Functional Specifications for System Integrator

Operation Green Light:

Administered by Mid-America Regional Council

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Chapter 1

General

Operation Green Light: Phase 1

1.1 General

This document functionally specifies the software (central system software) and enumerates the tasks and deliverables to be produced by the SYSTEM INTEGRATOR for the new Advanced Traffic Management System (ATMS) for the Operation Green Light (OGL) project administered by the Mid-America Regional Council, hereinafter referred to as MARC.

References to SYSTEM INTEGRATOR pertain to the successful proposer and sub-proposers of this contract for services relating to supply and installation of the software for the Advanced Traffic Management System.

References contained in this document to the NETWORK CONSULTANT pertain to the consulting firm(s) selected by MARC to design the communications network.

References contained in this document to the NETWORK CONTRACTOR pertain to the firm(s) selected by MARC to install the communications network.

References contained in this document to the FIELD DESIGN CONSULTANT pertain to the consulting engineering firm(s) selected by MARC to design the field equipment, including controller and cabinet replacement and necessary communication equipment.

References to FIELD INSTALLATION CONTRACTOR pertain to the successful bidder under a separate contract, for providing and installing intersection controllers (including cabinets and modems), local software, twisted pair cables, fiber optic cable, spread spectrum radios, and other communications equipment.

The functional requirement for the SYSTEM INTEGRATOR RFP will include the following chapters:

Chapter 1 describes the project in general. It will give an overview of the project, its scope, and identity of Operation Green Light Phase 1 member cities.

Chapter 2 describes the system objectives and desired system architecture.

Chapter 3 lists the functional specifications of the central system software

Chapter 4 identifies and describes the involved SYSTEM INTEGRATOR tasks along with the provision of the central system software.

Chapter 5 identifies and describes the SYSTEM INTEGRATOR deliverables.

Finally, Chapter 6 addresses the issue of the Central System Software interfacing seamlessly with other NTCIP compliant field devices.

1.2 Project Overview

Phase I of Operation Green Light will focus on improving traffic flow along several priority traffic corridors. There are about 600 signals identified along these priority corridors that OGL will address. These corridors span multiple municipalities and the states of Kansas and Missouri. The agencies involved in Operation Green Light are listed below:

- Kansas cities:
  - Kansas City (Unified Government)
  - Overland Park
  - Lenexa
  - Shawnee
  - Countryside
  - Olathe
  - Merriam
  - Mission
  - Fairway
  - Westwood
  - Prairie Village
  - Leawood
- Missouri cities:
  - Kansas City
  - Raytown
  - North Kansas City
  - Lee's Summit
  - Liberty
  - Independence
  - Gladstone
- Missouri Department of Transportation (MoDOT)

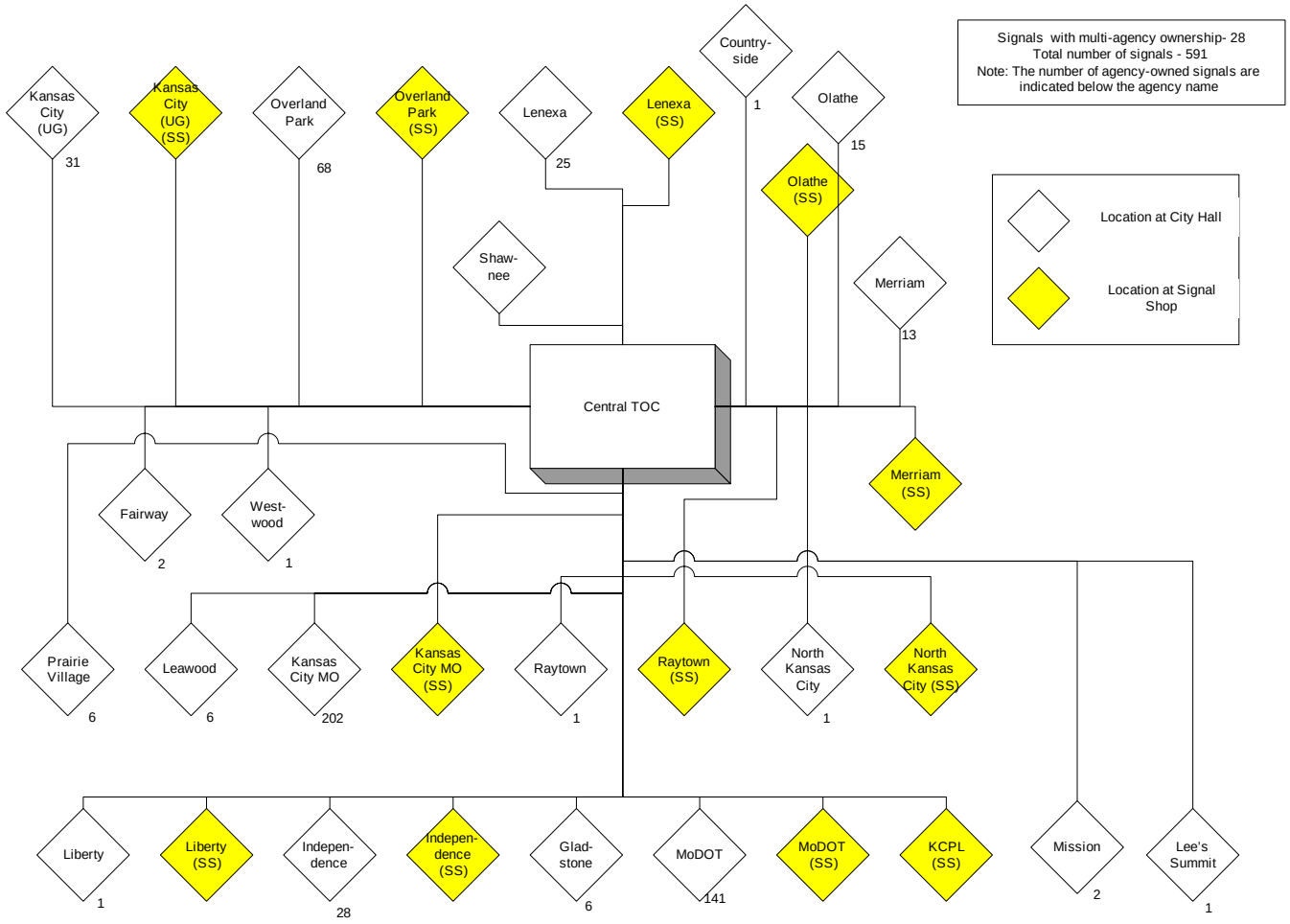
It should be noted that other cities in the MARC area may be added to the list during later phases of OGL. With this in view, it is desirable that the preliminary phase of the central system software and infrastructure should be initially designed to control 750 field devices with the provision to easily and cost-effectively expand to 5,000 field devices at a later date.

Most of the signals on OGL priority corridor are Type-170 controllers that run Wapiti W4IKS software on the local and W70SM on the field master controllers. There are some electro-mechanical controllers in the OGL priority corridor that will be upgraded through a separate Field Design and Field Installation contract to 2070 controllers. The priority corridors have some NEMA controllers as well. Several of the NEMA controllers will be upgraded to 2070N type controllers. If the selected central software has the capability to effectively communicate to the existing NEMA controllers, they will not be replaced under Phase 1 of OGL project. This capability will be a factor in the selection of the central system software.

1.2.1 Location of ATMS

The Traffic Operations Center (TOC) will be located at the MoDOT District 4 headquarters in Lee's Summit. The TOC will share operating space with the Kansas City Scout Project, a freeway operations management center, jointly operated by the Kansas Department of

Transportation (KDOT) and MoDOT. The member cities will connect to the central TOC using various communication media designed by the NETWORK CONSULTANT. Phase 1 will allow 32 workstations at locations designated by member agencies to connect to the TOC at Lee's Summit. The distribution of workstations across member agencies is shown in Figure 1.



Workstation Locations

Figure 1

1.2.2 Existing ATMS

Phase 1 of OGL does not include all signals in the MARC region but rather a subset of signals along a few traffic corridors identified as priority locations. Most cities, therefore, have only a fraction of their signals included in the OGL traffic signal network for Phase 1. While OGL is being deployed, it should not deprive a member city of the ability to communicate to signals that are not included in the OGL network. Also, member cities may have their own TOC's with compatible NTCIP-compliant software. OGL will seek efficient and effective communication on a center-to-center (C2C) level with such member city TOC's.

1.3 Scope

This functional specification document sets forth minimum requirements for an Advanced Traffic Management System (ATMS) that provides multi-user, multi-jurisdictional access to ITS field devices. The ATMS shall comply with current NTCIP specifications and shall be capable of supporting ITS field devices that comply with NTCIP specifications. It is desirable that components in the traffic operations network be truly non-proprietary and not vendor-dependent.

The primary field devices that the ATMS shall communicate and control, but not limited to are: Type 170 (Wapiti W4IKS for local and W70 SM for field master controllers), NTCIP compliant NEMA controllers (especially Eagle EPAC 300), and 2070 and 2070N actuated traffic controllers. Since Type 170 controllers are being used extensively in the Kansas City region, it is required that the central software communicates to Wapiti controllers in their native language. The firmware for the 2070 controllers has not been selected at the time of this document was prepared. It is required that the central software shall communicate to the 2070 controllers using NTCIP protocol. The central system software that provides most range of support to field traffic controller firmware will enjoy higher consideration in the central software procurement process.

1.4 Project Development and Flow

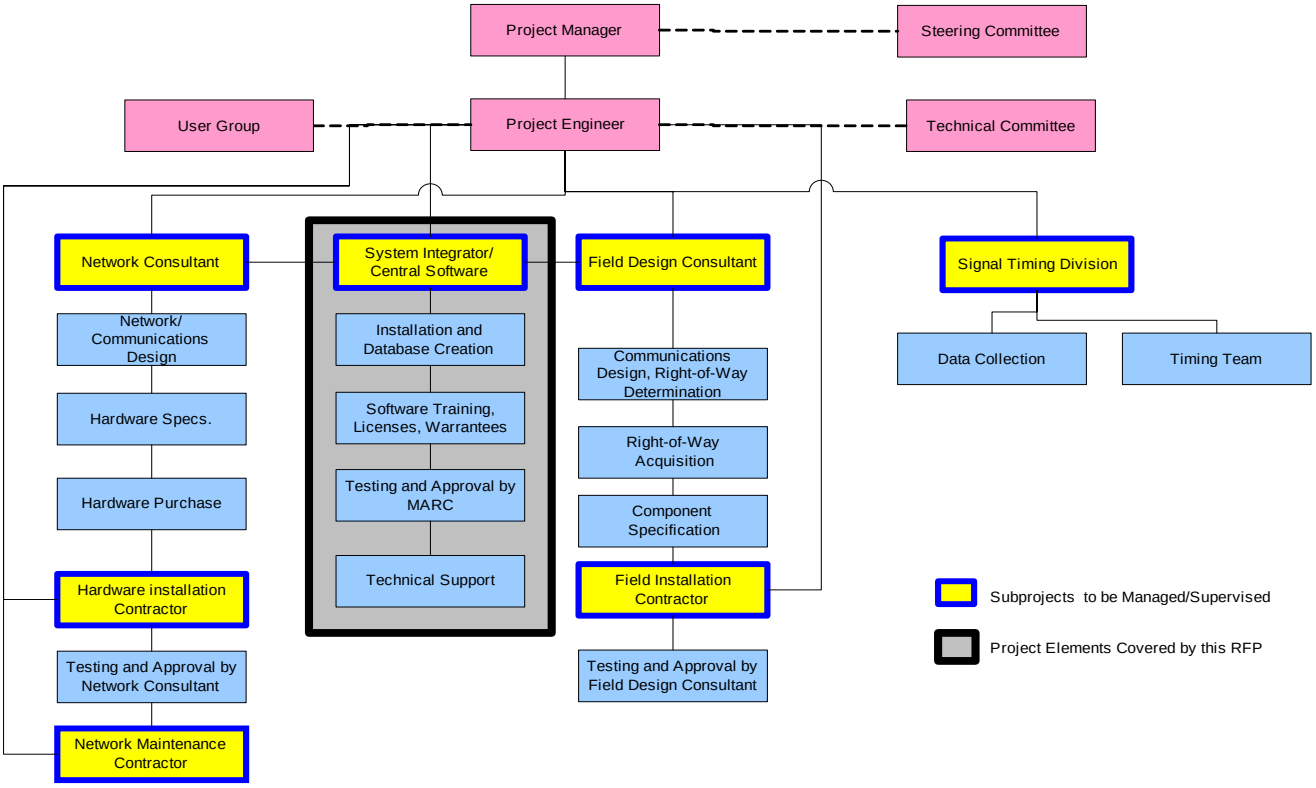
The Operation Green Light Project flow diagram is depicted in Figure 2. The OGL project can be divided into four sections:

- TOC hardware/communication design and installation
- Central System Software supply and installation
- Field communications/hardware design and installation
- Regional signal timing implementation

1.4.1 TOC Hardware/Communication Design and Installation

This process will begin with the selection of a network consultant. The tasks to be executed by the network consultant are listed below:

1. Obtain hardware/network requirements from the SYSTEM INTEGRATOR.
2. Design the OGL communications network.
3. Provide specifications for hardware components for OGL network.



Project Development Flow Diagram

Figure 2

4. Submit design plans for SYSTEM INTEGRATOR and MARC approval.

5. Assist MARC in selecting the NETWORK CONTRACTOR.

6. Approve purchase hardware and work executed by the NETWORK CONTRACTOR.

1.4.2 Central System Software Supply and Installation

This section of the project will be initiated with the selection of a SYSTEM INTEGRATOR. The tasks to be executed by the SYSTEM INTEGRATOR are listed below:

1. The SYSTEM INTEGRATOR shall give hardware/network requirements for the effective functioning of the Central System Software to the NETWORK CONSULTANT.

2. The SYSTEM INTEGRATOR shall give hardware/communication requirements to the field components to the FIELD DESIGN CONSULTANT to design hardware and the communication infrastructure that will permit the effective functioning of the Central System Software.

3. The SYSTEM INTEGRATOR shall approve designs submitted by the NETWORK CONSULTANT and the FIELD DESIGN CONSULTANT and recommend any changes if required.

4. Install Central System Software and adjust/connect hardware at TOC, workstations, and laptops.

5. Provide testing plans for software acceptance within two months after receipt of the notice to proceed.

6. Implement testing plans.

7. Provide warrantees, licenses.

8. Provide training.

9. Provide technical support for software.

1.4.3 Field Design and Installation

This section of the project will be initiated with the selection of the FIELD DESIGN CONSULTANT. The tasks to be executed by the FIELD DESIGN CONSULTANT are listed below:

1. Obtain hardware/communication requirements from the SYSTEM INTEGRATOR.

2. Identify traffic controllers to be replaced and develop plans/specifications for controller upgrade.

3. Design communication infrastructure to the field devices from the central TOC.

4. Submit all design to be approved by the SYSTEM INTEGRATOR and MARC.

5. Assist MARC in selecting the FIELD INSTALLATION CONTRACTOR.

6. Test and approve all field hardware and work executed by the FIELD INSTALLATION CONTRACTOR.

1.4.4 The Signal Timing Division

The Signal Timing Division shall have four major tasks:

1. Collect turning movement data on intersections along priority corridors.

2. Develop timing plans along priority corridors from a regional perspective.

3. Conduct event/incident/special event monitoring and responding.

4. Inspect intersection/arterial performance and design appropriate and optimum timing plans and improvements.

1.5 NTCIP Specifications

MARC understands that National Transportation Communication for ITS Protocol (NTCIP) is evolving as this document is being drafted. MARC also realizes the need for standardizing communication protocols across the transportation arena. It is therefore recommended that the ATMS implements the following NTCIP Specifications:

NTCIP 1101, NTCIP Simple Transportation Management Framework (STMF)
NTCIP 1102, Octet Encoding Rules
NTCIP 1103, Simple Transportation Management Protocol (SMTP)
NTCIP 1201, Global Object Definitions
NTCIP 1202, NTCIP Objects for ASC
NTCIP 1203, Object Definitions for Dynamic Message Signs
NTCIP 2001, Class B Profile
NTCIP 2101, Point to Multi-Point Protocol Using RS-232 Subnetwork Profile
NTCIP 2102, Subnet Profile for PMPP Over FSK Modems
NTCIP 2103, Subnet Profile for Point-to-Point Protocol Using RS 232
NTCIP 2104, Subnet Profile for Ethernet
NTCIP 2201, Transportation Transport Profile
NTCIP 2202, Internet (TCP/IP and UDP/IP) Transport Profile
NTCIP 2301, Application Profile for Simple Transportation Management Framework (STMF)
NTCIP 2302, Application Profile for Trivial File Transfer Protocol
NTCIP 2303, Application Profile for File Transfer Protocol (FTP)
NTCIP 2304, Application Profile for Data Exchange ASN.1 (DATEX)
NTCIP 2305, Application Profile for Common Object Request Broker Architecture (CORBA)
NTCIP 2501, Information Profile for DATEX
NTCIP 2502, Information Profile for CORBA

Please note that compliance may be for either DATEX or CORBA (NTCIP 2304 and NTCIP 2501 or NTCIP 2305 and NTCIP 2502.)

These documents may be ordered from:

Institute of Transportation Engineers
1099 14th Street, N.W., Suite 300 W.
Washington, DC 20005

The SYSTEM INTEGRATOR shall indicate compliance by completing Attachment B in this RFP and submitting it along with the proposal. If there is non-compliance to any standard, the SYSTEM INTEGRATOR shall indicate that in Attachment B and explain the alternative solution provided. The SYSTEM INTEGRATOR shall also complete a Protocol Implementation Conformance Statement (PICS) found in Attachment C and include it with the submittal of proposal. In attachment C, the SYSTEM INTEGRATOR will agree to support a line item with a "Yes" and declare not to support with a "No." If there is a range of values supported, the SYSTEM INTEGRATOR shall indicate the range currently supported.

Chapter 2

System Objectives and Architecture

The central system shall be housed at the TOC in Lee's Summit and shall allow multiple workstations at OGL member jurisdictions to connect to it. Part of the capabilities involved with multi-jurisdictional signal control shall be provision of security for each agency-owned signal control; allowing multiple user-level access that is password protected, etc. These are base requirements that facilitate multi-jurisdictional access of the OGL traffic signals. The system shall utilize client/server software application that will provide multi-user access to the field devices and various other centers (center-to-center.)

2.1 System Objectives

The primary objectives of the regional traffic-coordinated system are:

1. Regional incorporation of traffic signals into a traffic-coordinated network in the MARC area among member cities.

2. Continuous, automatic central system monitoring of priority corridors in the MARC area.

3. Implementation of optimized regional timing plans across multiple jurisdictions.

4. Ability for workstations to be connected to the central TOC through LAN, WAN, dial-up, and VPN, thus facilitating monitoring of traffic behavior from a regional perspective.

5. Operational failure monitoring, logging (indicating failure by date, time, nature, and location), and appropriate response.

6. Monitoring of real-time status of all traffic controllers in the system, including phase status (both vehicle and pedestrian), flash status, local and master timers, preempt on or off, current timing plan detail, mode of operation, and controller status. Monitoring of real-time status of the consummate system in both tabular and graphic form (superposed over a scale map of the region). The regional display shall indicate the green and the red phase, communication status, and preempt status on the regional map.

7. Automatic and user-defined reporting of failures and alarms.

8. Incident management through central deployment of appropriate timing plans to impacted signals.

2.2 System Architecture

1. The system shall have the ability to vest the control of an intersection in the system with a member agency.

2. Each jurisdiction shall have the capability to permit other jurisdictions to view its signal timing parameters and real-time status.

3. The system shall have the ability to control 750 intersections with expansion capability to 5000 NTCIP-compliant field devices at a later date.

4. The overall architecture of the system shall be a client/server structure based on distributed open architecture concepts. Industry standard and "open" communication protocol shall be used for all interfaces. The workstations (the "clients") shall access the network computers that perform traffic management, database management, and real-time traffic control functions. The system shall have a remote version that runs on portable computers with graphics resident within the portable computer. A recommended conceptual design of the OGL network is shown in Figure 3.

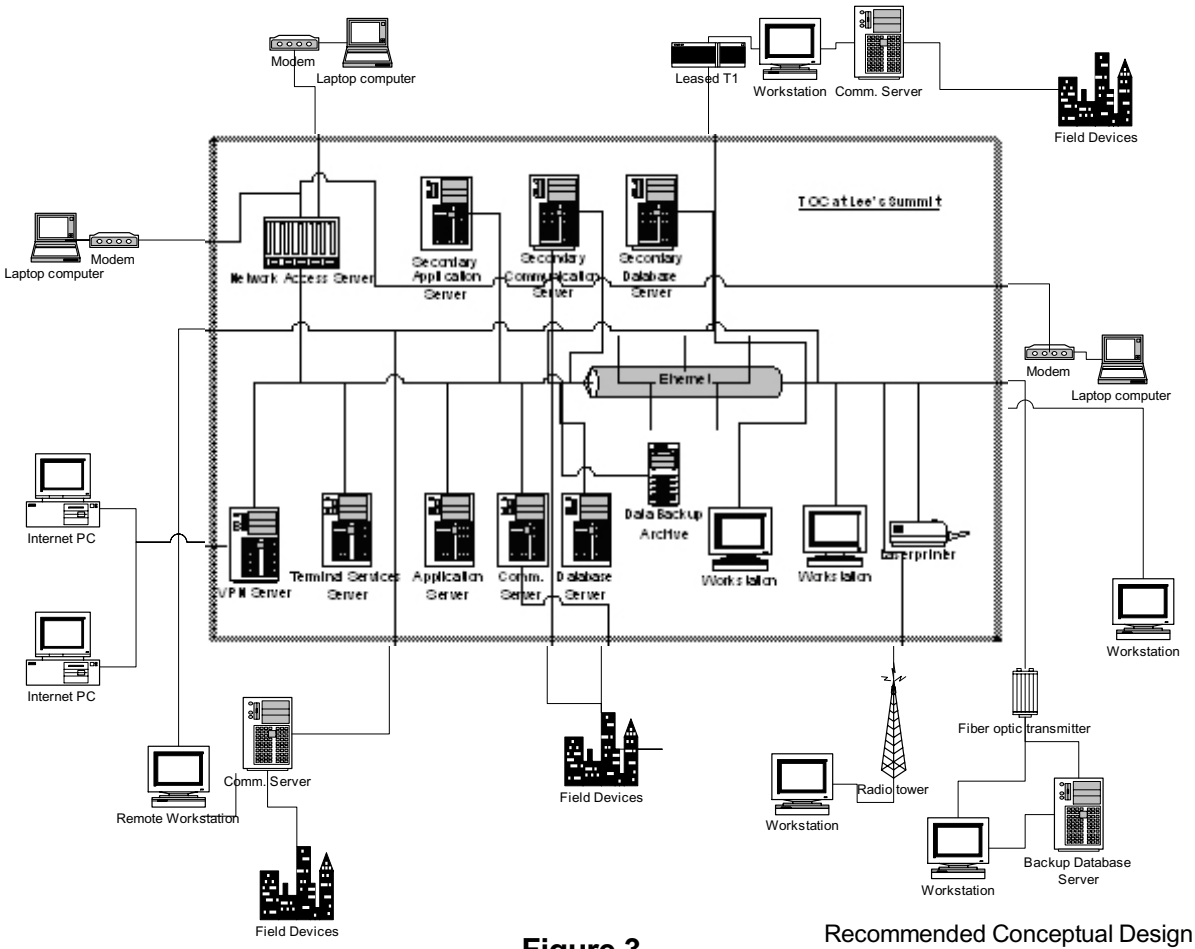


Figure 3

Recommended Conceptual Design of OGL Network

5. The system shall allow technicians to connect portable computers directly to the traffic controllers and make changes bypassing the central TOC. The SYSTEM INTEGRATOR shall provide a means to generate an alarm automatically if there is any discrepancy between the data in the local controller and the central database.

6. The operating system on all servers, workstations, and laptops shall be based on current and future Microsoft Windows™ Operating system. The application server must support Windows Terminal Services.

7. The system shall have the capability of sending messages in response to alarms to pagers, cellular telephones, etc. This capability should provide several options for the user to choose, such as, but not limited to type of alarm, course of action, entity to page, time frame to page, etc. The system shall provide a filtering capability for these alarms. Standard, commercially available, business grade Wintel PC-based hardware shall be used in the system.

8. Standard, commercially available, business grade Wintel PC-based hardware shall be used in the system.

9. The system shall provide a means by which the system's central clock is automatically synchronized with universal time. The recommended options are using WWV radio broadcast or a GPS Clock. The system shall permit automatic, scheduled, or manual download of time-of-day to local controllers.

10. Control and security modes should be provided to allow multiple levels of control for the system user.

11. Controller level control shall be provided for manual, time-of-day, traffic-responsive modes.

12. Section level control shall be provided for manual, time-of-day, traffic-responsive modes.

13. Selected remote workstations will have a backup data server that will mirror the central TOC database and update dynamically and automatically over the network. The remote workstation shall access the data from the backup data server. This database shall be commercially available and non-proprietary and should be user upgradeable with little of no changes to the central software.

14. System shall provide backup and storage capability for all data as frequently as possible but should not affect overall system performance. This data shall time stamped and be archived for records. The system also shall log and record all user activity tagged by date and time.

15. There shall be a backup data-server, application server, and communication server at the TOC. If the primary servers fail or lockup, the backup servers shall shoulder the functional load without affecting system operations. It is desirable that the fail-over processes be automatic.

16. The system shall be able to communicate to controllers and ITS devices over various communication media such as, but not limited, twister-pair cable, wireless, cat-5 or fiber optics.

17. The system shall be able to communicate to Type 170 and 2070 controllers. Ability to communicate to NEMA and other types of traffic controllers will be a factor in the choice of the central system software. The system shall use NTCIP Center to Field protocols and signal system objects.

18. The system software, workstation software, and laptop software shall have a menu-driven install function. The user should be able to install the software fully with minimum input.

This installation media shall contain all licensed Commercial Off the Shelf (COTS) software required for the central software to function.

19. The system shall store user profiles and varying levels of security access for zones, sections and intersections. For example, the system shall have the capability of being configured to permit a user to have administrative privileges in zone A, upload privileges in zone B, and view-only privileges in Zone C. This should carry over into sections and intersections.

20. The system shall be able to generate input files for offline signal optimization.

Chapter 3

Specifications for Central System Software

The system shall utilize intelligent local intersection controllers. The local controllers shall be programmed with timing plans, TOD/DOW schedules, and all other required parameters to operate the intersection. All intersection controllers shall be capable of being monitored on a real-time (preferably second-by-second) basis by the system.

At startup, the system shall establish communications with all intersection controllers and begin real-time monitoring. The system shall start to process both incoming data and operator requests.

The SYSTEM INTEGRATOR shall show support for each of the line items listed below by submitting a completed Attachment D (Requirement Traceability Matrix) with the proposal.

3.1 Control Modes

The system shall be designed for unattended operation 24 hours per day, 7 days a week, without requiring an operator to be logged into the system. The system shall provide system control by coordinating intersection operations on an individual, section, or system-wide basis. The system shall include at least the six operator-selectable control modes listed below:

3.1.1 Manual Control

1. The operator shall be able to manually override the plan that the system, section, or controller is in currently.

2. The operator shall have two options for implementing manual override:
    a. Set manual override and later release manual override via the Graphical User Interface (GUI).
    b. Set manual override with a specified time frame for termination.

3. When manual override is terminated, the controller shall revert to its previous mode of operation.

3.1.2 Time-of-day/day-of-week control

1. The system shall utilize TOD/DOW mode for controlling traffic conditions that occur regularly.

2. In this TOD/DOW, each controller shall automatically select and implement traffic signal timing plans in accordance with the defined schedule, locally stored, on a TOD/DOW basis.

3. The TOD/DOW schedule shall include the ability to implement plans for holidays and special days.

4. The system shall provide for daylight savings time.

5. TOD/DOW plans shall be downloadable from the system and portable devices to the traffic controller in the field. This should be done at maximum speed supported by the traffic controller.

6. The 32 TOD/DOW plans shall be selectable from the central computer either manually, as a result of traffic responsive selection, or TOD/DOW selection.

3.1.3 Traffic-Responsive Control

1. In the traffic-responsive mode of operation, the system shall select the timing plan that is best suited to the existing traffic conditions as measured by the system detectors and analyzed by the system's traffic-responsive process.

2. Once the system's traffic-responsive process has selected the appropriate timing plan, the plan number shall be commanded to the intersections on a continuous basis until the traffic-responsive process recognizes, based on sufficient change in traffic conditions, the need to command a different timing plan.

3. The traffic-responsive algorithm shall be based on the UTCS algorithm or other traffic-responsive algorithm approved by MARC.

4. In order to enhance traffic responsive operation, the following three traffic-responsive process points shall be implemented:

    a. Each section shall be capable of being associated with zero other sections, one of which shall be designated as the master section. When traffic conditions warrant a traffic-responsive timing plan change for the master section, the ATMS shall automatically change the timing plans for the other associated sections. If no other sections are associated with a section, only that section shall change timing plans.

    b. The operator shall be able to define a single detector station as a section. When the traffic-responsive process detects that this station has exceeded operator-defined thresholds, the associated sections shall automatically change to the appropriate traffic-responsive plan. This process is intended for use in conjunction with special events (such as to detect and respond to a surge of traffic leaving the parking facility of a stadium or arena following the end of a sporting or other type of event).

    c. Section definitions shall be changeable on a time-of-day basis. The intersections within a section shall be changeable, allowing intersections to be in different sections depending on the time-of-day. Definition of master sections and associated sections shall be changeable, allowing sections to be associated with different master sections depending on the time-of-day.

    d. Flexibility to not enter a traffic-responsive pattern if an operator-selectable number (or percent) of section controllers are offline due to communications failure.

3.1.4 Free Control

In the free mode, the controller shall run without coordination in response to existing traffic demand. In this mode the system shall monitor controller operation. Free control may be initiated manually or by TOD/DOW function.

3.1.5 Flash Control

To initiate flashing operation, the controller shall be commanded to flash from the system. Flash control may be initiated manually or by TOD/DOW function.

3.1.6 Default Control Mode

1. At system startup, the mode shall always be local TOD /DOW
2. If the system was shut down in traffic-responsive mode, it will revert back to traffic-responsive mode.
3. In the event that, while in software-commanded override, a controller does not receive any communication from the system within a operator-defined time frame, it shall revert back to its local TOD/DOW schedule.
4. The operator override shall be allowable on an intersection, section, zone, or system-wide basis.

3.2 Signal Timing Plan Implementation and Monitoring

The system shall be capable of dividing the traffic signal system into zones, sections, and intersections. A section is a collection of user-defined intersections that will be controlled by the system as a single entity.

3.2.1 Zone Control

1. A zone is a collection of grouped sections and shall be user assignable.
2. The sections in each zone shall be assignable by TOD/DOW.

3.2.2 Section Control

1. The system shall be capable of dividing the traffic network into a minimum of 100 sections.
2. Intersections and detectors shall be dynamically/online-assignable to any section.
3. It shall be possible to have intersections/detectors assigned to different sections, for different times of the day, either by operator command or the TOD/DOW command scheduler.
4. These dynamic groupings may be stored at the central location on a TOD/DOW basis.

3.2.3 Intersection Control

These functional requirements apply for the central software communicating to Type 170, NEMA and 2070 controllers.

1. Local traffic signal control functions shall be provided by the local controller firmware.

2. The intersection controller shall determine the coordination cycle synchronization point from the current time-of-day.

3. All offset, split, and transition timings shall be determined and implemented locally.

4. The ATMS shall provide for a minimum of 32 timing plans for each intersection to be stored in the central database.

5. At any one time, it shall be possible for a minimum of 24 of these plans to be stored in the local controller's database and implemented upon command by the ATMS.

6. Each timing plan shall include uniquely programmable values for cycle length and offset, a uniquely programmable phase sequence, and uniquely programmable split values.

7. The software shall provide both the automatic calculation of permissive periods (based on split values) and the ability for the operator to input desired values for the beginning and end of permissive periods.

8. The system shall also provide the capability to handle special signal and/or timing plans to accommodate unusual traffic flow patterns during special events, parades, etc.

9. Special event timing plans may be included within the 24 timing plans.

10. The system shall provide for the independent control of each phase of a 16-phase controller with sequence and barriers all user programmable.

11. The ATMS shall provide control over lead-lag phase sequences.

12. In conjunction with each timing plan, the software shall enable the independent programming of each odd-numbered phase to be either leading or lagging with respect to its associated even-numbered phase.

13. The system shall also provide for the control of standard three-phase and four-phase (e.g., TTI) diamond-interchange phasing.

14. The system shall recognize the occurrence of locally-initiated preemption and thereby not erroneously diagnose a coordination failure because the local controller has been preempted.

15. The system shall not fail the intersection as a result of a normal force-off time being exceeded to service a pedestrian call.

16. The system shall accommodate the control and monitoring of the on/off status of a minimum of four special functions to be implemented by the local controller.

17. Maintenance technicians shall have the ability, from the local controller, to effect a download of the local controller database from the central database without the need for an operator to be present at the TOC.

18. The system shall monitor the phase returns from the controller at each intersection to ensure that its operation is within proper constraints of the timing plan that is in effect.

19. The system shall use the ATMS database timing parameters to check against the real-time phase returns.

20. Operator-definable filters shall be utilized to define the window of time that a phase must start or stop.

21. The system shall provide an alarm if a difference is found between the timing stored in the database and that stored in the local controller.

22. The operator shall have the opportunity to determine which of the two should be used.

23. Communications and controller hardware monitoring shall cause the system to fail individual components when operator-definable error thresholds are exceeded.

24. These components shall include intersections, detectors, and communication channels.

25. Upon failure, the system shall log the event and also display a visual alarm to the operator.

26. The system shall continue to attempt communication with the failed component.

27. If the failed component communicates successfully for an operator-specified amount of time, the component shall be considered operational.

28. This event shall also be logged, along with the clearing of the alarm for the failed component.

29. The operator shall be able to disable any component in the system through the user interface.

30. When disabled, the software shall not communicate with the component.

31. The operator shall be able to schedule any command for execution at any time.

32. The system administrator shall be able to inhibit any commands from being entered into the command scheduler.

33. The entries in the command scheduler shall be automatically sequenced in ascending order by time-of-day/day-of-week, regardless of the order in which the entries are made.

34. Any operator commands shall have priority over scheduled entries in the command scheduler.

35. The operator shall be able to make entries in the command scheduler for up to a minimum of one year in advance.

36. The number of entries shall be a minimum of 1,000. Capabilities shall be provided to schedule and execute multiple commands for the same time.

37. For commands scheduled at the same time, execution shall be sequential.

38. Commands entered into the command scheduler shall be of two types, permanent and temporary.

39. Permanent commands shall be performed every time the matching of time parameters occurs.

40. Temporary commands shall be performed once and then be deleted from the command scheduler database.

41. The permanent commands shall be the following:
    a. Every day basis (i.e. every day of the year);
    b. Every week basis (i.e. on a given day or days of every week);
    c. Every time-span basis (i.e. every hour);
    d. Every weekday (i.e. given weekday from Mon to Fri); and,
    e. Every weekend (i.e. given weekend day such as Sat and/or Sun).

42. The temporary commands shall be the following:
    a. Date basis (i.e. specific dates, December 25, 2003);
    b. Time basis (i.e. at 2:00 pm or 1400 hours); and,
    c. Date/time basis (i.e. on 4/15/03 at 11:00am).

3.3 Detector Data Collection

1. The system shall have both system and local detectors that shall be used for both traffic counting, traffic actuated and traffic-responsive operation.

2. The system shall be capable of handling the maximum number of detectors allowable per controller.

3. The system shall process and maintain detector count data and occupancy data on a continuous basis to be used for various traffic control strategies and reporting tasks.

4. Detector feedback shall be obtained in an operator-selectable time frame in minimum one-minute increments.

5. The two detector data types are as follows:
    - Volume — the number of vehicles (counted in an interval of time) where raw and smoothed volume shall be displayable in operator-defined intervals.
    - Occupancy —the percentage of time the detector loop is occupied

6. The system shall automatically record detector data in the ATMS database based on TOD/DOW instructions.

7. The detector data shall be archived periodically and automatically.

8. Up to four weeks of five-minute detector data for each intersection shall be stored in the ATMS database by the database program. After four weeks the data shall be archived.

9. If bad data or no data is received from the detector loops during any or all of the five-minute time frames, the data will be tagged as questionable or not available in the ATMS database.

10. Each five-minute block shall be date/time tagged.

11. In case of failure during a database write process, the database program shall not leave a partially-written five-minute block.

12. Any missing five-minute blocks shall be tagged as unavailable for that five-minute period. The operator shall have the ability to enable or disable the detector data collection function by detector.

13. The system shall record and report detector failures as determined by the intersection controllers through the local detector monitoring.

3.4 Intersection Measures of Effectiveness

1. The system shall collect and store data on intersection measures of effectiveness (MOE).

2. The software shall process and maintain intersection MOE data on a continuous basis to be used for various timing analysis and reporting tasks.

3. Intersection feedback shall be stored on a per-phase basis.

4. The intersection MOE, which shall be stored, includes, but is not be limited to, the following:
    a. Smoothed volumes;
    b. Smoothed occupancies;

5. Intersection data for each intersection shall be stored on the ATMS database by the database program.

6. If bad data or no data are received from the intersection, the data will be tagged as questionable or not available in the ATMS database. This shall trigger a log for

7. The operator shall have the capability to enable or disable data collection on an individual intersection basis. This needs to be logged with at least: Time, date, operator, and room for notes.

3.5 Reporting Capabilities

1. This display/report shall show the selected intersection operation in detailed real-time mode.

2. The intersection graphic shall display both dynamic and static information.

3. This display shall be available on an intersection basis only.

4. The components of information that the display/report shall include are as follows.
    a. Controller time and date.
    b. All vehicle signal indications for each active phase and for a minimum of eight (8) phases with red, yellow and green indications.
    c. All pedestrian signal indications for a minimum of eight (8) active phases. Walk, flashing Don't Walk and steady Don't Walk shall be shown.
    d. Vehicle and pedestrian detector actuations for each active phase.
    e. Cycle countdown.
    f. Timing plan in effect (with cycle length and offset).
    g. Actual controller offset
    h. Split timer
    i. Status of minimum four (4) special functions.

j. Operations status of the intersection (in TOD/DOW or traffic responsive control), in transition, free operation, flash, preemption (railroad or emergency vehicle), local manual control or failed.
k. The actuation status of a minimum of eight (8) local intersection detectors.
l. The actuation status of a minimum of eight (8) system detectors.

5. The intersection display shall accommodate all standard NEMA phasing as well as those that can be produced by the phase sequence of the controller.

6. The printable reports shall be formatted to print on letter-sized paper on a laser printer or continuous-feed dot-matrix printer.

7. The printable reports shall include operator log, status (operational statistics and failure statistics) of connected ITS components, detector information, timing plans, etc. At a minimum, it shall include the following:
   a. Operational events;
   b. Traffic device failures/repairs;
   c. Communication failures/repairs;
   d. Traffic data transfer messages;
   e. Manual override changes; and,
   f. Operator log-on and log-off.

8. The system shall maintain a user-activity log.

9. The system shall have the capability of recording actual splits that occur at the intersection.

3.6 Graphical Display System

1. The Graphical Display System (GDS) shall follow the same graphical user interface guidelines as the system.

2. All commands for manipulating the GDS shall be available directly from the ATMS user interface.

3. Any remotely stored graphic files shall be automatically updated by the system. The graphic system shall have a base map that covers the entire extent of the MARC region.

4. The dynamic layers of the GDS shall be incorporated onto the base map by the SYSTEM INTEGRATOR.

5. At a minimum, the base map will show the roadway centerlines of arterials and collector streets, freeway centerlines, rail lines, and major landmarks.

6. The system shall allow superposing of to-scale ortho-photographs as a separate layer over the base map.

7. The dynamic mapping provided by the SYSTEM INTEGRATOR shall incorporate full pan/zoom capability. It shall have the following features:

   A. **System-wide display**, which shall include the entire OGL region. This level shall include, as a minimum, centerlines of major roadways (including all those which include a signal), freeway centerlines, rail lines, and major landmarks. At this

level, signalized intersections, system detector stations, and other field devices shall be depicted as dynamic symbols (e.g., circles, squares, etc.). The operator shall have pan/zoom capability within the system-wide display.

B. **Area displays** shall include portions of the system-wide display (an example would be an area display of the central business district). At this level, roadways may still be depicted as centerlines but all minor streets shall be included. At this level, it shall be possible to view the green status of the coordinated phase green. The operator shall have pan/zoom capability within each area display.

C. **Intersection displays**, which shall depict roadway curb lines and lane lines and shall include static displays of the following:
    a. Street names;
    b. Intersection number;
    c. Phase numbering;
    d. Special function definition; and
    e. North arrow.

The intersection display shall also include dynamic indicators listed below:

    f. Controller operational mode (e.g., TOD/DOW, traffic-responsive, manual, free, or remote flash)
    g. Controller status (e.g., in transition, preempted, conflict flash, etc.)
    h. Communications status (e.g., on-line, bad communication, or no communication);
    i. Timing parameters currently effect (e.g., control mode, transition status, control section assignment, timing plan number, cycle length, offset, and split values);
    j. Phase numbers and color status of all vehicular phases and overlaps (including the circular red, yellow and green indications and all arrows)
    k. Color status of all pedestrian phases (including walk, flashing don't walk, and steady don't walk);
    l. Actuation status of all local detectors (vehicular and pedestrian) and all system detectors associated with the intersection;
    m. Special function status
    n. Count-up of cycle clock
    o. Count-down of the number of seconds remaining for the force off of the phase in service.
    p. TOD on the local controller and on the application server

8. Common icons shall be used as much as possible for all display levels.

9. All colors shall be selectable by the operator. ITS field equipment owned by each jurisdiction shall have the capability of being uniquely identified, both by color and by shape.

10. The same colors and icons shall also be used in display/report screens.

11. A legend shall be available within the display window, defining the meaning of each icon and color.

12. If discrete display levels are used in lieu of full zoom capability, icons shall be provided on each level's display to select the view of the other levels.

13. The system shall include a library of standard intersection drawings (e.g., standard four-legged intersection, standard tee intersection, etc.).

3.7 Database Management

1. The system software shall automatically record intersection data in the ATMS database, and periodically archive the data onto removable optical/magnetic tape media at the highest time resolution possible.

2. The time increment between writing of data to the optical disk drive and start time shall be operator-selectable with defaults of 24 hours and midnight, respectively.

3. Data shall be automatically compressed when written to the removable optical/magnetic tape media.

4. Each history file shall be date and duration tagged via file naming convention.

5. The data storage feature shall have the ability to append intersection data to the removable optical media, enabling full usage of the media.

6. When the removable optical media does not have enough storage space left for a full time interval of intersection data, the system shall notify the operator that a new storage disk is required.

7. The operator shall have the ability to enable and disable archiving on an individual intersection basis.

8. Intersection data shall be retrievable from the removable optical/magnetic tape media for use with the relational database and traffic modeling packages.

9. The system shall have the capability to download/upload the entire intersection database from the field or just one table.

10. In case of failure during a database write process, the database program shall not leave a partially written block and shall log the write failure.

Chapter
4

Required System Integrator Tasks

The SYSTEM INTEGRATOR shall execute the following tasks along with providing the central system software. These tasks shall be executed in a timely manner and to the satisfaction of MARC staff. The SYSTEM INTEGRATOR shall provide a listing of tasks to be performed with an estimate of time required for each task and include the listing with the submittal of proposal. A Gantt chart (from the SYSTEM INTEGRATOR'S perspective) from the notice to proceed shall also be included with the proposal.

4.1 Provide Software/Hardware Data/Specifications/Information

The SYSTEM INTEGRATOR shall provide necessary software/hardware data for the design and deployment of the OGL communication network. Along with the proposal, the SYSTEM INTEGRATOR shall include minimum and desired specifications for all computer hardware and peripherals in the TOC, workstations and laptop computers that will pertain to the system software. For a conceptual sketch on the proposed TOC network, please refer to Figure 2. This data shall be made available to MARC, NETWORK CONSULTANT, and the NETWORK CONTRACTOR.

Information concerning field devices shall be provided to MARC, NETWORK CONSULTANT, NETWORK CONTRACTOR, FIELD DESIGN CONSULTANT and FIELD INSTALLATION CONTRACTOR.

4.1.1 Approval of Communication Network Design

The NETWORK CONSULTANT and FIELD DESIGN CONSULTANT shall present their design drawings to the SYSTEM INTEGRATOR for approval. The design of the network will be approved for installation by MARC only after approval by the SYSTEM INTEGRATOR. The final responsibility for making the central software system function over the network, thus lies with the SYSTEM INTEGRATOR once the approved network design is installed per specifications.

4.2 Install Software

The NETWORK CONTRACTOR shall install the Operating System requested by the SYSTEM INTEGRATOR, on computers in the SYSTEM INTEGRATOR-approved network. The SYSTEM INTEGRATOR shall be responsible for installation of all relevant software in all servers, workstations and laptops that are part of the initial deployment.

4.3 Install Hardware

The NETWORK CONTRACTOR will be responsible for the purchase and installation of hardware specified by the SYSTEM INTEGRATOR. The NETWORK CONTRACTOR shall be responsible for connecting all computers to the SYSTEM INTEGRATOR-approved network. The SYSTEM INTEGRATOR shall connect the modems and communication devices (to field devices) to appropriate servers and will be responsible for the effective functioning of the system software. All communication servers and peripherals shall be configured by the SYSTEM INTEGRATOR. Ultimately, the responsibility for making the system work as per design will lie with the SYSTEM INTEGRATOR.

4.4 Testing

4.4.1 NTCIP Compliance Testing

The SYSTEM INTEGRATOR shall develop with MARC a detailed and comprehensive procedure to MARC to test the central software for compliance to the NTCIP standards. The test plans supplied shall clearly define acceptance. If the software does not meet with the SYSTEM INTEGRATOR-claimed compliance to the NTCIP standard, the SYSTEM INTEGRATOR shall correct the non-compliance within 30 days at no additional cost to MARC. The failed item shall be retested for compliance.

4.4.2 Operational Testing

The SYSTEM INTEGRATOR shall develop with MARC a detailed and comprehensive procedure to test the supplied software against the requirements of the system specifications. The test plans supplied shall clearly define acceptance. The testing shall take place after the installation of the entire system. This procedure shall be presented to MARC within two months after issuance of notice to proceed. If MARC determines that the results of the test procedures are unacceptable and below the standards set forth by the required and claimed system specifications, the SYSTEM INTEGRATOR shall correct the central software to meet the required system specifications without additional cost to MARC. This rectification process should be within 30 days of MARC notifying the SYSTEM INTEGRATOR of the non-conformity or malfunction.

MARC will score each of the system requirements on a pass/fail basis. The operational testing shall be conducted on two levels. The first level will take place immediately after the installation with the SYSTEM INTEGRATOR PRESENT. The second level of testing will take place over a period of three months, during which the member jurisdictions will have an opportunity to test the software. The central, workstation, and laptop software shall be tested through various communication media.

4.4.3 Final Acceptance Testing

The final acceptance testing will be executed over a period of six months. This process will test all the components of the system against conformity to system specifications. If a malfunction or non-compliance to the specifications is discovered, the SYSTEM INTEGRATOR shall repair the problem within five working days after notification. If the problem with the signal is a condition where the normal function of the signal is hampered

as determined by MARC, the SYSTEM INTEGRATOR shall respond within four hours via telephone and fix the problem remotely if possible within eight working hours. If the problem is of such complexity that it can not be fixed remotely, the SYSTEM INTEGRATOR shall fix the problem physically at the site within 24 hours. The SYSTEM INTEGRATOR shall be responsible for all costs involved for such a repair.

4.4.4 Development of Test Plans

Tests shall be conducted by the agency under direct supervision of MARC delegate(s). All test plans developed by SYSTEM INTEGRATOR shall have the following elements:

a. Test description and identifier

b. Description of element being tested

c. Description of testing procedure

d. Expected result

e. Actual result

f. Comments

g. Approval or rejection by MARC

All test plans shall be developed by the SYSTEM INTEGRATOR and MARC. All tests shall be jointly conducted by MARC delegate(s) and the SYSTEM INTEGRATOR.

4.5 Training and Manuals

SYSTEM INTEGRATOR shall provide both theoretical and hands-on training for the central software, workstation software, and laptop software. The training shall be scheduled for two consecutive days after the installation of the system. Four other eight-hour training sessions shall be scheduled after the six-month acceptance testing period. The training shall be initiated with a MARC request and conducted within a month of the requested date.

The training shall cover, but is not limited to, the following areas:

- Software installations for workstations, laptops, servers
- Setting up servers
- Setting up workstations
- General training to use the software in all hardware platforms
- Creation of system and intersection maps
- Trouble shooting techniques
- System startup and shut down

- Configuration settings
- Database manipulation
- Custom report generation
- Data backup and recovery procedures

The SYSTEM INTEGRATOR shall supply 50 hard copies of user manuals prior to or during software installation. The manual also shall be provided in an electronic format with license for unlimited reproduction and distribution in the MARC region. The software shall have context sensitive help and also a Windows help file that can be accessed from within the software environment.

4.6 Generation of Graphical Maps

The SYSTEM INTEGRATOR shall be responsible for provide and install a regional map that provides the operator with a view of the entire MARC system. MARC will provide an ESRI ArcView base map for the region. The SYSTEM INTEGRATOR shall install dynamic displays on the regional map for 50 intersections in the OGL system. The SYSTEM INTEGRATOR shall also be responsible for installing intersection graphic displays for 50 intersections. The installation of these graphics shall be done in the presence of MARC delegates and training on the procedure shall be conducted simultaneously.

4.7 Technical Support

The SYSTEM INTEGRATOR shall include with the proposal a cost schedule to provide telephone and e-mail support for the software. Detailed information on the nature and type of support shall be provided by the SYSTEM INTEGRATOR.

4.8 Warrantees

The SYSTEM INTEGRATOR shall include detailed warrantee information along with the proposal.

4.9 Licenses

The SYSTEM INTEGRATOR shall include with the proposal a cost schedule to provide an unlimited software installation/use license for workstation and laptop versions of the system software. The perpetual right to use the software shall be made available to all member agencies in the MARC area. The cost schedule (Attachment A) shall include provision of one copy of the central system software to MARC (local license) and also for providing a regional license in the MARC area.

4.10 Upgrades

All software upgrades for two years after acceptance shall be provided without additional cost to MARC. There shall be at least 8 upgrades during this period. The proposal shall discuss provision of upgrades after the period of two years.

Chapter 5

SYSTEM INTEGRATOR Deliverables

The SYSTEM INTEGRATOR shall provide tangible deliverables in addition to/along with the tasks. The deliverables are listed below:

5.1 Hardware Requirements

The SYSTEM INTEGRATOR shall provide detailed minimum and desired specifications for all computer hardware and peripherals that will be impacted by the Central System Software.

5.2 Network Requirements

The SYSTEM INTEGRATOR shall provide requirements for the Central System Software to function across a Microsoft Windows™ network.

Both items 5.1 and 5.2 shall be provided to MARC and the NETWORK CONSULTANT within 30 days of the notice to proceed. The SYSTEM INTEGRATOR will be available to respond to inquiries that MARC and the NETWORK CONSULTANT may have pertaining to items 5.1 and 5.2.

5.3 Network Acceptance Document

The NETWORK CONSULTANT shall submit network design for SYSTEM INTEGRATOR perusal and approval. The SYSTEM INTEGRATOR shall issue a document of acceptance of network design and hardware specifications.

5.4 Central System Software

The SYSTEM INTEGRATOR shall:

- provide the Central System Software and install it on servers at the TOC
- configure communication servers,
- provide and install the System Map
- setup 50 intersections in the system including intersection graphics
- install software on all workstations at member jurisdictions (32)

- install software on all workstations at TOC (2)
- Install on all laptop computers (30)
- execute all relevant tasks required for efficient functioning of the Central System Software

It should be noted that the SYSTEM INTEGRATOR shall provide a document of approval of the network installation prior to beginning software installation.

5.5 Licenses and Warrantees

The SYSTEM INTEGRATOR shall provide all required licenses and warrantees. (Refer to items 4.8 and 4.9)

5.6 User Manuals and Training

The SYSTEM INTEGRATOR shall provide user manuals and training for the Central System Software. Details can be found in section 4.5.

5.7 Test Plans

The SYSTEM INTEGRATOR shall provide test plans for software acceptance within two months of receipt of notice to proceed. Details can be found in section 4.6.

5.8 Upgrades

The SYSTEM INTEGRATOR shall provide upgrades as detailed in section 4.10.

Chapter

6

Control of Other ITS Devices

5.1 Dynamic Message Signs

The system shall have the capability of communicating and controlling NTCIP-compliant dynamic message signs (DMS). SYSTEM INTEGRATOR candidates will provide detailed specifications for any proposed DMS communications and control software as part of their written proposal. Cost schedule for including DMS support, if it is not included in original software delivery, shall be indicated in Attachment A.

5.2 Cameras

The system shall have the capability of communicating with and controlling (Pan, Zoom, and Tilt) NTCIP-compliant Closed Circuit Television (CCTV) cameras. SYSTEM INTEGRATOR candidates will provide detailed specifications for any proposed CCTV communications and control software as part of their written proposal. Cost schedule for including CCTV support, if it is not included in original software delivery, shall be indicated in Attachment A.

5.3 Other ITS Devices

The system shall have the capability to communicate with NTCIP-compatible field components including but not limited to: vehicle detection equipment, weather stations, speed stations, etc. SYSTEM INTEGRATOR candidates will provide detailed specifications for any proposed communications and control software for these devices as part of their written proposal. Cost schedule for including these modules, if it is not included in original software delivery, shall be indicated in Attachment A.

ATTACHMENT A

	Description	Time required to Develop	Cost	Comments
	Required Items			
1	Communication and Management			
2	Supply of software			
3	Installation of Software and Populating Database per Specifications			
4	License Fee (Local)			
5	License Fee (Regional)			
6	Warrantees			
7	Training			
8	Testing			
9	Technical support			
	Optional Items			
1	CCTV Control Module			
2	Weather Station Control Module			
3	Incident Management Module			
4	DMS Module			
5	Traffic Responsive Module			
6	Highway Advisory Radio Module			
7	System Detection Module			
8	Ramp Metering Module			
9	Traffic Adaptive Module			
	Signal Controller Support: 2070			
1	NextPhase - Siemen's Gardner			
2	OASIS – AECOM			
3	Econolite (2070)			
4	Eagle (2070)			
5	Naztec (2070)			
	Signal Controller Support: NEMA			
6	Econolite ASC-2			
7	Multisonic 820			
8	Multisonic 820A			
9	Peek TRA 3000			
10	Peek LMD 8000			
11	Eagle EPAC 300 (Mandatory Support)			
	Signal Controller Support: Type 170			
1	Wapiti W4IKS (Mandatory Support)			

Note: Please provide detailed specifications for each item/module along with the proposal. The SYSTEM INTEGRATOR may include options along with the required specifications for each item as well. Concerning signal controller support—the time required for development of the software shall also be included with the proposal. If there are problems with supporting a particular brand/model of signal controller, the SYSTEM INTEGRATOR shall clearly indicate that in the proposal. The cost schedule (Attachment A) shall be provided in a sealed envelope.

ATTACHMENT B

	NTCIP Standard	Compliance	Comments
1	NTCIP 1101	Yes / No	
2	NTCIP 1102	Yes / No	
3	NTCIP 1103	Yes / No	
4	NTCIP 1201	Yes / No	
5	NTCIP 1202	Yes / No	
6	NTCIP 1203	Yes / No	
7	NTCIP 2001	Yes / No	
8	NTCIP 2101	Yes / No	
9	NTCIP 2102	Yes / No	
10	NTCIP 2103	Yes / No	
11	NTCIP 2104	Yes / No	
12	NTCIP 2201	Yes / No	
13	NTCIP 2202	Yes / No	
14	NTCIP 2301	Yes / No	
15	NTCIP 2302	Yes / No	
16	NTCIP 2303	Yes / No	
17	NTCIP 2304	Yes / No	
18	NTCIP 2305	Yes / No	
19	NTCIP 2501	Yes / No	
20	NTCIP 2502	Yes / No	

ATTACHMENT C

PHASE CONFORMANCE GROUP						
NTCIP 120	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	**Comments**
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	
2.2	**Phase Conformance Group**	---	M	---	---	
2.2.1	maxPhases	S	M	0-255		
2.2.2	phaseTable	--	M	----	---	
	phaseEntry	--	M	---	---	
2.2.2.1	phaseNumber	S	M	1..255		
2.2.2.2	phaseWalk	P	M	0-255		
2.2.2.3	phasePedestrianClear	P	M	0-255		
2.2.2.4	phaseMinimumGreen	P	M	0-255		
2.2.2.5	phasePassage	P	M	0-255		
2.2.2.6	phaseMaximum1	P	M	0-255		
2.2.2.7	phaseMaximum2	P	M	0-255		
2.2.2.8	phaseYellowChange	P	M	0-255		
2.2.2.9	phaseRedClear	P	M	0-255		
2.2.2.10	phaseRedRevert	P	O	0-255		
2.2.2.11	phaseAddedInitial	P	M	0-255		
2.2.2.12	phaseMaximumInitial	P	M	0-255		
2.2.2.13	phaseTimeBeforeReduction	P	M	0-255		
2.2.2.14	phaseCarsBeforeReduction	P	O	0-255		
2.2.2.15	phaseTimeToReduce	P	M	0-255		
2.2.2.16	phaseReduceBy	P	O	0-255		
2.2.2.17	phaseMinimumGap	P	M	0-255		
2.2.2.18	phaseDynamicMaxLimit	P	O	0-255		
2.2.2.19	phaseDynamicMaxStep	P	O	0-255		
2.2.2.20	phaseStartup	P2	M	1-6		
	other(1)	--	---	---	---	
	phaseNotON(2)	--	---	---	---	
	greenWalk(3)	--	---	---	---	
	greenNoWalk(4)	--	---	---	---	
	yellowChange(5)	--	---	---	---	

	redClear(6)	--	---	---	---	
2.2.2.21	phaseOptions	P2	M	0-65535		
	Bit 0 - Enabled Phase	--	---	---	---	
	Bit 1 - Automatic Flash Entry Phase	--	---	---	---	
	Bit 2 - Automatic Flash Exit Phase	--	---	---	---	
	Bit 3 - Non-Actuated 1	--	---	---	---	
	Bit 4 - Non-Actuated 2	--	---	---	---	
	Bit 5 - Non-Locking Detector Memory	--	---	---	---	
	Bit 6 - Min Vehicle Recall	--	---	---	---	
	Bit 7 - Max Vehicle Recall	--	---	---	---	
	Bit 8 - Ped Recall	--	---	---	---	
	Bit 9 - Soft Vehicle Recall	--	---	---	---	
	Bit 10 - Dual Entry Phase	--	---	---	---	
	Bit 11 - Simultaneous Gap Disable	--	---	---	---	
	Bit 12 - Guaranteed Passage	--	---	---	---	
	Bit 13 - Actuated Rest In Walk	--	---	---	---	
	Bit 14 - Conditional Service Enable	--	---	---	---	
	Bit 15 - Added Initial Calculation	--	---	---	---	
2.2.2.22	phaseRing	P2	M	0-255		
2.2.2.23	phaseConcurrency	P2	M	string		
2.2.3	maxPhaseGroups	S	M	1-255		
2.2.4	phaseStatusGroupTable	--	M	----	---	
	phaseStatusGroupEntry	--	M	---	---	
2.2.4.1	phaseStatusGroupNumber	S	M	1-255		
2.2.4.2	phaseStatusGroupReds	S	M	0-255		
2.2.4.3	phaseStatusGroupYellows	S	M	0-255		
2.2.4.4	phaseStatusGroupGreens	S	M	0-255		
2.2.4.5	phaseStatusGroupDontWalks	S	M	0-255		
2.2.4.6	phaseStatusGroupPedClears	S	M	0-255		
2.2.4.7	phaseStatusGroupWalks	S	M	0-255		
2.2.4.8	phaseStatusGroupVehCalls	S	M	0-255		
2.2.4.9	phaseStatusGroupPedCalls	S	M	0-255		
2.2.4.10	phaseStatusGroupPhaseOns	S	M	0-255		
2.2.4.11	phaseStatusGroupPhaseNexts	S	M	0-255		
2.2.5	phaseControlGroupTable	--	O	----	---	
	phaseControlGroupEntry	--	2.2.5 : M	---	---	
2.2.5.1	phaseControlGroupNumber	S	2.2.5 : M	1-255		
2.2.5.2	phaseControlGroupPhaseOmit	C	2.2.5 : M	0-255		
2.2.5.3	phaseControlGroupPedOmit	C	2.2.5 : M	0-255		
2.2.5.4	phaseControlGroupHold	C	2.2.5 : M	0-255		
2.2.5.5	phaseControlGroupForceOff	C	2.2.5 : O	0-255		
2.2.5.6	phaseControlGroupVehCall	C	2.2.5 : M	0-255		

			M			
2.2.5.7	phaseControlGroupPedCall	C	2.2.5 : M	0-255		
DETECTOR CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.3	**Detector Conformance Group**	--	M	----	-----	
2.3.1	maxVehicleDetectors	S	M	0-255		
2.3.2	vehicleDetectorTable	--	M	----	---	
	vehicleDetectorEntry	--	M	---	---	
2.3.2.1	vehicleDetectorNumber	S	M	1..255		
2.3.2.2	vehicleDetectorOptions	P	M	0-255		
	Bit 0 - Volume Detector	--	---	---	---	
	Bit 1 - Occupancy Detector	--	---	---	---	
	Bit 2 -Yellow Lock Call	--	---	---	---	
	Bit 3 -Red Lock Call	--	---	---	---	
	Bit 4 -Passage	--	---	---	---	
	Bit 5 -Added Initial	--	---	---	---	
	Bit 6 -Queue	--	---	---	---	
	Bit 7 - Call	--	---	---	---	
2.3.2.3	vehicleDetectorCallPhase	P	M	0-255		
2.3.2.4	vehicleDetectorSwitchPhase	P	M	0-255		
2.3.2.5	vehicleDetectorDelay	P	M	0-65535		
2.3.2.6	vehicleDetectorExtend	P	M	0-255		
2.3.2.7	vehicleDetectorQueueLimit	P	O	0-255		
2.3.2.8	vehicleDetectorNoActivity	P	M	0-255		
2.3.2.9	vehicleDetectorMaxPresence	P	M	0-255		
2.3.2.10	vehicleDetectorErraticCounts	P	M	0-255		
2.3.2.11	vehicleDetectorFailTime	P	O	0-255		
2.3.2.12	vehicleDetectorAlarms	S	M	0-255		
2.3.2.13	vehicleDetectorReportedAlarms	S	O	0-255		
2.3.2.14	vehicleDetectorReset	C	M	0-1		
2.2.3	maxVehicleDetectorStatusGroups	S	M	0-255		
2.3.4	vehicleDetectorStatusGroupTable	--	M	----	---	
	vehicleDetectorStatusGroupEntry	--	M	---	---	
2.3.4.1	vehicleDetectorStatusGroupNumber	S	M	1-255		
2.3.4.2	vehicleDetectorStatusGroupActive	S	M	0-255		
2.3.4.3	vehicleDetectorStatusGroupAlarms	S	M	0-255		
2.3.6	maxPedestrianDetectors	S	M	0-255		
2.3.7	pedestrianDetectorTable	--	M	----	---	
	pedestrianDetectorEntry	--	M	---	---	
2.3.7.1	pedestrianDetectorNumber	S	M	1..255		
2.3.7.2	pedestrianDetectorCallPhase	P	M	0-255		

2.3.7.3	pedestrianDetectorNoActivity	P	M	0-255		
2.3.7.4	pedestrianDetectorMaxPresence	P	M	0-255		
2.3.7.5	pedestrianDetectorErraticCounts	P	M	0-255		
2.3.7.6	pedestrianDetectorAlarms	S	M	0-255		
VOLUME OCCUPANCY REPORT CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.3.5	**VOL / OCC Report Conformance Group**	--	O	----		
2.3.5.1	volumeOccupancySequence	S	2.3.5 : M	0-255		
2.3.5.2	volumeOccupancyPeriod	P	2.3.5 : M	0-255		
2.3.5.3	activeVolumeOccupancyDetectors	S	2.3.5 : M	0-255		
2.3.5.4	volumeOccupancyTable	--	2.3.5 : M	----	---	
	volumeOccupancyEntry	--	2.3.5 : M	---	---	
2.3.5.4.1	detectorVolume	S	2.3.5 : M	0-255		
2.3.5.4.2	detectorOccupancy	S	2.3.5 : M	0-255		
UNIT CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.4	**Unit Conformance Group**	--	O	-----	----	
2.4.1	unitStartUpFlash	P	2.4 : M	0-255		
2.4.2	unitAutoPedestrianClear	P	2.4 : M	1-4		
	disable(1)	--	---	---	---	
	enable(2)	--	---	---	---	
2.4.3	unitBackupTime	P	2.4 : M	0-65535		
2.4.4	unitRedRevert	P	2.4 : M	0-255		
2.4.5	unitControlStatus	S	2.4 : M	1-8		
2.4.6	unitFlashStatus	S	2.4 : M	1-8		
2.4.7	unitAlarmStatus2	S	2.4 : M	0-255		
2.4.8	unitAlarmStatus1	S	2.4 : M	0-255		
2.4.9	shortAlarmStatus	S	2.4 : M	0-255		
2.4.10	unitControl	C	2.4 : M	0-255		
	Bit 0 - Reserved	--	---	---	---	
	Bit 1 - Reserved	--	---	---	---	
	Bit 2 - External Minimum Recall	--	---	---	---	
	Bit 3 - Call to Non-Actuated 1	--	---	---	---	
	Bit 4 - Call to Non-Actuated 2	--	---	---	---	
	Bit 5 - Walk Rest Modifier	--	---	---	---	
	Bit 6 - Interconnect	--	---	---	---	
	Bit 7 - Dimming Enable	--	---	---	---	
2.4.11	maxAlarmGroups	S	2.4 : M	0-255		

2.4.12	alarmGroupTable	--	2.4 : M	----	----	
	alarmGroupEntry	--	2.4 : M	----	----	
2.4.12.1	alarmGroupNumber	S	2.4 : M	0-255		
2.4.12.2	alarmGroupState	S	2.4 : M	0-255		
SPECIAL FUNCTION CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
sfg	**Special Function Conformance Group**	--	O	----	---	
2.4.13	maxSpecialFunctionOutputs	S	sfg : M	0-255	---	
2.4.14	specialFunctionOutputTable	--	sfg : M	---	---	
	specialFunctionOutputEntry	--	sfg : M	---	---	
2.4.14.1	specialFunctionOutputNumber	S	sfg : M	1-255		
2.4.14.2	specialFunctionOutputState	C	deprecated	0-1		
2.4.14.3	specialFunctionOutputControl	C	sfg : M	0-1		
2.4.14.4	specialFunctionOutputStatus	S	sfg : M	0-1		
COORDINATION CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.5	**Coordination Conformance Group**	--	O	-----	----	
2.5.1	coordOperationalMode	P	2.5 : M	0-255		
2.5.2	coordCorrectionMode	P	2.5 : M	1-4		
	other(1)	--	---	---	---	
	dwell(2)	--	---	---	---	
	shortway(3)	--	---	---	---	
	addOnly(4)	--	---	---	---	
2.5.3	coordMaximumMode	P	2.5 : M	1-4		
	other(1)	--	---	---	---	
	maximum1(2)	--	---	---	---	
	maximum2(3)	--	---	---	---	
	maxinhibit(4)	--	---	---	---	
2.5.4	coordForceMode	P	2.5 : M	1-3		
	other(1)	--	---	---	---	
	floating(2)	--	---	---	---	
	fixed(3)	--	---	---	---	
2.5.5	maxPatterns	S	2.5 : M	0-253		
2.5.6	patternTableType	S	2.5 : M	1-4		
	other(1)	--	---	---	---	
	patterns(2)	--	---	---	---	
	offset3(3)	--	---	---	---	
	offset5(4)	--	---	---	---	
2.5.7	patternTable	--	2.5 : M	---	---	

	patternEntry	--	2.5 : M	---	---	
2.5.7.1	patternNumber	S	2.5 : M	1-253		
2.5.7.2	patternCycleTime	P	2.5 : M	0-255		
2.5.7.3	patternOffsetTime	P	2.5 : M	0-255		
2.5.7.4	patternSplitNumber	P	2.5 : M	0-255		
2.5.7.5	patternSequenceNumber	P	2.5 : M	0-255		
2.5.8	maxSplits	S	2.5 : M	0-255		
2.5.9	splitTable	--	2.5 : M	---	---	
	splitEntry	--	2.5 : M	---	---	
2.5.9.1	splitNumber	S	2.5 : M	1-255		
2.5.9.2	splitPhase	S	2.5 : M	1-255		
2.5.9.3	splitTime	P	2.5 : M	0-255		
2.5.9.4	splitMode	P	2.5 : M	1-7		
	other(1)	--	---	---	---	
	none(2)	--	---	---	---	
	minimumVehicleRecall(3)	--	---	---	---	
	maximumVehicleRecall(4)	--	---	---	---	
	pedestrianRecall(5)	--	---	---	---	
	maximumVehicleAndPedestrainRecall(6)	--	---	---	---	
	phaseOmitted(7)	--	---	---	---	
2.5.9.5	splitCoordPhase	P	2.5 : M	0-1		
2.5.10	coordPatternStatus	S	2.5 : M	0-255		
2.5.11	localFreeStatus	S	2.5 : M	1-11		
2.5.12	coordCycleStatus	S	2.5 : M	0-65535		
2.5.13	coordSyncStatus	S	2.5 : M	0-65535		
2.5.14	systemPatternControl	C	2.5 : M	0-255	----	
2.5.15	systemSyncControl	C	2.5 : M	0-255	----	
TIME BASE CONFORMANCE GROUP						
NTCIP 1201	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.4	**Time Base Conformance Group**	--	O	-----	----	
2.4.1	globalTme	C	2.4 : M	counter		
2.4.2	globalDayLightSavings	P	2.4 : M	1-6		
2.4.3	timebase	--	2.4 : M	----	---	
2.4.3.1	maxTimeBaseScheduleEntries	S	2.4 : M	0-65535		
2.4.3.2	timeBaseScheduleTable	--	2.4 : M	---	---	
	timeBaseScheduleEntry	--	2.4 : M	---	---	
2.4.3.2.1	timeBaseScheduleNumber	S	2.4 : M	1-65535		
2.4.3.2.2	timeBaseScheduleMonth	P	2.4 : M	0-65535		
2.4.3.2.3	timeBaseScheduleDay	P	2.4 : M	0-255		
2.4.3.2.4	timeBaseScheduleDate	P	2.4 : M	0-4294967295		

2.4.3.2.5	timeBaseScheduleDayPlan	P	2.4 : M	1-255		
2.4.4.1	maxDayPlans	S	2.4 : M	1-255		
2.4.4.2	maxDayPlanEvents	S	2.4 : M	1-255		
2.4.4.3	timeBaseDayPlanTable	--	2.4 : M	---	---	
	timeBaseDayPlanEntry	--	2.4 : M	---	---	
2.4.4.3.1	dayPlanNumber	S	2.4 : M	1-255		
2.4.4.3.2	dayPlanEventNumber	S	2.4 : M	1-255		
2.4.4.3.3	dayPlanHour	P	2.4 : M	0-23		
2.4.4.3.4	dayPlanMinute	P	2.4 : M	0-59		
2.4.4.3.5	dayPlanActionNumberOID	P	2.4 : M	OID		
2.4.4.4	dayPlanStatus	S	2.4 : M	0-255		
2.4.5	globalTimeDifferentail	P	2.4 : M	-43200..43200	deprecated	
2.4.6	controller-standardTimeZone	P	2.4 : M	-43200..43200		
2.4.7	controller-localTime	S	2.4 : M	counter		
TIME BASE CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.6	timebaseAsc	--	2.4 : M	----	---	
2.6.1	timebaseAscPatternSync	P	2.4 : M	0-65535		
2.6.2	maxTimebaseAscActions	S	2.4 : M	0-255		
2.6.3	timebaseAscActionTable	--	2.4 : M	---	---	
	timebaseAscActionEntry	--	2.4 : M	---	---	
2.6.3.1	timebaseAscActionNumber	S	2.4 : M	1-255		
2.6.3.2	timebaseAscPattern	P	2.4 : M	0-255		
2.6.3.3	timebaseAscAuxillaryFunction	P	2.4 : M	0-255		
	Bit 0 - Auxiliary 1	--	---	---	---	
	Bit 1 - Auxiliary 2	--	---	---	---	
	Bit 2 - Auxiliary 3	--	---	---	---	
	Bit 3 - Reserved	--	---	---	---	
	Bit 4 - Reserved	--	---	---	---	
	Bit 5 - Reserved	--	---	---	---	
	Bit 6 - Reserved	--	---	---	---	
	Bit 7 - Reserved	--	---	---	---	
2.6.3.4	timebaseAscSpecialFunction	P	2.4 : M	0-255		
	Bit 0 - Special Function 1	--	---	---	---	
	Bit 1 - Special Function 2	--	---	---	---	
	Bit 2 - Special Function 3	--	---	---	---	
	Bit 3 - Special Function 4	--	---	---	---	
	Bit 4 - Special Function 5	--	---	---	---	

	Bit 5 - Special Function 6	--	---	---	---	
	Bit 6 - Special Function 7	--	---	---	---	
	Bit 7 - Special Function 8	--	---	---	---	
2.6.4	timebaseAscActionStatus	S	2.4 : M	0-255		
PREEMPT CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.7	**Preempt Conformance Group**	--	O	-----	----	
2.7.1	maxPreempts	S	2.7 : M	0-255		
2.7.2	preemptTable	--	2.7 : M	---	---	
	preemptEntry	--	2.7 : M	---	---	
2.7.2.1	preemptNumber	S	2.7 : M	1-255		
2.7.2.2	preemptControl	P	2.7 : M	0-255		
	Bit 0 - Non-Locking memory	--	---	---	---	
	Bit 1 - Override Flash	--	---	---	---	
	Bit 2 - Override preemptNumber+1	--	---	---	---	
	Bit 3 - Flash Dwell	--	---	---	---	
	Bit 4 - Reserved	--	---	---	---	
	Bit 5 - Reserved	--	---	---	---	
	Bit 6 - Reserved	--	---	---	---	
	Bit 7 - Reserved	--	---	---	---	
2.7.2.3	preemptLink	P	2.7 : M	0-255		
2.7.2.4	preemptDelay	P	2.7 : M	0-65535		
2.7.2.5	preemptMinimumDuration	P	2.7 : M	0-65535		
2.7.2.6	preemptMinimumGreen	P	2.7 : O	0-255		
2.7.2.7	preemptMinimumWalk	P	2.7 : O	0-255		
2.7.2.8	preemptEnterPedClear	P	2.7 : O	0-255		
2.7.2.9	preemptTrackGreen	P	2.7 : M	0-255		
2.7.2.10	preemptDwellGreen	P	2.7 : M	0-255		
2.7.2.11	preemptMaximumPresence	P	2.7 : M	0-65535		
2.7.2.12	preemptTrackPhase	P2	2.7 : M	string		
2.7.2.13	preemptDwellPhase	P2	2.7 : M	string		
2.7.2.14	preemptDwellPed	P2	2.7 : O	string		
2.7.2.15	preemptExitPhase	P2	2.7 : M	string		
2.7.2.16	preemptState	S	2.7 : O	9-Jan		
2.7.2.17	preemptTrackOverlap	P2	2.7 : M	string		
2.7.2.18	preemptDwellOverlap	P2	2.7 : M	string		
2.7.2.19	preemptCyclingPhase	P2	2.7 : M	string		
2.7.2.20	preemptCyclingPed	P2	2.7 : M	string		
2.7.2.21	preemptCyclingOverlap	P2	2.7 : M	string		
2.7.3	preemptControlTable	--	2.7 : O	---	---	
	preemptControlEntry	--	2.7.3 : M	---	---	
2.7.3.1	preemptControlNumber	S	2.7.3 : M	1-255		
2.7.3.2	preemptControlState	C	2.7.3 : M	0-1		

RING CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.8	**Ring Conformance Group**	--	O	---	---	
2.8.1	maxRings	S	2.8 : M	0-255		
2.8.2	maxSequences	S	2.8 : M	0-255		
2.8.3	sequenceTable	--	2.8 : M	---	---	
	sequenceEntry	--	2.8 : M	---	---	
2.8.3.1	sequenceNumber	S	2.8 : M	1-255		
2.8.3.2	sequenceRingNumber	S	2.8 : M	1-255		
2.8.3.3	sequenceData	P2	2.8 : M	string		
2.8.4	maxRingControlGroups	S	2.8 : M	0-255		
2.8.5	ringControlGroupTable	--	2.8 : M	---	---	
	ringControlGroupEntry	--	2.8 : M	---	---	
2.8.5.1	ringControlGroupNumber	S	2.8 : M	0-255		
2.8.5.2	ringControlGroupStopTime	C	2.8 : M	0-255		
2.8.5.3	ringControlGroupForceOff	C	2.8 : M	0-255		
2.8.5.4	ringControlGroupMax2	C	2.8 : O	0-255		
2.8.5.5	ringControlGroupMaxInhibit	C	2.8 : O	0-255		
2.8.5.6	ringControlGroupPedRecycle	C	2.8 : M	0-255		
2.8.5.7	ringControlGroupRedRest	C	2.8 : O	0-255		
2.8.5.8	ringControlGroupOmitRedClear	C	2.8 : O	0-255		
2.8.6	ringStatusTable	--	2.8 : O	---	---	
	ringStatusEntry	--	2.8 : O	---	---	
2.8.6.1	ringStatus	S	2.8 : O	0-255		
CHANNEL CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.9	**Channel Conformance Group**	--	O	----	---	
2.9.1	maxChannels	S	2.9 : M	0-255		
2.9.2	channelTable	--	2.9 : M	---	---	
	channelEntry	--	2.9 : M	---	---	
2.9.2.1	channelNumber	S	2.9 : M	1-255		
2.9.2.2	channelControlSource	P	2.9 : M	0-255		
2.9.2.3	channelControlType	P	2.9 : M	1-4		
	other(1)	--	---	---	---	
	phaseVehicle(2)	--	---	---	---	
	phasePedestrian(3)	--	---	---	---	
	overlap(4)	--	---	---	---	
2.9.2.4	channelFlash	P	2.9 : M	0-255		
	Bit 0 - Reserved	--	---	---	---	
	Bit 1 - Flash Yellow	--	---	---	---	
	Bit 2 - Flash Red	--	---	---	---	
	Bit 3 - Flash Alternate Half Hertz	--	---	---	---	
	Bit 4 - Reserved	--	---	---	---	

	Bit 5 - Reserved	--	---	---	---	
	Bit 6 - Reserved	--	---	---	---	
	Bit 7 - Reserved	--	---	---	---	
2.9.2.5	channelDim	P	2.9 : M	0-255		
	Bit 0 - Dim Green	--	---	---	---	
	Bit 1 - Dim Yellow	--	---	---	---	
	Bit 2 - Dim Red	--	---	---	---	
	Bit 3 - Dim Alternate Half Line Cycle	--	---	---	---	
	Bit 4 - Reserved	--	---	---	---	
	Bit 5 - Reserved	--	---	---	---	
	Bit 6 - Reserved	--	---	---	---	
	Bit 7 - Reserved	--	---	---	---	
2.9.3	maxChannelStatusGroups	S	2.9 : M	0-255		
2.9.4	channelStatusGroupTable	--	2.9 : M	---	---	
	channelStatusGroupEntry	--	2.9 : M	---	---	
2.9.4.1	channelStatusGroupNumber	S	2.9 : M	1-255		
2.9.4.2	channelStatusGroupReds	S	2.9 : M	0-255		
2.9.4.3	channelStatusGroupYellows	S	2.9 : M	0-255		
2.9.4.4	channelStatusGroupGreens	S	2.9 : M	0-255		
OVERLAP CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.1	**Overlap Conformance Group**	--	O	----	---	
2.10.1	maxOverlaps	S	2.10 : M	0-255		
2.10.2	overlapTable	--	2.10 : M	---	---	
	overlapEntry	--	2.10 : M	---	---	
2.10.2.1	overlapNumber	S	2.10 : M	1-255		
2.10.2.2	overlapType	P	2.10 : M	1-3		
	other(1)	--	---	---	---	
	normal(2)	--	---	---	---	
	minusGreenYellow(3)	--	---	---	---	
2.10.2.3	overlapIncludedPhases	P2	2.10 : M	string		
2.10.2.4	overlapModifierPhases	P2	2.10 : M	string		
2.10.2.5	overlapTrailGreen	P	2.10 : M	0-255		
2.10.2.6	overlapTrailYellow	P	2.10 : M	0-255		
2.10.2.7	overlapTrailRed	P	2.10 : M	0-255		
2.10.3	maxOverlapStatusGroups	S	2.10 : M	0-255		
2.10.4	overlapStatusGroupTable	--	2.10 : M	---	---	
	overlapStatusGroupEntry	--	2.10 : M	---	---	
2.10.4.1	overlapStatusGroupNumber	S	2.10 : M	1-255		
2.10.4.2	overlapStatusGroupReds	S	2.10 : M	0-255		
2.10.4.3	overlapStatusGroupYellows	S	2.10 : M	0-255		
2.10.4.4	overlapStatusGroupGreens	S	2.10 : M	0-255		
TS 2 PORT 1 CONFORMANCE GROUP						

NTCIP 1202	Object	Object	Object	Allowed	Supported Yes/No?	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.11	**TS 2 PORT 1 CONFORMANCE GROUP**	--	O	----	---	
2.11.1	maxPort1Addresses	S	2.11 : M	0-255		
2.11.2	port1Table	--	2.11 : M	---	---	
	port1Entry	--	2.11 : M	---	---	
2.11.2.1	port1Number	S	2.11 : M	1-255		
2.11.2.2	port1DevicePresent	P	2.11 : M	0-1		
2.11.2.3	port1Frame40Enable	P	2.11 : M	0-1		
2.11.2.4	port1Status	S	2.11 : M	1-3		
2.11.2.5	port1FaultFrame	S	2.11 : M	0-255		
BLOCK OBJECT CONFORMANCE GROUP						
NTCIP 1202	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.12	**Block Object Conformance Group**	--	O	-----	----	
2.12.1	ascBlockGetControl	C	2.12 : M	string		
2.12.2	ascBlockData	C	2.12 : M	string		
CONFIGURATION CONFORMANCE GROUP						
NTCIP 1201	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.2	**Global Config Conformance Group**	--	O	-----	----	
2.2.1	globalSetIDParmeter	S	2.2 : O	0-65535		
2.2.2	globalMaxModules	S	2.2 : M	0-255		
2.2.3	globalModuleTable	--	2.2 : M	---	---	
	moduleTableEntry	--	2.2 : M	---	---	
2.2.3.1	moduleNumber	S	2.2 : M	1-255		
2.2.3.2	moduleDeviceNode	S	2.2 : M	OID		
2.2.3.3	moduleMake	S	2.2 : M	String		
2.2.3.4	moduleModel	S	2.2 : M	String		
2.2.3.5	moduleVersion	S	2.2 : M	String		
2.2.3.6	moduleType	S	2.2 : M	1-3		
	other(1)	--	---	---	---	
	hardware(2)	--	---	---	---	
	software(3)	--	---	---	---	
DATABASE MANAGEMENT CONFORMANCE GROUP						
NTCIP 1201	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	

Clause	Name	Type	Status	Values	Values	Comment
2.3	**DB Management Conformance Group**	--	M	-----	----	
2.3.1	dbCreateTransaction	C	M	1,2,3,6		
2.3.6	dbVerifyStatus	S	M	0-2		
2.3.7	dbVerifyError	S	M	string		
REPORT CONFORMANCE GROUP						
NTCIP 1201	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.5	**Report Conformance Group**	--	O	-----	----	
2.5.1	maxEventClasses	S	2.5 : M	0-255		
2.5.2	eventClassTable	--	2.5 : M	---	---	
	eventClassEntry	--	2.5 : M	---	---	
2.5.2.1	eventClassNumber	S	2.5 : M	1-255		
2.5.2.2	eventClassLimit	P	2.5 : M	0-255		
2.5.2.3	eventClassClearTime	P	2.5 : M	counter		
2.5.2.4	eventClassDescription	P	2.5 : O	string		
2.5.2.5	eventClassNumRowsInLog	S	2.5 : M	0-255		
2.5.3	maxEventLogConfigs	S	2.5 : M	0-65535		
2.5.4	eventLogConfigTable	--	2.5 : M	---	---	
	eventLogConfigEntry	--	2.5 : M	---	---	
2.5.4.1	eventConfigID	S	2.5 : M	1-65535		
2.5.4.2	eventConfigClass	P	2.5 : M	1-255		
2.5.4.3	eventConfigMode	P	2.5 : M	1-6		
	other(1)	--	---	---	---	
	onChange(2)	--	---	---	---	
	greaterThanValue(3)	--	---	---	---	
	smallerThanValue(4)	--	---	---	---	
	hystersisBound(5)	--	---	---	---	
	periodic(6)	--	---	---	---	
	andedWithValue(7)	--	---	---	---	
2.5.4.4	eventConfigCompareValue	P	2.5 : M	INT		
2.5.4.5	eventConfigCompareValue 2	P	2.5 : M	INT		
2.5.4.6	eventConfigCompareOID	P	2.5 : M	OID		
2.5.4.7	eventConfigLogOID	P	2.5 : O	OID		
2.5.4.8	eventConfigAction	P	2.5 : M	3-Jan		
2.5.5	maxEventLogSize	S	2.5 : M	0-65535		
2.5.6	eventLogTable	--	2.5 : M	---	---	

	eventLogEntry	--	2.5 : M	---	---	
2.5.6.1	eventLogClass	S	2.5 : M	0-255		
2.5.6.2	eventLogNumber	S	2.5 : M	1-255		
2.5.6.3	eventLogID	S	2.5 : M	0-65535		
2.5.6.4	eventLogTime	S	2.5 : M	counter		
2.5.6.5	eventLogValue	S	2.5 : M	opaque (1)		
SFMP GROUP						
NTCIP 2101	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.8	**AUXIO GROUP**	--	O	----	---	
PMPP GROUP						
NTCIP 1201	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
2.6	**PMPP GROUP**	--	O	----	---	
2.6.1	maxGroupAddress	S	2.6 : M	0..255		
2.6.2	hdlcGroupAddressTable	--	2.6 : M	---	---	
	hdlcGroupAddressEntry	--	2.6 : M	---	---	
2.6.2.1	hdlcGroupAddressIndex	S	2.6 : M	0..255		
2.6.2.2	hdlcGroupAddress	P	2.6 : M	INT	deprecated	
2.6.2.3	hdlcGroupAddressNumber	P	2.6 : M	INT		
SNMP GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1213	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
snmp	**SNMP GROUP**	--	O	---		
snmp.1	snmpInPkts	S	snmp : M	Counter		
snmp.2	snmpOutPkts	S	snmp : M	Counter		
snmp.3	snmpInBadVersions	S	snmp : M	Counter		
snmp.4	snmpInBadCommunityNames	S	snmp : M	Counter		
snmp.5	snmpInBadCommunityUses	S	snmp : M	Counter		
snmp.6	snmpInASNParseErrs	S	snmp : M	Counter		
snmp.8	snmpInTooBigs	S	snmp : M	Counter		
snmp.9	snmpInNoSuchNames	S	snmp : M	Counter		
snmp.10	snmpInBadValues	S	snmp : M	Counter		
snmp.11	snmpInReadOnlys	S	snmp : M	Counter		
snmp.12	snmpInGenErrs	S	snmp : M	Counter		

snmp.13	snmpInTotalReqVars	S	snmp : O	Counter		
snmp.14	snmpInTotalSetVars	S	snmp : O	Counter		
snmp.15	snmpInGetRequests	S	snmp : M	Counter		
snmp.16	snmpInGetNexts	S	snmp : M	Counter		
snmp.17	snmpInSetRequests	S	snmp : M	Counter		
snmp.18	snmpInGetResponses	S	snmp : M	Counter		
snmp.19	snmpInTraps	S	snmp : M	Counter		
snmp.20	snmpOutTooBigs	S	snmp : M	Counter		
snmp.21	snmpOutNoSuchNames	S	snmp : M	Counter		
snmp.22	snmpOutBadValues	S	snmp : M	Counter		
snmp.24	snmpOutGenErrs	S	snmp : M	Counter		
snmp.25	snmpOutGetRequests	S	snmp : M	Counter		
snmp.26	snmpOutGetNexts	S	snmp : M	Counter		
snmp.27	snmpOutSetRequests	S	snmp : M	Counter		
snmp.28	snmpOutGetResponses	S	snmp : M	Counter		
snmp.29	snmpOutTraps	S	snmp : M	Counter		
snmp.30	snmpEnableAuthenTraps	P	snmp : M	INT		
SNMP GROUP						
NTCIP 1103	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
A.3	snmp-maxPacketSize	S	snmp : M	484-65535		
SYSTEM GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1213	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
system	**SYSTEM GROUP**	--	O	---		
system 1	sysDescr	S	system : M	string		
system 2	sysObjectID	S	system : M	OID		
system 3	sysUpTime	S	system : M	TimeTicks		
system 4	sysContact	P	system : M	string		
system 5	sysName	P	system : M	atring		
system 6	sysLocation	P	system : M	string		

system 7	sysServices	S	system : M	0..127		
SFMP GROUP						
NTCIP 1103	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
A.4	**Objects for SFMP**	--	O	----	---	
STMP GROUP						
NTCIP 1103	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
A.5	**Objects for STMP**	--	O	---	---	
A.5.1	Dynamic Object Definition	--	A.5 : M	---	---	
	dynObjDef	--	A.5 : M	---	---	
	dynObjEntry	--	A.5 : M	---	---	
	dynObjNumber	S	A.5 : M	1..13		
	dynObjIndex	S	A.5 : M	1..255		
	dynObjVariable	C	A.5 : M	OID		
	dynObjOwner	NA	NA	---	deprecated	
	dynObjStatus	NA	NA	---	deprecated	
A.5.2	Dynamic Object Data	--	NA	---	deprecated	
A.5.3	Dynamic Object Configuration	--	A.5 : M	---	---	
	dynObjConfigTable	--	A.5 : M	---	---	
	dynObjConfigEntry	--	A.5 : M	---	---	
	dynObjConfigOwner	C	A.5 : M	string		
	dynObjConfigStatus	C	A.5 : M	1..3		
A.5.4	STMP Statistics	--	A.5 : M	--		
0.1	stmp-InPkts	S	A.5 : M	counter		
0.2	stmp-OutPkts	S	A.5 : M	counter		
0.6	stmp-InParseErrs	S	A.5 : M	counter		
0.8	stmp-InTooBigs	S	A.5 : M	counter		
0.9	stmp-InNoSuchNames	S	A.5 : M	counter		
0.1	stmp-InBadValues	S	A.5 : M	counter		
0.11	stmp-InReadOnlys	S	A.5 : M	counter		
0.12	stmp-InGenErrs	S	A.5 : M	counter		
0.15	stmp-InGetRequests	S	A.5 : M	counter		
0.16	stmp-InGetNexts	S	A.5 : M	counter		
0.17	stmp-InSetRequests	S	A.5 : M	counter		
0.18	stmp-InGetResponses	S	A.5 : M	counter		
0.2	stmp-OutTooBigs	S	A.5 : M	counter		
0.21	stmp-OutNoSuchNames	S	A.5 : M	counter		
0.22	stmp-OutBadValues	S	A.5 : M	counter		
0.23	stmp-OutReadOnly	S	A.5 : M	counter		
0.24	stmp-OutGenError	S	A.5 : M	counter		
0.25	stmp-OutGetRequests	S	A.5 : M	counter		
0.26	stmp-OutGetNexts	S	A.5 : M	counter		
0.27	stmp-OutSetRequests	S	A.5 : M	counter		

0.28	stmp-OutGetResponses	S	A.5 : M	counter		
0.29	stmp-OutTrapResponses	S	A.5 : M	counter		
0.31	stmp-InSetRequestsNoReply	S	A.5 : M	counter		
0.32	stmp-InSetResponses	S	A.5 : M	counter		
0.33	stmp-InErrorResponses	S	A.5 : M	counter		
0.34	stmp-OutSetRequestsNoReply	S	A.5 : M	counter		
0.35	stmp-OutSetResponses	S	A.5 : M	counter		
0.35	stmp-OutErrorResponses	S	A.5 : M	counter		
A.5.5	STMP Configuration	--	A.5 : M	---	---	
0.1	dynamicObjectPersistence	P	A.5 : M	0-65535		
0.2	dynamicObjectTable-ConfigID	S	A.5 : M	0-65535		
LOGICAL NAME GROUP						
NTCIP 1103	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
A.6	**Objects for Logical Names**	--	O	----	---	
	logicalNameTranslationTable-maxEntries	S	A.6 : M	0..255		
A.6.2	logicalNameTranslationTable	--	A.6 : M	---	---	
	logicalNameTranslationEntry	--	A.6 : M	---	---	
A.6.2.1	logicalNameTranslation-index	S	A.6 : M	INT		
A.6.2.2	logicalNameTranslation-logicalName	P	A.6 : M	string		
A.6.2.3	logicalNameTranslation-networkAddress	P	A.6 : M	string		
A.6.2.4	logicalNameTranslation-status	C	A.6 : M	INT		
TRAP MANAGEMENT GROUP						
NTCIP 1103	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
A.7	**Objects for Trap Management**	--	O	----	---	
A.7.1	trapMgmt-managerName	P	A.7 : M	string		
A.7.2	trapMgmt-applicationProtocol	P	A.7 : M	INT		
A.7.3	trapMgmt-transportProfile	P	A.7 : M	INT		
A.7.4	trapMgmt-mode	P	A.7 : M	INT		
A.7.5	trapMgmt-repeatMin	P	A.7 : M	0..255		
A.7.6	trapMgmt-repeatDelta	P	A.7 : M	0..255		
A.7.7	trapMgmt-maxRetries	P	A.7 : M	0..254		
A.7.8	trapMgmt-tries	S	A.7 : M	0.255		
A.7.9	trapMgmt-time	S	A.7 : M	Counter		
A.7.10	trapMgmt-counter	S	A.7 : M	Counter		
A.8	Trap Data	--	A.7 : M	---	---	
A.8.1	trapEvent	--	A.7 : M	---	---	
A.8.2	trapMgmt-log	S	A.7 : M	string		
A.9	Generic Trap Objects	--	A.7 : M	---	---	

A.9.1	agentHealth-coldStarts	S	A.7 : M	Counter		
A.9.2	agentHealth-warmStarts	S	A.7 : M	Counter		
A.9.3	agentHealth-linkDowns	S	A.7 : M	Counter		
A.9.4	agentHealth-linkUps	S	A.7 : M	Counter		
A.9.5	agentHealth-authenticationFailures	S	A.7 : M	Counter		
A.9.6	agentHealth-linkDownData	S	A.7 : M	INT		
A.9.7	agentHealth-linkUpData	S	A.7 : M	INT		
SECURITY GROUP						
NTCIP 1103	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
Clause	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
A.10	**SECURITY GROUP**	--	O	----	---	
A.10.1	communityNameAdmin	P	A.10 : M	string		
A.10.2	communityNamesMax	S	A.10 : M	1..255		
A.10.3	communityNameTable	--	A.10 : M	---	---	
	communityNameTableEntry	--	A.10 : M	---	---	
A.10.3.1	communityNameIndex	S	A.10 : M	1..255		
A.10.3.2	communityNameUser	P	A.10 : M	string		
A.10.3.3	communityNameAccessMask	P	A.10 : M	gauge		
RS232 GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1317	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
rs232	**RS232 GROUP**	--	O	----	---	
rs232.1	rs232Number	S	rs232 : M	INT		
rs232.2	rs232PortTable	--	rs232 : M	---	---	
	rs232PortEntry	--	rs232 : M	---	---	
rs232.2.1	rs232PortIndex	S	rs232 : M	INT		
rs232.2.2	rs232PortType	S	rs232 : M	1..5		
	other(1)	--	---	---	---	
	rs232(2)	--	---	---	---	
	rs422(3)	--	---	---	---	
	rs423(4)	--	---	---	---	
	v35(5)	--	---	---	---	
rs232.2.3	rs232PortInSigNumber	S	rs232 : O	INT		
rs232.2.4	rs232PortOutSigNumber	S	rs232 : O	INT		
rs232.2.5	rs232PortInSpeed	P	rs232 : M	INT		

rs232.2.6	rs232PortOutSpeed	P	rs232 : M	INT		
rs232.3	rs232AsyncPortTable	--	rs232 : M	---	---	
	rs232AsyncPortEntry	--	rs232 : M	---	---	
rs232.3.1	rs232AsyncPortIndex	S	rs232 : M	INT		
rs232.3.2	rs232AsyncPortBits	P	rs232 : O	5..8		
	five(5)	--	---	---	---	
	six(6)	--	---	---	---	
	seven(7)	--	---	---	---	
	eight(8)	--	---	---	---	
rs232.3.3	rs232AsyncPortStopBits	P	rs232 : O	1..4		
	one(1)	--	---	---	---	
	two(2)	--	---	---	---	
	one-and-half(3)	--	---	---	---	
	dynamic(4)	--	---	---	---	
rs232.3.4	rs232AsyncPortParity	P	rs232 : O	1..5		
	none(1)	--	---	---	---	
	odd(2)	--	---	---	---	
	even(3)	--	---	---	---	
	mark(4)	--	---	---	---	
	space(5)	--	---	---	---	
rs232.3.5	rs232AsyncPortAutobaud	P	rs232 : O	1..2		
	enabled(1)	--	---	---	---	
	disabled(2)	--	---	---	---	
rs232.3.6	rs232AsyncPortParityErrs	S	rs232 : O	Counter		
rs232.3.7	rs232AsyncPortFramingErrs	S	rs232 : M	Counter		
rs232.3.8	rs232AsyncPortOverrunErrs	S	rs232 : M	Counter		
HDLC GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1381	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
lapb	**HDLC GROUP**	--	O	----	---	
lapb.1	lapbAdmnTable	--	lapb : M	---	---	
	lapbAdmnEntry	--	lapb : M	---	---	
lapb.1.1	lapbAdmnIndex	S	lapb : M	IfIndexType		
lapb.1.2	lapbAdmnStationType	P	lapb : O	1..3		
	dte(1)	--	---	---	---	
	dce(2)	--	---	---	---	
	dxe(3)	--	---	---	---	
lapb.1.3	lapbAdmnControlField	P	lapb : O	1..2		

	modulo8(1)	--	---	---	---	
	modulo128(2)	--	---	---	---	
lapb.1.4	lapbAdmnTransmitN1FrameSize	P	lapb : M	P Integer		
lapb.1.5	lapbAdmnReceiveN1FrameSize	P	lapb : M	P Integer		
lapb.1.6	lapbAdmnTransmitKWindowSize	P	lapb : O	1..127		
lapb.1.7	lapbAdmnReceiveKWindowSize	P	lapb : O	1..127		
lapb.1.8	lapbAdmnN2RxmitCount	P	lapb : O	0..65535		
lapb.1.9	lapbAdmnT1AckTimer	P	lapb : M	P Integer		
lapb.1.10	lapbAdmnT2AckDelayTimer	P	lapb : M	P Integer		
lapb.1.11	lapbAdmnT3DisconnectTimer	P	lapb : M	P Integer		
lapb.1.12	lapbAdmnT4IdleTimer	P	lapb : M	P Integer		
lapb.1.13	lapbAdmnActionInitiate	P	lapb : O	1..5		
	sendSABM(1)	--	---	---	---	
	sendDISC(2)	--	---	---	---	
	sendDM(3)	--	---	---	---	
	none(4)	--	---	---	---	
	other(5)	--	---	---	---	
lapb.1.14	lapbAdmnActionRecvDM	P	lapb : O	1..3		
	sendSABM(1)	--	---	---	---	
	sendDISC(2)	--	---	---	---	
	other(3)	--	---	---	---	
lapb.2	lapbOperTable	--	lapb : M	----	---	
	lapbOperEntry	--	lapb : M	----	---	
lapb.2.1	lapbOperIndex	S	lapb : M	IfIndexType		
lapb.2.2	lapbOperStationType	S	lapb : O	1..3		
	dte(1)	--	---	---	---	
	dce(2)	--	---	---	---	
	dxe(3)	--	---	---	---	
lapb.2.3	lapbOperControlField	S	lapb : O	1..2		
	modulo8(1)	--	---	---	---	
	modulo128(2)	--	---	---	---	
lapb.2.4	lapbOperTransmitN1FrameSize	S	lapb : O	P Integer		
lapb.2.5	lapbOperReceiveN1FrameSize	S	lapb : O	P Integer		
lapb.2.6	lapbOperTransmitKWindowSize	S	lapb : O	1..127		
lapb.2.7	lapbOperReceiveKWindowSize	S	lapb : O	1..127		
lapb.2.8	lapbOperN2RxmitCount	S	lapb : O	0..65535		
lapb.2.9	lapbOperT1AckTimer	S	lapb : O	P Integer		
lapb.2.10	lapbOperT2AckDelayTimer	S	lapb : O	P Integer		
lapb.2.11	lapbOperT3DisconnectTimer	S	lapb : O	P Integer		

lapb.2.12	lapbOperT4IdleTimer	S	lapb : O	P Integer		
lapb.2.13	lapbOperPortId	S	lapb : M	OID		
lapb.2.14	lapbOperProtocolVersionID	S	lapb : O	OID		
INTERFACES GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1213	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
if	**INTERFACES GROUP**	--	O	----	---	
if.1	ifNumber	S	if : M	---	---	
if.2	ifTable	--	if : M	---	---	
	ifEntry	--	if : M	---	---	
if.2.1	ifIndex	S	if : M	INT		
if.2.2	ifDescr	S	if : M	string		
if.2.3	ifType	S	if : M	INT		
if.2.4	ifMtu	S	if : M	INT		
if.2.5	ifSpeed	S	if : M	gauge		
if.2.6	ifPhysAddress	S	if : M	PhysAddress		
if.2.7	ifAdminStatus	C	if : O	INT		
if.2.8	ifOperStatus	S	if : M	INT		
if.2.9	ifLastChange	S	if : O	TimeTicks		
if.2.10	ifInOctets	S	if : O	counter		
if.2.11	ifInUcastPkts	S	if : O	counter		
if.2.12	ifInNUcastPkts	S	if : O	counter		
if.2.13	ifInDiscards	S	if : O	counter		
if.2.14	ifInErrors	S	if : O	counter		
if.2.15	ifInUnknownProtos	S	if : O	counter		
if.2.16	ifOutOctets	S	if : O	counter		
if.2.17	ifOutUcastPkts	S	if : O	counter		
if.2.18	ifOutNUcastPkts	S	if : O	counter		
if.2.19	ifOutDiscards	S	if : O	counter		
if.2.20	ifOutErrors	S	if : O	counter		
if.2.21	ifOutQLen	S	if : O	gauge		
if.2.22	ifSpecific	S	if : O	OID		
IP GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1213	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
ip	**IP GROUP**	--	O	----	---	
ip.1	ipForwarding	C	ip : M	INT		
ip.2	ipDefaultTTL	C	ip : M	INT		
ip.3	ipInReceives	S	ip : M	counter		
ip.4	ipInHdrErrors	S	ip : M	counter		
ip.5	ipInAddrErrors	S	ip : M	counter		
ip.6	ipForwDatagrams	S	ip : M	counter		

ip.7	ipInUnknownProtos	S	ip : M	counter		
ip.8	ipInDiscards	S	ip : M	counter		
ip.9	ipInDelivers	S	ip : M	counter		
ip.10	ipOutRequests	S	ip : M	counter		
ip.11	ipOutDiscards	S	ip : M	counter		
ip.12	ipOutNoRoutes	S	ip : M	counter		
ip.13	ipReasmTimeout	S	ip : M	counter		
ip.14	ipReasmReqds	S	ip : M	counter		
ip.15	ipReasmOKs	S	ip : M	counter		
ip.16	ipReasmFails	S	ip : M	counter		
ip.17	ipFragOKs	S	ip : M	counter		
ip.18	ipFragFails	S	ip : M	counter		
ip.19	ipFragCreates	S	ip : M	counter		
ip.20	ipAddrTable	--	ip : M	---		
ip.20.1	ipAddrEntry	--	ip : M	---		
ip.20.1.1	ipAdEntAddr	S	ip : M	IpAddress		
ip.20.1.2	ipAdEntIfIndex	S	ip : M	INT		
ip.20.1.3	ipAdEntNetMask	S	ip : M	IpAddress		
ip.20.1.4	ipAdEntBcastAddr	S	ip : M	INT		
ip.20.1.5	ipAdEntReasmMaxSize	S	ip : M	INT		
ip.21	ipRouteTable	--	ip : M	---		
ip.21.1	ipRouteEntry	--	ip : M	---		
ip.21.1.1	ipRouteDest	C	ip : M	IpAddress		
ip.21.1.2	ipRouteIfIndex	C	ip : M	INT		
ip.21.1.3	ipRouteMetric1	C	ip : M	INT		
ip.21.1.4	ipRouteMetric2	C	ip : M	INT		
ip.21.1.5	ipRouteMetric3	C	ip : M	INT		
ip.21.1.6	ipRouteMetric4	C	ip : M	INT		
ip.21.1.7	ipRouteNextHop	C	ip : M	IpAddress		
ip.21.1.8	ipRouteType	C	ip : M	INT		
ip.21.1.9	ipRouteProto	C	ip : M	INT		
ip.21.1.10	ipRouteAge	C	ip : M	INT		
ip.21.1.11	ipRouteMask	C	ip : M	IpAddress		
ip.21.1.12	ipRouteMetric5	C	ip : M	INT		

ip.21.1.13	ipRouteInfo	S	ip : M	OID		
ip.22	ipNetToMediaTable	--	ip : M	---		
ip.22.1	ipNetToMediaEntry	--	ip : M	---		
ip.22.1.1	ipNetToMediaIfIndex	C	ip : M	INT		
ip.22.1.2	ipNetToMediaPhysAddress	C	ip : M	PhysAddress		
ip.22.1.3	ipNetToMediaNetAddress	C	ip : M	IpAddress		
ip.22.1.4	ipNetToMediaType	C	ip : M	INT		
ip.23	ipRoutingDiscards	S	ip : M	counter		
ICMP GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1213	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
icmp	**ICMP GROUP**	--	O	----	---	
icmp.1	icmpInMsgs	S	icmp : M	counter		
icmp.2	icmpInErrors	S	icmp : M	counter		
icmp.3	icmpInDestUnreachs	S	icmp : M	counter		
icmp.4	icmpInTimeExcds	S	icmp : M	counter		
icmp.5	icmpInParmProbs	S	icmp : M	counter		
icmp.6	icmpInSrcQuenchs	S	icmp : M	counter		
icmp.7	icmpInRedirects	S	icmp : M	counter		
icmp.8	icmpInEchos	S	icmp : M	counter		
icmp.9	icmpInEchoReps	S	icmp : M	counter		
icmp.10	icmpInTimestamps	S	icmp : M	counter		
icmp.11	icmpInTimestampReps	S	icmp : M	counter		
icmp.12	icmpInAddrMasks	S	icmp : M	counter		
icmp.13	icmpInAddrMaskReps	S	icmp : M	counter		
icmp.14	icmpOutMsgs	S	icmp : M	counter		
icmp.15	icmpOutErrors	S	icmp : M	counter		
icmp.16	icmpOutDestUnreachs	S	icmp : M	counter		
icmp.17	icmpOutTimeExcds	S	icmp : M	counter		
icmp.18	icmpOutParmProbs	S	icmp : M	counter		
icmp.19	icmpOutSrcQuenchs	S	icmp : M	counter		
icmp.20	icmpOutRedirects	S	icmp : M	counter		
icmp.21	icmpOutEchos	S	icmp : M	counter		

icmp.22	icmpOutEchoReps	S	icmp : M	counter		
icmp.23	icmpOutTimestamps	S	icmp : M	counter		
icmp.24	icmpOutTimestampReps	S	icmp : M	counter		
icmp.25	icmpOutAddrMasks	S	icmp : M	counter		
icmp.26	icmpOutAddrMaskReps	S	icmp : M	counter		
TCP GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1213	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
tcp	**TCP GROUP**	--	O	----	---	
tcp.1	tcpRtoAlgorithm	S	tcp : M	INT		
tcp.2	tcpRtoMin	S	tcp : M	INT		
tcp.3	tcpRtoMax	S	tcp : M	INT		
tcp.4	tcpMaxConn	S	tcp : M	INT		
tcp.5	tcpActiveOpens	S	tcp : M	counter		
tcp.6	tcpPassiveOpens	S	tcp : M	counter		
tcp.7	tcpAttemptFails	S	tcp : M	counter		
tcp.8	tcpEstabResets	S	tcp : M	counter		
tcp.9	tcpCurrEstab	S	tcp : M	counter		
tcp.10	tcpInSegs	S	tcp : M	counter		
tcp.11	tcpOutSegs	S	tcp : M	counter		
tcp.12	tcpRetransSegs	S	tcp : M	counter		
tcp.13	tcpConnTable	--	tcp : M	---		
tcp.13.1	tcpConnEntry	--	tcp : M	---		
tcp.13.1.1	tcpConnState	C	tcp : M	INT		
tcp.13.1.2	tcpConnLocalAddress	S	tcp : M	IpAddress		
tcp.13.1.3	tcpConnLocalPort	S	tcp : M	INT		
tcp.13.1.4	tcpConnRemAddress	S	tcp : M	IpAddress		
tcp.13.1.5	tcpConnRemPort	S	tcp : M	INT		
tcp.14	tcpInErrs	S	tcp : M	counter		
tcp.15	tcpOutRsts	S	tcp : M	counter		
A.34 UDP Group						
UDP GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1213	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**

udp	**UDP GROUP**	--	O	----	---	
udp.1	udpInDatagrams	S	udp : M	INT		
udp.2	udpNoPorts	S	udp : M	INT		
udp.3	udpInErrors	S	udp : M	INT		
udp.4	udpOutDatagrams	S	udp : M	INT		
udp.5	udpTable	--	udp : M	---		
udp.5.1	udpEntry	--	udp : M	---		
udp.5.1.1	udpLocalAddress	S	udp : M	IpAddress		
udp.5.1.2	udpLocalPort	S	udp : M	INT		
A.35 Ethernet Group						
ETHERNET GROUP						
rfc	**Object**	**Object**	**Object**	**Allowed**	**Supported Yes/No?**	
1643	**Name**	**Type**	**Status**	**Values**	**Values**	**Comment**
dot3	**ETHERNET GROUP**	--	O	----	---	
dot3.2	dot3StatsTable	--	dot3 : M	---	---	
dot3.2.1	dot3StatsEntry	--	dot3 : M	---	---	
dot3.2.1.1	dot3StatsIndex	S	dot3 : M	INT		
dot3.2.1.2	dot3StatsAlignmentErrors	S	dot3 : M	counter		
dot3.2.1.3	dot3StatsFCSErrors	S	dot3 : M	counter		
dot3.2.1.4	dot3StatsSingleCollisionFrames	S	dot3 : M	counter		
dot3.2.1.5	dot3StatsMultipleCollisionFrames	S	dot3 : M	counter		
dot3.2.1.6	dot3StatsSQETestErrors	S	dot3 : M	counter		
dot3.2.1.7	dot3StatsDeferredTransmissions	S	dot3 : M	counter		
dot3.2.1.8	dot3StatsLateCollisions	S	dot3 : M	counter		
dot3.2.1.9	dot3StatsExcessiveCollisions	S	dot3 : M	counter		
dot3.2.1.10	dot3StatsInternalMacTransmitErrors	S	dot3 : M	counter		
dot3.2.1.11	dot3StatsCarrierSenseErrors	S	dot3 : M	counter		
dot3.2.1.13	dot3StatsFrameTooLongs	S	dot3 : M	counter		
dot3.2.1.16	dot3StatsInternalMacReceiveErrors	S	dot3 : M	counter		
dot3.2.1.17	dot3StatsEtherChipSet	S	dot3 : M	OID		
dot3.5	dot3CollTable	--	dot3 : O			
dot3.5.1	dot3CollEntry	--	dot3 : O			

dot3.5.1.2	dot3CollCount	S	dot3 : O	INT		
dot3.5.1.3	dot3CollFrequencies	S	dot3 : O	counter		
dot3.6	dot3Tests	--	dot3 : O			
dot3.6.1	dot3TestTdr	S	dot3 : O			
dot3.6.2	dot3TestLoopBack	S	dot3 : O			
dot3.7	dot3Errors	--	dot3 : O			
dot3.7.1	dot3ErrorInitError	S	dot3 : O			
dot3.7.2	dot3ErrorLoopbackError	S	dot3 : O			

ATTACHMENT D

Requirement Traceability Matrix

Requirement Number	Installed	Comments
2.2.1	Yes / No	
2.2.2	Yes / No	
2.2.3	Yes / No	
2.2.4	Yes / No	
2.2.5	Yes / No	
2.2.6	Yes / No	
2.2.7	Yes / No	
2.2.8	Yes / No	
2.2.9	Yes / No	
2.2.10	Yes / No	
2.2.11	Yes / No	
2.2.12	Yes / No	
2.2.13	Yes / No	
2.2.14	Yes / No	
2.2.15	Yes / No	
2.2.16	Yes / No	
2.2.17	Yes / No	
2.2.18	Yes / No	
2.2.19	Yes / No	
2.2.20	Yes / No	
3.1.1.1	Yes / No	
3.1.1.2.a	Yes / No	
3.1.1.2.b	Yes / No	
3.1.1.3	Yes / No	
3.1.2.1	Yes / No	
3.1.2.2	Yes / No	

3.1.2.3	Yes / No	
3.1.2.4	Yes / No	
3.1.2.5	Yes / No	
3.1.2.6	Yes / No	
3.1.3.1	Yes / No	
3.1.3.2	Yes / No	
3.1.3.3	Yes / No	
3.1.3.4.a	Yes / No	
3.1.3.4.b	Yes / No	
3.1.3.4.c	Yes / No	
3.1.3.4.d	Yes / No	
3.1.4	Yes / No	
3.1.5	Yes / No	
3.1.6.1	Yes / No	
3.1.6.2	Yes / No	
3.1.6.3	Yes / No	
3.1.6.4	Yes / No	
3.2.1.1	Yes / No	
3.2.1.2	Yes / No	
3.2.2.1	Yes / No	
3.2.2.2	Yes / No	
3.2.2.3	Yes / No	
3.2.2.4	Yes / No	
3.2.3.1	Yes / No	
3.2.3.2	Yes / No	
3.2.3.3	Yes / No	
3.2.3.4	Yes / No	
3.2.3.5	Yes / No	
3.2.3.6	Yes / No	
3.2.3.7	Yes / No	
3.2.3.8	Yes / No	
3.2.3.9	Yes / No	
3.2.3.10	Yes / No	
3.2.3.11	Yes / No	
3.2.3.12	Yes / No	
3.2.3.13	Yes / No	
3.2.3.14	Yes / No	
3.2.3.15	Yes / No	
3.2.3.16	Yes / No	
3.2.3.17	Yes / No	
3.2.3.18	Yes / No	
3.2.3.19	Yes / No	
3.2.3.20	Yes / No	
3.2.3.21	Yes / No	
3.2.3.22	Yes / No	
3.2.3.23	Yes / No	
3.2.3.24	Yes / No	
3.2.3.25	Yes / No	
3.2.3.26	Yes / No	

3.2.3.27	Yes / No	
3.2.3.28	Yes / No	
3.2.3.29	Yes / No	
3.2.3.30	Yes / No	
3.2.3.31	Yes / No	
3.2.3.32	Yes / No	
3.2.3.33	Yes / No	
3.2.3.34	Yes / No	
3.2.3.35	Yes / No	
3.2.3.36	Yes / No	
3.2.3.37	Yes / No	
3.2.3.38	Yes / No	
3.2.3.39	Yes / No	
3.2.3.40	Yes / No	
3.2.3.41.a	Yes / No	
3.2.3.41.b	Yes / No	
3.2.3.41.c	Yes / No	
3.2.3.41.d	Yes / No	
3.2.3.41.e	Yes / No	
3.2.3.42.a	Yes / No	
3.2.3.42.b	Yes / No	
3.2.3.42.c	Yes / No	
3.3.1	Yes / No	
3.3.2	Yes / No	
3.3.3	Yes / No	
3.3.4	Yes / No	
3.3.5	Yes / No	
3.3.6	Yes / No	
3.3.7	Yes / No	
3.3.8	Yes / No	
3.3.9	Yes / No	
3.3.10	Yes / No	
3.3.11	Yes / No	
3.3.12	Yes / No	
3.3.13	Yes / No	
3.4.1	Yes / No	
3.4.2	Yes / No	
3.4.3	Yes / No	
3.4.4.a	Yes / No	
3.4.4.b	Yes / No	
3.4.5	Yes / No	
3.4.6	Yes / No	
3.4.7	Yes / No	
3.5.1	Yes / No	
3.5.2	Yes / No	
3.5.3	Yes / No	
3.5.4.a	Yes / No	
3.5.4.b	Yes / No	
3.5.4.c	Yes / No	

3.5.4.d	Yes / No	
3.5.4.e	Yes / No	
3.5.4.f	Yes / No	
3.5.4.g	Yes / No	
3.5.4.h	Yes / No	
3.5.4.I	Yes / No	
3.5.4.j	Yes / No	
3.5.4.k	Yes / No	
3.5.4.l	Yes / No	
3.5.5	Yes / No	
3.5.6	Yes / No	
3.5.7	Yes / No	
3.5.8.a	Yes / No	
3.5.8.b	Yes / No	
3.5.8.c	Yes / No	
3.5.8.d	Yes / No	
3.5.8.e	Yes / No	
3.5.8.f	Yes / No	
3.5.8.9	Yes / No	
3.6.1	Yes / No	
3.6.2	Yes / No	
3.6.3	Yes / No	
3.6.4	Yes / No	
3.6.5	Yes / No	
3.6.6	Yes / No	
3.6.7.A	Yes / No	
3.6.7.B	Yes / No	
3.6.7.C.a	Yes / No	
3.6.7.C.b	Yes / No	
3.6.7.C.c	Yes / No	
3.6.7.C.d	Yes / No	
3.6.7.C.e	Yes / No	
3.6.7.C.f	Yes / No	
3.6.7.C.g	Yes / No	
3.6.7.C.h	Yes / No	
3.6.7.C.I	Yes / No	
3.6.7.C.j	Yes / No	
3.6.7.C.k	Yes / No	
3.6.7.C.l	Yes / No	
3.6.7.C.m	Yes / No	
3.6.7.C.n	Yes / No	
3.6.7.C.o	Yes / No	
3.6.7.C.p	Yes / No	
3.6.8	Yes / No	
3.6.9	Yes / No	
3.6.10	Yes / No	
3.6.11	Yes / No	
3.6.12	Yes / No	
3.6.13	Yes / No	

3.7.1	Yes / No	
3.7.2	Yes / No	
3.7.3	Yes / No	

	Description	Supported Currently	If not, time required to develop support
	Signal Controller Support: 2070	Yes/No	
1	NextPhase - Siemen's Gardner	Yes/No	
2	OASIS – AECOM	Yes/No	
3	Econolite (2070)	Yes/No	
4	Eagle (2070)	Yes/No	
5	Naztec (2070)	Yes/No	
	Signal Controller Support: NEMA		
6	Econolite ASC-2	Yes/No	
7	Multisonic 820	Yes/No	
8	Multisonic 820A	Yes/No	
9	Peek TRA 3000	Yes/No	
10	Peek LMD 8000	Yes/No	
11	Eagle EPAC 300 (Mandatory Support)	Yes/No	
	Signal Controller Support: Type 170		
1	Wapiti W4IKS (Mandatory Support)	Yes/No	

3.7.4	Yes / No	
3.7.5	Yes / No	
3.7.6	Yes / No	
3.7.7	Yes / No	
3.7.8	Yes / No	
3.7.9	Yes / No	
3.7.10	Yes / No	

ATTACHMENT E