CUBIC™ | Transportation Systems

North Central Texas Council of Governments I Request for Proposals I

Advanced Traffic Signal Controller Systems to the NCTCOG TXShare Program

SUBMITTED By: Cubic ITS, Inc **November 2, 2023**

Cubic ITS, Inc.
522 Gillingham Lane
Sugar Land, TX 77478

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Table of Contents

Abbreviations/Acronyms

ASCT	Adaptive Signal Control Technology
ATMS	Advanced Transportation Management System
ATSPM	Automated Traffic Signal Performance Measures
CCTV	Close-Circuit Television
CMS	Changeable Message Sign
Comm	Communications
COTS	Commercial off the Shelf
CPU	Central Processing Unit
CTS	Cubic Transportation Systems
CV	Connected Vehicle
CV2X	Connected Vehicle to Anything
DBE	Disadvantaged Business Enterprise
DSRC	Dedicated Short-Range Communications
DSS	Decision Support Systems
FAE	Field Application Engineer
FYA	Flashing Yellow Arrow
GUI	Graphical User Interface
I/O	Input/Output
IoT	Internet of Things
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
LOS	Level Of Service
MMU	Malfunction Management Unit
MOE	Measures of Effectiveness
NEMA	National Electrical Manufacturers Association
NTCIP	National Transportation Communications for ITS Protocol
PDF	Portable Document Format
PE	Professional Engineer
RFP	Request for Proposal
SFP	Small Form-Factor Pluggable
SMA	Support and Maintenance Agreement
SOP	Standard Operating Procedures
SPaT	Signal Phase and Timing
SPM	Signal Performance Measures
TMC	Turning Movement Count
TRO	Traffic Responsive Operation
TSP	Transit Signal Priority
VLAN	Virtual Local Area Network
VDM	VRU Data Module
VRU	Vulnerable Road User

Trademarks

A. Cover Letter

Respondent: Cameron Cooper
Title: Manager, ITS
Cubic ITS, Inc.
522 Gillingham
Sugar Land, TX 77478
Phone: 512-496-3611
Email: cameron.cooper@cubic.com

November 2, 2023

Craigan Johnson
North Central Texas Council Of Governments
Purchasing Division
616 Six Flags Drive
Arlington, TX 76011

Advanced Traffic Signal Controller Systems to the NCTCOG TXShare Program

Dear Members of the Evaluation Committee,

Cubic ITS (Cubic) appreciates the opportunity to submit this proposal in response to the *Advanced Traffic Signal Controller Systems RFP #2023-092* project for the North Central Texas Council of Governments (NCTCOG). The selection of a traffic signal system provider is a critical decision for agencies throughout the United States, as traffic control is one of the most visible public works services. Selecting system vendors is a partnership, facilitating safe and reliable traffic operations as well as capital improvements, community mobility, economic development, and transportation plans for decades. Cubic is a trusted brand throughout the world, providing mobility solutions for agencies of all sizes.

For this response, Cubic ITS is able to provide products and services for all three desired categories:

Product Category 1: Advanced Traffic Signal Controller Systems Software
Product Category 2: Advanced Traffic Signal Controller Systems Hardware
Product Category 3: Advanced Traffic Signal Controller Systems Products and Services

Cubic's offering is highlighted by our Scout Local Controller Software and Commander Traffic Controllers. These items are field proven throughout the United States and comply with all applicable North American traffic signal standards. Our Scout software is continually updated, and we are proud to present its current features as well as what we will be releasing in the coming year to help our customers perform their tasks more efficiently and provide safe and reliable traffic operations.

On behalf of Cubic ITS, we sincerely appreciate the opportunity to submit this proposal. We aim to not just meet, but to exceed expectations and project requirements in all ways. Above is our address and contact information for our principal place of business; also, please feel free to contact Cameron Cooper with any questions, Cameron.cooper@cubic.com. Mr. Cooper is the Cubic ITS representative for this proposal and is authorized to negotiate the terms of this project on Cubic's behalf and provide clarification.

Sincerely,

Terry Griffith
Vice President and General Manager – ITS
Cubic Transportation Systems
terry.griffith@cubic.com

cc: Michelle Grossholz; Vice President – Cubic ITS Sales
Marshall Cheek, PE; Director ITS Traffic Engineering & Solutions

B. Executive Summary

Our proposal incorporates the products and services necessary to exceed the North Central Texas Council of Governments needs as stated in the RFP document. All products must work seamlessly with one another and help the Council establish a baseline for future expansion and help each municipality to reach their potential.

Our proposal includes the latest Scout Local Controller Software which will allow the municipalities within the State of Texas to leverage the latest in connected vehicle technology, ATSPMs, as well as provide enhanced features for transit signal priority (TSP) and light rail transit (LRT) operations. Scout controller software is the industry's premier traffic signal software. With over 40 Years of traffic industry experience, Scout has the functionality to address the most complex intersection needs and supports NTCIP, CV2X and other industry standards. Scout supports ATC cabinets and has expanded phases, overlaps, coordination parameters, and preemption enabling easy customization to support your traffic demands. In addition to Scout Local Controller Software, our offering also includes Commander Traffic Controllers.

Below is a list of several differentiators that favor Cubic ITS solutions for NCTCOG and partnering agencies:

- **A Platform for the future –** Cubic ITS systems serve as the basis of a Smart City platform. NCTCOG's RFP seeks to implement new technologies, such as ASCT, TSP, and ASTPM in Texas and beyond. These solutions are becoming more common within our industry; however, our systems will allow agencies to be prepared for tomorrow's new technology. Some of those technologies include Mobility as a Service (MaaS), detection systems for vulnerable road users, Decision Support Systems (DSS), centralized priority and pre-emption systems as well as overarching transport management platforms. Cubic is already developing and deploying these solutions in select markets and the systems purchased for this project will allow agencies to easily pivot to satisfy future needs.
- **Standards Based Software** – Cubic has implemented industry standards at the core of our software, including NTCIP, TMDD, and others. This core is essential for interoperability and ensuring that agencies have the flexibility to choose the solutions that work best for them. Additionally, Cubic's software builds upon these standards with "plus" features that provide one of a kind functionality designed by experienced Cubic customers and our own engineers.
- **Designed for Efficiency** Cubic solutions allow for more comprehensive monitoring, reporting and control. Cubic systems will not only help improve traffic operations but will help the agency do more with limited resources.
- **Extensive Integration Experience** –Our team has experience integrating with various makes, models of controller and software, and performing tests to ensure functionality. The Cubic team has also worked with vendors such as LYT, TrafficCast (Iteris) and a number of ATSPM vendors to ensure that our controllers and central management systems support the latest industry standards and functionality that are pushing our industry forward.
- **Expedited Onsite Support –** If any municipalities within the State of Texas ever require immediate support, Cubic ITS has several resources that can provide expedited service. The ability to provide immediate support from factory technicians is a distinguishing factor that the NCTCOG and its members should consider when purchasing any ITS product; this provides additional peace of mind and comfort knowing that problems will be addressed quickly.

C. Key Personnel

Cubic brings global ITS experience to the traffic control industry and has quickly gained a prominent role in the traffic signal control industry through the acquisition of Trafficware and GRIDSMART. Trafficware and GRIDSMART will remain product brands in the Cubic portfolio, with all employees united under the *One Cubic* banner. Trafficware and GRIDSMART have been combined to form Cubic ITS.

Since 1979, Cubic ITS has been dedicated to the traffic signal control industry, providing uncompromised quality and service. Cubic is known worldwide for Synchro Studio, the traffic engineering standard for signal timing and optimization, as well as ATMS, our Advanced Traffic (central) Management System. We have also leveraged our expertise in Synchro, ATMS and traffic control hardware products to create the nation's fastest growing ASCT, SynchroGreen. All Cubic ITS products are proudly designed and supported in America and are held to the highest standards for quality and customer care.

Cubic offers the most extensive product catalog in the traffic signal control industry, including traffic controllers, cabinets and accessories, detection, central management systems, adaptive systems, emergency response systems, traffic simulation software and more. Cubic is a proven industry leader in traffic control systems. Our solutions have proven to be reliable and have been applied in a variety of traffic conditions and operational environments. A summary of technical services is below.

Table 1 - Summary of Cubic Technical Capabilities	
• NEMA, 2070, ATC Controllers	• Traffic Simulation (Synchro/SimTraffic)
• Traffic Controller Software/Firmware	• Central Management Systems (ATMS)
• NEMA, 33x, ITS, ATC & Custom Cabinets	• Adaptive Systems (SynchroGreen)
• Cabinet Accessories	• Connected Vehicle Technology
• Single Camera Detection (GRIDSMART)	• Transit Signal Priority (TSP) Systems
• Hardware Installation Services	• Systems Design and Engineering

More than just products, we believe in creating a partnership with our customers. Our solution includes expert support from our team of more than 75 engineers and technical staff who have worked throughout the United States to enhance traffic signal operations using the latest in traffic control technologies. Customers rely on Cubic staff for support, advice and to introduce industry best practices. Our staff's experience will prove to be an invaluable resource to an agency as systems are installed and after projects are completed. Our staff have experience with not just Cubic systems, but other systems such as detection and communications and have the experience necessary to advise the agency regarding industry best practices and how to integrate system components. We are confident that our staff will prove to be the most professional and experienced individuals to help complement any agency's implementation of our systems.

For NCTCOG's bid, Cubic will not utilize any subcontractors. Additionally, we have attached resumes of individuals an agency is likely to interact with should they elect to implement either our Local Controller Software or traffic signal controllers. Resumes for these individuals are as follows.

Cameron Cooper

Manager, ITS Sales

EDUCATION

Simon Fraser University
CPP, PMAC
Certification

CDI Technical College
Computer Science

REGISTRATION & CERTIFICATES

IMSA Level II Field Technician

PROJECT RESPONSIBILITIES

Product Management
Contract Negotiation
Key Account Management

Mr. Cooper has been involved in the Traffic Industry for over 13 years in various positions. He has extensive experience getting products introduced, approved and sold into the public sector market. He is a top salesperson known for exceeding expectations and taking on large scale contract negotiations. He has experience in multiple business avenues including Sales, Management, Material Management, Product Development and Marketing.

ITS Sales Manager
Cubic Transportation Systems
October 2022-Present

Sales Manager
Mobotrex
September 2018-October 2022
Regional Sales Manager
September 2015-January 2018
Dealer Delopment Manager
November 2013-September 2015

Worked with Brown Traffic's dealer network to promote and sell the Eagle Traffic Control System product ine. This includers our Caltrans/NEMA/ITS cabinets as well as our signals. Works with DOTs across the county to introduce and approve products for sale. Presents and displays products at various National and Regional trade shows.

Regional Sales Manager
Siemens Industry
July 2010-October 2013

Global Account Manager
TTI
March 2007-July 2010

Manages a Global team with multiple design and production facilities, coordinating sales teams efforts within locations. Establishes and maintains effective business rapport with customer's purchasing, engineering and management staff by ensuring all aspects of transactions are handled in a professional, ethical, and timely manner. Pursues new opportunities by using all the resources available including reps, trade shows, networking, manufacturers, internet, and Internal resources to penetrate and secure new business resulting in expanding the customer base. Attend quarterly business reviews with customers, suppliers as well as regular meetings with internal management, to understand the business outlook and opportunities.

Strategic Account ManagerStrategic Account Manager
Future ElectronicsFuture Electronics
May 1998 - Jul 2005

Managed all aspects of the strategic accounts including developing budgets, sales forecasting, productivity, contract pricing, customer profiles and branch territories as they relate to expanding sales within the strategic account base. Managed and informed branch sales personnel with respect to demand creation, market penetration and supplier marketing programs. Coordinated training seminars with manufacturing partners for salespeople and strategic customers. Maintained existing e-supply chain partnerships including growth and development of E-Commerce integration. Provided constant proactive supervision and encouragement of the Account Executive Team. Supplier champion for several product lines to increase overall revenue for sales force

RF Technologist/Materials CoordinatorRF Technologist/Materials Coordinator
ADC TelecomunicationsADC Telecomunications
Jun 1994 - Jun 1997

Lab Technologist responsible for circuit debugging on various boards used in 900MHz and 1.9GHz PCS signal repeaters. Performed extensive work with PCB layouts for CTE systems using PADS software. In charge of purchasing and procurement, inventory control, and MRP system. Coordinated production procurement through local and international contract manufacturing facilities. Maintained expandable and PADS part system databases. Maintained LAN, WAN, Unix Firewall and individual workstations.

Materials ManagerMaterials Manager Adept TechnologiesAdept Technologies
Jun 1997 - May 1998

Managed a purchasing and inventory control team for multi-shift manufacturing plant. Responsible for expediting and second sourcing on long lead time and hard to find items during allocation process. Oversaw contract negotiating for reduced pricing through methods such as J.I.T., bonding programs, delivery and scheduling of large orders, extended terms, and early payment discounts. Maintained inventory accuracy through means such as cycle counting and monitoring WIP inventory and MRP maintenance.

Computer Technologist / Network ManagerComputer Technologist / Network Manager
Hewitt Rand CorporationHewitt Rand CorporationJun 1992 - Jun 1994
Evaluated new hardware and software for performance and resolved compatibility issues with existing product line. Operated a Novell network test lab for system certification of Novell Servers and Workstations. Responsible for I.S Network Management of a 50+ employee office with Manufacturing, R&D, office staff spanning multiple networks on various O/S platforms. Created various software installation suite programs to streamline manufacturing and pre-configuration of production lines assemblies.

Marshall Cheek, PE

Director Traffic Engineering Solutions

(Sugarland, TX)

EDUCATION

B.S., Civil Engineering, Iowa State University
M.S., Civil Engineering, Texas A&M University

REGISTRATION & CERTIFICATES

Professional Engineer: Texas No. 105,929; Florida No. 71818

PROJECT RESPONSIBILITIES

System Design
Product Expert
Customer Support
Customer Liaison

ATMS and SynchroGreen *(South Carolina Department of Transportation - SCDOT)*
(2012 – Present)

Mr. Cheek served as the lead technical resource for the architecture of the SCDOT ATMS system that eventually supported nearly 3,000 intersections throughout the state. Mr. Cheek has been involved in several upgrades of this system, as well as the expansion of the system to several local agencies, including Greeneville, Myrtle Beach and other areas. Mr. Cheek also designed the state's SynchroGreen system which now supports nearly 250 SynchroGreen intersections, one of the largest adaptive signal control systems in the United States. Mr. Cheek has been hands-on with SCDOT and currently works with the state to expand their ATMS system to other regions in the state, and modernize the system to support emerging technologies, such as signal performance measures.

ATMS and Local Controller Software *(City of Houston, TX)*

(April 2016 – May 2021)

Mr. Cheek served as Project Manager for the installation of ATMS and Cubic ITS Local Controller Software at 2,400 intersections in Houston, Texas. Mr. Cheek was responsible for delivering the City's ATMS system, as well as coordinating the development and deployment of the Local Controller Software for installation on a variety of controller hardware, including Econolite, Intelight and McCain 2070 CPUs. Mr. Cheek continues to work with the City of Houston as they expand systems to support SynchroGreen, Connected Vehicle and Disaster Recovery systems.

Carlsbad SynchroGreen *(Carlsbad, CA)*
(January 2019 – May 2021)

Mr. Cheek served as the Project Manager for the conversion of the City of Carlsbad's ATMS system from a McCain traffic control system, to Cubic ITS. This solution was deployed at 180 intersections and included the upgrade of controller CPUs to utilize Cubic ITS' Scout Local Controller Software and configuration of ATMS modules. Mr. Cheek also served as the Project Manager for the installation of 10 SynchroGreen intersection along Rancho Santa Fe Road in Carlsbad, California. This project was conducted in 2019 and resulted in improved travel times along this major arterial. In addition to reducing travel timings along Rancho Santa Fe, SynchroGreen also reduced or maintained the cycle length along the corridor, resulting in lowered side street delay. The success of this project led to two additional SynchroGreen projects in 2020 along with additional ATMS modules reduced or maintained the cycle length along the corridor, resulting in lowered side street delay. The success of this project led to two additional SynchroGreen projects in 2020 along with additional ATMS modules.

Fresno SynchroGreen *(Fresno, California)* – (December 2013 – Present)

Mr. Cheek was Project Manager for the installation of nine intersections on Shaw Avenue in Fresno, California. Shaw Avenue is a major arterial between SH 41 and SH 168 and has an ADT greater than 50,000. Shaw Avenue is adjacent to several major shopping centers as well as Fresno State University. Congestion caused by these traffic generators often results in unpredictable traffic conditions. This project involved knowledge of Fresno's ITS infrastructure and server configuration. This project required extensive knowledge of traffic operations and the application of advanced SynchroGreen features to accommodate special event and holiday traffic accessing Shaw Avenue. The City of Fresno has since expanded the SynchroGreen system to several additional corridors in the City, including Blackstone Avenue, Herndon Avenue and has also expanded the original Shaw Avenue corridor.

Statewide ATMS *(Louisiana Department of Transportation and Development - LADOTD)* – (March 2016 – June 2018)

Mr. Cheek served as Project Manager for the installation of the statewide ATMS system in Louisiana, incorporating over 3,000 intersections. Mr. Cheek worked with representatives from the State of Louisiana on a daily basis to install ATMS, as well as several system modules, including StreetSync and a custom module to integrate the state's Delcan freeway management system with ATMS. Mr. Cheek was responsible for drafting test plans and procedures, as well as working with the agency to develop cutover and installation plans. During this project, Mr. Cheek led the installation of ATMS on five (5) regional servers throughout the state, as well as a disaster recovery system that centralized all of the state's ATMS databases to a single repository.

ATMS Upgrade *(City of Council Bluffs, Iowa)* – (December 2020 – March 2021)

Mr. Cheek was the System Designer for the City of Council Bluff's upgrade to Cubic ITS ATMS in 2020. This project involved the installation of the ATMS system, new Commander Controllers, as well as the upgrade of Siemens M50 Series controllers to operate Cubic ITS' V.76 Local Controller Software. This project involved nearly 60 intersections and was completed in less than four months. Mr. Cheek also managed two previous projects for the City where SynchroGreen was installed along two major corridors

ATMS Upgrade *(City of Pearland, Texas)* –

Mr. Cheek oversaw the upgrade of the City of Pearland, Texas' ATMS upgrade in 2020. This project involved installing the ATMS system, as well as upgrading nearly 90 traffic controllers. This project involved careful database conversion and close interaction with the agency and subcontractors to ensure systems were installed quickly. Cubic ITS went the extra mile on this project to ensure a smooth transition for an agency that is understaffed and ensured the agency had a comprehensive understanding of all systems.

Silicon Valley ATMS and Traffic Controllers Deployment *(City of Palo Alto, CA)* – (December 2015 – May 2017)

Mr. Cheek served as the Project Manager for the installation of ATMS and traffic controllers for the City of Palo Alto, California. Mr. Cheek was responsible for the installation of all systems elements, including ATMS and SynchroGreen throughout Palo Alto. Mr. Cheek also oversaw the database conversion and installation of approximately 100 traffic controllers. Most notably, Mr. Cheek also played an important role designing the City of Palo Alto's Connected Vehicle Module, which was a Best in ITS National Finalist in 2016, whereby traffic signal data is broadcasted in real time to auto manufacturers in Silicon Valley. The City of Palo Alto's system also involved a public broadcast system, CCTV cameras, as well as the installation of over a dozen new NEMA traffic signal cabinets.

Brevard County SynchroGreen/ATMS *(Brevard County, FL)* – (March 2012 – December 2016)

Project Manager for one of the largest ASCT implementations in the United States. This design-build project involved the installation of SynchroGreen at 101 intersections in Brevard County, Florida. Extensive simulation of SynchroGreen adaptive operations was performed and the creation of custom signal controller logic and functionality. Controller software and ATMS was installed to monitor and control the adaptive system, along with installation of controllers. SynchroGreen integration with various detection technologies was a major part of this project (video, inductive loops, magnetometers).

Shaun Alford

Product Manager

Mr. Alford has over 18 years experience in the traffic signal sector. Both in the field and in-office, his knowledge of traffic systems and products is extensive.

EDUCATION
Hallettsville High School
1996

REGISTRATION & CERTIFICATES
IMSA Level III
Journeyman Electrician

Cubic Transportation Systems
Product Manager – Controller Software and Adaptive Applications
January 2022-Present

Product Specialist – Controller Software
March 2020-January 2022

Trafficware
Field Application Engineer – Support and Services with Controllers and Cabinets
April 2015-March 2020

Siemens
Field Supervisor – Managed Signal Construction and Maintenance Crews
April 2011-October 2014

Mica Construction Corp
Signal Construction – Bottom Up Construction for Traffic Signals
May 2005-February 2011

Committee Involvement:
NTCIP
NEMA
CTI WG

Project Experience:
- 6 TSP Projects
- 3 yrs with City of Houston performing conversion and install support for Controller software upgrade
- 4 SynchroGreen installs
- 2 LRT Projects
- 2 BRT Projects

D. Technical Proposal

D.1. Product Information

D.1.1. Scout Local Controller Software

Scout Local Controller Software offers the most feature-rich and versatile intersection operation in the industry. Scout Local Controller Software features provide flexibility and can be applied in almost any type of traffic signal control scenario. Scout Local Controller Software is built on nearly four decades of experience in the traffic control and ITS industry, as well as input from our loyal customers. Scout Local Controller Software is compliant with ATC, NEMA, and NTCIP standards, and is native on all new Cubic Commander Controllers as well as newer 2070LX controllers operating ATC V.6 engine boards.

Scout Local Controller Software has proven to be an efficient and cost-effective way for agencies to drastically improve traffic signal operations, simply by installing the software. Features such as advanced coordination logic, multiple pre-emption recovery modes, flashing yellow arrow (FYA) support and custom I/O logic statements allow the flexibility that progressive agencies desire to provide the best service to the motoring public. Scout Local Controller Software delivers the following features and much more:

- Browser Based GUI and Web Interface for Remote Control Capabilities
- 32 Vehicle and Pedestrian Phases and 32 Overlaps
- 8 Alternate Signal Timing Tables
- 253 Coordination Patterns
- Coordination Synchronization Modes (Long, Short, Dynamic Short)
- NTCIP-based Scheduler with Easy Scheduler Feature
- Purdue High Resolution Data Logging
- Flashing Yellow Arrow (FYA) Support & Mapping
- Pedestrian Friendly FYA Support
- 16 Pre-emption Routines
- 128-Channels of Detection with Failure Diagnostics
- Full Status and Diagnostics Screens
- 100 Boolean I/O Logic Statements
- Real-Time I/O Status Viewer
- Re-assignable I/O in any mode
- Peer-to-Peer capability

Cubic recently joined the Free the MIBs movement and openly shares NTCIP and proprietary MIB libraries for Scout Local Controller Software at https://www.cubic.com/freethemibs-scout-controller#.104 Third-party vendors, such as central system software providers and those providing pre-emption services for emergency vehicles or transit, have obtained the Scout MIBs and routinely address our controllers to obtain status and execute pre-emption requests, amongst other functionalities. Free the MIBs demonstrates Cubic's desire to develop *Open Platforms* and allow our customers to select the best solutions to suit their needs.

The latest version of Scout software, 85.4, is compliant with the following NTCIP standards:

- NTCIP 1103 v01, Transport Management Protocols
- NTCIP 1201 v01, Global Objects (GO) Definitions
- NTCIP 1202 v03A, Object Definitions for Actuated Signal Controllers (ASC) Interface
- NTCIP 1211 v01, Object Definitions for Signal Control and Prioritization (SCP)

In fall 2023, Scout will implement the latest NTCIP 1211 v02 standards and introduce an updated TSP algorithm as part of Scout 85.5.

Scout Local Controller Software (v.85.3 or later) is equipped with our latest web browser interface which allows users to remotely control, monitor, and view real time operations, logs and reports, just as if they were at the intersection.

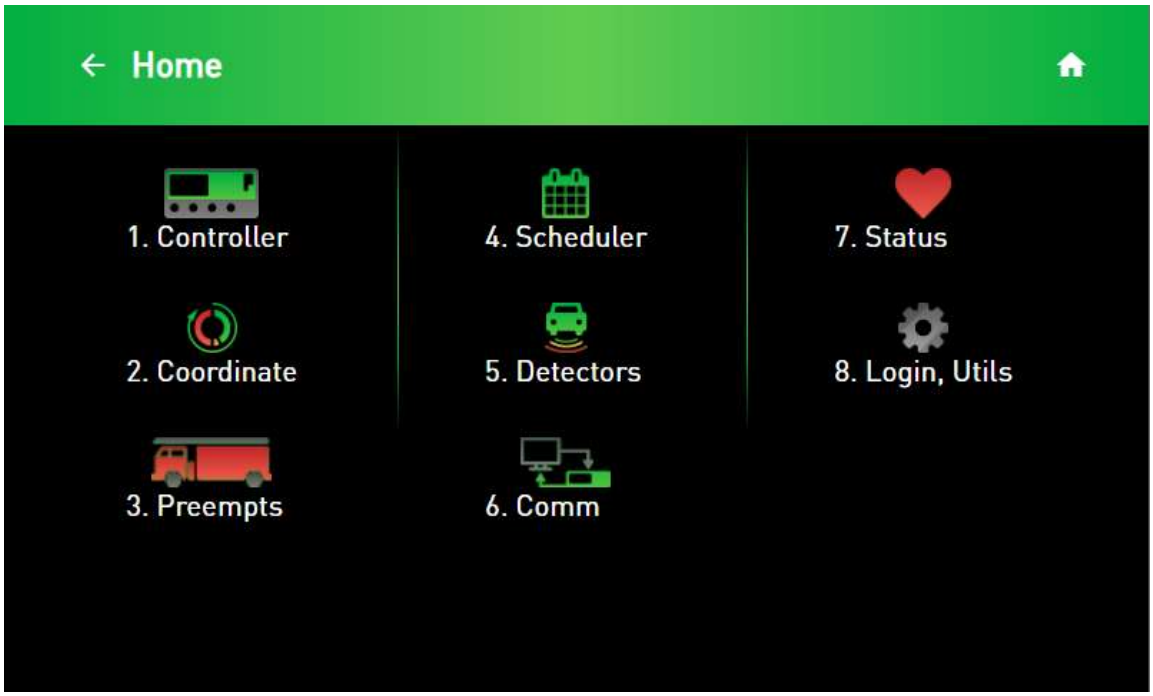


Figure 1 – Scout Web Interface

Cubic will be implementing Over the Air (OTA) updates for Scout software using ATMS. This feature will be rolled out in phases over Scout versions 85.5 and 85.7. The first phase will allow for remote download of the latest Scout software to the controller through ATMS. The update will first download the software, perform a diagnostic to ensure a successful update, and then require the controller to be restarted (flash required). The second phase of the OTA update implementation will be rolled out in Scout 85.7 and will allow for OTA updates without a controller restart (no flash required). Scout 85.7 will include a change to standard ring logic and the implementation of an "all red" interval in order to implement updated controller software. The OTA update represents a fundamental change in how controller software has been updated in the past, where traditionally, controller software was "set it and forget it." The OTA update will allow customers to benefit more from their controller software and implement the latest features to improve intersection safety and operations.

D.1.2. Rackmount Commander Controller

The Commander utilizes a Linux-based platform and represents Cubic's next generation of traffic controllers. The Commander has a 7-inch color LCD touchscreen display powered by a separate graphics processor, as well as a standard keypad. The Commander has 128 MB SDRAM, 256MB of Flash memory and SD card receptacle for additional storage. The controller is equipped with five (5) 10/100 Ethernet ports and three (3) USB 2.0 ports that allows the user to quickly update controller software and upload/download databases using a standard USB flash drive. The Commander controller comes in shelf mount or rack mount form factors. Detailed Commander specifications for the rack mount configuration is provided as follows:

Figure 2 - Rackmount Commander Controller

ATC Engine Board

- PowerQUICC 2 Pro @ 400MHz
- 2nd QUICC (communications processor) for port expansion
- 128MB DDR2 SDRAM
- 256MB NAND Flash
- 2MB SRAM (with SuperCap-backed supply voltage – non-volatile)
- Linux version 3.4.118
- SD Card receptacle with high-speed SDIO interface (internal)

Graphics Processor Unit

- ARM Cortex-A7 Processor @ 800MHz
- 256MB DDR3 SDRAM
- 256MB NAND Flash
- Two 10/100 Mbit Ethernet Ports
- USB 2.0 High-speed port
- TFT LCD Interface
- Linux version 4.5

User Interface

- Display
  - 7-inch Color 800 x 480 TFT, high-brightness/sunlight readable display
  - Resistive touch panel
- Keypad
  - 29 keys
  - Model 2070 key assignments are provided
  - Model 980 key assignments and methodology are maintained
  - 0.8 inch spacing (center-to-center)
  - Metal dome tactile switches
- Speaker supports tones and audio

- Active LED Indicator
- Graphical Mode and Classic Text mode software interface

Communication Interfaces

- 2 Ethernet switches, one per Engine Board Ethernet interface
- 5 10/100 Ethernet Ports
  - 2 Ethernet ports per switch
  - 1 Ethernet port to Graphics Processor
- 3 USB 2.0 High-speed Ports
  - 2 USB Ports from Engine Board
- Serial Ports
  - NEMA TS-2 Port 1 – SDLC EIA-485 at 153.6Kbps nominal
  - NEMA TS-2 Port 2 – ASYNC EIA-694 (232) to 230.4 K-Baud, with modem control
  - ATC Console Port – ASYNC EIA-694 (232) to 230.4 K-Baud
- Communications Card Slot
  - Dual serial channels – SP1 and SP2
  - 10/100 Ethernet port access

Removable Storage

- Optional SD Card – 512MB – 8GB
- Optional Datakey – 3.3V, 2Mb-32Mb

Physical

- Size: 6.75” H x 19” W x 10” D
- Recessed surfaces for Datakey, SD Card and communications slot
- Moisture-sealed touch-panel and keypad

Electrical & Environmental

- Voltage: 89 – 135 VAC, 60 Hz
- Power: 20 – 90 Watts
- Temperature: -37 deg. C to +74 deg. C
- Humidity: 95 percent or less, non-condensing

D.2. Responses to Questions

1. Description of the services for which the Proposer is able to provide. In responding, please use the categories identified in the Scope of Services and Appendices A and B of this RFP.

Cubic ITS is able to provide products and services for all three desired categories:

Product Category 1: Advanced Traffic Signal Controller Systems Software
Product Category 2: Advanced Traffic Signal Controller Systems Hardware
Product Category 3: Advanced Traffic Signal Controller Systems Products and Services

Pricing for each category and specific items are in Section F.

2. Description of the Proposer’s process for responding to an order for product.

General procedures for customer order submission:

- All purchase orders must originate from a quote or contract generated by a Cubic ITS business development manager (BDM) or authorized distributor. All quotes/contracts must be active and not beyond stated expiration/termination date.
- Customers are required to submit all orders to their regional Cubic ITS BDM or authorized distributor.

- All orders must match quote or contract pricing, part numbers and quantities. Buyers may not attach additional terms beyond those stated in Cubic ITS quotes or contracts, or attempt to supersede any previously agreed upon terms or those stated in the quote or contract.
- Upon submission, buyers may be subject to credit checks. Buyers may also be required to submit valid tax information, including tax exemption forms. Buyers will also be required to provide points of contact, and information regarding where Cubic should send invoices.
- Upon successful order entry, buyers will receive an order confirmation from the Cubic ITS BDM or distributor.

3. Description of the Proposer's process for delivering orders to respective clients.

All software items will be delivered electronically. Buyers will receive a link to download the latest software once the buyer's purchased order has been accepted. Cubic ITS support will then contact the buyer directly to arrange for the distribution of any licensed software.

Once a buyer's order is received and it contains hardware items, the buyer will receive a ship date estimate from the Cubic ITS BDM. Cubic ITS BDMs will keep the buyer appraised of all shipped hardware items and will provide any freight tracking information.

4. Description of the Proposer's customer satisfaction services, to include any warranty and/or repair capabilities.

All support issues may be submitted to Cubic via our online support portal (http://cubicits.freshdesk.com). On average, Cubic has over a dozen qualified systems technicians and engineers (agents) available during business hours to remotely assist customers with support inquiries. Cubic contact information for all support inquiries is below.

Cubic ITS, Inc.
522 Gillingham
Sugar Land, TX 77478
Support Hotline: 1-(800)-952-7285
Website: http://cubicits.freshdesk.com
Hours: Weekdays (Excluding Holidays) 7AM – 7PM CT

Customers will also be provided the phone number for their regional Field Application Engineer (FAE). This phone number will be used for urgent support items that require after-hours assistance.

Once the request is sent via phone or email, it will be entered into Cubic's Support system (Freshdesk). The support system will automatically generate a ticket number and will email this ticket number to the agency staff member reporting the issue (email receipt). The staff member may reply to the email receipt to provide additional information regarding the issue or to communicate with Cubic agents. The agency staff member reporting the issue should provide the following information:

- Name
- Phone Number
- Email Address
- Product causing the issue
- Description of how to replicate the issue, with screen shots, databases, reports, etc.
- Priority Level (Cubic has a support document that explains different levels – Urgent, Critical, High, etc.). That document can be made available upon request.

The metrics relate to response times and time to triage – times will vary based on the complexity and nature of the specific issue. Response times are defined as the time between when the issue is first reported by an agency member and when a Cubic Support Team member (agent) replies to the agency staff member reporting the issue. Responses may be provided by phone or email and will be accompanied by a support ticket number. Triage relates to the time between when the issue is first reported by the agency staff member and when the issue can be resolved to a point where service is restored, or where a reasonable temporary solution can be applied until a permanent solution can be implemented. In some cases, permanent solutions may require specific expertise or development to correct the issue. In such cases, Cubic will make every effort to rectify the issue in a timely manner. Below are target metrics for response and triage times related to different priority levels and summary definitions. Note, that all hours are business hours as defined at the beginning of this section.

- **Response times**: Time between when the issue is first reported by an agency member and when a Cubic Support Team member (agent) replies to the agency staff member reporting the issue. This will include a support ticket number.
- **Triage**: Time between when the issue is first reported by the agency staff member and when the issue can be resolved to a point where service is restored, or where a reasonable temporary solution can be applied until a permanent solution can be implemented.

Table 2 - Service Level Targets

Priority	Response (Hours)	Triage (Hours)
Critical (software)	Immediately (<4)	Immediately (<8)
Urgent/High	4	8
Normal	8	24
Low	24	72

Below is a basic workflow of Cubic's support system. During the project, the Cubic Project Manager will manage this process for the agency. After the project concludes and the systems have been accepted, the agency may enter and track support requests using the Cubic ITS online support portal http://cubicits.freshdesk.com. Important milestones in this process are the *Response*, when a Cubic ITS agent (support personnel or technician) contacts the agency, as well as when the issue is triaged or resolved. The target service levels associated with these milestones are noted in Table 2. If an issued is triaged and requires escalation to Cubic ITS's software development or hardware engineering teams, these teams will develop a solution for the agency as quickly as reasonable. Once this solution is developed, it will be re-tested by Cubic ITS's agent until the issue is resolved. Additional warranty related to hardware and software products is provided in Exhibit A.

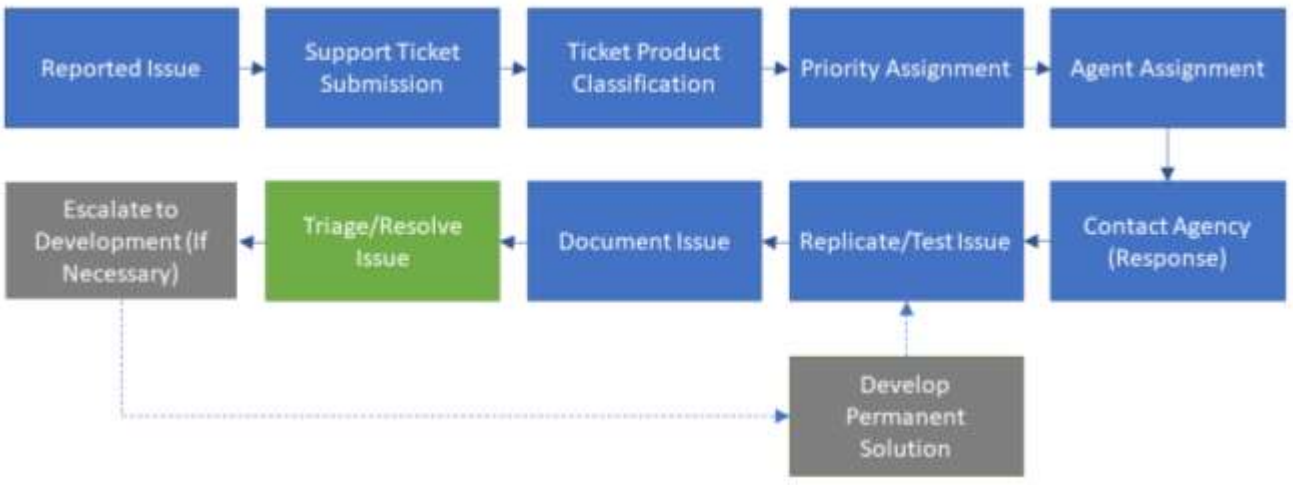


Figure 3 – Cubic ITS Support Escalation Process

5. Description of the Proposer's invoicing process used by the Proposer.

Once items have shipped to the buyer, Cubic will invoice the customer electronically based on information provided by the buyer. All default Cubic Incoterms are FOB Origin. All Cubic payment terms are NET30.

6. Any assumptions made in responding to the requirements.

None.

7. Any exceptions to the requirements. If there are no exceptions, Proposer shall explicitly state that no exceptions are taken to any part of this RFP. Offer must be in compliance with stated term and conditions unless NCTCOG accepts identified exceptions of the Proposer.

See responses to specifications in Section D.3 for any deviations from specifications/requirements.

8. Any special features or services the Proposer is proposing in response to the requirements that are included within the pricing provided.

See Section F for all items proposed and related pricing.

D.3. Responses to Specifications

Section	Specification	Satisfies (Yes/No/Partial)	Response
SPECIFICATIONS			
5.8	**Compatibility with Traffic Signal Controller Hardware** The selected software shall be fully functional on a wide variety of ATC hardware, regardless of manufacturer. Proposers should recognize that over the course of the life of the software, the ATC could be provided by multiple vendors. It shall be the responsibility of the selected vendor to provide detailed hardware requirements for proper functionality of the local controller software, including but not limited to, minimum processor speed, memory and cache requirements, on-board storage requirements, and supported display screen configurations.	Yes	Scout software is designed for Linux OS, and for controllers that operate according to the ATC 5201 standard. Minimum hardware requirements include PowerPC processor, 32MB DRAM, 16MB Flash Memory. When installed on another manufacturer's hardware, Cubic requires that the manufacturer provides a board support package (BSP), for every board revision and for every component within the controller. Cubic also requires that the hardware manufacturer is involved in the process. Cubic also requires that the hardware manufacturer provides two (2) controllers for every revision of the hardware where Scout software is to be installed.
5.9	**Commercially Available Off-The-Shelf Software** TXShare expects that commercially available Off-The-Shelf (COTS) software will meet a vast majority, if not all, of the requirements contained in this specification. Minor software enhancements will be allowed to existing COTS software packages to meet all requirements. Any required software enhancements to comply with this specification must be identified and detailed in the responder's submittal. To be considered as COTS software, the proposed software should be currently available and operating in the field at a minimum of 200 intersections.	Yes	Cubic has noted compliance in this document, as well as any exceptions.
5.10	**Cabinet Types**	-	-

5.10.1	The Software must be configurable to operate in the following cabinet types: (1) Caltrans Model 332 (2) Advanced Transportation Controller Cabinet (based on ATC Cabinet Standard ATC5301 v02.02) (3) NEMA TS 1 (4) NEMA TS 2	Yes	Scout software has been installed on NEMA (TS1 and TS2) cabinets, ITS, 33X and ATC cabinets. Scout software has easy configuration menus to automatically configure inputs/outputs for different cabinets and configurations.
5.11	**Software License**	-	-
5.11.1	TXShare Participating Entities will consider the following licensing options for the software: (1) Per individual controller installed on hardware provided by the vendor. (2) Per individual controller installed on hardware not provided by the vendor. (3) City-wide (i.e., enterprise) license installed on hardware provided by the vendor. (4) City-wide i.e., enterprise) license installed on hardware not provided by the vendor.	Yes	Scout software is licensed on a per controller basis, whether provided by Cubic or other. Cubic does not offer agency-wide licensing for Scout software.
5.11.2	The software licensing agreements shall indicate: (1) Perpetual use of the software. (2) The conditions in which the software applications may be used and any restrictions regarding the use of the software. (3) The maintenance and support period for the software applications including software updates and upgrades. (4) The cost of the rights for a TXShare Participating Entity to use the software. (5) TXShare Participating Entity's rights to obtain access to source code generated through the development of any custom functionality.	Yes	Scout software licensing information is provided in Exhibit A and B of this document. No terms shall supersede this document. Cubic does not allow access to any source code under any circumstances.

	(6) Any warranty terms as well as any liabilities relating to the TXShare Entity's use of software.		
5.12	**Product Life** The selected local controller software product shall have a minimum product life of 10 years. During the life of the product, the provider shall maintain and upgrade the product to prevent the software from becoming obsolete, provide technical support, and maintain security against existing and future external threats as defined in the licensing agreement.	Yes	See Exhibit A for software warranty. No terms shall supersede this document.
5.13	**Warranty**	-	-
5.13.1	Warranty period The selected provider shall warrant that the software will perform in accordance with this specification for a period of ten (10) years from the initial delivery and acceptance of the software by a TXShare Participating Entity. During the initial warranty period, the selected provider will, at no cost to the TXShare Participating Entity, rectify any faults in the software identified by the TXShare Participating Entity and communicated to the selected vendor, provide software upgrades, and conduct initial and major version update training.	Partial	See Exhibit A for software warranty. No terms shall supersede this document. Cubic's software warranty is one (1) year. Agencies may purchase additional years of warranty from Cubic for software, up to five (5) years.
5.14	**Failure to Maintain Support** Should the vendor discontinue support and/or fail to maintain the selected software system during the product life, the TXShare Participating Entity may elect to implement either of the following remedies:	-	-
5.14.1	Alternate Vendor-Supplied Replacement Replace the originally supplied software with a vendor-supplied alternate system that meets or exceeds the requirements defined in this specification. Under this remedy, the vendor shall be	Yes	Cubic agrees to this term under 5.14.1 only.

	required to demonstrate that the new software meets all requirements by repeating the acceptance tests. If the TXShare Participating Entity selects this option, the vendor shall be responsible for all costs incurred by the TXShare Participating Entity to replace the software.		
5.14.2	Acquire and Install New Local Controller Software The TXShare Participating Entity shall have the right to select, acquire, and install local controller software provided by another Vendor that meets or exceeds the TXShare Participating Entity's requirements defined in this specification. If the TXShare Participating Entity selects this option, the existing vendor shall be responsible for all costs to the TXShare Participating Entity to purchase, install, and test the new software as well as cost incurred in training staff to operate and maintain the new system.	No	Cubic does not agree to this requirement.
5.15	**Industry Standard Nomenclature** All names, labels, data elements, and other descriptions within the software shall be defined in English using industry standard, easily understood nomenclature. All nonstandard nomenclature shall be approved by the TXShare Participating Entity. Hexadecimal numbers are not permitted.	Yes	Scout software is based on nearly 40 years of experience designing and manufacturing traffic controllers and software in the North American traffic signal control market. Scout software complies with NEMA, NTCIP and other common standards common in North America.
5.16	**Security**	-	-
5.16.1	Passwords The software shall be configurable to enable/deny access to the controller through user passwords. User access and passwords shall be definable by the software administrator. (1) Security levels shall include view only, access to change timing parameters only, access to change	Yes	Scout Local Controller software allows up to 64 separate password logins; each login is required to enter a valid user number and access code. The level of security can also be assigned for each user which allows variable access to each user depending on their assigned permissions, duties, etc. All user logins are timestamped, and note the

	controller unit configuration, and access to on-board software administration functions. (2) As security levels increase, the user will be able to access and change more features in the software and each level shall include access to all lower levels. (3) The software shall log the user ID, date, and time of log-in and log-out and any changes the user made. (4) The software shall automatically log out the last user after a user specified amount of time has passed where there was no front panel activity or activity from a remote connection.		user login and logout, these are typically downloaded to Cubic's central system software for permanent logging. Automatic logouts are defined by the Display Timeout feature that can be set to permanently keep users in or log them out to a definite value 1-254 minutes.
5.17	**Accessibility**	-	-
5.17.1	Accessibility Options All controller objects and functions shall be accessible for configuration, editing, and saving through any of the following means: (1) Direct keyboard entry on the local controller front panel (2) Authorized remote device connected directly to the Ethernet port on the local controller front panel. (3) Supported web browsers via the Local Controller's built-in web server. (4) Central Traffic Management System	Yes	Scout software allows users to utilize the alphanumeric keyboard, or Cubic's StreetSync companion tool to edit settings in the field. Additionally, Scout has a built-in web user interface (UI) that allows users to access the controller remotely using a standard web browser. Scout software can also be access using Cubic's central management system software (ATMS) or other central management system software that have implemented the Scout MIB.
5.17.2	Exceptions Exceptions to this requirement include the following objects which should be configurable via the controller front panel only: (1) IP Address and local controller network configuration (2) Unit or Station ID Number	Yes	Scout software prevents remote editing of the controller's IP address and critical network configuration, as well as the controller's station ID.

5.17.3	Web Browsers The software shall support accessibility to all software objects and functions through any current or future versions of Google Chrome, Safari, Microsoft Edge, and Firefox throughout the duration of the product life as described above. (1) Access using a Web Browser shall comply with the security requirement defined in Section 3.10 of this specification. (2) The Software shall support web browser access and all functionality through any of the following devices: (a) Computer (b) Smartphone (c) Tablet (3) All status objects shall be refreshed by the web browser automatically. The refresh shall have a latency of less than 2/10 of a second after a value change occurs. (4) The software shall be accessible from a web browser on any device without the need for additional software or browser plugins (i.e., Flash, Java, or Silverlight).	Yes	Scout has a built-in web user interface (UI) that allows users to access the controller remotely using a standard web browser. The Web UI can be accessed using any standard web browser.
5.18	**User Manuals**	-	-
5.18.1	Updates The Vendor shall maintain user manuals updated to the latest released software version. The TXShare Participating Entity shall receive electronic notification when an updated user manual is published.	Yes	All Scout manuals are available on Cubic ITS's support site, https://cubicits.freshdesk.com
	Format User manuals shall be provided in electronic format, downloadable from a vendor provided web page.	Yes	All Scout manuals are available on Cubic ITS's support site, https://cubicits.freshdesk.com

	Local Controller User manuals and/or help screens shall be resident in the controller and accessible through the controller front panel.	Yes	Users can access the Controller's help menu within Scout Software by press "F" or "ALT" twice.
5.19	**Software Updates**	-	-
5.19.1	Notification (1) The TXShare Participating Entity shall be automatically notified by the vendor when software upgrades are available. (2) The automatic notice should include a link to a vendor's web page with release notes, including a detailed description of all changes to the software and any bug fixes included in the update.	Yes	Cubic will typically send press releases or emails to customers when new versions of Scout software are available. Users may download the latest Scout software on Cubic ITS's support site, https://cubicits.freshdesk.com. The software download includes are current and archived release notes.
5.19.2	Remote Software Downloads (1) The software shall allow users to download upgrades to the local controller software from a remote location (i.e., central management system or remote device) without requiring the traffic signal to be placed in flashing operation.	Future	Cubic is currently developing an over the air (OTA) update system to update Scout local controller software from ATMS. This system will first be released in Fall 2023 and will allow customers to update controller software remotely using ATMS (Phase 1). A subsequent development effort will be performed in 2024, that will allow the OTA update to occur during an all-red condition, as opposed to putting the traffic signal in flash.
5.19.3	Flash Memory The upgraded software shall reside in flash memory in the local controller unit and not automatically replace the existing software in the controller unit.	Future	Cubic is currently developing an over the air (OTA) update system to update Scout local controller software from ATMS. This system will first be released in Fall 2023 and will allow customers to update controller software remotely using ATMS (Phase 1). A subsequent development effort will be performed in 2024, that will allow the OTA update to occur during an all-red condition, as opposed to putting the traffic signal in flash.
5.19.4	Implementation Options 1) Once downloaded, the user shall have the ability	Future	Cubic is currently developing an over the air (OTA) update system to update Scout local controller

	to activate the software at the beginning of the next signal cycle, upon next reboot, or schedule the time and date when the software will be activated. (2) If the software upgrade is considered minor, the user shall be able to remotely replace the existing software while the controller is still operating and shall not require a controller restart. (3) If the software upgrade is considered major, a controller restart may be required to replace the existing software. (4) Any scheduled upgrades shall not take place before their scheduled time and date (if any) due to either a controller reboot or in the event of a power failure. (5) The software provider shall submit their definition of minor and major upgrades for City approval.		software from ATMS. This system will first be released in Fall 2023 and will allow customers to update controller software remotely using ATMS (Phase 1). A subsequent development effort will be performed in 2024, that will allow the OTA update to occur during an all-red condition, as opposed to putting the traffic signal in flash.
5.19.5	Installation Verification (1) The controller software download utility software shall verify that the upgraded software was successfully downloaded to the controller unit without errors.	Yes	The Scout software allows remote systems to view the version of software, this will verify that the software was upgraded correctly.
5.20	**Management Information Base (MIB)**	-	-
5.20.1	Documentation (1) Software documentation shall include all NTCIP standard MIBs and extensions, developer-specific MIBs, and all SNMP/STMP data elements.	Yes	Cubic ATMS and Scout Local Controller Software have several integration options allowing third party systems to interact with our systems. In November 2021, Cubic Joined ***Free the MIBs***. Cubic now has joined several other ITS solutions providers and now openly shares our NTCIP and proprietary MIB libraries for Scout software. Cubic's Scout MIBS are openly available at *https://www.cubic.com/freethemibs-scout-controller#.*

5.20.2	Re-distribution and Re-use Rights (1) The Vendor shall not place any limitations on the re-distribution and re-use of the MIB. The TXShare Participating Entity shall be able to re-distribute and/or re-use the MIBs as required to provide the required functionality defined in this specification.	Yes	By using Cubic's Scout MIBs, users must agree to all Cubic terms and conditions. No other document may supersede Cubic's Terms and Conditions regarding MIB usage.
5.20.3	MIB extensions (1) All MIB extensions shall be clearly defined. Primarily, all extensions shall be accomplished by the following methods: (a) Extending the capabilities of existing standard features. (b) Defining new data elements or features under a developer-specific MIB extension. (2) To the extent possible, the replacement of a partially complete feature with a complete custom feature shall be avoided.	Yes	Cubic's Scout MIBS are openly available at *https://www.cubic.com/freethemibs-scout-controller#.*
5.21	**Virtual Controller Application**	-	-
5.21.1	Appearance (1) The virtual controller application shall duplicate the appearance and functionality of the web-based user interface.	Yes	Agencies must purchase a minimum of 20 Scout Licenses, and Cubic will provide one (1) license for our Scout Virtual Controller at no additional charge.
5.21.2	Database Programming (1) Users shall be able to create and/or edit controller databases in the virtual controller application.	Yes	The Scout Virtual Controller operates the same as a normal controller. Users may emulate various inputs and view outputs (signal states: red, yellow, green, etc.)
5.21.3	Import/Export (1) Users shall be able to import/export controller databases to/from the virtual controller application.	Yes	Users may use Cubic's standard .STD file format in the Scout Virtual Controller.

5.21.4	Software Upgrades (1) Users shall be able to upload new versions of the software to the Virtual controller application or download an updated virtual controller application from the vendor's website. The vendor shall make updated versions of the virtual controller software available within 60 days of the release of the new local controller software.	Yes	When Cubic releases new Scout Local Controller Software, users must obtain a new version of the Scout Virtual Controller.
5.22	Training	-	-
5.22.1	Initial Training Following the initial delivery of the software, the selected Vendor shall provide a minimum of sixty (60) hours of initial training on the software. Training will be tailored to the specific audience and their roles in operating and/or maintaining the software. The Training audiences will include traffic operations engineers, traffic management center staff, and public works maintenance staff. Training may be provided through formal in-person sessions, online meeting platforms (i.e., Zoom, Teams), or through prerecorded video (i.e., YouTube). A minimum of 40 hours of training shall be provided in the in-person format.	Yes	Cubic has included prices for 60 hours of training Section F, Pricing. All 60 hours are assumed to be in person.
5.22.2	Annual Training Throughout the product life, the selected vendor shall annually provide an additional eight (8) hours of training for City personnel. Annual training may include, at a minimum, any of the following types of training. (1) Training of new personnel (2) Training specific to new software features (3) Training specific to operational changes introduced in software upgrades.	Yes	Cubic has included prices for eight (8) hours of Scout training in Section F, Pricing.

	(4) General refresher training.		
5.22.3	Training Goals and Objectives Each training session shall have established goals and objectives for the session.	Yes	Cubic has a standard training agenda and format. Instructors will provide an updated agenda prior to every training session.
5.22.4	Training Materials The vendor shall provide electronic copies of all training materials required to facilitate effective and efficient training sessions.	Yes	All Cubic ITS product manuals are available on our support website, https://cubicits.freshdesk.com. Cubic instructors will make electronic copies of specific presentations during training.
5.22.5	Training Effectiveness At the end of each training session, the vendor shall measure the effectiveness of the training session against the session's stated goals and objectives. The vendor shall identify the process that will be implemented to measure training effectiveness. Typical ways to measure training effectiveness could include post-training quizzes, one-to-one discussions with participants, surveys, and/or participant case studies.	Yes	Cubic has a standard training agenda and format. Instructors will provide an updated agenda prior to every training session. Effectiveness will be measured through brief quizzes throughout the training, as well as participant feedback at the end of the training course.
FUNCTIONAL REQUIREMENTS			
5.23	**NTCIP 1202 v03**	-	-
5.23.1	Compliance (1) The Software shall be compliant with NTCIP 1202 v03 as defined and extended in this specification, including all functional requirements marked as required in the Protocol Requirements List (PRL). Note: NTCIP 1202 v03 includes normative references (as presented in Section 1.2.1 of the 1202 standard) which are referenced in the standard and, in total, constitute the complete provisions of the standard.	Yes	Scout software is compliant with NTCIP 1202 v03A, and will adopt NTCIP 1202 v03B once this standard is adopted.
5.23.2	Requirements Traceability Matrix (RTM) (1) The RTM provided in Annex A of the NTCIP 1202 v03 Standard is included in this specification by	-	-

	reference.		
5.23.3	NTCIP 1202 v03 Project Specific Requirements List (1) Section 3 of NTCIP 1202 v03 defines the Functional Requirements based on user needs identified in Section 2 of the standard. Each user's need is mapped to one or more requirements in the Protocol Requirements List (PRL). The TXShare Participating Entity has selected the requirements defined in the PRL that meet their needs. These are identified in a TXShare Project Specific PRL attached as Appendix A to this Specification.	-	-
5.23.4	Future Upgrades (1) If not currently available, The TXShare Participating Entity will allow functional requirements presented in the following sections of the PRL to be delivered as a future software upgrade, provided the upgrade is provided within two years of the initial software delivery. 2.5.4.1.1. Manage RSU Interface 2.5.4.1.2 Manage RSU Interface Watchdog 2.5.4.2.1.Manage Roadway Geometrics Information 2.5.4.2.2. Manage Movement Configuration for Connected Vehicles 2.5.4.2.3. Manage Collection of Connected Devices Data 2.5.4.2.4. Monitor Broadcasted MAP Messages	Partial	CTI 4501 and 1202 v4 are in progress with 1202 v3B soon to be published, which will amend some of these stated standards between RSU and ASC which Cubic will comply with in future updates.
5.24	**NTCIP 1211 v02** TXShare Participating Entities are implementing a pilot project to provide Transit Signal Priority (TSP) for buses along specific routes in their respective locales. The Centralized TSP System will collect data from buses and, if certain criteria are met, generate	Yes	Scout 85.5.0 software is compliant with NTCIP 1211 v02, with PRS and CO located in the controller as stated.

	a TSP request that is transmitted to the TXShare Participating Entity's traffic management system for action. The Centralized TSP system is based on NTCIP 1211 v02. NTCIP 1211 defines the management information base for signal control and prioritization (SCP) systems. It defines individual parameters that represent the configuration, status, and control information that is unique to SCP. Within the standard, NCTIP 1211 defines the following three critical SCP components: • Priority Request Generator (PRG) • Priority Request Server (PRS) • Coordinator (CO) NTCIP 1211 defines the primary functions of these components as follows: Priority Request Generator (PRG) • To produce an estimate of the arrival time at the intersection • To produce an estimate of the time for departure from the intersection. • To send a request for signal priority to the Priority Request Server. • To send and receive the status of a priority request from the PRS. Priority Request Server (PRS) • To receive priority requests from the PRG • To send the status of priority requests back to the PRG. • To prioritize multiple priority requests • To exchange service requests with the coordinator. • To exchange status information with the		

	coordinator Coordinator • To receive service requests from the PRS • To transmit status information back to the PRS • To implement the requested priority strategy Based on the architecture of the Centralized TSP System, the PRS and CO will be located in the local controller.		
5.24.1	Compliance (1) The software shall be compliant to NTCIP 1211 v02 for all functional requirements, dialogs, and objects defined in the Standard for the Priority Request Server (PRS) and the coordinator (CO).	Yes	Scout 85.5.0 software is compliant with NTCIP 1211 v02, with PRS and CO located in the controller as stated.
5.24.2	Existing Software Functionality (1) The PRS and CO shall utilize existing software functionality for time synchronization, event logging, device identify and configuration.	Yes	Scout 85.5.0 software is compliant with NTCIP 1211 v02, with PRS and CO located in the controller as stated.
5.24.3	Requirements Traceability Matrix (1) The Requirements Traceability Matrix provided in Annex A of the NTCIP 1211 v02 is included in this specification by reference.	-	-
5.25	**NTCIP 1211 v02 Project Specific Protocol Requirements List** Section 3 of NTCIP 1211 v02 defines the Functional Requirements based on user needs identified in Section 2 of the standard. Each user's need is mapped to one or more requirements in the Protocol Requirements List (PRL). Conformance to each functional requirement is identified as Mandatory, Optional, Conditional, Not Applicable, or Excluded as defined in Table 1 of Section 3.3.1.1. The TXShare Participating Entity has selected the	-	-

	requirements defined in the PRL that meet their needs. These are identified in a TXShare Specific PRL attached as Appendix B and incorporated into this Specification.		
5.25.1	Compliance (1) To be considered complaint to this NTCIP 1211 v02 and this specification, the software shall include all requirements marked as "Yes" (i.e., required) in the NTIP 1211 v02 PRL.	Yes	-
5.26.	**Extensions to NTCIP 1202 v03**	-	-
5.26.1	Background (1) The NTCIP 1202 v03 Standard does not define every traffic signal control feature, only addressing features in wide use. TXShare Participating Entities have identified additional user needs and functional requirements for the local controller software. This section provides the following information: (a) Defines new functional requirements not included in NTCIP 1202 v03. (b) Defines additional functional requirements for user needs identified in NTCIP 1202 v03.	-	-
5.26.2	General Information (1) Users shall be able to enter the following general Intersection Information into the software. (a) Intersection ID Number (b) Major Street Name (c) Minor Street Name (2) Users shall be able to view the current active software version from either the controller front panel display or through the web interface.	Partial	Scout does not support items b and c. This is due to the fact that the keyboard is not a standard QWERTY keyboard allowing users to enter full alphanumeric characters.
5.26.3	Labels (1) The software shall allow users to enter, at a minimum, alpha-numeric labels for the following:	No	This is due to the fact that the keyboard is not a standard QWERTY keyboard allowing users to enter full alphanumeric characters.

	(a) Vehicle Phases (b) Pedestrian Phases (c) Overlaps (d) Timing Plan Sets (e) Preempts (2) All labels shall be a minimum of six characters in length.		
5.26.4	Peer-to-Peer Communication (1) The local controller software shall support peer to peer communication between local intersection controllers exclusive of a central management system and along the most direct and reliable path allowable by the communication topology. (2) The local controller software shall support transmission and reception of multiple peer messages simultaneously. (3) The local controller software shall be able to transmit peer to peer messages to a minimum of five (5) intersections in all directions from the intersection transmitting the messages. (4) The local controller software shall be able to receive peer to peer messages from a minimum of five (5) intersections in all directions from the intersections receiving the message. (5) A peer message shall be generated and transmitted based on a user defined controller action, event, input, or output occurring at the transmitting intersection. (a) The user shall be able to select any local controller input, output, or event to initiate a peer-to-peer message. (b) Up to five (5) controller actions/events may be grouped together to generate a peer message.	Yes	Cubic's Peer to Peer communication exceeds this requirement and allows communications with up to 15 peers at 0.1 second resolution.

	(6) Receipt of a peer message at an intersection shall result in the initiation of a user defined action/event at the receiving intersection. (a) The user shall be able to select any internal control action/event available in the software. (b) Receipt of a peer message can result in the initiation of up to five (5) user defined controller actions/events.		
5.26.5	(1) The software shall support a minimum of sixty-four logic statements. (2) The software shall support the following Boolean logic gates: (a) OR – if either function is true, the logic channel will be true. (b) AND – if both functions are true, the logic channel will be true. (c) NOT- if the first function is NOT true, the logic channel will be true the second function is not used for this command. (d) XOR- if either function is true the channel is true; if both are true the channel will be false. (e) NOR – If either function is true, the logic channel will be false. (f) NAND – if both functions are true, the logic channel will be false. (g) ORNOT2 – if the first function is true OR the second function is not true, the logic channel will be true. (h) ANDNOT2 – if the first function is true AND the second function is not true, the logic channel will be true. (3) The software shall support the following Logic commands:	Partial	Scout software does not support some of the listed inputs and outputs.

	(a) LATCH – once the first function is true, the logic channel will be true until the second function is true. (b) DELAY AND/OR EXTEND – once the function is true, the logic channel shall not be true until the amount of time in seconds defined by the user has elapsed. After the function changes from true to false, the logic channel shall remain true until the amount of time in seconds defined by the user has elapsed. (i) The range of the delay time shall be from 0 to 255 seconds and defined separately. (ii) The range of the extended time shall be from 0 to 255 seconds and defined separately. (4) The software shall provide the ability to program the following outputs in logic statements: a) Phase green (b) Phase yellow (c) Phase red (d) Phase omit. (e) Overlap green. (f) Overlap (g) Overlap red. (h) Walk (j) Don't walk. (k) Overlap walk. (l) Overlap Pedestrian clear. (m) Overlap don't walk. (n) Phase on (o) Phase next (p) Phase check (q) Phase hold (r) Virtual phase green (s) Virtual phase yellow		

	(t) Virtual phase red (u) LRV green (v) LRV yellow (w) LRV red (x) Force off. (y) Preempt on (z) Preempt entry one. (aa) Preempt entry two. (bb) Preempt dwell. (cc) Preempt off. (dd) Flash (ee) Free (ff). Special Function (gg). Active plan (hh) Special output/time of day (5) The software shall provide the ability include the following inputs in logic statements: (a) Vehicle detector (b) Pedestrian detector/call (c) Overlap detector. (d) Overlap pedestrian detector. (e) System detector (f) Queue detector (g) LRV detector (h) Terminate detector. (i) Vehicle omit. (j) Pedestrian omit. (k) Overlap omit. (l) Overlap pedestrian omit. (m) LRV Omit (n) Phase hold (o) Overlap hold. (p) Walk hold.		

	(q) Overlap walk hold. (r) Preempt train input. (s) Preempt emergency vehicle input. (t) Flash sense (u) Manual control enable. (v) Manual control advance (w) Stop time. (x) Minimum recall (y) External start (z) Walk rest modifier. aa) External coordination enable. (bb) Plan select enable. (cc) External Time set. (dd) Door open (ee) Force off. (ff) Red rest (gg) Max inhibit. (hh) Max 2 (ii). Max 3 (jj) Pedestrian recycle (kk). External plan select (ll). Master sync input (mm). Free select input (nn) MMU flash (oo). Local flash (pp). Automatic flash (qq). Gate down (6) The software shall support a minimum of sixty-four user definable logic statements. (7) The software shall not limit the number of items that can be linked together in logical statements. (a) The software shall process the logic commands every 0.1 seconds.		

5.26.6	Monitor Conflict Monitor/MMU (1) The Software shall be able to report the status of the Cabinet's Conflict Monitor/MMU. (2) The Software shall be capable of retrieving the Cabinet's Conflict Monitor/MMU logs.	Yes	Using ITS or ATC cabinets, Scout software has the ability to report CMU status, including faults and field check faults, as well as output voltage and amperage. Scout software also can integrate with older Naztec monitors and can obtain logs from these units and currently relays them to Cubic's current ATMS system. Note that EDI does not currently have an open API to collect logs from their MMU/CMUs.
5.26.7	Diagnostics (1) The software shall include a diagnostic routine that conducts verification checks on edits and/or downloaded traffic signal controller databases. (2) The verification routine shall automatically run prior to when either of the following criteria exist: (a) A traffic signal controller database is downloaded from a remote management station or when copied from an approved external source. (b) Before edits to a database are saved. (c) Timing changes via the front panel result in a verification failure (3) Any discrepancies identified during the verification check shall be clearly identified and displayed to the user. (a) A description of the discrepancy shall also be displayed. (4) The verification routines shall include, at a minimum, the following checks: (a) Out of range parameters (b) Overlap/phase is activated but yellow and	Yes	Scout conducts coordination diagnostics on active plans, and failures are identified. Scout will not allow entries out of range, nor operate features if programming is incorrect.

	red time below minimums. (c) Pedestrian overlap/phase activated but no detector input assigned. (d) Vehicle overlap/phase activated but no recall or detector input assigned. (e) Walk rest is called for, but the pedestrian minimum is violated. (f) The offset is greater than the cycle length. (g) Coordinated plan phase times do not add up to cycle length unless cycle length is set to zero. (h) Plan has coordination numbers, and transition parameters are not defined, unless cycle length is set to zero. (i) Coordination plan calls for phases with "0" minimum green and/or gap time. (j) Coordination plan calls for phases that are not in the overlap table referenced by the coordination plan.		
5.26.8	Remote Commands: Definitions of remote commands (remote devices directly to the controller's web interface and/or from the Central system. (1) Users shall be able to remotely change between TOD / FREEOP / Remote Flash / Remote Manual Command / Central System Command. (2) Users shall be able to remotely place a detector call and preempt inputs in real-time by checkbox (or similar implementation method) from a real-time status window.	Yes	Users can send remote commands to change the TOD, Free and Flash operation using the Instant Pattern function. All controllers operate using settings programmed locally but are overwritten by a central when an Instant Pattern is initiated. Users can place Phase Calls remotely for vehicle or phase calls. This is done in Cubic's current central system using the Instant Phase Call function.
5.26.9	Manage Phase Configuration (NTCIP 1202 – User 2.5.2.1.2 (1) Users shall be able to configure phases for	Yes	Users can program Scout software allows the use of Conditional Service/Reservice; this function allows users to program a phase to reservice if

	conditional inclusion in a sequence without requiring a programmed split. (2) Minimum and maximum green times shall be programmable by phase for each TOD plan. (3) Users shall be able to select start-up and programed flash entrance/exit phases/phase status/sequence. (4) The software shall provide a rapid transition between TOD plans and at any point when the coordinator is interrupted/preempted while running a coordinated TOD plan. (5) The Software shall support a minimum of twenty-five barrier groups.		there is no demand on any concurrent phases. An example is a leading left turn may reservice if the opposing through movement has already serviced and there is no demand. Scout also three alternate tables that allows for alternate minimum and maximum times for each phase. These alternate tables may be called by time-of-day plan. Scout has several synchronization correction mechanisms to allow signals to resynchronize after pattern changes, these correct methods include dwell, long-way, short-way and dynamic short-way routines. Scout allows users to program up to 32 barriers using the concurrency and ring logic functions.
5.26.10	Manage Coordination Configuration (NTCIP 1202 – User ID 2.5.2.1.3) (1) Coordinated phases shall be assignable for each ring and barrier (i.e., Dual Coordination) (2) The user shall be able to assign phases in different rings and/or barriers as coordinated / reference phases in different TOD plans.	Yes	Users may change the coordinated phase to be any of the 32 allowable phases. The coordinated phase may be any enabled phase in any ring or barrier. The coordinated phase can vary by time of day.
5.26.11	Manage Overlap Configurations (NTCIP 1202 – User ID 2.5.2.1.8) (1) In addition to the overlap types identified in NTCIP 1202, the software shall include a configuration template for a Left Turn – Arlington Display overlap. (2) The software shall support a minimum of sixteen overlap included phases.	Partial	Scout does not support items 6 and 13

	(3) The software shall support a minimum of eight (8) modifier phases for all overlap types requiring such. (4) Users shall be able to configure the overlap clearance times to be driven by either of the following options: (a) Overlap Timing (b) Parent Phase Timing (5) Users shall be able to enable/disable flashing yellow arrow overlaps by time-of-day plan. (6) Users shall be able to able to configure flashing yellow right-turn overlaps to omit green or flashing yellow state(s) based on conflicting Walk and/or Flashing Don't Walk. The following options shall be available. (a) Conflicting Pedestrian Walk – Red or FYA (b) Conflicting Pedestrian Flashing Don't Walk – Red or FYA (c) Conflicting Pedestrian Don't Walk – FYA or Green Arrow (7) Users shall be able to separate delay values for leading and lagging flashing yellow arrow sequences. (8) The software shall support separate delay values for leading and lagging flashing yellow arrow sequences. (a) A lagging flashing yellow arrow sequence shall be configurable for any of the following: (i) Include the All-Red State (ii) Skip the All-Red State (no red-revert) (9) The flashing yellow arrow delay shall be user configurable to suppress the delay upon the start of the opposing through phase.		

	(10) The software shall support the flashing yellow arrow delay/suppression by detector for the entire duration of the opposing phase split or maximum green. (11) Pedestrian overlaps with walk/flashing don't walk times shall operate independently from parent phase pedestrian timing. (12) Pedestrian overlaps shall operate independently from parent phase order as programmed for that overlap (i.e., parent phases 1,2,3 operate the same as parent phases 3,2,1) (13) Users shall be able to program trailing green/green clearance times in one-tenth (1/10) second intervals. (14) Users shall be able to program omits or suppression conditions by phase sequence/phase next.		
5.26.12	<u>Manage Preempt Configurations (NTCIP 1202 - User ID 2.5.2.1.9)</u> (1) The software shall be able to accept preempt requests from either local controller contact closures, remote management station, or central management or centralized vehicle preemption system. (2) The user shall be able to configure overlap settings for each preempt. (3) In addition to the exit phase strategies identified in NTCIP 1202 v03, the software shall support the following exit phase strategies: (a) Free (b) User-defined exit sequence (c) Longest unserved movement (d) Skipped movement(s)	Yes	Scout software allows for traditional preemption inputs, such as contact closure, and has been used with more modern preemption and priority systems that utilize NTCIP or other software-based mechanisms to activate preemption routines in the controller. Scout implements preemption objects from NTCIP 1202, including correction mechanisms upon preemption recovery. Preemption routines allow for settings such as minimum and maximum times related to preemption phases, allowable sequences and even allows multiple preempts to be tied together for more advanced operations. During preemption entry, dwell and exit and users can program allowable phases and which phases

	(e) Exit into coordination. (4) Users shall be able to define minimum and maximum green times per phase for each preempt. (5) Users shall be able to define specific sequences for preemption entry based on active phase condition when a preemption call is received. (6) Phases shall honor detection input throughout preemption and during preempt exit. (7) Preempt exit mode programmable by TOD. May be accomplished through either preemption configuration or via user logic programming.		can be called via detection during different preemption intervals. Allowable phases and sequences during preemption can vary by time of day.
5.26.13	Manage Timing Pattern Scheduler (NTCIP 1202 – User ID 2.5.2.1.10) (1) The scheduler shall support a minimum of 40 day plans, with a minimum of sixty-four events per day plan. (2) The scheduler shall support a minimum of three auxiliary functions and 16 special functions.	Partial	Scout software has 64 day plans, and can select from 48 events. Scout software supports three auxiliary functions and eight (8) special functions.
5.26.14	Manage Detector Configuration (NTCIP 1202 – User ID 2.5.3.1) (1) The pedestrian detector failure behavior shall be user selectable to either “Fail On” or ‘Fail Off.” (a) Users shall be able to select by individual detector and/or detector set. (2) Detectors shall be able to call phases or overlaps. (a) An overlap call shall call all parent phases for that overlap. (3) The software shall allow users to assign more than one call/extend phase per detector. (4) The software shall allow users to call/extend phases by overlap.	Partial	Scout does not support item 1

5.26.15	Monitor Detector Status (NTCIP 1202 – User ID 2.5.3.2) (1) In addition to the number of 128 vehicle detectors identified in NTCIP 1202, The software shall support an additional 320 prioritor and preempt detectors)	No	-
5.26.16	Manage Split Configuration (NTCIP 1202 – User ID 2.5.2.1.5) (1) The software shall allow oversized pedestrian splits to be accommodated through a “stop in walk” method where the controller adds time to the background cycle length or by “reallocating time” from other phases by modifying split times within a user-definable number of cycles to maintain coordination without requiring a coordination transition.	Yes	Within Scout software, S*top-In-Walk* causes the local cycle counter to “stop” during coordination if a force-off is applied to the phase and it is still timing walk or pedestrian clearance. Stop-In-Walk is enhanced by short-way offset correction because the coordinator can usually re-synchronize the offset within one cycle when ped clearance only extends 5 – 10” beyond the force-off.

E. References

Agency: City of Frisco, Texas
Address: 6101 Frisco Square Blvd, Frisco, TX 7504
Contact: Brian Moen, PE, Assistant Director of Engineering
Email: bmoen@friscotexas.org
Phone: 972-292-5450
Products: Cabinets NEMA TS-2, Trafficware 980 Ethernet NEMA TS-2 and 980 ATC, Agency Size 110 Intersections

Agency: City of Pearland, Texas
Address: 2559 Hillhouse Road, Pearland, TX 77584
Contact: Name: Ryan McKinnis, PE A.D. of Traffic Engineering
Email: rmckinnis@pearland.tx.gov
Phone: 281-652-1686
Products: Cabinets NEMA and 33x, Trafficware 2070, Interconnect Fiber Optic, Agency Size 90 intersections

Agency: City of Oklahoma City, Oklahoma
Address: 200 N. .Walker Ave.
Contact: Dennis Haikin, Public Works Dept/Traffic Manager
Email: dennis.haikin@okc.gov
Phone: 405-297-3531
Products: Cabinets NEMA TS-2, Trafficware Commander and 980 ATC, Agency Size 800 Intersections

F. Pricing

Item #	Description	Part #	Quantity	Unit	Unit Price	Extended Price	Notes
Product Category #1: Advanced Traffic Signal Controller Systems Software							
1	Scout Local Controller Software (2070-1C or 980ATC Upgrade) (Quantity 1-10)	97085-6100	1	EA	$ 750.00	$ 750.00	Quantity 10 Controllers or Less
2	Scout Local Controller Software (2070-1C or 980ATC Upgrade) (Quantity 11-50)	97085-6100	1	EA	$ 600.00	$ 600.00	Quantity Greater than 10 Controllers, Up to 50 Controllers
3	Scout Local Controller Software (2070-1C or 980ATC Upgrade) (Quantity >50)	97085-6100	1	EA	$ 525.00	$ 525.00	Quantity Greater than 50 Controllers
4	Transit Signal Priority Scout Module	97085-6400	1	EA	$ 750.00	$ 750.00	Transit Signal Priority License for Scout (license per controller, non-transferable)
Product Category #2: Advanced Traffic Signal Controller Systems Hardware							
5	Shelf Mount Commander with ATC card. TS2, Type 1, Scout Software Included	COM-11020010	1	EA	$ 5,340.00	$ 5,340.00	Shelf Mount Commander with ATC card. Scout Software
6	Rack Mount Commander. C1 Connector. Scout Software Included	COM-41000010	1	EA	$ 5,150.00	$ 5,150.00	Rack Mount Commander. C1 Connector. Scout Software
7	980 ATC Controller TS2, Type 1, Scout Software Included	980ATC-41024080	1	EA	$ 3,530.00	$ 3,530.00	Scout Software Included.
8	ATC Card for Shelf Mount Commander Controller	50247-2000	1	EA	$ 1,680.00	$ 1,680.00	Shelf Mount Commander Controller Required in Addition
Product Category #3: Advanced Traffic Signal Controller Systems Products and Services							
9	Controller Field Installation	96807-1000	10	EA	$ 500.00	$ 5,000.00	Minimum of 10 Controllers Required for Price. Does not include programming. See Item #10.
10	Controller Programming/Database Conversion to Scout Format	96801-1000	10	EA	$ 400.00	$ 4,000.00	Minimum of 10 Controllers Required for Price.
11	60 Hours Training (General Cubic Systems), Onsite	96502-1000	1	EA	$ 18,750.00	$ 18,750.00	RFP Section 5.22.1 - Initial Training
12	8 Hours Training (General Cubic Systems), Onsite	96502-1000	1	EA	$ 2,500.00	$ 2,500.00	RFP Section 5.22.2 - Annual Training, Limit 1 per Year per Agency

G. Required Attachments

TXShare
Your Public Sector Solutions Center

REQUEST FOR PROPOSALS
For
Advanced Traffic Signal Controller Systems
RFP # 2023-092

Sealed proposals will be accepted until **2:00 PM CT, Monday, November 6, 2023** and then publicly opened and read aloud thereafter.

Cubic ITS, Inc.
Legal Name of Proposing Firm

Cameron Cooper — Cubic Sales
Kathy Davis — Cubic Contracts & Bids
Contact Person — Title

281-240-7233 Cameron Cooper
281-269-6504 Kathy Davis
Telephone Number

Cameron.Cooper@Cubic.com
Contract-Bids@Cubic.com
E-Mail Address

522 Gillingham — Sugar Land, TX
Street Address of Principal Place of Business — City/State — Zip

522 Gillingham — Sugar Land, TX — 77478
Complete Mailing Address — City/State — Zip

Acknowledgment of Addenda: #1_____ #2 _____ #3 _____ #4 _____ #5 _____

By signing below, you hereby certify that the information contained in this proposal and any attachments is true and correct, and may be viewed as an accurate representation of proposed services to be provided by this organization. You agree that failure to submit all requested information may result in rejection of your company's proposal as non-responsive. You certify that no employee, board member, or agent of the North Central Texas Council of Governments has assisted in the preparation of this proposal. You acknowledge that you have read and understand the requirements and provisions of this solicitation and that the organization will comply with the regulations and other applicable local, state, and federal regulations and directives in the implementation of this contract. And furthermore that I certify that I am legally authorized to sign this offer and to submit it to the North Central Texas Council of Governments, on behalf of said offeror by authority of its governing body.

Authorized Signature

REQUIRED ATTACHMENT CHECKLIST

Please utilize this checklist to ensure that all required attachments are included with your proposal. IF AN ATTACHMENT DOES NOT APPLY, PLEASE MARK AS "**NOT APPLICABLE**" AND SUBMIT WITH THE PROPOSAL. FAILURE TO SUBMIT **ALL REQUIRED DOCUMENTS** MAY NEGATIVELY IMPACT YOUR EVALUATION SCORE.

- ☒ Page 1 - Cover Sheet
- ☒ Page 36 - Attachment I: Instructions for Proposals Compliance and Submittal
- ☒ Page 37 - Attachment II: Certification of Offeror
- ☒ Page 38 - Attachment III: Certification Regarding Debarment
- ☒ Page 39 - Attachment IV: Restrictions on Lobbying
- ☒ Page 41 - Attachment V: Drug-Free Workplace Certification
- ☒ Page 42 - Attachment VI: Certification Regarding Disclosure of Conflict of Interest
- ☒ Page 44 - Attachment VII: Certification of Fair Business Practices
- ☒ Page 45 - Attachment VIII: Certification of Good Standing Texas Corporate Franchise Tax Certification
- ☒ Page 46 - Attachment IX: Historically Underutilized Businesses, Minority Or Women-Owned Or Disadvantaged Business Enterprises
- ☒ Page 47 - Attachment X: Federal and State of Texas Required Procurement Provisions
- ☒ Page 50 - Appendix A: NTCIP 1202 Protocol Requirements List
- ☒ Page 51 - Appendix B: NTCIP 1211 Protocol Requirements List
- ☒ Page 52 – Appendix C: Service Questionnaire
- ☒ Page 53 – Appendix D: Service Area Designation Forms
- ☒ Page 54 – Appendix E: Pricing Proposal

- ☒ Respondent recognizes that all proposals must be submitted electronically through Public Purchase by the RFP due date and time. All other forms of submissions will be deemed nonresponsive and will not be opened or considered.

ATTACHMENT I:
INSTRUCTIONS FOR PROPOSALS COMPLIANCE AND SUBMITTAL

Compliance with the Solicitation

Submissions must be in strict compliance with this solicitation. Failure to comply with all provisions of the solicitation may result in disqualification.

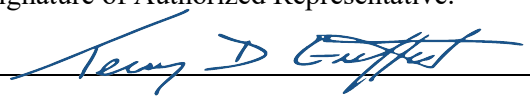
Acknowledgment of Insurance Requirements

By signing its submission, Offeror acknowledges that it has read and understands the insurance requirements for the submission. Offeror also understands that the evidence of required insurance may be requested to be submitted within ten (10) working days following notification of its offer being accepted; otherwise, NCTCOG may rescind its acceptance of the Offeror's proposals. The insurance requirements are outlined in Section 6.04.

Name of Organization/Contractor(s):

Cubic ITS, Inc.

Signature of Authorized Representative:



Terry Griffith
Vice President & General Manager

Date: 10/19/2023

ATTACHMENT II:
CERTIFICATIONS OF OFFEROR

I hereby certify that the information contained in this proposal and any attachments is true and correct and may be viewed as an accurate representation of proposed services to be provided by this organization. I certify that no employee, board member, or agent of the North Central Texas Council of Governments has assisted in the preparation of this proposal. I acknowledge that I have read and understand the requirements and provisions of the solicitation and that the organization will comply with the regulations and other applicable local, state, and federal regulations and directives in the implementation of this contract.

I also certify that I have read and understood all sections of this solicitation and will comply with all the terms and conditions as stated; and furthermore that I, Terry Griffith (typed or printed name) certify that I am the Vice President & General Manager (title) of the corporation, partnership, or sole proprietorship, or other eligible entity named as offeror and respondent herein and that I am legally authorized to sign this offer and to submit it to the North Central Texas Council of Governments, on behalf of said offeror by authority of its governing body.

Name of Organization/Contractor(s):

Cubic ITS, Inc.

Signature of Authorized Representative:

Terry Griffith
Vice President & General Manager

Date: 10/19/2023

ATTACHMENT III:
CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS

This certification is required by the Federal Regulations Implementing Executive Order 12549, Debarment and Suspension, 45 CFR Part 93, Government-wide Debarment and Suspension, for the Department of Agriculture (7 CFR Part 3017), Department of Labor (29 CFR Part 98), Department of Education (34 CFR Parts 85, 668, 682), Department of Health and Human Services (45 CFR Part 76).

The undersigned certifies, to the best of his or her knowledge and belief, that both it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency;

2. Have not within a three-year period preceding this contract been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction, violation of federal or State antitrust statues or commission of embezzlement, theft, forgery, bribery, falsification, or destruction of records, making false Proposals, or receiving stolen property;

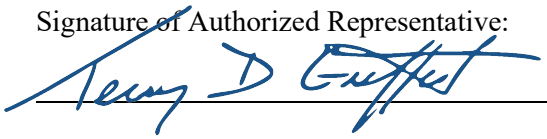
3. Are not presently indicated for or otherwise criminally or civilly charged by a government entity with commission of any of the offense enumerated in Paragraph (2) of this certification; and,

4. Have not within a three-year period preceding this contract had one or more public transactions terminated for cause or default.

Where the prospective recipient of federal assistance funds is unable to certify to any of the qualifications in this certification, such prospective recipient shall attach an explanation to this certification form.

Name of Organization/Contractor(s):
Cubic ITS, Inc.

Signature of Authorized Representative:



Terry Griffith
Vice President & General Manager

Date: 10/19/2023

ATTACHMENT IV:
RESTRICTIONS ON LOBBYING

Section 319 of Public Law 101-121 prohibits recipients of federal contracts, grants, and loans exceeding $100,000 at any tier under a federal contract from using appropriated funds for lobbying the Executive or Legislative Branches of the federal government in connection with a specific contract, grant, or loan. Section 319 also requires each person who requests or receives a federal contract or grant in excess of $100,000 to disclose lobbying.

No appropriated funds may be expended by the recipient of a federal contract, loan, or cooperative agreement to pay any person for influencing or attempting to influence an officer or employee of any federal executive department or agency as well as any independent regulatory commission or government corporation, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered federal actions: the awarding of any federal contract, the making of any federal grant, the making of any federal loan the entering into of any cooperative agreement and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

As a recipient of a federal grant exceeding $100,000, NCTCOG requires its subcontractors of that grant to file a certification, set forth in Appendix B.1, that neither the agency nor its employees have made, or will make, any payment prohibited by the preceding paragraph.

Subcontractors are also required to file with NCTCOG a disclosure form, set forth in Appendix B.2, if the subcontractor or its employees have made or have agreed to make any payment using nonappropriated funds (to include profits from any federal action), which would be prohibited if paid for with appropriated funds.

LOBBYING CERTIFICATION
FOR CONTRACTS, GRANTS, LOANS, AND COOPERATIVE AGREEMENTS

The undersigned certifies, to the best of his or her knowledge or belief, that:

1. No federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an officer or employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal loan, the entering into of any cooperative Contract, and the extension, continuation, renewal, amendment, or modification or any federal contract, grant, loan, or cooperative contract; and

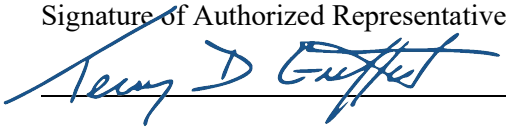
2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, and or cooperative contract, the undersigned shall complete and submit Standard Form – LLL, "Disclosure Form to Report Lobbying", in accordance with the instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers and that all sub-recipients shall certify accordingly.

Name of Organization/Contractor(s):

Cubic ITS, Inc.

Signature of Authorized Representative:



Terry Griffith
Vice President & General Manager

Date: 10/19/2023

ATTACHMENT V:
DRUG-FREE WORKPLACE CERTIFICATION

The Cubic ITS, Inc, (company name) will provide a Drug Free Work Place in compliance with the Drug Free Work Place Act of 1988. The unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited on the premises of the Cubic ITS, Inc. (company name) or any of its facilities. Any employee who violates this prohibition will be subject to disciplinary action up to and including termination. All employees, as a condition of employment, will comply with this policy.

CERTIFICATION REGARDING DRUG-FREE WORKPLACE

This certification is required by the Federal Regulations Implementing Sections 5151-5160 of the Drug-Free Workplace Act, 41 U.S.C. 701, for the Department of Agriculture (7 CFR Part 3017), Department of Labor (29 CFR Part 98), Department of Education (34 CFR Parts 85, 668 and 682), Department of Health and Human Services (45 CFR Part 76).

The undersigned subcontractor certifies it will provide a drug-free workplace by:

Publishing a policy Proposal notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the workplace and specifying the consequences of any such action by an employee;

Establishing an ongoing drug-free awareness program to inform employees of the dangers of drug abuse in the workplace, the subcontractor's policy of maintaining a drug-free workplace, the availability of counseling, rehabilitation and employee assistance programs, and the penalties that may be imposed on employees for drug violations in the workplace;

Providing each employee with a copy of the subcontractor's policy Proposal;

Notifying the employees in the subcontractor's policy Proposal that as a condition of employment under this subcontract, employees shall abide by the terms of the policy Proposal and notifying the subcontractor in writing within five days after any conviction for a violation by the employee of a criminal drug abuse statue in the workplace;

Notifying the Board within ten (10) days of the subcontractor's receipt of a notice of a conviction of any employee; and,

Taking appropriate personnel action against an employee convicted of violating a criminal drug statue or requires such employee to participate in a drug abuse assistance or rehabilitation program.

Name of Organization/Contractor(s):

Cubic ITS, Inc.

Signature of Authorized Representative:

Terry Griffith
Vice President & General Manager

Date: 10/19/2023

ATTACHMENT VI:
CERTIFICATION REGARDING DISCLOSURE OF CONFLICT OF INTEREST

The undersigned certifies that, to the best of his or her knowledge or belief, that:

"No employee of the contractor, no member of the contractor's governing board or body, and no person who exercises any functions or responsibilities in the review or approval of the undertaking or carrying out of this contract shall participate in any decision relating to this contract which affects his/her personal pecuniary interest.

Executives and employees of contractor shall be particularly aware of the varying degrees of influence that can be exerted by personal friends and associates and, in administering the contract, shall exercise due diligence to avoid situations which give rise to an assertion that favorable treatment is being granted to friends and associates. When it is in the public interest for the contractor to conduct business with a friend or associate of an executive or employee of the contractor, an elected official in the area or a member of the North Central Texas Council of Governments, a permanent record of the transaction shall be retained.

Any executive or employee of the contractor, an elected official in the area or a member of the NCTCOG, shall not solicit or accept money or any other consideration from a third person, for the performance of an act reimbursed in whole or part by contractor or Department. Supplies, tools, materials, equipment or services purchased with contract funds shall be used solely for purposes allowed under this contract. No member of the NCTCOG shall cast a vote on the provision of services by that member (or any organization which that member represents) or vote on any matter which would provide a direct or indirect financial benefit to the member or any business or organization which the member directly represents".

No officer, employee or paid consultant of the contractor is a member of the NCTCOG.

No officer, manager or paid consultant of the contractor is married to a member of the NCTCOG.

No member of NCTCOG directly owns, controls or has interest in the contractor.

The contractor has disclosed any interest, fact, or circumstance that does or may present a potential conflict of interest.

No member of the NCTCOG receives compensation from the contractor for lobbying activities as defined in Chapter 305 of the Texas Government Code.

Should the contractor fail to abide by the foregoing covenants and affirmations regarding conflict of interest, the contractor shall not be entitled to the recovery of any costs or expenses incurred in relation to the contract and shall immediately refund to the North Central Texas Council of Governments any fees or expenses that may have been paid under this contract and shall further be liable for any other costs incurred or damages sustained by the NCTCOG as it relates to this contract.

Name of Organization/Contractor(s):

Cubic ITS, Inc.

Signature of Authorized Representative:

Terry Griffith
Vice President & General Manager

Date: 10/19/2023

Not Applicable to Cubic ITS, Inc.

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

_____

Name of Officer

4 **Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.**

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

_____ _____

Signature of vendor doing business with the governmental entity Date

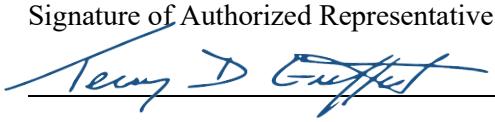
ATTACHMENT VII:
CERTIFICATION OF FAIR BUSINESS PRACTICES

That the submitter has not been found guilty of unfair business practices in a judicial or state agency administrative proceeding during the preceding year. The submitter further affirms that no officer of the submitter has served as an officer of any company found guilty of unfair business practices in a judicial or state agency administrative during the preceding year.

Name of Organization/Contractor(s):

Cubic ITS, Inc.

Signature of Authorized Representative:



Terry Griffith
Vice President & General Manager

Date: 10/19/2023

ATTACHMENT VIII:
CERTIFICATION OF GOOD STANDING
TEXAS CORPORATE FRANCHISE TAX CERTIFICATION

Pursuant to Article 2.45, Texas Business Corporation Act, state agencies may not contract with for profit corporations that are delinquent in making state franchise tax payments. The following certification that the corporation entering into this offer is current in its franchise taxes must be signed by the individual authorized on Form 2031, Corporate Board of Directors Resolution, to sign the contract for the corporation.

The undersigned authorized representative of the corporation making the offer herein certified that the following indicated Proposal is true and correct and that the undersigned understands that making a false Proposal is a material breach of contract and is grounds for contract cancellation.

Indicate the certification that applies to your corporation:

____X_____ The Corporation is a for-profit corporation and certifies that it is not delinquent in its franchise tax payments to the State of Texas.

_____ The Corporation is a non-profit corporation or is otherwise not subject to payment of franchise taxes to the State of Texas.

Type of Business (if not corporation):

☐ Sole Proprietor

☐ Partnership

☐ Other

Pursuant to Article 2.45, Texas Business Corporation Act, the North Central Texas Council of Governments reserves the right to request information regarding state franchise tax payments.

Terry Griffith, Vice President & General Manager
(Printed/Typed Name and Title of Authorized Representative)

Signature

Date: 10/19/2023

Not Applicable to Cubic ITS, Inc.

ATTACHMENT IX:
HISTORICALLY UNDERUTILIZED BUSINESSES, MINORITY OR WOMEN-OWNED OR DISADVANTAGED BUSINESS ENTERPRISES

Historically Underutilized Businesses (HUBs), minority or women-owned or disadvantaged businesses enterprises (M/W/DBE) are encouraged to participate in the solicitation process. Representatives from HUB companies should identify themselves and submit a copy of their certification.

NCTCOG recognizes the certifications of both the State of Texas Program and the North Central Texas Regional Certification Agency. Companies seeking information concerning HUB certification are urged to contact:

State of Texas HUB Program
Texas Comptroller of Public Accounts
Lyndon B. Johnson State Office Building
111 East 17th Street
Austin, Texas 78774
(512) 463-6958
http://www.window.state.tx.us/procurement/prog/hub/

Local businesses seeking M/W/DBE certification should contact:

North Central Texas Regional Certification Agency
624 Six Flags Drive, Suite 100
Arlington, TX 76011
(817) 640-0606
http://www.nctrca.org/certification.html

Submitter must include a copy of its minority certification documentation as part of this solicitation.
If your company is already certified, attach a copy of your certification to this form and return with your proposal.

Indicate all that apply:

_____Minority-Owned Business Enterprise

_____Women-Owned Business Enterprise

_____Disadvantaged Business Enterprise

ATTEST TO Attachments of Certification:

_____
Authorized Signature

_____ _____
Typed Name Date

Subscribed and sworn to before me this _____day of _____ (month), 20__ in

_____ (city), _____ (county), _____ (state).

_____ **SEAL**

Notary Public in and for _____ (County),
State of _____ Commission expires: _____

ATTACHMENT X
NCTCOG FEDERAL AND STATE OF TEXAS REQUIRED PROCUREMENT PROVISIONS

The following provisions are mandated by Federal and/or State of Texas law. Failure to certify to the following will result in disqualification of consideration for contract. Entities or agencies that are not able to comply with the following will be ineligible for consideration of contract award.

PROHIBITED TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT CERTIFICATION

This Contract is subject to the Public Law 115-232, Section 889, and 2 Code of Federal Regulations (CFR) Part 200, including §200.216 and §200.471, for prohibition on certain telecommunications and video surveillance or equipment. Public Law 115-232, Section 889, identifies that restricted telecommunications and video surveillance equipment or services (e.g., phones, internet, video surveillance, cloud servers) include the following:

A) Telecommunications equipment that is produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliates of such entities).

B) Video surveillance and telecommunications equipment produced by Hytera Communications Corporations, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliates of such entities).

C) Telecommunications or video surveillance services used by such entities or using such equipment.

D) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, Director of the National Intelligence, or the Director of the Federal Bureau of Investigation reasonably believes to be an entity owned or controlled by the government of a covered foreign country.

The entity identified below, through its authorized representative, hereby certifies that no funds under this Contract will be obligated or expended to procure or obtain telecommunication or video surveillance services or equipment or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as a critical technology as part of any system prohibited by 2 CFR §200.216 and §200.471, or applicable provisions in Public Law 115-232 Section 889.

☒ **The Contractor or Subrecipient hereby certifies that it does comply with the requirements of 2 CFR §200.216 and §200.471, or applicable regulations in Public Law 115-232 Section 889.**

SIGNATURE OF AUTHORIZED PERSON: Terry D Griffith

NAME OF AUTHORIZED PERSON: Terry Griffith, Vice President & General Manager

NAME OF COMPANY: Cubic ITS, Inc.

DATE: 10/19/2023

-OR-

☐ **The Contractor or Subrecipient hereby certifies that it cannot comply with the requirements of 2 CFR §200.216 and §200.471, or applicable regulations in Public Law 115-232 Section 889.**

SIGNATURE OF AUTHORIZED PERSON: _____

NAME OF AUTHORIZED PERSON: _____

NAME OF COMPANY: _____

DATE: _____

DISCRIMINATION AGAINST FIREARMS ENTITIES OR FIREARMS TRADE ASSOCIATIONS

This contract is subject to the Texas Local Government Code chapter 2274, Subtitle F, Title 10, prohibiting contracts with companies who discriminate against firearm and ammunition industries.

TLGC chapter 2274, Subtitle F, Title 10, identifies that "discrimination against a firearm entity or firearm trade association" includes the following:

A) means, with respect to the entity or association, to:

I. refuse to engage in the trade of any goods or services with the entity or association based solely on its status as a firearm entity or firearm trade association; and

II. refrain from continuing an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; or

III. terminate an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association.

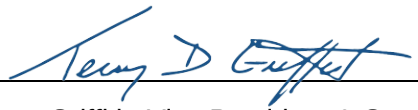
B) An exception to this provision excludes the following:

I. contracts with a sole-source provider; or

II. the government entity does not receive bids from companies who can provide written verification.

The entity identified below, through its authorized representative, hereby certifies that they have no practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and that they will not discriminate during the term of the contract against a firearm entity or firearm trade association as prohibited by Chapter 2274, Subtitle F, Title 10 of the Texas Local Government Code.

☒ **The Contractor or Subrecipient hereby certifies that it does comply with the requirements of Chapter 2274, Subtitle F, Title 10.**

SIGNATURE OF AUTHORIZED PERSON: 

NAME OF AUTHORIZED PERSON: Terry Griffith, Vice President & General Manager

NAME OF COMPANY: Cubic ITS, Inc.

DATE: 10/19/2023

-OR-

☐ **The Contractor or Subrecipient hereby certifies that it cannot comply with the requirements of Chapter 2274, Subtitle F, Title 10.**

SIGNATURE OF AUTHORIZED PERSON: _____

NAME OF AUTHORIZED PERSON: _____

NAME OF COMPANY: _____

DATE: _____

BOYCOTTING OF CERTAIN ENERGY COMPANIES

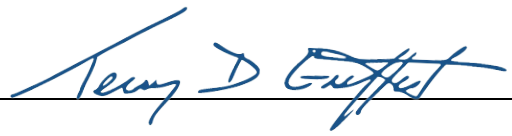
This contract is subject to the Texas Local Government Code chapter 809, Subtitle A, Title 8, prohibiting contracts with companies who boycott certain energy companies.

TLGC chapter Code chapter 809, Subtitle A, Title 8, identifies that "boycott energy company" means, without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company:

I. engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law; and
II. does business with a company described by paragraph (I).

The entity identified below, through its authorized representative, hereby certifies that they do not boycott energy companies, and that they will not boycott energy companies during the term of the contract as prohibited by Chapter 809, Subtitle A, Title 8 of the Texas Local Government Code.

☒ The Contractor or Subrecipient hereby certifies that it does comply with the requirements of Chapter 809, Subtitle A, Title 8.

SIGNATURE OF AUTHORIZED PERSON: 

NAME OF AUTHORIZED PERSON: Terry Griffith, Vice President & General Manager

NAME OF COMPANY: Cubic ITS, Inc.

DATE:

-OR-

☐ The Contractor or Subrecipient hereby certifies that it cannot comply with the requirements of Chapter 809, Subtitle A, Title 8.

SIGNATURE OF AUTHORIZED PERSON:

NAME OF AUTHORIZED PERSON:

NAME OF COMPANY:

DATE:

APPENDIX A
NTCIP 1202 Protocol Requirements List

For organizational purposes, Appendix A is attached separately in the Public Purchase dashboard for RFP 2023-092.

APPENDIX A

NTCIP 1202 Protocol Requirements List

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.3	Reference Physical Architecture [Informative]					
2.3.1	ASC Characteristics – Cabinet Specifications			M	Yes	
2.3.1.a (332)	Model 332 Cabinet			O.1 (1)	Yes / No	
2.3.1.b (TS1)	NEMA TS 1 Cabinet			O.1 (1)	Yes / No	
2.3.1.c (TS2-2)	NEMA TS 2 Type 2 Cabinet			O.1 (1)	Yes / No	
2.3.1.d (TS2-1)	NEMA TS 2 Type 1 Cabinet			O.1 (1)	Yes / No	
2.3.1.e (ITS)	ITS Cabinet			O.1 (1)	Yes / No	
2.3.2	ASC Characteristics – Controller Types			M	Yes	
2.3.2.a	Phase-based controller			M	Yes	
2.3.2.b	Interval-based controller			NA	NA	Interval-based controllers are not supported by NTCIP 1202 v03
2.4	Architectural Needs					
2.4.1	Provide Live Data			M	Yes	
		3.4.1.1	Retrieve Data	M	Yes	
		3.4.1.2	Deliver Data	M	Yes	
		3.4.1.3	Explore Data	M	Yes	
		3.6.1	Response Time for Requests	M	Yes	The Response Time for all requests shall 25 be milliseconds (5-500: Default=25).
2.4.2	Provide Dynamic Object Data			O	Yes / No	
		H.1.1.9.1.1	Configure Dynamic Object Persistence Time	M	Yes / NA	
		H.1.1.9.1.2	Configure Dynamic Object Configuration ID	M	Yes / NA	
		H.1.2.5.1.1	Determine Dynamic Object Persistence Time	M	Yes / NA	
		H.1.2.5.1.2	Determine Dynamic Object Configuration ID	M	Yes / NA	
		H.1.2.5.2.1.1	Monitor Incoming and Outgoing STMP Packet Exchanges	M	Yes / NA	
		H.1.2.5.2.1.2	Monitor Incoming and Outgoing STMP Packet Types	M	Yes / NA	
		H.1.2.5.2.2.1	Monitor Incoming and Outgoing STMP Error Exchanges - Too Big Error	M	Yes / NA	
		H.1.2.5.2.2.2	Monitor Incoming and Outgoing STMP Error Exchanges - No Such Name	M	Yes / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.1.2.5.2.2.3	Monitor Incoming and Outgoing STMP Error Exchanges - Bad Value	M	Yes / NA	
		H.1.2.5.2.2.4	Monitor Incoming and Outgoing STMP Error Exchanges - Read-Only	M	Yes / NA	
		H.1.2.5.2.2.5	Monitor Incoming and Outgoing STMP Error Exchanges - General Error	M	Yes / NA	
2.4.3	Provide Block Data			O	Yes / No	
		3.5.2.1.14.1.1.1	Configure Block Object Get Control - Phase Data	O	Yes / No	
		3.5.2.1.14.1.1.2	Configure Block Object Get Control - Vehicle Detector Data	O	Yes / No	
		3.5.2.1.14.1.1.3	Configure Block Object Get Control - Pedestrian Detector Data	O	Yes / No	
		3.5.2.1.14.1.1.4	Configure Block Object Get Control - Pattern Data	O	Yes / No	
		3.5.2.1.14.1.1.5	Configure Block Object Get Control - Split Data	O	Yes / No	
		3.5.2.1.14.1.1.6	Configure Block Object Get Control - Time Base Data	O	Yes / No	
		3.5.2.1.14.1.1.7	Configure Block Object Get Control - Preempt Data	O	Yes / No	
		3.5.2.1.14.1.1.8	Configure Block Object Get Control - Sequence Data	O	Yes / No	
		3.5.2.1.14.1.1.9	Configure Block Object Get Control - Channel Data	O	Yes / No	
		3.5.2.1.14.1.1.10	Configure Block Object Get Control - Overlap Data	O	Yes / No	
		3.5.2.1.14.1.1.11	Configure Block Object Get Control - Port 1 Data	O	Yes / No	
		3.5.2.1.14.1.1.12	Configure Block Object Get Control - Schedule Data	O	Yes / No	
		3.5.2.1.14.1.1.13	Configure Block Object Get Control - Day Plan Data	O	Yes / No	
		3.5.2.1.14.1.1.14	Configure Block Object Get Control - Event Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.15	Configure Block Object Get Control - Event Class Data	O	Yes / No	
		3.5.2.1.14.1.1.16	Configure Block Object Get Control - Dynamic Object Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.17	Configure Block Object Get Control - Dynamic Object Owner Data	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	User Need	FR ID	Functional Requirement	Conformance	Support	Additional Specifications
		3.5.2.1.14.1.1.18	Configure Block Object Get Control - Dynamic Object Status Data	O	Yes / No	
		3.5.2.1.14.1.1.19	Configure Block Object Get Control - Miscellaneous ASC Data	O	Yes / No	
		3.5.2.1.14.1.1.20	Configure Block Object Get Control - Version 3 Additional Phase Data	O	Yes / No	
		3.5.2.1.14.1.1.21	Configure Block Object Get Control - Version 3 Additional Vehicle Detector Data	O	Yes / No	
		3.5.2.1.14.1.1.22	Configure Block Object Get Control - Version 3 Vehicle Detector Volume Occupancy Report Data	O	Yes / No	
		3.5.2.1.14.1.1.23	Configure Block Object Get Control - Version 3 Additional Pedestrian Detector Data	O	Yes / No	
		3.5.2.1.14.1.1.24	Configure Block Object Get Control - Version 3 Pedestrian Detector Report Data	O	Yes / No	
		3.5.2.1.14.1.1.25	Configure Block Object Get Control - Version 3 Pedestrian Push Button Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.26	Configure Block Object Get Control - Version 3 Additional Pattern Data	O	Yes / No	
		3.5.2.1.14.1.1.27	Configure Block Object Get Control - Version 3 Additional Split Data	O	Yes / No	
		3.5.2.1.14.1.1.28	Configure Block Object Get Control - Version 3 Additional Preempt Data	O	Yes / No	
		3.5.2.1.14.1.1.29	Configure Block Object Get Control - Version 3 Preempt Queue Delay Data	O	Yes / No	
		3.5.2.1.14.1.1.30	Configure Block Object Get Control - Version 3 Additional Channel Data	O	Yes / No	
		3.5.2.1.14.1.1.31	Configure Block Object Get Control - Version 3 Additional Overlap Data	O	Yes / No	
		3.5.2.1.14.1.1.32	Configure Block Object Get Control - Communications Port Definition Data	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	User Need	FR ID	Functional Requirement	Conformance	Support	Additional Specifications
		3.5.2.1.14.1.1.33	Configure Block Object Get Control – Ethernet Communications Port Definition Data	O	es / No	
		3.5.2.1.14.1.1.34	Configure Block Object Get Control – SIU Communications Port 1 Definition Data	O	Yes / No	
		3.5.2.1.14.1.1.35	Configure Block Object Get Control - Version 3 Additional Miscellaneous ASC Data	O	Yes / No	
		3.5.2.1.14.1.1.36	Configure Block Object Get Control – User-Defined Backup Timer Content Data	O	Yes / No	
		3.5.2.1.14.1.1.37	Configure Block Object Get Control – ASC Location Data	O	Yes / No	
		3.5.2.1.14.1.1.38	Configure Block Object Get Control – Global Set ID Data	O	Yes / No	
		3.5.2.1.14.1.1.39	Configure Block Object Get Control – ASC Environmental Monitoring Data	O	Yes / No	
		3.5.2.1.14.1.1.40	Configure Block Object Get Control – ASC Cabinet Temperature Sensor Data	O	Yes / No	
		3.5.2.1.14.1.1.41	Configure Block Object Get Control – ASC Cabinet Humidity Sensor Data	O	Yes / No	
		3.5.2.1.14.1.1.42	Configure Block Object Get Control - I/O Input Mapping Data	O	Yes / No	
		3.5.2.1.14.1.1.43	Configure Block Object Get Control - I/O Input Mapping Status Data	O	Yes / No	
		3.5.2.1.14.1.1.44	Configure Block Object Get Control – I/O Output Mapping Data	O	Yes / No	
		3.5.2.1.14.1.1.45	Configure Block Object Get Control - I/O Output Mapping Status Data	O	Yes / No	
		3.5.2.1.14.1.1.46	Configure Block Object Get Control - I/O Mapping Description Data	O	Yes / No	
		3.5.2.1.14.1.1.47	Configure Block Object Get Control – Connected Vehicle Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.48	Configure Block Object Get Control – Connected Vehicle RSU Port Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.49	Configure Block Object Get Control - SPaT Lanes Concurrency Data	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.14.1.1.50	Configure Block Object Get Control – Connected Vehicle SPaT RSU Port Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.51	Configure Block Object Get Control – Connected Vehicle Detector Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.52	Configure Block Object Get Control – Connected Vehicle Detection Zone Configuration Data	O	Yes / No	
		3.5.2.1.14.1.1.53	Configure Block Object Get Control – Connected Vehicle Detection Report Data	O	Yes / No	
		3.5.2.1.14.1.2	Configure Block Data	M	Yes	
		3.5.2.1.14.2.1	Monitor Block Object Get Control	M	Yes	
		3.5.2.1.14.2.2	Monitor Block Data	M	Yes	
		3.5.2.1.14.2.3.1	Monitor Block Error Status - STMP Set/Get Command Attempt	M	Yes	
		3.5.2.1.14.2.3.2	Monitor Block Error Status - Configuration Validity Check Error	M	Yes	
		3.5.2.1.14.2.3.3	Monitor Block Error Status - Value Set Validity Check Error	M	Yes	
		3.5.2.1.14.2.3.4	Monitor Block Error Status - Error-causing Data Element	M	Yes	
		3.5.2.1.14.1.1.1	Configure Block Object Get Control Requirements	O	Yes / No	
2.4.4	Provide for Log Data Local Storage and Retrieval			O	Yes / No	
		3.5.1.6.1	Configure ASC Clock Source	O	Yes / No	
		3.5.1.6.2	Determine ASC Clock Status	O	Yes / No	
		3.5.1.6.3	Determine Current ASC Clock Source	O	Yes / No	
		3.5.1.6.4	Determine Available ASC Clock Sources	O	Yes / No	
		H.1.1.5.1	Configure Time	M	Yes / NA	
		H.1.1.5.2	Configure Time Zone	TimeZone: O	Yes / No / NA	Note: Users are cautioned that this object definition has been revised to address interoperability issues in version 01, but remains at the same ObjectID. Pay close attention to the implementation, and
		H.1.1.5.3	Configure Daylight Saving Mode	DST:O	Yes / No / NA	
		H.1.1.5.4	Determine Time Setting	M	Yes / NA	
		H.1.1.5.5 (TimeZone)	Determine Time Zone Setting	O	Yes / No / NA	
		H.1.1.5.6 (DST)	Determine Daylight Saving Mode Setting	O	Yes / No / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.1.1.5.7	Monitor Current Time	M	(Yes) / NA	interoperability of this object. Place a checkmark below, if the ASC is NOT required to support the major version that is checked. Version v01 X Version v02 X
		H.1.3.1.1	Retrieve Current Configuration of Logging Service	M	(Yes) / NA	
		H.1.3.1.2	Configure Event Logging Service	M	(Yes) / NA	
		H.1.3.1.3	Retrieve Event Logged Data	M	(Yes) / NA	
		H.1.3.1.4	Configure Clearing of Event Class Log	M	(Yes) / NA	
		H.1.3.1.5	Determine Capabilities of Event Logging Service	M	(Yes) / NA	
		H.1.3.1.6	Determine Number of Logged Events per Event Class	M	(Yes) / NA	
		H.1.3.1.7	Support a Number of Events to Store in Log	M	(Yes) / NA	The ASC shall be capable of storing at least 200 events in the event log file (up to 65535).
		H.1.3.1.8	Configure Clearing of Global Log	O	(Yes) / No / NA	
		H.1.3.1.9	Determine Total Number of Logged Events	O	(Yes) / No / NA	
		H.1.3.1.10	Determine Number of Events within a Class	M	(Yes) / NA	
		H.1.3.1.11	Determine Event Logging Resolution	M	(Yes) / NA	
		H.1.3.1.12	Clear Event Configuration	M	(Yes) / NA	
		H.1.3.1.13	Clear Event Classes	M	(Yes) / NA	
		H.1.3.1.14	Clear Event Class Log	M	(Yes) / NA	
		H.1.3.1.15	Retrieve Non-Sequential Clock Changes	O	(Yes) / No / NA	
		H.1.3.2.1	Record and Timestamp Events	M	(Yes) / NA	
		H.1.3.2.2	Support a Number of Event Classes	M	(Yes) / NA	The ASC shall support at least 10 event classes.
		H.1.3.2.3	Support a Number of Events to Log	M	(Yes) / NA	The ASC shall be able to log at least 20 events.
		H.1.3.2.4.1	Support On-Change Events	M	(Yes) / NA	
		H.1.3.2.4.2	Support Greater Than Events	M	(Yes) / NA	
		H.1.3.2.4.3	Support Less Than Events	M	(Yes) / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.1.3.2.4.4	Support Hysteresis Events	M	Yes / NA	
		H.1.3.2.4.5	Support Periodic Events	M	Yes / NA	
		H.1.3.2.4.6	Support Bit Flag Events	M	Yes / NA	
		H.1.3.2.4.7	Support Event Monitoring on Any Data	M	Yes / NA	
		3.6.1	Response Time for Requests	M	Yes / NA	The Response Time for all requests shall be 25 milliseconds (5-500: Default=25).
2.4.5	Provide for Database Management			M	Yes	
		H.1.2.2.1	Monitor Database Operation	M	Yes	
		H.1.2.2.2	Monitor Database Operation Status	M	Yes	
		H.1.2.2.3	Monitor Database Operation Error Status	M	Yes	
		H.1.4.2.1	Control Database Access	M	Yes	
		H.1.4.2.2	Perform Database Consistency Check	M	Yes	
		H.1.4.2.3	Enforce Consistency Check Parameters	M	Yes	
2.4.6 (Traps)	Condition-based Exception Reporting			O	Yes / No	
		3.6.2	Condition-based Maximum Transmission Start Time	M	Yes	The Maximum Transmission Start Time for all reports shall be 500 milliseconds (Default=10000).
		H.1.1.10.1	Enable/Disable Exception Reporting	M	Yes	
		H.1.1.10.2.1	Configure a Monitored (Watch) Object	M	Yes	
		H.1.1.10.2.2 (Watch)	Configure a Monitored Group of Objects (Watch Block)	M	Yes	
		H.1.1.10.3.1	Configure a Report Object	M	Yes	
		H.1.1.10.3.2 (Report)	Configure a Report Group of Objects (Block)	M	Yes	
		H.1.1.10.4	Configure Exception Reporting Destination	M	Yes	
		H.1.1.10.5	Configure Exception Reporting Community	M	Yes	
		H.1.1.10.6.1 (TrapAck)	Configure Exception Reporting Acknowledgement	O.2 (1..*)	Yes / No	
		H.1.1.10.6.2	Configure Exception Reporting Aggregation	O.2 (1..*)	Yes / No	
		H.1.1.10.6.3 (TrapQueue)	Configure Exception Reporting Queue	O.2 (1..*)	Yes / No	
		H.1.1.10.6.4	Configure Exception Reporting (Forced)	O.2 (1..*)	Yes / No	
		H.1.1.10.6.5	Configure Exception Reporting Communications	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.1.1.10.6.6 (AntiStream)	Configure Exception Reporting - Maximum Rate	O	Yes / No	
		H.1.1.10.7	Determine Watch Block Capabilities	Watch:M	Yes / NA	
		H.1.1.10.8	Determine Report Block Capabilities	Report:M	Yes / NA	
		H.1.1.10.9	Determine Exception Reporting Trap Channel Capabilities	M	Yes	
		H.1.1.10.10	Determine Exception Reporting Aggregation Capabilities	M	Yes	
		H.1.1.10.11	Determine Event Reporting Latency	M	Yes	
		H.1.1.10.12	Monitor Communications Link State	M	Yes	
		H.1.1.10.13.1	Monitor Exception Based Communications Link Error	M	Yes	
		H.1.1.10.13.2	Monitor Exception Based Maximum Rate Exceeded	AntiStream:M	Yes / NA	
		H.1.1.10.13.3	Monitor Exception Based Queue Full Error	TrapQueue:M	Yes / NA	
		H.1.1.10.14	Monitor Exception Based Transmissions	M	Yes	
		H.1.1.10.15	Monitor Number of Lost Queued Exception Based Reports	TrapQueue:M	Yes / NA	
		H.1.1.10.16	Monitor Number of Exception Based Events	M	Yes	
		H.1.1.10.17	Monitor Exception Based Data	M	Yes	
		H.1.1.10.18	Clear Event Class	O	Yes / No	
		H.1.1.10.19	Clear Event Configuration	O	Yes / No	
		H.1.1.10.20	Clear Event Log Table	O	Yes / No	
		H.1.1.10.21	Clear Report Objects	O	Yes / No	
		H.1.1.10.22	Clear Report Blocks	O	Yes / No	
		H.1.1.10.23	Clear Watch Objects	O	Yes / No	
		H.1.1.10.24	Clear Watch Blocks	O	Yes / No	
		H.1.1.10.25	Clear Exception Based Reporting Tables	O	Yes / No	
		H.1.1.10.26	Reset a Communications Link	TrapAck:O	Yes / No / NA	
		H.1.5.1	Atomic Operations	M	Yes	
2.5	Features					
2.5.1	Manage the ASC Configuration			M	Yes	
2.5.1.1	Retrieve Device Identity			M	Yes	
		3.5.1.1.1	Configure ASC Location	O	Yes / No	Only needed if no external GNSS device is attached to the ASC

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.1.1.2	Configure ASC Location - Antenna Offset	O	Yes / No	Only needed if an external GNSS device is attached to the ASC
		H.1.1.1	Determine Device Component Information	M	Yes	
		H.1.1.2.1	Determine Unique Deployment Configuration Identifier	M	Yes	
		H.1.1.2.2	Determine Configuration Identifier Parameter Content	O	Yes / No	
		H.1.1.3	Determine Supported Standards	M	Yes	Note: was optional in NTCIP 1202 v02
		H.1.1.4	Manage Unique System Name	O	Yes / No	
2.5.1.2	Manage Communications			O	Yes / No	
		3.5.1.2.1.1	Enable/Disable Communications Port	M	Yes	The ASC shall not be allowed to enable/disable the following ports numbers: _____
		3.5.1.2.1.2	Configure ASC Ethernet Ports	O	Yes / No	The ASC shall not be allowed to configure the following ports:
		3.5.1.2.1.3	Configure ASC Asynchronous Serial Ports	O	Yes / No	The ASC shall not be allowed to configure the following ports:
		3.5.1.2.1.4	Configure ASC Synchronous Serial Ports	O	Yes / No	The ASC shall not be allowed to configure the following ports:
		3.5.1.2.1.5	Configure ASC Communications Protocol - Serial Ports	O	Yes / No	The ASC shall not be allowed to configure the following ports:
		3.5.1.2.2.1	Determine Number of ASC Communications Ports	M	Yes	
		3.5.1.2.3.1	Monitor Response Timeout - Ethernet	O	Yes / No	
		3.5.1.2.3.2	Monitor Response Timeout - Serial	O	Yes / No	
		3.5.1.2.3.3	Monitor Data Link Errors - Ethernet	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.1.2.3.4	Monitor Data Link Errors - Serial	O	Yes / No	
		3.5.1.2.3.5	Monitor Polling Timeout - Port 1	TS1:O, TS2-2:O, TS2-1:O	Yes / No / NA	
		3.5.1.2.3.6	Monitor Polling Timeout - Serial Bus	ITS:O	Yes / No / NA	
		3.5.1.2.4.1	Set Communications Port to Loopback Mode	O	Yes / No	
		3.5.1.2.4.2	Set Communications Port to Echo Mode	O	Yes / No	
2.5.1.3	Manage Cabinet Environment			O	Yes / No	
		3.5.1.3.1	Monitor Cabinet Door Status	M	Yes	
		3.5.1.3.2	Monitor Cabinet Fan Status	O	Yes / No	
		3.5.1.3.3	Monitor Cabinet Heater Status	O	Yes / No	
		3.5.1.3.4	Monitor Cabinet Float Switch Status	O	Yes / No	
		3.5.1.3.5 (Temp)	Monitor ASC Temperature	O	Yes / No	
		3.5.1.3.6 (Humidity)	Monitor ASC Humidity	O	Yes / No	
		3.5.1.3.7	Configure ASC Temperature Threshold	Temp:O	Yes / No / NA	
		3.5.1.3.8	Configure ASC Humidity Thresholds	Humidity:O	Yes / No / NA	
		3.5.1.3.9	Configure ATC Cabinet Device LEDs	O	Yes / No	
2.5.1.4 (Power)	Monitor Power			O	Yes / No	
		3.5.1.4.1	Determine Power Source	M	Yes	
		3.5.1.4.2	Monitor AC Power Status	O	Yes / No	
		3.5.1.4.3 (UPS)	Monitor UPS Battery Charge	O	Yes / No	
		3.5.1.4.4	Monitor UPS Battery Voltage	UPS:O	Yes / No / NA	
		3.5.1.4.5	Monitor UPS Battery Current	UPSO	Yes / No / NA	
2.5.1.5 (Perform)	Retrieve Operational Performance Data			O	Yes / No	
		3.5.1.5.1.1	Enable/Disable Collection of Operational Performance Data	M	Yes	
		3.5.1.5.1.2	Start Collection of Operational Performance Data on Specific Date/Time	O	Yes / No	
		3.5.1.5.1.3	End Collection of Operational Performance Data on Specific Date/Time	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.1.5.1.4	Configure Collection of Operational Performance Data	O	Yes / No	
		3.5.1.5.2.1	Determine Collection of Operational Performance Data	M	Yes	The ASC shall allow the recording of at least 5 days' worth of data for each event code at a recording interval of 1/10 seconds (maximum 7 days).
		3.5.1.5.2.2	Determine Operational Performance Data Collection Capabilities	M	Yes	
		3.5.1.5.3.1	Monitor Operational Performance Data	O	Yes / No	
		3.5.1.5.3.2	Retrieve Operational Performance Data	O	Yes / No	
		3.5.1.5.3.3	Retrieve Operational Performance Data - Time Range	O	Yes / No	
		3.5.1.5.3.4	Retrieve Operational Performance Data - Event Code	O	Yes / No	
		3.5.1.5.4.1	Clear Operational Performance Data - All	O	Yes / No	
		3.5.1.5.4.2	Clear Operational Performance Data - Time Range	O	Yes / No	
		3.5.1.5.4.3	Clear Operational Performance Data - Event Code	O	Yes / No	
		3.5.1.5.4.4	Clear Operational Performance Data - Event Class	O	Yes / No	
		3.5.1.5.4.5	Clear Operational Performance Data - Configuration	O	Yes / No	
2.5.1.6	Manage Auxiliary External Inputs/Outputs			O	Yes / No	
		H.1.1.6.1	Determine External Port Information	M	Yes	
		H.1.1.6.2	Configure Port Information	M	Yes	
		H.1.1.6.3	Required Number of Auxiliary Ports	O	Yes / No	The ASC shall support at least ____ analog Auxiliary Ports. The ASC shall support at least ____ digital Auxiliary Ports.
		H.1.2.1	Monitor Status of External Device	O	Yes / No	
		H.1.4.1	Control External Device	O	Yes / No	
2.5.1.7	Manage Database			M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.1.6	Configure Parameters for Creation of an Alternate Device Configuration Identifier	O	Yes / No	
		H.1.1.2.1	Determine Unique Deployment Configuration Identifier	M	Yes	
		H.1.1.2.2	Determine Configuration Identifier Parameter Content	O	Yes / No	
2.5.2	Manage Signal Operations			M	Yes	
2.5.2.1	Manage Signal Configuration			M	Yes	
2.5.2.1.1	Manage Controller Startup Functions			M	Yes	
		3.5.2.1.1.1.1	Configure Startup All-Red Flash Mode	O	Yes / No	
		3.5.2.1.1.1.2	Configure Startup Flash Time	M	Yes	
		3.5.2.1.1.1.3	Enable/Disable Automatic Pedestrian Clearance Setting	M	Yes	
		3.5.2.1.1.2	Configure Backup Time	M	Yes	
		3.5.2.1.1.3 (BackupUD)	Configure Backup Time - User-Defined	O	Yes / No	
		3.5.2.1.1.4	Configure Backup Time - User-Defined Functions	BackupUD: M	Yes / NA	The user shall provide a list of all objects to be contained in the Backup timer monitoring. Alternatively, user could require vendor to provide a list.
		3.5.2.1.1.5	Determine Maximum Number of Functions Supported for Backup Time	BackupUD: M	Yes / NA	
2.5.2.1.2	Manage Phase Configurations			M	Yes	
		3.5.2.1.2.1.1	Enable/Disable Phase	M	Yes	
		3.5.2.1.2.1.2	Configure Vehicle Phase Minimum Green Time	M	Yes	
		3.5.2.1.2.1.3	Configure Vehicle Phase Passage Time	M	Yes	
		3.5.2.1.2.1.4	Configure Vehicle Phase Maximum Green Times	M	Yes	
		3.5.2.1.2.1.5	Configure Vehicle Phase Third Maximum Green Times	O	Yes / No	
		3.5.2.1.2.1.6	Configure Phase Yellow Time	M	Yes	
		3.5.2.1.2.1.7	Configure Red Clearance Time	M	Yes	
		3.5.2.1.2.1.8	Configure Phase Red Revert Time	O	Yes / No	
		3.5.2.1.2.1.9	Configure Unit Red Revert Time	Unit:M	Yes / NA	
		3.5.2.1.2.1.10	Configure Added Initial Time	M	Yes	
		3.5.2.1.2.1.11	Configure Maximum Initial Time	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	User Need	FR ID	Functional Requirement	Conformance	Support	Additional Specifications
		3.5.2.1.2.1.12	Configure Time Before Reduction	M	Yes	
		3.5.2.1.2.1.13	Configure Phase Time to Reduce	M	Yes	
		3.5.2.1.2.1.14	Configure Cars Before Reduction	O	Yes / No	
		3.5.2.1.2.1.15	Configure Phase Reduce By Time	O	Yes / No	
		3.5.2.1.2.1.16	Configure Phase Minimum Gap Time	M	Yes	
		3.5.2.1.2.1.17	Configure Phase Dynamic Maximum Limit	O	Yes / No	
		3.5.2.1.2.1.18	Configure Phase Dynamic Maximum Step	O	Yes / No	
		3.5.2.1.2.1.19.1	Configure Phase Startup - Initialize in a Red State	O.3 (1..*)	Yes / No	
		3.5.2.1.2.1.19.2	Configure Phase Startup - Initialize at Beginning of Min Green and Walk	O.3 (1..*)	Yes / No	
		3.5.2.1.2.1.19.3	Configure Phase Startup - Initialize at Beginning of Min Green	O.3 (1..*)	Yes / No	
		3.5.2.1.2.1.19.4	Configure Phase Startup - Initialize at Beginning of Yellow	O.3 (1..*)	Yes / No	
		3.5.2.1.2.1.19.5	Configure Phase Startup - Initialize at Beginning of Red Clearance	O.3 (1..*)	Yes / No	
		3.5.2.1.2.1.20	Configure Automatic Flash Entry Phase	O	Yes / No	
		3.5.2.1.2.1.21	Configure Automatic Flash Exit Phase	O	Yes / No	
		3.5.2.1.2.1.22	Configure Call to Non-Actuated 1	O	Yes / No	
		3.5.2.1.2.1.23	Configure Call to Non-Actuated 2	O	Yes / No	
		3.5.2.1.2.1.24	Configure Non-Lock Detector Memory	O	Yes / No	
		3.5.2.1.2.1.25	Configure Minimum Vehicle Recall	O	Yes / No	
		3.5.2.1.2.1.26	Configure Maximum Vehicle Recall	O	Yes / No	
		3.5.2.1.2.1.27	Configure Soft Vehicle Recall	O	Yes / No	
		3.5.2.1.2.1.28	Configure Dual Phase Entry	O	Yes / No	
		3.5.2.1.2.1.29	Configure Simultaneous Gap Disable	O	Yes / No	
		3.5.2.1.2.1.30	Configure Guaranteed Passage	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.2.1.31	Configure Actuated Rest-in-Walk	O	Yes / No	
		3.5.2.1.2.1.32	Configure Conditional Service Enable	O	Yes / No	
		3.5.2.1.2.1.33	Configure Added Initial Calculation	O	Yes / No	
		3.5.2.1.2.1.34	Configure Phase-to-Ring Association	M	Yes	
		3.5.2.1.2.1.35	Configure Phase Concurrency	M	Yes	
		3.5.2.1.2.1.36	Configure Yellow Change Time Before End of Ped Clearance	O	Yes / No	
		3.5.2.1.2.1.37	Enable/Disable Ped-only Phase	O	Yes / No	
		3.5.2.1.2.1.38	Configure Pedestrian Green Time	M	Yes	
		3.5.2.1.2.1.39	Configure Pedestrian Clearance Time	M	Yes	
		3.5.2.1.2.1.40	Configure Ped Phase Walk Recycle Time	M	Yes	
		3.5.2.1.2.1.41	Configure Ped Phase Don't Walk Revert Time	M	Yes	
		3.5.2.1.2.1.42	Configure Non-Lock Ped Detector Memory	M	Yes	
		3.5.2.1.2.1.43	Configure Pedestrian Recall	M	Yes	
		3.5.2.1.2.1.44	Configure Alternate Pedestrian Clearance Time	O	Yes / No	
		3.5.2.1.2.1.45	Configure Alternate Pedestrian Walk Time	O	Yes / No	
		3.5.2.1.2.1.46	Configure Vehicle Phase Walk Offset Time	O	Yes / No	
		3.5.2.1.2.1.47 (AdvGrWarn)	Configure Advanced Green Warning - Associated Vehicle Phase	O	Yes / No	
		3.5.2.1.2.1.48	Configure Advanced Green Warning - Start Delay Time	AdvGrWarn:M	Yes / NA	
		3.5.2.1.2.1.49 (AdvRdWarn)	Configure Advanced Red Warning - Associated Vehicle Phase	O	Yes / No	
		3.5.2.1.2.1.50	Configure Red Indication Advanced Warning - Start Delay Time	AdvRdWarn:M	Yes / NA	
		3.5.2.1.2.1.51	Configure Flashing Yellow Arrow Associated Vehicle Phase	O	Yes / No	
		3.5.2.1.2.1.52	Configure Flashing Red Arrow Associated Vehicle Phase	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.2.1.53 (Bicycle)	Configure Bicycle Phase Minimum Green Time	O	Yes / No	
		3.5.2.1.2.1.54	Configure Bicycle Phase Yellow Time	Bicycle:M	Yes / NA	
		3.5.2.1.2.1.55	Configure Bicycle Phase Red Clearance Time	Bicycle:M	Yes / NA	
		3.5.2.1.2.1.56	Configure Bicycle Phase Red Revert Time	Bicycle:O	Yes / No / NA	
		3.5.2.1.2.1.57	Enable/Disable Bicycle Phase	Bicycle:O	Yes / No / NA	
		3.5.2.1.2.1.58	Configure Non-Lock Bicycle Detector Memory	Bicycle:O	Yes / No / NA	
		3.5.2.1.2.1.59	Configure Bicycle Phase Recall	Bicycle:O	Yes / No / NA	
		3.5.2.1.2.1.60	Configure Soft Bicycle Phase Recall	Bicycle:O	Yes / No / NA	
		3.5.2.1.2.1.61	Configure Bicycle Phase-to-Ring Association	Bicycle:M	Yes / NA	
		3.5.2.1.2.1.62	Configure Bicycle Phase Concurrency	Bicycle:M	Yes / NA	
		3.5.2.1.2.1.63 (Transit)	Configure Transit Phase Minimum Green Time	O	Yes / No	
		3.5.2.1.2.1.64	Configure Transit Phase Maximum Green Time	Transit:M	Yes / NA	
		3.5.2.1.2.1.65	Configure Transit Phase Third Maximum Green Time	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.66	Configure Transit Phase Yellow Time	Transit:M	Yes / NA	
		3.5.2.1.2.1.67	Configure Transit Phase Red Clearance Time	Transit:M	Yes / NA	
		3.5.2.1.2.1.68	Configure Transit Phase Red Revert Time	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.69	Configure Transit Phase Added Initial Time	Transit:M	Yes / NA	
		3.5.2.1.2.1.70	Configure Transit Phase Maximum Initial Time	Transit:M	Yes / NA	
		3.5.2.1.2.1.71	Enable/Disable Transit Phase	Transit:M	Yes / NA	
		3.5.2.1.2.1.72	Configure Non-Lock Transit Detector Memory	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.73	Configure Transit Phase Recall	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.74	Configure Soft Transit Phase Recall	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.75	Configure Dual Transit Phase Entry	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.76	Configure Transit Phase-to-Ring Association	Transit:M	Yes / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.2.1.77	Configure Transit Phase Concurrency	Transit:M	Yes / NA	
		3.5.2.1.2.1.78	Enable/Disable Vehicle Phase Omit	PhsCtrl:M	Yes / NA	
		3.5.2.1.2.1.79	Enable/Disable Vehicle Phase Omit during Transition	O	Yes / No	
		3.5.2.1.2.1.80	Enable/Disable Ped-only Phase Omit	PhsCtrl:M	Yes / NA	
		3.5.2.1.2.1.81	Enable/Disable Ped-only Phase Omit during Transition	O	Yes / No	
		3.5.2.1.2.1.82	Enable/Disable Bicycle-only Phase Omit	Bicycle, PhsCtrl:M	Yes / NA	
		3.5.2.1.2.1.83	Enable/Disable Bicycle-only Phase Omit during Transition	Bicycle:O	Yes / No / NA	
		3.5.2.1.2.1.84	Enable/Disable Transit Phase Omit	Transit, PhsCtrl:M	Yes / NA	
		3.5.2.1.2.1.85	Enable/Disable Transit Phase Omit during Transition	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.86	Configure Alternate Minimum Vehicle Green Time during Transition	O	Yes / No	
		3.5.2.1.2.1.87	Configure Alternate Minimum Pedestrian Walk Time during Transition	O	Yes / No	
		3.5.2.1.2.1.88	Configure Alternate Minimum Bicycle Green Time during Transition	Bicycle:O	Yes / No / NA	
		3.5.2.1.2.1.89	Configure Alternate Minimum Transit Green Time during Transition	Transit:O	Yes / No / NA	
		3.5.2.1.2.1.90.1	Configure Phase-level Force Mode for Coordination - Floating	Coord:O.4 (1..*)	Yes / No / NA	
		3.5.2.1.2.1.90.2	Configure Phase-level Force Mode for Coordination - Fixed	Coord:O.4 (1..*)	Yes / No / NA	
		3.5.2.1.2.2.1	Determine Maximum Number of Phases	M	Yes	The ASC shall support at least 40 phases.
2.5.2.1.3 (Coord)	Manage Coordination Configurations			O	Yes / No	
		3.5.2.1.3.1.1	Configure Operational Mode for Coordination - Automatic	O.5 (1..*)	Yes / No	
		3.5.2.1.3.1.2	Configure Operational Mode for Coordination - Manual Pattern	O.5 (1..*)	Yes / No	
		3.5.2.1.3.1.3	Configure Operational Mode for Coordination - Manual Free	O.5 (1..*)	Yes / No	
		3.5.2.1.3.1.4	Configure Operational Mode for Coordination - Manual Flash	O.5 (1..*)	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.3.2.1	Configure Correction Mode for Coordination - Dwell	O.6 (1..*)	Yes / No	
		3.5.2.1.3.2.2	Configure Correction Mode for Coordination - Shortway	O.6 (1..*)	Yes / No	
		3.5.2.1.3.2.3	Configure Correction Mode for Coordination - AddOnly	O.6 (1..*)	Yes / No	
		3.5.2.1.3.2.4	Configure Correction Mode for Coordination - SubtractOnly	O.6 (1..*)	Yes / No	
		3.5.2.1.3.3.1	Configure Correction Mode for Coordination - Maximum 1	O.7 (1..*)	Yes / No	
		3.5.2.1.3.3.2	Configure Correction Mode for Coordination - Maximum 2	O.7 (1..*)	Yes / No	
		3.5.2.1.3.3.3	Configure Correction Mode for Coordination - Maximum Inhibit	O.7 (1..*)	Yes / No	
		3.5.2.1.3.3.4	Configure Correction Mode for Coordination - Maximum 3	O.7 (1..*)	Yes / No	
		3.5.2.1.3.4.1	Configure Unit-level Force Mode for Coordination - Floating	O.8 (1..*)	Yes / No	
		3.5.2.1.3.4.2	Configure Unit-level Force Mode for Coordination - Fixed	O.8 (1..*)	Yes / No	
		3.5.2.1.3.5.1	Configure Unit Coordination Point - First Phase Green Begin	O.9 (1..*)	Yes / No	
		3.5.2.1.3.5.2	Configure Unit Coordination Point - Last Phase Green Begin	O.9 (1..*)	Yes / No	
		3.5.2.1.3.5.3	Configure Unit Coordination Point - First Phase Green End	O.9 (1..*)	Yes / No	
		3.5.2.1.3.5.4	Configure Unit Coordination Point - Last Phase Green End	O.9 (1..*)	Yes / No	
		3.5.2.1.3.5.5	Configure Unit Coordination Point - First Phase Yellow End	O.9 (1..*)	Yes / No	
		3.5.2.1.3.5.6	Configure Unit Coordination Point - Last Phase Yellow End	O.9 (1..*)	Yes / No	
		3.5.2.1.3.6.1	Configure Coordination Point - First Phase Green Begin	O.10 (1..*)	Yes / No	
		3.5.2.1.3.6.2	Configure Coordination Point - Last Phase Green Begin	O.10 (1..*)	Yes / No	
		3.5.2.1.3.6.3	Configure Coordination Point - First Phase Green End	O.10 (1..*)	Yes / No	
		3.5.2.1.3.6.4	Configure Coordination Point - Last Phase Green End	O.10 (1..*)	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.3.6.5	Configure Coordination Point - First Phase Yellow End	O.10 (1..*)	Yes / No	
		3.5.2.1.3.6.6	Configure Coordination Point - Last Phase Yellow End	O.10 (1..*)	Yes / No	
		3.5.2.1.3.7	Configure Omit Phases During Transitions	O	Yes / No	
		3.5.2.1.3.8	Configure Minimum Green Times During Transitions	O	Yes / No	
		3.5.2.1.3.9	Configure Minimum Pedestrian Times During Transitions	O	Yes / No	
		3.5.2.1.3.10.1	Configure Transit Correction Mode for Coordination - Maximum 1	O.11 (1..*)	Yes / No	
		3.5.2.1.3.10.2	Configure Transit Correction Mode for Coordination - Maximum 2	O.11 (1..*)	Yes / No	
		3.5.2.1.3.10.3	Configure Transit Correction Mode for Coordination - MaxInhibit	O.11 (1..*)	Yes / No	
		3.5.2.1.3.10.4	Configure Transit Correction Mode for Coordination - Maximum 3	O.1 (1..*)	Yes / No	
2.5.2.1.4	Manage Timing Patterns			Coord:M	Yes / NA	
		3.5.2.1.4.1.1	Configure Pattern Cycle Time	M	Yes	
		3.5.2.1.4.1.2	Configure Pattern Offset Time	M	Yes	
		3.5.2.1.4.1.3	Configure Pattern Split Association	M	Yes	
		3.5.2.1.4.1.4	Configure Pattern Sequence Association	M	Yes	
		3.5.2.1.4.1.5	Configure Pattern Maximum Mode	O	Yes / No	
		3.5.2.1.4.2.1	Determine Maximum Number of Phase-based Timing Pattern	M	Yes	The ASC shall support at least 32 timing patterns.
		3.5.2.1.4.2.2	Determine Phase-based Timing Pattern Type	M	Yes	The ASC shall support one of the following types of signal patterns (Select one only): X Each pattern is unique ____ Each pattern consists of a plan with 3 different offsets ____ Each pattern consists of a plan with 5 different offsets
2.5.2.1.5	Manage Splits Configurations			O	Yes / No	
		3.5.2.1.5.1.1	Configure Phase Split Time	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.5.1.2.1	Configure Phase Split Mode - None	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.2	Configure Phase Split Mode - Minimum Vehicle Recall	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.3	Configure Phase Split Mode - Maximum Vehicle Recall	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.4	Configure Phase Split Mode - Pedestrian Recall	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.5	Configure Phase Split Mode - Maximum Vehicle and Pedestrian Recall	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.6	Configure Phase Split Mode - Phase Omit	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.7	Configure Phase Split Mode - Bicycle Recall	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.8	Configure Phase Split Mode - Transit Recall	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.2.9	Configure Phase Split Mode - Non-Actuated	O.12 (1..*)	Yes / No	
		3.5.2.1.5.1.3	Configure Split Coordination Phase	M	Yes	
		3.5.2.1.5.1.4	Configure Pre-timed Split	O	Yes / No	
		3.5.2.1.5.2.1	Determine Maximum Number of Phase Splits	M	Yes	The ASC shall support at least 24 splits
2.5.2.1.6 (Ring)	Manage Ring Configurations			O	Yes / No	
		3.5.2.1.6.1.1	Configure Sequence Data	M	Yes	
		3.5.2.1.6.2.1	Determine Maximum Number of Rings	M	Yes	The ASC shall support at least 16 rings
		3.5.2.1.6.2.2	Determine Maximum Number of Sequences	M	Yes	The ASC shall support at least 16 sequences
2.5.2.1.7 (Channel)	Manage Channel Configurations			O	Yes / No	
		3.5.2.1.7.1.1	Configure Channel Control Source	M	Yes	
		3.5.2.1.7.1.2.1	Configure Channel Control Type - Vehicle Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.2.2	Configure Channel Control Type - Vehicle Overlap Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.2.3	Configure Channel Control Type - Pedestrian Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.2.4	Configure Channel Control Type - Pedestrian Overlap Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.2.5	Configure Channel Control Type - Bicycle Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.2.6	Configure Channel Control Type - Bicycle Overlap Phase	O.13 (1..*)	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.7.1.2.7	Configure Channel Control Type - Transit Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.2.8	Configure Channel Control Type - Transit Overlap Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.2.9	Configure Channel Control Type - Queue Jump Phase	O.13 (1..*)	Yes / No	
		3.5.2.1.7.1.3.1	Enable/Disable Channel Flash - Yellow	O.14 (1..*)	Yes / No	
		3.5.2.1.7.1.3.2	Enable/Disable Channel Flash - Red	O.14 (1..*)	Yes / No	
		3.5.2.1.7.1.3.3	Enable/Disable Channel Flash - Alternate Half Hertz	O.14 (1..*)	Yes / No	
		3.5.2.1.7.1.4.1	Enable/Disable Channel Dim - Green	Dimming:O	Yes / No / NA	
		3.5.2.1.7.1.4.2	Enable/Disable Channel Dim - Yellow	Dimming:O	Yes / No / NA	
		3.5.2.1.7.1.4.3	Enable/Disable Channel Dim - Red	Dimming:O	Yes / No / NA	
		3.5.2.1.7.1.4.4	Enable/Disable Channel Dim - Alternate Half Hertz	Dimming:O	Yes / No / NA	
		3.5.2.1.7.2.1	Determine Maximum Number of Channels	M	Yes	The ASC shall support at least 32 channels (See appropriate hardware specification such as NEMA TS 2 to determine maximum number of supported channels)
2.5.2.1.8 (Overlap)	Manage Overlap Configurations			O	Yes / No	
		3.5.2.1.8.1.1.1	Configure Overlap Type - Vehicle Normal	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.2	Configure Overlap Type - Vehicle Minus Green and Yellow	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.3	Configure Overlap Type - Pedestrian Normal	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.4	Configure Overlap Type - Bicycle Normal	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.5	Configure Overlap Type - Transit Normal	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.6	Configure Overlap Type - Flashing Yellow Arrow - 3 Section Head	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.7	Configure Overlap Type - Flashing Yellow Arrow - 4 Section Head	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.8	Configure Overlap Type - Flashing Yellow Arrow for Pedestrians	O.15 (1..*)	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.8.1.1.9	Configure Overlap Type - Flashing Red Arrow - 3 Section Head	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.10	Configure Overlap Type - Flashing Red Arrow - 4 Section Head	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.11	Configure Overlap Type - Transit Specific Signal Head	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.1.12	Configure Overlap Type - 2 Section Transit Specific Signal Head	O.15 (1..*)	Yes / No	
		3.5.2.1.8.1.2	Configure Overlap Included Phases	M	Yes	
		3.5.2.1.8.1.3	Configure Overlap Modifier Phases	O	Yes / No	
		3.5.2.1.8.1.4	Configure Pedestrian Modifier Phases	O	Yes / No	
		3.5.2.1.8.1.5	Configure Overlap Trailing Green	M	Yes	
		3.5.2.1.8.1.6	Configure Overlap Trailing Yellow	M	Yes	
		3.5.2.1.8.1.7	Configure Overlap Trailing Red Clearance	M	Yes	
		3.5.2.1.8.1.8	Configure Overlap Walk	O	Yes / No	
		3.5.2.1.8.1.9	Configure Overlap Pedestrian Clearance	O	Yes / No	
		3.5.2.1.8.2.1	Determine Maximum Number of Overlaps	M	Yes	The ASC shall support at least 16 overlaps
2.5.2.1.9 (Preempt)	Manage Preempt Configurations			O	Yes / No	
		3.5.2.1.9.1.1	Enable/Disable Preempt Inputs	O	Yes / No	
		3.5.2.1.9.1.2.1	Configure Preempt Control - Non-Locking Memory	O.16 (1..*)	Yes / No	
		3.5.2.1.9.1.2.2	Configure Preempt Control - Preempt Override Flash	O.16 (1..*)	Yes / No	
		3.5.2.1.9.1.2.3	Configure Preempt Control - Preempt Override Priority	O.16 (1..*)	Yes / No	
		3.5.2.1.9.1.2.4	Configure Preempt Control - Flash Dwell	O.16 (1..*)	Yes / No	
		3.5.2.1.9.1.3	Configure Preempt Link	M	Yes	
		3.5.2.1.9.1.4	Configure Preempt Delay	M	Yes	
		3.5.2.1.9.1.5	Configure Preempt Minimum Duration	M	Yes	
		3.5.2.1.9.1.6	Configure Preempt Enter Minimum Green Time	O	Yes / No	
		3.5.2.1.9.1.7	Configure Preempt Enter Minimum Walk Time	O	Yes / No	
		3.5.2.1.9.1.8	Configure Preempt Enter Pedestrian Clearance Time	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.9.1.9	Configure Preempt Track Clearance Time	M	Yes	
		3.5.2.1.9.1.10	Configure Preempt Minimum Dwell Time	M	Yes	
		3.5.2.1.9.1.11	Configure Preempt Maximum Presence Time	M	Yes	
		3.5.2.1.9.1.12	Configure Preempt Track Clearance Phases	M	Yes	
		3.5.2.1.9.1.13	Configure Preempt Dwell Phases	M	Yes	
		3.5.2.1.9.1.14	Configure Preempt Dwell Pedestrian Movements	O	Yes / No	
		3.5.2.1.9.1.15 (preemptExit)	Configure Preempt Exit Phases	O	Yes / No	
		3.5.2.1.9.1.16.1	Configure Preempt Exit Phase Strategy - Exit to Normal Operation	preemptExit:O.17 (1..*)	Yes / No / NA	
		3.5.2.1.9.1.16.2	Configure Preempt Exit Phase Strategy - Exit to Coordination	preemptExit:O.17 (1..*)	Yes / No / NA	
		3.5.2.1.9.1.16.3 (preemptQueue)	Configure Preempt Exit Phase Strategy - Exit to Queue Delay Recovery	preemptExit:O.17 (1..*)	Yes / No / NA	
		3.5.2.1.9.1.16.4	Configure Preempt Exit Phase Strategy - Exit to Short Service Phase	preemptExit:O.17 (1..*)	Yes / No / NA	
		3.5.2.1.9.1.17	Configure Preempt Track Overlap	O	Yes / No	
		3.5.2.1.9.1.18	Configure Preempt Dwell Overlap	O	Yes / No	
		3.5.2.1.9.1.19	Configure Preempt Cycling Phases	M	Yes	
		3.5.2.1.9.1.20	Configure Preempt Cycling Pedestrian Movements	O	Yes / No	
		3.5.2.1.9.1.21	Configure Preempt Cycling Overlaps	O	Yes / No	
		3.5.2.1.9.1.22	Configure Preempt Enter Yellow Change Time	O	Yes / No	
		3.5.2.1.9.1.23	Configure Preempt Enter Red Clearance Time	O	Yes / No	
		3.5.2.1.9.1.24	Configure Preempt Track Yellow Change Time	O	Yes / No	
		3.5.2.1.9.1.25	Configure Preempt Track Red Clearance Time	O	Yes / No	
		3.5.2.1.9.1.26	Configure Preempt Exit Priority Levels	preemptQueue:O	Yes / No / NA	
		3.5.2.1.9.1.27.1	Configure Preempt Max Presence Exceeded - Normal	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.9.1.27.2	Configure Preempt Max Presence Exceeded - All Flash Red	O	Yes / No	
		3.5.2.1.9.1.28	Configure Preempt Cycling Phases Sequence	M	Yes	
		3.5.2.1.9.1.29	Configure Preempt Enter Minimum Bicycle Time	O	Yes / No	
		3.5.2.1.9.1.30	Configure Preempt Enter Bicycle Clearance Time	O	Yes / No	
		3.5.2.1.9.1.31	Configure Preempt Cycling Bicycle Phases	O	Yes / No	
		3.5.2.1.9.1.32	Configure Preempt Enter Minimum Transit Time	O	Yes / No	
		3.5.2.1.9.1.33	Configure Preempt Enter Transit Clearance Time	O	Yes / No	
		3.5.2.1.9.1.34	Configure Preempt Cycling Transit Phases	O	Yes / No	
		3.5.2.1.9.2.1	Determine Maximum Number of Preempts	M	Yes	The ASC shall support at least 12 preempts
2.5.2.1.10 (Scheduler)	Manage Timing Pattern Scheduler			O	Yes / No	
		3.5.2.1.10.1.1	Configure Timebase Pattern Synchronization Time	M	Yes	
		H.1.1.5.1	Configure Time	M	Yes	
		H.1.1.5.2	Configure Time Zone	TimeZone: O	Yes / No / NA	Note: Users are cautioned that this object definition has been revised to address interoperability issues in version 01, but remains at the same ObjectID. Pay close attention to the implementation, and interoperability of this object. Place a checkmark below, if the ASC is NOT required to support the major version that is checked. Version v01 ✓ Version v02
		H.1.1.5.3	Configure Daylight Saving Mode	DST:O	Yes / No / NA	
		H.1.1.5.4	Determine Time Setting	M	Yes	
		H.1.1.5.5 (TimeZone)	Determine Time Zone Setting	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.1.1.5.6 (DST)	Determine Daylight Saving Mode Setting	O	Yes / No	
		H.1.1.7.1	Configure Timebased Scheduler Month-Day-Date	M	Yes	The ASC shall support at least 1000 Schedule Entries (between 1 and 65535). Note: This requirement also appears under User Need ID 2.5.2.1.12 in the PRL.
		H.1.1.7.2	Configure Timebased Scheduler Day Plans and Timebased Actions	M	Yes	The ASC shall support at least 40 Day Plans (between 1 and 255). The ASC shall support at least 64 Events per Day Plans (between 1 and 255). Note: This requirement also appears under User Need ID 2.5.2.1.12 in the PRL.
		H.1.2.3.1	Monitor Timebased Scheduler Month-Day-Date	M	Yes	
		H.1.2.3.2	Monitor Timebased Scheduler Day Plans and Timebased Actions	M	Yes	
		H.1.2.3.3	Monitor Active Timebased Schedule	M	Yes	
		H.1.2.3.4	Monitor Active Timebased Schedule Day Plan and Timebased Actions	M	Yes	
2.5.2.1.11	Manage Action Scheduler			Scheduler: M	Yes / NA	
		3.5.2.1.10.1.1	Configure Timebase Pattern Synchronization Time	M	Yes	
		3.5.2.1.10.1.2	Configure Timebased Action - Pattern	M	Yes	
		3.5.2.1.10.1.3.1	Configure Timebased Action - Auxiliary Function 1	O.18 (1..*)	Yes / No	
		3.5.2.1.10.1.3.2	Configure Timebased Action - Auxiliary Function 2	O.18 (1..*)	Yes / No	
		3.5.2.1.10.1.3.3	Configure Timebased Action - Auxiliary Function 3	O.18 (1..*)	Yes / No	
		3.5.2.1.10.1.3.4	Configure Timebased Action - Dimming	Dimming: O.18 (1..*)	Yes / No / NA	
		3.5.2.1.10.1.4.1	Configure Timebased Action - Special Function 1	O.19 (1..*)	Yes / No	
		3.5.2.1.10.1.4.2	Configure Timebased Action - Special Function 2	O.19 (1..*)	Yes / No	
		3.5.2.1.10.1.4.3	Configure Timebased Action - Special Function 3	O.19 (1..*)	Yes / No	

Gary Jost
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Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.10.1.4.4	Configure Timebased Action - Special Function 4	O.19 (1..*)	Yes / No	
		3.5.2.1.10.1.4.5	Configure Timebased Action - Special Function 5	O.19 (1..*)	Yes / No	
		3.5.2.1.10.1.4.6	Configure Timebased Action - Special Function 6	O.19 (1..*)	Yes / No	
		3.5.2.1.10.1.4.7	Configure Timebased Action - Special Function 7	O.19 (1..*)	Yes / No	
		3.5.2.1.10.1.4.8	Configure Timebased Action - Special Function 8	O.19 (1..*)	Yes / No	
		3.5.2.1.10.2.1	Determine Maximum Number of Timebased Actions	M	Yes	The ASC shall support at least 1000 Timebased Actions (between 1 and 65535).
		3.5.2.1.10.2.2	Determine Action In Effect	M	Yes	
		H.1.1.7.1	Configure Timebased Scheduler Month-Day-Date	M	Yes	The ASC shall support at least 1000 Schedule Entries (between 1 and 65535). Note: This requirement also appears under User Need ID 2.5.2.1.11 in the PRL.
		H.1.1.7.2	Configure Timebased Scheduler Day Plans and Timebased Actions	M	Yes	The ASC shall support at least 40 Day Plans (between 1 and 255). The ASC shall support at least 64 Events per Day Plans (between 1 and 255). Note: This requirement also appears under User Need ID 2.5.2.1.11 in the PRL.
		H.1.2.3.1	Monitor Timebased Scheduler Month-Day-Date	M	Yes	
		H.1.2.3.2	Monitor Timebased Scheduler Day Plans and Timebased Actions	M	Yes	
		H.1.2.3.3	Monitor Active Timebased Schedule	M	Yes	
		H.1.2.3.4	Monitor Active Timebased Schedule Day Plan and Timebased Actions	M	Yes	
2.5.2.1.12	Manage I/O Mapping			O	Yes / No	
		3.5.2.1.11.1.1	Set Active I/O Map	M	Yes	
		3.5.2.1.11.1.2.1	Configure I/O Map Description	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.11.1.2.2.1	Configure I/O Map Input Device	M	Yes	
		3.5.2.1.11.1.2.2.2	Configure I/O Map Input Device Pin	M	Yes	
		3.5.2.1.11.1.2.2.3	Configure I/O Map Input Function	M	Yes	
		3.5.2.1.11.1.2.3.1	Configure I/O Map Output Device	M	Yes	
		3.5.2.1.11.1.2.3.2	Configure I/O Map Output Device Pin	M	Yes	
		3.5.2.1.11.1.2.3.3	Configure I/O Map Output Function	M	Yes	
		3.5.2.1.11.2.1	Retrieve Maximum Number of I/O Maps	M	Yes	
		3.5.2.1.11.2.2	Retrieve Maximum Number of I/O Map Inputs	M	Yes	
		3.5.2.1.11.2.3	Retrieve Maximum Number of I/O Map Outputs	M	Yes	
		3.5.2.1.11.2.4	Retrieve I/O Mapping Activate Conditions	M	Yes	The following conditions shall be satisfied before a new I/O map can be activated: ___ Cabinet Door Open X in any flash state ___ programmed all red flash ___ in CVM flash ASC restart
		3.5.2.1.11.2.5	Retrieve I/O Mapping Input Functions	M	Yes	
		3.5.2.1.11.2.6	Retrieve I/O Mapping Output Functions	M	Yes	
		3.5.2.1.11.2.7	Retrieve I/O Map Input Device Pin Status	M	Yes	
		3.5.2.1.11.2.8	Retrieve I/O Map Output Device Pin Status	M	Yes	
		3.5.2.1.11.2.9.1	Enumerate I/O Map - FIO Inputs	332:M	Yes / NA	
		3.5.2.1.11.2.9.2	Enumerate I/O Map - FIO Outputs	332:M	Yes / NA	
		3.5.2.1.11.2.9.3	Enumerate I/O Map - TS1 Inputs	TS1, TS2-2:M	Yes / NA	
		3.5.2.1.11.2.9.4	Enumerate I/O Map - TS1 Outputs	TS1, TS2-2:M	Yes / NA	
		3.5.2.1.11.2.9.5	Enumerate I/O Map - TS2 BIU Inputs	TS2-1:M	Yes / NA	
		3.5.2.1.11.2.9.6	Enumerate I/O Map - TS2 BIU Outputs	TS2-1:M	Yes / NA	
		3.5.2.1.11.2.9.7	Enumerate I/O Map - ITS Cabinet SIU Inputs	ITS:M	Yes / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.1.11.2.9.8	Enumerate I/O Map - ITS Cabinet SIU Outputs	ITS:M	Yes / NA	
		3.5.2.1.11.2.9.9	Enumerate I/O Map - Auxiliary Device Inputs	O	Yes / No	
		3.5.2.1.11.2.9.10	Enumerate I/O Map - Auxiliary Device Outputs	O	Yes / No	
2.5.2.1.13 (Intra)	Manage Intra-Cabinet Communications Configuration			O	Yes / No	
		3.5.2.1.12.1	Determine Serial Bus 1 Device Present	ITS:M	Yes / NA	The ASC shall support at least 10 Serial Bus 1 Addresses (between 1 and 255).
		3.5.2.1.12.2.1	Determine TS2 Port 1 Device Present	TS2-2:M	Yes / NA	The ASC shall support at least 10 TS2 Port1 Addresses (between 1 and 255).
		3.5.2.1.12.2.2	Determine TS2 Port 1 Frame 40 Enable	TS2-2:M	Yes / NA	
2.5.2.1.14	Manage ADA Support			O	Yes / No	
		3.5.2.1.13.1.1	Configure APS Push Button Minimum Press Time	M	Yes	
		3.5.2.1.13.1.2	Configure APS Push Button to Phase Association	M	Yes	
		3.5.2.1.13.1.3	Configure APS Extra Crossing Time	M	Yes	
		3.5.2.1.13.2	Determine Maximum Number of Pedestrian Buttons	M	Yes	The ASC shall support at least 16 Pedestrian Push Button inputs (between 1 and 16).
2.5.2.2	Monitor Signal Operations Status					
2.5.2.2.1	Determine Controller Health			M	Yes	
		3.5.2.2.1.1.1	Monitor Preempt Active	Preempt:M	Yes / NA	
		3.5.2.2.1.1.2	Monitor Terminal and Facilities Flash	M	Yes	
		3.5.2.2.1.1.3	Monitor Local Cycle Zero Alarm	M	Yes	
		3.5.2.2.1.1.4	Monitor Local Override	M	Yes	
		3.5.2.2.1.1.5	Monitor Coordination Alarm	Coord:M	Yes / NA	
		3.5.2.2.1.1.6	Monitor Detector Fault	Detector:M	Yes / NA	
		3.5.2.2.1.1.7	Monitor Non-Critical Alarm	M	Yes	
		3.5.2.2.1.1.8	Monitor Stop Time Input Alarm	M	Yes	
		3.5.2.2.1.1.9	Monitor Cycle Fault Alarm	M	Yes	
		3.5.2.2.1.1.10	Monitor Coordination Fault	Coord:M	Yes / NA	
		3.5.2.2.1.1.11	Monitor Coordination Fail Alarm	Coord:M	Yes / NA	
		3.5.2.2.1.1.12	Monitor Cycle Fail Alarm	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.2.1.1.13	Monitor SMU Flash Alarm	M	Yes	
		3.5.2.2.1.1.14	Monitor Local Flash Alarm	M	Yes	
		3.5.2.2.1.1.15	Monitor Local Free Alarm	M	Yes	
		3.5.2.2.1.1.16	Monitor Coordination Active Alarm	Coord:M	Yes / NA	
		3.5.2.2.1.1.17	Monitor Power Restart Alarm	Power:M	Yes / NA	
		3.5.2.2.1.1.18	Monitor Low Battery Alarm	Power:O	Yes / No / NA	
		3.5.2.2.1.1.19	Monitor Response Fault Alarm	M	Yes	
		3.5.2.2.1.1.20	Monitor External Start	M	Yes	
		3.5.2.2.1.1.21	Monitor Stop Time Alarm	M	Yes	
		3.5.2.2.1.1.22	Monitor Offset Transitioning Alarm	M	Yes	
		3.5.2.2.1.1.23	Monitor Stall Condition	M	Yes	The vendor shall list the ASC processes or services where a watchdog timer is maintained and is considered critical to the safe operation of the ASC.
		3.5.2.2.1.1.24	Monitor Memory Fault	M	Yes	
		3.5.2.2.1.1.25	Monitor Process Failure	M	Yes	
		3.5.2.2.1.1.26	Monitor Communications Timeout	M	Yes	
		3.5.2.2.1.1.27	Monitor Power Problems	Power:M	Yes / NA	
		3.5.2.2.1.1.28	Monitor UPS Errors	UPS:O	Yes / No / NA	
		3.5.2.2.1.1.29	Monitor Scheduler Errors	Scheduler: M	Yes / NA	
		3.5.2.2.1.1.30	Monitor Signal Monitor Communications Error	O	Yes / No	
		3.5.2.2.1.1.31	Monitor Signal Monitor Unit Presence	O	Yes / No	
		3.5.2.2.1.1.32	Monitor USB Memory Device	O	Yes / No	
		3.5.2.2.1.1.33	Monitor ASC Cabinet Temperature Alarm	Temp:M	Yes / NA	
		3.5.2.2.1.1.34	Monitor ASC Cabinet Humidity Alarm	Humidity:M	Yes / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.2.1.1.35	Monitor Clock Failure	M	Yes	
		3.5.2.2.1.1.36	Monitor Preempt Maximum Presence Alarm	Preempt:O	Yes / No / NA	
		3.5.2.2.1.1.37	Monitor RSU Watchdog Timer	CV:M	Yes / NA	
		3.5.2.2.1.1.38	Monitor CV Certificate Faults	CV:O	Yes / No / NA	
		3.5.2.2.1.2	Monitor Alarm Group State	M	Yes	The ASC shall support at least 48 Alarm Groups (between 1 and 255).
2.5.2.2.2	Determine Mode of Operation					
2.5.2.2.2.1 (Unit)	Monitor Unit-wide General Operations			O	Yes / No	
		3.5.2.2.2.1	Monitor Unit Control Status	M	Yes	
		3.5.2.2.2.2	Monitor External Minimum Recall	O	Yes / No	
		3.5.2.2.2.3	Monitor Call to Non-Actuated 1	O	Yes / No	
		3.5.2.2.2.4	Monitor Call to Non-Actuated 2	O	Yes / No	
		3.5.2.2.2.5	Monitor Walk Rest Modifier	O	Yes / No	
		3.5.2.2.2.6	Monitor Interconnect	O	Yes / No	
		3.5.2.2.2.7 (Dimming)	Monitor Dimming Enabled	O	Yes / No	
2.5.2.2.2.2	Monitor Flashing			Unit:M	Yes / NA	
		3.5.2.2.2.8	Monitor Unit Flash Status	M	Yes	
2.5.2.2.2.3	Monitor Current Timing Pattern			Coord:M	Yes / NA	
		3.5.2.2.2.9.1	Monitor Current Pattern Status	M	Yes	
		3.5.2.2.2.9.2	Monitor Local Free Status	M	Yes	
		3.5.2.2.2.9.3	Monitor Current Mode of Operation	M	Yes	
		3.5.2.2.2.9.4	Monitor Programmed Pattern	M	Yes	
2.5.2.2.2.4	Monitor Current Cycle			Coord:M	Yes / NA	
		3.5.2.2.2.10.1	Monitor Coordination Cycle Status	M	Yes	
		3.5.2.2.2.10.2	Monitor Coordination Synchronization Status	M	Yes	
		3.5.2.2.2.10.3	Monitor Current Split	M	Yes	
		3.5.2.2.2.10.4	Monitor Current Offset	M	Yes	
2.5.2.2.3	Monitor Signal Indication			M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.2.3.1	Determine Maximum Number of Phase Groups	M	Yes	The ASC shall support at least 5 Phase Groups (between 1 and 255).
		3.5.2.2.3.2	Monitor Phase Group Reds	M	Yes	
		3.5.2.2.3.3	Monitor Phase Group Yellows	M	Yes	
		3.5.2.2.3.4	Monitor Phase Group Greens	M	Yes	
		3.5.2.2.3.5	Monitor Phase Group Don't Walks	M	Yes	
		3.5.2.2.3.6	Monitor Phase Group Pedestrian Clearance	M	Yes	
		3.5.2.2.3.7	Monitor Phase Group Walks	M	Yes	
		3.5.2.2.3.8	Monitor Phase Group Flashing Yellow Arrow	O	Yes / No	
		3.5.2.2.3.9	Monitor Phase Group Flashing Red Arrow	O	Yes / No	
2.5.2.2.4	Monitor Phase Status			M	Yes	
		3.5.2.2.4.1	Monitor Phase Group Phase Ons	M	Yes	
		3.5.2.2.4.2	Monitor Phase Group Phase Nexts	M	Yes	
		3.5.2.2.4.3	Monitor Phase Group Vehicle Call	M	Yes	
		3.5.2.2.4.4	Monitor Phase Group Pedestrian Call	M	Yes	
		3.5.2.2.4.5	Monitor Phase Group Bicycle Call	Bicycle:M	Yes / NA	
		3.5.2.2.4.6	Monitor Phase Group Transit Call	Transit:M	Yes / NA	
2.5.2.2.5	Monitor Ring Status			Ring:M	Yes / NA	
		3.5.2.2.5.1	Monitor Ring Status	M	Yes	
		3.5.2.2.5.2	Monitor Ring Termination Cause	M	Yes	
2.5.2.2.6	Monitor Channel Status			Channel:M	Yes / NA	
		3.5.2.2.6.1	Determine Maximum Number of Channel Status Groups	M	Yes	
		3.5.2.2.6.2	Monitor Channel Status Group Reds	M	Yes	
		3.5.2.2.6.3	Monitor Channel Status Group Yellows	M	Yes	
		3.5.2.2.6.4	Monitor Channel Status Group Greens	M	Yes	
2.5.2.2.7	Monitor Overlap Status			Overlap:M	Yes / NA	
		3.5.2.2.7.1	Determine Maximum Number of Overlap Status Groups	M	Yes	
		3.5.2.2.7.2	Monitor Overlap Status Group Reds	M	Yes	
		3.5.2.2.7.3	Monitor Overlap Status Group Yellows	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.2.7.4	Monitor Overlap Status Group Greens	M	Yes	
		3.5.2.2.7.5	Monitor Overlap Status Group Flashing Yellow Arrows	O	Yes / No	
		3.5.2.2.7.6	Monitor Overlap Status Group Flashing Red Arrows	O	Yes / No	
2.5.2.2.8	Monitor Preempt Input State			Preempt:M	Yes / NA	
		3.5.2.2.8.1	Monitor Currently Active Preempt	M	Yes	
		3.5.2.2.8.2	Monitor Current Preempt Inputs	M	Yes	
2.5.2.2.9	Monitor Preempt State			Preempt:O	Yes / NA	
		3.5.2.2.8.3	Monitor Current Preempt State	M	Yes	
		3.5.2.2.8.4	Monitor Current Gate Status	O	Yes / No	
2.5.2.2.10 (SpecialFunc)	Monitor Special Function Outputs			O	Yes / No	
		3.5.2.2.9.1	Determine Maximum Number of Special Functions	M	Yes	The ASC shall support at least 16 Special Functions (between 1 and 255).
		3.5.2.2.9.3	Monitor Special Function Status	M	Yes	
		3.5.2.2.9.4	Monitor Special Function Control Source	O	Yes / No	
2.5.2.2.11	Monitor Timebase Action Status			Scheduler: M	Yes / NA	
		3.5.2.2.10.1	Monitor Timebase Action Status	M	Yes	
		3.5.2.2.10.2	Monitor Timebase Timing Pattern Status	M	Yes	
2.5.2.2.12	Monitor Intra-Cabinet Communications Configuration			O	Yes / No	
		3.5.2.2.11.1	Monitor TS2 Port 1 Status	TS2-2:M	Yes / NA	
		3.5.2.2.11.2	Monitor TS2 Port 1 Fault Frame	TS2-2:M	Yes / NA	
		3.5.2.2.11.3	Monitor Serial Bus 1 Status	ITS:M	Yes / NA	
2.5.2.3	Control Signal Operations			M	Yes	
2.5.2.3.1	Control ASC-wide General Operations			M	Yes	
		3.5.2.3.1.1	Control External Minimum Recall	M	Yes	
		3.5.2.3.1.2	Control Call to Non-Actuated 1	M	Yes	
		3.5.2.3.1.3	Control Call to Non-Actuated 2	O	Yes / No	
		3.5.2.3.1.4	Control Walk Rest Modifier	M	Yes	
		3.5.2.3.1.5	Control Interconnect	O	Yes / No	
		3.5.2.3.1.6	Control Dimming Enabled	Dimming:M	Yes / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.3.1.7	Control Disable Remote Commands	O	Yes / No	
		3.5.2.3.1.8	Acknowledge Local Cycle Zero Alarm	M	Yes	
		3.5.2.3.1.9	Control Weather-based Signal Operation Changes	O	Yes / No	
2.5.2.3.2	Command Timing Pattern			Coord:M	Yes / NA	
		3.5.2.3.2.1	Command System Timing Pattern	M	Yes	
		3.5.2.3.2.2	Command System Timing Pattern System Reference Point	M	Yes	
2.5.2.3.3 (PhsCtrl)	Phase Requests			O	Yes / No	
		3.5.2.3.3.1	Control Phase Group Phase Omits	M	Yes	
		3.5.2.3.3.2	Control Phase Group Pedestrian Omits	M	Yes	
		3.5.2.3.3.3	Control Phase Group Holds	M	Yes	
		3.5.2.3.3.4	Control Phase Group Force Offs	O	Yes / No	
		3.5.2.3.3.5	Control Phase Group Vehicle Calls	M	Yes	
		3.5.2.3.3.6	Control Phase Group Pedestrian Calls	M	Yes	
		3.5.2.3.3.7	Control Phase Group Bicycle Calls	Bicycle:M	Yes / NA	
		3.5.2.3.3.8	Control Phase Group Transit Calls	Transit:M	Yes / NA	
2.5.2.3.4	Activate Preempt			Preempt:O	Yes / No	
		3.5.2.3.4.1	Command Preempt Remote Activation	M	Yes	
2.5.2.3.5	Control Ring Operations			Ring:O	Yes / No / NA	
		3.5.2.3.5.1	Control Ring Stop Time	M	Yes	
		3.5.2.3.5.2	Control Ring Force Offs	M	Yes	
		3.5.2.3.5.3	Control Ring Maximum 2 Time Settings	M	Yes	
		3.5.2.3.5.4	Control Ring Maximum 3 Time Settings	O	Yes / No	
		3.5.2.3.5.5	Control Ring Maximum Inhibit Settings	M	Yes	
		3.5.2.3.5.6	Control Ring Pedestrian Recycle Settings	M	Yes	
		3.5.2.3.5.7	Control Ring Red Rest Settings	M	Yes	
		3.5.2.3.5.8	Control Ring Red Clearance Omit Settings	M	Yes	
		3.5.2.3.5.9	Determine Maximum Number of Ring Control Groups	M	Yes	The ASC shall support at least 2 ring control groups.

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.3.6	Activate Special Function Output			SpecialFunc:O	Yes / No / NA	
		3.5.2.3.6.1	Activate Special Function	M	Yes	
		3.5.2.3.6.2	Release Special Function Control	M	Yes	
2.5.2.3.7	Control Frame 40			TS1:O TS2-2:O TS2-1:O	Yes / No / NA	
		3.5.2.3.7.1	Control TS2 Port 1 Frame 40 Messages	M	Yes	
2.5.2.3.8	Activate Action Plan			O	Yes / No	
		3.5.2.3.8	Activate Action Plan	M	Yes	
2.5.2.3.9	Remote Manual Control			O	Yes / No	
		3.5.2.3.9.1	Enable Manual Control	M	Yes	
		3.5.2.3.9.2	Remote Manual Control Advance Command	M	Yes	
		3.5.2.3.9.3	Configure Manual Control Timeout	M	Yes	
2.5.3	Manage Detectors					
2.5.3.1 (Detector)	Manage Detector Configuration			M	Yes	
		3.5.3.1.1.1.1	Configure Vehicle Volume Detectors	O	Yes / No	
		3.5.3.1.1.1.2	Configure Vehicle Occupancy Detectors	O	Yes / No	
		3.5.3.1.1.1.3 (Speed)	Configure Vehicle Speed Detectors	O	Yes / No	
		3.5.3.1.1.1.4	Configure Vehicle Detection Zone Length	O	Yes / No	
		3.5.3.1.1.1.5	Configure Vehicle Travel Mode	O	Yes / No	
		3.5.3.1.1.1.6	Configure Vehicle Detector Yellow Lock Call Enabled	O	Yes / No	
		3.5.3.1.1.1.7	Configure Vehicle Detector Red Lock Call Enabled	O	Yes / No	
		3.5.3.1.1.1.8	Configure Vehicle Detector Passage Enabled	O	Yes / No	
		3.5.3.1.1.1.9	Configure Vehicle Detector Added Initial Time Enabled	O	Yes / No	
		3.5.3.1.1.1.10	Configure Vehicle Detector Queue Enabled	O	Yes / No	
		3.5.3.1.1.1.11	Configure Vehicle Detector Call Enabled	M	Yes	
		3.5.3.1.1.1.12	Configure Vehicle Detector Call Phase	M	Yes	
		3.5.3.1.1.1.13	Configure Vehicle Detector Switch Phase	M	Yes	
		3.5.3.1.1.1.14	Configure Vehicle Detector Delay Time	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.3.1.1.1.15	Configure Vehicle Detector Extend Time	M	Yes	
		3.5.3.1.1.1.16	Configure Vehicle Detector Queue Limit Time	O	Yes / No	
		3.5.3.1.1.1.17	Configure Vehicle Detector No Activity Time	M	Yes	
		3.5.3.1.1.1.18	Configure Vehicle Detector Maximum Presence Time	M	Yes	
		3.5.3.1.1.1.19	Configure Vehicle Detector Erratic Counts	M	Yes	
		3.5.3.1.1.1.20	Configure Vehicle Detector Fail Time	O	Yes / No	
		3.5.3.1.1.1.21	Configure Single Detector Speed Mode	Speed:M	Yes / NA	
		3.5.3.1.1.1.22	Configure Paired Detector	Speed:M	Yes / NA	
		3.5.3.1.1.1.23	Configure Paired Detector Placement	Speed:M	Yes / NA	
		3.5.3.1.1.1.24	Configure Paired Detector Spacing	Speed:M	Yes / NA	
		3.5.3.1.1.1.25	Configure Average Vehicle Length	Speed:M	Yes / No	
		3.5.3.1.1.2.1	Configure Pedestrian Detector Call Phase	M	Yes	
		3.5.3.1.1.2.2	Configure Pedestrian Detector No Activity Time	M	Yes	
		3.5.3.1.1.2.3	Configure Pedestrian Detector Maximum Presence Time	M	Yes	
		3.5.3.1.1.2.4	Configure Pedestrian Detector Erratic Counts	M	Yes	
		3.5.3.1.1.2.5	Configure Pedestrian Detector Non-Lock Calls	O	Yes / No	
		3.5.3.1.1.2.6	Configure Pedestrian Detector Alternate Pedestrian Timing	O	Yes / No	
		3.5.3.1.1.2.7	Configure Pedestrian Detector Type	O	Yes / No	
2.5.3.2	Monitor Detector Status			O	Yes / No	
		3.5.3.1.2.1.1	Determine Maximum Number of Vehicle Detectors	M	Yes	The ASC shall support at least 128 vehicle detectors (between 1 and 255).
		3.5.3.1.2.2.1	Determine Maximum Number of Pedestrian Detectors	M	Yes	The ASC shall support at least 16 pedestrian detectors (between 1 and 255).
		3.5.3.2.1.1	Determine Maximum Number of Vehicle Detector Status Groups	M	Yes	The ASC shall support at least 5 vehicle detector status groups (between 1 and 255).

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.3.2.1.2	Monitor Vehicle Detector Status Group Active	M	Yes	
		3.5.3.2.1.3	Monitor Vehicle Detector Status Group Alarm Status	M	Yes	
		3.5.3.2.2.1	Determine Maximum Number of Pedestrian Detector Status Groups	M	Yes	The ASC shall support at least 5 Pedestrian detector status groups (between 1 and 255).
		3.5.3.2.2.2	Monitor Pedestrian Detector Status Active	O	Yes / No	
		3.5.3.2.2.3	Monitor Pedestrian Detector Alarm Status	M	Yes	
2.5.3.3	Monitor Detector Health			O	Yes / No	
		3.5.3.3.1.1	Monitor Vehicle Detector No Activity Fault	M	Yes	
		3.5.3.3.1.2	Monitor Vehicle Detector Max Presence Fault	M	Yes	
		3.5.3.3.1.3	Monitor Vehicle Detector Erratic Output Fault	M	Yes	
		3.5.3.3.1.4	Monitor Vehicle Detector Communications Fault	M	Yes	
		3.5.3.3.1.5	Monitor Vehicle Detector Configuration Fault	M	Yes	
		3.5.3.3.2.1	Monitor Loop Vehicle Detector Watchdog Failure	O	Yes / No	
		3.5.3.3.2.2	Monitor Loop Vehicle Detector Open Loop Failure	O	Yes / No	
		3.5.3.3.2.3	Monitor Loop Vehicle Detector Shorted Loop Fault	O	Yes / No	
		3.5.3.3.2.4	Monitor Loop Vehicle Detector Excessive Change Fault	O	Yes / No	
		3.5.3.3.3.1	Monitor Pedestrian Detector No Activity Fault	M	Yes	
		3.5.3.3.3.2	Monitor Pedestrian Detector Max Presence Fault	M	Yes	
		3.5.3.3.3.3	Monitor Pedestrian Detector Erratic Output Fault	M	Yes	
		3.5.3.3.3.4	Monitor Pedestrian Detector Communications Fault	M	Yes	
		3.5.3.3.3.5	Monitor Pedestrian Detector Configuration Fault	M	Yes	
2.5.3.4	Control Detectors			O	Yes / No	
		3.5.3.4.1	Control Vehicle Detector Reset	M	Yes	
		3.5.3.4.2	Control Pedestrian Detector Reset	M	Yes	
		3.5.3.4.3	Control Vehicle Detector Actuation	O	Yes / No	
		3.5.3.4.4	Control Pedestrian Detector Actuation	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.3.5	Manage Detector Data			O	Yes / No	
		3.5.3.5.1.1.1	Configure Detector Data Sample Period	M	Yes	
		3.5.3.5.1.1.2	Configure Detector Data Sample Period - Version 3	M	Yes	
		3.5.3.5.2.1.1	Monitor Detector Data Sequence	M	Yes	
		3.5.3.5.2.1.2	Determine Detector Data Active Detectors	M	Yes	
		3.5.3.5.2.1.3	Monitor Volume Data	O	Yes / No	
		3.5.3.5.2.1.4	Monitor Average Speed	Speed:M	Yes / NA	
		3.5.3.5.2.1.5	Monitor Occupancy Data	O	Yes / No	
		3.5.3.5.2.1.6	Monitor Vehicle Detector Data Alarms	M	Yes	
		3.5.3.5.2.1.7	Monitor Detector Data Sample Time	M	Yes	
		3.5.3.5.2.1.8	Monitor Detector Data Sample Duration	M	Yes	
		3.5.3.6.1.1	Configure Pedestrian Data Collection Sample Period	M	Yes / No	
		3.5.3.6.2.1	Monitor Pedestrian Counts	O	Yes / No	
		3.5.3.6.2.2	Monitor Pedestrian Detector Actuations	O	Yes / No	
		3.5.3.6.2.3	Monitor Pedestrian Detector Data Alarms	O	Yes / No	
		3.5.3.6.2.4	Monitor Pedestrian Services	O	Yes / No	
		3.5.3.6.2.5	Determine Pedestrian Detector Data Active Detectors	O	Yes / No	
		3.5.3.6.2.6	Monitor Pedestrian Detector Data Sample Time	O	Yes / No	
		3.5.3.6.2.7	Monitor Pedestrian Detector Data Sample Duration	O	Yes / No	
		3.5.3.6.2.8	Monitor Pedestrian Detector Data Sequence	O	Yes / No	
2.5.4 (CV)	Manage Connected Vehicles Interface			O	Yes / No	Not required with initial software delivery. See procurement document for details
2.5.4.1	Connected Vehicle Manager: Management Station – ASC Interface			M	Yes / No	
2.5.4.1.1	Manage RSU Interface			M	Yes	
		3.5.4.1.1.1	Configure RSU Interface	M	Yes	
		3.5.4.1.1.2	Configure Logical RSU Ports	M	Yes	
		3.5.4.1.1.3	Configure RSU Interface Polling Period	O	Yes / No	
2.5.4.1.2	Manage RSU Interface Watchdog			O	Yes / No	
		3.5.4.1.2.1	Configure RSU Interface Watchdog	M	Yes	
		3.5.4.1.2.2	Monitor RSU Interface Watchdog Timer	M	Yes	
2.5.4.1.3	Manage Signal Phase and Timing Data			O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.1.3.1	Enable Signal Phase and Timing Data	M	Yes	
		3.5.4.1.3.2	Retrieve Intersection Identifier	M	Yes	
		3.5.4.1.3.3	Retrieve Signal Phase and Timing Time Point	M	Yes	
		3.5.4.1.3.4	Retrieve Signal Phase and Timing Generation Time	M	Yes	
		3.5.4.1.3.5	Retrieve Signal Phase and Timing Intersection Status	M	Yes	
		3.5.4.1.3.6.1	Monitor Movement State	M	Yes	
		3.5.4.1.3.6.2.1	Monitor Movement Minimum End Time	O	Yes / No	
		3.5.4.1.3.6.2.2	Monitor Movement Maximum End Time	O	Yes / No	
		3.5.4.1.3.6.2.3	Monitor Movement Likely End Time	O	Yes / No	
		3.5.4.1.3.6.2.4	Monitor Movement Likely End Time Confidence	O	Yes / No	
		3.5.4.1.3.6.2.5	Monitor Movement Next Occurrence	O	Yes / No	
		3.5.4.1.3.6.3.1	Configure Queue Detectors for Movement Assistance	MvtQueue: M	Yes / NA	
		3.5.4.1.3.6.3.2	Configure Pedestrian Detectors for Movement Assistance	MvtConflict: O.13 (1..*)	Yes / No / NA	
		3.5.4.1.3.6.3.3	Configure Bicycle Detectors for Movement Assistance	MvtConflict: O.13 (1..*)	Yes / No / NA	
		3.5.4.1.3.6.4.1 (MvtQueue)	Monitor Lane Connection Queue Length	O	Yes / No	
		3.5.4.1.3.6.4.2	Monitor Lane Connection Available Storage Length	O	Yes / No	
		3.5.4.1.3.6.4.3	Monitor Lane Connection Stop Line Wait	O	Yes / No	
		3.5.4.1.3.6.4.4 (MvtConflict)	Monitor Lane Connection Traveler Detection	O	Yes / No	
		3.5.4.1.3.6.4.5	Monitor Lane Connection State	M	Yes	
		3.5.4.1.3.6.5.1 (SpdAdvice)	Configure Advisory Speed Type	O	Yes / No	
		3.5.4.1.3.6.5.2	Configure Advisory Speed	SpdAdvice: O	Yes / No / NA	
		3.5.4.1.3.6.5.3	Configure Advisory Speed Zone	SpdAdvice: O	Yes / No / NA	
		3.5.4.1.3.6.5.4	Configure Advisory Speed Vehicle Type	SpdAdvice: O	Yes / No / NA	
		3.5.4.1.3.6.5.5	Retrieve Advisory Speed Confidence Level	SpdAdvice: O	Yes / No / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.1.3.6.6	Monitor Movement Status	O	Yes / No	
		3.5.4.1.3.6.7	Monitor Lane Connection Maneuver Status	O	Yes / No	
		3.5.4.1.3.7.1	Configure Concurrent Enabled Lanes	O	Yes / No	
		3.5.4.1.3.7.2	Configure Enabled Lanes for a Pattern	O	Yes / No	
		3.5.4.1.3.7.3	Command Enabled Lanes	O	Yes / No	
		3.5.4.1.3.8	Configure Movement Type	M	Yes	
		3.5.4.1.3.9	Configure Lane Connection Type	M	Yes	
		3.5.4.1.3.10	Enable Signal Phase and Timing Data Exchange	O	Yes / No	
2.5.4.1.4	Exchange Connected Devices Data for Operational Performance Data			Perform:O	Yes / No / NA	
		3.5.1.5.1.1	Enable/Disable Collection of Operational Performance Data	M	Yes	
		3.5.1.5.1.2	Start Collection of Operational Performance Data on Specific Date/Time	O	Yes / No	
		3.5.1.5.1.3	End Collection of Operational Performance Data on Specific Date/Time	O	Yes / No	
		3.5.1.5.1.4	Configure Collection of Operational Performance Data	O	Yes / No	
		3.5.1.5.2.1	Determine Collection of Operational Performance Data	M	Yes	
		3.5.1.5.2.2	Determine Operational Performance Data Collection Capabilities	M	Yes	
		3.5.1.5.3.1	Monitor Operational Performance Data	O	Yes / No	
		3.5.1.5.3.2	Retrieve Operational Performance Data	O	Yes / No	
		3.5.1.5.3.3	Retrieve Operational Performance Data - Time Range	O	Yes / No	
		3.5.1.5.3.4	Retrieve Operational Performance Data - Event Code	O	Yes / No	
		3.5.4.3.3.1.1	Retrieve Actuation Report (ASC)	ASC:M	Yes / NA	
		3.5.4.3.3.2.1	Provide Actuation Report	RSU:M	Yes / NA	
2.5.4.2	Connected Vehicle Manager: Management Station – CV Roadside Process Interface			O	Yes / No	
2.5.4.2.1	Manage Roadway Geometrics Information			O	Yes / No	
		3.5.4.2.1.1.1	Configure Intersection Identifier	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.2.1.1.2	Configure Intersection Location	M	Yes	
		3.5.4.2.1.1.3	Configure Intersection Name	O	Yes / No	
		3.5.4.2.1.1.4	Configure Intersection Default Lane Width	O	Yes / No	
		3.5.4.2.1.1.5.1	Configure Lane Identifier	M	Yes	
		3.5.4.2.1.1.5.2	Configure Lane Description	O	Yes / No	
		3.5.4.2.1.1.5.3	Configure Ingress Approach	O	Yes / No	
		3.5.4.2.1.1.5.4	Configure Egress Approach	O	Yes / No	
		3.5.4.2.1.1.5.5	Configure Allowed Lane Direction	M	Yes	
		3.5.4.2.1.1.5.6	Configure Vehicle Lane Attributes	M	Yes	
		3.5.4.2.1.1.5.7	Configure Crosswalk Attributes	M	Yes	
		3.5.4.2.1.1.5.8	Configure Bicycle Lane Attributes	O	Yes / No	
		3.5.4.2.1.1.5.9	Configure Sidewalk Attributes	O	Yes / No	
		3.5.4.2.1.1.5.10	Configure Barrier Attributes	O	Yes / No	
		3.5.4.2.1.1.5.11	Configure Striping Lane Attributes	O	Yes / No	
		3.5.4.2.1.1.5.12	Configure Tracked Lane Attributes	O	Yes / No	
		3.5.4.2.1.1.5.13	Configure Parked Lane Attributes	O	Yes / No	
		3.5.4.2.1.1.5.14	Configure Shared Lanes Attributes	M	Yes	
		3.5.4.2.1.1.5.15	Configure Allowed Maneuvers	O	Yes / No	
		3.5.4.2.1.1.5.16	Configure Lane Path	M	Yes	
		3.5.4.2.1.1.6.1	Configure Node Point Attributes	O	Yes / No	
		3.5.4.2.1.1.6.2	Configure Lane Segment Attributes	O	Yes / No	
		3.5.4.2.1.1.6.3	Configure Lane End Point Angle	O	Yes / No	
		3.5.4.2.1.1.6.4	Configure Lane Crown Angle - Center	O	Yes / No	
		3.5.4.2.1.1.6.5	Configure Lane Crown Angle - Left Edge	O	Yes / No	
		3.5.4.2.1.1.6.6	Configure Lane Crown Angle - Right Edge	O	Yes / No	
		3.5.4.2.1.1.6.7	Configure Lane Angle	O	Yes / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.2.1.1.6.8 (SpeedLimit)	Configure Speed Limit Type at Node	O	Yes / (No)	
		3.5.4.2.1.1.6.9	Configure Speed Limit at Node	SpeedLimit: O	Yes / No / (NA)	
		3.5.4.2.1.1.6.10	Configure Lane Width Delta	O	Yes / (No)	
		3.5.4.2.1.1.6.11	Configure Lane Elevation Delta	O	Yes / (No)	
		3.5.4.2.1.1.7.1 (Computed)	Configure Computed Lane Reference	O	Yes / (No)	
		3.5.4.2.1.1.7.2	Configure Computed Lane X Offset	Computed: M	Yes / (NA)	
		3.5.4.2.1.1.7.3	Configure Computed Lane Y Offset	Computed: M	Yes / (NA)	
		3.5.4.2.1.1.7.4	Configure Computed Lane Rotation	Computed: O	Yes / No / (NA)	
		3.5.4.2.1.1.7.5	Configure Computed Lane X Scale	Computed: O	Yes / No / (NA)	
		3.5.4.2.1.1.7.6	Configure Computed Lane Y Scale	Computed: O	Yes / No / (NA)	
		3.5.4.2.1.1.8	Configure Overlays	O	Yes / (No)	
		3.5.4.2.1.1.9 (RestrictClass)	Configure Applicable Users	O	Yes / (No)	
		3.5.4.2.1.2.1	Determine Maximum Number of Intersections Supported	M	(Yes)	The ASC shall support at least 255 (1-255) intersection definitions.
		3.5.4.2.1.2.2	Determine Maximum Number of Lanes Supported	M	(Yes)	The ASC shall support at least 255 (1-255) lane definitions.
		3.5.4.2.1.2.3	Determine Maximum Number of Computed Lanes Supported	Computed: M	(Yes)	The ASC shall support at least 255 (1-255) computed lanes.
		3.5.4.2.1.2.4	Determine Maximum Number of Node Points Supported	M	(Yes)	The ASC shall support at least 63 (2-63) node points for a lane.
		3.5.4.2.1.2.5	Determine Maximum Number of Speed Limits Supported	SpeedLimit: M	(Yes)	The ASC shall support at least 9 (1-9) speed limit types.
		3.5.4.2.1.2.6	Determine Maximum Number of Vehicle Type Definitions	RestrictClass:M	(Yes)	The ASC shall support at least 100 (1-255).
		3.5.4.2.1.3.1	Configure Roadway Geometry Plan Process Method	O	(Yes) / No	
		3.5.4.2.1.3.2	Configure Roadway Geometry Plan Process Agency	O	(Yes) / No	
		3.5.4.2.1.3.3	Configure Roadway Geometry Plan Date	O	(Yes) / No	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.2.1.3.4	Configure Roadway Geometry Plan Geoid	O	Yes / No	
		3.5.4.2.1.3.5	Configure Roadway Geometry Plan Layer Type	O	Yes / No	
		3.5.4.2.1.3.6	Configure Roadway Geometry Plan Layer Identifier	O	Yes / No	
2.5.4.2.2	Manage Movement Configuration for Connected Devices			O	Yes / No	
		3.5.4.2.2.1.1	Configure Connecting Lane	M	Yes	
		3.5.4.2.2.1.2	Configure Connecting Maneuver	M	Yes	
		3.5.4.2.2.1.3	Configure Remote Intersection Identifier	O	Yes / No	
		3.5.4.2.2.1.4	Configure Matching Signal Group	M	Yes	
		3.5.4.2.2.2	Configure Lane Connection Users	O	Yes / No	
		3.5.4.2.2.3	Configure Connection Identifier	O	Yes / No	
		3.5.4.2.2.4	Configure MAP Plans	O	Yes / No	
		3.5.4.2.2.5	Determine Maximum Number of Signal Groups Supported	M	Yes	
		3.5.4.2.2.6	Determine Maximum Number of Lane Connections Supported	M	Yes	
		3.5.4.2.2.7	Command MAP Plans	O	Yes / No	
2.5.4.2.3	Manage Collection of Connected Devices Data			O	Yes / No	
		3.5.4.2.3.1.1	Enable Connected Device Detection	M	Yes	
		3.5.4.2.3.1.2	Enable Connected Device Detector	M	Yes	
		3.5.4.2.3.1.3	Configure Connected Device Detector Reference Point	O	Yes / No	
		3.5.4.2.3.1.4	Configure Connected Device Detector Zone - Geographic	O	Yes / No	
		3.5.4.2.3.1.5	Configure Connected Device Detector Zone - Lane	O	Yes / No	
		3.5.4.2.3.1.6	Configure Connected Device Data Filters	O	Yes / No	
		3.5.4.2.3.1.7	Configure Connected Device Detector Assignments	Detector:O	Yes / No / NA	
		3.5.4.2.3.1.8	Determine Maximum Number of Connected Device Detectors Supported	M	Yes	The ASC shall support at least 255 connected device detectors (between 1 and 255).
		3.5.4.2.3.1.9	Determine Maximum Number of Connected Device Detectors Node Points Supported	M	Yes	

Gary Jost
2023-05-24 17:30:40

255

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.2.3.2.1 (DetZoneOut)	Configure Connected Device Detector Outputs	O	Yes / No	
		3.5.4.2.3.2.2	Configure Actuation Sampling Period	DetZoneOut:O	Yes / No / NA	
		3.5.4.2.3.2.3	Retrieve Actuation Report	DetZoneOut:O	Yes / No / NA	
		3.5.4.2.3.2.4	Configure Detection Reports Data	DetZoneOut::O	Yes / No / NA	
		3.5.4.2.3.2.5	Configure Detection Report Sampling Period	DetZoneOut:O	Yes / No / NA	
		3.5.4.2.3.2.6	Retrieve Detection Report	DetZoneOut:O	Yes / No / NA	
2.5.4.2.4	Monitor Broadcasted MAP Messages			O	Yes / No	
		3.5.4.2.4.1	Monitor MAP Data Message Sequence	M	Yes	
		3.5.4.2.4.2	Monitor MAP Data Message Time	O	Yes / No	
		3.5.4.2.4.3	Monitor MAP Data Message Intersection Sequence	M	Yes	
		3.5.4.2.4.4	Monitor MAP Plan	O	Yes / No	
2.5.4.2.5	Monitor Broadcasted SPAT Messages			O	Yes / No	
		3.5.4.2.5.1	Monitor Signal Phase and Timing Message Sequence	M	Yes	
		3.5.4.2.5.2	Monitor Signal Phase and Timing Message Timestamp	O	Yes / No	
		3.5.4.2.5.3	Monitor Intersection SPaT Message Timestamp	O	Yes / No	
		3.5.4.2.5.4	Monitor Enabled Lanes	O	Yes / No	
2.5.4.3	Connected Vehicle Manager: ASC - CV Roadside Process Interface			CV:O	Yes / No	
		3.5.4.3.a (RSU)		O.20:(1)	Yes / No	
		3.5.4.3.b (ASC)		O.20:(1)	Yes / No	
2.5.4.3.1	Exchange Current and Next Movement Information			O	Yes / No	
		3.5.4.3.1.1.1	Provide Intersection Identifier	ASC:M	Yes / NA	
		3.5.4.3.1.1.2	Provide Signal Phase and Timing Intersection Status	ASC:M	Yes / NA	
		3.5.4.3.1.1.3.1	Provide Movement Time Point	ASC:M	Yes / NA	
		3.5.4.3.1.1.3.2	Provide Movement State	ASC:M	Yes / NA	
		3.5.4.3.1.1.3.3	Provide Movement Minimum End Time	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.3.4	Provide Movement Maximum End Time	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.3.5	Provide Movement Likely End Time	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.3.6	Provide Movement Likely End Time Confidence	ASC:O	Yes / No / NA	

Protocol Requirements List (PRL)						
User Need ID	User Need	FR ID	Functional Requirement	Conformance	Support	Additional Specifications
		3.5.4.3.1.1.3.7	Provide Movement Next Occurrence	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.3.8	Provide Movement Status	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.4.1	Provide Lane Connection Queue Length	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.4.2	Provide Lane Connection Available Storage Length	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.4.3	Provide Lane Connection Stop Line Wait	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.4.4	Provide Lane Connection Traveler Detection	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.4.5	Provide Lane Connection State	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.4.6	Provide Lane Connection Status	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.5.1	Provide Advisory Speed Type	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.5.2	Provide Advisory Speed	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.5.3	Provide Advisory Speed Zone	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.5.4	Provide Advisory Speed Vehicle Type	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.5.5	Provide Advisory Speed Confidence Level	ASC:O	Yes / No / NA	
		3.5.4.3.1.1.6	Provide Intersection Channel Assignment	ASC:M	Yes / NA	
		3.5.4.3.1.2.1	Retrieve Intersection Identifier	RSU:M	Yes / NA	
		3.5.4.3.1.2.2	Retrieve Signal Phase and Timing Intersection Status	RSU:M	Yes / NA	
		3.5.4.3.1.2.3.1	Retrieve Movement Time Point	RSU:M	Yes / NA	
		3.5.4.3.1.2.3.2	Retrieve Movement Time Point - Milliseconds	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.3.3	Retrieve Movement State	RSU:M	Yes / NA	
		3.5.4.3.1.2.3.4	Retrieve Movement Minimum End Time	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.3.5	Retrieve Movement Maximum End Time	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.3.6	Retrieve Movement Likely End Time	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.3.7	Retrieve Movement Likely End Time Confidence	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.3.8	Retrieve Movement Next Occurrence	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.3.9	Retrieve Movement Status	RSU:O	Yes / No / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.3.1.2.4.1	Retrieve Lane Connection Queue Length	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.4.2	Retrieve Lane Connection Available Storage Length	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.4.3	Retrieve Lane Connection Stop Line Wait	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.4.4	Retrieve Lane Connection Traveler Detection	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.4.5	Retrieve Lane Connection State	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.4.6	Retrieve Lane Connection Status	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.5.1	Retrieve Advisory Speed Type	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.5.2	Retrieve Advisory Speed	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.5.3	Retrieve Advisory Speed Zone	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.5.4	Retrieve Advisory Speed Vehicle Type	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.5.5	Retrieve Advisory Speed Confidence Level	RSU:O	Yes / No / NA	
		3.5.4.3.1.2.6	Retrieve Intersection Channel Assignment	RSU:M	Yes / NA	
		3.6.3.1	SPaT Maximum Transmission Start Time	ASC:M	Yes / NA	The Maximum Transmission Start Time for all SPAT data shall be 10 milliseconds (Default=10).
		3.6.3.2	Movement Time Point Minimum Transmission Rate	ASC:M	Yes / NA	The Movement Time Point Minimum Transmission Rate shall be once per 100 milliseconds (Default=100).
		3.6.3.3	SPaT-data Request Transmission Rate	RSU:M	Yes / NA	The nominal Rate to request SPAT-data from an ASC shall be once per ___ milliseconds (Default=100).
		3.6.3.4	Condition-based SPaT Maximum Transmission Start Time	RSU, Traps:O	Yes / No / NA	The Maximum Transmission Start Time for all SPAT reports shall be ___ milliseconds (Default=10).
		3.6.3.5	SPaT Latency	M	Yes	
2.5.4.3.2	Exchange Next Occurrence of a Movement			O	Yes / No	
		3.5.4.3.2.1	Provide Movement Next Occurrence	ASC:M	Yes / NA	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.3.2.2	Retrieve Movement Next Occurrence	RSU:M	Yes / NA	
		3.6.3.1	SPaT Maximum Transmission Start Time	ASC:M	Yes / NA	The Maximum Transmission Start Time for all SPAT data that changed shall be ___ milliseconds (Default=10).
		3.6.3.2	Movement Time Point Minimum Transmission Rate	ASC:M	Yes / NA	The Movement Time Point Minimum Transmission Rate shall be once per _____ milliseconds (Default=100).
		3.6.3.3	SPaT-data Request Transmission Rate	RSU:M	Yes / NA	The nominal Rate to request SPAT-data from an ASC shall be once per ___ milliseconds (Default=100).
		3.6.3.4	Condition-based SPaT Maximum Transmission Start Time	RSU, Traps:O	Yes / No / NA	The Maximum Transmission Start Time for all SPAT reports shall be ___ milliseconds (Default=10).
		3.6.3.5	SPaT Latency	M	Yes	
2.5.4.3.3	Exchange Presence of Connected Devices			O	Yes / No	
		3.5.4.3.3.1.1	Retrieve Actuation Report (ASC)	ASC:O.21(1..*)	Yes / No / NA	
		3.5.4.3.3.1.2	Retrieve Detection Report (ASC)	ASC:O.21(1..*)	Yes / No / NA	
		3.5.4.3.3.2.1	Provide Actuation Report	RSU:O.22(1..*)	Yes / No / NA	
		3.5.4.3.3.2.2	Provide Detection Report	RSU:O.22(1..*)	Yes / No / NA	
2.5.4.3.4	Exchange Roadway Geometrics Information			O	Yes / No	
		3.5.4.3.4.1.1	Retrieve MAP Plan in Effect	ASC:M	Yes / NA	
		3.5.4.3.4.2.1	Provide MAP Plan in Effect	RSU:M	Yes / NA	
		3.5.4.3.4.3	Confirm MAP Plan Compatibility	M	Yes	
2.5.5	Backward Compatibility Features					
2.5.5.1	Backward Compatible with NTCIP 1202 v01			O	Yes / No	.
		3.5.5.1	NTCIP 1202 v01 - Configure Special Function State	O	Yes / No	
2.5.5.2	Backward Compatible with NTCIP 1202 v02			NA	NA	
2.6	Security			M	Yes	
2.6.1	Manage Authentication			M	Yes	
		H.1.1.8.1	Configure Security Definitions	M	Yes	
		H.1.2.4.1	Determine Security Definitions	M	Yes	
2.6.2	Manage Accessibility			M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.4.4.1	Configure Access	M	Yes	
		3.4.4.2	Determine Current Access Settings	M	Yes	
2.6.3	Manage Users			M	Yes	
		3.4.4.1	Configure Access	M	Yes	
		3.4.4.2	Determine Current Access Settings	M	Yes	
2.6.4	Log User Access			O	Yes/No	
		3.5.1.6.1	Configure ASC Clock Source	O	Yes / No	
		3.5.1.6.2	Determine ASC Clock Status	O	Yes / No	
		3.5.1.6.3	Determine Current ASC Clock Source	O	Yes / No	
		3.5.1.6.4	Determine Available ASC Clock Sources	O	Yes / No	
		H.1.1.5.1	Configure Time	M	Yes	
		H.1.1.5.2	Configure Time Zone	TimeZone: O	Yes / No / NA	
		H.1.1.5.3	Configure Daylight Saving Mode	DST:O	Yes / No / NA	
		H.1.1.5.4	Determine Time Setting	M	Yes	
		H.1.1.5.5 (TimeZone)	Determine Time Zone Setting	O	Yes / No	
		H.1.1.5.6 (DST)	Determine Daylight Saving Mode Setting	O	Yes / No	
		H.1.1.5.7	Monitor Current Time	M	Yes	
		H.1.3.1.1	Retrieve Current Configuration of Logging Service	M	Yes	
		H.1.3.1.2	Configure Event Logging Service	M	Yes	
		H.1.3.1.3	Retrieve Event Logged Data	M	Yes	
		H.1.3.1.5	Determine Capabilities of Event Logging Service	M	Yes	
		H.1.3.1.6	Determine Number of Logged Events per Event Class	M	Yes	
		H.1.3.1.7	Support a Number of Events to Store in Log	M	Yes	The ASC shall be capable of storing at least 200 events in the event log file (up to 65535).
		H.1.3.1.9	Determine Total Number of Logged Events	O	Yes / No	
		H.1.3.1.10	Determine Number of Events within a Class	M	Yes	
		H.1.3.2.1	Record and Timestamp Events	M	Yes	
		H.1.3.2.2	Support a Number of Event Classes	M	Yes	The ASC shall support at least 10 event classes.

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.1.3.2.3	Support a Number of Events to Log	M	Yes	The ASC shall be able to log at least 200 events.
		H.1.3.2.4.1	Support On-Change Events	M	Yes	
		H.1.3.2.4.6	Support Bit Flag Events	M	Yes	
		H.1.3.2.4.7	Support Event Monitoring on Any Data	M	Yes	
		3.6.1	Response Time for Requests	M	Yes	The Response Time for all requests shall be 25 milliseconds (5-500: Default=25).

APPENDIX B

NTCIP 1211 Protocol Requirements List

For organizational purposes, Appendix B is attached separately in the Public Purchase dashboard for RFP 2023-092 .

EXHIBIT B

NTCIP 1211 Protocol Requirements List (PRL)

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.4	Architectural Needs					
2.4.1	Integral Entities			C	Yes / NA	Where two entities are integral to the same physical device, the interface between these entities is implementation-specific.
2.4.2	Provide Live Data			M	Yes	
		3.4.1.1	Provide Data	M	Yes	
		3.4.1.2	Receive Data	M	Yes	
		3.4.1.3	Explore Data	M	Yes	
		3.6.1	Response Time for Requests	M	Yes	The Response Time for all requests shall be ___ milliseconds (25-500: Default=100).
2.4.3	Support Multiple Instances of an Entity			M	Yes	
		3.4.1.1	Provide Data	M	Yes	An agent shall be capable of providing data to at least ___ (1-10:Default=10) managers at any time.
		3.4.1.2	Receive Data	M	Yes	An agent shall be capable of receiving data from at least ___ (1-10:Default=10) managers at any time.
		3.4.1.3	Explore Data	M	Yes	An agent shall be capable of dynamically providing data to at least ___ (1-10:Default=10) managers at any time.
2.4.4	Provide Compressed Data					
2.4.4.1	Provide Compressed Data between a Management Station and a PRS			M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.1.1	Set Reservice Period	M	Yes	
		3.5.1.2	Set Time To Live Period	M	Yes	
		3.5.1.3.1	Retrieve Priority Request Settings	M	Yes	
2.4.4.2	Provide Compressed Data between a Management Station and a CO			M	Yes	
		3.5.2.1.1	Set Priority Strategy Configuration	M	Yes	
		3.5.2.2.1	Retrieve Priority Strategy Settings	M	Yes	
2.5	Features					
2.5.1	Interface – Management Station to PRS			M	Yes	
2.5.1.1	Manage the PRS			M	Yes	
2.5.1.1.1	Determine PRS Identity			C	Yes / No / NA	Note: This may be NA if the PRS is integral to the traffic signal controller and the traffic signal controller already supports Device Identity.
		H.2.1	Determine Device Component Information	M	Yes	
		H.2.3	Determine Supported Standards	M	Yes	
		H.2.4	Determine System Name	O	Yes / No	
2.5.1.1.2	Determine PRS Configuration			C	Yes / No / NA	Note: This may be NA if the PRS is integral to the traffic signal controller and the traffic signal controller already supports Device Configuration.
		H.2.2	Determine Device Configuration Identifier	M	Yes	
2.5.1.1.3	Configure Reservice Period			M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.1.1	Set Reservice Period	M	Yes	
2.5.1.1.4	Configure Time To Live Period			M	Yes	
		3.5.1.2	Set Time To Live Period	M	Yes	
		3.6.2.2	Clear Expired Priority Requests	M	Yes	
2.5.1.1.5	PRS Clock Synchronization			C	Yes / No / NA	Note: This may be NA if the PRS is internal to the traffic signal controller and the traffic signal controller already supports clock synchronization.
		H.2.5.1	Set Time	M	Yes	
		H.2.5.2	Set Time Zone	M	Yes	
		H.2.5.3	Set Daylight Savings Mode	M	Yes	
		H.2.5.4	Verify Current Time	M	Yes	
2.5.1.2	Determine Priority Request Criteria			M	Yes	
		3.5.1.3.1	Retrieve Priority Request Settings	M	Yes	
		3.5.1.3.2	Retrieve Reservice Period for a Vehicle Class	M	Yes	
		3.5.1.3.3	Retrieve Priority Request Time To Live Value	M	Yes	
2.5.1.3	Monitor the PRS			O	Yes / No	
		3.5.1.4	Monitor the Status of the PRS	M	Yes	
2.5.1.4	Retrieve Log Data from the PRS			C	Yes / No / NA	Note: This may be NA if the PRS is integral to the traffic signal controller and the traffic signal controller already supports event logging.
		H.2.5.1	Set Time	M	Yes	
		H.2.5.2	Set Time Zone	M	Yes	
		H.2.5.3	Set Daylight Savings Mode	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.2.5.4	Verify Current Time	M	Yes	
		H.2.6.1	Retrieve Current Configuration of Logging Service	M	Yes	
		H.2.6.2	Configure Logging Service	M	Yes	
		H.2.6.3	Retrieve Logged Data	M	Yes	
		H.2.6.4	Clear Log	M	Yes	
		H.2.6.5	Determine Capabilities of Event Logging Service	M	Yes	
		H.2.6.6	Determine Total Number of Logged Events	M	Yes	
		H.2.7.1	Record and Timestamp Events	M	Yes	
		H.2.7.2	Support a Number of Event Classes	M	Yes	The PRS shall support at least ____ event classes.
		H.2.7.3	Support a Number of Event Types to Monitor	M	Yes	The PRS shall support at least ____ event types.
		H.2.7.4.1	Support On-Change Events	M	Yes	
		H.2.7.4.2	Support Greater Than Events	M	Yes	
		H.2.7.4.3	Support Less Than Events	M	Yes	
		H.2.7.4.4	Support Hysteresis Events	M	Yes	
		H.2.7.4.5	Support Periodic Events	M	Yes	
		H.2.7.4.6	Support Bit-flag Events	M	Yes	
		H.2.7.4.7	Support Event Monitoring on Any Data	M	Yes	
		H.2.8	Support a Number of Events to Store in Log	M	Yes	The PRS shall be capable of storing at least ____ events in the event log file.
2.5.2	Interface – Management Station to CO			M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.1	Configure Priority Strategies			M	Yes	Note: The definition and selection of the strategy is system- and implementation-specific, and may vary from system to system. The user should be aware that differences in definition and selection may result in an interoperability issue.
		3.5.2.1.1	Set Priority Strategy Configuration	M	Yes	
		3.5.2.1.2	Define Default Coordination Pattern	M	Yes	
		3.5.2.1.3	Define Maximum Priority Strategies Supported	O	Yes / No	
		3.5.2.1.4	Define Maximum Service Requests To Consider	O	Yes / No	
2.5.2.2	Determine Priority Strategies			M	Yes	
		3.5.2.2.1	Retrieve Priority Strategy Settings	M	Yes	
		3.5.2.2.2	Retrieve Priority Strategies	M	Yes	
		3.5.2.2.3	Retrieve Priority Splits	M	Yes	
		3.5.2.2.4	Retrieve Default Coordination Pattern	M	Yes	
		3.5.2.2.5	Retrieve Maximum Priority Strategies Supported	O	Yes / No	
		3.5.2.2.6	Retrieve Maximum Service Requests To Consider	O	Yes / No	
2.5.2.3	Monitor the CO			M	Yes	
		3.5.2.3	Monitor the Status of the CO	M	Yes	
2.5.2.4	Retrieve Log Data from the CO			C	Yes / No / NA	Note: This may be NA if the traffic signal controller already supports event logging.

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		H.2.5.1	Set Time	M	Yes	
		H.2.5.2	Set Time Zone	M	Yes	
		H.2.5.3	Set Daylight Savings Mode	M	Yes	
		H.2.5.4	Verify Current Time	M	Yes	
		H.2.6.1	Retrieve Current Configuration of Logging Service	M	Yes	
		H.2.6.2	Configure Logging Service	M	Yes	
		H.2.6.3	Retrieve Logged Data	M	Yes	
		H.2.6.4	Clear Log	M	Yes	
		H.2.6.5	Determine Capabilities of Event Logging Service	M	Yes	
		H.2.6.6	Determine Total Number of Logged Events	M	Yes	
		H.2.7.1	Record and Timestamp Events	M	Yes	
		H.2.7.2	Support a Number of Event Classes	M	Yes	The CO shall support at least ____ event classes.
		H.2.7.3	Support a Number of Event Types to Monitor	M	Yes	The CO shall support at least ____ event types.
		H.2.7.4.1	Support On-Change Events	M	Yes	
		H.2.7.4.2	Support Greater Than Events	M	Yes	
		H.2.7.4.3	Support Less Than Events	M	Yes	
		H.2.7.4.4	Support Hysteresis Events	M	Yes	
		H.2.7.4.5	Support Periodic Events	M	Yes	
		H.2.7.4.6	Support Bit-flag Events	M	Yes	
		H.2.7.4.7	Support Event Monitoring on Any Data	M	Yes	
		H.2.8	Support a Number of Events to Store in Log	M	Yes	The CO shall be capable of storing at least ____ events in the event log file.

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.3	Interface – PRG to PRS			C	Yes / No / NA	If the PRG and PRS are integral to the same physical device, the interface between these entities is implementation-specific.
2.5.3.1	Exchange Priority Requests			M	Yes	
		3.5.3.1.1	Initiate a Priority Request	M	Yes	
		3.5.3.1.2	Send a Priority Request Update	M	Yes	
		3.5.3.1.3	Send a Cancel Priority Request	M	Yes	
		3.5.3.1.4	Send a Clear Priority Request	M	Yes	
		3.6.2.1	Support Multiple Priority Requests	M	Yes	The PRS shall be capable of supporting at least ___ (1-10:Default=10) and no more than ____ (1-10:Default=10) priority requests.
2.5.3.2	Exchange Priority Request Status			M	Yes	
		3.5.3.2	Receive Priority Request Status	M	Yes	
2.5.4	Interface – PRS to CO			C	Yes / No / NA	If the PRS and CO are integral to the same physical device, the interface between these entities is implementation-specific.
2.5.4.1	Exchange Service Requests			M	Yes	
		3.5.4.1	Exchange Service Request	M	Yes	The PRS or the CO shall poll each other no less than once per _____ milliseconds (100-1000: Default=100).
		3.6.3	Process Service Requests	M	Yes	
2.5.4.2	Exchange Service Request Status			M	Yes	
		3.5.4.2	Exchange Service Request Status	M	Yes	

Protocol Requirements List (PRL)						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.4	Backward Compatibility Needs					
2.5.5.1	Backward Compatible with NTCIP 1211 v01			O	Yes / No	Note: These object definitions have not been deprecated to address interoperability issues with NTCIP 1211 v01. The associated objects were deprecated and replaced by newer objects that have a wider scope or that have been changed to ease implementation. Pay close attention to the implementation and interoperability of these objects.
		3.5.3.1.5	Initiate a Priority Request—NTCIP 1211 v01	C	Yes / NA	If the PRG and PRS are integral to the same physical device, the interface between these entities is implementation-specific.
		3.5.3.1.6	Send a Priority Request Update—NTCIP 1211 v01	C	Yes / NA	If the PRS and CO are integral to the same physical device, the interface between these entities is implementation-specific.
		3.6.2.3	Support Multiple Priority Requests—NTCIP 1211 v01	M	Yes	The PRS shall be capable of supporting at least ___ (1-10:Default=10) and no more than ____ (1-10:Default=10) priority requests.

APPENDIX C
Service Questionnaire

Indicate the services you are able to provide:

SERVICE	YES	NO
Bid Item #1 Software solutions	X	
Bid Item #2 Hardware solutions	X	
Bid Item #3 Services not anticipated	X	

Respondents should address the following items in Tab D: Technical Proposal if they are applicable for the service(s) being proposed.

- Respondents are asked to identify services that they are able to provide.
- Respondents are not required to be able to respond to all services in order to provide a proposal to this RFP.
- Those Respondents that are capable of providing more than a single service, indicate which in the table above, and provide an individual narrative relating to the needs of each Bid Item as described in Appendix C.
- Responses should consist of detailed descriptions of what a Respondent's firm is capable of providing to the TXSHARE Public Purchasing Cooperative. The bulleted points in each Bid Item must be addressed, but Respondents are encouraged to provide additional detail about their operation and capabilities.

Note: Respondent is not required to complete any questions that are not applicable to the services you are bidding.

APPENDIX D
Service Designation Forms

RFP 2023-092	Texas Service Area Designation or Identification		
Proposer Name:	Cubic ITS, Inc.		
Notes:	**Indicate in the appropriate box whether you are proposing to service the entire State of Texas**		
	Will service the entire State of Texas	Will not service the entire State of Texas	
	X		
	If you are not proposing to service the entire State of Texas, designate on the form below the regions that you are proposing to provide goods and/or services to. By designating a region or regions, you are certifying that you are willing and able to provide the proposed goods and services.		
Item	**Region**	**Metropolitan Statistical Areas**	**Designated Service Area**
1.	North Central Texas	16 counties in the Dallas-Fort Worth Metropolitan area	
2.	High Plains	Amarillo Lubbock	
3.	Northwest	Abilene Wichita Falls	
4.	Upper East	Longview Texarkana, TX-AR Metro Area Tyler	
5.	Southeast	Beaumont-Port Arthur	
6.	Gulf Coast	Houston-The Woodlands-Sugar Land	
7.	Central Texas	College Station-Bryan Killeen-Temple Waco	
8.	Capital Texas	Austin-Round Rock	
9.	Alamo	San Antonio-New Braunfels Victoria	
10.	South Texas	Brownsville-Harlingen Corpus Christi Laredo McAllen-Edinburg-Mission	
11.	West Texas	Midland Odessa San Angelo	
12.	Upper Rio Grande	El Paso	

RFP 2023-092	Nationwide Service Area Designation or Identification Form		
Proposer Name:	Cubic ITS, Inc.		
Notes:	**Indicate in the appropriate box whether you are proposing to provide service to all Fifty (50) States.**		
	Will service all Fifty (50) States	Will not service Fifty (50) States X	
	If you are not proposing to service to all Fifty (50) States, then designate on the form below the States that you will provide service to. By designating a State or States, you are certifying that you are willing and able to provide the proposed goods and services in those States. **If you are only proposing to service a specific region, metropolitan statistical area (MSA), or city in a State, then indicate as such in the appropriate column box.**		

Item	State	Region/MSA/City	Designated as a Service Area
1.	Alabama		
2.	Alaska		
3.	Arizona		
4.	Arkansas		
5.	California		
6.	Colorado		
7.	Connecticut		
8.	Delaware		
9.	Florida		
10.	Georgia		
11.	Hawaii		
12.	Idaho		
13.	Illinois		
14.	Indiana		
15.	Iowa		
16.	Kansas		
17.	Kentucky		
18.	Louisiana		
19.	Maine		
20.	Maryland		
21.	Massachusetts		

22.	Michigan		
23.	Minnesota		
24.	Mississippi		
25.	Missouri		
26.	Montana		
27.	Nebraska		
28.	Nevada		
29.	New Hampshire		
30.	New Jersey		
31.	New Mexico		
32.	New York		
33.	North Carolina		
34.	North Dakota		
35.	Ohio		
36.	Oregon		
37.	Oklahoma		
38.	Pennsylvania		
39.	Rhode Island		
40.	South Carolina		
41.	South Dakota		
42.	Tennessee		
43.	Texas	Statewide	X
44.	Utah		
45.	Vermont		
46.	Virginia		
47.	Washington		
48.	West Virginia		
49.	Wisconsin		
50.	Wyoming		

EXHIBIT A – WARRANTY INFORMATION

CUBIC ITS HARDWARE WARRANTY

CUBIC WARRANTS TO THE BUYER THAT THE HARDWARE DELIVERABLES HEREUNDER WILL BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR THESE PERIODS:

- THREE (3) YEARS FOR GRIDSMART PROCESSORS AND FISHEYE CAMERAS;
- NINETY (90) DAYS FOR GRIDSMART ACCESSORIES;
- ONE (1) YEAR FOR ALL OTHER NEW HARDWARE NOT EXPLICITLY NAMED ABOVE INCLUDING, BUT NOT LIMITED TO, TRAFFIC SIGNAL CONTROLLERS, TRAFFIC CABINETS, TRAFFIC CABINET PLUG-INS, TRAFFIC CABINET ACCESSORIES, AND GRIDSMART TRADITIONAL CAMERAS.

THE APPLICABLE WARRANTY PERIOD SHALL BEGIN NINETY (90) DAYS AFTER THE DATE OF SHIPMENT. THE WARRANTY PERIOD FOR ANY REPAIRED HARDWARE OUTSIDE THE INITIAL WARRANTY PERIOD IS ONE (1) YEAR AND APPLIES TO THE REPAIRED COMPONENTS ONLY. IF ANY DELIVERABLES DO NOT CONFORM TO THE APPLICABLE WARRANTY, AND IF THE BUYER PROMPTLY NOTIFIES CUBIC, CUBIC SHALL DETERMINE WHETHER OR NOT THE CLAIMED DEFECT EXISTS. IF CUBIC DETERMINES THAT A DEFECT DOES EXIST, IT WILL, AT CUBIC'S OPTION, EITHER (I) REPAIR THE DEFECT, (II) REPLACE THE DEFECTIVE PRODUCT, OR (III) CREDIT OR REFUND THE BUYER A PRO-RATED AMOUNT OF THE PURCHASE PRICE OF THE PRODUCT. BUYER MAY OPTIONALLY PURCHASE ADDITIONAL YEARS OF WARRANTY FROM CUBIC.

THIS LIMITED WARRANTY DOES NOT COVER LOSS OR DAMAGE WHICH: (i) IS DUE TO IMPROPER INSTALLATION (OTHER THAN INSTALLATION BY CUBIC), MAINTENANCE, MISUSE, NEGLECT, OR ANY CAUSE OTHER THAN THE BUYER'S, OR ITS CUSTOMER'S OR CONTRACTOR'S, USE OF THE PRODUCT IN THE APPLICATION IT WAS INTENDED; (ii) IS DUE TO ADJUSTMENT, REPAIR OR MODIFICATION BY ANY PERSON OTHER THAN AS AUTHORIZED BY CUBIC; OR, (iii) IS DUE TO STORAGE OR USE IN AN IMPROPER ENVIRONMENT, EXCESSIVE OR INADEQUATE HEATING OR AIR CONDITIONING, AND ELECTRICAL POWER FAILURES, SURGES OR OTHER IRREGULARITIES WHILE IN THE CUSTODY OR CONTROL OF BUYER OR ITS CUSTOMER OR CONTRACTORS.

CUBIC IS NOT RESPONSIBLE FOR PROBLEMS CAUSED BY HARDWARE OR COMPUTER OPERATING SYSTEMS WHICH ARE NOT COMPATIBLE WITH THE SYSTEM SPECIFICATIONS AS SET FORTH IN CUBIC'S TECHNICAL DOCUMENTATION, OR FOR PROBLEMS IN THE INTERACTION WITH NON-CUBIC SUPPLIED SOFTWARE OR EQUIPMENT, THE USE OF WHICH IS NOT APPROVED BY CUBIC. CUBIC SHALL HAVE NO LIABILITY WITH RESPECT TO DELIVERABLES THAT WERE SUBJECTED TO ABUSE, VANDALISM OR MISUSE.

THE WARRANTY SET FORTH HEREIN IS THE SOLE AND EXCLUSIVE WARRANTY, IN LIEU OF ALL OTHER WARRANTIES, AND NO OTHER WARRANTIES OF ANY KIND SHALL APPLY, WHETHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND FREEDOM FROM THIRD PARTY INFRINGEMENT CLAIMS.

NO RETURNS, FOR ANY REASON, WILL BE ACCEPTED WITHOUT BUYER OBTAINING A RETURN MATERIAL AUTHORIZATION (RMA) NUMBER IN ADVANCE FROM CUBIC. A 25% RESTOCKING FEE BASED ON THE ITEM PRICE WILL BE CHARGED TO THE BUYER FOR ALL RETURNS FOR REASONS OTHER THAN WARRANTY. FREIGHT CHARGES WILL BE THE RESPONSIBILITY OF THE BUYER. BEFORE RETURNING ANY PRODUCT FOR ANY REASON, BUYER MUST:(I) CONTACT THE CUBIC FACILITY FROM WHICH THE PRODUCT WAS PURCHASED; (II) USE THE CUBIC TICKETING SYSTEM HTTP://CUBICITS.FRESHDESK.COM; OR (III) CALL CUSTOMER CARE AT 1-866-652-5347 TO SPEAK TO YOUR CUSTOMER SERVICE REPRESENTATIVE

CUBIC ITS SOFTWARE WARRANTY

CUBIC WARRANTS TO THE BUYER THAT THE SOFTWARE SHALL SUBSTANTIALLY PERFORM AS DESCRIBED IN THE CUBIC DOCUMENTATION, AS IT EXISTS ON THE DATE OF DELIVERY FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY WITH RESPECT TO TRAFFICWARE SOFTWARE AND FOR THE LIFE OF THE SYSTEM WITH RESPECT TO GRIDSMART SOFTWARE. BUYER MAY OPTIONALLY PURCHASE ADDITIONAL YEARS OF WARRANTY FROM CUBIC FOR THE TRAFFICWARE SOFTWARE, UP TO FIVE (5) YEARS TOTAL.

CUBIC'S SOLE OBLIGATION WITH RESPECT TO THIS SOFTWARE WARRANTY SHALL BE LIMITED TO USING REASONABLE EFFORTS TO CORRECT CUBIC CONFIRMED DEFECT(S) AND TO EITHER (I) SUPPLY A CORRECTED VERSION WITHIN CUBIC'S NORMAL DEVELOPMENT PROCESS AND SOFTWARE RELEASE CYCLE, OR (II) IF A CORRECTED VERSION CANNOT BE COMMERCIALLY REASONABLY DEVELOPED CREDIT OR REFUND THE BUYER A PRO-RATED AMOUNT OF THE PURCHASE PRICE OF THE SOFTWARE.

THE LIMITED WARRANTIES CONTAINED HEREIN DO NOT INCLUDE LOSS OR DAMAGE WHICH: (i) IS DUE TO IMPROPER INSTALLATION (INSTALLATION BY ANYONE OTHER THAN CUBIC OR AS APPROVED BY CUBIC); (ii) IS DUE TO MISUSE, NEGLECT, FAILURE TO PERFORM PROPER AND REQUIRED MAINTENANCE, OR ANY USE OTHER THAN IN A TRANSIT APPLICATION BY LICENSEE OR ITS CUSTOMER OR CONTRACTORS; OR (iii) IS DUE TO ADJUSTMENT, REPAIR OR MODIFICATION BY ANY PERSON OTHER THAN CUBIC OR AS AUTHORIZED BY CUBIC.

CUBIC DOES NOT WARRANT THAT OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR- FREE; THAT THE FUNCTIONS CONTAINED IN THE SOFTWARE WILL OPERATE IN ALL COMBINATIONS OR SEQUENCE; THAT ALL SOFTWARE ERRORS OR DEFECTS FOR WHICH THERE IS A REASONABLE WORK- AROUND WILL BE CORRECTED; OR THAT THE SOFTWARE IS FREE FROM VIRUS AND ALL LATENT DEFECTS. CUBIC IS NOT RESPONSIBLE FOR PROBLEMS CAUSED BY COMPUTER HARDWARE OR OTHER COMPUTER OPERATING SYSTEMS WHICH ARE NOT COMPATIBLE WITH THE SYSTEM SPECIFICATIONS REQUIRED TO RUN THE SOFTWARE AS SET FORTH IN CUBIC'S TECHNICAL DOCUMENTATION, OR FOR PROBLEMS IN THE INTERACTION OF THE SOFTWARE WITH NON-CUBIC SUPPLIED SOFTWARE OR EQUIPMENT, THE USE OF WHICH IS NOT APPROVED BY CUBIC.

EXCEPT FOR THE EXPRESS WARRANTIES STATED ABOVE, CUBIC GRANTS NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND FREEDOM FROM THIRD PARTY INFRINGEMENT CLAIMS.

FOR ANY SOFTWARE WARRANTY CLAIMS, BUYER MUST: (i) LOG A SUPPORT TICKET USING CUBIC'S ONLINE SUPPORT PORTAL, HTTP://CUBICITS.FRESHDESK.COM; OR (ii) CALL CUSTOMER CARE AT 1-866- 652-5347 TO SPEAK TO A CUSTOMER SERVICE REPRESENTATIVE.

EXHIBIT B - CUBIC ITS TERMS AND CONDITIONS

These terms and conditions of sale (the "Terms and Conditions") constitute the terms and conditions of sale between Cubic ITS and the party identified on the face hereof or in any separate quote, purchase order or services agreement ("Buyer").

Section I. TERMS OF SALE

A. GENERAL These Terms and Conditions apply to equipment purchases, spare parts, software licensing, services and repairs obtained from Cubic. These terms apply to orders placed by the issuance of a purchase agreement or purchase order via email, facsimile, courier, or mail as well as to electronic sales placed by Buyer through a Cubic website, if applicable.

B. ACCEPTANCE. Buyer's acceptance of any offer, goods or services associated with these terms is expressly conditioned on the Buyer's assent to these terms and conditions. Cubic hereby objects to and expressly rejects any additional or different terms proposed by the Buyer. Buyer's issuance of an order in response to this quote shall constitute acceptance of the quote and these terms and conditions. No understanding, promise or representation, and no waiver, alteration, addition to, or modification of any provision hereof, shall be binding upon Cubic unless agreed to in writing by an authorized representative of Cubic. These Terms and Conditions supersede all other agreements, oral or written heretofore made between Buyer and Cubic relating to the subject matter contained herein.

C. PRICING All prices are in United States Dollars, exclusive of all applicable taxes and are subject to correction or change upon 90 days written notice. Buyer agrees to pay and be solely responsible for the payment of any applicable taxes other than taxes payable based on Cubic's net income. Export orders may be subject to special pricing. Market sensitive products will be priced according to current market conditions. Despite our efforts, occasional pricing errors may occur. Cubic reserves the right to cancel any and all orders resulting from such pricing errors, even if Buyer has received an order confirmation from Cubic.

D. CHANGES All changes in any term or condition hereof must be agreed to and accepted by Cubic. Any difference in price, delivery or other terms resulting from such change shall be equitably adjusted and the purchase agreement/purchase order modified accordingly.

E. TERMINATION/CANCELLATION In the event of a partial termination or if the entire purchase agreement/purchase order is terminated, the Buyer shall pay 100% of the actual costs incurred by Cubic relating to such termination plus 15%, up to a maximum of 115% of the value of the purchase agreement/purchase order.

F. DELAY IN SHIPMENT If the Buyer fails to accept shipment in accordance with the agreed schedule, such failure may be considered by Cubic as a Breach entitling Cubic to terminate this purchase agreement/purchase order in whole or in part, as applicable, in accordance with Clause E hereof.

G. DELIVERY date is the date stated in the purchase agreement/purchase order acknowledgment. Cubic will not allow partial shipments without the consent of the Buyer. Partial shipments will be subject to payment terms in Clause I. If the Buyer desires partial shipments, Buyer must place separate purchase orders with the desired shipment date(s).

H. SHIPMENT and RISK OF LOSS Shipment will be F.O.B. Origin Freight Paid. Transportation method is at Cubic's option and Cubic shall bear the responsibility for outbound transportation charges. The risk that the ordered goods may be lost, damaged, or delayed in transit shall be borne by Buyer at the point of origin.

I. INVOICING AND PAYMENT TERMS Invoicing shall take place at time of shipment. Payment terms are net thirty (30) days from date of invoice. Buyer agrees that these same terms will also apply to any partial shipments. Cubic accepts cash, check, Electronic Funds Transfer, and certain credit cards. All credit extended by Cubic to Buyer and the limits of such credit, is at Cubic's sole discretion, and may be reduced or revoked by Cubic at any time, for any reason. As a condition for the continued extension of credit, Buyer agrees to provide Cubic with current credit information and the latest annual financial statement within five (5) business days following request by Cubic. Furthermore, Cubic reserves the right to charge Buyer a late payment fee at the rate of one and one-half percent (1½%) of the amount due for each month or portion thereof that the amount due remains unpaid or such amount as may be permitted under applicable law. Export orders may be subject to special export payment terms and conditions. All payments must be made in U.S. dollars. If Buyer fails to make payment within thirty (30) days of invoice, or fails to comply with Cubic's credit terms, or fails to supply adequate assurance of full performance to Cubic within a reasonable time after requested by Cubic (such time as specified

in Cubic's request), Cubic may suspend shipments and/or services, if any, until such payment or compliance is made. Additionally, Cubic may require cash in advance for any further shipments, demand immediate payment of all amounts then owed, elect to pursue collection action (including without limitation, attorneys' fees and any and all other associated costs of collection), and/or may, at its option, cancel all or any part of an unshipped order in accordance with Clause E hereof. Additionally, Buyer, and each of its subsidiaries and affiliates, agrees to provide to Cubic proper authorization necessary for Cubic to request any financial information from third parties. Buyer agrees to assume responsibility for, and Buyer hereby unconditionally guarantees payment of, as provided herein, all purchases made by Buyer, its subsidiaries, and affiliates. Each of Buyer's subsidiaries and affiliates purchasing from Cubic are jointly and severally liable for purchases with Buyer, and Buyer is also acting as agent for such subsidiaries and affiliates.

J. SALES AND SIMILAR TAXES The prices provided for in any purchase agreement/purchase order are exclusive of any present or future import duty, federal, state, provincial, county, municipal, or other sales, use, excise, gross receipts, value added or similar tax with respect to the products and services covered hereby, and of any inventory or property tax or other similar charges with respect to the products and services covered hereby, unless such taxes are provided in the applicable quotation. If Cubic is assessed or is required by applicable law or regulation to pay or collect any such duty, tax, or charge on account of this purchase agreement/purchase order, then such amount of tax or taxes shall be paid by the Buyer to Cubic in addition to the prices otherwise provided in the purchase agreement/purchase order. If the Buyer is exempt from the payment of applicable duty, tax, or charge, the Buyer shall provide Cubic with a suitable copy of the tax-exempt certificate or permit at the time the purchase agreement/purchase order is issued.

K. WARRANTY - See Warranty terms in Exhibit A

L. MAINTENANCE Buyer shall be responsible for the maintenance of any deliverables provided. In the event Buyer elects to have Cubic perform maintenance, such maintenance will be provided at prevailing service rates.

M. LIMITATION OF LIABILITY

CUBIC SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT, CONSEQUENTIAL, EXEMPLARY OR PUNITIVE DAMAGES OR LOSSES WHICH MAY BE SUFFERED BY BUYER WITH RESPECT TO THIS PURCHASE AGREEMENT/PURCHASE ORDER, INCLUDING BUT NOT LIMITED TO, LOSS OF PRESENT OR PROSPECTIVE CUBIC TERMS AND CONDITIONS PROFITS, LOSS OF INCOME OR REVENUE, EXPENDITURES, INVESTMENTS OR COMMITMENTS, OR LOSS OF BUSINESS OR DATA, WHETHER IN AN ACTION IN CONTRACT, EQUITY, NEGLIGENCE, INTENDED CONDUCT, TORT, OR OTHERWISE (INCLUDING BREACH OF WARRANTY, NEGLIGENCE, AND STRICT LIABILITY IN TORT), EVEN IF CUBIC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE TOTAL AGGREGATE LIABILITY OF CUBIC FOR CLAIMS ASSERTED UNDER THIS AGREEMENT SHALL BE LIMITED TO THE PURCHASE PRICE PAID FOR THE PRODUCT THAT GIVES RISE TO ANY LIABILITY.

N. TITLE The title and right of possession of Buyer's equipment repaired or modified hereunder shall remain with the Buyer, subject to any applicable lien rights of Cubic. Cubic shall bear risk of loss for Buyer's property while on Cubic's premises. Reasonable access to this equipment shall be provided to Buyer. Cubic shall retain title for all shipped items until delivery F.O.B. Origin Freight Prepaid.

O. CHOICE OF LAW / DISPUTES The validity, interpretation and performance of the purchase agreement/purchase order shall be governed by and construed under the laws of the State of Texas, excluding its choice of law principles. Any controversy or claim arising out of or relating to the purchase agreement/purchase order, transaction or the breach, termination, or invalidity thereof, shall be settled by binding arbitration in Fort Bend County, Texas, USA, in accordance with the rules of the American Arbitration Association ("AAA"). There shall be one arbitrator appointed by the AAA trained in the law who shall have experience in arbitration of similar disputes. The language of the arbitration shall be English. Judgment upon the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. Each party shall be responsible for its respective costs and attorneys' fees incurred in arbitration, except that costs and fees invoiced by the AAA for the services of the arbitrator(s) and its own fees and expenses shall be borne equally by the parties.

P. PROPRIETARY RIGHTS AND SOFTWARE Title to all Cubic and third-party software (including software embedded within hardware), proprietary data, intangible property, intellectual property, patents, patents pending, trade secrets, copyrights, trade dress, service and trademarks, service and trade names, designs,

drawings, and the like, shall remain with Cubic or relevant third party, as applicable. All software usage hereunder shall be governed by the Cubic Software License Agreement, Section III. Buyer shall have no right, title, or interest in the trade names, trademarks, trade dress, copyrights, patents, domain names, product names, catalogs or any other intellectual property rights reserved by Cubic, or any trademarks or service marks owned by suppliers to Cubic. Buyer shall have no right to copy or use any of the intellectual property of Cubic or its suppliers without Cubic's written permission.

Q. CONFIDENTIALITY Buyer shall treat the delivery items as confidential, and shall not disclose them, nor any part of them to third parties Only Buyer's employees who have a need to know, and who are informed in writing not to disclose the deliverable items or any part of them to third parties, may have access to the deliverable items. Buyer shall not reverse engineer the deliverable items. In addition, any other items which are marked as confidential, proprietary, or the like, shall not be disclosed to any third party and may be disclosed to only those employees of Buyer described above.

R. FORCE MAJEURE The parties shall not be liable to each other for any loss, damage or other claim whatsoever arising out of a delay, failure, or inability to perform any obligation(s) contained in the purchase agreement/purchase order which is beyond a party's reasonable control. Such causes may include, but are not limited to, any act of God, severe weather conditions, catastrophic events, fire, flood, lightning, earthquake, tornado, labor disputes, transportation delays, pandemic, war, terrorism (actual or threatened), revolution, riot, sabotage, act of the public enemy, explosion, embargo, confiscation or act or failure to act of any government, agency, board, or commission. Lack of finances shall in no event be deemed to be a cause beyond a party's reasonable control.

S. CUSTOM PRODUCTS Cubic may offer products manufactured or assembled to Buyer's specifications ("Custom Product(s)"). Cubic is not responsible for verifying or confirming the accuracy of specifications provided by Buyer to Cubic for Custom Products. All Custom Products are sold on a "FINAL SALE" basis only, and no cancellations, returns, refunds or credits are allowed. CUBIC'S LIMITED WARRANTY TERMS INCLUDED IN THESE TERMS AND CONDITIONS (AS EXHIBIT A) DO NOT APPLY TO CUSTOM PRODUCTS. CUSTOM PRODUCT WARRANTY PROVIDED BY CUBIC SHALL BE LIMITED TO WHATEVER WARRANTY TERMS ARE AGREED BETWEEN THE PARTIES AS REFLECTED IN APPLICABLE SALES OR PURCHASE ORDER DOCUMENTATION.

T. EXPORT COMPLIANCE Cubic's performance hereunder may be subject to export restrictions, regulations, and licensure. Buyer shall assist Cubic, to the extent necessary, in obtaining all applicable

U.S. Government export licenses. Cubic's failure to timely receive appropriate export licensure or government documentation shall excuse Cubic from performance.

Once the delivery items are in Buyer's custody, Buyer shall comply with continuing export restrictions, regulations, licensure, and technical assistance agreement(s), including without limitation, the International Traffic in Arms Regulations, Title 22 Code of Federal Regulations Section 120 et seq. Buyer shall defend and indemnify Cubic from all losses and damages arising from Buyer's breach of the obligations set forth in this Section.

U. ANTI-BRIBERY/GRATUITIES/CORRUPTION COMPLIANCE Buyer hereby certifies that it has and will continue to comply with all applicable anti-bribery, anti-corruption, and procurement integrity laws and regulations (including, but not limited to, the United States Foreign Corrupt Practices Act and the U.S. Procurement Integrity Act) in all matters pertaining or related to the subject matter of this Agreement. Buyer shall, from time to time, provide written certifications to this effect upon written request from Cubic.

SECTION II

ADDITIONAL TERMS AND CONDITIONS RELATED TO THE PERFORMANCE OF SERVICES.

IN ADDITION TO THE STANDARD TERMS AND CONDITIONS IN SECTION I, PERFORMANCE OF SERVICES WILL BE GOVERNED BY THE FOLLOWING ADDITIONAL TERMS AND CONDITIONS ("ADDITIONAL SERVICE TERMS"). SERVICES MAY BE PERFORMED BY: (i) CUBIC, ITS EMPLOYEES AND AGENTS ("CUBIC PERSONNEL"); (ii) CUBIC SUBSIDIARIES OR AFFILIATES ("CUBIC SERVICE ENTITIES"); OR THIRD-PARTY SUBCONTRACTORS ("THIRD-PARTY PROVIDERS"). FOR PURPOSES OF THIS SECTION II, CUBIC PERSONNEL, CUBIC SERVICE ENTITIES AND THIRD-PARTY PROVIDERS ARE EACH REFERRED TO AS A "SERVICE PROVIDER" AND EACH SERVICE PROVIDER, TOGETHER WITH ITS PERSONNEL, IS REFERRED TO AS "SERVICE PROVIDER PERSONNEL." THE TERMS AND CONDITIONS CONTAINED IN THIS SECTION II ARE EXTENDED SOLELY BY THE SPECIFIC SERVICE PROVIDER PERFORMING SERVICES. DEPENDING UPON THE NATURE OF THE SERVICES PROVIDED, THE APPLICABLE SERVICE PROVIDER MAY REQUIRE BUYER TO EXECUTE ADDITIONAL CONTRACTUAL DOCUMENTS PRIOR TO THE PERFORMANCE OF SUCH SERVICES. IN THE EVENT OF A CONFLICT BETWEEN THE STANDARD TERMS AND CONDITIONS IN SECTION I AND THE ADDITIONAL SERVICE TERMS IN SECTION II, THE ADDITIONAL SERVICE TERMS IN SECTION II SHALL PREVAIL FOR THE PERFORMANCE OF SERVICES.

AA. LIMITED SERVICES WARRANTY ALL SERVICES WILL (i) BE PERFORMED IN A WORKMANLIKE MANNER; (ii) CONFORM TO THE SPECIFICATIONS (IF ANY) PROVIDED BY THE SERVICE PROVIDER IN A STATEMENT OF WORK; AND (iii) IF SERVICES ARE IMPROPERLY PERFORMED AND BUYER NOTIFIES THE SERVICE PROVIDER OF THE IMPROPERLY PERFORMED SERVICES WITHIN 90 DAYS AFTER PERFORMANCE OF SUCH SERVICES, THEN THE SERVICE PROVIDER WILL RE-PERFORM THOSE SERVICES, IN WHOLE OR IN PART, AS NECESSARY TO CURE THE PARTICULAR BREACH, OR AT THE SERVICE PROVIDER'S SOLE OPTION, REFUND THE AMOUNT PAID BY BUYER FOR THE SERVICES DIRECTLY ATTRIBUTABLE TO THE PARTICULAR BREACH. THE SERVICE PROVIDER'S RE-PERFORMANCE OR REFUND OF AMOUNTS PAID BY BUYER FOR THE SERVICE DIRECTLY ATTRIBUTABLE TO THE PARTICULAR BREACH SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY.

BB. WARRANTY DISCLAIMER AND WAIVER FOR SERVICES TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THE EXPRESS WARRANTIES SET FORTH IN THIS SECTION II FOR SERVICES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND THE SERVICE PROVIDER DISCLAIMS, AND BUYER WAIVES, ALL OTHER WARRANTIES FOR SERVICES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY. THE WARRANTIES SET FORTH IN THIS SECTION II ARE EXPRESSLY CONDITIONED UPON THE USE OF THE SERVICES FOR THEIR INTENDED PURPOSE AND SHALL NOT APPLY TO SERVICES WHICH HAVE BEEN SUBJECT TO MODIFICATION BY BUYER OR ANY THIRD PARTY.

CC. LIMITATION OF LIABILITY THE SERVICE PROVIDER EXPRESSLY DISCLAIMS ANY LIABILITY FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL, EXEMPLARY OR PUNITIVE DAMAGES IN THE PERFORMANCE OF SERVICES. THE SERVICE PROVIDER'S LIABILITY IN ALL CIRCUMSTANCES IS LIMITED TO, AND SHALL NOT EXCEED, THE PURCHASE PRICE FOR THE PERFORMANCE OF THE PORTION OF SERVICES THAT GIVES RISE TO ANY PARTICULAR LIABILITY.

DD. PAYMENT AND CREDIT TERMS Except as otherwise agreed to by the parties, Buyer will be invoiced upon completion of mutually agreed milestone(s) or completion of services. Payment terms are net thirty (30) days from the date of invoice. All other payment terms are as set forth in Section I.

EE. TERMINATION Either party may terminate the service agreement at any time and for any reason upon sixty (60) days' written notice to the other party. If terminated by Buyer, Buyer shall, in addition to amounts previously paid, pay Service Provider an amount equal to the value of any work completed and not billed plus all reasonable wind-down costs to close out the service agreement the greater of (i) Ten percent (10%) of the total project cost quotation thereto (the "Total Project Cost"), or (ii) an amount equal to the Total Project Cost multiplied by the percentage completion for such project at the time the notice of termination is given, as determined by Service Provider.

FF. INDEMNITY Buyer shall defend, indemnify and hold harmless Service Provider and its respective

officers, directors, employees, subcontractors and agents (each individually, an “Indemnified Party”) from and against any and all any claims, suits, liabilities, damages, settlements, charges, taxes and any other losses or expenses (including reasonable attorneys' fees) (collectively “Liabilities”) for physical injury to, illness or death of, any third party regardless of status and damage to or destruction of any tangible property which the third party may sustain or incur, to the extent such Liabilities relate to the services; except for such Liabilities relating to or arising out of a final judgment of gross negligence or willful misconduct of the Indemnified Party. In any action, suit or proceeding brought against an Indemnified Party by reason of any such claim as specified above, Buyer shall resist and defend such action, suit or proceeding by counsel of its choice with consent from the Indemnified Party, at the sole expense of Buyer, provided that (i) the Indemnified Party notifies Buyer promptly in writing of the claim; (ii) Buyer's counsel does not give rise to a conflict of interest with respect to the Indemnified Party; (iii) Buyer has control of the defense and all related settlement negotiation but shall keep the Indemnified Party reasonably informed of status, provided that Buyer shall only settle the legal action with consent from the Indemnified Party; and (iv) the Indemnified Party provides Buyer with all reasonably necessary assistance, information, and authority to perform the foregoing at Buyer's expense.

ACCESS TO BUYER’S PREMISES To the extent access to and/or office space within Buyer's premises is required; Buyer shall provide Service Provider personnel such access to and/or office space within Buyer's premises free of charge as necessary for performance of services supplied by Service Provider. Prior to starting any work at Buyer's premises, Buyer will: (i) provide documentation that identifies any existing hazardous materials or dangerous or potentially dangerous conditions on or about Buyer's premises; and (ii) allow Service Provider personnel, at its option, reasonable access to Buyer's premises to perform or have performed a visual site inspection. Service Provider will have no responsibility or liability for the actual existing conditions; or identifying, correcting or advising Buyer of existing conditions on Buyer's premises (“Pre-Existing Conditions”), and Buyer shall be responsible for and shall indemnify each Service Provider and each of the Service Provider personnel from and against any Liabilities arising out of or relating to any Pre-Existing Conditions, regardless of whether previously disclosed to any Service Provider or Service Provider personnel. Buyer shall not attempt to condition the right of Service Provider personnel to obtain free access to Buyer's premises upon the signing of any agreement, waiver, or release which in any way purports to affect the legal rights or obligations of Service Provider or Service Provider personnel. If any Service Provider personnel sign such an agreement, waiver, or release, it shall be of no force and effect.

Buyer shall comply with Cubic’s workplace safety requirements, including the COVID-19 Workplace Safety Protocols and all other applicable laws relating to workplace safety and COVID-19 including Executive Order (EO) 14042 on Ensuring Adequate COVID Safety Protocols for Federal Contractors, DFARS 252.223-7999 Ensuring Adequate COVID-19 Safety Protocols for Federal Contractors (Deviation 2021-O009) and FAR 52.223-99 Ensuring Adequate COVID-19 Safety Protocols for Federal Contractors (Oct 2021) (Deviation). Buyer shall also comply with such other and further protocols and rules as may be announced by Cubic from time to time or required by additional US Government regulations, EOs or under the guidance of the Safer Federal Workforce Task Force.

GG. RIGHT TO SUBCONTRACT Buyer agrees that the Service Provider may subcontract the performance of services to third parties. Buyer authorizes the Service Provider to disclose all information to the subcontractor, including confidential information necessary for such performance of services by the subcontractor.

SECTION III

SOFTWARE LICENSE AGREEMENT

THE SOFTWARE PROGRAMS AND/OR DOCUMENTATION ("SOFTWARE") PROVIDED TO YOU ARE LICENSED, NOT SOLD. CUBIC ITS, ("CUBIC "), OWNS ALL COPIES OF THE SOFTWARE, INCLUDING BACKUP AND ARCHIVAL COPIES. YOU (THE "LICENSEE") ONLY HAVE THE LIMITED RIGHTS EXPRESSLY GRANTED TO YOU UNDER THE TERMS OF THIS SOFTWARE LICENSE AGREEMENT ("SLA").

LICENSEE UNDERSTANDS AND ACKNOWLEDGES THE FOLLOWING TERMS AND CONDITIONS AND AGREES THAT INSTALLING, OPERATING OR USING THE SOFTWARE IN ANY WAY INDICATES LICENSEE'S ACCEPTANCE OF THESE TERMS AND CONDITIONS.

1. Rights in Data. Licensee acknowledges and agrees that all ownership rights, title and interest in the Software shall remain with Cubic, whether or not incorporated into or with other software, including, but not limited to, the right of copyright. Licensee acknowledges and agrees that the Software is the proprietary information of Cubic and that this Agreement grants Licensee no title or right of ownership in the Software.

2. License Grant. In consideration of the payment of the license fee under separate agreement and Licensee's acceptance of the terms of this SLA, Cubic hereby grants to Licensee a royalty free, irrevocable, perpetual, nonexclusive, non-transferable, non-sublicensable license to use the Software. Any revision changes, updates, upgrades or enhancements to the Software that are provided to Licensee shall be subject to all terms of this SLA. Licensee may make one (1) copy of the Software for back-up purposes only.

3. Restrictions. Licensee may not: (a) copy (other than the one copy for back-up purposes), distribute, rent, lease, assign, transfer, mortgage, or sell the Software or sublicense all or any portion of the Software; (b) reverse engineer, decompile or disassemble the Software; or (c) modify, alter or make derivative works of the Software. Licensee agrees to keep confidential and implement reasonable measures to prevent and protect the Software and its contents from unauthorized disclosure or use. Licensee also agrees to include the copyright notice, trademark, or proprietary legends of Cubic associated with the Software on the back-up copy, and to verify the same has been affixed to any revision changes, updates, upgrades or enhancements that are provided to Licensee.

4. Warranty. See software warranty terms in Exhibit A.

5. CUBIC SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT, CONSEQUENTIAL, EXEMPLARY OR PUNITIVE DAMAGES OR LOSSES WHICH MAY BE EXPERIENCED BY LICENSEE WITH RESPECT TO THIS SOFTWARE LICENSE AGREEMENT AND/OR USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO, LOSS OF PROFITS, LOSS OF INCOME OR REVENUE, EXPENDITURES, INVESTMENTS OR COMMITMENTS, OR LOSS OF BUSINESS OR DATA, WHETHER IN AN ACTION IN CONTRACT, EQUITY, NEGLIGENCE, INTENDED CONDUCT, TORT, OR OTHERWISE (INCLUDING BREACH OF WARRANTY, NEGLIGENCE, AND STRICT LIABILITY IN TORT), EVEN IF CUBIC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE TOTAL AGGREGATE LIABILITY OF CUBIC FOR CLAIMS ASSERTED UNDER THIS SOFTWARE LICENSE AGREEMENT SHALL BE LIMITED TO THE TOTAL VALUE OF THE LICENSE FEE PAID FOR THE SOFTWARE GIVING RISE TO ANY SUCH LIABILITY.

6. INDEMNIFICATION.

(a) Cubic agrees to defend, or at its option settle, indemnify and hold Licensee harmless from any and all third party intellectual property infringement suits, claims, or proceedings brought against Licensee as a result of Licensee's stand-alone use of the Software where Licensee has (i) given Cubic prompt notice of such suit, claim, or proceeding; (ii) allowed Cubic to have sole control of the defense or settlement of such suit, claim or proceeding; and (iii) given Cubic all necessary assistance to defend the same.

Notwithstanding subparagraph (a) above, Cubic shall not be bound to defend, indemnify, or hold Licensee harmless where (i) such claim or action would have been avoided but for modifications of the Software, or portions thereof, made after delivery to the Licensee; (ii) such claim or action would have been avoided but for the combination or use of the Software, or portions thereof, with other products, processes or materials not supplied or specified in writing by Cubic; (iii) Licensee continues allegedly infringing activity

after being notified thereof or after being informed of modifications that would have avoided the alleged infringement; or (iv) Licensee's use of the Software is not strictly in accordance with the terms of this Software License Agreement. Licensee will be liable for all damages, costs, expenses, settlement and attorneys' fees related to any claim of infringement arising as a result of (i) – (iv) in the immediately preceding sentence.

(b) If a third party's claim endangers or disrupts Licensee's use of the Software, Cubic shall, at Cubic's option and at no charge to Licensee, (i) obtain a license so Licensee may continue use of the Software; (ii) modify the Software to avoid the infringement; (iii) replace the Software with a compatible, functionally equivalent and non-infringing product; or (iv) refund to Licensee the amount paid for the Software as depreciated on a straight-line sixty (60) month basis; provided, however, Cubic shall have no such obligation where any of subparagraphs (b)(i)-(iv) apply.

(c) THE FOREGOING PROVISIONS OF THIS SECTION STATE THE ENTIRE LIABILITY AND OBLIGATIONS OF CUBIC, AND THE EXCLUSIVE REMEDY OF LICENSEE, WITH RESPECT TO ANY ACTUAL OR ALLEGED INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS BY THE SOFTWARE.

7. EXPORT REGULATIONS. If the Software is for use outside of the United States, Licensee agrees to comply fully with all relevant regulations of the United States Department of Commerce and with the United States Export Administration Act to assure that the Software and media are not exported in violation of the United States Export Laws.

8. MAINTENANCE. Licensee may obtain maintenance support after the one year period for the Software by purchasing a software maintenance contract from Cubic at its then current applicable fees.

9. GOVERNING LAW. This Software License Agreement shall be deemed to have been made in, and shall be construed pursuant to, the laws of the State of Texas, USA.

10. DISPUTE. In the event of any unresolved dispute between the parties relating to this Software License Agreement, such unresolved dispute shall be submitted to binding arbitration under the Commercial Rules of Arbitration of the American Arbitration Association (AAA). The arbitration shall be held in Fort Bend County, Texas, USA. There shall be a single arbitrator appointed by the AAA. The decision of the arbitrator shall be final and binding. The prevailing party shall be entitled to recover actual attorney fees and costs, including expert witness fees and associated expenses. Licensee acknowledges that, due to the unique nature of the Software, there may be no adequate remedy at law for the Licensee's unauthorized use or disclosure of the Software in breach of this Software License Agreement and that such breach may cause immediate and irreparable harm to Cubic. Accordingly, notwithstanding the provisions of the paragraph above, upon any such breach or any threat thereof by the Licensee, Cubic shall be entitled to pursue appropriate equitable or injunctive relief from any court of competent jurisdiction.

11. NON-WAIVER. Failure or neglect by Cubic to enforce at any time any of its rights or remedies shall not be deemed a waiver of its rights or remedies nor prejudice Cubic's right to take subsequent action.

12. SEVERABILITY. In the event any of these terms are determined to be invalid or unenforceable to any extent such term shall be modified to the limited extent required to permit its enforcement in a manner most closely representing the intention of the Parties as expressed herein, and the remainder of this Software License Agreement shall continue to be valid to the fullest extent permitted by law.

13. ASSIGNMENT. Licensee may not assign this Software License Agreement without the prior written consent of Cubic which shall not be unreasonably withheld.

14. TAXES. Licensee is responsible for payment of all applicable taxes associated with this Software License Agreement.

15. ENTIRE AGREEMENT. No change, waiver, or discharge hereof shall be valid unless in writing and signed by authorized representatives of both the Licensee and Cubic. This Software Agreement is the exclusive statement of the understanding between the parties with respect to licensing the Software.