MEETING DATE: 07/16/07

AGENDA ITEM: Approval of Final Plans and Specifications and Authorize Advertising for Bids for Mutual Video Sharing and to Migrate Traffic Signals Data Transmission from Twisted Pair Copper to Fiber Optics Components of the Fox Hills Traffic Signal Synchronization Project.

ATTACHMENTS

		Pages
1	Mutual Video Sharing Analysis Report	1-9
2	Migrate Traffic Signals from 50-pair TWP Copper to 24-SMFO Cable Report	10-21
3	KOA Proposal for Additional Work	22-24

Fox Hills Traffic Signal Synchronization Upgrade
Project P-852

Mutual Video Sharing Analysis

FINAL

Prepared for:

City of Culver City

May 16, 2007

1. INTRODUCTION/PURPOSE

Currently Los Angeles Department of Transportation (LADOT) has the ability to monitor but not control of eight (8) Culver City's eleven (11) Pelco pan, tilt and zoom (PTZ) CCTV cameras through the Automated Traffic Surveillance and Control (ATSAC) System. Culver City would like to utilize one (1) Fiber Optic strand from the existing twenty-four (24) Single Mode Fiber Optic (24-SMFO) cable between Culver City communication room and Fire Station 68 (FS-68) to provide ATSAC the ability to view and control the existing four (4) PTZ CCTV cameras in Culver City. Culver City is working with LADOT to be able to view and control ten (10) Cohu PTZ CCTV cameras, which are owned by LADOT but located in the Culver City boundaries.

At Culver City communication room the City has a Pelco video matrix switch that is used to manage the viewing and control of the cameras. This analysis will review the existing communications architecture and will present a communications architecture design, which allows for ATSAC and Culver City to view and control selected PTZ cameras utilizing the existing 24-SMFO cable and each Agency's existing video matrix switch equipment. In addition, this communication design report document will include an equipment list and cost estimate.

2. EXISTING SYSTEM OVERVIEW

The current communications scheme between the LADOT ATSAC system and the Culver City Hall communication room is comprised of two (2) separate components and is illustrated below in Figure 2.

- An existing LADOT owned OC-3 Fiber Optic communication network (Optical Carrier Level 3, approximately 622.08Mbps) from LA City Hall Operation Center (ATSAC) to FS-68, where video images, communications for Culver City intersections are bundled with other LADOT intersections served from that location,
- An existing Culver City owned 24-SMFO cable from Culver City Hall communication room to FS-68 Communication hub.

The ten (10) LADOT-owned Cohu PTZ cameras that are of interest to Culver City are listed below along with the assigned ATSAC Communications Hub, Cohu camera numbers and the associated wavelength that are/will be communicating.

Figure 1 – LADOT CCTV Cameras Located around Culver City

No	Intersection	ATSAC Comm Hub	Cohu Camera #	TX/RX Wavelength
1	Robertson & Venice	FS-68	22	1530nm
2	La Cienega & Venice	FS-68	13	1530nm
3	La Cienega & Jefferson	FS-68	12	1530nm
4	La Cienega & Rodeo	FS-68	24	1530nm
5	Jefferson & Rodeo (PROPOSED)	WESTADAMS	178	1490nm
6	Sepulveda & Howard Hughes	LAX	74	1490nm
7	Jefferson & Mesmer	MAR VISTA	118	1490nm
8	Washington & Lincoln	MAR VISTA	114	1490nm
9	Sepulveda & Venice	Westwood	129	1490nm
10	La Tijera & La Cienega	LAX	73	1490nm

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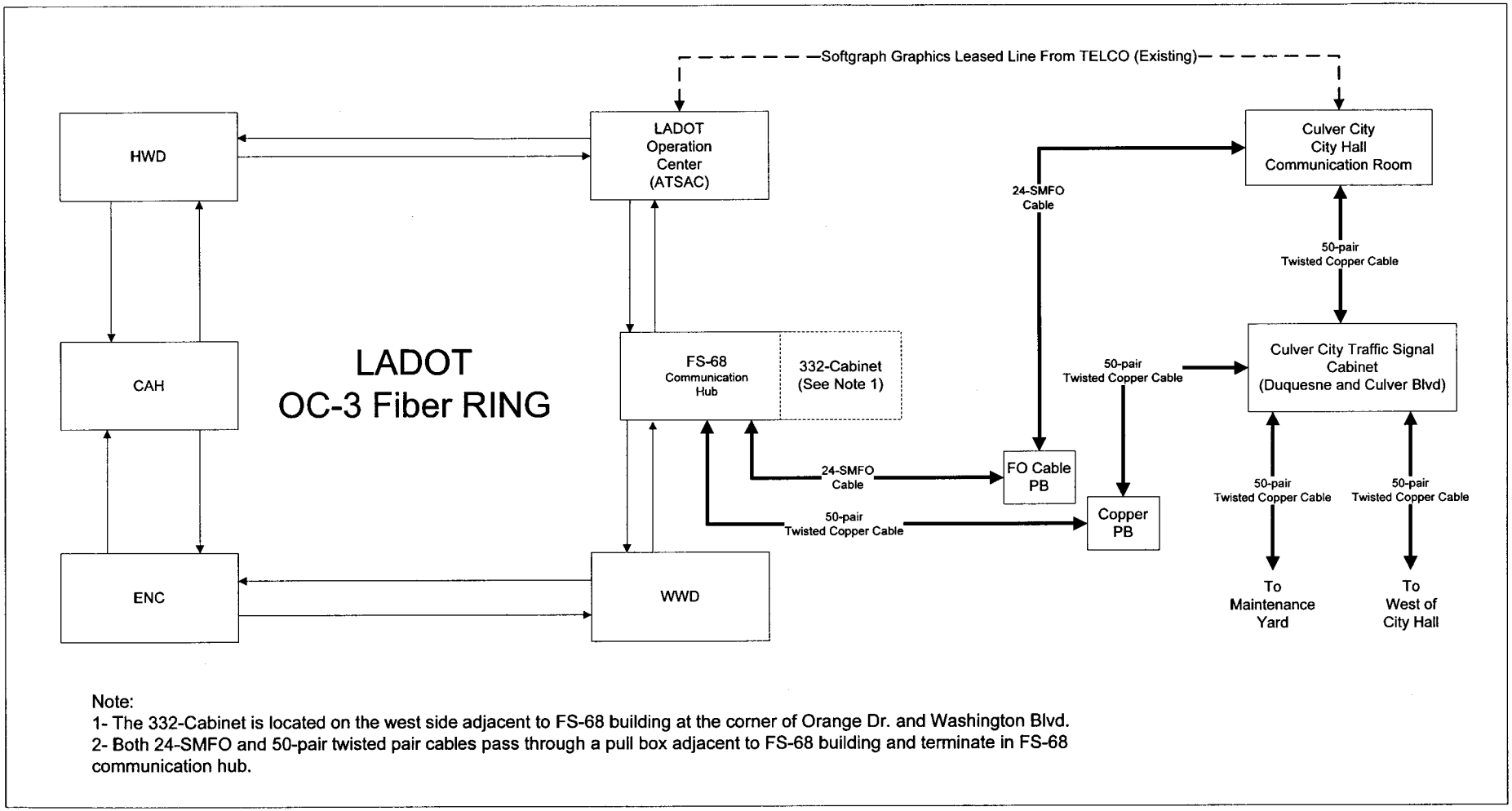
Figure 2 – Overview of Existing Communications System Block Diagram



Note:
1- The 332-Cabinet is located on the west side adjacent to FS-68 building at the corner of Orange Dr. and Washington Blvd.
2- Both 24-SMFO and 50-pair twisted pair cables pass through a pull box adjacent to FS-68 building and terminate in FS-68 communication hub.

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3. PROPOSED ARCHITECTURE

As mentioned previously, the focus of this project is to create a communications infrastructure that:

- Allows LADOT to view and control eleven (11) Pelco PTZ Cameras utilizing Pelco "P" PTZ data protocol that are operated by Culver City using their existing Cybermation Video Matrix Switch.
- Allows Culver City to view and control ten (10) Cohu PTZ Cameras utilizing Cohu PTZ data protocol that are operated by LADOT using their existing Pelco Video Matrix Switch.

Since Culver City has Optelecom video transmission equipment in place to support other aspects of their ITS network and Culver City staff is presumably familiar with Optelecom equipment, the recommendation is to use the same manufacturer on this project.

3.1 Culver City Viewing and Control of LADOT PTZ Cameras

The proposed topology should be that Culver City view and control the four (4) PTZ CCTV cameras assigned to FS-68 at FS-68 communication hub and the remaining six (6) PTZ CCTV cameras from ATSAC. The proposed system architecture is illustrated below in Figures 3 and 4.

The four (4) CCTV cameras that originate at FS-68 communications hub (See Figure 4) will be transmitted on 1530 nanometer (nm) wavelength to the Culver City's communications room using the existing Optelecom eight (8) Channel Video/Data transceivers (Optelecom 9152DT, refer to Appendix A for equipment specification and detail) through the Optelecom Series 9989 Coarse Wavelength Division Multiplexer and from FS-68 to Culver City Communications Room via an existing 24-SMFO cable (Fiber #6).

The remaining six (6) CCTV cameras will originate from ATSAC (See figure 3). In order to minimize the impact on ATSAC's current operations, a new Video Distribution Amplifier (GE Security Model KTS-250-16, refer to Appendix E for equipment specification and detail) will be installed at ATSAC that will split the NTSC video feeds coming in from the field in two directions. The first direction will be to the Cybermation Video Matrix Switch, and the second direction will be to a new Video/Data transceiver (Optelecom 9552DT-LD3B-FC, refer to Appendix A for equipment specification and detail) that will transmit the video on 1490nm wavelength to FS-68 through the Optelecom Series 9989 Coarse Wavelength Division Multiplexer and from FS-68 to Culver City Communications Room via an existing 24-SMFO cable (Fiber #12).

Culver City will control LADOT's PTZ cameras as follows. PTZ commands originating from the Pelco Matrix Switch (CM9760) will be converted from Pelco "P" protocol to Cohu protocol using a camera control code translator (Sennetech Model SCT-1059, refer to Appendix B for equipment specification and detail), then transmitted to ATSAC via an existing data port on the Optelecom 9152DT Video multiplexer through the Optelecom Series 9989 Coarse Wavelength Division Multiplexer via an existing 24-SMFO cable (Fiber # 1). Upon arrival at ATSAC, the PTZ data will be transferred from the existing Optelecom 9152DR Video multiplexer data port to a data port on the Cohu Video Control PC. In order for the Cohu Video Control PC to recognize Culver City's PTZ commands, minor software modifications to the Cohu Video Control PC will

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be necessary. LADOT staff indicated that LADOT would perform all necessary Cohu Video Control PC modifications.

3.2 ATSAC Viewing and Control of Culver City PTZ Cameras

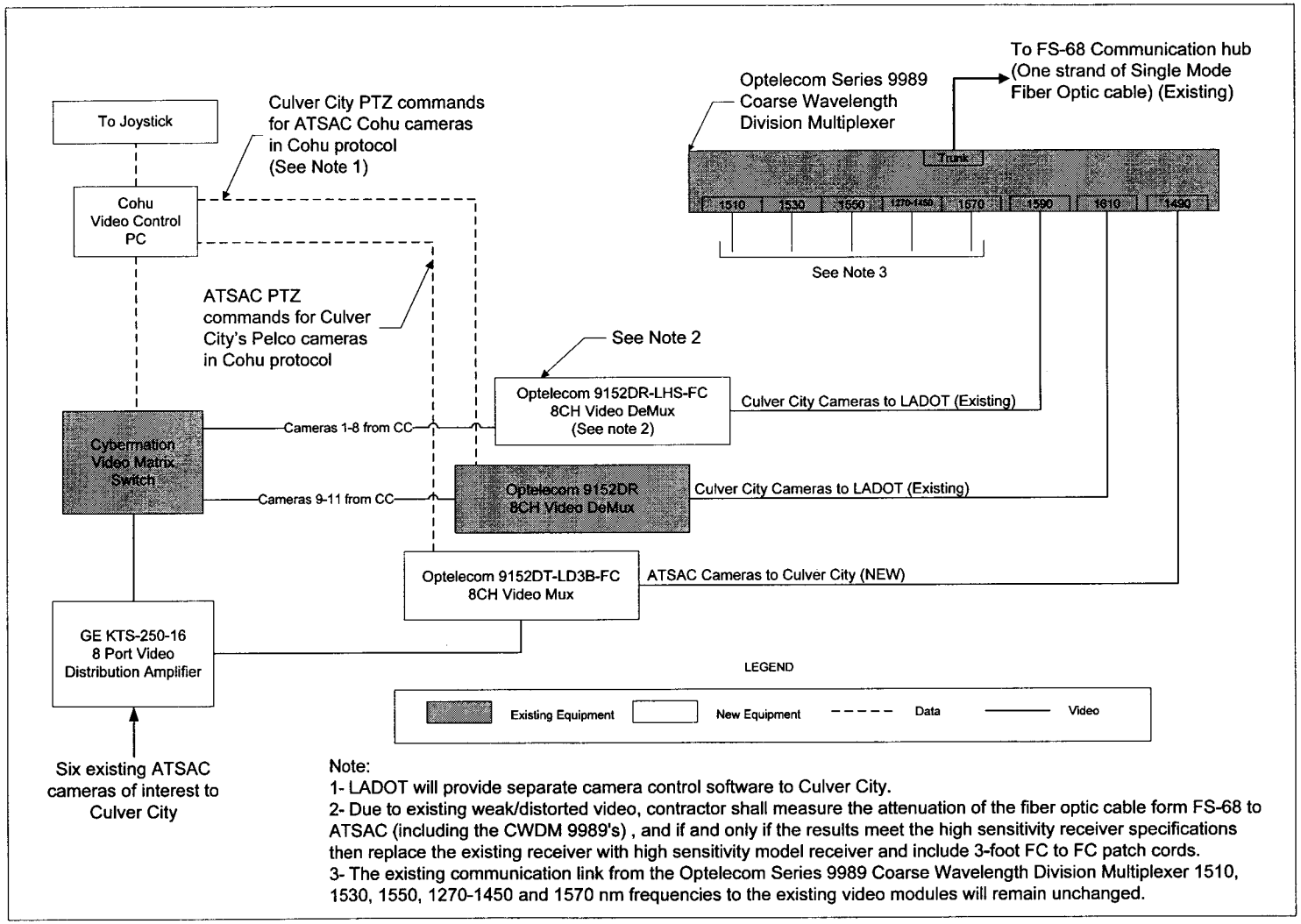
As mentioned previously, Culver City's Pelco PTZ cameras are currently received at the ATSAC facility however the current optical power from the 1590nm wavelength (Culver City Cameras # 1-8) through the Optelecom Series 9989 Coarse Wavelength Division Multiplexer is not sufficient to provide ATSAC a useable video image. Therefore, replace the existing Optelecom 9152DR with a new high sensitivity model receiver (Optelecom 9152DR-LHS-FC). A demo model of this type has been tested and produces good video.

ATSAC will control Culver City's PTZ cameras as follows. PTZ commands originating from the Cohu Video Control PC will be connected to the data port of the new Video/Data transceiver (Optelecom 9552DT-LD3B-FC, refer to Appendix B for equipment specification and detail) that is supporting the ATSAC PTZ camera transmission to Culver City (Fiber # 12) via FS-68 through the Optelecom Series 9989 Coarse Wavelength Division Multiplexer 1490nm wavelength. Upon arrival at Culver City communications room, the PTZ data will pass through the Optelecom 9152DR-LHS-FC and will be converted from Cohu protocol to Pelco "P" protocol using a camera control code translator (Sennetech Model SCT-1053, refer to Appendix C for equipment specification and detail), then combined with Culver City's PTZ commands using a camera control Code Merger (Sennetech Model SCM-200, refer to Appendix D for equipment specification and detail). The Code Merger will be connected to an existing Pelco CM9760 CDU-T Code Distribution Unit, which governs the PTZ data commands for Culver City's Pelco Matrix Switch.

In order to ensure effective PTZ control by ATSAC and Culver City, the two Agencies must coordinate their camera channel assignments. For example, there can only be one camera assigned to Channel 1 among the two Agencies Video Matrix Switch. Given that Culver City has only eleven (11) CCTV cameras and LADOT has hundreds, Culver City shall rearrange their channel assignments to work around LADOT's assignments. Reassigning cameras channels is a relatively simple task that can be performed by a certified Pelco technician.

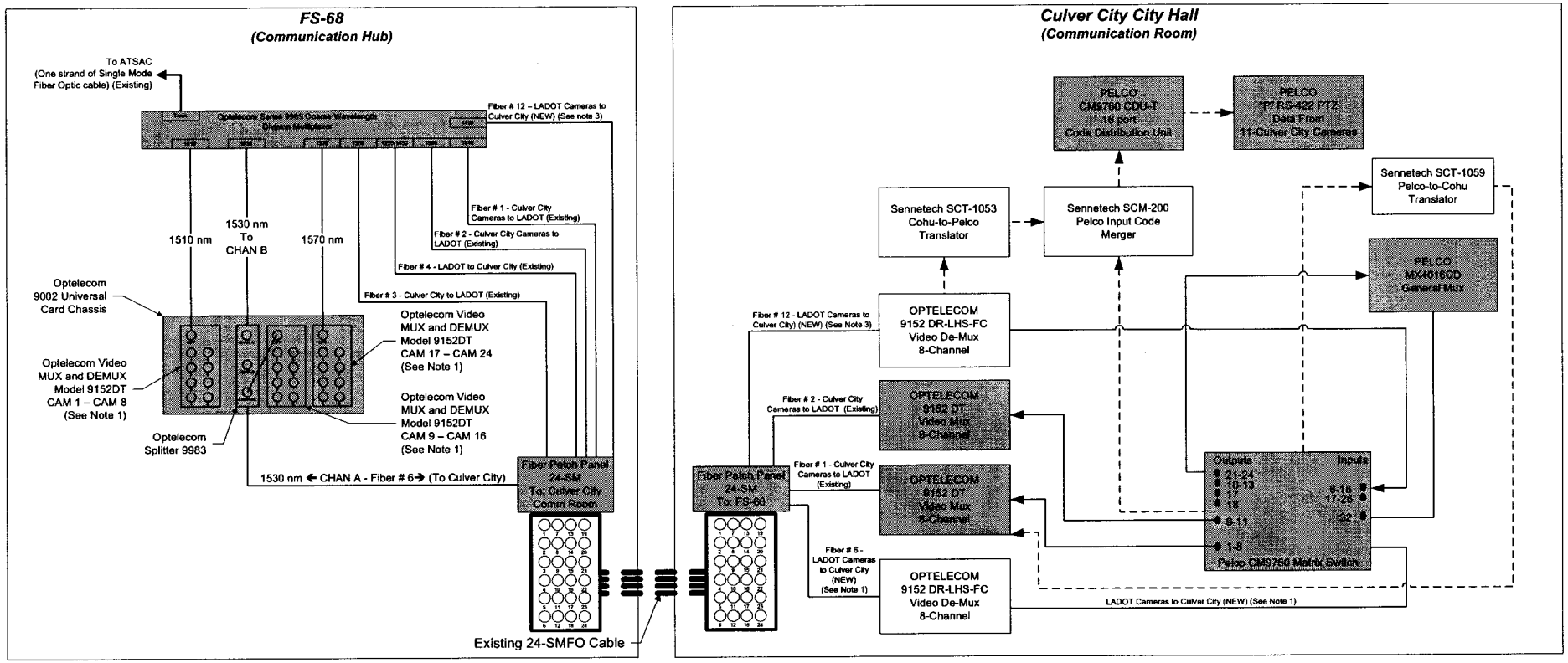
In order to ensure the owning Agency has PTZ control priority over the other Agency for the PTZ cameras they own, programming this logic into each Agency's matrix switch is recommended. This is another task that can be performed by a Cohu and Pelco certified technician.

Figure 3 – Proposed LADOT ATSAC CCTV Video System Block Diagram



Note:
1- LADOT will provide separate camera control software to Culver City.
2- Due to existing weak/distorted video, contractor shall measure the attenuation of the fiber optic cable form FS-68 to ATSAC (including the CWDM 9989's) , and if and only if the results meet the high sensitivity receiver specifications then replace the existing receiver with high sensitivity model receiver and include 3-foot FC to FC patch cords.
3- The existing communication link from the Optelecom Series 9989 Coarse Wavelength Division Multiplexer 1510, 1530, 1550, 1270-1450 and 1570 nm frequencies to the existing video modules will remain unchanged.

Figure 4– Proposed Culver City Hall Communications Room Video System Block Diagram



Note:

1- Contractor to rearrange video outputs from LADOT cameras to have camera # 12,13,22 and 24 placed on the Optelecom 9152-DT unit connected to the Optelecom 9983. These cameras will be transmitted to the Culver City Hall communication room on fiber #6.

2- Contractor to disconnect the Optelecom 9983 Splitters/Combiners associated with 1510 nm and 1570 nm jumper cables.

3- LADOT Camera # 73, 74, 114, 118, 129 and 178 and two (2) others as needed.

4. TECHNICAL SPECIFICATIONS

The manufacture and model number of the equipment for this project has been identified in Section 5 (Equipment list & Cost estimate) and supplemented by the cut sheets provided in Appendix A-F. All equipment must meet or exceed the specifications provided in the cut sheets or equivalent. Below are additional detail specifications for the Multiplexer and Demultiplexers.

4.1 General Video Multiplexer/demultiplexer Requirements and Specifications

- All video multiplexer/demultiplexers shall be Optelecom Model 9152 series.
- All video multiplexer/demultiplexer shall transport eight (8) channels of simplex video and five (5) channels of simplex data over one fiber using digital transmission techniques.
- The video multiplexer/demultiplexer shall be used in a mini-chassis and an external power shall be provided.
- The video multiplexer/demultiplexer shall transport eight (8) channels of real-time NTSC video using 10-bit digital PCM coding in one direction over one (1) fiber optic strand without use of any other video compression techniques.
- The video multiplexer/demultiplexer cards shall be hot-swappable.
- The fiber optic transceiver cards shall be rack mount.
- The video multiplexer/demultiplexer card shall occupy two (2) slots in the 9002 series chassis with external power supply.
- The video multiplexer/demultiplexer card shall have Sync, error, Carrier Detect and Power indicators for visual display of optical and electrical operational status.
- The video multiplexer/demultiplexer cards shall be compatible with coarse wavelength division multiplexing (CWDM) techniques.
- The video multiplexer/demultiplexer cards shall support an optional PC-based management system for monitoring and logging operating status and conditions.
- The video multiplexer/demultiplexer cards shall experience no degrade or reduced video performance when the data channels are used.
- The transceiver cards shall have MTBF of >100,000 Hours.
- The transceiver cards shall be meet relevant IPC standards.
- The video multiplexer/demultiplexer optical connectors shall be "FC" type.
- The video multiplexer/demultiplexer shall have at the minimum three (3) duplex ports (one RS-232, two switch-selectable RS422 and RS-485)

4.2 Video Distribution Amplifier

- The Video Distribution Amplifier shall buffer and distribute video signals to multiple outputs.
- The Video Distribution Amplifier shall feature eight groups of input/output channels and each group of inputs/outputs shall be configurable as a single 1 x 8 video distribution amplifier or two 1 x 4 video distribution amplifiers.
- The Video Distribution Amplifier shall have equal video strength for all outputs.
- The Video Distribution Amplifier shall be compatible with NTSC or PAL video.
- The Video Distribution Amplifier video connections shall be made via BNC connectors up to 16 inputs.

5. EQUIPMENT LIST & COST ESTIMATE

The following is a list of equipment and associated cost for ATSAC, FS-68 and Culver City communication room.

Figure 5 – Equipment List and Cost Estimate

Description	Model Number	Quantity	Unit Cost	Extended Cost
Culver City Communication Room				
Furnish & Install 8 Channel Video/3 Channel Data Transceiver	Optelecom 9152DR-LHS-FC	2	$6,832.00	$13,664.00
Furnish & Install 2 Input Pelco Code Merger*	Sennetech SCM-200	1	$600.00	$600.00
Furnish & Install Pelco to Cohu Code Translator*	Sennetech SCT-1059	1	$2,390.00	$2,390.00
Furnish & Install Cohu to Pelco Code Translator*	Sennetech SCT-1053	1	$2,390.00	$2,390.00
Furnish & Install Coaxial Cable 12' with BNC connector	ULTRARCVB-12	6	$120.00	$720.00
Furnish & Install Fiber Optic Pigtails (Single Mode) 10'	Corning 616101R3131010F	1	$25.75	$25.75
FS-68				
Furnish & Install Fiber Optic Pigtails (Single Mode) 10'	Corning 616101R3131010F	1	$25.75	$25.75
ATSAC				
Furnish & Install 8 Channel Video/3 Channel Data Transceiver	Optelecom 9152DT-LD3B-FC	1	$7,200.00	$7,200.00
Furnish & Install 8 Channel Video/3 Channel Data Transceiver	Optelecom 9152DR-LHS-FC	1	$6,832.00	$6,832.00
Furnish & Install 16 Input Video Distribution Amplifier	GE KTS-250-16	1	$805.00	$805.00
Furnish & Install Coaxial Cable 12' with BNC connector	ULTRARCVB-12	12	$120.00	$1,440.00
			TOTAL	**$36,092.50**

* Sennetech sells all their equipment at list price. For the purposes of this cost estimate the indicated list price is doubled to estimate the price charged by a Contractor to Furnish & Install.

Fox Hills Traffic Signal Synchronization Upgrade
Project P-852

Migrate Traffic Signals from 50-pair TWP Copper to 24-SMFO Cable

FINAL

Prepared for:

City of Culver City

May 16, 2007

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1. INTRODUCTION/PURPOSE

Currently Los Angeles Department of Transportation (LADOT) is controlling and monitoring the system performance of the signalized traffic signals for the City of Culver City through the LADOT Automated Traffic Surveillance and Control (ATSAC) System. ATSAC is a computer-based traffic signal control system that monitors traffic conditions and system performance, selects appropriate signal timing (control) strategies, and performs equipment diagnostics and alert functions.

The communications between ATSAC and Culver City is provided over a hybrid network that includes fiber optic cable from the ATSAC facility to Fire Station 68 at the intersection of Washington Boulevard & Orange Drive. A 50-pair Copper cable that extends out from Fire Station 68 currently serves all of the traffic signals in Culver City. This cable supports the intersections between Fire Station 68 and Culver City Hall, and also serves as a backbone cable for other intersections west of Culver City Hall. As Culver City continues to expand the number of signalized intersection, the 50-pair twisted copper cable between Fire Station 68 (ATSAC – Communication Hub) and Culver City Hall communication room is reaching capacity. The purpose of this report is to analyze improvements that are necessary to transition Culver City's traffic signals from the existing 50-pair twisted copper cable onto an existing 24-Single Mode Fiber Optic (24-SMFO) cable between these same facilities.

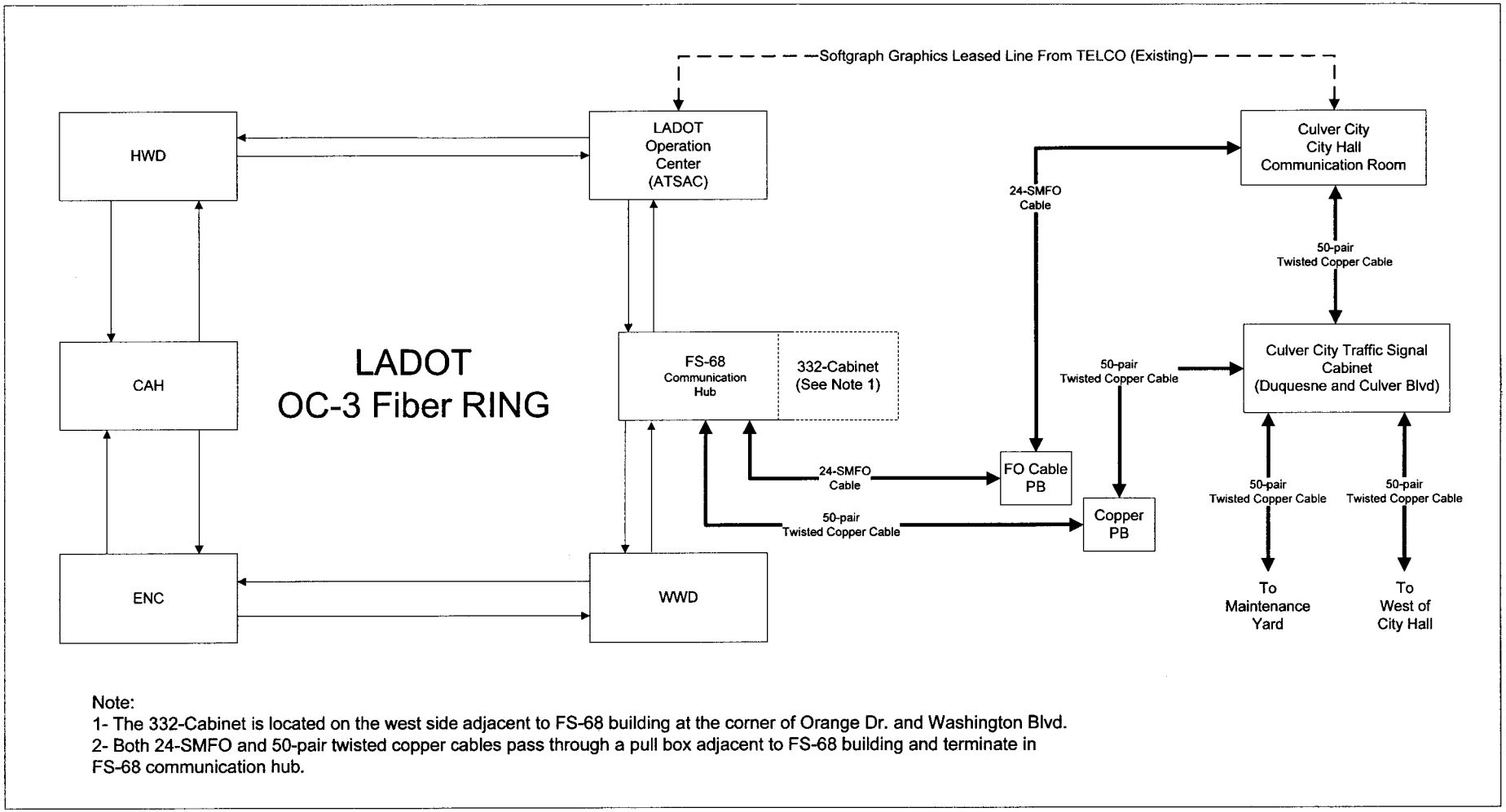
This analysis will review the existing communications architecture and will present a communications architecture design utilizing the existing 24-SMFO (Single Mode Fiber Optic) cable. In addition, this communication design report document will also include an equipment list, cost estimate and an interconnect diagram.

2. EXISTING SYSTEM OVERVIEW

The current communications scheme between the LADOT ATSAC system and the Culver City Hall communication room to the traffic control signals is comprised of four (4) separate components and is illustrated in Figure 1.

- An existing LADOT owned OC-3 Fiber Optic communication network (Optical Carrier Level 3, approximately 622.08Mbps) from LA City Hall Operation Center (ATSAC) to Fire Station 68 (FS-68), where communications for Culver City intersections are bundled with other LADOT intersections served from that location,
- An existing Culver City owned 50-pair twisted copper cable extends the individual communications channels from Fire Station 68 to the Culver City Hall Communications (while supporting traffic signal controllers along the way). This 50-pair Copper cable is operating at close to capacity with 46 pairs supporting the 23 traffic signal channels in Culver City. Culver City has the ability to add two channels supporting an additional eight (8) intersections. As the City increases the number of traffic signals additional capacity will be required between the field and the City Hall,
- An existing Culver City owned 24-SMFO cable from Culver City Hall communication room to FS-68 Communication hub, and
- Two (2) 50-pair twisted copper cables located in the Duquesne Avenue & Culver Boulevard traffic signal cabinet that support the traffic signal distribution network west of the City hall and the signals along the way past the Culver City maintenance yard to the south.

Figure 1 – LADOT and Culver City Existing Communication System Block Diagram



Note:
1- The 332-Cabinet is located on the west side adjacent to FS-68 building at the corner of Orange Dr. and Washington Blvd.
2- Both 24-SMFO and 50-pair twisted copper cables pass through a pull box adjacent to FS-68 building and terminate in FS-68 communication hub.

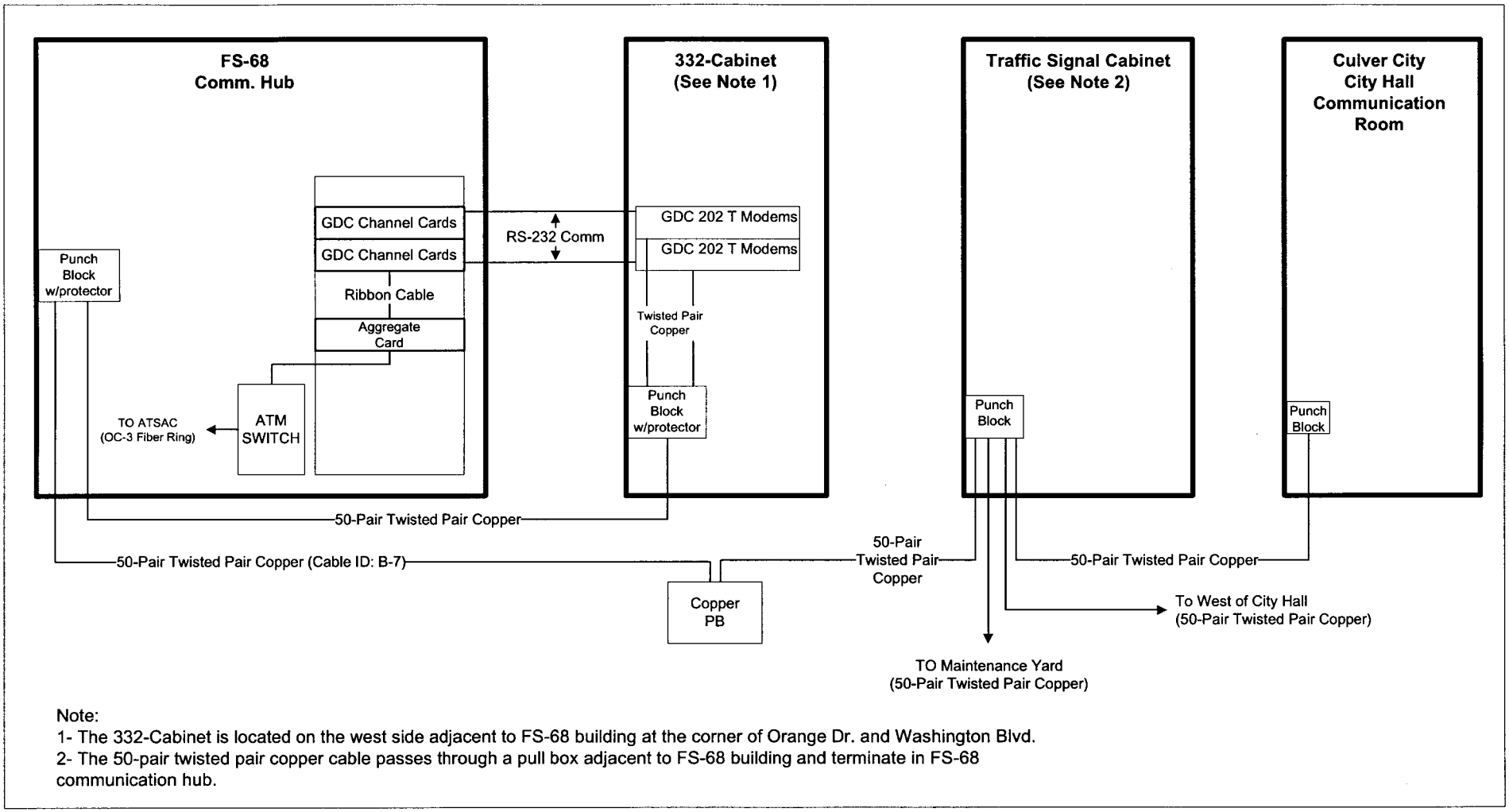
The existing 50-pair twisted copper communication network between Culver City Hall communication room and FS-68 is comprised of the following sections that are illustrated below in Figure 2.

- An existing 50-pair twisted copper cable from the Culver City Hall communication room to traffic signal controller cabinet located at the corner of Duquesne and Culver Blvd.
- The traffic signal controller cabinet currently has one (1) 50-pair twisted copper cable routed to FS-68 communication hub while supporting traffic signal controllers along the way and supporting the communication link between them. Two (2) other 50-pair twisted copper cables are present in this cabinet that is used to support communications between Culver City Hall and the field.
- (1) 50-pair twisted copper cable provides the link between FS-68 and 332-cabinet located on the west side adjacent to the building (Orange Dr. and Washington Blvd),
- Individual RS-232 connections support the link between the channel cards (located in FS-68) and 202-T modems (located in the 332-cabinet).
- The communication inside FS-68 from individual channel cards to Aggregate Cards to the ATM switch onto the ATSAC OC-3 fiber ring.

Culver City currently has fifty-four (54) signalized intersections operating on LADOT's ATSAC system with another twenty-eight (28) signalized intersections ATSAC ready. In addition the upgrade of thirteen (13) signalized intersections within the Fox Hills area, in 2007, will add thirteen (13) more locations to the City traffic signal system. There are four (4) intersections that are to be signalized in the near future. The total intersections that will be signalized at that time will be ninety-nine (99). The list of the intersections will be provided by the City in the future.

As Culver City expands the number of signalized intersections, they will soon surpass the capacity of the 50-pair twisted copper cable linking Culver City Traffic Signal cabinet (located at Duquesne Ave and Culver Blvd) to FS-68 communication hub. Once the existing 50-pair twisted copper cable reaches capacity it will be a bandwidth constraint, preventing further expansion to the existing network. Therefore, additional copper cable (i.e. 25-pair, 50-pair, 100-pair) or replacing the existing 50-pair TWP copper cable with 150-pair TWP copper cable will be required from Culver City communication room to the traffic signal cabinet outside the Culver City Hall.

Figure 2 – Existing Culver City 50-pair Twisted Copper Cable Communication System Block Diagram



Note:
1- The 332-Cabinet is located on the west side adjacent to FS-68 building at the corner of Orange Dr. and Washington Blvd.
2- The 50-pair twisted pair copper cable passes through a pull box adjacent to FS-68 building and terminate in FS-68 communication hub.

3. PROPOSED ARCHITECTURE

As mentioned previously, the focus of this project is to migrate the traffic signal data communications from the 50-pair twisted copper cable onto the 24-SMFO cable linking FS-68 communication hub and Culver City Hall communication room. The existing communications and channel assignment between individual signalized intersections and Culver City Hall as well as communications between LADOT Operation Center and FS-68 will remain unchanged.

Signalized intersections in Culver City will communicate with the LADOT ATSAC server as follows:

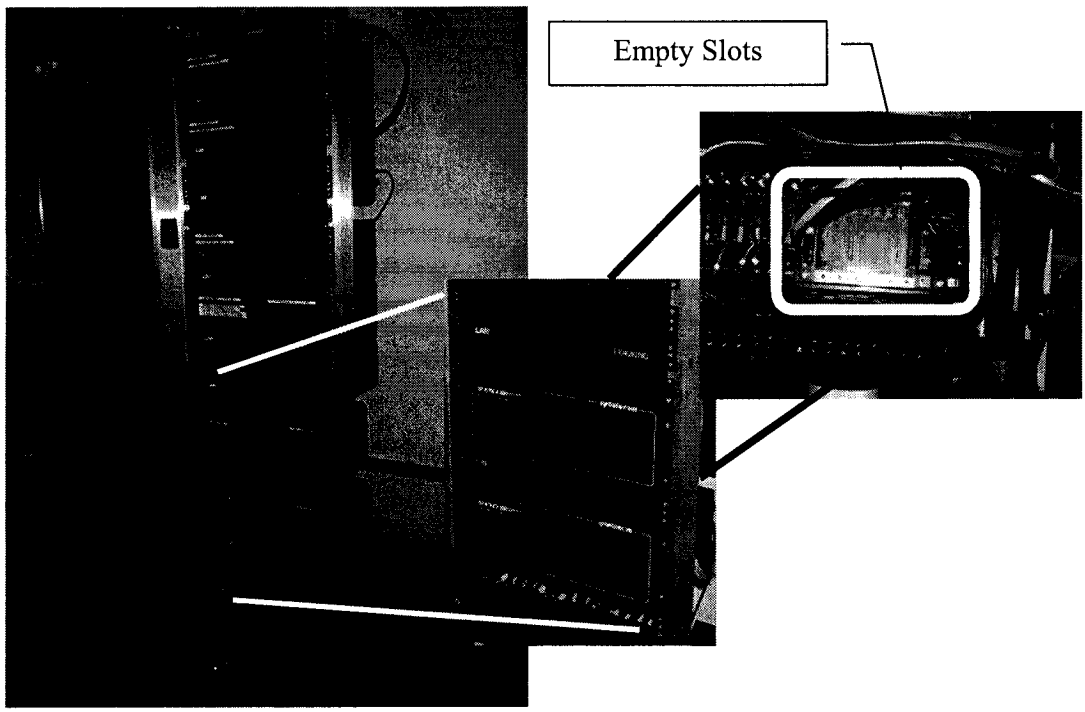
- Existing copper cable and modems from the intersection to the Culver City Hall communications room.
- At the Culver City Hall communications room, relocate the existing 202-T modems from the 332-cabinet outside FS-68[1]. Using fan-out cables (to be provided by the contractor), each RS-232 channel output from the 202-T modem will be connected to an RS-232 input on an eight (8) Channel RS-232 Fiber Modem (Optelecom 9551Y-SM-13T-ST) and transported to the FS-68 communications hub over a single fiber strand. A total of four (4) strands of 24-SMFO cables are required for this link. (Note: During relocation of the 202-T modems, the traffic signal controllers will be operating on time-of-day (TOD) plan. ATSAC will not be able to monitor or control the traffic signals during the relocation and integration of the system.)
- At the FS-68 communications hub, the traffic signal data will be output from the Optelecom Fiber Modem (Optelecom 9551Y-SM-15T-ST) (located either in the 332-cabinet or the Communication Hub) and will be connected to the existing Channel Cards, via RS-232 connectors for transport to ATSAC via the existing Aggregate Card and ATM switch.

Since Culver City has Optelecom fiber transmission equipment in place to support other aspects of their ITS network, it is recommended using the same manufacturer on this project for the following two reasons:

- The existing 9002 Rack Mounted Chassis can be used (See Figure 3 below) to house data and video transceiver cards, which will save equipment rack space.
- Culver City staff is presumably familiar with Optelecom equipment.

[1] The 202-T modems shall be installed in the Culver City Communication Room to the left of an existing rack that houses the "Minute Man" battery packs (across the existing punch down blocks).

Figure 3 – Existing Culver City Optelecom Chassis

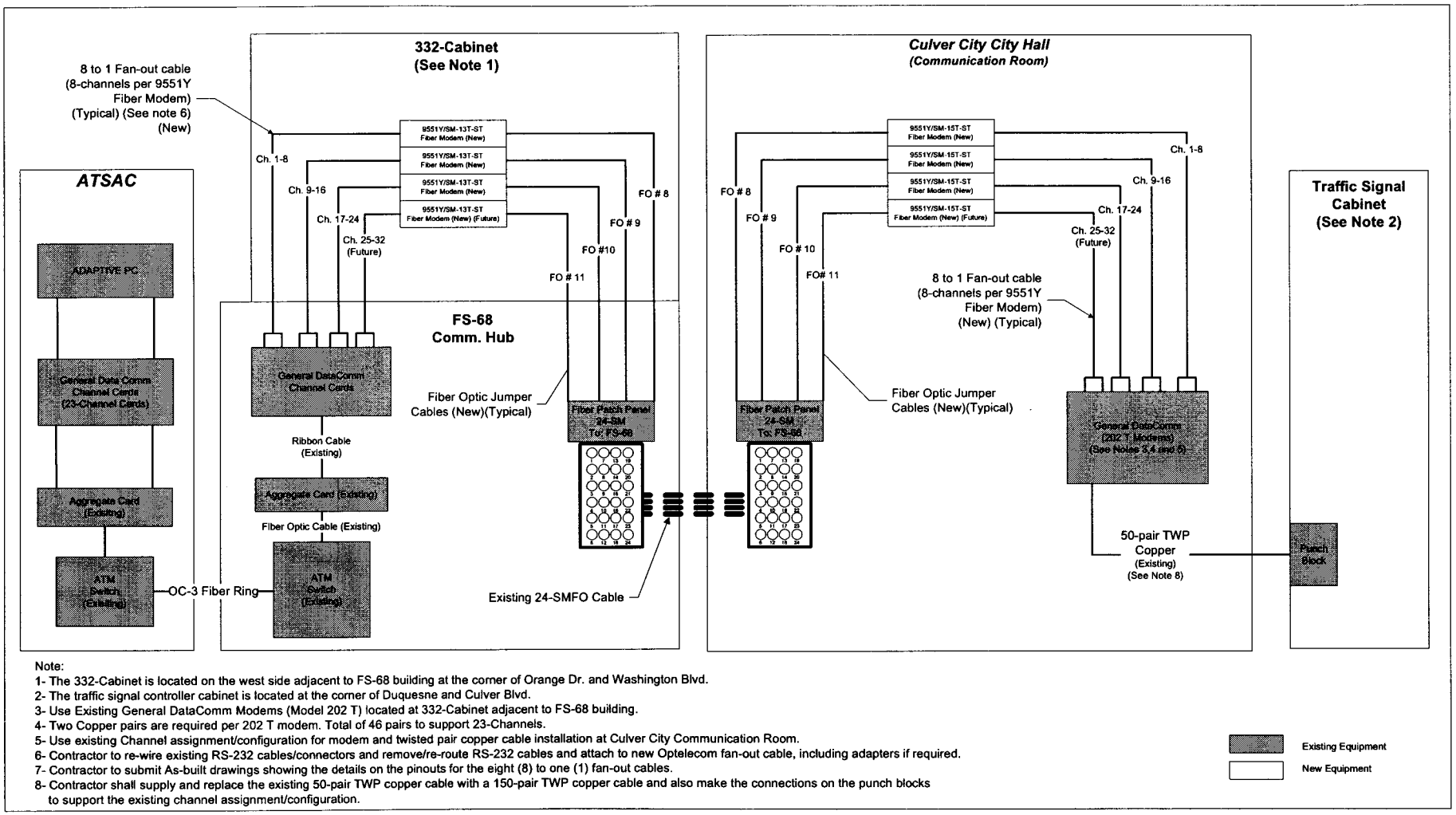


It is recommended deploying Single Fiber eight (8)-Channel RS-232 modems (Optelecom Model 9551Y/SM-13T-ST, refer to Appendix A for equipment specification and detail) to support traffic signal data communications from Culver City Hall communication room to FS-68. Each pair of modems can support the transmission of eight (8) communications channels over a single fiber optic strand. Culver City currently has twenty-three (23) communications channels.

Deploying three (3) pairs of fiber modems (three at each location) at this time will support the twenty-three (23) existing communications channels. An additional fiber optic strand and a pair of modems will support the future expansion. In order for the City to be able to support total of 128-signalized intersections (future), the existing 50-pair TWP copper cable form Culver City communication room to the traffic signal cabinet outside the Culver City Hall (Duquesne and Culver Blvd) shall be replaced with a 150-pair TWP copper cable to support each 50-pair TWP copper cable from Maintenance yard, the West end and FS-68.

Figure 4 illustrates the proposed traffic signal communications architecture at a high level.

Figure 4 – Proposed Traffic Signal Communications System Block Diagram



Note:
1- The 332-Cabinet is located on the west side adjacent to FS-68 building at the corner of Orange Dr. and Washington Blvd.
2- The traffic signal controller cabinet is located at the corner of Duquesne and Culver Blvd.
3- Use Existing General DataComm Modems (Model 202 T) located at 332-Cabinet adjacent to FS-68 building.
4- Two Copper pairs are required per 202 T modem. Total of 46 pairs to support 23-Channels.
5- Use existing Channel assignment/configuration for modem and twisted pair copper cable installation at Culver City Communication Room.
6- Contractor to re-wire existing RS-232 cables/connectors and remove/re-route RS-232 cables and attach to new Optelecom fan-out cable, including adapters if required.
7- Contractor to submit As-built drawings showing the details on the pinouts for the eight (8) to one (1) fan-out cables.
8- Contractor shall supply and replace the existing 50-pair TWP copper cable with a 150-pair TWP copper cable and also make the connections on the punch blocks to support the existing channel assignment/configuration.

4. TECHNICAL SPECIFICATIONS

The manufacture and model number of the equipment for this project has been identified in Section 5 (Equipment list & Cost estimate) and supplemented by the cut sheets in Appendix A. All equipment must meet or exceed the specifications provided in the cut sheets or equivalent. Below are additional detail specifications for the fiber optic transceiver cards.

4.1 Fiber Optic Transceiver Cards

4.1.1 General Requirements

- All fiber optic transceiver cards must be from the same manufacturer.

4.1.2 Detailed Functional Requirements

- A pair of 9551Y units shall transport eight (8) channels of RS-232 data in both directions over one optical fiber.

4.1.3 Detailed Card Specifications

- The fiber optic transceiver cards shall be rack mount.
- The fiber optic transceiver cards shall be hot-swappable.
- The fiber optic transceiver cards shall occupy only one (1) slot in the existing 9002 series chassis.
- The fiber optic transceiver cards shall use time division and wavelength division multiplexing techniques.
- The fiber optic transceiver cards shall support an optional PC-based management system for monitoring and logging operating status and conditions.
- The fiber optic transceiver cards shall be capable of synchronous or asynchronous operation.
- The fiber optic transceiver cards shall be meet relevant IPC standards
- The fiber optic transceiver cards shall have an RS-232 interface
- The fiber optic transceiver cards shall have DB25S connector
- The fiber optic transceiver cards shall have eight (8) synchronous and asynchronous channels
- The fiber optic transceiver cards shall meet the optical specifications as shown below:

Fiber Size	Unit A*	Unit B*	Optical Budget (dB) A to B/B to A	Wavelength (nm) A to B/B to A	Range (km)**
09/125	9551Y/SM-13T-ST	9551Y/SM-15T-ST	24/24	1310/1550	60

* ST connectors standard, FC and other connectors available.

** Range based on losses of 0.35 dB/km @ 1310nm or 0.25dB @ 1550nm and includes a 3dB safety margin.

5. EQUIPMENT LIST & COST ESTIMATE

Figure 5 presents a list of equipment, model number, quantity and unit cost needed if the City elects to install the fiber modems in the 332-cabinet outside of FS-68 (Option 1).

Figure 5 – Equipment List for: Option 1

Fiber Modems Installed in the 332-Cabinet Outside FS-68

Description	Model Number	Qty	Unit Cost	Extended Cost
Furnish & Install Transceiver, 8 CH RS232 1 Slot Card, Single at Culver City Hall Communications Room	Optelecom 9551Y/SM-13T-ST	4	$2,268.00	$9,072.00
Furnish & Install Transceiver, 8 CH RS232 1 Slot Card, Single in Washington/Orange Type 332 Cabinet	Optelecom 9551Y/SM-15T-ST	4	$2,268.00	$9,072.00
Furnish & Install Fiber Optic Pigtails (Single Mode) 10' at Culver City Hall Communications Room	Corning 616101R3131010F	4	$25.75	$103.00
Fiber Optic Pigtails (Single Mode) 50' between FS 68 and Washington/Orange Type 332 Cabinet	Corning 616101R3131050F	4	$28.55	$114.20
Relocate 202T FSK Modems from Washington/Orange Type 332 Cabinet and install in Culver City Hall Communications Room	N/A	1	$5,000.00	$5,000.00
Furnish & Install Fan-out cable connecting 202T FSK modems and Fiber Transceiver in Culver City Hall Communications Room	N/A	8	$100.00	$800.00
Furnish & Install one (1) 150-pair TWP Copper Cable from Culver City Communication Room to First Traffic Signal Cabinet @ Duquesne and Culver Blvd	N/A	300-ft	$6.20/ft	$1860.00
			Total	**$26,021.20**

Figure 6 presents a list of equipment, model number, quantity and unit cost needed if the City elects to install the fiber modems inside the FS-68 communications hub (Option 2).

Figure 6 – Equipment List for: Option 2

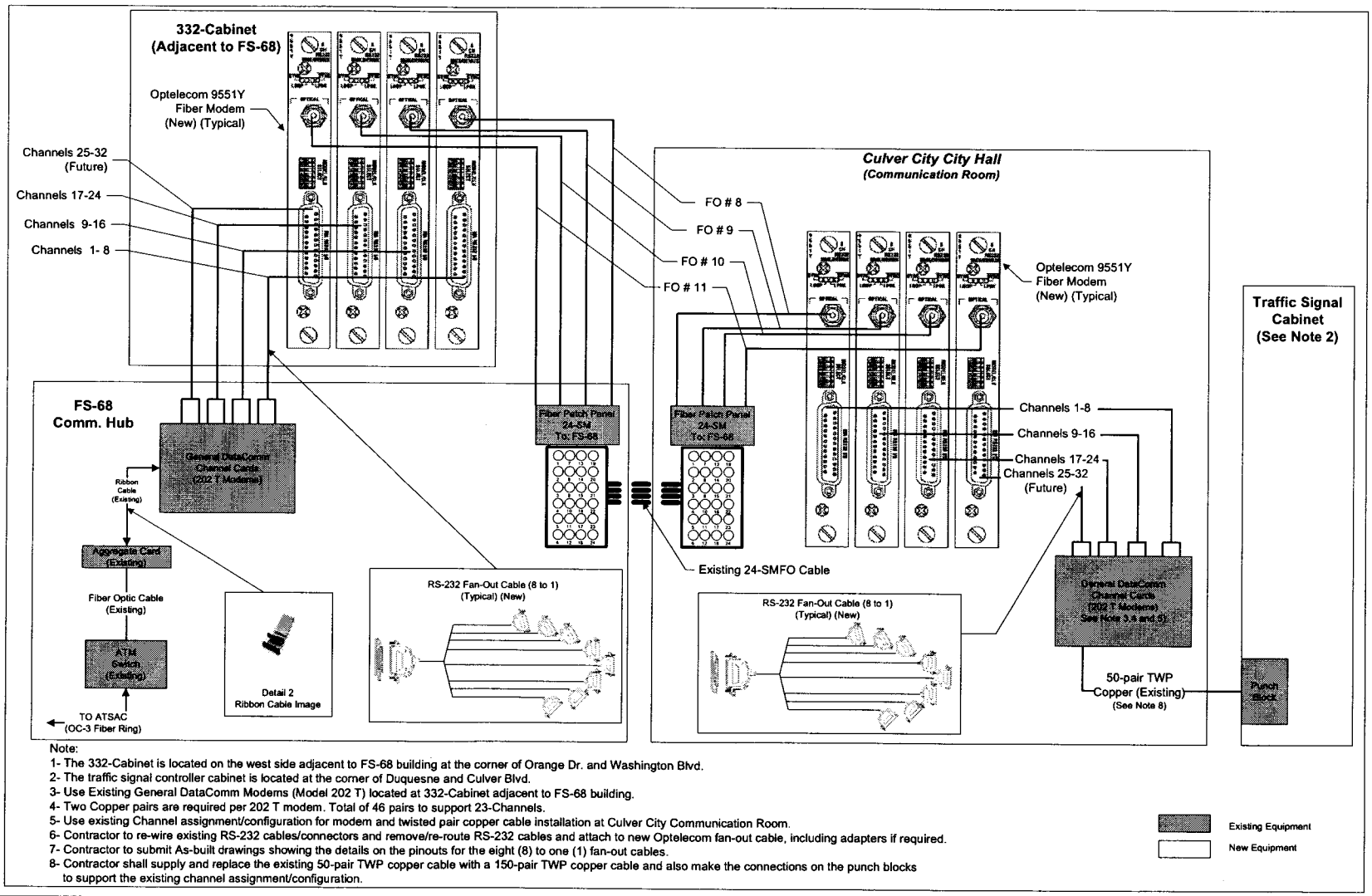
Fiber Modems Installed Inside FS-68

Description	Model Number	Qty	Unit Cost	Extended Cost
Furnish & Install Transceiver, 8 CH RS232 1 Slot Card, Single at Culver City Hall Communications Room	Optelecom 9551Y/SM-13T-ST	4	$2,268.00	$9,072.00
Furnish & Install Transceiver, 8 CH RS232 1 Slot Card, Single in Washington/Orange Type 332 Cabinet	Optelecom 9551Y/SM-15T-ST	4	$2,268.00	$9,072.00
Furnish & Install Fiber Equipment Chassis in FS 68 Communications Hub	Optelecom 9002	1	$716.00	$716.00
Furnish & Install Fiber Optic Pigtails (Single Mode) 10' at Culver City Hall Communications Room	Corning 616101R3131010F	4	$25.75	$103.00
Fiber Optic Pigtails (Single Mode) 10' in FS 68 Communications Hub	Corning 616101R3131010F	4	$25.75	$103.00
Relocate 202T FSK Modems from Washington/Orange Type 332 Cabinet and install in Culver City Hall Communications Room	N/A	1	$5,000.00	$5,000.00
Furnish & Install Fan-out cable connecting 202T FSK modems and Fiber Transceiver in Culver City Hall Communications Room	N/A	8	$100.00	$800.00
Furnish & Install one (1) 150-pair TWP Copper Cable from Culver City Communication Room to First Traffic Signal Cabinet @ Duquesne and Culver Blvd	N/A	300-ft	$6.20/ft	$1860.00
			Total	**$26,726.00**

6. FIBER INTERCONNECT DIAGRAM

Figure 7 illustrates the Fiber Optic interconnect diagram between Culver City Hall communication room and FS-68 communication hub.

Figure 7 – Proposed Fiber Optic Interconnect Diagram



Note:
1- The 332-Cabinet is located on the west side adjacent to FS-68 building at the corner of Orange Dr. and Washington Blvd.
2- The traffic signal controller cabinet is located at the corner of Duquesne and Culver Blvd.
3- Use Existing General DataComm Modems (Model 202 T) located at 332-Cabinet adjacent to FS-68 building.
4- Two Copper pairs are required per 202 T modem. Total of 46 pairs to support 23-Channels.
5- Use existing Channel assignment/configuration for modem and twisted pair copper cable installation at Culver City Communication Room.
6- Contractor to re-wire existing RS-232 cables/connectors and remove/re-route RS-232 cables and attach to new Optelecom fan-out cable, including adapters if required.
7- Contractor to submit As-built drawings showing the details on the pinouts for the eight (8) to one (1) fan-out cables.
8- Contractor shall supply and replace the existing 50-pair TWP copper cable with a 150-pair TWP copper cable and also make the connections on the punch blocks to support the existing channel assignment/configuration.

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June 6, 2007

Elaine Jeng
City of Culver City Public Works
9770 Culver Boulevard
Culver City, CA 90232

ja6252x

Subject: **Proposal for Additional Work: Signal Interconnect Plans, Interconnect Certification Specifications, and Assistance during Bidding & Construction**

Dear Ms. Jeng:

Katz, Okitsu & Associates proposes to perform additional work for the Fox Hills Signal Synchronization Upgrade Project. This letter contains our scope of work, price, and schedule to prepare a city-wide traffic signal interconnect plan, specifications for certification of city-wide traffic signal interconnect, and assistance during bidding and construction.

Background

Our original work scope provided for design of traffic signal upgrades, interconnect design, and signal timing within the Fox Hills Area. In addition to the original work scope, Addendum Task 1 designed the migration of traffic signals from 50-pair twisted pair cable to fiber optic cable, and Addendum Task 2 provided for design of mutual video sharing between the Cities of Los Angeles and Culver City.

Scope of Work

The following describes the work scope for three additional tasks:

Addendum Task 3. Prepare a map and cable pair assignment chart showing the existing interconnection of all traffic signals within the city of Culver City. Currently, most signals should be connected by copper cable to the City Hall punch block after completion of the Fox Hills job. This task will result in preparation of a total of three sheets, including a title sheet, numbered 1 to 3. These sheets will have a separate numbering from our Fox Hills sheets. The sheets will not be intended to depict the installation of interconnect, but will instead to serve as the final result of the various traffic signal and interconnect projects performed throughout the City following the completion of the Fox Hills Signal Synchronization Upgrade Project.

Addendum Task 4: Prepare specification intended for an electrical contractor to conduct a *certification* of the interconnect. The documents will specify the testing of the cable pairs to determine their suitability for interconnection, and providing a methodology for recording problems. The City of Culver City intends to issue these

specifications in the same bid package as the Fox Hills signal upgrade and interconnect plans.

Addendum Task 5: Provide engineering assistance during the bidding and construction phases. The staffs of Katz, Okitsu & Associates and Transcore will be available on an as-needed basis during the bidding and construction phases of the project.

Price

Katz, Okitsu & Associates will conduct the tasks as follows:

Task	**Lump Sum Price**
Addendum Task 3: City-wide Interconnect Plan and Cable Pair Assignments	$7,500.00
Addendum Task 4: Bid Documents for Interconnect Certification and Repair	$5,000.00
Addendum Task 5: Assistance during Bidding and Construction	Time & Materials Basis
TOTAL (excluding task conducted on a Time & Materials basis)	$12,500.00

Our unit billing rates for this work will be per the following schedule:

Classification	FY2007-08 Rates	FY2008-09 Rates	FY2009-10 Rates
Katz, Okitsu & Associates			
Principal Engineer	$210	$221	$232
Senior Engineer	$190	$200	$209
Associate Engineer	$106	$112	$117
Associate Designer	$102	$107	$113
Assistant Engineer	$86	$90	$95
Assistant Designer	$72	$75	$79
Admin Assist.	$63	$66	$69
Transcore			
System Engineer IV	$171	$180	$189
System Engineer II	$115	$121	$127
Admin Assist.	$68	$71	$75
Direct Costs			
Mileage	per Federal IRS rates		
All other expenses	At cost		

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Schedule

We propose to complete the tasks listed above as follows:

City-wide Interconnect Plan and Cable Pair Assignments:

1st draft submittal, 10 calendar days after initiation.
2nd submittal, 24 calendar days after initiation, or 7 days after receipt of City review, whichever is later.
Final Submittal, 36 calendar days after initiation, or 7 days after receipt of City review, whichever is later.

Bid Documents for Interconnect Certification

1st draft submittal, 21 calendar days after initiation.
2nd submittal, 35 calendar days after initiation, or 7 days after receipt of City review, whichever is later.
Final Submittal, 47 calendar days after initiation, or 7 days after receipt of City review, whichever is later.

Assistance during Bidding and Construction

Work will be conducted on an as-needed basis.

Staffing

The project manager will be Doug Yeh, P.E., a senior engineer.

Sincerely,

KATZ, OKITSU & ASSOCIATES

Walter Okitsu

Walter Okitsu, Principal Engineer
(Calif. License Civil 52655, Traffic 1406)