

Town of Gray, Maine

REQUEST for PROPOSAL

For

DIGITAL CAPABLE TWO-WAY RADIO SYSTEM

Technical Requirements

July 10, 2022



1.0 Project Overview

Town of Gray seeks proposals from interested suppliers for a digital-capable land mobile radio system. The selected supplier shall engineer, furnish, configure, install, and commission the Town's digital land mobile radio system. The proposed system shall comply with the DMR Tier II open standard as part of this initial system installation and shall also be capable of a software upgrade to support P25 Phase 1, should this option be chosen in the future.

1.1 Existing Two-Way Radio System

Presently, the Town of Gray operates on a VHF Legacy analog system. The system has reached end-of-life, and our coverage has diminished with the advent of narrow banding. The system operates on VHF frequencies, 12.5 kHz channel.

1.2 New VHF Radio System

The new radio system will replace the legacy system with a new digital system. The new system will improve reliability and operational costs by replacing the aging technology at the end of its life cycle. The advanced digital technology will be capable of providing new communication functions and features and will operate at greater spectral efficiency. The build-out of the new digital land mobile radio system will utilize existing infrastructure, including existing buildings and tower sites. The system will be interconnected using the licensed microwave. The system shall use IP for its backhaul and, to the greatest extent possible, commercial off-the-shelf computers, switches, and servers (COTS) for system management and control.

1.3 Goals and Scope of the Project

This RFP aims to procure a DMR Tier II capable (4) site simulcast radio system. The new simulcast radio system is to:

- Provide the most cost-effective solution, including capital and ongoing operating and maintenance costs.
- Provide an open standards-based system with true, multi-vendor interoperability to lower capital and operations costs.
- Provide a modern digital radio system with twice the spectral efficiency of the legacy system
- Increase reliability and radio system availability while improving maintenance efficiency.
- Leverage software-defined radio technology to reduce operational costs.
- Support required system and user features/applications/use cases and interfaces as further delineated herein.
- Complete successful installation, deployment, commissioning, system tests, and migration to the new radio system.

1.4 The scope of the system entails:

- Upgrading as required land mobile infrastructure at the Water Tank, Fire Station, WPXT Tower, and a new installation at the State of Maine Gray Barracks Tower.
- Upgrades as required to site back-haul linking.
- Provisioning of new digital land mobile radio infrastructure.
- Provide new antenna transmission feed lines to the Fire Station, WPXT, and State of Maine sites.

- Provide antenna system duplexers for (3) sites.
- Provide (3) Carrier-grade, Licensed Microwave links to interconnect the sites.

2.0 Roles & Responsibilities

2.1 Customer Responsibilities.

The town of Gray will be responsible for:

- Negotiating leases or agreements with the State of Maine to use the Gray Barracks Tower and other tower sites.
- If any Letters of Concurrence are required from other agencies, Gray will acquire signatures from the agencies as needed.
- Ensuring vendor access to the proposed tower site locations.

2.2 Supplier Responsibilities:

Supplier shall engineer, furnish, configure, install, and commission the digital land mobile system. This includes providing all site radio system equipment, antenna system equipment, and new antenna transmission feed lines and connections to the current CCRCC Zetron console system.

2.3 Project Management:

The vendor shall provide a qualified project manager for the project. This person will have project management and telecommunication skill sets and provide comprehensive project management and coordination. The project manager will meet with the Fire Chief or the Assistant Chief either in person, virtually, or by phone each Monday to give a recap of the previous week and anticipated work for the coming week.

3.0 System Description

This is a request for a proposal to engineer, furnish, configure, install, and commission a multi-site, wide-area Tier II DMR capable simulcast/voter radio system.

The radio system shall operate within a 12.5 kHz bandwidth in the 150 MHz frequency band and be designed to support voice, automatic vehicle location (AVL), and low-speed data services. The Town has licensed VHF MHz frequencies under FCC Part 90 rules. This spectrum will be used to support the new system.

3.1 DMR Open Standards

The system shall be DMR Tier II Conventional. The radio system shall be fully compliant with the European Telecommunications Standards Institute (ETSI) Digital Mobile Radio Standard TS-102 361-1, 2, 3, 4. This is a two-slot TDMA 6.25 “equivalent” technology. The system shall have an IP-based interface capable of supporting interoperability with other digital Land Mobile and commercial PTT radio applications. The Town strongly supports the DMR open standards, and the evaluation of the proposed system will hinge on the ability of the system to support third-party subscriber mobile/portable units and console systems. Suppliers shall, in their response, state if any portion of their proposed system is proprietary or limits the number of third-party suppliers.

The backbone of the system shall consist of multiple repeater sites connected to a wide area controller(s), or switch(s), to provide reliable wide-area voice communications to and from mobile and portable units and central console systems throughout the Town of Gray's service areas. To enhance system reliability, and avoid single points of failure, distributed control architecture, is strongly recommended.

For the new system, emphasis will be placed on a system design that provides fault-tolerant, highly reliable, high quality, minimum latency 2-way communications throughout the service area. If multiple wide-area controllers are necessary to provide the required network coverage and reliability, they must be capable of being linked for extended system-wide communications.

As described in later sections, all controllers or system switches will have redundant backup units if present in the design. The network communications architecture shall provide the radio user with transparent radio communications across the entire coverage area. The proposed simulcast radio system shall permit the radio user to travel across the entire coverage area without requiring manually switching or changing sites.

To reach the requested degree of radio coverage without adding more frequency pairs, especially in areas where the number of calls to be managed is low, the proposed Simulcast/voter system shall be simulcast capable without adding any optional hardware.

Another critical element is the successful installation and conversion of the proposed new system and related project management and communications. The transition from the present conventional radio and analog voted systems to the proposed DMR system shall be seamless. The Supplier shall continuously work with the project team to complete the final design, support the schedule, and coordinate testing, installation, proof of performance, and cutover.

3.2 Microwave Interconnectivity.

Site interconnectivity shall be accomplished in the following way:

- 3.2.1 Continue to use the existing CCRCC owned microwave between the WPXT site and the CCRCC New Gloucester site
- 3.2.2 Remove the existing microwave link between the CCRCC New Gloucester site and the Water Tank and install a new microwave link between the CCRCC New Gloucester site and the Fire Station.
- 3.2.3 Install a new microwave between the Fire Station and State of Maine Gray Barracks Tower.

3.3 System Block Diagram:

The supplier will provide a complete high-level block diagram for the entire proposed system showing the repeater sites, wide-area controller(s) or local controllers as applicable, dispatch consoles, and any other major system components (system management computer, AVL interface, etc.).

3.4 System Configurations:

For maximum reliability, the proposed system shall be capable of being configured in a fully decentralized mode without the necessity for a centralized switch. This shall provide for local

area communications without the requirement of providing back-haul to a centralized switch. All communications traffic shall be peer-to-peer/site-to-site. Loss of a site(s) or connectivity to a site(s) shall not degrade wide-area communications amongst the remaining sites operating in decentralized configuration. The supplier shall specify any limitations to the number of sites/channels/groups/users that can be combined into a fully decentralized configuration.

To accommodate the legacy backhaul networks, the system shall also be capable of being configured in a fully centralized mode of operations using a centralized switch. All inter-site traffic is routed through the centralized switch. Loss of a site(s) or connectivity to a site(s) shall not degrade wide-area communications amongst the remaining sites operating in the centralized configuration.

3.5 Repeater Site Locations

Site 1: Fire Station, 125 Shaker Rd, 43°54'3.17"N, 70°20'42.94"W

Site 2: Water Tank, off Yarmouth Rd, 43°53'14.33"N, 70°19'19.41"W

Site 3: WPXT (the small tower on the roof), Eagles Nest Rd, 43°51'5.12"N, 70°19'37.90"W

Site 4: State of Maine Gray Barracks Tower, Game Farm Rd, 43°55'46.23"N, 70°21'7.31"W

The supplier shall provide a block diagram of the space required and rack layouts for each repeater site configuration, showing all major components at the site and the quantity and type of communication circuits needed to connect the site to the wide-area controller in Visio format. A block diagram and rack layout for each site IS NOT required. But each site representative "configuration," e.g., 2 carrier, 3 carrier, 4 carrier, etc., shall be included in the suppliers' response.

3.6 Site Backhaul Circuits:

The proposed microwave back-haul shall be carrier-grade and be a minimum of 50 Mbps bandwidth using an FCC-licensed frequency spectrum (not 4.9 GHz) with reliability of 99.9990% minimum. The vendor will be responsible for hardware at the radio site to interconnect the radio system to the IP network.

Suppliers must include all path engineering design and link budget documentation in their response.

3.7 DMR Tier II

Gray anticipates there may be discrete parts of its operations, such as the generating stations, disaster recovery, interoperability, etc. Gray will want to continue operating in conventional mode but take advantage of digital technology innovations.

Supplier shall state if the proposed system can operate in DMR Tier II Digital simulcast and Conventional simulcast modes. The supplier shall describe their digital conventional system operations and any additional equipment or software required.

Gray prefers that analog communications can occur on the same Tier II hardware. If not, the supplier shall state any limitations on the system.

To assist with system cutover, Gray would like to first upgrade the site equipment with Tier II capable equipment and allow users to operate as they always have, but in analog mode. Then, when Gray chooses in the future, after all radios have been upgraded, they will cutover to digital mode. The supplier will explain if this option is available and how the transition/cutover would occur. Gray prefers a smooth cutover with as little change to the end-user "radio experience" as possible.

3.8 Simulcast

Gray prefers a simulcast option where control points are "soft" - defined by software versus hardpoints defined by hardware. The simulcast/voter system should not have a single point of failure that would result in an inoperable system. The supplier shall describe redundant features for synchronization and equalization of the signal for the voting process. The simulcast/voter system should have a small footprint and fit within a standard EIA 19" rack.

3.8.1 Provide a description of how the proposed simulcast/voter system operates, unique features, etc.

3.9 Additional RF System Options and Features

Gray has outlined the requirements for the Digital Two-Way Radio System herein. There may be additional software and hardware options and features the Supplier system incorporates that would provide additional value to help boost system performance, reduce the cost of ownership, and extend the useable life of the proposed system. For example, areas of interest are software-defined radios that can support additional RF and system configurations without the requirement of additional hardware to support interoperability, system, and coverage enhancements. The supplier shall state whether such options and features are included or available as options and describe how the choice would be enabled and associated costs.

4.0 Radio Coverage Requirements and Testing

4.1 Mobile Radio Coverage

The system shall be designed for reliable communications using mobile radio units.

4.2 Coverage Guidance

Coverage predictions must be conducted in accordance with TIA TSB-88 latest version to the greatest extent possible, and the following TSB-88 definitions shall be used. All coverage testing will be performed in both analog and digital modes.

The Service Area is the Town of Gray. Ideally, the new system will provide Gray radio communication capability to and from Maine Medical Center, Mercy Hospital, Central Maine Hospital, and Saint Mary's Hospital. The proposal will identify the feasibility and any additional costs associated with this requirement.

- The target device for two-way communications shall be mobile radios with a quarter-wave whip antenna mounted in the center of the roof.
- Basic network coverage shall be designed to accommodate vehicles traveling at speeds up to 70 MPH.
- Channel Performance Criteria (CPC), the minimum design performance in a faded channel, shall be a Delivered Audio Quality (DAQ) of DAQ3.0.
- Reliability Design Goal should be a service area probability of 95%.
- Required Service Area Reliability CPC target shall be 95% of the Service Area.
- Mobile radio talk-in and talk-out balance shall be within two db.

4.3 Coverage Maps

Suppliers shall include their response coverage maps for their proposed system. Radio coverage shall be predicted using the "Okamura-Hata" radio propagation model, which was developed based on theoretical and empirical data and considers terrain irregularity, foliage, urban clutter, noise, and long and short-term signal variations. The use of other radio propagation models must be approved by Gray. If the respondent requests to use a different model, it shall be clearly identified, and the rationale for system losses (e.g., power, gain, etc.) and performance shall be provided. Coverage maps will meet the following guidelines:

- 4.3.1 The supplier shall provide their coverage maps using a "tiling" style output with a resolution of at least 0.5 miles per tile both vertically and horizontally. Simple contour maps are not acceptable for system planning and design. The Town of Gray's service area boundary and appropriate highway, city, and county boundaries shall be included in all coverage plots. An electronic shapefile (.shp, .dbf and .shx) with the service area is available upon request.
- 4.3.2 The supplier will provide detailed RF propagation coverage maps for both the individual sites and a composite system map for both mobile talk-in and talk-out.
- 4.3.3 Coverage plots shall be presented on a drafting standard ANSI Size A drawing or larger (smaller size is unacceptable). The supplier will supply three sets of coverage maps. An electronic version of the plots is desirable in pdf or other acceptable format but does not replace the requirement for printed outputs.
- 4.3.4 Included with coverage maps Supplier will include a spreadsheet(s) with all input link budget data used to develop the coverage plots and a spreadsheet(s) with all output

data resulting from the map calculations. These will include but not be limited to, for each site, transmitter power output, combiner losses, adequate radiated power, antenna pattern used, antenna height, and field strength(s) required to meet coverage requirements. The supplier will supply any reasonable additional information requested by Gray not included on spreadsheets to validate the coverage predictions.

4.3.5 Coverage maps will include (either on them or on a related spreadsheet) the following:

- Name of Site
- RF Power Output and ERP
- Repeater antenna height, gain, and orientation (if applicable)
- Effective receiver sensitivity
- Mobile antenna type and height above ground
- Mobile RF power output (Gray anticipates using 50-watt mobiles)
- Portable RF Power output 6 watts

4.3.6 RF Coverage Testing

RF coverage testing may be required at the Town's discretion. The purpose is to characterize and verify that the system design and installed equipment meet Gray's requirements and as proposed by the supplier. If requested, coverage testing will occur after the system is installed, commissioned, and aligned. The cost for this testing should be included as a separate optional item.

4.3.6.1 All costs for testing (except for Gray personnel and vehicles involved in witnessing and participating in tests) shall be borne by the vendor and, as needed to be included in the vendor's optional proposed costs.

4.3.6.2 Gray and vendor personnel talking over the radios to verify that DAQ 3.0 intelligibility is attained. Delivered Audio Quality 3.0 is defined as "speech understandable with slight effort – occasional repetition required due to noise/distortion." The human intelligibility tests shall incorporate both talk-out and talk-in test formats.

4.3.6.3 Conformance Test Confidence Level (TSB-88) of 99 percent shall be attained. Respondent shall describe their proposed automated field test and validation procedures, including how representative tiles will be selected and sampled, the number sampled, and test parameters used to validate system performance.

4.3.7 Voice Quality

Coverage is defined as the minimum signal required to provide Delivered Audio Quality of 3.0 (DAQ 3.0). DAQ 3.0 is defined as "speech understandable with slight effort with occasional repetition required due to noise/distortion." Gray expects that most areas will have a DAQ better than this, typically DAQ 3.4. For digital system acceptance testing purposes, the supplier shall relate the voice quality ratings to a signal level, BER, and Frame Error Rate.

5.0 Radio Spectrum and Channel Assignments

- 5.1.1 Gray has a single VHF repeater pair currently licensed under FCC Part 90 rules.
- 5.1.2 This spectrum will be used to support this new system.
- 5.1.3 Repeater Channel Assignments and FCC Licensing
 - 5.1.3.1 The existing frequencies to be used by the new system are as follows by site:
- 5.1.4 FCC Licensing.

It will be the Suppliers responsibility to submit all required FCC license applications.
- 5.1.5 The supplier shall compose the required Letters of Concurrence. It will be Gray's responsibility, if needed, to acquire all signatures for any Letters of Concurrence from other agencies.

Site #	Site Name	Frequencies	Current License	Required License Changes
1	Fire Station	154.3250 TX	License KNHB594 Location 2 FB, 98', 100 watt/100 watt ERP	- Change FB to FB2 - Add DMR emissions
2	Water Tank	154.3250 TX	License KNHB594 Location 6 FB2, 78', 100 watt/80 watt ERP	- Add DMR emissions
3	WPXT	154.3250 TX	Not Licensed	- Add a new FB2 location with analog DMR emissions
4	State of Maine Gray Barracks	154.3250 TX	License KNHB594 Location 1 FB2, 275', 110 watt/88 watt ERP	- Add DMR emissions
	Repeater input	155.7150 RX	License KNHB594 Location 4 MO, 100 watt/100 watt ERP 17km around Location 1	- Add DMR emissions

6.0 System Requirements

6.1 Core Functional Requirements

- 6.1.1 The minimum basic operational mode of the system will be DMR Tier II Simulcast/voter system, with field units monitoring DMR and analog channels. Most of the communications will use this mode, with communications taking place through repeater sites located throughout the served territory.
- 6.1.2 Wide area calls over multiple sites will take place in a similar manner, except calls will be routed to the applicable repeater sites by a wide area call control management system and switch(s). The mobile and portable radios will also enable users to manually select communication modes such as conventional channels or talk-around mode when out of range of the repeater site.

6.1.3 Wide Area Communications

The system shall provide the ability to place and receive calls to and from any point in the network covered by the DMR repeater sites. All sites shall be linked to the wide-area radio network using an IP microwave.

6.2 General Features

6.2.1 Channelization

The system shall be designed to operate within 12.5 KHz frequency channels in the 150 MHz spectrum and with 6.25 KHz “equivalency.”

6.2.2 Interoperability

The Supplier shall describe industry standards related to “over the air” interfaces and operation. Solutions that utilize open standards are preferred. The Supplier shall state what Tier level the system has been certified by the DMR Association. The Supplier shall also include, with the proposal, copies of each Tier level certification. If the proposed system is not certified at a Tier III level, the Supplier shall state when the proposed system is expected to be certified and explain why it is not certified at a Tier III level at the time of the RFP submittal.

Automatic is defined as operating without operator (user or dispatcher) intervention. It is acceptable for an operator to be required to set up the initial connection. However, all subsequent inter-system communications should occur without any human intervention. The supplier shall explain how this is accomplished.

6.2.3 Caller Identification and Alias

The radio ID shall be included in each transmission. The system shall display this ID on its associated group module in the console at the dispatch center. Mobile and portable radios shall be able to display the calling unit ID for both individual and group calls. Each mobile radio, portable radio, control station, and dispatch console shall be capable of displaying an alphanumeric alias corresponding to the unit ID if so programmed into the system.

6.3 Trunking Features

***** Any mention of trunking or trunking features is this bid shall be a capable/ future-ready option, without additional infrastructure “hardware” upgrades *****

6.3.1 Basic Trunking Operation

The system shall support a voice group (talk group) operation, where a voice group consists of a number of operational users distributed through the radio network. The radio user manually selects the voice group he wishes to communicate with and then presses PTT on the radio. If resources are available, the system shall respond by establishing a voice call to the selected group.

Once the group call has been established, the voice from the source radio is transmitted to all members of the group, which may involve multiple repeater sites. The system shall track voice group members as they roam through the network and ensure that each multi-site call is routed only to the repeater site(s) containing members of that voice group. The system shall support “all calls” through a suitable definition of a voice group membership.

6.3.2 Call Queuing

If resources are not immediately available, the system shall queue the request and inform the

user that the call is queued through a suitable audible indicator. The user can then release PTT. Later, when channel resources become available, the system shall establish the call and notify the user through an audible “grant” indicator. The user can then press PTT, and the call proceeds normally. The queuing system shall have multiple levels or priorities. The supplier shall state the number of priority levels available.

6.3.3 Dispatcher Override

This feature ensures that calls originating from a dispatch console (Design A or B) cannot be blocked by regular members of the same voice group. The system shall permit a call originating from a dispatch console to interrupt a call by a regular member of the same voice group, overriding the call so that other members of the voice group only hear the dispatcher.

6.3.4 Emergency Alert and Emergency Call

The system shall support an emergency call for mobile and portable radios. When the emergency button is pressed on a mobile or portable radio, the radio shall transmit an emergency alert message to the central dispatch locations and all other radios within that talk group. The emergency button must be held down for a pre-programmable time duration before an emergency alert can be activated (to prevent false activation). At a minimum, this programmable function shall be from 0 to 3 seconds.

The emergency alert message should include the radio ID, alphanumeric alias (if available), emergency talk group, and the location of the radio (if available through AVL). The system shall immediately establish an emergency voice call upon receiving an emergency alert message.

An emergency voice call shall be a message trunked call with the highest priority and an infinite hang time. The system shall permit the call to be cleared only from a dispatch console (Type 1) or a system administration console.

6.3.5 Late Call Entry

The system shall permit a user who has just re-entered radio coverage or was engaged in another call to late enter into a call in progress. The Supplier shall indicate the typical average delay between a radio entering service (for example, completing another call) and beginning a new call through late entry.

6.4 System Reliability and Fault Tolerance

System reliability and fault-tolerance shall be major objectives in the system’s design. The supplier shall describe in detail all measures taken to ensure the reliable operation of the system. This includes, at a minimum, the repeaters and system management computer.

6.4.1 Wide Area Control

The system shall be designed such that there are no situations where a single failure in equipment will disable wide-area operation. No single point of failure within the wide-area controller(s) shall prevent any unit from normal operation. Gray desires a system configuration whereby wide-area controllers are configured in a cluster such that if one controller fails, the second controller assumes call control management. Gray also desires a system whereby wide-area controllers incorporate geo-diversity. The supplier shall describe

how the same is realized if a distributed approach is proposed.

The wide area controllers will be supplied as a cluster in a hot-standby redundant configuration. A second set of hot-standby wide-area controller equipment shall be capable of being located in a remote backup emergency operations center interconnected by an appropriate communication media such as Gray's microwave, fiber, or leased circuits.

The backup site will be several miles from the primary operations center. The supplier shall state the number of circuits, type, and communication bandwidth required for the remote backup control connectivity for the hot-standby wide-area controller functions.

6.4.2 Failover

A hot-standby wide-area controller shall take full control within 15.0 seconds after sensing that the primary unit has failed. Any loss of voice or data communications shall be limited to the interval from the failure of the primary unit to the time the standby unit takes full control. The supplier shall describe the performances and pros and cons if a distributed approach is proposed.

6.5 Repeater Site Requirements

Equipment provided at each site shall consist of repeaters and all other associated hardware and software for the proposed system.

6.5.1 Duty Cycle

All transmitting and receiving equipment (all repeater channels) shall be capable of 100% continuous duty cycle operation limiting the use of fans or blowers.

6.5.2 Transmitter ID

All repeaters shall be able to transmit automatic call sign identification that meets the FCC requirements for identifying trunked repeater sites.

6.6 Programming Software

All required programming software will be included. The programming software application shall run on the Windows 10 (or a newer Microsoft operating system).

The system shall provide the ability to reprogram individual repeaters through the network backhaul interface. The Supplier shall indicate the extent to which repeater parameters can be configured remotely and whether this programming is restricted to repeater parameters or also includes repeater software.

6.7 Physical Environment

The trunked repeater stations, including repeater and station trunking controller, shall be housed in standard 19-inch width EIA aluminum relay racks of various heights depending on which sites the equipment will be installed. All hardware and software necessary for the stations to perform the trunking functions and to meet the system requirements shall be provided and housed in this same rack.

Duplexer equipment that cannot be mounted in the same rack shall be mounted in an

adjacent aluminum rack.



Repeater/System Minimum Specifications

General

- Compliant with the Telecommunications Industry Association (TIA) Project 25 Common Air Interface.
- Compliant with the European Telecommunications Standards Institute (ETSI) Digital Mobile Radio (DMR) Standard TS-102 361-1, 2, 3, 4.

Standard Operating Modes

1. Analog FM
2. DMR II Digital Conventional
3. Analog FM/DMR II Digital Conventional hybrid system

Software Upgradable Operating Modes

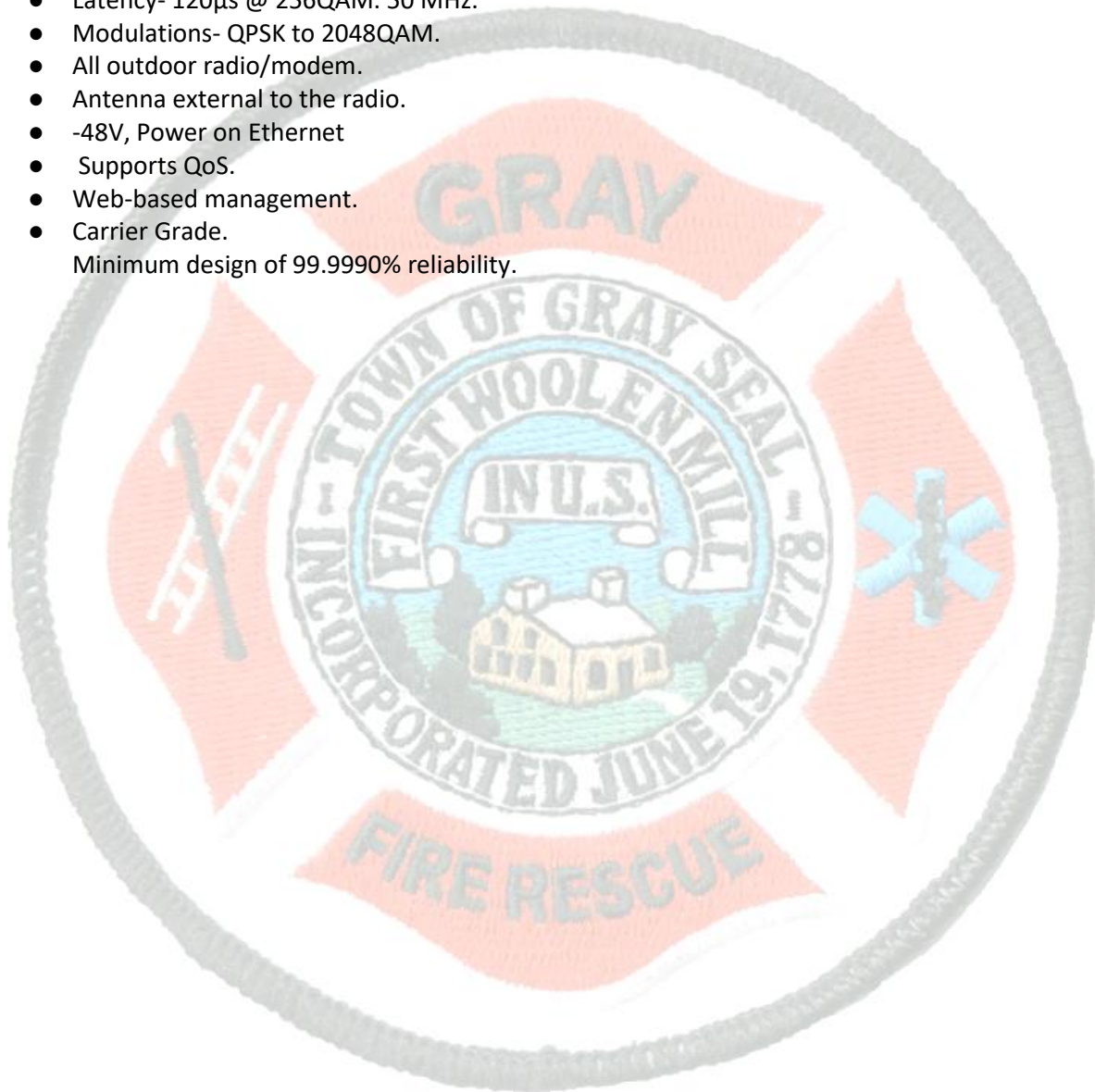
1. P25 Phase 1 Simulcast
2. DMR III Digital Trunked Simulcast

Standard Features and Hardware

- TX and RX frequency range 136-174MHz.
- Output Power Programmable from 2W up to 50W.
- Analog Sensitivity PM modulation: < -119 dBm @ 12 dB SINAD.
- Digital sensitivity C4FM: < -120 dBm @ 5% BER.
- Frequency stability +/- 0.5ppm.
- 4 (four) wire audio line interface (E&M).
- Capable of operating in “dual-mode” and switching automatically from digital DMR II (or P25) to Analog FM on the same channel and vice versa.
- All tuning and configuration entirely via software.
- The synchronization, equalization, and voting are all contained within the repeater.
- Completely “auto-tuning.” Synchronization is maintained. Equalization is automatically adjusted. Voting is automatic and continuous. There is no requirement for periodic alignment and tuning.
- Supports multicast as well as hybrid multicast and simulcast networks using the same hardware/firmware
- Simulcast Master and Sub-Master within the same device. Each repeater with the license feature can be configured as a master or submaster and can be configured as a master in the event of a failure.
- Voting is integral to the repeater.
- Embedded AMBE+2 vocoder.
- Network ethernet port RJ45.
- Serial port RJ12.

Microwave System Minimum Specifications

- FCC Licensed (no unlicensed or 4.9Ghz).
 - 50 Mbps full-duplex minimum.
 - Software upgradable as an add-on future option to 1000 Mbps.
 - Integrated 256-bit AES encryption.
 - Latency- 120 μ s @ 256QAM. 50 MHz.
 - Modulations- QPSK to 2048QAM.
 - All outdoor radio/modem.
 - Antenna external to the radio.
 - -48V, Power on Ethernet
 - Supports QoS.
 - Web-based management.
 - Carrier Grade.
- Minimum design of 99.9990% reliability.



7.0 Antenna Systems

The Supplier shall develop complete antenna systems that achieve the required coverage and are most advantageous to Gray from cost and performance aspects. The antenna system design shall include antennas, antenna mounts, transmission line, lightning suppression, coaxial entrance boot(s), cable hangers, connectors, weatherproofing, ground kits, filters, transmitter duplexers, a receiver multi-coupler, tower-top amp, etc. as appropriate.

All antennas should be designed for mounting at the top of the tower/building (unless otherwise specified by Gray) if they do not extend the overall tower height beyond the ASR (if applicable) height or over 200 feet where there is not an ASR issued.

If the existing radio system antennas are causing a problem with the installation of the new radio system antennas, they can be relocated to a temporary lower location on the tower while they are still in use.

7.1 Repeater Antennas

All repeater antenna configurations shall be designed to provide the specified coverage.

All antennas shall be supplied with all necessary heavy-duty, corrosion-resistant mounting brackets and mounting hardware for both top and side mounting on a mast or tower. All brackets, masts, clamps, and other hardware shall be galvanized or stainless steel. The antennas shall survive undamaged during wind gusts up to 125 mph. The Supplier shall state the mechanical specifications for rated wind speeds.

The supplier shall submit an antenna design with the required antenna types.

All antennas will need to be pre-approved by Gray. Antenna down tilt, where required, shall be generated using electrical down tilt (antenna design). Obtaining pattern down tilt through mechanical mounting methods is not acceptable.

The Town reserves the right to use existing antennas if they will operate according to coverage specs.

7.2 Transmission Line Couplers

Transmission lines shall be constructed from one continuous length of low-loss dielectric coaxial cables.

Cable hangers shall be provided that are appropriate to the type of structure and cable ladder system on which the transmission line is mounted (Valmont/Microflex or equivalent). Cable hanging hardware shall be corrosion protected (galvanized) or made of stainless steel.

7.3 Interconnection RF Cable and Connectors

Super-flexible 1/2" coaxial cable shall be utilized for interconnecting transmitters, combiners, receivers, multi-couplers, and antenna system transmission lines inside of the equipment

building. Type N connectors or better suitable for the 150 MHz band with Teflon insulation and gold or silver-plated mating surfaces, shall be used throughout the RF system. Adapters shall not be used.

8.0 System & Network Management

The Base station and associated equipment shall be capable of secure remote network diagnostics, management, and control, including remote firmware/software upgrades/patches and user access lists, using the Supplier-supplied Network- or Element Management System. Secure local access shall also be provided. Supplier shall provide details of his proposed Network- or Element Management system, including system capabilities, instruction, and use.

The system management device shall be a UNIX or Windows 10 (or newer Microsoft operating system) based computer with a client/server architecture and single-point database for all system management functions. The system shall include at least one system management console which provides system management of the entire system. The vendor shall describe what type of computer, with pricing, that is proposed.

8.1 Network Management Features

- 8.1.1 Network Topology Map: The system management computer shall provide a hierarchical network topology map, showing all managed devices using color-coding to represent device status. Through the network topology map, it shall be possible for the operator to determine the current detailed status of a managed object by double-clicking on the object.
- 8.1.2 Remote Access: The system Manager shall be accessible through the internet. Gray will be responsible for external security access to the System Manager.
- 8.1.3 System Administration: The system administration computer shall support establishing and updating repeater site parameters, remotely enabling, and disabling radios, etc. The supplier shall detail what parameters can be programmed over the air.

The system administration computer shall support the registration of new voice users in the system, assigning voice group membership, and assigning user privileges. The supplier shall list all functions and controls available.

The system administration computer shall connect to the proposed radio system via an IP connection. The system administration computer shall run on Windows 10 or newer Microsoft operating systems.

8.2 Dispatch Equipment

The equipment proposed shall connect to the existing Zetron MAX consoles at the CCRCC Dispatch Center. Gray prefers a direct connection to the DMR network without using control station radios.

Connectivity between the DMR Network and Zetron MAX should be:

- Via IP connection directly connecting the console to the proposed DMR system.
- Or
- Via a wireline connection, using standard tone or E&M format

Gray does not wish to use “control stations” as the primary connection to the system. Connection to the Zetron MAX console will be a direct connection.

8.3 Project management

The supplier will provide a project manager for the project. This person will have project management and telecommunication skill sets and provide comprehensive project management and coordination. Supplier shall anticipate that common project management tools, including on-site meetings, scheduled conference calls, and meeting minutes. Gray Fire-Rescue requires communication with the project manager each Monday morning at a set time until the job has been completed. This communication can be in person, by phone, or virtual. Participants, at a minimum, will be the project manager and the Fire Chief or the Assistant Chief, or their designee.

8.4 Project System Engineering

Project engineering services shall be provided from the initial system design through the completion of system acceptance and the warranty period. At a minimum, the services shall include:

- Final system design and review.
- Coverage prediction and acceptance testing of the analog and digital systems.
- System configuration.
- Implementation & testing support.
- Final system documentation.
- Resolution of technical problems.

8.5 Supplier Service Capabilities and Year 1 Service

The Town requires the following, not to exceed response and repair times during the warranty period: For all fixed infrastructure equipment, 24-hour x7-day coverage. One (1) hour OSR (on-site response) 8-hour repair from time of OSR.

The proposer shall identify in the response the local organization or organizations that will be responsible for the warranty during the first year. If more than one (1) organization is offered, a

breakout shall be provided, identifying the items that each organization will be responsible for.

The response shall include the following information on the offered warranty organization or organizations only if different from the bidder organization: Business name, address, and telephone, number of years in service under this or any other name, name of General Manager and Technical Manager.

The total number of technicians.

A brief overview of the relevant experience of the business.

State whether the organization has any pending litigation and state whether the organization has had any litigation in the last five years.

If the Vendor's warranty and maintenance staff are not the same organization(s) that perform the system and equipment installations, the above information shall be stated in the response for the offered installation organization.

WARRANTY AND MAINTENANCE.

Costs associated with this warranty period shall be clearly and individually identified in the pricing section of the response.

9.0 VENDOR RFP RESPONSE FORMAT

COVER LETTER

Respondents must include a cover letter transmitting the proposal to the Town of Gray, signed by an official authorized to contract for the firm. The letter must contain the name, title, address, telephone number, and email of the firm's contact person for the Proposal. The letter shall contain a statement that the respondent understands and agrees with the scope of work and accepts all other requirements and terms and conditions of the RFP.

TABLE OF CONTENTS

SECTION 1 – SYSTEM OVERVIEW, REFERENCES, AND WARRANTY

- **System Overview** - Submit an executive summary of your proposed system and equipment provided, covering the main features and benefits that distinguish it in non-technical terms.
- **Prime Proposer** - Introduction of the prime Proposer company, including history, qualifications, experience, the main line of business, and how business is organized (corporation, partnership, public, private, etc.).
- **Sub-contractors** - Introduction of the Sub-contractors, including history, qualifications, experience, the main line of business, and how business is organized (corporation, partnership, public, private, etc.). Identify all Sub-contractors by listing name, address, phone, and contact person. State whether the prime Proposer has worked with the Sub-contractors in the past. If so, provide brief descriptions of the projects - no more than 3; the

system elements; the Scope of each Sub-contractor's responsibility; the approximate start date and duration of the project.

- **List of References** - For both Prime and Sub-contractors. Provide a list of three (3) references with radio systems having similar requirements to this solicitation. The systems identified shall have been accepted no less than six (6) months and no greater than two (2) years from the due date of this response. Include a brief description of the system, approximate date of acceptance, contact name, and telephone number.
- **Warranty** - This sub-section shall also contain all of the warranty information requested.

SECTION 2 – COMPLIANCE SECTION

- If there are any exceptions, clarification, or other notes of concern, please *list in detail all exceptions* and related discussion to the specification. In addition, discussion regarding any points of clarification shall also be provided in this section. Use as many pages as necessary to describe each exception or clarification. Please provide clear references to the Specification document where needed.
- Note that Town of Gray will have the final interpretation of what is a clarification or an exception. In no instance shall the Proposer deem an exception as a clarification.
- Please identify the anticipated responsibilities of the Town of Gray in this section.
- Any item of clarification or exception that is not included in this section will be deemed to have been accepted and agreed to by the Proposer.
- For clarifications or substitutions, provide an explanation of the difference between what the specification requested and what the Proposer will supply. Proposers shall explain why they believe their method of accomplishing the requested functionality will be equal to or better than what is requested.
- It is the Proposer's choice to submit a point X point response to the specifications.

SECTION 3 – STATEMENT OF WORK

- Describe the work to be performed in detail by the prime Proposer by identifying all major project tasks and milestones.
- Describe the work to be performed by each Sub-contractor by identifying all major project tasks and milestones. Group all project tasks by their associated sub-contractors.
- Provide a proposed project organizational chart.
- Provide a Project Schedule

SECTION 4 - TECHNICAL SYSTEM INFORMATION

- Description of the system or equipment being offered.
- Description of specification items requesting a detailed response.
- Include block system diagrams, network configuration, equipment interfaces, plan views and diagrams that clearly depict the proposed system, its equipment, and components. These diagrams shall be provided on a per-site basis.
- Other diagrams as required.
- Include a detailed itemized list and quantities, in matrix form, of all equipment supplied and their intended installed location. The matrix should have equipment items on the vertical scale [rows] and site locations on the horizontal scale [columns]. Do not include costs.

SECTION 5 – COVERAGE RESPONSE

- This section shall contain all detailed discussion regarding signal propagation and shall include coverage maps (required) and other items as specified in this document.

SECTION 6 – MICROWAVE SYSTEM RESPONSE

- This section shall contain all detailed discussions regarding the microwave system. It shall include routing maps, point-to-point path profiles, antenna/path calculation sheets, and other items specified in this document.

SECTION 7 – PRICING

- Vendors shall submit their cost proposals based upon their best offer price at the initial RFP submission, including any special discounts. The equipment proposed by the Vendors shall be a complete turnkey system, with firm pricing for all equipment and services described by the specifications. The town of Gray shall not pay for any additions, omissions, or errors in the cost proposals.
- The town of Gray will not consider adjusted pricing once the bid period closes.
- Cost for major services such as installation, licensing, systems engineering, program management, coverage testing, training, etc., shall be clearly identified as separate line items. Costs for these services shall not be lumped.
- Prices must be held for (90) days after RFP due date to allow for a vendor to be selected and a contract can be awarded.
- Prices are not subject to increase after a contract has been signed. The Town of Gray is not liable for escalation resulting from project delays caused by the Vendor. All pricing shall be FOB destination.
- Detailed cost sheets shall be in matrix form to the greatest extent possible.
- Identify all cost sheet items as line items, at a minimum and in the following order: the item number, manufacturer, model number, descriptor, quantity and intended location, total quantity, unit cost, and extended cost.
- Any costs for optional items or offerings shall be clearly stated as optional.

SECTION 8 – Specification Sheets

- Include equipment catalog, cut sheets, brochures, or specification sheets in this section.