1	1	1	
	Channel 1	Los Robles Ave	Mission St.	A		1	1	1						
	Channel 2	Los Robles Ave	Wilson Ave	A		1	1	1						

F2C Equipment/Installation/Integration Cost	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	6	23	29	29	5	150	1	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$9,000.00	$34,500.00	$11,600.00	$7,250.00	$8,000.00	$15,000.00	$10,000.00	$900.00	$900.00	$97,150.00
Total Installation	$6,000.00	$23,000.00								$29,000.00
Total Integration	$3,000.00	$11,500.00								$14,500.00
SUB TOTAL	$18,000.00	$69,000.00	$11,600.00	$7,250.00	$8,000.00	$15,000.00	$10,000.00	$900.00	$900.00	$140,650.00
Design (20% of Sub Total)										$28,130.00
Escalation (15% of Sub Total)										$21,097.50
Contingency (20% of Sub Total)										$28,130.00
									Grand Total	$218,007.50
									Yearly Maintenance 5%	$4,857.50
									10 Year Maintenance cost	$48,575.00
									10 year Grand Total cost	$266,582.50

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion					
Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of San Marino	$0	$319.96	1544	$3,839.52	$3,839.52
				Total Annual Cost w/o Installation	$3,839.52
				Installation Cost (One Time Fee)	$0.00
				Total Annual Cost	$3,839.52
				Yearly Maintenace 5%	$191.98
				10 year Maintenace cost	$1,919.76
				Total 10 year cost	$40,314.96

5.1.4 City of South El Monte

The City of South El Monte has total of twenty (20) signalized intersections which include four (4) pedestrian signals. In order to simplify the F2C communication design for the City of South El Monte the following traffic signal has been assigned to the City of El Monte:

- Garvey Ave and Potrero Ave
- Garvey Ave and Lashbrook (Pedestrian signal)

Additionally, Caltrans has six (6) signals located in the City of El Monte as listed below. Communications to these intersections will be handled by Caltrans under separate project(s).

- Garvey Ave and Lee Ave
- Garvey Ave and Chico
- Garvey Ave and Rosemead
- Rosemead and SR-19
- Peck Rd and Durfee
- US-60 and Durfee

The City of South El Monte does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of wireless-based design. There will be total of four (4) Consolidation points not including the LCCS. Exhibit 5.4 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of South El Monte will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.4 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $285,787.50, and for the C2C communication is $39,158.70.

Exhibit 5.4 – City Map of South El Monte

Table 5.4 – City of South El Monte Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	300		1	1	
CP1	CP1	Tyler Ave	Michael Hunt	VPN23A	2	3	5	5	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	Michael Hunt	Lidcombe Ave	A		1	1	1						
	Channel 2	Tyler Ave	Santa Anita	A		1	1	1						
	Channel 3	Santa Anita	Central	SR		3	3	3						
		Central Ave	Lerma	A		1	1	1						
		Santa Anita / Fawcette	Fawcette	A		1	1	1						
CP2	CP2	Michael Hunt	Durfee (***)	11A	1	1	2	2	1					
	Channel 1	Peck Rd / Durfee	Thienes Ave	A		1	1	1						
		Rush	Durfee	SR		2	2	2						
		Rush	Peck Rd	A		1	1	1						
CP3	CP3	Rush	Santa Anita (***)	22A	2	2	4	4	1					
	Channel 1	Rush	Tyler Ave	A		1	1	1						
	Channel 2	Santa Anita Ave	Klingerman	A		1	1	1						
		Santa Anita Ave	Elliot / Fern	A		1	1	1						
CP4	CP4	Rush	Merced	12A	1	2	3	3	1					
	Channel 1	Rush	Potrero	A		1	1	1						
		Rush	Chico	A		1	1	1						
	Channel 2	Merced	Alesia	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	6	25	31	31	4	300	0	2	2	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$9,000.00	$37,500.00	$12,400.00	$7,750.00	$6,400.00	$30,000.00	$0.00	$600.00	$600.00	$104,250.00
Total Installation	$6,000.00	$25,000.00								$31,000.00
Total Integration	$3,000.00	$12,500.00								$15,500.00
SUB TOTAL	$18,000.00	$75,000.00	$12,400.00	$7,750.00	$6,400.00	$30,000.00	$0.00	$600.00	$600.00	**$150,750.00**
Design (20% of Sub Total)										$30,150.00
Escalation (15% of Sub Total)										$22,612.50
Contingency (20% of Sub Total)										$30,150.00
									Grand Total	**$233,662.50**
									Yearly Maintenance 5%	**$5,212.50**
									10 Year Maintenance cost	**$52,125.00**
									10 year Grand Total cost	**$285,787.50**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of South El Monte	$250	$289.95	1544	$3,729.40	$3,479.40
			Total Annual Cost w/o Installation		$3,729.40
			Installation Cost (One Time Fee)		$250.00
			Total Annual Cost		$3,979.40
			Yearly Maintenace 5%		$186.47
			10 year Maintenace cost		$1,864.70
			Total 10 year cost		**$39,158.70**

5.1.5 City of South Pasadena

The City of South Pasadena has total of twenty-nine (29) traffic signals which includes one (1) pedestrian signal. In addition there are three (3) proposed traffic signals and two (2) Caltrans traffic signals which are located at Columbia St./Pasadena Ave and Columbia St./Fremont Ave. Communications to these two intersections will be addressed separately by Caltrans.

The City of South Pasadena does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of wireless-based design. There will be total of six (6) consolidation points not including the LCCS. Most of the traffic signal controllers have a clear LOS with the consolidation points or a repeater site. Consolidation point one (1) will have a direct fiber optic connection with the LCCS or Police Department..

The City of South Pasadena has three (3) proposed traffic signals that will not be integrated in the communication conceptual design at this time. After installation of the traffic signals, the equipment and the communication network of City of South Pasadena will be evaluated in order to provide the most economical solution to communicate with the additional traffic signals. The proposed traffic signal locations are:

- Monterey Ave and Orange Grove
- Sterling and Orange Grove
- Monterey Ave and Garfield Ave

In City of South Pasadena there are two locations that require signal strength testing. One location is between the intersections of Monterey/Mission and Monterey/Indiana where Monterey Street has an uphill curve towards the closest consolidation point. The combination of the curve, hill and the trees the LOS is obstructed, and further field testing should be performed as part of the detailed design to ensure additional repeaters are not necessary. The intersection is located west of consolidation point six (6).

The second intersection is located between Mission/Grand and Mission/Meridian. At this location there is also a small hill on Mission Street that may affect on the LOS to the next controller or the consolidation point. This area should also be further field tested during the detailed design phase to ensure additional repeaters are not necessary. This intersection is located west of consolidation point one (1).

Exhibit 5.5 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of South Pasadena will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.5 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $365,800, and for the C2C communication is $38,896.20.

Exhibit 5.5 – City Map of South Pasadena

Table 5.5 – City of South Pasadena Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	100		1	1	
CP1	CP1	Fremont	Mission St	VPN22A	2	2	4	4	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	Mission St	Meridian Ave	A		1	1	1						
		Mission St	Grand Ave	A		1	1	1						
	Channel 2	Fremont	El Centro St	A		1	1	1						
CP2	CP2	Fair Oaks	State St (***)	12A	1	2	3	3	1					
	Channel 1	Fremont	Grevelia St	A		1	1	1						
	Channel 2	Garfield	Clark Pl	A		1	1	1						
CP3	CP3	Fair Oaks	Mission St	33A	3	3	6	6	1					
	Channel 1	Fair Oaks	Hope St	A		1	1	1						
	Channel 2	Fair Oaks	El Centro St	A		1	1	1						
		Fair Oaks	Oxley St	A		1	1	1						
		Fair Oaks	Monterey Rd	A		1	1	1						
		Fair Oaks	Rollin St	A		1	1	1						
		Fair Oaks	Oak St	A		1	1	1						
	Channel 3	Mission St	Garfield (***)	A		3	3	3						
CP4	CP4	Fair Oaks	Huntington Dr. (***)	11A	1	1	2	2	1					
	Channel 1	Huntington	Marengo	A		1	1	1						
		Huntington	Fletcher (***)	A		1	1	1						
CP5	CP5	Huntington	Fremont	12A	1	2	3	3	1					
	Channel 1	Fremont	Oak St	A		1	1	1						
		Fremont	Rollin St	A		1	1	1						
	Channel 2	Huntington	Maple	A		1	1	1						

Table 5.5 – City of South Pasadena Equipment and Costs (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP6	CP6	Fremont	Monterey Rd	22A	2	2	4	4	1					
	Channel 1	Monterey Rd	Diamond Ave	A		1	1	1						
		Monterey Rd	Meridian Ave	A		1	1	1						
		Monterey Rd	Via Del Ray	A		1	1	1						
		Monterey Rd	Indiana	SR		2	2	2						
		Monterey Rd	Pasadena	A		1	1	1						
	Channel 2	Fremont	Bank St	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	10	38	48	48	6	100	0	2	2	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$15,000.00	$57,000.00	$19,200.00	$12,000.00	$9,600.00	$10,000.00	$0.00	$600.00	$600.00	$124,000.00
Total Installation	$10,000.00	$38,000.00								$48,000.00
Total Integration	$5,000.00	$19,000.00								$24,000.00
SUB TOTAL	$30,000.00	$114,000.00	$19,200.00	$12,000.00	$9,600.00	$10,000.00	$0.00	$600.00	$600.00	**$196,000.00**
Design (20% of Sub Total)										$39,200.00
Escalation (15% of Sub Total)										$29,400.00
Contingency (20% of Sub Total)										$39,200.00
									Grand Total	**$303,800.00**
									Yearly Maintenance 5%	**$6,200.00**
									10 Year Maintenance cost	**$62,000.00**
									10 year Grand Total cost	**$365,800.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of South Pasadena	$225	$289.95	1544	$3,704.40	$3,479.40
			Total Annual Cost w/o Installation		$3,704.40
			Installation Cost (One Time Fee)		$225.00
			Total Annual Cost		$3,929.40
			Yearly Maintenace 5%		$185.22
			10 year Maintenace cost		$1,852.20
			Total 10 year cost		**$38,896.20**

5.1.6 City of Temple City

The City of Temple City has total of twenty-nine (29) traffic signals which are currently being maintained by LA County Department of Public Works. The City of Temple City does not have any existing F2C communication infrastructure; therefore the recommended communication infrastructure will consist of an Agency-owned wireless-based design. In order to simplify the communication design for the City of El Monte the following traffic signals have been assigned to the Temple City communications network and are included in the twenty-nine (29) intersections mentioned above:

- Baldwin Ave and Lower Azusa Rd.
- Lower Azusa Rd. and Arden Dr.
- Lower Azusa Rd. and Halifax Rd.

There will be total of three (3) consolidation points not including the LCCS. Most of the traffic signal controllers have a clear LOS with the consolidation points or a repeater site. Consolidation point one (1) will have a direct fiber optic connection with the LCCS.

In City of Temple City there is one location that requires additional signal strength testing. This site is located between E. Broadway/Encinita and E. Broadway/Temple City. The serial repeater located at Temple City/E. Broadway does have direct LOS with radio located at Encinita/E. Broadway; however E. Broadway has lots of trees that might interfere with the transmit and receive signal. Further field testing during the detailed design phase is necessary to ensure additional repeaters are not required. This intersection is located south of consolidation point one (1).

Exhibit 5.6 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of Temple City will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.6 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $349,530 and for the C2C communication is $39,158.70.

Exhibit 5.6 – City Map of Temple City

Table 5.6 – City of Temple City Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	200		1	1	
CP1	CP1	La Tunas Drive	Temple City Blvd	VPN23A	2	3	5	5	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	La Tunas Drive	Camellia Ave	A		1	1	1						
		La Tunas Drive	Kauffman Ave	A		1	1	1						
		La Tunas Drive	Golden West Ave (***)	A		1	1	1						
	Channel 2	La Tunas Drive	Sultana Ave (2 ***)	A		1	1	1						
		La Tunas Drive	Loma Ave	A		1	1	1						
		La Tunas Drive	Encinita Ave	SR		2	2	2						
		La Tunas Drive	Alessandro Ave	A		1	1	1						
		La Tunas Drive	Oak Ave	A		1	1	1						
		La Tunas Drive	Cloverly Ave	A		1	1	1						
		La Tunas Drive	Primrose Ave	A		1	1	1						
	Channel 3	Temple City Blvd	Live Oak Ave	SR		3	3	3						
		Temple City Blvd	Broadway	SR		3	3	3						
		Temple City Blvd	Olive Street	A		1	1	1						
		Temple City Blvd	La Rosa Ave	A		1	1	1						
		Broadway	Encinita Ave	A		1	1	1						
		Baldwin Ave	Olive Street	A		1	1	1						
CP2	CP2	Temple City Blvd	Lower Azusa Rd	11A	1	1	2	2	1					
	Channel 1	Lower Azusa Rd.	Home Depot/Golden West Ave	A		1	1	1						
		Baldwin Ave	Lower Azusa Rd.	SR		3	3	3						
		Lower Azusa Rd.	Arden Drive	A		1	1	1						
		Lower Azusa Rd.	Halifax Rd.	A		1	1	1						
		Baldwin Ave	Olive St (***)	A		1	1	1						
CP3	CP3	Temple City	Longden Ave	13A	1	3	4	4	1					
	Channel 1	Temple City	Lemon Ave	A		1	1	1						
		Temple City	Camino Real	A		1	1	1						
	Channel 2	Oak Ave	Longden Ave	A		1	1	1						
	Channel 3	Temple City Blvd	Garibaldi Ave	A		1	1	1						
		Temple City Blvd	Woodruff	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	4	40	44	44	3	200	0	2	2	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$6,000.00	$60,000.00	$17,600.00	$11,000.00	$4,800.00	$20,000.00	$0.00	$600.00	$600.00	$120,600.00
Total Installation	$4,000.00	$40,000.00								$44,000.00
Total Integration	$2,000.00	$20,000.00								$22,000.00
SUB TOTAL	$12,000.00	$120,000.00	$17,600.00	$11,000.00	$4,800.00	$20,000.00	$0.00	$600.00	$600.00	**$186,600.00**
Design (20% of Sub Total)										$37,320.00
Escalation (15% of Sub Total)										$27,990.00
Contingency (20% of Sub Total)										$37,320.00
									Grand Total	**$289,230.00**
									Yearly Maintenance 5%	**$6,030.00**
									10 Year Maintenance cost	**$60,300.00**
									10 year Grand Total cost	**$349,530.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Temple City	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.2 LEVEL 2A AGENCIES

Level 2A Agency is defined in the ATMS Alternative Analysis Report (Deliverable 2.5.1.1) as an agency that:

- Passively manages its traffic signals
    - Establish initial signal timing, monitoring system status daily, etc.
    - May operate on an exception/as-needed basis
    - Monitor mainly the alarms and malfunctions
- Wants to be "Agency B" on another Agency's ATMS
- Is provided with an IEN W/S to monitor traffic signals and incident management activities (regional view)
- Maintains a separate ATMS W/S that is connected to "host" Agency's ATMS (Local view)

5.2.1 City of Azusa

The City of Azusa has total of forty-five (45) traffic signals. In addition there are seven (7) Caltrans traffic signals along Azusa Ave, Citrus and First Ave. The City of Azusa has also four (4) proposed CCTV Camera locations. The CCTV cameras are located along Foothill Blvd and Citrus Ave. In order to simplify the communication design for the City of Azusa and surrounding Agencies the following traffic signals have been assigned to City of Covina and City of Irwindale:

- Arrow Hwy and Cerritos Ave (Covina)
- Arrow Hwy and Citrus Ave (Covina)
- Irwindale and First ST. (Irwindale)
- Irwindale and Gladstone St. (Irwindale)
- Arrow Hwy and Vincent Ave (Irwindale)

The City of Azusa does not have any existing F2C communication infrastructure; therefore the communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of seven (7) Consolidation points not including the LCCS. Most of the traffic signals have a clear LOS with the consolidation points or to a repeater site. Consolidation point one (1) will have a direct fiber optic connection with the LCCS. Consolidation point number four (4) will need to be connected to LCCS directly via leased DSL circuit, since there is no LOS between any consolidation point and the LCCS.

In the City of Azusa there is one location that requires additional signal strength testing during the detailed design phase. This site is consolidation point three (3). This location has lots of trees that might interfere with the signal. Exhibit 5.7 presents the location of all field devices, serial repeaters, consolidation points, CCTV cameras and location of the LCCS.

The City of Azusa will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system, and potentially video images from the CCTV cameras. Table 5.7 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $526,992.50 and for the C2C communication is $13,418.90.

Exhibit 5.7 – City Map of Azusa

Table 5.7 – City of Azusa Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	200	0	1	1	
	CP1	Foothill Blvd	Azusa Ave (****)	VPN23C	2	3	5	5	1			1		
	Channel 1	Azusa Ave	Third St	A		1	1	1						
		Azusa Ave	Fifth St.	A		1	1	1						
	Channel 2	Azusa Ave	Eleveneth St.	A		1	1	1						
CP1	Channel 3	Foothill Blvd	Alameda Ave	A		1	1	1						Fiber optic Connetion to LCCS
		Foothill Blvd	Pasadena Ave	A		1	1	1						
		Foothill Blvd	Cerritos Ave	SR		1	1	1						
		Foothill Blvd	Alosta Ave (***)	A		3	3	3						
		Cerritos Ave	Fifth St.	A		1	1	1						
	CP2	Foothill Blvd	San Gabriel Ave	23A	2	3	5	5	1					
	Channel 1	San Gabriel Ave	Fifth St.	A		1	1	1						
		San Gabriel Ave	Third St	A		1	1	1						
	Channel 2	Foothill Blvd	Orange Ave	A		1	1	1						
CP2	Channel 3	San Gabriel Ave	Ninth St.	A		1	1	1						
		San Gabriel Ave	Eleventh ST.	SR		3	3	3						
		Vernon Ave	Eleventh St.	A		1	1	1						
		San Gabriel Ave	Sierra Madre Ave	SR		2	2	2						
		Sierra Madre Ave	Lori Ann Dr.	A		1	1	1						
CP3	CP3	Foothill Blvd	Todd Ave (***)(****)	11C	1	1	2	2	1			1		
	Channel 1	Foothill Blvd	Virginia / Georgia Aves	A		1	1	1						
		Foothill Blvd	Vernon Ave	A		1	1	1						
	CP4	Azusa Ave	Gladstone Ave (***)	VPN03A	0	3	3	3	1		1	1		
	Channel 1	Azusa Ave	Newburgh Ave	A		1	1	1						
	Channel 2	Gladstone Ave	Donna Beth Ave	A		1	1	1						
		Gladstone Ave	Pasadena aVe	A		1	1	1						
CP4		Gladstone Ave	Cerritos Ave	SR		2	2	2						
		Ceritus Ave	Newburgh Ave	A		1	1	1						
	Channel 3	Gladstone Ave	Vernon Ave	SR		2	2	2						
		Vernon Ave	First St.	A		1	1	1						
		Vernon Ave	Second St.	A		1	1	1						
		Gladstone Ave	Vincent Ave	A		1	1	1						

Table 5.7 – City of Azusa Equipment and Costs (Cont.)

CP5	CP5	Foothill Blvd	Citrus Ave	CPR	2	0	2	2	1			1		
CP6	CP6	Alosta Ave	Citrus Ave (***) (****)	22C	2	2	4	4	1			1		
	Channel 1	Alosta Ave	Calera AVE	A		1	1	1						
	Channel 2	Citrus Ave	900' South of Alosta Ave	A		1	1	1						
CP7	CP7	Citrus Ave	Baseline Ave (****)	12C	1	2	3	3	1			1		
	Channel 1	Citrus Ave	Armestead St.	A		1	1	1						
		Citrus Ave	Gladstone Ave (***)	SR		2	2	2						
	Channel 2	Rockvale Ave	Baseline Ave	A		1	1	1						
		Cerritos Ave	Baseline Ave	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	10	55	65	65	7	200	1	7	1	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$15,000.00	$82,500.00	$26,000.00	$16,250.00	$11,200.00	$20,000.00	$10,000.00	$2,100.00	$300.00	$183,350.00
Total Installation	$10,000.00	$55,000.00								$65,000.00
Total Integration	$5,000.00	$27,500.00								$32,500.00
SUB TOTAL	$30,000.00	$165,000.00	$26,000.00	$16,250.00	$11,200.00	$20,000.00	$10,000.00	$2,100.00	$300.00	**$280,850.00**
Design (20% of Sub Total)										$56,170.00
Escalation (15% of Sub Total)										$42,127.50
Contingency (20% of Sub Total)										$56,170.00
									Grand Total	**$435,317.50**
									Yearly Maintenance 5%	**$9,167.50**
									10 Year Maintenance cost	**$91,675.00**
									10 year Grand Total cost	**$526,992.50**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Azusa	$90	$99.00	1544	$1,277.99	$1,188.00
			Total Annual Cost w/o Installation		$1,277.99
			Installation Cost (One Time Fee)		$89.99
			Total Annual Cost		$1,367.98
			Yearly Maintenace 5%		$63.90
			10 year Maintenace cost		$639.00
			Total 10 year cost		**$13,418.90**

5.2.2 City of Baldwin Park

The City of Baldwin Park has total of fifty-one (51) traffic signals. The City of Baldwin Park does not have any existing communication infrastructure; therefore the F2C communication infrastructure will consist of an Agency-owned wireless-based design. There will be total of eight (8) consolidation points not including the LCCS. Consolidation point one (1) will have a direct fiber optic connection with the LCCS.

Exhibit 5.8 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of Baldwin Park will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.8 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $635,230 and for the C2C communication is $39,158.70.

Exhibit 5.8 – City Map of Baldwin Park

Table 5.8 – City of Baldwin Park Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	200	0	1	1	
CP1	CP1	**Baldwin Park Blvd**	**Calais St (***)**	VPN23A	2	3	5	5	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	Ramona Blvd	Bogart Ave	A		1	1	1						
		Downing Ave	Ramona Blvd	A		1	1	1						
		Ramona Blvd	Badillo Ave	SR		2	2	2						
		Ramona Blvd	Puente Ave (***)	A		1	1	1						
		Badillo Ave	Puente Ave	SR		3	3	3						
	Channel 2	Downing Ave	Pacific Ave	SR		2	2	2						
		Pacific Ave	Vineland Ave	A		1	1	1						
		Maine Ave	Shopping Ctr	A		1	1	1						
		Puente Ave	Pacific Ave	A		1	1	1						
	Channel 3	Ramona Blvd	Cesar Chavez	A		1	1	1						
CP2	CP2	**Maine Ave**	**Los Angeles St**	12A	1	2	3	3	1					
	Channel 1	Maine Ave	Clark St	A		1	1	1						
	Channel 2	Los Angeles St	Phelan	A		1	1	1						
CP3	CP3	**Ramona Blvd**	**La Rica Ave**	43A	4	3	7	7	1					
	Channel 1	Baldwin Park Blvd	Sterling Way	A		1	1	1						
	Channel 2	Ramona Blvd	Monterey Ave	A		1	1	1						
		Ramona Blvd	Merced Ave	A		1	1	1						
		Ramona Blvd	Stewart Ave	A		1	1	1						
		Ramona Blvd	La Rica Ave	A		1	1	1						
	Channel 3	Baldwin Park Blvd	Clark St	A		1	1	1						
		Baldwin Park Blvd	Morgan Park PED Crossing	A		1	1	1						
CP4	CP4	**Baldwin Park Blvd**	**Los Angeles St**	21A	2	1	3	3	1					
	Channel 1	Los Angeles St	Walnut Ave	A		1	1	1						
		Los Angeles St	Merced Ave	A		1	1	1						
		Los Angeles St	Bresee	A		1	1	1						
		Los Angeles St	Steward Ave	A		1	1	1						
CP5	CP5	**Baldwin Park Blvd**	**Foster Ave**	12A	1	2	3	3	1					
	Channel 1	Maine Ave	Olive St	A		1	1	1						
	Channel 2	Baldwin Park Blvd	Calais St	A		1	1	1						
CP6	CP6	**Ramona Ave**	**Foster Ave**	11A	1	1	2	2	1					
	Channel 1	Ramona Ave	Earl Ave	A		1	1	1						
		Ramona Ave	Francisquito Ave (***)	A		1	1	1						
CP7	CP7	**Baldwin Park Blvd**	**Merced Ave**	22A	2	2	4	4	1					
	Channel 1	Merced Ave	Vineland Ave	SR		2	2	2						
		Puente Ave	Merced Ave (***)	SR		4	4	4						
		Puente Ave	Towne Ctr. Dr	A		1	1	1						
		Merced Ave	Market Place	A		1	1	1						
		Puente Ave	Dalewood St	A		1	1	1						
	Channel 2	Baldwin Park Ave	Foster Ave	A		1	1	1						

Table 5.8 – City of Baldwin Park Equipment and Cost (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP8	CP8	Baldwin Park Blvd	Francisquito Ave	13A	1	3	4	4	1					
	Channel 1	Francisquito Ave	Maine	A		1	1	1						
		Francisquito Ave	Garvey Ave (***)	SR		2	2	2						
		Francisquito Ave	Vineland Ave	A		1	1	1						
		Francisquito Ave	Dalewood St	SR		2	2	2						
		Francisquito Ave	Puente Ave	A		1	1	1						
	Channel 2	Baldwin Park Blvd	Tracy St	A		1	1	1						
		Baldwin Park Blvd	Bess Ave	A		2	2	2						
		Baldwin Park Blvd	Hamburger (***)	A		1	1	1						
	Channel 3	Francisquito Ave	Frazier Ave	SR		2	2	2						
		Frazier Ave	Earl Ave	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	14	72	86	86	8	200	0	2	2	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$21,000.00	$108,000.00	$34,400.00	$21,500.00	$12,800.00	$20,000.00	$0.00	$600.00	$600.00	$218,900.00
Total Installation	$14,000.00	$72,000.00								$86,000.00
Total Integration	$7,000.00	$36,000.00								$43,000.00
SUB TOTAL	$42,000.00	$216,000.00	$34,400.00	$21,500.00	$12,800.00	$20,000.00	$0.00	$600.00	$600.00	**$347,900.00**
Design (20% of Sub Total)										$69,580.00
Escalation (15% of Sub Total)										$52,185.00
Contingency (20% of Sub Total)										$69,580.00
									Grand Total	**$539,245.00**
									Yearly Maintenance 5%	**$10,945.00**
									10 Year Maintenance cost	**$109,450.00**
									10 year Grand Total cost	**$648,695.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agencies	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Baldwin Park	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.2.3 City of El Monte

The City of El Monte has total of seventy-eight (78) traffic signals which includes 4 Caltrans Traffic Signals that are located along I-10 Fwy. In addition, the following traffic signals that are in the City of South El Monte have been assigned to City of El Monte communications network. The location of these intersections along the municipal boundary makes it more cost effective for these intersections to be integrated with the City of El Monte.

- Garvey Ave and Potrero Ave
- Garvey Ave and Lashbrook Ave (Pedestrian signal)

In order to simplify the communication design for City of El Monte the following traffic signals have been assigned to the City of Temple City:

- Baldwin Ave and Lower Azusa Rd.
- Lower Azusa Rd. and Arden Dr.
- Lower Azusa Rd. and Halifax Rd.

The City of El Monte does not have any existing signal interconnect; therefore the F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of eleven (11) consolidation points not including the LCCS. All consolidation points except consolidation point four (4) will be interconnected to consolidation point one (1) and there will be a direct fiber optic connection to the LCCS.

Exhibit 5.9 presents the location of all field devices, serial repeaters, consolidation points, system detectors and location of the LCCS.

The City of El Monte will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.9 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $887,192.50 and for the C2C communication is $38,896.20.

Exhibit 5.9 – City Map of El Monte

Table 5.9 – City of El Monte Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0		500	0	1	1	
CP1	CP1	**Peck Rd**	**Valley Blvd**	VPN22A	2	2	4	4	1		0	1	1	Fiber optic Connetion to LCCS
	Channel 1	Peck Rd	Federal DR	A		1	1	1						
		Peck Rd	Stewart St	A		1	1	1						
		Peck Rd	Alloway St	A		1	1	1						
	Channel 2	Valley Blvd	Ramona Blvd	A		1	1	1						
		Valley Blvd	Johnson Ave	A		1	1	1						
CP2	CP2	**Tyler Ave**	**Valley Blvd**	22A	1	2	3	3	1					
	Channel 1	Tyler Ave	Ramona Blvd	A		1	1	1						
	Channel 2	Valley Blvd	Monterey Ave	A		1	1	1						
		Valley Blvd	Center Ave	A		1	1	1						
		Valley Blvd	Valley Mall	SR		2	2	2						
CP3	CP3	**Peck Rd**	**Ramona Blvd**	22A	2	2	4	4	1					
	Channel 1	Ramona Blvd	Cogswell Rd (***)	A		1	1	1						
		Ramona Blvd	Maxson Rd	SR		2	2	2						
		Ramona Blvd	La Madera Ave	A		1	1	1						
		Ramona Blvd	Gilman Rd	A		1	1	1						
	Channel 2	Peck Rd	Forest Grovd	A		1	1	1						
		Peck Rd	Bryant Rd (***)	A		1	1	1						
		Peck Rd	Lambert Ave	SR		2	2	2						
		Peck Rd	Emery St	A		1	1	1						
CP4	CP4	**Santa Anita Ave**	**Valley Blvd (***)**	VPN22A	2	2	4	4	1		1	1	1	No Traffic Signal
	Channel 1	Samta Anita Ave	Ramona Blvd	A		1	1	1						
		Samta Anita Ave	Amador St	A		1	1	1						
	Channel 2	Valley Blvd	(Btw) Arden Dr & Santa Anita Ave	A		1	1	1						
CP5	CP5	**Valley Blvd**	**Baldwin Ave**	13A	1	3	4	4	1					
	Channel 1	Valley Blvd	Arden Dr	A		1	1	1						
		Valley Blvd	Gibson Rd	A		1	1	1						
	Channel 2	Baldwin Ave	Loftus Dr	A		1	1	1						
	Channel 3	Baldwin Ave	Rose Ave	A		1	1	1						
		Baldwin Ave	Gidley St (***)	A		1	1	1						
CP6	CP6	**Valley Blvd**	**Durfee Ave**	12A	1	2	3	3	1					No Traffic Signal
	Channel 1	Durfee Ave	Fineview Avd	A		1	1	1						
		Durfee Ave	Klingerman St	A		1	1	1						
		Durfee Ave	Elliott Ave	A		1	1	1						
		Durfee Ave	Magnolia St	SR		2	2	2						
	Channel 2	Durfee Ave	Clora Place	A		1	1	1						
		Garvey Ave	Durfee Ave	A		1	1	1						
CP7	CP7	**Garvey Ave**	**Santa Anita Ave (***)**	13A	1	3	4	4	1					
	Channel 1	Tyler Ave	Elliott Ave	A		1	1	1						
		Tyler Ave	Bodger St	A		1	1	1						
		Garvey Ave	Tyler Ave	SR		3	3	3						
		Garvey Ave	Lexington Ave	A		1	1	1						
	Channel 2	Santa Anita Ave	Mildred St	A		1	1	1						
		Santa Anita Ave	Bodger St	A		1	1	1						
		Santa Anita Ave	Asher St	A		1	1	1						
	Channel 3	Garvey Ave	Merced Ave	SR		1	1	1						
		Garvey Ave	Central Ave	A		1	1	1						
		Garvey Ave	Edwards	A		1	1	1						
		Garvey Ave	Potrero	A		1	1	1						
		Garvey Ave	Lashbrook	A		1	1	1						
CP8	CP8	**Garvey Ave**	**Peck Rd**	33A	3	2	5	5	1					
	Channel 1	Peck Rd	Fineview St (***)	A		1	1	1						
		Peck Rd	Mountain View Rd	A		1	1	1						
		Peck Rd	Elliott Ave	A		1	1	1						
		Peck Rd	Dodson St	A		1	1	1						
	Channel 2	Peck Rd	Meeker Ave	A		1	1	1						

Table 5.9 – City of El Monte Equipment and Costs (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP9	CP9	Garvey Ave	Valley Blvd (***)	22A	2	2	4	4	1					
	Channel 1	Valley Blvd	Mountain View Rd	A		1	1	1						
	Channel 2	Garvey Ave	Meeker Ave	A		1	1	1						
		Garvey Ave	Mountain View Rd	A		1	1	1						
CP10	CP10	Peck Rd	Lower Azusa Rd (***)	23A	2	3	5	5	1					
	Channel 1	Lower Azusa Rd	Cogswell Rd	SR		2	2	2						
		Lower Azusa Rd	Durfee Ave	A		1	1	1						
	Channel 2	Peck Rd	Hemlock St	A		1	1	1						
	Channel 3	Lower Azusa Rd	Cedar Ave	A		1	1	1						
CP11	CP11	Santa Anita Ave	Lower Azusa Rd	13A	1	3	4	4	1					
	Channel 1	Santa Anita Ave	Hondo Pkwy (***)	A		1	1	1						
		Kings Row	Vista Lane	A		1	1	1						
		Santa Anita Ave	Kings Row	A		1	1	1						
	Channel 2	Lower Azusa Rd	El Monte Ave	A		1	1	1						
		Lower Azusa Rd	Daleview Ave	A		1	1	1						
	Channel 3	Santa Anita Ave	Bryant Rd (***)	A		1	1	1						
		Santa Anita Ave	Tyler Ave	SR		2	2	2						
		Santa Anita Ave	Mulhall St	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	18	97	85	85	8	500	1	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$27,000.00	$145,500.00	$34,000.00	$21,250.00	$12,800.00	$50,000.00	$10,000.00	$900.00	$900.00	$302,350.00
Total Installation	$18,000.00	$97,000.00								$115,000.00
Total Integration	$9,000.00	$48,500.00								$57,500.00
SUB TOTAL	$54,000.00	$291,000.00	$34,000.00	$21,250.00	$12,800.00	$50,000.00	$10,000.00	$900.00	$900.00	**$474,850.00**
Design (20% of Sub Total)										$94,970.00
Escalation (15% of Sub Total)										$71,227.50
Contingency (20% of Sub Total)										$94,970.00
									Grand Total	**$736,017.50**
									Yearly Maintenance 5%	**$15,117.50**
									10 Year Maintenance cost	**$151,175.00**
									10 year Grand Total cost	**$887,192.50**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of El Monte	$225	$289.95	1544	$3,704.40	$3,479.40
			Total Annual Cost w/o Installation		$3,704.40
			Installation Cost (One Time Fee)		$225.00
			Total Annual Cost		$3,929.40
			Yearly Maintenace 5%		$185.22
			10 year Maintenace cost		$1,852.20
			Total 10 year cost		**$38,896.20**

5.2.4 City of Glendora

Within the City of Glendora there are total of forty (40) traffic signals including two (2) Caltrans traffic signals located along Lone Hill Ave and Grand Ave. Communications to these two intersections will be provided by Caltrans as part of future projects. The City of Glendora does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will be based on an Agency-owned wireless-based and DSL network. There will be total of five (5) Consolidation points not including the LCCS. All consolidation points will be interconnected to LCCS.

The intersection of Glendora Mountain and Boulder Springs is located in a remote location away from other traffic signal locations and there is no LOS to any signal repeater site, consolidation point or existing communication infrastructure. It would not be cost effective to connect on traffic signal directly to LCCS via leased DSL services; therefore it is recommended to not interconnect this intersection from any communication network till further communication means are available.

Exhibit 5.10 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of Glendora will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.10 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $438,325 and for the C2C communication is $39,158.70.

Exhibit 5.10 – City Map of Glendora

Table 5.10 – City of Glendora Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	2	0	2	2	1			1	1	
CP1	CP1	Route 66	Lone Hill Rd (***)	12A	1	2	3	3	1					
	Channel 1	Route 66	Amelia Avd	SR		3	3	3						
		Amelia Ave	Duell St	A		1	1	1						
		Amelia Ave	Duell St	A		1	1	1						
	Channel 2	Lone Hill Rd	Petunia St	A		1	1	1						
		Lone Hill Rd	Glendora Market Place	A		1	1	1						
		Lone Hill Rd	Gladstone St	A		1	1	1						
		Allen Ave	Walmart	A		1	1	1						
CP2	CP2	Route 66	Glendora Ave	23A	2	3	5	5	1					
	Channel 1	Route 66	Vermont Ave	A		1	1	1						
	Channel 2	Glendora Ave	Baseline Rd	A		1	1	1						
		Glendora Ave	Muana Loa Ave	A		1	1	1						
	Channel 3	Route 66	Pasadena	A		1	1	1						
		Route 66	Elmwood Ave (***)	A		1	1	1						
		Route 66	Loraine Ave	SR		2	2	2						
		Route 66	Hunters Trail	A		1	1	1						
		Route 66	Compromise Line Rd	A		1	1	1						
CP3	CP3	Grand Ave	Gladstone St	11A	1	1	2	2	1					
	Channel 1	Glendora Ave	Juanita Ave	A		1	1	1						
		Glendora Ave	Gladstone St	SR		2	2	2						
		Gladstone St	Sunflower Ave	SR		2	2	2						
		Juanita Ave	Sunflower Ave	A		1	1	1						
CP4	CP4	Foothill Blvd	Grand Ave	23A	2	3	5	5	1					
	Channel 1	Foothill Blvd	Vermont Ave	A		1	1	1						
		Foothill Blvd	Glendora Ave	A		1	1	1						
		Foothill Blvd	Cullen Ave	SR		2	2	2						
		Foothill Blvd	Loraine Ave	SR		3	3	3						
		Foothill Blvd	Valley Center Ave	A		1	1	1						
		Loraine Ave	Steffen St	A		1	1	1						
	Channel 2	Foothill Blvd	Barranca Ave	A		1	1	1						
	Channel 3	Grand Ave	Bennette Ave	A		1	1	1						
		Grand Ave	Sierra Madre Ave	A		1	1	1						
CP5	CP5	Route 66	Grand Ave	23A	2	3	5	5	1					
	Channel 1	Grand Ave	Muana Loa Ave	A		1	1	1						
	Channel 2	Route 66	Vecino	A		1	1	1						
		Route 66	Barrance Ave (***)	A		1	1	1						
	Channel 3	Grand Ave	Ada Ave	A		1	1	1						
CP6	CP6	Glendora Mountain Rd	Boulder Springs Dr	Eliminated										Eliminated

F2C Equipment/Installation/Integration Cost										
	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	10	52	62	62	6	0	0	1	1	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$15,000.00	$78,000.00	$24,800.00	$15,500.00	$9,600.00	$0.00	$0.00	$300.00	$300.00	$143,500.00
Total Installation	$10,000.00	$52,000.00								$62,000.00
Total Integration	$5,000.00	$26,000.00								$31,000.00
SUB TOTAL	$30,000.00	$156,000.00	$24,800.00	$15,500.00	$9,600.00	$0.00	$0.00	$300.00	$300.00	$236,500.00
Design (20% of Sub Total)										$47,300.00
Escalation (15% of Sub Total)										$35,475.00
Contingency (20% of Sub Total)										$47,300.00
									Grand Total	$366,575.00
									Yearly Maintenance 5%	$7,175.00
									10 Year Maintenance cost	$71,750.00
									10 year Grand Total cost	$438,325.00

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion					
Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Glendora	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	$39,158.70

5.2.5 City of Monrovia

The City of Monrovia has total of thirty-four (34) traffic signals and eight (8) Caltrans traffic signals along I-210 Fwy. Communications for the 8 Caltrans intersections will be provided separately by Caltrans. In addition to the traffic signals the City of Monrovia is planning to install six (6) CCTV cameras located along Huntington Blvd and Myrtle Ave.

In order to simplify the communication design for the City of Duarte the following traffic signals have been assigned to the City of Monrovia communications network:

- Huntington Dr. and Mountain Ave
- Mountain Ave and Duarte Rd
- Mountain Ave and Wal-Mart/Home Depot

The City of Monrovia does not have any existing signal interconnect; therefore the F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. The consolidation points will be divided into two (2) groups. Group one (1) will include consolidation point four (4) and five (5). These consolidation points will be interconnected and will be connected to the LCCS through consolidation point five (5) via DSL circuit. Group two (2) will include the remaining four (4) consolidation points which will be interconnected to consolidation point (1). There will be a fiber optic connection between the consolidation point one (1) and the LCCS.

Exhibit 5.11 presents the location of all field devices, CCTV cameras, serial repeaters, consolidation points and location of the LCCS.

The City of Monrovia will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system and potentially the video images from the CCTV cameras. Table 5.11 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $469,111.25 and for the C2C communication is $39,158.70.

Exhibit 5.11 – City Map of Monrovia

Table 5.11 – City of Monrovia Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0		400		1	1	
CP1	CP1	**Myrtle Ave**	**Palm Ave (****)**	VPN22C	2	2	4	4	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	Myrtle Ave	Olive Ave	A		1	1	1						
	Channel 2	Myrtle Ave	Lemon Ave	A		1	1	1						
		Myrtle Ave	Lime Ave	A		1	1	1						
		Myrtle Ave	Palm Ave	A		1	1	1						
CP2	CP2	**Foothill Blvd**	**Myrtle Ave (***)(****)**	12C	1	2	3	3	1					
	Channel 1	Foothill Blvd	Fifth Ave	A		1	1	1						
		Foothill Blvd	Madison Ave	A		1	1	1						
		Foothill Blvd	Violet Ave	A		1	1	1						
		Foothill Blvd	Mayflower Ave	SR		2	2	2						
		Foothill Blvd	Magnolia Ave	A		1	1	1						
		Foothill Blvd	Primrose Ave	A		1	1	1						
	Channel 2	Foothill Blvd	Ivy Ave	A		1	1	1						
		Foothill Blvd	Canyon Blvd	A		1	1	1						
		Foothill Blvd	Shamrock Ave	A		1	1	1						
		Foothill Blvd	Mountain Ave	SR		2	2	2						
		Mountain Ave	Lemon Ave	A		1	1	1						
		Mountain Ave	Royal Oaks	A		1	1	1						
CP3	CP3	**Huntington Dr**	**Myrtle Ave (****)**	22C	2	2	4	4	1					
	Channel 1	Huntington Dr	California Ave	A		1	1	1						
		Huntington Dr	Shamrock Ave	A		1	1	1						
		Huntington Dr	Mountain Ave	A		1	1	1						
	Channel 2	Huntington Dr	Magnolia Ave (***)	A		1	1	1						
		Huntington Dr	Mayflower Ave	A		1	1	1						
		Huntington Dr	Highway Espianade	A		1	1	1						
		Huntington Dr	Monterey Rd	A		1	1	1						
CP4	CP4	**Myrtle Ave**	**Central Ave (****)**	10C	1	0	1	1	1					
CP5	CP5	**Myrtle Ave**	**Duarte Ave (***)(****)**	VPN12C	1	2	3	3	1		1	1	1	
	Channel 1	Duarte Ave	California Ave	A		1	1	1						
		Duarte Ave	Mountain Ave	SR		2	2	2						
		Duarte Ave	Wal-Mart/Home Depot	A		1	1	1						
	Channel 2	Duarte Ave	Magnolia Ave	A		1	1	1						
		Duarte Ave	Mayflower Ave	A		1	1	1						
		Duarte Ave	Tenth / Almitas Ave	SR		2	2	2						
		Duarte Ave	Sixth Ave	A		1	1	1						
		Duarte Ave	Fifth Ave	A		1	1	1						
CP6	CP6	**Huntington Dr**	**210 Freeway East (****)**	11C	1	1	2	2	1					
		Huntington Dr	Fifth Ave	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	8	45	53	53	6	400	1	3	3	
Unit Cost	$1,450.00	$1,450.00	$325.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$11,600.00	$65,250.00	$17,225.00	$13,250.00	$9,600.00	$40,000.00	$10,000.00	$900.00	$900.00	$168,725.00
Total Installation	$8,000.00	$45,000.00								$53,000.00
Total Integration	$4,000.00	$22,500.00								$26,500.00
SUB TOTAL	$23,600.00	$132,750.00	$17,225.00	$13,250.00	$9,600.00	$40,000.00	$10,000.00	$900.00	$900.00	**$248,225.00**
Design (20% of Sub Total)										$49,645.00
Escalation (15% of Sub Total)										$37,233.75
Contingency (20% of Sub Total)										$49,645.00
									Grand Total	**$384,748.75**
									Yearly Maintenance 5%	**$8,436.25**
									10 Year Maintenance cost	**$84,362.50**
									10 year Grand Total cost	**$469,111.25**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City Monrovia	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.2.6 City of Montebello

The City of Montebello has total of seventy-three (73) traffic signals. The City of Montebello does not have any existing signal interconnect; therefore the F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network.

In order to simplify the communication design for the City of Montebello the following traffic signals have been assigned to the City of Monterey Park communications network:

- Garfield Ave and Pomona
- Garfield Ave and Via Camp
- Findlay and Pomona
- Findlay and Via Camp

There will be total of ten (10) consolidation points not including the LCCS. Three (3) of the consolidation points will be interconnected to consolidation point seven (7). Consolidation point seven (7) will be connected to the LCCS via a leased DSL circuit. Consolidation point nine (9) which does not have a LOS to any consolidation point or to the LCCS will be connected to the LCCS via a leased DSL circuit. The remaining six (6) consolidation points which will be interconnected to LCCS via Agency-owned wireless network.

The City of Montebello has numerous hills and curves on major arterials that might have an impact on the LOS and the signal propagation; therefore further field testing will be required during the detailed design phase to ensure additional repeaters are not necessary.

Exhibit 5.12 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of Montebello will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.12 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $834,810 and for the C2C communication is $39,158.70.

Exhibit 5.12 – City Map of Montebello

Table 5.12 – City of Montebello Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	2	0	2	2	1			1	1	
CP1	CP1	Whittier	Maple	12A	1	2	3	3	1					
	Channel 1	Whittier	10th	A		1	1	1						
		Whittier	Taylor	A		1	1	1						
	Channel 2	Whittier	Garfield	A		1	1	1						
CP2	CP2	Beverly Blvd	Wilcox	33A	3	3	6	6	1					
	Channel 1	Wilcox	Hay	A		1	1	1						
		Wilcox	Merle	A		1	1	1						
		Lincoln	Wilcox	SR		2	2	2						
	Channel 2	Wilcox	Madison	A		1	1	1						
	Channel 3	Beverly Blvd	Via Val Verde	A		1	1	1						
		Beverly Blvd	Hay	SR		3	3	3						
		Garfield Ave	Beverly Blvd	A		1	1	1						
		Garfield Ave	Hay	A		1	1	1						
CP3	CP3	Garfield Blvd	Via Acosta	12A	1	2	3	3	1					
	Channel 1	Garfield Blvd	Via Paseo	A		1	1	1						
	Channel 2	Beverly Blvd	Findlay	A		1	1	1						
		Beverly Blvd	Bradshawe	A		1	1	1						
CP4	CP4	Whittier	Wilcox	22A	2	2	4	4	1					
	Channel 1	Whittier	California	A		1	1	1						
		Whittier	Vail	SR		3	3	3						
		Whittier	21st	A		1	1	1						
		Olympic	Vail	A		1	1	1						
	Channel 2	Whittier	Concourse	SR		2	2	2						
		Whittier	Garfield	A		1	1	1						
		Olympic	Concourse	A		1	1	1						
CP5	CP5	Montebello Blvd	Whittier	13A	1	3	4	4	1					
	Channel 1	Montebello Blvd	Olympic	A		1	1	1						
		Montebello Blvd	Truckway	A		1	1	1						
	Channel 2	Whittier	Bluff / 1st	A		1	1	1						
		Whittier	2nd	A		1	1	1						
		Whittier	5th	A		1	1	1						
		Whittier	10th	A		1	1	1						
	Channel 3	Montebello Blvd	Victoria Ave	A		1	1	1						
		Montebello Blvd	Madison	A		1	1	1						
CP6	CP6	Greenwood Ave	Olympic	11A	1	1	2	2	1					
	Channel 1	Greenwood	Mines	A		1	1	1						
		Greenwood	Beach	A		1	1	1						
CP7	CP7	Greenwood Ave	Washington	VPN23A	2	3	5	5	1		1	1	1	
	Channel 1	Greenwood Ave	Date	A		1	1	1						
		Greenwood Ave	Oakwood	A		1	1	1						
		Greenwood Ave	Elm	A		1	1	1						
		Greenwood Ave	Sycamore St	A		1	1	1						
		Greenwood Ave	Telegraph	A		1	1	1						
	Channel 2	Washington	Bluff	A		1	1	1						
		Washington	Montebello Blvd	A		1	1	1						
	Channel 3	Washington	Maple	A		1	1	1						
		Washington	Vail	SR		2	2	2						
		Vail	Flotilla	A		1	1	1						

Tab le 5-12 – City of Montebello Equipment and Costs (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP8	**CP8**	**Beverly Blvd**	**Montebello Blvd**	**23A**	2	3	5	5	1					
	Channel 1	Lincoln	Poplar	A		1	1	1						
		Beverly Blvd	Rea Dr	A		1	1	1						
		Beverly Blvd	Poplar	SR		2	2	2						
		Beverly Blvd	4th	A		1	1	1						
		Beverly Blvd	6th	A		1	1	1						
	Channel 2	Lincoln	Maple	A		1	1	1						
		Lincoln	Howard	A		1	1	1						
		Montebello Blvd	Avenida De La Merced	A		1	1	1						
		Montebello Blvd	Lincoln	SR		2	2	2						
		Montebello Blvd	Victoria Ave	A		1	1	1						
	Channel 3	Beverly Blvd	Howard	A		1	1	1						
		Beverly Blvd	Taylor	A		1	1	1						
		Beverly Blvd	Maple	A		1	1	1						
		Beverly Blvd	Civic Center	A		1	1	1						
		Beverly Blvd	18th	A		1	1	1						
CP9	**CP9**	**Montebello Blvd**	**Jefferson**	**VPN01a**	0	1	1	1	1		1	1	1	
	Channel 1	Montebello Blvd	Liberty	SR		2	2	2						
		Montebello Blvd	Costco Driveway	SR		2	2	2						
		Montebello Blvd	Sears Driveway	A		1	1	1						
		Montebello Blvd	Paramount	SR		2	2	2						
		Montebello Blvd	Plaza Dr	A		1	1	1						
CP10	**CP10**	**Greenwood Ave**	**Telegraph**	**11A**	1	1	2	2	1					
	Channel 1	Slauson	Chaplin	A		1	1	1						
		Slauson	Telegraph	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	16	96	112	112	11	0	2	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$24,000.00	$144,000.00	$44,800.00	$28,000.00	$17,600.00	$0.00	$20,000.00	$900.00	$900.00	$280,200.00
Total Installation	$16,000.00	$96,000.00								$112,000.00
Total Integration	$8,000.00	$48,000.00								$56,000.00
SUB TOTAL	$48,000.00	$288,000.00	$44,800.00	$28,000.00	$17,600.00	$0.00	$20,000.00	$900.00	$900.00	**$448,200.00**
Design (20% of Sub Total)										$89,640.00
Escalation (15% of Sub Total)										$67,230.00
Contingency (20% of Sub Total)										$89,640.00
									Grand Total	**$694,710.00**
									Yearly Maintenance 5%	**$14,010.00**
									10 Year Maintenance cost	**$140,100.00**
									10 year Grand Total cost	**$834,810.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Montebello	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.2.7 City of Monterey Park

The City of Monterey Park has total of sixty-two (62) traffic signals. The City of Monterey Park does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network.

In order to simplify the communication design for the City of Rosemead the following traffic signals have been assigned to the City of Monterey Park communications network:

- Garvey and New Ave

In order to simplify the communication design for the City of Montebello the following traffic signals have been assigned to the City of Monterey Park communications network:

- Huntington Dr. and Mountain Ave
- Mountain Ave and Duarte Rd
- Mountain Ave and Wal-Mart/Home Depot

There are total of nine (9) consolidation points recommended as part of the conceptual design. Five (5) of these consolidation points would be interconnected to consolidation point nine (9), which will be interconnected to the LCCS via a fiber optic link. The four (4) remaining consolidation points will need to be integrated with the LCCS via leased DSL circuits due to limited LOS from the consolidation points.

The intersection at Potrero Grande Drive and Greenwood Ave. is located remote from other signal locations and there is no LOS to any signal repeater site, consolidation point or existing communication infrastructure. It would not be cost effective to connect that intersection to the LCCS via leased DSL circuit; therefore it is TransCore's recommendation to not provide communications to this intersection till future communication infrastructure has been installed or evaluate this intersection again during the final design phase.

The City of Monterey Park has numerous hills and curves on major arterials such as Garfield Ave, Corporate Center Drive, Atlantic Blvd, and Monterey Pass Road; and extensive field signal testing should be performed as part of the detailed design phase to ensure additional repeaters or consolidation points are not required.

Exhibit 5.13 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of Monterey Park will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.13 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $854,225 and for the C2C communication is $38,896.20.

Exhibit 5.13 – City Map of Monterey Park

Table 5.13 – City of Monterey Park Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0		500		1	1	
CP1	CP1	**Garfield Ave**	**Elmgate Ave(***)**	VPN02A	0	2	2	2	1		1	1	1	
		Garfield Ave	Maronda Way/Roca Way (***)	A		1	1	1						
	Channel 2	Riggin St	Findlay Ave	A		1	1	1						
		Garfield Ave	Riggin St	SR		3	3	3						
		Garfield Ave	Pomona Blvd	A		1	1	1						
		Pomona Blvd	Wilcox Ave	A		1	1	1						
CP2	CP2	**Atlantic Blvd**	**Cesar Chaves/Riggin**	VPN03A	0	3	3	3	1		1	1	1	
	Channel 1	Atlantic Blvd	Floral Dr (***)	SR		2	2	2						
		Atlantic Blvd	MB btw Floral / Riggin	SR		2	2	2						
		Floral Dr	Collegian Dr	A		1	1	1						
		Collegian Ave	MB btw Cesar Chavez/Floral	A		1	1	1						
	Channel 2	Pomona Blvd	Gerhart Ave	A		1	1	1						
		Gerhart Ave	Via Campo	A		1	1	1						
		Gerhart Ave	Riggin St.	SR		2	2	2						
	Channel 3	Ceasar Chavez	Collegian Ave	A		1	1	1						
		Ceasar Chavez	Schoolside Ave	A		1	1	1						
		Ceasar Chavez	Bleakwood Ave	SR		2	2	2						
		First St	Woods Ave	A		1	1	1						
CP3	CP3	**Corporate Cntr Dr**	**Casuda Canyon Dr**	VPN02A	0	2	2	2	1		1	1	1	
	Channel 1	Corporate Cntr Dr	MB btw Casuda Cyn/Davidson Dr	A		1	1	1						
		Monterey Pass Road	Davidson Dr	A		1	1	1						
		Corporate Cntr Dr	Davidson Dr	SR		2	2	2						
	Channel 2	Corporate Cntr Dr	Ramona Blvd	SR		2	2	2						
		Ramona Blvd	Centre Plaza Dr	A		1	1	1						
CP4	CP4	**Monterey Pass Rd**	**Fremont Ave**	VPN03A	0	3	3	3	1		1	1	1	
	Channel 1	Garvey Avenue	Hitchcock Dr	A		1	1	1						
	Channel 2	Monterey Pass Rd	Vagabond Road	SR		2	2	2						
		Monterey Pass Rd	South of Vagabond	A		1	1	1						
	Channel 3	Garvey Avenue	Abajo Drive	A		1	1	1						
		Garvey Avenue	Casuda Canyon(***)	A		1	1	1						
CP5	CP5	**Atlantic Blvd**	**Sevilla St (***)**	12A	1	2	3	3	1					
	Channel 1	Atlantic Blvd	El Repetto Dr	A		1	1	1						
		Atlantic Blvd	Brightwood St	A		1	1	1						
	Channel 2	Atlantic Blvd	Cadiz	A		1	1	1						
		Atlantic Blvd	El Portal Place	A		1	1	1						
		Atlantic Blvd	Harding Ave	A		1	1	1						
CP6	CP6	**Atlantic Blvd**	**Newmark Ave**	21A	2	1	3	3	1					
	Channel 1	Atlantic Blvd	Garvey Ave (***)	SR		4	4	4						
		Atlantic Blvd	MB btw Emerson / Garvey	A		1	1	1						
		Atlantic Blvd	Emerson Ave (***)	A		1	1	1						
		Atlantic Blvd	Hellman Ave	A		1	1	1						
		Garvey Ave	Chandler Ave	A		1	1	1						
		Garvey Ave	Ynez Ave	A		1	1	1						
		Garvey Ave	McPherrin Ave	A		1	1	1						
CP7	CP7	**Garfield Ave**	**Garvey Ave**	22A	2	2	4	4	1					
	Channel 1	Garvey Ave	Ramona Ave	A		1	1	1						
	Channel 2	Garfield Ave	Hampton Ave	A		1	1	1						
		Garfield Ave	North of Hilliard	A		1	1	1						
		Garfield Ave	Emerson Ave	A		1	1	1						
		Garfield Ave	Avondale Ave	A		1	1	1						

Table 5.13 – Monterey Park Equipment and Cost (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP8	CP8	Garvey Ave	Alhambra Ave	12A	1	2	3	3	1					
	Channel 1	Garvey Ave	Nicholson Ave	A		1	1	1						
		Garvey Ave	Lincoln Ave	A		1	1	1						
	Channel 2	Garvey Ave	Orange (***)	A		1	1	1						
		Garvey Ave	New Ave	SR		3	3	3						
		New Ave	Hellman Ave	A		1	1	1						
		New Ave	Emerson Ave	A		1	1	1						
		New Ave	Newmark Ave	A		1	1	1						
CP9	CP9	Garfield Ave	Newmark Ave (***)	VPN22A	2	2	4	4	1			1	1	
	Channel 1	Garfield Ave	Graves Ave	SR		2	2	2						
		Ramona Ave	MB btw Newmark & Harding	A		1	1	1						
CP10	CP10	Potero Grande Drive	Greenwood Ave	N/A		0	0	0						Eliminate

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	8	86	94	94	9	500	4	6	6	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$12,000.00	$129,000.00	$37,600.00	$23,500.00	$14,400.00	$50,000.00	$40,000.00	$1,800.00	$1,800.00	$310,100.00
Total Installation	$8,000.00	$86,000.00								$94,000.00
Total Integration	$4,000.00	$43,000.00								$47,000.00
SUB TOTAL	$24,000.00	$258,000.00	$37,600.00	$23,500.00	$14,400.00	$50,000.00	$40,000.00	$1,800.00	$1,800.00	**$451,100.00**
Design (20% of Sub Total)										$90,220.00
Escalation (15% of Sub Total)										$67,665.00
Contingency (20% of Sub Total)										$90,220.00
									Grand Total	**$699,205.00**
									Yearly Maintenance 5%	**$15,505.00**
									10 Year Maintenance cost	**$155,050.00**
									10 year Grand Total cost	**$854,255.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Monterey Park	$225	$289.95	1544	$3,704.40	$3,479.40
				Total Annual Cost w/o Installation	$3,704.40
				Installation Cost (One Time Fee)	$225.00
				Total Annual Cost	$3,929.40
				Yearly Maintenace 5%	$185.22
				10 year Maintenace cost	$1,852.20
				Total 10 year cost	**$38,896.20**

5.2.8 City of San Gabriel

The City of San Gabriel has total of thirty-four (34) traffic signals. The City of San Gabriel does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There are total of seven (7) consolidation points recommended as part of the conceptual design. Six (6) of these consolidation points would be interconnected to consolidation point one (1) via an Agency-owned wireless network. Consolidation point seven (7) will need to be integrated with the LCCS via leased DSL circuits due to limited LOS from the consolidation points. Consolidation point one (1) will be connected to the LCCS via a fiber optic cable link.

Exhibit 5.14 presents the location of all field devices, serial repeaters, consolidation points and location of the LCCS.

The City of San Gabriel will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information and also the data for the traffic control system. Table 5.14 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $485,972.50 and for the C2C communication is $39,158.70.

Exhibit 5.14 – City Map of San Gabriel

Table 5.14 – City of San Gabriel Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0		400		1	1	
CP1	CP1	Del Mar	Mission Rd	VPN32A	3	2	5	5	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	Del Mar	Fairview	A		1	1	1						
		Del Mar	Wells	A		1	1	1						
	Channel 2	Del Mar	Angeleno	A		1	1	1						
CP2	CP2	Valley	Del Mar	13A	1	3	4	4	1					
	Channel 1	Del Mar	Shopping Ctr (Dewey)	A		1	1	1						
		Del Mar	Marshall	A		1	1	1						
	Channel 2	Valley	Walnut	A		1	1	1						
	Channel 3	Valley	Abbot	A		1	1	1						
		Valley	Prospect (***)	A		1	1	1						
CP3	CP3	San Gabriel	Mission (***)	11A	1	1	2	2	1					
	Channel 1	San Gabriel	Chestnut	A		1	1	1						
		San Gabriel	Scott	A		1	1	1						
		San Gabriel	Valley	A		1	1	1						
		San Gabriel	Marshall (***)	A		1	1	1						
CP4	CP4	Del Mar	Broadway	21A	2	1	3	3	1					
	Channel 1	San Gabriel	Broadway	A		1	1	1						
		Walnut Grove	Broadway	A		1	1	1						
CP5	CP5	Las Tunas	Del Mar	22A	2	2	4	4	1					
	Channel 1	Las Tunas	Mission	A		1	1	1						
		Las Tunas	Santa Anita	A		1	1	1						
		Las Tunas	San Marino	A		1	1	1						
	Channel 2	San Gabriel	Hermosa	A		1	1	1						
CP6	CP6	Las Tunas	San Gabriel (***)	12A	1	2	3	3	1					
	Channel 1	Las Tunas	Charlotte	A		1	1	1						
		Las Tunas	Willard	A		1	1	1						
		Las Tunas	Burton	A		1	1	1						
	Channel 2	San Gabriel	Hermosa	A		1	1	1						
CP7	CP7	Mission Dr	Santa Anita	VPN02A	0	2	2	2	1		1	1	1	
	Channel 1	Mission Rd	Junipero Serro	A		1	1	1						
		Mission Rd	Ramona/Mission Dr	SR		4	4	4						
		Mission Rd	Santa Anita	A		1	1	1						
		Grand	Ramona	A		1	1	1						
	Channel 2	Mission Dr	Broadway	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	10	43	53	53	7	400	1	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$15,000.00	$64,500.00	$21,200.00	$13,250.00	$11,200.00	$40,000.00	$10,000.00	$900.00	$900.00	$176,950.00
Total Installation	$10,000.00	$43,000.00								$53,000.00
Total Integration	$5,000.00	$21,500.00								$26,500.00
SUB TOTAL	$30,000.00	$129,000.00	$21,200.00	$13,250.00	$11,200.00	$40,000.00	$10,000.00	$900.00	$900.00	$256,450.00
Design (20% of Sub Total)										$51,290.00
Escalation (15% of Sub Total)										$38,467.50
Contingency (20% of Sub Total)										$51,290.00
									Grand Total	$397,497.50
									Yearly Maintenance 5%	$8,847.50
									10 Year Maintenance cost	$88,475.00
									10 year Grand Total cost	$485,972.50

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of San Gabriel	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	$39,158.70

5.3 LEVEL 2B AGENGIES

Level 2B Agency is defined in the ATMS Alternative Analysis Report (Deliverable 2.5.1.1) as an agency that:

- Agency manages and operates it own ATMS
  - Actively manages ATMS during exceptions
  - Passively manages ATMS during AM and PM peak periods
- Agency may operate some other ITS devices (small amount)
- Agency may operate other Agencies' traffic signals (Level 1)
- Agency may "host" other Agencies' traffic signal (Level 2A)
- Maintains an LCCS facility to manage traffic signals and incident management activities
  - IEN W/S (Regional view)
  - ATMS W/S (local view)
  - CDI between the ATMS and IEN

5.3.1 City of Alhambra

The City of Alhambra has total of ninety-six (96) traffic signals. In addition to the traffic signals the City of Alhambra has seven (7) CCTV cameras located along Las Tunas Blvd, Valley Blvd, Mission Blvd and Fremont Ave. The City of Alhambra does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and leased DSL network. There are total of twelve (12) consolidation points recommended as part of the conceptual design. Five (5) of these consolidation points would be interconnected to consolidation point nine (9) via an Agency-owned wireless network. The remaining five (5) will be connected to consolidation point four (4) via Agency-owned wireless network also. Consolidation point four (4) will need to be integrated with the LCCS via leased DSL circuits due to limited line of site from the consolidation points. Consolidation point nine (9) will be interconnected to the LCCS via agency-owned fiber optic cable link.

Exhibit 5.15 presents the location of all field devices, system detectors, CCTV cameras, serial repeaters, consolidation points and location of the LCCS.

The City of Alhambra will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information back to the Sub-Regional TMC. Table 5.15 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $1,148,995.00 and for the C2C communication is $39,158.70.

Exhibit 5.15 – City Map of Alhambra

Table 5.15 – City of Alhambra Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0		500		1	1	
	CP1	**Garfield Ave**	**Commonwealth Ave**	22A	2	2	4	4	1					
	Channel 1	Garfield Ave	Bay State St	A		1	1	1						
CP1		Commonwealth Ave	Second St	A		1	1	1						
	Channel 2	Commonwealth Ave	First St	A		1	1	1						
		Garfield Ave	Btw Main St / Bay State St	SR		2	2	2						
		Chapel Ave	Bay State St	A		1	1	1						
	CP2	**Mission Rd**	**Garfield Ave (****)**	12C	1	2	3	3	1					
	Channel 1	Mission Rd	Champel Ave	A		1	1	1						
CP2	Channel 2	Garfield Ave	Los Higos St	A		1	1	1						
		Garfield Ave	San Marino Ave	A		1	1	1						
		Garfield Ave	Shorb St	A		1	1	1						
	CP3	**Valley Blvd**	**Garfield Ave (****)**	12C	1	2	3	3	1					
	Channel 1	Garfield Ave	Norwood Pl	A		1	1	1						
		Garfield Ave	Glendon Way	A		1	1	1						
		Garfield Ave	Hellman Ave	A		1	1	1						
		Hellman Ave	Almansor St	A		1	1	1						
CP3	Channel 2	Valley Blvd	Chapel Ave	A		1	1	1						
		Valley Blvd	Almansor St	SR		2	2	2						
		Valley Blvd	Granada Ave	A		1	1	1						
		Valley Blvd	Vega St	A		1	1	1						
		Valley Blvd	New Ave	A		1	1	1						
		New Ave	Norwood Pl	A		1	1	1						
	CP4	**Valley Blvd**	**Atlantic Blvd (****)**	VPN33C	3	3	6	6	1		1	1	1	
	Channel 1	Atlantic Blvd	Shorb St	A		1	1	1						
CP4	Channel 2	Valley Blvd	Ninth St	A		1	1	1						
		Valley Blvd	Sixth St	SR		2	2	2						
		Valley Blvd	Fourth St	A		1	1	1						
	Channel 3	Atlantic Blvd	Glendon Way	A		1	1	1						
	CP5	**Valley Blvd**	**Fremont Ave (****)**	23C	2	3	5	5	1					
	Channel 1	Fremont Ave	Rose Ave	A		1	1	1						
		Fremont Ave	Hellman Ave	SR		2	2	2						
		Fremont Ave	Montezuma Ave	SR		2	2	2						
		Fremont Ave	Carlos St (***)	A		1	1	1						
		Garvey Ave	Westminster Ave	A		1	1	1						
CP5		Garvey Ave	Ramona Road South	A		1	1	1						
	Channel 2	Valley Blvd	Westmont Dr	A		1	1	1						
		Valley Blvd	Cabrillo Ave	SR		2	2	2						
		Valley Blvd	Grand View Dr	A		1	1	1						
	Channel 3	Fremont Ave	Concord Ave	A		1	1	1						
		Fremont Ave	Orange St	SR		2	2	2						
		Fremont Ave	Btn Orange St / Mission Dr	A		1	1	1						
		Fremont Ave	Mission Rd	A		1	1	1						
	CP6	**Fremont Ave**	**Commonwealth Ave**	12A	1	2	3	3	1					
	Channel 1	Fremont Ave	Poplar Blvd	SR		2	2	2						
		Fremont Ave	Main St (***)	A		1	1	1						
		Fremont Ave	Alhambra	SR		2	2	2						
CP6		Huntington Blvd	Alhambra/Kendall Ave	A		1	1	1						
	Channel 2	Commonwealth Ave	Date Ave	A		1	1	1						
		Commonwealth Ave	Palm Ave	A		1	1	1						
		Commonwealth Ave	Marengo Ave	SR		2	2	2						
		Marengo Ave	Btw Lemone St / Orange St	A		1	1	1						
	CP7	**Main St**	**Marengo Ave**	13A	1	3	4	4	1					
	Channel 1	Main St	Raymond Ave	SR		2	2	2						
CP7		Main St	Palm Ave (***)	A		1	1	1						
	Channel 2	Main St	Fremont Ave (***)	A		1	1	1						
	Channel 3	Marengo	Larch St.	A		1	1	1						
	CP8	**Maint St**	**Atlantic Blvd (****)**	23C	2	3	5	5	1					
	Channel 1	Atlantic Blvd	Washington St	A		1	1	1						
		Atlantic Blvd	Commonwealth Ave	A		1	1	1						
	Channel 2	Main St	Sixth St	A		1	1	1						
		Main St	Fifth St	A		1	1	1						
		Main St	Fourth St	A		1	1	1						
CP8		Main St	Third St	A		1	1	1						
		Main St	Second St	A		1	1	1						
		Main St	First St	A		1	1	1						
	Channel 3	Atlantic Blvd	Spruce St.	A		1	1	1						
		Atlantic Blvd	Alhambra Rd	SR		2	2	2						
		Atlantic Blvd	Woodward Ave	A		1	1	1						
		Atlantic Blvd	Pine St.	A		1	1	1						

Table 5.15 – City of Alhambra Equipment and Costs (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP9	CP9	Main St	Garfield Ave (****)	VPN32C	3	2	5	5	1			1	1	
	Channel 1	Main St	Stoneman Ave	A		1	1	1						
		Main St	Monterey St	A		1	1	1						
		Main St	Chapel Ave	A		1	1	1						
		Main St	Btw Chapel Ave/Almansor St	A		1	1	1						Fiber optic Connetion to LCCS
	Channel 2	Garfield Ave	Pine St	A		1	1	1						
		Garfield Ave	McLean St	A		1	1	1						
		Garfield Ave	Alhambra Rd	SR		3	3	3						
		Garfield Ave	Woodward Ave	A		1	1	1						
		Garfield Ave	Elgin St	A		1	1	1						
		Alhambra Rd	Granada Ave	A		1	1	1						
		Garfield Ave	Huntington (***)	A		1	1	1						
CP10	CP10	Mission Rd	Atlantic Blvd (****)	12C	1	2	3	3	1					
	Channel 1	Mission Rd	Sixth St	A		1	1	1						
		Mission Rd	Fourth St	A		1	1	1						
	Channel 2	Mission Rd	Palm Ave	A		1	1	1						
		Mission Rd	Marengo Ave	SR		2	2	2						
		Mission Rd	Marguerita Ave	A		1	1	1						
CP11	CP11	Valley Blvd	Marengo Ave	22A	2	2	4	4	1					
	Channel 1	Valley Blvd	Benito Ave	A		1	1	1						
		Valley Blvd	Marguerita Ave	A		1	1	1						
	Channel 2	Valley Blvd	Edgewood Dr	A		1	1	1						
		Valley Blvd	Raymond Ave	A		1	1	1						
CP12	CP12	Main St	Alamansor St	11A	1	1	2	2	1					
	Channel 1	Main St	Hidalgo Ave	A		1	1	1						
		Main St	Cordova Ave	A		1	1	1						
		Main St	Granada Ave (***)	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	20	126	146	146	12	500	1	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$30,000.00	$189,000.00	$58,400.00	$36,500.00	$19,200.00	$50,000.00	$10,000.00	$900.00	$900.00	$394,900.00
Total Installation	$20,000.00	$126,000.00								$146,000.00
Total Integration	$10,000.00	$63,000.00								$73,000.00
SUB TOTAL	$60,000.00	$378,000.00	$58,400.00	$36,500.00	$19,200.00	$50,000.00	$10,000.00	$900.00	$900.00	**$613,900.00**
Design (20% of Sub Total)										$122,780.00
Escalation (15% of Sub Total)										$92,085.00
Contingency (20% of Sub Total)										$122,780.00
									Grand Total	**$951,545.00**
									Yearly Maintenance 5%	**$19,745.00**
									10 Year Maintenance cost	**$197,450.00**
									10 year Grand Total cost	**$1,148,995.00**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Alhambra	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.3.2 City of Arcadia

The City of Arcadia has total of seventy-one (71) traffic signals, and six (6) CCTV cameras. The City of Arcadia is in the process of installing fiber optic cable infrastructure north of Duarte Ave and the SGVTF project will complement the communication network infrastructure by concentrating its efforts to design the communication network south of and including Duarte Ave. There will be total of twenty-two (22) traffic signals, and two (2) CCTV cameras that will be part of the wireless communication design. The CCTV cameras will be located along Santa Anita Blvd, Huntington Blvd and Baldwin Ave.

The wireless communication design will consist of four (4) consolidation points. These consolidation points will be routed through consolidation point three (3), which will be integrated with the LCCS via an existing fiber optic communications link installed by City of Arcadia.

Exhibit 5.16 presents the location of all field devices, system detectors, CCTV cameras, serial repeaters, consolidation points and location of the LCCS.

The City of Arcadia will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information back to the Sub-Regional TMC. This link may also be used to share video images from the CCTCV cameras. Table 5.16 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $257,022.50 and for the C2C communication is $39,158.70.

Exhibit 5.16 – City Map of Arcadia

Table 5.16 – City of Arcadia Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTER-FACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0						
CP1	CP1	Santa Anita Ave	Live Oak Ave	13A	1	3	4	4	1					
	Channel 1	Las Tunas Dr	Live Oak Ave	A		1	1	1						
	Channel 2	Live Oak Ave	Second Street	A		1	1	1						
		Live Oak Ave	Sixth Street	A		1	1	1						
	Channel 3	Santa Anita Ave	Longden Ave	A		1	1	1						
		Santa Anita Ave	Wisteria Ave	A		1	1	1						
		Santa Anita Ave	Camino Real Ave	A		1	1	1						
CP2	CP2	Baldwin Ave	Las Tunas Dr	21A	2	1	3	3	1					
	Channel 1	Las Tunas Dr	Warren Way	A		1	1	1						
		Las Tunas Dr	El Monte Ave	A		1	1	1						
		Las Tunas Dr	Holly Ave	A		1	1	1						
CP3	CP3	Baldwin Ave	Duarte Rd (****)	VPN23C	2	3	5	5	1		1	1	1	
	Channel 1	Baldwin Ave	Londgen Ave (***)	A		1	1	1						
		Baldwin Ave	Camino Real Ave	SR		1	1	1						Fiber optic Connetion to LCCS
		Baldwin Ave	Naomi Ave	A		1	1	1						
	Channel 2	Duarte Rd	El Monte Ave	A		1	1	1						
		Duarte Rd	Holly Ave	A		1	1	1						
	Channel 3	Duarte Rd	Golden West	A		1	1	1						
		Duarte Rd	Sunset Blvd (***)	SR		1	1	1						
CP4	CP4	Sanata Anita Ave	Duarte Rd (***)(****)	12C	1	2	3	3	1					
	Channel 1	Duarte Rd	First Ave	A		1	1	1						
		Duarte Rd	Second Ave	A		1	1	1						

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	6	27	33	33	4	0	1	1	1	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$9,000.00	$40,500.00	$13,200.00	$8,250.00	$6,400.00	$0.00	$10,000.00	$300.00	$300.00	$87,950.00
Total Installation	$6,000.00	$27,000.00								$33,000.00
Total Integration	$3,000.00	$13,500.00								$16,500.00
SUB TOTAL	$18,000.00	$81,000.00	$13,200.00	$8,250.00	$6,400.00	$0.00	$10,000.00	$300.00	$300.00	$137,450.00
Design (20% of Sub Total)										$27,490.00
Escalation (15% of Sub Total)										$20,617.50
Contingency (20% of Sub Total)										$27,490.00
									Grand Total	$213,047.50
									Yearly Maintenance 5%	$4,397.50
									10 Year Maintenance cost	$43,975.00
									10 year Grand Total cost	$257,022.50

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Arcadia	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	$39,158.70

5.3.3 City of Covina

The City of Covina has total of sixty-three (63) traffic signals, and five (5) CCTV cameras that it is planning to install. The CCTV cameras are located along Azusa Ave. In order to simplify the communication design for the City of Azusa the following traffic signals have been assigned to City of Covina:

- Arrow Hwy and Cerritos Ave
- Arrow Hwy and Citrus Ave

In addition to the signals from City of Azusa, the following signals from the City of West Covina have been assigned to the City of Covina communications network:

- Azusa Canyon and San Bernardino
- Badillo and Vincent

The City of Covina does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of twelve (12) consolidation points not including the LCCS. Four (4) of the consolidation points will be interconnected to consolidation point ten (10) via an Agency-owned wireless network. Consolidation point ten (10) will be integrated with the LCCS via leased DSL circuits due to limited line of site from the consolidation point. Five (5) of the consolidation points will be interconnected to consolidation point four (4) via an Agency-owned network. Consolidation point four (4) will need to be integrated with the LCCS via leased DSL circuits due to limited line of site from the consolidation point. The remaining three (3) consolidation points will be connected to LCCS via Agency-owned wireless network.

Exhibit 5.17 presents the location of all field devices, system detectors, CCTV cameras, serial repeaters, consolidation points and location of the LCCS.

The City of Covina will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information back to the Sub-Regional TMC. Table 5.17 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $740,382.50 and for the C2C communication is $39,158.70.

Exhibit 5.17 – City Map of Covina

Table 5.17 – City of Covina Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	2	0	2	2	1			1	1	
CP1	CP1	Citrus	College	11A	1	1	2	2	1					
	Channel 1	Citrus	Puente (***)	A		1	1	1						
		Citrus	Rowland St	A		1	1	1						
		Citrus	Badillo	A		1	1	1						
CP2	CP2	San Bernardino Rd	Citrus	22A	2	2	4	4	1					
	Channel 1	San Bernardino Rd	2nd Ave	SR		2	2	2						
		2nd Ave	College St	A		1	1	1						
		Badillo St	2nd Ave	A		1	1	1						
		2nd Ave	Puente St	A		1	1	1						
		2nd Ave	Rowland	A		1	1	1						
	Channel 2	Citrus Ave	Arrow Hwy (***)	SR		2	2	2						
		Citrus Ave	Devanah St	A		1	1	1						
		Citrus Ave	Covina Blvd	A		1	1	1						
		Citrus Ave	Cypress St (***)	A		1	1	1						
		Citrus Ave	Metro Rail	A		1	1	1						
		Citrus Ave	Front St	A		1	1	1						
CP3	CP3	San Bernardino Rd	Hollenbeck Ave	12A	1	2	3	3	1					
	Channel 1	Badillo St	Hollenbeck Ave	A		1	1	1						
		Puente St	Hollenbeck Ave	A		1	1	1						
		Rowland St	Hollenbeck Ave	A		1	1	1						
		Workman St	Hollenbeck Ave	A		1	1	1						
	Channel 2	Hollenbeck Ave	Hollenbeck Park	A		1	1	1						
		Covina Blvd	Hollenbeck Ave	SR		2	2	2						
		Cypress St	Hollenbeck Ave	A		1	1	1						
CP4	CP4	San Bernardino Rd	Azusa Ave (****)	VPN41C	4	1	5	5	1		1	1	1	
	Channel 1	San Bernardino Rd	Lark Ellen Ave	SR		2	2	2						
		Lark Ellen Ave	Bridger St	A		1	1	1						
		San Bernardino Rd	Rimsdale Ave	A		1	1	1						
CP5	CP5	Badillo St	Azusa Ave (2 ***) (****)	11C	1	1	2	2	1					
	Channel 1	Badillo St	Vincent Ave (***)	SR		2	2	2						
		San Bernardino Rd	Vincent Ave	A		1	1	1						
		Badillo St	Lark Ellen Ave	A		1	1	1						
CP6	CP6	Azusa Ave	Cypress St (***) (****)	11C	1	1	2	2	1					
	Channel 1	Cypress St	Homerest Ave	A		1	1	1						
CP7	CP7	Azusa Ave	Covina Blvd (****)	10C	1	0	1	1	1					
CP8	CP8	Azusa Ave	Grondahl St (****)	11C	1	1	2	2	1					
	Channel 1	Azusa Ave	SEARS	A		1	1	1						
		Azusa Ave	Arrow Hwy (2 ***)	A		1	1	1						
CP9	CP9	San Bernardino Rd	Barranca Ave	12A	1	2	3	3	1					
	Channel 1	Badillo St	Barranca Ave (***)	SR		2	2	2						
		Puente St	Barranca Ave	A		1	1	1						
		Rowland St	Barranca Ave	A		1	1	1						
		Workman St	Barranca Ave	A		1	1	1						
	Channel 2	Cienega St	Barranca Ave	A		1	1	1						
		Covina Blvd	Barranca Ave	A		1	1	1						
		Cyrpess St	Barranca Ave	A		1	1	1						
CP10	CP10	Grand Ave	San Bernardino Rd	VPN31A	3	1	4	4	1		1	1	1	
	Channel 1	Grand Ave	Cypress St	A		1	1	1						
		Grand Ave	Edna Place	A		1	1	1						

Table 5.17 – City of Covina Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP11	CP11	**Grand Ave**	**Badillo St**	12A	1	2	3	3	1					
	Channel 1	Badillo St	Glendora Ave (***)	A		1	1	1						
		Badillo St	Banna Ave	SR		2	2	2						
		Badillo St	Reeder Ave (***)	A		1	1	1						
		Badillo St	Sunflower Ave	SR		3	3	3						
		Badillo St	Cypress St	A		1	1	1						
		Covina Blvd	Sunflower Ave	A		1	1	1						
	Channel 2	Grand Ave	Puente St	A		1	1	1						
		Grand Ave	Rowland St	A		1	1	1						
CP12	CP12	**Grand Ave**	**Covina Blvd**	12A	1	2	3	3	1					
	Channel 1	Covina Blvd	Glendora Ave	A		2	2	2						
		Covina Blvd	Bonnie Cove Ave	A		1	1	1						
	Channel 2	Grand Ave	Arrow Hwy (***)	A		1	1	1						
		Grand Ave	Cienega St	A		1	1	1						

F2C Equipment/Installation/Integration Cost										
	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	20	77	97	97	13	0	2	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$30,000.00	$115,500.00	$38,800.00	$24,250.00	$20,800.00	$0.00	$20,000.00	$900.00	$900.00	$251,150.00
Total Installation	$20,000.00	$77,000.00								$97,000.00
Total Integration	$10,000.00	$38,500.00								$48,500.00
SUB TOTAL	$60,000.00	$231,000.00	$38,800.00	$24,250.00	$20,800.00	$0.00	$20,000.00	$900.00	$900.00	**$396,650.00**
Design (20% of Sub Total)										$79,330.00
Escalation (15% of Sub Total)										$59,497.50
Contingency (20% of Sub Total)										$79,330.00
									Grand Total	**$614,807.50**
									Yearly Maintenance 5%	**$12,557.50**
									10 Year Maintenance cost	**$125,575.00**
									10 year Grand Total cost	**$740,382.50**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion					
Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Covina	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.3.4 City of Irwindale

The City of Irwindale has total of thirty-two (32) traffic signals and six (6) CCTV cameras. The CCTV cameras are located along Irwindale Ave and Arrow Hwy. In order to simplify the communication design for the City of Azusa the following traffic signals have been assigned to City of Irwindale:

- Irwindale and First St.
- Irwindale and Gladstone St.
- Arrow Hwy and Vincent Ave

The City of Irwindale does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of eleven (11) consolidation points not including the LCCS.

Four (4) of these consolidation points would be interconnected to consolidation point five (5) via an Agency-owned wireless network. Consolidation point five (5) will be connected to LCCS via leased DSL leased circuit. The remaining seven (7) will be connected to consolidation point one (1) via Agency-owned wireless network. Consolidation point one (1) will need to be integrated with the LCCS via fiber optic connection

Exhibit 5.18 presents the location of all field devices, system detectors, CCTV cameras, serial repeaters, consolidation points and location of the LCCS.

The City of Irwindale will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information back to the Sub-Regional TMC. Table 5.18 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $478,592.50 and for the C2C communication is $39,158.70.

Exhibit 5.18 – City Map of Irwindale

Table 5.18 – City of Irwindale Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	300		1	1	
CP1	CP1	Arrow Hwy	Irwindale Ave (****)	VPN43C	4	3	7	7	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	Irwindale Ave Ave	Calle Del Norte	A		1	1	1						
		Martinez St	Tapia St	A		1	1	1						
		Irwindale Ave Ave	Cypress St	A		1	1	1						
	Channel 2	Arrow Hwy	Vincent Ave	A		1	1	1						
		Arrow Hwy	Moranda St	A		1	1	1						
	Channel 3	Arrow Hwy	Azusa Canyon Rd (***)	SR		2	2	2						
		Azusa Canyon Rd	Olive St	A		1	1	1						
		Azusa Canyon Rd	Cypress St	A		1	1	1						
CP2	CP2	Irwinwdale Ave	First St (****)	11C	1	1	2	2	1					
	Channel 1	Irwindale Ave	Gladstone (***)	A		1	1	1						
CP3	CP3	Arrow Hwy	Live Oak Ave	13A	1	3	4	4	1					
	Channel 1	Live Oak Ave	Baldwin Park Blvd	A		1	1	1						
		Live Oak Ave	Stewart Ave	SR		2	2	2						
		Stewart Ave	Rivergrade Rd	A		1	1	1						
	Channel 2	Arrow Hwy	Santa Fe Dam Splwy(Flashing	A		1	1	1						
		Arrow Hwy	Rivergrade Rd (***)	A		1	1	1						
	Channel 3	Arrow Hwy	Main St.	A		1	1	1						
CP4	CP4	Live Oak Ave	Rivergrade	31A	3	1	4	4	1					
	Channel 1	Commerce Dr	Rivergrade	A		1	1	1						
CP5	CP5	Arrow Hwy	Live Oak Ave	VPN31A	3	1	4	4	1		1	1	1	
	Channel 1	Arrow Hwy	Buena Vista St	1		1	1	1						
CP6	CP6	Live Oak Ave	Longden Ave (***)	11A	1	1	2	2	1					
	Channel 1	Longden Ave	Myrtle Ave (***)	A		1	1	1						
CP7	CP7	Live Oak Ave	Peck Rd (***)(****)	10C	1	0	1	1	1					
CP8	CP8	Rivergrade Rd	Brooks Ave	11A	1	1	2	2	1					
	Channel 1	Little John	Los Angeles St	SR		2	2	2						
		Ramona Blvd	Barnes Ave / Durbin St	A		1	1	1						
		Ramona Blvd	Syracuse Ave/Schabarum Ave	A		1	1	1						
CP9	CP9	Irwindale Ave	Bircher/Gateway Bnss (****)	10C	1	0	1	1	1					
CP10	CP10	Irwindale Ave	Foothill Blvd (****)	10C	1	0	1	1	1					
CP11	CP11	Arrow Hwy	I-605 (***)(****)	10C	1	0	1	1	1					

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	18	35	53	53	11	300	1	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Total Unit Cost	$27,000.00	$52,500.00	$21,200.00	$13,250.00	$17,600.00	$30,000.00	$10,000.00	$900.00	$900.00	$173,350.00
Total Installation	$18,000.00	$35,000.00								$53,000.00
Total Integration	$9,000.00	$17,500.00								$26,500.00
SUB TOTAL	$54,000.00	$105,000.00	$21,200.00	$13,250.00	$17,600.00	$30,000.00	$10,000.00	$900.00	$900.00	$252,850.00
Design (20% of Sub Total)										$50,570.00
Escalation (15% of Sub Total)										$37,927.50
Contingency (20% of Sub Total)										$50,570.00
									Grand Total	$391,917.50
									Yearly Maintenance 5%	$8,667.50
									10 Year Maintenance cost	$86,675.00
									10 year Grand Total cost	$478,592.50

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Connection

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Irwindale	$250	$289.95	1544	$3,729.40	$3,479.40
			Total Annual Cost w/o Installation		$3,729.40
			Installation Cost (One Time Fee)		$250.00
			Total Annual Cost		$3,979.40
			Yearly Maintenace 5%		$186.47
			10 year Maintenace cost		$1,864.70
			Total 10 year cost		$39,158.70

5.3.5 City of Rosemead

The City of Rosemead has total of forty-nine (49) traffic signals and eight (8) CCTV cameras. The CCTV cameras are located along Rosemead Ave, Walnut Grove Ave, San Gabriel Blvd, Valley Blvd and Garvey Ave.

In order to simplify the communication design for the City of Rosemead the following traffic signals have been assigned to the City of Monterey Park communications network:

- Garvey and New Ave

The City of Rosemead does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of eleven (11) consolidation points not including the LCCS.

Four (4) of these consolidation points would be interconnected to consolidation point three (3) via an Agency-owned wireless network. Consolidation point three (3) will be connected to LCCS via a leased DSL leased circuit. The remaining five (5) will be connected to consolidation point ten (10) via Agency-owned wireless network. Consolidation point ten (10) will need to be integrated with the LCCS via fiber optic cable connection.

Exhibit 5.19 presents the location of all field devices, system detectors, CCTV cameras, serial repeaters, consolidation points and location of the LCCS.

The City of Rosemead will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information back to the Sub-Regional TMC. Table 5.19 provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $663,822.50 and for the C2C communication is $39,158.70.

Exhibit 5.19 – City Map of Rosemead

Table 5.19 – City of Rosemead Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	300		1	1	
CP1	CP1	Walnut Grove Ave	Landis View Lane	10A	1	0	1	1						
CP2	CP2	Walnut Grove Ave	Rush St	11A	1	1	2	2	1					
	Channel 1	Walnut Grove Ave	Marriortt	A		1	1	1						
		Walnut Grove Ave	Edison Way	A		1	1	1						
		Walnut Grove Ave	Klingerman St	A		1	1	1						
CP3	CP3	Garvey Ave	Walnut Grove Ave****	VPN33C	3	3	6	6	1		1	1	1	
	Channel 1	Garvey Ave	Delta Ave (***)	A		1	1	1						
	Channel 2	Walnut Grove Ave	Fern Ave	A		1	1	1						
	Channel 3	Garvey Ave	Muscatiel Ave	A		1	1	1						
		Garvey Ave	Rosemead Pl/River Ave	A		1	1	1						
		Rosemead Place	Driggs Ave	A		1	1	1						
		Garvey Ave	Driggs Ave (***)	SR		2	2	2						
		Rosemead Place	Telestar Ave (***)	A		1	1	1						
CP4	CP4	Garvey Ave	San Gabriel Blvd (****)	23C	2	3	5	5	1					
	Channel 1	Garvey Ave	Jackson Ave	A		1	1	1						
		Garvey Ave	Del Mar Ave	SR		4	4	4						
		Garvey Ave	Kelburn Ave	A		1	1	1						
		Emerson Ave	Del Mar Ave	A		1	1	1						
		Del Mar Ave	Highcliff St	A		1	1	1						
		Del Mar Ave	Graves Ave	A		1	1	1						
	Channel 2	San Gabriel Blvd	Graves Ave	A		1	1	1						
		San Gabriel Blvd	Angeles Ave	SR		2	2	2						
		San Gabriel Blvd	Rush St (***)	A		1	1	1						
	Channel 3	Emerson Ave	San Gabriel Blvd	A		1	1	1						
CP5	CP5	Hellman Ave	San Gabriel Blvd (****)	11C	1	1	2	2	1					
	Channel 1	Hellman Ave	Jackson Ave	A		1	1	1						
		Hellman Ave	Del Mar Ave	A		1	1	1						
CP6	CP6	Walnut Grove Ave	Marshall St	11A	1	1	2	2	1					
	Channel 1	Hellman Ave	Walnut Grove Ave	A		1	1	1						
CP7	CP7	Rosemead Place	Marshall St (****)	11C	1	1	2	2	1					
	Channel 1	Rosemead Place	Glendon Way	A		1	1	1						
CP8	CP8	Valley Blvd	Rio Honcho Ave (***)(****)	11C	1	1	2	2	1					
	Channel 1	Valley Blvd	Grand Ave	A		1	1	1						
		Valley Blvd	Temple City Blvd	SR		2	2	2						
		Marshall St	Temple City Blvd	A		1	1	1						
		Temple City Blvd	Loftus Dr	A		1	1	1						
CP9	CP9	Mission Dr	Rosemead Place (****)	13C	1	3	4	4	1					
	Channel 1	Mission Dr	Encinita Ave	A		1	1	1						
	Channel 2	Lower Azusa Rd	Rosemead Pl (***)	SR		2	2	2						
		Lower Azusa Rd	Encinita Ave	A		1	1	1						
	Channel 3	Mission Dr	Walnut Grove Ave	SR		2	2	2						
		Mission Dr	Muscatel Ave	A		1	1	1						
		Walnut Grove Ave	Wells St	A		1	1	1						

Table 5.19 – City of Rosemead Equipment and Cost (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP10	CP10	Valley Blvd	Rosemead Place (****)	VPN41C	4	1	5	5	1			1	1	Fiber optic Connetion
	Channel 1	Valley Blvd	Hart Ave	A		1	1	1						to LCCS
CP11	CP11	Valley Blvd	Walnut Grove Ave (****)	22C	2	2	4	4	1					
	Channel 1	Valley Blvd	Delta Ave (***)	A		1	1	1						
	Channel 2	Valley Blvd	Muscatel Ave	A		1	1	1						
		Valley Blvd	Ivar Ave	A		1	1	1						

F2C Equipment/Installation/Integration Cost										
	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	18	63	81	81	10	300	1	3	3	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$27,000.00	$94,500.00	$32,400.00	$20,250.00	$16,000.00	$30,000.00	$10,000.00	$900.00	$900.00	$231,950.00
Total Installation	$18,000.00	$63,000.00								$81,000.00
Total Integration	$9,000.00	$31,500.00								$40,500.00
SUB TOTAL	$54,000.00	$189,000.00	$32,400.00	$20,250.00	$16,000.00	$30,000.00	$10,000.00	$900.00	$900.00	**$353,450.00**
Design (20% of Sub Total)										$70,690.00
Escalation (15% of Sub Total)										$53,017.50
Contingency (20% of Sub Total)										$70,690.00
									Grand Total	**$547,847.50**
									Yearly Maintenance 5%	**$11,597.50**
									10 Year Maintenance cost	**$115,975.00**
									10 year Grand Total cost	**$663,822.50**

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion					
Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of Rosemead	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	**$39,158.70**

5.3.6 City of West Covina

The City of West Covina has total of ninety-one (91) traffic signals. In order to simplify the communication design for the City of West Covina the following traffic signals have been assigned to the City of Covina communications network:

- Azusa Canyon and San Bernardino
- Badillo and Vincent

The City of West Covina does not have any existing communication infrastructure; therefore the recommended F2C communication infrastructure will consist of an Agency-owned wireless-based and DSL network. There will be total of twenty (20) consolidation points not including the LCCS.

The consolidation points have been divided into six (6) groups primarily to minimize the latency to communicate with the field devices and second due to limited line of site from consolidation points to the LCCS or next consolidation point. The first group will consist of five (5) consolidation points that would be interconnected to consolidation point seventeen (17) via an Agency-owned wireless network. Consolidation point seventeen (17) will need to be integrated with the LCCS via a leased DSL leased circuit. The second group will consist of three (3) consolidation points that would be interconnected to consolidation point fourteen (14) via an Agency-owned network. Consolidation point fourteen (14) will be integrated with the LCCS via a leased DSL circuit.

Group three (3) is located along I-10 Fwy. These groups of signals do not have any existing communication infrastructure or line of sight to any consolidation point, therefore consolidation point eleven (11) will be connected to LCCS via leased DSL circuit.

Group four (4) will consist of ten (10) consolidation points which will be interconnected to consolidation point five (5) via an Agency-owned wireless network. Consolidation point five (5) will need to be integrated with the LCCS via fiber optic cable connection.

The intersection at Citrus and Lark Hill (consolidation point 20) is located remote from other signal locations and there is no LOS to any signal repeater site, consolidation point or existing communication infrastructure. It would not be cost effective to connect that intersection to the LCCS via leased DSL circuit; therefore it is TransCore's recommendation to not provide communications to this intersection till future communication infrastructure has been installed or evaluate this intersection again during the final design phase.

Error! Reference source not found. presents the location of all field devices, system detectors, serial repeaters, consolidation points and location of the LCCS.

The City of West Covina will require a dedicated 1.544Mbps communication link to the Sub-Regional TMC for C2C communication. The communication link will carry the IEN workstation information back to the Sub-Regional TMC. **Error! Reference source not found.** provides the breakdown of cost and field equipment and associated costs to deploy the F2C and C2C conceptual communications network and maintenance for 10 years. As shown, the estimated cost for F2C is $1,175,947.50 and for the C2C communication is $39,158.70.

Exhibit 5.20 – City Map of West Covina

Table 5.20– City of West Covina Equipment and Costs

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
LCCS				LCCS	0	0	0	0	0	300	0	1	1	
CP1	CP1	North Garvey	Sunset	20A	2	0	2	2	1					
CP2	CP2	Sunset	Workman	31A	3	1	4	4	1					
	Channel 1	Vincent	Workman	A		1	1	1						
CP3	CP3	Puente	Sunset	11A	1	1	2	2	1					
	Channel 1	Puente	Vincent	A		1	1	1						
		Lark Ellen	Puente	SR		2	2	2						
		Lark Ellen	Rowland	SR		2	2	2						
		Lark Ellen	Workman	A		1	1	1						
		Rowland	Azusa	A		1	1	1						
CP4	CP4	Badillo	Sunset	11A	1	1	2	2	1					
	Channel 1	Badillo	Orange	SR		2	2	2						
		Orange	San Bernardino	A		1	1	1						
CP5	CP5	Sunset	West Covina Pkwy	VPN33A	3	3	6	6	1			1	1	Fiber optic Connetion to LCCS
	Channel 1	Fashion Plaza Way	West Covina Pkwy	SR		2	2	2						
		California	West Covina Pkwy	A		1	1	1						
		Vincent	West Covina Pkwy	SR		1	1	1						
		Vincent	Lakes/plaza	A		1	1	1						
		Vincent	Glendora	A		1	1	1						
	Channel 2	Plaza	Sunset	A		1	1	1						
	Channel 3	Toluca	West Covina Pkwy	A		1	1	1						
		Cameron	Pacific	A		1	1	1						
CP6	CP6	Cameron	Sunset	33A	3	3	6	6	1					
	Channel 1	California	Cameron	A		1	1	1						
		Cameron	Glendora (Ped Signal)	A		1	1	1						
		Christopher	Glendora (Ped Signal)	A		1	1	1						
	Channel 2	Sunset	Vine	A		1	1	1						
		Sunset	Roseway Street	A		1	1	1						
	Channel 3	Cameron	Orange	A		1	1	1						
CP7	CP7	Merced	Sunset	13A	1	3	4	4	1					
	Channel 1	California	Merced	A		1	1	1						
		Glendora	Merced	SR		2	2	2						
		Glendora	Vine	A		1	1	1						
	Channel 2	Durnes	Sunset	A		1	1	1						
	Channel 3	Merced	Orange	A		1	1	1						
CP8	CP8	Francisquito	Sunset	13A	1	3	4	4	1					
	Channel 1	California	Fancisquito	A		1	1	1						
	Channel 2	Fairgrove	Sunset (***)	A		1	1	1						
	Channel 3	Francisquito	Orange	A		1	1	1						
		Francisquito	Willow	A		1	1	1						
CP9	CP9	South Garvey	Lark Ellen	11A	1	1	2	2	1					
	Channel 1	Lark Ellen	Stuart	A		1	1	1						
CP10	CP10	Citrus	South Garvey	13A	1	3	4	4	1		1	1	1	
	Channel 1	Citrus	Workman	A		1	1	1						
		Citrus	Eastland (***)	A		1	1	1						
	Channel 2	Barranca	North Garvey	A		1	1	1						
		Barranca	South Garvey	A		1	1	1						
	Channel 3	Hollenbeck	North Garvey	A		1	1	1						
		Hollenbeck	South Garvey	A		1	1	1						
CP11	CP11	Grand	Holt	VPN01A	0	1	1	1	1		1	1	1	
	Channel 1	Grand	Fairway	A		1	1	1						
CP12	CP12	Azusa	Francisquito	11A	1	1	2	2	1					
	Channel 1	Azusa	Aroma	SR		2	2	2						
		Azusa	Fairgrove (***)	A		1	1	1						
CP13	CP13	Azusa	Cameron	13A	1	3	4	4	1					
	Channel 1	Azusa	Merced	A		1	1	1						
		Azusa	Vine	A		1	1	1						
	Channel 2	Cameron	Hollenbeck	A		1	1	1						
	Channel 3	Azusa	Cortez (***)	A		1	1	1						

Table 5.20 - City of West Covina Equipment and Costs (Cont.)

Consolidation Point	Channels	Arterial	Crosstreet	Configuration	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	Comments
CP14	CP14	Cameron	Valinda	VPN23A	2	3	5	5	1		1	1	1	
	Channel 1	Cameron	Dawley (Flasher)	A		1	1	1						
		Cameron	Lark Ellen/(Flasher)	A		1	1	1						
		Cameron	Fernwood	A		1	1	1						
	Channel 2	Merced	Valinda	A		1	1	1						
		Valinda	Vine	A		1	1	1						
	Channel 3	Service	Valinda	A		1	1	1						
		Glendora	Valinda/West Covina Pkwy	A		1	1	1						
CP15	CP15	Francisquito	Valinda	11A	1	1	2	2	1					
	Channel 1	Valinda	Maples Grove	A		1	1	1						
CP16	CP16	Amar	Valinda (***)	12A	1	2	3	3	1					
	Channel 1	Amar	Lark Ellen	A		1	1	1						
	Channel 2	Valinda	Summer Place	A		1	1	1						
CP17	CP17	Amar	Azusa	VPN33A	3	3	6	6	1		1	1	1	
	Channel 1	Azusa	Winglane	A		1	1	1						
		Azusa	Temple (***)	A		1	1	1						
	Channel 2	Amar	Shadow Oak	A		1	1	1						
		Amar	Temple	SR		2	2	2						
		Amar	Westport	SR		2	2	2						
	Channel 3	Azusa	B.K.K.	A		1	1	1						
CP18	CP18	Amar	Nogales	21A	2	1	3	3	1					
	Channel 1	Nogales	Francesca	A		1	1	1						
CP19	CP19	Nogales	Shadow Oak	11A	1	1	2	2	1					
	Channel 1	Nogales	Shakesphere	A		1	1	1						
		Nogales	Amada	A		1	1	1						
		Nogales	Las Puenta	SR		2	2	2						
		La Puenta	Sentous	SR		2	2	2						
		Sentous	Valley	SR		2	2	2						
		Valley	Nogales	A		1	1	1						
CP20	CP20	Citrus	Lark Hill	N/A		0	0	0						Eliminate

F2C Equipment/Installation/Integration Cost

	Ethernet DSSS Radio	Serial DSSS Radio	Omni/Yaggi Antenna Assembly*	Antenna Cable	Serial Server + Ethernet Switch	Fiber optic connection to LCCS (per feet)	TELCO INTERFACE	Cable Modem	VPN Router	
UNIT TOTALS	29	114	143	143	19	300	4	6	6	
Unit Cost	$1,500.00	$1,500.00	$400.00	$250.00	$1,600.00	$100.00	$10,000.00	$300.00	$300.00	
Installation per Location	$1,000.00	$1,000.00	**	**	**	**	**	**	**	
Integration per Location	$500.00	$500.00	**	**	**	**	**	**	**	
										Totals
Toal Unit Cost	$43,500.00	$171,000.00	$57,200.00	$35,750.00	$30,400.00	$30,000.00	$40,000.00	$1,800.00	$1,800.00	$411,450.00
Total Installation	$29,000.00	$114,000.00								$143,000.00
Total Integration	$14,500.00	$57,000.00								$71,500.00
SUB TOTAL	$87,000.00	$342,000.00	$57,200.00	$35,750.00	$30,400.00	$30,000.00	$40,000.00	$1,800.00	$1,800.00	$625,950.00
Design (20% of Sub Total)										$125,190.00
Escalation (15% of Sub Total)										$93,892.50
Contingency (20% of Sub Total)										$125,190.00
									Grand Total	$970,222.50
									Yearly Maintenance 5%	$20,572.50
									10 Year Maintenance cost	$205,725.00
									10 year Grand Total cost	$1,175,947.50

* Antenna Assembly includes the following: 6 Element 8.5db gain Yagi Antenna, 900M Lightning Arrestor, 3' Lightning Arrestor Coax Cable Assy., Waterproofing Kit for Antenna Connectors.
** Installation and Integration cost is included in the cost of the Unit Cost
*** System Detector location
**** CCTV Camera location

C2C DSL Conncetion

Agency	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
City of West Covina	$250	$289.95	1544	$3,729.40	$3,479.40
				Total Annual Cost w/o Installation	$3,729.40
				Installation Cost (One Time Fee)	$250.00
				Total Annual Cost	$3,979.40
				Yearly Maintenace 5%	$186.47
				10 year Maintenace cost	$1,864.70
				Total 10 year cost	$39,158.70

5.4 LEVEL 3 AGENGIES

Level 3 Agency is defined in the ATMS Alternative Analysis Report (Deliverable 2.5.1.1) as an agency that:

- Agency actively manages its own ATMS and other ITS devices (large amount)
    - Typically AM & PM peak period traffic operations & incidents
    - May support 24/7 operations
- Agency may operate other Agencies' traffic signals (Level 1)
- Agency may "host" other Agencies' traffic signals (Level 2A)
- Agency will have a TMC from which to operate its ATMS, the IEN, & other ITS devices
- Maintains an TMC/LCCS facility to manage ATMS & incident management activities
    - IEN W/S (Regional view)
    - ATMS W/S (Local view)
    - CDI between the ATMS & IEN

5.4.1 Los Angeles County

The SGVTF Sub-Regional TMC will be co-located with the LA County Sub-Regional TMC located at 900 S. Fremont Ave, Alhambra, CA. The SGVTF Sub-Regional TMC will house all the centralized traffic management components such as SGV IEN site server, SGV IEN corridor server, CDI, County TCS server (KITS) and the ATMS workstation, which will allow the individual Agencies within the SGVTF to communicate and share information.

There will be approximately twenty (20) dedicated DSL circuits entering the SGVTF Sub-Regional TMC from the Agencies. The communication link will carry the field data and the IEN workstation information back to the SGV Sub-Regional TMC. In order to consolidate and integrate the information provided from the field, approximately ten (10) routers with DSL modules will be necessary.

Table 5.21 provides the breakdown of associated costs to deploy the SGVTF Sub-Regional TMC conceptual communications network and maintenance for 10 years. As shown, the estimated cost for the Sub-Regional TMC is $177,000.

Table 5.21 – SGVTF Sub-Regional TMC Equipment and Costs

Location	Router	
SGVTF Sub-Regional TMC	10	
UNIT TOTALS	10	
Unit Cost	$7,500.00	
Installation	$5,000.00	
Integration	$10,000.00	
		Totals
Toal Unit Cost	$75,000.00	$75,000.00
Total Installation	$5,000.00	$5,000.00
Total Integration	$10,000.00	$10,000.00
SUB TOTAL	$90,000.00	**$90,000.00**
Design (20% of Sub Total)		$18,000.00
Escalation (15% of Sub Total)		$13,500.00
Contingency (20% of Sub Total)		$18,000.00
	Grand Total	**$139,500.00**
	Yearly Maintenance 5%	**$3,750.00**
	11 Year Maintenance cost	**$37,500.00**
	10 year Grand Total cost	**$177,000.00**

Table 5.22– Total Cost Summary

F2C Communication				C2C DSL Conncetion				
Agency Name	Grand Total	10 Year Maintenance	10 Year Grand Total with Maintenance	One Time Installation Fee	Monthly Fee	Connection Rate (Kbps)	Annual Cost w / Installation	Annual Cost w / o Installation
Alhambra	$951,545	$197,450	$1,148,995	$250	$289.95	1544	$3,729.40	$3,479.40
Arcadia	$213,048	$43,975	$257,023	$250	$289.95	1544	$3,729.40	$3,479.40
Azusa	$435,318	$91,675	$526,993	$80	$79.99	1544	$1,039.87	$959.88
Baldwin Park	$539,245	$109,450	$648,695	$250	$289.95	1544	$3,729.40	$3,479.40
Covina	$614,808	$125,575	$740,383	$250	$289.95	1544	$3,729.40	$3,479.40
Duarte	$76,260	$15,600	$91,860	$250	$289.95	1544	$3,729.40	$3,479.40
El Monte	$736,018	$151,175	$887,193	$225	$289.95	1544	$3,704.40	$3,479.40
Glendora	$366,575	$71,750	$438,325	$250	$289.95	1544	$3,729.40	$3,479.40
Irwindale	$391,918	$86,675	$478,593	$250	$289.95	1544	$3,729.40	$3,479.40
La Puente	$154,380	$34,800	$189,180	$250	$289.95	1544	$3,729.40	$3,479.40
Monrovia	$384,749	$84,363	$469,111	$250	$289.95	1544	$3,729.40	$3,479.40
Montebello	$694,710	$140,100	$834,810	$250	$289.95	1544	$3,729.40	$3,479.40
Monterey Park	$699,205	$155,050	$854,255	$225	$289.95	1544	$3,704.40	$3,479.40
Rosemead	$547,848	$115,975	$663,823	$250	$289.95	1544	$3,729.40	$3,479.40
San Gabriel	$397,498	$88,475	$485,973	$250	$289.95	1544	$3,729.40	$3,479.40
San Marino	$218,008	$48,575	$266,583	$0	$319.96	1544	$3,839.52	$3,839.52
South El Monte	$233,663	$52,125	$285,788	$250	$289.95	1544	$3,729.40	$3,479.40
S. Pasadena	$303,800	$62,000	$365,800	$225	$289.95	1544	$3,704.40	$3,479.40
Temple City	$289,230	$60,300	$349,530	$250	$289.95	1544	$3,729.40	$3,479.40
West Covina	$970,223	$205,725	$1,175,948	$250	$289.95	1544	$3,729.40	$3,479.40
Grand total	**$9,218,044**	**$1,940,813**	**$11,158,856**					

Total Annual Cost w/o Installation	$71,933.59
Installation Cost (One Time Fee)	$4,504.99
Total Annual Cost	$76,438.58
Yearly Maintenace 5%	$3,596.68
10 year Maintenace cost	$35,966.80
Total 10 year cost	**$755,302.70**

6. CONFIGURATION MANAGEMENT PLAN

6.1 PURPOSE OF CONFIGURATION MANAGEMENT PLAN

The purpose of Configuration Management (CM) plan is to identify and describe the overall policies and methods to be used during the life cycle of the system from this initial planning through deployment and operation. The CM plan will provide the basis for uniform and concise CM practices for the system. The CM plan is also a management control mechanism to ensure system changes are within the scope of the system design and to also to keep track of the system changes and status. All the field devices such as traffic signal controllers, CCTV cameras and system detectors will be included in the configuration management plan.

SGVTF project consists of many tiers, systems and sub-systems, and it is critical to establish interoperability and maintain operation throughout. The following sections will provide the objectives and responsibilities in order to maintain, identify and coordinate the actual design changes.

6.2 OBJECTIVES OF CONFIGURATION MANAGEMENT PLAN

The objective of CM plan for SGVTF project is to ensure that each Agency involved follows the procedure, standards and ensures that all documentations, requirements, system design, testing, acceptance testing documents and etc. is accurately being updated per actual physical design of the system.

6.3 RESPONSIBILITIES

The CM plan for SGVTF project is recommended to be divided into two sections: Local authority and Regional authority. The local authority will be responsible for maintaining, documenting the local area infrastructure. The local authority will keep track of all the changes to the existing infrastructure, and the effects if the changes would have on the system design and the operation. In addition, the Local authority will ensure the interoperability of the system. The primary devices that the Local authority will be interfacing with are as follows: Traffic signal controllers, CCTV cameras, CMS, VDS etc.

The Regional authority will be overseeing the local authority potential modifications and the impact on the overall system design, performance and operation. Even though the Local authority has complete autonomy to make changes to the local system design configuration, they must communicate and coordinate the changes through the Regional CM committee to insure that all the changes are communicated throughout the SGVTF project and it maintains the integrity of the original system design and functionality. The primary responsibility of the Regional authority is to keep track of the potential system changes, system performance, operation and IEN network.

7. CONSTRUCTION STAGING PLAN

The purpose of the Construction Staging Plan (CSP) for SGVTF project is to ensure that the construction and/or operation are being properly implemented. In order to keep track of the construction phase the CSP will be divided into four (4) phases. Each phase of the CSP will require providing a detail schedule of works by dates and location where work would be performed and followed by a completion report of the particular phase.

7.1 PHASE ONE – INFRASTRUCTURE DESIGN

During phase one (1), all the field components such as radios, antennas, firmware, fiber optic communications devices, IEN workstations, TCS, routers and any other equipment that will be necessary to complete the communication link between the field devices, LCCS and the Sub-Regional TMC should be ordered per specifications. Final design drawings shall be submitted for review and approval. In addition to the infrastructure design, C2C communication link shall be established with the local service provider. The C2C communication link will be a dedicated DSL circuit from each Agency to SGVTF Sub-Regional TMC located in LACODPW building.

Two (2) week look ahead detailed schedules should be provided for review and approval, in addition a four (4) week look ahead general schedule should be accompanied the detailed schedule.

7.2 PHASE TWO – COORDINATION AND INSTALLATION

Phase two (2) and one (1) should happen simultaneously. Any improvements to any controllers, LCCS, traffic signal poles and/or any construction needed for preparation and installation shall be completed. In addition any Memorandum of Understanding (MOU) between Local Agencies and LA County should be submitted for review and approval.

Two (2) week look ahead detailed schedules should be provided for review and approval, in addition a four (4) week look ahead general schedule should be accompanied the detailed schedule.

7.3 PHASE THREE – INSTALLATION AND INTEGRATION

Prior to phase three (3), the installation of all field components such as radios, antennas, firmware and etc. should be installed and pre-tested. All level 1, 2A and 2B Agency field devices shall have communication with the LCCS and Sub-Regional TMC. The communication link between the IEN workstations shall be tested for C2C communication.

Two (2) week look ahead detailed schedules should be provided for review and approval, in addition a four (4) week look ahead general schedule should be accompanied the detailed schedule.

7.4 PHASE FOUR – TESTING AND TRAINING

The final phase includes overall system testing and system training. Upon successful completion of integration and testing, the IEN should be tested and verified that each field device can receive and transmit data back to the LCCS and/or Sub-Regional TMC. This test shall include C2C communication. In addition to testing, training session shall be conducted for each Agency users. The training shall consist of but not limited to basic operation and maintenance operations of the system

APPENDIX A – EQUIPMENT CONFIGURATION