SECTION 770 — TRAFFIC SIGNAL MATERIALS

Make the following amendments to said Section:

(I)   **Replace Section 770 — Traffic Signal Materials in its entirety:**

770.01 Traffic Management Center (TMC)

(A) The TMC shall;

(1)   Have all servers and necessary hardware to operate existing Centracs software, be server based with cloud backup, and maintained by the supplier. Troubleshooting, repair, and maintenance of the TMC shall be the responsibility of the supplier for the duration of the contract.

(2)   Have a platform that allows remote access.

(3)   Communicate to the latest version of the current controller software for the life of the system. The existing system consists of 32 Cobalt controllers. The Contractor shall incorporate any additional controllers in the existing system if needed.

(4)   Have a Warranty period of five (5) years that begins upon final acceptance by the State. Warranty to include the following:

a. Servicing of system/replacement of any parts necessary until the end of the warranty period. Hardware replacement shall be completed within 7 calendar days of notification. If a Contractor is needed, this cost shall be considered incidental to this work.

b. Offer an additional three (3), twelve (12) month renewal periods.

c. Training shall be available in the application design, operation, and setup of the TMC Software. Full client technical support shall be available for the duration of the warranty period. Client support shall respond within 24 hours of notification.

(5)   The system shall support launching EDI conflict monitor.

(B)   TMC Hardware shall;

43		**(1)**	Include all necessary components to optimize the full
44			operation of the Centracs software. All wiring for the TMC
45			shall be concealed as best as possible.

47 **(2)** The Traffic Management Center (TMC) shall consist of:

48 a. One (1) core server

49 1. The core server located at the Kauai
50 Baseyard Traffic Signal Technician office shall be
51 relocated to the HWY-K server room.

52 b. One (1) database server

53 1. The database server shall be installed in the
54 HWY-K server room.

55 2. Hardware specifications of the database server
56 shall include, but not be limited to:

57 i. Trusted Platform Module: No Trusted
58 Platform Module

59 ii. Chassis Configuration: Chassis with up to 8
60 x 3.5" SAS/SATA Hard Drives for 2 CPU
61 Configuration

62 iii. Processor: Intel Xeon Gold 5118 2.3G,
63 12C/24T, 10.4GT/s, 16.5M Cache, Turbo, HT
64 (105W) DDR4-2400

65 iv. Additional Processor: Intel Xeon Gold 5118
66 2.3G, 12C/24T, 10.4GT/s, 16.5M Cache,
67 Turbo, HT (105W) DDR4-2400

68 v. Memory DIMM Type and Speed: 2666MT/s
69 RDIMMs

70 vi. Memory Configuration Type: Performance
71 Optimized

72 vii. Memory Capacity: (2) 32GB RDIMM,
73 2666MT/s, Dual Rank

74 viii. RAID configuration: C4, RAID 5 for 3 or
75 more HDDs or SSDs (Matching
76 Type/Speed/Capacity)

77 ix. RAID/Internal Storage Controllers: PERC
78 H730P RAID Controller, 2GB NV Cache,
79 Adapter, Low Profile

80 x. Hard Drives: (6) 480GB SSD SATA Read
81 Intensive 6Gbps 512 2.5in Hot-Plug AG Drive,
82 3.5in HYB CARR, 1 DWPD, 876 TBW

| 83 | xi. Operating System: Microsoft Windows |
| 84 | Server 2016 Standard, 5 CAL |

| 85 | xii. SQL server: Microsoft SQL Server 2016 |
| 86 | Standard, Retail, 10 CAL |

| 87 | xiii. Embedded Systems Management: |
| 88 | iDRAC9, Enterprise |

| 89 | xiv. PCIe riser: Riser Config 3, 2 x8, 3 x16 |
| 90 | slots |

| 91 | xv. Network Daughter Card: Broadcom 5720 |
| 92 | QP 1Gb Network Daughter Card |

| 93 | xvi, IDSDM and VFlash Card Reader: IDSDM |
| 94 | and Combo Card Reader with 16GB Flash SD |

| 95 | xvii. Internal SD Module: 16Gb |
| 96 | microSDHC/SDXC Card |

| 97 | xviii. Internal Optical Drive: DVD+/-RW,SATA, |
| 98 | Int |

| 99 | xix. Fans: 6 Standard Fans for R740/740XD |

| 100 | xx. Power Supply: Dual, Hot-Plug, Redundant |
| 101 | Power Supply (1+1), 750W |

102	xxi. Power Cords: (2) NEMA 5-15P to C13
103	Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m),
104	Power Cord, North America

105	xxii. BIOS and Advanced System
106	Configuration Settings: Performance BIOS
107	Setting

| 108 | xxiii. Advanced System Configurations: UEFI |
| 109 | BIOS Boot Mode with GPT Partition |

| 110 | xxiv. Rack rails: Sliding Rails with Cable |
| 111 | Management Arm |

112	xxv. Hardware Support Services Beginning
113	Upon Final Acceptance: Five (5) Years Basic
114	Hardware Warranty Repair, With Option of an
115	Additional Three (3) Years: 5x10 HW-Only,
116	5x10 NBD Onsite, PIT

117   c. Two (2) workstations

118   1. Workstations shall include all necessary
119   hardware such as, but not limited to, keyboard,
120   mouse, cables, etc.

121   d. One (1) mobile workstation

e. Four (4) wall-mounted monitors

      1. Three (3) monitors shall be installed in the main Traffic Management Center (TMC) room.

            i. Monitors shall include all necessary mounting hardware and be sized to optimize the length of the display wall shown in Figure 2 upon approval by the Engineer.

      2. One (1) monitor shall be installed in the District Engineer office room.

            i. Monitor shall include all necessary mounting hardware and be sized at a minimum of 75" upon approval by the Engineer.

770.02 Signal Performance Measures (SPM)

(A)   **The Signal Performance Measure (SPM) shall;**

    (1)   Be a cloud-based traffic, web-hosted data collection and analytics software.

    (2)   Provide the means to compare various performance metrics over user definable date ranges providing tabular comparison results with indications of improvement or degradation of the performance scores.

    (3)   Collect and analyze "High-Resolution" data which shall be gathered from traffic controllers

    (4)   Be compatible with existing Cobalt controllers and Centracs software.

    (5)   Provide all services and software necessary for retrieving high-resolution controller data. The "On-Premise" data collection service shall push the data to the cloud host for storage and processing.

    (6)   Collect controller level high-resolution data via FTP or other protocols from the controllers, or through SQL data queries to a Centracs database licensed to store high-resolution data.

    (7)   Have communication of high-resolution data to the cloud host be performed via a "push" the cloud host from the On-

premise data service. The On-premise data service shall not require an inbound port for these communications.

(9)   User Management

    a.   The system shall support authentication of individual users via user names and passwords.

    b.   The system shall not limit the number of user accounts that can be created to allow and grant access.

    c.   The system shall employ https to ensure user login names and passwords are encrypted prior to transmitting them over the internet.

(10)   General Display Features

    a.   The user web interface shall consist of a front-page dashboard providing an overview of general traffic system health.

    b.   The system shall be capable of showing locations for degraded signal performance as a 'Heat Map'.

    c.   Dashboard views shall include an indication of overall system health or performance.

    d.   The dashboard shall provide a list of signals with possible performance concerns.

(11)   Map Display

    a.   The system shall incorporate a map view.

    b.   The map shall provide heat-map views that highlight problem areas.

    c.   The map shall allow a user to zoom and pan to identify specific intersections in more detail.

d.   The user shall be able to click on an intersection to drill down to access a variety of SPM charts relating to the intersection.

e.   The map shall include a control to be enable/disable the following layers: heat map, travel times, incidents, individual signal status icons and counting stations.

(12) Be able to compare specific SPM metrics between two date ranges.

(13) Detector Diagnostic Analysis

a.   The system shall be capable of providing a separate list of intersections with degraded detector performance.

b.   The system shall apply statistical data science in analyzing detector performance in order to identify detectors that may not be fully operational.

(14) Arrivals on Green

a.   The system shall track and report metrics relating to the volumes of traffic arriving at an intersection during the green interval.

b.   The system shall provide an Arrival on Green chart, which graphs the volume (vehicles per hour), volume of vehicles arriving at the intersection on green and the percent of vehicles arriving on green for each cycle during a 1-day/24-hour period.

c.   The system shall provide the Arrivals on Green chart for each phase of a signal that meets detection requirements.

(15) Pedestrian Events

a.   The system shall track and report metrics relating to pedestrian activity at each intersection.

b.   The system shall provide a Pedestrian Delays chart, which graphs cycles during the day that experiences a pedestrian actuation on a phase. The chart will indicate the time during the day when the event took place and the amount of delay introduced by the pedestrian

actuation.

c. The system shall provide the Pedestrian Delays chart for individual approaches of a signal or as a combined report for al approaches of a signal.

(16) Power Failures

a. The system shall track and report metrics relating to power failures.

b. The system shall highlight individual intersections and corridors that have experienced power failures over a user specified date

(17) Preemption Events

a. The system shall track and report metrics relating to preemption.

b. The system shall provide a table, which indicates each preemption event, the start time, and duration and cause of transition for a selected intersection.

c. The system shall provide preemption information on a corridor level and signal level indicating the total amount of time spent in preemption, average preemption duration, total number of preemption requests and total number of preemptions serviced.

(18) Incident Reports

a. The system shall display a list of incidents that have been detected. It shall categorize these incidents by type (congestion, construction, etc.) and include the number of incidents of each type.

b. The system shall represent incidents on the map via an icon. The icon shall identify the type of incident

c. If the cursor is positioned over an incident icon, details of that incident shall be displayed in a tool tip.

d. The system shall also display the location of individual incidents in reverse chronological order (newest first). Clicking on an incident shall display the location of the incident on the map as well as the details of the incident such as type, length, priority and delay caused by the

incident (if available).

e.   Incident data shall be obtained from Microsoft Azure Maps Services Traffic API.

(19) Embedded Travel Time

a.   The system shall include a package to utilize GPS for measuring travel time.

b.   The system map shall display travel time information where available. Roadway links shall be color-coded to indicate whether travel times are normal, slower or much slower.

c.   Travel time data shall be obtained from Microsoft Azure Maps Services Route API

(20) Purdue Coordination Diagram (PCD) Report

a.   The system shall provide a PCD, which graphs the volume (vehicles per hour), start of green, start of yellow, and start of red along with predicted vehicle arrivals based on detector actuations during each cycle throughout a day.

b.   The system shall provide the PCD chart for each coordinated phase of a signal that meets detection requirements.

(21) ROR$_5$/GOR

a.   The system shall provide an ROR$_5$/GOR chart, which can be used to identify split failures when the ROR and GOR are both above 85% during the phase of a cycle. This scatter diagram shall cover all cycles for a phase during 1-day/24-hour period.

b.   The system shall provide the ROR$_5$/GOR chart for each phase of a signal that meets detection requirements.

(22) Split Failures

a.   The system shall track and report metrics relating to split failures.

b.   The system shall provide a Split Failures Report for each phase, which plots by percentages the ROR and

GOR phase terminations for each cycle during a day.

    c.   The system shall provide the Split Failures Report for each phase of a signal that meets detection requirements.

(23)   **Split Monitor Report**

    a.   The system shall provide a Split Monitor chart, which, for each phase, plots by phase duration the phase termination reason for each cycle during the day. Reasons include Gap Out, Max Out, Force Off, Pedestrian call, and Unknown.

    b.   The system shall provide the Split Monitor chart for each phase of a signal that meets detection requirements.

(24)   **Transitions**

    a.   The system shall provide a table, which indicates each transition event, the start time, duration and cause of transition for a selected signal.

    b.   The system shall provide transition information on a corridor level and signal level indicating the total amount of time spent in transition, average transition durations for Add, Subtract, Dwell, and combined transition types.

    c.   The system shall provide a signal level view of transitions allowing a user to investigate individual transition events.

    d.   For transitions due to pattern change, the report will also indicate the new pattern causing the transition.

    e.   For transitions due to Pedestrian events, the report will also indicate the phase for which the pedestrian transition was generated.

(25)   **Vehicle Delays**

    a.   The system shall provide a vehicle delay chart, which, for each phase graphs the combined amount of time, in seconds for all detected vehicles over all cycles throughout the day.

    b.   This report shall include the average delay per vehicle and the total amount of day for the entire day.

c. The system shall provide the Vehicle Delay report for each phase of a signal that meets detection requirements.

(26) Volume/Capacity Ratio Report

a. The system shall provide a Volume/Capacity Ratio chart, which graphs the volume (vehicles per hour) against the theoretical capacity of the approach. Values are plotted for each cycle during a 1-day/24-hour period.

b. The system shall provide the Volume/Capacity Ratio chart for each phase of a signal that meets detection requirements.

(27) Volumes

a. The system shall report metrics relating to vehicle delays at the system, corridor and intersection levels.

(28) Service and Support

a. Service

1. SPM software shall be subscription-based with a service period of five (5) years.

b. Support

1. Training shall be available in application design, operation, and setup of the SPM software.

770.03 Cellular Communications

(A) Cellular Router shall;

(1) Include all hardware, antennae, and other components necessary to ensure communication between the controller and the TMC.

(2) Include a priority network service subscription from a cellular provider for a period of twenty-four (24) months. Cellular provider shall manage and service the router for the duration of the subscription period.

770.04 Conflict Monitoring Unit (CMU)

(A) Conflict Monitoring Unit shall be;

(1)   An Eberle Design Inc. (EDI) model 2010ECLip Signal Monitor equal or better.

(2)   Meets all requirements of the CalTrans "TSCE Specifications 1/89".

770.05 Video Detection System

This specification sets forth the minimum requirements for a video detection system that detects vehicles, bicycles, and motorcycles on a roadway by processing video images and that provides vehicle presence, traffic flow data, event alarms, and full-motion video for real-time traffic control and management systems.

(A) System Hardware

The video detection system shall be comprised of two major hardware components: a video sensor and a communications interface panel. An optional wired input/output card shall be available for certain cabinet types.

(1)   Video Sensor

The video detection system shall include a video sensor that integrates a high-definition (HD) camera with an embedded processor for analyzing the video and performing detection.

a. Camera and Processor

1. The camera shall be a color CMOS imaging array.

2. The camera shall have HD resolution of at least 720p (1280x720 pixels).

3. The camera shall include a minimum 10X optical zoom.

4. It shall be possible to zoom the lens as required to satisfy across-the-intersection detection objectives, including stop line and advance detection.

5. It shall be possible to zoom the lens remotely from the TMC for temporary traffic surveillance operations or to inspect the cleanliness of the faceplate.

6. The camera shall have direct, real-time iris and shutter speed control by the integrated processor.

7. The processor shall support H.264 video compression for streaming output.

b. Video Sensor Enclosure Assembly

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1. The camera and processor shall be housed in a sealed IP-67 enclosure.

2. The faceplate of the enclosure shall be glass and shall have hydrophilic coating on the exterior surface to reduce debris accumulation and maintenance.

3. The faceplate shall have a thermostatically-controlled indium tin oxide (ITO) heater applied directly on the interior surface to keep the faceplate clear of condensation.

4. An adjustable aluminum visor shall shield the faceplate from the sun and extraneous light sources.

5. An integral aiming sight shall assist in aiming the camera for the detection objectives.

6. A removable rear cap and cable strain relief shall seal the power connection.

7. The rear cap shall be tethered to the enclosure to avoid dropping the cap during installation.

8. The rear cap shall be fastened to the body of the video sensor with a single, captive bolt.

9. The rear cap and enclosure shall include Gore breathers to equalize internal and external pressure.

10. The sensor shall be self-supporting on manufacturer's mounting brackets for easier fastening during installation.

11. It shall be possible to rotate the field-of-view 360° without changing the angle of the visor.

c. **Power and Communications**

1. Power and communications for the video sensor shall be carried over a single three-conductor cable.

2. Termination of the three-conductor cable shall be inside the rear cap of the enclosure on a three-position, removable Phoenix terminal block. Each conductor shall be attached to the Phoenix plug via a screw connection.

3. The video sensor shall operate normally over an input voltage range of 89 to 265 VAC at 50 or 60 Hz.

4. Power consumption shall be no more than 16 watts typical.

5. No supplemental surge suppression shall be required outside the cabinet.

6. All communications to the video sensor shall be broadband-over-power via the same three-conductor cable that powers the unit. Coaxial cable shall not be required.

(2)   Communications Interface Panel

The video detection system shall include an interface panel in the traffic cabinet that manages communications between the video sensors, the traffic management center (TMC), a maintenance technician, and the traffic cabinet itself.

a. Video Sensor Connection

1. The communications interface panel shall provide connection points for four video sensors.

   i.   Each sensor connection shall be a 3-pole terminal block, which supplies power and broadband-over-power communications to the sensor.

   ii.   The broadband-over-power communications shall provide a throughput of 70 to 90 Mbps.

   iii.   The broadband-over-power connection shall support at least 1,000 feet of cabling to the video sensor.

   iv.   Each video sensor connection shall include a power switch.

   v.   There shall be an LED for each video sensor to indicate the state of the power to the sensor and an LED for each video sensor to indicate the status of communications.

   vi.   Each video sensor connection shall contain a resettable fuse.

   vii.   Each video sensor connection shall provide high-energy transient protection.

b. Traffic Management Center (TMC) Communications

1. An Ethernet port shall be provided to connect to a remote Traffic Management Center (TMC).

   i.   The TMC connection shall support 10/100/1000 Mbps Ethernet communication.

   ii.   A security protocol shall be set up to restrict communication to the main TMC and all components to prevent any unauthorized access.

iii. The communications interface panel shall proxy all network requests that arrive on the TMC connection to avoid unwanted network traffic from reaching the broadband-over-power network between the communications interface panel and the video sensors.

iv. All communications to the video detection system through the TMC connection shall be to a single IP address.

c. **Local User Communications**

1. A wired Ethernet port shall be provided to connect the technician at the cabinet to the video detection system for setup and maintenance purposes.

   i. The maintenance port shall support 10/100/1000 Mbps Ethernet communication.

   ii. All communications to the video detection system through the maintenance port shall be to a single IP address.

   iii. The maintenance port shall support DHCP to automatically assign an IP address to the user's computer, if desired.

2. An 802.11g Wi-Fi access point shall allow wireless connection to the video detection system at the cabinet for setup and maintenance purposes.

   i. All communications to the video detection system through the Wi-Fi access point shall be to a single IP Address.

   ii. The Wi-Fi access point shall support DHCP to automatically assign an IP Address to the user's computer.

   iii. The Wi-Fi access point shall include a dipole, omnidirectional antenna.

   iv. A momentary pushbutton shall allow the user to turn the Wi-Fi access point on or off.

   v. The Wi-Fi access point shall turn itself off automatically after a period of inactivity from connected devices.

   vi. An LED shall indicate when the Wi-Fi access point is enabled.

vii. The Wi-Fi access point shall operate simultaneously with the wired maintenance port and with the TMC connection.

d. Traffic Controller Connection

The communications interface panel shall provide one connection to communicate to the traffic controller through the cabinet.

1. The traffic controller connection shall support a TS2 Type 1 compatible SDLC interface.

   i. The traffic controller connector shall be a 15-pin female metal shell D sub-miniature type connector to support a standard NEMA TS2 or TEES SDLC cable.

   ii. The traffic controller connection shall support a protocol interface to SDLC-capable traffic controllers (NEMA or TEES).

   iii. The traffic controller connection shall support the NEMA TS2 SDLC protocol to include up to 64 detector outputs and 32 inputs.

2. The traffic controller connection shall be able to connect to a wired input/output card, which supports wired I/O in cabinets without a SDLC-capable controller.

   i. The wired I/O data communications link shall support at least 24 outputs and 16 inputs.

   ii. It shall be possible to connect and use both SDLC communications and communication to the wired input/output card simultaneously.

e. USB Ports

1. The communications interface panel shall include two USB 2.0 ports.

   i. If a communications interface panel fails to start and run due to a software or operating system failure, it shall be possible to reinstall all system and application software from a USB memory stick without necessitating removal of the communications interface panel from the cabinet.

f. Power

1. The communications interface panel shall accept input voltage in the range of 89-265 VAC, 50/60 Hz power from the transient-protected side of the cabinet.

644		2.	The communications interface panel shall be protected by two slow blow fuses. Spares shall be attached to the panel.
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(3)   Wired Input/Output Card

The video detection system shall support an optional wired input/output card that communicates with the communications interface panel for real-time detection states and other I/O to the traffic controller. The card may reside in a standard detector rack or shelf-mount enclosure with power module.

a. The optional wired input/output card shall comply with the form factor and electrical characteristics to plug directly into a NEMA type C or D detector rack or Caltrans TEES Input File.

1. The card shall occupy two slots of the detector rack.

2. The card shall provide four detector outputs on its rear-edge connector.

3. A front connector shall provide communication to the communications interface panel.

4. A front connector shall allow 16 inputs and 24 contact-closure detector outputs for wiring into the cabinet.

i.   A front panel LED for each of the 16 inputs and 24 outputs shall indicate the state of the input or output.

5. The wired input/output card shall support optional expansion cards in other slots. Each expansion card shall support 4 outputs to the back edge of the card.

6. The wired input/output card shall support optional harnesses for connection to Input Files or C1, C4, C11, and C12 ports to support Type 170 or Type 2070 controllers.

(B) System Software

The video detection system shall include management software for configuration, monitoring and data collection purposes.

(1)   Management Software

a. Management software shall be a Windows-based application.

1. The software shall be compatible with Windows 7 and Windows 10 operating systems.

2. The software shall communicate with the video detection system via Ethernet.

b. The management software shall automatically determine all video sensors and communications interface panels available on the local network and populate a list of all devices.

c. The management software shall provide the user a means to name individual video sensors and communications interface panels.

d. The management software shall provide a means for the user to zoom the camera optics while viewing a live video stream.

e. The management software shall provide a means for the user to calibrate distances in the field of view.

f. The management software shall provide the user a means to create 4-sided detection zones in the field of view using either a still snapshot or live video.

1. The management software will overlay an outline of each detection zone over the background image.

2. It shall be possible for the user to place detection zones anywhere in the field of view for stop line detection and/or advance detection.

3. It shall be possible for the user to set the desired color of both the on and off states of the detection zone overlay.

4. It shall be possible for the user to alter the size and shape of any previously created zone.

5. It shall be possible for the user to overlap zones, either partially or fully.

6. It shall be possible for the user to name each zone uniquely.

7. It shall be possible for the user to assign each zone to detect vehicles, to detect bicycles, or to detect both, and to specify different outputs for each type.

8. It shall be possible for the user to assign the same output to multiple zones such that the output will be on if any of the zones are detecting a vehicle or bicycle.

9. It shall be possible for the user to assign a single zone to more than one output such that if a vehicle or bicycle is detected, all the assigned outputs shall be turned on.

10. The management software shall be capable of creating at least 99 detection zones per video sensor.

g. It shall be possible for the management software to retrieve all configuration parameters from video sensors or communications interface panels.

　　1. It shall be possible for the user to save all the settings for a video sensor or a communications interface panel to a laptop file.

　　2. The management software shall provide a means to read or import all the settings from a previously saved configuration file for a video sensor or a communications interface panel.

h. The management software shall be able to download a new version of the application software into a communications interface panel and its attached video sensors.

i. The management software shall provide a screen to monitor operation of a video sensor.

　　1. The monitoring screen shall include a live video stream from the video sensor with at least HD 1280x720 pixel resolution.

　　2. The monitoring screen shall show indications of detection in real time by changing the color of the detection zone.

　　3. It shall be possible for the user to configure different indications for vehicle detections vs. bicycle detections when both are configured for the same zone.

　　4. The monitoring screen shall include the following optional, configurable objects. It shall be possible for the user to size and position them anywhere on the screen and to change the color and size of text.

　　　　i.　An indication of when an output is on or off, along with a user-configurable name for that indicator.

　　　　ii.　The current time in the video sensor.

　　　　iii.　A user-configurable title or name.

　　　　iv.　The version number of the video sensor software.

　　5. It shall be possible for the user to turn the overlay graphics on or off with a single setting.

j. The management software shall provide a screen to monitor operation of the intersection with a quad-view video stream from the communications interface panel.

  1. The quad-view video stream shall have a resolution of at least HD 1280x720 pixels, where each of the sensor videos comprising the quad-view shall be at least 640x360 pixels.

  2. It shall be possible for the user to configure the order that the sensor videos appear in the quad-view.

  3. The real-time quad-view video stream shall be capable of displaying the overlay graphics for all four sensors simultaneously.

k. While monitoring the video of a single video sensor or of the quad-view, it shall be possible for the user to request a "snapshot" or single-frame image to save to a named file on a laptop.

l. While monitoring the video of a single video sensor or of the quad-view, it shall be possible for the user to record a period of the video to save to a named file on a laptop.

(C) System Functionality

The video detection system shall provide the following features and functionality.

(1) Detection Performance

a. The video detection system shall detect the presence of vehicles in defined zones and turn on the assigned output when the vehicle is present in the zone.

  1. Stop Line Detection

      i. For detection zones placed at the stop line, the probability of not detecting the presence of a vehicle shall be 1% or less under all operating conditions when the video sensor is installed and configured properly.

      ii. For detection zones placed at the stop line, the probability of falsely detecting a vehicle that is not present shall be 3% or less under all operating conditions when the video sensor is installed and configured properly.

2. Advance Detection

    i.   It shall be possible to place advance detector zones such that the farthest point of the zone is up to 600 feet from the video sensor. Advance detector zone placement shall include 2-3 car lengths of field-of-view beyond the farthest point of the zone.

b. To ensure statistical significance for the above detection performance specifications, the data shall be collected over 24-hour time intervals (so as to avoid a single lighting condition) and will contain a minimum of one hundred (100) vehicles per lane. The calculations of detection performance will not include turning movements where vehicles do not pass through the detectors, vehicle lane-change anomalies, or where they stop short or stop beyond the combined detection zones.

(2) Failsafe Mode

a. The video detection system shall provide a failsafe mode for each video sensor. If the failsafe mode is enabled, all programmed presence detection outputs for the video sensor shall be turned on, thus placing constant calls to the controller. When failsafe mode is disabled, all outputs revert to normal on/off operations.

b. The video sensor shall continuously monitor the overall contrast in the video. If the overall contrast falls below a preset level (such as caused by dirty faceplate, severe glare, or extreme fog on the faceplate), the sensor shall enable the failsafe mode. When sufficient contrast is restored in the video, the sensor will disable the failsafe mode.

c. The communications interface panel shall continuously monitor the connectivity status of the attached video sensors. If any video sensor goes offline due to either electrical failure or internal software failure, the communications interface panel shall enable the failsafe mode for that video sensor. If the video sensor comes back online, failsafe mode shall be disabled.

(3) Data Collection

a. The video detection system shall automatically collect and store traffic flow data in non-volatile memory for later retrieval and analysis. No additional hardware or software shall be necessary. The data shall include:

1. Vehicle counts per phase.

| 845 | | 2. Vehicle average speeds. |

b. All data shall be stored in a cloud-based storage indefinitely.

c. The management software shall be able to retrieve collected data for a specified period of time or for all currently stored data and save into a standard CSV file.

(4) Operations Log

a. The communications interface panel and each video sensor shall maintain a time-stamped operations log of routine and special events in non-volatile memory for later retrieval and analysis.

(5) Time Synchronization

a. The video detection system and management software shall provide three methods to synchronize the time of day clocks in the communication interface panel and the video sensors, as follows:

1. Manual time synchronization operation by the user, which sets the time to the current time on the laptop where the management software is running.

2. A configuration setting to allow the communications interface panel to automatically obtain time from the NEMA TS2 protocol on the SDLC channel and broadcast it to the video sensors.

3. A configuration setting to allow the communications interface panel to automatically obtain time from up to five Network Time Protocol (NTP) sources and broadcast it to the video sensors.

(6) Video Streaming

In addition to the ability to view video streams in the management software, it shall be possible to view video from individual sensors or to view the quad-view from the communications interface panel using a third-party video player application on a tablet, smartphone or laptop computer.

(D) Installation and Setup

The video detection system hardware shall be designed for flexible, fast and easy installation and setup.

(1) It shall be possible to mount the video sensor on an intersection pole, mast arm, or luminaire arm.

(2) No special tools or extra equipment, other than a laptop for configuration, will be required.

(3) Once all hardware is installed, connected and functional, it shall be possible to configure the video detection system for a typical 4-approach, 8-phase intersection in 15 minutes or less.

(E) Warranty, Service and Support

The video detection system shall be provided with the following warranty, service and support options.

(1) **Warranty**

    a. The manufacturer shall warrant the video detection system for a minimum of five (5) years that begins upon final acceptance by the State. An option for up to three (3) years of warranty shall be available.

(2) **Service**

    b. Ongoing software support by the manufacturer will include software updates of the video sensor, communications interface panel, and management software. These updates will be provided free of charge during the warranty period. The manufacturer will maintain a program for technical support and software updates following expiration of the warranty period. This program will be available to the contracting agency in the form of a separate agreement for continuing support.

(3) **Support**

    a. A quick-start guide, installation guide, application notes, and other materials shall be available from the manufacturer to assist in product installation and setup for various applications. In addition, training online or in person shall be available.

    b. Training shall be available in application design, operation, setup, and maintenance of the video detection system.

    c. Manufacturer shall provide a tech support website and an 800 number for technical support.

END OF SECTION 770