BID SOLICITATION

City of Chattanooga
101 East 11th Street, Suite G13
Chattanooga, TN 37402

BID OPENING DATE AND TIME:
16-JUN-20 at 2:00 PM
BID NUMBER: 305909

SEALED BIDS

Mail or submit two (2) signed copies of bid form to this office in the enclosed envelope. Retain one copy for your file.

BUYER:
PHONE #: (423) 643-7230
DELIVERY REQUIRED:

V E N D O R	RFQ

M A I L T O	City of Chattanooga 101 East 11th Street, Suite G13 Chattanooga, TN 37402

Item	Class-Item	Quantity	Unit	Unit Price	Total

Requisition No.: 198946
Ordering Dept.: Chattanooga Department Of Transportation
Buyer: Dedra Partridge
Phone No.: (423) 643-7237

Items Being Purchased: Connected Vehicle Traffic Signal System (CVTSS)

ATTACHMENTS:
Specificatins For CVTSS
Instructions To Bidders
Iran Divestment Act Form
No Contact/No Advocacy Statement
City of Chattanooga Supplier Information Form
W9 Form
Affirmative Action Plan
City of Chattanooga (COC) Terms and Conditions posted on Website
http://www.chattanooga.gov/purchasing/standard-terms-and-conditions
If you can't download call buyer for a copy.

*** BID MUST BE RECEIVED NO LATER THAN ***
*** 2:00 PM EST ON June 16, 2020 ***

NOTE:
ALL BIDS MUST BE SIGNED
All bids received are subject to the terms and conditions contained herein and as listed in the above referenced website. The undersigned Bidder acknowledges having received, reviewed, and agrees to be bound to these terms and conditions, unless specific written exceptions are otherwise stated.

Any manufacturer;s names, trade names, brand names, or catalog numbers used in the specifications are for the purpose of describing and establishing general quality levels. Such references ar enot intended to be restrictive. Bids will be considered for any brand which meets or exceeds the quality of the specifications listed for any item.

The City of Chattanooga reserves the right to reject any and/or all bids, waive any informalities in the bids received, and to accept any bid which in its opinion may be for the best interest of the city.

The City of Chattanooga will be non-discriminatory in the purchase of all goods and services on the basis of race, color, or national origin.

**** NOTE ****
PLEASE PROVIDE US WITH THE FOLLOWING INFORMATION:

Company Name_____

Address_____

_____

Phone/Toll-Free No._____

Fax No._____

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VENDOR

RFQ

MAILTO

City of Chattanooga
101 East 11th Street, Suite G13
Chattanooga, TN 37402

Item	Class-Item	Quantity	Unit	Unit Price	Total
eMail Address_____					
Contact Person's Name_____					
Estimated Delivery_____					
Minority-Owned Business_____ Small Business_____ Veteran_____					
Minority Woman-Owned Business_____Disabled Veteran_____					
Woman-Owned Business_____					
**** ALL ITEMS MUST BE QUOTED F.O.B. DESTINATION ****					

NOTE: ALL BIDS RECEIVED ARE SUBJECT TO THE TERMS AND CONDITIONS

ALL BIDS MUST BE SIGNED – The undersigned offers the above quoted prices under the conditions contained herein.

The City is Exempt from all Federal and State Tax.
Bids will be received at the above mentioned address.

COMPANY: _____

TERMS OF PAYMENT: _____

SIGNATURE: _____

TELEPHONE NUMBER: _____

NAME AND TITLE: _____

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VENDOR

RFQ

MAIL TO

City of Chattanooga
101 East 11th Street, Suite G13
Chattanooga, TN 37402

Item	Class-Item	Quantity	Unit	Unit Price	Total
1	Connected Vehicle Traffic Signal System (CVTSS)	4	Each	_____	_____

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TERMS OF PAYMENT: _____

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SIGNATURE: _____

NAME AND TITLE: _____

Procurement Specification for a Connected Vehicle Traffic Signal System (CVTSS)

Overview

The Agency wishes to procure an agency wide Connected Vehicle Traffic Signal System (the CVTSS). The intention of the CVTSS is to allow the following key requirements to be provided:

1) The system shall integrate into the traffic signal controller and provide connected vehicle applications to mobile phones through a hybrid system using Vehicle to Network (V2N), C-V2X (cellular direct) and DSRC (Dedicated Short-Range Radio Communications).

2) A mobile phone application shall be able to connect to V2N, C-V2X and DSRC radios to display CV applications and the HMI (Human Machine Interface).

3) The DSRC system shall be compatible with US DOT standards and be interoperable with other manufacturers.

4) The C-V2X system shall work directly with vehicle manufacturers.

5) The supplier of the system shall have an infrastructure automotive testing laboratory for vehicle manufacturers to test their systems with the infrastructure equipment.

6) The system shall provide Signal Phase and Timing (SPaT) to the C-V2X radios, DSRC radios, and mobile phones.

7) The system shall also support MAP files (MAP) and SPaT files that determine the approaches, link the lanes to the correct phases, and in turn provide SPaT messages. When a vehicle approaches an intersection, they should only receive the information from the traffic controller that relates to their approach.

8) A web-based configuration utility shall provide an easy way of editing the MAP and SPaT information.

9) The system shall use a GPS position of the vehicle OBU or smart phone to determine when to provide the SPaT information to the vehicle/smart phone.

10) Display real time fault status of the traffic intersections to the Agency.

11) Issue real time alerts via SMS and email to the appropriate response personnel immediately when a fault occurs. This allows the Agency to respond much quicker than relying on the public for notification.

12) Operation of the CVTSS shall be through a cloud hosted software with web-based access and that does not require special software or IT infrastructure for The Agency to install or maintain.

13) The monitoring of the CVTSS shall assure that the traffic intersections are functioning correctly, and that the system will be available when required.

14) The CVTSS system shall support the option for a monitoring and maintenance service agreement provided by the manufacturer to ensure high availability of the connected vehicle service.

15) The CVTSS system shall include a sensor with the ability to detect if a cabinet has been "knocked down". The sensor shall be able to determine if the cabinet has, for example, been struck by a vehicle and needs immediate attention.

16) Field devices shall be capable of receiving "over the air" software and security updates. The over the air updates allows new features to be installed remotely without having to physically go to the field devices.

17) The "over the air" updates shall have the ability to add new connected vehicle functionality and keep the units up to date within SAE J2735 standards to support future connected vehicle communication protocols.

18) The DSRC and C-V2X radios shall comply with the NEMA TS10 Standards.

19) The hardware shall be under warrantee for as long as the devices have connectivity and support licenses and are connected to the Connected Vehicle Traffic Signal System.

20) The hardware shall be capable of being upgraded to support future 5G cellular communications.

21) The CVTSS shall support probe based statistics that report the number of red light violations, speeding violations in school zones, number of arrivals on red light vs green light per intersection, and travel time along corridors.

22) All connected vehicle data collected shall be available to the city in real time. This shall be provided to the city computers at a single server via IP address. All data shall be in the SAE J2735 format.

23) The Connected Vehicle Traffic Signal System shall support the following applications
    i.   SPaT/MAP display of signal timing – V2I
    ii.   Green Light Prompt – V2I
    iii. Red-light running at traffic signals – V2I
    iv.   Emergency vehicle preemption – V2I
    v.   Where is the emergency vehicle coming from – V2V
    vi.   Intelligent cross walks/rapid flashing beacons – V2I
    vii. Intelligent school beacons – V2I
    viii. Bus/transit priority – V2I
    ix.   Motorist – Cyclist communication - V2V
    x.   Motorist – Pedestrian communication – V2V
    xi.   Rear end collision warning – V2V
    xii. Virtual/advance traffic detectors to make signals work better – V2I
    xiii. Curve warning/reduce speed – V2I
    xiv. Wrong way detection – V2I
    xv.   Railroad Crossing in Use Ahead warning – V2I

A. Experience and Local Support Requirements
   a) The CVTSS supplier shall have completed at least three hybrid connected vehicle city deployments using both cellular and direct communications in the last three years. The CVTSS supplier shall provide references for these three cities and provide demonstration drives in these cities to showcase the system within two weeks of award.

b) The CVTSS supplier shall be able to support the system and provide local training to the agency.

c) The CVTSS supplier shall have local offices to support the deployment of the Connected Vehicle System.

B. Connected Vehicle Traffic Signal System (CVTSS) Client User Interface Requirements. The CVTSS software user interface shall provide, as a minimum, features to meet the following requirements:

1) **General**

   a. The user interface shall provide a mechanism to monitor and manage all connected vehicle equipment to ensure that all equipment is working correctly. Whenever failures are detected, alerts and alarms are sent to personnel to ensure a high availability of the connected vehicle system.

   b. The user interface shall be web-based and be able to be viewed in a browser. Internet Explorer, Chrome, and Firefox browsers shall be supported, as well as Safari on an iPad. Systems that use remote desktops or similar systems to view a thick-client user interface shall not be acceptable.

   c. The CVTSS shall require a username and password to log on.

   d. The CVTSS system shall be mobile friendly and operators shall be able to open the system on a mobile phone to access the data and control the traffic signals. The web based system shall be viewable on any modern web browser on a mobile phone and automatically sized for the screen.

   e. The system shall be able to report any failures of connected vehicle equipment including network failures, DSRC/C-V2X radio failures and traffic controller failures

   f. The system shall be able to determine if the controllers database has been changed in the field and warn users that phasing information could have been modified.

2) **Map Display**

   a. The CVTSS shall include a scrollable, zoomable map display, with the intersections and emergency vehicles shown as representative icons on the map. The map shall include the ability to see the intersections via Google Streetview.

   b. The alarm status of the intersection shall be clearly indicated by an icon on the map, so that the user can see at a glance which intersections are in alarm.

   c. The map display shall also include a list of intersections, with the number and priority of alarms indicated on the list. Intersections in high priority alarm shall be moved to the top of the list, followed by medium priority, low priority, and then finally by intersections not in alarm.

   d. The icons shall change to clearly indicate if an intersection is offline.

e. Clicking on the icon on the map shall expose a box with the current parameters of the intersection shown.
f. The default map display position and zoom shall be configurable by user, so that the user's view will default to show the intersections that the user is responsible for managing.
g. The map view shall have the ability to show Google traffic overlays on the map.
h. The map view shall be able to show vehicle trails for emergency vehicles and transit vehicles when the vehicles have been in an emergency or not active.

3) **Regional Intersection and Vehicle Grouping**
   a. The CVTSS shall provide for intersections and special vehicles to be logically grouped into regional groupings (for example, north; south; Fire 1; Fire 2)
   b. The CVTSS user login shall be configurable so that if a maintenance or operational person is responsible for, say, the north intersections and emergency vehicles, then when that user logs on, the user is only able to view intersections that belong to the group that the user is authorized to view.
   c. The operator shall also be able to navigate to different "views" that only show the relevant devices under that view, such as all the "north" or "south" intersections.

4) **Intersection Detail Display**
   a. It shall be possible to drill down, either from the map icon or from the list, to a device level detail for the intersection, which as a minimum shall display the following parameters:
      i. The alarm status, with priority indicated, and a text description of the alarm (if an alarm is present for this device).
      ii. The time since the last communication with the device
      iii. The following parameters (real time now values, minimum for the day values, maximum for the day values, and average for the day values)
         1. The AC mains voltage (value)
         2. The Preemption output (Value 1-8)
         3. The battery back-up voltage (value)
         4. The cabinet temperature (value)
         5. The cabinet humidity (value)
         6. The presence of AC power (OK or Fail)
         7. The flashing status of the intersection (OK or Flashing)
         8. Stop Time status (OK or Stop Time Active)
         9. The cabinet door status (Open or Closed)
         10. The intersection fan status (Fan On or Fan off)
         11. Live conflict monitor information (OK or Fail and Alarm)
         12. Connected Vehicle Radio Faults (OK or Fail)

iv. It shall be possible to view each of the value parameters in graphical form, over the recent one-week period. This includes real time graphs of:
   1. The AC mains voltage
   2. Preemption Output
   3. Conflict Monitor Information
   4. The battery back-up voltage
   5. The cabinet temperature
   6. The cabinet humidity

5) Diagnostics and Log Display
   a. From the device level detail, it shall be possible to further drill down to get raw data, the error logs, and the communications logs to allow a technician to fault-find problems on the CVTSS.
   b. It shall be possible to filter the logs by Device, by Device Type, and/or by Group as well as between dates.
   c. It shall be possible to print these selected logs to a local printer or a PDF file.
   d. It shall be possible to export these logs to Excel on a local computer for further analysis.

6) Alarms
   a. The CVTSS shall have a comprehensive alarm generation capability
   b. It shall be possible to configure alarms to be generated on any parameter coming out of tolerance, including analog values, digital values, and enumerated values.
   c. Alarms shall be configurable to be of Low, High, or Critical Priority.
   d. The alarm priority shall be displayed throughout the CVTSS, on all displays, using color codes, such as red-critical; yellow – high; and amber-low, to indicate the priority of the alarm.
   e. The current active alarms shall be accessible for view in an expandable window, to see which alarms are active and when the alarm occurred. The highest priority alarms shall rise to the top of the list.

7) Alerts
   a. The CVTSS shall have comprehensive alerting capability, to enable the response personnel to be notified when an abnormal situation has occurred.
   b. It shall be possible to configure alerts to one or more personnel for each alarm. This will cause, as selected, an SMS and/or an email to be sent to the person when an alarm occurs.
   c. The alert shall be configurable to optionally send via email and/or via SMS a message when an alarm clears.
   d. The intention is that the CVTSS provides the alerts to the user in near real time. The SMS and email shall be issued within 30 seconds of the occurrence of event that results in an alert.

8) Reports

a. It shall be possible to view reports on the screen, in the browser of the CVTSS, and if desired print the report to a printer or a PDF file.

b. Alarm Activity Report

   i. The CVTSS shall include a report which shows the alarms activity for a period.

   ii. The Alarm Report shall indicate the time the alarm occurred, by color the priority of the alarm, whether it is still active, and if not active, then the time that the alarm cleared.

   iii. It shall be possible to filter the alarms by Device, by Device Type and/or by Device Group as well as by date time to drill down into a large alarm list to be able to view, for example, the alarm activity for a particular intersection or controller type over a three month period.

c. User Activity Report

   i. The CVTSS shall include a report which shows user activity for a given period to enable an audit of a user's response to an alarm to be made.

   ii. The report shall show which screens the user viewed, when the screen was viewed, and the IP address of the computer from which the screen was viewed.

d. Connected Vehicles System Operational Availability Report

   i. The CVTSS shall include a report which shows the overall operational availability of the Agency's intersections. The intersection is available even when not in an alarm condition.

e. Response Time for Fault Repair Report

   i. The CVTSS shall include a report which shows the response time to clear faults for a given time frame (for example, 1 month).

   ii. This report will allow the user to determine the number of faults, the total time, and average time to clear faults.

   iii. This report will allow the response times by region to be compared.

f. Vehicle Trip Report

   i. The CVTSS shall include a report which shows all the emergency connected vehicle trips and include information on start time, end time, total travel time, average speed, and destination point.

   ii. The report shall include the average response times for a month period. The report shall also calculate the 90th percentile response time for ISO ratings.

   iii. The report shall also calculate the emergency connected vehicle operational availability so that fire chiefs can determine if more vehicles are needed at a station.

9) Vehicle Trails

a. The maps display shall show live information of the preempt status of the emergency and transit connected vehicles on the system.
b. The user shall have the option to select which class of emergency connected vehicles to display on the map via the information overlay menu.
c. The information overlay will provide the option to select the number of hours of live data the operator would like to see. This ranges from 1 hour to 24 hours. The user shall have the ability to select that vehicle trails will fade away as the data becomes older.
d. The information overlay shall provide the ability for the user to display the device names on the map, for easy identification of both intersections and emergency vehicles.
e. Operators will have the ability to display legends that explain the emergency vehicle trails color codes, including idle, preempt service requested, left turn indicator, and right turn indicator so that it is easy to see the behavior of the emergency vehicle.

10) Vehicle Playback

a. The CVTSS shall include the ability to playback the activity of the emergency connected vehicles so that retrospective fault finding of the preempt system can be carried out.
b. Playback shall support the same controls for panning and zooming the map, as well as using the information overlay to select the type of data being displayed on the playback menu.
c. Users shall have the additional functionality of controlling which devices are displayed by selecting the checkboxes on a selection panel on the left of the map.
d. The playback screen should provide the user with the option to select a date range via a drop down date selector menu. The menu will provide a full calendar and the option to select the exact start time and end time for the playback.
e. The bottom section of the map screen shall display the timestamp based on the location within playback.
f. The user shall have controls that allow one click access to start from the beginning, rewind, play, fast-forward, and scroll to end.
g. The user shall have the option to use a slider that is operated by click and drag to the time of interest in the playback.

11) Remote Power Cycle

a. The CVTSS shall include the ability to remotely cycle power to the outlets on the back of the field device. In this way, it shall be possible to cycle power to ancillary connected equipment, such as network switches, DSRC radios, cameras, and similar equipment.

b. The user interface shall display the status of the outlets and provide confirmation via an associated input whether the sockets are energized or not.

12) MAP files for connected vehicles.

    a. The CVTSS shall include a web based configuration tool for setting up the MAP messages for capturing the intersection or ITS device geometry. Input for this MAP configuration works by drawing the lanes on a google map image. Lanes are linked to phase data so that users get the correct information when they are approaching on a specific lane. Once configured these MAP files are saved at each intersection as well being saved on a cloud server where they would be available for use by the connected vehicle system.

    b. The RSU-Processor shall connect to the server where the MAP files are stored and shall securely check the status of the MAP files. Anytime the MAP file stored on the server is changed, the RSU-Processor shall securely retrieve the revised MAP file and store it locally at the intersection. The contents of the MAP file shall then be encoded in accordance with J2735 to make a MAP message. This shall then be broadcast out of the DSRC radio once per second. The On board unit (OBU) shall retrieve the MAP messages over DSRC, where they shall be available for use in applications.

    c. It shall be possible to configure the following items in this file.

        i. The approach lanes by drawing a set of points on a Google map that define the lane. The lane width shall also be configurable to define the size of the lane.

        ii. Each lane approach shall include the name of the approach in relation to the intersection.

        iii. Each lane shall have the lane phase that it maps to. This is so that the SPaT message from the controller can be linked to the approaching lane.

        iv. Each lane shall also include a allowed maneuvers field. This field defines the allowed maneuvers for the lanes, such as left only, straight only, straight and right, right on red, etc.

C. Connected Vehicle In-Vehicle Smart Phone Application

The Connected Vehicle Traffic Signal System shall conform to the following requirements:

1) General

    a. The smart phone application shall support both Apple and Android telephones.

    b. The smart phone application shall connect to the connected vehicle system through either cellular communications or via Bluetooth to a DSRC OBU.

    c. The smart phone application shall be capable of running in the background.

    d. The smart phone application shall provide audible alerts for warnings messages.

e. The application shall automatically detect if the user is a pedestrian, cyclist, or motorist. The operator shall have the ability to override to become a pedestrian, cyclist, or motorist.

f. When the application detects the operator has not moved for a long period of time the application shall go into an idle state and stop sending information.

2) Smart phone display

a. The smart phone application shall provide audible alerts to users. The application shall not require any user interaction and shall always run in the background.

b. User shall be capable of also receiving visual alerts via the smart phone application.

c. Users shall be capable of seeing count down timers for the traffic intersections.

d. Users shall have the ability to turn on/off audible alarms for the various applications.

e. The smart phone application shall support the following applications as standard:

    i. SPaT/MAP display of signal timing – V2I

    ii. Green Light Prompt – V2I

    iii. Red-light running at traffic signals – V2I

    iv. Direction of approaching emergency vehicle – V2V

    v. Intelligent cross walks – V2I

    vi. Intelligent school beacons – V2I

    vii. Motorist to Cyclist and Pedestrians Warnings - V2V

    viii. Rear end collision warning – V2V

    ix. Virtual/advance traffic detectors at traffic signals – V2I

    x. Curve warning/reduce speed – V2I

    xi. Wrong way detection – V2I

    xii. Railroad Crossing in Use Ahead warning – V2I

D. Connected Vehicle Application Requirements

The Connected Vehicle system shall support the below applications and conform to the following requirements:

1) SPaT/MAP Display of Signal Timing Overall Requirements

a. The CVTSS shall be capable of providing real time Signal Phase and Timing messages to the motorist. These SPaT message shall be collected directly from the traffic signal controller and include the next phase information.

b. When the vehicle/mobile application approaches an intersection, it shall receive the MAP files that include all the geometry of the traffic intersection, the lane, and phase information.

c. The vehicle/mobile application shall then determine which lane the vehicles is approaching via GPS position and reference this to the MAP files. The mobile

application shall then display the real-time traffic signal conditions for the phase/phases at the intersection the vehicle is approaching.

    d. The display shall include the current traffic signal conditions and the countdown of when the traffic signal will change its conditions.

    e. The SPaT message shall not be derived from a database and/or algorithms that try to predict the next phase. This SPaT message shall be directly received from the traffic signal controller provider.

2) **Red Light Running at Traffic Signals Overall Requirements**

    a. The CVTSS shall be capable of detecting when a vehicle equipped with the smart phone application has the potential of running the red light.

    b. The smart phone application shall alert the driver of the vehicle that they have the potential of running a red light.

    c. The smart phone application shall also broadcast the red light running alert to all motorist approaching the intersection.

3) **Emergency Vehicle Priority and Bus Priority Overall Requirements**

    a. When an emergency connected vehicle requests preempt service, the CVTSS shall reliably request a preempt from the traffic controller by activating a digital output, which is connected to one of the preempt inputs on the traffic controller. When the circumstance of the emergency vehicle, such as location, speed, estimated time of arrival, indicator comply with the rules established by the configuration of the intersection, preemption will be initiated.

    b. The preempt activation shall be managed by implementing the following rules/parameters. It shall be possible to have up to 32 rules.

        i. The approach area of a rule shall be bounded by a left and right direction and a minimum and maximum distance. A preempt shall only be activated if the vehicle is within this boundary and is approaching the intersection.

        ii. If enabled, the preempt shall be activated when the estimated time of arrival (ETA) for the vehicle is less than the set parameter.

        iii. If enabled, the preempt shall be activated when the vehicle is less than the minimum distance to the intersection.

        iv. If enabled, the preempt shall only be activated if the vehicle has the left turn signal or right turn signal active as configured.

        v. If enabled, the preempt shall be activated early if congestion is detected in front of the emergency vehicle so that the early activation of the preempt can help clear the congested traffic out from in front of the emergency vehicle. Congestion will be detected by the emergency vehicle travelling below a threshold speed.

   vi. Each rule shall cause a particular preempt to be activated. Multiple rules can be associated with a particular preempt.

   vii. If configured, a preempt rule shall stay active until the vehicle is detected at a safe distance away from the intersection, and is moving away from the intersection.

   viii. The preempt shall be released once all active rules that triggered the preempt have become deactivated.

c. The preempt system shall support eight (8) preempt or pulsed low priority outputs. All inputs are optically isolated.

d. The status of preempts shall be indicated by LEDs on the front of the in-cabinet preempt unit.

e. It shall be possible to test each of the preempts by pressing a test button (with an associated selector switch) that will cause each preempt to be triggered. This will allow for the wiring, and operation of the signal controller, to be tested without actually driving a vehicle down each approach.

f. The system shall be able to support service calls on a first come, first serve basis.

a. Communications Requirements

a. The connected emergency vehicle system shall support redundant communications using multiple forms of radio communications. This shall include either cellular, 900MHz radio, and/or DSRC radio communications.

b. The radio communications shall have a range in excess of 2,500 feet.

c. The optional DSRC radio shall have a range in excess of 1,000 feet.

d. The system latency shall support real time communications on a second-by-second basis from the vehicle to the intersection over the cellular communication link.

e. Data paths shall be established, if configured, to operate via radio, via cell network and DSRC radio. In this way, the preemption request packets from the vehicle will potentially arrive at the intersection from both communication paths. The intersection shall process the packet that arrives first and ignore the packet that arrives subsequently.

f. The system shall continue to operate correctly in the event of radio or cellular failure.

b. Central configuration Requirements

a. It shall be possible to configure the parameters required to implement the desired rules on a browser the client has connected to the central computer.

b. Setting of left and right direction limits and distances shall be accomplished by clicking and dragging of lines on a road map.

c. Other rule parameters shall be entered on the user interface, and saved and/or sent to the intersection as required.

d. Systems that require the installation of software onto client computers will not be acceptable.

c. Local Configuration Requirements
a. It shall be possible to edit the preemption rules at the roadside by connecting a laptop computer to the controller with an Ethernet cable.
b. The editing of the rules shall be accomplished by using a local website, hosted by the preempt controller, using a browser.
c. Systems that require the user to load custom configuration software on the laptop for the purpose of editing the preemption rules shall not be acceptable.

4) **Direction of Approaching Emergency Vehicle Overall Requirements**
a. When an emergency vehicle has their lights and sirens turned on, it shall broadcast the emergency situation.
b. All vehicles that the emergency vehicle is traveling towards shall receive a warning message that an emergency vehicle is approaching
c. The emergency vehicle message shall include the direction of the approaching emergency vehicle, such as "Emergency Vehicle from behind", "Emergency vehicle from the right/left" or "Emergency vehicle from the front".

5) **Intelligent Crosswalks Overall Requirements**
a. When a pedestrian plans to use a midblock crosswalk, they need to push a button to activate the flashing beacons or the Hawk signal.
b. The system must integrate into the midblock crossing cabinet and receive the button activations.
c. When a midblock crossing has been activated by a pedestrian, the intelligent crosswalk shall broadcast a message to the motorists that it is activated.
d. All smartphone applications that are traveling in the direction of the midblock crossing and are within a predefined estimated time of arrival shall be alerted of the active pedestrian crossing.
e. If a detected vehicle is not slowing down and that the chance of an impact with the pedestrian is high, an audible alert shall be provided to both the pedestrian and the motorist.

6) **Intelligent School Beacon Overall Requirements**
a. The system must integrate into the school beacon cabinet and shall broadcast a message when the beacon is activated with the new applicable speed information.
b. When a motorist drives through an active school zone area and is driving substantially faster than the school zone speed limit, the motorist shall be alerted that he is in an active school zone area.

7) **Motorist to Cyclist and Pedestrian Warnings Overall Requirements**
   a. The smartphone application shall provide alerts when there is a high chance for collision between motorists, cyclists, or pedestrians.
   b. The smartphone application shall utilize the GPS position and heading of multiple data points to determine if a vehicle has the potential of colliding with a cyclist or pedestrian.
   c. The motorist/cyclist/pedestrians shall be warned 7-10 seconds in advance of the potential collision.
   d. The smartphone application shall provide multiple warning tones dependent on the vehicle speed and the potential of the collision.

8) **Rear End Collision Warnings Overall Requirements**
   a. The smartphone application shall provide alerts when there is a high chance for a rear end collision between two vehicles.
   b. The smartphone application shall utilize the GPS position and heading of multiple data points to determine if a vehicle has the potential of a rear end collision.
   c. The motorist shall be warned 7-10 seconds in advance of the potential collision.
   d. The smartphone application shall provide multiple warning tones dependent on the vehicle speed and the potential of the collision.

9) **Virtual/Advance traffic detection at traffic signals Overall Requirements**
   a. The smartphone application shall transmit its position to the Road Side Processor (RSP) at the traffic signal.
   b. The RSP shall process the GPS positions of each vehicle and shall be capable of configuring virtual loop detection points.
   c. When the vehicle is approaching and in a virtual loop detection point, the RSP shall then send a signal to the traffic signal controller of the vehicle presence.
   d. The RSP shall be capable of sending a vehicle detection signal directly to a IO detector card.
   e. The RSP shall also be capable of sending the vehicle detection signal directly over an Ethernet interface to the traffic signal controller.

10) **Curve Warning Overall Requirements**
   a. The system must integrate into the curve warning beacon cabinet and shall broadcast a message when the beacon is activated with the new applicable speed information for the sharp curve.
   b. When a motorist drives through an active curve warning area and is driving substantially faster than the curve warning speed limit, the motorist shall be alerted that he or she is approaching a dangerous curve.

11) **Wrong Way Vehicle Detection Overall Requirements**
   a. The system must integrate into the wrong way vehicle warning beacon cabinet at off ramps to the highway.
   b. When a wrong way vehicle is detected, the warning beacons shall be activated and the system shall broadcast a connected vehicle message to the driver that he or she is entering the wrong way on the roadway
   c. The system shall also broadcast a warning message to all vehicles approaching the wrong way detected vehicle.
   d. The system shall utilize the GPS position and heading of multiple data points to determine if a vehicle has is driving the wrong way on an off ramp or roadway.

E. Intersection Road Side Processor Device Requirements

It is a requirement that the CVTSS operate independent of the brand/type of intersection controller deployed at the intersection. The traffic controller shall support SPaT information. The CVTSS contractor shall install a small field device into each intersection cabinet which connects to the terminal strip in the cabinet via a wiring harness and connects to the traffic controller via an Ethernet port. The CVTSS RSP shall conform to the following requirements:
   a. The RSP shall function correctly between -34 degrees C and +74 degrees C.
   b. The maximum size of the RSP shall be 19" x 7,455" by 1.719" (1U), and shall be suitable for placing in an Agency traffic cabinet.
   c. The RSP shall be provided with appropriately rated connects that allows the CVTSS to be exchanged by unplugging connectors, without tools.
   d. The RSP shall incorporate an integrated GPS, cell modem, and 900MHz radio.
   e. The RSP shall be capable of communicating to multiple different radios via Ethernet communications.
   f. The Road Side Unit (RSU) shall be capable of abstracting the receipt of the SPaT message from the traffic controller and forwarding to the radio communication. This means the RSU shall receive the SPaT message from the traffic controller and send a processed J2735 SPaT message out the radio device. The RSU shall support multiple types of traffic controllers with different formats and multiple different radios.
   g. The RSU shall support J2735 complaint message for the radio using either the 2009 or 2016 standard and use DER/UPR encoding schemes as appropriate.
   h. The configuration of the RSP shall be accomplished by accessing the internal web server with a browser. It shall be possible to configure the RSP without any special software.
   i. The RSP shall be powered via a standard 120V input power.
   j. The RSP FD shall allow for the routing of the controller configuration packets to and from the controller (either by Ethernet or serial communications) for the types of controller that are utilized by the Agency. In this way, it shall be possible to configure

the controller, utilize the controller specific software to interrogate the controller, and have the RSP shall provide the communications pipe.

k. The RSP shall utilize field initiated communications. This allows for a low cost cellular data plans to be used, with infrequent polling. However, when an abnormal event occurs and is detected by the RSP, then the RSP shall immediately initiate the transfer of a data packet to the RSP to enable real-time alerting of response personnel to take place.

l. The RSP shall, within the size limitations above, include a battery and battery charging/monitoring circuit, to allow the RSP to function correctly even when all power to the intersection has failed. The battery shall continue to power the RSP for a minimum of 3 hours after all power has failed to the intersection.

m. The RSP shall incorporate an integrated GPS which will allow the RSP to geo-locate itself on the map without configuration.

n. The RSP shall operate without requiring a static IP address. The only configuration required at the RSP is to enter the URL of where the CVTSS central software is hosted.

o. In the event that the cell service is interrupted or is not available, the RSP shall store any events that occur in internal memory and forward these events automatically to the RSP when the cell service is restored. In this way, a complete record of events at the device can be maintained even if cell service is interrupted for a period. The system will store 5,000 events.

p. The RSP shall utilize HTTP, HTTPS protocols, and XML data structures, for communications with the CVTSS. In this way, the data will be open for future expansion and competition. The use of secret proprietary protocols is not permitted.

q. The RSP shall be a 1U 19" rack mount device, with all connections on the rear, and LED indicators, power switches and selector switches on the front.

r. The RSP shall support "over the air" software updates to remotely update firmware software.

s. The RSP shall include a build in high speed 4 port Ethernet switch

t. The RSP shall support VPN connections to connect to agencies network VPN's.

u. The RSP shall use no self-tapping screws.

v. The RSP shall be powered coated aluminum enclosures.

w. The RSP shall include weather proof antennas if installed externally.

F. Dual Mode DSRC and C-V2X combined Roadside Unit (RSU)

a. The RSU shall combine both DSRC and C-V2X communications in the same RSU unit.

b. The RSU shall be capable of sending out simultaneous messages over both DSRC and C-V2X radios.

c. The RSU radios shall be software controlled to allow for radio transmission at different times to avoid interference.

d. The RSU shall support rebroadcasting messages across radios. If a message is received via DSRC it shall be re-broadcast out over C-V2X and vice versa.
e. The RSU shall include a small internal battery for monitoring of power failure events to send out alerts over DSRC and C-V2X.
f. The RSU shall include additional radio slots to support future radio types for expansion. These include upcoming 5G communication radios that will be available in the future.
g. The RSU shall include digital inputs to monitor door status and other internal alerts.
h. Antennas shall be separate from the RSU unit so that they can be placed high on the traffic signal pole.
i. The DSRC and C-V2X radios shall be monitored and if faults are detected an email/text message alert shall be sent to appropriate personnel.
j. The system shall be maintainable without the use of a bucket truck.
k. DSRC and C-V2X antennas shall be separated and installed in different locations to reduce interference.
l. RSUs shall comply with the FCC.
m. Proposers shall work with the city to get FCC licenses approved for the RSUs.
n. The DSRC and C-V2X RSU unit shall support SAE J2735 communications protocols.
o. The RSU shall be pole mounted via bandit straps and accessible via a ladder for maintenance purposes.
p. The RSU shall be powered using DC power and have Ethernet communications.
q. The system shall be capable of being connected to trajectory detectors to virtualize vehicles that do not have DSRC or C-V2X radios. This will create virtual BSM messages for these non-connected vehicles so that all connected vehicles can see these vehicles.
r. The small cabinets shall utilize the same locking mechanism that the agency uses either physical key or digital lock.

G. In-vehicle Emergency Connected Vehicle Device Requirements

The Emergency Connected Vehicle System Vehicle Device (ECVSVD) shall conform to the following requirements:
a. The ECVSVD shall function correctly between -34 degrees C and +74 degrees C.
b. The ECVSVD shall be capable of being mounted inside a vehicle either under a seat or strapped under the dashboard. The unit will come with all wiring needed to connect the system to the vehicle.
c. The ECVSVD shall be provided with appropriately rated and keyed connectors that allow the ECVSVD to be exchanged, without tools, by unplugging connectors.
d. The ECVSVD shall incorporate an integrated GPS chipset that has gyroscopes and accelerometers to enable dead reckoning. The GPS shall support dual GNSS satellite signals for enhance accuracy.
e. The ECVSVD shall support DSRC, C-V2X and V2N communications on one single unit.

f. The ECVSVD shall include Bluetooth communications for interface with the smartphone/tablet HMI interface.

g. The configuration of the ECVSVD shall be accomplished by accessing the internal web server with a browser. It shall be possible to configure the ECVSVD without any special software.

h. The ECVSVD shall utilize field-initiated communications. This allows for low cost cellular data plans to be used with infrequent polling. However, when an abnormal event or significant change in road conditions occurs, then the ECVSVD will immediately initiate the transfer of a data packet to the CVTSS to enable real-time road condition information to be displayed on the CVTSS.

i. The ECVSVD shall incorporate an integrated GPS which will allow the ECVSVD to geo-locate itself on the map, without configuration.

j. The ECVSVD shall operate without requiring a static IP address. The only configuration required by the ECVSVD is to enter the URL of where the ECVSVD central software is hosted.

k. In the event that the cell service is interrupted or is not available, the ECVSVD shall store any events that occur in internal memory, and then forward these events automatically to the CVTSS when the cell service is restored. This way, a complete record of events of the device can be maintained even if cell service is interrupted for a period.

l. The ECVSVD shall utilize HTTP, HTTPS protocols, and XML data structures, for communications with the CVTSS. In this way the data will be open for future expansion and competition. The use of secret proprietary protocols is not permitted.

m. The ECVSVD shall support Ethernet, cellular and license free radio communication.

n. The ECVSVD shall have the option of being supplied with an enhanced GPS, which provides GPS coordinates based on dead-reckoning even when the GPS signal is shielded from the vehicle, such as under an overpass, in a tunnel, or in between tall buildings in a city. The dead reckoning system shall include accelerometers, gyroscopes, and a distance measure that will provide accuracy of better than 20 feet in 1000 feet. These will be used when there is no information from the GPS satellites. The enhanced GPS shall optionally be connected to the vehicle OBD-II port, the J1939 ECU port (for heavy vehicles), or a wheel tick sensor as the project requires. The enhanced GPS shall self-calibrate the wheel tick input.

H. Installation

All installation work in the Agency's cabinets shall be carried out by personnel certified by the Agency for work in Agency traffic cabinets.

I. Hosting and Connectivity and Service.

The CVTSS contractor, as part of the quote, shall include 5 or 10 years' options for Connectivity and Service, as part of the purchase price. The RSBMS contractor, as part of the

response to this RFQ, shall provide the option to extend the operation for a further 5 years of the Connectivity and Service agreement of the RSBMS.

The Connectivity and Service agreement shall include at a minimum:
i. Cellular Connectivity
ii. Upgrade the cellular modem if the technology is not supported by the cellular networks.
iii. Telephone and email support
iv. No cellular overage charges
v. Extended warranty on the hardware for the period of the Connectivity and Service Agreement
vi. Over-the-air software updates
vii. Over-the-air security updates
viii. Future Connected Vehicles Service

J. Commissioning, Training and Documentation

The CVTSS contractor shall configure the system and reports, and train the Agency in the correct operation of the CVTSS to enable the Agency to utilize the CVTSS for the objectives outlined above.

K. Extensibility

The TSPRMS shall be designed to be extensible to cover the monitoring, maintenance and operations of additional ITS systems such as:
i. School Beacons
ii. Speed Feedback Radars
iii. Dynamic message signs
iv. Mobile systems such as maintenance vehicles, and Remote Weather tracking vehicles.
v. Traffic detection systems.
vi. ITS cabinet monitoring systems.
vii. Remote Weather Information Systems (RWIS)
viii. Over-height vehicle detection and warning systems
ix. High Mast lighting control systems

Instructions To Bidders

(1) Bid documents can be downloaded from the City of Chattanooga's website at: www.chattanooga.gov. At the left side of that page is a link labeled "Bid Solicitations." One of the top results will be a link that will display a page listing the current Bid Solicitations, with links that will display a PDF version of the bid documents suitable for printing.

(2) Any Addenda will be published in the list of Bid Solicitations mentioned above. Bidders should check this list before submitting their bids, to see whether any Addendum has been issued.

(3) Bid documents should be submitted to the Purchasing Office at the following address:

> Purchasing Department
> City Of Chattanooga
> 101 East 11th Street, Suite G 13
> Chattanooga, TN 37402

(4) Sealed Bids should be submitted in a sealed envelope. No particular envelope is required, but the Solicitation number should be noted on the outside of the envelop. This is a six-digit number starting with a 3, along with the bid opening date.

(5) Any questions regarding the specifications or bidding process should be directed to the Buyer, Dedra Partridge at the following email address:

> dpartridge@chattanooga.gov

The Buyer will, if possible, find answers to the submitted questions and will issue an Addendum, so that all potential bidders will have access to the answers.

Chapter No. 817 (HB0261/SB0377). "Iran Divestment Act" enacted.
Vendor Disclosure and Acknowledgement

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to § 12-12-106.

(SIGNED)   _____

(PRINTED NAME)   _____

(BUSINESS NAME)   _____

(DATE)   _____

For more information, please contact the State of Tennessee, Central Procurement Office
https://www.tn.gov/generalservices/procurement/central-procurement-office--cpo-/library-/public-information-library.html

No Contact/No Advocacy Statement

City of Chattanooga
Purchasing Division

For Submission with Sealed RFP, RFQ, Sealed Bid Responses:

State of _____

County of _____

_____ (agent name), being first duly sworn, deposes and says that:

(1) He/She is the owner, partner, officer, representative, or agent of _____

_____ (business name), the Submitter of the attached sealed solicitation

response to Solicitation #_____;

(2) _____ (agent name) swears or affirms that the Submitter

has taken notice, and will abide by the following No Contact and No Advocacy clauses:

NO CONTACT POLICY: After the posting of this solicitation, a potential submitter is prohibited from directly or indirectly contacting any City of Chattanooga representative concerning the subject matter of this solicitation, unless such contact is made with the Purchasing Division.

NO ADVOCATING POLICY: To ensure the integrity of the review and evaluation process, companies and/or individuals submitting sealed solicitation responses, as well as those persons and/or companies formally/informally representing such submitters, may not directly or indirectly lobby or advocate to any City of Chattanooga representative.

Any business entity and/or individual that does not comply with the No Contact and No Advocating policies may be subject to the rejection or disqualification of its solicitation response from consideration.

Submitter Signature: Printed Name:

_____   _____

Title:_____

Business Name: _____

PO Address: _____

Remittance Address: _____

If your business Tax Filing Status is Individual/Sole Proprietor or a Partnership and you provide a service to the City of Chattanooga, you will be issued a 1099 Form for the preceding Tax year. Please indicate which address you wish your document sent to if applicable:

1099 Address: _____

Contact Name: _____

Primary Phone Number: _____

Primary Fax Number: _____

Primary Email: _____

Are you Providing: (Check All That Apply)

Service	☐	Construction	☐
Goods	☐		
Both	☐		

Vendor Type (Must be Marked-Check All That Apply)

MBE-Minority Business Enterprise	☐
WBE-Woman Business Enterprise	☐
SDVBE-Service Disabled Vet Business Enterprise	☐
LGBTE-LGBT Business Enterprise	☐
None of the Above	☐

Preferred Payment Method

Check	☐
ACH	☐

ACH-Please provide remittance notice email and complete Separate City ACH Authorization Form:

_____

_____

Authorized Representative Signature   Print Name   Date

All Suppliers are required to include IRS Form W9

Form **W-9**
(Rev. October 2007)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer
Identification Number and Certification

Give form to the
requester. Do not
send to the IRS.

<table>
<tr><td rowspan="8">Print or type
See Specific Instructions on page 2</td><td>Name (as shown on your income tax return)</td></tr>
<tr><td>Business name, if different from above</td></tr>
<tr><td>Check appropriate box: ☐ Individual/Sole proprietor   ☐ Corporation   ☐ Partnership
☐ Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶ ....
☐ Other (see instructions) ▶   ☐ Exempt payee</td></tr>
<tr><td>Address (number, street, and apt. or suite no.)   Requester's name and address (optional)</td></tr>
<tr><td>City, state, and ZIP code</td></tr>
<tr><td>List account number(s) here (optional)</td></tr>
</table>

Part I   Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number

or

Employer identification number

Part II   Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and

2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a *result* of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and

3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here	Signature of U.S. person ▶	Date ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

● An individual who is a U.S. citizen or U.S. resident alien,

● A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,

● An estate (other than a foreign estate), or

● A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

● The U.S. owner of a disregarded entity and not the entity.

Affirmative Action Plan

The City of Chattanooga is an equal opportunity employer and during the performance of this Contract, the Contractor agrees to abide by the equal opportunity goals of the City of Chattanooga as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap. The Contractor will take affirmative action to ensure that applicants are employed, and the employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay, or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or handicap.

3. The Contractor will send to each labor union or representative of workers with which he/she has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. During the term of this contract the following non-discriminatory hiring practices shall be employed to provide employment opportunities for minorities and women:

    a. All help wanted ads placed in newspapers or other publications shall contain the phrase "Equal Employment Opportunity Employer."

    b. Seek and maintain contracts with minority groups and human relations organizations as available.

    c. Encourage present employees to refer qualified minority group and female applicants for employment opportunities

    d. Use only recruitment sources which state in writing that they practice equal opportunity. Advise all recruitment sources that qualified minority group members and women will be sought for consideration for all positions when vacancies occur.

5. Minority statistics are subject to audit by City of Chattanooga staff or other governmental agency.

6. The Contractor agrees to notify the City of Chattanooga of any claim or investigation by State or Federal agencies as to discrimination.

_____

(Signature of Contractor)

_____

(Title and Name of Company)

_____

(Date)