

Executive Summary

The City of Chula Vista is preparing for the next generation of technology which will support the City’s smart growth and development. At the core of the City’s “Smart City” initiatives are investments in Intelligent Transportation Systems (ITS) infrastructure. Through leveraging state-of-the-art communications systems and Internet of Things (IoT) devices the city will have the ability to gather and analyze data to gain insights into infrastructure and travel that will lead to better transportation system management and overall improvement in public services.

The Traffic Signal Communications Master Plan purpose (hereby referred to as Master Plan) is to guide the City’s investment and implementation in traffic signal communications systems and ITS technology. Chula Vista is San Diego County’s second largest and fastest growing city. The Master Plan is critical to ensure the City’s current and future transportation system needs and objectives are realized through this growth. Most importantly, the implementation of the Master Plan will promote the City’s vision of sustainability, economic vitality and high quality of life – through the significant benefits of traffic systems technology and improved traffic management and operations.

E1 Need

The communications system is the most critical part of a traffic management system and delivers information from City streets and intersections back to the Traffic Management Center (TMC) where the management and operation activities take place. The City of Chula Vista monitors and manages 267 traffic signals, providing safe movement at signalized intersections for vehicles, pedestrians, bicyclists, emergency vehicles, transit, and rail¹. The City of Chula Vista is the fastest growing City in San Diego County and is expected to add in the order of 100 new traffic signals in the next five to ten years².

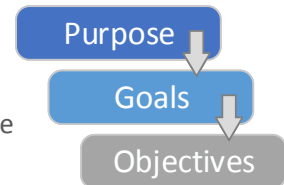
Like many municipalities in San Diego County, the Chula Vista traffic signal communication system operates legacy equipment and obsolete communication protocol. POTS (Plain Old Telephone Service) leased lines provide the primary communication links between groups of traffic signals and the traffic equipment room in City Hall. There are several limiting factors associated with this antiquated communication architecture: modern devices with desirable capabilities do not support the legacy protocols, the existing communication bandwidth is a fraction of modern systems, operating and maintaining the existing communications and legacy devices is increasingly difficult and expensive, and the City relies on a third-party service provider which is costly³. To sum it up, the existing traffic communications system is functionally obsolete and costly. As the City continues to experience rapid growth and development it is critical to plan for new technology that will promote efficient management and operations in the modern traffic environment.



E2 Purpose, Goals and Objectives

The purpose of the Master Plan is to create a detailed inventory of the City’s communications systems and to guide the City’s future traffic signal communications and ITS technology improvements. An intelligent traffic signal communications system is beneficial in many ways and promotes goals including: increased roadway safety, shortened commute times, travel reliability, reduced greenhouse gasses, economic and sustainable growth, and increased mobility at signalized intersections for all modes of travel including motorists, bicyclists, pedestrians, transit, and emergency vehicles.

The traffic signal communications system is essential for Chula Vista to provide a proactive approach to traffic management and all around better service to the traveling public. The Master Plan provides a framework to strategically achieve the following primary objectives:



- Develop system topology and network architecture for a future-proof city-owned communication platform concept.
- Leverage existing communications infrastructure investments to support new systems and technologies.
- Establish solutions for existing system deficiencies.
- Eliminate 3rd party service for traffic signal communications.
- Identify current and future traffic system needs and leverage new technology to meet the needs.
- Incorporate recommendations into other City planning and development projects.
- Support other City departments communication system needs.
- Identify connections to City initiatives including Smart City and Climate Action that will benefit from the Master Plan.
- Identify potential partnerships with regional public agencies and private entities to advance master plan implementation.
- Establish consistent ITS infrastructure improvements through the various capital improvement channels.
- Develop an implementation prioritization and phasing strategy.
- Estimate order of magnitude costs, assess resources, and system benefits.

E3 Key Recommendations

Key communications systems and ITS element recommendations identified in the Master Plan are summarized below and in the following section.

- The City of Chula Vista future traffic signal communication system network will be based on Ethernet protocol.
- The future network will combine multiple communications medium such as single mode fiber, existing copper plant, point-to-multipoint wireless, and cellular.

- The future “CORE” network will use Layer 3 nodes connecting to each other via single mode fiber links.

E4 Implementation Phasing

The highest priorities include establishing a City-owned traffic signal communication system and implementing Ethernet-compatible systems/network. Existing investments in communication infrastructure, underground systems, signal interconnect cable, and traffic signal cabinets will continue to be utilized. Obsolete legacy network equipment will be upgraded or decommissioned and replaced with new modern communication technologies. The timeframe for each phase of implementation is based on available funding and could be accelerated as additional funds are made available.

Phase 1: City-Owned Infrastructure (Year 1-3)

Phase 1 of the implementation plan includes providing a wholly City-owned traffic signal communication network, converting from Serial to an all Ethernet-based network, upgrading traffic signal controllers to Ethernet protocol, and establishing video monitoring at the City’s highest priority locations. The following summarizes the Phase 1 traffic signal communications network upgrades:

- Upgrade existing fiber optic system to Ethernet communications.
- Convert leased copper lines to City-owned wireless Ethernet radio communications.
- Upgrade City-owned copper lines to Ethernet-over-copper communications.
- Install City-owned wireless Ethernet radio communications at all offline traffic signals.
- Convert leased cellular network for existing Traffic Measurement Devices to City-owned wireless Ethernet radio communications.
- Install video monitoring devices at high priority locations.
- Install fixed Dynamic Message Signs at the Chula Vista Amphitheater.
- Obtain 2 portable Dynamic Message Signs for use during planned or unforeseen major traffic impacting events.
- Install a satellite Traffic Management Center at the City’s Traffic Operations Maintenance Facility.
- Upgrade all traffic signal equipment to Ethernet-enabled devices Citywide.
- Implement Layer 3 communication hubs at strategic locations.

Phase 2: Infrastructure and Priority Corridors Upgrade (Year 4-6)

Phase 2 of the Implementation Plan prioritizes fiber optic communications. Strategic signalized intersections along priority corridors throughout the City will be upgraded to include type 2070 ATC traffic signal controllers and closed circuit televisions (CCTV) cameras for remote video monitoring. The following summarizes the Phase 2 traffic signal communications network upgrades:

- Upgrade existing empty communications conduit and install fiber optic cable.

- Install conduit and fiber optic cable to resolve communications gaps in the network and create redundant ring topology.
- Upgrade traffic signal equipment on primary fiber optic ring route with fiber devices.
- Upgrade traffic signal equipment on priority corridors with new 2070 controllers and CCTV cameras.

Phase 3: Citywide Buildout (Year 7-10)

Buildout of the traffic signal communications network will be completed in Phase 3. Remaining signalized intersections will be upgraded with type 2070 ATC traffic signal controllers and closed-circuit television (CCTV) cameras for remote video monitoring.

E5 Order of Magnitude Cost Estimate

A summary of the costs for the deployment of the Master Plan, broken down by the implementation phase, is shown on **Table ES-1**.

Table ES-0-1 Citywide Master Plan Deployment Cost Estimate

PHASE	DESCRIPTION	TOTAL
1	City-Owned Infrastructure	\$4,794,750
2	Infrastructure and Priority Corridor Upgrades	\$7,092,075
3	Citywide Buildout	\$3,949,500
GRAND TOTAL		\$15,836,325

Note: Each phase will be implemented in stages as funding becomes available.

The order of magnitude cost estimate for the Master Plan implementation is \$15,836,325.

E6 Cost and Benefit Analysis

The annual benefit-cost ratio for implementing Phase 1 is 65:1. This indicates that improvements would yield benefits of \$65 for every dollar spent. With cost savings exceeding the State and National benefit-cost ratio range of 20 to 60:1 return on investment (ROI) for Phase 1 alone, the monetary investments identified in the Master Plan are poised to be recaptured many times over for both economic and social benefit.