

City of Nome, Alaska



Request for Proposals (RFP) Functional Specifications

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1. Functional Specifications

These functional specifications describe the desired system's general, functional, and operational requirements. While not a design, these specifications provide requirements for system architecture, performance, and support, as well as system implementation, testing, and acceptance of the new system.

The term "Contractor" refers to the prime contractor awarded this project and all subcontractors hired by the prime contractor. All Request for Proposal (RFP) requirements throughout the rest of this section, referred to as the Contractor, apply equally to the prime contractor and all subcontractors. The Contractor shall have a current Contractor's License for the state of Alaska.

1.1 System Overview

The City of Nome, Alaska (City) intends to purchase and implement an integrated public safety wireless communication system that will provide first responders with real-time operable and interoperable voice services that support day-to-day mutual aid and operations. The public safety wireless communication system shall consist of:

- A. Four VHF Project 25 (P25) conventional channels
- B. Two Radio Frequency (RF) Sites, each containing two P25 conventional base stations configured as repeaters
- C. Three-operator position dispatch console system, including backup RF control stations and integration with existing logging recorder system
- D. Field/subscriber radios (portable, mobile, and control station radios)
- E. Site upgrades, as required, to implement the radio and dispatch console systems.

1.2 Project Scope

- A. The Contractor shall furnish all equipment, materials, labor, transportation, and storage facilities necessary to complete the specified work and required for a fully functional system meeting all requirements of this RFP.
- B. The Contractor shall design, install, and test all required equipment and parts.
- C. All equipment, antennas, parts, and accessories shall be new.





- D. The Contractor shall be responsible for providing the following project components:
 - 1. Project management
 - 2. Frequency search, coordination, and Federal Communications Commission (FCC) licensing
 - 3. Site surveys
 - 4. Engineering and system design
 - 5. Detailed drawings and design submittals
 - 6. System installation and construction management
 - 7. Acceptance testing
 - 8. Software installation and equipment programming
 - 9. Training
 - 10. Hardware and software warranty and maintenance, including spares and parts support
- E. The City's existing land mobile radio (LMR) systems shall support operations during the implementation and testing of the new systems.
- F. The Contractor shall plan, coordinate, and conduct all work with minimal service interruption to the existing mission-critical systems. All required outages shall be scheduled in advance with the City.
- G. All outages or system resource reduction from current system operations require a detailed plan of action with contingencies identified and approved by the City prior to execution.
- H. The Contractor shall not perform any work until the City has approved the Contractor's migration and cutover plans.
- I. The radio and dispatch console systems shall be fault-tolerant and contain no single point of failure that would disrupt communications.
- J. Critical hardware shall use devices such as redundant hot standby cards and power supplies to prevent any single points of failure.





- K. The Contractor shall complete system implementation and acceptance no later than November 1, 2024.

1.3 Standards and Guidelines

- A. The Contractor shall comply with the applicable portions of the following standards, rules, regulations, and industry guidelines (presented here in alphabetical order; not reflective of priority):
1. American National Standards Institute (ANSI)
 2. American Society of Testing Materials (ASTM)
 3. Federal Aviation Administration (FAA)
 4. Federal Communications Commission (FCC)
 5. Institute of Electrical and Electronics Engineers (IEEE)
 6. International Building Code (IBC)
 7. National Fire Protection Association (NFPA) 1221
 8. National Electrical Code (NEC) NFPA-70
 9. National Electrical Manufacturer's Association (NEMA)
 10. Telecommunications Distribution Methods Manual (TDMM)
 11. Telecommunications Industry Associations (TIA)
 12. Underwriters Laboratories, Inc. (UL)
- B. The Contractor shall comply with industry best practices for cable installation and management in equipment racks and cabinets, as outlined in the following standards:
1. ANSI/TIA-942 - Telecommunications Infrastructure Standard for Data Centers
 2. ANSI/BICSI N1-2019 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure
 3. ANSI/NFPA 70 - the National Electrical Code® (NEC®), Article 392 Cable Trays





4. IEEE 802.3ba-2010 - IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 3: CSMA/CD Access Method and Physical Layer Specifications Amendment 4: Media Access Control Parameters, Physical Layers, and Management Parameters for 40 Gb/s and 100 Gb/s Operation
 5. ISO/IEC 14763-2:2019 - Information technology — Implementation and operation of customer premises cabling — Part 2: Planning and installation
 6. UL 60950-1 - Information Technology Equipment - Safety - Part 1: General Requirements
 7. UL 62275 - Cable Management Systems - Cable Ties for Electrical Installations
 8. UL 2024 - Cable Routing Assemblies and Communications Raceways
- C. The Contractor shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in one or more of the following standards:
1. ANSI/TIA-607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, latest revision
 2. Motorola Solutions R56 Standards and Guidelines for Communication Sites, latest revision
 3. L3Harris AE/LZT 123 4618/1 Site Grounding and Lightning Protection Guidelines, latest revision
 4. MIL-STD-188-124B Grounding, Bonding, and Shielding for Common Long Haul/Tactical Communications Systems Including Ground-Based Communications-Electronics Facilities and Equipment

1.4 Governing Codes and Conflicts

- A. If the requirements of this RFP differ from those of the governing codes and regulations, then the more stringent of the two shall apply.
- B. If the requirements of this RFP conflict with those of the governing codes and regulations, the Contractor is responsible for identifying the conflict and resolving it to the satisfaction of the City.





2. Project 25 Conventional Radio System

2.1 General Requirements

- A. The radio system shall comply with applicable TIA-102 (P25) standards as published at the time of proposal. If revised or new TIA-102 standards are published after the proposal date that affects the designated system components, the Contractor shall work with the City to determine an agreeable solution to achieve compliance with the revised or new standards.
- B. The system shall be built as a P25 conventional radio system.
- C. The system shall provide a P25 technology solution capable of operating with all P25 Compliance Assessment Program (CAP) compliant radios.

2.2 Site Selection

- A. The City has selected the following two locations for use as RF sites:
 - 1. Icy View (Latitude 64.519193°, Longitude -165.375114°)
 - 2. Recreation Center (Latitude 64.501585°, Longitude -165.395997°)
- B. These RF sites have been equipped with antenna support structures, which shall be utilized to support the proposed antennas.

2.3 P25 System Equipment

2.3.1 Repeaters/Base Stations

- A. Repeaters/base stations shall:
 - 1. Comply with appropriate Part 90 of the FCC Rules and Regulations
 - 2. Be FCC type accepted for the appropriate frequency band and type of service
 - 3. Comply with appropriate TIA 102 and similar standards
 - 4. Be solid-state in design and function and must operate in the temperature range from -20°F to 140°F without degradation





5. Consist of modular components or field-replaceable units, allowing for in-the-field repairs whenever possible
6. Use linear power amplifiers

2.3.2 Antenna Systems

- A. Antenna systems shall:
 1. Provide the required guaranteed coverage
 2. Match the antenna design used for all coverage modeling
 3. Meet applicable FCC rules and regulations
- B. Antennas shall be selected to perform in and endure the anticipated environmental conditions.
- C. Low passive intermodulation (PIM) antennas shall be used to the greatest extent possible.
- D. Transmission line type and length shall be appropriate to provide the required coverage. Lightning protection and grounding devices shall be used per the appropriate industry standard(s) and manufacturer requirements.
- E. Antenna systems shall support single-mounted antennas where possible. Single antenna systems may include the following:
 1. Two-channel duplexer and single transmit/receive antenna
 2. Dual port antenna with associated combining/multicoupler equipment

2.3.3 Dispatch Console System

2.3.3.1 General Requirements

- A. The dispatch console system shall support dispatch operations for the current dispatch centers.
- B. The current dispatch center is located at 102 Greg Kruschek Ave, Nome, AK.
- C. The dispatch console system shall be equipped with three new operator positions.





- D. The dispatch console system shall utilize RF control stations to interface with the RF site equipment.
- E. One control station per channel shall be provided (four total).
- F. The dispatch console system must not contain any single point of failure which would disable more than a single operator position or system resource.
- G. The dispatch console system shall be integrated with the City's existing logging recorder.
- H. As an OPTION, the dispatch console system shall support a direct connection to the four repeaters via a City-provided backhaul network.

2.3.3.2 Backup Solution

- A. The dispatch console system shall be provided with a backup solution that provides the following:
 - 1. Maintain dispatch operations in the event of a dispatch system, individual position, or multiple position failure
 - 2. Not be dependent on the primary dispatch console system for operations
 - 3. Allow users to change channels/talkgroups at dispatch positions without affecting other dispatch positions
 - 4. Be capable of operating with a headset and with a conventional speaker and microphone

2.3.3.3 Dispatch Console System Operator Equipment Requirements

- A. All dispatch console equipment supplied shall operate 24 hours a day, 7 days a week, 365 days a year.
- B. Each dispatch console position shall include a tilt/swivel display monitor 24" or larger LCD/LED with a resolution of 1920 x 1080 or better.
- C. The dispatch consoles shall be capable of displaying all dispatching functions on a single display unit.
- D. The dispatch console system shall allow authorized personnel to determine which functions are available at each operator position.





- E. The dispatch console system shall provide an individual unit ID and text alias readout for calling units and a stacking display to reflect at least the last ten unit calls for the visible channels/talkgroups.
- F. The dispatch console position keyboard interface shall be compatible with standard PC USB 2.0 keyboards.
- G. Each dispatch console position shall be provided with a standard 101-key PC keyboard and a standard mouse/pointer device.
- H. Operators shall be able to perform console functions by positioning a screen pointer (cursor) over the appropriate icon and pressing the mouse button or by touching the monitor screen.
- I. Custom mice, trackballs, and accessories may be proposed.
- J. Each operator position shall have a high-quality gooseneck microphone.
- K. Each operator position shall have a heavy-duty footswitch to allow operators to key the selected channel hands-free.
- L. All computers supplied shall be based on current production processors running a currently supported operating system. The City reserves the right to specify or supply the computer platform(s) in accordance with the City standards. All computers shall be certified for the latest version of operating system available at the time of acceptance.
- M. The failure of one or more console positions should have no effect on the remaining console positions.
- N. Equipment shall enable operators to acoustically cross-mute channels to eliminate acoustic feedback between operators.
- O. Console positions shall respond appropriately to the activation of an emergency alarm by field units.
 - 1. Dispatch console system operator positions shall provide an audible alert, provide a visual alert of an emergency activation, and display the unit ID of the calling unit.
 - 2. Dispatch console system operator positions shall be able to acknowledge the emergency alarm.





3. The unit ID and alias for an unacknowledged emergency alarm shall not scroll from the unit ID display.
- P. Console positions shall decrypt and encrypt secure voice communications.
1. A distinctive icon shall signify encrypted channels.
 2. Multiple encryption algorithms and keys shall be supported.
- Q. Each operator position shall be able to utilize both a headset (wired and/or wireless) and a stationary gooseneck-type microphone for transmitting audio.
- R. Each operator position shall support a single headset capable of both telephone and radio use.
- S. The dispatch console system shall provide an instant recall recording capability for each operator position.
1. Instant recall recording shall provide an interface to connect to the console operators' microphone audio, the selected radio channel receiver audio, and telephone audio.
 2. Playback shall be available on the operator's position.
- T. Conventional resources (e.g., repeaters, base stations, and control stations) capable of operating on multiple frequencies and/or modes shall be reconfigurable to select the desired transmit frequency/mode (select channel).
- U. An audio level meter shall be provided showing the level of transmitted voice and indicate the level of receive audio present on the selected channel/talkgroup.
- V. Operator positions shall be able to set each channel and talkgroup volume level independently. Minimum audio levels should be capable of being set to avoid missed calls.
- W. Operator positions shall be able to mute or un-mute audio from unselected channels. The operator's monitor shall indicate muted audio status.
- X. Selected audio and unselected audio shall be presented from separate speakers.
- Y. Operator positions shall be able to select multiple channels for broadcast to several channels at once.





- Z. Operator positions shall be able to patch two or more conventional resource channels so that users may communicate directly.
- AA. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.

2.3.3.4 Dispatch Console System Configuration Requirements

- A. The dispatch console system shall support new features and screen configurations through software programming and not reconfiguration of hardware.
- B. The dispatch console system shall support the capability to program, store, retrieve, and edit multiple custom operator screens and configurations for each operator position.
- C. Operator positions display configurations and alias database shall be stored locally, at each position, or on a centrally located server.

2.3.3.5 Dispatch Console System Headset Requirements

- A. Two headset jacks, configurable for 4-wire or 6-wire, shall be provided for each dispatch operator position and it shall allow the operator to hear select audio via a headset and allow the operator to respond via a microphone attached to the headset.
 - 1. The headset jack box will also have a volume knob to control the received radio volume.
 - 2. A headset plug inserted into the jack shall automatically disconnect the console's microphone and mute the console's select speakers.
- B. One wired headset shall be provided for each dispatch operator position.
- C. The headsets shall be integrated with telephony and radio, allowing dispatchers to communicate via telephony or radio from a single headset.

2.3.4 Logging Recorder System

- A. The City currently operates an Eventide DX logging recorder system. The Contractor shall integrate the four new P25 channels, backup control stations,





interoperability control stations, and dispatch console system with the City's existing logging recorder.

2.3.5 Interoperability Gateways

- A. An interoperability gateway device with the capabilities to support up to eight base station/control station devices shall be provided at the dispatch center.
- B. The Contractor shall interface the interoperability gateway device to the two (2) existing Kenwood NX-5700 interoperability control stations.
- C. The Contractor shall provide a multiband console/control station and associated antenna network at the Dispatch Center to allow for interoperable communications in VHF, UHF, and the 7/800 MHz bands. This station shall be controlled via the dispatch consoles and be programmed with multiple interoperability frequencies.

2.4 Radio Coverage

2.4.1 Coverage Requirements

- A. The radio system design shall cover the City of Nome, Alaska, and extend 5 miles beyond its boundaries.
- B. The term Delivered Audio Quality (DAQ) in this document applies to both incoming and outgoing communications. See Table 1 for DAQ values and definitions.

Table 1 – DAQ Values and Definitions

DAQ	SUBJECTIVE PERFORMANCE DESCRIPTION
1	Unusable, Speech Present, but unreadable
2	Understandable with considerable effort. Frequent repetition due to noise/distortion
3	Speech is understandable with slight effort. Occasional repetition required due to noise/distortion
3.4	Speech is understandable with repetition only rarely required. Some noise/distortion
4	Speech easily understood. Occasional noise/distortion
4.5	Speech easily understood. Infrequent noise/distortion
5	Speech easily understood





- C. The Contractor shall provide a radio coverage guarantee for the three distinct coverage types specified in Table 2, with 95% reliability and a DAQ of 3.4. The coverage guarantee shall specify the percentage of the area covered with 95% reliability and a DAQ of 3.4 for each coverage type.

Table 2 – Coverage Types and Geographic Area

Coverage Type	Coverage Area
P25 Mobile	City boundary plus 5-mile extension
P25 Portable on-street	City boundary
P25 Portable in 15 dB buildings	City boundary

- D. Coverage design, implementation, and testing for the system shall adhere to Telecommunications Systems Bulletin (TSB) TSB 88.3 – Wireless Communications Systems Performance in Noise and Interference-Limited Situations Part 3: Recommended Methods for Technology Independent Performance Verification, current version.
- E. Base station radio output power and Effective Radiated Power (ERP) levels and antenna height and gain shall be the maximum as permitted by FCC rules and regulations unless system engineering determines that a lower height or ERP is sufficient (such as for tower top amplifiers (TTAs) or to minimize simulcast interference).

2.4.2 Coverage Maps

- A. The Contractor shall:
 1. Employ a suitable coverage prediction model using appropriate terrain and land cover data for the environment
 2. Provide a detailed description of the propagation models used and the assumptions made in preparation of the coverage maps
 3. Include coverage statistics that account for geography, population, and coverage on major roads





4. Submit both talk-out and talk-in system composite coverage maps for all proposed Coverage Types specified in Table 2.
- B. All talk-out and talk-in coverage maps shall be clearly labeled and show system gain calculations for each of the following:
1. Mobile radios – standard dash or trunk mount with a unity gain antenna mounted in the center of the roof
 2. Standard portable radio outdoors – a portable radio worn at hip level in a belt case with the proposed antenna
 3. Standard portable inside a 15 dB loss building – a portable radio worn at hip level in a belt case with the proposed antenna
- C. All maps shall clearly delineate the difference between areas predicted to be equal to or greater than DAQ 3.4 equivalent coverage and areas that do not meet coverage guarantee using a light transparent color or cross-hatching for those areas that meet or exceed the minimum coverage reliability threshold.
- D. Coverage maps shall be provided in two formats:
1. Hardcopy format printed on 11" x17" (minimum) full-color paper
 2. On a flash drive in PDF file format with an image resolution greater than 600 dpi when printed at 11" x17"
- E. All maps shall include a background layer suitable for the City's reference (e.g., topographic map, roads, and rivers).
- F. Link budgets shall be provided, clearly defining the following minimum information relating to each map and each site:
1. Propagation model
 2. Design target
 3. ATP target
 4. Faded performance criteria
 5. Inferred noise floor
 6. Base station/repeater transmit power output





7. Antenna gain (transmit and receive)
 8. Antenna down tilt (if applicable)
 9. Antenna height
 10. Transmit site effective radiated power (ERP)
 11. Receiver sensitivity
 12. Total antenna system gains or losses
 13. Calculations utilized to determine antenna system gains or losses
 14. Mobile and portable antenna height for talk-out and talk-in
 15. Mobile and portable transmit output power
 16. Loss factors used for portable radios
- G. The Contractor shall use 30-meter United States Geologic Survey (USGS), North American Datum (NAD)-83 terrain elevation data for coverage simulations. Alternatively, the Contractor may use 3 arc-second data where 30-meter data is unavailable.

2.5 Field/Subscriber Radio Equipment

2.5.1 General Requirements

- A. All subscriber units shall include the following minimum capabilities:
1. Shall be P25 certified to support P25 conventional operation within the VHF frequency band.
 2. Shall be capable of placing and receiving P25 VHF conventional mode calls.
 3. Shall be capable of placing and receiving analog VHF conventional mode calls.
 4. The subscriber unit software shall be flash-programmable for adding future software/firmware enhancements and features.
 5. Support AES-256 encryption and multiple keys
- B. All subscriber units shall be FCC Type Accepted.
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- C. All subscriber units shall support the scanning of conventional channels.
- D. Scan groups shall support up to 16 members and a priority scan feature.
- E. Scan lists shall be retained during power-off/on (power-on default shall be the last operator selection).
- F. All subscriber units shall allow users to configure or alter scan operations including the definition of a scan list.
- G. Contractors shall propose and price the quantity of subscriber devices detailed in Table 3.

Table 3 – Subscriber Quantities to be Proposed

Subscriber Quantities		
Agency	Type	Quantity
Law Enforcement	Portable Radios	15
Law Enforcement	Mobile Radios	15
Fire Service	Portable Radios	40
Fire Service	Mobile Radios	15

2.5.2 Portable Subscriber Units

- A. All portable subscriber devices shall provide the following capabilities:
 - 1. Push-to-talk switch
 - 2. On-Off/Volume knob, mounted on top
 - 3. Minimum of two soft keys
 - 4. Minimum of 3 navigation keys
 - 5. Emergency button, mounted on top with easy access
 - 6. Front display with two lines of text (minimum 12 characters per line) and status icons for battery status and in-range/RSSI indicator
 - 7. Display shall be readable in all conditions, from direct sunlight to total darkness





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- B. All portable subscriber radios shall be equipped with a flexible, covered antenna (readily removable utilizing a screw-in connector).
 - C. All portable subscriber radios shall be equipped with standard-capacity batteries that, when starting with a full charge, allow operations for 10 hours at a duty cycle of 5% transmit, 5% receive, and 90% idle.
 - D. Batteries shall connect securely to portable subscriber radios and shall not require the use of tools to attach or remove.
 - E. All portable subscriber devices shall be equipped with chargers that operate from 110 VAC sources, support the rapid charge of batteries (complete charge in 1 to 2 hours), and support both standard and high-capacity batteries with or without radios connected to the battery.
 - F. Internal speaker/ microphone shall include:
 - 1. Connection of an external speaker/microphone that mutes the internal speaker/ microphone
 - 2. Connection of an external earpiece that mutes the internal speaker
 - G. Universal or individual connectors with the following features:
 - 1. Microphone and earpiece connections must be capable of supporting the following types of microphone/earpiece devices (including types used in surveillance):
 - a. External speaker/ microphone
 - b. Earpiece
 - c. Programming interface
 - H. All Portable subscriber radios shall meet or exceed the following environmental specifications per MIL-STD-810E (or equivalent items in 810 F):
 - 1. Operating Temperature: -30 C to +60 C
 - 2. Low-Pressure Operation: 500.3 Procedure II
 - 3. High Temperature, Storage / Operation: 501.3 Procedure I / II
 - 4. Low Temperature, Storage / Operation: 502.3 Procedure I / II





5. Temperature Shock: 503.3 Procedure I
6. Solar Radiation: 505.3 Procedure I
7. Humidity: 507.3 Procedure II
8. Dust, Blowing: 510.3 Procedure I
9. Vibration: 514.4 Procedure I
10. Shock, Functional: 516.4 Procedure I
11. Rain, Blowing / Dripping Water (for metal case): 506.3 Procedure I / II
12. Salt Fog (for metal case): 509.3 Procedure I

2.5.3 Portable Subscribers – Models to be Proposed

- A. Contractors shall propose, describe, and price portable radios suited for use by the following departments:
 1. Law Enforcement
 2. Fire/EMS Service
- B. Contractors shall provide information detailing the differences between the proposed portable subscriber models and how each feature and function benefits the two user departments.
- C. In addition to these two models, Contractors shall propose alternative models that meet the minimum requirements of this functional specification.

2.5.3.1 Portable Subscriber Radio – Law Enforcement Model

- A. In addition to the general requirements for portable subscriber devices, the Law Enforcement model shall include the following capabilities:
 1. AES Encryption
 2. Multikey option
 3. Surveillance mode allowing for covert operation (lights dimmed, tones muted, etc.)





- B. The Law Enforcement subscriber devices shall be provided with a remote speaker-microphone (heavy-duty, palm-type with push-to-talk switch, emergency button, and self-retracting coil cord)

2.5.3.2 Portable Subscriber Radio – Fire Service Model

- A. In addition to the general requirements for portable subscriber devices, the Fire Service model shall include the following capabilities:
 - 1. Extended environmental specifications
 - 2. Larger and easier to access knobs and controls.
 - 3. Highly visible color(s)
 - 4. Noise reduction technology for fire service environments
- B. The Fire Service subscriber devices shall be provided with a remote speaker-microphone designed for Fire Service operation, including the following:
 - 1. Extended environmental specifications
 - 2. Larger and easier to access knobs and controls.
 - 3. Highly visible color(s)
 - 4. Emergency button

2.5.4 Mobile Subscribers Requirements

- A. The Mobile subscriber radios shall be constructed with the following components:
 - 1. A microphone with a self-retracting coil cord that shall be 4 feet long (minimum) when extended
 - 2. An internal speaker of at least 5W or an external speaker
 - 3. Installation brackets and interface cables for all the above components
- B. The mobile subscriber radios shall provide the following minimum capabilities for user controls and displays:
 - 1. Push-to-talk switch on the microphone





2. On-Off button
 3. Volume knob
 4. Rotary knob for mode or zone selection, each bank consisting of 16 channels/talkgroups
 5. Minimum five soft keys
 6. Emergency button
 7. External speaker
 8. Display with two lines of text (minimum 12 characters per line) plus one line of icons and one line of menus
 9. Display shall be readable in all conditions, from direct sunlight to total darkness
- C. All mobile subscriber radios shall meet or exceed the following environmental specifications per MIL-STD-810E (or equivalent items in 810 F):
1. Operating Temperature: -30 c to +60 C
 2. Low Pressure Operation: 500.3 Procedure II
 3. High Temperature, Storage / Operation: 501.3 Procedure I / II
 4. Low Temperature, Storage / Operation: 502.3 Procedure I / II
 5. Temperature Shock: 503.3 Procedure I
 6. Solar Radiation: 505.3 Procedure I
 7. Humidity: 507.3 Procedure II
 8. Dust, Blowing: 510.3 Procedure I
 9. Vibration: 514.4 Procedure I
 10. Shock, Functional: 516.4 Procedure I
 11. Rain, Blowing / Dripping Water (for metal case): 506.3 Procedure I / II
 12. Salt Fog (for metal case): 509.3 Procedure I





- D. The Contractor shall be responsible for programming and installation of mobile subscribers. Installations shall include the following:
1. Installation of new antennas and lines, power cords, and any control cables required for a complete working unit
 2. Maintaining and providing to the City a log containing serial numbers, vehicle number, date of installation, forward and reflected power readings, and radio ID numbers
 3. Removal and retention of legacy units and associated wiring in a secure location until turned over to the City or retained by the Contractor in the event a trade-in is offered
 4. The Contractor shall maintain and provide the City an inventory of all legacy units removed from service

2.5.5 Mobile Subscribers – Models to be Proposed

- A. Contractors shall propose, describe, and price mobile radios suited for use by the following departments:
1. Law Enforcement
 2. Fire/EMS Service
- B. Contractors shall provide information detailing the differences between the proposed mobile subscriber models and how each model's features and functions are beneficial to the two user departments (Law Enforcement and Fire/EMS Service)
- C. In addition to these two models, Contractors shall propose alternative models that meet the minimum requirements of this functional specification.

2.5.5.1 Mobile Subscriber Radio – Law Enforcement Model

- A. In addition to the requirements listed for all subscriber devices, the Law Enforcement model shall include the following capabilities:
1. AES Encryption
 2. Multikey option





2.5.5.2 Mobile Subscriber Radio – Fire Service Model

- A. In addition to the requirements listed for all subscriber devices, the Fire Service model shall include the following capabilities:
 - 1. Extended environmental specifications

2.5.5.3 Mobile Subscriber Radio – Control Station Option

- A. A Control Station option shall be available allowing for use within a building or fixed location. The control station option shall provide the following:
 - 1. Configured/equipped as a single unit containing the radio chassis and a DC power supply
 - 2. An outdoor permanently mounted antenna, associated coaxial cables, and grounding
 - 3. As an option, console-style stations may be proposed

2.5.6 Subscriber Radios – Multiband OPTIONS

Contractors shall also provide pricing for all-band and portables and mobiles. All-band devices shall operate in the VHF, UHF, and 7/800 MHz bands.

2.5.7 Subscriber Radios – Programming Equipment

The Contractor shall also include two (2) full sets of programming equipment to support the proposed subscriber radios. This includes programming cables and programming software. Contractors shall provide the PC requirements.





3. Civil Development

3.1 Existing Site Improvements

3.1.1 General

- A. The Contractor shall verify that all sites selected for use have sufficient space to support the proposed communications equipment and ancillary devices.
- B. The Contractor shall identify and propose any additional work necessary to make existing City-owned sites and infrastructure capable of supporting the proposed public safety wireless communications system.
- C. The Contractor shall be responsible for updating all existing sites supporting the new public safety wireless communications system to comply with their selected grounding and lightning protection standards. The Contractor shall be accountable for updating all deficient site conditions.
- D. The Contractor shall be responsible for completing any documents required by local, state, and federal departments including, but not limited to, permitting documents and State Historic Preservation Office (SHPO) forms.
- E. The Contractor shall be responsible for any issues related to site selection and will be responsible for resolving any issues related to site permitting or zoning.
- F. Code Compliance:
 - 1. Installation of all electrical equipment, power distribution, lighting assemblies, and associated wiring shall comply with the most recent edition of the National Electric Code (NEC) and Occupational Safety and Health Administration (OSHA) regulations.
 - 2. All electrical equipment shall be listed or approved by Underwriters Laboratories (UL).
 - 3. The Contractor shall comply with all applicable local codes, industry best practices, and guidelines stipulated in Section 1.3, Standards and Guidelines.





3.2 Antenna Support Structure

3.2.1 General

- A. The city has installed antenna support structures at the two RF site locations and the dispatch center. The Contractor shall utilize these structures to support the proposed antenna systems.
- B. The Contractor shall supply and install the necessary hardware to mount the new antenna systems at the RF sites.

3.2.2 Waveguide Bridge (Ice Bridge)

- A. The Contractor shall supply and install a waveguide bridge (ice bridge) to support and protect the coaxial cables as they transition from the coaxial entry port and the antenna support structure.
- B. Posts shall be placed on both lateral sides of the bridge to support the load fully. No more than 10 feet of distance shall be between the posts.
- C. The Contractor shall furnish and install the waveguide bridge between the tower and the cable entry panel.
- D. The following criteria shall govern the design of the waveguide bridge:
 - 1. Structurally sturdy to support live and dead loads
 - 2. Freestanding (i.e., not attached to the building or tower)
 - 3. Minimum width of 2 feet in width
 - 4. Length/height as required by the site specifics
 - 5. Waveguide Bridge (Ice Bridge) material shall be fabricated from galvanized bar grating or approved equivalent
 - 6. All components of the waveguide bridge shall be hot-dipped galvanized after fabrication
 - 7. Posts shall have galvanized caps
 - 8. Posts shall be set in concrete foundations





9. Waveguide bridge shall be adjustable in height to allow interface with building waveguide entry ports

3.3 Outdoor Cabinets

3.3.1 General

- A. The Contractor may recommend reuse of existing equipment rooms based on space availability, physical site security, and the ability to meet system requirements.
- B. The Contractor may propose using outdoor cabinets for existing sites or modifying existing equipment rooms to support RF and dispatch site equipment.
- C. If required, outdoor cabinets may be proposed for use indoors to further protect the communications equipment from the environment and improve physical security.

3.3.2 Cabinet Size

- A. The cabinet shall be sized appropriately to allow a single cabinet to support all RF, antenna network, AC/DC power equipment, and environmental control equipment.
- B. The cabinet shall contain typical 19" rack mounts.

3.3.3 Cabinet Design and Construction Requirements

- A. Where possible, the cabinet shall be considered a "field ready enclosure," whereas the cabinet contains preinstalled components, including HVAC, electrical panels, internal grounding system, and generator receptacle plugs.
- B. The Contractor is responsible for all costs, permits, and approvals required to transport the cabinet to the site and assemble the cabinet.
- C. The outdoor cabinet shall be at a NEMA 4X rated enclosure or better.
- D. The Contractor shall install outdoor cabinets on a poured concrete foundation to elevate and protect the cabinet from standing and running water.





3.4 Site Generator

3.4.1 General

- A. If required, the Contractor shall supply a new site generator to support the proposed equipment.
- B. The Contractor shall supply and install new generators that comply with the Outdoor-Use Units specifications in UL 2200, latest edition.

3.4.2 Power and Electric Requirements

- A. Generator specifications include the following:
 - 1. Fuel: Liquefied Propane Gas (natural gas or diesel may be provided as an option)
 - 2. Output: Minimum 25 kW (sized for the proposed system)
 - 3. Phase: Single
 - 4. Voltage: 120/240 VAC
 - 5. Frequency: 60 Hz

3.4.3 Enclosure

- A. The generator enclosure shall be outdoor weather protective and securely attached to a foundation designed to the generator manufacturer's specifications.

3.4.4 Muffler Type

- A. The generator muffler shall be of residential critical grade, including a flexible exhaust section.

3.4.5 Control Panel

- A. The generator control panel shall be either analog or digital and capable of displaying the following:
 - 1. Oil Pressure





2. Coolant temperature
 3. Fuel level (where applicable)
 4. DC battery voltage
 5. Run time hours
 6. Alarm Status
- B. The generator shall be capable of providing, at a minimum, the following alarm status information:
1. High or low AC voltage
 2. High or low battery voltage
 3. High or low-frequency
 4. Low or pre-low oil pressure
 5. Low water level
 6. Low water temperature
 7. High and pre-high engine temperature
 8. High, low, and critical low fuel levels (where applicable)
 9. Over crank
 10. Over speed
 11. Unit not in "Automatic Mode"

3.4.6 Miscellaneous

- A. The generator will be supplied with a block heater and battery charger, meeting NFPA99 and NFPA110 requirements.
- B. Fuel tanks shall be sized to accommodate a 7-day run time with a minimum size of 500 gallons.





- C. The Contractor shall be responsible for generator installation, test, and first fill of all fuel tanks.
- D. Fuel tanks shall be equipped with a monitoring device capable of triggering an alarm contact upon low fuel. The low full threshold shall be programmable.
- E. Fuel tanks shall be securely attached to a poured concrete foundation.

3.4.7 Automatic Transfer Switch (ATS)

- A. The Contractor shall provide and install the ATS.
- B. ATS shall include a programmable exerciser capable of automatic starting and shutdown of the generator on a weekly basis.
- C. ATS shall be enclosed in NEMA 3R enclosure.

3.5 Power Systems

3.5.1 DC Power Requirements

- A. The proposal shall include new DC power systems for all RF sites.
- B. The DC power system shall be designed to meet the specific load requirements for all system equipment at each site and include enough capacity for an additional future load of 25% of the equipment furnished under this contract.
- C. The power supply/charger shall meet the following requirements:
 - 1. Input Voltage: single phase, 120 VAC +/- 10%
 - 2. Frequency: 60 Hz +/- 5%
 - 3. Output Voltage Range: -42 to -56 VDC (positive ground)
 - 4. Output Current:
 - a. As calculated to support load requirements
 - b. A full recharge of batteries shall be accomplished within eight hours
 - 5. Output noise shall not degrade the performance of LMR equipment in the vicinity of the power supply/charger





6. Shall be 19-inch rack-mountable
 7. Shall be equipped with an input power AC circuit breaker, output power DC circuit breaker, DC current meter, and DC voltage meter
 8. Shall be initially configured for independent operation; however, it shall be capable of operating in parallel with another power supply/charger in the future without damage to either unit
 9. Shall provide separate adjustable voltages for floating and equalizing of the batteries, with the voltages initially adjusted to accommodate the batteries provided
 10. Shall include short circuit current protection and high voltage shutdown circuitry
- D. The batteries shall:
1. Be designed for float connection in support of continuous steady current loads with battery discharge only during loss of charger/power-supply output
 2. Be sized to support full load operation during an AC power failure for a minimum of 8 hours
 3. Include support trays for installation inside the communication cabinets
 4. Include all cell interconnect bus pieces and hardware
 5. Be sealed, lead acid batteries requiring no maintenance
 6. Have a minimum service life of 10 years, defined as the time in which the battery capacity drops below 80% of the original capacity
- E. Other DC Power System Components:
1. Load distribution/disconnect panels shall:
 - a. Include individual circuit breakers for protecting and/or disconnecting each charger/battery bank from the load
 - b. Include a front panel LED display indicating whether a breaker has been tripped
 - c. Be 19-inch rack-mountable





2. Circuit breaker panels shall:
 - a. Include circuit breakers, appropriately sized for disconnecting the individual loads
 - b. Be 19-inch rack-mountable
3. The negative and positive bus bars shall:
 - a. Be 19-inch rack-mountable
 - b. Be equipped with standoffs that will electrically isolate it from the mounting rack inside the cabinet
 - c. Be solid copper, sized to handle the required current capacity
4. DC power cables shall be of the appropriate size to handle the load current requirements, as specified





4. System Implementation, Test, and Acceptance

4.1 Project Management

- A. The Contractor shall attend project and construction meetings as deemed necessary by the City before and during installation. Additional meetings may be scheduled at the discretion of the City.
- B. If any changes in the overall timeline occur, the Contractor shall update the project schedule for discussion during these meetings.
- C. The Contractor shall provide written minutes of all meetings no later than five business days after the meeting.

4.1.1 Project Staffing

The Contractor shall provide the appropriate project staff based on workload and the level of effort required throughout the implementation/installation process.

- A. The staff identified in the Contractor's proposal shall serve the duration of the project unless the Contractor proposes an alternative plan to the City for consideration and gains approval. The City reserves the right to accept or reject any proposed staffing changes.
- B. The Contractor's project manager shall be:
 - 1. The primary point of contact for the City
 - 2. Fully responsible for supervising and coordinating the installation and deployment of the communications system
 - 3. Responsible for:
 - a. Development and acceptance of the project management plan
 - b. Managing the execution of the project against that plan
 - c. Overseeing the day-to-day project activities, deliverables, and milestone completion
 - d. Coordinating and facilitating weekly status meetings





- C. The Contractor's project engineer shall:
 - 1. Have the primary responsibility for managing the system design and ensuring system installation in accordance with the approved system design
 - a. Any deviation from the proposed system design shall be subject to project change control procedures and will not be undertaken until approved by the City.
 - 2. Ensure the accurate development of block diagrams, system-level diagrams, and rack diagrams
 - 3. Supervise the development and execution of:
 - a. Factory Acceptance Test Plan (FATP)
 - b. System Acceptance Test Plan (SATP)
 - c. Coverage Acceptance Test Plan (CATP)
 - 4. Guide the project team through the processes and procedures necessary to prove that the system performs as specified in the contract
 - a. The City shall approve all test plans prior to execution.

4.1.2 Scheduling

- A. The Contractor shall develop and maintain a project schedule including tasks, milestones, start and end dates, task predecessors, and task owners based on an approved work breakdown structure (WBS).
- B. The schedule shall represent tasks associated with completing work on all items identified in the WBS.
- C. The Contractor shall update the project schedule with actual dates as tasks are completed.
- D. The Contractor shall present all schedule updates to the City during the weekly status meetings.
- E. The schedule shall address the following at a minimum:
 - 1. Site surveys





2. Detailed Design Review
3. Site preparation
4. Equipment order and manufacturing
5. Factory acceptance test
6. Equipment delivery
7. System installation
8. System configuration
9. System optimization
10. System acceptance testing
11. Coverage testing
12. User training
13. System cutover
14. System documentation development and delivery
15. System and equipment warranty

- F. The City desires a project completion date of **November 1, 2024**. In the event the project completion extends beyond this date, the Contractor must identify critical path tasks that are key factors to the extension and include reasons why the Contractor cannot reduce the durations of these tasks.

4.1.3 Project Meetings

- A. The Contractor shall schedule a project kickoff meeting prior to the beginning of the project.
- B. The Contractor shall schedule weekly project status meetings following the contract award and the initial kickoff meeting.
- C. Weekly status meetings shall continue throughout the duration of the project until the City issues final system acceptance.





- D. The Contractor shall be responsible for facilitating the weekly status meetings.
- E. The Contractor shall prepare and distribute meeting agendas and minutes to the City via email on a weekly basis at least 24 hours prior to each scheduled meeting.
- F. Meeting agenda items shall include, as a minimum, the following items:
 - 1. Schedule review
 - 2. Status of deliverables
 - 3. Risk items and planned responses
 - 4. Proposed changes
 - 5. Plans for the next period
 - 6. Action item assignments
 - 7. Punch list review

4.1.4 QA/QC Plan

- A. The Contractor shall submit the QA/QC plan for review during preliminary design as described in this section.
- B. The QA/QC plan shall address all stages of the project, including, but not limited to:
 - 1. Procurement
 - 2. System design
 - 3. Installation
 - 4. Implementation
 - 5. Testing
 - 6. Cutover





C. The QA/QC plan shall:

1. Describe the plans and procedures that ensure the proposed system design complies with the RFP requirements
2. Be included in the project management plan developed by the Contractor's project manager
3. Be an integral part of the project
4. Include the City personnel as part of the review and approval process for all deliverables and submittals
5. Address the following project tasks at a minimum:
 - a. Design analysis and verification
 - b. RF coverage analysis and verification
 - c. Design changes and document control
 - d. Material ordering, shipping, receiving, and storage
 - e. Site preparation (if required)
 - f. Field installation and inspection
 - g. Equipment inventory and tracking
 - h. System testing and validation
 - i. Software regression testing
 - j. Deficiency reporting and correction
 - k. Implementation and cutover
 - l. Training and certification

4.1.5 Project Punch List

- A. The Contractor shall establish and maintain a punch list, as agreed upon with the City. The punch list shall be maintained in real-time.





- B. The punch list shall address all open issues, including those related to sites, facilities, equipment, and acceptance tests.
- C. The Contractor shall distribute the punch list to the City weekly via email.
- D. The punch list shall include the following at a minimum:
 - 1. Sequential punch list item number
 - 2. Date Identified
 - 3. Item description
 - 4. The party responsible for the resolution
 - 5. Expected resolution date
 - 6. Resolution date
 - 7. Details about how each punch list item was resolved and tested
 - 8. Notes about the item
- E. If the Contractor receives written permission from the City to transfer the responsibility of an item to another person or group, the Contractor shall add a new entry to the punch list and appropriately note the original entry.
- F. The Contractor shall be responsible for reviewing each punch list item and advising the City of any changes.
- G. The Contractor shall update the status of punch list items during each weekly status meeting.

4.2 Frequency Coordination and Licensing

- A. The City currently operates in the VHF frequency band and holds the following FCC licenses:
 - 1. KZW878
 - 2. WQCJ329
 - 3. WPWG287





- B. The Contractor shall update the FCC licenses or obtain new FCC licenses if required.
- C. The Contractor shall:
 - 1. Provide all FCC and frequency coordination modifications and applicable forms to the City for review and approval following approval of the preliminary design
 - 2. Complete all engineering tasks required for channel search/identification, coordination, and licensing of all new LMR frequencies and the modification of existing licenses, which are required for the new system, including the completion of all forms and submission of license applications to the FCC
 - 3. Track all applications and filings with the selected frequency coordinator and the FCC
 - 4. Respond to any questions by the selected frequency coordinator and the FCC regarding all applications and filings
 - 5. Correct and resubmit any applications or filings by the selected frequency coordinator and the FCC for the modification of licenses or re-licensing of existing channels at no additional cost
 - 6. Complete all required FCC construction deadline notifications
 - 7. Ensure compliance with the FCC's Maximum Permissible Exposure (MPE) requirements
 - 8. Provide copies of each license to the City

4.2.1 Intermodulation Interference

- A. The Contractor shall analyze all transmitters at each site for intermodulation interference, considering transmitting equipment from all tenants located at the sites as identified in FCC license information.
- B. If the Contractor identifies an intermodulation problem prior to, during, or following implementation, the Contractor shall resolve the issue without degrading system coverage or performance for a period of up to 12 months after System Acceptance and at no cost to the City.





- C. Transmitters at each site shall meet FCC Maximum Permissible Exposure (MPE) standards (per the latest revision of FCC Office of Engineering and Technology (OET Bulletin 65).
- D. The Contractor shall mitigate causal and occupational exposure at locations that exceed MPE standards.

4.3 Site Surveys

- A. The Contractor shall participate in a mandatory site survey with the City to confirm the actual equipment location within each space prior to submitting the detailed design package.
- B. Site Surveys shall be scheduled after the kickoff meeting and prior to the Detailed Design Review.
- C. During the mandatory site survey, the Contractor shall determine and document any changes to the detailed design installation drawings. All detailed design drawings and documents requiring changes shall be revised and provided at the Detailed Design Review.
- D. The Contractor shall visit all sites to:
 - 1. Assess site, safety, and access conditions
 - 2. Verify work to be completed, including location of equipment and installation requirements
 - 3. Assess the condition of existing equipment rooms, radio towers, power systems, standby power systems, cable and waveguide routing, earthquake bracing, site grounding and lightning protection systems, and all other installation practices to ensure that they adhere to industry standard(s) listed in Section 1.3.
 - 4. Identify existing City equipment that can be reused on the new system
- E. The Contractor shall produce a Site Survey report for each site, including, at a minimum:
 - 1. Cover page with site name, date of survey, survey team member(s), and general site description





2. Accurate site coordinates (latitude/longitude) using Datum WGS84, preferably near the tower or antenna structure of interest
 3. Potential obstructions at or near the site that could impede radio paths and radio coverage, including type and approximate azimuth and height
 4. A list of existing equipment that can be reused for the new system
 5. A list of issues encountered or identified and proposed solution(s) for each deficiency
 6. A statement of the work to be completed for system implementation and the method to complete the work
 7. Recommended site upgrades, including, but not limited to, equipment room, radio tower, antenna, waveguide, AC or DC power system, backup generator(s), UPS system(s), site access, and physical site security
 8. Accurate drawings of the cabinets/equipment room in Microsoft Visio native format
- F. The Contractor shall produce a Grounding Assessment report for each site based on the standard(s) in Section 1.3. The report shall include, at a minimum:
1. Cover page with site name, date of survey, survey team member(s), general site description, and selected standard(s) name and revision
 2. Accurate site coordinates (latitude/longitude) using Datum WGS84, preferably near the tower or antenna structure of interest
 3. Clamp-on meter measurements (in ohms) for each component assessed per the selected standard(s)
 4. A list of existing grounding equipment that can be reused for the new system
 5. A list of issues encountered or identified and proposed solution(s) for each deficiency
 6. A statement of the work to be completed for system implementation and the method to complete the work
 7. List of site upgrades, including recommended or optional requirements specified in the selected standard(s) for compliance with industry best practices





4.4 Detailed Design

- A. The Contractor shall submit the detailed design package within 60 days after the contract award, which shall include the following:
1. Any updates to previously submitted design information
 2. Site survey reports
 3. A detailed description of the new LMR systems, including the function of all equipment and how they interact to meet the requirements of this RFP
 4. System block diagrams
 5. Radio channel/frequency plan(s)
 6. Radio coverage maps
 7. IP addressing scheme and plan
 8. Recommended antenna mount location and height
 9. Migration/Cutover plan:
 - a. Describing how the radio system will be cutover to a fully operational system
 - b. Describing the completion of all tests and training prior to cutover
 - c. Detailing the necessary labor to cutover from existing systems to the proposed system
 - d. Including the schedule outlining the procedures for transitioning each operational user group to the new system with minimal operational impact
 - e. Including detailed component and subsystem cutover plans, clearly distinguishing between those that impact ongoing operations and those that do not
 - f. The City reserves the right to approve and change the cutover plan as it relates to any or all system components.
 10. Coverage Acceptance Test Plan (CATP), complete with coverage overview, service area definitions and grid structures, talk-in and talk-out test procedures, City and Contractor responsibilities, and sample pass/fail sheet





11. System installation, optimization, operation, and maintenance manuals for all equipment
12. Blank site installation, grounding remediation, and optimization documents to be completed during and after installation and provided with as-built documentation
13. Complete detailed design package for each site consisting of the following content (at a minimum):
 - a. Cover page with site name, site type (control, multicast, simulcast, etc.), simulcast cell name (if applicable), technology (Conventional, P25 Phase 1, P25 Phase 2, etc.), frequency band, number of channels, and other pertinent site data if applicable (region, site ID, etc.), Google Earth site photo, accurate site coordinates, elevation, City name, ownership (land, tower, building)
 - b. Index page with sheet titles, drawing descriptions, drawing versions, and page numbers
 - c. Block diagram(s) showing the entire network and any region- or subsystem-specific diagram
 - d. Mobile and Portable Talk-in and Talk-out coverage maps
 - e. Site plan showing existing and/or proposed site compound, tower(s), and building(s), all to scale and orientation
 - f. Tower drawings (to scale and different elevations as needed) including tower type and height, number of legs, existing and proposed antenna and coaxial cable loading information, antenna center line heights, and any other equipment mounted on the tower
 - g. Transitional and final floor plan drawings, including room layouts with doorways, existing and proposed rack location(s), cable trays, RF entry port(s), power system(s), HVAC unit(s), generator room(s), all to scale with interior and exterior dimensions and measurements of rack(s) to room(s)/cabinet(s) and/or other surrounding equipment
 - h. Equipment rack/cabinet elevation diagrams for radio/backhaul rack(s), combiner rack(s), and any DC power rack(s), with dimensions and rack unit locations





- i. Equipment room/cabinet power drawing(s) showing how new equipment connects to AC or DC power systems, as well as backup generator and UPS systems
 - j. Detailed electrical loading for AC and/or DC power systems (itemized by equipment types and quantities), as well as UPS and generator sizing and BTUs for HVAC for the entire site
 - k. RF entry port drawing(s) showing existing and/or proposed entry ports, labels for existing and proposed transmission lines (color-coded by size), and quantity and types of lightning protection devices for
 - l. Interior and exterior site grounding system drawings
 - m. Site-specific frequency and combiner plans
 - n. Network equipment interconnection drawings showing router and switch connections, with cables and port numbers labeled and color-coded
 - o. Site-specific IP addressing scheme, showing host names, host addresses, subnet mask, equipment use/description, and configuration-specific notes
 - p. Patching schedules and termination details for all cabling necessary for a complete record of the installation
 - q. Location of demarcation points for any items to be provided by the City
 - r. Site-specific bill of materials for all new equipment to be installed at the site
 - s. Site remediation summary (with pricing) based on results from the Site Survey report, Grounding Assessment report, and Structural Analysis report
- 14. Draft Factory Acceptance Test Plan (FATP) outlining a comprehensive series of tests that will demonstrate proof of performance and readiness for shipment
 - 15. Draft System Acceptance Test Plan (SATP) outlining a comprehensive series of tests that will demonstrate proof of performance after installation and optimization is complete
 - 16. Any other items as required or requested by the City prior to Detailed Design Review





- B. The Final FATP and Final SATP shall be submitted no later than 15 business days before the testing starts and shall be approved no later than five business days before the testing starts.
- C. A Detailed Design Review meeting shall be conducted to allow the Contractor to present the system detailed design for review and approval. All items required for the detailed design shall be submitted to the City 10 business days prior to the Detailed Design Review meeting.
- D. The Detailed Design Review shall be considered the last step prior to ordering and/or manufacturing of equipment. Upon approval of the detailed design by the City, the Contractor may begin the ordering and manufacturing of system equipment. The City shall not be held liable for any equipment ordered or manufactured prior to approval of the detailed design.

4.5 Staging

- A. Each individual assembly or equipment unit for the LMR systems shall undergo factory testing prior to shipment.
- B. The Contractor shall submit standard factory test documentation, documenting the tests performed and indicating successful completion of testing to the City.
- C. System staging:
 - 1. The Contractor shall perform system staging and testing on the complete system at a location in the United States.
 - 2. The intent of the staging tests is to demonstrate to the City that the system is ready for shipment and installation.
 - 3. The Contractor shall provide all necessary technical personnel and test equipment to conduct staging tests.
 - 4. All deviations, anomalies, and test failures shall be resolved at the Contractor's expense.
 - 5. The Contractor shall use an approved staging Factory Acceptance Test Plan (FATP).
 - 6. The Contractor shall successfully perform all tests before the City witnesses the official FATP and provide a copy of the test results.





7. The Contractor shall provide a detailed agenda for the FATP one week before the City is onsite to witness the testing.
8. The Contractor and the City shall jointly execute and date the FATP following completion of all tests.
9. All tests in the FATP shall be marked as either pass or fail.
10. The Contractor shall document all failed components.
11. The Contractor shall correct and retest all failed components.
12. The Contractor shall replace at its own expense failed components that are not repairable.
13. The decision to retest an individual failed FATP tests or the entire plan shall be at the City's discretion.
14. The Contractor shall provide the City with the fully executed and complete FATP document.

4.6 Shipping and Warehousing

- A. The Contractor shall ship and warehouse all equipment and materials at its own expense. The City will not store equipment.
- B. The Contractor shall be responsible for transporting LMR equipment to and from the Contractor's warehouse(s) and the City sites.
- C. The Contractor maintains all liability and risk for all equipment until it has been installed at the site.

4.7 System Installation

- A. Installation shall consist of a complete, tested system to include placement of associated cabling, appropriate system layout, and terminal connections.
- B. The Contractor shall provide associated power supplies and any other hardware, adapters, and/ or connections to deliver a complete operable system to the City.
- C. The Contractor shall participate in a mandatory project site survey with the City to confirm the actual equipment location within each space prior to the start of the system installation.





- D. All detailed design drawings and documents requiring changes shall be revised prior to installation.
- E. The Contractor shall coordinate with others, as appropriate, to confirm that any preparatory work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, and electrical, is complete before final inspection.
- F. The Contractor shall provide and pay for all materials necessary for the execution and completion of all work.
- G. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this RFP.
- H. All materials furnished and work completed shall be subject to inspection by the City.
 - I. The Contractor shall be responsible for preparing and submitting the necessary applications for site permissions/access to install system equipment at non-City-owned sites.
- J. Qualified, trained personnel experienced with this type of work shall perform all installations.
- K. Equipment installation will be compliant with all applicable standards for seismic bracing.
 - 1. Equipment placement in racks or cabinets shall be such that heavier items are lower in the racks while lighter items are higher in the racks to minimize the effect of centrifugal forces and swaying during an earthquake.
 - 2. Bracing of equipment is required during unattended periods of construction.
- L. The Contractor shall not use equipment supplied as spares for installation of the proposed system.
- M. The Contractor shall supply all spare equipment in new condition.
- N. The Contractor shall clean all equipment and devices and repair all damaged finishes.
- O. The Contractor shall leave sites neat and broom-swept upon completion of work each day.





- P. The Contractor shall thoroughly clean all equipment rooms and building floors and remove all scuff marks and abrasions prior to acceptance.
- Q. The Contractor shall remove all trash weekly.
- R. Inspection:
 - 1. The City shall conduct an inspection of the installations upon substantial completion.
 - 2. The City shall document any deficiencies on a single punch list and provide the punch list to the Contractor for resolution.
 - 3. System acceptance testing shall not commence until all punch list items are resolved.
- S. The Contractor shall provide the City with all programming cables required for the programming or configuring of any provided piece of equipment.

4.8 Acceptance Testing

4.8.1 General

- A. Prior to testing, the Contractor shall:
 - 1. Verify and document that all equipment, hardware, and software are upgraded to the latest factory revision (multiple revision levels among the same equipment types are not acceptable)
 - 2. Provide written notice to the City that the system is ready two weeks in advance
 - 3. Submit an Acceptance Test Plan for review and approval by the City
- B. The Contractor shall provide all test equipment and miscellaneous cables, adapters, and parts required to perform all testing specified in this RFP. All test equipment shall be calibrated prior to testing.
- C. The Contractor shall utilize quality instruments in proper condition for all tests. Calibration records for all instruments shall be available at the site during all testing.
- D. The Contractor shall perform all tests in the presence of the City or a City-approved representative.





- E. The Contractor shall submit all testing schedules to the City for approval.

4.8.2 System Acceptance Testing

- A. The Contractor shall use the completed and approved System Acceptance Test Plan (SATP).
- B. The Contractor shall successfully perform all SATP tests before the City witnesses the official SATP.
- C. The Contractor and the City representatives shall jointly execute and date the SATP following completion of all tests.
- D. All tests in the SATP shall be marked as either pass or fail.
- E. The Contractor shall provide all necessary technical personnel and test equipment to conduct SATP tests.
- F. All deviations, anomalies, and test failures shall be resolved at the Contractor's expense.
- G. The Contractor shall document, correct, and retest all failed components.
- H. The Contractor shall replace at its own expense any failed component that is not repairable.
- I. Retest of individual failed SATP tests or the entire plan shall be at the City's discretion.
- J. The Contractor shall provide the City with the fully executed and completed SATP document.

4.9 Coverage Testing

- A. The Contractor shall complete radio coverage testing with witnesses from the City, utilizing Bit Error Rate (BER) testing. The Contractor shall submit appropriate documentation confirming lab testing of the Bit Error level for the portable radio, which will yield the equivalent of a DAQ 3.4 audio quality. Likewise, the Contractor shall test the system to that level.
- B. The BER test results shall be the determining factor for pass/fail of the P25 system on-street system coverage.





- C. The Contractor shall submit a Coverage Acceptance Test Plan (CATP) that will validate the coverage requirements defined in Section 2.4.
 - 1. The CATP shall be consistent with the procedures and guidelines outlined in the current version of TSB-88.
 - 2. Coverage testing shall only commence after the radio system is fully optimized, tested, and aligned.
 - 3. Significant changes to the system will require retesting of coverage at the City's discretion.
 - 4. The Contractor shall perform automated talk-out and talk-in objective BER drive testing.

- D. Test configurations:
 - 1. Test configurations shall represent typical operating configurations to the greatest extent possible, using portable and mobile radio equipment (including the proper microphones) that will be used with the system. In addition, the proper subscriber antenna location (e.g. roof-mounted, hip-level, etc.) should be simulated during the testing, and the attenuator values required to simulate those locations shall be submitted to the City for their review and approval prior to testing.
 - 2. Automated objective drive testing:
 - a. The Contractor shall test on-street BER, using a portable to be used on the system.
 - b. The Contractor shall test at a statistically significant number of test locations throughout the City. Methods for determining the minimum number of tiles are provided in TSB-88.
 - c. The Contractor shall test both talk-out and talk-in BER.

- E. For testing purposes, the City shall be divided into 1/4-mile square test tiles .25-mile x .25-mile. The Contractor may subdivide test tiles if necessary.

- F. The Contractor shall not count inaccessible test tiles as a pass or fail in the statistical analysis.





- G. Should the coverage test fail, the Contractor shall correct the cause of the failure and re-conduct the coverage test in its entirety.
- H. The Contractor shall measure talk-out and talk-in performance separately for each test tile (i.e., BER shall be measured in both directions in each test tile), and the overall system pass/fail percentages shall be calculated.
- I. The Contractor shall provide a standardized test form for testing.
- J. The Contractor shall provide raw data (Microsoft Excel format) immediately following testing.

4.10 Training

4.10.1 Training Programs

- A. The Contractor shall develop and conduct training programs to allow the City personnel to become knowledgeable with the system, subsystems, and individual equipment.
- B. The Contractor shall provide:
 - 1. Operational training
 - 2. System management training
 - 3. System repair training
- C. Operational training shall include the following categories:
 - 1. APCO P25 Fundamentals
 - 2. P25 Portable Unit Operation
 - 3. P25 Mobile Unit Operation
 - 4. P25 IP Console Operation
- D. System management training shall include, but is not limited to:
 - 1. Planning and setting up the system and network
 - 2. Building and implementing system and network profiles and configurations





3. Dispatch console administration training
- E. System repair training shall include, but is not limited to:
1. Console and RF site equipment troubleshooting
 2. Replacement of "field replaceable units"
 3. Programming of system equipment
- F. The Contractor shall:
1. Conduct all training at a location where duplication of system operation will not impact daily operations
 2. Coordinate with the City regarding number of attendees, schedule, and training location
 3. Schedule classes as close to system cutover as possible
 4. Train the City employees or designated individuals
- G. For console and subscriber operator training, the Contractor shall provide "train-the-trainer" courses to selected City personnel.

4.10.2 Training Materials

- A. The Contractor shall provide all instructional material for all technical and operational training classes for the exact model and series of equipment delivered, including:
1. Printed manuals
 2. Audio, video, interactive self-paced personal computer programs
 3. Complete equipment operating instructions
- B. All instructional material shall be subject to the approval of the City and shall become the property of the City.
- C. Training materials shall be professionally produced and provided in binders.
1. Loose-leaf materials are not permitted.





2. The paper shall be 8 ½ x 11" whenever possible.
 3. If a larger paper is utilized, it must be professionally incorporated into the document.
 4. Binders shall be color-coded where it will provide an organizational benefit.
 5. Illustrations and photographs, where provided, shall be specific to the City installation.
 6. Color photos must be provided where detail or clarity is supported by the use of color.
 7. Black and white photocopying of color materials is unacceptable.
- D. The Contractor shall provide fully editable (softcopy) versions of all training materials so that the City trainers can update the course materials.

4.11 System Cutover

4.11.1 Cutover Plan

- A. The Contractor shall develop a Cutover Plan for review and approval by the City. The City reserves the right to approve and change the cutover plan as it relates to any or all system components. The Cutover Plan shall be logical and must consider every facet of the existing and new networks. Key objectives of the Cutover Plan are:
1. Ensure new systems are brought online with minimum interruption to all existing systems and communications.
 2. The Contractor shall be responsible for planning and coordinating the implementation of all equipment, subsystems, and the overall system.
 3. The Contractor shall:
 - a. Be responsible for any costs associated with their proposed cutover plan
 - b. Program the users' existing and/or new radios
 - c. Identify the cutover of individual circuits
 - d. Identify temporary alternate routing of critical circuits





- e. Include fallback, recovery, and contingency plans to mitigate the risk of circuit failure during cutover
 - f. Maintain reliable and stable communications
 - g. Ensure the timely deployment of a complete and functional network
 - h. Identify physical and technical constraints that must be considered for successful implementation planning, such as site ownership, site access, outdoor cabinet space, tower loading and availability, and electrical load limitations
 - i. Ensure successful integration with all legacy systems, including a smooth transition from existing operations
 - j. Clearly define roles and responsibilities between the Contractor and the City
- B. The Cutover Plan shall demonstrate that it meets the following requirements:
- 1. Supports the operational requirements of each participating agency
 - 2. Ensures users and technical staff are prepared for the migration to the new network
 - 3. Mitigates risk
 - 4. Does not exceed maximum outage times
 - 5. Considers site access issues, such as sites that are inaccessible during winter months
- C. During detailed design, the Contractor shall deliver a draft Cutover Plan describing how the existing radio systems will be migrated to the new system.
- D. The Cutover Plan shall:
- 1. Include the schedule and procedures associated with the transition of each operational user group
 - 2. Specifically address how the existing users will begin using the new system with minimal operational impact
 - 3. Provide detailed component or subsystem cutover plans and specifically delineate between systems that affect and do not affect ongoing operations
-





- E. The City reserves the right to approve and change the Cutover Plan as it relates to any or all system components.

4.11.2 Cutover Execution

- A. After successful completion of all tests and training, the Contractor shall execute the system cutover according to the approved Cutover Plan.
- B. Any modifications to the plan shall be proposed to and approved by the City at least ten business days prior to execution.
- C. The Contractor shall provide 5 business days advance notice for required outages of the existing system during the cutover. All planned outages require the approval of the City.
- D. The Contractor shall provide the necessary labor to cutover from existing systems to the new system.

4.12 Decommissioning, Removal, and Disposal of Legacy Equipment

- A. The Contractor shall remove existing equipment (e.g., transmitters, consoles, mobiles, cables, and antenna systems) not being reused in the new system or identified for future use by the City.
- B. The Contractor shall maintain a detailed inventory of all equipment removed, listing the following at a minimum:
 - 1. The owning agency
 - 2. Model numbers
 - 3. Serial numbers
 - 4. Asset numbers
 - 5. Location removed from
 - 6. Location within the warehouse
 - 7. Trade-in or disposition value
- C. The Contractor, at its sole expense, shall warehouse, as necessary, removed equipment prior to disposal.





- D. The Contractor, at its sole expense, shall transport all removed equipment to the City-specified disposal location.

4.13 As-Built Documentation

- A. At the completion of each implementation phase, the Contractor shall provide complete as-built documentation as outlined below:
 - 1. Equipment provided
 - 2. Plan and elevation drawings of all equipment including antennas on towers
 - 3. Floor plans
 - 4. Cabling and terminations
 - 5. Block and level diagrams
 - 6. Fleet mapping and programming
 - 7. Setup, configuration, and alignment information, including commissioning, provisioning, testing, and turn-up
 - 8. Successfully completed, signed, and dated Coverage and System Acceptance Test Plans
- B. The Contractor shall provide final documentation in printed form:
 - 1. Six bound, hard copy, printed sets
 - a. Hand-modified drawings are not acceptable.
 - b. Hard copies of all drawings shall be 11" x 17".
 - 2. The Contractor shall provide final documentation in electronic form:
 - a. All drawings in Microsoft Visio native format
 - b. All other documentation in Microsoft Word or Excel native format
 - c. A copy of all drawings and documentation in Adobe Portable Document Format (PDF)





4.14 System Acceptance

- A. The City shall deem the system ready for final acceptance following successful completion and approval of the following:
1. Detailed Design Review
 2. Staging Acceptance Test Plan
 3. All contracted installations completed
 4. Final inspection and punch list resolution
 5. As-built documentation
 6. Coverage Acceptance Test Plan
 7. System Acceptance Test Plan
 8. Delivery of final documentation
 9. Successful completion of (30)-Day Burn-in test
 10. Training completed
- B. No conditional acceptances will be granted.





5. Warranty, Maintenance, and Support

- A. The Contractor support includes the initial 3-year warranty, software and firmware upgrade support, and spare parts and equipment.

5.1 Warranty

- A. All equipment provided shall be new and covered by a full manufacturer's warranty for three (3) years, commencing with the City's final acceptance of their portion of the system or mutually agreed project phase.
- B. System performance, installation, and all hardware, parts, software, and materials (including third-party equipment) shall be warranted for three (3) years.
- C. Warranty coverage shall include all related return and delivery fees.
- D. The Contractor shall provide a single toll-free telephone number staffed and available 24 hours a day, 7 days a week, 365 days a year, for service requests, technical support, and warranty claims.
- E. The City shall have the right to perform any maintenance and/or repairs required during the warranty period without voiding or affecting the Contractor's warranty.
- F. If Contractor level support is required, the following repair response time and repair-completed time criteria shall be in effect:
 - 1. The Contractor shall contact the City within 30 minutes of telephone notification for a service issue.
 - 2. The Contractor's qualified service representative and the City's representative shall attempt to resolve the Critical Service issue over the phone or via remote network management.
 - 3. If the Contractor's qualified service representative and the City's representative cannot resolve the issue remotely or over the phone, then the City shall make the determination regarding the criticality of the service issue. If determined to be critical, the Contractor shall dispatch a qualified service representative to the site experiencing the service issue.
- G. The Contractor shall repair all equipment, hardware, and software throughout the implementation, cutover, and warranty periods.





- H. Replacement parts shall be new or original repaired parts only.
- I. Fixed-equipment mail-in repair shall be completed within seven calendar days of receipt.
- J. Serialized units sent in for depot repair must not be exchanged unless specifically authorized by the City.
- K. The original unit must be repaired and returned unless specifically authorized by the City.
- L. The Contractor shall warrant all software and firmware.
- M. During the installation, warranty, and extended warranty periods, the Contractor shall provide, at no additional cost, commercially available upgrades of all software and firmware originally sold to the City.
- N. The frequency and timing of installation of upgrades during this period shall be at the sole discretion of the City based on availability by the Contractor.
- O. The Contractor shall provide all backup media and revised software manuals to the City at the time of any software revisions at no cost.
- P. The Contractor shall update all devices to the same and latest release level prior to the conclusion of the warranty period at no additional cost to the City.
- Q. Recurring Failures and Manufacturer Defects:
 - 1. Any fixed equipment or fixed equipment module that fails twice during the acceptance test or twice during the first 12 months after System Acceptance shall be indicative of a recurring or systemic failure or defect that warrants further investigation by the Contractor and City.
 - 2. If the defect is deemed by the City to be systemic after the investigation is completed, the Contractor shall then be responsible for replacing at no additional cost to the City all equipment and/or equipment modules related to the recurring or systemic failure, not only the specific equipment affected.
 - 3. The Contractor, at no additional cost to the City, shall correct latent design defects or recurring problems relating to software, firmware, hardware, or overall system design during the warranty period.





- R. During the warranty period, the Contractor shall correct all system malfunctions due to software at no additional cost to the City.

5.2 Parts Availability

- A. The Contractor shall certify that replacement parts for all delivered equipment shall be available for a period of at least 10 years after the last date of production.
- B. In the event the Contractor plans to discontinue the manufacture of any product-line or stocking of any part required for maintenance in the system, the Contractor shall send written notice to the City 24 months prior to the date of discontinuance to allow for last-time buys and spares replenishment.

5.3 Spare Equipment

- A. The Contractor shall include recommended initial spare parts and equipment to be procured as part of the initial contract.
- B. The initial spare parts and equipment shall include, but is not limited to, the following:
 - 1. All Contractor-identified Field Replaceable Units (FRUs)
 - 2. All infrastructure components having no FRUs, but that can cause a critical failure
 - 3. Power supplies
 - 4. Required and/or recommended test, measurement, calibration equipment, and repair kits
 - 5. Recommended diagnostic equipment to support the City maintenance activities
- C. Initial spares for less critical items shall also be enumerated
- D. The spare parts and equipment shall include items that will rapidly and completely restore all critical system functionality with the least amount of effort (e.g., board replacement instead of troubleshooting to component level when a critical unit fails).
- E. The Contractor shall determine the types and quantities of spares based on their proposed system size and design.





- F. The Contractor shall define the primary equipment category each spare kit supports (e.g., transceiver board for a base radio or interface board for a router).

5.4 Lifecycle Support

- A. System(s) shall not be accepted with components or equipment at the end of their respective lifecycles.
- B. Contractor shall provide a roadmap for end-of-life dates on existing and/or proposed products.
- C. A product for which development and/or distribution will be discontinued within the next 5 years shall be considered "end of lifecycle" products.
- D. The City shall have the option to purchase post-warranty service for the entire system and all provided subsystems and associated equipment.
- E. The Contractor shall:
 - 1. Provide spare parts and equipment at a discounted rate for the life of the contract.
 - 2. Provide technical support at a discounted rate for the life of the contract.
 - 3. Provide engineering services at a discounted rate for the life of the contract.
 - 4. Offer OPTIONAL service tier(s) for the system.
 - 5. Provide discounted software support and upgrades for the system.





6. Options

6.1 Network Management System (NMS)

- A. As an Option, the Contractor shall propose a Network Management System that provides a central source to view and manage site alarms and the operating status of individual system components.
- B. The City shall be responsible for the backhaul networking, providing connectivity between the RF sites and dispatch center.
- C. The NMS shall be a hierarchical system capable of incorporating multiple management systems into a high-level management system that provides a single point to manage multiple subsystems.
- D. The NMS shall monitor real-time and ensure proper equipment configuration, operation, and integration of existing systems.
- E. The NMS shall monitor and allow remote configuration changes to the following subsystems at a minimum:
 - 1. RF site equipment
 - 2. Dispatch console subsystem
 - 3. Site alarms (environmental)
 - 4. Any other proposed subsystem
- F. The NMS shall display system status and alarm conditions.
- G. The NMS shall support Simple Network Management Protocol (SNMP), allowing interfaces with higher-level network management systems.
- H. The NMS shall provide Simple Mail Transfer Protocol (SMTP) and Short Message Service (SMS) support for email and text notification of system issues and alarms.

6.2 Network Management Terminal (NMT)

- A. As an Option, the Contractor shall furnish one NMT.
- B. The NMT shall include:





1. Computer
 2. Display
 3. Keyboard, mouse, interfaces
 4. Networking equipment
- C. The NMT shall provide administrative and user profiles that set permissions for each set of user credentials.

6.3 Site Alarms/Environmental Alarms

- A. As an Option, the Contractor shall furnish all hardware and software to monitor, at a minimum, 20 conditions/points at each site (system control, simulcast/voting, dispatch, microwave backhaul, and RF sites). At a minimum, the following alarms shall be monitored:
1. Door open/close
 2. Temperature high/low
 3. Power failure (AC and DC)
 4. DC Plant failure
 5. Generator run and trouble
 6. Smoke alarm
- B. The proposal shall assume existing sites to be reused in the system design will contain a punch block where existing environmental alarms shall be available.

